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АНГЛИЙСКИЙ ЯЗЫК ДЛЯ СТРОИТЕЛЕЙ

УЧЕБНО-МЕТОДИЧЕСКИЙ КОМПЛЕКС
для студентов специальности 1-70 04 02
«Теплогазоснабжение, вентиляция и охрана воздушного бассейна»

Составление и общая редакция
Н. Г. Антонович, Т. М. Королёвой

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РЕЦЕНЗЕНТЫ:

С. С. КОСТЫРЕВА, канд. филол. наук, зам. директора по УВ и НР,
декан факультета УО ВФ ФПБ «МИТСО»;
Т. М. КОТЕНКОВА., магистр пед. наук,
ст. преподаватель кафедры иностранных языков

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Представлено содержание изучаемого курса на втором этапе обучения (2 – 4 семестры), определены цели, задачи и объем практических занятий каждого семестра. Комплекс построен по модульно-блочному типу. Материал учебных блоков каждого модуля объединен тематически и рассчитан на один семестр.

Предлагаются тесты для входного и итогового контроля каждого модуля, ключи к тестам, комплекс лексико-грамматических упражнений и текстов для дополнительного чтения.

Предназначен для студентов специальности «Теплогазоснабжение, вентиляция и охрана воздушного бассейна».

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СОДЕРЖАНИЕ

ПРЕДИСЛОВИЕ

В настоящее время одной из основных отличительных особенностей изучения иностранного языка в вузе студентами неязыковых специальностей является его профессионально-ориентированный характер, отраженный в учебной цели и содержании обучения. Идет поиск наиболее эффективных методов и технологий организации учебного процесса. Особый акцент делается на организацию самостоятельной работы студента. Это вдвойне оправдано относительно изучения иностранного языка, так как специалисты говорят, что языку нельзя научить, а можно только научиться. Эффективным инструментом обеспечения самостоятельной работы является использование в учебном процессе учебно-методических комплексов (УМК). УМК нового поколения, в отличие от традиционных, не имеют в своей структуре учебника как такового, а представляют собой сжатый банк информации с целевой программой действий и различными формами самоконтроля знаний. Такие УМК должны и могут быть созданы только при наличии и ведущей роли учебника или учебников, хрестоматий и других источников информации. К сожалению, специальность 1-70 04 02 «Теплогазоснабжение, вентиляция и охрана воздушного бассейна», не привлекла до сих пор внимания ученых-педагогов, и никакого базового учебника или учебного пособия по данной специальности нет. Исходя из этого, авторы попытались, сохраняя суть и структуру УМК, максимально наполнить его текстами по специальности, чтобы в конце курса и студент, и преподаватель могли сказать: «Наша цель – практическое владение иностранным языком как средством общения в сфере профессиональной деятельности – достигнута».

ВВЕДЕНИЕ

В соответствии с Типовой Программой по иностранным языкам для высших учебных заведений неязыковых специальностей [11] «весь курс методически делится на несколько этапов:

1-й этап – I семестр; 2-й этап – II – IV/V семестры;

3-й этап – V – VII семестры; 4-й этап – VIII – IX семестры»

Учебными планами по специальностям 1-70 04 02 «Теплогазоснабжение, вентиляция и охрана воздушного бассейна» изучение иностранных языков предусмотрено с I по IV семестры, что соответствует первому и второму этапам обучения. В связи с тем, что для первого этапа учебно-методический комплекс уже разработан (УМК «Английский язык» Т.М. Котенкова, Новополоцк 2004) и может быть использован для всех неязыковых специальностей, данный УМК охватывает II – IV семестры, т.е. соответствует второму этапу обучения.

Учебными планами по специальностям «Теплогазоснабжение, вентиляция и охрана воздушного бассейна» второй этап обучения рассчитан на 166 часов.

Цель данного этапа, согласно Типовой Программе, – «развить и закрепить способность студента выражать свои мысли на иностранном языке адекватно намерению и коммуникативной ситуации, ввести студентов в область иноязычного профессионально ориентированного общения».

Задачи: «в конце курса студенты должны:

– усвоить различия между устной и письменной формами коммуникаций;

– овладеть основными механизмами построения сложных и производных слов, словосочетаний, предложений и видами текстов в устной и письменной формах коммуникации;

– усвоить основные языковые формы и речевые формулы, служащие для выражения определенных видов намерений, оценок, отношений и т.п.».

Формы контроля

Изучение всего курса завершается экзаменом, который включает в себя:

1) письменный перевод текста профессионально-ориентированного характера со словарем (1600 печатных знаков за академический час);

2) передачу содержания текста для общего ознакомления (1500 печатных знака за 10 минут) на родном или иностранном языке;

3) монологическое сообщение по изученному материалу применительно к знакомым типовым ситуациям. Объем высказывания – до 20 фраз;

4) ситуативно-обусловленную беседу с преподавателем (10 – 12 реплик).

Перечень тем, выносимых на экзамен для устного собеседования:

1. My family and biography.
2. My working day and day off.
3. Our university.
4. Novopolotsk.
5. Belarus.
6. Great Britain.
7. My future profession.
8. Environmental protection.
9. HVAC.

Кроме того, программа предусматривает текущий и промежуточный контроль в устной форме и в виде тестирования в зависимости от требуемого уровня усвоения, а также семестровый зачет, который носит накопительный характер.

Нормы оценки

1. Оценка перевода

Уровни	Баллы	Чтение
	0	Отсутствие перевода или отказ от него.
I. Низкий (рецептивный)	1	Перевод текста на уровне отдельных словосочетаний и предложений при проявлении усилий и мотивации.
	2	Неполный перевод текста (менее 90 %). Допускаются грубые искажения в передаче содержания. Отсутствует правильная передача характерных особенностей стиля переводимого текста.
II. Удовлетворительный (рецептивно-репродуктивный)	3	Неполный перевод (90 %). Допускаются грубые смысловые и терминологические искажения. Нарушается правильность передачи характерных особенностей стиля переводимого текста.
	4	Полный перевод. Допускаются грубые терминологические искажения. Нарушается правильность передачи характерных особенностей стиля переводимого текста.
III. Средний (репродуктивно-продуктивный)	5	Полный перевод. Допускаются незначительные искажения смысла и терминологии. Не нарушается правильность передачи стиля переводимого текста.
	6	Полный перевод. Отсутствуют смысловые искажения. Допускаются незначительные терминологические искажения. Нарушается правильность передачи характерных особенностей стиля переводимого текста.

IV. Достаточный (продуктивный)	7	Полный перевод. Соблюдается точность передачи содержания. Отсутствуют терминологические искажения. Допускаются незначительные нарушения характерных особенностей стиля переводимого текста.
	8	Полный перевод. Отсутствуют смысловые и терминологические искажения. В основном соблюдается правильная передача характерных особенностей стиля переводимого текста.
V. Высокий (продуктивный, творческий)	9	Полный перевод. Отсутствие смысловых и терминологических искажений. Правильная передача характерных особенностей стиля переводимого текста.
	10	Полный перевод. Отсутствие смысловых и терминологических искажений. Творческий подход к передаче характерных особенностей стиля переводимого текста.

2. Оценка понимания при чтении. Показатели оценки чтения

Уровни	Баллы	Чтение
	0	Отсутствие ответа или отказ от ответа.
I. Низкий (рецептивный)	1	Понимание менее 30 % основных фактов и смысловых связей между ними.
	2	Понимание 30 % основных фактов и смысловых связей между ними.
II. Удовлетворительный (рецептивно-репродуктивный)	3	Понимание менее 50 % основных фактов и смысловых связей между ними.
	4	Понимание 50 % основных фактов текста и смысловых связей между ними.
III. Средний (репродуктивно-продуктивный)	5	Понимание большинства основных фактов текста, смысловых связей между ними и отдельных деталей текста.
	6	Понимание всех основных фактов текста, смысловых связей между ними и 50 % деталей текста.
IV. Достаточный (продуктивный)	7	Понимание всех основных фактов текста, смысловых связей между ними и 70 % деталей текста.
	8	Понимание всех основных фактов текста, смысловых связей между ними и 80 % деталей текста.
V. Высокий (продуктивный, творческий)	9	Понимание всех основных фактов текста, смысловых связей между ними и 90 % деталей текста.
	10	100-процентное понимание основных фактов текста, смысловых связей между ними и деталей текста.

3. Оценка письменных тестов

Шкала перевода в десятибалльную систему в соответствии с Приложением к постановлению Министерства образования РБ от 1.04.2004 г. № 22

100 % – 95 % правильных ответов	10 баллов
94 % – 90 % правильных ответов	9 баллов
89 % – 83 % правильных ответов	8 баллов
82 % – 75 % правильных ответов	7 баллов
74 % – 65 % правильных ответов	6 баллов
64 % – 50 % правильных ответов	5 баллов
49 % – 35 % правильных ответов	4 баллов
34 % – 20 % правильных ответов	3 баллов
19 % – 10 % правильных ответов	2 баллов
9 % – 2 % правильных ответов	1 баллов
1 % – 0 % правильных ответов	0 баллов

Наименьшая положительная оценка – 4 балла – выставляется при правильном выполнении не менее 2/3 заданий. Отсутствие работы или отказ от выполнения соответствуют оценке 0 баллов.

РАБОЧАЯ ПРОГРАММА

Модульная структура курса «Английский язык»
для специальности «Теплогазоснабжение, вентиляция
и охрана воздушного бассейна» 1-70 04 02 (I – IV семестры)

М-0 | М-1 | М-2 | М-3 | М-4 | М-Р | М-К

№	семестры	Название модулей	Количество часов
М-0	I	Введение в курс. Дидактическая цель курса	
М-1	I	Введение в специальность	72
М-2	II	Профессия инженера-строителя	64
М-3	III	Отопление	54
М-4	IV	Вентиляция и кондиционирование воздуха	48
М-Р	IV	Резюме	
М-К	V	Итоговый контроль	
		Итого практических занятий:	238

Модуль 2 «My Future Profession» (II семестр)							
УБ-0	УБ-1	УБ-2	УБ-3	УБ-4	УБ-5	УБ-6	УБ-К

	Название учебных элементов	Форма занятия	Количество часов
УБ-0	Введение в модуль	практ. занятие	2
УБ-1	«My Future Profession»	практ. занятие	8
УБ-2	«Air and its Properties»	практ. занятие	8
УБ-3	«Human Comfort and Indoor Air Quality (IAQ)»	практ. занятие	8
УБ-4	«Indoor Air Pollution»	практ. занятие	8
УБ-5	«Environmental Protection»	практ. занятие	12
УБ-6	«HVAC»	практ. занятие	8
УБ-К	Final Control	зачет	2
Итого практических занятий:			64

Модуль 3 «Heating » (III семестр)									
УБ-0	УБ-1	УБ-2	УБ-3	УБ-4	УБ-5	УБ-6	УБ-7	УБ-8	УБ-К

	Название учебных элементов	Форма занятия	Количество часов
УБ-0	Введение в модуль	практ. занятие	2
УБ-1	«Heating»	практ. занятие	6
УБ-2	«Panel Heating»	практ. занятие	6
УБ-3	«Natural Gas»	практ. занятие	8
УБ-4	«Gas Burner»	практ. занятие	6
УБ-5	«Fuel and Heating Oil»	практ. занятие	6
УБ-6	«Boilers»	практ. занятие	6
УБ-7	«Classification of Boilers»	практ. занятие	6
УБ-8	«Radiators»	практ. занятие	6
УБ-К	Final Control	зачет	2
Итого практических занятий:			54

Модуль 4 «Ventilation and Air Conditioning » (IV семестр)								
УБ-0	УБ-1	УБ-2	УБ-3	УБ-4	УБ-5	УБ-6	УБ-Р	УБ-К

	Название учебных элементов	Форма занятия	Количество часов
УБ-0	Введение в модуль	практ. занятие	2
УБ-1	Pure Air for Respiration	практ. занятие	8

УБ-2	Natural Ventilation	практ. занятие	6
УБ-3	Ventilation Combined with Heating	практ. занятие	6
УБ-4	Fans	практ. занятие	8
УБ-5	Basic Principles of Air Conditioning	практ. занятие	8
УБ-6	Types of Air Conditioners	практ. занятие	8
УБ-К	Final Control	зачет	2
Итого практических занятий:			48

Как вы видите, рабочая программа данного комплекса построена по блочно-модульному принципу: весь курс разбит на модули, а те, в свою очередь, на учебные блоки (УБ). Учебный модуль – это, по сути, целевой план действий студента плюс банк информации (текст) плюс методическое руководство по достижению поставленных целей. Учебные модули сопровождаются «модулями дополнительного порядка:

– модуль нулевой (М-0) служит введением в изучение курса;

– модуль-контроль (М-К) обеспечивает итоговый контроль по курсу [10].

Материал учебных блоков каждого модуля объединен тематически и рассчитан на один семестр. Каждый модуль начинается нулевым учебным блоком (УБ-0), служащим введением в модуль и обозначающим интегрирующую цель.

Заканчивается модуль учебным блоком – контроль (УБ-К) – итоговый контроль.

УБ-0 и УБ-К включают в себя тесты для самоконтроля, ключи к которым можно найти в приложении 1. В приложении 2 находятся ключи к анкете по теме «Охрана окружающей среды», а в приложении 3 список наиболее распространенных химических элементов.

Для повторения грамматики рекомендуется учебник: Карпышева Н. М., Янушков В. Н. Практическая грамматика английского языка. – Минск : САДИ, 1996.

Прежде чем приступить к работе с УМК, вам необходимо ознакомиться с целями и задачами, как всего курса, так и каждого модуля. Обратите внимание на название модулей и учебных блоков и их последовательность – это порядок, в котором вы будете их изучать. Следуйте инструкциям каждого учебного блока.

Желаем успехов!

МОДУЛЬНОЕ ОБЕСПЕЧЕНИЕ КУРСА

МОДУЛЬ 2

Модуль 2 «My Future Profession» (II семестр)							
УБ-0	УБ-1	УБ-2	УБ-3	УБ-4	УБ-5	УБ-6	УБ-К

	Название учебных элементов	Форма занятия	Количество часов
УБ-0	Введение в модуль	практ. занятие	2
УБ-1	«My Future Profession»	практ. занятие	8
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УБ-4	«Indoor Air Pollution»	практ. занятие	8
УБ-5	«Environmental Protection»	практ. занятие	12
УБ-6	«HVAC»	практ. занятие	8
УБ-К	Final Control	зачет	2
Итого практических занятий:			64

УБ-0. ВВЕДЕНИЕ В МОДУЛЬ

Интегрирующая цель:

Вы должны знать:	Вы должны уметь:
Грамматика: 1. Основные способы словообразования. 2. Притяжательный падеж. 3. Степени сравнения. 4. Времена Simple, Continuous, Perfect в действительном залоге. 5. Страдательный залог. 6. Модальные глаголы. 7. Причастие I, II в функции определения. Лексика: Основную лексику по темам модуля.	Использовать знания грамматики и лексики на различных этапах работы с текстом: при ознакомительном и изучающем чтении, при переводе, а также в устной речи, как в форме диалогов, так и в монологических высказываниях.

Entry Test 1

(Входной тест)

Part A

Ответьте на вопросы.

I. How do you see your future profession? Which of the following would you like (√) or not like (×) in a job?

1. a) well-paid but boring and routine work;
   b) badly-paid but interesting work.
2. a) working with the same people;
   b) meeting a lot of different people.

3. a) wearing a uniform;
   b) wearing what you like.
4. a) working mostly indoors;
   b) working mostly outdoors.
5. a) intellectual work;
   b) physical or manual work.
6. a) working flexible hours (including weekends);
   b) working set working hours every day.
7. a) traveling a lot in your job;
   b) no traveling on business.
8. a) working mainly with people of your own sex;
   b) working mainly with people of the opposite sex;
   c) working with people of both sexes.
9. a) working in a large company that employs thousands of people;
   b) working in an organization that employs up to a hundred people;
   c) working in a firm that employs ten or fewer people.

II. What are the most important factors for you in your work? Arrange these aspects in order of importance and add some more things you think are important.

1. job satisfaction;
2. earning plenty of money;
3. having pleasant co-workers/ colleagues;
4. meeting people;
5. security and good working conditions;
6. good career prospects.

III. Out of all the people you know who have the job you'd most like to have? Why?

IV. If you could choose any job in the world to do, what would it be?

V. Please, discuss advantages and disadvantages of your future profession.

a) Do you think your future profession is prestigious and well-paid?
b) Is the job more suitable for men / women?
c) How difficult is it to find a good job in your field?

Part B

I. Прочтите предложения, определив время и залог сказуемого. Переведите предложения.

1. The number of new devices in our country is increasing constantly.
2. This engineer's design was much spoken about at the conference.
3. Building engineering has developed the system of heating.
4. Testing the device the engineer applied new methods.
5. In future scientists will discover new materials for industrial processes.
6. The operation of this device is studied by engineers.
7. Specialists of all branches do their best to protect the environment.
8. This problem will be discussed at the meeting in a week.

II. Заполните предложения, выбрав один из приведенных вариантов. Только один ответ является верным.

1. ____ name is Alice Stevens. She is a teacher.
   a) she c) her
   b) it d) hers
2. It is not her bag. It is ____.
   a) our c) mine
   b) my d) their
3. I took the book and opened ____.
   a) she c) it
   b) her d) hers
4. I have not done ____ work today.
   a) many c) few
   b) much d) a few
5. I don’t want ____ of these books.
   a) any c) something
   b) some d) everything
6. Could I see these ear-rings, please? – These ____?
   a) one c) some
   b) any d) ones
7. This lake is ____ than that one.
   a) more beautiful c) as beautiful as
   b) most beautiful d) beautiful
8. ____ Indian Ocean is between Africa and Australia.
   a) – c) an
   b) the d) a

9. Would you like ____ egg or a sandwich?

a) a c) –

b) an d) the

10. Our flat is ____ the second floor of the building.

a) on c) at

b) in d) –

УЧЕБНЫЙ БЛОК 1 (УБ-1)
«MY FUTURE PROFESSION»

Цели:

Вы должны знать:	Вы должны уметь:
1. Грамматика: – Настоящие времена (Present Tenses), их вопросительная и отрицательная формы; – Герундий (Gerund); – Модальные глаголы (Modal Verbs). 2. Лексика: – азы строительной терминологии. 3. Место и значение работы инженера-строителя в народном хозяйстве.	Использовать грамматические и лексические навыки: а) для чтения и перевода текстов, б) в диалогической и монологической речи по теме «Моя будущая профессия».

I. Vocabulary and grammar

1. Read these international words and try to guess their meaning.

Faculty (n), specialist (n), design (n), construct (v), industry (n), industrial (adj), gasification (n), modern (adj), central (adj), atmospheric (adj), temperature (n), comfort (n), function (n), nature (n), natural (adj), economical (adj), thermodynamics (n), conditioning (n).

2. Read the words and try to remember their meanings.

various (adj)	part (n)	equal (adj)
graduate from (v)	clean (adj)	field (n)
provide (v)	health (n)	hard (adj)
require (v)	space (n)	warm (adj)
produce (v)	air (n)	use (v)
advantage (n)	connect (v)	keep (v)
source (n)	imagine (v)	
cooking (n)	erect (v)	

3. Read and memorize the active vocabulary to the text.

honourable (adj)	почетный
protection (n)	защита
utilization (n)	употребление
maintenance (n)	эксплуатация, техническое обслуживание
maintain (v)	использовать, обслуживать
environment (n)	окружающая среда
branch (n)	отрасль
purpose (n)	цель
cheap (adj)	дешевый
cost (n,v)	стоимость, стоить
excess (n)	избыток, излишек
odour (n)	запах
amenities (n) pl.	удобства
indispensable (adj)	необходимый
treatment (n)	обработка, очистка
pollution (n)	загрязнение
equipment (n)	оборудование
device (n)	механизм, прибор

4. Memorize the following new word combinations.

industrial heating	теплофикация
gas supply	газоснабжение
heat supply	теплоснабжение
water supply	водоснабжение
air conditioning	кондиционирование воздуха
research institution	научно-исследовательский институт
boiler plant	котельная установка
heating plant	теплоцентраль
methods of cleaning industrial waste gas	методы очистки промышленных газовых выбросов
economics and planning of sanitary work	экономика и планирование санитарно-технических работ
safety work	охрана труда
purification plant	очистная установка
treatment plant	обрабатывающая установка
to be concerned with	быть связанным с чем-либо
to be busy with	заниматься чем-либо
to deal with	иметь дело с чем-либо
to do one's best	делать все возможное
to carry away	уносить
achievements of science	достижения науки

5. Think of synonyms for the following words.

Construct (v), field (n), different (adj), provide (v), aim (n), conveniences (n), necessary (adj).

6. Give antonyms for the following words.

Advantage (n), discomfort (n), dirty (adj), inconvenient (adj), important (adj), pollution (n).

7. Give derivatives of the following words.

Design (v), construct (v), equal (adj), hard (adj), require (v), warm (adj), concern (v), use (v), utilize (v).

8. Give the three forms of the following verbs.

To be, to supply, to deal, to do, to protect, to say, to keep, to make, to become, to study.

9. Form Gerunds from the following verbs and translate them into Russian.

To design, to construct, to use, to provide, to produce, to keep, to study.

10. Read the sentences and word combinations, translate them into Russian paying attention to:

a) Tense Forms-

1. Many students study at PSU. 2. The graduates will work as building engineers. 3. Engineers were busy with designing heating systems. 4. Specialists of all branches of sanitary engineering do their best to protect the environment. 5. It has become widely used. 6. We have been using natural gas as economical source of heat for many years. 7. Now specialists are using this new method of treatment.

b) Modal verbs-

We can hardly imagine, one must study hard, you should be familiar with, you have to study hard, they are to be, they must be well aware of.

c) Gerund-

After graduating from the Institute, engineers are busy with designing and constructing, specialists of building engineering, the advantage of central heating, the temperature for maintaining comfort, the methods of cleaning industrial waste gas.

11. Read and translate the following sentences paying attention to the verb-form of the predicate. Put sentences into negative and interrogative forms.

1. The protection of the environment is a very important problem nowadays.
2. Building engineers deal with the maintenance of heating systems at the plant.
3. Ventilation carries away excess heat and odours.
4. They have built a lot of purification and treatment plants at many chemical enterprises.
5. Today building engineers are working at putting boiling and central heating plants into operation.
6. This term the students of our faculty are going to study the methods of cleaning industrial waste gas and safety work.
7. Most of the people in our country have flats with all modern amenities.
8. Modern building construction has connected very closely all branches of building engineering.
9. Central heating has been keeping homes well heated in winter time for many years.
10. Gas supply is becoming an indispensable part of modern amenities nowadays.

II. Work with the text

1. Read the text and do the exercises that follow it.

My future profession

Finishing school is the beginning of the independent life for millions of school-leavers. Many roads are opened before them: vocational and technical schools, colleges and universities. But it is not an easy thing to choose a profession out of more than 2000 existing in the world. Some people choose the industrial training centers, some follow the advice of their parents, others can't decide even after leaving school.

As for me, I made my choice and now I am a student of Polotsk State University. I study at the building-engineering faculty. After graduating from the University, the graduates of this faculty will work as building engineers in various parts of our country.

The profession of a building engineer is very honorable and important nowadays. Building engineers are busy with designing and construction of heat-

ing and ventilating systems, air conditioning, industrial heating and gasification of modern dwellings. They also deal with the maintenance of heating systems, ventilation and gas supply at the plants. They design and construct water supply systems for domestic and industrial purposes, erect various purification and treatment plants. They should be familiar with possible problems at their work and should know how to solve them. Specialists of all branches of building engineering do their best to protect the environment against various forms and types of pollution.

All branches of building engineering are equally important, but I'd like to say some words about specialists in heat and gas supply and ventilation.

These branches are very closely connected as they are concerned (related) with providing a required atmospheric environment.

The purpose of heat supply is to produce a desired temperature for maintaining comfort and health of the occupants. The most widely used system of heating is central heating. The advantage of central heating is that it keeps homes well heated at a cheap cost.

The main function of ventilation is to carry away excess heat and odors.

Gas supply is another indispensable part of modern amenities. It has come to be very widely used. The main advantage of natural gas is that it is a clean, convenient and economical source of heat. In homes it is used for cooking, water heating as well as for space heating.

As to the air conditioning it is treatment of the air in buildings so as to make it more comfortable for the occupants.

Our University gives us all opportunities for our studying. At the University the students with the help of highly qualified teachers study many subjects concerning their future profession such as: heating, thermodynamics, heat supply, gas supply, air conditioning, ventilation. Besides they study the methods of cleaning industrial waste gas, boiler units, organization of building work, economics and planning of building work, safety work, computers and their usage in calculating building-engineering systems, etc.

We must study hard to become good specialists and take an active part in the life of our country.

2. Choose the best alternative according to the text.

1. Building engineers are busy with designing and constructing

a) building equipment b) heating and ventilation systems

c) sewerage systems

2. They are also busy with

a) protection of the environment b) water treatment

c) new energy sources discovery

3. The purpose of heat supply is

a) to clean and to dry the air b) to produce a desired temperature

c) to treat the air

4. The most widely used heating system is

a) local system b) central heating

c) other ones

5. The main purpose of ventilation is

a) control of air pressure b) to control climate

c) to carry away excess heat

6. The main advantage of natural gas is that it is

a) cheap and clean b) harmless

c) colorless

7. Air conditioning is designed

a) to modify air temperature b) to control air humidity

c) to treat air from contaminants d) to perform all the above mentioned functions

3. Agree or disagree with the following statements.

1. The profession of a building engineer is very honorable and important nowadays.

2. Building engineers are busy with designing and constructing heating and ventilation systems as well as gas and water supply systems.

3. They are also busy with constructing tunnels and bridges.

4. Heating and ventilation are very closely connected as they are both concerned with providing a required atmospheric environment.

5. The main function of ventilation is to produce a desired temperature within a room.

6. Natural gas is known as a clean, convenient and economical source of heat.

7. At the University students study many subjects concerning their future profession such as building materials, construction machinery, architecture and other subjects.

4. Answer the following questions.

1. What are you to do after finishing school?
2. Is it an easy thing to choose a profession?

3. What do you want to become and why?
4. What faculty do you study at?
5. What are building engineers busy with?
6. All branches of building engineering are equally important, aren't they?
7. What is the role of heating in modern dwellings?
8. Why is central heating considered to be the most widely used system of heating?
9. What is the function of ventilation?
10. What are the main characteristics of natural gas?
11. Where is natural gas used?
12. What is air conditioning? What is its role?
13. What subjects do students study at the University?

5. Put in the right prepositions.

1. I am a student…PSU. 2. We'll be building engineers…graduating…the University. 3. Building engineers are busy…heating, ventilation and air conditioning. 4. Engineers also deal…the gas supply at the plants. 5. Building engineers do their best to protect the environment…various forms and types …pollution. 6. Specialists must be well aware…the importance… heat and gas supply processes. 7. It is difficult to imagine a modern house…heating and ventilating systems. 8. The main purpose …ventilation is to carry…excess heat and odours. 9. Gas is used as an economical and convenient source…heat. 10. Heating and ventilation are both concerned…providing the climate control in a building.

6. Complete the following statements.

1. The profession of a building engineer is… .
2. Building engineers are busy with… .
3. They also deal with… .
4. Specialists of all branches of building engineering do their best to… .
5. Building engineers design…, erect… .
6. The purpose of heat supply is… .
7. The main function of ventilation is… .
8. We characterize natural gas as… .
9. Air conditioning is… .
10. To become good specialists students study many subjects such as… .

7. Translate from Russian into English.

1. Инженер-строитель проектирует и строит системы отопления, вентиляции и кондиционирования воздуха в помещении, очистные и перерабатывающие установки на предприятии, а также делает все возможное для защиты окружающей среды. 2. В данный момент специалисты работают над внедрением достижений науки в производство. 3. Современная система центрального отопления дает тепло в дома и квартиры горожан. 4. Использование нового оборудования сэкономило время и энергию нагрева помещения. 5. Современная система теплоснабжения использует природный газ, как чистый и экономичный источник энергии. 6. Не входите. Специалисты обсуждают вопрос газоснабжения этого района. 7. Современная система кондиционирования охлаждает, очищает, нагревает и вентилирует воздух в помещении. 8. Предприятие купило новое климатическое, вентиляционное и тепловое оборудование. 9. К зиме сформирован большой ассортимент теплового оборудования. 10. Фирма производит высококачественное оборудование на протяжении сорока лет. 11. Ученые найдут грамотное решение проблемы. 12. Компания выполняет полный комплекс проектных, строительных, монтажных и инженерных работ.

III. Summarizing

1. Look through the text again and discuss it in the form of a dialogue using the active words and expressions. The topics for dialogues:

– What are building engineers busy with?
– Heating
– Ventilation
– Air conditioning
– Subjects to study

2. Get ready to speak on the topic «My future profession».

IV. Supplementary reading

1. Read the text. Translate it in written form using a dictionary.

Building engineering: a discipline for the modern era

Building engineering, commonly known as architectural engineering, is an engineering discipline that concerns the planning, designing, construction operation, renovation, and maintenance of buildings, as well as their impacts (influence) on the surrounding environment. As building construction projects are increasingly large and complex, the discipline requires knowledge integrated from several disciplines: Civil engineering; Mechanical engineering for Heating, Ventilation and Air Conditioning system; Physics for building lighting and acoustics; Electrical engineering; Chemistry and biology for indoor air quality; Architecture for building forms.

Education. Building engineers would normally have an accredited academic degree with a concentration in building engineering from a recognized university. The completed degree may be a Bachelor of Engineering or a Bachelor of Science. The length of study is between three to four years and the program consists of engineering sciences and subjects such as technical drawing, engineering mechanics, mechanics of materials, thermodynamics, mathematics, computer programming, surveying, structural analysis and design, soil mechanics, building engineering systems, the visual environment, building design, building economics, construction management, thermal environment and building service systems. Elective courses at the end of the program allow students to specialize in one or more sub-disciplines.

Some building engineers may get a postgraduate degree such as a Master of Engineering, Master of Science, an Engineer's degree, or a Doctor of Engineering. The Master and Engineer's degree may consist of either research, coursework or a mixture of the two. The Doctor of Engineering consists of a significant research component and is often viewed as the entry point to academia.

building engineering – жилищно-общественное строительство
civil engineering – гражданское строительство
mechanical engineering – машиностроение
electrical engineering – электротехника
visual environment – окружающий мир
soil mechanics – механика грунтов
surveying – геодезия
building service – коммунальные услуги

УЧЕБНЫЙ БЛОК 2 (УБ-2)
«AIR AND ITS PROPERTIES»

Цели:

Вы должны знать:	Вы должны уметь:
1. Грамматика: – Словообразование (Word Building); – Пассивный Залог (Passive Voice); – Причастие I, II (Participle I, II); – Настоящие времена (Present Tenses). 2. Лексика: – ключевые слова и словосочетания по теме «Air and its Properties».	– использовать знания грамматики и ключевых слов в переводе текста; – рассказать и провести беседу о воздухе и его составе.

I. Vocabulary and grammar

1. Read these international words and try to guess their meaning.

Argon (n), carbon (n), krypton (n), neon (n), chemical (adj), combination (n), mixture (n), gas (n), product (n), ion (n), indication (n), effect (n), atmosphere (n), discomfort (n).

2. Read the words and try to remember their meanings.

composition (n)	quantity (n)	occupy (v)
proportion (n)	reaction (n)	necessary (adj)
different (adj)	pure (adj)	increase (v)
amount (n)	destroy (v)	present (v)
variable (adj)	contain (v)	measurement (n)
dependent (adj)	weak (adj)	partially (adv)
volume (n)	soil (n)	building (n)

3. Read out the following words and memorize them.

nitrogen ['naitrədʒən]	азот
argon ['a:gən]	аргон
oxygen ['ɔksidʒən]	кислород
carbon ['ka:bən]	углерод
dioxide [dai'ɔksaid]	двуокись
hydrogen ['haidridʒən]	водород
neon ['ni:ən]	неон
krypton ['kriptɔn]	криптон
helium ['hi:ljəm]	гелий

ozone ['əuzəun]	озон
xenon ['zenon]	ксенон
dilute [dai'lju:t]	разбавлять, разжижать
vapor (n)	пар
harmful (adj)	вредный
destroy (v)	разрушать
dissolve (v)	растворять
vary (v)	изменяться
dust (n)	пыль
content (n)	содержание
artificial (adj)	искусственный
odor (n)	запах
condition (n)	условие
constitute (v)	составлять
impurity (n)	примесь
additives (n)	добавки
breathe, respire (v)	дышать
exhale [eks'heil], breathe out	выдыхать

4. Memorize the following new word combinations.

air composition	состав воздуха
water vapor	водяной пар
weather conditions	погодные условия
harmful particles	вредные частицы
radioactive decay	радиоактивный распад
chemical combination	химическое соединение
product of respiration	продукт выдыхания
exhalation process	процесс выдыхания, испарения
weak acid	слабая кислота
poisonous effect	отравляющий эффект
rate of breathing	частота дыхания
electrical discharge	электрический разряд

5. Think of synonyms for the following words.

Change (v), amount (n), pure (adj), comprise (v), ruin (v), breathing (n), exhale (v).

6. Give antonyms for the following words.

Harmless (adj), dirty (adj), purity (n), natural (adj), weak (adj), increase (v), discomfort (n).

7. Give derivatives of the following words.

Mix (v), vary (v), consist (v), dependence (n), function (n), produce (v), form (v), respire (v), necessary (adj), indicate (v), comfort (n), charge (n), art (n), pleasant (adj).

8. Give the three forms of the following verbs.

To draw, to know, to find, to be, to have, to take, to make, to produce.

9. Read the sentences and expressions. Translate them into Russian paying attention to:

a) Passive Voice-

1. Some products are exhaled in to the air. 2. Carbon dioxide will be found in large quantities. 3. Carbon dioxide was believed to have a poisonous effect. 4. It is now known to be quite harmful. 5. Ozone is produced by electrical discharge. 6. It can also be produced artificially.

b) Participle I, II-

Resulting products, diluting oxygen, dissolved in water, occupied room, living processes, air containing parts of CO_2, consisting of molecules, being supplied, ventilating work.

c) Tense Forms-

1. The oxygen unites chemically in the lungs with impurities of the blood. 2. The lungs draw in and expel a small quantity of air. 3. For a long time people believed in poisonous effect of carbon dioxide. 4. The atmosphere of pure oxygen will destroy the body tissue. 5. Nitrogen constitutes 4/5 of the air by volume.

10. Open the brackets using the correct Tense Form. Read the sentences and translate them into Russian.

1. The proportions of gases (to vary) slightly in different localities.
2. The purest air (to contain) from 3 to 4 parts of CO_2 by volume in 10,000.
3. Air conditioning (to depend) upon a number of factors.
4. The atmosphere of the Earth (to be) a mixture of various gases.
5. Nitrogen (to perform) the function essential for the human body.
6. CO_2 (to be) considered to have a harmful effect when taken into lungs.

7. Human health and comfort (to be) dependent on the proper performance of the process of respiration.

8. Artificial weather in the building (to influence) the body comfort even in future.

9. Water vapor (to be) an important constituent of the atmosphere.

10. Nitrogen (to dilute) the oxygen that is why it is essential for the human life.

II. Work with the text

1. Read the text and do the exercises that follow it.

Air and its properties

The biosphere is the surface of the Earth – its atmosphere, hydrosphere and lithosphere.

The atmosphere of the earth is a mixture of several gases, the proportions of which vary slightly in different 1ocalities.

The composition of dry air by volume (exclusive of water vapor) is as follows:

Dry air.... 100.00	Hydrogen …. 0.01	Xenon …. 0.000009
Nitrogen …. 78.09	Neon …. 0.0018	
Oxygen …. 20.95	Krypton ….. 0.0001	
Argon 0.93	Helium …. 0.0005	
Carbon dioxide.... 0.03	Ozone …. 0.00005	

The atmosphere contains water vapor at all times. Water vapor is an important constituent; its amount is quite variable under different conditions. Besides, the air usually contains different aerosol particles.

Air is not a chemical combination but is a mechanical mixture of these gases.

Oxygen which constitutes about one fifth of the air by volume is the element upon which animal life is dependent. The amount of oxygen in the air remains constant because of photosynthesis in plants. Human health and body comfort are dependent upon the right proportion of oxygen in the air.

Nitrogen (N), which constitutes nearly all the remaining four fifths of the air by volume, is a relatively inert gas. The life is largely dependent on the nitrogen for its living processes. It dilutes the oxygen – the function, essential for the human body, the atmosphere of pure oxygen would soon burn up and destroy the body tissues.

Carbon dioxide (CO_2) exists in small amounts in the open air. It is also known as carbonic acid gas. The sources of carbon dioxide are volcanic gases, breathing of man, animals, plants, burning of fuels. It dilutes the oxygen content of the air and can cause (under extreme conditions) great discomfort.

As CO_2 is a product of respiration, its presence in the room atmosphere is an indication of necessity of the fresh air supply or ventilating work.

Ozone (O_3) exists in minute quantities in the atmosphere particularly in the country. Ozone is produced by electrical discharge and is generated artificially for use in ventilation. It has unpleasant odor. Its characteristic odor is somewhat like that of chlorine.

The presence of inert gases (helium, neon, argon, krypton, xenon) in the atmosphere is associated with the continuous processes of radioactive decay.

