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МЕТОДИЧЕСКОЕ ПОСОБИЕ ПО НАПИСАНИЮ УЧЕБНОГО РЕФЕРАТА (SUMMARY) К НАУЧНОЙ СТАТЬЕ НА АНГЛИЙСКОМ ЯЗЫКЕ

Для студентов 1, 2 курсов
начинающих и слабопродолжающих групп
химического факультета МГУ

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Данное учебное пособие предназначено для написания реферата (summary) к статье по химии на английском языке для начинающих и слабопродолжающих групп. Учебное пособие имеет целью выработку у студентов навыка смыслового сжатия текстов по химии, краткое и обобщённое изложение содержания материала. Практическая цель учебного пособия – научиться извлекать информацию из большого объема научной литературы.

Учебное пособие состоит из двух частей: теоретической и практической. В теоретической части изложен алгоритм действий при написании реферата (summary). В практической части приводятся тексты с разработанными к ним упражнениями, развивающими умение обобщать научную информацию и кратко излагать материал.

Написание учебного реферата (summary) (от лат. *referre* «докладывать, сообщать») - это интеллектуальный творческий процесс, включающий смысловую компрессию (сжатие) письменных текстов, краткое и обобщенное изложение содержания материала. Материал подается в форме перечисления фактов, без использования рассуждения, исторических экскурсов и субъективных оценок.

Главная цель написания summary – дать общее представление о проблемах, вопросах, изложенных в данной статье.

Алгоритм действий при написании summary:

1. Внимательно прочитайте текст статьи.
2. Определите основную идею текста, первостепенные и второстепенные факты. Определите причинно-следственные связи между основными фактами и идеями текста.
3. Выделите в тексте ключевые слова и фрагменты.
4. Изложите основные положения текста в виде плана.
5. Упростите текст: обобщите несколько предложений в одно, сократите длинные предложения до словосочетаний.
6. Используйте лексическое и грамматическое перефразирование, избегайте механического переписывания фрагментов исходного текста. Найдите синонимы или альтернативные способы выражения мыслей (кроме терминологической лексики).
7. Summary должно быть выдержано в строгом научном стиле, чтобы придать summary формальный тон:

- ✓ не используются сокращенные глагольные формы (*it's, aren't, hasn't и др.);*
- ✓ не используются разговорные, идиоматические выражения, сленг;
- ✓ не используется местоимения 1-го лица (*I, we*);
- ✓ не используются эмоционально окрашенные слова, восклицательные знаки;
- ✓ не используются предложения, начинающиеся с союзов *and, but, or, so, because и др.*

8. Для текста summary характерно использование страдательного залога, как правило, настоящего времени (Present Simple Passive Voice).

Примеры:

A new problem *is studied.* - *Изучается* новая проблема.

Several substances *are examined*. - *Рассматривается* несколько соединений.

The cause of the explosion *is investigated*. - *Исследуется* причина взрыва.

9. Используйте в summary порядка 9-12 предложений или больше в зависимости от объема статьи и количества информации, которую необходимо изложить.

Как правило, summary состоит из двух частей: введения и основной части.
Во введении обычно формулируется основная идея статьи или цель ее написания.
Основная часть текста посвящена изложению основных положений статьи, аргументируются основные факты, приводятся примеры.
Примечание: если в анализируемой статье автор делает заключение, то в конце summary формулируется вывод.

I. Introduction (введение)

Введение обычно состоит из одного-двух предложений. Первое предложение реферата раскрывает основную идею статьи и может быть представлено одним из вариантов:

- **The article/paper deals with** … В статье рассматривается…
- **The article/paper is devoted to / concerned with** … Статья посвящена…
- **The chief/general/central/main/primary/ key/aim/goal/purpose/task of this article/ paper/ study is to investigate /to study/to establish** … главная/ основная/ ключевая цель/задача данной статьи заключается в том, чтобы исследовать/изучить/установить…

Примеры:

The article is devoted to the fundamentals of chemistry. – *Статья посвящена основным принципам изучения химии.*

The main aim of the paper is to find some optimal ways of producing hydrogen. *– Основная цель статьи заключается в том, чтобы найти оптимальные способы получения водорода*.

II. The body (основная часть)

В основной части дается общая характеристика статьи, раскрывается ее основное содержание, перечисляются основные идеи, затронутые в тексте. Для этого используются определенные лексические единицы:

Ниже перечислены глаголы, которые могут быть использованы при составлении summary:

- **to argue/to state** - утверждать
- **to analyze** - анализировать
- **to compare -** сравнивать
- **to consider** - рассматривать
- **to describe** - описывать
- **to demonstrate/illustrate** – демонстрировать, показывать
- **to develop** (method, technology, device) – разрабатывать (метод, технологию, прибор)
- **to discuss** - обсуждать
- **to define/to determine** - определять
- **to explain/to account for -** объяснять
- **to emphasize/to highlight -** выделять, подчеркивать
- **to examine -** изучать
- **to identify** - определять
- **to indicate/to point out -** указывать
- **to investigate/to study -** исследовать
- **to mention** – упоминать
- **to note** - отмечать
- **to observe** - наблюдать
- **to outline** - наметить в общих чертах/обрисовать
- **to propose/to suggest -** предлагать
- **to present/to reveal** - представлять
- **to report** - сообщать
- **to specify** - уточнять
- **to stress/to underline** - подчеркивать
- **to tackle/to solve a problem** - решать (проблему)
- **to touch upon** – затрагивать

Примеры*:*

The advantages of the method involved are outlined. - *Описаны преимущества данного метода.*

The characteristics of the acids are mentioned. - *Отмечаются свойства кислот.*

Следующие ***прилагательные*** *и* ***наречия*** помогут придать предложениям больше выразительности:

• **main/major/general/central/basic** – главный, основной (basic concept – основное положение, main difference – главное отличие, major constituents – основные составляющие)
• **significant/essential/crucial/key** – важный (significant information - важная информация, essential properties – важные свойства)
• **particular, special, specific** - особый (special/particular attention – особое внимание)
• **primary** – первостепенный (primary importance – первостепенная важность)
• **common** – широко известный, распространенный (common knowledge – общеизвестные факты)
• **accurately, carefully** - тщательно, внимательно
• **thoroughly, in detail** – подробно, детально, во всех подробностях
• **especially, particularly, specially, specifically** – особенно (исключительно) (particularly noted – особенно отмечено)

Примеры:

Special attention is paid to the phosphorus concentration in buffer solution. - *Особое внимание уделяется концентрации фосфора в буферном растворе.*

The structure of the tissue is thoroughly investigated. – *Тщательно изучается структура ткани*.

