

МИНИСТЕРСТВО ОБРАЗОВАНИЯ РЕСПУБЛИКИ БЕЛАРУСЬ
УЧРЕЖДЕНИЕ ОБРАЗОВАНИЯ
<< БРЕСТСКИЙ ГОСУДАРСТВЕННЫЙ ТЕХНИЧЕСКИЙ УНИВЕРСИТЕТ >>
КАФЕДРА ИНОСТРАННЫХ ЯЗЫКОВ ПО ТЕХНИЧЕСКИМ СПЕЦИАЛЬНОСТЯМ

МЕТОДИЧЕСКИЕ УКАЗАНИЯ
ДЛЯ САМОСТОЯТЕЛЬНОЙ АУДИТОРНОЙ РАБОТЫ
ПО АНГЛИЙСКОМУ ЯЗЫКУ

для студентов специальности:
1-70 04 02 – «Теплогазоснабжение, вентиляция и охрана воздушного
бассейна»

Часть 1

Брест 2012

Методические указания предназначены для студентов специальности «Теплогазоснабжение, вентиляция и охрана воздушного бассейна».

Данные методические указания составлены в соответствии с требованиями Программы по иностранным языкам.

Методические указания нацелены на подготовку студентов к самостоятельной работе со специальной литературой, совершенствование навыков чтения и понимания оригинальной научно-технической литературы по специальности, развитие навыков перевода, реферирования, обучение устным формам общения по научной тематике на материале предложенных текстов, системное развитие коммуникативных способностей студентов, расширение их активного и пассивного лексического запаса.

Данные методические указания одобрены на заседании кафедры иностранных языков по техническим специальностям и рекомендованы к изданию.

Составители: Л.Н. Шпудейко, ст. преподаватель
И.И. Гайдук, ст. преподаватель

Рецензент: Н.А. Тарасевич, к.ф.н., доцент, зав. кафедрой английского языка с методикой преподавания Брестского государственного университета имени А.С.Пушкина.

Содержание

Unit 1. HVAC

Text 1. HVAC

Unit 2. Heating

Text 2. Central Heating

Text 3. Water Heating and Hot Water Supply

Text 4. Boilers

Text 5. Heat Pumps

Text 6. Hydronic and Steam Systems

Text 7. Radiators

Text 8. Underfloor Heating

Text 9. Forced-Air Heating

Text 10. Gas Heating

Text 11. Electric Heating

Приложение 1

Unit 1. HVAC

Text 1

1. *Найдите русские эквиваленты английских слов.*

- | | |
|----------------------|---|
| 1. heating | a. распределение тепла, теплообмен, теплоотдача, перенос тепла |
| 2. ventilating | b. открытие |
| 3. air conditioning | c. техобслуживание, эксплуатация |
| 4. humidity | d. вентиляция, проветривание |
| 5. plumbing | e. установка |
| 6. refrigeration | f. водопровод, водопроводно-канализационная сеть; водопроводно-канализационные работы |
| 7. heat transfer | g. воздухораспределение |
| 8. invention | h. давать подробное описание, определение |
| 9. discovery | i. отопление |
| 10. installation | j. разрабатывать, создавать |
| 11. maintenance | k. кондиционирование воздуха |
| 12. air distribution | l. разрешение на строительство; строительная лицензия |
| 13. to design | m. влажность |
| 14. to specify | n. охлаждение, замораживание |
| 15. building permit | o. изобретение |

2. *Прочитайте и переведите текст.*

HVAC

HVAC (pronounced “H-V-A-C”) is an initialism or acronym that stands for “heating, ventilation, and air-conditioning”. HVAC is sometimes referred to as climate control and is particularly important in the design of large industrial and office buildings such as skyscrapers and in marine environments such as aquariums, where humidity and temperature must be closely regulated while maintaining safe and healthy conditions within. In certain regions (e.g., UK) the term “Building Services” is also used, but it may also include plumbing and electrical systems. Refrigeration is sometimes added to the field’s abbreviation as HVAC&R or HVACR, or ventilating is dropped as HACR.

HVAC systems use ventilation air ducts installed throughout a building that supply conditioned air to a room through rectangular or round outlet vents, called diffusers; and ducts that remove air through return-air “grilles”.

Heating, ventilating, and air-conditioning are based on the principles of thermodynamics, fluid mechanics, and heat transfer, and on inventions and discoveries made by Michael Faraday, Willis Carrier, Reuben Trane, James Joule, William Rankine, Sadi Carnot, and many others. The invention of the

components of HVAC systems went hand-in-hand with the industrial revolution, and new methods of modernization, higher efficiency, and system control are constantly introduced by companies and inventors all over the world.

The three functions of heating, ventilation and air-conditioning are closely interrelated. All seek to provide thermal comfort, acceptable indoor air quality, and reasonable installation, operation, and maintenance costs. HVAC systems can provide ventilation, reduce air infiltration, and maintain pressure relationships between spaces. How air is delivered to and removed from spaces is known as room air distribution.

In modern buildings the design, installation, and control systems of these functions are integrated into one or more HVAC systems. In case of very small buildings, contractors normally “size” and select HVAC systems and equipment. For larger buildings “building services” designers and engineers, such as mechanical, architectural, or building services engineers analyze, design, and specify the HVAC systems, and mechanical contractors build and commission them. In all buildings, building permits and code-compliance inspections of the installations are the norm.

The HVAC industry is a worldwide enterprise, with career opportunities including operation and maintenance, system design and construction, equipment manufacturing and sales, education and research.

3. Закончите предложения в соответствии с содержанием текста.

1. Diffusers are
2. Ducts remove
3. HVAC is sometimes referred to as
4. In some regions “Building services” include
5. HVAC is based on the principles ... and on the inventions made by
6. The invention of the components of HVAC systems was influenced by
7. HVAC systems can provide
8. ... are integrated into one or more HVAC systems.
9. ... is a worldwide enterprise.

4. Определите, соответствуют ли следующие предложения содержанию текста. Обоснуйте свой ответ. Используйте следующие выражения: *I can't agree with this, it's false, that may be true, but..., on the contrary, vice versa, I suppose it's true, that's right, I entirely agree with this statement.*

1. HVAC systems use sewage collectors.
2. HVAC is an acronym that stands for “heating, ventilation, air conditioning”.

3. HVAC is particularly important in the design of those buildings where air pressure and temperature must all be closely regulated while maintaining safe and clean conditions within.

4. HVAC is sometimes referred to as room air distribution,

5. In certain regions HVAC may also include plumbing and electrical systems.

6. The main functions of HVAC systems are to provide thermal comfort and acceptable indoor air quality.

7. The invention of the components of HVAC systems went hand-in-hand with the development of the science of electro-magnetism.

8. New methods of modernization, higher efficiency, and system control are constantly introduced by companies and inventors all over the world.

9. The HVAC industry is a worldwide enterprise with a wide range of career opportunities.

5. Ответьте на вопросы.

1. What does "HVAC" stand for?

2. How do HVAC systems work?

3. For what types of buildings is HVAC especially important and why?

4. What principles is HVAC based on?

5. What are the functions of HVAC?

6. What is room air distribution?

7. Who selects HVAC equipment for small buildings (for large ones)?

8. What career opportunities does the HVAC industry provide?

6. Расположите следующие пункты плана в последовательности, соответствующей содержанию текста.

1. The functions of HVAC.

2. Specialists engaged in work with HVAC systems.

3. The meaning of the term "HVAC".

4. The principles HVAC is based on.

5. Career opportunities in the HVAC industry.

7. Перескажите текст на английском языке, опираясь на план задания 6.

8. а) Переведите следующие слова и словосочетания на русский язык, при необходимости воспользуйтесь словарем: to network, a remote terminal unit controller, remote access, a web browser, a direct digital control program code, input, output, digital, variable, medium, current.

б) Прочтите текст и перечислите вопросы, освещаемые в нем.

An HVAC Control System

An HVAC control system is a computerized control system for climate control in buildings. Control devices may be pneumatic or electronic. Some of them may have microprocessors, but to be considered a “control system” they must be computerized and networked. HVAC stands for “heating, ventilation, and air-conditioning”. Often, these integrate fire, security, and lighting controls into one system. These systems typically use one or more central controllers to command and monitor the remote terminal unit controllers, and they communicate with one or more personal computers that are used as the operator interface. These control systems are usually used in large commercial and industrial buildings to allow central control of many HVAC units around the buildings. The latest systems use Ethernet for communications between central controllers allowing remote access from a web browser.

Central controllers and most terminal unit controllers are programmable, meaning a *direct digital control* program code may be customized for the intended use. The unit controllers have analog and digital inputs that allow measurement of the variable (temperature, humidity, or pressure) and analog and digital outputs for control of the transport medium (hot or cold water or steam). Digital inputs are dry contacts of a control device, and analog inputs are a voltage or current measurement of a variable (temperature, humidity, velocity, or pressure) sensing device. Digital outputs are relay contacts used to start and stop equipment, and analog outputs are voltage or current signals to control the movement of the medium (air/water/steam) control devices.

c) Распределите вопросы в последовательности, соответствующей содержанию текста.

1. What devices belong to direct digital control?
2. Where are these systems used?
3. What is the difference between analog and digital inputs?
4. What is an HVAC control system?
5. What is direct digital control?
6. What are central controllers used for?

d) Кратко ответьте на поставленные вопросы.

Unit 2. Heating

Text 2

1. Найдите русские эквиваленты английских слов.

- | | |
|--------------------|--|
| 1. boiler | a. тепловой насос |
| 2. furnace | b. устройство |
| 3. central heating | c. аккумулирующий цилиндр |
| 4. heat pump | d. теплофикация, централизованное отопление района |
| 5. ductwork | e. горячая проточная вода |

6. fluid	f. воздушный фильтр, воздухоочиститель
7. heat exchanger	g. труба
8. radiator	h. нагрев сопротивлением, контактный электронагрев; электроотопление
9. supply of heat	i. система каналов, труб; трубопровод
10. storage cylinder	j. воздушный поток, вентиляционная струя
11. hot running water	k. воздушное отопление
12. forced-air heating	l. обратное отопление
13. air cleaner	m. теплообменник
14. resistance heating	n. система распределения
15. fossil fuel	o. бойлер, котел
16. reverse heating	p. газовый нагреватель; газовая плита
17. vent	q. центральное отопление
18. air current	r. входное (выходное) отверстие, вентиляционное отверстие, отдушина; клапан
19. pipe	s. камин, очаг
20. fireplace	t. система отопления, работающая на жидком топливе; бензиновое отопление
21. device	u. печь, очаг; топка
22. distribution system	v. подача тепла, обеспечение теплом
23. oil-fired system	w. электростанция
24. gas heater	x. текучая среда (жидкость или газ)
25. district heating	y. ископаемое топливо
26. generating plant	z. радиатор, батарея (отопления)

2. Прочитайте и переведите текст.

CENTRAL HEATING

Heating systems may be classified as central or local. Central heating is often used in cold climates to heat private houses and public buildings. A central heating system provides warmth to the whole interior of a building (or a portion of a building) from one point to multiple rooms.

When combined with other systems in order to control the climate inside a building, the whole system may comprise HVAC (heating, ventilation and air conditioning).

Central heating differs from local heating in that the heat generation occurs in one place, such as a furnace room in a house or a mechanical room in a large building. Such a system contains a boiler, a furnace, or a heat pump to heat water, steam, or air. The most common method of heat generation involves the combustion of fossil fuel in a furnace or a boiler. The resultant heat then gets distributed: by forced air through ductwork, by water circulating

through pipes, or by steam fed through pipes. The system also contains radiators to transfer this heat to the air. The term “radiator” in this context is misleading since most heat transfer from a heat exchanger is by convection, not radiation. The radiators may be mounted on walls or buried in the floor to give underfloor heat.

Boiler feedwater or radiator heating systems have a pump to circulate water and ensure an equal supply of heat to all the radiators. The heated water can also be fed through another (secondary) heat exchanger inside a storage cylinder to provide hot running water.

Forced-air systems send heated air through ductwork. When the weather is warm the same ductwork can be used for air conditioning. The forced air can also be filtered or put through air cleaners.

Heating can also be provided by electric, or resistance heating using a filament that becomes hot when electricity is caused to pass through it. This type of heat can be found in electric baseboard heaters, portable electric heaters, and as backup or supplementary heating for a heat pump (or reverse heating) system.

The heating elements (radiators or vents) should be located in the coldest part of the room, typically next to the windows to minimize condensation and offset the convective air current formed in the room due to the air near the window becoming negatively buoyant due to the cold glass. Cold air draughts can contribute significantly to subjectively feeling colder than the average room temperature. Therefore, it is important to control the air leaks from the outside in addition to proper design of the heating system.

In northern Europe and in urban regions of Russia, where people seldom require air conditioning in homes due to the temperate climate, most new housing comes with central heating installed. Such areas normally use gas heaters, district heating, or oil-fired systems. In the western and southern United States natural-gas-fired central forced-air systems occur most commonly; these systems and central boiler systems both occur in the far northern regions of the USA. Steam heating systems, fired by coal, oil or gas, feature in the USA, Russia and Europe primarily for large buildings. Electrical heating systems occur less commonly and are only practical with low cost electricity or when geothermal heat pumps are used. As for the combined system of a central generating plant and electric resistance heating, the overall efficiency will be less than with direct use of fossil fuels for space heating.