2. Choose the best alternative according to the text.

1. The atmosphere of the earth is a mixture of
   a) several gases b) different vapors c) chemical elements
2. Water vapor amount varies under
   a) season of the year b) weather conditions c) industrial progress
3. Air is a…mixture of gases.
   a) mechanical b) biological c) chemical
4. Human beings' lives are dependent upon the amount of
   a) nitrogen b) oxygen c) hydrogen
5. …dilutes oxygen.
   a) nitrogen b) carbon c) argon
6. Carbon dioxide is one of the product of
   a) chemical reaction b) breathing c) respiration
7. Ozone is produced by
   a) chemical reaction b) mechanical reaction c) electrical discharge

3. Agree or disagree with the following statements.

   1. The atmosphere of the earth is a mixture of several gases.
   2. The gases proportions are not variable in different localities.
   3. Oxygen constitutes 1/5 of the air.
   4. Carbon dilutes oxygen.
   5. Carbon dioxide is one of the products of respiration.
   6. CO_2 is an indicator of necessity of ventilating work.
   7. Ozone exists in large quantities in the atmosphere of the city.

4. Answer the following questions.

1. What elements does the atmosphere consist of?
2. What does water vapor amount depend on?
3. What is the role of oxygen?
4. What function does nitrogen perform?
5. What is the role of CO_2? Is it harmful?
6. What does a great amount of CO_2 in the room indicate?
7. How is ozone produced? What is its role?
8. What inert gases do you know? What are they associated with?

5. Put in the right prepositions.

1. Water vapor amount is variable …different weather conditions. 2. The atmosphere… the Earth is a mixture … several gases. 3. Oxygen constitutes about one fifth… the air… volume. 4. It is the element … which animal life is dependent. 5. Human comfort depends…the oxygen quantity. 6. Ozone is produced… electrical discharge.

6. Complete the following statements.

1. The atmosphere of the Earth is … .
2. Water vapor amount is … .
3. Air is not a chemical combination but is … .
4. Oxygen is the element… .
5. Nitrogen … .
6. Carbon dioxide exists …, and is known as … .
7. The source of CO_2 is … .
8. CO_2 presence is an indicator of … .
9. Ozone has the following characteristics: … .

7. Translate from Russian into English.

1. Атмосфера Земли – это механическая смесь нескольких газов. 2. Водяной пар является важной составляющей атмосферы. 3. Кислород составляет около 1/5 объема воздуха. 4. Объем кислорода в воздухе остается постоянным из-за процесса фотосинтеза в растениях. 5. Азот является инертным газом и делает концентрацию кислорода менее насыщенной. 6. Углекислый газ – продукт процесса дыхания, наличие определенного его количества в помещении говорит о необходимости поступления свежего воздуха. 7. Озон образуется при помощи электрического разряда.

III. Summarizing

1. Look through the text again and discuss it in the form of dialogues using the active words and expressions. The topics for dialogues:

– Air composition
– Oxygen
– Nitrogen
– Carbon dioxide
– Ozone

2. Get ready to speak on the topic «Air and its properties».

IV. Supplementary reading

1. Read the text. Try to understand it and be ready to retell it in Russian. Translate the abstract printed in italics in written form using a dictionary.

What is an air ionizer?

An air ionizer is a relatively new device that is intended to purify the air. It is used instead of fans and filters. An air ionizer creates ions which remove microscopic particles from the air. Rooms are healthier for those who suffer from asthma, allergies, weak immunity or respiratory problems.

Air ionizers rely on the chemical properties of particles. An ion is just a particle that is charged, either negatively or positively. This commercial device, a tabletop or stand alone unit, creates negative ions using electricity. The ions flood the room and seek positively charged particles, such as dust, bacteria, pollen, mold, smoke, chemical vapors, and many other allergens. Bonded particles are too heavy to float around and they can not be easily inhaled (breathed). As a result, the harmful airborne particles become large pieces of dirt, fall on the ground where they can be cleaned by normal means.

Often outdoor pollutants get a lot of attention. We do not want car exhaust or factory emissions to cause health hazards. But indoor air pollution remains a serious problem. Dust and mould collect inside heating and air conditioning ducts. Higher humidity inside a building allows bacteria to thrive. An air ionizer addresses (struggles with) to these home and office sources of pollution and odor. The ozone that is created when negative ions are generated, battles pollution by breaking it down into smaller, harmless components. Ozone makes it more difficult for germs to grow, and deodorizes as well.

Ionizers conserve power and run silently, unlike air purifiers with fans. Another advantage over other purifiers is that there are no parts that need regular replacement, because there are no physical filters. Most air ionizers don't have a motorized fan, the ionization creates a breeze that helps to distribute the ions throughout a room. Some are also outfitted with screens that catch the particles of dust as they fall to the ground.

flood – наполнять
pollen – пыльца
mould – плесень, плесенный грибок
inhale [in'heil] – вдыхать
interfere (зд.) – служить препятствием, мешать, быть помехой (with)
thrive (throve, thriven) – благоденствовать, преуспевать, процветать
address – направлять усилия на
germ – бактерия, микроб, микроорганизм

УЧЕБНЫЙ БЛОК 3 (УБ-3)
«HUMAN COMFORT AND INDOOR AIR QUALITY (IAQ)»

Цели:

Вы должны знать:	Вы должны уметь:
1. Грамматика: – Словообразование (Word Building); – Пассивный Залог (Passive Voice); – Причастие I, II (Participle I, II); – Герундий (Gerund); – Модальные глаголы (Modal Verbs). 2. Лексика: – Ключевые слова и словосочетания по теме «Human Comfort and Indoor Air Quality».	– использовать лексические и грамматические навыки: а) для перевода текстов; б) в монологической и диалогической речи.

I. Vocabulary and grammar

1. Read these international words and try to guess their meaning.

Characteristic (n), comfort (n), component (n), biochemical (adj), biological (adj), individual (adj), factor (n), serious (adj), standard (n), method (n), conservation (n), balance (n), concentration (n), infection (n).

2. Read the words and try to remember their meanings.

quality (n)	device (n)	contaminant (n)
affect (v)	building (n)	lead (v)
provide (v)	cause (n), (v)	significant (adj)
condition (n)	vary (v)	equipment (n)
environmental (adj)	volume (n)	source (n)

3. Read out the following words and memorize them.

background (n)	происхождение, истоки
define (v)	определять, характеризовать
interaction (n)	взаимодействие
acceptability (n)	приемлемость
suffer (v)	страдать, претерпевать
irritation (n)	раздражение
establish (v)	учреждать, устанавливать
intend (v)	предназначать, намереваться
emission (n)	выделение, распространение
composite (adj)	составной сложный, смешанный
impact (v)	сильно воздействовать, влиять
exposure (n)	подвергание какому-либо воздействию
solution (n)	решение, разрешение (вопроса)
guideline (n)	руководящие указания, инструкция
intake (n)	приемное, впускное устройство
outlet (n)	выпускное, выходное отверстие

4. Memorize the following new word combinations.

indoor air quality (IAQ)	свойства, качество воздуха в помещении
noise level	уровень шума; уровень помех
secretion of human body	выделение, секреция чел. тела
outgassing of materials	выделение газов материалами
thermal conditions	термические, тепловые условия
air cleaning device	устройство воздушной очистки
energy conservation standards	стандарты по экономии энергии
lighting level	уровень освещенности
heating/ cooling load	отопительная / охлаждающая нагрузка

ventilation rate	скорость / частота воздухообмена
variable air volume system	система изменения объема воздуха
viral infection	вирусная инфекция
greenhouse effect	парниковый эффект
ultraviolet contamination	загрязнение ультрафиол. излучением
synthetic finish	синтетическая отделка
blueprint machine	копировальный аппарат
stagnant pocket	зона застоя воздуха

5. Give synonyms for the following words (choose an appropriate synonym from the box below).

Component (n), interaction (n), establish (v), device (n), reduce (v), emission (n), contaminant (n), significant (adj), impact (n), location (n), rural (adj), prevent (v), solution (n).

Situation (n), machine (n), set up (v), decision (n), pollutant (n), essential (adj), constituent (adj), influence (n), lower (v), secretion (n), country (adj), obviate (v), cooperation (n)

6. Give antonyms for the following words (choose an appropriate synonym from the box).

Noisy (adj), many (pron), misbalance (n), comfort (n), concentration (n), clean (adj), increase (v), wide (adj), synthetic (adj), single (adj), direct (n), severe (adj), outdoor (adj), minimize (v).

natural (adj), few (pron), discomfort (n), enlarge (v), decrease (v), balance (n), narrow (adj), composite (adj), dispersion (n), indirect (adj), mild (adj), indoor (adj), calm (adj), polluted (adj)

7. Read the chains of derivatives and translate them.

Comfort – comfortable – comforter – comforting – comfortless.

Noise – noiseless – noiseproof – noisy.

Define – definable – definite – definition – definitive.

Accept – acceptability – acceptable – acceptance – accepted – accepter.

Intend – intent – intention – intentional.

Emit – emission – emissive.

Respire – respiration – respirator – respiratory.

8. Give the three forms of the following verbs.

To become, to understand, to pay, to lead, to forget, to get, to put, to leave.

9. Read the sentences and expressions. Translate them into Russian paying attention to:

a) Passive Voice-

1. Comfort today is measured by indoor air quality.
2. Air quality cannot be defined by biochemical or biological components.
3. Standards are intended for the most fundamental of all problems.

b) Participle I, II, Gerund-

Outgassing of materials, working place, established standards, methods for testing air cleaning devices, causes for misbalancing, pollutants leading to viral infections, car parking, polluted area, low lighting level, reduced heating / cooling loads.

c) Modal Verbs-

Can be defined, we are to understand, it may not be allowed, we should not forget, contaminants can cause severe toxicological effect.

II. Work with the text

1. Read the text and do the exercises that follow it.

Human comfort and indoor air quality (IAQ)

Comfort today is measured by indoor air quality, lighting characteristics and background of noise level.

Specialists think that acceptable indoor air quality should provide comfort level of 80 % of subjects. If for example you suffer from headaches, eyes, nose or throat irritation, dry skin while in your working place, then you probably have serious IAQ problems.

Established many Indoor Air Quality Standards such as: thermal environmental conditions for human occupancy, methods for testing air cleaning devices, energy conservation standards for new buildings, etc. All these standards are intended for the most fundamental of all problems in building design – human comfort.

We are to understand that there are many causes for misbalancing the environment around us.

1) Part of this cause is the low lighting level, reduced heating / cooling loads, low ventilation rates, variable air volume systems, minimum outside air ventilation, smokers etc. In order to supply space with healthy environment it is necessary to pay attention to such processes as ventilation rates, humidity, air circulation, air filtration.

2) Part of it may be the wide use of synthetic materials and their emission of contaminants. While a single pollutant element may in itself not cause significant health effect, the composite action of pollutants can seriously impact human respiratory system leading to viral infections.

3) We should not forget that the concentration of air contaminants (carbon dioxide, carbon monoxide, chlordane, ozone, radon, nitrogen dioxide, sulfur dioxide) also influences the IAQ. For example ozone has critical influence on our environment. Too little of it (together with carbon dioxide) is leading to greenhouse effect and ultraviolet contamination. Too much of it, as direct exposure, can cause severe toxicological effect.

4) We should remember that IAQ depends of course on outdoor Air Quality, as the last gets inside through ventilation system. Obviously conditions are worse in big cities; on the contrary rural areas have a higher level of air quality.

There is no single or simple solution to maintaining human comfort. There are some simple guidelines that will minimize the potential for trouble: minimize the emission from synthetic building finishes such as wall coverings and carpeting; provide proper ventilation at critical points such as blue print machines, copying equipment, smoking areas, etc; locate outside air intakes so as to prevent re-incoming of contamination sources such as car parkings, toilets, vent outlets; provide adequate air ventilation to all areas of the building; design to prevent stagnant pockets of air; install and maintain air filtration systems correctly; be aware of sources of potential viral bacteria contamination and treatment methods; become knowledgeable of the potential problems and their solutions.

2. Choose the best alternative according to the text.

1. Acceptable indoor air quality provides acceptable comfort level of
   a) 80 % of subjects b) 60 % of subjects c) 100 % of subjects
2. IAQ Standards are intended for
   a) human comfort b) environmental protection c) noise reduction
3. The cause for misbalancing the environment around us is
   a) excessive ventilation b) air conditioning c) low lighting level

4. Single pollutant element

a) may cause health effect b) may not cause health effect

c) causes health effect

5. IAQ depends on

a) outdoor air quality b) air pollutants concentration

c) the use of synthetic materials

3. Agree or disagree with the following statements.

1. Comfort today is measured by indoor air quality, lighting characteristics and background of noise level.

2. Specialists define acceptable indoor air quality as one that provides acceptable comfort level of 100 % of subjects.

3. All Standards are intended for the most fundamental of all problems – building design.

4. Low lighting level, reduced heating loads, low ventilation rates misbalance the environment.

5. The wide use of synthetic materials is considered today to be not harmful.

6. IAQ depends on outdoor air quality.

7. Nowadays we have a clear solution to IAQ problem.

4. Answer the following questions.

1. What features is comfort measured by today?

2. What is acceptable indoor air quality?

3. What IAQ Standards are established? What are they intended for?

4. What are causes for misbalancing the environment around us?

5. Why should the outgassing of materials be reduced?

6. What places must be properly ventilated? Why?

7. Where should outside air intakes be located?

8. What should the occupants be aware of?

5. Put in the right prepositions.

1. Comfort today is measured… indoor air quality. 2. You may suffer…IAQ problems. 3. There are many causes… misbalancing the environment… us. 4. … order… supply space… healthy environment it is necessary to pay attention… such processes as ventilation rates, humidity, air circulation, air filtration. 5. Ozone has critical influence… our environment. 6. Too little… it (together… carbon dioxide) is leading… greenhouse effect. 7. IAQ depends… course…

outdoor Air Quality. 8. … the contrary rural areas have a higher level of air quality. 9. Air gets inside…ventilation system. 10. Be aware… sources… potential viral bacteria contamination.

6. Complete the following statements.

1. Comfort today is measured by … .

2. IAQ Standards are… .

3. In order to supply space with healthy environment it is necessary to pay attention to such processes as… .

4. While a single pollutant element may not…, the composite action of pollutants can … .

5. The concentration of air contaminants… . For example … .

6. Air circulation devices such as… can serve as… if… .

7. IAQ depends of course on outdoor Air Quality, as … .

8. There are some simple guidelines that will minimize the potential for trouble:

– minimize the emission from …,

– provide proper ventilation at such places as …,

– locate outside air intakes so …,

– minimum total air circulation rate should be …,

– install and maintain air filtration systems …,

– be aware of… .

7. Translate from Russian into English.

Комфорт внутри помещения сегодня определяется качеством воздуха, уровнем освещенности и уровнем шума. Многочисленные стандарты качества воздуха направлены на обеспечение комфорта человека внутри помещения. Существует много причин, которые вызывают нарушение баланса среды внутри помещения: низкий уровень освещения, плохая вентиляция, низкая отопительная нагрузка, курение в помещении, использование синтетических материалов, повышенная концентрация загрязняющих веществ в воздухе, качество воздуха в данной местности. Для поддержания комфорта необходимо уменьшить использование синтетических материалов, обеспечить достаточную вентиляцию во всем здании, располагать отверстия забора воздуха для вентиляции вдали от загрязненных мест, знать об источниках загрязнения и методах их предотвращения.

III. Summarizing

1. Comment on:
– There are many causes for misbalancing the environment around us.
– There are many IAQ Standards.
– There are some guidelines that will minimize air quality problems.

2. Prove that:
– Synthetic material is a source of air pollution.
– IAQ depends on outdoor air quality.
– Low lighting level, low ventilation rates, smokers etc. misbalance the environment.

3. Look through the text again and discuss it in the form of dialogues using the active words and expressions. The topics for dialogues:
– Causes for misbalancing the environment.
– Guidelines on maintaining human comfort.

4. Get ready to speak on the topic «Human comfort and indoor air quality».

IV. Supplementary reading

1. Read the text. Try to understand it and be ready to retell it in Russian. Translate the abstract printed in italics in written form using a dictionary.

Air cleaners

An air cleaner, also known as an air purifier, is an appliance that cleans the air by removing impurities. An air cleaner can clean the air in a single room, a whole house or an industrial workspace. Air cleaners are employed in situations where the air typically becomes unhealthy due to smoke, pets or pollutants such as molds, or when a work situation would otherwise be dangerous to the human operator, as when working with hazardous materials.

Air cleaners employ a variety of technologies to remove impurities from the air. The easiest to understand is a simple filter.

Portable or room-sized air cleaners can also employ filters. These can remove impurities of different types, depending on the filter technology used. The finer (more tightly spaced) the filter material is, the smaller the airborne particles that it can remove from the air. HEPA filters, or High-Efficiency

Particulate Arresting filters, are currently the finest and can therefore remove the most impurities. However, gases and other pollutants will not be captured by HEPA filters.

Activated charcoal in an air cleaner can be used to remove gases and odor-causing small particles that a HEPA filter will not affect.*

Some modern air cleaners fall into the «ionic air purifier» category. An «ionic» air cleaner creates and releases negative ions into the air of your home. These negative ions bond with the positive air pollutant particles, causing them to fall out of the air. Of course, they're still in the room, as dust on the floor, walls or furniture but they can be easily removed.

Selecting an appropriate air cleaner for your home should depend on several factors. If you or someone in your home has allergies, you will need to remove smaller particles, which limits you to HEPA type filtering air cleaners: activated charcoal filtering stage or ionic system.

If you plan to run the air cleaner in a bedroom, you must be sure that it works quiet enough. A humming noise loud enough might awake you at night that means you will turn off the air cleaner and waste your purchase price.

*activated charcoal – активированный уголь

УЧЕБНЫЙ БЛОК 4 (УБ-4)
«INDOOR AIR POLLUTION»

Цели:

Вы должны знать:	Вы должны уметь:
1. Грамматика: – Словообразование (Word Building); – Пассивный Залог (Passive Voice); – Причастие I, II (Participle I, II); – Условные предложения (Conditional Sentences); – Будущее простое время (Future Indefinite). 2. Лексика: – ключевые слова и словосочетания по теме «Indoor Air Pollution».	– использовать лексические и грамматические навыки: а) для перевода текстов; б) в монологической и диалогической речи.

I. Vocabulary and grammar

1. Read these international words and try to guess their meaning.

Percent (n), microscopic (adj), organism (n), chemicals (n), product (n), allergen (n), office (n), problem (n), bacteria (n), effective (adj), strategy (n), circulation (n).

2. Read the words and try to remember their meanings.

inside (n, a, adv, prep)	cloth (n)	filter (n)
indoor (adj)	surface (n)	moisture (n)
pollution (n)	breathing (n)	population (n)
create (v)	humidity (n)	clean (v)
environment (n)	conduct (v)	skin (n)
exposure (n)		

3. Read out the following words and memorize them.

indoors (adv)	внутри помещения
originate (v)	порождать, возникать
pollutant (n)	загрязняющее вещество
dust (n)	пыль
allergen (n)	вещество, вызывающее аллергию
excretion (n)	выделение
cause (v)	быть причиной, причинять
prevent (v)	предотвращать
wipe (n,v)	вытирание, вытирать
appliance (n)	прибор, приспособление
duct (n)	трубопровод
screen (n)	щит, заслонка, экран
bedding (n)	постельное белье
ionizer (n) ['aiənaizə]	ионизатор воздуха
mildew (n) ['mildju:]	плесень

4. Memorize the following new word combinations.

harmful particles	вредные частицы
indoor air pollution	загрязнение воздуха внутри помещения
pet dander	загрязнение от дом. животных
mold spores	споры плесени, грибка
cleaning products	чистящие средства
dust mite	пылевой клещ
exposure time	длительность воздействия
itchy skin	раздраженная кожа
respiratory problems [ris'paiərətəri]	дыхательные проблемы
preventative measures	предупредительные меры
hard surface	твердая поверхность

ventilating outlet	вентил. выходное отверстие
window screen	оконное стекло
purification tools	приспособления, средства очистки
carbon filter	углеродный фильтр
collection area	зона, место скопления

5. Think of synonyms for the following words.

Pollution (n), humidity (n), reduce (v), keep (v), frequently (adv), replace (v), install (v), device (n), purification (n), emergency (n), inside (adj).

6. Give antonyms for the following words.

Outside (adj), contamination (n), danger (n), fresh (adj), necessary (adj), warm (adj), a lot (pron), dry (v), humidify (v), collection (n), hard (adj).

7. Give derivatives of the following words.

Harm (n), pollute (v), circulate (v), respire (v), conduct (v), moist (adj), create (v), equip (v).

8. Give the three forms of the following verbs.

To take, to become, to keep, must, to clean, to get, to pollute, can.

9. Read the sentences and expressions. Translate them into Russian paying attention to:

a) Passive Voice-

1. Millions of mites are sustained by water vapor. 2. The bedroom is the most affected place. 3. Replace pillows yearly if they cannot be laundered. 4. Filters, ducts, or screens must be cleaned or replaced regularly.

b) Participle I, II, Gerund -

1. There is lots of humidity due to people's breathing. 2. Mites rely on conditions that are conducive to most people's working places. 3. The most effective strategy against pollution is still old-fashioned cleaning. 4. Cleaning products may be the source of pollution. 5. Keep minimum moist surfaces or standing water in a room. 6. Centralized heating and air conditioning can serve as collection areas for dust.

c) One, that, which, as, such as-

1. Harmful particles that originate inside become indoor air pollution. 2. Mites rely on conditions that are conducive to people's living places. 3. The most common culprits are dust, which is 70% percent dead skin, pet dander… 4. Air circulation devices, such as fans, air purifiers, or dehumidifiers can serve as collection areas for dust. 5. With indoor air, five to ten times as polluted as outdoor air, there are plenty of preventative and corrective measures one can take. 6. Even house plants, which recycle carbon dioxide into oxygen, help clean air.

10. Read and translate the sentences. Put them in Present, Past and Future Indefinite Tense Forms.

1. Usually harmful particles originate inside.
2. Very often these spaces have no adequate ventilation to freshen air.
3. A warm and wet place is the best harbor for mites.

11. Read the sentences. Open the brackets, using the correct tense forms. Translate the sentences into Russian.

(Не забывайте употреблять настоящее время вместо будущего в придаточном предложении времени и условия после соответствующих союзов: if, as soon as, before, till (until).)

1. If we (to keep) the window closed, very soon we (need) fresh air supply.
2. If you (to wash) bedding in a very hot water, it (to kill) some of the dust mites.
3. Floors (to harbor) more mites, if you (to use) carpets.
4. After you (to install) air circulation devices, you (need) a regularly service work.
5. Before you (to choose) a new air conditioner, you (have to) consult a specialist.
6. If the humidity (to be) very high in the room, it (to cause) the growth of mites population.

II. Work with the text

1. Read the text and do the exercises that follow it.

Indoor air pollution

Harmful particles that originate inside and tend to stay inside become indoor air pollution (Note*). The most common culprits (pollutants) are dust, which is 70 % percent dead skin, pet dander, mold spores, bacteria, microscopic

organisms, smoke, and chemicals from cleaning products. Certain rooms contain higher amounts of certain allergens, but even offices and the interior of cars are susceptible (sensitive) to indoor pollution. None of these spaces has adequate ventilation to freshen air, and all of them have high humidity.

The top indoor allergen is dust mite. Mites pollute the environment with their carcasses and excretions. As with most allergies, dust mites cause congestion, red and itchy eyes, itchy skin, or respiratory problems. These mites rely on a moist, warm environment with lots of dust, conditions that are similar to most people's living and work places. Millions of mites are sustained by water vapor and particles from our skin flakes and bacteria. The bedroom is the most affected as there are plenty of cloth surfaces for the tiny creatures to live, and there is lots of humidity due to people's breathing. To this end, a dehumidifier can dramatically reduce the moisture in a room to 30 – 50 % and influence dust mite population.

The most effective strategy against all this pollution is still old-fashioned cleaning as a preventative measure. Keep minimum moist surfaces or standing water in rooms and kitchens. Vacuum, wipe, dust, or mop floors and hard surfaces frequently. Wash bedding and linens in a very hot water, which will kill some of the dust mites. Replace pillows, especially children's pillows, yearly. Consider installing wood or tile floors, they harbor (collect) less mites and dust than carpets and rugs.

Air circulation devices, such as centralized heating and air conditioning, fans, air purifiers, or dehumidifiers can serve as collection areas for dust and mildew if not properly maintained. All these appliances have filters, ducts, or screens that must be cleaned or replaced regularly. Make sure that all the ventilating outlets in your house are clean, including window screens.

Other purification tools include air ionizers, vacuums equipped with HEPA (High Efficiency Particle Arresting) filtration, HEPA air purifiers, and carbon filters. With indoor air there are plenty of preventative and corrective measures one can take. Even house plants, which recycle carbon dioxide into oxygen, help to clean air.

*Note

Common indoor air contaminants:

– aspergillous (microbial aerosol-airborne dust origin)
– formaldehyde (plywood and synthetics)
– volatile organic compounds (furniture and draperies)
– dust mites (rugs, lubricants)
– asbestos fibers (fireproofing)
– ammonia (cleaning agents)

– biological aerosols (sprays)
– outgassing (plastics)
– benzyl chloride (vinyl)
– phthalates (wall coverings)
– toluene, methilene chloride, benzene, acetone, styrene, refrigerant, dioxin (tobacco smoke)
– legionellous (virus – airborne moisture particles)
– carbon tetrachloride (cleaning agents)

2. Choose the best alternative according to the text.

1. Room containing a high amount of pollutants
a) has enough ventilation to freshen air b) does not have enough ventilation to freshen air c) has too much ventilation to freshen air.
2. Dust mites rely on
a) moist environment b) dry air c) moist and warm environment
3. Millions of mites are sustained by
a) water vapor and bacteria b) dry air and light
c) air circulation devices
4. The most effective strategy against the pollutants is
a) cleaning b) humidification c) heating
5. Air circulation devices can serve as
a) energy collection area b) air distribution system
c) collection area for dust.
6. House plants
a) recycle carbon b) make the house beautiful c) can't help to clean air
7. Air circulation devices and their parts should be
a) replaced regularly b) maintained properly c) installed in time

3. Agree or disagree with the following statements.

1. Air polluted space has no adequate ventilation to freshen air.
2. Mites rely on a dry, cool environment with lots of dust.
3. Dehumidifier can reduce the moisture in a room and influence dust mite population.
4. Wood or tile floors harbor more mites and dust than carpets and rugs.
5. Air circulation devices can serve as collection areas for dust and mildew if not properly maintained.
6. Ducts, screens need not regular cleaning or replacing.
7. House plants recycle carbon dioxide into oxygen, help to clean air.

4. Answer the following questions.

1. What particles become indoor air pollution?

2. What are the most common pollutants?

3. What is the top air allergen? What does it cause?

4. What environment do the dust mites rely on?

5. What can reduce the moisture level in a room?

6. What are the most effective measures against the pollutants?

7. What devices can serve as a source of pollution and why? How can we prevent it?

8. How can house plants clean air?

5. Put in the right prepositions.

Mites rely… a moist, warm environment with lots… dust, conditions that are conducive… most people's living and work places. Millions… mites are sustained… water vapor and particles… our skin flakes and bacteria. The bedroom is the most affected as there are plenty… cloth surfaces … the tiny creatures to live, and there is lots… humidity due… people's breathing. Hot water kills some… the dust mites. House plants recycle carbon dioxide… oxygen, help … clean air.

6. Complete the following statements.

1. Harmful particles that originate inside and tend to stay inside become… .

2. The most common pollutants are… .

3. Pollutants rely on… .

4. The top indoor allergen is… , it causes… .

5. Dehumidifier can… .

6. The most effective measures against pollution are… .

7. Air circulation devices such as… can serve as… if… .

8. All these appliances have …that must be… .

9. Other purification tools are: … .

10. House plants can… .

7. Translate from Russian into English.

Уровень загрязнения воздуха выше в помещениях с повышенной влажностью воздуха и недостаточной вентиляцией. Самое распространенное загрязнение – пыль, которая состоит на 70 % из отмерших клеток кожи, бактерий, микроорганизмов, дыма и химикалий от чистящих средств. Опасность представляет пылевой клещ, вызывающий зуд кожи, дыхатель-

ные проблемы, раздражение слизистой оболочки глаз. Источником загрязнения могут быть различные системы и приборы: центральное отопление, кондиционеры, вентиляторы, увлажнители, фильтры, защитные экраны, трубопроводы и др. Наиболее эффективными мерами по борьбе с загрязнением воздуха в помещении считается влажная уборка, стирка постельного белья в горячей воде, ежегодная замена подушек. Ионизаторы и очистители воздуха, углеродные фильтры в приборах, комнатные растения снижают уровень загрязнения воздуха в помещении.

III. Summarizing

1. Look through the text again and discuss it in the form of dialogues using the active words and expressions. The topics for dialogues:

– Types of indoor pollutants
– Sources of indoor air pollution
– Preventative measures against indoor air pollution

2. Get ready to speak on the topic «Indoor air pollution».

IV. Supplementary reading

1. Read the text. Try to understand it and be ready to retell it in Russian. Translate the abstract printed in italics in written form using a dictionary.

Basics of microbial growth

Indoor air quality is a complex issue. There are too many potential contaminant sources and their diversity is too great. They originate inside a building and threaten the quality of its environment, they get from outside through the ventilation system.

The most common indoor contaminants are the volatile organic compounds outgassed from interior furnishings. Then run microbiological contaminants (namely bacteria, mold, mildew and fungi). Ventilation and filtration combat (fight with) these contaminants diluting their concentrations in a building. We understand the sources and causes of microbiological contamination in a building. Microbes need four basic ingredients to thrive: (1) organic nutrients or «food»; (2) moisture in the form of standing water or humid air; (3) a surface on which to grow; (4) darkness. Therefore, if we keep the air conveyance (passage) system clean and dry, we can significantly reduce the potential for microbial contamination in a building.

So, we can name three specific equipment design characteristics which can reduce the heating, ventilation and air conditioning systems as a potential source of microbial contamination. These basic characteristics are sloped drain pans, cleanable surfaces and accessibility should be applied to all types of equipment and can be considered «IAQ (Indoor Air Quality) equipment basics».

Unexpected events like equipment malfunctions, power outages or drainage problems can occur, raising the humidity level inside the building. Relative humidity over 60 % (with dirt, which is always present in building air systems) promotes microbiological growth. Therefore, it's important to inspect the air handler and duct system (for signs of contamination) regularly as a part of normal heating, ventilation and air conditioning systems maintenance.

Equally important is the choice of materials used to construct heating, ventilation and air conditioning equipment. Porous materials hold dirt and moisture and are almost impossible to clean.

Using smooth, nonporous surfaces inside ducts and equipment simplifies inspection and cleaning.

malfunction – плохое функционирование
outage – остановка работ, простой
drainage – (зд.) канализация
air handler – прибор управления воздушным потоком
duct system – система трубопровода
slopped drain pan – наклонный поддон
treated water (steam) – очищенная вода (пар)
nutrient – питательное вещество
volatile – летучий, быстро испаряющийся

УЧЕБНЫЙ БЛОК 5 (УБ-5)
«ENVIRONMENTAL PROTECTION»

Цели:

Вы должны знать:	Вы должны уметь:
1. Грамматика: – Словообразование (Word Building); – Пассивный Залог (Passive Voice); – Причастие I, II (Participle I, II); – Герундий (Gerund); – Настоящие, прошедшие, будущие времена (Present, Past, Future Tenses), их вопросительная и отрицательная формы; – Модальные глаголы (Modal Verbs). 2. Лексика: – ключевые слова и словосочетания по теме«Environmental Protection».	Использовать грамматические и лексические навыки: а) для чтения и перевода текстов, б) в диалогической и монологической речи по теме «Защита окружающей среды».

Pretext discussion

Answer the questions of the form.

How green are you?

1. Which is more environmentally friendly?

A. normal petrol

B. unleaded petrol

C. diesel fuel

2. Which gas is mainly responsible for the greenhouse effect?

A. oxygen

B. carbon dioxide

C. chloride gas

3. Every person on the Earth produces the following amount of garbage every day:

A. 100 gm

B. 1 kg

C. 3 kg

4. If you throw away 13 used batteries, you will release the following amount of mercury into the atmosphere:

A. 0.1 gm

B. 1 gm

C. 10 gm

5. Which uses the most energy?

A. a fridge

B. a cooker or stove

C. a washing machine

6. Which uses the most water in the home?

A. the toilet

B. the bath

C. the washing machine

D. the dishwasher

7. What does the statement «ozone-friendly» (on aerosol cans) mean?

A. they contain no ozone-damaging substances

B. they are biodegradable

C. they are recyclable

8. Which is the most environment-friendly form of energy?

A. nuclear power

B. coal

C. gas

D. oil

Check your answers (Appendix II).

I. Vocabulary and grammar

1. Read these international words and try to guess their meaning.

Form (n), atmosphere (n), radioactive (adj), astronomical (adj), cement (n), metal (n), process (n), illumination (n), product (n), organic (adj), result (n), contact (n), smog (n), erosion(n), system (n), method (n), installation (n), organization (n), standard (n), cooperation (n)

2. Read the words and try to remember their meanings.

nature (n)	substance (n)	dangerous (adj)
chemical (adj)	power (n)	disease (n)
biological (adj)	nuclear (adj)	enterprise (n)
mechanical (adj)	weapon (n)	cut (n,v)
surface (n)	contain (v)	burn (v)
ground (n)	important (adj)	security (n)
change (v)	industrial (adj)	development (n)
increase (v)	affect (v)	groundwater (n)
produce (v)	source (n)	measure (n,v)
install (v)	limit (n,v)	riches (n)

3. Read out the following words and memorize them.

pollution (n)	загрязнение
environment (n)	окружающая среда
influence (n)	влияние, действие, воздействие
interfere (v)	препятствовать, вмешиваться
cause (n,v)	причина; послужить причиной
degrade (v)	ухудшать
defoliate (v)	уничтожать
damage (v)	нанести вред
contamination (n)	загрязнение

create (v)	создавать
treatment (n)	обработка, очистка
purification (n)	очистка, очищение
protection (n)	защита
shortage (n)	недостаток, дефицит

4. Read out these expressions several times till you remember them.

environmental protection	охрана окружающей среды
scientific progress	научный прогресс
natural riches	природные богатства
space exploration	космические исследования
ozone layer destruction	разрушение озонового слоя
ecosystem degradation	ухудшение экосистемы
acid rain	кислотный дождь
soil erosion	эрозия почв
industrial wastes	промышленные сточные воды (отходы)
greenhouse effect	парниковый эффект
ecological security	экологическая безопасность
pollution level	уровень (степень) загрязнения

5. Think of synonyms for the following words.

Degenerate (v), pollution (n), cleaning (n), defend (v), reason (n), produce (v), affect (v), destruct (v), deficit (n).

6. Give antonyms for the following words.

Treated (adj), disease (n), reduce (v), purification (n), degrade (v), increase (v), include (v), save (v), defoliate (v).

7. Give derivatives of the following words.

Treat (v), purify (v), protect (v), create (v), install (v), limit (v), reduce (v), contaminate (v), degrade (v), interfere (v), cooperate (v), destruct (v).

8. Give the three forms of the following verbs.

To be, to know, to include, to lead, to take, to install, to fly, to break, to see, to understand, to rise, to do, to cut, to bring.

9. Form Gerund, Participle I and Participle II from the following verbs and translate them in to Russian.

To form, to pollute, to refine, to cause, to treat, to affect, to lead.

10. Read the sentences. Translate them into Russian paying attention to the underlined grammatical forms and explain them.

1. Pollution includes different forms. 2. New types of contamination were added in the 20th century. 3. Changes caused by human influence are great. 4. Pollution is increasing, resulting in the danger to nature. 5. Pollutants degraded the quality of air even many decades before. 6. They are known as air pollutants. 7. Different accidents can cause contamination. 8. If people do not pay attention to nature protection, it will lead to global catastrophe. 9. Manufacturing of goods gives birth to serious ecological problems. 10. People must take care of our planet. 11. Company has paid a big fine for cutting down woods.

11. Give the Russian equivalents to the following words and word combinations.

Environmental pollution, ancient times, source of life, unlimited riches, development of civilization, man's interference, to feel the danger, complete surprise, unexpected catastrophe, to come logically, technological progress, mankind achievements, chemical industry, atomic power station, groundwater pollution, considerable amount, to affect ecosystem, different diseases, nature defoliation, animals extinction, drinking water shortage, reduction of crops, nuclear wastes, serious measures, ecological security, treatment plants, industrial areas, new method, air filter, water treatment, water bodies, seasonal limitation, pollution level, rare animals, natural protection, international problem, political program, to cooperate forces, major organizations, to save the planet, future generations.

II. Work with the text

1. Read the text and do the exercises that follow it.

Protection of the environment

The problem of environmental protection is very important and serious today. Ecology is a science which studies the relationship between all forms of life on our planet.

Since ancient times Nature has served Man, being the source of his life. People lived in harmony with nature and it seemed to them that natural riches were unlimited. With the development of civilization man's interference in environment began to increase.

The problem of environmental protection was first mentioned after the Second World War. The first to feel the danger was Europe. The problem came to many people as a complete surprise, something like an unexpected catastrophe. This catastrophe however came logically from the development of human life on the planet.

The twentieth century is known as the century of the scientific and technological progress. The achievements of the mankind in mechanization and automation of industrial processes, in chemical industry and space exploration, in creation of atomic power stations and ships are amazing. But at the same time, the progress gave birth to very serious problems. Air, soil, rivers and groundwater contain today a considerable amount of the products of mechanical, chemical and biological pollution and contamination.