Примечание: Наречия *accurately*, *carefully* и *thoroughly* ставятся между вспомогательными и смысловыми глаголами, сочетание *in detail* – в конце предложения.

Логичность изложения достигается использованием ***слов-связок (linking words).***

Для **последовательного изложения** идей, фактов:

• ***To begin with –*** для начала следует сказать, что…/начнем с того, что…
• ***First/ Firstly -*** во-первых
• ***Second/ Secondly -*** во-вторых
• ***Third/Thirdly*** - в-третьих
• ***Then*** – затем
• ***Finally –*** наконец

Пример*:*

First/Firstly, three basic states of matter, such as liquid, gas and solid, are mentioned. – *Во-первых, в статье упоминаются три состояния материи, такие как жидкое, газообразное и твердое.*

Second/Secondly, special properties of each state of matter are described in detail. – *Во-вторых, подробно обсуждаются особые свойства каждого состояния материи.*

Для введения **дополнительной информации:**

- ***In addition, additionally*** **-** в дополнение
- ***Furthermore*** - далее, кроме того, более того
- ***What is more*** – более того
- ***Besides*** - кроме того
- ***Also*** – также
- ***Moreover*** **-** более того

Пример:

Furthermore, the difference in properties of various substances, which is determined by their molecular structure, is investigated*. – Кроме того, исследуются различия в свойствах веществ, что определяется их молекулярной структурой.*

Для указания на **результат или следствие** используются:

- ***As a result*** **-** *в результате*
- ***Therefore/ Consequently*** **-** *следовательно*

Пример:

Consequently, great attention to such notions as the binding energy of molecules and atoms is paid. - *Следовательно, огромное внимание уделено таким понятиям, как энергия связи молекул и атомов.*

Для приведения **примеров**:

- ***For example/ for instance*** – например
- ***Namely*** – а именно
- ***Such as*** –такие, как
- ***e.g.*** **-** например (напр.)
- ***i.e.*** - то есть (т.е.)

Пример:

The constituents of the atmosphere, namely, nitrogen, oxygen, carbon dioxide and water vapour, are listed. - *Основные компоненты атмосферы, а именно, азот, кислород, углекислый газ и водяной пар, перечислены в тексте.*

Запомните! **Большинство вводных слов и выражений отделяются от основной части предложения запятой.**

Примечание. Если в заключении статьи автор делает вывод, то в конце summary этот вывод излагается. Он может состоять из одного или двух предложений. Резюмировать информацию можно при помощи следующих ***слов-связок***:

- ***Thus/ therefore*** – таким образом
- ***Hence/ consequently*** – следовательно
- ***Finally/ ultimately*** – и наконец, в конечном итоге
- ***To summarize/to sum up*** **-** если подытожить, суммировать, то можно сказать, что…
- ***To conclude/in conclusion/to make/to draw the conclusion*** **-** в заключении следует сказать, что…

Пример:

In conclusion, the importance of water to living things is emphasized. – *В заключение, подчеркивается важность воды для всех живых существ.*

To sum up, the property of matter which is called inertia and fundamental law of conservation of matter are considered. - *В заключении скажем, что свойство материи, которое называется инерция, а также основные законы сохранения материи рассматриваются в статье.*

NB. По окончании работы проверьте summary на предмет орфографии, грамматики, пунктуации, стиля, написав черновой вариант, посмотрите, какие факты можно добавить, а какие стоит исключить. Убедитесь, что ваш текст:

1) точно и правильно передаёт содержание текста оригинала;

2) не содержит повторений;

3) не цитирует текст оригинала (мысль сформулирована своими словами), не содержит громоздких фраз, прямой речи.

Ниже приводится пример написания summary по данному тексту.

TEXT

Chemistry is the study of matter and chemical reactions between substances. Chemistry is also the study of matter's composition, structure, and properties. Matter is essentially anything in the world that takes up space and has mass. Chemistry is sometimes called "the central science" because it bridges physics with other natural sciences, such as geology and biology.

A basic chemical hypothesis first emerged in Greece when Aristotle defined the four elements of fire, air, earth, and water. It was not until the 17th and 18th centuries when scientists such as Robert Boyle (1627-1691) and Antoine Lavoisier (1743-1794) began to reshape the old alchemical traditions into a rigorous scientific discipline.

Chemistry has the power to explain innumerable phenomena in the world, from the ordinary to the bizarre. Why does iron rust? What makes propane such an efficient, clean-burning fuel? How can soot and diamond be so different in appearance yet so chemically similar? Chemistry has the answer to these questions and many more.

Understanding chemistry can be organized into distinct branches that emphasize subsets of chemical concepts. Analytical chemistry seeks to determine the exact chemical compositions of substances. Biochemistry is the study of chemicals found in living things (such as DNA and proteins). Inorganic chemistry studies substances that do not contain carbon. Organic chemistry studies carbon-based substances. Physical chemistry is the study of the physical properties of chemicals. Biophysical chemistry is the application of physical chemistry in a biological context.

As one of the natural sciences, chemistry provides scientists with insight into other physical sciences and powerful analytical tools for engineering applications. The biological sciences are rooted in biochemistry, and scientists are only now beginning to understand how different levels of organization influence each other. For example, the basis of modern medicine is the biochemical processes of the human body.

The plan of the text:

1. The definition of chemistry and matter
2. The historical background of chemistry
3. The questions that chemistry answers
4. The branches of chemistry
5. The scope of chemistry (or the application of chemistry)

An example of a summary

The article deals with the overview of chemistry. The main goal of the article is to give the general definition of chemistry as well as to speak about its scope and application. First, the notion of matter as anything in the world that has mass and occupies space is introduced. Second, chemistry is identified as a central science that is related to other natural sciences, such as physics, biology and geology. Third, early development of chemistry beginning from ancient Greece up to the 17^{th} -18^{th} centuries is mentioned.