From an energy-efficiency standpoint considerable heat gets lost or goes to waste if only a single room needs heating, since central heating has distribution losses and (in case of forced-air systems particularly) may heat some unoccupied rooms without need. In such buildings which require isolated heating, one may wish to consider non-central systems such as individual room heaters, fireplaces or other devices. Alternatively, architects can design new buildings to use low-energy building techniques which can virtually eliminate the need for heating.

However, if a building does need full heating, combustion central heating offers a more environmentally friendly solution than electric-air central heating or than other direct electric heating devices because most electricity originates using fossil fuels, with up to two-thirds of the energy lost at the power station and in transmission. In Sweden there exist proposals to phase out direct electric heating for this reason. Nuclear and hydroelectric sources reduce energy losses.

In contrast, hot water central heating systems can use water heated in or close to a building using high-efficiency condensing boilers, biofuels, or district heating. Wet underfloor heating has proved to be ideal. This offers relatively easy conversion to the use of developing technologies such as heat pumps and solar systems.

Typical efficiency for central heating is 85-97% for gas-fired heating; 80-89% for oil-fired, and 45-60% for coal-fired heating.

3. Подберите определения к приведённым слева словам.

- | | |
|----------------|---|
| 1. fireplace | a) a device that moves heat from one location to another location using the physical concept of mechanical work |
| 2. fossil fuel | b) a closed vessel in which water or other fluid is heated |
| 3. pipe | c) something that is burnt to create energy to produce light and heat in our homes. It has usually been coal, oil or gas. |
| 4. pump | d) an architectural structure to contain a fire for heating and, especially historically, for cooking |
| 5. boiler | e) a device used to convey fluids (liquids and gases) from one location to another |

4. Закончите предложения в соответствии с содержанием текста.

1. Central heating is used
2. ... comprises HVAC.
3. In case of central heating heat generation occurs
4. Central heating contains ... for heating ... and it also contains ... for heat distribution.
5. ... have a pump for ... and a heat exchanger for
6. Ductwork in forced air systems is used for ... and for ...in warm weather.
7. Radiators or vents should be located
8. Resistance heating uses
9. ... occur in much of northern Europe and in urban portions of Russia ... are common in the western and southern United States, ... feature in the USA, Russia and Europe primarily for large buildings.
8. The main disadvantage of central heating and forced-air systems is

9. Combustion central heating is more environmentally friendly than electric-air central heating because
10. A central heating system has heat loss if
11. Hot water central heating systems can use
12. Typical efficiencies for central heating are

5. *Определите, соответствуют ли следующие предложения содержанию текста. Обоснуйте свой ответ. Используйте следующие выражения: I can't agree with this, it's false, that may be true, but..., on the contrary, vice versa, I suppose it's true, that's right, I entirely agree with this statement.*

1. A central-heating system provides warmth to the whole interior of a building.
2. There is no difference between central and local heating.
3. A central heating system contains a boiler to heat water, steam, or air.
4. The system also contains either ductwork for forced-air systems, or piping to distribute a heated fluid and radiators to transfer this heat to the air.
5. Boiler feedwater systems have a pump to provide hot running water and a secondary heat exchanger to circulate the water and ensure an equal supply of heat to all the radiators.
6. Heating can be electric or resistance.
7. The heating elements should be located in the coldest part of the room, next to the door.
8. Most new housing in Russia comes with natural-gas-fired central forced-air systems installed.
9. Steam heating systems, fired by coal, oil or gas, are used in the USA, Russia and Europe primarily for large buildings.
10. Electrical heating systems are widely used everywhere.
11. From the energy-efficiency point of view forced-air systems are more preferable than central heating ones.
12. Electric-air central heating is less environmentally friendly than combustion central heating.
13. Hot water central heating systems have proved to be ideal.

6. *Расположите следующие слова в логической последовательности в соответствии с содержанием текста.*

A radiator, a furnace room, piping (ductwork), a heat exchanger, a boiler, a heat pump.

7. *Ответьте на вопросы.*

1. What is central heating used for?
2. What's the difference between central and local heating?

3. What are the methods of heat generation?
4. The system contains either ductwork, for forced-air systems, or piping to distribute a heated fluid, doesn't it?
5. What does the system contain to transfer heat to the air?
6. Where may radiators be located?
7. Why should the heating elements be located in the coldest part of the room next to the windows?
8. Why is it important to control air leaks from the outside?
9. What types of heating are common in northern Europe, in the USA?
10. What types of heating systems there exist? What are the main principles of work of each of them?
11. Which of the heating systems is considered to be the most energy-efficient and the most environmentally friendly?

8. Расскажите о существующих системах отопления, их устройстве, принципе работы и эффективности.

9. Прочтите текст, при необходимости воспользуйтесь словарем.

Ответьте на вопросы:

- 1. What is space heating?*
- 2. What is the difference between space heating and central heating?*
- 3. What types of space heating devices do you know?*
- 4. What do they operate on?*
- 5. Which space heating device is the safest (the cheapest, the most efficient)?*

Space Heating

Space heating is the heating of an area, usually enclosed, such as a house or a room. A space heater keeps the air and surroundings at a comfortable temperature for people or animals, or even plants in a greenhouse. Space heating generally warms a small area, and is usually held in contrast with central heating, which warms many connected spaces at once. Space heating does not include water heating, unless it is used for hydronic heating.

While central boilers that heat buildings and houses heat space, the term "space heater" is normally used to refer to relatively small heaters, especially those that are portable or wall-mounted. These space heaters may use natural gas or propane, but they are most commonly electric. Electric heaters are safer because there is no danger of carbon monoxide poisoning. They are also cheaper to buy. However, they are often far more expensive to operate, because electricity is typically more expensive per unit of heat energy produced than gas or propane. However, a ground source heat pump operating with a coefficient of performance of more than 3 will be cheaper to operate than a gas heater.

Modern electric space heaters usually have ceramic heating elements rather than nichrome wires, and are fan-forced with a blower or a squirrel-cage fan. They distribute heat much more evenly, and allow it to be encased in

plastic, nearly eliminating the chance of burns or fire. Window and wall units, often seen in hotel rooms, are permanent space heaters. They often employ heat pumps, which use reverse-cycle air conditioning to transfer heat to the inside from the outside. The domestic incandescent bulb contributes a small but significant amount of heat to domestic interiors. It is important in extremely well-insulated homes, where such bulbs may be left on so as to extend their service life.

Propane space heaters are generally one of two types, radiant (infrared) or circulation-type space heaters. Infrared propane space heaters function to heat objects which in turn heat the surrounding air whereas circulation type space heaters heat the air directly using a fan or a convector. Additionally, propane space heaters are either vented or unvented. Unvented space heaters are low capacity heaters used to heat living areas but are not allowed in bedrooms, bathrooms or confined spaces due to fire danger and the possible accumulation of flue gases at high levels.

Kerosene heaters were once common, but may easily cause a fire, and must be completely cooled before being refuelled.

10. Прореферлируйте текст, используя клише для реферирования, приведенные в приложении 1.

Text 3

1. Найдите русские эквиваленты английских слов.

- | | |
|-------------------------|---|
| 1. domestic | a. горючее |
| 2. water heater | b. газовая колонка для подогрева воды |
| 3. heat exchanger | c. отходящая (сбросная, использованная) теплота |
| 4. tap water | d. циркулировать, двигаться по кругу |
| 5. geyser | e. сжиженный нефтяной газ |
| 6. potable | f. тепловой насос, обратное тепловое устройство |
| 7. space heating | g. геотермальное отопление |
| 8. fossil fuel | h. электростанция, энергоустановка, силовая установка |
| 9. liquefied petroleum | i. теплообменник |
| 10. natural gas | j. теплофикация, централизованное отопление района |
| 11. fuel oil | к. отопление помещений |
| 12. solid fuels | l. мусоросжигательная печь |
| 13. renewable resources | m. ускоритель; акселератор |
| 14. heat pump | n. бытовой, домашний |
| 15. recycling | o. солнечный обогрев (отопление) |

16. waste heat	р. водопроводная вода
17. power plant	q. твердое горючее
18. incinerator	г. питьевой, пригодный для питья
19. solar heating	s. скрытый
20. geothermal heating	t. водонагреватель
21. district heating	у. переработка; повторное использование, возвращение в оборот
22. to circulate	v. природный газ
23. accelerator	w. ископаемое топливо
24. latent	x. расширительный бак
25. expansion tank	y. возобновляемые ресурсы

2. *Прочитайте и переведите текст.*

WATER HEATING AND HOT WATER SUPPLY

Water heating is a thermodynamic process using an energy source to heat water above its initial temperature. Typical domestic uses of hot water are for cooking, cleaning, bathing, and space heating. In industry both hot water and water heated to steam have many uses.

Appliances for providing a more or less constant supply of hot water are known as water heaters, boilers, heat exchangers, or geysers depending on whether they are heating potable (drinking) or non-potable water, in domestic or industrial use, their energy source, and in which part of the world they are found. In domestic installations, potable water heated for other uses than space heating is sometimes known as Domestic Hot Water (DHW).

The term "central heating" applied to the heating of domestic and other buildings indicates that the whole building is heated from a central source, usually an independent boiler, fired by fossil fuels: natural gas, electricity or fuel oil, liquefied petroleum gas or sometimes solid fuels. These fuels may be consumed directly or by the use of electricity (which may derive from any of the above fuels or from nuclear or renewable sources). Alternative energy such as solar energy, heat pumps, hot water heat recycling, and sometimes geothermal heating may also be used, usually in combination with backup systems supplied by gas, oil or electricity.

In some countries district heating is a major source of water heating. This is especially the case in Scandinavia. District heating systems make it possible to supply all necessary energy for water heating as well as space heating from waste heat from industries, power plants, incinerators, geothermal heating and central solar heating. The actual heating of the tap water is performed in heat exchangers at the consumers' premises. Generally the consumer needs no backup system due to high availability of district heating systems.

In general, a heating system should be designed so that the water will circulate by gravity. In some installations a pump or an accelerator is used to achieve a satisfactory circulation.

When designing a heating system for a large building, it is usual – in the interests of economy and to ensure efficient heating – to first calculate how much heat will be needed to maintain the building at the desired temperature. Then the size of the boiler and the amount of pipe and radiator heating surface required to give out this heat are estimated. For small systems, past experience and “rules-of-thumb” methods are generally a sufficient guide.

A steam or a hot water heating plant consists essentially of a boiler (or a heat exchanger for district heating) which heats water in a closed-water system; radiators, or wall-mounted panels, through which the heated water passes in order to release heat into rooms; and a piping system connecting the former with the latter. Steam or hot water from the boiler is circulated through the piping and radiators in which the steam condenses giving off its latent heat and the water gives out some of its heat, thus warming the rooms. In the usual hot water installation, the boiler, pipes and radiators are kept full of water at all times, and an expansion tank compensates for the increase in volume of water when it is heated and prevents explosions in case too much steam is generated.

3. Найдите в тексте английские эквиваленты следующих словосочетаний.

Нагретый до парообразного состояния, постоянная подача воды, в помещениях потребителей, двигаться под действием силы тяжести, выделять тепло, состоять из, циркулировать по трубам, для компенсации увеличения объема воды.

4. Найдите пары слов, имеющих сходное значение.

potable	to release
to generate	residential
initial	drinkable
domestic	to carry out
to perform	primary
to give out	to produce

5. Закончите предложения в соответствии с содержанием текста.

1. Water heating is a thermodynamic process during which
2. ... have many uses in industry.
3. Appliances used for providing a more or less constant supply of hot water depend on
4. Domestic hot water is
5. A boiler is fired by
6. District heating systems make it possible
7. A heating system should be designed so that

8. When designing a heating system for a large building, it is usual to calculate ..., to estimate

9. A steam or a hot water heating plant consists essentially of a boiler which is meant for ..., radiators through which ..., and a piping system which

10. The rooms are warmed by

11. The boiler, pipes and radiators are kept full of

6. Определите, соответствуют ли следующие предложения содержанию текста. Обоснуйте свой ответ. Используйте следующие выражения: I can't agree with this, it's false, that may be true, but..., on the contrary, vice versa, I suppose it's true, that's right, I entirely agree with this statement.

1. Water heating is a mechanical process using an energy source to produce steam.

2. Appliances for providing a more-or-less constant supply of hot water are known as gas heaters.

3. The term "central heating" indicates that the whole building is not heated but only its central part.

4. A boiler may be fired by electricity or fuel oil, natural gas, liquefied petroleum gas or solid fuels.

5. In case of district heating the actual heating of the tap water is performed in heat exchangers at the consumers' premises.

6. A heating system should be designed so that the water will circulate by carrying capacity.

7. The size of the boiler and the amount of pipe and radiator heating surface are not taken into account when designing a heating system.

8. A boiler heats water in a closed-water system.

9. Radiators connect a boiler and a piping system.

10. Hot water from the boiler is circulated through the piping and radiators in which the water gives out some of its heat warming the rooms.