No doubt all pollutants affect and degrade ecosystem and lead to different diseases, nature defoliation, extinction of animals and birds, destruction of the ozone layer, radioactive contamination, acid rains, shortage of drinking (palatable) water, soil erosion, reduction of crops, industrial and nuclear wastes, greenhouse effect and many others.

People realize that serious measures should be taken to create a system of ecological security: pollution credits* for different enterprises and countries; treatment plants in all industrial areas; development of new methods of air and water treatment; purification of water bodies; installation of water and air filters at enterprises; aeration of soils; seasonal limitation on hunting and fishing; noting down of rare animals and birds in the ″Red Book″; fines for cutting down and burning woods etc.

Nature protection is an international problem. It has become a part of political program(me)s in many countries. Many different organizations and agencies cooperate their forces to protect our planet. Major organizations are: Environmental Protection Agency (EPA), Global Atmosphere Watch, Greenpeace, National Air Quality Standards, Green Parties etc.

People must understand that it is necessary to save our planet for future generations. All of us should always remember the advice of a great English writer John Galsworthy who said: «If you don't think about the future you will not have it».

**pollution credit* is a pollution standard (level) which is accepted by the ecological organization or the country government. This standard can't be exceeded.

2. Answer the following questions.

1. Do you agree that the problem of environmental protection is very important?

2. What does the word «ecology» mean?

3. When was the problem of environmental protection first mentioned?

4. Did the problem come logically from the development of human life on the planet?

5. What is the 20^{th} century known for?

6. How do pollutants affect and degrade ecosystem?

7. What serious measures should be taken to create a system of ecological security?

8. Natural protection is an international problem, isn't it?

9. What steps are taken to protect environment in the world?

10. Why should we do our best to save nature?

3. Put in the right prepositions.

1. People lived … harmony with nature. 2. It seems … them that natural riches are unlimited. 3. The problem … environmental protection was first mentioned … the Second World War. 4. But … the same time, the progress gave birth … very serious problems. 5. It is necessary to save our planet … future generations.

4. Give the Russian equivalents to the following words and word combinations.

Впервые упомянута, неисчерпаемые богатства, человеческое вмешательство в природу, космические исследования, породить серьезные проблемы, значительное количество, разрушать экосистему, вымирание животных, радиоактивное загрязнение, предпринять серьезные меры, создать систему экологической безопасности, уничтожение природы, часть политической программы, занести в Красную Книгу, штраф за загрязнение окружающей среды, промышленные отходы, объединить силы, сохранить планету, будущие поколения.

5. Complete the following statements translating the words in brackets.

1. Air (загрязнение) is a serious problem in most of the world's big cities. We should (снизить, уменьшить) the amount of cars there. 2. Thousands of hectares of the world's rainforests are (уничтожаются) every year. This (уничтожение) of the rainforests affects the global climate in various ways. 3. Scientists now believe that ozone layer is (разрушается) by the chemicals in some common products, such as deodorants and hair-sprays. The (разрушение) caused to the ozone can never be repaired. 4. Everybody knows that nuclear (отходы) can (нанести вред) the environment. 5. Our rivers need (очистка).

6. Compose sentences with the following word combinations.

Ecology, the source of life, first mentioned, unexpected catastrophe, to come logically, scientific and technological progress, to give birth, considerable amount, to affect and degrade ecosystem, serious measures, new methods, installation, big fines, international problem, major organizations, part of a political program, to cooperate forces, to remember the advice.

7. Read the sentences and the text. Fill in the gaps with one of the proposed combinations.

too much	too many	not enough

How we are destroying out planet

1. There are <u>too many</u> cars on the roads.
2. We <u>don't</u> use <u>enough</u> energy from the sun.
3. We use ___ plastic.
4. We put ___ chemicals into the see.
5. We use ___ electricity.
6. We burn ___ coal.
7. We ___ use ___ wind power.
8. We are destroying ___ trees and forests.
9. We ___ recycle ___ glass and paper.
10.

so	so much	so many	too	too much	too many	enough

Save the Earth

We are slowly destroying the Earth. The seas and rivers are ___ dirty to swim in. There is ___ smoke in the air that it is unhealthy to live in many of the world's cities. In one well-known city, for example, poisonous gases from cars pollute the air ___ that traffic policemen have to wear oxygen masks.

We have cut down ___ trees that there are now vast areas of waste-land all over the world. As a result, farmers in parts of Africa cannot grow ___ to eat. In certain countries in Asia there is ___ little rice. Moreover, we do not take ___ care of the countryside. However, it is not ___ simple to talk about the problem. We must act now before it is ___ late to do anything about it. Save the Earth.

8. Make up sentences with the help of the substitution table. Pay attention to the form of the predicate in the subordinate clause.

Ex: Present Simple Future Simple
If we <u>have</u> electric cars we'<u>ll need</u> less petrol.

If When	we	reduce the amount of cars in cities	there won't there'll	be less air pollution
		do not throw old things away		be so much rubbish
		build airports far from towns		be less noise
		use fewer chemicals		be less water pollution
		build more treatment plants		be much cleaner air in our cities
		use the natural energy of the sun, the wind and the waves		be so much harmful waste of one kind or another
		use ozone-friendly deodorants and hair sprays		be destruction of the ozone-layer

9. Read the text with the dictionary and then its summary. Insert correct words in the blanks, using the information from the text.

a) Air pollution is a cause of ill-health in human beings. In a lot of countries there are laws limiting the amount of smoke which factories can produce. Although there is not enough information on the effects of smoke in the atmosphere, doctors have proved that air pollution causes lung diseases.

The gases from the exhausts of cars have also increased air pollution in most cities. The lead in petrol produces a poisonous gas which often collects in busy streets surrounded by high buildings. Children who live in areas where there is a lot of lead in the atmosphere cannot think as quickly as other children and are clumsy when they use their hands.

There are other long-term effects of pollution. If the gases in the atmosphere continue to increase, the earth's climate may become warmer. A lot of the ice near the Poles may melt and cause serious floods.

b) Air (1) pollution can make people (2) ___. Consequently, some countries pass (3) ___to control the quantity of (4) ___in the air. (5) ___causes particular damage to the body by harming the (6) ___. (7) ___should not be used in petrol because it is bad for children's (8) ___ and makes them clumsy in using their hands. Poisonous gas from (9) ___collects in those parts of cities where there are skyscrapers. Pollution can also have an influence on the earth's (10) ___. The ice may melt near the North and South Poles, resulting in very bad (11) ___.

III. Summarizing

1. Look through the text again and discuss it in the form of dialogues using the active words and expressions. The topics for dialogues:

– From the history of environmental pollution.

– The results of the mankind development.

– Measures on nature protection.

– Nature protection is an international problem.

2. Get ready to speak on the topic «Protection of the environment».

IV. Supplementary reading

1. Read the text. Try to understand it and be ready to retell it in Russian.

Worldwide pollution

Pollution is the introduction of substances or energy into the environment, resulting in the danger to human health and nature. The major forms of pollution include:

– Air pollution – the release of chemicals and particulates into the atmosphere;

– Water pollution – surface water and groundwater contamination;

– Soil contamination – spill of chemicals or underground storage tank leakage;

– Radioactive contamination, added in the 20th century with discoveries in atomic physics;

– Noise pollution – roadway noise, aircraft noise, industrial noise;

– Light pollution – light over-usage, over-illumination and astronomical interference;

– Visual pollution – the presence of overhead power lines, motorway billboards, open storage of trash or solid waste;

– Thermal Pollution – a temperature change in natural water bodies caused by human influence.

Air Pollution.

Substances which degrade the quality of the air are known as air pollutants. There are three primary sources of air pollution:

chemical, biological and particulate.

Chemical pollution is emitted by thermal power plants, motor vehicles and aircrafts, mines, refineries, cement and metal processing, manufacture of pesticides etc.

Biological air pollutants include molds, pollen, fungi, and bacteria. In addition, human accidents can cause the release of biological agents.

Particulate pollution is air pollution caused by small particles in the air. Sources of particulate pollution:

– natural such as dust, storms, fires and volcanic activity;

– human processes: such as manufacturing facilities, nuclear weapons, fumes from paint, aerosol spray, varnish etc.

Air pollution influences the world in a number of ways:

– diseases of the heart and lungs, asthma, emphysema and respiratory allergies;

– ultraviolet radiation;

– air pollutants are ingredients in acid rain, smog and other pollutions.

2. Read the texts. Translate them in written form using a dictionary.

Water pollution

It is a process of contamination of surface or ground water.

Some of the principle sources of water pollution are:

– industrial discharge of chemical wastes and byproducts,

– discharge of poorly-treated or untreated sewage,

– farming practice,

– surface runoff containing spilled petroleum products,

– discharge of contaminated and/or heated water used for industrial processes,

– acid rain caused by industrial discharge of sulfur dioxide,

– underground storage tank leakage.

Water contaminants may be organic and inorganic substances.

Organic pollutants: insecticides and herbicides, bacteria from sewage operations, food processing waste, industrial solvents.

Inorganic water pollutants include: heavy metals, acidity caused by industrial discharges, chemical waste as industrial byproducts, agriculture fertilizers including nitrates and phosphates.

Soil contamination

It is the presence of man-made chemicals in the soil. This type of contamination typically results from the rupture (break) of underground storage tanks, application of pesticides, discharge of industrial wastes to the soil. The most common chemicals are petroleum hydrocarbons, solvents, pesticides, lead and other heavy metals.

The main problem is that many people are in direct contact with contaminated soils, drinking water or inhalation of soil vaporized contaminants. The main soil pollutants are: chromium, pesticide, herbicide, lead, benzene, mercury, organophosphates, and chlorinated solvents. They are carcinogenic, dangerous for nervous system, associated with leukemia, depression of the central nervous system, headache, eye irritation, skin rash etc.

УЧЕБНЫЙ БЛОК 6 (УБ-6)
«HVAC»

Цели:

Вы должны знать: 1. Грамматика: – Словообразование (Word Building); – Пассивный Залог (Passive Voice); – Причастие I, II (Participle I, II); – Степени сравнения прилагательных (Degrees of Comparison of Adjectives); – Конструкции с инфинитивом (Infinitive Constructions). 2. Лексика: – ключевые слова и словосочетания по теме «HVAC».	Вы должны уметь: – использовать лексические и грамматические навыки: а) для чтения и перевода текстов; б) в монологической и диалогической речи.

I. Vocabulary and grammar

1. Read these international words and try to guess their meaning.

Ventilating (n), air conditioning (n), climate (n), control (n), regulate (v), system (n), base (n), principle (n), component (n), method (n), modernization (n), function (n), specialist (n), service (n), central (adj), local (adj), factor (n), natural (adj), designer (n), thermodynamics (n).

2. Read the words and try to remember their meanings.

Building (n), condition (n), transfer (v), necessary (adj), space (n), invention (n), discover (v), attempt (n), dust (n), odor (n) maintain (v),volume (n).

3. Read out the following words and memorize them.

Heating (n)	отопление
Ventilation (n)	вентиляция
Air conditioning (n)	кондиционирование воздуха
humidity (n)	влажность
efficiency (n)	эффективность
engineer (n)	инженер
install (v)	устанавливать, монтировать
specify (v)	точно определять, устанавливать
conditions (n)	обстановка, условия
moisture (n)	влага
smoke (n)	дым, копоть
safe (n,adj)	безопасность, безопасный
device (n)	устройство, механизм, прибор
remove (v)	удалять, перемещать
provide (v)	обеспечивать, снабжать
pressure (n)	давление

4. Read out these expressions several times till you remember them.

climate control	контроль климата
central heating	центральное отопление
local heating	местное отопление
self-contained heater	самоконтролируемый обогреватель
Indoor Air Quality (IAQ)	качество воздуха в помещении
Variable Air Volume (VAV) system	система изменения объема воздуха
manual control	ручное управление
forced ventilation	принудительная вентиляция
natural ventilation	естественная вентиляция
sealed window	пластиковое (герметичное) окно

5. Match the English words and their Russian equivalents.

1. discovery (n)	a. эффективность
2. moisture (n)	b. давление
3. efficiency (n)	c. открытие
4. heater (n)	d. тех. обслуживание
5. conditions (n)	e. обогреватель
6. maintenance (n)	f. условия
7. pressure (n)	g. влага

6. Find pairs of synonyms.

1. safe (adj)	1. supply(v)
2. provide (v)	2. various(adj)
3. building (n)	3. humidity(n)
4. moisture (n)	4. harmless(adj)
5. different (adj)	5. dwelling(n)

7. Give antonyms for the following words (choose an appropriate synonym from the box below).

Comfortable (adj), harmful (adj), big (adj), inefficient (adj), dehumidify (v), integrate (v), comfort (n), install (v).

separate (v), useful (adj), inconvenient (adj), humidify (v), efficient (adj), discomfort (n), small (adj), dismantle (v).

8. Think of derivatives of the following words.

System (n), regulate (v), humidity (n), vary (v), heat (n), maintain (v).

9. Give the three forms of the following verbs.

To make, to go, to cost, to build, to flow, to get, to mean, to choose, to buy.

10. Read the sentences. Translate them into Russian paying attention to the underlined grammatical forms and explain them.

1. Humidity and temperature must be closely regulated.
2. It is based on the principles of heat transfer.
3. The invention goes hand-in-hand with the industrial revolution.
4. Function of heating is very important.
5. Heating systems may be classified as central and local.
6. Local heating devices are self-contained heaters.

7. Air conditioned buildings often have sealed windows, because open windows would disrupt the right work of an HVAC system.

8. Methods for ventilating a building may be of several types.

11. Give the Russian equivalents to the following words and word combinations.

Climate control, design of a building, safe and healthy conditions, basic principles, heat transfer, industrial revolution, to go hand-in-hand, methods of modernization, high efficiency, to be closely interrelated, to change the pressure and humidity, specialists from different fields, building services engineer, to vary the air volume, to install the system, Variable Air Volume system, necessary air temperature, central or local heating, cold climate, private house, public building, heating devices, self-contained heater, to control manually, process of changing, to remove moisture, to give away odors and smoke, to remove dust, airborne bacteria, indoor air quality, method for ventilating, to divide into classes, mechanical/forced and natural types, stand-alone air conditioner, sealed window, constant indoor air conditions.

II. Work with the text

1. Read the text and do the exercises that follow it.

What is HVAC?

HVAC is initials for «**heating, ventilating, and air conditioning**». It is like «climate control» and is important in the design of buildings where humidity and temperature must all be closely regulated. This system maintains safe and healthy conditions in a building.

Heating, Ventilation, and Air conditioning is based on the basic(main) principles of thermodynamics, heat transfer and on inventions and discoveries made by Michael Faraday, Willis Carrier, James Joule, William Rankine, Sadi Carnot, and many others. The invention of the components of HVAC systems goes hand-in-hand with the industrial revolution, and new methods of modernization, higher efficiency, and system control.

The three functions of heating, ventilation and air conditioning are closely interrelated as they all change the *temperature*, *pressure* and *humidity* of the air in a building and provide thermal comfort and acceptable indoor air quality. They may be integrated into one or more HVAC systems.

Many specialists from different fields such as designers and engineers, mechanics, architects, or building services engineers analyze, design, and specify the HVAC systems.

HVAC systems may be large or small, may be installed in different parts of a building, but all of them vary the air volume and that is why all of them are called Variable Air Volume (VAV) systems.

Heating. It provides necessary air temperature in a space. Heating systems may be classified as *central* or *local*. Central heating is often used in cold climates to heat private houses and public buildings. Local heating devices are self-contained heaters and usually controlled manually and can heat a desired space.

Ventilation. Ventilation is the process of «changing» or replacing of air in any space to remove moisture, odors, smoke, heat, dust and airborne bacteria. It is one of the most important factors for maintaining acceptable indoor air quality in buildings. Methods for ventilating a building may be divided into *mechanical/forced* and *natural* types.

Air Conditioning. Air Conditioning gives the necessary comfort in a room or a building. An air conditioning system, or a stand-alone air conditioner, provides cooling, ventilation, and humidity control for all or part of a house or a building. Air conditioned buildings often have sealed windows, because open windows would disrupt the right work of the HVAC system.

HVAC – Heating, Ventilating, Air Conditioning
IAQ – Indoor Air Quality
VAV – Variable Air Volume

2. Answer the following questions.
1. What does the abbreviation HVAC stand for?
2. What does this system regulate and maintain?
3. What principles is HVAC based on?
4. Are three functions of HVAC closely interrelated or not? Why?
5. What specialists help to control HVAC systems?
6. What is Heating?
7. What is Ventilation?
8. What is Air Conditioning?

3. Put in the right prepositions.

1. The discovery was made … Michael Faraday. 2. HVAC is based… several principles. 3. HVAC systems go hand…hand with the industrial revolution. 4. Functions may be integrated … one or more HVAC systems. 5. Ventilation may be divided … two types.

4. Complete the following statements.

1. HVAC is initials for… . 2. Heating, Ventilation, and Air conditioning is based on the principles of … . 3. HVAC provides … . 4. Heating systems may be classified as … . 5. Central Heating is used in … and for … . 6. Local Heating is used for … . 7. The main role of Ventilation is … . 8. Methods of Ventilation may be classified as … . 9. An air conditioning system provides … .

5. Compose sentences with the following word combinations.

Climate control, basic principles, to be interrelated, specialists from different fields, central heating, to control manually, air conditioning, natural ventilation.

6. Translate from Russian into English.

Отопление, вентиляция и кондиционирование регулируют влажность и температуру воздуха. Система поддерживает комфортные и безопасные для здоровья условия в помещении. HVAC система базируется на принципах передачи тепла и законах термодинамики. Все компоненты системы тесно взаимосвязаны. Они могут быть объединены в одну или несколько систем HVAC.

Функция отопления – поддерживать необходимую температуру воздуха в помещении. Система отопления может быть центральной и местной. Вентиляция – это процесс замены воздуха в помещении при помощи удаления влаги, запахов, дыма, излишков тепла, пыли и бактерий. Вентиляция может быть принудительной и естественной. Кондиционирование поддерживает комфортную температуру воздуха в комнате или здании.

III. Summarizing

1. Look through the text again and discuss it in the form of dialogues using the active words and expressions. The topics for dialogues:

– What is HVAC and HVAC systems?

– Heating.

– Ventilation.

– Air Conditioning.

2. Get ready to speak on the topic «HVAC».

IV. Supplementary reading

1. Read the text. Try to understand it and be ready to retell it in Russian.

Direct digital control of HVAC systems

Until the 1990s, pneumatic controls were used as the most popular controls with most HVAC systems. Smaller system control was converted to electronic control in the 1980s, but the larger systems were often pneumatic-based. However, pneumatic, mechanical, and analog electronic controls today are obsolete (old-fashioned), inflexible, and provide poor performance if compared with direct digital controls (DDC).

DDC is based on programmable digital logic that provides superior flexibility, diagnostics, and efficiency of operation.

A direct digital controller is a microprocessor based unit designed to be used for local loop HVAC control. It can interface directly with the local sensors and controlled devices, replacing the usual local controllers. Single controller and its internal programming are limited by its internal memory and controller is normally associated with a large central computer.

Today, the air system and air terminals can be integrated in a powerful DDC network that provides the user with unlimited diagnostic and programming capabilities. Zone temperatures can be set, monitored, and alarmed before the space occupants notice a problem. The electronic communication capabilities of these systems even permit the control and monitoring of the whole world if desired.

The use of DDC systems requires routine attention and tool maintenance. If errors are found they should be corrected immediately. With DDC, the wiring and power supplies may need routine inspection. Some systems contain backup batteries for power-failure protection, and these batteries have to be replaced in time. Self-diagnostics and numerous operations with much information provide quicker and easier problem solution. Today's service technicians are well acquainted with digital electronics and their repairing. Maintenance of these systems is not the problem as it was when technicians were mechanically but not electronically oriented.

DDC (direct digital control) – цифровое управление
loop control – управление циклом
wiring – прокладка электрических проводов; электропроводка
power supply – электроснабжение, энергоснабжение
digital logic – цифровая логика, цифровые логические схемы

microprocessor based unit – устройство с микропроцессором
internal programming – внутреннее программирование
air system – система воздушного охлаждения
air terminal – воздухораспределитель
capability – мощность; производительность
backup – дублирование, замена, дублер, запасной вариант
power failure – отключение электричества

2. Read the text. Translate it in written form using a dictionary.

Heating, ventilation and air conditioning (HVAC) systems help to control the climate, and keep occupants comfortable by regulating the temperature and air flow. HVAC systems are also important to occupants' health, because a well regulated and maintained system will keep a home free from mold and other harmful organisms. In some environments, such as museums, HVAC systems are vitally important for the preservation of historic artifacts.

A great variety of systems, devices, and equipment configurations are used today. HVAC systems may be large or small, one terminal or hundreds of terminals, may be installed in different parts of a building – but all of them vary the air volume and that is why all of them are called Variable Air Volume (VAV) systems.

Specialists have been refining HVAC devices and systems for over 20 years. And today HVAC systems are installed in most modern office buildings and dwellings. Even laboratories, hospitals, and many industrial applications are using systems due to the energy saving benefits and comfort that these systems can provide.

When you choose any type of HVAC system, it is important to find one that is size-appropriate to the building to achieve the best efficiency and comfort level. If your HVAC contractor recommends a heating system that is too big or too little for your home or business, the result will be an inefficient system that will cost more money in the long run. An oversized air conditioner will not efficiently dehumidify the air and create an uncomfortable climate inside the building.

size-appropriate – подходящий по размеру
refine (v) – улучшать, усовершенствовать
mold = mould – плесень, грибок
in the long run – в конце концов

УЧЕБНЫЙ БЛОК К (УБ-К)

Контроль по модулю

Final Test 1

I. К началу утверждений из левой колонки подберите окончание из правой.

1. Building engineers are busy with …	1. … harmful particles that originate and tend to stay inside.
2. Human comfort is measured by …	2. … necessary comfort in a building.
3. Acceptable indoor air quality …	3. … air replacing in a space.
4. Indoor air pollutants are …	4. … direct digital control devices.
5. There are three sources of air pollution …	5. … HVAC systems and their treatment.
6. Most of HVAC systems are controlled today by …	6. … necessary air temperature in a space.
7. Heating provides …	7. … provides acceptable comfort level of 80 % of subjects.
8. Ventilation is a process of …	8. … air temperature, relative humidity and air movement.
9. Air conditioning gives …	9. … chemical, biological and particulate.
10. Conditions that affect human comfort are …	10. … indoor air quality, light and noise level.

II. Раскройте скобки, употребив правильно видовременную форму глаголов.

1. After graduating from PSU young specialists (to work) as building engineers in different parts of Belarus.
2. Specialists (to build) already a lot of treatment plants to protect the environment.
3. At this moment they (to develop) a new project.
4. Natural gas (to use) for water and air heating.
5. Gases proportions (to vary) slightly in different localities.
6. Specialists (to establish) Indoor Air Quality standards for many years.
7. At the previous conference they (to find) new ways of problem solution.
8. The system (to maintain) safe and healthy conditions in a building.

III. Отметьте значками T (True – верно) или F (False – неверно) следующие утверждения.

1. Building engineers are busy with necessary comfort level supply for the occupants.
2. The most widely used heating system is a local heating system.
3. Air conditioning is designed to modify air temperature.
4. The main advantage of natural gas is that it is harmless and colorless.
5. The main function of ventilation is to produce a desired temperature.
6. CO_2 level is an indicator of ventilation necessity.
7. Indoor Air Quality is a definite level of comfort of occupants.
8. HVAC devices can not be sources of pollution.
9. To protect environment people should create a system of ecological security.
10. Functions of HVAC are interrelated as they change temperature, pressure and humidity of the air.

IV. Ответьте на вопросы.

1. Why is the role of a building engineer very important nowadays?
2. What is the composition of the air?
3. What are the causes of IAQ misbalancing?
4. What are the most common indoor air pollutants?
5. What is an air cleaner device and when do we use it?
6. What is Heating? How can heating systems be classified?
7. What is Ventilation? What methods of Ventilation do you know?
8. What is Air Conditioning?
9. What measures should be taken to protect our environment?

МОДУЛЬ 3

Модуль 3 «Heating » (III семестр)									
УБ-0	УБ-1	УБ-2	УБ-3	УБ-4	УБ-5	УБ-6	УБ-7	УБ-8	УБ-К

	Название учебных элементов	Форма занятия	Количество часов
УБ-0	Введение в модуль	практ. занятие	2
УБ-1	«Heating»	практ. занятие	6
УБ-2	«Panel Heating»	практ. занятие	6
УБ-3	«Natural Gas»	практ. занятие	8
УБ-4	«Gas Burner»	практ. занятие	6
УБ-5	«Fuel and Heating Oil»	практ. занятие	6
УБ-6	«Boilers»	практ. занятие	6
УБ-7	«Classification of Boilers»	практ. занятие	6
УБ-8	«Radiators»	практ. занятие	6
УБ-К	Final control	зачет	2
Итого практических занятий:			54

УБ-0. ВВЕДЕНИЕ В МОДУЛЬ

Интегрирующая цель:

Вы должны знать:	Вы должны уметь:
Грамматика: 1. Основные способы словообразования. 2. Степени сравнения прилагательных и наречий. 3. Неличные формы глагола (причастие I, II, герундий, инфинитив). 4. Страдательный залог. 5. Модальные глаголы. Лексика: 1. Базовую лексику и основные термины по темам модуля. 2. Все о системах отопления, видах отопительных приборов, топлива, используемого с целью отопления.	Использовать знания грамматики и лексики на различных этапах работы: с текстом (при ознакомительном и изучающем чтении, при переводе текстов); в устной речи, как в форме диалогов, так и в монологических высказываниях по теме «Отопление».

Entry Test 2

(Входной тест)

I. Укажите номера предложений, сказуемое которых в страдательном залоге.

1. These device is used for climate control in a building.
2. Engineers are in the laboratory now.
3. The first company appeared in the 18^{th} century.
4. Fuel oil has been obtained from petroleum.

5. Scientists have discovered a new type of heating oil.
6. The process will be divided into several stages.
7. Gasoline is the fuel type generally used for home heating.
8. A boiler is a vessel in which water is heated under pressure.
9. Their application can be limited.
10. Building engineers have a wide range of activity.

II. Укажите номер (a, b или c) правильного перевода подчеркнутых грамматических явлений.

1. Central heating system <u>differs</u> from local system.	a) отличалась b) отличается c) будет отличаться
2. Central heating <u>is installed</u> in most new housing.	a) устанавливается b) должно устанавливаться c) установлены
3. Heating <u>is to provide</u> comfort.	a) обеспечивает b) должно обеспечить c) представляет обеспечение
4. Different types of devices <u>have been used</u> since the Industrial Revolution.	a) используются b) были использованы c) будут использоваться
5. <u>Heating</u> system consists of three parts.	a) отопительная b) отопление c) отапливаемая
6. Natural gas is used for <u>heating.</u>	a) отапливаемый b) отопительный c) отопление
7. Some districts <u>have to use</u> local heating.	a) используют b) должны использовать c) будут использовать
8. They <u>found</u> a way to put natural gas to good use.	a) находят b) нашли c) найдут
9. Gas burner <u>should provide</u> rapid mixing.	a) должен обеспечивать b) должен быть обеспечен c) будет обеспечен
10. Future work <u>will be aimed</u> at reducing cost.	a) должна быть нацелена b) будет нацелена c) была бы нацелена

11. Fuel of this type is becoming very important.	a) становится b) является c) должно стать
12. Boilers are being used to transfer the heat to the water.	a) использовали b) были использованы c) используются
13. A boiler uses circulated hot water.	a) циркулировала b) циркулирующую c) циркуляцию
14. Water circulated through a number of pipes.	a) циркулирует b) циркулировала c) циркулирующая
15. Natural gas production spread after the turn of the century.	a) естественный производитель газа b) потребление природного газа c) добыча природного газа
16. This gas is less clean.	a) очень чистый b) не такой чистый c) менее чистый
17. This method of production is the simplest.	a) проще b) очень простой c) самый простой
18. These different devices are widely used now.	a) этот b) эти c) те
19. This oil is applied for residential use.	a) использование b) используют c) пользователи
20. Serious measures should be taken to protect environment.	a) защищая b) чтобы защитить c) для защиты

УЧЕБНЫЙ БЛОК 1 (УБ-1)
«HEATING»

Цели:

Вы должны знать:	Вы должны уметь:
1. Грамматика: – Словообразование (Word Building); – Герундий (Gerund); – Причастие, деепричастие(Participle I, II); – Пассивный залог (Passive Voice). 2. Лексика: – ключевые слова и словосочетания по теме «Heating».	– использовать лексические и грамматические навыки: а) для перевода текстов; б) в монологической и диалогической речи.

I. Vocabulary and grammar

1. Read these international words and try to guess their meaning.

Atmospheric(adj), control(n), radiator(n), station(n), central(adj), standard(n), portion(n), result(n), electricity(n), energy(n), circulation(n), convector(n).

2. Read the words and try to remember their meanings.

heating (n)	floor (n)	occur (v)
conditioning (n)	rate (n)	building (n)
comfortable (adj)	consist (v)	distribute (v)
space (n)	local (adj)	degree (n)
prevent (v)	provide (v)	environment (n)
ceiling (n)	refer (v)	deliver (v)
amount (n)	interior (n)	maintain (v)
warmth (n)	necessary (adj)	

3. Read out the following words and memorize them.

amenities (n)	удобства
ambient (adj)	окружающий
generate (v)	производит
nuclear (adj)	ядерный
solar (adj)	солнечный
geothermal (adj)	геотермический, геотермальный
piping (n)	система (сеть) трубопроводов
install (v)	устанавливать (оборудование)
steam (n)	пар
fuel (n)	топливо, горючее
purpose (n)	цель
solid (adj)	твердый
coal (n)	(каменный) уголь
peat (n)	торф
refine (v)	очищать; перерабатывать (нефть)

4. Read out these expressions several times till you remember them.

indispensable part	необходимая часть
rate of heat loss	степень потери тепла
heating system	система отопления
heat generator	тепловой генератор
cogeneration plant (Heating and Electricity Stations)	ТЭЦ (теплоэлектроцентраль)

fossil fuel	ископаемое топливо
heat medium	теплоноситель
heat load	тепловая нагрузка
heat boiler station	тепловая станция
central heating	центральное отопление
local heating	местное отопление
district heating	централизованное отопление района
natural gas	природный газ
petroleum gas, oil gas	нефтяной (попутный) газ
manufactured gas	отопительный газ
measure of thermal energy	мера, единица измерения тепловой энергии
straw fuel	соляровое топливо

5. Match the English words and word expressions with their Russian equivalents.

1. to produce heat	a. смешанные системы
2. to circulate heat medium	b. относиться (к)
3. modern amenities	c. выработка теплоты
4. to deliver heat	d. производить тепло, нагревать
5. combined systems	e. циркулировать теплоноситель
6. to refer (to)	f. отличаться (от)
7. to differ (from)	g. современные удобства
8. heat generation	h. перегонка нефти
9. oil refining	i. подавать, доставлять тепло

6. Find pairs of synonyms.

1. amount (n)	a. 0,453 kg
2. medium (n)	b. create, generate (v)
3. comfortable (adj)	c. number , quantity (n)
4. produce (v)	d. aim (n)
5. deliver (v)	e. mount (v)
6. install (v)	f. convenient (adj)
7. purpose (n)	g. surrounding (adj)
8. thermal (adj)	h. agent (n)
9. ambient (adj)	i. happen, befall (v)
10. occur (v)	g. carry (v)
11. pound (n)	k. heat, thermic (adj)

7. Choose antonyms for the following words from the box below.

Comfort (n), convenient (adj), prevent (v), rapid (adj), standard (adj), urban (adj), install (v), new (adj), necessary (adj), heat (v).

permit (v), unusual (adj), slow (adj), discomfort(n), rural (adj), dismount (v), old (adj), unnecessary (adj), cool (v), inconvenient (adj)

8. Read derivatives of the following words and try to translate them.

Generate (v) – generated (adj), generating (adj), generation (n), generator (n), generative (adj).

Combine (v) – combined (adj), combining (adj), combination (n).

Refine (v) – refined (adj), refinery (adj), refining (adj).

9. Give the three forms of the following verbs.

To lose, to be, to get, to mean, to say, to smell.

10. Read the sentences. Translate them into Russian paying attention to the grammatical forms and explain them.

1. The main aim of heating is to provide the comfort. 2. It may refer either to heating or to ventilation. 3. It is for heating to prevent heat loss. 4. Heating system consists of three parts. 5. Combined with other systems it gives good results. 6. The system is referred to HVAC. 6. Central heating system differs from local one. 7. Different types of fuel are used today.

11. Give the Russian equivalents to the following words and word combinations.

Inseparable part, refer either to heating or to ventilation, to provide warmth, to maintain comfort, to prevent heat loss, ambient air, parts of the heating system, heat generator, nuclear station, geothermal station, cogeneration plant, to deliver heat, urban portions, to install the system, district heating, resultant heat, local heating, heating medium, fuel types, oil refining, straw fuel, thermal unit, basic measure, heat energy.

II. Work with the text

1. Read the text and do the exercises that follow it.

Heating

Heating is an indispensable part of modern amenities and is an inseparable part of HVAC as it may refer either to heating or to ventilation and air conditioning. The main aim of heating is to provide a comfortable atmospheric environment within a space and in such a way to maintain comfort, health or efficiency of the occupants. It is for heating to prevent the too quick loss of heat from the body. Heating of the ambient (surrounding) air of walls, ceiling or floor helps to control the rate of heat loss from the body.

All **heating systems** consist of three **parts**:

– heat generator (cogeneration or Heating and Electricity Stations (nuclear, solar, geothermal), heat only Boiler Stations)) to produce heat;

– piping (ductwork or pipes) to circulate and transfer heating medium;

– heater (radiator, convector) to deliver heat.

There are two **types of heating systems**: central and local.

– Central heating system – it is a standard method of providing warmth to the interior of a building. When combined with other systems (ventilation, air conditioning) in order to control the building climate the whole system may be referred to as HVAC. In the UK and much of northern Europe and urban portions (parts) of Russia central heating is installed in most new housing and it often can be used in a system of district heating. It differs from the local heating in that the heat generation occurs in one place (e.g. cogeneration plant in a town) and then the resultant heat is distributed by the system of pipes to the required place.

– Local heating system – the whole heating system is installed in the place (room, building) which is necessary to heat.

Heat may be carried by the following **heating mediums**: water, steam and air.

Different **types of fuel** are used today for the purpose of heating:

– solid (wood, coal, peat);

– liquid (oil and products of oil refining: mazut, petrol, kerosene, straw fuel);

– gaseous (natural gas, oil gas, manufactured gas);

– electricity.

A **BTU**, short for British Thermal Unit, is a basic **measure of thermal** (heat) **energy**. One BTU is the amount of energy needed to heat one pound* of water one degree Fahrenheit.

*pound – фунт (0,453 кг) современная мера веса, используемая в англоговорящих странах

2. Agree or disagree with the following statements.

1. The main purpose of heating is to prevent the too quick loss of heat from the body. 2. Cogeneration plants produce only electricity. 3. The system of pipes circulates and distributes heating agent. 4. Central heating system can be referred to HVAC. 5. In Belarus central heating system is the most popular in towns and cities. 6. Central heating differs from local one. 7. Heat may be carried only by water. 8. The most popular fuel for heating today is petrol. 9. The basic international measure of heat is BTU.

3. Answer the questions.

1. What is the purpose of heating?
2. What parts do all heating systems consist of?
3. What are the roles of all parts?
4. How many types of heating systems do you know?
5. Where can we use central heating and local heating?
6. How do two heating system types differ from each other?
7. What heating mediums can you name?
8. What types of fuel do you know?
9. What is the basic measure of heat energy?

4. Put in the right prepositions.

1. Heating is an important part … our life. 2. Heating provides comfortable environment … a space. 3. It serves to prevent heat loss … the body. 4. When combined … other systems … order to control the climate it may be referred …HVAC. 5. The resultant heat is distributed … the system … pipes. 6. We can use many appliances … the purpose of heating.

5. Complete the statements.

1. Heating is … .
2. The purpose of heating is … .
3. Heating systems consist of … . These parts are … .
4. The aim of heaters is …, of piping is … , of heat generator is … .
5. Central heating is a standard method of … and it is used in … .
6. Central heating system differs from local in that … .
7. Heating mediums are: … .
8. Heating fuels are: … .

6. Translate from Russian into English.

1. Теплоснабжение является сегодня неотъемлемой частью современных удобств. 2. Оно тесно связано с такими процессами как вентиляция и кондиционирование воздуха. 3. Цель теплоснабжения – обеспечить комфорт в помещении. 4. Все системы отопления состоят из трех частей: производителя тепла, системы труб для его распределения и отопительных приборов. 5. Существует два типа систем отопления: центральное и местное. 6. Центральная система наиболее популярна в городах. 7. Местная система чаще используется в небольших населенных пунктах, загородных домах и коттеджах. 8. При центральной системе отопления тепло производится на теплоэлектростанциях, а при местной – в отопительных узлах, находящихся в отапливаемом объекте. 9. Теплоносителем может быть вода, пар и воздух. 10. Топливо делится на категории: твердое, жидкое, газообразное. Также с этой целью может использоваться электричество.

III. Summarizing

1. Comment on:

– All heating systems consist of three parts.

– We know two types of heating systems.

– Different types of fuel are used today for heating.

– Heat may be carried by several heating mediums.

2. Prove that:

– Heating is an indispensable part of modern amenities and is an inseparable part of HVAC.

– Central heating differs from the local heating.