Then, some natural phenomena that chemistry tries to explain, for example, why iron rusts or why soot and diamond differ in properties, are noted. In addition, the examples of some branches of chemistry, such as organic, inorganic, analytical, physical and others are listed and defined. Finally, the importance of chemistry as the study that provides scientists with insight into other natural sciences is underlined and the biochemical processes of the human body being the basis of modern medicine are regarded as an example of application of chemistry.

ПРАКТИЧЕСКАЯ ЧАСТЬ

В практической части предлагаются тексты для составления summary и некоторые упражнения для обучения реферированию.

TEXT 1

Alexander Fleming was looking for ways to destroy bacteria. He was growing lots of bacteria on special plates. The lab was rather untidy and from time to time **mold** appeared on the plates. Fleming noticed that no bacteria were growing around the mold. Straight on Fleming noticed that this might be important.

Fleming worked hard on his discovery. He got some "mold juice" which he called penicillin. But he could not get much penicillin from the mold. It would not keep even in the fridge. By 1934 Fleming had given up on penicillin. He went on to do some different work.

Other scientists decided to continue research on penicillin. They infected eight mice with bacteria which would normally kill them. Four of them were given penicillin. The four treated mice stayed healthy – but the other four died.

The scientists did not give up. They collected more penicillin and used it for a 15-year old boy who had an infection after an operation. The boy was cured.

The scientists showed the value of penicillin in destroying bacteria. The next problem was making enough of it to supply the demand of the soldiers in World War II. In Great Britain big laboratories and factories were busy with this research. The scientists took their mold to the United States where some of the big chemical companies helped them make penicillin on a large scale. Penicillin became available to everyone and the history of infectious diseases changed forever.

mold (mould) - плесень

1. Choose the most suitable title out of the given ones:

A. The biography of A. Fleming
B. The discovery of penicillin
C. The work of A. Fleming
D. The value of penicillin

2. Match the headings A-G with the corresponding paragraphs. There is one extra heading.

A. Experimenting with mice
B. Fighting the infection
C. Obtaining mold
D. Drawbacks of "mold juice"
E. The importance of penicillin and largescale production

G. The properties of penicillin

3. Choose the most suitable item reflecting the aim of the text out of the given ones:

- The main objective of the text is to inform the reader about the biography of the great scientist A. Fleming.
- The central aim of the text is to highlight some important stages in penicillin production.
- The principal goal of the author is to give some information about discovery, application and value of penicillin.
- The chief purpose of the text is to inform the reader about the history of the discovery of penicillin.
- The main purpose of the text is to give some information about curative properties of penicillin.

4. Write out:

a) key words of each paragraph (for example, in the first paragraph – mold, bacteria, untidy etc.);
b) the sentences expressing the main idea(s) of each paragraph.

5. Read the statements (situations) and answer the following questions using the pattern:

1) *Alexander Fleming was looking for ways to destroy bacteria and to obtain the mold.*
- What does the author point out?
- The author points out search for ways to destroy bacteria and to obtain the mold.

2) *The lab was rather untidy and from time to time mold appeared on the plates.*
- What does the author note?
- The author notes appearance of mold on the plates because of the messy lab.

3) He got some "mold juice" which he called penicillin but he could not get much penicillin from the mold.
- What does the author report on?
- ……

4) By 1934 Fleming had given up on penicillin. He went on to do some different work.

- What does the author mention?
- ……

5) Other scientists decided to continue research on penicillin.
- What does the paper consider?
- ……

6) The scientists showed the value of penicillin in destroying bacteria.
- What does the article emphasize?
- ……

7) The next problem was making enough of it to supply the demand of the soldiers in World War II.
- What does the author stress?
- ……

8) The scientists took their mold to the United States where some of the big chemical companies helped them make penicillin on a large scale.
- What does the author describe?
- ……

9) Penicillin became available to everyone and the history of infectious diseases changed forever.
- What does the author draw attention to?
- ……

6. Change the following sentences from Active Voice into Passive Voice:

1) *The author **points out** search for ways to destroy bacteria and to obtain the mold. – Search for ways to destroy bacteria and to obtain the mold **is pointed out**.*
2) The author ***notes*** the appearance of mold on the plates because of the messy lab.
3) The author ***reports on*** the impossibility of getting much of the "mold juice", which he obtained and called penicillin.
4) The author ***mentions*** Fleming's giving up his work and switching to a different work.
5) The paper ***considers*** the decision of other scientists to continue their work on penicillin.
6) The article ***emphasizes*** the value of penicillin in destroying bacteria.
7) The author ***stresses*** the necessity of making sufficient amount of penicillin to supply the demand of the soldiers in World War II.
8) The author ***describes*** taking the mold to the United States and starting its production on a large scale.

9) The author ***draws attention*** to availability of penicillin to everyone and its role in changing the history of infectious diseases.

7. Write a summary of the text using your plan, the key words and the sentences you have written out.

TEXT 2

Scientists working on a problem do not know and sometimes cannot even guess what the final result will be. Professor Rontgen was a physicist at the University of Wurzburg in Germany. Late on Friday, 8 November 1895, he was doing an experiment in his laboratory when he noticed something extraordinary. He had covered an electric bulb with black cardboard, and when he switched on the current, he saw little dancing lights on his table. Now the bulb was completely covered; how then could any ray penetrate? On the table there were some pieces of paper, which had been covered with metal salts. It was on this paper that the lights were shining. Professor Rontgen took a piece of this paper and held it at a distance from the lamp. Between it and the lamp, he placed a number of objects: a book, a pack of cards, a piece of wood and a doorkey. The ray penetrated every one of them except the key. This mysterious ray could shine through everything except the metal. He called his wife into the laboratory and asked her to hold her hand between the lamp and the photographic plate. She was very surprised by this request, but she obediently held up her hand for a quarter of an hour, and when the plate was developed, there was a picture of the bones of her hand and of the ring on one finger. The ray could pass through the flesh and not through the bone or the ring. At a scientific meeting where he described what happened Professor Rontgen called this new ray "the Unknown", the X-ray. Doctors quickly saw how this could be used, and soon there were X-ray machines in all the big hospitals. At first the doctors did not understand how powerful the rays were and many of them were injured, losing a finger or an arm through the exposure to X-rays when they were using machines. The most obvious use for this discovery was to make possible for doctors and surgeons to see how a bone was fractured. Other uses came later. It was found that these rays could be used to destroy cancer cells. Methods were found later by which **ulcers** in the stomach could be located, the lungs could be X-rayed to show if there was any tuberculosis present. Unfortunately for Rontgen whose discovery did so much for medical science, envious colleagues spread the story that he had stolen his discovery from a laboratory assistant who worked for him. He died, poor and forgotten, in 1923.

