

## Вступ

Даний навчальний посібник призначений для студентів першого курсу хіміко-технологічних факультетів, які вивчали англійську мову у школі та продовжують вивчати її у вищому навчальному закладі.

Мета посібника – розвинути у студентів навички читання та розуміння оригінальної літератури англійською мовою, письма, реферування й усного мовлення в об'ємі, який передбачає навчальна програма.

Навчальний посібник розрахований на 90–100 годин аудиторного часу та 30–40 годин самостійної роботи.

Всі наукові тексти було запозичено з оригінальної англійської та американської літератури й незначною мірою адаптовано. Тематика цих текстів відбиралась з урахуванням рівня знань, які студенти одержали у середній школі. Тексти доступні для розуміння студентами I курсу.

Навчальний матеріал розподілений на два етапи навчання, де всі види мовленнєвої діяльності пов'язані між собою, але на різних етапах це співвідношення різне. На першому етапі вдосконалюються базові мовленнєві навички та вміння: повторення базової граматики, певного лексичного мінімуму з урахуванням словарного запасу, що було отримано у школі, та введення базової спеціальної лексики (Уроки 1–4). На другому етапі вдосконалюються навички та вміння навчального та проглядового читання за спеціальністю й усного мовлення (Уроки 5–9).

Структура кожного уроку включає в себе граматичні правила (представлені у вигляді таблиць) і вправи для їх закріплення, передтекстові, текстові та післятекстові вправи. Якщо передтекстові вправи (мовні та мовленнєві) підводять студента до розуміння текстової інформації, то післятекстові вправи виконують наступні функції: опанування лексико-граматичного матеріалу, застосування його в усному та письмовому мовленні та контроль навичок і вмінь читання й усного мовлення. Вправи підвищеної складності помічені зірочкою (\*). Кожний урок закінчується тестом для перевірки засвоєння матеріалу.

Під час роботи з даним навчальним посібником автори рекомендують проводити як індивідуальні, так і парні та групові вправи, що сприяють розширенню мовленнєвого середовища, а також розвитку усного мовлення.

## Unit 1

*Grammar: Indefinite Tenses; the verbs “to be” and “to have”; the construction there be; the word order; the Plural forms of the Noun; Personal, Possessive and Demonstrative pronouns*



**Study the following grammar rule.**

Часи групи Indefinite		
Present	Past	Future
help, write (he, she, it) helps, writes	helped, wrote	will help, will write (I, we) shall help, shall write
Вживання		
Дія як факт (звичайна, постійна, повторна)		
usually every day often seldom sometimes	yesterday last week six days ago	tomorrow next week in a month

Утворення запитання		
do does	I/we/you/they he/she/it	help? write?
did	I/we/you/they/he/ she/it	help? write?
shall will	I/we you/they/he/ she/it	help? write?

Утворення заперечної форми		
I/we/you/they he/she/it	don't doesn't	help write
I/we/you/they/he/ she/it	didn't	help write
I/we/you/they/he/ she/it	won't	help write

### Ex. 1. Study the following words and remember them.

accident [ˈæksɪd(ə)nt], acid [ˈæsɪd], amount [əˈmaʊnt], apologize [əˈpɒləˌɡaɪz], apparatus [əˈpærɪtəs], branch [brɑːnʃ], chlorine [ˈklɒrɪːn], coal [kəʊl], competition [ˌkɒmpɪˈtɪʃ(ə)n], department [dɪˈpɑːtmənt], discovery [dɪsˈkʌv(ə)ri], Earth [ɜːθ], equipment [ɪˈkwɪpmənt], examination [ɪɡˈzæmɪˈneɪʃ(ə)n], experiment [ɪksˈperɪmənt], faculty [ˈfæk(ə)lti], furniture [ˈfɜːnɪtʃə], huge [hjuː], hydrocarbon [ˈhaɪdrəʊˈkaːbən], inorganic [ˌɪnɔːˈɡænɪk], iron [ˈaɪən], language [ˈlæŋɡwɪʃ], lecture [ˈlektʃə], method [ˈmeθəd], nature [ˈneɪtʃə], necessary [ˈnesɪs(ə)ri], oil [ɔɪl], organic [ɔːˈɡænɪk], Periodic Law [ˌpiəriˈɒdɪk lɔː], piece [piːs], reagent [riˈeɪʃ(ə)nt], resource [riˈsɔːs], sample [ˈsɑːmpl]

**Ex. 2. Translate the following sentences into Ukrainian.**

- A. 1. Many people come to our city every day. 2. She teaches chemistry at school. 3. On Sunday she doesn't go to the Institute. 4. You don't often see her, do you? 5. Students buy a lot of books at the beginning of each term. 6. My mother doesn't like when we play in the street. 7. I watch evening news every day. 8. Do you always miss lectures? 9. Nothing happens by accident. 10. Do you remember that Margaret owns a villa on the Adriatic?
- B. 1. He did a huge amount of work. 2. We had absolutely nothing to do last weekend. 3. Did the students carry out the experiment yesterday? 4. She began the examination on time. 5. My friend taught English for twenty-five years. 6. Where did you actually meet? – At some party. 7. The mother cut the cake and put a large piece on my plate. 8. Mary didn't smile when she saw him. 9. On the way home she usually bought a slice of honeycake at the baker's. 10. When did you leave the city? – I left it last Tuesday.
- C. 1. Shall we go to the museum of Nature after the lectures? 2. Many students of our faculty will take part in the conference in November. 3. The graduates will work in different branches of chemistry. 4. Next summer the students of our group will go to work in different camps. 5. They won't take part in that competition. 6. Nobody knows when he will come back from London. 6. I shall believe you after you apologize. 7. Next week we shall have more time for hobbies and friends. 8. I hope you will like my present, darling. – I'm sure I shall. 9. Will you pass the message for them? 10. It's a nice table. Where will you place it?



*Remember the forms of the verbs to be and to have in the Indefinite tenses.*

Present	Past	Future
<b>I am</b> we/you/they <b>are</b> he/she/it <b>is</b>	<b>I/he/she/it was</b> we/you/they <b>were</b>	<b>I/we shall be</b> You/he/she/it/they <b>will be</b>
<b>I/we/you/they have</b> he/she/it <b>has</b>	<b>I/he/she/it we/you/they had</b>	<b>I/we shall have</b> You/he/she/it/they <b>will have</b>

**Ex. 3. Put the right form of the verb to be.**

1. The test samples ... in the box. 2. Some of those books ... mine. 3. Next year these girls ... the students of the University. 4. Some of these acids ... necessary for their experiment. 5. ... this salt organic? 6. Yesterday our first lesson ... a Grammar lesson. 7. The house of this great writer ... a museum now. 8. I think we ... the winners of this competition. 9. Kharkiv ... the capital of the Ukraine in 1930. 10. They ... at the corner of the street when the accident happened.

**Ex. 4. Put the right form of the verb to have.**

1. They ... lectures and practical lessons in this room. 2. ... you ... a nice time at the party yesterday? 3. George is Irish – he ... blue eyes and red hair. 4. ... you ... special equipment in your laboratory? 5. These people are homeless – they ... where to live. 6. Every person ... the right to vote. 7. Next year they ... more difficult subjects. 8. What ... we ... for dinner? 9. He ... time yesterday but today he is free. 10. ... she ... the book that I need?

**Ex. 5. Open the brackets choosing the correct form of the verb.**

1. This scientist (work/ works/ doesn't work) in the field of organic chemistry, he deals with organic compounds. 2. He (take/ doesn't take/ will take) part in this work as he has no time. 3. Last year she (uses/ used/ will use) a new method in her work. 4. He (attends/ attend/ doesn't attend) lectures on Sunday. 5. In three days they (shall carry out/ will carry out/ don't carry out) this interesting work.

**Ex. 6. Complete the sentences using one of the following words:**

*cause close drink live open speak take place*

1. Ann ... English very well. 2. I never ... coffee. 3. The swimming pool ... at nine o'clock and ... at half past six in the evening every day. 4. Bad driving ... many accidents. 5. My parents ... in a very small flat. 6. The Olympic Games ... every four years.

**Ex. 7. Put the verb in the correct form.**

1. Maria ... (not/drink) tea very often. 2. What time ... (the banks/close) in Britain? 3. Where ... (Martin/come) from? – He is from France. 4. What ... (you/do)? – I am a chemical engineer. 5. It ... (take) me an hour to get to work. And how long ... (it/take) you? 6. I ... (play) the piano but I ... (not/play) very well. 7. I ... (not/understand) this sentence. What ... (this word/mean)?

**Ex. 8. Complete the sentences using the following verbs. Sometimes you need the negative.**

*believe eat flow go grow make rise tell translate*

1. The Earth ... round the Sun. 2. Rice ... in Britain. 3. The sun ... in the East. 4. Bees ... honey. 5. Vegetarians ... meat. 6. An atheist ... in God. 7. An interpreter ... from one language into another. 8. A liar is someone who ... the truth. 9. The River Amazon ... into the Atlantic Ocean.

**Ex. 9. Put the verb into the correct form, positive or negative.**

1. It was warm, so I ... (take) off my coat. 2. The lecture wasn't very good. I ... (enjoy) it very much. 3. I knew that Mary was very busy, so I ... (disturb) her. 4. I was very tired, so I ... (go) to bed early. 5. The bed was very uncomfortable. I ... (sleep) very well. 6. Peter was not very hungry, so he ... (eat) anything. 7. He went to Kate's house but she ... (be) at home. 8. It was a funny situation but nobody ... (laugh). 9. The window was open and a bird ... (fly) into the room. 10. The reagents were not very expensive. They ... (cost) very much. 11. I was in a hurry, so I ...

(have) time to phone you. 12. It was hard work carrying the bags. They ... (be) very heavy.

**Ex. 10. Complete the following sentences according to the models.**

- A. *She is in the laboratory now. (to come soon, here) – She is in the laboratory now but she will come soon here.* 1. They go to school this year. (to finish, next year)  
2. She is still in Kyiv. (to leave, Kharkiv, tomorrow) 3. We translate the article. (to continue our work, tomorrow too)
- B. *I shall come if (provided, when, unless) I have time.* 1. The students will go home when they.... 2. She will take part in this work if she.... 3. He will answer your questions if.... 4. I shall speak to him unless.... 5. They will help us if.... 6. We shall find the document if....

**Ex. 11. Reconstruct the following sentences.**

1. the/ laboratory/ works/ in/ every/ he/ day
2. distillation/ apparatus/ is/ an/ steam/ for/ it
3. does/ hydrocarbon/ chemistry/ not/ inorganic/ study
4. are/ salts/ of/ any/ these/ organic?
5. number/ with/ is/ 17/ an/ atomic/ chlorine/ element
6. they/ boxes/ do/ in/ not/ chemicals/ keep
7. reaction/ place/ high/ takes/ at/ this/ temperature
8. chemistry/ Law/ explains/ Periodic/ the/ inorganic
9. in/ an/ industry/ the/ world/ holds/ the/ important/ chemical/ place
10. time/ of/ discovery/ was/ the/ major/ a/ theory/ reaction/ chain/ of/ our

**Ex. 12. Translate the following sentences into English.**

1. Кожен день я встаю о сьомій годині.
2. У нашому університеті вчиться багато студентів.
3. Наші заняття починаються о дев'ятій годині.
4. Ми завтра підемо у музей.
5. Ми почали вивчати хімію у сьомому класі.
6. Як тільки прийде викладач, ми почнемо лабораторну роботу.
7. Влітку він склав іспити і тепер навчається на нашому факультеті.
8. Зазвичай ми маємо три або чотири пари на день.
9. Перший курс ніколи не вчиться по суботах.
10. Ми збудуємо гідроелектростанцію на цій річці.
11. Багато реакцій проходять при високій температурі.
12. Скільки Вам потрібно часу, щоб дістатися університету?

*Study the following table.*

<u>Існує</u> дуже багато сполук.	<u>There are</u> a lot of compounds.
<u>Напроти</u> нашого <u>дому</u> <u>стоїть</u> чудовий сад.	<u>There is</u> a nice garden <u>opposite</u> our house.
<u>У</u> вашому <u>диктанті</u> <u>немає</u> помилок.	<u>There are</u> no mistakes <u>in</u> your dictation.
Чи <u>існують</u> якісь правила гри?	<u>Are there</u> any rules of this game?

**Ex. 13. Translate the following sentences into Ukrainian.**

1. There is a good library in our Institute.
2. There were no mistakes in his work.
3. Are there English books on this shelf?
4. There will be a lot of new schools

in our city. 5. Many years ago our town was very small: there were no big houses, cinemas and institutes in it. 6. We will come tomorrow: there will be an interesting lecture at five o'clock. 7. Your work was very poor: there were too many mistakes in it. 8. Our country is rich in mineral resources: there is much iron, coal and oil in it. 9. There are some masters of sports among the students of our University. 10. There was a test in our group yesterday. 11. There will be a meeting at our department next week. 12. There must be a lecture on chemistry today. 13. There are all kinds of laboratories where students carry out experiments. 14. Are there many power stations in Ukraine? 15. Will there be a conference next month?

**Ex. 14. Reconstruct the following sentences.**

1. wrong/ her/ with/ is/ there/ nothing
2. snow/ were/ footsteps/ there/ in/ no/ the
3. anything/ worrying/ there/ is/ you?
4. life/ could/ there/ something/ in/ awful/ her/ be
5. person/ should/ party/ this/ be/ interesting/ at/ there/ least/ at/ one
6. little/ there/ pigs/ upon/ lived/ merry/ once/ a / three/ time
7. some/ were/ playing/ the/ garden/ little/ there/ in / children

**Ex. 15. Put in the right form of the verb *to be*.**

1. There ... much acid here. 2. What ... there in the room? 3. ... there newspapers on the table? 4. How many boxes ... there under the table? 5. There ... an interesting lecture the next Monday. 6. There ... some remarks which I wanted to discuss with you. 7. ... there any apparatus for steam distillation there? 8. There ... several new laboratories next year. 9. There ... not many English magazines in the library. 10. There ... no time for this work.

**Ex. 16. Make the following sentences negative and interrogative.**

1. There is a new equipment in our laboratories. 2. There are some students taking part in that conference. 3. There were some old houses in this street. 4. There will be a nice furniture in this room. 5. There are some laws that you must know. 6. There are many good rest-homes not far from Moscow. 7. There was a small skating ring near the house I live in. 8. There is no water in the Sahara desert. 9. There will be much fruit in the garden this autumn. 10. There were some pictures on the walls in this room

**Ex. 17. Read the first sentence and then rewrite a sentence beginning with *there*....**

*The roads were busy today. There was a lot of traffic.*

1. This soup is very salty. 2. The box was empty. 3. The film was very funny. 4. The shops were very crowded. 5. I like this town – it's lively. 6. Two cars crashed at the corner of the street.



**Ex. 18. Translate the following sentences into English.**

1. У нашій читальній залі багато гарних книг, газет і журналів. 2. На цій полиці багато книг з хімії, а на тій багато цікавих книг про Англію. 3. У цьому журналі є якісь статті з неорганічної хімії? 4. А у Вашій лабораторії є хто-небудь зараз? 5. Ніде немає статей про Ваш новий пристрій. 6. У нашій країні багато університетів та інститутів. 7. Чи є десь поблизу книжкова крамниця? – Так, є декілька на Сумській вулиці. 8. Чи багато людей було на лекції? – Ні, тільки десять чоловік. 9. Мені не подобається це місто: тут нічого робити. 10. Кілька днів тому в нашому місті був шалений шторм. 11. По телевізору нічого не було, і я його вимкнув. 12. Я хотів закінчити експеримент, але не мав часу. 13. У нашій сонячній системі існують десять основних планет. 14. Я нікуди не піду – тут відбудуватиметься щось цікаве. 15. У цьому селі була школа, але тепер вона зачинена.



**Study the following grammar rule.**

*There are words that can be used only in the singular. Read and remember them*

- a) *mass nouns* – iron, butter, sand, etc.
- b) *names of sciences* – Physics, Chemistry, Statistics, etc.
- c) *abstract notions* – information, love, news, success, etc.
- d) fish, fruit, money, weather, advice

*There are words that can be used only in plural. Read and remember them*  
*tools and instruments consisting of two parts* – glasses, scissors, spectacles, etc.  
*And also:*

arms–зброя  
regards–привіт  
contents–зміст  
goods–товар  
savings–збереження  
clothes–одяг

spirits–настрій  
premises–приміщення  
congratulations–поздоровлення  
manners–манери  
whereabouts–місце знаходження  
works–фабрика

*Remember singular and plural forms of the following nouns.*

*a) nouns ending -f*

a wife – wives  
a life – lives  
a shelf – shelves

self – selves  
a leaf – leaves  
a half – halves

*b) traditional exceptions*

a man – men  
a woman – women  
a child – children

a tooth – teeth  
a foot – feet  
a mouse – mice

*c) nouns of Greek and Latin origin*

a focus – foci	a diagnosis – diagnoses
a nucleus – nuclei	an analysis – analyses
a radius – radii	a crisis – crises
a formula – formulae	a criterion – criteria
a datum – data	an equilibrium – equilibria
a medium – media	a phenomenon – phenomena
a spectrum – spectra	

**Ex. 19. Write the plural form of the following nouns.**

a subject, a morning, a teacher, a class, a study, a wife, a book-case, a boy, a page, a watch, a student, a torch, a window, an education, a phenomenon, an exam, a foot, a man, a roof, a fox, a mouse, a family, a hat, a day, a knife, a life, a valley, a crisis, a century, a woman, a nucleus, a datum

**Ex. 20. Tell the singular form of the following nouns, if there is such.**

foci, walls, contents, news, computers, letters, Mathematics, spirits, chemists, phenomena, leaves, mice, scissors, binoculars, pages, trees, works, children, potatoes, analyses, radii, goods, arms

**Ex. 21. Translate the following sentences into English.**

1. Я пам'ятаю всі ваші поради. Вони мені завжди допомагають. 2. Це – чудова новина. 3. Сьогодні чудова погода. 4. Успіх завжди залежить від праці та вдачі. 5. Група дуже раділа своїм успіхам. 6. Гроші його не цікавлять. 7. Йому дуже потрібна таємна інформація. 8. У цій річці багато риби. 9. Скільки риб ти зловив у неділю? 10. Для багатьох людей фрукти дуже дорогі. Вони не можуть собі їх дозволити кожен день. 11. Вони зберігають усі дані у комп'ютері. 12. Багато шкіл мають зовсім різні програми. 13. Зміст цього пакету невідомий. 14. На столі лежать половинки від яблук. 15. На поверхні цієї планети можна побачити дивні явища.

**Ex. 22. Before reading the text guess the answers for the following questions. Check yourself after reading.**

When was the University found?

- A. 1800
- B. 1805
- C. 1905
- D. 1804

Who of the following scientists was not given the Nobel Prize?

- A. Landau
- B. Kuznets
- C. Mechnikov
- D. Beketov

How long do you have to study to get the Master Degree?

- A. 5 years



- B. 4 years  
C. 6 years

**Ex. 23. Memorize the following words.**

establishment – заклад  
scientist – науковець  
science – наука  
researcher – дослідник  
concept – концепт, ідея  
contribution – внесок  
chemist – хімік

physicist – фізик  
mathematician – математик  
astronomer – астроном  
philologist – філолог  
specialist – спеціаліст  
specialization – спеціалізація  
proportion – пропорція

**Text 1:**

**Karazin National University**

Karazin National University is one of the oldest academic educational establishments in eastern Europe. It was founded in 1805 by V.N. Karazin, one of the most outstanding and public figures of his time. A prominent Ukrainian scientist and educator, he was an active member of the Kharkiv cultural centre in the first half of the nineteenth century. He came into science as a researcher and the author of a number of democratic concepts. V.N. Karazin played a great role in spreading progressive ideas in Ukraine. Only in 1999 Kharkiv National University was named after V.N. Karazin.

Kharkiv University is a highly-reputable academic institution of Ukraine. A great contribution to the world science has been made by chemist Beketov, the physiologist Danilevsky, the physicists Trinkler and Girshman, the mathematician Lyapunov, the astronomer Barabashov, the philologist Potebnya. The names of the Nobel Prize winners Mechnikov, Landau and Kuznets are associated with Kharkiv University too.

About 12 thousand students and post-graduates are being trained at the University at present. The teaching staff comprises<sup>1</sup> about 2 thousand lecturers and laboratory assistants, 200 of them are professors and more that 1000 assistant professors of about 100 different departments.

The University trains specialists in more than 40 disciplines for work in the national economy. It also trains teachers for secondary and higher education, research workers as well as carries an extensive research program<sup>2</sup> in different academic fields.

The curriculum which meets the requirements of modern science<sup>3</sup> offers from 4 (for the Bachelor Degree) to 5 years (for the Master's Degree) of education. A fixed proportion of candidates is chosen and admitted to the University through the competitive entrance examinations.

The first two years are devoted to general education while specialization starts in the third year of studies. Various methods of education, including lectures,

seminars and consultations are practiced here. The progress is evaluated through tests and exams at the end of each term of study. Finals are taken at the end of the course.

Our University is housed in 2 opposite buildings in Freedom Square. Some faculties have buildings of their own.

Academic research institutes of chemistry, biology, laser biology and laser medicine are attached to the University. One of the oldest and well-known Astronomical Observatory in Ukraine, the Museum of Nature, the oldest in our country Botany Garden are worth mentioning<sup>4</sup> too.

<sup>1</sup>The teaching stuff comprises – професорсько-викладацький штат включає в себе

<sup>2</sup>as well as carries an extensive research program – а також проводить велику дослідницьку роботу

<sup>3</sup>meets the requirements of modern science – що відповідає вимогам сучасної науки

<sup>3</sup>are worth mentioning – також слід згадати

**Ex. 24. Give Ukrainian equivalents for the following words and word combinations.**

cultural centre; to play a great role; progressive ideas; highly-reputable; physicist; contribution to; faculty; curriculum; Master's degree; to admit; term; laser medicine; well-known

**Ex. 25. Give English equivalents for the following words and word combinations.**

навчальний заклад; аспірант; на даний момент; лаборант; кафедра; дослідник; диплом бакалавра; вступні іспити; контрольні роботи та іспити; лазерна біологія

**Ex. 26. Find in the text synonyms for the following words.**

distinguished; idea; to go along with; to include; to teach; curriculum; correspond; level; quota; different; to estimate, terminal examinations; investigation; to add/ to attribute

**Ex. 27. Tell if the statements below are true, false or not stated.**

1. Before 1999 the University was named after M.Gorky.
2. The University is the oldest educational centre in western Europe.
3. Three scientists of the University were awarded the Nobel Prize, they are Mechnikov, Kuznets and Lyapunov.
4. The candidates of science comprise nearly half of the teaching stuff.
5. The faculty of Economics has the building of its own.
6. The specialization starts only from the second year of studying.
7. The University is in charge of the Museum of Nature and of the Botany Garden.

**Ex. 28. Answer the following questions.**

1. When was the University found?
2. What do you know about the founder of the University?

3. Name the most outstanding scientists of this educational establishment.
4. What kinds of tuition are practiced here?
5. How many building does the University have?
6. What other establishments are attached to the University?
7. Think and try to name all the faculties of the University.
8. Name the subjects that you are to study in this term.

**Ex. 29. Name each paragraph of the text.**

**Ex. 30. Render the text.**

**Ex. 31. Translate the following sentences into English.**

1. Існує багато спеціальностей, але хімія для мене найкраща. 2. Потебня зробив великий внесок у світову філологію. 3. Після закінчення університету я стану видатним науковцем і зроблю велике відкриття в галузі органічної хімії. 4. Математики не отримують Нобелівських премій. 5. У минулому році я захистив диплом та отримав ступінь магістра. 6. Приблизно двісті професорів працюють майже на ста різних кафедрах. 7. Студенти виконують такі види навчальної роботи як експерименти. 8. Контрольні роботи й іспити обов'язкові для всіх студентів. 9. У минулі роки державні іспити складав п'ятий курс, а тепер їх складає четвертий. 10. Перші два роки студенти вивчають такі загальні дисципліни як історія, соціологія, психологія та інші.

**Ex. 32. Supply pronouns and say which words they replace (*Personal and Possessive Pronouns*).**

1. The letter has arrived. ... is on your table. 2. –Who told him the news? – Not ... . 3. Who's that? – ... my friend. He studies here. 4. I have a car but I really don't need ... . 5. Let's you and ... do it together. 6. He wanted that Jessy went to the movie with ... . 7. I don't want a partner. I want this business to be full ... . 8. Can I use ... computer? 9. This book is very rare. ... price is very high. 9. I didn't do it. It all didn't happen because of ... . 10. Dr. Robert, one of ... patients has just called. 11. The conference will be opened in several days but ... program is still unknown. 12. I'm looking for John. Have you seen ... . 13. Mary is pretty and ... eyes are so bright! 14. Here is a letter Can you give ... to the Professor. It is for ... . 15. We are planning to take a taxi but I'm afraid that ... luggage is too big.

**Ex. 33. Insert necessary *Demonstrative Pronouns* (*this, these, that*).**

1. ... spectacles are of the best quality. 2. I'll sign all the papers ... morning. 3. We can meet at half past eleven. – ... will be fine. 4... was a really terrible air crush last week. 5. I don't think very much about the exams ... days. 5 ... was a wrong thing to do. 6. Do I have any chance to carry out ... experiment successfully? 7. They discussed ... events at the meeting. 8. Who was calling? – ... was Dr. Robert. 9. ... week I have a lot to do. 10. Who will fulfil ... project? – ... specialists.

**Ex. 34. Insert the articles where necessary.**

Our Institute dining-room is ... large square room with ... white ceiling and ... green walls. ... dining-room is very light as ... windows are large. In ... evening many lamps light up ... room. There are many tables in ... room. Some of them are round and some are square. All ... tables are covered with ... table-cloth. There are flowers on ... tables as well as on ... window sills. There is ... vase on each table. ... choice is usually wide. You can find ... soup, ... fish, ... meat, ... potato, ... beefsteak, ... sausages and other things there. At ... buffet, which is on ... left-hand side of ... room as you enter, you can also find many good things, such as ... salad, ... sandwiches, ... fruit, ... sweets, ... tea, ... coffee and ... cake. When you are hungry you go to ... dining-room and sit down at ... vacant table. You call ... waitress and order ... meal. ... waitress first put ... knife, ... fork and ... spoon on ... table in front of each person and then brings ... white and ... brown bread and ... food. You usually take something for ... desert at ... buffet. You can have ... good meal at ... Institute dining-room.

**Ex. 35. Insert necessary prepositions.**

1. It is the tradition ... the University to start the academic year ... the freshers ... a remarkable holiday ... the “First Bell”. They put flowers ... the foot ... the Monuments ... Students who gave their lives ... our country. 2. Students ... the University are provided ... scholarships, hostels and holiday accommodations. 3. “Figurovka” camp ... the banks ... the Seversky Donets is the example ... such an accommodation. 4. “Student Parliament” and “Student Councils” organize amateur art, labour activities and arrange holidays ... the students ... winter and summer vacations. 5 The monument ... V.N. Karazin was erected ... 1905 ... the occasion ... the century jubilee ... the University. 6. The citizens ... Kharkiv made their own contribution ... the monument installation.

**Ex. 36. Match the words and word combinations with their translation.**

so-called	—	ювілей
chair	—	випуск (журналу, газети)
witness	—	так званий
to issue	—	бойові дії
issue	—	кафедра
anniversary	—	відроджуватися
military operations	—	бути свідком
to rise	—	випускати, публікувати

**Ex. 37. Study the translation of the following word combinations.**

Department of Sciences of Physics and Mathematics – відділення фізичних та математичних наук

Kharkiv Society of Physics and Chemistry – Харківське фізико-хімічне товариство

Academy of Theoretical Studies – Академія теоретичних знань

Kharkiv Institute of People’s Education – Харківський інститут народної освіти

**Text 2:**

**Chemistry In the Karazin National University**

The history of the chemistry department started with the opening of the University itself in 1805 though at first there was no such a specialty as chemistry. It belonged to the so-called “Department of Sciences of Physics and Mathematics”. Only in the year 1894 the chemical section managed to separate. The newly formed department consisted of two chairs, namely the chair of organic chemistry and that of inorganic and analytical chemistry.

In the second part of the nineteenth century the number of qualified chemists increased greatly. Here worked the Kharkiv Society of Physics and Chemistry where the scientists reported about the results of their work and the news in scientific literature. However the World War I and the following revolution changed the further history of the University and the University chemists.

Instead of the University the Academy of Theoretical Studies appeared, later in 1921 – the Kharkiv Institute of People’s Education. It was reorganized in 1930 into the Kharkiv Institute of Physics, Chemistry and Mathematics. Its structure included the department of chemistry that was the largest one then. 1933 witnessed the second organization of the Kharkiv University. By this time the department included the following chairs: Inorganic Chemistry, Organic and Physical Chemistry, the Chemistry of Qualitative and Quantitative Analyses and Technical Chemistry. In three years the chair of Colloid Chemistry (the first one in Ukraine) appeared. 1935 was the year when the department started to issue the journal “The Works of the Chemistry Institute”. The first issue was dedicated to the 130 anniversary of the University.

World War II interrupted the studying and scientific processes. A part of teachers and lectures were evacuated, a lot of them took part in military operations.

Just after the liberation of Kharkiv scientific schools started to rise and to develop. Now the department can be proud of a great number of Doctors of Science, Professors. A great contribution to the development of the department of chemistry and to the chemistry itself made N. N. Beketov, E. N. Gapon, J. O. Gabel, N. A. Valiashko, N. A. Izmajlov etc.

**Ex. 38. Tell if the statements are true or false. If it is false, correct it.**

1. At first chemistry was not studied at the University at all.
2. 1894 witnessed the appearance of the chemistry department.
3. Kharkiv Society of Physics and Chemistry analyzed the works of its members.
4. By the year 1938 the department consisted of 7 chairs.
5. The fist issue of The Works of the Chemistry Institute was dedicated to the opening of the University.
6. Since 1894 the department of chemistry continued its work without any break.