11. An expansion tank compensates for the increase in volume of water when heated and prevents explosions in case too much steam is generated.

7. Ответьте на вопросы.

1. What is water heating?

2. What is hot water used for?

3. What appliances are used to provide a constant supply of hot water?

4. What does the term "central heating" mean?

5. What types of fuel do boilers usually use?

6. What kinds of alternative energy can be used for water heating?

7. What are district heating systems?

8. What is taken into consideration when a heating system for large buildings (for small systems) is designed?
9. What does a steam or a hot water heating plant consist of?
10. How does a hot water heating plant work?

8. Расскажите об устройстве и принципе работы системы подачи горячей воды и водяного отопления.

9. Прочтите текст, при необходимости воспользуйтесь словарем. После прочтения ответьте на вопросы:

- 1. What types of water heating appliances are mentioned in the text?*
- 2. Which of them are the most popular in European countries, the USA, New Zealand and Iceland?*
- 3. What are their advantages and disadvantages?*

Types of Water Heating Appliances

Water for space heating can be heated by fossil fuels in a boiler. Potable water may be heated in a separate appliance.

Stand-alone appliances for instantaneously heating water for DHW (Domestic Hot Water) are known as tankless heaters, multipoint heaters, geysers or Ascots. Appliances capable of supplying both space heating and DHW are known as combination (or “combi”) boilers. Tankless water heaters, also called combi boilers, continuous flow, on-demand or instant-on water heaters heat the water as it flows through the device, and do not retain any water internally except for that which is in the heat exchanger coil. Tankless heaters are often installed throughout a house at more than one point-of-use (POU), far from the central water heater, or larger models may still be used to satisfy all the hot water needs for an entire house. The main advantages of tankless water heaters are a continuous supply of hot water and energy savings (as compared to a limited flow of continuously heating hot water from conventional tank water heaters). But the rate at which these heaters give a continuous flow of DHW is limited by the thermodynamics of heating water from the available fuel supplies.

Another popular arrangement with higher flow rates (although for limited periods) is to heat water in a pressure vessel capable of withstanding a hydrostatic pressure close to that of the incoming mains supply. These vessels are known as tanks and may incorporate a gas or oil burner heating the water directly. Tank-type water heaters, also called storage water heaters, consist of a cylindrical tank in which water is kept continuously hot and ready for use. Typical sizes range from 75 to 400 litres. These heaters may use electricity, natural gas, propane, heating oil, solar, or other energy sources. Natural gas heaters are most popular in the United States and most European countries, since the gas is often conveniently piped throughout cities and towns and currently is the cheapest to use. Compared to tankless heaters, storage water heaters have the advantage of using energy (gas or electricity) at a relatively slow rate, storing the heat for later use.

In some localities, solar powered water heaters are used. Their solar collectors are installed outside dwellings, typically on the roof or nearby. Nearly all models consist of flat panels in which water circulates. Other types may use dish mirrors to concentrate sunlight on a collector tube filled with water, brine or other heat transfer fluid. A storage tank is placed indoors or out. Circulation is caused by natural convection or by a small electric pump. At night, or when there is insufficient sunlight, circulation through the panel can be stopped by closing a valve or stopping the circulating pump, to keep hot water in the storage tank from cooling. Depending on the local climate, freeze protection as well as overheating prevention must be added in the design, installation, and operation of solar powered water heaters.

Another type of a solar water heater is the evacuated tube collector. It is usually mounted on a roof, and has a row of glass tubes containing heat conducting rods, typically copper ones. The rods act as heating elements in a circulating loop of antifreeze. The captured heat is transferred into the domestic hot water system by a heat exchanger. This design is smaller and more efficient than traditional flat plate collectors, and works well in very cold climates.

In countries like Iceland and New Zealand, and other volcanic regions, water heating may be done using geothermal heating, rather than combustion.

10. Прореферлируйте текст, используя клише для реферирования, приведенные в приложении 1.

Text 4

1. Найдите русские эквиваленты английских слов.

- | | |
|-----------------------|---|
| 1. to vaporize | a. жаротрубный котел |
| 2. flue gas | b. медь |
| 3. stainless steel | c. паровое пространство (в резервуаре) |
| 4. wrought iron | d. сгорание |
| 5. copper | e. прямоугольный |
| 6. brass | f. нагрев погружением |
| 7. cast iron | g. виток, катушка; змеевик |
| 8. combustion | h. латунь |
| 9. resistance | i. разборный, секционный котел |
| 10. immersion heating | j. конусообразный, конический |
| 11. fire-tube boiler | k. испарять(ся), распылять |
| 12. water-tube boiler | l. тепловой, термический сифон |
| 13. flash boiler | m. гидронический (использующий жидкости для охлаждения и нагрева) |
| 14. sectional boiler | n. водотрубный котел |
| 15. barrel | o. котел с быстрым разведением паров |

16. steam space	р. нержавеющая сталь
17. monotube boiler	q. цельная отливка
18. coil	г. бочка
19. firebox	с. чугун
20. thermic syphon	т. поддерживать огонь (в топке), подбрасывать топливо, топить; шуровать
21. rectangular	и. топочный (дымовой) газ
22. one-piece casting	v. огневое пространство (коробка) котла, топка
23. conical	w. сопротивление
24. to stoke	х. однотрубный котел, бойлер
25. hydronic	у. кованое железо

2. Прочитайте и переведите текст.

BOILERS

A boiler is a closed vessel in which water or other fluid is heated. The heated or vaporized fluid exits the boiler and is used in various processes or heating applications.

Boilers have many applications. They can be used in stationary installations to provide heat, hot water, or steam for domestic use or in generators and they can be used in mobile machinery such as trains, ships, and boats to provide steam for locomotion. Using a boiler is a way to transfer stored energy from the fuel source to the water in the boiler, and then finally to the point of end use.

Boilers are mainly made of steel, stainless steel, and wrought iron. In steam models, copper or brass are often used. Cast iron is used for domestic water heaters. Although these are usually termed “boilers”, their purpose is to produce hot water, not steam, and they run at low pressure and try to avoid actual boiling.

The source of heat for a boiler is combustion of wood, coal, oil, or natural gas. Electric steam boilers use resistance or immersion type heating elements.

Boilers can be classified into the following configurations:

- “Pot boilers” or “Haycock boilers”. It’s a primitive “kettle” where a fire heats a partially filled water container from below. 18th Century Haycock boilers generally produced and stored large volumes of very low pressure steam. They could burn wood or most often, coal and their efficiency was very low.
- Fire-tube boilers. Here, water partially fills a boiler barrel with a small volume left above to accommodate the steam (steam space). The heat source is inside a furnace or firebox that has to be kept permanently surrounded by the water in order to maintain the temperature of the heating surface just below boiling point. Fire-tube boilers usually have a comparatively low rate of steam production, but high steam storage capacity. Fire-tube boilers mostly burn solid fuels.

- Water-tube boilers. In this type of boilers water tubes are arranged inside a furnace in a number of possible configurations: often the water tubes connect large drums, the lower of which contain water and the upper ones contain steam; in other cases, such as a monotube boiler, water is circulated by a pump through a succession of coils. This type generally gives high steam production rates, but less storage capacity.

- Flash boilers are a specialized type of water-tube boilers.

- Fire-tube boilers with a water-tube firebox. Sometimes the two above-mentioned types are combined in the following manner: the firebox contains an assembly of water tubes, called thermic siphons.

- Sectional boilers. In a cast iron sectional boiler, sometimes called a “pork chop boiler”, the water is contained inside its cast iron sections.

Boilers can be solid one-piece casting, rectangular in form; they can be sectional or conical in shape and of wrought or cast iron. For small systems, the first and the last-named types are both cheap and suitable. The sectional boiler has the advantage of possible adding sections should more heat be needed after the initial installation.

The boiler is usually placed at the lowest available point in a building, having regard to the convenience of stoking and fuel delivery.

Boilers can be superheated steam, supercritical steam and hydronic ones. Hydronic boilers are used in generating heat for residential and industrial purposes. They are typical power plants for central heating systems fitted to houses in northern Europe (where they are commonly combined with domestic water heating), as opposed to forced-air furnaces or wood burning stoves which are more common in North America. A hydronic boiler operates by heating water or other fluid to a preset temperature (or in case of single pipe systems, until it boils and turns to steam) and by circulating that fluid throughout the home through radiators, baseboard heaters or through the floors. The fluid is in an enclosed system and is circulated throughout by means of a motorized pump. Most new systems are fitted with condensing boilers for greater efficiency. The name “boiler” can be a misnomer here except for systems using steam radiators because the water in a properly functioning hydronic boiler never actually boils. These boilers are referred to as condensing ones because they condense water vapour in flue gases and capture the latent heat of water vaporization produced during combustion.

3. Подберите определения к приведённым слева словам.

1. wood

a) a gaseous mixture consisting mainly of methane

2. coal

b) a yellow-coloured metal made from copper and zinc

3. oil

c) a form of steel containing chromium, resistant to rust

- | | |
|--------------------|---|
| 4. natural gas | d) a hard, relatively brittle alloy of iron and carbon |
| 5. brass | e) a hard fibrous material that forms the main substance of the trunk or branches of a tree |
| 6. copper | f) a liquid derived from petroleum, especially for use as a fuel or lubricant |
| 7. cast iron | g) a red-brown metal, the chemical element of atomic number 29 |
| 8. stainless steel | h) a combustible black or dark brown rock consisting mainly of carbonized plant matter |

4. Закончите предложения в соответствии с содержанием текста.

1. A boiler is
2. Boilers can be used in
3. Cast iron is used
4. In pot boilers
5. Fire-tube boilers mostly burn ...
6. In a cast iron sectional boiler
7. The lower drum of a water-tube boiler contains ..., the upper one contains
8. Boilers are usually placed in....

5. Ответьте на вопросы.

1. What is a boiler?
2. Where can boilers be applied?
3. What metals are boilers made of?
4. What are boilers used for?
5. What types of fuel do they use?
6. What configurations of boilers do you know? What is their storage and production capacity?
7. What types of boilers are used in generating heat for residential and industrial purposes? How do they operate?
8. What device helps to circulate the fluid in an enclosed heating system?
9. The water boils in a hydronic system, doesn't it?
10. Why are hydronic boilers called condensing ones?

6. Заполните таблицу в соответствии с содержанием текста.

Type of a boiler	Type of fuel used	Production capacity	Storage capacity
...

7. *Расскажите о котлах, их устройстве и конфигурациях, принципе работы, сравните их по вместимости и производительной мощности. Используйте таблицу упражнения 6.*

8. а) *Переведите следующие слова и словосочетания на русский язык, при необходимости воспользуйтесь словарем: superheated steam boilers, supercritical steam boilers, steam plant, a higher flue gas exhaust temperature, piping, turbine blades, critical point, a supercritical pressure steam generator, bubbles, device.*

б) *Прочтите текст. Назовите типы котлов, которые упоминаются в тексте, и определите, чем они отличаются друг от друга.*

Types of Boilers

Except for hydronic boilers there are superheated steam boilers and supercritical steam ones.

Most boilers heat water until it boils, and then the steam is used at saturation temperature (saturation temperature means boiling point at which a liquid boils into its vapour phase. Superheated steam boilers boil the water and then further heat the steam in a superheater. This increases the temperature of the steam, and can decrease the overall thermal efficiency of the steam plant because a higher steam temperature requires a higher flue gas exhaust temperature. However, there are some advantages to superheated steam. For example, useful heat can be extracted from the steam without causing condensation, which could damage piping and turbine blades.

Supercritical steam generators (also known as Benson boilers) are frequently used for the production of electric power. They operate at “supercritical pressure”. In contrast to a “subcritical boiler”, a supercritical steam generator operates at such a high pressure (over 3200 PSI, 22 MPa, and 220 bar) that actual boiling ceases to occur, and the boiler has no water-steam separation. There is no generation of steam bubbles within the water, because the pressure is above the “critical pressure” at which steam bubbles can form. This is more efficient, resulting in less fuel consumption. The term “boiler” should not be used for a supercritical pressure steam generator, as no “boiling” actually occurs in this device.

Text 5

1. *Найдите русские эквиваленты английских слов.*

- | | |
|--------------------|--|
| 1. heat sink | a. сантехника, водопроводно-канализационная сеть |
| 2. air conditioner | b. испаритель |
| 3. reversible pump | c. охлаждающее вещество, охладитель |
| 4. drying | d. отвод теплоты |
| 5. refrigerant | e. стандартная настройка |

6. to switch	f. абсорбционный тепловой насос
7. default setting	g. перепад (разность) температур
8. evaporator	h. теплоотвод, радиатор-теплосъемник
9. to swap	i. режим
10. plumbing	j. менять(ся), обменивать(ся)
11. compression pump	к. реверсивный насос
12. absorption heat pump	l. отопительная нагрузка
13. burnable	m. переключать; направлять, изменять
14. temperature difference	n. подводимая энергия
15. efficiency	o. получить из (чего-л.), извлечь
16. to draw from	p. кондиционер воздуха
17. heat extraction	q. воспламеняемый, горючий
18. input energy	г. эффективность, продуктивность
19. heating load	s. высушивание, сушка
20. mode	t. компрессор

2. Прочитайте и переведите текст.