(After "Britain in the Modern World, the Twentieth Century" by E.N. Nash and A.M. Newth)

ulcer - язва

1. Read the following text and choose the most suitable title out of the given ones:

A. The discovery and application of X-rays
B. Professor Rontgen's biography
C. The application of X-rays
D. The properties of X-rays
E. A powerful technique
F. The science of roentgenology and radiology

2. Divide the text into logical parts and entitle them.

3. Write out the sentence(s) expressing the main idea(s) of each logical part of the text.

4. Condense the sentences of the text where possible.

Example: He had covered an electric bulb with black cardboard, and when he switched on the current, he saw little dancing lights on his table. – While making an experiment with electric current and black cardboard, he noticed something unusual.

5. What information given in the text is *not* important to understand the idea of discovery of X-rays and their application?

6. Read the statements (situations) and answer the following questions using the pattern:

1) *Scientists working on a problem do not know and sometimes cannot even guess what the final result will be.*
- What does the author emphasize?
- The author emphasizes the unknown final result while working on a problem.

2) The ray penetrated every one of them (a book, a pack of cards, a piece of wood) except the key. The ray could pass through the flesh and not through the bone or the ring.
- What does the author point out?
- ……

3) Doctors quickly saw how this could be used, and soon there were X-ray machines in all the big hospitals.
- What does the author stress?
- …….

4) At first the doctors did not understand how powerful the rays were and many of them were injured, losing a finger or an arm through the exposure to X-rays when they were using machines.
- What does the author describe?
- ……..

5) It was found that these rays could be used to destroy cancer cells… the lungs could be X-rayed to show if there was any tuberculosis present.
- What does the author note?
- ……

7. Transform your answers to the statements (situations) from exercise 6 from Active Voice into Passive Voice using the pattern:

Example 1: *The author emphasizes the unknown final result while working on a problem. – The possibility of an unknown final result while working on a problem is emphasized.*

8. Write a summary of the text making use of the plan and the sentences you have written out. Omit unnecessary details. Begin your summary in the following way:

The text entitled « … **» *deals with/ is concerned with/ is devoted to* the discovery of X-rays, one of the most powerful tools in the history of science.**

TEXT 3

Acids and bases are two of the most important classes of chemical compounds. The presence of a small sampling of acids and bases around the home demonstrates their importance in daily life. A few of these include fruit juice, aspirin, milk, ammonia, baking soda, vinegar and soap. Beyond their necessity in numerous household items, acids and bases are key ingredients in the chemical process industry. In the United States sulfuric acid is more produced than any other chemical with an annual production of 40 million tons. While the commercial applications of acids and bases illustrate their importance in everyday life, on a more fundamental level each one of us inherited our characteristics and genetic make-up through the acid DNA, deoxyribonucleic acid.

Human use of acids and bases dates back thousands of years. Probably the first acid to be produced in large quantities was acetic acid. Vinegar is a diluted aqueous solution of acetic acid. This acid is an organic acid that forms when naturally occurring bacteria *acetobacter aceti* convert alcohol to acetic acid. Ancient Sumerians used wine to produce vinegar for use in medicines and as a preserving agent. A significant advance in chemistry occurred around the year

1200 when alchemists discovered how to prepare strong mineral acids. These acids include sulfuric, nitric and hydrochloric acid. *Aqua regia* or royal water consists of a mixture of one-part nitric acid and three parts of hydrochloric acid. The name *aqua regia* denotes the ability of this mixture to dissolve precious metals such as gold. The word "acid" comes from the Latin word "acere", which means sour.

The use of bases or alkalines also dates back thousands of years. Bases were created as prehistoric humans carried out their daily activities. Bases are a key ingredient of soap; some of the first soap recipes date back to 2800 B.C. from the Babylonian period. The Egyptians combined lime (calcium oxide) and soda ash (sodium carbonate) and evaporated the product to produce caustic soda (NaOH). They used this base to produce cleansers and dyes for materials and in the preparation of papyrus. Bases were used in ancient China to make paper.

Chemical analyses conducted by Humphrey Davy around 1810 demonstrated that oxygen was not present in many acids, for example, hydrochloric acid (HCL). In 1838 Justus Liebig (1803-1873) defined an acid as a compound that contains hydrogen that can be replaced by a metal. Throughout the 1800s scientists considered a base to be a substance that neutralized an acid. In the last decade of the nineteenth century chemists had an adequate theoretical description of acids and bases. Until then, most acids and bases were classified according to their general properties.

1. Read the following text and choose the most suitable title out of the given ones:

A. The importance of acids and bases in daily life
B. Human use of acids and bases
C. The properties and applications of bases and acids
D. Acids and bases

2. Match the heading A-E with the corresponding paragraphs. There is one extra heading.

A. Creating and using bases in ancient times
B. Chemical experiments on bases and acids
C. Important classes of chemical compounds
D. Composition of acids and history of their usage
E. The preparation of paper

3. Which of the following sentences expresses the aim of the article:

1. The main purpose of the text is to give some general information on acids and bases.

2. The principal goal of the text is to describe two broad classes of compounds that have significant impacts on our lives.
3. The central aim of the text is to highlight that the most common acids and bases are those that occur in aqueous solutions.
4. The main objective of the text is to provide an introduction and history of two of the most important classes of chemical compounds which are acids and bases.
5. The chief purpose of the text is to illustrate a significant advance in chemistry which occurred in the nineteenth century.
6. The main goal of the text is to give an adequate definition for acids and bases.
7. The main aim of the text is to give theoretical description of acids and bases.