3. Get ready to speak on the topic «Heating».

IV. Supplementary reading

1. Read the texts. Try to understand them and be ready to retell them in Russian.

Text A

District heating (less commonly called teleheating) is a system for distributing heat generated in a centralized location for residential and

commercial heating requirements. The heat is often obtained from a cogeneration plant (simultaneously generates both electricity and useful heat). For the purpose of heat heat-only boiler stations are also used (Station generates thermal energy in the form of hot water for use in district heating applications. Unlike cogeneration plants, heat-only boiler stations are dedicated to generating heat). A district heating plant can provide higher efficiencies and better pollution control than localized boilers.

District heating accumulator tower in London. This plant use waste water piped from Power Station on the River Thames. (January2006)

In most Russian cities, district-level Heating and Electricity Stations (Russian: ТЭЦ, Теплоэлектроцентраль) produce more than 50 % of the nation's electricity and simultaneously provide hot water for neighboring city blocks. They mostly use coal and oil-powered steam turbines for cogeneration of heat. Now, gas turbines and combined cycle designs are beginning to be widely used as well. A Soviet-era approach of using very large central stations to heat large districts of a big city or entire small cities is fading away due to inefficiency, much heat is lost in transportation tubes because of leakages and lack of proper thermal insulation. In the United Kingdom, district heating also became popular after World War 2, but on a restricted scale. The photo (right) shows the accumulator for heated water. It is still in operation, the water now being heated locally. Many other such heating plants still operate on estates across Britain. Though they are said to be efficient, a frequent complaint of residents is that the heating levels are often set too high – the original designs did not allow individual users to have their own thermostats.

Text B

Diffusion of district heating

Penetration of district heating (DH) into the heat market is very different in various countries. Penetration is influenced by different factors, including environmental conditions, availability of heat sources and economic and legal framework. In the year 2000 the percentage of houses supplied by heat from district heating in some European countries was as follows: Iceland 95 %, Estonia 52 %, Poland 52 %, Denmark 51 %, Sweden 50 %, Slovakia 40 %, Finland 49 %, Hungary 16 %, Austria 12,5 %, Germany 12 %, Netherlands, 3 %, UK 1 %.

On Iceland the prevailing positive influence on DH is availability of easily captured geothermal heat. In most East European countries energy planning included development of cogeneration and district heating. Negative influence in The Netherlands and UK can be attributed partially to milder climate and also to stiff competition with natural gas.

2. Translate the text in written form using a dictionary.

District heating traces its roots to the hot water-heated baths and greenhouses of the ancient Roman Empire. District systems gained prominence in Europe during the Middle Ages and Renaissance. One system in France is in continuous operation since the 14th century. Across the Atlantic, the U.S. Nava Academy in Annapolis began steam district heating service in 1853.

Although these and numerous other systems have operated over the centuries, the first commercially successful district heating system was launched in Lockport, New York, in 1877 by American hydraulic engineer Birdsill Holly, considered the founder of modern district heating.

The future of many of these systems is in doubt; the same kind of problems many district heating operations in former Soviet Union and Eastern Europe have today. In North America, the owners, in many cases power utilities, completely lost interest in the district heating business and did not provide sufficient funding for maintenance of the systems. The result was that, after some years, the systems started to lose customers; the reliability for heat supply went down and finally the whole system closed down. For example, in Minnesota in the 1950s there were about 40 district steam systems; today only a few remain.

УЧЕБНЫЙ БЛОК 2 (УБ-2)
«PANEL HEATING»

Цели:

Вы должны знать:	Вы должны уметь:
1. Грамматика: – Пассивный Залог (Passive Voice); – модальные глаголы (Modal Verbs); – Степени сравнения прилагательных и сравнительные конструкции (Degrees of Comparison of Adjectives and Comparative Constructions). 2. Лексика: – ключевые слова и словосочетания по теме «Panel Heating».	– использовать лексические и грамматические навыки: а) для перевода текстов; б) в монологической и диалогической речи.

I. Vocabulary and grammar

1. Read these international words and try to guess their meaning.

System (n), radiator (n), climate (n), design (n), gas (n), element (n), thermostat (n), wall (n).

2. Read the words and try to remember their meanings.

purpose (n)	private (adj)	locate (v)
use (v)	fuel (n)	place (n)
medium (n)	source (n)	necessary (adj)
pipe (n)	fossil (adj)	fire (n)
heat (n)	distribute (v)	efficient (adj)
deliver (v)	occupy (v)	equal (adj)

3. Read out the following words and memorize them.

combustion (n)	горение, возгорание, сжигание
coal (n)	уголь
duct (work) (n)	трубопровод, труба (система труб)
feed (v)	подавать, питать, снабжать
furnace (n)	печь
steel (n)	сталь
copper (n)	медь
draft (n)	сквозняк, дутье, тяга
mount (v)	монтировать, крепить
bury (v)	закапывать, засыпать, прятать
thermostat (n)	термостат
device (n)	устройство, механизм, аппарат
install (v)	устанавливать, монтировать
pump (n)	насос, помпа
tap (n)	кран (водопроводный, газовый)
boiler (n)	(паровой) котел, бойлер
flexible (adj)	легко приспосабливаемый, гибкий
burn (v)	гореть, сгорать
separate (v)	разделять(ся)
basement (n)	подвал

4. Read out these expressions several times till you remember them.

forced air	нагнетаемый воздух, сжатый воздух
solar powered	питаемый солнечной энергией
resultant heat	полученное тепло
wasted heat	потерянное тепло
air leak	утечка воздуха
water circulation	круговорот (циркуляция) воды
hot water supply system	система горячего водоснабжения
manual control	ручное управление
air-duct system	система воздуховодов, вент. каналов
wood-burning stove	дровяная печь
electric heater	электрич. радиатор, нагреватель
fan heater	воздушный отопительный агрегат, калорифер, тепловентилятор
forced convection	принудительная конвекция
self-contained heater	автономный нагреватель

5. Match the English words and word expressions with their Russian equivalents.

1. installation (n)	a. водоснабжение
2. draft (n)	b. утечка воздуха
3. flexibility (n)	c. управлять вручную
4. source (n)	d. пар
5. air leak	e. циркулировать
6. to control manually	f. установка
7. water supply	g. источник
8. steam (n)	h. воздухораспределение
9. circulate (v)	i. сквозняк
10. air distribution	j. гибкость

6. Find pairs of synonyms

1. purpose (n)	a. discovery, finding (n)
2. medium (n)	b. supply (v)
3. deliver (v)	c. divide (v)
4. invention (n)	d. carry, bring (v)
5. feed (v)	e. effectual (adj)
6. mount (v)	f. aim, goal, object (n)
7. separate (v)	g. duct (n)

8. pipe (n)	h. appliance (n)
9. device (n)	i. agent (n)
10. efficient (adj)	g. install (v)

7. Choose antonyms for the following words from the box below.

Flexible (adj), heated (adj), manual (adj), connect (v), combine (v), private (adj), used (adj), install (v), basement (n).

unheated (adj), dismount (v), attic (n), separate (v), common (adj), disconnect (v), stable (adj), automatic (adj), unused (adj).

8. Give the three forms of the following verbs.

To feed, to make, to have, to mean, to come, to build, to leave, to fall.

9. Read the word combinations and expressions. Translate them into Russian paying attention to:

a) Passive Voice-

The system can be used, central heating is credited to ancient Rome, ducts were fed by steam, pipes will be made of modern material.

b) the Predicate, its Tense form and Voice-

The system works regularly, the Romans installed a system, pipes were feeding radiators, the water will never come from the tap.

c) Modal Verbs-

Heating elements should be located, they can have a thermostat, they have to use local heating.

d) Degrees of Comparison and Comparative constructions-

Central heating is the most widely used system, the coldest part of the room, local heating is less efficient, it offers greater flexibility.

e)Participle I, Participle II-

Heating system, widely used system, specially designed room, circulating water, steam fed through pipes, heat may be solar powered, wasted heat.

10. Give the Russian equivalents to the following word combinations and phrases.

Purpose of Panel Heating, to circulate heating mediums, pipes connected with radiators, private houses, to deliver heat, air ducts, central fire, burned fuel, specially designed room, to install in the basement, combustion of fossil fuel, heat source, resultant heat, forced air, water circulating, pipes are made of steel,

pipes feed radiators, heat source may be solar powered, mounted on or in walls, buried in the floor, ensure an equal supply of heat, heated by one boiler, to installed in a concrete place, local systems, self-contained heaters, unused rooms, greater flexibility, can be left unheated, central heating is more efficient.

II. Work with the text

1. Read the text and do the exercises that follow it.

Panel Heating

For the purpose of Panel Heating the two heating systems may be used: central and local.

Central heating is a system which works by circulating heating mediums around a network of pipes connected with radiators, and then radiators deliver heat to the space that should be heated.

Central heating is often used in cold climates to heat private houses and public buildings.

The invention of central heating is often credited to the ancient Romans, who installed a system of air ducts in walls and floors of public baths and private villas. The ducts were fed with hot air from a central fire.

The central heating is the most widely used system of heating, where the fuel is burned in one place – the basement or a specially designed room. The most common heat source is from combustion of fossil fuel (coal, oil, manufactured and natural gases, wood) in a furnace or boiler (gas, oil and electric*). The resultant heat is distributed typically by forced *air* through ductwork, by *water* circulating through pipes or by *steam* fed through pipes. However the heat source may be solar powered, in which case the distribution system is normally hydraulic.

The pipes of central heating system are usually made of steel or copper and they feed radiators with heating medium. The heating elements (radiators or vents) should be located in the coldest part of the room, typically next to the windows. But it is necessary to prevent so called «wasted» heat – air leaks or drafts. The heating elements may be mounted on or in walls, or buried in the floor (walls or ceiling).

All but the simplest system have a pump to circulate the water and ensure an equal supply of heat to all radiators. Also they can have a thermostat to control the central heating.

An important thing to remember is that the central heating system is separate from the hot water supply system; it means that the water circulating around

the central heating system will never come out of your taps. Although, these two systems may be heated by one boiler.

Local heating devices are self-contained heaters that are usually controlled manually and installed in a concrete place which is necessary to heat. Such devices include:

– wood-burning stove or furnace
– resistive electric heater (electric fire)
– heat-lamps
– fan-heater(electric heater with forced convection)

While central systems are more efficient, local systems offer greater flexibility. In sparsely (not often) occupied building, the unused rooms can be left unheated in local heating systems.

* electric heating system is far less energy efficient and less common.

2. Agree or disagree with the following statements.

1. With central heating the heat is generated by combustion of a fuel. 2. Heating system and hot water supply are two separate branches which are not connected. 3. Heat pumps circulate the water and supply heat exchangers (radiators) with heat. 4. The radiators can be located in any suitable part of the room. 5. It is necessary to control the air leaks in a building. 6. In local heating system the unused rooms are heated simultaneously with all rooms. 7. Devices for local heating are usually controlled manually. 8. Local systems are more efficient than central ones.

3. Answer the questions.

1. What is the classification of heating systems?
2. How does central heating system work?
3. What was the system of heating in ancient Rome?
4. How is the heat source produced and where?
6. What heating mediums is the resultant heat distributed by?
8. What is the role of pipes?
9. Where should the radiators be located?
10. What is the role of the pump and the thermostat?
11. What local heating devices can you name?

4. Put in the right prepositions.

1. It is a system which works … circulating heating mediums … a network … pipes connected … radiators. 2. Central heating is often used … cold climates. 3. The invention is credited …the ancient Romans. 4. The ducts were fed … hot air … a central fire. 5. The resultant heat is distributed … forced air …ducts. 6. The pipes are usually made … steel. 7. The heating elements may be mounted … or … walls, or buried … the floor. 8. The water circulating … the central heating system will never come … … your taps.

5. Complete the following statements.

1. We classify heating systems as… . 2. Central heating is a system… . 3. Central heating is often used in… . 4. Central heating was invented in … . 5. The most common heat source is from … . 6. The pipes of central heating system are made of … . 7. Radiators should be located in … . 8. All systems can have a… . 9. Central heating system is separate from … . 10. Local heating devices are heaters that are installed in … and controlled …, they are:... . 11. Central heating system is more …, but local system is more … .

6. Translate from Russian into English.

С целью отопления используются две системы отопления: центральная и местная. Центральная система отопления используется в основном в странах с холодным климатом. Центральное отопление – это система, которая циркулирует теплоноситель (горячую воду, пар, воздух) по системе труб, соединенных с батареями. Источник тепла производится при сгорании топлива в печи. Батареи должны быть расположены в самой холодной части комнаты. Чтобы отопление было успешным, необходимо ликвидировать утечку теплого воздуха из помещения. Система может иметь насос для циркуляции воды и термостат для контроля уровня тепла. Местное отопление используется в основном для нагрева отдельных помещений. Центральная система отопления считается более эффективной, хотя местная система является более гибкой.

III. Summarizing

1. Comment on:

– The Romans invented the central heating system.

– Central heating is a system which works by circulating heating mediums around a network of pipes connected with radiators.

2. Prove that:

– It is necessary to prevent air leaks in a building.

– Local heating system is more flexible than central one.

3. Look through the text again and discuss it in the form of dialogues using the active words and expressions. The topics for dialogues:

– Central heating system.

– Local heating system.

4. Get ready to speak on the topic «Panel heating».

IV. Supplementary reading

1. Read the text. Try to understand it and be ready to retell it in Russian.

Central heating systems are generally comprised of the boiler (to heat the water), piping (to circulate the water) and radiators (to deliver the heat).These are the very basic components. Central heating is the most economical heating system for heating the whole house. Your dwelling may be only partially occupied for some periods of time, for example, the occupants may be out at school or work. In this situation, you should consider a two tier heating system. Use the central heating system when the house needs heating for example, first thing in the morning, late afternoon and evenings and finally weekends. For the time of partial occupancy a separate heating solution is a good idea – perhaps a storage heater* or electric radiator. Alternatively, you could install Thermostatic Radiator Valves* (TVRs), which will control the temperature of individual radiators.

Some of the other methods of controlling the central heating are the room thermostat, which will switch the central heating on and off depending on the desirable temperature. You need to locate this in a sensible place with easy access and preferably not affected by draughts.

Boilers have quite sophisticated programming systems that allow you to turn the heating on and off automatically. This can be particularly effective when you are away during winter months. Turning the central heating on for a short period can prevent the water in the central heating from freezing and causing burst pipes. Burst pipes in the winter are not any fun.

* *storage heater*– is an electric appliance which stores heat at a time when base load capacity is available at a low price, usually during the night, and

releases it during the day. Heat is usually stored in clay bricks or other ceramic materials because of its low cost and high specific heat capacity.

**Thermostatic Radiator Valves* – клапан термостата

2. Translate the text in written form using a dictionary.

Heat distribution

Water is used as heat carrier in heat distribution networks. The route length consists of two pipes, one for heated forward water and one for return water. The temperature of forward water varies between 70 and 120 °C depending on the load demands, while the temperature of the returned water varies between 40 and 65 °C.

In the childhood of heating distribution pipes were insulated with mineral wool and laid in a common concrete square box duct. This first generation of distribution pipes was expensive to build, but was reliable, if the ducts were well ventilated and well drained.

In order to reduce the cost of distribution, the second generation of pipes was introduced during the 60's: pipes in two separate asbestos cement casings. This type of piping was not so expensive, but more unreliable. In order to low the distribution cost and to increase the reliability, the third generation was introduced during the 70's: prefabricated* pipes with polyethylene casing and insulated with polyurethane foam. However, there have been some problems with the reliability of the joints brining together the prefabricated pipes. Nowadays, more than 90 % of all pipes buried in the ground during a year are pipes of this third generation.

**prefabricated* – изготовленный заводским способом.

УЧЕБНЫЙ БЛОК 3 (УБ-3)
«NATURAL GAS»

Цели:

Вы должны знать:	Вы должны уметь:
1. Грамматика: – Герундий (Gerund); – Причастие, деепричастие (Participle I, II); – Степени сравнения прилагательных и сравнительные конструкции (Degrees of Comparison of Adjectives and Comparative Constructions); 2. Лексика: – ключевые слова и словосочетания по теме «Natural Gas».	– использовать лексические и грамматические навыки: а) для чтения и перевода текстов; б) в монологической и диалогической речи.

I. Vocabulary and grammar

1. Read these international words and try to guess their meaning.

Natural (adj), gas (n), process (n), geologic (adj), organic (adj), economical (adj), electricity (n), role (n), microorganism (n), technology (n).

2. Read the words and try to remember their meanings.

produce (v)	source (n)	clean (adj)
locate (v)	use (v)	break down (v)
create (v)	pipeline (n)	surface (n)
cooling (n)	channel (v)	condition (n)
heater (n)	manufacture (v)	occur (v)
dryer (n)	efficient (adj)	boil (v)

3. Read out the following words and memorize them.

combustion (n)	горение, возгорание, сжигание
compose (v)	составлять, состоять
methane (n)	метан, болотный газ
deposit (n)	отложение, осадок
emission (n)	выделение, распространение
appliance (n)	аппарат, прибор, устройство
seep (v)	просачиваться, проникать
flame (n)	огонь, пламя
escape (n)	утечка (газа, пара и т.п.)
manufacture (n)	производство
well (n)	колодец
significance (n)	значение, смысл
spread (v)	распространяться
reside (v)	проживать, находиться
marshland (n)	болотистая местность
undertake (v)	предпринимать, совершать
intestine (n) (syn. bowels)	кишечник
distinguish (v)	находить отличия, различать
commercialize (v)	превращать в источник прибыли
demand (n)	спрос

4. Read out these expressions several times till you remember them.

hydrocarbon gas	углеводородный газ
pressurized natural gas	сжатый природный газ
associated natural gas	попутный газ
deposited natural gas	залежи природного газа
gas production	добыча газа
oil deposit	залежи нефти (месторождение)
organic matter	органическое вещество
valued resource	ценный ресурс
distilled water	дистиллированная вода
coal-manufactured gas	газ, добытый из угля
regulated resources	регулируемые ресурсы
tiny microorganism	крошечные микроорганизмы
landfill gas	газ из органических отходов
anaerobic conditions	анаэробные условия (без доступа кислорода, воздуха)
biogenic methane	биогенный метан
methanogens	метан-продуцирующие бактерии
thermogenic methane	термогенный метан
unconventional natural gas	нетрадиционный природный газ
to develop technology	развивать технологию, методику

5. Match the English words and their Russian equivalents.

1. composition (n)	a. житель
2. resident (n)	b. традиционный
3. resource (n)	c. обнаруживать, раскрывать
4. discover (v)	d. альтернативный
5. fuel (n)	e. состав
6. alternative (adj)	f. запасы, ресурсы
7. conventional (adj)	g. соединять, связывать
8. couple (v)	h. проводить канал
9. channel (v)	i. топливо

6. Find pairs of synonyms.

1. compose (v)	a. utilize (v)
2. produce (v)	b. small (adj)
3. use (v)	c. constitute, form (v)
4. escape (v)	d. create (v)

5. tiny (adj)	e. far-reaching (adj)
6. invent (v)	f. seep (v)
7. various (adj)	g. generate (v)
8. extensive (adj)	h. different (adj)

7. Choose antonyms for the following words from the box below.

Unconventional (adj), heater (n), dryer (n), natural (adj), elementary (adj), clean (adj), efficient (adj), regulated (adj), break down (v).

uncontrollable (adj), cooler (n), build up (v), complex (adj), artificial (adj), dirty (adj), ineffective (adj), traditional (adj), humidifier (n)

8. Read derivatives of the following words and try to translate them.

Combust (v) – combustion (n), combustible (adj), combustive (adj), combustibility (n), combustor (n).

Deep (v) – deepened (adj), depth (n), deepen (v).

Signify (v) – significance (n), significant (adj), significantly (adv), significative (adj), signification (n).

Develop (v) – developable (adj), developed (adj), developer (n), development (n), developmental (adj), developments (n).

Invent (v) – invented (adj), invention (n), inventive (adj), inventor (n), inventively (adv), inventiveness (n).

9. Give the three forms of the following verbs.

To find, to make, to keep, to spread, to strike, to dig, to burn, to break, to deal, to bring, to cut, to hold.

10. Read the word combinations and expressions. Translate them into Russian paying attention to:

a) Participle I, Participle II, Gerund-

Composed of methane, located above, to use for cooking, naturally occurring gas, running appliances, seeped gas, by creating pipelines, seawater boiling, distilled water, coal-manufactured gas, organic matter breaking down, inspired by the miraculous flames, looking for naturally occurring gas.

b) the Predicate, its Tense form and Voice-

High combustibility makes natural gas a valued resource. Natural gas played an interesting role in early civilizations. Natural gas was used by people many centuries ago. Chinese has found a way to put natural gas to good use.

Natural gas production spread after the turn of the century. Natural gas is produced by methanogens. Organic matters are broken down by tiny microorganisms. Unconventional natural gas will be used in the nearest future. They found areas where natural gas was escaping the earth.

c) Degrees of Comparison and Comparative constructions-

More economical, less clean, more properly, the most extensive.

11. Give the Russian equivalents to the following words and word combinations.

Highly combustible gas, to be located deep in the earth's crust, geologic processes, low emission, highly valued resource, water heater, clothes dryer, ancient people, supernatural significance, to lighten the gas, rudimentary pipelines, bamboo stalks, to channel the gas to fuel fires, alternative natural gas, gas production, the turn of the century, a regulated resource, tiny microorganisms, natural gas deposits, deposited natural gas, biogenic methane, thermogenic methane, to escape into the air, anaerobic conditions, to develop new technologies, unconventional natural gas, to be inspired by the flames.

II. Work with the text

1. Read the text and do the exercises that follow it.

Natural gas

Natural gas is a highly combustible odorless and colorless hydrocarbon gas largely composed of methane – 80 – 95 %, ethane – 5 – 15 %, propane and butane < 5 %. It is produced in pressurized deposits located deep in the earth's crust, commonly located just above oil deposits. Gas produced from oil wells is called associated gas. **Deposited natural gas** is created in roughly the same manner as oil, by geologic processes that act upon organic matter over millions of years. High combustibility coupled with low emissions makes natural gas a highly valued resource. More economical than electricity, natural gas is primarily used for heating homes, cooking and running appliances such as water heaters and clothes dryers.

Natural gas played an interesting role in early civilizations. In ancient times gas seeped from the Earth and lightened by lighters considered miraculous flame and had supernatural significance (priestess made prophecies inspired by it).

By 500 B.C., the Chinese found a way to put natural gas to good use by creating rudimentary pipelines with bamboo stalks. They found areas where natural gas was escaping the earth, then channeled the gas to fuel fires beneath pots of boiling seawater in order to make distilled drinking water.

In 1785, the United Kingdom commercialized an alternative natural gas manufactured from coal – **thermogenic methane**. Natural gas production spread to the United States after the turn of the century, but coal-manufactured gas was less clean and less efficient.

In 1821, William Hart of New York dug the first well looking for naturally occurring gas and the first American gas company soon followed (appeared). Robert Bunsen invented the Bunsen burner in 1885, and by 1938 natural gas was a regulated resource in many countries.

Aside from natural gas deposits, tiny microorganisms called *methanogens* produce natural gas by breaking down organic matter. Methanogens reside in the intestines (bowels) of humans and many animals, including cattle, and can also be found near the surface of the earth in anaerobic conditions. These microorganisms are responsible for landfill gas termed (called) **biogenic methane or biogas**.

Though a great deal of natural gas escapes from various sources, efforts are undertaken to develop technology that can harvest (give) unconventional or renewable natural gas*. This would compliment (widen, enlarge) natural gas resources.

Today natural gas is commercially produced from oil fields and natural gas fields. The largest natural gas fields are probably fields in Iran and Urengoy gas field in Russia. Africa and Asia have the third place.

Natural gas demand grows faster than other fuels such as oil ad coal. Natural gas has clean-burning properties, lower greenhouse gas emissions and lower cost. Its environmental benefits make it the fuel of choice for many governments and corporation. So we can say that Natural Gas represents transition from the petroleum age to the era of clean energy.

**renewable natural gas* – is a biogas similar to natural gas. It is also known as Sustainable Natural Gas

renewable – восстановимый, возобновляемый
sustainable – рациональный
prophecy – предсказание, пророчество
priestess – жрица
turn of the century – окончание столетия

2. Choose the best alternative according to the text.

1. Natural gas is

a) non combustible gas; b) multicolored gas; c) odorless gas

2. Deposited natural gas is located
a) on the surface of the Earth; b) between oil deposits;
c) deep in the earth's crust.
3. Natural gas is used for
a) heating; b) lighting; c) car launching.
4. An alternative natural gas is manufactured from
a) sun energy; b) coal; c) oil.
5. Biogenic methane is produced by breaking down
a) organic matter; b) chemical substances; c) inorganic substances.

3. Agree or disagree with the following statements.

1. Natural gas is a gas composed of methane. 2. Natural gas is full of colors and odors. 3. Natural gas is not highly combustible hydrocarbon gas that is why it is not a very important resource. 4. For ancient people natural gas took super-natural significance. 5. By 500 B.C., the Spanish found a way to put natural gas to good use. 6. The Chinese used natural gas in distilled drinking water making. 7. In 1945, the United Kingdom commercialized an alternative natural gas manufactured from coal. 8. Coal-manufactured gas was cleaner and more efficient. 9. Methanogens are produced in anaerobic conditions deep in the Earth. 10. Natural gas demand grows slower than other fuels such as oil and coal.

4. Answer the questions.

1. What is natural gas?
2. Where is deposited natural gas produced and located? By what process?
3. What does the term «associated natural gas» mean?
4. What purposes is natural gas used for?
5. Why is it such a highly valued resource?
6. When did people find a way to put natural gas to good use? In what way?
7. What is alternative natural gas (thermogenic methane) manufactured from?
8. What are the characteristics of coal-manufactured gas?
9. When was the first well of natural gas dug? Where? By whom?
10. How do methanogens produce natural gas (biogenic methane)?
In what conditions?
11. What are the latest efforts of specialists in the field of natural gas?
12. What can you say about natural gas production today?
13. Why is natural gas fuel number one for many countries?

5. Put in the right prepositions.

1. Natural gas is produced … deposits located deep in the earth's crust, just … oil deposits. 2. Deposited natural gas is created …geologic processes. 3. Natural gas is used …heating homes. 4. Gas seeps … deep in the earth. 5.The Chinese found a way to put natural gas … good use by creating rudimentary pipelines … bamboo stalks. 6. Alternative natural gas is manufactured …coal. 7. Methanogens produce natural gas … breaking down organic matter. 8. Microorganisms are responsible …biogenic methane. 9. Natural gas escapes … …various source. 10. Methanogens can also be found …the surface … the earth … anaerobic conditions. 11. Natural gas represents transition … the petroleum age … the era of clean energy.

6. Complete the statements.

1. Natural gas is… .
2. Natural gas is located … .
3. Deposited natural gas is created… .
4. Natural gas is used… .
5. To ancient people gas was … .
6. By 500 B.C. the Chinese… .
7. Alternative natural gas is … and it is called … .
8. Methanogens reside … and produce natural gas (biogenic methane) by … .
9. Methanogens can only exist in … .
10. Specialists undertake efforts to … .

7. Translate from Russian into English.

Природный газ воспламеняемое вещество без цвета и запаха, является экономичным источником тепла, применяется для отопления помещений, приготовления пищи, нагрева воды и т.д. Природный газ может быть получен несколькими способами: залегать глубоко в земной коре (геологический процесс); может быть получен из угля; может быть образован при разложении органических веществ в анаэробных условиях. В последнее время ученые предпринимают попытки по созданию альтернативного нетрадиционного источника природного газа.

III. Summarizing

1. Comment on:

– Natural gas played an interesting role in early civilizations.

– Methanogens produce biogas.

2. Prove that:

– Natural gas is a highly valued resource.

– Natural gas manufactured from coal is not so popular today.

3. Look through the text again and discuss it in the form of dialogues using the active words and expressions. The topics for dialogues:

– The history of natural gas.

– Natural gas sources.

4. Get ready to speak on the topic «Natural gas».

IV. Supplementary reading

1. Read the text. Try to understand it and be ready to retell it in Russian.

What is the difference between propane and natural gas?

The difference between propane and natural gas is in their portability, compression, energy efficiency, and cost. But both are used for heating, cooking, or drying. The mixture of natural gas is comprised of propane with other gases like methane, butane, ethane, and pentane.

One difference in the physical properties of propane and natural gas is how easily they liquefy and transport. Propane turns easier into a liquid, so it's easy to compress it and carry in a portable tank. You can buy compressed propane at most gas stations. Natural gas can't be compressed so easily. It usually comes to your home from a utility company along dedicated lines to power things like a central heating system, clothes dryer, and water heater. When uncompressed, propane is lighter than natural gas, so it will dissipate in air. Natural gas can accumulate in an enclosed area, displacing oxygen and causing asphyxiation.

Propane provides more energy than natural gas does. Heat is measured in BTUs, or British Thermal Units. Propane provides about 2500 BTUs for the same volume of natural gas that only gives 1000 BTUs. However, natural gas can be less expensive (one-sixth the cost of propane), depending on where you live. Utilities in colder climates might supply natural gas for less money, especially during winter months. Some rural areas don't have access to a utility company that provides gas service.

Since they are both petroleum distillates, made of hydrocarbons, these gases have comparable power. Natural gas, as its name implies, develops naturally in deposits underground, so it only needs to be pumped out to use. Propane, since it is one of the gases in those deposits, must be further separated and distilled.

You probably couldn't tell the difference between their performance on a grill or water heater. They ignite at the same temperature. Some barbecue enthusiasts prefer natural gas because it is a cleaner burning fuel, which means it doesn't release as many pollutants into the air. Exhaust from propane might affect the taste of food. To the end user, there aren't many differences between natural gas and propane, but they do differ in their chemical properties

utilities – коммунальные предприятия
to ignite – воспламенять, зажигать
portable tank – передвижной бак, резервуар
distillate – продукт перегонки, дистилляции, дистиллят
exhaust – выпуск, выхлоп

2. Translate the text in written form using a dictionary.

Use of natural gas

Natural gas is a major source for *electricity* generation through the use of gas turbines and steam turbines. Particularly high efficiencies can be achieved through combining gas turbines with a steam turbine in a combined cycle mode. Natural gas burns cleaner than other fossil fuels, such as oil and coal, and produces less greenhouse gas. For an equivalent amount of heat, burning natural gas produces about 30 % less carbon dioxide than burning petroleum and about 45 % less than burning coal. Combined cycle power generation using natural gas is thus the cleanest source of power, using fossil fuels, and this technology is widely used wherever gas can be obtained at a reasonable cost. Also, the natural gas supply is said to peak around the year 2030, 20 years after the peak of oil. It is also projected that the world's supply of natural gas should be exhausted around the year 2085. So we can say that Natural Gas represents transition from the petroleum age to the era of clean energy.

Natural gas can be used to produce *hydrogen* that can be used in hydrogen vehicles.

Compressed natural gas (CNG) (methane) is used as a clean alternative to other *automobile fuels* such as gasoline (petrol) and diesel. The energy efficiency is generally equal to that of gasoline engines, but lower compared with modern diesel engines, partially due to the fact that natural gas engines is on the way of improvement.

Liquefied petroleum gas (LPG) (a propane and butane blend) is also used to fuel vehicles. LPG and CNG vehicle fuel systems are not compatible. CNG also requires higher pressure tanks which are typically much heavier than those used for LPG.

Residential domestic use Natural gas is supplied to homes, where it is used for such purposes as cooking in natural gas-powered appliances and/or ovens, natural gas-heated clothes dryers, and heating/cooling. Home or other building heating may include boilers, furnaces, and water heaters. CNG is used in rural homes without connections to piped-in public utility services*, or with portable grills.

Natural gas is a major feedstock for the production of ammonia, for use in fertilizer* production.

Natural gas is also used in the manufacture of fabrics, glass, steel, plastics, paint, and other products.

**public utility services* – коммунальные услуги
**fertilizer* – удобрение

УЧЕБНЫЙ БЛОК 4 (УБ-4)
«GAS BURNER»

Цели:

Вы должны знать:	Вы должны уметь:
1. Грамматика: – Словообразование (Word Building); – Герундий (Gerund); – Причастие, деепричастие (Participle I, II); – Пассивный залог (Passive Voice) 2. Лексика: – ключевые слова и словосочетания по теме «Gas Burner».	– использовать лексические и грамматические навыки: а) для чтения и перевода текстов; б) в монологической и диалогической речи.

I. Vocabulary and grammar

1. Read these international words and try to guess their meaning.

Industrial (adj), atmosphere (n), energy (n), regulation (n), gas (n), combination (n), result (n).

2. Read the words and try to remember their meanings.

domestic (adj)	supply (n)	generate (v)
furnace (n)	develop (v)	ring (n)
flame (n)	amount (n)	necessary (adj)
device (n)	combustion (n)	volume (n)

3. Read out the following words and memorize them.

burner (n)	горелка, форсунка
gradual (adj)	постепенный, последовательный

uniform (adj)	однородный, постоянный
acetylene (n)	ацетилен
simultaneous (adj)	одновременный
liberation (n)	выделение
pulverize (v)	растирать, измельчать, распылять
inlet (n)	впуск, вход, входное отверстие
application (n)	применение, использование
proportioner (n)	дозирующее устройство, дозатор
port (n)	отверстие, проход
induce (v)	заставлять, приводить (к чему-л.)
annulus (n)	кольцо
pass (v)	проходить, идти
require (v)	требовать, нуждаться

4. Read out these expressions several times till you remember them.

domestic burner	горелка для домашнего пользования
furnace atmosphere	атмосфера (газовая среда) печи
slow flame	слабое пламя
short flame	моментальное (быстрое) пламя
long flame	долгое пламя
energy liberation	выделение энергии
variable supply	непостоянное снабжение, подача
combination burner	комбинированная горелка
ignition temperature	температура воспламенения
instantaneous combustion	мгновенное сгорание
thorough mixing	тщательное смешивание
complete combustion	полное сгорание
burner ring	кольцо форсунки

5. Match the English words and their Russian equivalents.

1. furnace (n)	a. кольцо
2. ring (n)	b. объем
3. fuel (n)	c. сгорать
4. mixture (n)	d. круглый
5. volume (n)	e. печь
6. burn (v)	f. выделять, освобождать
7. annular (n)	g. смесь
8. liberate (v)	h. воспламенение
9. ignition (n)	i. топливо

6. Find pairs of synonyms.

1. supply (v)	a. go by (v)
2. simultaneous (adj)	b. changeable (adj)
3. pass (v)	c. cause (v)
4. variable (adj)	d. provide (v)
5. thorough (adj)	e. use (n)
6. annulus (n)	f. atomize (v)
7. pulverize (v)	g. ring (n)
8. application (n)	h. detailed (adj)
9. induce (v)	i. synchronous (adj)
10. combustion (n)	j. burning (n)

7. Choose antonyms for the following words from the box below.

Domestic (adj), ignite (v), inlet (n), entrance (n), induce (v).

outlet (n), exit (n), put out (v), discourage (v), industrial (adj)

8. Read derivatives of the following words and try to translate them.

Pulverize (v) – pulverizer (n), pulverizing (adj), pulverization (n), pulverizable (adj), pulverized (adj).

Burn (v) – burnable (adj), burned (adj), burner (n).

Pass (v) – passable (adj), passability (n), passage (n).

Require (v) – required (adj), requirement (n).

9. Give the three forms of the following verbs.

To bring, to know, to make, to fall, to become, to leave, to let.

10. Read the sentences and expressions. Translate them into Russian paying attention to the grammatical forms and explain them.

Gas is burned in a burner, burning flame, using a gaseous fuel, combination burners were developed, simultaneous burning, pulverized coal, when the gas is mixed with the oxygen, the burner should provide rapid mixing, gas enters the burner, the flame can be shortened, the required furnace volume.

11. Give the Russian equivalents to the following words and word combinations.

Industrial burners, cleanliness, furnace atmosphere, to produce a flame, long slow burning flame, uniform and gradual energy liberation, temperature regulation, to heat up products, gaseous fuel, propane, seasonal supply, simultaneous

burning, pulverized coal, sufficient amount, required steam, following principles, necessary oxygen, ignition temperature, instantaneous combustion, air inlet, complete combustion, steam generation, short flame, rapid and thorough mixing, correct proportions, mixing device, long «lazy» flames, slow and gradual mixing, supply line, burner port, to induce, to flow through a ring, to provide.

II. Work with the text

1. Read the text and do the exercises that follow it.

Gas Burner

Gas is burned in industrial or domestic burners and furnaces because of its cleanliness, ease of control of burner or furnace atmosphere, ability to produce a long slow burning flame with uniform and gradual energy liberation, and ease of temperature regulation. Gas burner is a device to generate a flame to heat up products using a gaseous fuel such as acetylene, natural gas or propane.

Because of the variable or seasonal supply of gaseous fuels, combination burners were developed. They permit the simultaneous burning of the available gas together with pulverized coal or oil in an amount sufficient to produce the required steam.

The principle of combustion in the burner is the following: when a molecule of combustible gas is mixed with the oxygen necessary for its combustion at a temperature above the ignition temperature, combustion is practically instantaneous. Some burners have an air inlet to mix the fuel gas with air to ensure complete combustion. For steam generation, where a short flame is desired in order to reduce the required furnace volume, the burner should provide rapid and thorough mixing of the fuel and air in the correct proportions for good combustion. For such applications, a good burner is primary a proportioner and mixing device.