HEAT PUMPS

A heat pump is a machine or device that moves heat from one location to another location using the physical concept of mechanical work. Most heat pump technology moves heat from a low temperature heat source to a higher temperature heat sink. Common examples are food refrigerators and freezers, air conditioners, and reversible-cycle heat pumps for providing thermal comfort. Heat pumps can also operate in reverse, producing heat.

Heat pumps can be thought of as a heat engine, which is operating in reverse. One common type of heat pump works by exploiting the physical properties of an evaporating and condensing fluid known as a refrigerant. Since 2001, carbon dioxide, R-744, has increasingly been used as a refrigerant. In residential and commercial applications, the hydrochlorofluorocarbon (HCFC) R-22 is still widely used. In heating, ventilation, and cooling (HVAC) applications, a heat pump normally refers to a vapour-compression refrigeration device that includes a reversing valve and optimized heat exchangers so that the direction of heat flow may be reversed. The reversing valve switches the direction of a refrigerant through the cycle and therefore the heat pump may deliver either heating or cooling to a building. In cooler climate areas the default setting of the reversing valve is heating. The default setting in warmer climates is cooling. As the two heat exchangers, the condenser and evaporator, must swap functions, they operate in both modes. The efficiency of a reversible heat pump is less than that of two separate devices.

In plumbing applications, a heat pump is sometimes used to heat or pre-heat water for swimming pools or domestic water heaters.

Sometimes when air cooling and water heating are needed, a single heat pump can serve two purposes.

Most commonly, heat pumps draw heat from the air or from the ground (groundwater or soil). Air-source heat pumps do not work well when temperatures fall below around -5°C (23°F).

The heat drawn from the ground is in most cases stored solar heat, and it should not be confused with geothermal heat, though the latter contributes to all heat in the ground. Other heat sources include water of nearby streams and other natural water bodies; and sometimes domestic waste water which is often warmer than the ambient temperature.

In mild climates a heat pump can be used to air-condition the building during hot weather, and to warm the building using heat extracted from outdoor air in cold weather. Air-source heat pumps are generally uneconomic for outdoor temperatures much below freezing. In colder climates, geothermal heat pumps can be used to extract heat from the ground. For economy, these systems are designed for operating in average low winter temperatures and use supplemental heating for extreme low temperature conditions. The advantage of a heat pump is that it reduces the energy required for building heating; often geothermal source systems also supply domestic hot water. Even in places where fossil fuels provide most electricity, a geothermal system may offset gas production since most energy furnished for heating is supplied from the environment, with only 15–30% purchased.

The two main types of heat pumps for heating private and communal buildings are compression heat pumps and absorption heat pumps. Compression heat pumps always operate on mechanical energy (through electricity), while absorption heat pumps may also run on heat as an energy source (through electricity or burnable fuels).

Air source heat pumps are relatively easy and inexpensive to install and therefore they have historically been the most widely used heat pump type. However, one of their disadvantages is the use of the outside air as a heat source or sink. The high temperature differential during periods of extreme cold or heat leads to low efficiency.

Geothermal heat pumps typically have higher efficiencies than air-source heat pumps because they draw heat from the ground or groundwater which is at a relatively constant temperature all year round below a depth of about eight feet (2.5 m). This means that the temperature differential is lower, leading to higher efficiency. The disadvantage is an expensive installation of a ground-source heat pump due to the need for digging trenches to place the pipes that carry the heat exchange fluid. When compared to each other, groundwater heat pumps are generally more efficient than heat pumps using heat from the soil.

3. Найдите в тексте английские эквиваленты следующих словосочетаний.

Работать в обратном направлении, энергосберегающий, когда температура опускается ниже 5°C , работать в двух режимах, приводить к че-

му-то (быть следствием), круглый год, глубина 8 футов, при сопоставлении, снизить энергопотребление на 40%.

4. Закончите предложения в соответствии с содержанием текста.

1. Most heat pump technology moves heat
2. In heating, ventilation, and cooling (HVAC) applications, a heat pump
3. Heat pumps are used for
4. Heat pumps can draw heat from
5. The most widely used heat pump type has been

5. Определите, соответствуют ли следующие предложения содержанию текста. Обоснуйте свой ответ. Используйте следующие выражения: *I can't agree with this, it's false, that may be true, but..., on the contrary, vice versa, I suppose it's true, that's right, I entirely agree with this statement.*

1. A heat pump is a device used to cool water.
2. Heat pumps use heat from the sun and wind.
3. The heat drawn from the ground is different from geothermal heat.
4. Water heat sources include nearby streams, rivers and even domestic waste water.
5. Air-source heat pumps are the most suitable for being used in low winter temperatures.
6. Air-source heat pumps are less efficient because of the high temperature differential of the air.

6. Ответьте на вопросы.

1. What is a heat pump?
2. What is a refrigerant? What fluids are used as refrigerants?
3. What is the function of the reversing valve?
4. How many types of heat exchangers are there? What are they?
5. What are the types of heat pumps for heating private and communal buildings? What do they run on?
6. Why do geothermal heat pumps have higher efficiencies than air-source heat pumps?
7. What types of geothermal pumps do you know?

7. Расскажите на английском языке

- 1) о тепловых насосах, их устройстве;
- 2) о функциях насосов;
- 3) о разновидностях насосов, их принципе работы.

8. а) *Переведите следующие слова и словосочетания на русский язык, при необходимости воспользуйтесь словарем:* to troubleshoot, to fix, manuals, to make repairs, to replace, faulty connections, a furnace, a boiler power switch, to check a fuse, to turn a lever counterclockwise, temperature swings, to recalibrate.

б) *Прочтите текст. Найдите ответы на следующие вопросы:*

1. *What is the main thing to do when you are making repairs yourself?*

2. *What actions will you take to fix problems with your heating system?*

3. *What instruments or devices will you need?*

4. *What will you do if you are not sure that you can fix a problem yourself?*

How to Troubleshoot a Heating System

Problems with modern heating systems are rare, but when they occur, you want to fix them quickly, before your household's population freezes in place. You can usually troubleshoot and correct the most common ones yourself; and contact a professional for other problems. Always consult the manuals for your heating system and thermostat when you're making repairs yourself.

Instructions

1 If there isn't any heat coming out, set the thermostat switch to the heat setting or to the desired temperature for electric heat.

2 Repair and replace a defective thermostat or faulty connections. Relight the pilot light and press the reset button on the heating unit.

3 Turn on the furnace or boiler power switch or check the fuse. In a low-voltage system, test the transformer and its wiring connections.

4 Increase the amount of time the furnace is turned on to reduce excessive cycling by turning the anticipator lever counterclockwise. Decrease time to reduce the temperature swings by turning the lever clockwise.

5 Test the thermometer with another thermometer to make sure it isn't out of calibration. Re-calibrate any inaccuracies according to manufacturer instructions. If the thermometer is correct, re-calibrate the thermostat.

Text 6

1. *Найдите русские эквиваленты английских слов.*

1. concrete

2. slab

3. medium

4. heat exchanger

5. fan coil unit

6. copper

7. fin

8. combustion

9. mould

10. byproduct

11. faulty

a. неисправный

b. передвигать по кругу

c. бетон

d. плесень, грибок

e. ребро, пластина радиатора

f. плита

g. вентиляторный доводчик

h. побочный продукт

i. горение, сжигание

j. медь

k. средство

12. circulate
13. solution

- l. теплообменник
m. средство

2. Прочитайте и переведите текст.

HYDRONIC AND STEAM SYSTEMS

Hydronic heating systems are systems that circulate a medium for heating. Hydronic radiant floor heating systems use a boiler or district heating to heat up hot water and a pump to circulate the hot water in plastic pipes installed in a concrete slab. The pipes, embedded in the floor, carry heated water that conducts warmth to the surface of the floor where it distributes energy to the room.

Hydronic systems circulate hot water for heating. Steam heating systems are similar to water heating systems, except steam is used as a heating medium instead of water.

Hydronic heating systems generally consist of a boiler or a district heating heat exchanger, hot water circulating pumps, distribution piping, and a fan coil unit or a radiator located in the room or space. Steam heating systems are similar except no circulating pumps are required.

Steam has the advantage of flowing through the pipes under its own pressure without the need for pumping. For this reason, it had been put into use earlier, before electric motors and pumps became available. Steam is also far easier to distribute than hot water throughout large and high buildings like skyscrapers. However, the higher temperatures at which steam systems operate make them inherently less efficient, as unwanted heat loss is inevitably greater.

Steam pipes and radiators are also prone to producing banging sounds (known as “water hammer”) if condensate fails to drain properly; this is often caused by a building’s foundation settlement and the resultant condensate pooling in pipes and radiators that no longer tilt slightly back towards the boiler.

Hydronic systems are a closed loop; the same fluid is heated and then reheated. Hydronic heating systems are also used with antifreeze solutions in ice and snow melt systems for walkways, parking lots and streets. They are more commonly used in commercial offices and in whole-house radiant floor heating systems, while electric radiant heating systems are more commonly used in smaller “spot warming” applications.

Hydronic systems are being used in construction for several reasons. Among them are the following:

- They are more efficient and more economical than forced-air systems (although initial installation can be more expensive because of the cost of copper and aluminium).
- The copper baseboard pipes and aluminium fins take up less room and use less metal than the bulky steel ductwork required for forced-air systems.

- They provide more even, less fluctuating temperatures than 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 be switched off and on very often. Copper heats mostly through conduction and radiation, whereas forced air heats mostly through forced convection. Air has much lower thermal conductivity than copper; however, convection results in faster heat loss of air as compared to copper.

- They do not dry the interior air out much.
- They do not give off any dust, allergens, mould, or (in case of a faulty heat exchanger) combustion byproducts into the living space.

3. Найдите в тексте английские эквиваленты следующих словосочетаний.

Включать, выключать, состоять из, намного легче, по причине, выделять аллергены, предрасположенный к, лучистая система напольного отопления, электрическая система лучистого отопления, пересушивать воздух, побочные продукты сгорания.

4. Найдите пары слов, имеющих сходное значение.

room	broken
efficient	inside
faulty	outdoor
interior	include
consist of	effective
outside	space

5. Подберите определения к приведённым слева словам.

1. hydronic	a) the vapour into which water is converted when heated
2. steam	b) a mechanical device using suction or pressure to raise or move liquids
3. pump	c) a fuel-burning apparatus or container for heating water
4. pipe	d) denoting a cooling or heating system in which heat is transported using circulating water
5. boiler	e) a tube of metal or plastic used to convey water, gas, oil, or other fluid substances

6. Определите, соответствуют ли следующие предложения содержанию текста. Обоснуйте свой ответ. Используйте следующие вы-

ражения: I can't agree with this, it's false, that may be true, but..., on the contrary, vice versa, I suppose it's true, that's right, I entirely agree with this statement.

1. Hydronic systems circulate steam for heating.
2. Steam heating systems are different from water heating systems.
3. A boiler, hot water circulating pumps, distribution piping, and a radiator are parts of a hydronic heating system.
4. The same fluid is heated and then reheated in hydronic systems.
5. Hydronic and steam systems can't heat large buildings.
6. Hydronic systems are expensive because of the cost of steel required for them.
7. The baseboard copper pipes and aluminium fins take up little room.
8. Hydronic systems do not dry out the interior air and give off allergens, mould and dust.

7. Ответьте на вопросы.

1. What systems are called hydronic?
2. What is the difference between hydronic and steam systems?
3. What does a steam heating system consist of?
4. What are the advantages and disadvantages of using steam heating systems?
5. Why are hydronic and steam systems used in construction?

8. Расскажите на английском языке о системах водяного и парового отопления, их различии и целесообразности применения в современном строительстве.

9. а) Переведите следующие слова и словосочетания на русский язык, при необходимости воспользуйтесь словарем: one-pipe heating systems, an inlet, an outlet, a return pipe, a supply pipe, an appliance, a diaphragm, a safety valve, to replenish, to escape, an open-vent heating system, a sealed water-circulating system.

б) Прочтите текст. Ответьте на вопросы:

1. *What is the difference between one-pipe and two-pipe heating systems?*
2. *What factors are taken into consideration when selecting a heating plant for residences?*
3. *What is the difference between sealed water-circulating systems and open-vent systems?*
3. *Do you know what type of heating system is used in your country?*

Piping

Piping systems usually used for steam heating are an ordinary one-pipe system and a two-pipe system. In a one-pipe heating system all radiators are connected to the same pipe, which acts both as an inlet for steam and an out-

let for condensation water. In a two-pipe system there is a supply pipe and a return pipe for each radiator. The two-pipe system is expensive, and is not generally used in steam heating except for indirect radiators which always have two connections in order to function properly.

In selecting a heating plant for residences there must be considered the size and the type of building, the climate and the cost of operation.

Engineers in the United Kingdom and in other parts of Europe usually combine the needs for room heating with hot water heating and storage. These systems occur less commonly in the USA. In this country the heated water in a sealed system flows through a heat exchanger in a hot-water tank or a hot water cylinder where it heats water from the water supply system before this water gets to hot water outlets in the house. These outlets may serve hot water taps or appliances such as washing machines or dishwashers.