4. Write out:

a) key words out of each paragraph (for example, in the first paragraph – chemical compounds, key ingredients, genetic make-up etc.);
b) the sentences expressing the main idea(s) of each paragraph.

5. Change the following sentences from Active Voice into Passive Voice:

Example: *Acids and bases are two of the most important classes of chemical compounds. - Acids and bases as two of the most important classes of chemical compounds are pointed out.*

1. The author considers the key role of acids and bases in the chemical process industry.
2. The author mentions the commercial applications of acids and bases and their importance in everyday life.
3. The author regards acetic acid as the first acid produced in large quantities.
4. The author notes using wine for medical purposes and as a preserving agent.
5. The paper touches upon the creation of bases by prehistoric humans as a result of their daily activities.
6. The author describes the ability of *aqua regia* to dissolve precious metals such as gold.
7. The author emphasizes the usage of bases in making paper in ancient China.
8. The author points out production of caustic soda by combining lime (calcium oxide) and soda ash (sodium carbonate) and evaporating the product.
9. The paper mentions the use of the base (NaOH) to produce cleansers and dyes and to prepare papyrus.

10. The author regards the definition of an acid as a compound containing hydrogen that can be replaced by a metal.

6. Transform the sentence(s) in such a way that the idea expressed in them starts with the noun in the subject function and Present Passive Voice is used:

Example 1: *The presence of a small sampling of acids and bases around the home demonstrates their importance in daily life.* – The importance of a small sampling of acids and bases around the home is stressed.

Example 2: *Beyond their necessity in numerous household items, acids and bases are key ingredients in the chemical process industry.* – Acids and bases as key ingredients in the chemical process industry are pointed out.

1) Each one of us inherited our characteristics and genetic make-up through the acid DNA, deoxyribonucleic acid.
2) Probably, the first acid to be produced in large quantities was acetic acid.
3) Ancient Sumerians used wine to produce vinegar for applying in medicines and as a preserving agent.
4) The Egyptians combined lime (calcium oxide) and soda ash (sodium carbonate) and evaporated the product to produce caustic soda (NaOH).
5**)** In 1838 Justus Liebig defined an acid as a compound that contains hydrogen that can be replaced by a metal.
6) Throughout the 1800s scientists considered a base to be a substance that neutralized an acid.

7. The first sentence in your summary reflects the main idea of the text. Complete the first sentence of your summary using one of these phrases:

The text deals with…
The text is concerned with…
The text is devoted to…

8. Write a summary of the text using your plan, the key words and the sentences you have written out.

TEXT 4

Just as the modern science of chemistry developed from the ancient arts and alchemy, so did the language of chemistry progress from ancient roots. During ancient times, humans knew of seven metals and each of these was associated with the seven known celestial bodies and the seven days of the week. The characteristics of the metal and celestial bodies were thought to be related, and astrological symbols represented an early form of naming chemicals. Gold was associated with the glowing sun, and a circle, considered to be the most perfect shape, was used to represent it. Silver was related to and represented by the moon. Saturn, the most distant planet known at the time, moved slowly across the sky and was associated with the heavy metal lead. The seven metals and their associated **celestial body** and ancient symbols are shown in the Table. As the ancients and alchemists discovered more substances, an increasing number of symbols were required to represent the substances. Because different civilizations used different symbols for the same substance, confusion resulted and there was no common language to transfer chemical knowledge. This situation **persisted** up to the nineteenth century. Even Lavoisier, who put so much effort in constructing an **unambiguous** chemical language, used pictures to represent elements. Lavoisier and his colleagues used letters enclosed in a circle, short straight lines, and semicircles to represent substances. Hydrogen, sulfur, carbon, and phosphorus were represented as H, S, C and P respectively. Dalton too would not **divorce** himself **from** the use of pictures to represent elements and compounds.

Metals, Celestial Bodies and Ancient symbols

In 1814, the eminent Swedish chemist Jacob Berzelius (1779–1848) **discarded** the old sign language of chemical symbols and proposed a new system based on the initial letter of the element. Berzelius used the initial letter of its Latin name to symbolize an element. If two elements had the same first letter, Berzelius would include a second letter that the two elements did not have in common. He used names for existing chemicals, and this explains why some of our modern symbols seem unrelated to their English names. For example, gold comes from aurum (Au), sodium from natrium (Na), and potassium from kalium (K). During the nineteenth and twentieth centuries, as new elements were identified, the discoverer received the honor of naming the element. Different trends in assigning names developed at different times. Element names were based on mythological figures, celestial bodies, color, chemical properties, geographical areas, minerals, derived names and people.

Metal	Body	Symbol
Gold	Sun	
Silver	Moon	
Mercury	Mercury	
Copper	Venus	
Iron	Mars	
Tin	Jupiter	
Lead	Saturn	

to discard – *отбрасывать, отклонить*
celestial bodies – *небесные тела*
to persist – *настаивать, продвигаться*
unambiguous – *недвусмысленный, неоднозначный*
to divorce from – *отказываться от чего-либо*

1. Read the following text and choose the most suitable title out of the given ones:

A. Astrological symbols represent an early form of naming elements
B. The use of different symbols by different civilizations
C. The history of naming elements
D. Different trends in assigning elements developed at different times

2. Divide the text into the logical parts and entitle them.

3. Write out the sentence(s) expressing the main idea(s) of each logical part of the text.

4. Condense the sentences of the text where possible.

Example: *Berzelius used the initial letter of the Latin name of the element to symbolize an element. If two elements had the same first letter, Berzelius would include a second letter that the two elements did not have in common.* – While naming the element he used the initial letter of the Latin description of the element and the second one if they had the same first letter.

5. What information given in the text is *not* important to understand the Idea of the history of naming elements?

6. Read the statements (situations) and answer the following questions using the pattern:

1) *Just as the modern science of chemistry developed from the ancient arts and alchemy, so did the language of chemistry progress from ancient roots.*
- What does the author point out?
- The author points out the development of modern science and the language of chemistry from the ancient arts and alchemy.

2) During ancient times, humans knew of seven metals and each of these was associated with the seven known celestial bodies and the seven days of the week.
- What does the author explain?
- ……

3) The characteristics of the metal and celestial bodies were thought to be related, and astrological symbols represented an early form of naming chemicals.
- What does the author discuss?
- ……..