**Ex. 39. Make up your own question to the text.**

**Ex. 40. Name each paragraph of the text.**

**Ex. 41. Check your Grammar.**

1. Why ... to bed so early last night? – Because I was feeling very tired.
  - a. will you go
  - b. does you go
  - c. do you go
  - d. did you go
2. Well, what time...? – Come to the cafe by the station at four o'clock.
  - a. shall we meet
  - b. shall we met
  - c. will we meet
  - d. we shall meet
3. All his ... are not so useful as we thought.
  - a. advice
  - b. pieces of advice
  - c. pieces of advise
  - d. advise
4. Mary usually ... me on Fridays but she ... last Friday.
  - a. will phone
  - b. phone
  - c. phones
  - d. don't phone
  - e. won't phone
  - f. didn't phone
5. How was your holiday? ... a nice time
  - a. Do you have
  - b. Did you have
  - c. Do you has
  - d. Does you have
6. There ... a nice play in the theatre next week.
  - a. is
  - b. shall be
  - c. will be
  - d. are
7. ... anything that was really worth seeing?
  - a. Was there
  - b. Are there
  - c. Were there
  - d. Will there
8. It's usually dry here at this time of the year. It ... much.
  - a. rain not
  - b. rains not
  - c. don't rain
  - d. doesn't rain
9. This phenomenon ... great interest.
  - a. causes
  - b. cause
10. When Sue heard the news she ... very pleased.
  - a. is not
  - b. are not
  - c. was not
  - d. were not



## Unit 2

*Grammar: Continuous tenses; means of expressing Future; Numerals; Reflexive Pronouns, SOME vs. ANY; some-, any-, no- ; meanings of ONE*



**Study the following grammar rule.**

Часи групи Continuous		
Present	Past	Future
I <b>am</b> helping he/ she/ it <b>is</b> helping you/ we/ they <b>are</b> helping	I/ he/ she/ it was helping you/ we/ they <b>were</b> helping	I/ we <b>shall be</b> helping he/ she/ it/ you/ they <b>will be</b> helping
Вживання		
Дія у процесі (на даний момент, протягом якогось часу)		
now	at 4 o'clock from 5 till 7 yesterday інша дія	at 4 o'clock from 5 till 7 tomorrow інша дія

Утворення запитання		
Am Is Are	I he/ she/ it you/ we/ they	helping?
Was Were	I/ he/ she/ it you/ we/ they	helping?
Shall Will	I/ we he/ she/ it you/ they	helping?

Утворення заперечної форми		
I he/ she/ it you/ we/ they	am not is not are not	helping?
I/ he/ she/ it you/ we/ they	was not were not	helping?
I/ we he/ she/ it you/ they	shall not will not (won't)	be helping?

### Ex. 1. Study the following words and remember them.

Analytical ['æŋɡ'litik(q)l], article ['a:tɪkl], billion ['bɪljən], cardinal ['ka:dɪnl], decimal ['desɪm(q)l], denominator [di'nɒmineɪt(q)], derivative [di'rɪv(q)tɪv], fraction ['fræk](q)n], hundred ['hʌndr(q)d], million ['mɪljən], numerator ['nju:m(q)reɪt(q)], ordinal ['ɔ:dɪnl], repel [ri'pel], sample ['sɑ:mpəl], thousand ['θauz(q)nd]

### Ex. 2. Translate the following sentences into Ukrainian.

- A. 1. Mary is cleaning the room now. 2. Mike is working on the fourth floor at present. 3. The students are having their English lesson now. 4. They are laughing at what you said. 5. The Smiths are having lunch outside. 6. Are they looking for the box which they lost? 7. Professor is writing a series of articles on the analytical chemistry. 8. The teacher is not looking at us though we are having a test. 9. The lab assistant is typing a new course. 10. The doctor is examining the patient.
- B. 1. We were standing at the platform when the train arrived. 2. Jane was making her bed when the telephone rang. 3. What was John doing when Ann came? – He

was watching TV. 4. The students were discussing the novel for the whole evening. 5. It was raining when we decided to go to the cinema. 6. From 7 till 9 yesterday I was preparing for the seminar. 7. The teacher was checking up tests last night.

- C. 1. Jane will be writing letters all morning tomorrow. 2. While she is writing her letters, John will be working on the computer. 3. How long will they be staying in London? 4. Sarah will be playing the main part all next season. 5. I promise I will be visiting all lectures next term. 6. While the teacher is developing the theme, the students will be giving examples. 7. Sam is too busy – he won't be watching TV all week-end. 8. I shall be making a report all the lecture. 9. They will be translating documents all Monday. 10. The weather will be changing all the week.

**Ex. 3. Reconstruct the following sentences.**

1. building/ in/ our/ are/ of/ a/ they/ office/ house/ front
2. are/ of/ a/ making/ lot/ they/ noise?
3. samples/ for/ new/ are/ our/ we/ taking/ experiments
4. chemistry/ morning/ students/ on/ the/ yesterday/ were/ lectures/ having
5. listening/ are/ you/ what/ to?
6. whole/ were/ the/ missing/ term/ they/ classes
7. reagents/ not/ he/ with/ at/ working/ moment/ the/ is/ that
8. are/ what/ in/ they/ apparatus/ the/ using/ laboratory?
9. airport/ shall/ this/ at/ arriving/ at/ be/ we/ time/ tomorrow/ the
10. tomorrow/ hoping/ I/ feel/ shall/ I/ am/ better

**Ex. 4. Complete the sentences with one of the following verbs in the correct form:**

*come    get    happen    look    make    start    stay    try    work*

1. 'You ... hard today.' – 'Yes, I have a lot to do.'
2. I ... for Christine. Do you know where she is?
3. It ... dark. Shall I turn on the light?
4. They haven't got anywhere to live at the moment. They ... friends until they find somewhere to live.
5. 'Are you ready, Ann?' 'Yes, I ... .'
6. Have you got an umbrella? It ... to rain.
7. You ... a lot of noise. Could you be quieter? I ... to concentrate.
8. Why are all these people here? What ... ?

**Ex. 5. Use the right form of the verb in brackets.**

1. My aunt often (*talk*) to herself. Look, Grandpa (*talk*) to himself.
2. I never (*drink*) anything with my meals. What you (*drink*)? – Tonic water.
3. The days (*get*) longer from January to June. The days (*get*) longer now.
4. We (*go*) out a lot in the summer. We (*go*) out on Saturday.
5. What's that terrible noise? – My neighbour (*drill*) the wall. He (*do*) it every weekend.
6. I wonder if Kate is on a diet. She (*get*) thinner and thinner.
7. My house plants (*grow*) very slowly.
8. She can't come to the phone right now. She (*wash*) her hair. She (*wash*) it twice a week.
9. Many people (*go*) to church on Sundays. Hey, people! Where you (*go*)?
10. Don't disturb him, he (*work*).

**Ex. 6. Put the verb into the correct form. Sometimes you need the negative.**

1. I'm tired. I ... (go) to bed now. Goodnight! 2. We can go out now. It ... (rain) any more. 3. "How is your new job?" – "Not so good at the moment. I ... (enjoy) it very much. 4. Catherine phoned me last night. She's on holiday in France. She ... (have) a great time and doesn't want to come back. 5. I want to lose weight, so this week I ... (eat) lunch. 6. Angela has just started evening classes. She ... (learn) German. 7. I think Paul and Ann have had an argument. They ... (speak) to each other.

**Ex. 7. Put the verb in the correct form – past continuous or past simple.**

1. Jane ... (wait) for me when I ... (arrive). 2. What ... (you/do) this time yesterday? – I was asleep. 3. ... (you/ go) out last night? - No, I was too tired. 4. Was Mary at the party last night? – Yes, she ... (wear) a really nice dress. 5. How fast ... (you/drive) when the accident ... (happen)? 6. John ... (take) a photograph of me while I ... (not/look). 7. We were in a very difficult position. We ... (not/know) what to do. 8. I ... (walk) along the street when suddenly I ... (hear) footsteps behind me. Somebody ... (follow) me. I was frightened and I ... (start) to run. 9. When I was young, I ... (want) to be a chemist.

**Ex. 8. What were you doing at the following times?**

at 8 o'clock yesterday evening; at 5 o'clock last Saturday; at 10.15 yesterday morning, at 4.50 this morning, at 7.45 yesterday evening, half an hour ago

**Ex. 9. Translate the following sentences into English.**

A. 1. Зараз вони записують формули в зошити. 2. Дівчина розкладає книжки по полицях. 3. Завтра о цій годині вони будуть писати контрольну роботу. 4. Вчені розвивають цю галузь хімії. 5. Викладачі розробляють новий підручник для студентів хімічного факультету. 6. Вчора з другої до третьої години ми проводили експеримент у лабораторії. 7. Зараз лаборант розповідає першокурсникам про правила безпеки в лабораторії. 8. Зараз Марія пише реферат з історії хімічного факультету. 9. Протягом наступного тижня аспіранти будуть здавати кандидатський іспит з англійської мови. 10. На даний момент студенти п'ятого курсу обирають тему для кваліфікаційної роботи магістра.

B. 1. Ми зараз готуємось до концерту на честь дня першокурсника. 2. Я буду шукати реагенти, а ти в цей час будеш готувати місце для експерименту. 3. Я роблю все правильно? – Ні, ти не дотримуєшся правил безпеки. 4. Це фотографія нашої групи під час уроку: Саша відповідає біля дошки, а всі інші пишуть речення у зошитах. 5. Не заважайте йому. Він готується до виступу з доповіддю. 6. Лаборант проводив експеримент дуже обережно. 7. Студенти писали контрольну роботу дуже старанно. 8. Викладач спостерігає, як студенти працюють із кислотою. 9. Завтра у цей час він буде їхати у поїзді на конференцію. 10. Він дуже ледачий і рідко відвідує заняття. Зараз він боїться, що не складе сесію, і зубрить цілими днями. Наприклад, учора з 2 до 6 години вечора він відповідав викладачам на питання з різних предметів.

**Ex. 10. Match the English words, word combinations and chemical terms in A with their Ukrainian equivalents in B, Use dictionary if necessary.**

Box A		Box B	
A	to value	1	опиратися
B	rare	2	старіння
C	to resist	3	перевага
D	to damage	4	розвивати
E	performance	5	ліки
F	ageing	6	цінувати
G	to urge	7	свідчення
H	to spread	8	рідкий
I	purpose	9	довіра
J	to be related to	10	мета
K	benefit	11	руйнувати
L	remedy	12	визнання
M	to evolve	13	дія
N	reliance	14	бути пов'язаним
O	evidence	15	переконувати
P	recognition	16	розповсюджувати

### Text 1:

#### History of Chemistry

Thousands of years ago people valued gold as a rare and beautiful substance. They also understood that gold had a unique ability to resist decay and corrosion. Since there was no known acid or other substance that could damage gold, they thought that gold had a quality of performance that could be transmitted to humans. Therefore, every medicine that fought ageing contained gold as an essential ingredient and doctors urged people to drink from gold cups to prolong life.

This universal desire for gold made alchemy a formal discipline in the first century A.D. It first appeared among Greek scholars, then spread to eastern Mediterranean countries, and finally to Spain and Italy in the 12th century. Though the attempts to produce gold from other substances was the original and central purpose of alchemy, a number of physician-chemists in Europe in the Middle Ages tried to produce medicines that were not dependent on gold or related to it.

They worked to produce medicines and spirits from raw materials, such as herbs, and in this way improved methods of separating elements by distillation. For example, as early as the 13th century, Thaddeus of Florence identified the

medical benefits of alcohol distillates taken internally and applied locally. Paracelsus (1493-1541), the German-Swiss physician and alchemist, was the first person to unite medicine with chemistry through his use of remedies that contained mercury, sulphur, iron, and copper sulphate. This led to steam distillation and improved equipment.

The development of apparatus and the extensive efforts to break down or distil substances laid the foundation for modern chemistry, but as true science began to evolve during the Renaissance, the study of alchemy blocked the birth of modern chemistry. Some scientists tried to lead people toward reliance on empirical evidence (that is, what can actually be observed and/or measured), but the idea of four essential elements (earth, air, fire, and water) lived on and there was no recognition that these four substances are made up of a combination of basic elements.

**Ex. 11. Give the English equivalents for the following words and word combinations.**

не піддаватися розпаду та корозії; невід’ємна складова; зробити довшим; всесвітня жага; вчені Греції; початкова та головна мета; Середні віки; бути пов’язаним із; спирти; трави; метод поділу; перегонка з водяною парою; стихія

**Ex. 12. Find in the text synonyms for the following words.**

Millenium; to make; aim; way; advantage; to combine; apparatus; research; concept

**Ex. 13. Look through the text again and find the sentences describing a) gold; b) production of medicines; c) contributions of scholars.**

**Ex. 14. Read the text thoroughly with a dictionary and answer the following questions:**

1. Why did every medicine fighting ageing contain gold?
2. What made alchemy a formal discipline?
3. When and where did alchemy appear?
4. What did some physicians use to produce medicines in the Middle Ages?
5. Who was the first to unite alchemy with chemistry?
6. What laid the foundation for modern chemistry?
7. What was the idea of ancient scholars about the four essential elements?



**Study the following grammar rule.**

How to express Future				
Future Indefinite <i>рішення, що було прийняте</i>	Future Continuous <i>дія, що буде у процесі у певну мить</i>	Present Simple <i>майбутні події згідно з розкладом,</i>	Present Continuous <i>особиста домовленість</i>	to be going to <i>рішення, що було зроблене давно;</i>

зараз, спонтанно; майбутня дія як факт	часу майбутнього	календарем		передбачення дії на основі теперішніх подій
Where are you going? – To the party. – <u>I'll go</u> with you <u>I'll be famous</u> one day	This time tomorrow <u>I'll be making</u> a report	Next term <u>starts</u> on 1 September	<u>I'm meeting</u> my supervisor at 2 o'clock tomorrow	They <u>are going to take part</u> in that conference. Look at those clouds. <u>It's going to rain.</u>

**Ex. 15. Use each expression once to fill the gaps in the. pairs of sentences.**

a) *get/ 'll get*

'I've got a headache.' 'Stay there. I ... you an aspirin.'

I'm a newspaper junkie. I ... five newspapers a day.

b) *'ll see/ 'm going to see*

I can't do my homework tonight. I ... a movie.

'What are you going to give me for my birthday?' 'I don't know yet. I ... .'

c) *are you going to do/ will you do*

So you're going to America for a year! What ... when you get there?

I'm sure you'll pass your exams, but what ... if you fail them?

d) *'ll come/ 'm coming*

I ... with you if you like.

I ... with you whether you like it or not.

e) *are you doing/ are you going to do*

What ... about that leaking tap? You said you'd fix it ages ago!

What ... this weekend?

f) *'s raining/ 's going to rain*

It ... tomorrow, so now's the time to cut the grass.

Oh, no! It ... ! That means we can't play tennis.

**Ex. 16. Put the verbs in the most suitable form.**

1. *A decided to learn a language*

A: I decided to try and learn a foreign language.

B: Oh, really? Which language ... (you/learn)?

A: German.

B: I see. And ... (you/do) a course?

A: Yes. ... (it/start) next week.

B: That's great! I'm sure ... (you/enjoy) it.

A: I hope so. But I think ... (it/be) quite difficult.

2. *Two secret agents are talking on the phone*

A: Well, what time ... (we/meet)?



B: Come to the cafe by the station at four o'clock. ... (I/wait) for you when ... (you/arrive). ... (I/sit) by the window and ... (I/wear) a bright green sweater.

A: OK. ... (Agent 007/ come) too?

B: No, he can't be there.

A: Oh. ... (I/bring) the documents?

B: Yes. ... (I/explain) everything when ... (I/see) you. And don't be late.

A: ... (I/try) to be on time.

**Ex. 17. Put in the verb in the correct form.**

1. I feel a bit hungry. I think ... (I/have) something to eat. 2. Why are you putting on your coat? ... (you/go) somewhere? 3. What time ... (I/phone) you this evening? 4. Look! The plane is flying towards the airport. ... (it/land). 5. Are you still watching that program? What time ... (it/ end)? 6. ... (I/go) to Kyiv next weekend for a wedding. My sister ... (get) married. 7. I'm not ready yet. ... (I/tell) you when ... (I/be) ready. I promise ... (I/not/be) very long. 8. I wonder where ... (we/live) ten years from now? 9. She was very rude to me. I refuse to speak to her again until ... (she/apologize). 10. What do you plan to do when ... (you/finish) your course at the university?

**Ex. 18. Insert the articles where necessary.**

When we want to write ... letter, we take ... piece of ... paper and ... pen. We first write our ... address and ... date in ... right-hand corner. Then on ... left-hand side we write ... greeting. We may write, for instance, "My dear brother," "Dear Sirs," for business letters ect. (when we know ... name of ... person we are addressing, we use his or her name), and then on ... line we begin ... real letter. We must not forget to leave ... margin on ... left-hand side of ... page. At ... end of ... letter we write "Yours," and then we sign our name. We put ... letter into ... envelope and close ... envelope. On ... envelope we write ... name and address of ... person who will receive it. We stick ... stamp in ... top right-hand corner, and then we post ... letter.

**Ex. 19. Insert necessary prepositions (at, by, in, of, on, to, with).**

1. He was cured ... a very skilful doctor. 2. He was taken to hospital ... an ambulance. 3. We tried to speak ... him, but he did not want to listen ... us. 4. It is clear ... me that you don't know your lesson. 5. I explained ... the teacher that by the end ... the lesson I had not finished the translation ... the text and that's why I had not handed it ... him. 6. We did not want to stay ... town on such a hot day, so we went ... the country. 7. We went ... the garden and sat down ... a bench. 8. ... Wednesday I usually have a lot ... homework. 9. Our lessons are usually over ... fifteen minutes to two. 10. The young scientist was trying to prove ... the professor the necessity ... the experiment.



**Study the following grammar rule.**

*Remember the reading of the numbers*

правило	приклади
1. Put the stress on the last syllable when you deal with numbers 13-19	<b>fifteen, sixteen</b>
2. Put the stress on the first syllable dealing with 20, 30, 40 etc.	<b>fifty, sixty</b>
3. Always put a hyphen after the decimals	fifty-two; twenty-eight
4. The words <i>hundred, thousand, million, billion</i> are always in singular. Put comas to emphasize thousands, millions when writing in figures	3,000 – three thousand, 2,678,044 – two million six hundred and seventy-eight thousand forty-four
5. To make an ordinal number we add the suffix <b>-th</b>	twentieth, sixty-seventh but one – first, two – second, three – third
6. After the point in decimal fractions we read figures one by one	23.704 – twenty-three point seven zero four 0.001 – zero point zero zero one
7. Read years in two figures	1998 – nineteen ninety-eight
8. For a common fraction read the numerator as a cardinal number and the denominator as an ordinal number	3/7 – three seventh 8/100 – eight hundredth
9. Read the power as follows	1 1/6 – one and one sixth 5 <sup>2</sup> – five squared 6 <sup>3</sup> – six cubed 7 <sup>5</sup> – seven to the fifth power

**Ex. 20. Write down the following numbers in words.**

462	3 ¾	In 1699
2 ½	1,675,900	In 2006
2,876	10.04	In 1991
9.056	5 <sup>4</sup>	In 1802
0.046	6 <sup>9</sup>	

**Ex. 21. Give the right form of the figures in brackets in letters.**

1. They got flat (40) on the (5) floor in house (123) 2. Find file (11) and correct the (2) sentence. 3. Catherine (2) put a monument to Peter (1) in St. Petersburg. 4. My birthday is on the ... of ... . 5. What's the date today? – It's ... of ... today. 6. Read the (3) paragraph. 7. My son is (21) today. 8. They are celebrating their (15) anniversary on Saturday. 9. Will you give me the (2) chance? 10. Statistics says that more than (4,000,000) adults in Britain have troubles with reading and writing.

**Ex. 22. Insert necessary Reflexive Pronouns (*myself, ourselves, yourself, himself, herself, itself, themselves*).**

1. They have only ... to blame. 2. That woman put ... in a difficult position. 3. You can't expect that baby will take care of ... . 4. I am sorry that I don't make ... clear.

5. He is a great chemist. He dedicated ... to the branch of colloidal chemistry. 6. The laboratory that days suffered from the lack of money so we bought the chemicals ... . 7. Be careful when you work in the laboratory. You may injure ... with something dangerous.

**Ex. 23. Insert *some* or *any*.**

1. My teacher lives ... distance away from the University. 2. I think I'll buy ... new clothes. 3. Will there be ... discussion of the report? – I think, it will be. ... people don't like it. 4. Is there ... reliable source of information that you will use in your investigation? 5. Do you speak ... French? – No, but I speak ... English. 6. There aren't ... lectures on Sunday. 7. ... people don't like seafood. 8. Let's talk about it ... other time. 9. There's ... papers left on the table. – Oh, I didn't have time to take them away. 10. I was sure we had ... bread left. At breakfast it turned out that we didn't have ... .

**Ex. 24. Make the following sentences interrogative and negative.**

1. People usually have some free time on weekends. 2. Some of my friends also learn English. 3. There's some snow in the street. 4. I'll make some coffee for us. 5. I think I need some help. 5. We must do some experiments tomorrow.

**Ex. 25. Use *some-*, *any-*, *no-* + *one* / *body* / *thing* / *where*.**

1. Never do ... in the laboratory alone. 2. Is there ... at home? 3. Shall I bring you ... to drink? 4. We couldn't find you ... yesterday. 5. ... of us understood the rule. 6. Is there ... I have to know? – No, ... . 6. Don't worry. I am sure ... will help you. 7. We were looking for help but there was ... who could help. 8. Nobody can find out ... about that strange student.

**Ex. 26. Study the following words.**

material [m<sub>q</sub>'ti□ri<sub>q</sub>l]  
 property ['prɒp<sub>q</sub>ti]  
 undergo ["ʌnd<sub>q</sub>'g<sub>q</sub>u]  
 composition ['kɒmp<sub>q</sub>'zi](<sub>q</sub>)n]  
 condition [k<sub>q</sub>n'di](<sub>q</sub>)n]  
 accompany [q'kʌmp(<sub>q</sub>)ni]  
 fundamental ["fʌnd<sub>q</sub>'mentl]  
 important [im'p□:t(<sub>q</sub>)nt]  
 quantitatively ['kwɒntit<sub>q</sub>tivli]  
 relationship [ri'lei](<sub>q</sub>)nʃip]  
 external [eks'tɜ:nl]  
 molecule ['mɒlikju:l]

equal ['i:kw(<sub>q</sub>)l]  
 among [q'mʌŋ]  
 hydrogen ['haɪdrɪ](<sub>q</sub>)n]  
 biochemistry ['baɪ<sub>q</sub>u'kemistri]  
 geology [dʒi'ɒl<sub>q</sub>dʒi]  
 origin ['ɒrɪdʒin]  
 manufacture ["mʌnju'fækt](<sub>q</sub>)  
 sufficient [s(<sub>q</sub>)'fi](<sub>q</sub>)nt]  
 radium ['rei](<sub>q</sub>)m], ['reɪdɪ<sub>q</sub>m]  
 create [kri:'eit]  
 machine [m<sub>q</sub>'ʃi:n]  
 polymer ['pɒlim<sub>q</sub>]

**Ex. 27. Think if these statements are true or false. Check yourself after reading.**

1. The beginning of chemistry goes back to the first manufacture of iron, glass, ceramics.
2. The modern chemistry appeared in the sixteenth century.
3. Robert Boyle introduced the concept of the chemical element.
4. The greatest discovery of chemistry – Periodic Law – appeared in 1869.
5. The scientists have already studied chemistry completely.

**Text 2:**

**Chemistry**

Chemistry is the science which deals with materials, their properties and the transformations they undergo. So chemistry is the study of the composition and properties of matter, their changes, the conditions under which such changes take place, and the energy changes which accompany them.

Chemistry is concerned with the nature of fire and the structure of water, it deals with colours, catalysis and crystal structure, with physical properties and chemical reactivity.

Chemistry is one of the fundamental sciences. It plays an important part in the development of biochemistry, physics, geology, and many other fields of science. Chemistry's origin goes back to ancient times, with the manufacture of bronze, iron, ceramics, glass.

At the end of the sixteenth century sufficient facts, entirely free of magic which surrounded the work of the alchemists appeared.

In the seventeenth century modern chemistry began with the work of Robert Boyle. He was the first one who studied quantitatively the relationship between the volume of a gas and the external pressure upon it. Later A. Lavoisier introduced the concept of the chemical elements.

In the 19th century A. Avogadro introduced the formulation of molecules. He stated that equal volumes of gases under the same conditions of temperature and pressure contain the same number of molecules.

F. A. Kekule and A. M. Butlerov introduced the structural theory of organic chemistry.

In 1869 D. I. Mendeleev discovered regularities in the properties of the elements. D. I. Mendeleev's discovery was the greatest one in chemistry.

Many great scientists devoted their life to the development of chemistry among them Bohr whose theory of the hydrogen atom was very important, the Curies who in 1934 announced the preparation of artificial radio-active elements, Marie Curie who discovered radium, and the element polonium.

Many great Russian chemists made a great contribution to world science. Among them, the outstanding Russian chemists M. V. Lomonosov, D. I. Mendeleev, A. M. Butlerov, Academician N. N. Semenov, and many others.

Everyone now understands the importance of chemistry. The future of chemistry is practically unlimited. Rapid development of chemical industry will

make it possible to create many new goods, machines, plastics, polymers, it will help to understand many new phenomena.

**Ex. 28. Answer the following questions:**

1. What do you know about chemistry? 2. What does chemistry study? 3. What does chemistry deal with? 4. Why is chemistry one of the fundamental sciences? 5. When did sufficient facts about chemistry appear? 6. When did modern chemistry begin? 7. Who was the first to study quantitatively the relationship between the volume of a gas and the external pressure upon it? 8. What did Lavoisier introduce? 9. Who discovered regularities in the properties of the elements? 10. What can you tell about the future of chemistry?

**Ex. 29. Match the word and its explanation.**

- |           |   |
|-----------|---|
| 1 concept | A space occupied by a gas or liquid   |
| 2 goods   | B apparatus for applying mechanical power, having several interrelated parts              |
| 3 machine | C general notion; abstract idea   |
| 4 plastic | D compound of one or more large molecules formed from repeated units of smaller molecules |
| 5 polymer | E synthetic resinous substance that can be given any shape                                |
| 6 volume  | F a movable property  |

**Ex. 30. Find the paragraphs that correspond to the following names.**

1. Great scientists of the 19<sup>th</sup> century.
2. The great chemist Robert Boyle and his theory.
3. The definition of chemistry.
4. D.I. Mendeleev's Periodic Law.
5. The relation of chemistry to other fields of science.
6. The future of chemistry.
7. The origin of chemistry.
8. A. Avogadro's formulation of molecules.

**Ex. 31. Render the text according to the plan you have got.**

**Ex. 32. Translate the following sentences into English.**

1. Наука хімія включає в себе вивчення властивостей, складу та структури речовини, зміни у структурі та композиції, що зазнає речовина, а також зміни енергії, що їх супроводжують.
2. Хімія має тісний зв'язок з іншими науками: геологією, біохімією, фізикою тощо.
3. Цей матеріал дуже важливий для промисловості країни, тому що він має надзвичайні властивості.
4. Зараз хіміки працюють над проблемою виробництва цієї речовини.
5. За звичайних умов молекула водню не є дуже активною.

**Ex. 33. Mind the note and translate the following sentences into Ukrainian.**

**one** один (числівник)  
підмет (у неозначено-  
особовому реченні)

**no one** – ніхто  
**anyone** – будь-хто  
**one may** – можливо, можна  
**one must** – потрібно

**one, ones** Слова, що  
замінюють іменник

- A 1. Ten minus **one** is nine. 2. These trousers aren't as tight as the other **ones**. 3. We'll discuss it **one** day when you are feeling better. 4. Do you want a drink? – I think I'll have **one**. 5. **One can** get a free dinner here. 6. People were standing around in **ones** and twos. 7. It's nearly **one** o'clock. 8. **One must** do it oneself. 9. Which is your file? – The **one** on the upper shelf. 10. **One can** never tell, but to my mind this play would be great.
- B 1. They study organic processes and inorganic **ones**. 2. **Anyone** can take part in this work. 3. This method is simpler than that **one**. 4. **No one** observed this phenomenon. 5. **One must** know all the properties of this substance. 6. Sodium is the only **one** of the alkali metals which is used industrially in the large scale. 8. **One may** expect that this substance dissolves easily in water. 9. Only **one** out of 100 million atoms of radium decomposes per second. 10. At **one** time chemists took the weight of the hydrogen atom as the unit. 11. Hydrogen consists of particles, each **one** is made up of 2 hydrogen atoms.

**Ex. 34. Match given word combinations and their translation.**

- |   |  |   |
|---|--|---|
| A | 1 different branches of chemistry                        | a) вивчення цих речовин   |
|   | 2 the field of inorganic chemistry                       | b) вуглеводи та їх похідні  |
|   | 3 hydrocarbons and their derivatives                     | c) хімія сполук вуглецю   |
|   | 4 the study of these substances                          | d) область неорганічної хімії                                       |
|   | 5 chemistry of carbon compounds                          | e) різні галузі хімії   |
| B | 1 relation between electrical energy and chemical change | a) метод відкладення металу з розчину                               |
|   | 2 conducting medium                                      | b) співвідношення між кількістю електроенергії та хімічною реакцією |
|   | 3 method of deposition metals from their solution        | c) межа між фізикою та хімією                                       |



- |  |                                |
|--|--------------------------------|
| 4 the presence of a magnetic field             | d) присутність магнітного поля |
| 5 the boundaries between physics and chemistry | e) провідне середовище         |

**Ex. 35. Think of the translation of these international words.**

analytical, antibiotics, colloidal, electricity, electrolysis, energy, hydrocarbons, idea, inorganic, laboratory, material, medicine, method, organic, organism, paramagnetic, pharmaceutical, physical

**Text 3:**

**Fields Of Chemistry**

The field of chemistry is now a very large one. There are more than 30 different branches of chemistry. Some of them are inorganic chemistry, organic chemistry, physical chemistry, analytical chemistry, pharmaceutical chemistry, nuclear chemistry, industrial chemistry, colloidal chemistry, electrochemistry, magnetochemistry, and biochemistry.

*Inorganic chemistry.* It was originally considered that the field of inorganic chemistry consists of the study of materials not derived from living organisms. However, it now includes all substances except the hydrocarbons and their derivatives.