A sealed water-circulating system provides a form of central heating in which the water used for heating usually circulates independently of a building water supply system. A pressure vessel contains compressed gas, separated from the sealed system water by a diaphragm. This allows normal variations of pressure in the system. A safety valve allows water to escape from the system when pressure becomes too high, and a valve can open to replenish water from the water supply system if the pressure drops too low. Sealed systems offer an alternative to open-vent systems, in which steam can escape from the system and get replaced with water from a building water supply system via a central storage system.

Text 7

1. *Найдите русские эквиваленты английских слов.*

- | | |
|--------------------|---|
| 1. transfer | a. продувать, спускать воду |
| 2. sealed | b. площадь поверхности |
| 3. hollow | c. передавать |
| 4. pressure | d. установить |
| 5. surface area | e. подающая труба; подводная труба |
| 6. to attach | f. герметичный; запаянный |
| 7. to set up | g. батарея, радиатор |
| 8. supply pipe | h. прикреплять, присоединять |
| 9. return pipe | i. проникать |
| 10. to seep | j. возвратная (спускная, сливная) труба |
| 11. radiator | k. давление |
| 12. to mount | l. вставлять, монтировать |
| 13. to bleed | m. пустой, полый |
| 14. stub | n. жаростойкий |
| 15. heat-resistant | o. колебание |
| 16. fluctuation | p. заглушка |

2. Прочитайте и переведите текст.

RADIATORS

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 US.

Radiators and convectors are types of heat exchangers designed to transfer thermal energy from one medium to another for the purpose of cooling and heating.

One might expect the term "radiator" to mean devices which transfer heat primarily by thermal radiation, while a device which relied primarily on natural or forced convection would be called a "convector". In practice, the term "radiator" refers to any of a number of devices in which a liquid circulates through pipes (often with fins or other means of increasing surface area), notwithstanding that such devices tend to transfer heat mainly by convection and might logically be called convectors. The term "convector" refers to a class of devices in which the source of heat is not directly exposed.

In buildings a radiator is a heating device, which is warmed by steam from a boiler, or by hot water pumped through it from a water heater (a boiler). Such radiators transfer the majority of their heat by radiation and by convection.

A conventional hot water radiator consists of a sealed hollow metal container, usually flat in shape. Hot water enters at the top of the radiator by pressure from a pump or by convection.

As it gives out heat, the hot water cools and sinks to the bottom of the radiator and is forced out of a pipe at the other end. The pipe either has a large surface area or attached fins to increase its surface area and contact with the surrounding air. The air near a radiator heats and produces a convection current in the room, drawing in cold air to heat.

If set up improperly, radiators, and their supply and return pipes, can make loud banging noises like someone hammering on the pipes. This is due to either the pipes rubbing on surrounding surfaces while expanding and contracting because of heat changes or to sudden fluctuations of the supplied water pressure. The proper mounting of the radiators and supply pipes will reduce expansion noises, while upward-mounted stub ends with a trapped bubble of air providing a cushion against pressure fluctuations.

Cast iron radiators are no longer common in new construction. They are being replaced mostly with copper pipes which have aluminium fins to increase their surface area. In the U.K., modern domestic radiators tend to be made of sheet steel (often with steel fins), though copper and aluminium are often found in industrial heat exchangers.

A more recent type of heater used in homes is a fan assisted radiator. It contains a heat exchanger into which hot water is fed from the heating system. A thermostatic switch senses the heat and energizes an electric fan which blows air over the heat exchanger.

The advantages of this type of heaters are their small size and even distribution of heat around the room. The disadvantages are the noise produced by the fan, and the need for an electricity supply.

For homes with radiators it is recommended to place heat-resistant reflectors between radiators and exterior walls to keep warmth coming into the room and prevent it from seeping outside.

3. Подберите определения к приведённым слева словам.

- | | |
|---------------|--|
| 1. heater | a) the state of pressing or being pressed |
| 2. convection | b) a device for warming the air or water |
| 3. pressure | c) an apparatus with rotating blades that creates a current of air for cooling or ventilation |
| 4. fan | d) transfer of heat with the tendency of hotter and less dense material to rise, and colder to sink under the influence of gravity |

4. Закончите предложения в соответствии с содержанием текста.

1. San Galli patented his invention
2. Radiators and convectors are types of
3. The term "radiator" refers to
4. The term "convector" refers to
5. Hot water enters at the top of a radiator
6. If set up improperly, radiators can make loud noises because of
7. ... will provide a cushion against pressure fluctuations.
8. The most common types of radiators nowadays are

5. Определите, соответствуют ли следующие предложения содержанию текста. Обоснуйте свой ответ. Используйте следующие выражения: *I can't agree with this, it's false, that may be true, but..., on the contrary, vice versa, I suppose it's true, that's right, I entirely agree with this statement.*

1. Radiators transfer the majority of their heat by gravity.
2. Hot water enters at the top of a radiator, gives out heat, cools down, sinks to the bottom of the radiator and leaves through a pipe at the other end.
3. If set up improperly, radiators whistle.
4. A cushion at the top of a radiator will protect against pressure fluctuations.
5. A more recent type of heater used in homes is a fan assisted radiator.

6. Ответьте на вопросы.

1. What is a radiator? Whom was it invented by?
2. What is a convector?
3. What is the function of radiator fins?
4. What is a radiator warmed by?
5. What is the principle according to which radiators operate?
6. What metals are radiators produced of?
7. What are the advantages of fan assisted radiators?

7. Расположите следующие пункты плана в порядке их упоминания в тексте.

1. The elements of radiators.
2. Proper and improper mounting.
3. The definitions of the terms "radiator" and "convector".
4. Fan assisted radiators.
5. The invention of the radiator.
6. Copper-aluminium radiators.
7. Measures to prevent warmth from seeping outside.

8. Перескажите текст на английском языке, опираясь на пункты плана упражнения 7.

9. а) Переведите следующие слова и словосочетания на русский язык, при необходимости воспользуйтесь словарем: bleeding, a bleed screw, the topmost point of the system, to exclude, a corrosion inhibitor, oxygen, hydrogen, a dripping valve, a leak, loose joint.

б) Прочтите текст. Объясните на английском языке, что такое продувание, как часто и зачем системы отопления необходимо продувать.

Bleeding

All "radiant" (i.e. heat radiates from hot water) systems need to be *bled*, or purged of air, on occasion.

If there is air (or other gases such as hydrogen) trapped inside the radiator, then the water cannot rise to the top, and only the bottom area gets hot. A bleed screw near the top of the radiator allows the trapped air to be "bled" from the system, and thus to restore correct operation. Often radiators located on the upper floors will accumulate more air than those on the lower floors as the air tends to rise to the topmost point in the system. These radiators may have to be bled more often. Usually radiators are bled once or twice per season, or as needed. Another reason to exclude air is to minimize corrosion of pressed steel radiators. Most central heating systems need a corrosion inhibitor added into the circulating hot water, so that the production of hydrogen is minimized. This is created in untreated systems, by the action of the hot water on the iron in the absence of air (making the oxygen atom to leave hy-

drogen as H₂ when iron oxide is created). If air gets into radiators frequently, this may be a sign of a leak somewhere, such as a dripping valve, or loose joint.

Text 8

1. Найдите русские эквиваленты английских слов.

- | | |
|------------------------|---|
| 1. mesh | a. отделка |
| 2. film | b. дерево |
| 3. floor covering | c. решетка, сетка |
| 4. finishing | d. микроклимат помещений |
| 5. tile | e. увлажнение |
| 6. wood | f. пленка |
| 7. stone | g. имеющий течь; неплотный, негерметичный; пропускающий |
| 8. indoor climate | h. покрытие пола |
| 9. humidification | i. клещ |
| 10. thermal comfort | j. кафель, плитка |
| 11. forced-air heating | k. переносимый по воздуху |
| 12. leaky | l. тепловой комфорт |
| 13. moisture | m. камень |
| 14. dust | n. воздушное отопление |
| 15. mite | o. влажность, сырость |
| 16. airborne | p. клейкий, липкий, вязкий |
| 17. clammy | q. пыль |
| 18. to plug up | r. отверстие |
| 19. hole | s. заделывать |
| 20. cork | t. (каменная) кладка |
| 21. carpeting | u. пробка, кора пробкового дерева |
| 22. masonry | v. конструкция перекрытий |
| 23. floor system | w. крепить |
| 24. to fasten | x. ковровое покрытие, настил |

2. Прочитайте и переведите текст.

UNDERFLOOR HEATING

Underfloor heating is a form of central heating which utilizes heat conduction and radiant heat for indoor climate control, rather than forced-air heating which relies on convection. Heat can be provided by circulating heated water or by an electric cable, mesh, or film heaters.

Underfloor heating can be used with concrete and wooden floors, with all types of floor covering (e.g., stone, tile, wood, vinyl, and carpet), and at ground level or upstairs. The choice of floor finishing requires careful consideration, because changes of floor finish may affect its performance.

Radiant heating is arguably superior to convection methods because warm air rises wastefully to the ceiling in convection-heated rooms, warming the upper body (often with some discomfort, particularly to the head) but leaving the lower body cooler.

In contrast, radiant in-floor heating warms the lower part of both the room and the body because when warm air rises from the radiant floor surface, it loses approximately two degrees Celsius at two meters above the floor. This imparts a feeling of natural warmth, since the limbs should ideally be warmer than the head. (The most acceptable indoor climate is one in which the floor temperature ranges between 19 and 29 °C and the air temperature at head level ranges between 20 and 24 °C.)

Humidification may still be needed for thermal comfort with a radiant system, but this humidification is less than that needed for forced-air heating. This is because forced-air systems which are improperly balanced or have leaky ducts can draw in outside air which has low moisture content in the winter. Asthma sufferers may benefit from underfloor heating because it reduces the airborne circulation of both dust and dust mites.

Underfloor heating is invisible from above and does not use valuable wall space with unsightly heating equipment. In a sense, the entire floor is a radiator and because of its area it doesn't need to reach the high temperatures of a steam radiator. It has a particular advantage in public areas where exposed hot or sharp surfaces can be dangerous and unsightly.

Air infiltration heat loss is reduced significantly as compared to forced-air systems in which duct leakage can drive infiltration of outside air into the building. Heating cold air from the outside requires extra energy and decreases humidity.

If the boiler water temperature in a hydronic system is set to the relatively low temperature required by underfloor heating, rather than the higher temperature typically used in other types of radiators, the boiler may have higher efficiency and lower standby losses. However, it is possible in a boiler designed for condensing operation; in many boilers the water temperature must be set higher and reduced by a mixing valve. Depending on the piping layout and insulation, heat loss in the water distribution system may also be lower because of the lower temperature.

Although electric underfloor heating can deliver almost 100% of the electric energy coming into the heated space of a building, the overall system efficiency of electric heating is low because generating electricity from heat in a power plant is less efficient than using the heat directly. In addition hydronic underfloor systems (and even forced-air systems) can be incorporated as part of an ultra-efficient geo-exchange system, whereas electric underfloor heating can't.

Rooms heated by underfloor heating tend to have much warmer floors than those heated by radiator or forced-air heating. Although many people appreciate this, others who prefer the crisp, cool feeling of a polished wood floor may find such warmth unpleasantly clammy.

Although some people consider a wall radiator unsightly, others prefer the old-fashioned look of a bright copper radiator kept in good shape, especially in a vintage house. Converting from radiator heat to underfloor heat can also mean expensive repairs to plug up unsightly holes in floors and walls.

Although underfloor heating is generally less expensive than radiator heating, insulating flooring (such as carpeting or cork) can reduce the efficiency of underfloor heating to the point where a conversion to underfloor heating may not be financially prudent.

Modern underfloor heating systems are generally either warm water systems or electric systems. Systems can be poured into a masonry mix (called a poured floor system or a wet system) or fastened directly to the subfloor (called a subfloor system or a dry system).

3. Найдите в тексте английские эквиваленты следующих слов и словосочетаний.

Бетон, дерево, камень, влиять на характеристики (качество), превосходить что-то в чём-л., открытая поверхность, ремонт чего-л., заделать дырки в полу, черный пол (накат), медь, в хорошем состоянии, старинный дом.

4. Найдите пары слов, имеющих сходное значение.

affect	proportional
superior	humidity
balanced	influence
moisture	reasonable
prudent	the best

5. Образуйте слова с противоположным значением.

comfort (n)	possible (adj)
balance (n)	pleasant (adj)
sightly (adj)	properly (adv)
visible (adj)	to increase (v)

6. Определите, соответствуют ли следующие предложения содержанию текста. Обоснуйте свой ответ. Используйте следующие выражения: *I can't agree with this, it's false, that may be true, but..., on the contrary, vice versa, I suppose it's true, that's right, I entirely agree with this statement.*

1. Underfloor heating is based mainly on forced-air heating.
2. Underfloor heating can be used with all types of floor covering.
3. Radiant heating is worse than convection methods.

4. The most acceptable indoor climate is one in which the floor temperature ranges between 20 and 24 °C and the air temperature at head level ranges between 19 and 29 °C.