4) Gold was associated with the glowing sun, and a circle, considered to be the most perfect shape, was used to represent it.
- What does the author report?
- ……..

5) As the ancients and alchemists discovered more substances, an increasing number of symbols were required to represent the substances.
- What does the author note?
- ……

6) Because different civilizations used different symbols for the same substance, confusion resulted and there was no common language to transfer chemical knowledge.
- What does the author explain?
- ……..

7. Transform your answers to the statements (situations) from exercise 6 From Active Voice into Passive Voice using the pattern:

Example 1: *The author points out the development of modern science and the language of chemistry from the ancient arts and alchemy. – The development of modern science of chemistry and the language of chemistry from the ancient arts and alchemy is pointed out.*

8. Write a summary of the text making use of the plan and the sentences you have written out. Omit unnecessary details. Begin your summary in the following way:

The text entitled « … **» *deals with/ is concerned with/ is devoted to* the history of naming elements since ancient times to nowadays.**

APPENDIX I

ADDITIONAL TEXTS FOR WRITING A SUMMARY

TEXT 1

Environmental chemistry plays a key role in the environment. Chemical species present in the environment are either naturally occurring or generated by human activities. Environmental pollution is the effect of undesirable changes in the surrounding that have harmful effects on plants, animals and human beings. Pollutants exist in all the three states of matter. We have discussed only those pollutants, which are due to human activities, and which can be controlled. Atmospheric pollution is generally studied as tropospheric and stratospheric pollution. Troposphere is the lowest region of the atmosphere (~10 km) in which man along with other organisms including plants exist. Whereas stratosphere extends above troposphere up to 50 km above the sea level. Ozone layer is one of the most important constituents of stratosphere. Tropospheric pollution is basically due to various oxides of sulphur, nitrogen, carbon, halogens and also due to **particulate pollutants**. The gaseous pollutants come down to the earth in the form of acid rains. 75% of the solar energy reaching earth is absorbed by the earth surface and the rest is radiated back to the atmosphere. The gases mentioned above trap the heat which results in global warming. It is important to realize that these very gases are also responsible for sustaining life on the earth as they trap the **requisite amount** of solar energy for that. The increase in the greenhouse gases is raising the temperature of the earth's atmosphere which, if not checked, may eventually result in melting polar ice caps and consequently may **submerge** the costal land mass. Many human activities are producing chemicals, which are responsible for the depletion of ozone layer in the stratosphere, leading to the formation of ozone hole. Through the ozone hole, ultraviolet radiation can penetrate the earth's atmosphere causing mutation of genes. Water is the elixir of life but the same water, if polluted by pathogens, organic wastes, toxic heavy metals, pesticides etc., will turn into poison. Therefore, one should take care to follow international standards to maintain purity levels of drinking water. Industrial wastes and excessive use of pesticides result in pollution of land mass and water bodies. **Judicious** use of chemicals required for agricultural practices can lead to sustainable development. Strategies for controlling environmental pollution can be: (i) waste management i.e., reduction of waste and proper disposal, also recycling the materials and energy, (ii) adopting methods in day-to-

day life, which result in the reduction of environmental pollution. The second method is a new branch of chemistry, which is referred to as green chemistry. It utilizes the existing knowledge and practices so as to bring about reduction in the production of pollutants.

particulate pollutants – загрязняющие частички**,** твердые частицы (в воздухе)
requisite amount – требуемое количество
to submerge – затопить
judicious - благоразумный

Exercise 1. Provide the text with a title.
Exercise 2. Divide the text into paragraphs and entitle them.
Exercise 3. Write a summary of the text.

TEXT 2

The usage of bacteria for the controlled storage and release of hydrogen

The fight against climate change is making the search for carbon-neutral energy sources increasingly urgent. Green hydrogen, which is produced from water with the help of renewable energies such as wind or solar power, is one of the solutions on which hopes are pinned. However, transporting and storing the highly explosive gas is difficult, and researchers worldwide are looking for chemical and biological solutions. A team of microbiologists from Goethe University Frankfurt has found an enzyme in bacteria that live in the absence of air and bind hydrogen directly to CO_2, in this way producing **formic acid**.
The process is completely reversible -- a basic requirement for hydrogen storage. These acetogenic bacteria, which are found, for example, in the deep sea, feed on carbon dioxide, which they metabolize to formic acid with the aid of hydrogen. Normally, however, this formic acid is just an intermediate product of their metabolism and further digested into acetic acid and ethanol. But the team led by Professor Volker Müller, head of the Department of Molecular Microbiology and Bioenergetics, has adapted the bacteria in such a way that it is possible not only to stop this process at the formic acid stage but also to reverse it. The basic principle has already been patented since 2013.
"The measured rates of CO_2 reduction to formic acid and back are the highest ever measured and many times greater than with other biological or chemical catalysts; in addition, and unlike chemical catalysts, the bacteria do not require rare metals or extreme conditions for the reaction, such as high temperatures and high pressures, but instead do the job at 30 °C and normal pressure," reports Müller. The group now has a new success to report: the development of a biobattery for hydrogen storage with the help of the same bacteria.

For municipal or domestic hydrogen storage, a system is desirable where the bacteria first store hydrogen and then release it again in one and the same bioreactor and as stably as possible over a long period of time. Fabian Schwarz, who wrote his doctoral thesis on this topic at Professor Müller's laboratory, has succeeded in developing such a bioreactor. He fed the bacteria hydrogen for eight hours and then put them on a hydrogen diet during a 16-hour phase overnight. The bacteria then released all the hydrogen again. It was possible to eliminate the unwanted formation of acetic acid with the help of genetic engineering processes. "The system ran extremely stably for at least two weeks," explains Fabian Schwarz, who is pleased that this work has been accepted for publication in *Joule*, a journal for chemical and physical process engineering.
Volker Müller had already studied the properties of these special bacteria in his doctoral thesis -- and spent many years conducting fundamental research on them. As a result of climate change, his research has acquired a new, **application-oriented** dimension. Surprisingly for many engineers, biology can produce by all means practicable solutions.

formic acid - муравьиная кислота
application-oriented – проблемно-ориентированный, ориентированный на конкретное применение

Exercise 1. Make up a plan of the text.
Exercise 2. What part of the text if any can be omitted for your future summary?
Exercise 3. Write a summary of the text.