*Organic chemistry.* At one time it was thought that all substances found in plants and animals could be made only by using part of a living plant or animal. The study of these substances, most of which contain carbon, was therefore called organic chemistry. It is now known that this idea is quite wrong. In 1828 Fr. Wohler, a German scientist, made an “organic” substance using a simple laboratory process. Organic chemistry now merely means the chemistry of carbon compounds.

*Physical chemistry.* This field of chemistry is concerned with those parts of chemistry which are closely linked with physics as, for instance, the behaviour of substances when a current of electricity is passed through them.

*Electrochemistry* is concerned with the relation between electrical energy and chemical change. Electrolysis is the process whereby electrical energy causes a chemical change in the conducting medium, which usually is a solution or a molten substance. The process is generally used as a method of deposition metals from a solution.

*Magnetochemistry* is the study of behaviour of a chemical substance in the presence of a magnetic field. A paramagnetic substance, i.e. a substance having unpaired electrons, is drawn into a magnetic field. Diamagnetic substances, i.e. substances having no unpaired electrons, are repelled by a magnetic field.

*Biochemistry.* Just as the physical chemist works on the boundaries between physics and chemistry, so the biochemist works on the boundaries between biology and chemistry. Much of the work of the biochemist is connected with food-stuffs

and medicines. The medicines known as antibiotics, of which penicillin is an early example, were prepared by biochemists.

**Ex. 36. Answer the following questions.**

1. How many different branches of chemistry are there? 2. Which are the better known fields of chemistry? 3. What does inorganic chemistry deal with? 4. Give an example of an inorganic compound. 5. How many elements does water consist of? 6. What is the subject of electrochemistry? 7. What is the study of behaviour of chemical substances in the presence of a magnetic field called? 8. What is the difference between paramagnetic and diamagnetic substances? 9. By whom were the medicines known as antibiotics prepared?

**Ex. 37. Fill in the blanks using appropriate words from the text.**

1. Inorganic chemistry now \_\_\_\_\_ all substances except the \_\_\_\_\_ and their \_\_\_\_\_. 2. Once scientists thought that all substances found in \_\_\_\_\_ and \_\_\_\_\_ were organic. 3. \_\_\_\_\_ chemist studies the \_\_\_\_\_ of substances when a current of \_\_\_\_\_ is passed through them. 4. \_\_\_\_\_ is generally used as a method of deposition metals from their \_\_\_\_\_. 5. \_\_\_\_\_ such as \_\_\_\_\_ are prepared by biochemists.

**Ex. 38. Decide what word or word combination is being defined in these sentences.**

1. a subdivision of a family, knowledge, etc.
2. a thing got from some particular source
3. the way of acting upon something under particular conditions
4. the ordered movement of electrically charged particles
5. a physical environment etc. of a living organism
6. a conversion of a solid or gas into a liquid by mixture with a liquid
7. the area of force around a magnet
8. the limits of an area
9. a substance used as food
10. a substance that can inhibit or destroy susceptible micro-organisms

**Ex. 39. Work with a dictionary. Write out as many derivatives of the following words as you can. Remember them.**

to solve  
to resist  
to recognize  
to relate  
to place  
to create

to evolve  
to discover  
to form  
composition  
machine  
regular

**Ex. 40. Translate the following sentences into English.**

1. Потрібно бути обережним з вибуховими речовинами. 2. Де Ви вчора були? – Вчора ми виконували експеримент у лабораторії протягом 8 годин. 3. Ця стаття

описує експеримент з аналітичної хімії. 4. Зараз біохіміки працюють над новими антибіотиками проти цієї небезпечної інфекції. 5. Синтетичний пластик займе місце металів у машинобудуванні. 6. Метали є добрим провідником тепла, в той час як дерево – поганим. 7. Вивчення вуглеводнів і їх похідних відноситься до органічної хімії. 8. Предмети з натуральних матеріалів не мають усіх потрібних властивостей. 9. У майбутньому типічними матеріалами будуть продукти органічного синтезу, а саме полімери. 10. Над чим Ви зараз працюєте? – Ми розробляємо матеріали з такою електричною провідністю та магнітними властивостями, які стануть важливими у електроніці та допоможуть створити нові типи транзисторів.

#### Ex. 41. Check your Grammar.

1. He came at 6 o'clock when they ... dinner.
  - a. are having
  - b. had
  - c. was having
  - d. were having
2. The professor asked a question but ... could answer.
  - a. anybody
  - b. nobody
  - c. somebody
  - d. no one
3. They ... this experiment yesterday.
  - a. made
  - b. maked
  - c. were making
  - d. are making
4. Now she ... difficulty in putting the facts in order.
  - a. has
  - b. have
  - c. is having
  - d. was having
5. The professor says that they ... test tomorrow.
  - a. will have
  - b. are having
  - c. were having
  - d. have
6. Don't go out! It ... hard.
  - a. is raining
  - b. was raining
  - c. rain
  - d. rains
7. ... this week? – No, she is on holiday.
  - a. Does she work
  - b. She is working
  - c. Does work she
  - d. Is she working
8. That bag looks heavy. ... you with it.
  - a. I'm helping
  - b. I help
  - c. I'll help
  - d. I'm going to help
9. Jessy is in hospital. – I know. I ... her tomorrow.
  - a. I visit
  - b. I'm visiting
  - c. I'm going to visit
  - d. I'll visit
10. He ... his hand when he was cooking the dinner.
  - a. burnt
  - b. was burning
  - c. burn
  - d. burned

### Unit 3

*Grammar: Perfect tenses; Adjective; Adverb; Degrees of comparison of Adjectives and Adverbs; Meanings of the words HARD, HARDLY and MUCH; Pronouns (Revision); Imperative mood*

**G** Study the following grammar rule.

Часи групи Perfect		
Present	Past	Future
I/you/ we/ they <b>have helped (written)</b> He/she/it <b>has helped (written)</b>	<b>had helped</b> <b>had written</b>	I/we <b>shall have helped (written)</b> You/they/he/she/it <b>will have helped (written)</b>
Вживання		
Дія з результатом на даний момент часу		
today this week already ever, never just, not yet	by 4 o'clock yesterday інша дія	by 4 o'clock tomorrow інша дія

Утворення запитання		
have	I/you/ we/ they	helped?
has	he/she/it	written?
had	I/we/you/he/she/it/they	helped? written?
shall	I/we/	have
will	you/they/he/she/it	helped? (written?)

Утворення заперечної форми		
I/you/ we/ they	haven't	helped
he/she/it	hasn't	written
I/we/you/he/she/it/they	hadn't	helped written
I/we/	shall not	have
you/they/he/she/it	will not	helped (written)

**Ex. 1. Study the following words and remember them.**

Artificial  $['a:ti'fiʃ(q)l]$ , boiling point  $['bɔ:liŋ'pɔ:nt]$ , compound  $['kɒmpaʊnd]$ , deflection  $[di'flekʃ(q)n]$ , disintegration  $[dis'intigreiʃ(q)n]$ , environmental  $[in'vaiqr(q)n'mentl]$ , hardness  $['hɑ:dnɪs]$ , importance  $[im'pɔ:t(q)ns]$ , liquid  $['likwɪd]$ , melting point  $['meltiŋ'pɔ:nt]$ , mercury  $['mɜ:kjuri]$ , multifarious  $['mʌlti'fɛəriəs]$ , overflow  $['əvəfləʊ]$ , oxide  $['ɒksaɪd]$ , oxygen  $['ɒksɪdʒ(q)n]$ , pollution  $[pə'lju:ʃ(q)n]$ , powder  $['paʊdər]$ , series  $['siəri:z]$ , sharp  $['ʃɑ:p]$ , shift  $['ʃɪft]$ , simplification  $['sɪmplɪfɪ'keiʃ(q)n]$ , solid  $['sɒlɪd]$ , test-tube  $[test-tju:b]$ , type  $[taɪp]$ , viscosity  $[vis'kɒsɪti]$

**Ex. 2. Translate the following sentences into Ukrainian.**

- A. 1. I've said all wanted to say on the matter. 2. I think you have made a good choice. 3. The country has made enormous progress this year. The Prime Minister has done so much good. 4. Wait! You haven't read the details! 5. Have you ever made this experiment before? 6. We have had some successes in inorganic chemistry lately. 7. I have had a headache since I got up. 8. Have you ever had an experience at any conference? 9. They have been friends since they left school. 10. Have you ever traveled without a ticket on public transport.
- B. 1. By the time we got to the shopping centre it had closed. 2. We had discussed the news and were now thinking about it. 3. She complained that she was penniless as she had spent all her money. 4. When I came home my family had already had dinner and were watching the film. 5. We learnt that they had been friends for many years. 6. He said he was awfully sorry for the things he had done. 7. After I had had my cup of tea, I went back to the library. 8. When they had eaten as many sandwiches as they could, they rose and left the pub. 9. They walked towards the house. It had been months since they had been there. 10. It crossed her mind that she had arrived almost five weeks ago.
- C. 1. By the time by parents get back home I will have cleaned the house from top to bottom. 2. The tourists hope the storm will have finished before they arrive to the Crimea. 3. Next month I will have worked here for ten years. 4. By the time you start writing your test I will have finished mine. 5 .Will you have arranged everything for tomorrow? 6. I hope I will have written my term paper by the end of the term. 7. Will you have solved all your problems till our next meeting? 8. By the end of the year the prices for petroleum will have again increased. 9. By the time you get home pizza will have been already done. 10. The program maker will have finished his work before the arranged date.

### Ex. 3. Translate the following text into Ukrainian.

Changes are taking place in all the substances around us. Chemists have divided these changes into physical and chemical. There is no sharp dividing line between the two, but this division has been of great importance since its discovery.

A physical change is a change in the state or form of a substance. If a substance changes from a liquid to a solid, (for example liquid water has become solid ice), this is a physical change. Likewise if liquid water has become water vapour (gas), a physical change has occurred.

Physical properties are those properties, such as size, weight, density, colour, hardness, and melting and boiling points, which scientists have called physical changes.

A chemical change, as you have already stated, is the conversion of one substance into another.

Chemical properties are those properties of elements and compounds which reflect the manner in which they undergo chemical changes.

### Ex. 4. Put the verb in the correct form - present continuous or present perfect.

1. Let's go out. It ... (not/ rain) now .2. Julia is very good at languages. She ... (speak) four foreign languages very well. 3. Hurry up! Everybody ... (wait) for you. 4.

... (you/listen) to the radio? – No, you can turn it off. 5. We usually ... (grow) vegetables in our garden but this year we ... (not/ grow) any. 6. How is your English? – Not bad. It ... (improve) slowly. 7. Can we stop walking soon? I ... (start) to feel tired. 8. Can you drive? – I ... (learn). My father ... (teach) me. 9. What ... (your father/do)? – He's an architect but he ... (not/work) at the moment. 10. The train is never late. It ... (always/ leave) on time.

**Ex. 5. Put the verbs in brackets in the correct form, present perfect or past continuous.**

1. 'Where's your key?' – 'I don't know. I ... (lose) it.' 2. I ... (be) very tired, so I lay down on the bed and went to sleep. 3. Mary ... (go) to Kyiv for a while but she's back again now. 4. 'Where's John?' – 'He ... (go) out. He'll be back in about an hour. 5. I did German at school but I ... (forget) most of it. 6. I meant to phone her last night but I ... (forget). 7. I ... (have) a headache but I feel better now. 8. Look! There's an ambulance over there. There ... (be) an accident. 9. They are still building a new road. They ... (not/finish) it. 10. 'Is Helen still there?' – 'No, she ... (just/go) out.' 11. The police ... (arrest) three people but later they let them go. 12. Ann ... (give) me her address but I'm afraid I ... (lose) it. 13. Where's my bike? It ... (be) outside the house. It ... (disappear)! 14. What do you think of my English? Do you think I ... (improve)?

**Ex. 6. Put the verb into the correct form, past perfect or past simple.**

1. 'Was he at the party when you arrived?' – 'no, he ... (go) home.' 2. I felt very tired when I got home, so I ... (go) straight to bed. 3. The house was very quiet when I got home. Everybody ... (go) to bed. 4. Sorry I'm late. The car ... (break) down on my way here. 5. We were driving along the road when we ... (see) a car which ... (break) down, so we ... (stop) to see if we could help.

**Ex. 7. Put the verbs in brackets into the correct form.**

What is the chemical change? Let's set up an apparatus with two test-tubes. In one of them there is a red powder which chemists ... (call) mercuric oxide. We ... (fill) the other tube with water. When we ... (heat) the mercuric oxide the bubbles of gas ... (go) up in this test tube and we can see little drops of silvery material gathering on the side of the tube which ... (contain) the red powder. This material ... (be) mercury. The second tube with the water now ... (contains) oxygen. Now what ... (take place) in the experiment? We ... (break) up one substance into two. Mercury oxide ... (be) a compound. By means of heat we ... (force) apart the atoms of mercury and oxygen and two substances different from the red oxide ... (come) into being. One ... (be) the liquid metal – mercury. These two substances ... (be) different from the original substance. They ... (be) different from each other. This type of change chemists ... (call) a chemical change.

**Ex. 8. Reconstruct the following sentences.**

1. their/ they/ already/ exams/ passed/ have



2. he/ this/ two/ by/ had/ o'clock/ work/ finished
3. will/ built/ they/ end/ this/ the/ of/ year/ have/ by/ the/ house
4. visited/ have/ new/ research/ ever/ the/ you/ centre?
5. lately/ out/ we/ experiments/ have/ many/ carried
6. recently/ solved/ radioactivity/ artificial/ has/ he/ of/ field/ problems/ important/ the/ in/ many
7. our/ year/ research/ we/ finished/ academic/ have/ shall/ by/ this/ the/ of/ end
8. he/ he/ had/ began/ all/ material/ his/ report/ found/ work/ to/ the/ at/ before/ necessary
9. with/ a/ developed/ experiments/ they/ pollution/ of/ have/ dealing/ environmental/ program/ large
10. our/ with/ enriched/ great/ scientists/ technology/ have/ science/ and

**Ex. 9. Translate the following questions into English.**

1. Ви вже встановили прилад? 2. Лаборант уже заповнив пробірку водою? 3. Ви вже працювали з окисом ртуті? 4. Чи з'явилися у пробірці бульбашки газу? 5. Вони нагріли ртутний окис? 6. Чи з'явилися у пробірці краплі сріблястої речовини? 7. Вони отримали дві нові речовини?

**Ex. 10. Open the brackets using the correct tense.**

1. Every day our research-workers (carry on, have carried on) great research work.
2. This year our plant (has produced, produces) many new products which are better than those which (are produced, were produced, have been produced) last year.
3. They (solved, have solved) that problem two months ago.
4. They already (completed, have completed) their investigation.
5. He (hasn't worked, didn't work) at this problem since he left our Institute.
6. I (have never been, was) in Sidney.
7. Last year they (applied, have applied) that new method.
8. Recently a group of scientists (has created, created) a new accelerator.
9. Next year our scientists (have solved, will solve) many new problems.
10. Now he (is carrying out, has carried out) an experiment.

**Ex. 11. Translate the following sentences into English.**

- A. 1. Його погляди не дуже змінилися протягом декількох років. 2. Ніколи у своєму житті я не бачила такого безладу! 3. За останні декілька років їх відносини значно змінилися. 4. Ми друзі з тих самих пір, коли ми ходили разом до школи. 5. Це було щось, про що ми ніколи не чули. 6. Нам не довелося стояти у черзі, тому що ми взяли квитки заздалегідь. 7. Він виглядав як людина, яка тільки-но отримала мільйон доларів. 8. Не хвилюйся! Все буде зроблено до вечірки. 9. Вчитель обіцяє, що перевірить наші контрольні роботи до наступного уроку. 10. До наступної суботи ми вже будемо знати чемпіона.
- B. 1. У цьому експерименті ми розклали окисел ртуті на кисень і гідраргіум. 2. Він легко розчинив цю речовину. 3. Вони ще не вирішили цю проблему. 4. Він зробив більш ніж двадцять відкриттів, які відіграють важливу роль у нашій дослідницькій роботі. 5. Вчені й інженери сконструювали обладнання, яке надає можливість протестувати матеріал. 6. Хіміки відкрили, як

розділити сполуки, що зустрічаються у природі. 7. Ми не бачили його з тих пір, як він закінчив університет. 8. Ви вже бачили цей новий прилад у лабораторії. 9. Наші вчені приділяли увагу розвитку мирного використання ядерної енергії. 10. До кінця минулого року він уже зібрав необхідну інформацію про цю галузь хімії.

**Ex. 12. Study the translation of the following word combinations.**

1. were discovered – були відкриті
2. to revolutionize the material conditions – приводять матеріальні умови до корінних змін
3. we are aware of the fact that ... – ми знаємо, що ...
4. which have been considerably affected – на які значно вплинув
5. polymers obtained from – полімери, що було отримано
6. which are extracted and burned up – що видобуваються та спалюються

**Text 1:**

**Chemistry And Chemical Industry In Modern Life**

Everybody knows that chemistry with its today's possibilities is a young science. But its history began several thousand years ago. A great number of facts which are still useful in modern chemistry, were discovered<sup>1</sup> in ancient Greece, Rome and especially Egypt. But that knowledge was purely practical. They could not explain many things which they were observing in the material world. They prepared medicines from plants but could not tell what elements they consisted of.

Today, chemistry is revolutionizing the material conditions<sup>2</sup> of life of contemporary society. Everybody knows that chemistry is an extremely useful thing. We are aware of the fact that<sup>3</sup> none of the key industries can develop without chemistry. This applies to machine-building, rocketry, agriculture, light and building industry, medicine, national defense, etc. There are other sciences (biochemistry, molecular biology, geochemistry, astrochemistry, etc.) which have been considerably affected<sup>4</sup> by the progress of chemistry.

We all realize that the successes of contemporary chemistry have been amazingly great. Take, for instance, the chemistry of polymers. Scientists, who are working jointly with the chemical branches of industry, have created excellent polymers as far as durability and thermal stability are concerned. In our everyday life we are using beautiful fabrics and other materials which one can now make out of polymers obtained from<sup>5</sup> natural gas, coal, shale, wood or oil. We also know that almost all detergents, fertilizers, lubricants, fuels, antifreezes, pesticides, cosmetics, solid-state devices, energy-converters (magnets, lasers) and thousands of other products are constructed wholly or in part of synthetics.

In the not too distant future, when the atom, the Sun, the heat of the Earth, and the tides become the main sources of energy, the great quantities of coal, oil, gas, shales and wood, which are extracted and burned up<sup>6</sup> all over the world every year, will be used to make consumer goods.

Today we are witnessing the development of a new scientific and technical branch – biochemical technology. The chemists-researchers have already succeeded in determining the place and the role of each atom in a complex bio-organic compound. We are also reading quite frequently about the scientists who can retrace and organize the processes in a living organism. The combination of biological or microbiological processes with those of direct chemical synthesis helps to obtain new substances or microorganisms. This also will provide humanity with unlimited sources of food, medicines, fodder, many types of highly valuable raw materials, etc.

We are sure that there will be many new discoveries in chemistry. They will create new opportunities in the future of mankind.

**Ex. 13. Find in the text the English equivalents for the following words and word combinations.**

Складатися з; машинобудування; ракетобудування; сільське господарство; медицина; сучасна хімія; довговічність; природний газ; вугілля; сланець; деревина; нафта; миючі засоби; добрива; мастильні матеріали; спостерігати; складна біоорганічна сполука; фураж

**Ex. 14. Find in the text the Ukrainian equivalents for the following words and word combinations.**

Key industry; light and building industry; national defense; thermal stability; fabrics; fuels; antifreeze; pesticides; cosmetics; solid-state devices; energy-converters; humanity; raw material; mankind

**Ex. 15. Find in the text synonyms for the following words and word combinations.**

Opportunity; a lot of; to watch; to know; to influence; for example; together; perfect; to be made of; to manage; to get; to establish

**Ex. 16. Put the sentences in order of their appearance in the text.**

- A. They will create new opportunities in the future of mankind.
- B. But that knowledge was purely practical.
- C. In the not too distant future, when the atom, the Sun, the heat of the Earth, and the tides become the main sources of energy.
- D. Scientists have created excellent polymers as far as durability and thermal stability are concerned.
- E. This also will provide humanity with unlimited sources of food, medicines, fodder, many types of highly valuable raw materials.
- F. Everybody knows that chemistry with its today's possibilities is a young science.
- G. Take, for instance, the chemistry of polymers.
- H. Everybody knows that chemistry is an extremely useful thing.
- I. Today we are witnessing the development of a new scientific and technical branch – biochemical technology.
- J. We all realize that the successes of contemporary chemistry have been amazingly great.

**Ex. 17. Fill in the gaps using the exercises after the text.**

1. ... facts were discovered in ancient Greece, Rome and Egypt.
2. We ... that none of the key industries can develop without chemistry.
3. There are sciences which have been considerably ... by the progress of chemistry.
4. We are using beautiful ... and other materials, which can now be made out of polymers obtained from ..., ..., ..., ... and ... .
5. Great quantities of ..., ..., ..., ... and ... are extracted and burned up all over the world every year.
6. The chemists have already ... in the determining the place and the role of each atom in a ... .

**Ex. 18. Answer the questions to the text.**

1. What is the characteristic feature of the ancient chemistry?
2. What is the role of chemistry in the life of contemporary society?
3. Why is chemistry an extremely useful science?
4. What is the impact of modern chemistry on production?
5. In what branches of industry is chemistry useful?
6. What new scientific and technical branches of chemistry have appeared?
7. What are the tendencies of modern chemistry?

**Ex. 19. Insert articles before nouns where necessary.**

1. ... importance of ... scientific research and ... discoveries is growing with every ... year. 2. Due to ... achievements of ... world science ... lot of ... things are brought to ... life. 3. Science opens broad ... opportunities for ... development of ... country's productive force. 4. All ... scientists of ... world value ... our scientists for their brilliant discoveries. 5. ... state should provide scientific and educational institutes with all necessary ... equipment and facilities. 6. ... role of ... science increases in all spheres of our ... life because it became ... direct productive force.



**Study the following grammar rule.**

***Degrees of Comparison***

Positive degree	Comparative degree	Superlative degree
One- and two-syllable adjectives		
small	smaller	the smallest
large	larger	the largest
big	bigger	the biggest
happy	happier	the happiest
Remember the following forms		

good	better	the best
bad	worse	the worst
old	older	the oldest
	elder	the eldest
far	farther	the farthest
	further	the furthest
many/ much	more	the most
little	less	the least
Multy-syllable adjectives		
interesting	more interesting	the most interesting
beautiful	more beautiful	the most beautiful

**Ex. 20. Tell if the word written in bold type adjective or an adverb.**

1. It was an **easy** question and I answered it **easily**. 2. Try to write this exercise **better**. Take a **better** pen. 3. He has **little** time for sports. 4. I thought **little** of that question. 5. We talked **much**. 6. There is **much** water in the glass.

**Ex. 21. Form the degrees of comparison of the adjectives.**

vast, industrial, wonderful, electrical, progressive, difficult, complex, creative, great, good, scientific, new, full, bad, broad, little, late, far.

**Ex. 22. Open the brackets choosing the correct form of the adjectives:**

1. The monument to Pushkin is one of (old, the oldest) and (good, better, the best) in Moscow. 2. The Moscow underground is (better, the best) in the world. 3. The Korolenko Library is (large, the largest, larger) than other libraries in our city. 4. This street is as (green, the greenest) as that one. 5. This building is much (big, bigger, the biggest) than the old one. 6. This park is (beautiful, the most beautiful) in our city. 7. This street is not so (longer, long) as that one.

**Ex. 23. Translate the following sentences into Ukrainian:**

Note: **hard** – трудний, старанний  
старанно, багато

**hardly** – навряд, ледве

1. There is **hardly** anybody who doesn't know the properties of oxygen. 2. His work was very **hard**. 3. He worked very **hard** and passed all his exams well. 4. There is **hardly** any living substance which does not consist of compounds containing oxygen. 5. Though he spoke very slowly I could **hardly** understand him as my English was very poor at the time. 6. The text was very **hard** and we could **hardly** understand it.

**Ex. 24. Translate the following sentences paying attention to the meanings of the word "much":**

1. This experiment is much more tedious and time consuming than the first one. 2. That work was much more interesting for us though it was more difficult. 3. The solubility of helium is much less than that of nitrogen. 4. It would be noted that as much as 20 per

cent of this solvent was used. 5. He worked very much last year and could fulfil as much as 50 per cent of his work. 6. Much attention has been paid to the development of nuclear physics in our country. 7. Much research in the field of atomic structure has been carried out recently. 8. As much as 30 per cent of water was evaporated from this solution upon heating. 9. This new discovery is much spoken about.

**Ex. 25. Translate the following sentences into Ukrainian. Mind the following constructions:**

**as ... as** – такий (самий) ... як

**not so ... as/ not as ... as** – не такий ... як

1. English is as difficult as German. 2. My composition is not as long as yours. 3. It isn't as warm today as it was yesterday. 4. The house his aunt lives in is as old as the one his uncle lives in. 5. His apartment isn't as elegant as her apartment, but it's much bigger. 6. Johnny isn't as rich as Don but he is younger and much happier. 7. My dog isn't as friendly as your dog. 8. You can eat as much as you like. 9. A football match isn't as exciting as a hockey match. 10. The hotel isn't as cheap as we expected. 11. His songs aren't as popular as the Beatles' songs. 12. Her brother is as intelligent as his wife.

**Ex. 26. Fill in the gaps with *as ... as* and *so ... as*.**

1. Mike is ... tall ... Pete. 2. Kate is not ... nice ... Ann. 3. My room is ... light ... this one. 4. This book is not ... thin ... that one. 5. Sasha is ... old ... Michael. 6. She is ... young ... Tom's brother. 7. This woman is ... good ... that one. 8. Nick's English is not ... good ... his friend's. 9. I am not ... tall ... Pete. 10. This woman is ... young ... that one. 11. I am ... thin ... you. 12. Kate is ... lazy ... her brother. 13. This child is not ... small ... that one.

**Ex. 27. Translate the following sentences into Ukrainian.**

1. The longer a candle stands the shorter it grows. 2. The lower the energy barrier, the more often will it be passed over. 3. The larger the molecule, the less is the chance for the shift to occur. 4. Within each disintegration series, the energy is greater the shorter the half-life period. 5. The danger of oversimplification is the greater the more multifarious and complex the phenomenon is. 6. As the pressure is increased, the overflow through the pipe increases and, within rather wide limits, the greater becomes the current through the pipe. 7. The amount of the deflection is greater the less the velocity of the particles. 8. The more readily molecules can carry momentum from point to point, the greater is the viscosity. 9. The boiling point will be lower, the lower is the atmospheric pressure. 10. At any instant most of the molecules have orientations in the slower speed region; this tendency is greater the stronger the force of gravitation.

**Ex. 28. Translate the following sentences into English.**

1. Мій комп'ютер не такий новий, як у мого друга. 2. Наш університет – один із найстаріших в Україні. 3. Яка з цих доповідей Вам сподобалась більше? 4.



Граматика англійської мови складна, але англійська вимова важче. 5. Сьогодні Ви написали роботу набагато краще. 6. Наше місто не таке велике як Київ, але воно теж красиве. 7. Сьогодні полімери використовуються ширше, ніж у минулому столітті. 8. Стан навколишнього середовища став гіршим. 9. Ви маєте поводити більше часу у лабораторії. 10. Хімія – одна з найважливіших галузей промисловості.

**Ex. 29. Before reading the text, think if these statements are true or false.**

1. At the university D. I. Mendeleev studied at the chemical faculty.
2. D. I. Mendeleev got the degree for his work on the combination of alcohol and water.
3. There is hardly any branch of science that was not contributed by D. I. Mendeleev.
4. D. I. Mendeleev left Russia in order to work in London.
5. The greatest achievement of D. I. Mendeleev was the Periodic Law.

**Text 2:**

### **D. I. Mendeleev**

D. I. Mendeleev, the great Russian chemist, was born in Siberia on the eighth of February, 1834. When he was seven years old, he went to gymnasium in Tobolsk. He studied very hard, he especially liked mathematics, physics and history. At the age of 16 he entered the Pedagogical Institute in St. Petersburg, physico-mathematical department. He graduated from the Institute in 1855 and



began teach chemistry at the Technological Institute and then at the University. In 1865 Mendeleev was granted the Doctor of Science Degree for the thesis on the combination of alcohol with water. This work was both of great theoretical and practical significance. Soon after that D. I. Mendeleev was appointed Professor of General Chemistry of St. Petersburg University. Besides lectures and supervision of the laboratory, D. I. Mendeleev carried out great research work.

Mendeleev's greatest discovery was the Periodic Table. The Periodic Law suggested by Mendeleev stated that the properties of the elements were a periodic function of their atomic masses. He presented the work to the Russian Chemical Society. Mendeleev's Periodic Law opened a new era in the history of chemistry.

Mendeleev was interested in many branches of science, indeed there is hardly any field of science that was not enriched by his contribution. His numerous works dealt with many subjects: properties of liquids, theories of solutions, the development of the gas law, the use of oil and many others.

D. I. Mendeleyev was a great patriot. He did everything for the development and progress of his country.

D. I. Mendeleyev continued his research work to the very last day of his life. He died in 1907.

The world is thankful to Mendeleyev for his great contribution to the world science. At present there is hardly anyone who doesn't know this Russian scientist and his Periodic Law. We are proud of D. I. Mendeleyev who did so much for his country, for the development of world science.

**Ex. 30. Answer the following questions.**

1. When was D. I. Mendeleyev born? 2. Where was he born? 3. When did he go to gymnasium? 4. What subjects did he like? 5. What Institute did he enter? 6. Where did he work after the graduation from the Institute? 7. When was he granted the Doctor of Science degree? 8. What was he granted this degree for? 9. What was Mendeleyev's greatest discovery? 10. What did he present to the Russian Chemical Society? 11. What other problems was Mendeleyev interested in? 12. What subjects did his numerous works deal with? 13. When did he die?

**Ex. 31. Retell the text according to the following plan:**

1. D. I. Mendeleyev's childhood.
2. The gymnasium and the Pedagogical Institute.
3. D. I. Mendeleyev's work at the Technological Institute and at the University.,
4. His research work.
5. D. I. Mendeleyev's greatest discovery.
6. D. I. Mendeleyev's greatest contribution to science.
7. D. I. Mendeleyev is a great chemist and patriot.