5. Underfloor heating is better for human health.

6. Underfloor heating has a particular advantage in public areas where exposed hot or sharp surfaces can be dangerous and unsightly.

7. Heat loss is less in case of underfloor heating as compared to water heating.

8. Electric underfloor heating has the highest efficiency.

9. Unsightly holes in floors, clammy polished floor and high cost are the main disadvantages of underfloor heating.

7. Ответьте на вопросы.

1. What is underfloor heating?

2. What types of floors can underfloor heating be used with?

3. What is the difference between in-floor radiant heating and radiant heating?

4. What are the advantages of underfloor heating as compared with forced-air heating?

5. If the boiler water temperature in a hydronic system is set to the relatively low temperature required by underfloor heating, the boiler has higher efficiency and lower standby losses, hasn't it?

6. Is hydronic or electric underfloor heating more efficient?

7. What are the disadvantages of underfloor heating?

8. Where can underfloor heating systems be placed?

9. Would you like to have underfloor heating in your house or flat?

8. Составьте план текста для пересказа.

9. Перескажите текст на английском языке по плану задания 8.

10. Прочтите текст, при необходимости воспользуйтесь словарем.

Ответьте на вопросы:

1. What types of underfloor heating systems are mentioned in the text?

2. What are the advantages and disadvantages of underfloor heating?

3. Where is water circulated in a hot water system?

4. Which diameter tubing is the most popular?

5. What types of boilers can be used as a source of heat for any underfloor heating system?

6. Has electric heating any advantages over a warm water system?

Underfloor Heating

During construction, tubing is placed on the floor throughout the room, and later covered with a concrete layer.

The current trend in radiant heating is towards underfloor heating, where warm water is circulated under the entire floor of each room in a building. A network of pipes, tubing or heating cables is buried in the floor, and heat rises into the room. Because of the large area of this type of radiator, the floor only needs to be heated a few degrees above the desired room temperature, and as a result, convection is almost non-existent. 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.

In a hot water system, warm water is circulated through pipes or tubes that are laid into the floor. As it offers a good balance between cost and pressure drop, $\frac{5}{8}$ -inch (16 mm) diameter tubing is popular: $\frac{3}{4}$ -inch (19 mm) and 1-inch (25 mm) tubing are relatively expensive, and $\frac{3}{8}$ -inch (10 mm) and $\frac{1}{2}$ -inch (13 mm) offer too much resistance, which means more energy consumption is needed to pump the liquid through the pipe; and the $\frac{5}{8}$ -inch tubing is often the minimum size needed for effective thermosiphon.

However, a system designed to use solar-heated water that circulates by thermosiphon is susceptible to blockage by air bubbles. Bubbles in the water accumulate in the smallest high spots, finally blocking the flow.

Gas, oil, solid fuel, or electric-resistance hot water boilers can be used as the source of heat for any underfloor heating system. Condensing boilers and ground-coupled heat pumps are particularly well-suited as the operation of underfloor heating systems allows them to operate in their most efficient manner.

Wet underfloor heating systems can also be used in reverse, where cold water from a chiller is placed in the system taking heat energy out of the building. However, care is needed to ensure that surfaces' temperatures remain above the air's dew point temperature. Otherwise, slipping hazards or mold growth are a concern.

Electric floor heating systems have very low installation cost for smaller spaces (1-5 rooms) because they are easy to install and have a very low start-up cost. A thermostat is all that is required. Although electric floor heating systems work well as a primary heat source, most systems are installed in the bathroom to add comfort and warmth to cold tiles. Electric floor heating systems are also typically installed in kitchens or in rooms that require additional heat (such as a cold basement or a kids' playroom).

Another advantage of electric underfloor heating over a warm-water system is the floor buildup (its height). Floor buildup can be as little as 1mm. The electric cables are usually installed onto an insulation board or directly onto the subfloor or padding (under a carpet or laminate); then the floor covering is placed directly over the heating system.

11. Прореферлируйте текст, используя клише для реферирования, приведенные в приложении 1.

Text 9

1. *Найдите русские эквиваленты английских слов.*

- | | |
|-----------------------|--|
| 1. forced-air heating | a. теплообменник |
| 2. ductwork | b. элементы управления |
| 3. blower | c. входное или выходное отверстие; отдушина |
| 4. heat exchanger | d. устанавливать |
| 5. vent | e. горение, возгорание, сжигание |
| 6. coil | f. система труб; трубопровод |
| 7. controls | g. компрессор |
| 8. to install | h. воздушное отопление |
| 9. ignition | i. охлаждающий |
| 10. combustion | j. змеевик; катушка |
| 11. to burn | k. содержание, тех. обслуживание; текущий ремонт |
| 12. maintenance | l. воспламенение, зажигание |
| 13. refrigerant | m. гореть |
| 14. to replace | n. воздухоочиститель; воздушный фильтр |
| 15. air cleaner | o. повторный нагрев |
| 16. reheating | p. заменять, замещать |
| 17. return air plenum | q. распределительная камера подаваемого воздуха; смешительная камера подаваемого воздуха |
| 18. supply plenum | r. распределительная камера возвратного воздуха |

2. *Прочтите следующие интернациональные слова и, основываясь на значениях слов русского языка, определите их значения.*

System, central, filter, control, thermostat, type, natural, gas, to accumulate, problem, electric, element, climate, boiler, allergen, infiltration, period, conditioning, risk, structural, energy.

3. *Прочитайте и переведите текст.*

FORCED-AIR HEATING

A forced-air or warm air heating system is one which uses air as its heat transfer medium. These systems use ductwork and vents as a means of air distribution. A return plenum carries the air from several large return vents to a central air handler for re-heating. A supply plenum directs heated air from the central unit to the rooms which the system is designed to heat. Regardless of type, all air handlers consist of an air filter, a blower, a heat exchanger

or coil, and various controls. Like any other kind of central heating system, thermostats are used to control forced-air heating systems.

Forced-air heating is probably the type most commonly installed in North America. It is less common in Europe, particularly in the United Kingdom (where it is typically referred to as “warm air” heating).

Forced-air systems can use the following types of fuel to produce heat: natural gas, propane, oil. In this case a heat exchanger keeps the combustion byproducts from entering the air stream and safety devices ensure that combustion gases and unburned fuel do not accumulate in the event of an ignition failure or a venting problem.

Forced-air systems can also be electric that means that a simple electric heating element warms the air. These systems require very little maintenance but are extremely expensive.

Forced-air systems with heat pumps are more efficient than fossil fuel fired furnaces (gas/oil) and electric resistance heating but are not suitable for cold climates unless used with a backup (secondary) source of heat. Newer air heat pumps can provide heat well below 0 degrees Celsius (32 °F). A refrigerant coil is located in an air handler instead of a heat exchanger. The system can also be used in cooling, just like any central air-conditioning system.

Hydronic coil systems combine hydronic (hot water) heating with a forced-air delivery. Heat is produced via combustion of fuel (gas/propane/oil) in a boiler. A heat exchanger (hydronic coil) is placed in an air handler similar to a refrigerant coil in a heat pump system or central AC. Heated water is pumped through the heat exchanger then back to the boiler to be reheated.

As for the disadvantages of forced-air systems, when they are improperly installed, they are prone to leaky ducts and other problems which lead to air infiltration. Air infiltration typically lowers humidity in the heated space as well as requiring extra heating energy. They are noisier than hydronic systems and they can distribute allergens and cooking odours throughout heated space. They require a filter, which must be replaced periodically.

The advantages are the following: forced-air systems can accommodate central air-conditioning, humidifiers, HRVs, and whole-house air cleaners. They are less expensive than hydronic systems and there is no risk of structural damage due to water leaks.

4. Найдите пары слов, имеющих противоположное значение.

expensive	humid
dry	to cool
to heat	to increase
noisy	cheap
to lower	quiet

5. Определите, соответствуют ли следующие предложения содержанию текста. Обоснуйте свой ответ. Используйте следующие вы-

ражения: I can't agree with this, it's false, that may be true, but..., on the contrary, vice versa, I suppose it's true, that's right, I entirely agree with this statement.

1. A forced-air system uses steam as its heat transfer medium.
2. Forced-air systems use fans as a means of air distribution.
3. Forced-air systems with heat pumps are suitable for cold climates.
4. Hydronic coil systems combine hot water heating with a forced-air delivery.
5. Air filters must be replaced regularly.

6. Ответьте на вопросы.

1. What is a return plenum meant for?
2. What is a supply plenum meant for?
3. What parts do all air handlers consist of?
4. In what countries is forced-air heating most commonly installed?
5. What types of fuel do forced-air systems use?
6. Which type of forced-air system is considered to be the most efficient?
7. What are the advantages and disadvantages of forced-air systems?

7. Составьте план текста для пересказа.

8. Перескажите текст на английском языке с опорой на составленный план.

9. Прочтите текст, при необходимости воспользуйтесь словарем.

Ответьте на вопросы:

1. *What is the difference between forced-air heating and radiant heating?*
2. *In your opinion, which system is the best and why?*

Forced-Air Heating vs. Radiant Heating

Let's compare some factors which any homeowner expects from his heating system.

In a home which is heated by radiant heat, your body circulation will improve because your feet are warm. That isn't the case with a forced-air system. The heat is near the ceiling, around your head. Chairs and walls keep warm without cold spots or draughts in a radiant heated home - objects in a forced-air home are only as warm as the air around them.

Radiant heating keeps your furniture, drapes and painted walls clean and keeps the floors dry. When the home is heated by blowing air; dust, dirt, grime, molds and other materials are blown from the ducts soiling the objects in the room. There are no grills or baseboards with a radiant heating system. You can place furniture anywhere. You can hang drapery right to the floor, use wood, tile, carpet, or any other floor coverings without fear of cold feet. Forced air can't come close to the flexibility of a radiant heating system.

Take a look at the following comparison table, and decide for yourself which system would be the best for you.

Warm Air Heating	Radiant Heating
Warm air heaters heat air which then warms the surroundings where people live and work. In buildings where doors are opened regularly there are high air exchange rates which result in high heat loss.	Radiant heat is not absorbed by the air, that's why it is ideal for buildings which have high air exchange rates. Radiant heat offers considerable energy savings over warm air systems.
Directing heat to working/living areas is difficult with warm air heaters. A garage heated by warm air will have cold spots at the working level and wastefully high temperatures at the roof level.	Radiant heat is transmitted by infrared waves and is directional. Radiant panel heating ensures absence of cold spots.
Draughts and natural convection currents make it difficult to control warm air movement within a building.	Radiant system zone control allows selected areas to be heated to the required temperature.
Hot air rises. That's why the ceiling of a house heated with warm air will be much hotter than the area beneath. Poor roof insulation, a common problem in older buildings, will allow this heat to escape, increasing fuel costs.	Radiant heating minimizes roof heat loss. By keeping the heat at the floor level and around the objects to be heated, the temperature at the ceiling level becomes cooler and substantially reduces the heat loss.
Warm air heats living space slowly. For heating to be effective it is necessary to heat all the air in a building. While the air gets to the required temperature, extra fuel is burned and the people remain cold.	Radiant heat warms up cold bodies directly without heating the whole building. The less frequent warm up periods save fuel and allow the heating system to match flexible working arrangements.
Warm air heaters rely on air movement to heat the living space. In areas where cleanliness is essential, draughts from a hot air blower will stir up unwanted dirt and dust. In addition, rapid air movement actually has a cooling effect on the body.	Radiant heating does not circulate air, therefore the number of airborne particles is reduced.

10. Прореферируйте текст, используя клише для реферирования, приведенные в приложении 1.

11. Сравните системы воздушного и лучистого отопления. Расскажите о преимуществах и недостатках обеих систем.

Text 10

1. Найдите русские эквиваленты английских слов.

- | | |
|------------------------------|--|
| 1. gas heating | a. воздуходувка; нагнетательный вентилятор |
| 2. burner | b. устройства воздействия на окружающую среду |
| 3. blower | c. приводить в действие, включать |
| 4. climate-control appliance | d. газовое отопление |
| 5. air duct | e. регулировать |
| 6. to activate | f. выключать, отключать |
| 7. wall-mounted | g. топка, горелка |
| 8. to adjust | h. газовый счётчик, газомер |
| 9. lever | i. воздуховод, воздухопровод; вентиляционный канал |
| 10. gas meter | j. настенный; установленный на стене |
| 11. to shut off | k. рычаг |

2. Прочитайте и переведите текст.

GAS HEATING

One of the primary concepts of a natural gas heating system is that the capability of an appliance to heat the environment is measured in various ways. For natural gas heating systems, the applicable unit of measurement is British thermal units per hour, which refers to the amount of energy needed to increase the temperature of one pound of water by one degree Fahrenheit. Natural gas can also be computed in cubic meters or feet.

A natural gas heating system is composed of the usual parts found in other kinds of climate control appliances. It has a source for the warm air, which in case of this particular heating system is natural gas. It also has air ducts to distribute heat and a device for controlling the temperature. In case of a natural gas heating system, the temperature is controlled by a thermostat. When the temperature of a particular environment drops, the heating can be turned on automatically or manually to cause a natural gas burner to activate. Most modern heating systems have a wall-mounted thermostat that has the capability of showing the current temperature of the room. The property owner can adjust the lever to set the temperature.