In industrial furnaces where long «lazy» flames are desired, slow and gradual mixing of the air and fuel in the furnace is necessary. In the burner the gas, under pressure in the supply line, enters the burner through a burner port and induces a flow of air to pass through the port. Mixing is poor, and a fairly long flame results. The flame can be shortened by use of the «burner ring». The gas flows through a ring and induces air to flow both around and within the annulus of the ring.

2. Choose the best alternative according to the text.

1. Gas is burned in burners because of its
   a) ability to produce a long burning flame; b) high combustibility;
   c) ability to evaporate.

2. Combination burner permits

a) highly efficient heating; b) the steam production; c) simultaneous burning of some fuels.

3. Complete combustion depends on

a) the size of the burner; b) the correct air and fuel proportion;

c) the quality of fuel.

4. The flame can be shortened by

a) the burner ring; b) the air shortage; c) the burner size.

3. Agree or disagree with the following statements.

1. Gas burner is a device to produce electricity. 2. Combination burners permit the simultaneous burning of the gas together with pulverized coal or oil. 3. An air inlet permits to mix the fuel gas with air to ensure complete combustion. 4. For good combustion the burner should provide rapid and thorough mixing of fuel and air in arbitrary (free) proportions. 5. Gas enters the burner through a great number of holes.

4. Answer the questions.

1. Where is gas burned?
2. What is a gas burner?
3. What is a combination burner like? When is it used?
4. What is the principle of combustion in a burner?
5. What is necessary for short flames?
6. What is necessary for full (complete) combustion?
7. What is necessary for long flames?
8. How can the flame be shortened?
9. What is the principle of the «burner ring» work?

5. Put in the right prepositions.

1. Gas is burned … burners because … its cleanliness, ease … control of burner atmosphere, ability … produce a long slow burning flame … gradual energy liberation. 2. A short flame is desired in order … reduce the furnace volume. 3. In the burner the gas, … pressure in the supply line, enters the burner … a burner port and induces a flow … air to pass through the port.

6. Complete the statements.

1. Gas burner is a … .
2. Gaseous fuels for gas burners are … .

3. The combination burner is a … .

4. The principle of combustion in the burner is the following … .

5. For the short flame … … mixing is necessary.

6. To ensure complete combustion some burners have an … to mix the fuel gas with air.

7. Long «lazy» flames need … .

8. In the burner ring the gas flows through… and induces air to….

7. Translate from Russian into English.

Ацетилен, природный газ и пропан сжигаются в промышленных или бытовых топках для получения пламени. Однако существуют комбинированные топки (горелки), работающие на газу, угле или нефтепродуктах. Для получения быстрого пламени необходимо быстрое и тщательное смешивание топлива и воздуха в правильных пропорциях. Некоторые горелки имеют специальные входные отверстия для воздуха для достижения полного сгорания топлива. Для получения долгого пламени необходимо медленное постепенное смешивание топлива с воздухом. Пламя можно уменьшить при помощи специальных колец.

III. Summarizing

1. Look through the text again and discuss it in the form of a dialogue using the active words and expressions.

IV. Supplementary reading

1. Read the text. Try to understand it and be ready to retell it in Russian.

Types of flame

Gas can be burnt in a number of ways by which we mean that the air necessary for combustion can be brought into contact with gas at the burner by any of several different methods. These methods are:

1) Non-aerated flame. Also known as the luminous or «neat». The gas is supplied to the burner at low pressure, and all the air for combustion is obtained from the air surrounding the burner.

2) Aerated or Busen flame. Some of the air for combustion (about a half) is brought in before the gas reaches the burner head. The remaining air is obtained from the surrounding atmosphere. The gas is used at normal district pressure.

3) Air Blast. Air is supplied under pressure (1/2 to I Ib. per sq.in.) from a blower and the air jet entrains the low – pressure gas into the burner tube.

The flame produced is similar to that produced with high pressure gas, all the air for combustion being obtained in the primary stage.

4) High pressure gas. The burner construction is similar to the low pressure aerated burner, but gas is supplied at a pressure of about 3 Ib.per sq.in.

All the air for combustion is entrained as primary air.

5) Mixture gas. With this method of gas burning all the air (required for burning the gas) at first is mixed with gas and the mixture is supplied to the burner at high pressure.

For domestic uses of gas we are concerned with only the first two types of flame. The remaining three methods of burning gas are all confined to industrial applications.

«*neat*» – чистый, очищенный.

2. Translate the text in written form using a dictionary.

Town gas

Town gas is a generic term referring to manufactured gas produced for sale to consumers and municipalities. The terms coal gas, manufactured gas, syngas (SNG) and hygas are also common. Depending on the processes used for its creation, the gas is a mixture of caloric gases: hydrogen, carbon monoxide, methane, and volatile hydrocarbons with small amounts of noncaloric gases carbon dioxide and nitrogen as impurities.

The proportions of the various gases in the mixture vary slightly among different gas undertakings, and this is why we have different calorific values and different specific gravities.

Town gas is possibly one of the easiest fuels to burn. Other fuels like paraffin and petrol must first be vaporized before they actually unite with oxygen and burn. But town gas is already in gaseous form.

Prior to the development of natural gas supplies and transmission virtually all fuel and lighting gas was manufactured, and the byproduct coal tars were at some times an important chemical feedstock for the chemical industries. The development of manufactured gas led to the industrial revolution and urbanization.

undertaking – предприятие
gravity – сила тяжести, плотность
calorific value – теплотворная способность, калорийность

УЧЕБНЫЙ БЛОК 5 (УБ-5)
«FUEL AND HEATING OIL»

Цели:

Вы должны знать:	Вы должны уметь:
1. Грамматика: – Видовременные формы (Tenses); – Герундий (Gerund); – Причастие, деепричастие(Participle I, II); – Пассивный залог (Passive Voice). 2. Лексика: – ключевые слова и словосочетания по теме «Fuel and Heating Oil».	– использовать лексические и грамматические навыки: а) для перевода и чтения текстов; б) в монологической и диалогической речи.

Text A. Fuel oil

I. Vocabulary and grammar

1. Read out the following words and memorize them.

engine (n)	двигатель, мотор
purpose (n)	цель
kerosene (n) ['kerəsi:n]	керосин
affect (v)	оказывать влияние
refine (v)	перерабатывать (нефть)
obtain (v)	получать, добывать, приобретать
gasoline (n) ['gǽsə(u)li:n]	газолин, бензин
residual (adj) [ri'zidjuəl]	остаток, остаточный продукт

2. Read out these expressions several times till you remember them.

fuel oil	горючее
liquid petroleum product	жидкий нефтеродукт
petroleum distillation [pi'trəuljəm]	дистилляция, перегонка нефти
boiling temperature	температура кипения
oil fraction	нефтяная фракция
residual fuel oil	топочный мазут
diesel oil	дизельное топливо
rural location	сельское местожительство
fuel composition	топливный состав
heavy fuel	тяжелое топливо
commercial fuel	промышленное топливо
crude oil	сырая, неочищенная нефть
seasonal issue	сезонное обеспечение
petroleum gas	нефтяной (попутный) газ

3. Find pairs of synonyms.

1. produce (v)	a. petroleum (n)
2. oil (n)	b. refine (v)
3. constitution (n)	c. generate (v)
4. purify (v)	d. composition (n)

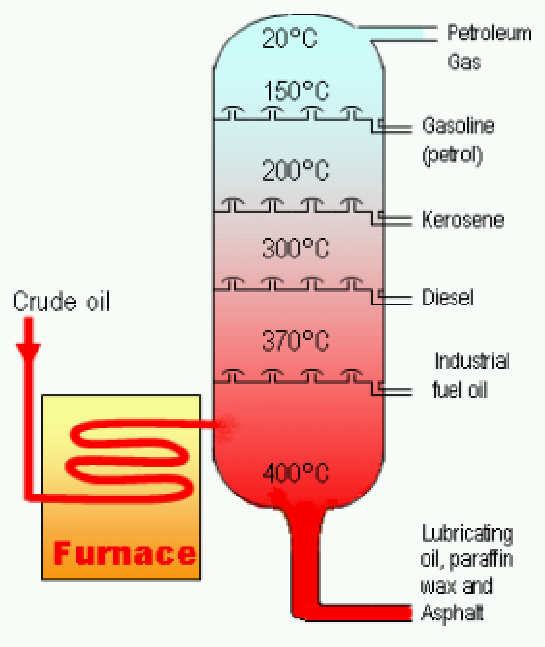
4. Give the Russian equivalents to the following words and word combinations.

Fuel oil, simple definition, liquid product, burner, furnace, power generation, petroleum distillation, obtained fraction, to classify into classes, boiling temperature, fuel composition, commercial fuel, crude oil, the heaviest fuel, commercial sense, diesel oil, residual fuel oil, home heating, to affect the price, the cost of refining, to influence the price, fuel transportation, fuel distribution, seasonal issue.

II. Work with the text

1. Read the text and do the exercises that follow it.

Fuel oil



A simple definition for fuel oil is any liquid petroleum product that is burned in furnaces or burners for the generation of heat or used in an engine for the generation of power.

Fuel oil is a fraction obtained from petroleum distillation. Fuel oil is classified into six classes, according to its boiling temperature, composition and purpose (the table). Factually the term fuel is used to indicate the heaviest commercial fuel, which can be obtained from crude oil, heavier than gasoline and petroleum gas.

In the commercial sense: № 1 fuel oil is kerosene; № 2 fuel oil is diesel oil; № 4, 5, 6 fuel oils are residual fuel oils. Distillate fuel oil such as **diesel oil** is the type generally used for home heating.

The price of crude oil directly affects the price of fuel oil. The costs of refining, transporting and distributing also influence the price of fuel oil. This may

be felt even more by families that live in rural locations, requiring long trips for fuel oil transportation and distribution. Seasonal issues tend to play a role in the price of fuel oil as well.

2. Agree or disagree with the following statements.

1. Fuel oil is a fraction obtained from petroleum distillation. 2. Fuel oil is classified into six classes, according to its color. 3. Gasoline is the fuel type generally used for home heating. 4. The price of fuel oil directly affects the price of crude oil.

3. Answer the following questions.

1. What is the definition for fuel oil? 2. Where is fuel oil used? 3. Where is fuel oil fraction obtained from? 4. What is the classification of fuel oil? 5. What type of fuel oil is used for home heating? 6. What factors affect the fuel oil price?

4. Complete the statements.

1. A simple definition for fuel oil is … . 2. Fuel oil is a fraction obtained from … . 3. Fuel oil is classified into… . 4. No 2 fuel oil is … . 5. Diesel oil is the type generally used for … .

5. Translate from Russian into English.

Горючее – это жидкий нефтепродукт, используемый для производства энергии. Эта фракция получена в процессе перегонки нефти. Горючее делится на 6 классов в зависимости от температуры кипения, состава и цели применения. В промышленных целях под горючим понимается фракция, полученная из сырой нефти и тяжелее чем бензин и нефтяной газ. Дизельное топливо обычно применяется при отоплении помещений. Цена горючего зависит от цен на сырую нефть, стоимости переработки, транспортировки, распределения горючего, а также от места жительства и времени года.

III. Summarizing

1. Comment on:

– Fuel oil is classified into six classes.

2. Prove that:

– The fuel oil price depends on a factor such as living in rural locations.

3. Make up a dialogue on the text «Fuel oil» using the active words and expressions.

Text B. Heating oil

I. Vocabulary and grammar

1. Read out the following words and memorize them.

viscosity (n)	вязкость, коэффициент вязкости
store (v)	хранить, сохранять
tank (n)	бак, цистерна, резервуар
condense (v)	конденсировать(ся), сжижать(ся)
color (v)	придавать цвет, окрашивать
dye (n)	краситель, красящее вещество
distinguish (v)	различать
solvent (n)	растворитель
tax (n)	налог
marker (n)	метка, указатель, признак

2. Read out these expressions several times till you remember them.

heating oil	печное топливо
flammable liquid	легковоспламеняющаяся жидкость
tank trunk	автоцистерна
storage tank	резервуар-хранилище
piping leak	утечка трубопровода
fuel dye	краситель топлива
taxed road-use diesel	автомобильное дизельное топливо, облагаемое налогом

3. Find pairs of synonyms.

1. low (adj)	a. carry (v)
2. deliver (v)	b. high (adj)
3. store (v)	c. keep (v)

4. Choose antonyms for the following words from the box below.

Basement (n), above-ground (adj), condense (v), color (v).

bleach (v), underground (adj), disperse (v), attic (n)

5. Read and translate the sentences. Explain the underlined grammatical categories.

1. Heating oil is a petroleum product used to fuel building furnaces or boilers. 2. It is stored in tanks. 3. It concerns environmental problems. 4. Heating oil is less used as an industrial fuel. 5. Heating oil produces 19,500BTU per pound. 6. Heating oil was colored by addition fuel dyes. 7. Yellow Dye 124 has been added as a «Euro marker» since 2002 in the European Union.

6. Give the Russian equivalents to the following words and word combinations.

Viscosity, flammable liquid, building furnaces, main source, to deliver, tank trunk, residential building, underground storage tank, environmental problem, piping leaks, industrial fuel, refinery process, oil distribution, fuel dye, tax, road use diesel, European Union.

II. Work with the text

1. Read the text and do the exercises that follow it.

Heating oil

Heating oil is a low viscosity flammable liquid petroleum product used to fuel building furnaces or boilers. It is the main source of heat in many homes. It is commonly delivered by tank trunks to residential, commercial and municipal buildings and stored in above-ground storage tanks located in the basement or adjacent to the building. It is sometimes stored in underground storage tanks but it concerns potential environmental problems because of tanks and piping leaks. Heating oil is less commonly used as an industrial fuel or for power generation.

Heating oil is similar to diesel oil, and the process of refining is very similar. During oil distribution, it condenses at between 250 °C and 350 °C. Heating oil produces 19,500BTU per pound (45MJ/kg) and weighs 7,2 pounds per gallon (0,72kg/l). Its flesh point is 52 °C.

Heating oil is usually colored by addition fuel dyes to distinguish it from highly taxed road-use diesel. Red dyes are usually used in countries like the United Kingdom and heating oil is known as **red diesel**. Solvent Yellow 124 is added as a «Euro marker» since 2002 in the European Union.

2. Answer the questions.

1. What is heating oil?
2. What purpose is it used for?

3. How can it be delivered to the necessary place?

4. Where is heating oil stored?

5. Why can underground storage tanks be a source of environmental problems?

6. What are specific characteristics of heating oil?

7. Why is heating oil colored by addition fuel dyes?

8. What fuel dyes are known? What countries are they used in?

3. Complete the statements.

1. Heating oil is a … . 2. It is the main source of … . 3. . It is delivered by … and stored in .. . 4. Heating oil is similar to … . 5. Its flesh point is … . 6. Red dyes are usually used in … .

4. Put in the right prepositions.

1. It is commonly delivered … tank trunks. 2. Heating oil is stored in … ground or in …ground storage tanks. 3. It concerns potential environmental problems because … piping leaks. 4. It condenses … … 250 °C and 350 °C. 5. Heating oil produces 19,500BTU … pound. 6. Heating oil is usually colored … addition fuel dyes. 7. It is usually colored to distinguish it … highly taxed road-use diesel.

5. Translate from Russian into English.

Печное топливо – легковоспламеняющаяся жидкость, используемая для работы бойлеров и печей. Это топливо является основным источником тепла в домах. Печное топливо перевозится в автоцистернах и хранится в резервуарах-хранилищах. Резервуары могут находиться в подвалах, а также могут быть наземными и подземными. Печное топливо редко используется как промышленное топливо. По процессу нефтепереработки печное топливо схоже с дизельным топливом. Обычно в печное топливо добавляют красный или желтый красители. Это помогает различать печное топливо и автомобильное дизельное топливо.

III. Summarizing

1. Comment on:

– Heating oil is stored in storage tanks.

– Heating oil is usually colored by addition fuel dyes.

2. Make up a dialogue on the text «Heating oil» using the active words and expressions.

IV. Supplementary reading

1. Read the text. Try to understand it and be ready to retell it in Russian.

Oil and its combustion

The combustion of oil can take place only after it has been gasified. The gasified oil burns when raised to a sufficient temperature in the presence of air. The carbon and hydrogen unite with the oxygen of the air in a series of successive reactions to form (if the combustion is complete) carbon dioxide and water. If the combustion is not completed, owing to an insufficient air or to the chilling of the flame by contact with cold surfaces, carbon will be deposited in the form of soot.

The amount of excess air being supplied to an oil flame can best be determined by means of a fire analysis, namely by observing the color of the flame. If the amount of excess air is high, the flame will be almost white in color and if the amount of air is reduced, the flame will change to yellow and then to orange and finally to red, the last usually being a smoke flame. In adjusting air supply, a bright orange color is usually the most satisfactory, indicating an excess of air of approximately 25 per cent.

A blue flame is obtained in vaporizing-type burners when the oil is vaporized and mixed with air before ignition. It does not necessarily indicate perfect combustion.

Industry adopted standards determine that a domestic oil burner should produce a combustion efficiency as measured by the percentage of CO_2 in the flue gases of not less than 10 per cent in the laboratory and 8 per cent in the field without producing smoke.

2. Translate the text in written form using a dictionary.

Heat transfer

Boilers, super heaters, economizers, condensers, evaporators, coolers, and heaters are types of equipment that are used to transfer energy from one fluid to another through a metal surface that prevents the fluids from mixing. Since most of this equipment operates at temperature that is considerably different from room temperature, the equipment and interconnecting piping are insulated to prevent transfer of energy to or from the atmosphere. The design of heat-transfer surface, its arrangement and the selection of the insulation material of the equipment are based on the laws of heat transfer and economics.

Heat has been defined as energy that is being transferred across the boundaries of a system because of a temperature difference. This transfer may occur through the mechanism of conduction, convection, or radiation, either separately or in combination.

Heat is transferred by conduction through a solid as a result of a flow of electrons which is induced by a temperature difference. Conduction also occurs in liquids and gases as a result of random motion of molecules. Convection occurs either because of a difference in density or because of the operation of a fan or pump. The fluid flows across a hot or cold surface and exchanges energy with that surface.

Radiation involves the transfer of energy through space in the form of electromagnetic waves.

In general, a heat exchanger consists of a metal wall through which heat flows from one fluid to another. Heat transfer through the wall follows the laws of conduction. Heat transfer between the moving fluid and the wall involves convection, in addition to which radiation may be important at high temperatures.

УЧЕБНЫЙ БЛОК 6 (УБ-6)
«BOILERS»

Цели:

Вы должны знать:	Вы должны уметь:
1. Грамматика: – Словообразование (Word Building); – Видовременные формы (Tenses); – Герундий (Gerund); – Причастие, деепричастие(Participle I, II); – Пассивный залог (Passive Voice). 2. Лексика: – ключевые слова и словосочетания по теме «Boilers».	– использовать лексические и грамматические навыки: а) для чтения и перевода текстов; б) в монологической и диалогической речи.

I. Vocabulary and grammar

1. Read these international words and try to guess their meaning.

Function (n), personal (adj), installation (n), electricity (n), system (n).

2. Read the words and try to remember their meanings.

pressure (n)	necessary (adj)	limit (v)
transfer (v)	fit (v)	source (n)
fluid (n)	corner (n)	combustion (n)
efficient (adj)	amount (n)	residence (n)
include (v)	construction (n)	

3. Read out the following words and memorize them.

boiler (n)	бойлер, котел
vessel (n)	сосуд (для жидкости)
circulate (v)	циркулировать, двигаться по кругу
radiator (n)	радиатор; батарея (отопления)
vent (n)	отверстие, вентиляционный канал
vaporizer (n)	испаритель, пульверизатор
assemble (v)	компоновать, монтировать
copper (n)	медь
brass (n)	латунь, желтая медь
steel (n)	сталь
cast iron (n)	чугун
resistance (n)	сопротивление, прочность
immersion (n)	погружение

4. Read out these expressions several times till you remember them.

steam turbine ['tə:bin]	паровая турбина
package boiler	транспортабельный котел
hot oil heater	масляный нагреватель
hot-water heater	кипятильник
steam generator	парогенератор, паровой котел
general (operation) life	срок эксплуатации
nuclear fission	деление ядра

5. Choose pairs of synonyms from the box below.

Transfer (v), type (n), include (v), assemble (v), vary (v), residence (n), amount (n), resistance (n).

home (n), contain (v), differ (v), arrange (v), quantity (n), kind (n), transport (v), strength (n)

6. Choose antonyms for the following words from the box below.

Includes (v), installation (n), cleaning (n), industrial (adj).

pollution (n), dismantling (n), omit (v), residential (adj)

7. Read derivatives of the following words and try to translate them.

Construct (v) – constructible (adj), construction (n), constructor (n), constructively (adv).

Resist (v) – resistance (n), resistant (adj), resistibility (n), resistor (n), resistive (adj), resisting (adj).

8. Give the three forms of the verbs.
To have, to let, to find, to go, to fit, to get.

9. Read the sentences. Translate them into Russian paying attention to the grammatical forms and explain them.

1. A boiler is a closed vessel in which water or other fluid is heated under pressure. 2. The function of the boiler is to transfer the heat to the water in the most efficient manner. 3. A boiler uses circulated hot water. 4. Steam boilers are used to produce steam for industrial usage such as cleaning. 5. Sources of heat for the boiler can be combustion of fuels. 6. Nuclear fission is also used as a heat source for generating steam.

10. Give the Russian equivalents to the following words and word combinations.

A closed vessel, under pressure, function of the boiler, to transfer heat, hot fuel, system of pipes, produced hot water, to heat a building, personal or industrial use, part of a building, to circulate through the pipes, circulated hot water, forced air, types of boilers, necessary parts, assembled parts, required installation, steam boiler, industrial usage, to vary in size, to be small enough, to fit in the corner, copper, brass, steel, amount of heat, construction of boilers, general life, sources of heat, fuel combustion, electric boilers, immersion type, heating element, nuclear fission.

II. Work with the text

1. Read the text and do the exercises that follow it.

Boilers

A boiler is a closed vessel in which water or other fluid is heated under pressure. The function of the boiler is to transfer the heat to the water in the most efficient manner.The hot fuel is then circulated out of the boiler through the system of pipes.

The produced hot water is then used to heat a building and/or to produce hot water for personal or industrial use. For example a boiler used as a heating system in a home would have radiators in a house or part of a building. The boiler heats the water for use and also circulates that hot water through the pipes

and the radiators, heating the rooms. A boiler uses circulated hot water whereas a furnace, found in many homes today, uses forced air and circulates it through vents.

Types of boilers include steam turbines, package boilers, steam generators, hot water heaters, hot oil heaters, boilers and vaporizers. A package boiler is a boiler with all necessary parts included, assembled and ready to use. Very little installation is required. Steam boilers are used to produce steam for industrial usage such as cleaning. Boilers vary in size and shape. A boiler used for a residence is going to be small enough to fit in the corner of a room, whereas industrial boilers can be large enough to fill up an entire room. The size depends on the amount of heat it needs to generate and what exactly it will be used for.

Construction of boilers is mainly limited to copper, brass, steel and cast iron. Boilers have a general life of 30 – 40 years.

Sources of heat for the boiler can be combustion of fuels such as wood, coal, oil or natural gas. Electric boilers use resistance or immersion type heating elements. Nuclear fission is also used as a heat source for generating steam.

2. Agree or disagree with the statements.

1. A boiler is a vessel in which water is heated under atmospheric pressure. 2. The function of the boiler is to heat the water in the most efficient manner. 3. The produced hot water is used only for building heating. 4. The negative feature of the boiler is that it is always a very big device. 5. Boiler is usually made of steel. 6. Boiler fuels are wood, coal, oil, natural gas, electricity and nuclear fission.

3. Answer the questions.

1. What is a boiler? 2. What is the main function of the boiler? 3. What purposes is the produced hot water used for? 4. How is the hot water from a boiler distributed? 5. What device helps to transfer heat to atmosphere? What are the main differences in the principles of work of a boiler and a furnace? 7. What types of boilers can you name? 8. What does the size of a boiler depend on? 9. What materials are boilers made of? 10. What is a boiler general life? 11. What are the heat sources for a boiler?

4. Put in the right prepositions.

1. The water is heated …pressure. 2. The hot fuel is then circulated … of the boiler … the system of pipes. 3. The size of the boiler depends … the amount of heat. 4. Construction of boilers is mainly limited … copper and brass. 5. Boilers have a general life …30 – 40 years.

5. Complete the statements.

1. A boiler is a .. . 2. The function of the boiler is to … . 3. The hot water from the boiler is then circulated through … . 4. The produced hot water is used for … . 5. A package boiler is a … . 6. A steam boiler is a … . 7. Boilers vary in … . 8. The residential boiler is going to be … in size, but the industrial one can be very … . 9. The boiler is usually made of … . 10. The operation boiler life is … . 11. The sources of heat for the boilers are … .

6. Translate from Russian into English.

Бойлер – это, закрытый сосуд, в котором вода нагревается под давлением. Нагретая вода затем циркулирует по системе труб и радиаторов. Нагретая вода используется для обогрева помещений или как источник горячей воды в бытовых и промышленных целях. Бойлеры различаются по типу, форме и размеру. Выбор бойлера зависит от количества тепла, которое необходимо произвести и от цели использования. Бойлеры обычно изготавливаются из таких материалов как медь, латунь, сталь, чугун. Источником тепла для бойлера может быть сгорание топлива, электричество и ядерная реакция.

III. Summarizing

1. Comment on:

– A boiler is a special heating device.

– There are several sources of heat for the boiler.

2. Prove that:

– A package boiler is one of the most convenient boilers.

– The size of the boiler depends on the amount of heat it needs to generate.

3. Get ready to speak on the topic «Boilers».

IV. Supplementary reading

1. Read the text. Try to understand it and be ready to retell it in Russian.

Industrial boilers

Industrial boilers are closed vessels that use a fuel source to heat water or generate steam for industrial heating and humidification applications. Common fuel sources include coal, electricity, natural or propane gas, oil, steam or hot water, and wood.

There are two basic types of industrial boilers: fire tube boilers and water tube boilers. Fire tube boilers channel hot gases through cylindrical tubes that are surrounded by the fluid (usually water) to heat. The boiler, which is the pressure vessel, contains the fluid. By contrast, water tube boilers channel water through tubes connected to a steam drum. The upper drum heats the water and generates the steam. Fire tube boilers are less expensive than water tube boilers, but are not suitable for applications that involve pressures above 2,500 psig. Water tube boilers are available in larger sizes, have faster recovery times, and can handle pressures up to 5,000 psig. Performance specifications for industrial boilers include heat output or capacity, maximum temperature, maximum pressure, and thermal efficiency.

Industrial boilers are available in several configurations. Cast iron boilers are suitable for low-pressure steam or hot water applications and typically range in size from 25 to 200 hp. Firebox boilers are similar to fire tube boilers, but are box-like instead of cylindrical. Industrial boilers with steam generators transfer heat from the primary reactor coolant system to the secondary steam system without contaminating the secondary system. Radiant boilers – a single-drum construction, are better suited for high-pressure applications than dual (double) drum devices. Other types of industrial boilers include bubbling fluidized bed (BFB), circulating fluidized bed (CFB), and pressurized circulated fluidized bed (PCFB) systems. BFB units are particularly efficient when burning fuels with low heating value, high moisture and ash content. CFB systems provide the cleaner combustion of fuels such as waste coals, petroleum coke, and even shredded (crushed) automobile tires. PCFB industrial boilers operate with high efficiencies and are used at power plants that fire pulverized coal.

drum – барабан, цилиндр, металлическая бочка
steam drum – паросборник, пароподогреватель
to handle – управлять, оперировать
recovery time – время восстановления
bubbling fluidized bed – кипящий слой
circulating fluidized bed – циркулирующий слой
waste coal – отходы углеобогащения

2. Translate the text in written form using a dictionary.

Superheated steam boiler

Most boilers heat water until it boils, and then the steam is used at saturation temperature (i.e., saturated steam). Superheated steam boilers boil the water and then further heat the steam in a super heater. This provides steam at much higher temperature, and can decrease the thermal efficiency of the steam

plant due to the fact that the higher steam temperature requires a higher flue gas exhaust temperature. However, there are advantages to superheated steam. For example, useful heat can be extracted from the steam without causing condensation, which could damage piping and turbine blades.

Superheated steam presents unique safety concerns, however, if there is a leak in the steam piping, steam at such high pressure/temperature can cause serious, instantaneous harm to anyone entering its flow. Since the escaping steam will initially be completely superheated vapor, it is not easy to see the leak, although the intense heat and sound from such a leak clearly indicates its presence.

УЧЕБНЫЙ БЛОК 7 (УБ-7)
«CLASSIFICATION OF BOILERS»

Цели:

Вы должны знать:	Вы должны уметь:
1. Грамматика: – Словообразование (Word Building); – Герундий (Gerund); – Причастие, деепричастие(Participle I, II); – Видовременные формы (Tenses); – Модальные глаголы (Modal Verbs) – Пассивный залог (Passive Voice). 2. Лексика: – ключевые слова и словосочетания по теме «Classification of Boilers».	– использовать лексические и грамматические навыки: а) для чтения и перевода текстов; б) в монологической и диалогической речи.

I. Vocabulary and grammar

1. Read these international words and try to guess their meaning.

Classification (n), type (n), container (n), form (n), design (n, v), vertical (adj), horizontal (adj), parallel (adj), evolution (n).

2. Read the words and try to remember their meanings.

Fire (n), tube (n, v), source (n), side (n, v, adj), simple (adj), efficient (adj), heat (n,v), complete (v), steam (n, v), pass (n, v), combustion (n), narrow (adj), pipe (n, v), appear (v), cross (n, v), furnace (n), shape (n, v), include (v).

3. Read out the following words and memorize them.

bend (n,v)	сгибание, изгиб; сгибать, гнуть
drum (n)	барабан, цилиндр
header (n)	коллектор, сборник

tower (n)	башня
surface (n)	поверхность, покрытие
unit (n)	агрегат, установка, устройство
fin (n)	ребро, пластина
set (n)	набор, комплект, множество
firebox (n)	топка (в жаротрубных котлах)

4. Read out these expressions several times till you remember them.

fire-tube boiler	жаротрубный котел
water-tube boiler	водотрубный котел
drum boiler	барабанный котел
pressure application	применение давления
sectional header	секционный коллектор
water-cooled surface	поверхн. с водяным охлаждением
longitudinal drum	продольный цилиндр
boiler header	коллектор котла

5. Match the English words to their Russian equivalents.

1. fin (n)	a. коллектор
2. combustion (n)	b. топка
3. surface (n)	c. труба
4. header (n)	d. пластина
5. furnace (n)	e. источник
6. source (n)	f. горение
7. pipe (n)	g. поверхность

6. Find synonyms for the following words in the box below.

Goal (n), popular (adj), combustion (n), evolution (n), type (n), set (n), frequently (adv).

often (adv), development (n), kind (n), number (n), famous (adj), purpose (n), burning (n)

7. Choose antonyms for the following words from the box below.

Bend (v), include (v), horizontal (adj), connect (v), straight (adj), outside (adv), wide (adj).

exclude(v), inside(adv), vertical(adj), narrow(adj), disconnect(v), straighten(v), bent(adj)

8. Give derivatives of the following words and translate them.
Side (n), bend (n), connect (v).

9. Give the three forms of the following verbs.
To be, to take, to flow, to get, to bend, to recognize, to pass, to know.

10. Read the sentences. Translate them into Russian paying attention to the grammatical forms and explain them.

1. Boilers can be classified into several categories. 2. The fire heats one side of the container. 3. In boilers the fire is to heat the water. 4. There are tubes passing through a boiler. 5. The surface area is maximized by fins. 6. Many new designs and shapes have appeared. 7. Boilers were recognized in the building. 8. The horizontal straight tube boiler may have a box type header made of steel plate.

11. Give the Russian equivalents to the following word combinations and expressions.

Fire-tube boilers, heat source, water container, fire-tube boilers, steam locomotives, straight tube, combustion gases, narrow tubes, surface area, high pressure, pressure applications, thin walls, horizontal tube, sectional header, steel plate, cross drum, water-cooled surfaces.

II. Work with the text

1. Read the text and do the exercises that follow it.

Classification of boilers

Boilers can be classified into:

– Fire-tube boilers. Here the heat source is inside the tubes and the water to be heated is outside.

– Water-tube boilers. Here the heat source is outside the tubes and the water to be heated is inside.

– The simple inefficient old type where there are no tubes and the fire heats one side of the water container.

In fire – tube boilers the goal is to make the heat flow as completely as possible from the heat source to the water. For example, steam locomotives have fire-tube boilers, where the fire is inside the tube and the water on the outside. These usually take the form of a set of straight tubes passing through the boiler through which hot combustion gases flow.

In water-tube boilers the water flows through a large number of narrow tubes around the fire. The tubes frequently have a large number of bends and sometimes fins to maximize the surface area. This type of boiler is generally preferred in high pressure applications since the narrow pipes with high pressure water/steam inside can contain the pressure with thin walls.

During the evolution of the boiler as a heat producer many new shapes and designs have appeared. Some of these boilers are popular and widely recognized in the trade, including the following:

1. Fire-tube boilers – horizontal return tubular, short firebox, locomotive boiler, vertical tube type, and residential units.

2. Water-tube boilers – both horizontal water-tube and bent tube unit. The horizontal straight tube boiler may have a box type header made of steel plate, or a sectional header each section of which connects the tubes in a single vertical tower. The bent tube boiler may have from one to four drums. If the drum is parallel to the tubes, the boiler is long-longitudinal drum; if across the tubes, it is a cross drum. If the furnace is enclosed with water-cooled surfaces, it is a water wall (water-cooled) furnace.

horizontal-return tube boiler – горизонтальный котел с обратными дымогарными трубами

short firebox boiler – бойлер с уменьшенной топкой

locomotive boiler – котел локомотива

vertical tube type boiler – котел вертикального типа

residential use boiler – бойлер бытового использования

horizontal water-tube boiler – горизонтально-водотрубный котел

bent tube boiler – барабанный котел

2. Answer the questions.

1. What categories are boilers classified into?
2. What is the work principle of the fire-tube boiler?
3. What is the work principle of the water-tube boiler?
4. What is the work principle of the old type boiler?
5. Where are different types of boilers used?
6. What types of fire-tube boilers can you name?
7. What types of water-tube boilers are known?

3. Put in the right prepositions.

1. Boilers can be classified … some types. 2. In water-tube boilers the heat source is … the tubes. 3. The boiler has the form of a set … straight tubes

passing … the boiler. 4. The tubes frequently have a large number … bends. 5. The heat flows … the heat source … the water. 6. This type of boiler is preferred in high pressure applications … the narrow pipes … high pressure water inside can contain the pressure … thin walls. 7. Boiler may have a box type header made … steel plate. 8. The bent tube boiler may have … one … four drums.

4. Complete the statements.

1. There are some classes of boilers such as… . 2. In fire-tube boilers the heat source is … . 3. In water-tube boilers the water is … . 4. In old type boilers there are no … . 5. In water-tube boilers the tubes frequently have … to … . 6. Water-tube boilers are generally preferred in … . 8. During the evolution of boilers appeared many new … . 9. Fire-tube boilers can be … . 10. Water-tube boilers can be … . 10. The water-type boiler is generally preferred in high pressure applications since … .

5. Make up sentences with the following words.

To classify, source, inside, tube, fire, bend, pressure, water, shape, drum, furnace, surface, header, purpose, narrow, tower, to include, to pass.

III. Summarizing

1. Comment on:

– Boilers can be classified into several types.

2. Prove that:

The water-tube boiler is generally preferred in high pressure applications.

3. Look through the text again and discuss it in the form of dialogues using the active words and expressions. The topics for dialogues:

– Fire-tube boilers.

– Water-tube boilers.

IV. Supplementary reading

1. Read the text. Try to understand it and be ready to retell it in Russian.

Hydronic boiler

Hydronic boilers are used in generating heat typically for residential use. They are the typical power plant for central heating systems fitted to houses in northern Europe, as opposed to the forced-air furnaces or wood burning stoves

more common in North America. The hydronic boiler operates by way of heating water/fluid to a preset temperature and circulating that fluid throughout the home typically by way of radiators, baseboard heaters or through the floors. The fluid can be heated by any means....gas, wood, fuel oil, etc, but in built-up areas where piped gas is available, natural gas is currently the most economical and therefore the usual choice. The fluid in the system is circulated throughout by means of a motorized pump. Most new systems are fitted with condensing boilers for greater efficiency.

Hydronic systems are being used more and more in new construction in North America for several reasons

– They are more efficient and more economical than forced-air systems (although initial installation can be more expensive, because of the cost of the copper and aluminum).

– The baseboard copper pipes and aluminum fins take up less room and use less metal than the bulky steel ductwork required for forced-air systems.

– The copper baseboard pipes hold and release heat over a longer period of time than air does, so the furnace does not have to switch off and on as much. (Copper heats mostly through conduction and radiation, whereas forced-air heats mostly through forced convection. Air has much lower thermal conductivity and higher specific heat than copper; however, convection results in faster heat loss of air compared to copper.)

– They do not dry out the interior air so much;

– They do not introduce any dust, allergens, mold, or (in the case of a faulty heat exchanger) combustion byproducts into the living space.

2. Translate the text in written form using a dictionary.

There are other types of boilers, largely of historical interest. For example, the Cornish boiler developed around 1812 by Richard Trevithick for generating steam for steam engines. This was both stronger and more efficient than the simple boilers which preceded it. It was a cylindrical water tank around, 27 feet long and 7 feet in diameter, and had a coal furnace placed in a single cylindrical tube about three feet wide which passed centrally along the long axis of the tank. The fire was tended from one end and the hot gases from it traveled along the tube and out of it through the other end. Then it circulated back along flues* running along the outside of the boiler before being expelled via (through) the chimney. This was later improved on in the Lancashire boiler which had a pair of furnaces in separate tubes side-by-side. This was an important improvement

since each furnace could be stoked at different times, allowing one to be cleaned while the other was operating. These designs are really primitive fire tube boilers, and led on to the Scotch boiler which remains a popular fire tube design.