**Ex. 32. Insert *this, that, these, those* or *it* and translate the sentences:**

1. ... terms are no longer associated with the origin of the substances. 2. ... phenomenon is not unknown in organic chemistry. 3. If ... two gases are mixed at high temperatures, a great amount of ... chemical substance is produced. 4. ... substance is far from ordinary and possesses a lot of highly interesting properties. 5. M. V. Lomonosov made brilliant discoveries at ... time. 6. Since ... time science and technology have made a great progress.

**Ex. 33. Substitute *that* or *these* for the repeated noun:**

1. Natural rubber is of higher quality than rubber produced artificially, 2. The chemists noticed the differences between substances derived from living matter and substances derived from materials. 3. Among the organic compounds the compounds containing only hydrogen and carbon, the so-called hydrocarbons, are the least reactive. 4. Physical changes are the changes which affect the state or condition of matter without changing its composition. 5. At temperatures higher than the temperatures mentioned before most substances melt or evaporate.



Study the following grammar rule.

Imperative Mood	
<i>We use the verb <b>to let</b> when dealing with I/ we/ he/ she/ it/ they</i> <i>Use Possessive pronouns <b>me/ us/ him/ her/ it/ them</b></i>	<i>We use the Infinitive form without the particle 'to' dealing with <b>you</b></i>
Let me do it. Let him answer that question. Let it rain! Let them come in.	Do these exercises for the next lesson. Don't go out alone. Give me your note-book. Don't ask stupid question.

**Ex. 34. Translate the following instructions.**

#### **Laboratory Rules**

1. Concentrate on your own experiment. Do not touch equipment which is not a part of your experiment. Do not move around more than necessary. Do not run.
2. Wear safety glasses. If your hair falls forward, tie it back.
3. Follow directions carefully. Make sure you are using the right amounts of the right chemicals. If you want to do an experiment of your own, check it out with your teacher.
4. Do not taste chemicals. Smell gases cautiously.
5. When heating a chemical in a test tube, be sure you are not pointing the test tube towards yourself or another pupil.
6. Write down your observations as soon as you have made them.
7. Use clean apparatus. Wash up and tidy up after a practical lesson. Put solid waste into the bins, not into the sinks. Let hot objects cool before putting them away.
8. If you have an accident, a burn, a cut or a splash of some chemical, wash with plenty of cold water. Tell your teacher immediately.

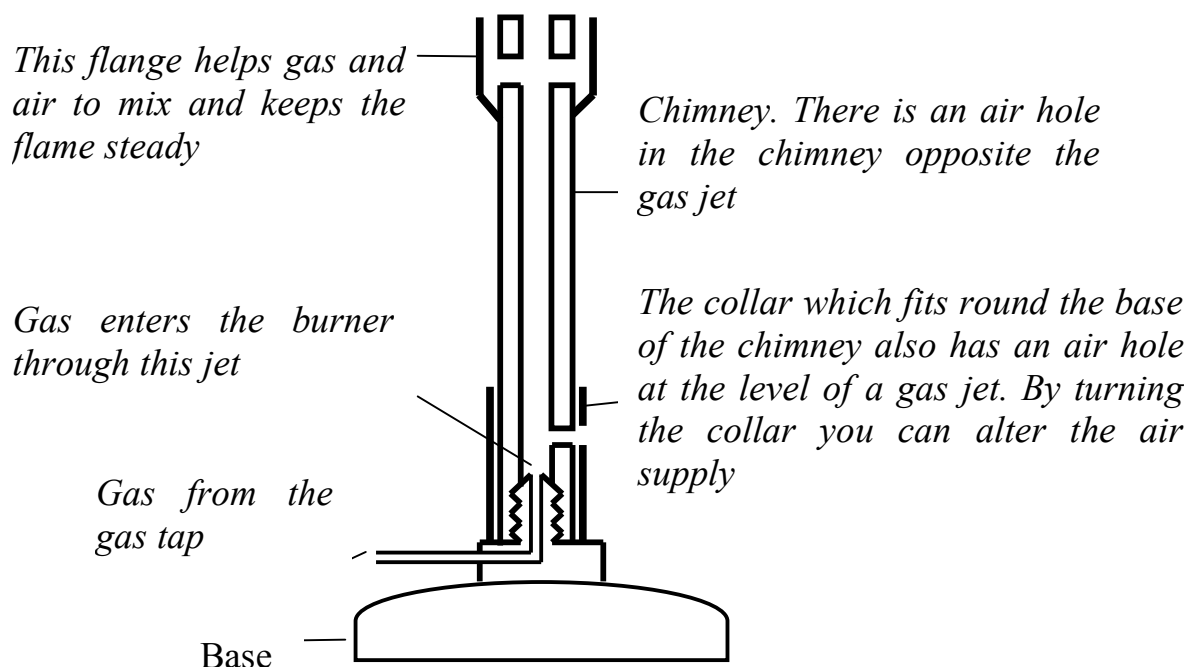
**Ex. 35. Translate the following sentences into English.**

1. Чому він не працює? – Він тільки-но обпік руку в лабораторії.
2. Будьте уважними, коли ви працюєте з кислотою.
3. У 1854 році німецький хімік Вільгельм Бунзен винайшов газову горілку, яку ми зараз використовуємо під час експериментів.
4. Періодичний закон став найбільшим досягненням в історії хімії.
5. Не виливайте кислоту у раковину!
6. Що трапилося з твоїм одягом? – Я пролив на нього луг.
7. Порівняйте ваші малюнки з малюнками в підручнику.
8. Найгарячіша частина полум'я знаходиться на його верхівці.
9. Зараз ми помітили, які речовина не змінюються під час нагрівання.
10. Коли ви запланували експеримент, покажіть ваш план лаборанту перед тим, як будете його виконувати.

**Ex. 36. Translate the instruction to the usage of Bunsen burner.**

#### *Using a Bunsen burner*

1. Connect the Bunsen to a gas tap. Close the air hole. Open the gas tap half way to the fully open position. Apply a lighted splint to the top of the chimney.
2. Note the appearance of the flame. Make a drawing.
3. Using tongs, hold a piece of pot in the flame for 1 minute. Observe the deposit which forms on the cold pot.



4. Slowly open the air hole. Notice the change in the amount of heat and light given out, the length and temperature of the flame and the noise. Draw the flame.
5. With the air hole open, repeat (3) with a fresh piece of pot.
6. Hold a piece of soft glass tubing with tongs at the top of the flame inside the blue cone just at the tip of the blue cone.
7. Which is the hottest region of the flame? How can you tell?
8. With the air hole open, turn the gas fully on. Note the appearance and the sound of the flame.

### Ex. 37. Fill in the gaps.

To light the Bunsen burner, have the air hole \_\_\_\_\_ and the gas tap \_\_\_\_\_. If you leave the burner alight on your bench, you want the flame to be clearly seen because \_\_\_\_\_. Use the \_\_\_\_\_ flame, with air hole \_\_\_\_\_. To heat with the Bunsen burner, use the \_\_\_\_\_ flame. Have the air hole \_\_\_\_\_ and the gas tap \_\_\_\_\_. For very strong heating, use the roaring flame. Have the air hole \_\_\_\_\_ and the gas \_\_\_\_\_.

### Ex. 38. Test your Grammar.

## A

*Correct mistakes in the following sentences. Some of them are already correct.*

1. The more you study, the smarter you will become.
2. The weather is much more worse today.
3. I know my jokes are bad, but yours are badder.
4. Nick looks elder than his older brother
5. Ann plays piano very well, but Christina plays more well.
6. Flying is much faster than travelling by car.
7. We are going to travel by car. It's much cheaper.
8. Could you speak more loudly?
9. He drives more slowly than his brother.
10. You should practise more often if you want to improve your language.
11. Einstein is one of the intelligent scientists who ever lived.
12. A train is the uncomfortablest place to sleep in.
13. What we need is a more good job!
14. It's best picture I've ever seen.
15. This meal is much better than as the one I ate yesterday.

## B

1. Jim is away on holiday. He ... to Spain.
  - a. is gone
  - b. has gone
  - c. has been
  - d. had gone
2. Everything is going well. We ... any problems so far.
  - a. didn't have
  - b. don't have
  - c. hadn't had
  - d. haven't have
3. Mary has lost her passport again. It's the second time this ... .
  - a. has happened
  - b. is happened
  - c. happens
  - d. happened
4. Where's the book I gave you? What ... with it?
  - a. have you done
  - b. did you do
  - c. do you do
  - d. are you doing
5. We are good friends. We ... each other for a long time
  - a. know
  - b. knew
  - c. had known
  - d. have known
6. The film was really boring. It was ... I've ever seen.
  - a. most boring film
  - b. the most boring film
  - c. the film more boring
  - d. the more boring film
7. He ... to find the job but he had no luck.
  - a. tried hard
  - b. tried hardly
  - c. hardly tried
  - d. hard tried
8. The more electricity you use, ... .
  - a. your bill will be higher
  - b. will be higher your bill
  - c. the higher your bill
  - d. higher your bill
9. Mary's English is excellent. She speaks ... .
  - a. perfectly English
  - c. perfect English

b. English perfectly

d. English perfect

10. The exam was quite easy – ... we expected

a. more easy that

c. easier than

b. more easy than

d. easier as



## Unit 4

### Grammar: The Passive Voice; Subject clauses



**Study the following grammar rule.**

Passive Voice				
	Present	Past	Future	Future in-the-Past
Indefinite	<i>to be + V<sub>3</sub></i> Letters <u>are written</u> <i>every day</i>	<i>was, were + V<sub>3</sub></i> Letters <u>were written</u> <i>yesterday</i>	<i>will, shall + V<sub>3</sub></i> The letter <u>will be written</u> <i>tomorrow</i>	<i>would be + V<sub>3</sub></i> (He said that) the letter <u>would be written</u> <i>the next day</i>
Continuous	<i>to be being + V<sub>3</sub></i> The letter <u>is being written</u> <i>now</i>	<i>was, were being + V<sub>3</sub></i> The letter <u>is being written</u> <i>at 5 o'clock yesterday</i>	---	---
Perfect	<i>to have been + V<sub>3</sub></i> The letter <u>has already been written</u>	<i>had been + V<sub>3</sub></i> The letter <u>had been written</u> <i>by 5 o'clock yesterday</i>	<i>will (shall) have been + V<sub>3</sub></i> The letter <u>will have been written</u> <i>by 5 o'clock tomorrow</i>	<i>would have been + V<sub>3</sub></i> (He said that) the letter <u>would have been written</u> <i>by 5 o'clock the next day</i>

#### Ex. 1. Study the following words and remember them.

Particle [ˈpɑːtɪkl], method [ˈmeθəd], determine [dɪˈtɜːmɪn], contact [ˈkɒntækt], molecule [ˈmɒlɪkjʊːl], radius [ˈreɪdʃəs], copper [ˈkɒpə], pile [paɪl], diagram [ˈdaɪəɡræm], gauze [ɡəʊz], constituent [kɒnˈstɪtjuənt], relative [ˈrelatɪv], ratio [ˈreɪʃiəʊ], electron [ɪˈlektɒn], proton [ˈprɒtɒn], neutron [ˈnjuːtrɒn], dioxide [daɪˈɒksaɪd], apparatus [ˈæpəreɪtəs], crucible [ˈkruːsɪbl], porcelain [ˈpɔːs(ə)lɪn]

#### Ex. 2. Make the following sentences interrogative and negative.

- All students are supplied with textbooks.
- America was discovered by Columbus.
- The library will be closed at 8 o'clock.
- The sick man is being operated on.
- This metro line was being built at that time.
- This novel has been translated into Ukrainian.
- The tickets had been sold out by that time.
- The experiment had been made by last Saturday.

**Ex. 3. Put questions to the italicized words.**

1. The letter will be answered *tomorrow*.
2. They were shown *many places of interest*.
3. Wheat is grown in *each of these regions*.
4. This town was founded *in the 15<sup>th</sup> century*.
5. Water-power stations are being built *on the mountain rivers*.
6. She was told the news *when she came*.

**Ex. 4. Translate the following sentences into Ukrainian paying attention to:**

*a) the forms of the Passive Voice constructions*

1. The statistical theory has been developed quite recently.
2. The result of the experiment is shown in Fig. 11.
3. Objects with negative stability are called unstable.
4. Thermal and other forms of diffusion were discarded.
5. We shall dwell upon the interphase nucleus which has been discussed.

*b) the combination of Modal verbs and Passive Voice constructions*

6. A supply of hydrogen must be kept in darkness.
7. A similar explanation can be offered for the melting of a solid.
8. Some words may be added about the course of the reaction.
9. At these frequencies oscillation can be prevented.

*c) translate the following sentences into Ukrainian using impersonal constructions beginning with **відомо, виявляється** etc.*

10. It was found that the substance was radioactive.
11. It has been shown that a number of species produce aminoacids.
12. It is assumed that the derivative has a constant value.
13. It was thought that the cells passed two main phases during their growth.

*d) translate the following sentences using a reversed word order*

14. Numerous classifications have been used.
15. A more careful approach is needed.
16. Separate coefficients of viscosity are used to establish stresses.
17. Information on the volume of reservoir is required.
18. The large disagreement between the various published data is discussed.

**Ex. 5. Translate the following sentences into English.**

1. У цій лабораторії проводять дослід. 2. Читальний зал провітрюється чотири рази на день. 3. Ця фабрика була збудована десять років тому. 4. Підручники продаватимуться завтра. 5. Коли було видано цю книжку? 6. Їй дали українсько-англійський словник. 7. Йому запропонували квиток на концерт. 8. Вам заплатять за цю роботу завтра. 9. Солдатам було наказано переправитися через річку. 10. Якщо мене запитують, я їм все розкажу. 11. Це питання зараз обговорюється на зборах. 12. Коли я зайшов до залу, це питання обговорювалося. 13. Його слухали дуже уважно. 14. Міст було зруйновано, перш ніж ми прибули туди. 15. Про цю подію багато говорять.

**Ex. 6. Find the sentences in which the form with the suffix “-ed” is a part of the**

### passive construction.

1. They produced many new goods at our plant. 2. This new material was produced at our plant. 3. He carried out his first experiment at the age of 18. 4. Great research work is being carried out by our students. 5. The Periodic Law opened a new era in chemistry. 6. The articles were translated by our students. 7. He was appointed professor of the physico-chemical department. 8. All the samples will be carefully examined. 9. The work was presented in time.

### Ex. 7. Use The Passive Voice according to the model:

*Model:* They gave her an interesting article.

She was given an interesting article.

1. I met them in our Institute yesterday. 2. She offered him this work. 3. They invited her to the meeting. 4. We held the meeting in our hall. 5. The students used the same solvents for their experiment. 6. He wrote a very good report. 7. They showed us a new laboratory of organic chemistry. 8. They will tell her results when the work is over. 9. Everybody spoke about this new method of production. 10. They always listen to him very attentively.

### Ex. 8. Translate the following sentences into Ukrainian.

1. The rate of this reaction can be strongly influenced by high temperature. 2. The changes in these parameters during decomposition were followed by a number of other changes. 3. Common salt was acted upon by sulphuric acid and hydrogen chloride was produced. 4. His work in this field can be relied on. 5. They were told about the new discoveries in oil production. 6. The change in colour was followed by the change of other properties. 7. Fermi is looked upon as an outstanding physicist of our time. 8. The results of their investigation can be referred to. 9. I was asked to attend his lecture on chemistry. 10. Liquid solutions will be dealt with in this chapter. 11. The qualitative examination of this compound is followed by the quantitative one. 12. At present potassium nitrite is manufactured widely at the plants. 13. This rule was explained at the last lesson. 14. All the reports which were presented by our young research-workers will be discussed.

### Ex. 9. Translate the following sentences paying attention to the meaning of the word "much"

1. This experiment is **much** more tedious and time consuming than the first one. 2. That work was **much** more interesting for us though it was more difficult. 3. The solubility of helium is **much** less than that of nitrogen. 4. It should be noted that **as much as** 20 per cent of this solvent was used. 5. He worked very **much** last year and could fulfil **as much as** 50 per cent of his work. 6. **Much** attention has been paid to the development of nuclear physics in our country. 7. **Much** research in the field of atomic structure has been carried out recently. 8. **As much as** 30 per cent of water was evaporated from this solution upon heating. 9. This new discovery is **much** spoken about.

**Ex. 10. Translate the following sentences paying attention to the meanings of the word "mean":**

**to mean** — означати, мати  
значення

**mean** (*a*)—середній

**means** (*n*)— засіб

**by means of**—за допомогою

1. In mechanics, force does not **mean** strength. 2. Electrolysis is a process by which a chemical reaction is carried out by **means** of the passage of an electric current. 3. Organic chemistry is the chemistry of carbon compounds. 4. This means that all the atoms of any element have the same properties. 5. It is generally possible by suitable **means** to separate the constituents of solutions. 6. Dissociation **means** the separation of a molecule into its original constituent atoms. 7. A number of various complicated problems has been solved **by means of** computers. 8. At any given temperature the molecules of gases have the same **mean** kinetic energy.

**Text 1:**

**Some Facts About Atoms and Molecules**

An atom may be spoken of as the smallest particle of any substance. If atoms cannot be seen it does not necessarily mean that they do not exist. It indicates that any particles, if present, must be extremely small. There are methods by means of which the sizes of atoms and their arrangement in molecules can be determined. One of these methods uses X-ray diffraction.

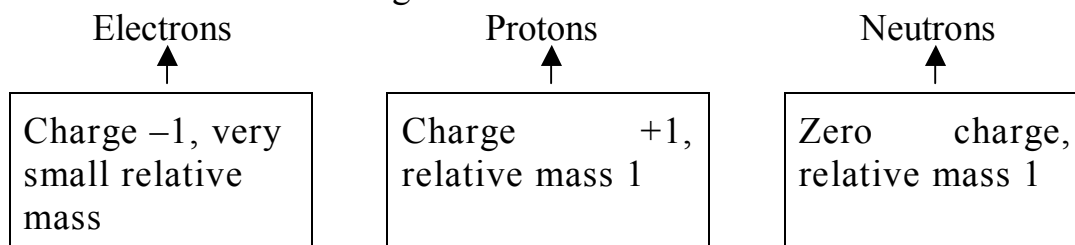
The results of a number of investigations show that when atoms are in contact with other atoms in molecules, their radius is as much as  $0.1 \times 10^{-9} m$  ( $0.1 \text{ nm}$ )<sup>1</sup>.

Some idea of how small atoms are can be obtained by imagining one million copper atoms (radius =  $0.13 \times 10^{-9} m$  ( $0.13 \text{ nm}$ )). If these copper atoms are stacked one on top of the other, the pile will be as high as the full stop<sup>2</sup> at the end of this sentence.

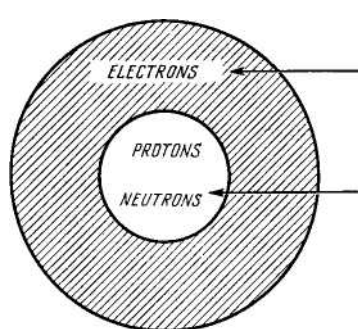
In the course of <sup>3</sup> many investigations, chemists came to a conclusion that the atoms of different elements are all made essentially of three simple types of units, which were referred to as protons, neutrons, and electrons.

The following diagram shows us the constituents of the atom:

1. Atoms contain the following structural units:



2. The position and numbers of these structural units in an atom is shown below:



Electrons fill the space around the nucleus.

Number of electrons = Atomic number.

Very small nucleus.

Number of protons = Atomic number.

Number of protons + Number of neutrons = Relative atomic

mass.

The number of electrons, protons, and neutrons in an atom of an element can be calculated if the atomic number and relative atomic mass of the element are known:

Number of electrons = Number of protons = Atomic number of element.

Number of protons + Number of neutrons = Relative atomic mass of element.

It was also found that many elements and compounds are composed of small numbers of atoms which are held together in regular arrangement<sup>4</sup>. These groups of atoms are referred to as molecules. The gas hydrogen, for example, is composed of pairs of hydrogen atoms and each pair is called a molecule and its formula is  $H_2$ .

Another example is the compound carbon dioxide which is composed of molecules, the formula is  $CO_2$ .

<sup>1</sup> the radius is as much as  $0.1 \times 10^{-9} m$  — радіус дорівнює  $0.1 \times 10^{-9} m$

<sup>2</sup> a full stop — точка

<sup>3</sup> in the course of — у процесі

<sup>4</sup> regular arrangement — упорядковане розташування

### Ex.11. Answer the following questions.

1. What is an atom? 2. What does it mean if atoms cannot be seen? 3. What methods are used to determine the size of atoms? 4. What is the radius of an atom? 5. To what conclusion did the chemists come? 6. What structural units do the atoms contain? 7. What space do the electrons fill? 8. How can the numbers of electrons, protons, and neutrons in an atom be calculated?

### Ex. 12. Translate the following sentences into Ukrainian.

1. According to the atomic theory this means that the number of atoms of carbon in combination with the same number of atoms of oxygen is two times as great in carbon monoxide as in carbon dioxide. 2. The velocity of a reaction means the amount of the material which undergoes change in unit time. 3. The heterogeneity of a substance may be shown by different means. 4. Fractional distillation is used extensively in chemical industry as a means of separating and purifying many products. 5. The average distance through which a molecule moves between collisions is called the mean free path. 6. The kinetic theory makes it possible to calculate the mean velocity of molecules.

**Ex. 13. Open the brackets choosing the correct form of the adjective. Translate the sentences into Ukrainian.**

1. Atoms are not (smaller, the smallest) particles, but they are very small. 2. This discovery is (more important, the most important) than the previous one. 3. It is much (easier, the easiest) to make parts of plastics than of metal or wood. 4. This is (the best, better) laboratory in our Institute. 5. Aluminium is (lighter, the lightest) known metal. 6. Hydrogen is (lighter, light, the lightest) of the elements. 7. Beryllium is (less, little, the least) active member of the group, and there is a regular increase in activity from metal to metal in the order of increased atomic numbers. 8. Karazin National University is (large, larger, the largest) University in our country. 9. (Much, more, the most) characteristic chemical property of hydrogen peroxide is its great oxidizing power.

**Ex. 14. Translate the following sentences into Ukrainian, mind the Passive forms of the verbs.**

1. Electrons have been spoken of as moving in orbits about the atomic nucleus. 2. This law is generally spoken of as the Second Law of Thermodynamics. 3. It had already been mentioned that many of the elementary gases could exist in diatomic molecules. 4. In general the oxidation number may be thought of as an electrical charge of the atom. 5. The results of our work will be discussed at the conference. 6. A base is referred to as a substance that accepts protons from another substance. 7. It has been noted that chlorine dioxide reacts with water. 8. The sodium salt is being manufactured in industrial quantities. 9. This method is being used in our laboratory. 10. The Institute was being built when we came to this town.

**Ex. 15 Translate the following sentences into Ukrainian paying attention to the passive construction.**

1. Physics and chemistry are taught at school. 2. Some of the experiments were carried out in our Institute. 3. Some of the properties of this substance will be predicted. 4. He was appointed Rector when he was 35 years old. 5. Almost all branches of chemistry and physics will be enriched by this new theory. 6. I was told about that great chemist who devoted his life to chemistry. 7. A new laboratory will be built in May. 8. The professor was asked many questions after the lecture. 9. He was sent abroad to continue his studies. 10. This problem is dealt with in many text-books. 11. This article will be presented as soon as we finish it. 12. This problem is being discussed by many scientists both in our country and abroad. 13. Some new results were obtained by a group of research-workers. 14. This substance cannot be used, it has many impurities.

**Ex. 16. Translate the sentences, paying attention on the verb “to be”.**

1. He was carrying out his experiments when I entered the laboratory. 2. The substance was examined under the microscope. 3. He was interested in chemistry when he was a school-boy. 4. He was sent to Petersburg to continue his studies. 5. This student was present at the lecture. 6. This work was interesting both



for him and for his students. 7. He was appointed Professor of Kharkiv University. 8. His work was devoted to physics. 9. Water is a compound substance. 10. The students were carrying out the experiment for many hours. 11. The new sort of steel is being tested by the engineers. 12. Most substances are complex in composition and can be decomposed to form two or more simpler substances. 13. To decompose molecules is to obtain molecules of simpler substances or atoms of the different elements that are present. 14. It is to be noted that bromine is one of the elements which must be handled with extreme care. 15. The more rapid diffusion of light molecules is to be explained by the fact that they are moving with a much greater velocity than the heavier ones.

**Ex. 17. Find the correct translations of the following English sentences.**

I. The professor was asked many questions by the students after the lecture.

- a) Професор поставив багато запитань студентам після лекції.
- b) Після лекції професору поставили багато запитань.
- c) Професору поставили студенти багато запитань після лекції.
- d) Після лекції студенти поставили професору багато запитань.

II. Chemistry is taught at our Institute by a well-known scientist.

- a) Хімія викладається у нашому інституті відомим ученим.
- b) Відомий учений викладає курс хімії у нашому інституті.

**Ex. 18. Open the brackets choosing a suitable word. Translate the sentences into Ukrainian.**

1. Many scientists tried to classify elements (despite, according to) their atomic weights. 2. He worked (hardly, hard) at the new problem. 3. It was (very, the very) important to solve this problem in time. 4. They could (hard, hardly) finish their work without his supervision. 5. Elements with (very, the same) properties are at definite intervals in the Periodic Table. 6. Give me (very, the very) book you brought. 7. He was very (interested, interesting) in chemistry from (very, the very) childhood. 8. I like (both, both... and) these pictures. 9. One may think that (the very, very) amount of heat which will raise the temperature of one gram of water from 0°C to 1°C will also raise the temperature of the same mass of water from 60°C to 61°C.

**Text 2:**

**The General Apparatus of Chemical Laboratory**

Yesterday we were shown the laboratory of general chemistry and were given instructions how to work there. The laboratory is the place where experiments as well as scientific research may be carried out. It usually consists of one large room with a weighing room, a reagent room and sometimes a dark room. The reagent room is used for storing chemicals and apparatus, and contains shelves of reagent bottles. The weighing room is specially constructed so as not to be affected by external

disturbances<sup>1</sup> and the balances generally stand on firm stone shelves. The analytical balance, which is kept in a glass case, consists of a beam, which swings on a knife edge, and has two pans suspended, one from each end. The material which is to be weighed is transported to and from the balance room in a dessicator. Chemical laboratory operations deal with gases<sup>2</sup>, liquids and solids, and require a variety of specialized apparatus for their manipulation<sup>3</sup>.

The laboratory is furnished with many long tables or benches, as they are usually called. On each of these benches there are shelves and racks for keeping apparatus, materials, etc.

On the shelves there are many bottles with different chemical substances. Some bottles contain solids, others – liquids. In the racks we see different glass tubes, test-tubes, condensers, flasks of different shapes and sizes, bowles, glass rods, crucibles, etc. Some crucibles are made of porcelain, others of quartz or platinum.

The apparatus used for carrying out experiments are clamped to ring-stands. The ring-stand consists of a stem having a ring with a copper gauze. Every working place is fitted with a Bunsen burner<sup>4</sup>. The flame of the burners is connected with the main gas line by a rubber tube. Sometimes steam-baths, water-baths and air-baths are used for heating.

The laboratory is also provided with gas and running water. There is a ventilating hood for the escape of disagreeable odours and harmful vapours.

<sup>1</sup>external disturbances – зовнішні перешкоди

<sup>2</sup>chemical laboratory operations deals with gases – робота у лабораторії пов'язана з газами

<sup>3</sup>for their manipulation – для роботи з ними

<sup>4</sup>Every working place is fitted with a Bunsen burner. – На кожному робочому місці є бунзенівський пальник.

### **Ex. 19. Open the brackets choosing a suitable word. Translate the sentences into Ukrainian.**

1. The reagent room is used for ... (storing, weighing) chemicals. 2. The weighing room is ... (specially, generally) constructed ... (so as, because) to be free from external disturbances. 3. Chemical laboratory operations ... (deal with, require) liquids, gases and solids. 4. The apparatus used for ... (transporting, carrying out) experiments are clamped to ring-stands. 5. The laboratory ... (is opened, is provided) with gas and running water.

### **Ex. 20. Answer the following questions.**

1. Where is scientific research carried out? 2. How many rooms does a laboratory usually consist of? 3. What is the reagent room used for? Where do balances generally stand? 4. What does the analytical balance consist of? 5. In what way is the material which is to be weighed transported? 6. What substances do chemical laboratory operations deal with? 7. What is the laboratory furnished with? 8. What is every working place fitted with? 9. What can the flame of the burners be regulated with? 10. Are all liquids colourless and odourless? 11. Where are liquids

kept? 12. What is a crucible made of? 13. What are the apparatus used for carrying out experiments clamped to? 14. What is the laboratory provided with?

**Ex. 21. Describe your chemical laboratory, using the basic vocabulary of this unit.**

**Ex. 22. Ask questions, using interrogative words.**

1. My friend's lab is on the third floor. (Whose ...) 2. The first-year students attend lectures on inorganic chemistry. (What students ...) 3. The analytical balance has to be kept in a glass case. (Where ...) 4. Substances must be weighed in a room free of external disturbances. (Where ...) 5. The new laboratory consists of several rooms. (How many ...) 6. They heated the substances by means of a Bunsen burner. (How ...) 7. Because of the different pressure, the temperature rise considerably. (Why ...)

**G Study the following grammar rule.**

Підрядні підметові речення (subject clauses)	
Підрядні <i>підметові</i> речення виконують <i>функцію підмета</i> головного речення (відповідають на питання <b>who хто?</b> чи <b>what що?</b> ) і приєднуються до головного речення сполучниками <b>that що, whether, if чи</b> та сполучними займенниками і прислівниками <b>who, whom, whose, what, which, where, when, how, why</b> :	
<u><b>Whether hydrogen or oxygen is taken for the experiment depends upon many factors.</b></u>	Той факт, береться чи кисень чи водень для досліду, залежить від багатьох факторів.
<u><b>What she wanted</b></u> was sea air.	Що їй було потрібно – це морське повітря.
<u><b>Which side wins</b></u> does not concern us here.	Яка з сторін виграє, нас не турбує.
Підрядне підметове речення може стояти після присудка головного речення. У цьому випадку на початку речення вживається ввідне <b>it</b> :	
It seemed to him <u><b>that all would be well.</b></u>	Йому здавалося, що все буде добре.