In response to the controls of the thermostat, the burner will switch on and make use of natural gas until it reaches the desired temperature. The natural gas is delivered to the houses through pipes that run underground. The gas enters a house through a gas meter that is often found in the exterior of the

building. The gas then circulates within the system causing it to increase in temperature. Once the burner switches off, the blower of the natural gas heating system has the option to continue to work for a while before completely shutting off.

Every natural gas heating system has a furnace blower, which functions to bring in the cool air from a particular part of the house and pushes it through a compartment called a heat exchanger. The air that was warmed by the burner is pushed outward and into the direction of the living area. The delivery of air to and from the heating system occurs through air ducts installed within the building. Aside from the temperature controlling devices, natural gas heating systems have regulators that control the blower. It allows for the property owner to increase heat without blowing air into the space.

3. Найдите в тексте английские эквиваленты следующих словосочетаний.

Отрегулировать рычаг, установить температуру, распределять тепло, повысить температуру на один градус, доставлять газ по трубам, выталкивать прохладный воздух через теплообменник, помимо устройств контроля температуры.

4. Найдите пары слов, имеющих противоположное значение.

to increase	manually
to activate	artificial
exterior	to reduce
to warm	to shut off
automatically	interior
natural	to cool

5. Подберите определения к приведённым слева словам.

1. Celsius	a) an apparatus for burning something
2. heat exchanger	b) a scale for measuring temperature, in which water freezes at 32 degrees and boils at 212 degrees. It is represented by the symbol °F.
3. blower	c) a device for transferring heat from one fluid to another without allowing them to mix
4. Fahrenheit	d) a scale for measuring temperature, in which water freezes at 0 degrees and boils at 100 degrees. It is represented by the symbol °C.

5. burner

e) a mechanical device for creating a current of air

6. *Определите, соответствуют ли следующие предложения содержанию текста. Обоснуйте свой ответ. Используйте следующие выражения: I can't agree with this, it's false, that may be true, but..., on the contrary, vice versa, I suppose it's true, that's right, I entirely agree with this statement.*

1. Every natural gas heating system has a source of heat, a heat distribution system, a temperature controlling device, a burner and a blower.

2. Most gas heating systems use petrol.

3. The function of air ducts is to control the temperature.

4. When the temperature of a particular environment drops, the heating can be turned on only by hand.

5. Most modern heating systems have a baseboard thermostat that has the capability of showing the temperature outside the room.

6. Natural gas is delivered to houses through pipes that run underground.

7. A gas meter is used for measuring and recording the amount of gas passed through it.

8. A burner functions to bring in the cool air from a particular part of the house and push it through a heat exchanger.

7. *Ответьте на вопросы.*

1. In what units is the capability of an appliance to heat the environment measured?

2. What components does a gas heating system consist of?

3. What is the function of air ducts?

4. What is a thermostat used for?

5. What is the function of a burner?

6. How is the temperature of the room controlled? What devices are used for this?

7. How does a blower operate?

8. *Составьте план текста для пересказа.*

9. *Расскажите об устройстве системы газового отопления, её основных элементах, о функциях, которые они выполняют, на английском языке. Используйте план упражнения 8.*

10. *а) Переведите следующие слова и словосочетания на русский язык, при необходимости воспользуйтесь словарем: combustion, induction heating, a household furnace, liquefied petroleum gas, fuel oil, to expel, a*

chimney, acidic condensate, a condensate pump, ducts, an intermediary distribution system, an air filter, a blower, plenum, foil duct tape, to seal.

b) Прочтите текст и перечислите вопросы, освещаемые в нем.

Furnace

A furnace is a device used for heating. The heat energy to fuel a furnace may be supplied by fuel combustion, by electricity or through induction heating in induction furnaces. A household furnace is installed to provide heat to the interior space through the movement of air, steam, or hot water. The most common fuel sources for modern furnaces include natural gas, liquefied petroleum gas, fuel oil, coal or wood.

Combustion furnaces always need to be vented to the outside. Traditionally, it has been through a chimney, which tends to expel heat and the exhaust. Modern high-efficiency furnaces can be 98% efficient and operate without a chimney. The small amount of waste gas and heat are mechanically ventilated through a small tube on the roof of the house.

Modern household furnaces are classified as condensing or non-condensing based on their efficiency in extracting heat from the exhaust gases. Furnaces with efficiencies greater than 89% heat extract from the exhaust and in which water vapour in the exhaust condenses are referred to as condensing furnaces. Such furnaces must be designed to avoid corrosion that this highly acidic condensate might cause and they must include a condensate pump to remove the accumulated water.

The flame originates at the burners and is drawn into the heat exchanger. The hot gasses pass through the chambers of the heat exchanger and heat its metal walls. The gasses cool as they transfer the heat to the heat exchanger. The cooled gasses then enter the draught inducer blower and are pushed into the venting pipes and out of the house.

As for heat distribution, the furnace transfers heat to the living space of the building through an intermediary distribution system. If the distribution is through hot water or through steam, then the furnace is termed a boiler. One advantage of a boiler is that the furnace can provide hot water for bathing and washing dishes, rather than requiring a separate water heater. But when the boiler breaks down, both heating and domestic hot water is not available. Most modern "warm air" furnaces use a fan to circulate air to the rooms of the house and to pull cooler air through ducts back to the furnace for reheating. This is called forced-air heating. At the furnace, cool air passes into the furnace, usually through the air filter, through the blower, then through the heat exchanger of the furnace, whence it is blown throughout the building. Air is circulated through metal or plastic ductwork. Unless the ducts and plenum have been sealed using mastic or foil duct tape, the ductwork is likely to have a high leakage of conditioned air into unconditioned spaces. Another cause of wasted energy is the installation of ductwork in unheated areas, such as attics and crawl spaces.

c) *Распределите вопросы в последовательности, соответствующей содержанию текста:*

1. Why can energy leakages occur?
2. What kinds of fuel are used for furnaces?
3. What components do furnaces have? What are their functions?
4. What types of furnaces are there? What is the difference between them?
5. What is a furnace?

d) *Ответьте на поставленные вопросы.*

Text 11

1. *Найдите русские эквиваленты английских слов.*

- | | |
|--------------------------------|---|
| 1. resistance heating | a. система отопления с баком-аккумулятором, теплоаккумуляционное электроотопление |
| 2. appliance | b. электрообогрев |
| 3. thermal storage heating | c. нагрев сопротивлением, контактный электронагрев |
| 4. electrical heating | d. нагрев джоулевым теплом, электрическим током, электрический нагрев |
| 5. baseboard electric heating | e. аппарат, прибор; приспособление, устройство |
| 6. space heater | f. печь; очаг |
| 7. radiant heater | g. комнатный электрообогреватель; электрический камин |
| 8. furnace | h. резистор, катушка сопротивления |
| 9. Joule heating | i. напольный электрообогрев |
| 10. electric current | j. источник (блок) электропитания |
| 11. resistor | k. радиационный нагреватель |
| 12. coil | l. тепловая электростанция |
| 13. electric power supply | m. катушка, обмотка |
| 14. fossil-fuelled power plant | n. электрический ток |

2. *Прочитайте и переведите текст.*

ELECTRIC HEATING

Electric heating or resistance heating converts electricity directly to heat. This process occurs when an electric current passes through a resistor, a device that turns the current into energy. Common applications include heating houses, cooking, and industrial processes. Electric heat is often more expensive than heat produced by combustion appliances using natural gas, propane, and oil. Electric resistance heat can be provided by baseboard heaters, space heaters, radiant heaters, furnaces, wall heaters, or thermal storage systems.

An electric heater is an electrical appliance that converts electrical energy into heat. The heating element inside every electric heater is simply an electrical resistor, and works on the principle of Joule heating: an electric current through a resistor converts electrical energy into heat energy. Electric heating can also occur through a heat pump, which uses an electric motor to draw heat from a source and to pump it into an area to be heated.

There is a wide variety of devices that provide electric heat. While the basic principles of these devices are the same, the manner in which they deliver heat is different. Radiant heaters (commonly referred to as space heaters) contain a coil that reaches a high temperature and emits heat. Convection heaters produce warm air that is released into the surrounding area through vent holes. Some convection heaters use an electric fan to speed up the air-flow. Radiant heating systems use electricity to heat tubes of water, which are generally located under the floor of a building. These tubes of water heat the floor, which then heats the surrounding area.

Mechanics of electrical heating is the following. When electric current passes through a resistor, the moving particles of the current interact with the resistor's atomic ions so that heat is produced. The resistor creates an electric field that accelerates the charged particles in the electric current, and these particles give up some part of their kinetic energy each time they collide with the atomic ions. The atomic ions absorb this kinetic energy, which manifests itself as heat and causes an increase in the temperature of the resistor. A typical electric heater has many resistors, which pass their heat to the heater's conductor (typically a series of metal coils). In this manner, energy is transferred from an electric power supply to the resistor and ultimately to the conductor, which then disperses the energy into the surrounding environment.

Electric heating is considered to be environmentally-friendly and economically efficient because of the high conversion rate of electric particles to heat. Modern electric heating systems can convert nearly all purchased electricity into heat. Many newer electric heating systems have storage capabilities that allow these systems to purchase electricity when the price is low and store that electric energy until it is needed to produce heat. You can calculate the cost of an electric heating system by estimating the system's cost per kilowatt hour, multiplying this number by the heater's efficiency, and then multiplying this quantity by the number of kilowatt hours the system will be used. For an electrical energy customer the efficiency of electric space heating can be 100% because all purchased energy is converted to heat. However, if the power plant supplying electricity is included, the overall efficiency drops. For example, a fossil-fuelled power plant may only deliver 4 units of electrical energy for every 10 units of fuel energy released. Even with a 100% efficient electric heater, the amount of fuel needed for a given amount of heat is more than if the fuel was burned in a furnace or a boiler in the building being heated.

In Sweden the use of direct electric heating has been restricted since the 1980s for this reason, and there are plans to phase it out entirely. Denmark has also banned the installation of electric space heating in new buildings for similar reasons.

3. Найдите пары слов, имеющих сходное значение.

to calculate	to prohibit
to heat	amount
quantity	appliance
to convert	to put a limit on
to restrict	to compute
to ban	to warm
device	to transform

4. Подберите определения к приведённым слева словам.

- | | |
|------------|---|
| 1. fuel | a) an appliance fired by gas, oil, or wood in which air or water is heated to be circulated throughout a building in a heating system |
| 2. device | b) material such as coal, gas, or oil that is burned to produce heat or power |
| 3. furnace | c) a thing made or adapted for a particular purpose, especially a piece of mechanical or electronic equipment |
| 4. heater | d) a device which is used to raise the temperature of something, for example, of the air or water |

5. Определите, соответствуют ли следующие предложения содержанию текста. Обоснуйте свой ответ. Используйте следующие выражения: *I can't agree with this, it's false, that may be true, but..., on the contrary, vice versa, I suppose it's true, that's right, I entirely agree with this statement.*

1. Heat produced by combustion appliances is more expensive than electric heat.
2. An electrical resistor is a heating element inside every electric heater.
3. An electrical resistor converts electrical energy into heat.
4. A conductor receives heat from resistors of an electric heater and disperses its energy into the surrounding environment.
5. Heat is produced when charged particles collide with the conductor's atomic ions.

6. In some countries direct electric heating has been restricted because of high electricity consumption.

6. Ответьте на вопросы.

1. What type of heating is called electric heating?
2. What electric heating devices do you know? Do they have any common elements?
3. What principle is their work based on?
4. What are the advantages and disadvantages of electric heating?
5. Why has electric heating been restricted or banned in some countries?
6. How can you calculate the cost of an electric heating system?

7. Перескажите текст на английском языке по следующему плану.

1. Overview of Electrical Heating.
2. Mechanics of Electrical Heating.
3. Environmental and Economic Considerations.

8. а) Переведите следующие слова и словосочетания на русский язык, при необходимости воспользуйтесь словарем: to plug into a wall socket, a heating coil, a circuit, low-gauge, to wrap, an alloy, to multiply, amperage, semi-permeable, to release, to diffuse, to disperse.

б) Прочтите текст и перечислите вопросы, освещаемые в нем.

How Does an Electric Heating System Work?

Components of Electric Heating

Electric heaters are generally heaters plugged into a wall socket. They're not a very complicated device. Basically, they're made up of a heating coil or element, possibly a fan or parabolic mirror to distribute the heat, and a unit for collecting energy that plugs into your wall and makes a completed circuit. This allows the heater to draw energy from your wall socket.

Basis of an Electric Heater: The Heating Coil

The heating coil is generally a very low-gauge wrapped wire that has a resistor on it. A resistor is an electric component made of wire wrapped around something with a very large amount of ohms, which measure electrical resistance. Many resistors are wires wrapped around a solid mixture of carbon dust and ceramics or resin, along with a plastic coating to hold it all together. These resistors serve to inhibit electrical flow through the wires of the heating coil. The resisting qualities of a heating coil are given by resistance wire, which has a high resistance from being low-gauge and is made of alloys that are highly resistant, such as nickel chrome alloys.