TEXT 3

Almost all the chemical processes in a living organism are controlled by the catalytic proteins called enzymes. They are the three-dimensional **jigs** and tools of biochemistry, with which molecules are assembled, transformed and destroyed. Each enzyme acts by combining with the molecules involved in a particular reaction (the substrates of the reaction) and speeding up the making or breaking of a specific covalent chemical bond. Most of the bonds in biological molecules are very stable and rarely break by chance; consequently, without enzymes few biological molecules would react with others at physiological temperatures. Enzymes catalytically promote reactions between molecules; like all other catalysts, they are never consumed in the course of the reaction. The proteolytic, or protein-cutting, enzymes constitute a large group. They are proteins whose function is to alter or decompose other proteins by splitting them into fragments. Within this group, the **serine proteases** form an important family whose members are essential to a variety of biological activities. Serine proteases participate in digestion, in the formation and dissolution of **blood clots**, in the immune reaction

to foreign cells and organisms and other vital processes. Even though their physiological functions are diverse, however, they all seem to employ the same catalytic mechanism to promote the same chemical process: the **cleavage** of a particular kind of chemical bond common to all proteins. The three-dimensional structure of some of the serine proteases — in particular those of the digestive enzymes — has been determined in atomic detail. The analysis of structure not only reveals what the molecule “looks like" but also suggests how it might work. Any proposed model of the catalytic mechanism must be consistent with the structure of the enzyme and the substrates. Knowledge of structure has provided another insight into the nature of the serine proteases. It reveals that most of these enzymes are related, that they evolved from a common ancestor. It appears that a single mechanism for protein cutting, which may have emerged early in the history of life, was conserved during subsequent evolution. Moreover, the same mechanism was applied to a variety of tasks, some of which must be far removed from the task of the **ancestral** enzyme.

jig – приспособление
serine protease – сериновая протеаза
blood clot – тромб
cleavage – расщепление
ancestral – исконный, наследственный

Exercise 1. Provide the text with a title.
Exercise 2. Divide the text into paragraphs and entitle them.
Exercise 3. Write a summary of the text.

TEXT 4

Purifying water with the help of wood, bacteria and the sun

According to the United Nations, about one-fifth of the world's population lives in areas where water is scarce. Therefore, technologies to produce clean water from undrinkable sources, such as seawater, river or lake water, and contaminated water, are urgently needed. Now, researchers reporting in *Nano Letters* have developed a wood-based steam generator that, with the help of bacterial-produced nanomaterials, **harnesses** solar energy to purify water.

A solar steam generator is a device that uses the abundant energy of the sun to separate pure water from its contaminants by evaporation. Many different versions of these devices have been developed with varying efficiencies. To design better solar steam generators, researchers must find ways to improve light absorption, heat management, water transport and evaporation. Scientists at the University of Science and Technology of China wanted to combine all four

improvements in a single device. They chose wood as the basis of their generator because of its sustainability and porous structure, which allows rapid water transport.

The researchers made their device with the help of bacteria that produced long cellulose nanofibers, which bound the layers of the device together. The team added bacteria to the surface of a block of wood and allowed them to ferment. Then, they sprayed an aerosol of glass bubbles -- tiny hollow spheres that provide excellent thermal insulation -- onto the surface. The glass bubbles became embedded in the cellulose nanofibers produced by the bacteria, forming a hydrogel. Finally, the researchers added carbon nanotubes, which **tangled** with the cellulose nanofibers to form a light-absorbing, water-evaporating top layer. The device works by transporting water upward through the wood to the light-absorbing layer, which is heated by the sun. The water evaporates, and the steam is collected and condensed to produce pure water. The insulating layer of glass bubbles keeps heat from being transferred downward through the device and lost, and the nanoscale structures lower the energy required for water vaporization. As a result, the new device has a higher evaporation rate and efficiency than most existing solar steam generators.

to harness- использовать
to tangle – переплетаться

Exercise 1. Make up a plan of the text.
Exercise 2. Write a summary of the text.

TEXT 5

The manufacture of many chemicals important to human health and comfort consumes fossil fuels, thereby contributing to extractive processes, carbon dioxide emissions and climate change. A new approach employs sunlight to convert waste carbon dioxide into these needed chemicals, potentially reducing emissions in two ways: by using the unwanted gas as a raw material and sunlight, not fossil fuels, as the source of energy needed for production.

This process is becoming increasingly **feasible** thanks to advances in sunlight-activated catalysts, or photocatalysts. In recent years investigators have developed photocatalysts that break the resistant double bond between carbon and oxygen in carbon dioxide. This is a critical first step in creating “solar” **refineries** that produce useful compounds from the waste gas—including “platform” molecules that can serve as raw materials for the synthesis of such varied products as medicines, detergents, fertilizers, and textiles. Photocatalysts are typically semiconductors, which require high-energy ultraviolet light to generate the electrons involved in the transformation of carbon dioxide. Yet ultraviolet light is

both scarce (representing just 5 percent of sunlight) and harmful. The development of new catalysts that work under more abundant and **benign** visible light has therefore been a major objective. That demand is being addressed by careful engineering of the composition, structure, and morphology of existing catalysts, such as titanium dioxide. Although it efficiently converts carbon dioxide into other molecules solely in response to ultraviolet light, doping it with nitrogen greatly lowers the energy required to do so. The altered catalyst now needs only visible light to yield widely used chemicals such as methanol, formaldehyde, and formic acid—collectively important in the manufacture of adhesives, foams, **plywood, cabinetry**, **flooring**, and disinfectants. At the moment, solar chemical research is occurring mainly in academic laboratories, including the Joint Center for Artificial Photosynthesis, run by the California Institute of Technology in partnership with Lawrence Berkeley National Laboratory; a Netherlands-based collaboration of universities, industry and research and technology organizations called the Sunrise consortium; and the department of heterogeneous reactions at the Max Planck Institute for Chemical Energy Conversion in Mülheim, Germany. Some start-ups are working on a different approach to transforming carbon dioxide into useful substances—namely, applying electricity to drive the chemical reactions. Using electricity to power the reactions would obviously be less environmentally friendly than using sunlight if the electricity were derived from fossil-fuel combustion, but reliance on photovoltaics could overcome that drawback. The advances occurring in the sunlight-driven conversion of carbon dioxide into chemicals are sure to be commercialized and further developed by start-ups or other companies in the coming years. Then the chemical industry—by transforming what today is waste carbon dioxide into valuable products—will move a step closer to becoming part of a true, waste-free, circular economy, as well as helping to make the goal of generating negative emissions a reality.