**Ex. 23. Translate the following sentences into Ukrainian.**

1. That water is a universal solvent is known to everybody. 2. Whether steel or stone is taken as building material depends on many factors. 3. Who was the inventor of this apparatus is not known. 4. That these students will take part in the work is certain. 5. That oxygen can be liquefied only under high pressure was proved by experiments. 6. When elements combine, a definite number of atoms of each element are used in forming a molecule of a given compound substance. 7. Whether a substance is a solid, a liquid, or a gas is determined entirely by the conditions of temperature and pressure to which it is subjected. 8. That matter exists in three physical states is a common knowledge.

**Ex. 24. Translate the following sentences into English.**

1. Що ці студенти братимуть участь у олімпіаді, не викликає сумніву. 2. Чи хоче він робити цей дослід, невідомо. 3. Хто з вас кращий студент, покаже тест. 4. Чи є слово “hand” дієсловом, чи іменником, можна вирішити згідно його місця в реченні. 5. “Все, що нам потрібно, – це відпочинок”, – сказав працівник. 6. Давно відомо, що блискавка є не що інше, як електрична іскра. 7. Хто врятував йому життя, залишилось невідомим. 8. Важко сказати, коли я повернуся. 9. Дивно, що ми зустрілися тут. 10. Було очевидно, що відбулося щось важливе. 11. Дивно, що він зробив помилку. 12. Ще не відомо, чи прийдуть вони сьогодні. 13. Невідомо, коли ми вирушимо.

**Ex. 25. Point out the verb in the Passive, state its form.**

1. At present many experiments are being made. 2. The components of a solution have been determined. 3. The students of our group have been given the new textbooks. 4. Our students are being shown new samples. 5. The substance has been broken down into two simpler chemical substances. 6. Substances which can not be broken down into simpler chemical substances by chemical means are called elements.

**Ex. 26. Translate the following sentences into Ukrainian.**

1. Oxygen is spoken of here as an active element. 2. Matter is acted upon by cathode rays. 3. The results of your experiment were spoken of last time. 4. Many materials now commonly made use of were not even thought of thirty years ago. 5. As it mentioned above it is stated that the atoms of mercury and oxygen have been forced apart and as was to be expected two substances different from the red oxide have come into being. 6. As is known this type of change has been called a chemical change. 7. As is known the improvements that chemistry has made in metals and other structural materials such as plastics, and many other materials such as oils have been so numerous that they can not be listed. 8. In 1911 some experiments were made by Ernest Rutherford which showed that the particles of which atoms are made are very small in size compared with the atoms.

**Ex. 27\*. Translate the following sentences into Ukrainian.**

1. It is believed that in many instances the explanations have been clarified. 2. Physicists were compelled to conclude that the discharge from the cathode must consist of a stream of particles of some sort electrically charged. 3. None of the data on plastic state have been presented at the conference. 4. The experimental facts can be explained by this supposition. 5. A discussion of *X-ray* spectra has been omitted, as it can be found in almost any advanced text on physics. 6. The process of separating or concentrating small amounts of the radioelements may, in general, be very conveniently followed by measurement of the activity. 7. The importance of water to living things is so evident, that it need not be insisted on here. 8. The invention of the nitrogen-filled lamp has been followed by the argon and neon lamps for special purposes. 9. The behaviour of gas stream during expansion is influenced by a variety of circumstances. 10. Many compounds can be decomposed,

when they are heated or when they are acted upon by other forms of energy, into simpler compounds or into their constituent elements. 11. The properties of metals are often strongly influenced by even small admixtures of other metals or nonmetals. 12. The presence of slight traces of hydrogen peroxide, in the atmosphere is accounted for by the action of ultraviolet light upon the moist oxygen. 13. From their very nature, charged particles are influenced by electric fields. 14. Many methods for detection of uranium have been proposed for use under various conditions and only a few can be referred to here. 15. Neutron capture by a nitrogen nucleus is sometimes followed by the immediate emission of a proton. 16. The method described above is the most accurate and should be followed. 17. The electrons were pictured as very small charged bodies, which generated the field in free space and conversely were acted upon by forces due to the field. 18. The recognition that isotopes could exist was first forced upon chemists from the study of the radioactive elements.

**Ex. 28\*. Translate the following sentences into Ukrainian.**

1. There are a number of coloured substances in a natural fiber that are changed to colourless products by reaction with oxygen. Many of these substances are not affected by atmospheric oxygen. 2. Complete precipitation is often ensured by the use of the common ion effect. 3. A few of the uses of aluminium have already been referred to in the article published this month. 4. Ions, such as the hydronium ions, which are made up of several atoms held together by covalence, are known as radicals. 5. An unsaturated compound is defined as one in which the maximum valency is not exerted by all the component atoms. 6. Cellulose acetate is unaffected by weak acids, oils and most solvents. 7. Since X-ray patterns for some amorphous substances are similar to those of fluid liquids, they are looked upon as liquids which have high viscosities, and are often referred to as supercooled liquids. 8. The preparation of sodium chromate from chromate ores has already been spoken of. 9. The discovery of manganese is usually credited to Cahn. 10. This question can't be answered at once. It should be thoroughly studied. 11. The heating of the solution was followed by a sudden cooling, which resulted in forming of a new product. 12. Oxidation has been defined as the losing of electrons. 13. The same procedure is followed in deriving the formula of a compound containing more than two elements. 14. Gold is slowly attacked by fused nitrates and alkali-metal hydroxides. 15. Glass and silica are not attacked by sulphuric acid of any strength.

**Ex. 29. Translate the following sentences into English.**

1. Її попросили прийти сюди. Її попросили розповісти про цей матеріал. 2. Чи знаєте ви, що ця книга була переведена на англійську мову тільки два роки тому? 3. Мене попросили допомогти йому закінчити експеримент сьогодні, тому принесли ці зразки. 4. Вам показали необхідні прилади? 5. Про цей прилад багато говорять. 6. Вас просили почати експеримент вранці.

**Ex. 30. Check your Grammar.**

1. The monument to V.N.Karazin ... to central exit of the University in 2004.



- |  |                        |
|--|------------------------|
| a. is removed  | c. was removed         |
| b. removed   | d. has been removed    |
| 2. Nobody came to the meeting because Ann ... to tell us about it yesterday. |                        |
| a. forget  | c. forgot              |
| b. forgets   | d. was forgetting      |
| 3. When I entered the laboratory the experiment ... by several students.     |                        |
| a. was carried on  | c. carried on          |
| b. was being carried on  | d. has been carried on |
| 4. The student ... many additional questions during the examination.         |                        |
| a. asking  | c. to ask              |
| b. ask   | d. was asking          |
| 5. The new Opera house ... in the city since I left it.                      |                        |
| a. was built   | c. has been built      |
| b. was building  | d. are building        |
| 6. America ... by Columbus.  |                        |
| a. is discovered   | c. discovered          |
| b. had been discovered   | d. was discovered      |
| 7. Cellulose acetate ... by weak acids, oils and most solvents.              |                        |
| a. is unaffected   | c. were unaffected     |
| b. unaffected  | d. to unaffected       |
| 8. The discovery of manganese ... usually ... to Cahn.                       |                        |
| a. has been...credited   | c. credits             |
| b. was ...credited   | d. is ...credited      |
| 9. Glass and silica ... by sulphuric acid of any strength.                   |                        |
| a. is not attacked   | c. do not attack       |
| b. are not attacked  | d. have been attacked  |
| 10. These substances ... called compounds.                                   |                        |
| a. was   | c. will                |
| b. are   | d. were                |
| 11. He ... the acid he needed for his experiment.                            |                        |
| a. is bring  | c. were brought        |
| b. was brought   | d. brings              |
| 12. All chemical substances ... subjected to changes.                        |                        |
| a. are   | c. is                  |
| b. will  | d. had                 |

## Unit 5

*Grammar: Sequence of Tense; Direct and Indirect speech; Subordinate clauses.*



**Study the following grammar rule.**

Правила узгодження часів (*Sequence of Tense*)



Present Simple → Past Simple Present Continuous → Past Continuous	Дія підрядного речення відбувається в той самий період часу, що і дія головного речення.
Present Perfect → Past Perfect Past Simple → Past Perfect	Дія підрядного речення відбулася раніше, ніж дія головного речення.
Future → Future-in-the Past	Дія підрядного речення відбувається пізніше, ніж дія головного речення.

! Правило послідовності часів не застосовується в підрядних додаткових реченнях, які виражають загальновідомі факти:

He **knew** that metals **conduct** electricity. – Він знав, що метали проводять електрику.

Правило узгодження часів діє при переведенні прямої мови в непряму мову: 1) розповідних речень; 2) загальних питань; 3) спеціальних питань; 4) наказового способу.

Приклади		Переклад
Розповідні речення		
Пряма мова	Непряма мова	
He <b>said</b> , "I <b>look</b> after the boy".	He <b>said</b> that he <b>looked</b> after the boy.	Він сказав, що він <b>доглядає</b> за хлопчиком.
He <b>said</b> , "I <b>looked</b> after the boy".	He <b>said</b> that he <b>had looked</b> after the boy.	Він сказав, що він <b>доглядав</b> за хлопчиком.
He <b>said</b> , "I <b>shall look</b> after the boy".	He <b>said</b> that he <b>would look</b> after the boy	Він сказав, що він <b>доглядатиме</b> за хлопчиком.

Замість дієслова **to say (to)** вживається дієслово **to tell** та проводяться відповідні зміни особових і присвійних займенників, а також місце та час дії.

Наприклад:

this – цей, це → that – той, та

these – ці → those – ті

now – зараз → then – тоді

here – тут → there – там

to day – сьогодні → that day – в той день

yesterday – учора → the day before – напередодні

tomorrow – завтра → the next day – наступного дня

next week – наступного тижня → the following week – наступного тижня

ago – тому назад → before – тому назад

*Питальні речення. Загальні питання.*

He asked, "Do you look after the boy?". He asked, "Did you look after the boy?". He asked, "Will you look after the boy?".	He asked <b>if (whether)</b> she looked after the boy. He asked <b>if (whether)</b> she had looked after the boy. He asked <b>if (whether)</b> she would look after the boy	Він спитав, <b>чи</b> доглядає вона за хлопчиком. Він <b>спитав</b> , <b>чи</b> доглядала вона за хлопчиком. Він спитав, <b>чи</b> буде вона доглядати за хлопчиком.
<i>Спеціальні питання</i>		
He enquired, "Where do you go every evening?"	He enquired where she went every evening.	Він питав (цікавився), куди вона ходить кожного вечора.
He enquired, "Where did you go every evening?"	He enquired where she had gone the day before.	Він питав (цікавився), куди вона ходила напередодні.
He enquired, "Where will you go every evening?"	He enquired where she would go the next day.	Він питав (цікавився), куди вона піде завтра.
<i>Наказовий спосіб.</i>		
The teacher demanded, "Hand in the translations of the text". The teacher asked, "Don't touch the device!".	The teacher demanded to hand in the translations of the text. The teacher asked not to touch the device.	Викладач наполягав здати переклади тексту. Викладач попросив не чіпати прилад.

**Ex. 1. Study the following words and remember them.**

convinced [k<sub>q</sub>n'vinst], proportion [pr<sub>q</sub>p<sub>o</sub>:ʒ(q)n], steam [sti:m], condition [k<sub>q</sub>n'diʒ(q)n], state [steit], involve [in'v<sub>o</sub>lv], influence [influ<sub>q</sub>ns], decomposition [di:k<sub>o</sub>mp<sub>q</sub>'ziʒ(q)n], current [k<sub>ʌ</sub>r<sub>q</sub>(q)nt], obtain [əb'tein], precaution [pri:k<sub>o</sub>:ʒ(q)n], fraction [frækʒ(q)n], crystallization [kristə'laɪ'zeɪʒ(q)n], droplet [dr<sub>o</sub>plit], distillation [disti'leiʒ(q)n], density [densiti], environment [in'vai<sub>r</sub>(q)nm<sub>q</sub>nt], abundance [əb<sub>ʌ</sub>nd<sub>q</sub>(q)ns], observation [əbz<sub>q</sub>(:)'veiʒ(q)n], impurity [im'pjʊ<sub>r</sub>iti].

**Ex. 2. Say the following took place in the past.**

Example: *The chemist says he has given a course of lectures on inorganic chemistry. → The chemist said that he had given a course of lectures on inorganic chemistry.*

1. He says that metals can be decomposed. 2. He says that oxygen can be easily prepared. 3. He says that he has got manganese dioxide. 4. He says that manganese dioxide has not changed. 5. He says that some substances burn spontaneously. 6. She says that iridium will not react directly with oxygen. 7. She says that she will prepare oxygen from solutions. 8. He says that some elementary substances combined very strongly.

**Ex. 3. Change the sentences from direct into indirect speech.**

Example: *Ann said, "The discovery was made this year".* → *Ann said that the discovery had been made that year.*

1. The professor said, "The experiment is being made to illustrate my report".  
2. The students said, "We translated this article yesterday". 3. The teacher asked the students, "What famous Ukrainian chemists do you know?". 4. He said, "I noticed a new element present in the sun this month". 5. She said, "I observed the density of nitrogen yesterday". 6. They said, "We shall remove the nitrogen as solid magnesium nitride now". 7. He said, "I shall introduce the residual gas into a Plücker tube now". 8. They said, "We shall examine the spectrum of the gas". 9. He said, "Janssen has examined the sun's corona today". 10. She said, "They have determined the properties of the new gas this year". 11. Oleg said to Boris, "Will you go to the laboratory tomorrow?". 12. She said to me, "Have you detected the characteristic spectrum of the element?". 13. We said to them, "Did you detect any new gas in the atmosphere?". 14. I said to Oleg, "Did anybody observe the phenomenon". 15. I said to Masha, "Did Ann read about the experiments by Cavendish?". 16. We said to them, "Have you detected the residue of the gas?". 17. He said to Ann, "Where will you characterise the spectrum of a new element?". 18. Anya said to Oleg, "When did chemists determine line spectra of alkali metals?". 19. I said to Oleg, "When did Lord Rayleigh observe the density of atmospheric nitrogen?". 20. He said to me, "Why did Ramsay pass atmospheric nitrogen over magnesium?".

**Ex. 4. Change the following questions from direct into indirect speech beginning each sentence with the words given in brackets.**

Example: *Have you found the book? (She asked me...)* – *She asked me whether I had found the book.*

1. Are there any new substances? (The student asked me ...) 2. Did you analyse the new mixture? (The assistant asked him ...) 3. Have you detected the new rays? (He didn't ask her ...) 4. Have they told him about the new discovery? (I didn't know ...) 5. Can he tell us anything about the inert gases? (I really didn't know ...) 6. Will you suggest a reason? (I didn't know ...) 7. Is he determining the combining weight of hydrogen and oxygen now? (I asked ...) 8. Did they discover the element terrestrially? (I asked ...)

**Text 1:**

### **The Periodic Table and the Periodic Law**

The story of how D. I. Mendeleev established the Periodic System of Elements has long been a matter of great interest to research workers<sup>1</sup>.

When Mendeleev began to teach at St. Petersburg University, chemistry was still far from being the well-ordered<sup>2</sup> and harmonious branch of science that we know today.

The great majority of scientists were firmly convinced that atoms of different elements were in no way connected with each other, and that they were quite independent particles of nature. Only a few advanced scientists realized that there must be a general system of laws which regulates the behaviour of atoms of each

and every element. However, the few attempts made by Beguyer de Chancourtois, Newlands, Lothar Meyer and others to find a system of laws controlling the behaviour of atoms were unsuccessful and exercised no influence<sup>3</sup> on Mendeleev, the future founder of the Periodic System of Elements.

"Mendeleev was a man who could not bear any kind of disorder and chaos," writes Academician A. A. Boikov. "This is why at the beginning of his course in chemistry at St. Petersburg University, where he had been appointed to the department of chemistry, D. I. had to establish the order in the chemical elements."

By comparison<sup>4</sup> of chemical properties of different elements researchers had long ago discovered that elements could be placed in several groups according to similarity<sup>5</sup> in their properties.

Mendeleev applied in his system the principles that he developed and included in his table the listing of the elements according to increasing weights.

Because he had the insight to see that many elements had not yet been discovered, he left open spaces in the Periodic Table. For example, he predicted<sup>6</sup> that an unknown element with atomic weight of 44 would be found for the space following calcium. And in 1879 the Swedish chemist Lars Fredric Nilson discovered scandium<sup>7</sup>.

Mendeleev's table developed into the modern Periodic Table is one of the most important tools in chemistry. The vertical columns of the modern Periodic Table are called groups and the horizontal rows are called periods. The atomic number of an element is the number of protons in the nucleus of the atom of that element. The modern Periodic Table not only clearly organizes all the elements, it lucidly<sup>8</sup> illustrates that they form "families" in rational groups, based on their characteristics.

<sup>1</sup>research worker – дослідник, вчений

<sup>2</sup>well-ordered – упорядкований

<sup>3</sup>influence - вплив

<sup>4</sup>comparison – порівняння

<sup>5</sup>similarity – схожість

<sup>6</sup>to predict – передбачати

<sup>7</sup>scandium – скандій

<sup>8</sup>lucidly – зрозуміло,

**Ex. 5. Look through the text again and find the sentences where the author describes the following facts:**

1. Mendeleev could foresee the existence of new elements because he was very gifted.
2. Scientists of Mendeleev's time didn't believe that elements are connected with each other.
3. Mendeleev's character made him order the elements.
4. Mendeleev's work on the Periodic Table and the Periodic Law has long interested scientists.
5. There were some scientists' attempts to find a system to order the elements but they failed.
6. Thanks to Mendeleev modern chemistry uses the clearly developed Periodic System as the main instrument.

**Ex. 6. Answer the following questions choosing the correct answer out of the given ones:**

1. Where did Mendeleev start ordering the elements?
  - a) at school;
  - b) at St. Petersburg University;
  - c) abroad.
2. Why did Mendeleev turn to ordering the elements? Because:
  - a) other scientists' attempts failed;
  - b) he had a talent;
  - c) he didn't like disorder.
3. What did the researchers try to do to find some order of the elements?
  - a) they compared different properties;
  - b) they read scientific literature;
  - c) they denied the earlier attempts of the scientists.
4. How did Mendeleev list the elements?
  - a) according to their names;
  - b) according to their atomic weights;
  - c) according to their chemical symbols.
5. What did scientists of Mendeleev's time think about atoms of different elements?
  - a) they were independent particles of nature;
  - b) they were closely connected;
  - c) they belonged to a well-ordered system.

**Ex. 7. Find in the text all the sentences containing the sequence of tenses. Translate them into Ukrainian.**

**Ex. 8. Translate the following sentences into Ukrainian.**

1. The scientist said that our age was the age of chemistry. 2. The ancient Greek philosophers thought that matter consisted of infinitely small particles. 3. Aristotle believed that his theory would agree with the general views on nature. 4. After Copernicus and Galileo everybody could know that the Earth turns round the Sun. 5. Cavendish discovered that water consists of a definite proportion of hydrogen and oxygen. 6. Few scientists of that time knew that Mendeleev had discovered the Periodic System of Elements. 7. It was reported that those interesting experiments would initiate a series of similar investigations. 8. The professor said that they had found some unknown properties of that substance. 9. It was reported that the new element would occupy the definite place in the Periodic Table. 10. They assumed that their method of investigation could be applied in many experiments.

**Ex. 9. Translate the following sentences into English.**

1. Професор сказав, що цей експеримент проводиться для ілюстрації його доповіді. 2. Студенти сказали, що дізналися про нове відкриття на семінарі. 3. Викладач знав, що декілька студентів стануть дослідниками. 4. Вчені були впевнені, що деякі відкриття вплинуть на наукові погляди Менделєєва. 5. Декілька прогресивних вчених розуміли, що існує визначена система елементів. 6. У своїй книзі Б. Н. Конарев доказує, що в стародавності люди знали тільки ті речовини, які були їм необхідні для життя. 7. Арабські алхіміки вже в IX-X ст. вважали, що всі речовини можна розділити на органічні та неорганічні. 8. Лавуазьє відповів на ті питання, на які не могли знайти відповіді вчені кількох поколінь. 9. Викладач розповів на лекції, який внесок зробив Берцеліус у неорганічну хімію. 10. Ми знаємо, що Берцеліус був автором декількох підручників з хімії.

**Ex. 10. Before reading the text find the explanation of the following words.**

- |              |  |
|--------------|--|
| 1 air        | A action taken beforehand to avoid risk or ensure a good result  |
| 2 current    | B colourless transparent liquid compound of oxygen and hydrogen. |
| 3 material   | C a gas into which water is changed by boiling                   |
| 4 precaution | D matter from which a thing is made                              |
| 5 steam      | E any of the limits of a solid                                   |
| 6 surface    | F an ordered movement of electrically charged particles          |
| 7 water      | G mixture mainly of oxygen and nitrogen surrounding the earth    |

**Text 2:**

**Why is Water so Important?**

Three-quarters of the Earth's surface is covered with water. This makes water the most common material on Earth. Like other substances, water can exist as a liquid, as a gas, or as a solid. Water in the form of a gas (water vapour) is commonly called *steam*. Solid water is *ice*. We can change one form into another form by simply changing the conditions, for example by heating it up or cooling it down. The change from one form to another is usually called a *change of state*. Changes of state are examples of a physical change. They don't involve making new substances.

Single substances are either compounds or elements. What about water? From the chemical point of view water has many points of interest, because it enters into chemical reactions which are of fundamental importance. Water not only reacts with many substances but it also has a marked influence upon many chemical reactions.

Well, water can be decomposed. So it can't be an element, can it? Decomposition of water can be made by electric current. In this way two volumes



of hydrogen and one volume of oxygen are obtained. So we can say that water is *a compound of hydrogen and oxygen*. The chemical name for water is *hydrogen oxide*. Right? Is it possible to make water from its elements? The answer is — yes! In fact, it's quite easy to do (but rather dangerous).

Hydrogen's the water former, remember? When it's burnt in air, water is formed. "Artificial water" formed in this way is exactly the same as "natural water". The experiment can be made in the laboratory, but only by the teacher, and with strict safety precautions.

**Ex. 11. Answer the following questions:**

1. What makes water similar to other substances? 2. How is water in the form of gas called? 3. Can we call solid water ice? 4. What should we do to change one form of water into another? Give examples. 5. Why is water interesting from the chemical point of view? 6. What important chemical reactions with water can you name? 7. How does water influence chemical reactions? 8. Why can't water be an element? 9. What is the chemical name for water? 10. How can you get "artificial water"? What are its properties?

**Ex. 12. Read and translate another text on water.**

Water is hydrogen oxide, a compound of hydrogen and oxygen. It can be made if hydrogen or a hydrogen-containing substance is burnt in air or oxygen.

Most of the world's water is liquid, but an important fraction is solid as ice and snow.

Many mineral substances contain water of crystallization (e. g., copper sulphate) and in the atmosphere there are millions of tons of water vapour. Clouds consist of minute droplets of water or crystals of ice.

Water dissolves a very large number of substances and is the most important solvent. It does not dissolve greasy, fatty substances or most plastics.

After they had found the composition of water, the scientists could investigate its properties. It was stated that ordinary water is impure, it usually contains dissolved salts and dissolved gases, and sometimes organic matter.

For chemical work water is to be purified by distillation. Pure water is colourless, tasteless, and odourless. Rain water formed by condensation of water in the air is nearly pure water, which contains only small proportions of dust and of dissolved gases.

After the examination of water properties the chemists found that physical properties of water can be used to define many physical constants and units.

The freezing point of water (saturated with air at 1-atm pressure); taken at 0° C and the boiling point of water at 1 atm is taken as 100° C

The unit of volume in the metric system is chosen so that 1 ml of water at 3.98° C (the temperature of its maximum density) weighs 1,000 g/cm<sup>3</sup>.

So water is one of the most important of all chemical substances. It is a major constituent of living matter and of the environment in which we live.

**Ex. 13. Read and translate the following words both as nouns and verbs:**

change, state, water, mark, influence, increase, decrease, experiment, experience, comment, matter

**Ex. 14. Match antonyms in A and B:**

<i>A</i>	<i>B</i>
1. the commonest	a) impossible
2. like	b) the most unusual
3. simple	c) old
4. usually	d) common
5. new	e) few
6. single	f) exceptionally
7. many	g) to lose
8. decomposition	h) natural
9. to obtain	i) unlike
10. possible	j) integration
11. easy	k) complicated
12. dangerous	l) secure
13. artificial	m) lenient
14. strict	n) difficult

**Ex. 15. Change the given sentences into indirect speech.**

1. The author writes: "Three-quarters of the Earth is covered with water."
2. The writer asks: "Is it possible to make water from its elements?"
3. The scientists stated: "The radiation from thorium nitrate is unsteady."
4. Rutherford remarked: "It's really very fine to see the things one has seen in imagination visibly demonstrated."
5. He said: "I have already drawn your attention to the social implications of the release of atomic energy."
6. Pauling often repeated: "I keep on the outlook for aspects that I don't understand."
7. The scholars usually asked: "What causes electrons to change or bit?"
8. They also asked: "Is the electron a wave or a particle?"

**Ex. 16. Work in pairs. One student reads the given statements, the other pretends that he does not hear and asks him/her to repeat. Take turns. You are given an example:**

*Example: STUDENT A:* When H<sub>2</sub>O falls from clouds it's called a rain.

*STUDENT B:* Where did you say it falls from?

*or*

What from did you say it falls in?

*STUDENT A:* I said it falls from clouds.

*or*

I didn't. But it falls in a liquid form.

1. When H<sub>2</sub>O falls in small frozen crystals, it's called snow.
2. When the snow begins to melt, it's called slush.
3. If the slush freezes again and becomes hard and solid, it's called ice.
4. The combinations of rain and snow is known as sleet.
5. Small round lumps that fall during a thunderstorm are called hail.
6. The H<sub>2</sub>O forming on the leaves and flowers is a dew in warm weather.
7. The same in cold weather is frost.
8. The H<sub>2</sub>O united into a liquid body which is relatively motionless may be a puddle, a pond, a lake, a sea, or even an ocean.
9. While the water moves, it may be a brook, a creek or stream, or a river.
10. When H<sub>2</sub>O comes out of the tap, it is just plain water.

**Ex. 17. Read another text on water.**

The abundance of water in liquid, solid and gaseous state is a matter of common observation. Water is not only the most abundant compound, but it is also very important for life. To be sure life would be impossible without water. For many purposes water must be pure. The purest natural water is rain. But we can't say that it is really pure. The same can be said about ground water. It contains a great deal of impurities which fail to settle. Dissolved substances do not settle and don't evaporate with water, and this makes their removal difficult. One of the most important problems is to obtain water sufficiently pure to meet our needs. The choice what process is to be used for purification of water depends upon the uses for which it is intended as well as the impurities it contains. Water used for steam boilers should be free from substances that cause corrosion and scale formation. Water for washing should not contain substances that react with soap. When water is to be used for drinking, it is necessary to kill the microbes it may contain. To achieve this, water which is to be purified is thoroughly filtered. Another way to purify water is to boil it. None of these methods is fit for producing pure water in the chemical sense, because most of the soluble salts are unaffected by the treatment. To remove these and to prepare chemically pure water suitable for scientific use, we take advantage of the fact that water is usually changed to steam while most of the dissolved substances as have already been mentioned are not volatile. If we condense the steam, we are thus able to remove all the impurities except volatile ones. This process is called distillation. Distilled water has many uses, both in the laboratory and in industry, when even a small quantities of impurities are undesirable.