Converting Electrical Energy to Thermal Energy

Joule heating states that the heat produced from a wire is proportional to the resistance of a wire, multiplied by the square of the electrical current of the wire. This means that as the resistance and current of a wire rise, the

heat emitted will also rise. Because the resistor of an electric heating coil has an incredibly high resistance, even the relatively low amperage from the wall socket from your home is enough to cause the coil to radiate large amounts of heat. A very easy way of understanding this is by making a connection from the heater to water flowing through pipes. As the water (electricity) flows through the pipes (the coil), the resistor keeps the water in the pipes, causing pressure to appear. Eventually, as the pressure is high enough, the water seeps out of the pipes and is released into the outside, as if the pipes were semi-permeable at high pressures. The released water is analogous to the heat released by the wires.

Dispersing the Heat

The heat created by the electric heater can be diffused across space in many ways. Fans can be used to disperse the hot air caused by the heating coil. The heated air often creates a convection current in an area which disperses the heat across a large area.

c) Распределите вопросы в соответствующей содержанию текста последовательности:

1. What alloys are highly resistant?
2. What does Joule heating state?
3. What is a heating coil?
4. How is the heat created by the electric heater diffused?
5. What is a resistor?

d) Ответьте на поставленные вопросы.

Итоговые задания к разделам 1-2

1. Назовите английские эквиваленты следующих слов и словосочетаний:

Система отопления, распределение тепла, техобслуживание, кондиционирование воздуха, тепловой насос, труба, обратное отопление, котел, теплообменник, печь, электрообогрев, ископаемое топливо, батарея, подача тепла, электростанция, возобновляемые ресурсы, пригодный для питья, переработка (повторное использование), газовое отопление, нержавеющая сталь, сопротивление, однострубный, горение, передвигать по кругу, неисправный, герметичный, продувать, жаростойкий, распределительная камера возвратного воздуха, газовый счётчик, регулировать, перекрывать, прибор, катушка (обмотка), радиационный нагрев (лучистое отопление), воздушное отопление.

2. Выберите правильный вариант ответа.

1. Forced-air systems send heated air through
- a) electric wire b) ductwork c) radiators d) a heat pump

2. The process used to get rid of air accumulation in water pipes is known as

- a) heating b) ventilating c) gas supply d) bleeding

3. ... is a device that uses a small amount of energy to move heat from one location to another.

- a) a resistor b) a boiler c) a burner d) a heat pump

4. A boiler, a pump, a heat exchanger and radiators are components of

- a) a central heating system b) a gas heating system c) a furnace

5. Which of the following does not require a vent to remove the products of combustion?

- a) forced warm air furnaces with ductwork
 b) hot water systems (baseboard or radiators)
 c) space heating (floor furnaces, wall furnaces, heaters)
 d) heat pumps

6. In our area, the most popular types of systems used to heat and cool residences are:

- a) forced warm air furnaces with ductwork
 b) hot water systems (baseboard or radiators)
 c) space heating (floor furnaces, wall furnaces, heaters)
 d) all the above

3. Заполните следующую таблицу.

Types of Heating

	Water heating	Steam heating	Forced-air heating	Gas heating	Electric heating
Components					
Application					
Advantages					
Disadvantages					
Efficiency					

4. Подготовьте на английском языке сообщение на тему «Сравнительная характеристика разных видов отопления».

5. Подготовьте проекты по теме «Heating»:

1. Describe two different types of heating systems for each of the following applications: a house, an office, a commercial garage, a shop, a warehouse and a heavy engineering factory.

2. Sketch the installation of a ducted warm air heating system in a house and describe its operation.
3. Safety precautions taken in buildings occupied by very young, elderly, infirm and disabled people.
4. Thermal resistance of building materials.
5. Gas supply in modern Belarus.

Приложение 1

В процессе реферирования происходит существенная переработка содержания, композиции языка оригинала: выделяются главные факты и излагаются в краткой форме.

Язык и стиль оригинала претерпевают изменения в сторону нормативности, нейтральности, простоты и лаконичности. Реферат - это не простой набор ключевых фрагментов текста, на базе которого он строится, а новый самостоятельный текст.

Последовательность этапов реферирования статьи

Шаг 1. Прочитать статью внимательно и неторопливо два раза.

Шаг 2. Сделать заметки. При помощи заметок на полях составить для себя первое общее представление о внутреннем содержании и внешнем построении статьи: какие темы обсуждаются, сколько и какие абзацы связаны друг с другом логически или по содержанию. Важная информация (имена, названия мест, даты, статистические данные) также записываются на полях.

Шаг 3. Зафиксировать структуру статьи (план будущего реферата).

Шаг 4. Составить новый текст своими словами, сократив исходный вариант.

Реферат должен содержать ключевые слова и повторять последовательность изложения информации в тексте.

Содержание статьи при реферировании излагается объективно, без критической оценки содержания с позиции реферирующего.

Чтобы текст был связным, т.е. чтобы была соблюдена когерентность текста, необходимо знать стереотипные выражения и фразы, связующие текст (напр., and, also, but, besides, however, nevertheless, still, as a result, in particular, etc.).

Реферат должен составлять примерно $\frac{1}{3}$ - $\frac{1}{4}$ исходного текста. Предельным объемом реферата принято считать 1200 слов при сокращении текста оригинала от 3 до 10 раз.

Приблизительный объем реферата:

вступление - 2-4 предложения,

основное содержание - 12-15 предложений,

заключение - 2-4 предложения + заключительное предложение.

Клише и связующие фразы для реферирования

<p>The title of the text (article) is ...</p> <p>I'm going to draw your attention to ... to present the article headlined (under the headline) ...</p>	<p>Текст (статья) называется ...</p> <p>Хочу обратить Ваше внимание на представить статью под заголовком ...</p>
<p>The text (article) is devoted to the problem of ...</p> <p>The following problems are raised in the text (article)</p> <p>The primary task of the published article is ...</p> <p>The main aim of the article (text) is ...</p> <p>The article under review aims at ...</p> <p>In the modern world the problem of / the issue of '....' gains special significance / great importance.</p> <p>The article (text) deals with dwells on / upon comments on runs / reads / says that...</p> <p>The reporter focuses his attention on</p> <p> highlights points out stresses / emphasizes reveals / discloses reviews summarizes</p> <p>The article starts with ...</p> <p>The article under consideration points out...</p>	<p>Текст (статья) посвящена проблеме</p> <p>В тексте (статье) поднимаются следующие проблемы</p> <p>Основная задача опубликованной статьи ...</p> <p>Основной целью данной статьи (текста) является ...</p> <p>Рассматриваемая статья направлена на</p> <p>В современном мире проблема приобретает особую значимость / большое значение.</p> <p>В статье (тексте) рассматривается статья останавливается на комментирует говорит, что...</p> <p>Репортер акцентирует внимание на</p> <p>освещает указывает подчеркивает статья раскрывает дает обзор подводит итог, суммирует</p> <p>Статья начинается с</p> <p>В статье рассматривается / указывается ...</p>

Great attention in the article is paid to ...	Большое внимание в статье уделяется ...
Much effort is undertaken to analyse ...	Много усилий предпринимается для анализа ...
A special concern of the reporter is ...	Вопросом, требующим особого решения, по мнению автора, является ...
The article goes on to say ...	Далее в статье говорится ...
The paper argues / maintains / claims ...	Статья оспаривает / поддерживает / заявляет ...
The reporter finds a good deal to say in support of/ against ...	Автор находит многое сказать в поддержку / против ...
The paper finds it significant that ...	В статье считается важным, что ...
The reporter is confident that ...	Автор уверен, что ...
The article agrees / strongly believes / expresses approval of /	В статье выражается согласие / уверенность / одобрение
The author insists on ... ing / bitterly affects	Автор настаивает на ... / выступает с яростными нападками на ...
The paper is sharply critical of... The article (the reporter) expresses concern / alarm at (Ving) ...	Документ резко критикует ... выражает обеспокоенность / тревогу по поводу
The paper puts / places the responsibility for smth on smb.	Возлагается ответственность за ... на кого-л.
Many people think ... but others do not agree.	Многие люди думают, (что) ... , но другие не согласны.
Let us consider what the advantages and disadvantages of this matter are.	Давайте рассмотрим некоторые плюсы и минусы этого вопроса.
Let's consider some pros and cons of it. / Let us start by considering pros and cons of it.	Начнем с рассмотрения плюсов и минусов этого вопроса.
Let us start by considering the facts.	Начнем с рассмотрения фактов.

It is generally agreed today that ...	Сегодня общепризнано, что
To begin with,	Начнем с того, что
Firstly, ... / Secondly, ... / Finally,	Во-первых, ... /Во-вторых, .../ Наконец,
One argument in support of	Один из аргументов в поддержку
The first thing that needs to be said is ...	Первое, что нужно сказать, это то, что (Прежде всего, следует сказать, что)
First and foremost	В первую очередь
It is true that ... / clear that ... / noticeable that	Это правда, что ... / Ясно, что ... / примечательно, что ...
One should note here that	Здесь следует отметить, что
Another good thing about ... is that	Еще один положительный момент ... заключается в (том, что)
The second reason for	Вторая причина
It is often said that	Часто говорят, что
It is undeniable that...	Нельзя отрицать, что
It is a well-known fact that	Хорошо известно, что
For the great majority of people	Для подавляющего большинства людей
A number of key issues arise from the statement. For instance,	Это утверждение затрагивает ряд ключевых вопросов. Например, ...
One of the most striking features of this problem is	Один из самых поразительных аспектов этой проблемы
First of all, let us try to understand ...	Прежде всего, давайте попытаемся понять
The public in general tend to believe that	Общественность в целом склонна полагать, что
What is more,	Более того,
Besides, ... because it is	Кроме того, ... потому что
Doubtless,	Несомненно,

One cannot deny that	Нельзя отрицать, что
It is (very) clear from these observations that	Из этих наблюдений (абсолютно) ясно, что
On the other hand, we can observe that	С другой стороны, мы можем наблюдать, что
The other side of the coin is, however, that	Однако, с другой стороны,
Another way of looking at this question is to	Чтобы взглянуть на эту проблему с другой стороны, надо
One should, nevertheless, consider the problem from another angle.	Тем не менее, следует взглянуть на эту проблему с другой стороны.
One should, however, not forget that	Тем не менее, не следует забывать, что
If on the one hand it can be said that ... the same is not true for	И если с одной стороны, можно сказать, что ... , то же самое нельзя сказать о
On the other hand,	С другой стороны,
Although	Хотя
Besides,	Кроме того,
Moreover,	Более того,
Furthermore, one should not forget that	Кроме того, не следует забывать, что
In addition to	Кроме (того, что)
Nevertheless, one should accept that	Тем не менее, следует признать, что
However, we also agree that	Однако, мы также согласны с тем, что
Experts... ... believe that say that suggest that are convinced that point out that emphasize that	Эксперты считают, что говорят, что предполагают, что убеждены, что отмечают, что подчеркивают, что
According to some experts...	По мнению некоторых экспертов, .

Perhaps we should also point out the fact that	Возможно, нам также следует отметить тот факт, что
It would be unfair not to mention that fact that	Было бы несправедливо не упомянуть тот факт, что
One must admit that	Надо признать, что
We cannot ignore the fact that	Мы не можем игнорировать тот факт, что
One cannot possibly accept the fact that	Трудно смириться с тем фактом, что
From these facts, one may conclude that	Из этих фактов, можно сделать вывод (о том), что
Which seems to confirm the idea that	Что, по-видимому, подтверждает мысль (о том), что
Thus, ... / Therefore,...	Таким образом, ... / Поэтому
The most common argument against this is that	Наиболее распространенным аргументом против этого является то, что
In conclusion, I can say that although ... ,	В заключение я могу сказать, что, хотя ... ,
To draw the conclusion, one can say that	Подводя итог, можно сказать, что ...
So it's up to everybody to decide whether ... or not.	Так что каждый должен решить для себя ... ли ... , или нет.
The arguments we have presented ... suggest that ... / prove that ... / would indicate that	Представленные нами аргументы ... предполагают, что ... / доказывают, что ... / указывают на то, что
From these arguments one must ... / could... / might... conclude that	Исходя из этих аргументов, надо ... / можно ... / можно было бы ... прийти к заключению о том, что ...
That's all I wanted to say.	Это все, что я хотел(а) сказать.
That's it as far as this article (text) is	Что касается этой статьи (текста), у

concerned.	меня всё.
------------	-----------

Учебное издание

Составители: Людмила Николаевна Шпудейко
Ирина Ивановна Гайдук

**МЕТОДИЧЕСКИЕ УКАЗАНИЯ
ДЛЯ САМОСТОЯТЕЛЬНОЙ АУДИТОРНОЙ РАБОТЫ
ПО АНГЛИЙСКОМУ ЯЗЫКУ**

**для студентов специальности:
1-70 04 02 – «Теплогазоснабжение, вентиляция и охрана воздушного
бассейна»**

Ответственный за выпуск: Гайдук И.И.
Редактор: Боровикова Е.А.