*flue (n) – дымоход
tend (v) – направляться; вести в определенном направлении
stoke (v) – поддерживать огонь (в топке); забрасывать топливо

УЧЕБНЫЙ БЛОК 8 (УБ-8)
«RADIATORS»

Цели:

Вы должны знать:	Вы должны уметь:
1. Грамматика: – Словообразование (Word Building); – Герундий (Gerund); – Причастие, деепричастие(Participle I, II); – Видовременные формы (Tenses); – Пассивный залог (Passive Voice). 2. Лексика: – ключевые слова и словосочетания по теме «Radiators».	– использовать лексические и грамматические навыки: а) для чтения и перевода текстов; б) в монологической и диалогической речи.

I. Vocabulary and grammar

1. Read these international words and try to guess their meaning.

Circulate (v), radiator (n), convection (n), central (adj), patent (n), metal (adj,n), aluminium (adj), reputation (n), comfort (n), season (n), popular (adj).

2. Read the words and try to remember their meanings.

Device (n), heating (n), invention (n), shape (n), pump (n), pressure (n), cool (v,adj), pipe (n), replace (v), copper (n), distribute (v), efficient (adj), contain (v), blow (v), noise (n), exist (v), cover (n), advantage (n).

3. Read out the following words and memorize them.

radiator (n)	радиатор, батарея (отопления)
seal (v,n)	изоляция; изолировать, запаивать
sink (v)	опускать(ся), оседать
force (v)	выгонять, вытеснять
tin (n)	олово
flow (n,v)	поток, струиться, течь

loss (n)	потеря
sense (n,v)	(зд.) распознавание, распознавать
energize (v)	подавать питание, вкл. напряжение
bury (v)	прятать, скрывать, укрывать
install (v)	устанавливать
conduct (v)	проводить (тепло, ток, звук, свет)
trap (v)	задерживать, удерживать
bleed (v)	отводить, стравливать (жидкость)

4. Read out these expressions several times till you remember them.

flat radiator	батарея с плоской поверхностью
cast iron radiator	чугунная батарея
conventional radiator	стандартная батарея
fan assisted radiator	батарея с вентилятором
heat exchanger	теплообменник, радиатор отопителя
thermostatic switch	термостатический клапан, термостат
underfloor heating	отопление под полом
concrete layer	слой бетона
supply/return pipe	подводящая / обратная труба

5. Find synonyms for the following words in the box below.

Hollow (adj), flat (adj), top (n), recent (adj), seep (v).

plain (adj), modern (adj), head (n), empty (adj), leak(v)

6. Choose antonyms for the following words from the box below.

Cold (adj), increase (v), advantage (n), loss (n), recent (adj), floor (n), noise (n), difficult (adj), obvious (adj).

decrese (v), ceiling (n), disadvantage (n), visible (adj), old (adj), find (n), silence (n), easy (adj), warm (adj)

7. Give derivatives of the following words and translate them.

Pump (v), install (v), cover (v).

8. Give the three forms of the following verbs.

To rise, to give, to flow, to lose, to feed, to blow, to bury, to bleed, to get.

9. Read the sentences. Translate them into Russian paying attention to the grammatical forms and explain them.

1. Radiator circulates hot water. 2. Radiator was invented in 1855. 3. Galli patented radiator in Germany and the USA. 4. Then the water is forced out of a pipe. 5. Steam is easier to distribute. 6. Steam system is less efficient. 7. Fan assisted radiator. 8. Fan is blowing the air at the moment. 9. In underfloor heating water is circulated under the concrete layer. 10. It is difficult to install it in existing building. 11. The air will be trapped inside the radiator. 12. The water cannot rise to the top.

10. Give the Russian equivalents to the following word combinations and expressions.

Heating device, to transfer heat by radiation, to patent an invention, conventional hot-water radiator, sealed hollow metal container, pump pressure, to give out heat, to force out of a pipe, convection flow, cast iron radiator, to replace with copper, aluminum fins, surface area, to be less efficient, unwanted heat loss, stem radiator, fan assisted radiator, heat exchanger, thermostatic switch, to sense the heat, to energize an electric fan, electricity supply, produced noise, underfloor heating, network of pipes, to bury in the floor, concrete layer, quiet system, unobvious system, bleed key, top of the radiator, trapped air, twice per season.

II. Work with the text

1. Read the text and do the exercises that follow it.

Radiators

In buildings, a radiator is a heating device which circulates hot water or steam from a boiler to produce heat for your home. In a building, radiators transfer the majority of their heat by radiation and by convection.

The radiator was invented in 1855 by Franz San Galli. He was the first to produce a system of central heating and patented his invention in Germany and the USA.

Conventional radiators

A conventional hot-water radiator consists of a sealed hollow metal container, usually flat in shape. Hot water enters at one end and rises to the top of the radiator by way of convection or by pressure from a pump.

As it gives out its heat, the hot water cools and sinks to the bottom of the radiator. Then it is forced out of a pipe at the other end. The air near a radiator is heated and produces a convection current (flow) heating cold air.

Stereotypical cast iron radiators are not popular in new construction. They are replaced with copper pipes which have aluminum fins to increase their surface area.

Steam radiators

The advantage of steam is that it flows through the pipes under its own pressure without the need for pumping. Steam is also easier to distribute than hot water throughout large, tall buildings like skyscrapers. However, the steam system is less efficient, as unwanted heat loss is inevitably (unavoidably) greater.

Fan assisted radiators

A more recent type of heater used in homes is the fan assisted radiator. It contains a heat exchanger fed by hot water from the heating system. A thermostatic switch senses the heat and energizes an electric fan which blows air from the heat exchanger.

Advantages of this type of heater are its small size and distribution of heat around the whole room. Disadvantages are the noise produced by the fan, and the need for an electricity supply.

Underfloor heating

In underfloor heating warm water is circulated under the floor of each room in a building. A network of pipes is buried in the floor under a concrete layer and a gentle heat rises into the room. These systems are reputed to have a high level of comfort, but are generally difficult to install into existing buildings. For best results a floor covering that conducts heat well (such as tiles) should be used. Radiant underfloor heating systems are becoming more popular. The system is quiet, unobvious; it is also considered more energy efficient.

Bleeding

All «radiant» (i.e. heat radiates from hot water) systems need to be bled on occasion.

If air is trapped inside the radiator, the water cannot rise to the top, and only the bottom area gets hot. A bleed key near the top of the radiator allows the trapped air to be 'bled' from the system, and restores correct operation. Usually radiators are bled once or twice per season, or as needed.

2. Answer the questions.

1. What is a radiator?
2. How does a radiator transfer heat?
3. Who invented the first radiator and when?
4. What is a conventional radiator?
5. What is the principle of its work?
6. What are the advantages and disadvantages of steam radiators?

7. What is a fan assisted radiator?
8. What are the advantages of the fan assisted radiator?
9. How does an underfloor heating system work?
10. What should be a floor covering for underfloor heating?
11. What process helps to restore correct operation of a radiator?
12. How often is bleeding necessary?

3. Put in the right prepositions.

1. Radiator transfers heat … radiation. 2. Radiator consists … a sealed container. 3. Cast iron radiators are replaced … copper pipes with aluminum fins. 4. In underfloor heating water is circulated … the floor. 5. Radiators are bled once or twice … season. 6. Steam flows … its own pressure.

4. Complete the statements.

1. Radiator is a heating device which … . 2. A conventional hot-water radiator consists of … . 3. Steam system is less efficient, because … . 4. Fan assisted radiator is a device which … . 5. Underfloor heating system is installed … . 6. The advantages of underfloor heating are: … . 7. Bleeding is a process of … 8. When the air is trapped in the system, the water … .

5. Compose sentences with the following words.

Device (n), consist (v), popular (adj), pipe (n), advantage (n), steam (n), fan (n), floor (n), conduct (v), comfort (n), trap (v), bleed (v).

III. Summarizing

1. Comment on:

– All «radiant» systems need to be bled on occasion.

2. Prove that:

– Underfloor heating systems are reputed to have a high level of comfort, but are generally difficult to install into existing buildings.

3. Look through the text again and discuss it in the form of dialogues using the active words and expressions. The topics for dialogues:

– Types of radiators, their advantages and disadvantages.
– Principles of work of different types of radiators.

IV. Supplementary reading

1. Read the text. Try to understand it and be ready to retell it in Russian.

Radiant floor heating systems

Radiant floor heating systems are used to disperse heat through a house or office building by heated medium beneath (under) the floor. There are three main types of radiant heating: electric, air, and liquid. Heated medium is pumped through pipes, heat rises from the floor in the air.

A radiant floor system can be built under a large thermal mass (as an insulator) such as concrete or beneath the wooden or linoleum floor. If placing carpet over the floor, it is important to use as thin carpet as possible, since the insulating properties of the carpet will keep the radiant heat from drifting upwards.

Electric floor systems are popular only in regions where electricity is inexpensive. When using electrical heating, it is almost always advisable to use a large thermal mass such as concrete as it accumulates heat and can disperse it during a long period of time.

Air heating systems are unpopular among the radiant floor heating because of their inability to retain (hold) much heat over time. They are used only in situations where little heat is needed.

Liquid is the most common medium in modem radiant floor heating systems. Also known as hydronic systems, they can use anything from oil to water as their heat-bearing liquid. A central boiler heats the liquid and then pumps it through the pipes in the house.

Any type of floor may be used with a radiant floor heating system, including hardwood, linoleum, concrete slab, tile, or vinyl. Ceramic tile is by far the most popular, because it passes the heat easily and is aesthetically pleasing. When using wood, it is a good idea to treat the wood to reduce cracking or warping (deformation).

Radiant floor heating is in use since the days of the Roman Empire. In the 1930s Frank Lloyd Wright was the first prominent architect widely used radiant floor systems, choosing hydronics. In addition this system is more energy efficient than traditional forced-air systems. Radiant floor heating systems have the added benefits of having no visible ducts, they do not introduce dust into the house, and they are completely silent. This has made it a favorite in recent years.

radiant floor heating – нижнее лучистое отопление
forced-air heating - воздушное отопление
insulating properties – изоляционные свойства

2. Translate the text in written form using a dictionary.

The types and position of a radiator

There are several styles of radiators that are popular today. The basic design is a single panel that contains the coil around which the hot water flows. This design was developed to a double panel. There are many different sizes so it is not difficult to find one that fits your location. If you feel that a radiator is not working to its best, then it may need bleeding. This is the method of removing trapped air from the radiator. Trapped air will restrict (stop) the flow of hot water and hence reduce the heating efficiency of the radiator. A radiator has a valve that can be opened with a radiator key to let the air to leak out. When the air is released and water starts dripping, the valve can be closed. Ideally a radiator should be bled a couple of times a year. Other problems with radiators can occur due to internal corrosion. This can be solved by removing the radiator and flushing with cold water.

One more problem can occur if a radiator is set up improperly (incorrectly). If set up improperly, radiators and their supply/return pipes can make loud banging noises. This is due to the pipes rubbing on surrounding surfaces or by sudden fluctuations (instability) of the water pressure.

The position of a radiator depends on several factors. Firstly the most important thing is how efficiently a radiator can deliver heat into a room. A radiator heats a room by convection. The radiator warms up and also warms the surrounding air, the warmer air rises and cooler air is drawn toward the radiator. This means the radiator should ideally be placed where the air can easily circulate. So try not to tuck the radiator behind a door or a sofa. It means that the radiator is likely to be in full view, so appearance becomes evermore (forever) important.

bleed (v) (bled,bled) – продувать, спускать воду, спускать лишнее давление
tuck (v) – убирать, засовывать, прятать
bang (n) – стук, треск, шум
rub (n) – трение, стирание

УЧЕБНЫЙ БЛОК К (УБ-К)

Контроль по модулю

Final Test 2

I. Укажите номера неверных утверждений.

1. There are two types of heating systems: central and local.
2. The most popular heating fuel is petrol.
3. Central Heating system is common to the hot water supply system.
4. Gas burner is a device to produce electricity.
5. Fuel oil is liquid petroleum product that is burned for the generation of heat.
6. Heating oil is usually colored to differ it from diesel oil.
7. The main purpose of a boiler is to boil the water.
8. All boilers have the same principle of work.
9. Radiator can be installed in any part of a room.
10. Radiator needs bleeding twice per month.
11. Underfloor heating is in use since the days of the Roman Empire.

II. К началу утверждений из левой колонки подберите их окончание из правой.

1. All heating systems consist of : …	1 … methane, ethane, propane and butane.
2. A basic measure of heat is …	2 … use of the burner ring.
3. Local heating devices are: …	3 … heat generator, pipes and heater.
4. Natural gas consists of …	4 … with the purpose of home heating.
5. Gas burner is a device to …	5 … outside the tubes and the heated water is inside.
6. The flame cab be shortened by …	6 … circulates hot water from a boiler to produce heat.
7. The diesel oil is used …	7 … self-contained heaters with manual control.
8. Sources of heat boiler can be …	8 … combustion of fuels.
9. In water-tube boiler the heat source is…	9 … British Thermal Unit
10. Radiator is a heating device which …	10 … to generate flame to heat fuel.

III. Ответьте на вопросы.

1. What is the purpose of heating? What parts does heating system consist of?
2. What types of heating system do you know?
3. Why is natural gas fuel number one in many countries?
4. What are the sources of natural gas?
5. Due to what principle does the gas burner work?
6. What is heating oil?
7. What is the classification of boilers?
8. What types of radiators can you name?

МОДУЛЬ 4

Модуль 4 «Ventilation and Air Conditioning » (III семестр)							
УБ-0	УБ-1	УБ-2	УБ-3	УБ-4	УБ-5	УБ-6	УБ-К

	Название учебных элементов	Форма занятия	Количество часов
УБ-0	Введение в модуль	практ. занятие	2
УБ-1	Pure Air for Respiration	практ. занятие	8
УБ-2	Natural Ventilation	практ. занятие	6
УБ-3	Ventilation Combined with Heating	практ. занятие	6
УБ-4	Fans	практ. занятие	8
УБ-5	Basic Principles of Air Conditioning	практ. занятие	8
УБ-6	Types of Air Conditioners	практ. занятие	8
УБ-К	Final Control	зачет	2
Итого практических занятий:			48

УБ-0. ВВЕДЕНИЕ В МОДУЛЬ

Интегрирующая цель:

Вы должны знать:	Вы должны уметь:
Грамматика: 1. Основные способы словообразования. 2. Эмфатические конструкции. 3. Степени сравнения прилагательных и наречий. 4. Неличные формы глагола (причастие I, II, герундий). 5. Страдательный залог. 6. Функции слова «one». 7. Части речи и их особенности. 8. Существительное в функции определения. 9. Служебные слова и словосочетания. Лексика: 1. Базовую лексику и основные термины по темам модуля. 2. Все о системах вентиляции и воздушного кондиционирования, видах вентиляторов и кондиционеров, очистке и обработке воздуха.	Использовать знания грамматики и лексики на различных этапах работы: с текстом (при ознакомительном и изучающем чтении, при переводе текстов); в устной речи, как в форме диалогов, так и в монологических высказываниях по теме «Вентиляция и кондиционирование воздуха».

Entry Test 3

(Входной тест)

I. К словам из левой колонки подберите их перевод. Запишите номера полученных пар.

1. space (n)	1. потолок
2. prevent (v)	2. эффективный
3. ceiling (n)	3. пространство, место
4. rate (n)	4. одновременный

5. provide (v)	5. случаться, происходить
6. simultaneous (adj)	6. воспламенение
7. fuel (n)	7. окаменелый, ископаемый
8. ignition (n)	8. насос
9. efficient (adj)	9. сопротивление, прочность
10. pump (n)	10. степень, норма, скорость
11. combustion (n)	11. цель
12. fossil (adj)	12. предотвращать
13. occur (v)	13. топливо, горючее
14. purpose (n)	14. горение, сожжение
15. resistance (n)	15. обеспечивать

II. К словам из левой колонки подберите синонимы. У одного слова может быть несколько синонимов. Запишите полученные варианты.

1. appliance (n)	a. ductwork (n)
2. install (v)	b. device (n)
3. amount (n)	c. vapor (n)
4. produce (v)	d. utilization (n)
5. steam (n)	e. annulus (n)
6. piping (n)	f. refine (v)
7. ring (n)	g. mount (v)
8. engine (n)	h. usage (n)
9. purify (v)	i. generate (v)
10. application (n)	j. unit (n)
	k. pipeline (n)
	l. motor (n)
	m. quantity (n)
	n. manufacture (v)

III. Укажите номер (a, b или c) правильного перевода подчеркнутых грамматических явлений.

1. Water will never come from the tap.

a) не должна выливаться
b) не будет литься
c) не льется

2. Heating elements should be located in the coldest part of the room.

a) были бы расположены
b) будут расположены
c)должны быть расположены

3. This problem may refer to either heating or ventilation.

a) как …, так и …
b) либо …, либо …
c) а также

4. Central heating system differs from local one.

a) от местной
b) от одной местной системы
c) от местной системы

5. Tiny microorganisms called methanogens produce natural gas by breaking down organic matter.

a) называемые
b) называли
c) называют

6. Gas is a valuable heat source because of its ability to produce a long slow burning flame.

a) горящее
b) горение
c) горит

7. These two systems may be heated by one boiler.

a) только
b) первым
c) одним

8. The most common heat source is coal.

a) очень распространенный
b) самый распространенный
c) большинство распространенных

9. Insulated ducts were used in the boiler plant.

a) были использованными
b) использовались
c) используются

10. Heating elements can be mounted on or in walls or buried in the floor.

a) нагревание
b) нагретые
c) нагревающие

IV. Заполните пропуски, употребив слово, данное в скобках, в правильной форме.

1. Different types of fuels are … (use) today. 2. The object of heating is to prevent heat … (lose). 3. Heating is an … (separate) part of modern amenities. 4. One of the key advantages of the warm air system is … (flexible). 5. Heaters are sometimes controlled … (manual).

УЧЕБНЫЙ БЛОК 1 (УБ-1)
«PURE AIR FOR RESPIRATION»

Цели:

Вы должны знать:	Вы должны уметь:
1. Грамматика: – степени сравнения прилагательных и сравнительные конструкции; – словообразование; – герундий и причастие II 2. Лексика: – ключевые слова и словосочетания по теме «Pure Air for Respiration».	– использовать лексические и грамматические навыки: а) для перевода текстов; б) в монологической и диалогической речи по теме блока.

I. Vocabulary and grammar

1. a) Revise the names of the gases that make up the atmosphere around our planet.

nitrogen	['naitridʒən]
argon	['ɑ:gən]
oxygen	['ɔksidʒən]
carbon dioxide	[ˌkɑ:bən dai'ɔksaid]
hydrogen	['haidridʒən]
neon	['ni:ɔn]
krypton	['kriptən]
helium	['hi:ljəm]
ozone	['əuzəun]
xenon	['zenɔn]

b) Answer the questions.

Which gases are the main constituents of the atmosphere by volume?
Which gas is the process of burning dependent on?
Which gas is present in large quantities in the air after thunderstorms and why?
Increased amounts of which gas cause global warming?
Which element is indispensable in all dioxides?
Which gas is usually used in balloons and why?

c) Complete the phrases with one of the gases.

a) ____ lights of Las Vegas; b) a hole in the ____ layer; c) ____ mask.

2. Match the English words to their Russian equivalents.

1. asphyxia	1. испорченный, загрязненный
2. alive	2. достаточный
3. to occur	3. насыщать
4. vitiated	4. вдыхание
5. disease	5. легкие (анатом.)
6. to expire	6. живой
7. lungs	7. потреблять
8. to saturate	8. выдыхать
9. injurious	9. удушье (мед.)
10. to consume	10. вредный
11. sufficient	11. случаться, происходить
12. inspiration	12. болезнь

3. Read out the following word partnerships and set expressions several times till you remember them.

1. carbonic acid	угольная кислота
2. on average	в среднем
3. oxygen deficiency	недостаток кислорода
4. asphyxiating point	момент наступления удушья
5. human being	человек
6. at least	по крайней мере

4. Read derivatives of the following words and try to translate them.

Asphyxia (n) – asphyxiant (n) – asphyxiate (v)
Alter (v) – alteration (n) – alterable (adj) – alterative (adj)
Compose (v) – decompose (v) – (de)composition (n) – decomposable (adj)
Place (v) – replace (v) – (re)placement (n) – replaceable (adj)
Prison (n) – prisoner (n) – imprison (v) – imprisonment (n)

5. Choose synonyms for the following words from the box below.

Change (n); amount; substance; exhale (v); harmful; illness; enough; happen (v); contaminated; usual

matter; sufficient; vitiated; quantity; alteration; ordinary; expire; disease; injurious; occur

6. Find pairs of antonyms.

1. inhale (v)	a. dry
2. wet (adj)	b. adult
3. internal (adj)	c. expire
4. child (n)	d. inspiration
5. expiration (n)	e. alive
6. dead (adj)	f. external

7. Fill in the sentences below with an appropriate word from the box. Be ready to translate the completed statements.

composition (n); deprive (v); vitality (n); vitiated (adj); combustion (n); gain(s) (v); blood (n); decomposable (adj); diffusion (n); lungs (n)

1. If highly _____ organic waste gets into drinking water pipe lines, hundreds of people can get poisoned. 2. Scientists are doing research into the chemical _____ of this unknown matter. 3. In the process of respiration the _____ inspire and expire periodically a small quantity of air. 4. The constant breathing of vitiated air lowers _____ and predisposes to disease. 5. Dehumidifiers _____ the air of moisture by condensing it onto a cold surface. 6. He lost a lot of _____ in the accident. 7. _____ is the process of burning. 8. A heating system must ensure the _____ of warmth all over the house. 9. In the process of respiration air loses oxygen and _____ carbon dioxide. 10. The proper ventilation consists of the warming and introduction of fresh air from without, and the discharge of the expired and _____ air from within.

8. Translate the following sentences paying attention to:

a) Comparative Structures-

The exhaled air is nearly as warm as the blood. Headache, drowsiness and uneasiness occur when less than one per cent of the oxygen of the atmosphere is replaced by other matters. The more we breathe, the more deprived of oxygen and charged with carbonic acid the air in the room becomes.

b) Gerund and Participle II-

Asphyxia can be caused by shutting out fresh air from a room or by increasing the number of people who are consuming the same air. The expired air is always saturated with watery vapor. The atmosphere deprived of oxygen and charged with carbonic acid necessitates an increase in the rate of breathing and under extreme conditions causes great discomfort. The discharge of the vitiated air from within may be accomplished by means of doors, windows, chimneys and ventilators.

II. Work with the text

1. Read the text and do the exercises that follow it.

Pure air for respiration

Ordinary atmospheric air contains nearly 2,100 parts of oxygen and 7,900 of nitrogen, and about three parts of carbonic acid in 10,000 parts; expired air contains about 470 parts of carbonic acid, and only between 1,500 and 1,600 parts of oxygen, while the quantity of nitrogen undergoes little or no alteration. Thus air which has been breathed has lost about five per cent of oxygen and has gained nearly five per cent of carbonic acid. In addition the expired air contains a greater or less quantity of highly decomposable animal matter, and, however dry the atmospheric air may be, the expired air is always saturated with watery vapor, and, no matter what the temperature of the external air may be, that of the exhaled air is always nearly as warm as the blood.

An adult man on average breathes about sixteen times a minute and at every inspiration takes in about thirty cubic inches of air, and at every expiration exhales about the same amount. Hence, it follows that about 16 cubic feet of air are passed through the lungs of an adult man every hour, and become deprived of oxygen and charged with carbonic acid to the amount of nearly five per cent.

The more nearly the composition of the external air approaches that of the expired air, the slower will be the diffusion of carbonic acid outwards and of oxygen inwards, and the more charged with carbonic acid and deficient in oxygen will the blood in the lungs become. Asphyxia takes place whenever the proportion of carbonic acid in the external air reaches ten per cent, providing the oxygen is diminished in like proportion, and it does not matter whether this condition of the external air is produced by shutting out fresh air from a room or by increasing the number of persons who are consuming the same air; or by permitting the air to be deprived of oxygen by combustion by a fire.

A deficiency of oxygen and an accumulation of carbonic acid in the atmosphere produce injurious effects, however, long before the asphyxiating point is attained. Headache, drowsiness, and uneasiness occur when less than one per cent of the oxygen of the atmosphere is replaced by other matters, and the constant breathing of such an atmosphere lowers vitality and predisposes to disease. Therefore, every human being should be supplied, by proper ventilation, with a sufficient amount of fresh air. Every adult individual ought to have at least 800 cubic feet of air-space to himself, and this space ought to communicate freely with the external atmosphere by means of direct or indirect channels.

Hence, a sleeping-room for one adult person should not be less than nine by ten feet in breadth and length and nine feet in height. What occurred in the Black Hole at Calcutta is an excellent illustration of the effect of vitiated air. One hundred and forty-six Englishmen were confined in a room eighteen feet square, with two small windows on one side to admit air. Ten hours after their imprisonment, only twenty-three were alive.

2. Look through the text again and name:
a) international words;
b) key words.

3. Which of the following problems were not mentioned in the text?
a) composition of air;
b) the tragedy in the Black Hole at Calcutta;
c) respiratory problems with adult people;
d) lung cancer;
e) the rate of breathing;
f) reasons for oxygen deficiency;
g) injurious effects of vitiated air;
h) sufficient air-space for an individual;
i) the temperature of the exhaled air;
j) direct and indirect air channels in ventilating systems.

4. Answer these questions.
1. How much oxygen and carbonic acid does the external air normally contain?
2. What happens to the air when it is consumed by human beings?
3. When does asphyxia take place?
4. What injurious effects can oxygen deficiency produce?
5. Is carbonic acid harmful of itself?
6. What is the main conclusion of the article?
7. What happened in the Black Hole at Calcutta?

5. Fill in the sentences with suitable prepositions.
1. His clothes were completely saturated ___ sweat. 2. An adult man ___ average breathes about sixteen times a minute. 3. The atmosphere which is deprived ___ oxygen and charged ___ carbonic acid can cause serious health problems. 4. If the blood is deficient ___ oxygen, an oxygen mask should be used.

5. Constant breathing of vitiated air lowers vitality and predisposes ___ disease.
6. Every human being should be supplied ___ a sufficient amount ___ fresh air.
7. The kitchen is three by four meters ___ breadth and length and three meters ___ height.

6. a) Revise the meaning of the following words used in the text.

while – в то время как; тогда как
thus – таким образом
hence – следовательно (hence it follows that… – отсюда следует, что…)
whenever – всякий раз когда, когда бы ни
providing – при условии, что; в том случае, если
whether – ли

b) Look through the article one more time to find sentences with the words from part a. Make sure you can translate them without any problems.

c) Translate the following sentences paying special attention to the underlined words.

1. That region has plenty of natural resources <u>while</u> this one has none. 2. We do not own the building. <u>Thus,</u> we can`t make any major changes to it. 3. Microwaves have become cheaper and <u>hence</u> more people buy them. 4. The roof leaks <u>whenever</u> it rains. 5. We`ll buy everything you produce, <u>providing</u> the price is reasonable. 6. They did not know <u>whether</u> the laboratory was equipped with air purifiers.

7. Translate into English.

Атмосферный воздух состоит из ряда газов, включая кислород, азот и углекислый газ. В процессе дыхания объем кислорода и угольной кислоты в атмосфере меняются, тогда как количество азота не претерпевает серьезных изменений. При каждом вдохе воздух теряет около 5 % кислорода. В конце концов, если в комнату не подается свежий воздух, в атмосфере внутри помещения начинает не хватать кислорода. Накопление угольной кислоты может вызывать большой дискомфорт, а также головную боль, сонливость и другие проблемы со здоровьем. Поэтому должная вентиляция крайне важна в жизни людей.

III. Summarizing

1. Discuss the text first in pairs, then in the group, consider:

a) the alteration the air undergoes in the process of respiration;

b) the influence of vitiated air on human health and the importance of proper ventilation.

2. Get ready to speak about the problem of air contamination and the importance of pure air for respiration.

IV. Supplementary reading

1. Read the text. Try to understand it and be ready to retell it in Russian.

Proper ventilation is good for your health and adds to your quality of life

Air quality standard defines acceptable indoor air quality (IAQ) as air in which there are no known contaminants at harmful concentrations and with which a substantial majority (80 per cent or more) of the people do not express dissatisfaction. This definition clearly states that the indoor air should be classified as fresh and pleasant by building occupants. Every day people spend an average of 20 hours indoors, some 12 hours of which are spent inside their own homes. Approximately 20 mi of fresh air are required each hour. For smokers, this amount increases to 30 mi. At the same time, a four-person household produces 10 to 12 litres of condensation every day, all of which weights heavy on the air indoors. Controlled ventilation is the best recipe for both your good health and the building itself. These systems make sure the air can circulate and eliminate air pollutants which could otherwise cause illness. Controlled ventilation regulates humidity before it turns into damp on the walls. Installation is simple, and used air is directed out of the house directly through an external wall or through an air shaft.

For optional air circulation, fresh air grilles or door grilles should also be fitted: ventilation needs a fresh air supply.

Air ventilation for particulate and gaseous contaminant control. Airborne contaminants are classified as vapors or aerosols, solids or particulates, and various gases, and come in a variety of particles. Different technologies ranging from mechanical filters and electronic air cleaners to gas-phase filtration can be used, depending on the type and size of contaminants present.

– Mechanical filters made of glass fiber and other media are most commonly used for particle removal. However, these filters are not effective for submicron indoor air contaminants.

– Electronic air cleaners are more efficient in capturing submicron-size particles. However, these air cleaners produce ozone, which may be harmful to human health if the devices are not maintained and operated properly.

– Gas-phase filtration is ideal for the removal of gaseous contaminants, tobacco smoke components, formaldehyde, and volatile organic compounds. However, there are some drawbacks in using gas filters. Carbon monoxide and carbon dioxide are not controlled. When the filter media are spent, they must be replaced. And, above all, there is an increase in operating cost because of higher pressure drops through the gas filters.

2. Find answers to the following questions.

1. What is acceptable indoor air quality?
2. What are the objectives of controlled ventilation?
3. What types of technologies are used for contaminant control?
4. What are mechanical filters like?
5. What are the advantages and disadvantages of electronic air cleaners?
6. What is gas-phase filtration like?

УЧЕБНЫЙ БЛОК 2 (УБ-2)
«NATURAL VENTILATION»

Цели:

Вы должны знать:	Вы должны уметь:
1. Грамматика: – существительное в функции определения; – части речи и их особенности. 2. Лексика: – ключевые слова и словосочетания по теме «Natural Ventilation».	– использовать лексические и грамматические навыки: а) для перевода текстов; б) в монологической и диалогической речи по теме блока.

I. Vocabulary and grammar

1. Read out the following words paying attention to their pronunciation.

accomplish	[ə'kʌmpliʃ]
temperature	['temprit∫ə]
excessive	[ik'sesiv]
approximately	[ə'prɔksimətli]
mechanism	['mekənizm]
intermediate	[ˌintə'mi:diət]
direction	[di'rek∫n]
to utilize	['ju:tilaiz]

2. Match the Russian words on the left with their equivalents on the right.

1. различный	a. convenient
2. объем	b. level
3. количество	c. wind
4. ценность	d. to move
5. увеличивать	e. neutral
6. переносимый по воздуху	f. natural
7. поток; течь	g. cause
8. ветер	h. amount
9. двигать, перемещать	i. outlet
10. нейтральный	j. to increase
11. удобный	k. volume
12. выпускное отверстие	l. airborne
13. впускное отверстие	m. flow
14. причина; вызывать	n. different
15. естественный	o. value
16. уровень	p. inlet

3. Think of synonyms for the following words.
quantity, to use, various, to fulfil

4. Find antonyms for the following words.
artificial, to decrease, negative, inlet

5. a) Memorize these word combinations.

1. aspirating effect	вытяжной эффект
2. storm-tight	способный выдерживать сильный ветер, ветроустойчивый
3. weather-proof	устойчивый против атмосферных влияний, погодоустойчивый

b) Translate on analogy.

chilling effect; an aspirating ventilator; airtight containers; a watertight watch; measures to make your home weather-tight; a bulletproof car; an oven-proof dish; a soundproof room; rainproof clothing

6. Determine the part of speech of the underlined words. Translate the sentences into Russian.

1. Temperature differences between inside and outside cause natural ventilation. Different forms of roof ventilators are available. Natural ventilation differs fundamentally from artificial ventilation. 2. Wind effect causes excessive ventilation. Temperature difference is the main cause of air motion. Ventilation in summer is caused mainly by wind effect. 3. Roof ventilators are built so that the wind increases the flow by an aspirating effect. Natural ventilation plays an increasingly important role in building practice. The role of air conditioning in industrial plants is constantly increasing. The temperature of the air has increased considerably. Our experiment has proved a considerable increase in air temperature in these conditions. 4. The wind can be utilized to move large volumes of air. The utilization of temperature difference in this case is very important.

7. Translate the following word partnerships.

Roof ventilators; air quality; temperature difference; window openings; wind effect; air flow; ground level

II. Work with the text

1. Read the text and do the exercises that follow it.

Natural ventilation

Ventilation is the process of «changing» or replacing of air in any space to remove moisture, odors, smoke, heat, dust, and airborne bacteria. It is one of the most important factors for maintaining acceptable indoor air quality (IAQ) in buildings. Methods for ventilating a building may be divided into mechanical / forced and natural types.

Natural ventilation is the ventilation of the premises with outside air without the use of a fan or other mechanical systems. Such kind of ventilation can be accomplished fairly well by making use of the wind and of the temperature differences between the inside and outside. Industrial buildings are often designed with no other ventilating systems, the air entering through open windows and leaving through skylights, roof ventilators or other open windows.

The wind can be utilized to move large volumes through the building in summer, when the temperature difference is small and of little effect in ventilation. In winter, on the other hand, the temperature difference can be made use of, whereas the wind effect would cause excessive ventilation.

In designing for natural ventilation the windows should be arranged with approximately the same amount of opening all sides of the building, and convenient operating mechanisms should be provided for the adjustment of the window openings.

Ventilation in summer by wind effect is for the most part a horizontal air flow, but ventilation through temperature difference is largely a vertical movement. In the latter case, there must be openings both at the top of the building, such as roof ventilators or monitors for the escape of air, and other openings near the ground and outward near the roof. Thus it follows that there is an intermediate neutral zone where the tendency for the air to flow either in or out (because of temperature difference) is zero, and openings near this intermediate level are much less effective than openings at the roof and ground levels. The amount of air that will flow through the building because of the temperature difference depends also upon the amount of openings.

Roof Ventilators. Various forms of roof ventilators are available. They are so constructed as to be storm-tight and to permit the outflow of air regardless of the direction of the wind, and some of them are built so that the wind actually increases the flow by an aspirating effect. Roof ventilators are of real value in providing a weather-proof exit for the air. They do not provide a positive flow, however, but are dependent upon the effect of the temperature difference and the aspirating effect of the wind.

2. Translate the fifth paragraph of the text in writing.

3. Look through the article to find answers to the following questions.

1. What is ventilation?
2. What main types do ventilating methods fall into?
3. What is natural ventilation?
4. What effects are used in accomplishing natural ventilation?
5. When is the wind effect used?
5. When is the temperature difference used?
6. What does the amount of air depend on?
7. How are roof ventilators constructed?
8. What purposes are roof ventilators utilized for?

4. Fill in the right prepositions.

1. In natural ventilation the air enters a building ___ open windows and leaves ___ skylights or roof ventilators. 2. Heating must be provided ___ human

comfort in cold seasons. 3. Attic vents are installed ___ the top of the building. 4. The amount ___ air that will flow through the building because ___ the temperature difference depends also ___ the amount of openings. 5. Roof ventilators ensure the outflow of air regardless ___ the direction of the wind. 6. Roof ventilators are ___ real value ___ providing a weather-proof exit for the air.

5. Translate from Russian into English.

1. Количество воздуха, циркулирующего по помещению, зависит от расположения вентиляционных отверстий. 2. В естественной вентиляции используется как эффект ветра, так и разница температур внутри и снаружи здания. 3. Цель вентиляции заключается в устранении излишней влаги и тепла, пыли, неприятных запахов и вредных бактерий, находящихся в воздухе. 4. Искусственная или механическая вентиляция используется для того чтобы контролировать качество воздуха в помещении. 5. Одной вентиляции не достаточно чтобы выполнить полную обработку воздуха. 6. Кондиционеры воздуха сильно ценятся в жарких странах, где приблизительно 85 % населения пользуются ими и днем, и ночью. 7. Впускные вентиляционные отверстия позволяют свежему воздуху поступать в здание. Выпускные отверстия, с другой стороны, позволяют загрязненному воздуху покидать помещение.

III. Summarizing

1. Get ready to discuss the text, consider:
   a) effects used in accomplishing natural ventilation;
   b) the effective arrangement of ventilating openings;
   c) peculiarities of roof ventilators.

2. Make up the plan of the text. Mind that there are three traditional types of plans:
   1) your plan may consist of word combinations, for example:
   a) the role of oxygen in the atmosphere;
   b) the function of nitrogen
2) it may consist of statements, for example:
   a) Oxygen cleans blood.
   b) Nitrogen dilutes oxygen.
3) or your plan may consist of questions:
   a) What is the role of oxygen?
   b) What function does nitrogen perform?