**Ex. 18. Read the text again, entitle it, then divide it into logical parts thus making a plan.**



**Study the following grammar rule.**

Підрядні речення (Subordinate clauses)



<p><u>Підрядні підметові речення</u> (subject clauses)</p> <p>Виконують функцію підмета і приєднуються до головного речення сполучниками <b>that</b> <i>що</i>, <b>whether</b> <i>чи</i>, та сполучними займенниками і прислівниками <b>who</b>, <b>whom</b>, <b>whose</b>, <b>what</b>, <b>which</b>, <b>where</b>, <b>when</b>, <b>how</b>, <b>why</b>:</p> <p><i>Whether hydrogen or oxygen is taken for the experiment depends upon many factors.</i>  – Той факт, береться чи кисень або водень для досліду, залежить від багатьох факторів.</p>
<p><u>Підрядні присудкові речення</u> (predicative clauses)</p> <p>Виконують функцію не всього присудка, а лише іменної частини складеного присудка-предикатива і приєднуються до головного речення сполучниками <b>that</b> <i>що</i>; <b>if</b>, <b>whether</b> <i>чи</i>, <b>as if</b>, <b>as though</b> <i>начеб-то</i>, <i>ніби</i>; <b>lest</b> <i>щоб не</i> та сполучними займенниками і прислівниками:</p> <p><i>That's what I wanted to ask you.</i> – Ось що я хотів запитати вас.</p>
<p><u>Підрядні додаткові речення</u> (object clauses)</p> <p>Виконують функцію додатка до дієслова або прикметника в головному реченні і приєднуються до головного речення сполучниками <b>that</b>, <b>if</b>, <b>whether</b>, <b>lest</b> і сполучними займенниками та прислівниками <b>who</b>, <b>whose</b>, <b>what</b>, <b>which</b>, <b>where</b>, <b>when</b>, <b>how</b>, <b>why</b>, а також безсполучниковим способом:</p> <p><i>It is not clear whether the experiment will be made this week.</i> – Ще не ясно, чи буде експеримент проводитися на цьому тижні.</p>
<p><u>Підрядні означальні речення</u> (attributive clauses)</p> <p>Виконують роль означення і з'єднуються з ним сполучними займенниками і прислівниками <b>who</b>, <b>whose</b>, <b>which</b>, <b>that</b>, <b>where</b>, <b>when</b>, а також безсполучниковим способом:</p> <p><i>It was the year when I began to study chemistry.</i> – Саме в той рік я почав вивчати хімію.  <i>Helium is a gas we obtain from the air.</i> – Гелій – це газ, який ми отримуємо із повітря.</p>
<p><u>Підрядні обставинні речення</u> (adverbial clauses)</p> <p>Виконують функцію різних обставин головного речення і поділяються на підрядні речення часу, місця, причини, наслідку, мети, способу дії, а також умовні та допустові речення.</p> <p><u>Підрядні речення часу</u> (adverbial clauses of time)</p> <p>З'єднуються з головним реченням сполучниками <b>when</b> <i>коли</i>; <b>after</b> <i>після того як</i>; <b>before</b> <i>перш ніж</i>, <i>перед тим як</i>; <b>while</b> <i>у той час як</i>, <i>поки</i>; <b>as</b> <i>коли</i>, <i>в той час як</i>, <i>в міру того як</i>; <b>till</b>, <b>until</b> <i>поки</i>; <b>whenever</b> <i>кожного разу</i>, <i>коли</i>, <b>as soon as</b> <i>як тільки</i>; <b>as long as</b> <i>поки</i>; <b>since</b> <i>з того часу як</i>:</p> <p><i>They worked hard until they got the exact data.</i> – Вони працювали завзято, поки не отримали точні дані.</p> <p><u>Підрядні речення місця</u> (adverbial clauses of place)</p> <p>З'єднуються з головним реченням сполучниками <b>where</b> <i>де</i>, <i>куди</i>; <b>wherever</b> <i>де б не</i>, <i>куди б не</i>:</p> <p><i>She stood where I had left her.</i> – Вона стояла там, де я залишив її.</p> <p><u>Підрядні речення причини</u> (adverbial clauses of cause)</p> <p>З'єднуються з головним реченням сполучниками <b>because</b> <i>бо</i>, <i>тому що</i>; <b>as</b>, <b>since</b></p>

оскільки, тому що, **for** через те що:

**I believe you because I know you. – Я вірю вам, бо знаю вас.**

Підрядні речення наслідку (adverbial clauses of result)

З'єднуються з головним реченням сполучником **so that** так що, тож:

*This ball was so large that the child couldn't hold it. – М'яч був такий великий, що дитина не могла тримати його.*

Підрядні речення мети (adverbial clauses of purpose)

З'єднуються з головним реченням сполучниками **so that, that so in order that** щоб; **lest** щоб не:

*I'll ring her up lest she should forget about it. – Я зателефоную їй, щоб вона не забула про це.*

Підрядні речення способу дії та порівняння (adverbial clauses of manner and comparison)

З'єднуються з головним реченням сполучниками **as** як, **as ... as** так ... як; **not so ... as** не так ... як; **than** чи; **as if, as though** наче, ніби, **the more ... the more** чим більше ... тим більше:

*I couldn't have done any more than they did. – Я не міг зробити більше, ніж вони.*

Підрядні допустові речення (adverbial clauses of concession)

З'єднуються з головним реченням сполучниками **though, although** хоч, хоча; **as** хоч; **whoever** хто б не; **whatever** що б не; **whichever** який би не; **however** як би не та ін.:

*Although the chemist got the necessary results he continued to experiment. – Хоч хімік отримав потрібні результати, він продовжував експериментувати.*

Підрядні умовні речення (adverbial clauses of condition)

З'єднуються з головним реченням сполучниками **if** якщо, якби; **unless** якщо не; **provided** при умові:

*Water freezes at 0°C unless it contains salt. – Вода замерзає при нулю градусів по Цельсію, якщо вона не містить солі.*

### Ex. 19. Find attributive clauses and translate them.

1. Torricelli was the first who discovered how to measure air pressure. 2. The distance that light travels in one second is 300 thousand kilometers. 3 Rubber is a durable material which is very important in industry. 4. Water dissolves very many substances, which makes it a universal solvent. 5. They're many Russian scientists whose names are known all over the world. 6. The process which oxygen takes part in is known as oxidation. 7. The molecules which every substance is composed of are in a state of constant motion. 8. The facts that the article referred to were very interesting. 9. This is the laboratory where we work. 10. September is the month when the academic year begins.

### Ex. 20. Translate the following sentences determining the ambit of Subordinate clauses.

1. The radio Russian scientist A.S. Popov invented was a great contribution to world science . 2. The prominent scientists' names you mentioned are known far and wide. 3. The whole world wonders at the achievements people have made in all fields



of science. 4. The atomic power station built in our country was the first in the world. 5. K.E.Tsiolkovsky is the man we call the father of space flights.

**Ex. 21. Find Subordinate clauses and translate the following sentences into Ukrainian.**

1. The materials chemists produce by organic synthesis occupy a very important place in industry and everyday life. 2. Some polymers our scientists discovered possess remarkable properties. 3. The subject they have chosen for discussion was connected with the chemistry of solids. 4. The task my friend is responsible for is very important. 5. The laboratory we work in is equipped with modern apparatus. 6. We suppose that the method he is insisting upon is reliable. 7. The tube Roentgen was experimenting with had been invented by Crookes. 8. The results of the research they carry out will be published.

**Ex. 22. Point out the Subordinate clauses; state to what kind the following belong to.**

A. 1. That water is a universal solvent is known to everybody. 2. Whether steel or stone is taken as building material depends on many factors. 3. Who was the inventor of this apparatus is not known.

B. 1. The decision of the commission was that the discovery was of great importance to industry. 2. This is what we were talking about. 3. One of the advantages of higher education in our country is that it is available to all.

C. 1. The bronze age began when bronze replaced copper. 2. As the temperature is raised the total vapour pressure increases. 3. After electricity had been discovered, it was widely used in all branches of industry. 4. While you work in the laboratory you must be very careful. 5. Before you leave the laboratory you must put everything in proper order. 6. As soon as I stay here, I shall go sightseeing. 8. I shall not leave the laboratory until I finish my work.

**Ex. 23. Translate the following sentences into Ukrainian, determining the kind of Subordinate clauses.**

1. That oxygen can be liquefied only under high pressure was proved by experiments. 2. When elements combine, a definite number of atoms of each element are used in forming a molecule of a given compound substance. 3. Whether a substance is a solid, a liquid, or a gas is determined entirely by the conditions of temperature and pressure to which it is subjected. 4. The characteristic property of an acid is that it is capable of giving hydrogen ions when dissolved in water. 5. The elements carbon dioxide is composed of are carbon and oxygen. 6. The process oxygen takes part in is known as oxidation. 7. The liquid a substance dissolves in is called a solvent. 8. The substance oxygen acts upon is oxidized. 9. Everybody knows that a gas expands as the temperature rises. 10. As long as water evaporates in an open vessel, water vapour mingles (змішується) with the atmosphere because of diffusion. 11. As soon as the experiment is done we shall see its result. 12. Many years have passed since Popov invented the radio. 13. While Maria and Pierre Curie were working at the laboratory,



they discovered a new substance. 14. Shortly after Roentgen had discovered X-rays, in Paris Professor Becquerel began experiments with a number of X-rays.

**Ex. 24. You're given descriptions of ten elements of the Periodic Table. Give the names and symbols of the elements. If in the given definitions some important details are lacking, add whatever you consider necessary. Choose the elements from the list below:**

*chlorine, tin, hydrogen, zinc, copper, bromine, carbon, helium, silver, oxygen*

1. Chemically it is a reactive metal, combining with oxygen and other nonmetals and reacting with dilute acids to release hydrogen.
2. Chemically it is reactive. It combines directly with chlorine and oxygen and displaces hydrogen from dilute acids. It also dissolves in alkalis to form stannates.
3. It is a white lustrous soft metallic transition element. It is used in jewellery, tableware, etc., and its compounds are used in photography.
4. A colourless, odourless gaseous element. It is the most abundant in the Earth's crust (49.2 percent by weight) and is present in the atmosphere (28 percent).
5. A colourless, odourless gaseous chemical element. It is the lightest and the most abundant element in the universe. It is used in the Haber process.
6. This nonmetallic element is totally inert and has no known compounds. It was discovered in the solar spectrum in 1868.
7. It is a red volatile liquid at room temperature. Chemically, it is intermediate in reactivity between chlorine and iodine. The liquid is harmful to human tissues and the vapour irritates the eyes and throat.
8. It is manufactured by the electrolysis of brine and also obtained in the Downs process for making sodium. It has many applications, one of which is purification of drinking water.
9. The name of this element comes from the island of Cyprus. It is used for making electric cables and wires. Its alloys are used extensively. Water does not attack it, but in moist atmospheres it slowly forms a characteristic green surface layer (patina).
10. A nonmetallic element belonging to group (diamond and graphite).

**Ex. 25. Translate the following sentences into Ukrainian, determining the kind of Subordinate clauses.**

1. Any element when it combines with oxygen forms an oxide.
2. The methods of determination of specific gravity are well known to everybody as they are used on a large scale.
3. That oxygen can be liquefied only under high pressure was proved by experiments.
4. The process oxygen takes part in is known as oxidation.
5. In order to learn the properties of a substance we must have it in its pure form.
6. Oxygen has been known since the 18<sup>th</sup> century.
7. Oxygen can be liquefied provided that pressure is sufficiently high.
8. If sugar and water are mixed, crystals of sugar disappear, but those crystals form again as water evaporates.
9. Whether water or other liquid is used as a solvent depends on many factors.
10. By means of a formula one can easily

determine whether a given gas is lighter or heavier than air. 11. One can show experimentally that hydrogen does not support burning. 12. At the beginning of the experiment it is not known yet if the necessary data will be obtained. 13. Everybody knows how closely chemistry is connected with the progress of the world. 14. The students want to know who will deliver lectures on chemistry. 15. Newton first explained why all objects on the Earth attracted one another.

**Ex. 26. Translate the following sentences into English.**

1. У своїй статті Менделєєв писав, що він відкрив періодичний закон. 2. Стародавні греки вважали, що речовина складається з безкінечно (infinitely) малих частинок. 3. Аристотель (Aristotle) думав, що його теорія буде узгоджуватись із його загальними поглядами (general views) на природу. 4. Вже у 1789 р. Лавуаз'є доповів Французькій академії наук, що вода – це сполука кисню та водню. 5. У той час Прістлі не розумів, що його відкриття дуже важливе. 6. Кавендіш (Cavendish) відкрив, що вода складається з визначеного проценту (proportion) водню та кисню. 7. Автори рішуче переконані, що їх робота може вплинути на розвиток хімії. 8. Ми повинні провести новий дослід, тому що необхідно (it is necessary) отримати ці речовини. 9. Ми не знали, що повинні були вибрати хід реакції. 10. Доповідач повідомив, що повинен закінчити нову серію (series) експериментів. 11. Якоб Берцеліус (Jakob Berzelius) почав свої дослідження після того, як дізнався про атомістичну теорію Дальтона (Dalton).

**Ex.27. Point out the Subordinate clauses; state to what kind the following belong to.**

1. She read the book which I had brought to her. 2. The man you want to speak to is our teacher. 3. The experiment you speak about is a very important one. 4. I came to the University the moment my friend left it. 5. This is the article my friend has translated. 6. This is the new apparatus you wanted to speak about. 7. I couldn't make the experiment because I had no time. 8. I am going to work at this problem after I finish my experiment. 9. I'll do it while you are away. 10. Please tell him which books you have read. 11. Do you know whose work they are discussing now? 12. I don't know when I'll be able to see him. 13. As he lives far from the University he must take a bus. 14. Whether he wants to do this work is unknown. 15. Which of you is the best student will be shown by the test. 16. The question is whether he will come in time.

**Ex.28. Translate into Ukrainian.**

1. Until the end of the nineteenth century chemists said that elements could not be converted into one another by any known means. 2. It was mentioned that Henri Becquerel discovered natural radioactivity in 1896. He noticed that salts of uranium were able to affect a photographic plate. 3. The element, Madame Curie named polonium, was the first element discovered through its property of radioactivity. 4. As a reaction proceeds the reacting substances are used up and new ones are formed.

5. Catalysts are very important, not only for industrial chemistry but also for life. It is likely that the human body contains thousands of different catalysts called enzymes. 6. We now see why the reaction does not go to completion. 7. The Van der Waals attractive forces between the molecules still operate whenever two molecules come close together. 8. Because molecular motion is free gas does not have either definite shape or definite size. 9. One had to find whether there were any pieces of uranium left. 10. The assistant did not know whether he would get the necessary substances. 11. As a crystal is heated the molecules move about more and more quickly. 12. He asked whether the test of the new apparatus had begun. 13. The chemists did not know whether a prominent line in the yellow of cleveite gas was identical with the yellow sodium lines. 14. They didn't know how to call the new element.

**Ex. 29. Finish sentences.**

a) 1. Here are new chemical materials which ... 2. Here is the student who ... 3. Is this the apparatus which ...? 4. Are these the data which ...? 5. Are these chemical properties which ...? 6. Is this a new chemical product which...? 7. This is a chemical institute where ... 8. This is the modern theory of atomic structure which ....

b) 1. What will you do when ... 2. What will you do as soon as ... 3. What kind of experiment will you make after ... 4. What lectures will you have to attend before ... 5. What will take place as soon as ...

c) 1. We have changed our concepts of chemical action as ... 2. The progress of chemistry during the present century has taken place in all directions as ... 3. Every man needs understanding of the material world because ... 4. Faraday was one of the greatest experimenters in the world as ...

d) 1. I wonder if ... 2. He doesn't know whether ... 3. She didn't remember whether ... 4. They weren't sure if ... 5. We wondered why ... 6. She wonders whether ...

e) 1. Every time I think of this chemical theory ... 2. Every time I read about the modern theory of atomic structure ... 3. Every time I refer to the Periodic Law ... 4. Every time I make this kind of experiment ...

f) 1. I'll arrange the elements if ... 2. He will divide the above mentioned substance into three classes when ... 3. I haven't heard whether ... 4. I don't know whether ...

**Ex.30. Translate the following sentences into English.**

1. Гелій – це газ, який має незвичайні властивості. 2. Це газ, який не утворює хімічних сполук? 3. Гелій — це газ, який існує тільки у вільному стані. 4. Я завжди буду пам'ятати лекцію, в якій (де) наш викладач назвав специфічні властивості інертних газів. 5. Я знайду статтю, в якій (де) подані нові дані. 6. Як тільки було виявлено наявність нового газу на сонці, вчені почали вивчати його властивості. 7. До того як цей газ було виявлено на землі, його виявили на

сонці. 8. Це все, що я можу розповісти вам про гелій. 9. Хоча все, що було відомо про гелій, було новим, учені широко використовували отриману інформацію у своїх дослідженнях. 10. Де стаття, про яку ви мені говорили? 11. Кожного разу, коли я запитую про неї, її немає на місці. 12. Це все, що ви збиралися зробити? 13. Я не знаю, як дістатися Університету. 14. Ви знаєте, як часто у нас будуть лекції з англійської мови? 15. Я чув, що ви працюєте над новою книгою. 6. Ви зможете сказати нам, коли ви закінчите свою книгу?

**Ex. 31. Read the text below and say what the text is about. Think of a title to the text.**

Whether the differentiation of chemical substances into two groups – elements and compounds – was possible, had been achieved by the end of the eighteenth century.

A long time was required for the recognition of the fact that the elements could be classified in the way now described by the Periodic Law. The first step was taken in 1817, when the German chemist J. W. Dobereiner (1780—1849) showed that the combining weight of strontium lies midway between the combining weights of the two related elements calcium and barium. Some years later he found the existence of other "triads" of similar elements (chlorine, bromine, iodine, lithium, sodium and potassium).

Other chemists then showed that the elements could be classified into groups consisting of more than three similar elements. Fluorine was added to the halogens, and magnesium to the alkaline — earth metals.

Oxygen, sulphur, selenium, and tellurium had been classed as one group, and nitrogen, phosphorus, arsenic, antimony, and bismuth as another group of elements by 1854.

In 1862 the French chemist A. E. B. de Chancourtois arranged the elements in the order of atomic weights on a helical curve in space. The English chemist Newlands in 1863 proposed a system of classification of the elements in order of atomic weights, in which the elements were divided into seven groups of seven elements each. Both of these systems were not developed further. But the final and most important step was taken by Mendeleev. He classified the elements according to their atomic weights, their physical and chemical properties with special attention to valence. Mendeleev not only classified the elements known to chemists at that time but predicted the existence of some other elements.

**Ex. 32. Reread the text and give the reasons why the chemists think that D. Mendeleev took the final step in the classification of elements.**

**Ex. 33. Read the text again and choose the correct ending.**

1. The differentiation of chemical substances had been achieved ...
  - a) by the end of the eighteenth century;
  - b) by the eighteenth century;
  - c) by the nineteenth century.

2. The recognition of the fact that the elements could be classified in the way now described by the periodic Law took ...

- a) one century;
- b) some years;
- c) a short time.

3. The classification of elements according to their atomic weights, their physical and chemical properties with special attention to valence was stated ...

- a) by Chancourtois;
- b) by Newlands;
- c) by Dobereiner.

**Ex. 34. Which words describe:**

- a) the two elements: calium and barium (different, similar, related);
- b) the differentiation of chemical substances (impossible, achieved, arranged, possible).

**Ex. 35. Translate the following sentences into Ukrainian.**

1. It is only recently that methods (such as the study of X-ray spectra) have become available to determine directly whether a substance contains atoms of only one kind or of two or more kinds. 2. Until the new physical methods, such as the X-ray method, were developed, there was no definite way proving that a substance is an element. 3. It was not until the present century, when powerful methods to study were discovered, that scientists could be sure that the forms of matter which they called elements were all really elements, and that some were not compounds. 4. Another very important reason to study the gas laws is that the density of a dilute gas is related in a simple way to its molecular weight, whereas for liquids there is no similar simple relation. 5. If the phenomenon is difficult to understand it is necessary to study it further unless it becomes clear. 6. As the years go by many new substances are discovered in nature and are made in the laboratory. 7. The most important of all chemical theories is the atomic theory. In 1805 John Dalton stated the hypothesis, that substances consist of small particles of matter. He called these particles atoms. As it was verified by further work in chemistry and physics, the atomic hypothesis became the atomic theory. 8. It is to be noted that the two forms of periodic acid,  $\text{H}_5\text{AO}_6$  and  $\text{HIO}_4$  (unstable, but forming stable salts), represent -the same oxidation state of iodine, and differ only in their coordination number.

**Ex. 36 Check you Grammar**

1. He showed that substances ... two categories.

- a. is falling into
- b. has fell into
- c. had fell into
- d. fell into

2. We saw that he ... some new data.

- a. was getting
- b. had got
- c. would got
- d. got

3. He said that he ... an experiment.

- a. makes  
b. make  
4. They ... they know about his experiments.  
a. say  
b. said  
5. They replied they ... their holidays a week before.  
a. are planning  
b. had planned  
6. She said she ... Chemistry that evening.  
a. learning  
b. is learning
- c. would make  
d. had make  
c. would say  
d. saying  
c. have planned  
d. were planned  
c. was learning  
d. learns

## Unit 6

*Grammar: Modal Verbs and their Equivalents.*

**G** Study the following grammar rule.

Present	Past	Future	Meaning
<p>I (he, she, they, we, you) <b>can</b> translate this text.</p> <p>I <b>am able to</b> translate this text. He (she, it) <b>is able to</b> translate this text. You (we, they) <b>are able to</b> translate this text.</p>	<p>I (he, she, they, we, you) <b>could</b> translate this text.</p> <p>I (he, she, it) <b>was able to</b> translate this text. You (we, they) <b>were able to</b> translate this text.</p>	<p>---</p> <p>I (we) <b>shall be able to</b> translate this text. You (he, she, it, they) <b>will be able to</b> translate this text.</p>	<p>Дозвіл, прохання, можливість, неможливість, вміння, припущення.</p>
<p>I (he, she, they, we, you) <b>must</b> translate this text.</p> <p>I (we, they) <b>have to</b> translate this text. He (she, it) <b>has to</b> translate this text.</p> <p>I <b>am to</b> translate this text. He (she, it) <b>is to</b></p>	<p>---</p> <p>I (he, she, they, we, you) <b>had to</b> translate this text.</p> <p>I (he, she, it) <b>was to</b> translate this text.</p>	<p>---</p> <p>I (we) <b>shall have to</b> translate this text. You (he, she, it, they) <b>will have to</b> translate this text.</p> <p>---</p>	<p>Обов'язок, заборона.</p> <p>Обставини.</p> <p>Запрограмованість.</p>



translate this text. You (we, they) <b>are to</b> translate this text..	You (we, they) <b>were to</b> translate this text.		
I (he, she, they, we, you) <b>may</b> translate this text.	I (he, she, they, we, you) <b>might</b> translate this text.	---	Дозвіл, шанс, можливість у майбутньому.
I <b>am allowed to</b> translate this text. He (she, it) <b>is allowed to</b> translate this text. You (we, they) <b>are allowed to</b> translate this text.	I (he, she, it) <b>was allowed to</b> translate this text. You (we, they) <b>were allowed to</b> translate this text.	I (we) <b>shall be allowed to</b> translate this text. You (he, she, it, they) <b>will be allowed to</b> translate this text.	
<p>Вживання модальних глаголів <i>must, can, may</i> з <i>Perfect Infinitive</i>.</p> <p>1) <i>Must+Perfect Infinitive</i> виражає припущення, можливість, імовірність, перекладається словами <i>повинно бути, ймовірно</i>: He <u>must have gone</u> to the laboratory. – Він, ймовірно, пішов до лабораторії.</p> <p>2) <i>May+Perfect Infinitive</i> виражає припущення, непевність, перекладається словами <i>можливо, може бути</i>: She <u>might have lost</u> your textbook. – Вона, можливо, загубила ваш підручник.</p> <p>3) <i>Could, might, should+Perfect Infinitive</i> означає, що дія, яка могла б відбутися в минулому, не відбулася. Перекладається на українську мову словами <i>слід би</i> і т. д.: You <u>should have prepared</u> better. – Вам би слід було підготуватися краще</p>			

### Ex. 1. Study the following words and remember them.

sample ['sa:mpl], microscope ['maɪkrɒskəp], lenses ['lenzɪz], permit [pə'mɪt], naked eye ['neɪkɪd aɪ], qualitative ['kwɒlɪteɪtɪv], metric ['metrɪk], millimetre ['mɪlɪ'mi:tə], micron ['maɪkrɒn], kilogram ['kɪlɒgræm], between [bi'twi:n], balance ['bæləns], calorimeter ['kælərɪmɪtə], thermometer [θər'mɒmɪtə], cylinder ['sɪlɪndə], burette [bju'ret], pipette [pɪ'pet], volumetric ['vɒlju'metrɪk], barometer [bə'rɒmɪtə], polarimeter ['pɒlə'rɪmɪtə], refractometer [rɪfræktɒmɪtə].

### Ex. 2. Read the following word combinations.

Burettes for the measurements [bju'rets fɔr ðə 'meʒʊmənts], extremely short [ɪks'tri:mli 'ʃɔrt], unit of mass [ju:nɪt əv 'mæs], quantitative relationship ['kwɒntɪteɪtɪv rɪ'leɪʃənʃɪp], measuring devices ['meʒʊrɪŋ di'vaɪsɪz], graduated cylinder ['grædʒueɪtɪd 'sɪlɪndə]

**Ex. 3. Read the following fluently.**

1. We studied the measurements in chemistry. 2. This is the one type of measurement. 3. The microscope is an instrument for making very small objects look larger. 4. The fundamental unit of the metric system is the metre.

**Ex. 4. Fill in the blanks with "to have to", "to be to", "must" according to the sense.**

1. The experiment ... take place on Monday, I think everything is ready. 2. They ... examine this sample under a very powerful microscope as it is very small. 3. I am very tired, I ... have a rest. 4. Our meeting ... take place after our last lecture. 5. You ... work hard if you want to finish this work. 6. I .... go to the reading-room as I have no books at home. 7. He ... wait for two hours as his train has just left. 8. All the students of our Institute ... carry out a number of experiments in analytical laboratory.

**Ex. 5. Fill in the blanks with "can", "could", "to be able to".**

1. If you come earlier I ... help you. 2. This solution ... be evaporated now. 3. Yesterday he ... finish his experiment, I think he ... do it today. 4. As he was very busy he ... attend the lecture.

**Ex. 6. Translate the following sentences into English.**

1. Він може розрахувати проект до вечора, але я не впевнений. 2. Я впевнений, що він може провести експеримент. 3. Можна мені взяти вашу книгу? – Ні, не можна, я зараз її читаю. 4. Тобі не потрібно братися за це. 5. Сьогодні у мене багато роботи, я можу зробити це лише завтра. 6. Він може полагодити цей прилад. 7. Мені потрібно використовувати цю суміш у моєму досліді? – Ні, не потрібно. 8. Обережно, ти можеш обпектися. Ця речовина дуже їдка. А її можна змішувати з іншою речовиною? – Ні, не можна. 9. Вона не знає техніки безпеки при роботі у лабораторії, але її можна навчити.

**Ex. 7. Listen and react.**

*Model: Sp.: Oleg may take some barium. (uranium).*

*St.: Can he take some uranium?*

1. Oleg may take some pure argon. (carbon). 2. Oleg may keep organic salts in this box. (inorganic salts). 3. Oleg may keep arsenic in this drawer. (chalk). 4. Ann may test the sample of tin. (the sample of fluorescent oil). 5. Ann may give them a number of funnels. (some tubes). 6. Pete may give us a number of new test-samples. (some old test-samples). 7. Pete may get some vessels for distilled water. (vessels for oil). 8. Ann may read Ukrainian articles on chemistry. (English).

**Ex. 8. Say that the analyst needn't do the following.**

*Model: Sp.: Must the analyst keep the oil in the bottle?*

*St.: No, he needn't*

1. Must the analyst ask for the permission to the test these samples? 2. Must he ask for the permission to keep the chemicals in this drawer? 3. Must he explain to them the difference in use between organic salts and inorganic salts? 4. Must he

explain to us the difference in use between oil and gas? 5. Must he give them a number of new test-samples? 6. Must he get some vessels for distilled water? 7. Must he explain the difference in use between argon and carbon?

**Ex. 9. Say that the analyst must do the following.**

*Model: Sp.: to explain the difference in use between argon and carbon.*

*St.: The analyst must explain the difference in use between argon and carbon.*

To explain the difference in use between these apparatuses; to explain the difference in use between these chemicals; to understand the test well; to ask for the permission to keep the chemicals in the laboratory; to understand the difference in use between organic and inorganic salts; to test these samples quickly; to give them the necessary vessels; to keep the chemicals in the boxes.

**Ex. 10. Finish the following sentences**

1. She must be at the lab now, as ... 2. He may not know the exact data as ... 3. I can't read this book as ... 4. He may help me to make this experiment as ...

**Ex. 11. Translate the following sentences into Ukrainian:**

*Note: since* → так як, оскільки;

з, з тих пір, як, з часів

1. **Since** we know all the properties of the substance, we can use it in our experiment. 2. Many interesting investigations have been done **since** the foundation of this research laboratory at our plant. 3. Helium belongs to the same group as argon **since** it does not combine with other elements. 4. I have not carried out any experiments in the laboratory **since** I graduated from the Institute. 5. We couldn't finish our work **since** we had no necessary devices. 6. **Since** the kinetics of the reaction was studied at room temperature, the results were good. 7. This element has been known **since** the 19th century.

**Ex. 12. Translate the following sentences paying attention to the meanings of the word "order":**

1. D. I. Mendeleev arranged the elements **in the order** of increasing atomic weights. 2. **In order to** be used in a chemical laboratory natural water must be purified. 3. **The order** was announced at the meeting. 4. **In order to** dissolve this substance one must heat it. 5. The students must put everything **in order** when they finish their work. 6. **In order to** study "the relationship between microstructural and mechanical properties of the gel, it is very important to use pure stable gels.

**Ex. 13. Give the Ukrainian equivalents of the following words:**

close relationship, exact measurement, quantitative analysis, necessary method, the order of arrangement.

**Text 1:**

**The Measurements in Chemistry**

In order to<sup>1</sup> understand the quantitative relationships which exist between various kinds of matter, the chemist who is interested in matter and the changes which it undergoes, has to measure the quantities of matter with which he works, that is<sup>2</sup> since mass is the measure of the quantity of matter, he is to measure mass. The measuring device the chemist is to employ in this determination should be the balance.

Since for every chemical change there is always accompanying energy change which the chemist has to take into account<sup>3</sup>, the calorimeter and the thermometer have to be used.

The chemist usually employs graduated cylinders, burettes, pipettes and volumetric flasks for the measurements of volumes of liquids, and the gas burette for the measurement of volumes of gases.

The chemist employs the barometer if he has to measure the pressure.

The analytical chemist and the physical chemist employ such devices as calorimeters, polarimeters, refractometers and a number of electrical devices.

If the chemist is to examine very small samples of matter, he should use a microscope. The microscope is an instrument which by the combination of lenses permits man to see objects which are too small to be seen with a naked eye. It is an instrument which is useful in many sciences and which, although more frequently used in a qualitative way can also be used quantitatively.

<sup>1</sup>in order to – для того щоб

<sup>2</sup>that is (i.e.) – тобто

<sup>3</sup>to take into account – приймати до уваги

### **The Metric System**

The fundamental unit of the metric system is the metre. The millimetre and centimetre are the units which the chemist uses very frequently in his work.

If one is to measure extremely short distances, the micron is to be used.

The unit of mass is the gram, milligram or the kilogram.

The unit of the heat measurement is the calorie.

#### **Ex. 14. Answer the questions according to the model:**

*Model:* What is the crucible used for?

**It is used for heating.**

1. What is the thermometer used for? 2. What is the balance used for? 3. What is the calorimeter used for? 4. What is the microscope used for?

#### **Ex. 15. Answer the following questions.**

1. What relationship exists between various kinds of matter? 2. What is the chemist to do if he wants to understand the quantitative relationships between various kinds of matter? 3. What does the chemist use balances for? 4. When does the chemist use a calorimeter and thermometer? 5. What is it necessary to use in order to measure volumes? 6. What devices do the analytical and physical chemists use? 7. What device does the chemist use if he wants to examine very small samples of matter? 8. What is the fundamental unit of the metric system? 9. When can the

micron be used? 10. What is the unit of volume? 11. What is the unit of the heat measurement?