feasible – возможный**,** выполнимый
refinery – установка
benign - мягкий
plywood – фанера
cabinetry – мебель
flooring - половое покрытие, настил

Exercise 1. Provide the text with a title.
Exercise 2. Divide the text into paragraphs and entitle them.
Exercise 3. Write a summary of the text.

TEXT 6

There are two basic options for determining the concentration of ammonium cations (NH_4^+) in rivers, lakes, and other bodies of water. This concentration is an important environmental indicator, as high levels of ammonium, often caused by industrial pollution or excess fertilizer washed from fields, can cause toxic and damaging **algal blooms.**

The first option is to analyze samples of water using ion chromatography, usually combined with a simple conductivity detector. The second option is to analyze samples using potentiometry, in which a voltage is generated by the presence of ammonium ions at an ion-selective electrode (ISE). This ISE usually consists of a glass carbon electrode covered in a membrane containing a molecule that preferentially binds to a specific ion, known as an **ionophore**, allowing the ISE to generate a voltage when encountering that ion.

As might be expected, both options have their advantages and disadvantages. Ion chromatography with conductivity detection is quick and easy, but is not as sensitive as potentiometry, struggling to determine low concentrations of ammonium cations. But potentiometry with an ISE can suffer from interference by other ions in the water samples. Although an ionophore such as nonactin preferentially binds with ammonium cations, it will also respond to other ions in the water, particularly potassium and sodium cations, leading to an inaccurate measurement of the ammonium cation concentration.

A team of researchers from Sweden and Portugal decided to try combining these two options. They hoped that the combined version would have the sensitivity of potentiometry and the ability to distinguish between different cations of ion chromatography.

To combine them, the scientists created a **flow cell** with space for three ISEs and then simply coupled this to an ion chromatography column. The eluent from the column flowed first through a conductivity detector and then through the flow cell, where it could interact with the ISEs.

The researchers fabricated the ISEs themselves. As usual, these ISEs were based on a glassy carbon electrode, but the researchers covered this in carbon nanotubes, to enhance the conversion of ionic charge to a detectable voltage. On top of this they coated a membrane cocktail comprising a polymer matrix, a plasticizer, a cation exchanger and an ionophore dissolved in tetrahydrofuran.

Initially, the investigators inserted three identical ISEs into the flow cell, each with nonactin as the ionophore. This set-up gives the most reliable measurements, as the responses from the three ISEs can be compared. As a first test of the combined system, they tried using it to analyze a specially prepared solution of lithium, potassium, sodium, and ammonium cations. As well as allowing them to optimize various separation parameters, these tests also confirmed that all four cations could clearly be separated by ion chromatography, allowing them to be detected by both the conductivity detector and the ISEs in the flow cell.

When all the cations were at the same concentration in the solution, they generated similar responses from the conductivity detector, which showed four similar-sized

peaks in the resulting chromatogram. But because nonactin responds best to ammonium cations, the response from the ISEs was stronger for ammonium cations than for the other cations, which generated much smaller peaks. Nevertheless, the ISEs did still detect the other cations, particularly potassium, showing that the flow cell would have **overestimated** the ammonium ion concentration if used on its own.

As the researchers report in a paper in *ACS Measurement Science Au*, these tests also confirmed that the ISEs were more sensitive than the conductivity detector, able to detect ammonium ions at micromolar concentrations. Finally, the research team showed that the combination worked just as well with actual water samples, with the ISEs able to distinguish ammonium cations and accurately determine their concentration in 10 environmental water samples from Sweden, Spain and Portugal.

algal bloom – цветение водорослей
ionophore – ионофор, переносчик ионов
flow cell – проточная кювета, элемент с проточным электролитом
to overestimate – давать завышенные значения, преувеличивать

Exercise 1. Provide the text with a title.
Exercise 2. Make up a plan of the text.
Exercise 3. Write a summary of the text omitting the unnecessary information.

APPENDIX II

RELEVANT VOCABULARY FOR WRITING A SUMMARY

to account for – *объяснять*	**to highlight –** *выделять*
to analyze – *анализировать*	**to identify –** *определять*
to apply - *применять*	**to investigate/to study -** *исследовать*
to argue/to state - *утверждать*	**to note -** *отмечать*
to compare – *сравнивать*	**to observe -** *наблюдать*
to describe - *описывать*	**to outline -** *наметить в общих чертах/обрисовать*
to demonstrate – *показывать*	
to determine – *определять*	**to point out -** *указывать*
to emphasize - *подчеркивать*	**to review –** *рассматривать*
to examine - *изучать*	**to specify -** *уточнять*
to find out - *выяснить*	**to stress/to underline -** *подчеркивать*
to give particular attention to - *уделять особое внимание*	**to study -** *изучать*
to give a description of - *дать описание*	**to suggest -** *предлагать*

the ability of smth - *возможность чего - либо*
the advantages and disadvantages of smth - *преимущества и недостатки чего - либо*
the application of smth - *применение чего - либо*
the approach to smth - *подход к чему - либо*
the challenge of smth - *сложная задача в чем - либо*
the change of smth - *изменение чего - либо*
the conditions for smth - *условия для чего - либо*
the effect of smth on/upon smth - *влияние чего – либо на что - либо*
the existence of smth - *существование чего - либо*
the formation of smth - *образование чего - либо*
the function of smth - *функция чего - либо*
the idea of - *идея чего - либо*
the initial substances - *исходные вещества*
the interest in - *интерес к чему - либо*
the introduction of smth - *введение чего - либо*
the importance of smth - *важность чего – либо*