3. Get ready to speak on the topic «Natural ventilation». Make use of your plan.

IV. Supplementary reading

1. Read the text. Try to understand it and be ready to retell it in Russian.

What are attic vents?

Attic vents are an essential part of maintaining quality construction in a home because they provide the air circulation that is necessary for preventing problems. Attic vents serve a specific purpose year round. There are different types of attic vents that are designed to be used with different types of roofs and home construction, and their installation and performance are required to meet certain building codes.

There are two principal types of attic vents: — intake vents and exhaust vents. The intake vents allow fresh air from outside the home to enter the attic, and the exhaust vents allow the air to escape. There are different types of intake attic vents, including *gable* vents, *soffit* vents and *static* vents. The type references the location of the vents.

Gable vents are installed in the gable end just below the roof peak. These are the least efficient style of intake vents. Soffit vents are installed in the soffit and can be evenly spaced or run the continuous length of the roofline. Static vents are any other type of vents installed directly into the roof and are designed with a hood to keep rain out and sheet metal flashing to prevent leaks in the roof. The efficiency of any intake vent depends on its location and the number of vents present.

Exhaust vents are the attic vents that allow air to escape. The exhaust vents may be *static* or *turbine.* Static exhaust vents allow the air to escape with no powered assistance, while turbine vents use the power of wind to move the air. Turbine vents can often be seen spinning on the rooftops of homes in any neighborhood and are efficient at moving the air.

The main purpose of attic vents is to prevent moisture build up from condensation in the winter time, which could lead to damaged wood and insulation, rot, and mildew or mold, and to relieve extreme heat build up in the summer. Without proper ventilation in the summer, the air temperature in an attic can easily exceed 100 °F (38 °C), which causes a home’s central air conditioning to run harder than necessary to cool the home as well as causing damage to the wood, roofing, and other building materials over time.

The attic ventilation systems in new home construction are inspected by a building inspector upon completion, and older home's ventilation systems should be inspected during a whole house inspection prior to purchase. If you have lived in your home for a long time or have never had a whole house inspection, you can call an inspector or licensed roofing company to check the efficiency of your attic vents. If you have no attic vents installed: they would prove a worthwhile investment.

УЧЕБНЫЙ БЛОК 3 (УБ-3)
«VENTILATION COMBINED WITH HEATING»

Цели:

Вы должны знать:	Вы должны уметь:
1. Грамматика: – существительное в функции определения; – части речи и их особенности; – суффиксальное словообразование; – пассивный залог (Passive Voice). 2. Лексика: – ключевые слова и словосочетания по теме «Ventilation Combined with Heating».	– использовать лексические и грамматические навыки: а) для перевода текстов; б) в монологической и диалогической речи по теме блока.

I. Vocabulary and grammar

1. Match the Russian words on the left to their equivalents on the right.

1. снабжать	a. to introduce
2. потеря	b. size
3. устанавливать	c. to determine
4. достаточный	d. satisfactory
5. размер	e. loss
6. вводить	f. to supply
7. канал, труба, воздуховод	g. glass
8. определять	h. to install
9. удовлетворительный	i. sufficient
10. нижняя тяга	j. duct
11. утечка	k. case
12. стекло	l. leakage
13. случай	m. downdraft
14. проводить	n. to supersede
15. заменять, вытеснять	o. to convey

2. Translate the following sentences into Russian. Determine the part of speech of the underlined words.

1. Sometimes it's advantageous to install dehumidifiers instead of costly air conditioners. It is necessary to counteract the cold downdraft at the windows if no radiators are installed. 2. The air is introduced into the space after complete treatment. The introduction of fresh air into the premises is a very important task. 3. The temperature of the air supplied to the room is determined by the heat requirements. The students of our faculty study gas supply, heat supply, ventilation and other subjects.

3. Find an appropriate synonym for each word from the box below.

To provide; enough; to determine; dimensions; helpful; fan; to control; pipe; outdoors; to neutralize; objective (n); heater; sort.

to define; radiator; sufficient; to counteract; type; size; to handle; advantageous; to supply; purpose; outside; ventilator; duct

4. Translate the following word partnerships.

Fan system, heat loss, room temperature, office buildings, heat requirements, unit heaters

5. a) Study these problematic words.

remainder (n)	остаток
likelihood (n)	вероятность
so that (conj)	чтобы
altogether (adv)	совсем, совершенно

b) Translate the following sentences paying attention to the items in question.

1. Please pay half the money now and the remainder when you receive the goods. 2. There is very great likelihood of heat loss due to poor insulation. 3. She was wearing dark glasses so that nobody would recognize her. 4. At the age of 55 he stopped working altogether.

II. Work with the text

1. Read the text and do the exercises that follow it.

Ventilation combined with heating

Sometimes it is advantageous to have the fan system supply part of the heat loss (about one-third) and to install radiators of a size sufficient to care for the remainder. The air is introduced at somewhat above the room temperature, so that there is less likelihood of uncomfortable drafts. Also, the room temperature is likely to be better regulated, because thermostats controlling the temperature of air in ducts usually work more accurately than those controlling radiators.

Still another method is to omit the radiators altogether and supply all the heat from the fan system. The temperature of the air supplied to the room is then determined entirely by the heat requirements. A system of this sort is fairly satisfactory; but in buildings where the occupants must be located near the windows, as in schools and office buildings, it is quite necessary to counteract in some other manner the cold downdraft at the windows if no radiators are installed. This downdraft, caused by the inleakage of air and the chilling effect of the cold glass, is always a factor to be reckoned with.

Sometimes the fan system is installed for heating purposes only, ventilation not being designed and no fresh air is drawn from outside. The fan system in this case is designed to handle only the amount of air needed to convey the necessary heat. This is sometimes termed the «hot-blast» system. Factory buildings and other large spaces not densely occupied may be heated in this way, although unit heaters have largely superseded the central fan system in factory buildings.

2. Look through the text and name:
   a) international words;
   b) engineering terms;
   c) key words.

3. Scan the article one more time to find the sentences that tell us:
   a) how room temperature is regulated;
   b) what fan systems are used for;
   c) how factory buildings are heated;
   d) why it is advantageous to combine heating with ventilation.

4. Decide whether the following statements are true or false. Correct the false ones.

1. Ventilation is sometimes combined with heating to achieve better ventilating results.

2. Approximately two – thirds of the heat loss is compensated by the fan system and one-third is provided by radiators.

3. If there are no radiators in the building, the fan system can be made to supply all the necessary heat.

4. The fan system alone is not enough to counteract the cold downdraft at the windows.

5. The fan system always provides the space with fresh air drawn from outside.

5. Complete the sentences with the correct form of the word in brackets. Be ready to translate them.

1. The (to install) of this apparatus is fairly simple. 2. The purpose of air conditioning is to make the air in buildings more (comfort) and healthful for human beings. 3. We should prevent a (leak) of toxic waste into the sea. 4. What are your (to require)? 5. It is (advantage) to buy energy efficient equipment. 6. Is the air (to introduce) stopped?

6. Find examples of the Passive Voice in the text.

7. Translate into English.

1. Его смерть была вызвана потерей крови. 2. Каковы размеры этой комнаты? 3. Качество этого стекла неудовлетворительно. 4. Особые термостаты в батареях помогают регулировать температуру в зданиях. 5. Батареи, как правило, располагаются под окнами. 6. Мы должны принять во внимание разницу температур внутри и снаружи здания. 7. Новые энергосберегающие технологии вытесняют старые. 8. Трубы проводят горячую воду от бойлера к батареям.

III. Summarizing

1. Write a brief summary of the text.

2. Prove that it is advantageous to combine ventilation with heating.

3. Get ready to speak on the topic «Ventilation combined with heating».

IV. Supplementary reading

1. Read the text. Suggest a suitable title for it.

There are some types and the general arrangement of systems used for the ventilating and air conditioning of different kinds of buildings.

Although summer air conditioning has made the greatest impression on the public mind, there is a large field for winter air conditioning and for systems that give ventilation only, without much if any treatment of the air. Ventilating and air conditioning systems are naturally divided into four classes:

1. *Ventilating systems*. The present definition of ventilation as distinguished from air conditioning is not very exact, but ventilation is generally taken to mean the circulation of air without much if any treatment other than heating it to the proper temperature.

2. *Winter air conditioning*. This includes cleaning, heating, humidifying and circulating of air.

3. *Summer air conditioning.* This includes cleaning, cooling, dehumidifying and circulating.

4. *Complete air conditioning.* This includes both the winter and the summer functions.

Ventilation is used where the refinements and the cost of air conditioning in its more complete forms are not believed to be justified. The circulation of untreated or partially treated air accomplishes some of the objectives of air conditioning, such as the reduction of odors, but cannot control the effective temperature except through a limited range of conditions.

Winter air conditioning, since it does not require costly cooling or dehumidifying apparatus, is used in office buildings, some auditoriums, schools and residences where the people do not feel that summer cooling is justified. Summer air conditioning alone is used in offices, small stores and other places where the cooling effect is primarily sought. Such buildings often depend upon window ventilation in all other seasons. Complete air conditioning is used in theatres, some office buildings, large department stores and other buildings where both the summer and winter features are desired. The climatic conditions, of course, influence the extent to which each kind of air conditioning is found necessary.

2. Translate the last paragraph of the article in written form using a dictionary.

3. Look through the text again and find answers to the following questions.

1. How are ventilating and air conditioning systems usually divided?
2. What does ventilation generally mean?
3. What does winter air conditioning include?
4. What does summer conditioning embrace?
5. What does complete air conditioning consist of?
6. Where is winter air conditioning used?

7. Why is winter air conditioning used in these places?

8. What does each kind of air conditioning depend on?

9. Which air conditioning system is the most acceptable in our climatic conditions?

4. Get ready to retell the text in Russian.

УЧЕБНЫЙ БЛОК 4 (УБ-4)
«FANS»

Цели:

Вы должны знать:	Вы должны уметь:
1. Грамматика: – stonewall constructions; – основные способы словообразования; – пассивный залог (Passive Voice). 2. Лексика: – ключевые слова и словосочетания по теме «Fans».	– использовать лексические и грамматические навыки: а) для перевода текстов; б) в монологической и диалогической речи по теме блока.

I. Vocabulary and grammar

1. Match the following English words with their Russian equivalents and memorize them.

1. cause (n/v)	1. подходящий, годный
2. blade (n)	2. сирена, сигнал
3. circumference (n)	3. последующий, последовательный
4. exceeding (adj)	4. причина; вызывать, быть причиной
5. siren (n)	5. лопасть
6. successive (adj)	6. удовлетворять (требованиям), соответствовать, годиться
7. suit (v)	7. окружность, периферия, периметр
8. suitable (adj)	8. огромный, безмерный

2. Read the chains of derivatives and translate them.

a) To consider – considerate (adj) – inconsiderate (adj) – considerately (adv) – inconsiderately (adv) – considerable (adj) – inconsiderable – considerably (adv) – consideration (n) – considering (prep).

b) To consist – consistency (n) – inconsistency (n) – consistent (adj) – inconsistent (adj) – consistently (adv) – inconsistently (adv) – consistence (n).

c) To deliver – delivery (n) – deliverance (n).

d) To resist – resistible (adj) – irresistible (adj) – resistance (n) – resistless (adj) – resistant (adj).

3. Form adjectives from the following adverbs. Translate them into Russian.

Commonly, essentially, considerably, sufficiently, usually, progressively, relatively, mainly.

4. Check each other whether you know the words below. Find:

a) the words formed with the help of conversion (for example, *cool* (adj) – *to cool* (v));

b) the words formed with the help of affixes (that is suffixes and prefixes).

1. angle (n)	угол
2. axial (adj)	осевой
3. blower (n)	вентилятор, воздуходувка
4. casing (n)	кожух, футляр, обшивка, коробка
5. coil (n)	змеевик, кольцо, катушка
6. direction (n)	направление
7. discharge (n/v)	выпускное отверстие, выход; выпускать
8. duct (n)	труба, проток, канал
9. humming (adj)	жужжащий, гудящий
10. essentially (adv)	по существу
11. exact (adj)	точный
12. extend (v)	протягивать, вытягивать, расширять(ся)
13. mount (v)	устанавливать, монтировать
14. operate (v)	работать, приводить в действие
15. overcome (v)	превозмогать, преодолевать
16. pitch (n)	уровень, степень, сила, высота
17. scroll (n)	спираль; спиральный кожух, улитка (центробежного насоса)
18. shaft (n)	вал, ручка
19. shell (n)	раковина, ракушка, гильза
20. non-overloading (adj)	неперегружаемый
21. top (adj)	предельный, максимальный
22. wheel (n/v)	колесо, штурвал; катить, двигать (что-либо)

5. Find synonyms for the following words from the box below. Three words in the box are odd!

Outlet, to decrease, cause (n), fan, casing, form, inside, shaft, volute, velocity, duct, top (adj), to mount.

Handle, opening, minimum, reduce, discharge, scroll, axial, pipe, install, reason, maximum, ventilator, inward, housing, speed, blower, shape, suit

6. Translate the following word combinations.

a) воздушный поток, воздушный фильтр, объем воздуха, вал вентилятора, предельная скорость, охладительный змеевик, вентилирующие системы, лопасти вентилятора, последовательные воздушные волны;

b) fan noise, a propeller fan, centrifugal fan/force, miniature siren, blower wheel, high velocity fan, discharge outlet, heat exchanger, circular opening, axial/radial flow type, outward air flow, air delivery conditions, exact operating pressure, considerable resistance, vibrating fan blades, careful analysis, lower speed.

7. Change the phrases omitting the word «of».

The amount of noise, the class of the fan, the circumference of a circle, the direction of the air flow, the loudness of the sound, the resistance of air filters, the top speed of the fan.

8. Translate the sentences paying attention to the meaning of the following words.

after	после
against	против
almost	почти
always	всегда
around	кругом, вокруг
as…as	такой же … как; настолько … насколько
both	оба
by itself	само по себе
often	часто
therefore	поэтому, следовательно
usually	обычно, обыкновенно

1. Carbon dioxide was for a long time believed to be a poisonous gas, but is now known to be quite harmless by itself, even in appreciable amounts. 2. Portable air conditioners are mounted on sturdy casters, therefore they can be easily wheeled from one location to another. 3. The centrifugal fan consists of a series of blades mounted around the circumference. 4. Tubular centrifugal fans are usually centrifugal fans that have a special housing design. 5. Large systems do not often use propeller fans due to their low-pressure capability. 6. The fan must be as energy-efficient as possible. 7. Centrifugal fans are capable of delivering large volumes of air against considerable resistance. 8. Almost all fans are capable of having a lighting system attached. 9. Ventilators are always available at a variety of stores. 10. You can put a fan in a window facing in both directions:

facing out to draw warm air out of your home or facing in to pull in cool air from outside. 11. The housing starts just after the discharge outlet.

9. Check each other whether you know the words used with fixed prepositions.

to burn out	перегорать; сжигать
capable of	способный (на что-либо)
compared with	в сравнении, по сравнению с
to consist of	состоять из
in the direction of	в направлении, по направлению к
to fall into	делиться на
to force through	проталкивать (через что-либо)
parallel to	параллельный чему-либо
outward from	в обратную сторону

10. Translate the following sentences paying attention to the Passive Voice.

1. This type of fan is commonly known as a propeller fan.
2. This outward air flow is produced by centrifugal force.
3. The forward curved fan is overloaded as the pressure is reduced, and the air volume is increased.
4. Blowers can be designed and operated at such speeds as to provide any desired air volume.
5. The noise is caused by the successive air waves.
6. A small amount of noise may be caused by the vibrating fan blades.
7. The noise may be created by a high velocity fan.
8. Thus, it can be seen that there is a definite relation between the amount of noise and the quantity of air being delivered.

II. Work with the text

1. Read the text and do the exercises that follow it.

Fans

Fan requirements. The fans used in modern air conditioning systems fall into two general classes depending on the direction of the air flow through them. The first class is the axial flow type through which the air flows in the direction of and parallel to the fan shaft. This type of fan is commonly known as a propeller fan. It consists essentially of two or more blades which extend from the shaft.

The second class of fan is the radial flow type through which the air flow is outward from the fan shaft. This outward air flow is produced by centrifugal

force. Therefore, this type is commonly known as a centrifugal fan or blower. It consists of a series of blades mounted around the circumference of a circle with the shaft in the center. The blades themselves are parallel to the shaft and may be either forward curved or backward curved. The fan using forward curved blades will generally run at a lower speed than a backward curved fan for the same air delivery conditions. However, the fan that uses backward curved blades will tend to be non-overloading while a forward curved fan will tend to overload as the pressure is reduced and the air volume is increased. Therefore, unless a very careful analysis is made as to the exact operating pressure, there is considerably more danger of overloading and burning out the motor with forward curved fans.

The fan wheel of a centrifugal blower is not sufficient by itself to provide a usable flow of air. A casing or housing is always necessary to collect and direct the air flow as it leaves the fan blades. This housing, or scroll, usually starts with a very small area just after the discharge outlet and progressively increases in size around the circumference of the shell until the maximum size is reached at the discharge opening. This shape is known as a volute. The air inlet to the wheel usually takes the form of a circular opening in the casing in one or both sides. The diameter of this opening is as large as possible without exceeding the inside diameter of the blower wheel.

Centrifugal fans are capable of delivering large volumes of air against considerable resistance. It is for this reason that they are the first choice* in air conditioning and ventilating systems where it is necessary to overcome the resistance of the air filters, cooling coils, heat exchangers, ducts and outlets.

Fan noises. Fans and blowers can be designed and operated at such speeds as to provide almost any desired velocity and air volume. However, the difficulty in air conditioning work is the noise produced by the fans and blowers. The noise is caused mainly by the successive air waves which are the result of the fan blades and the turbulence caused by the resistance of the air being forced through the system. A small amount of noise may be caused by the vibrating fan blades. This noise is relatively minor, however, when compared with the noise that may be created by a high velocity fan. The humming noise produced by a fan is in effect a miniature siren. The loudness and the pitch of the sound depend upon the top speed of the fan, the general shape of the blades, and the number and angle of the blades. Thus, it can be seen that there is a definite relation between the amount of noise and the quantity of air being delivered. To be suitable, an air conditioning system must deliver the proper quantity of air with a minimum of fan noise.

* *they are the first choice* – они предпочтительны

2. Look through the text to find scientific terms. Do they refer to international words?

3. Think of antonyms for the following words.

Minimum (adj), insufficient, forward, overloading, inlet, to increase, inconsiderable.

4. Answer these questions.

1. What are the general types of fans used in air conditioning?
2. What is the definition of a propeller fan?
3. What are the main features of a centrifugal fan or blower?
4. Why are centrifugal fans the first choice in air conditioning?
5. What is the cause of air noise in an air conditioning system?

5. Decide whether the following statements are true or false. Correct the false ones.

1. The two general types of fans used in air conditioning installations are: radial flow type fans and centrifugal fans.
2. Radial flow type fans are also called centrifugal blowers because the outward air flow in them is produced by centrifugal force.
3. The blades of centrifugal fans can be either forward curved or inward curved.
4. There is no danger of overloading and burning out the motor with centrifugal fans.
5. The casing of a centrifugal blower has the shape of a scroll.
6. Centrifugal fans can operate against greater air resistance than propeller fans.
7. The number and shape of the fan blades do not affect the intensity of fan noises.

6. Translate into English.

1. Теплообменник был установлен под неправильным углом. 2. Диаметр этого выпускного отверстия соответствует потоку воздуха. 3. Высокая температура и чрезмерная влажность вызывают большой дискомфорт. 4. Нам следует поменять змеевик в ванной комнате. 5. Это оборудование приводится в действие воздушными насосами. 6. Предельная скорость этого аппарата недостаточна, чтобы двигать вал. 7. Мы хотим установить в этом помещении высокоскоростной вентилятор. 8. Двигатель этого вентилятора сгорит, если вы его перегрузите. 9. Какова причина утечки газа? 10. Осевые вентиляторы работают лучше в условиях, когда сопротивление системы мало.

III. Summarizing

1. Make up the summary of the text.

2. Write the plan of the article.

3. Get ready to speak on the topic «Fans». Make use of your summary and plan.

IV. Supplementary reading

1. Read the text. Try to understand it and be ready to retell it in Russian.

What are the different types of ceiling fans?

Many homes and businesses use ceiling fans for functional as well as decorative purposes. Ceiling fans come in a variety of designs from simple to complex. With so many designs to choose from, you can find the perfect ceiling fan for nearly any space. Some ceiling fans have attached lighting elements, and there are also simple lighting kits* available if the fan you select does not include lighting.

Simple designs can be turned on and off by pulling a cord or flipping a switch. Models that are more elaborate may have dimmers or even use a remote control to set lighting or change fan speed. If you choose a remote control, make sure the remote is compatible with the type of fan you are purchasing. Some remotes are universal, while others are recommended for use with only certain brands of fans.

Many ceiling fans offer at least three speeds, although some may offer four or more. While ceiling fans are frequently used to keep certain areas cool, most also offer the option of reversing the fan's motion to distribute heat in colder months.

In addition to typical ceiling fans, there are also ceiling fans specifically designed for damp and wet areas, such as kitchens and baths, pool and spa areas, saunas or patios. These use blades made from weather resistant materials, as well as protected motors and working parts that resist moisture and rust*. When purchasing this type of ceiling fan, look for the Underwriter's Laboratory (UL) seal with a wet/damp rating.

Aside from functional differences, ceiling fans also vary in style. They may have three, four or five «paddles» or blades. These blades commonly range in size from just over two feet long (around 2/3 of a meter) to a little over four feet long (about 1,25 meters). The size and number of blades needed is dependent

upon the size of the room the fan will cool. Check the manufacturer's guidelines or consult with a service representative at your local lighting shop or home improvement center to determine the configuration most suitable to your needs.

**lighting kit* – комплект деталей для установки освещения
**patio* ['pætiəu] – внутренний дворик

2. Translate the abstract printed in italics in written form using a dictionary.

УЧЕБНЫЙ БЛОК 5 (УБ-5)
«BASIC PRINCIPLES OF AIR CONDITIONING»

Цели:

Вы должны знать:	Вы должны уметь:
1. Грамматика: – основные способы словообразования; – степени сравнения прилагательных и местоимений; – эмфатические конструкции; – существительное в роли определения; – служебные слова и словосочетания. 2. Лексика: – ключевые слова и словосочетания по теме «Basic Principles of Air Conditioning».	– использовать лексические и грамматические навыки: а) для перевода текстов; б) в монологической и диалогической речи по теме блока.

I. Vocabulary and grammar

1. a) Look up the following words in your dictionary paying special attention to their pronunciation.

Conscious (adj), simultaneous (adj), sweat (n), advantage (n), invent (v).

b) Fill in the sentences with the correct form of one of the words above. Be ready to translate the completed statements.

1. He stopped digging and wiped the ___ from his face. 2. Nowadays people are more ___ of the need to look after the environment. 3. The radio was ___ by A. Popov. 4. Complete air conditioning involves the ___ control of the following factors: temperature, humidity, air motion, air distribution, dust, odors, bacteria and toxic gases. 5. The key ___ of this air conditioning system are economy and efficiency.

2. Check each other whether you know the words below. Find:

a) the words formed with the help of conversion;

b) the words formed with the help of affixes.

1. to maintain	поддерживать, содержать, сохранять
2. maintenance	тех. обслуживание
3. appreciation	понимание
4. cool (n/v/adj)	прохлада; охлаждать(ся), остывать; прохладный, свежий
5. to reject	извергать, выделять
6. rejection	извержение, выделение
7. dependent	зависимый, зависящий
8. regard (n/v)	уважение, внимание; принимать во внимание, считаться
9. without regard to	без учета чего-либо
10. regardless	невзирая на, не считаясь с
11. scale	масштаб
12. to render	(в сочетании с прил.) приводить в какое-либо состояние, делать
13. to lose (lost, lost)	терять, лишаться, утрачивать
14. continuous	непрерывный, постоянный
15. to appear	показываться, появляться
16. drop (n/v)	капля; капать, падать
17. to float	плавать, держаться на поверхности
18. to flow (flew, flown)	течь, струиться
19. ray (n/v)	луч; излучать(ся), расходиться лучами
20. relation	отношение, соотношение, связь
21. in relation to	что касается, относительно
22. remain (n/v)	(обыкн. мн.ч.) остаток, остатки; оставаться
23. space	пространство, место
24. surface (n/v)	поверхность; всплывать
25. to surround	окружать, обступать
26. surrounding	окружающий

3. Form adverbs from the following adjectives. Translate them into Russian.

Proper, relative, constant, primary, simultaneous, true, large, principal, similar, continuous, direct, ready.

4. Read derivatives of the words and try to translate them.

a) to apply (применять) – appliance (n) – applied (adj) – application (n) – applicable (adj) – unapplicable (adj) – applicant (n)

b) to appreciate (понимать; оценивать) – appreciated (adj) – unappreciated (adj) – appreciation (n) – depreciation (n) – appreciable (adj) – inappreciable (adj)

c) humid (влажный, сырой) – humidify (v) – dehumidify (v) – humidity (n) – humidifier (n) – dehumidifier (n) – humidifying (n) – dehumidifying (n) – humidification (n) – dehumidification (n)

d) to impress (поражать, производить глубокое впечатление) – impressed (p.p.) – unimpressed (p.p.) – impressive (adj) – unimpressive (adj) – impressible (adj) – impressionable (adj) – impression (n) – impressionism (n) – impressionist (n)

5. Find pairs of synonyms.

1. steam (n)	a. space
2. continue (v)	b. close to
3. vary (v)	c. float (v)
4. surrounding (adj)	d. change (v)
5. swim (v)	e. cleanliness
6. sweat (n)	f. vapor
7. heat (v)	g. speed
8. next to	h. warm (v)
9. purity (n)	i. perspiration
10. room (n)	j. go on (v)
11. rate (n)	k. ambient

6. Match the antonyms.

1. indoor (adj)	a. less
2. humidify (v)	b. external
3. with (prep)	c. outdoor
4. increase (v)	d. slow
5. internal (adj)	e. dehumidify
6. dependent (adj)	f. without
7. advantage (n)	g. far
8. more	h. independent
9. fast (adj)	i. absorb
10. give off (v)	j. decrease
11. close (adv)	k. disadvantage

7. Make sure you know the translation of the following word combinations.

Body comfort, heat rejection, large scale use, constant temperature machine, atmospheric conditions, internal temperature, proper quantity, relative humidity, skin temperature, camp fire, heat regulation, low pressure steam, normal rate, conditioned space, continuous process

8. Read and translate these sentences with emphatic constructions, for example:

It is (was) … that (where, when, who) – именно, как раз

1. It was at this time that we expected him to come. 2. It was this system that we recommended. 3. It is at the University where I usually meet my group mates. 4. It was Bell who invented the telephone. 5. It is on Sundays when we go in for sports. 6. It was in the 1920-s when air conditioning appeared in public places for the first time. 7. It was these systems that first exposed large numbers of people to the comfort of summer cooling.

II. Work with the text

1. Read the first part of the text and do the exercises that follow it.

Basic principles of air conditioning (part 1)

Most people have little appreciation of the basic principles of air conditioning, although it was introduced to the public about a century ago. An air conditioning unit was invented by Willis Haviland Carrier around 1902. The large scale use of air conditioning on trains and in theatres began in the 1920-s. It was these systems that first exposed large numbers of people to the comfort and advantages of summer cooling and at the same time caused the incorrect impression that air conditioning is synonymous with cooling.

In fact air conditioning involves the simultaneous control of temperature (it means heating as well as cooling), humidity (either humidifying or dehumidifying), air purity and air motion. Unless all of these conditions are controlled, the term air conditioning cannot be properly applied to any system or equipment. Thus an industrial system which provides an indoor condition of 150 °F (66 °C) db at 75 % rh can just as well be called air conditioning as a system designed to provide indoor conditions of 80˚F (26,7 °C) db and 50 % rh. Similarly a system which only cools a space without regard to the relative humidity or air purity or motion cannot be properly called a true air conditioning system. An air conditioning system can maintain any atmospheric condition regardless of variations in the outdoor atmosphere.

The two primary reasons for using air conditioning are: to render the air more suitable for industrial processes and to maintain human comfort.

Human comfort is dependent upon how fast the body loses heat. The human body is basically a constant temperature machine. The internal temperature of the human body is 98.6˚F (37˚C) which is maintained by a delicate temperature regulating mechanism. Because the body always produces more heat than it needs, heat rejection is a constant process. The main object of air conditioning is not to heat or cool the body but to control its cooling rate. Thus, in summer the job is to increase the cooling rate, in winter – to decrease it.

*db (dry bulb) – сухой шарик (гигрометра)
*C (Centigrade) – температурная шкала Цельсия
*F (Fahrenheit) – температурная шкала Фаренгейта

	F	C
Water boils at	212°	100°
Water freezes at	32°	0°

2. Answer the questions.

1. What are the basic functions of a true air conditioning system?
2. What are the two primary reasons for using air conditioning?
3. What is the human comfort dependent on?

3. State the main points of the text in a plan.

4. Translate the following dialog.

– Не могли бы Вы дать определение термину кондиционирования воздуха? Что оно в себя включает?

– Конечно, могу. Полное кондиционирование воздуха включает одновременный контроль многих факторов.

– Назовите их, пожалуйста.

– Это температура, влажность, чистота, движение и распределение воздуха.

– Знаете ли Вы, какие факторы включает распределение воздуха?

– Конечно. Это пыль, запахи, бактерии, токсичные газы.

– Для чего мы используем кондиционирование воздуха?

– Я думаю, что, прежде всего, оно важно для человеческого комфорта.

– А от чего зависит человеческий комфорт?

– Человеческий комфорт зависит от того, как быстро тело теряет тепло.

– Тогда, я думаю, основная задача кондиционирования воздуха состоит в том, чтобы помочь телу контролировать скорость тепловыделения.

– Вы правы. Это верно как в отношении отопительных, так и охладительных сезонов.

I. Vocabulary and grammar

1. Use the words below to make up as many word partnerships as possible.

normal	cooling	system	motion
constant	heating	process	distribution
heat	comfort	conditioning	temperature
air	humidity	rejection	requirements
control	winter	regulation	rate
body	summer	loss	vapor
	water	purity	season

2. Translate the following sentences containing the words formed with the help of conversion.

1. Name the three ways that the body gives off heat. 2. Heat the furnace, please. 3. The warm air always floats upward. 4. When we warm the air it floats upward. 5. Sun rays warm the surface of the earth. 6. When moisture evaporates, it absorbs heat from the body and cools it. 7. The warm air is lighter than the cool air. 8. What is the first world cosmonaut's name?

3. a) Read derivatives of the words and try to translate them.

a) to depend (зависеть) – dependence (n) – independence (n) – dependency (n) – independency (n) – dependent (adj) – independent (adj) – dependently (adv) – independently (adv) – dependable (adj)

b) to radiate (излучать(ся)) – to irradiate – radiant (adj) – radiance (n) – radiancy (n) – radiation (n) – irradiation (n) – radiator (n) – radiating (adj) – radiative (adj)

c) to vary (менять(ся)) – variability (n) – invariability (n) – variable (n/adj) – invariable (n/adj) – variant (n) – invariant (n) – variance (n) – variation (n) – varied (adj) – variety (n) – various (adj)

b) Think of as many derivatives of the following words as possible.

Use (v), pure (adj), reject (v), convect (v)

4. Study the following words and set expressions, then translate the sentences illustrating their usage.

the same	тот же самый, одинаковый
in relation to	относительно, что касается, в зависимости от
just	точно, как раз, именно
regardless of = without regard to	независимо от, без учета чего-л.
unless	если не
although (though)	хотя
while	в то время как, пока
as well as	а также, также как
thus	так, таким образом
from … to	от … до

1. Although the deep body temperature remains the same, the human skin temperature varies. 2. Ceiling fans may have from three to five blades. 3. Fans are the perfect addition to a home for their aesthetic quality as well as practical use. 4. While the warm air rises, the cooler air floats downward. 5. This jacket is just my size. 6. Combustion is incomplete, unless sufficient amount of air is supplied to all parts of the fuel bed. 7. The moisture content of the air changes in relation to the pressure and temperature of the air. 8. A system which only cools a space without regard to the relative humidity cannot be properly called a true air conditioning system. 9. Thus it is more sensible to purchase energy efficient household goods to save money over time.

5. Translate the following sentences paying attention to the degrees of comparison.

1. The air close to the body becomes warmer than the surrounding air. 2. The warm air is lighter than the cool air. 3. Heat may flow from the skin to any surface that is cooler than the body. 4. The side next to the fire gets warmer than the other side. 5. Sometimes the body may produce more heat than it can reject.

II. Work with the text

1. Read the second part of the text and do the exercises that follow it.

Basic principles of air conditioning (part 2)

In the air conditioning process there are three ways that the body gives off heat: (1) convection, (2) radiation and (3) evaporation. In most cases the body uses all three methods at the same time.

Convection. In the convection process the air close to the body becomes warmer than the air farther away from the skin. Because the warm air is lighter than the cool air, the warm air rises. This warm air is replaced by the cooler air and the cooling by convection is a continuous process. As this air becomes warm, it also floats upward. Even though the deep body temperature remains at 98.6˚F (37˚C), the human skin temperature will vary. The skin temperature may vary from 40˚F to 105˚F (4.4˚C to 40˚C) in relation to the temperature, humidity and velocity of the surrounding air. If the temperature of the surrounding air drops, the temperature of the skin will also drop.

Radiation. Heat radiates directly from the body to any cooler surface just as the rays of the sun travel through space and warm the surface of the earth. Heat may flow from the skin to any surface or object that is cooler than the body. This process is independent of the convection process. The temperature of the air between the person and the cooler surface has no effect on the radiation process. The same principle applies when a person is warmed by a camp fire. The side next to the fire gets warm while the outer side is cool. The air temperature between the person and the fire is the same as the air temperature on the person's other side.

Evaporation. Evaporation heat regulation is the body process that maintains life outside of an air conditioned space. In this process moisture, or perspiration, is given off through the pores of the skin. When this moisture evaporates, it absorbs heat from the body and cools it. The effect of evaporation can be felt more easily when alcohol is put on the skin because the alcohol vaporizes more readily and absorbs heat faster. This evaporation turns the moisture into low pressure steam or vapor and is a continuous process. When drops of sweat appear on the skin it means that the body is producing more heat than it can reject at the normal rate.

2. Answer the questions.

1. What are the three ways a human body gives off heat?
2. Why does the warm air rise in the convection process?
3. What happens when a person is warmed by a camp fire?
4. What do the drops of sweat appearing on the skin mean?

3. Choose the sentence which expresses the main idea of the text.

a) Convection occurs when a fluid flows across a hot or cold surface and exchanges energy with that surface.

b) Radiation is energy transfer through space in the form of electromagnetic waves.

c) The human body gives off heat by means of convection, radiation and evaporation.

4. Make up the summary of the text.

5. Look through both parts of the text so as to find scientific terms. Which of them are international words?

III. Summarizing

1. Discuss the information you've got from the text with your group mates (question – answer). Consider:

– the history of air conditioning;
– the functions true air conditioning performs;
– the reasons for using air conditioning;
– human comfort and what it depends on;
– the ways the body gives off heat.

2. Get ready to speak on the topic «Basic principles of air conditioning».

IV. Supplementary reading

1. Read the text and do the exercises that follow it.

Conditions that affect body comfort

There is no set rule as to the best conditions for all people. In the same atmospheric conditions the young, healthy person may be slightly warm while an elderly one may be cool.

The three conditions that affect the ability of the body to give off heat are: temperature, relative humidity, and air motion. A change in any one of these conditions will either speed up or slow down the cooling process.

AIR TEMPERATURE: Air at a temperature lower than the skin will speed up the convection process (the air close to the body becomes warmer). The cooler the air, the more heat the body will lose through convection. Heat always flows from a warm place to a cooler place. The greater the temperature difference, the faster the heat will flow. If this difference in temperature is too great, the body will lose heat more rapidly than it should and it will become uncomfortable.

If the air temperature is higher that the skin temperature, the convection process will be reversed.

The temperature of any surrounding surfaces is also important because this temperature affects, the rate of radiation from the body. The lower the

surface temperature, the more heat is given off by the body through radiation (heat radiates directly from the body to any cooler space). As the temperature difference between the surface and the body is decreased, the rate of radiation is decreased. The radiation process will be reversed if the surrounding surface temperature is higher than the body temperature. When this happens, the body must give off more heat through the convection and evaporation processes.

RELATIVE HUMIDITY: Relative humidity regulates the amount of heat the body can reject through evaporation (moisture is given off through the pores of the skin). Relative humidity is a measure of the amount of moisture in the air. It is an indication of the ability of the air to absorb moisture. Relative humidity is basic to the air conditioning process.

If the air which surrounds the body has a low relative humidity, the body will give off more heat through evaporation. If the air surrounding the body has a high relative humidity, the body will give off less heat through evaporation. A conditioned air temperature at 80 °F (26,7 °C) and 50 % relative humidity will be reasonably comfortable.

AIR MOVEMENT: An increase in the rate of evaporation of perspiration from the body is largely a result of air movement. Evaporation is dependent upon the ability of air to absorb moisture.

The movement of air also speeds up the convection process. This is possible because the warm air next to the skin is replaced by cooler air and heat is given off from the body to the air.

Air movement also removes heat from other substances such as walls, ceilings, and other objects surrounding the body, thus, tending to speed up the radiation process. It must be remembered that air motion is one of the conditions which affect the comfort of human beings.