**Ex. 16. Translate the following sentences, mind the verbs.**

1. They **had to use** balances in their work. 2. He **was to determine** the relationships between these two substances. 3. You **should take into account** all the results of your first experimental work. 4. In order to determine the definite weight some of the samples **have to be examined**. 5. Students **should know** that barometers can be of two types, that is (i.e.) mercurial and aneroid. 6. The quantity of the sample **is to be measured** before the experiment. 7. Various instruments **are to be employed** if chemists want to get necessary results. 8. Some balances are much more sensitive than others and chemists **should take this fact into account**. 9. Students **have to know** the metric system. 10. When a chemist finishes his work he **is to put** the analytical balance into a special glass box. 11. For a number of reasons, mercury **is to be used** in barometers. 12. Everything **has to be put** in order when you finish your experiments in the laboratory. 13. The industry spread to areas where **coal had to be used**.

**Ex. 17. Find the pairs of synonyms and remember them.**

matter, various, main, quantity, often, different, use, amount, employ, frequently, substance, fundamental

**Ex. 18. Open the brackets choosing a suitable word. Translate the sentences into Ukrainian.**

1. (A balance, a calorimeter, a thermometer) is a device which determines the quantity, but not the quality of heat in a body. 2. If a chemist determines mass he is to employ (a flask, a thermometer, a balance). 3. (A calorimeter, a flask, a microscope) is used if a chemist must examine small samples of matter. 4. For the measurement of volumes of gases a chemist uses (burettes, pipettes, gas burettes). 5. The unit of (volume, mass) in the metric system is the gram. 6. On (the Centigrade scale, the Fahrenheit scale) the freezing point of water is 0° 7 If a chemist must measure extremely short distances (the centimeter the micron) is to be used.

**Ex. 19. Choose the Ukrainian equivalents from the right column:**

relationship	піддаватися
to take into account	приймати до уваги
determination	відношення, зв'язок
to undergo	вимірювання
flask	колба

**Ex. 20. Read and render the text.**

A thermometer is a device which is used to determine the temperature of a body. Two bodies of unequal size may have the same temperature; the bigger contains more heat, but the quality of the heat in each is the same. Thermometers take many forms, the commonest of which is the mercury-bulb variety.

There are two scales – Centigrade and Fahrenheit.

On the Fahrenheit scale the freezing point of water is marked as  $32^{\circ}$  and boiling point of water as  $212^{\circ}$ . On the Centigrade scale the freezing point of water is called  $0^{\circ}$  and its boiling point  $100^{\circ}$ . Thus, 130 divisions on the Fahrenheit scale are equal to 100 divisions on the Centigrade scale, and  $1^{\circ}\text{F} = 5/9^{\circ}\text{C}$ .

If the chemist wants to convert temperatures from one scale to the other, the following formulas are to be used:

$$\text{C.} = 5/9 (\text{F} - 32) \text{ and } \text{F} = 9/5 \text{ C.} + 32$$

**Ex. 21. Translate the text and answer the questions that follow.**

### **The Balance**

If the chemist is to determine mass, he should use a balance. The balance is an instrument which is used when it is necessary to compare known masses with unknown masses.

Some balances are much more sensitive than others that is, some can detect smaller differences in mass than others. This sensitivity depends upon several factors. In the first place, the sensitivity increases as the length of the beam increases, and secondly, the sensitivity increases as the mass of the object on the pan increases. Thirdly, the sensitivity increases as the weight of the beam decreases.

In the average chemical laboratory there are usually three types of balances. The analytical balance is the most sensitive. It is kept in a glass case, in a special balance room, where the temperature is constant. Hot or cold objects shouldn't be placed on such a balance and the glass case should be closed.

1. When is the chemist to use a balance?
2. What is a balance?
3. Which balance is the most sensitive?
4. Where is the analytical balance to be kept?

**Ex. 22. Read and render the text.**

Very often the chemist has to measure volumes of liquids. The commonest instrument is the graduated cylinder. On the side of it one can see scratches. They correspond to milliliters. The cylinder has a lip so that its contents may be poured easily into another container.

The volumetric flask is used for the preparation of solutions.

The burette and the pipette are used in quantitative analysis and other quantitative work. The burette is a glass tube, open at the top end. The pipette has a scratch on the neck. This scratch is the mark to which it can be filled.

**Text 2:**

### **Matter in the Universe**

That matter may exist in three physical states (solid, liquid and gas) is a common knowledge. It is usually possible to change matter from one state to the other by changing its temperature. For instance, a piece of ice is called a solid; it may melt and form a liquid; as it evaporates, liquid water changes into a vapour, i. e. into the gaseous state.



Many kinds of matter, like water, can be obtained in each of the three states; for some, however, extraordinary means have to be used in order to produce one, or even two of the states; and for others, only two states are known or can be produced.

Common salt, for example, exists normally as a solid; at a temperature of several hundred degrees, it can be liquefied; and at still higher temperature it is converted into vapour. Carbon, a solid under normal conditions, can be vaporized, but it has never been liquefied.

Solids have both a definite volume and a definite shape. Liquids, too, have a definite volume, but they take the shape of their containers.

Gases have neither a definite shape nor a definite volume. A chemist must have a thorough knowledge of the states of matter and of physical laws that govern the behavior of matter in various states.

That all matter is composed of molecules is known to everybody. The question which must be answered, then, is: if all matter is composed of molecules, what is the essential difference between the states of matter? The answer to this question is that the essential difference between these states is the relative quantities of energy molecules possess in different states.

**Ex. 23. Look through the text again and find the sentences where the author describes:**

- 1) the facts that are well-known;
- 2) examples of matter changes;
- 3) the necessity for a specialist to know matter transformations;
- 4) a question on the matter composition and the answer to it.

**Ex. 24. Read the text thoroughly with a dictionary and answer the following questions.**

1. How is it usually possible to change matter from one state to the other?
2. Can all kinds of matter be obtained in each of the three states?
3. What do solids have?
4. What characterizes gases?
5. Why should a chemist know the states of matter?
6. What other substances besides water can be obtained in the three states?

**Ex. 25. Find in the text English equivalents to the given Ukrainian words, word combinations and chemical terms:**

- |                       |                        |
|-----------------------|------------------------|
| 1. загальновідомо     | 11. отримувати         |
| 2. звичайно           | 12. виробити           |
| 3. існувати           | 13. форма              |
| 4. незвичайні засоби  | 14. тверде тіло        |
| 5. танути/плавитися   | 15. випаровуватися     |
| 6. визначений         | 16. об'єм              |
| 7. складатись із      | 17. ретельний/глибокий |
| 8. відносна кількість | 18. аналогічно         |
| 9. градуси            | 19. вуглець            |

10. перетворювати

20. випаровувати

**Ex. 26. Match the Ukrainian words, word combinations and chemical terms from ex. 25 with their English equivalents:**

- |                      |                        |
|----------------------|------------------------|
| a) to obtain         | k) like                |
| b) common knowledge  | l) usually             |
| c) definite          | m) carbon              |
| d) relative quantity | n) to be composed of   |
| e) to melt           | o) extraordinary means |
| f) to exist          | p) to vaporize         |
| g) volume            | q) degrees             |
| h) to evaporate      | r) to convert          |
| i) to produce        | s) solid               |
| j) thorough          | t) shape               |

**Ex. 27. Find in the text all the sentences containing modal verbs. Translate them into Ukrainian.**

**Ex. 28. Complete the following sentences using modal verbs.**

1. Chemicals ... be used carefully in the laboratory.
2. You ... stay out of the laboratory if your teacher is not there.
3. You ... obey the laboratory rules when working there.
4. If you ... to smell any chemical, fill your lungs with air first, then sniff carefully.
5. As you ... see, many of the chemicals ... be dangerous.
6. All chemicals ... to be treated with care.
7. Ethanol and water... look alike.
8. What we ... to remember is that a substance ... be recognized by its properties.
9. How... you tell that a substance is pure?
10. Dalton's ideas about atom ... explain many experimental observations and scientific laws.
11. Elements ... be decomposed because the atoms they are made of are indestructible.
12. The question that we ... answer at the start is: how do the atoms get electrical charges?

**Ex.29\*. Read another text attentively and say which statements following the text are true (T) to the fact, false (F), or not mentioned (NM).**

Antoine Laurent Lavoisier (1743—1794), the son of a wealthy Parisian lawyer, pursued the family tradition and received his licence to practice law in 1764. But within two years he was drawn back to his desire to learn more about science, an interest first experienced during his earlier education in maths, astronomy, chemistry, and botany. By 1772 he'd disproved several of ancient Greek principles about earth, air, fire, and water, and developed a reputation for exact quantitative procedures and brilliant experiments. He expanded the list of

known elements to thirty-three, although some were erroneous. From 1776 to 1782, Lavoisier conducted experiments in which he isolated oxygen in air and furthered Priestley's work on oxygen's role in combustion and respiration. In a 1783 paper titled *On the Nature of Water and on Experiments that Appear to Prove that this Substance is not Properly Speaking an Element, but Can Be Decomposed and Recombined* Lavoisier reported to the French Academy of Sciences that water was the product of combining hydrogen and oxygen. In a subsequent paper delivered to the Academy, Lavoisier presented a logical analysis about the substance that we now call oxygen. Through Lavoisier's sensitive balance instrument, keen insight, and inductive reasoning, he vanquished the Greek concept of earth, air, fire, and water, once and for all. For this and other work, he is now considered the father of modern chemistry. Lavoisier had been active in political affairs his entire adult life, and devoted much of his career to public service, including positions in the French government from 1768 to 1790 in the areas of economics, agriculture, education and social welfare. In the aftermath of the French Revolution of 1789, despite his many contributions as a reformer and political liberal and despite his participation in the Revolution, he came under attack because of his status as a wealthy member of the French aristocracy, but primarily because of a position he had held in 1768 in the Ferme-Generale, the country's tax collecting agency. When the Reign of Terror commenced in 1793, resulting in the suppression of the French Academy of Sciences and other learned societies, Lavoisier was arrested. On May 8, 1794, after a one-day trial, the prospects of Lavoisier's further contributions to science and rational thought were prematurely held at the age of 50 at *Place de la Concorde* in Paris, as his great mind fell into the blood-soaked basket at the foot of the guillotine along with twenty-seven former members of the Ferme-Generale.

1. Antoine's father made him practice science.
2. Lavoisier didn't believe in the four essential elements.
3. Lavoisier expanded the list of known elements.
4. Lavoisier discovered oxygen.
5. All the elements he discovered are now in the Periodic Table.
6. In 1770 Lavoisier investigated the effect of heat on tin.
7. Lavoisier understood the composition of water.
8. Lavoisier logically analyzed oxygen.
9. Lavoisier invented chemical balance.
10. He emphasized the role of oxygen in combustion and respiration.
11. The main interest of Lavoisier was chemistry.
12. Lavoisier thought that true knowledge could be obtained simply by discussing.
13. Lavoisier based his theories on those facts which he could establish in his laboratory.
14. Lavoisier was appointed Commissioner of Gunpowder to the French Government.

**Ex. 30. Read the text again, divide it into logical parts and entitle them.**

**Ex. 31. Write a summary of the text in your own words making use of the plan and the sentences you've written out. Provide your summary with a title.**

## Unit 7

*Grammar: Modal Verbs and their Equivalents. (Revision)*

**Ex. 1. Study the following words and remember them.**

escape [is'keip], harmful ['ha:mful], odour ['qud<sub>q</sub>], drawer ['dr<sub>o</sub>:q], device [di'vais], flask [fla:sk], beaker ['bi:k<sub>q</sub>], funnel ['fʌnl], glassware ['gla:swɛ<sub>q</sub>], serve [sq:v], ignite [ig'nait], quartz [kw<sub>o</sub>:ts], platinum ['plætɪn<sub>q</sub>m], pour [p<sub>o</sub>:], expel [iks'pel], colourless ['k<sub>o</sub>lɪs], fume [fju:m], moist [m<sub>o</sub>ɪst], bottom ['b<sub>o</sub>t<sub>q</sub>m], sour ['sau<sub>q</sub>], litmus ['litm<sub>q</sub>s], complete [k<sub>q</sub>m'pli:t], retort [ri't<sub>o</sub>:t]

**Ex. 2. Read the following words and word combinations.**

ventilating hood ['ventileɪtɪŋ 'hʊd], sodium chloride ['sqʊdʒ<sub>q</sub>m 'kl<sub>o</sub>:raɪd], test-tube ['test' tju:b], weighing bottles ['weɪɪŋ 'b<sub>o</sub>tl̩z], suffocating odour ['sʌf<sub>o</sub>k<sub>o</sub>keɪtɪŋ 'qud<sub>q</sub>], hydrogen chloride ['haɪdrɪdʒ(ə)n 'kl<sub>o</sub>:raɪd], sodium acid sulphate ['sqʊdʒ<sub>q</sub>m 'æsɪd 'sʌlfeɪt], hydrochloric acid ['haɪdr<sub>o</sub>ku'k<sub>o</sub>l<sub>o</sub>ɪk 'æsɪd], nitric acid ['naɪtrɪk 'æsɪd], sodium nitrate ['sqʊdʒ<sub>q</sub>m 'naɪtreɪt], sulphuric acid ['sʌlfjʊrɪk 'æsɪd], experiment [ɪks'perɪm<sub>q</sub>nt], running water ['rʌnɪŋ 'w<sub>o</sub>:t<sub>q</sub>], experimental work [eks'peri'ments 'w<sub>ɜ</sub>:k], evaporating dish [ɪ'væpreɪtɪŋ 'dɪʃ], originally [q'ridʒɪnəli], research-worker [ri'sq:tɪʃ 'w<sub>ɜ</sub>:k<sub>q</sub>]

**Ex. 3. Give the Past Indefinite Tense.**

1. He **can speak** English quite well. 2. He **is to be** at home at 7 o'clock. 3. She **has to work** at home today. 4. They **must be** very attentive at the lessons.

**Ex. 4. Complete the following sentences according to the models:**

*Model I.* I have missed many lessons and now **I have to work very hard.**

The results of their experiments were bad, **they had to repeat them.**

1. He has worked very hard this month, he ... a little now. 2. This substance is very dirty, if you want to use it, you ... before the experiment. 3. They used analytical balances as they ... very minute quantities. 4. The water is very cold, you ... before drinking it.

*Model II.* I cannot attend the lecture as **I am to be at home at six.**

1. Don't be late, the meeting ... at five sharp. 2. He ... his research work by the end of this year, that's why he is so busy. 3. The temperature ... to 100°C if you want to finish your experiment in time. 4. Don't you know that she ... at three, it will take her an hour to get here.

**Ex. 5. Fill in the blanks with "to have to" or "to be to".**

1. I can't go with them as I ... (to be) at the Institute at half past nine. 2. If you want to understand this phenomenon better you ... (to look through) some articles devoted to this problem. 3. As this question is not solved the meeting ... (to be put off). 4. At ten a.m. he ... (to make a report), I think it will be interesting to listen to him. 5. As he made many mistakes in his last work he ... (to rewrite it).

**Ex. 6. Compare the following pairs of sentences and translate them into Ukrainian.**

1. They washed glassware well.  
Glassware was washed well.
2. The professor-referred to this new book.  
The new book was referred to by the professor.
3. The student sent his friend to the library.  
The student was sent to the library.
4. The students have answered all the questions.  
The students have been answered all the questions.
5. He spoke much about this new invention.  
He was much spoken of.
6. He insisted on these conditions.  
These conditions were insisted on (by him).
7. They have produced large quantities of sulphur recently.  
Large quantities of sulphur have been produced recently at the plants.

**Ex. 7. Fill in the blanks with "can", "must", "may".**

1. I ... help you yesterday as I came very late from the Institute. 2. You ... understand now that it is necessary to do everything in time. 3. ... I take your dictionary? I have lost mine. 4. Yesterday he ... come to the Ministry as he had a meeting. 5. They ... prepare everything for the experiment tonight. 6. If you want, you ... read this article.

**Ex. 8. Translate the following sentences into Ukrainian.**

1. He was told to be in time. 2. She was asked to help him. 3. They were sent to the plant. 4. He was sent for. 5. The professor was sent for. 6. The speaker has been listened to with great interest and attention. 7. The new discovery is much spoken of in our Institute. 8. They will be given a very important task.

**Text 1:**

**Laboratory**

All the laboratories of inorganic chemistry are almost alike<sup>1</sup>. These are large rooms where both students and research-workers carry out their experimental work. Modern laboratories of inorganic as well as organic and analytical chemistry are provided with gas and running water. Every laboratory is to be provided with a



ventilating hood for the escape of both harmful and unpleasant vapours and odours. Every laboratory has to be lit up very well.

There are many laboratory benches with a great number of<sup>2</sup> drawers in every laboratory. Different apparatus, devices as well as materials are to be kept in them. Besides<sup>3</sup> we can see many shelves and cases for containers with chemicals.

On every laboratory bench one can see test-tubes, flasks, beakers, funnels, evaporating dishes, weighing bottles. All this glassware should be kept in good order<sup>4</sup>.

Various burners serve for producing flames. Bunsen burner is to be mentioned among them.

Different crucibles are to be employed when heating solutions and igniting materials are to be carried out. Crucibles are usually made of quartz, porcelain and iron. In addition to<sup>5</sup> these crucibles, there are platinum crucibles in some laboratories, but they are used very seldom.

Every laboratory should be equipped with different kinds of apparatus. Everything in the laboratory is to have its definite place.

## Experiments in the Laboratory

Many experiments can be carried out in the laboratory of inorganic chemistry. Thus, if we want to obtain hydrogen chloride (HCl), which is often referred to as a hydrochloric acid gas, it is necessary to pour some sulphuric acid through a tube over the crystals of sodium chloride, in a flask. The flask is to be heated. On warming the flask, the hydrogen chloride is expelled as a colourless gas with a suffocating odour. It produces heavy clouds of white fumes when it comes in contact with the moist air of the room.

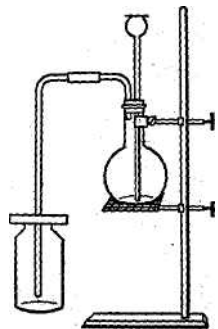


Fig. 1. Preparation of hydrogen chloride.

It is so soluble that it cannot be collected over water as are oxygen and hydrogen. It is much heavier than the air and may be passed through a glass tube to the bottom of a bottle (see Fig. 1). If we dissolve some of the gas in water, the solution has a sour taste, reddens blue litmus, reacts with zinc, etc.: it is hydrochloric acid. When all the sodium chloride originally present in the flask has been transformed, the reaction is complete. The flask then contains a salt called sodium acid sulphate ( $\text{NaHSO}_4$ ) together with unchanged excess of sulphuric acid.

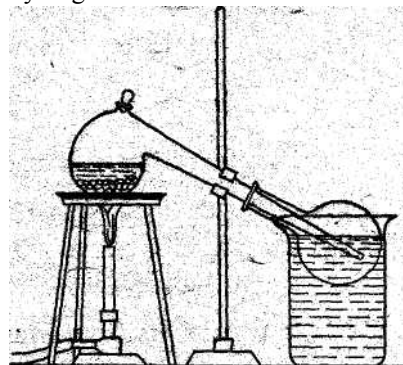
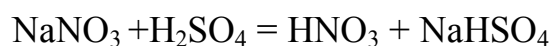


Fig. 2. Laboratory apparatus for the preparation of nitric acid.

Nitric acid may be prepared by the reaction of concentrated sulphuric acid with sodium nitrate.

In the laboratory method, a mixture of sodium nitrate and concentrated sulphuric acid is heated in a glass retort (see Fig. 2). Nitric acid is boiled out of the mixture and is condensed:





- <sup>1</sup>to be alike — бути подібним, схожим  
<sup>2</sup>a great number of — багато, велика кількість  
<sup>3</sup>besides — окрім  
<sup>4</sup>in good order — у доброму стані  
<sup>5</sup>in addition to — окрім

**Ex. 9. Answer the following questions.**

1. What do we call a laboratory? 2. In what laboratories can the students carry out their experiments? 3. What is every laboratory provided with? 4. Why is every laboratory provided with a ventilating hood? 5. What can you see on the shelves? 6. What glassware is there on every laboratory bench? 7. What are burners used for? 8. What are crucibles used for? 9. What are crucibles made of? 10. What is it necessary to do if we want to obtain hydrogen chloride? (describe the experiment) 11. How can nitric acid be prepared in the laboratory?

**Ex. 10. Answer the following questions according to the model.**

*Model:* May I come into the laboratory?

Yes, you may. No, you can't.

1. May he look through these documents? 2. May I take this test-tube? 3. May we use this glassware? 4. May she heat this substance?

**Ex. 11. Find the answers in the right column.**

- |  |  |
|--|--|
| 1. What are weighing bottles used for? | 1. for the measurement of quantities of liquids                              |
| 2. What is Bunsen burner used for?     | 2. for igniting materials  |
| 3. What is evaporating dish made of?   | 3. for heating substances  |
| 4. What is the beaker used for?        | 4. from glass or porcelain   |
| 5. What are crucibles used for?        | 5. for protecting material from the air, while the material is being weighed |
| 6. What is a water-bath used for?      | 6. for slow heating or evaporating the material                              |

**Ex. 12. Find the pairs of synonyms and remember them.**

alike, nearly, different, similar, almost, various, employ, obtain, use, get.

**Ex. 13. Find the pairs of antonyms and remember them.**

large, inorganic, cool, small, organic, harmful, pleasant, often, useful, unpleasant, seldom, warm, heavy, tasteful, indefinite, light, testless, definite

**Ex. 14. Translate the following sentences paying attention to the meanings of the verb "to have".**

1. The laboratory of general chemistry has many benches with a number of drawers. 2. A first-year student has to carry out a number of experiments in the laboratory of general chemistry. 3. This term the students have carried out a number of experiments. 4. These substances have very low solubility. 5. They have to find

out the solubility of this substance. 6. They have found the solubility of this substance and now can investigate its properties better. 7. This metal has found wide application both in industry and in agriculture. 8. They have to raise the temperature greatly as the mixture doesn't boil. 9. Hydrogen peroxide has been heated. 10. Hydrogen peroxide has a lower vapour pressure than water. 11. The evaporation has to be carried out in the waterbath. 12. This crucible has been used for heating some solutions. 13. This solution has an unpleasant odour, he has to open the window. 14. A rhombic sulphur has to be kept at a temperature of 96°C. 15. It is necessary to purify water, you will have to pass it through porous paper. 16. It has to be noted that chlorine dioxide reacts with water and yields a mixture of chlorous, and chloric acid. 17. It has been already noted that hydrogen is found in the free state only in minute quantities.

**Ex. 15. Translate the following sentences paying attention to the meanings of the verb "to be".**

1. This substance is colourless and odourless. 2. Liquids which are not appreciably soluble in each other are called immiscible liquids. 3. Many new research institutes are being built in our country. 4. They are discussing a very important, problem dealing with the development of new branches of chemistry. 5. The volume of an object increases when it is heated. 6. There is a large new laboratory in our Institute. 7. This experiment is to be carried out again, the results are wrong. 8. The meeting of our Chemical Society is to take place tomorrow at 5 o'clock. 9. He is to graduate from the Chemico-Technological Institute in 1977. 10. This solution was to be heated in a porcelain crucible. 11. The solution was heated and evaporated. 12. The glassware is to be washed very thoroughly when the experiment is over.

**Ex. 16. Complete the sentences according to the model.**

*Model:* This year he must work very hard, but a year ago he **didn't have to**.

1. Now I must help her but last year I ... . 2. This term the students must attend the lectures in the evening but last term they ... . 3. We must carry out a number of experiments but a year ago we ... .

**Ex. 17. Find the sentences in which "to be" is a modal verb.**

1. The laboratory was lit up very well. 2. This substance is to be heated to a high temperature. 3. In this experiment we were to find out all the properties of this substance. 4. This example was referred to by our teacher. 5. Hot water is to be poured in a flask. 6. If dry chlorine gas is passed into the liquid trichloride in a cooled container, pentachloride is formed. 7. Silver is not attacked by oxygen under ordinary conditions. 8. The use of this gas is to be omitted as it is very harmful. 9. If the boiling point of the solution is to be established, you should carry out this experiment. 10. Many ores which are to be refined often contain considerable quantities of impurities. 11. He is working at a very important experiment, it is to help our researchers to finish their work. 12. The vapor pressure of this unstable phase is greater than that of the stable phase at the same temperature.

**Ex. 18. Translate the following sentences, mind the verbs.**

1. The energy of the atomic bomb comes from within atoms; to learn how this is possible, we **shall have to analyse** the concept of energy carefully. 2. Each molecule **has** a microscopic impact force. 3. It **has been mentioned** that hydrogen is prepared in large quantities because of its numerous industrial uses. 4. The ability of water to dissolve a wide variety of substances **has to be noted**. 5. Attention **has to be directed** to the fact that iodine is more soluble in aqueous solutions of potassium iodide than it is in pure water. 6. He **has been studying** this subject for many years. The results of his investigation **have to be very interesting**. 7. In addition to his experimental work he **had to work** at the plant. 8. This gas **has to be passed** through a glass tube at a low temperature. 9. **Have you got** new devices in your laboratory?

**Ex. 19. Find the English equivalent of the following Ukrainian sentence**

*Усі прилади та посуд повинні бути в повному порядку у лабораторії.*

1. In the laboratory all the devices and glassware have been kept in good order.
2. All the devices and glassware were kept in good order in the laboratory.
3. In the laboratory the devices and glassware have its definite place.
4. All the devices and glassware are to be kept in good order in the laboratory.
5. A good order should be kept in the laboratory.

**Ex. 20. Fill in the blanks with the words given below:**

*Glassware, reaction, drawers, as well as, crucibles, chemicals, to pour.*

1. In the laboratory the students carry out experiments ... research work. 2. On the laboratory benches we can see much ... . 3. A laboratory bench has a number of ... . 4. ... are used for heating solutions. 5. Cases are used for containing ... . 6. When we obtain hydrogen chloride we ... some sulphuric acid in a flask. 7. Nitric acid may be obtained by the ... of concentrated sulphuric acid with sodium nitrate.

**Ex. 21. Choose the Ukrainian equivalents from the right column:**

the escape of harmful vapours	мензурка
to be lit up well	несмачний
as well as	перетворювати
both solutions	виробляти
both liquids and gases	безбарвний
fumes	пробірка
beaker	пари
test-tube	бути гарно освітленим
colourless	так, як і
Tasteless	обидва розчини
to transform	як рідина, так і газ
to produce	випаровування шкідливих парів

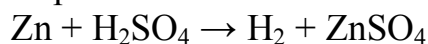
**Ex. 22. Describe the following experiment and answer the questions that follow**

### Laboratory Preparation of Hydrogen

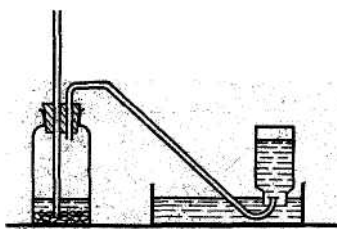
The most convenient laboratory method for the preparation of hydrogen is based on the reaction of zink with dilute sulphuric acid.

The gas is to be collected over water (see Fig.).

Zink's rate of reaction can be easily controlled by regulating the rate with which sulphuric acid is added.



The surface of pure zink placed in a solution of dilute sulphuric acid becomes coated with a film of hydrogen, the reaction proceeds very slowly. The evolution of gaseous hydrogen cannot be observed.



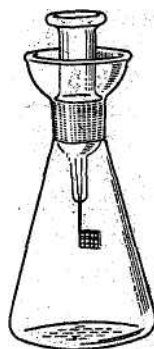
Laboratory preparation of hydrogen.

1. What is the laboratory method for the preparation of hydrogen based on?
2. Where is gas to be collected?
3. How can the zink's rate of reaction be controlled?
4. Can the evolution of gaseous hydrogen be observed?

**Ex. 23. Read the text using a dictionary and retell it.**

### A New, Simplified Technique for Catalytic Combustion of Organic Materials in Oxygen

A new technique is used for the rapid determination of sulphur halogens and traces of metals in organic substances. This can be done by simple combustion in oxygen. No elaborate equipment is required.



By means of this method it is possible to convert organic materials into soluble combustion products which then have to be analysed by usual inorganic gravimetric or volumetric methods.

Conical flask is made of barosilicate glass (see Fig.).

It has an elongated stopper with attached platinum wire gauze sample carrier and a holder of a sample. The sample is to be wrapped and is to be placed in the platinum

carrier. Then the flask has to be charged with a small amount of absorbing liquid and with free-flowing oxygen.

**Ex. 24. Retell the text.**

**Laboratory Rules**

Everybody working in the laboratory has to observe the following rules<sup>1</sup>:

1. Every vessel<sup>2</sup> used for the experiment must be absolutely clean.
2. One has to be very careful in handling<sup>3</sup> glass things.
3. One must pay special attention to<sup>4</sup> the flame. Every precaution has to be taken<sup>5</sup> in order to place the bottles containing inflammable or explosive substances as far as possible from any flame.
4. While making experiments it is necessary to register all the phenomena one observes. The yield<sup>6</sup> of the substance obtained and the result of each experiment is to be registered too.
5. After finishing work, all containers and apparatus used have to be cleaned too, so as to leave the working place in proper order<sup>7</sup>.

<sup>1</sup>to observe the following rules – дотримуватись наступних правил

<sup>2</sup>vessel – посудина

<sup>3</sup>handle – обертатися

<sup>4</sup>pay ...attention to – звертати ... увагу на

<sup>5</sup>precaution has to be taken – слід піклуватися

<sup>6</sup>yield – вихід речовини

<sup>7</sup>proper order – належний порядок

**Ex. 25. Answer the following questions.**

1. In what way must glass things be handled?
2. What must special attention be paid to?
3. Where must bottles containing inflammable or explosive substances be placed?
4. What is it necessary to do while making experiments?
5. What must be registered during the experiment?
6. What must you do after finishing work?

**Ex. 26. Translate the following sentences into English.**

1. Коли тіло може здійснювати роботу, говорять, що воно має енергію.
2. Якщо ми візьмемо лампу, наповнену спиртом, до і після досліду, ми зможемо визначити кількість згорілого спирту.
3. Тіло може бути розділено на окремі дрібні часточки.
4. Отже, ви говорите, що цей дослід, можливо, був одним із тих, які ми вже проводили.
5. Як тільки снаряд випущений із знаряддя, він повинен подолати опір повітря.
6. Почекайте трішки, дощ, мабуть, незабаром закінчиться.
7. Вам слід провести цей експеримент зараз.
8. Вам слід було зробити це відразу (але ви не зробили).
9. Мені не потрібно говорити вам, який це важливий внесок у розвиток науки.
10. Я не можу знайти свою лабораторну роботу з хімії. – Можливо, ви залишили її дома. – Ні, я не могла залишити її вдома.
11. Ви можете мені сказати, яким чином ця речовина змінює своє забарвлення?
12. Я не міг згадати назву цієї сполуки, і мені прийшлося звернутися до однокурсника.