Air distribution: The air introduced into a conditioned space should be distributed so that there will be only minor temperature differences between the floor and ceiling, and between the inside and outside walls.

2. Choose the best alternative according to the text.

1. Conditions that affect the ability of the body to give off heat are:

a) temperature, relative humidity, and air motion; b) relative humidity, moisture amount, convection; c) air movement, body ability, rate of radiation.

2. Air at a temperature lower than the skin

a) speeds up the convection process; b) slows down the convection process; c) increases the radiation rate.

3. The temperature of any surrounding surfaces affects

a) the process of evaporation; b) the movement of the air; c) the rate of radiation from the body.

4. When the surface temperature is low,

a) body gives off more heat through radiation; b) body gives off less heat through radiation; c) body doesn't give off heat through radiation.

5. Relative humidity regulates

a) the process of evaporation; b) the amount of heat the body can reject through evaporation; c) the process of convection.

6. Relative humidity is

a) a measure of heat amount in the air; b) a measure of dust amount in the air; c) a measure of moisture amount in the air.

7. The movement of air speeds up

a) the convection process; b) the radiation process; c) the cooling process.

3. Agree or disagree with the following statements.

1. The three conditions that affect the ability of the body to give off heat are: temperature, relative humidity, and air motion.

2. The cooler the air, the less heat the body will lose through convection.

3. Heat always flows from a cool place to a warmer place.

4. If difference in temperature is too great, the body will lose heat more rapidly than it should and it will become uncomfortable.

5. Relative humidity is an indication of the ability of the air to lose moisture.

6. If the air which surrounds the body has a low relative humidity, the body will give off more heat through evaporation.

7. The movement of air slows down the convection process.

8. The air introduced into a conditioned space should be distributed.

4. Answer the following questions.

1. What are the three conditions that affect the ability of the human body to give off heat?

2. What speeds up the convection process?

3. Where does heat always flow to?

4. When are the convection and radiation processes are reversed?

5. What also affects the rate of radiation from the body?

6. What is relative humidity?

7. What happens when relative humidity is low?

8. What is evaporation dependent upon?

9. What are the results of air movement?

10. Why should the conditioned air be distributed through the space?

5. Complete the following statements:

1. The three conditions that affect the ability of the body to give off heat are: ....

2. The cooler the air, the more heat ….

3. Heat always flows from ….

4. If difference in temperature is too great ….

5. The temperature of surrounding surfaces is also important because ....

6. Relative humidity regulates... .

7. Relative humidity is … .

8. If the air which surrounds the body has a low relative humidity... .

9. Air movement increases...., also speeds up…, also removes... speeding up... .

10. The air introduced into a conditioned space should be distributed so that there will be ... .

УЧЕБНЫЙ БЛОК 6 (УБ-6)
«TYPES OF AIR CONDITIONERS»

Цели:

Вы должны знать:	Вы должны уметь:
1. Грамматика: – составные союзы и предлоги; – функции слова «one». 2. Лексика: – ключевые слова и словосочетания по теме «Types of Air Conditioners».	– использовать лексические и грамматические навыки: а) для перевода текстов; б) в монологической и диалогической речи по теме блока.

I. Vocabulary and grammar

1. Read out the following international words paying particular attention to their pronunciation. Try to guess their meaning.

freon (n) ['fri:ɔn]

diameter (n) [dai'æmitə]

apartment (n) [ə'pɑ:tmənt]

crystalline (adj)	['kristəlain]
tobacco (adj)	[tə'bækəʊ]
kilowatt (n)	['kiləwɔt]
calorifier (n)	[kə'lɔrifaiə]
cartridge (n)	['kɑ:tridʒ]
decorative (adj)	['dekərətiv]

2. Match the English words on the left to their equivalents on the right.

1. domestic	a. ограничения
2. premises	b. портативный, передвижной
3. to single out	c. соединительная система
4. to mount	d. отводить, удалять
5. an advantage	e. требовать
6. portable	f. домашний, бытовой
7. to require	g. монтировать
8. inner	h. выделять
9. simultaneously	i. регулировать, устанавливать
10. to withdraw	j. внутренний
11. restrictions	k. достоинство, преимущество
12. communications	l. надежность
13. to adjust	m. помещение, дом
14. reliability	n. одновременно

3. Read out these word partnerships several times till you remember them.

crystalline liquid display	жидкокристаллический дисплей
coarse filter	фильтр первичной (грубой) очистки
preset time	заданное время
price benefit	выигрыш в цене
remote-control station	пульт дистанционного управления
widespread opinion	широко распространенное мнение
a wide range of air conditioners	широкий выбор кондиционеров воздуха
suspended ceiling	подвесной потолок
flexible hose	гибкий шланг

4. Think of antonyms for the following words.

Industrial (adj), rigid (adj), disadvantage (n), stationary (adj), outer (adj), floor (n).

5. Memorize the words, then complete the sentences below with one of them. Be ready to translate the completed statements.

grate – решетка
even – равномерный
avoid – избегать
dimensions – размеры
mode – режим, функция
power – мощность
exceed – превышать, превосходить

1. The simplest air conditioners can only chill the air, more expensive also have the heating _____. 2. The price of this unit will not ____ £600. 3. The vitiated air is withdrawn through ventilation outlets closed with decorative ____. 4. One of the advantages of cartridge air conditioners is ____ distribution of the air flow in four directions. 5. The ____ of domestic air conditioners rarely exceeds 7 kWt. 6. In some models air stream is directed upwards or along the ceiling to ____ direct flow on people. 7. The power of an air conditioning unit doesn't necessarily depend on its ____.

6. Think of synonyms for the following words.

Regulate (v), grill (n), pluses and minuses (pros and cons), install (v), energy (n), demand (v), flat (n), heater (n), size (n).

7. Give the three forms of these verbs.

To withdraw, to suspend, to hide.

8. a) Read the sentences. Translate them into Russian paying attention to the underlined fragments.

1. Air conditioners with the power of up to 7 kWt used for cooling of small premises are referred to domestic ones. 2. Some air conditioners of intermediate power can be used both in domestic and industrial conditions. 3. Thanks to reasonable prices window air conditioners are very popular with consumers. 4. Air conditioners are selected according to their cooling power and the dimensions of the premises in which the unit will operate. 5. Due to hidden installation, channel and cartridge air conditioners easily correspond with the interior.

b) Now translate the following sentences into English using the underlined fragments from Part A.

1. Самая популярная модель бытового кондиционера стоит вплоть до $600. 2. Кондиционеры воздуха могут устанавливаться как на стенах, так и на потолке. 3. Благодаря равномерному распределению воздуха в четырех направлениях одного кондиционера достаточно, чтобы охладить большое помещение. 4. В соответствии с дизайном все кондиционеры воздуха делятся на два больших класса: моноблочные кондиционеры, состоящие из одного блока, и сплит-системы, состоящие из двух и большего числа блоков. 5. Благодаря сплит-дизайну самая шумная и объемистая часть кондиционера воздуха выведена наружу.

c) While reading the text find some more sentences with the prepositions «up to, thanks to, according to, due to» and the conjunction «both … and».

9. Look at the sentences below. All of them contain the word «one» but it has different functions.

1. All air conditioners can be divided into domestic and industrial ones. 2. With the help of a remote-control station one can adjust the temperature in a building, regulate direction of air stream and do many other things. 3. Inner block of wall air conditioners is usually installed in the upper part of the wall, near the window, and the outer one – under the window. 4. In multisplit-systems several inner blocks are connected to one outer block. 5. One should be careful to understand the true meaning of air conditioning.

In which of the given sentences

a) does the word «one» have a numerical function?

b) does the word «one» substitute the already mentioned noun?

c) does the word «one» mean «people in general»?

II. Work with the text

1. Read the first part of the text and answer the questions that follow it.

Types of air conditioners (part 1)

All the air conditioners can be divided (somewhat conventionally) into domestic and industrial ones. The difference between them is not in their design but in the application domain. Air conditioners with the power of up to 7 kWt used for cooling of small premises of 15 – 80 square meters are referred to domestic ones. Industrial air conditioners are used for cooling of big premises,

for example, for the centralized cooling of the whole buildings. Also there is usually singled out a big class of air conditioners standing between domestic and industrial systems – semiindustrial air conditioners. Having power of 7 – 25 kWt, they can be used both in domestic conditions – cottages, multi-room apartments, – and in the office premises, stores, enterprises, etc. Leaving behind industrial systems, we will dwell on basic types of domestic and semiindustrial air conditioners.

According to their embodiment, all the air conditioners can be divided into two big classes: monoblock – consisting of one block (window, portable, etc.) and split-systems – consisting of two and more blocks (wall, channel, cartridge, column, etc.).

Monoblock air conditioners

☺The lowest price, simple mounting.
☹High level of noise, mounted in the window opening.

Window air conditioners

Not long ago it was one of the most widespread types of air conditioners. Now almost all the producers offer window models with the power of 1,5 – 6 кWt. The simplest of them can only chill the air, more expensive – have the heating mode and remote-control station. Main disadvantages of window air conditioners are increased noise and necessity of mounting into the window opening. Advantages – reasonable price (280 – 300 USD) and simple mounting not requiring special tools. Thanks to reasonable prices window air conditioners rank second in their popularity after split-systems of the wall type.

☺Does not require mounting.
☹High level of noise, high price.

Portable air conditioners

Monoblock portable air conditioner looks like a small wheeled bedside-table. Such air conditioners do not require special mounting, it is necessary only to lead out a flexible hose (air pipe) with the diameter of about 15 sm and 1-2 meters long outside through the air gate or opening in the wall. Through this hose hot air is withdrawn. Disadvantages of portable air conditioners are high level of noise while operation (compressor is actually located inside the building) and high price compared to the cost of the split-system.

Air -conditioners of the split- and multisplit-systems type

Split-system

Such an air conditioner consists of outer and inner blocks connected by the electric cable and copper pipes along which freon is circulating. Thanks to such design, the noisiest and bulkiest part of the air conditioner containing compressor, is withdrawn outside. Inner block can be placed almost in any part of the apartment or office. All the modern split-systems are equipped with remote-control station with the crystalline liquid display. With its help one can adjust the temperature in a building with accuracy up to 1 – 2 degrees, set up timer for the automatic switch-on and switch-off in the preset time, regulate direction of air stream and many others. Inner blocks have fine filters and coarse filters for air filtration from dust, tobacco smoke, plant pollen, etc.

Multisplit-system

It is a variety of split-systems. It's different because several inner blocks are connected to one outer block – usually 2 – 4 pieces. Inner blocks can be not only of different power (usually 2 – 5 kWt), but also of different types. Such design decision allows to save place on the outer wall of a building and not to spoil appearance of the building with outer blocks. At the same time, despite the widespread opinion, substitution of several split-systems for one multisplit-system does not lead to the price benefit because cost of the equipment is almost the same, and labor intensiveness is 1,5 – 2 times higher due to longer communications. Moreover, in case of breakdown of the outer block of multisplit-system all the inner blocks stop operating – with this regard reliability of several split-systems is higher. That's why, multisplit-systems are usually used only if it is impossible to place several outer blocks on the outer wall of a building.

☺ Low level of noise, possibility of selection of the installation place, wide range of inner blocks, remote-control station.

☹ Requires highly-qualified mounting and maintenance.

1. What types do air conditioners fall into? What does this division depend upon?
2. What types of monoblock air conditioners do you know?
3. What functions do cheap and expensive window air conditioners perform?
4. Why are window air conditioners more popular than portable ones?

5. What are the general advantages and disadvantages of monoblock air conditioners?

6. What`s the difference between split- and multisplit-systems?

7. What are the advantages of split-systems over monoblock air conditioners?

8. Are there any drawbacks associated with split-systems?

2. Read the second part of the text and answer the subsequent questions.

Types of air conditioners (part 2)

One more advantage of split- and multisplit-systems is a wide range of different inner blocks. Among them there are singled out the following modifications: *wall air conditioner*, *channel ai -conditioner*, *cartridge air conditioner*, *under-ceiling air conditioner* and *column air conditioner*.

Wall air conditioner

☺The lowest price among split-systems, wide range.
☹Limited power (up to 7 kWt). Restrictions as to the place of installation.

The most wide-spread and reasonable at price (550 – 600 USD) – wall air conditioner or split-model of the wall type. Sometimes it is also called domestic split-system, because they are mainly used in apartments. Wall air conditioner can be installed in any small premises – office, apartment, shop. Their power (2 – 7 kWt) allows to chill 15 – 70 square meters. Inner block of wall air conditioners is usually installed in the upper part of the wall, near the window, and the outer one – under the window. Such disposition allows to reduce the distance between blocks and the length of interblock communications which usually doesn't exceed 5 – 7 meters.

Channel air conditioner

☺Hidden installation, possibility of fresh air flow. Can serve several premises.
☹Required suspended ceiling and the system of air pipes.

Channel or central air conditioner is installed behind suspended or boarding ceiling which completely hides the inner block. Distribution of the cooled air is made through the system of heat-insulated air pipes which are also placed in the between-ceiling space. Due to such design, channel air conditioner can cool simultaneously several premises. Typical power of these air conditioners is 12 – 25 kWt, which is enough for cooling of a small office or 4 – 5

room apartment. Distinctive feature of the channel air conditioner compared to other split-systems is that it is possible to deliver fresh air in the volumes necessary for thorough ventilation of conditioned premises. Thus, using of one channel air conditioner allows to solve the tasks of both ventilation and air conditioning of the whole office, apartment and cottage. The only thing is that it is necessary to care for correct calculation of air exchange, selection of the air conditioner according to the cooling power and static pressure, to provide for installation of electric and water calorifer to heat outer air during winter-time.

Cartridge air conditioner

In order to install cartridge air conditioner, like channel one, suspended ceiling is required. However, compared to the channel air conditioner, cartridge air conditioner distributes the cooled air through the bottom part of the block. Correspondingly, the bottom part of such air conditioner has the size of a standard ceiling panel – 600×600 mm, and in case of higher power twice as much – 1200×600 mm and it is closed with a decorative grate with distributive shutters. Main advantage of the cartridge air conditioner is its invisibility because only decorative grate can be seen. One more advantage is even distribution of the air flow in four directions which allows to use only one cartridge air conditioner for cooling of big premises (when using wall split-systems in order to achieve the same effect it would be necessary to use 2 – 3 air conditioners with lower power).

☺Hidden installation, possibility of fresh air flow.
☹Required suspended ceiling.

Floor-underceiling air conditioner

If there is no suspended ceiling in the premises, then the alternative to cartridge air conditioners can become floor-underceiling (or simply ceiling) air conditioners. These air conditioners are peculiar for comparatively small depth – 18 – 25 sm. They are installed, as a rule, either at the bottom of the wall, or on the ceiling. Air flow in the first case is directed upwards, in the second case – along the ceiling. Such design allows to distribute the cooled air evenly all through the

☺Possible installation both on the ceiling and at the bottom of the wall. Suspended ceiling is not required.
☹Not designed for hidden installation.

premises and to avoid direct flow on people. There exist models of ceiling air conditioners distributing the cooled air on four directions at the same time, and the flow power is regulated separately on each of directions. Such air conditioner can be successfully used for cooling of premises of complicated form not having suspended ceiling.

Column (floor) air conditioner

☺High power. Suspended ceiling is not required.
☹Requires large area for placement, interferes in the general design.

Column (floor or wardrobe) air conditioner is used where high cold-productivity is required and there are no strict requirements to the premises design. These air conditioners according to their dimensions look like refrigerators, have big weight and are installed on the floor. Column air conditioners require comparatively large area for their placement because they produce strong flow of the cooled air and do not allow to be in close proximity to the air conditioner.

1. What modifications of split-systems do you know? What do they differ in?
2. Which type of domestic split-systems is the most wide-spread? Why?
3. Which split-systems require suspended ceiling? Is it an advantage or disadvantage?
4. Which design allows to avoid direct flow on people? How is this achieved?
5. Which of the presented split-systems seems to be more industrial than the others? Prove that.

3. Agree or disagree with the following statements based on both parts of the text.

1. Air conditioners can be classified either according to their embodiment or according to their application sphere. 2. The division of air conditioners into domestic and industrial ones is rather conventional and units of intermediate types are also commonly found. 3. Thanks to reasonable prices and simple mounting window air conditioners rank first in their popularity among all types of conditioning units. 4. One of the disadvantages of window air conditioners is that they can only chill the air having no additional functions. 5. Compared to monoblock air conditioners split- and multisplit-systems allow to reduce the noise because the compressor is withdrawn outside. 6. Column air conditioners are called so because they have a vertical shape like that of a refrigerator and are installed on the floor.

4. Put in the right prepositions.

1. Split-systems consist ___ outer and inner blocks connected ___ the electric cable and copper pipes ___ which freon is circulating. 2. Thanks ___ reasonable prices window air conditioners rank second ___ their popularity after split-systems of the wall type. 3. Monoblock portable air conditioner looks ___ a small wheeled bedside table. 4. All the modern split-systems are equipped ___ remote-control station. 5. Conditioning units have fine and coarse filters ___ air filtration ___ dust, tobacco smoke, plant pollen, etc. 6. Inner blocks of multisplit-systems can be ___ different power. 7. Substitution of several split-systems ___ one multisplit system does not lead ___ the price benefit. 8. Wall air conditioner is the most reasonable ___ price. 9. Channel air conditioner is installed ___ boarding ceiling. 10. Compared ___ the channel air conditioner, cartridge air conditioner distributes the cooled air ___ the bottom part ___ the block.

5. Complete the following statements.

1. According to the application domain all the air conditioners can be divided into…

2. According to their design all the air conditioners fall into …

3. Monoblock air conditioners consist of…, split-systems consist of …

4. The main disadvantage of monoblock air conditioners is …

5. All split-systems share the following advantages …

6. Among split- and multisplit-systems there are singled out the following modifications …

6. Translate from Russian into English.

1. Существуют две классификации кондиционеров воздуха: по сфере применения кондиционеры делятся на бытовые и промышленные, по конструктивному оформлению – на моноблочные кондиционеры и сплит-системы. 2. Как правило, промышленные кондиционеры имеют бóльшую мощность, чем бытовые модели, и используются для охлаждения больших помещений. 3. Оконные и настенные кондиционеры являются самыми распространенными, потому что в своем классе у них самая доступная цена. 4. Оконный кондиционер, в среднем, будет стоить вплоть до $300, а сплит-модель настенного типа вплоть до $600. Но если у вас достаточно денег, лучше выбрать сплит-систему, потому что у таких кондиционеров ряд преимуществ по сравнению с моноблочными моделями. Во-первых, сплит-системы оснащены многофункциональным пультом дистанционного

управления. Во-вторых, у них низкий уровень шума. В-третьих, они позволяют выбрать место установки внутреннего блока. Более того, благодаря маленьким размерам и особому дизайну сплит-системы не портят интерьер помещения.

III. Summarizing

1. Look through the text again and discuss it in the form of a dialogue using the active words and expressions. The topics for dialogues:

– monoblock air conditioners

– split- and multisplit-systems

– comparative analysis of different modifications of split-systems

2. Get ready to speak on the topic «Types of air conditioners».

IV. Supplementary reading

1. Read the text. Try to understand it and be ready to retell it in Russian. Translate the abstract printed in italics in written form using a dictionary.

Which type of air conditioners to choose?

In practice, in 90 % of cases, it's enough for you to choose between the window monoblock and the wall split-system. All the other types of air conditioners are used only in case window and wall air conditioners do not allow to solve the preset task. And it is quite rarely in domestic conditions.

In their class these air conditioners are the most reasonable at price. Window air conditioners have the absolute cost minimum; that's why, with the limited financial possibilities there is no other choice. Split-systems are more expensive than window air conditioners but they have a number of advantages: they are completed with multi-functional remote-control station, allow to choose the place of installation of the inner block, have low level of noise, easily correspond with the interior. Therefore, if you have enough money, it is better to choose the split-system of the wall type. The choice of split-systems with other types of inner blocks can be required only if it is necessary to air condition big areas – sales halls, cottages, elite apartments, complexes of office premises, and in this case it is better to apply to specialists.

In addition to purchasing and installing air conditioners, there is also energy costs associated with running them. Air conditioners use electricity and can increase monthly power bills significantly. If you live in the Deep South or other areas of the country where it gets extremely hot, your energy costs can double or even treble. In order to get the maximum use out of your air conditioner with the lowest possible energy costs, the efficiency of the unit should be examined. The more efficient a unit is, the less electricity it will take to run. An energy efficient unit will cycle the compressor on and off so that it doesn't operate continuously. However, high efficiency air conditioners are on the higher end of the price scale. You will need to balance the initial cost with the energy savings over time.

Also, keep in mind that proper installation is extremely important to the prolonged existence and performance of your new air conditioner. It is said that proper installation, efficiency, sizing, and a reputable contractor are much more important than the brand you choose.

Buying an air conditioner is a large investment that will last for several years and provide comfort to the whole family. Aside from being a summer necessity in some areas, installed air conditioning can be a selling point when a home is on the market. When properly researched, shopping for an air conditioner can be a smart decision.

УЧЕБНЫЙ БЛОК К (УБ-К)

Контроль по модулю

Final test 3

I. К словам из левой колонки подберите их перевод. Запишите номера полученных пар. Одно слово лишнее.

1. asphyxia (n)	1. выпускное отверстие
2. increase (v)	2. лопасть
3. blade (n)	3. размер
4. vitiated (adj)	4. змеевик
5. size (n)	5. осевой
6. determine (v)	6. колесо, штурвал
7. axial (adj)	7. увеличивать(ся)
8. blower (n)	8. определять
9. outlet (n)	9. удушье
10. coil (n)	10. вентилятор, воздуходувка
	11. испорченный, загрязненный

II. Укажите номера неверных утверждений.

1. Human health is badly affected when more than 10 % of the oxygen of the atmosphere is replaced by carbonic acid and other matters.

2. Natural ventilation is the ventilation of the premises with outside air without the use of a fan or other mechanical systems.

3. In natural ventilation the wind effect is usually utilized in winter.

4. Vents are most efficient when they are located both at the top of the building and near the ground level.

5. If there are no radiators in the building, the fan system can be made to supply all the necessary heat.

6. The basic design principles of modern fans fall into two classes: axial-flow fans and radial flow fans.

7. The blades of centrifugal fans can be either forward curved or inward curved.

8. Air conditioning was introduced to the public at the end of the 19^{th} century.

9. An air conditioning system can maintain any atmospheric condition regardless of variations in the outdoor atmosphere.

10. The division of air conditioners into domestic and industrial ones is based on their operating power.

III. К началу утверждений из левой колонки подберите их окончание из правой. Запишите номера полученных пар.

1. A deficiency of oxygen and an accumulation of carbonic acid in the atmosphere produce injurious effects…	1. how fast the body loses heat.
2. Ventilation is the process of replacing of air in any space …	2. by making use of the wind and of the temperature differences between the inside and outside.
3. Natural ventilation can be accomplished …	3. long before the asphyxiating point is attained.
4. Sometimes it is advantageous to have the fan system supply part of the heat loss and …	4. to render the air more suitable for industrial processes and to maintain human comfort.
5. There is a definite relation between the amount of fan noise and …	5. to control the cooling rate of the human body.
6. A lot of people are wrong to believe that …	6. the quantity of air being delivered.
7. The two primary reasons for using air conditioning are: …	7. to remove moisture, odors, smoke, heat, dust and airborne bacteria.
8. Human comfort is dependent upon …	8. convection, radiation and evaporation.
9. The main object of air conditioning is …	9. air conditioning only provides cooling.
10. The three ways that the body gives off heat are: …	10. to install radiators to care for the remainder.

МОДУЛЬ-РЕЗЮМЕ

Обобщение по курсу

1. Вернитесь к учебным целям и задачам курса и требованиям к экзамену (см. Введение). Проверьте себя – достигли ли вы поставленных целей. Если вы в чем-то сомневаетесь, то вернитесь к соответствующим разделам учебных модулей.

2. Повторите наиболее типичные для технических текстов разделы грамматики.

3. Выполните контрольный перевод текста модуля-контроль. Сравните свой перевод с ключом и проанализируйте все свои ошибки и неточности.

4. Подготовьтесь к монологическому сообщению и ситуативно обусловленной беседе с преподавателем по темам, выносимым на экзамен для устного собеседования. Проверьте себя, ответив на следующие вопросы:

1. Introduce yourself.
2. How old are you?
3. Is your family large?
4. What is your mother (father)?
5. What is she (he) like?
6. What does she (he) like?
7. Have you got a sister (a brother)?
8. Is she (he) younger than you?
9. What is she (he) interested in?
10. What other close relatives have you got?
11. What are you?
12. Where do you study?
13. What department (year) are you a student of?
14. What will you become after graduating from the University?
15. What is your future profession linked with?
16. What is the main task of a building engineer?
17. What subjects do you study to become a good specialist?
18. What way do people destroy the ecological system of our planet?
19. What steps are taken to protect the environment in the world?
20. What are the main requirements for human comfort and indoor air quality today?
21. What sources of indoor air contamination do you know?
22. What measures and appliances can help to purify the air inside a building?

23. Why is HVAC an important part of our life today?
24. Why is local heating becoming more and more popular nowadays?
25. What is the basic principle of heat distribution?
26. What fuels do people use to heat their homes?
27. What is a boiler?
28. What are the benefits of the radiant floor heating system?
29. How is natural ventilation accomplished?
30. Why is it advantageous to combine heating with ventilation?
31. What types do ventilators generally fall into?
32. What are the basic functions of a true air conditioning system?
33. Describe the processes of convection, radiation and evaporation.
34. What classes are air conditioners divided into?
35. Is it difficult to study?
36. When does your working day begin?
37. What do you do after getting up?
38. When do you leave home?
39. How do you get to the University?
40. How long does it take you to get to the University?
41. How many double periods do you usually have a day?
42. What do you do after classes?
43. What do you do in the evenings?
44. How do you spend your week-ends?
45. Do you do sports?
46. What sport facilities are there at your University?
47. What faculties and departments are there at the University?
48. When was it founded?
49. What educational facilities are there at it?
50. What are the achievements of your students and teachers?
51. Is your University the only higher school in Novopolotsk?
52. What other educational establishments are there in Novopolotsk?
53. Is Novopolotsk a large town?
54. Where is it located?
55. When was it founded?
56. What large industrial enterprises are there in it?
57. What are its places of interest?
58. What other industrial centers are there in Belarus?
59. What do you know about the origin of your country's name?
60. Is Belarus an industrial or an agricultural country?

61. What does its industry produce?
62. What does its agriculture specialize in?
63. What can you say about education and culture in Belarus?
64. What do you know about the History of Belarus?
65. What is its geographical position?
66. Does it boarder on Great Britain?
67. Where is Great Britain situated?
68. What is its official name?
69. Compare Great Britain with Belarus.
70. Is Great Britain a republic?
71. Who rules Great Britain (Belarus)?
72. What places of interest would you like to see in Great Britain?

Если вы испытали трудности, отвечая на поставленные вопросы, то повторите соответствующий учебный материал. Используйте также консультации преподавателя. Если же ни контрольный перевод, ни данные вопросы не вызвали у вас затруднений, значит вы прекрасно подготовлены и можете смело идти на экзамен. Удачи вам!

МОДУЛЬ-КОНТРОЛЬ

Прочитайте текст:

Выделенную курсивом часть переведите письменно со словарем. Время выполнения – один академический час.

Оставшуюся часть прочитайте без словаря. Время выполнения – 10 минут. Передайте содержание на родном или английском языке.

Air conditioner filters

Taking care of the filter in your central heating and / or air conditioning system is a huge step in maintaining the life and efficiency of the services. Not to mention, those that do take care of their filters also enjoy fresher, cleaner air. It is especially important to clean and change filters when someone in the house suffers from allergies. In fact, filters should be replaced more frequently in such cases.

Aside from allergies, those that live in a sandy community near a beach, near a major roadway, or near a construction project should also change their filters regularly. This is because filters within our heating and cooling units are responsible for filtering out the air and trapping harmful substances that shouldn’t be breathed in.

When looking for a replacement filter, it is a good idea to know a little bit about a measurement called the micron. A micron is another term for micrometer and stands for one millionth of a meter. Many of the particles mixed into our air, such as pollens and spores, are only a few microns in size. This makes them very difficult to filter. In order to filter out such small particles, the filter itself would have to contain holes so small that air would have a difficult time getting through. This obviously would affect the ability of the system to move air generously.

A process of electrostatic filtration was created to solve this problem. Electrostatic filtration works to create a cleaner home environment and a reduction of allergic reactions in occupants. The process works by allowing particles to be fed through a mesh that electrically charges them. These charged particles go through another filter that contains the opposite charge. The oppositely charged particles are then drawn to each other and adhere to the second layer of filtration material. Minute particles are removed from the air through this process.

With electrostatic filtration, two different types of filters exist depending on what type of electricity is used. Some filters use electricity to create

the magnetic field and others use static electricity. Those that use electricity are permanent filters that only get removed for cleaning purposes. They are designed to last a lifetime.

The other filters, relying on static electricity, are designed to last for several years as long as they receive the proper cleaning. They are made from polyester, a plastic-like substance. It is recommended that you first try using the polyester filter. If you come to finds that it isn't doing a good enough job filtering your air then switch to the electrically operated permanent type.

Regardless of the type of filter used, it is strongly recommended that you clean or change your filter quarterly. Keep in mind, failure to maintain your filters can lead to bigger, more expensive problems with your heating and cooling. Dirty filters can shorten the life of the motor which is much more expensive compared to a filter.

ПРИЛОЖЕНИЯ
APPENDIX 1
(Keys)

МОДУЛЬ 2

Entry test 1
Part B
I.
1. Present Continuous, Active Voice
2. Past Indefinite, Passive Voice
3. Present Perfect, Active Voice
4. Past Indefinite, Active Voice
5. Future Indefinite, Active Voice
6. Present Indefinite, Passive Voice
7. Present Indefinite, Active voice
8. Future Indefinite, Passive Voice

II.

1 – c	6 – d
2 – c	7 – a
3 – c	8 – b
4 – b	9 – b
5 – a	10 – a

Final Test 1
(Итоговый тест)
I.

1. 5	6. 4
2. 10	7. 2
3. 7	8. 3
4. 1	9. 6
5. 9	10. 8

II.
1. Future Indefinite, Active Voice
2. Present Perfect, Active Voice
3. Present Continuous, Active Voice

4. Present Indefinite, Passive Voice
5. Present Indefinite, Active Voice
6. Present Perfect Continuous, Active Voice
7. Past Indefinite, Active Voice
8. Present Indefinite, Active Voice

III.

1. T	6. T
2. F	7. T
3. T	8. F
4. F	9. T
5. F	10. T

МОДУЛЬ 3

Entry Test 2

I. 1, 4, 6, 8, 9

II.

1 b	6 c	11 a	16 c
2 a	7 b	12 c	17 c
3 b	8 b	13 b	18 b
4 a	9 a	14 b	19 a
5 a	10 b	15 c	20 b

Final Test 2

I. 2, 3, 4, 7, 8, 9, 10

II.

1-3	6-2
2-9	7-4
3-7	8-8
4-1	9-5
5-10	10-6

МОДУЛЬ 4

Entry Test 3

I.	II.	III.	IV.
1 – 3 2 – 12 3 – 1 4 – 10 5 – 15 6 – 4 7 – 13 8 – 6 9 – 2 10 – 8 11 – 14 12 – 7 13 – 5 14 – 11 15 – 9	1 – b, j 2 – g 3 – m 4 – i, n 5 – c 6 – a, k 7 – e 8 – l 9 – f 10 – d, h	1 – b 2 – c 3 – b 4 – a 5 – a 6 – a 7 – c 8 – b 9 – b 10 – c	1. used 2. loss 3. inseparable 4. flexibility 5. manually

Final Test 3

I.	II.	III.
1 – 9 2 – 7 3 – 2 4 – 11 5 – 3 6 – 8 7 – 5 8 – 10 9 – 1 10 – 4	1, 3, 7, 8	1 – 3 2 – 7 3 – 2 4 – 10 5 – 6 6 – 9 7 – 4 8 – 1 9 – 5 10 – 8

APPENDIX 2

Check yourself:

1. Diesel engines produce less carbon dioxide and hydrocarbons but more nitrogen and acid rain-causing sulphur dioxide, as well as health-damaging smoke.

2. Carbon dioxide is a greenhouse gas.

3. 1 kg.

4. 1 gm. It can contain 200 000 kg of food and 1 000 000 litres of water.

5. The cooker/stove is one of the most energy-hungry machines in the house. But gas is more efficient than electricity.

6. Major uses of water in the home:

Use	**Average water used**	**% of total consumption**
WC flush	10 litres	32 %
Baths	80 litres	
Showers	30 litres	**17 %**
Washing machine	100 litres	
Dishwasher	50 litres	12 %

7. Some aerosols still damage the ozone layer. And the manufacture of aerosols consumes considerable resources.

8. Gas appliances are usually more energy-efficient and cheaper to run, gas also produces less pollution than oil and coal. There is no totally green energy source. If we want to help the environment, we must use renewable energy sources like wind, waves and solar power.

APPENDIX 3

LIST OF CHEMICAL ELEMENTS

acid	['æsid]	кислота
ammonia	[ə'məunjə]	аммиак
argon	['a:gən]	аргон
benzyl	['benzil]	бензил
butane	['bju:tein]	бутан
carbon	['ka:bən]	углерод
chlorine	['klo:rin]	хлор
chloride	['klo:raid]	хлорид
dioxide	[dai'oksaid]	двуокись
fluoride	['fluərid]	фторид
gasoline	['gæsəuli:n]	газолин, бензин
helium	['hi :ljəm]	гелий
hydrocarbon	['haidrəu'ka:bən]	углеводород
hydrogen	['haidridʒən]	водород
kerosene	['kerəsi:n]	керосин
krypton	['kripton]	криптон
methane	['mi: θein]	метан, болотный газ
monoxide	[m'ɔnɔksaid]	одноокись
neon	['ni: ɔn]	неон
nitrogen	['naitrədʒən]	азот
nitrate	['naitreit]	нитрат, соль
oxygen	['ɔksidʒən]	кислород
oxide	['ɔksaid]	окись
ozone	['əuzəun]	озон
phosphate	['fɔsfeit]	фосфат
propane	['prəupein]	пропан
phthalate	['ftəleit]	фталат
radon	['reidon]	радон
sulphur	['sʌlfə]	сера
tetrachloride	[tetrə'klɔ:raid]	тетрахлорид
xenon	['zenɔn]	ксенон

APPENDIX 4

Фильтры для кондиционирования воздуха

Забота о фильтре в системе центрального отопления и/или воздушного кондиционирования – это важная мера для продления срока службы и поддержания эффективности этих услуг. Не говоря уже о том, что те, кто заботится о фильтрах, также получают более свежий и чистый воздух. Особенно важно чистить и менять фильтры, когда кто-либо в доме страдает аллергией. Дело в том, что в таких случаях фильтры следует менять чаще.

Кроме аллергии фильтры также следует регулярно менять тем людям, которые живут в песчаной местности возле пляжа, возле крупной автомагистрали или строительной площадки. Это связано с тем, что фильтры внутри отопительных и охладительных установок отвечают за фильтрацию воздуха и удержание вредных веществ, которые не должны вдыхаться человеком.

Когда вы ищите сменный фильтр, неплохо узнать хотя бы немного о такой размерной единице, как микрон. Микрон – это еще одно название микрометра, и он соответствует одной миллионной доле метра. Многие частицы, находящиеся в воздухе, такие как пыльца и споры, размером всего лишь в несколько микрон. Это затрудняет их фильтрацию. Для того чтобы отфильтровать такие микрочастицы, сам фильтр должен был бы иметь настолько маленькие отверстия, что воздух с трудом проходил бы через них. Очевидно, что это повлияло бы на способность системы перегонять большие объемы воздуха.

Чтобы решить эту проблему, был изобретен процесс электростатической фильтрации. Целью электростатической фильтрации является создание более чистой окружающей среды и снижение аллергических реакций у жителей. Процесс заключается в том, что частицы пропускаются через сетку, которая заряжает их электрическим током. Затем эти заряженные частицы проходят через другой фильтр, который обладает противоположным зарядом. Тогда противоположно заряженные частицы притягиваются друг к другу и прилипают ко второму слою фильтрационного материала. При помощи этого процесса из воздуха удаляются мельчайшие частицы.

В электростатической фильтрации существуют два разных типа фильтров в зависимости от типа используемого электрического тока. Некоторые фильтры используют электричество для создания магнитного поля, а другие используют статическое электричество. Те, в которых используется электричество, являются постоянными фильтрами, которые удаляются только с целью очистки. Их конструкция предполагает пожизненное применение.

Срок службы других фильтров, зависящих от статического электричества, рассчитан на несколько лет, при условии, что их должным образом чистят. Они изготавливаются из полиэстра, вещества, похожего на пластик. Рекомендуют сначала попробовать фильтр из полиэстра. Если вы обнаружите, что он недостаточно хорошо фильтрует воздух, тогда переходите на перманентный фильтр, управляемый электричеством.

Независимо от типа используемого фильтра, настоятельно рекомендуется чистить и менять фильтры раз в квартал. Имейте в виду, что неправильная эксплуатация фильтров может привести к более серьезным и более дорогостоящим проблемам с системой отопления и охлаждения. Засоренные фильтры могут сократить срок службы двигателя, который стоит намного дороже по сравнению с фильтром.

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Составители:
АНТОНОВИЧ Надежда Геннадьевна
КОРОЛЁВА Татьяна Михайловна

Редактор *Ю. М. Казакевич*

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