**Ex. 27. Read the text and describe the process of distillation by the picture.**

Distillation may be carried out simply in a retort or in a distilling flask connected through a condenser to a receiver, often cooled by means of a freezing mixture in an ice bowl. In the Liebig condenser the vapour condenses in a long tube which is surrounded by a water jacket in which the cold water circulates. The stream of cold water flows in at the bottom or cool end of the condenser and out at the top or hot end, so that the coolest part of the tube meets the coldest water, and as the water reaches the hottest part of the condenser it is less cool. By this application of the counter-current principle a uniform temperature-drop along the condenser is ensured, and hence as efficient cooling as possible is provided.

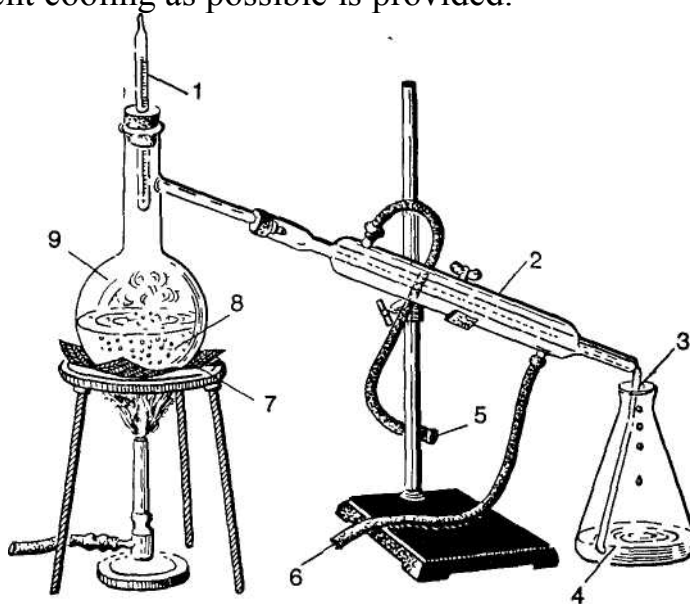


Fig. 1. Distillation

1 — thermometer; 2 — condenser; 3 — receiver; 4 — distillate, 5 — to drain;  
6 — from faucet; 7 — wire screen; 8 — glass or porcelain boiling chips; 9 — residue

**Ex. 28\*. Translate the following sentences into Ukrainian.**

1. If the substance for which the formula is to be derived is both non-volatile and insoluble, it's molecular weight is always unknown. 2. The most striking contrasts between organic and inorganic chemistry is to be found in the instantaneous character of most inorganic reactions. 3. Any material whose properties are to be studied must first be suitably purified. 4. The emulsion has to be sufficiently robust to withstand pigmentation. 5. If positive ions of a given element are to be deposited as the free element on a cathode, it is evident that the ions must be converted back into atoms. 6. Theoretically any element should be able to force any element below it in the series. 7. The dispersing action of water on an ionic solid may be explained in terms of the polar nature of its molecules. 8. This work can't be carried on in this laboratory. 9. We must make a brief excursion into the realm of geology if we are to get any clear understanding of the nature of the minerals. 10. They had to graduate from the Institute last year. 11. When liquid air is allowed to evaporate, different compounds predominate in the fractions obtained at different temperatures. 12. By studying matter in bulk, physicists have been able to draw conclusions concerning the size and



weights of the atoms and molecules. 13. From all that has been said, it might be imagined that structural formulas were the result of pure speculation. 14. A complex ion is to be regarded as a chemical entity with its own properties. 15. It is to be remembered that no animal can live without oxygen. 16. You should be very careful if you are to carry out this experiment in our laboratory. 17. The results reported have to be examined thoroughly. 18. The electron spectrometer used for this investigation is to be of a new type. 19. The surface of the metal has to be well cleaned before resins are applied, and at least some hours must be allowed for the resin to cure. 20. A substance may be crystalline and yet show no external regularity. 21. Once the pressure at which the distillation is to be conducted is established, the number of theoretical or equilibrium stages is determined.

### Ex. 29. Check you Grammar

a) Put C if the sentences is correct, put X if there is a mistake in the use of the modal verbs:

1. It was decided that metals and nonmetals can be given different names.
2. Matter can occupy three different states.
3. Could you show me his calculations?
4. Water must exist as a liquid, as a gas, or as a solid.
5. Water can be decomposed.
6. This experiment is to give good results.
7. Water for washing must contain substances that react with soap.
8. If we condense the steam, we are thus able to remove all the impurities except volatile ones.
9. At one time the ancients thought that everything should be made up of earth, air and water.
10. No chemist has been able to separate any other substances from mercury, oxygen or hydrogen.
11. Atoms of elements may be arranged in different ways to form molecules of different types of matter.
12. Dalton saw that the existence of atoms will explain the law of constant composition.
13. Atoms' existence could explain other observations that had been made about chemical reactions.

b) Find the one choice that best completes the sentences:

7. This matter ... exist in three physical states is common knowledge.
 

a. can	c. will
b. must	d. may
8. You ... obey the laboratory rules when working there.
 

a. must	c. have to
b. can	d. may
9. Elements ... be decomposed because the atoms they are made of are indestructible.
 

a. must	c. have to
b. can	d. may

## Unit 8

Grammar: Subjunctive Mood; Asyndetic constructions in Subjunctive Mood; construction *IT IS HIGH TIME*; conjunctions *SO THAT*, *IN ORDER TO*, *LEST*; *WISH* sentences; mixed type of conditionals



Study the following grammar rule.

The Subjunctive Mood (умовний спосіб)			
I	Складно-підрядні умовні речення	Умова – реальна, відноситься до теперішнього, минулого та майбутнього часів. Вживається будь-який час, що вимагається за змістом.	If you <u>enter</u> this department, you <u>will not feel sorry</u> . Ring me up if you <u>want</u> to know the news.
II	Складно-підрядні речення умовного способу	Умова – малоімовірна або неймовірна. Відноситься до теперішнього та майбутнього часів. <i>Smb. <b>would do</b> smth, if smb. <b>did /were</b> smth.</i>	He <u>would come</u> if he <u>were free</u> . He <u>would take part</u> in this work if he <u>were not so busy</u> . He <u>could answer</u> the question if you <u>helped</u> him.
III		Умова – неймовірна. Відноситься до минулого часу. <i>Smb. <b>would have done/ been</b> smth. if smb. <b>had done/ been</b> smth.</i>	They <u>would have passed</u> the exams successfully if they <u>had studied</u> well. He <u>would have come</u> yesterday if he <u>had been free</u> .

### Ex. 1. Study the following words and remember them.

Angle [ $\text{'}\alpha\text{ngl}$ ]; angstrom [ $\text{'}\alpha\text{Nstrqm}$ ]; attract [ $\text{'}\text{q'tr}\alpha\text{kt}$ ]; chaotic [ $\text{'}\text{kei}'\text{Otik}$ ]; collision [ $\text{'}\text{kq'fi}\downarrow(\text{q})\text{n}$ ]; concrete [ $\text{'}\text{k}\text{Onkri:t}$ ]; confine [ $\text{'}\text{k}\square\text{n'fain}$ ]; diameter [ $\text{'}\text{dai'xmit}\square$ ]; electron [ $\text{'}\text{i'lektrqn}$ ]; elevation [ $\text{'}\bullet\text{eli'vei}\mathfrak{S}(\text{q})\text{n}$ ]; erratic [ $\text{'}\text{i'rxtik}$ ]; identical [ $\text{'}\text{ai'dentik}(\text{q})\text{n}$ ]; identify [ $\text{'}\text{ai'dentifai}$ ]; illuminating [ $\text{'}\text{i'lju:mineiti}\mathfrak{N}$ ]; repel [ $\text{'}\text{ri'pel}$ ]; hypothesis [ $\text{'}\text{hai'p}\text{O}|\text{isis}$ ]; indivisible [ $\text{'}\bullet\text{indi'vizqbl}$ ]; meson [ $\text{'}\text{mi:z}\text{On}$ ]; neutron [ $\text{'}\text{nju:tr}\text{On}$ ]; onrush [ $\text{'}\text{Onr}\leftarrow\mathfrak{S}$ ]; overwhelming [ $\text{'}\bullet\text{quvq'welmi}\mathfrak{N}$ ]; perpetual [ $\text{'}\text{pq'pet}\mathfrak{S}u\text{ql}$ ]; positron [ $\text{'}\text{p}\text{O}zitr\text{On}$ ]; precisely [ $\text{'}\text{pri'saisli}$ ]; proton [ $\text{'}\text{pr}\square\text{ut}\text{On}$ ]; repel [ $\text{'}\text{ri'pel}$ ]; rust [ $\text{'}\text{r}\leftarrow\text{st}$ ]; slab [ $\text{'}\text{sl}\alpha\text{b}$ ]; solubility [ $\text{'}\bullet\text{s}\text{O}lju'biliti$ ]; verify [ $\text{'}\text{verifai}$ ]

**Ex. 2. Translate the following sentences into Ukrainian.**

A: 1. If I lived in London, I wouldn't have any problems with my English. 2. If people trusted and respected each other, it would make life easier. 3. If I could read people's thoughts, it would be interesting to know everything beforehand. 4. If I were ill I wouldn't eat anything. 5. If Mary had bought the dress yesterday, she would have spent all her money. 6. If you had given us a hint, we would have guessed your secret then. 7. It would have been helpful if somebody had met me at the airport and had taken me to the hotel. 8. He says that if he could start his life anew, he wouldn't change anything. 9. Your houseplants wouldn't have died if you had watered them regularly. 10. If she didn't like roses, he wouldn't give them to her on her birthday.

B: 1. If there were no dust, the air would become supersaturated with water. 2. If air is cooled sufficiently, it can be converted into a liquid. 3. If the liquid air were allowed to evaporate, different components would predominate in the fractions obtained at different temperatures. 4. If the atmosphere continued to be of uniform density, we should find that it is 5 miles deep. 5. Were a quantity of silver chloride placed in a quantity of water, silver and chloride ions would begin to leave the surface. 6. Had water been added to the mixture, more alcohol and acid would have been formed. 7. Had not chemistry made possible the production of fundamental materials, radio and TV would have been unknown.

**Ex. 3. Define the type of the following sentences and translate them into Ukrainian.**

1. Were air a single compound, it would have a definite composition by weight. 2. They could have obtained better results had they taken a stronger acid. 3. Had the mixture been heated, the change of colour would have started sooner. 4. Our chemical industry would not have made great progress had there not been close links between science and industry in our country. 5. Should one gram of ice be melted, 79 calories of heat will be absorbed. 6. The substance might have been identified had we known the properties it possessed. 7. Iron can be obtained from iron rust if it is subjected to the right conditions. 8. A glass of water would become coloured were a drop of ink added to it.

**Ex. 4. While translating the following sentences into Ukrainian pay attention to two types of unreal condition.**

1. If he were at the laboratory now he would make a practical on inorganic chemistry. 2. If he had been to the lab yesterday he would have made a practical on inorganic chemistry. 3. If he were to accept some theory now he would accept the atomic theory. 4. If he had been to accept some theory he would have accepted the atomic theory. 5. If the theory were presented in a simple manner I should use it in my work. 6. If the theory had been presented in a simple manner I wouldn't have made a mistake. 7. The scientists had to verify the hypothesis. If they had had enough knowledge about atoms they would have accepted it as a fact.

**Ex. 5. Complete the following sentences.**

1. If you had been at home ... . 2. If I were not so busy ... . 3. She wouldn't have done it if ... . 4. What would you answer if ... ? 5. You wouldn't have fallen ill if ... . 6. If he had sent a telegram ... . 7. The watch wouldn't have stopped if ... . 8. If it were not raining ... . 9. You would get excellent marks if ... . 10. If I had known everything ... . 11. If it were not so cold ... . 12. I'd have got there long ago if ... . 13. He would study much better if ... . 14. She wouldn't say so if ... . 15. If we knew him better ... . 16. The child wouldn't be crying if ... . 17. If you had managed to escape ... .

**Ex. 6. Make conditional sentences.**

1. The travellers had no camera with them, so they could not take photos of the beautiful scenery. If ... 2. There was no sugar left, so we had to go to the shop late in the evening. If ... 3. This house is very nice and comfortable, but it is not very good for living because it is situated close to a chemical plant and the air around is very bad. If ... 4. He is an excellent specialist, but I cannot ask his advice because I am not acquainted with him. If ... 5. You cannot enjoy this merry evening party because you have a toothache. If ... 6. You know the material well enough, but you are very absent-minded, and that's why you always make many mistakes. If ... 7. You did not ring me up, so I did not know you were in trouble. If ... 8. You left the child alone in the room, so he hurt himself. If ... 9. They spent a year in the tropics, so they got very sun-tanned. If ... 10. It rained heavily, so we got drenched to the skin. If ... 11. Why didn't you watch the cat? It ate all the fish. If ... 12. A huge black cloud appeared from behind the forest, so we had to turn back and hurry home. If ... 13. We shall not go to see them because it is very late. If ... 14. Naturally she was angry, because you were in her way. If ...

**Ex. 7. Translate the following sentences into Ukrainian paying attention to the word order.**

1. Had you given me the book before, I should have read it. 2. Had I been told about the conference, I should have been present at it. 3. Had I stayed at the lab yesterday, I would have finished the experiment. 4. Had I met my friend yesterday, I should have asked him to help me. 5. Were I free now, I should begin to work at the new problem. 6. Were I asked to present all the new data it would take a long time. 7. Nothing would have happened, had they not lost their way. 8. Had they studied the problem better they would have got the necessary results.

**Ex. 8. Translate the following sentences into English.**

A: 1. Я б узяв таксі, але в мене немає із собою грошей. 2. Я б зателефонував йому зараз, якщо б знав номер його телефону. 3. Якщо б ви залишили мені записку, я б зайшов до вас вчора. 4. Ми могли б переконати її, якщо б вона слідувала нашим порадам. 5. Я був би дуже вдячний, якщо б ви могли

відкласти нашу зустріч до понеділка. 6. Ви б отримали більше досвіду, якщо б працювали на заводі. 7. На вашому місці я б зв'язався з досвідченими спеціалістами. 8. Ми би не наполягали, якщо б справа не була терміновою. 9. Якщо б ви були більш уважними, ви би не плутали ці імена. 10. Я б вибачився, якщо б почувався неправим.

В: 1. Якщо речовину не можливо розкласти на інші речовини, вона називається елементом. 2. Якщо б газ був безбарвний, ми б не помічали його структури. 3. Ми б отримали кращі результати, якщо б використали інші матеріали. 4. Якщо б речовина перейшла з твердого стану безпосередньо у газовий, ця зміна називалася б сублімацією. 5. Рідина у пробірці змінила би свій колір, якщо б вони підвищили температуру. 6. Вони б виміряли вагу речовини точніше, якщо б використали аналітичні ваги. 7. Якщо б досягнення наших учених не були такими великими, багато складних проблем не було б вирішено.

**Ex. 9. Match the following words with their Ukrainian equivalents.**

- |                     |                    |
|---------------------|--------------------|
| 1. onrush           | A насос            |
| 2. vacuum pump      | B зовсім, повністю |
| 3. complicated      | C розміщений       |
| 4. particles        | D напруга м'язів   |
| 5. imbedded         | E протягом         |
| 6. uniform          | F складний         |
| 7. entirely         | G однорідний       |
| 8. throughout       | H натиск           |
| 9. molten           | I частинки         |
| 10. muscular effort | J розплавлений     |

**Text 1:**

**The World of Matter And Energy**

People, animals, trees, bacteria, rocks, the oceans, the air, and the stars and planets are all different forms of what scientists call *matter*. If we put it more simply, matter will be that which occupies space. We have no difficulty in recognizing certain forms of matter. We can see and touch solids, like wood, iron, and marble, and liquids, like water, gasoline, and milk. We know that muscular effort is required to move these materials and that they can be weighed. It would be easier to identify gases as matter, if many gases were not invisible. Yet if you blow against the palm of your hand, you can feel the onrush of the gases contained in your lungs. You will find, too, that a container weighs more when it is full of air – a mixture of gases – than when the air has been removed by means of a vacuum pump.

It is clear enough, then, that matter occupies space and has weight. But what, exactly, is matter? We know a vast number of different materials – different kinds of

matter. Concrete, iron, milk, illuminating gas, cosmetics, butter, blood, a cat's fur, a man's teeth – have these anything in common?

## MATTER

The problem seems to become more complicated than ever when we consider that many apparently pure substances are not so pure as we had imagined. From a distance a slab of concrete appears to be a uniform material of white or greyish colour. However, if we examine it closer, we will find that it is made up of several kinds of matter. There are particles of gravel or crushed stone imbedded in cement. A panful of seawater looks like a simple, uniform substance. Yet if the water evaporates, various salts will be left behind, including sodium chloride, or common table salt. Suppose we now pass an electric current through molten sodium chloride. We break it down into the metal called sodium and the gas called chlorine.

## ELEMENTS

This breaking down of apparently simple substances into other substances and then breaking down these others into still others might seem to lead nowhere. But if we continue the process long enough, we will find that all matter consists of about one hundred pure substances which cannot be decomposed into anything simpler by ordinary methods of analysis. We call such substances *elements*. Elements are made up of identical atoms. Atoms are, in turn, made up of smaller particles. Atoms cannot be separated by ordinary chemical means, however.

Here are some familiar elements:

Aluminium [ $\text{ʌ} \text{ʃ} \text{ju} \text{ 'min} \text{ j} \text{ qm}$ ]	Cobalt [ $\text{k} \text{qu} \text{ 'b} \text{ ʌ} \text{ft}$ ]	Nitrogen [ $\text{ 'nait} \text{ r} \text{ q} \text{ ʒ} \text{ qm}$ ]
Antimony [ $\text{ 'xntim} \text{ qni}$ ]	Copper [ $\text{ 'k} \text{ ʌ} \text{p} \text{ q} \text{ ʃ}$ ]	Oxygen [ $\text{ 'ʌ} \text{k} \text{ si} \text{ ʒ} \text{ (q) n}$ ]
Arsenic [ $\text{ 'a:snik}$ ]	Fluorine [ $\text{ 'f} \text{lu} \text{ gri:n}$ ]	Phosphorus [ $\text{ 'f} \text{ʌ} \text{sf} \text{ (q) r} \text{ qs}$ ]
Barium [ $\text{ 'b} \text{ ʃ} \text{ qri} \text{ qm}$ ]	Gold [ $\text{ ʒ} \text{qu} \text{ ld}$ ]	Platinum [ $\text{ 'p} \text{ ʌ} \text{xtin} \text{ qm}$ ]
Beryllium [ $\text{ be} \text{ 'ri} \text{ ʃ} \text{ qm}$ ]	Helium [ $\text{ 'hi:} \text{ ʃ} \text{ qm}$ ]	Potassium [ $\text{ 'p} \text{ q} \text{ 't} \text{ ʌ} \text{ ʃ} \text{ qm}$ ]
Bismuth [ $\text{ 'bi} \text{ zm} \text{ q} \text{ ʃ}$ ]	Hydrogen [ $\text{ 'haid} \text{ ri} \text{ ʒ} \text{ (q) n}$ ]	Radium [ $\text{ 'rei} \text{ ʒ} \text{ qm}$ ]
Boron [ $\text{ 'b} \text{ ʌ} \text{:r} \text{ ʌ} \text{ n}$ ]	Iodine [ $\text{ 'ai} \text{ qudi:n}$ ]	Silicon [ $\text{ 'si} \text{ fi} \text{ k} \text{ qm}$ ]
Bromine [ $\text{ 'br} \text{ qu} \text{ mi:n}$ ]	Iridium [ $\text{ ai} \text{ 'ridi} \text{ qm}$ ]	Silver [ $\text{ 'si} \text{ lv} \text{ q} \text{ ʃ}$ ]
Cadmium [ $\text{ 'k} \text{ ʌ} \text{dmi} \text{ qm}$ ]	Iron [ $\text{ 'ai} \text{ qn}$ ]	Sodium [ $\text{ 's} \text{qu} \text{ ʒ} \text{ qm}$ ]
Caesium [ $\text{ 'si:} \text{ z} \text{ j} \text{ qm}$ ]	Lead [ $\text{ ʃed}$ ]	Sulphur [ $\text{ 's} \text{ ʌ} \text{ ʃ} \text{ q} \text{ ʃ}$ ]
Calcium [ $\text{ 'k} \text{ ʌ} \text{ si} \text{ qm}$ ]	Lithium [ $\text{ 'li} \text{  } \text{ i} \text{ qm}$ ]	Tin [ $\text{ tin}$ ]
Carbon [ $\text{ 'k} \text{ a:} \text{ b} \text{ qn}$ ]	Magnesium [ $\text{ m} \text{ ʌ} \text{g} \text{ 'ni:} \text{ z} \text{ j} \text{ qm}$ ]	Tungsten [ $\text{ 't} \text{ ʌ} \text{ ʃ} \text{ t} \text{ qn}$ ]
Cerium [ $\text{ 'si} \text{ qri} \text{ qm}$ ]	Manganese [ $\text{ ʌ} \text{ m} \text{ ʌ} \text{ ʒ} \text{ 'ni:} \text{ z}$ ]	Uranium [ $\text{ ju} \text{ 'rein} \text{ j} \text{ qm}$ ]
Chlorine [ $\text{ 'k} \text{ ʌ} \text{:rin}$ ]	Mercury [ $\text{ 'm} \text{ ʒ} \text{:k} \text{ juri}$ ]	Zinc [ $\text{ zin} \text{ k} \text{ ʃ}$ ]
Chromium [ $\text{ 'k} \text{ r} \text{ qu} \text{ m} \text{ j} \text{ em}$ ]	Nickel [ $\text{ 'ni} \text{ k} \text{ ʃ}$ ]	

Under ordinary conditions many of these elements are solids – copper, gold, iron, and lead, for example. Others are liquids – bromine, mercury. Still others are gases – oxygen, nitrogen. The elements of which matter consists are distributed throughout the universe.

The oceans are composed of water (made up of the elements hydrogen and oxygen) and various salts. Air is almost entirely a mixture of oxygen and nitrogen,



with a few other elements in small quantities. Astronomers have succeeded in identifying in the sun and the other stars a great number of elements that we know on the earth. They have not found any that are not now known to exist on the earth. A number of meteorites have crashed through our atmosphere and have landed on the earth. More than fifty of the elements known on earth have been identified in these visitors from outer space.

**Ex. 10. Decide if the following statements are true or false.**

1. The gases are difficult to identify because they do not have mass.
2. If we now pass an electric current through molten sodium chloride, we will break it down into the metal called sodium and the liquid called chlorine.
3. Elements are made up of identical atoms and the latter are made up of smaller particles.
4. Under ordinary conditions many of the elements are solids – bromine, mercury, for example.
5. About fifty of the elements known on earth have been identified in meteors.

**Ex. 11. Give the equivalents from the text to the following explanations.**

- unicellular micro-organism lacking an organized nucleus, esp. of a kind causing disease
- inner surface of the hand between the wrist and fingers
- machine or device for raising or moving liquids, compressing gases
- unmixed, unadulterated
- mixture of coarse sand and small stones, used for paths etc.
- turn from solid or liquid into vapour
- progress or course
- separate (a substance, light, etc.) into its elements
- minute portion of matter
- large naturally luminous gaseous body such as the sun
- gases enveloping the earth, any other planet, etc.
- a continuous expanse in which things exist and move

**Ex. 12. Practice the pronunciation of the names of the elements given in the table in the text.**

**Ex. 13. Read the text given below and decide which word A, B, C or D best fits each space.**

### The Atomic Theory

Centuries ago, in 500 \_\_\_\_ (1), a Greek scientist had an idea that solids, liquids and gases are all made up of enormous number of minute particles. He could not \_\_\_\_ (2) that his idea was right, and it did not catch on. A British chemist \_\_\_\_ (3) John Dalton revived the idea in 1808. He called the particles atoms (from a Greek word meaning cannot be

\_\_\_\_(4)). According to Dalton's Atomic Theory, all forms of matter consist of atoms. Sometimes, a number of atoms combine to \_\_\_\_ (5) a more complex particle called a molecule. Some substances are made up of single atoms; \_\_\_\_ (6) substances are made up of molecules.

- |   |   |         |   |           |   |          |   |           |
|---|---|---------|---|-----------|---|----------|---|-----------|
| 1 | A | PM      | B | AD        | C | BC       | D | AM        |
| 2 | A | test    | B | create    | C | invent   | D | prove     |
| 3 | A | named   | B | labelled  | C | called   | D | mentioned |
| 4 | A | divided | B | spread    | C | decayed  | D | separated |
| 5 | A | join    | B | form      | C | unite    | D | organize  |
| 6 | A | another | B | the other | C | the rest | D | other     |

**Ex. 14. Translate the following sentences into Ukrainian**

1. It is high time you studied the details of the construction of the device. 2. It is high time you mastered the equipment used. 3. It is high time you understood the function of this mechanism. 4. It is high time the project were discussed in detail. 5. It is high time he were here. 6. It is high time everything were in order. 7. It is high time he presented his hypothesis. 8. It is high time they published the article.

**Ex. 15. Translate into Ukrainian. Remember that «so that», «in order to», «lest» introduce the subordinate clauses of purpose.**

1. A special effort has been made so that the subject of chemistry should be presented in a logical manner. 2. He wrote down the data lest he might forget them. 3. Give the most simple explanation of the hypothesis so that it should be understood and accepted. 4. The hypothesis was studied further in order that it might be verified. 5. You have to apply a theoretical principle in the solution of a problem lest you might give an unsatisfactory explanation of it. 6. You should accept the atomic theory in order that you might give a simple picture of previously unsatisfactorily explained hypothesis.

**Ex. 16. Match the word and its explanation.**

- |             |   |
|-------------|---|
| 1. electron | A elementary particle with a positive electric charge equal to that of an electron, and occurring in all atomic nuclei                            |
| 2. proton   | B elementary particle of about the same mass as a proton but without an electric charge   |
| 3. neutron  | C elementary particle believed to help hold nucleons together in the atomic nucleus   |
| 4. positron | D stable elementary particle with a charge of negative electricity, found in all atoms and acting as the primary carrier of electricity in solids |
| 5. meson    | E Physical elementary particle with the same mass as but opposite (positive) charge to an electron  |

## Text 2:

### The Atomic Structure of Matter

The most important of all chemical theories is the atomic theory. In 1805 the English chemist and physicist John Dalton (1766–1844), of Manchester, stated the hypothesis that substances consist of small particles of matter. He called these particles atoms, from the Greek word «atomos», meaning indivisible. This hypothesis gave a simple explanation or picture of previously observed but unsatisfactorily explained relations among the weights of substances taking part in chemical reactions with one another. It was necessary that the hypothesis be confirmed. Hadn't it been verified by further work in chemistry and physics it wouldn't have become the atomic theory. The existence of atoms is now accepted as a fact.

All ordinary matter consists of atoms. The exceptional kinds of matter are the elementary particles from which atoms are made (electrons, protons, neutrons) and similar sub-atomic particles (positrons, mesons). But atoms are the units which retain their identity when chemical reactions take place, and therefore they are important to us now. Atoms are the structural units of all solids, liquids, and gases. They are very small - only about 2 Å to 5 Å in diameter.

This is indeed small. If a piece of rock, or anything else, one inch in diameter were magnified to the size of the earth, its constituent atoms would become about the size of golf balls or tennis balls.

Every atom consists of one nucleus and one or more electrons. The nucleus is a small, heavy particle containing almost all the mass of the atom. Nuclei are very small indeed. The nucleus of an atom is only about one ten-thousandth as great in diameter as the atom itself, and the volume of the nucleus is one million-millionth, of the volume of the atom.

If nuclei could be packed together side by side, they would give a form of matter with very great density.

The electron is a particle with a small mass, 1/1845 that of the lightest nucleus, and with a negative electrical charge. The electron itself is about as large as a nucleus, its diameter being about  $10^{-12}$  cm. The electrons in an atom are attracted by the nucleus. The electrons in an atom move rapidly around in the space extending over a diameter of a few Å about the nucleus, and because they move about so fast they effectively fill this space in such a way as to repel any other atom which approaches to within this diameter.

Were it not for the rapid progress of scientific knowledge about atoms the evidence for the existence of atoms would not be so overwhelming.

#### Ex. 17. Give English equivalents for the following words and word combinations.

сформулювати гіпотезу; той, що неможливо поділити; недостатньо розтлумачені; потрібно було, щоб гіпотеза була підтверджена; прийняти як факт; елементарні частинки; коли відбувається хімічна реакція; це – дійсно

мало; будь-що інше; одна десятитисячна; простір, що тягнеться по діаметру у декілька ангстремів навколо ядра; ефективно заповнювати простір

**Ex. 18. Find in the text synonyms for the following words.**

To name; easy; interpretation; to check; type; to contain; significant; building; tiny; volume; component; weighty; really; large; structure; to near; fast; method; advance; learning; indication; innumerable

**Ex. 19. Tell if the statements below are true or false.**

1. The Greek word “atom” means invisible.
2. Atoms are the structural units of some substances.
3. Each atom consists of at least two constituents.
4. If a matter has a great density, its nuclei are packed together side by side.
5. The diameter of a nucleus is one million-millionth of the atom’s diameter.

**Ex. 20. Discuss the following issues.**

1. What would you do if the atomic theory were not verified yet? 2. What would you do if the hypothesis concerning the atomic structure of matter were not accepted yet by scientists? 3. What would you do if the atomic theory were unsatisfactorily explained? 4. What would you do if the relations among the weights of substances taking part in chemical reactions were only observed? 5. What would you do if you were interested in the problem of sub-atomic particles? 6. What would have happened if the hypothesis by John Dalton hadn’t been verified? 7. What would have happened if scientists hadn’t been confirmed by further work in chemistry and physics? 8. What would have happened if a piece of rock had been magnified to the size of the earth? 9. What would have happened if nuclei could be packed together side by side? 10. What would have happened if the progress of scientific knowledge about atoms hadn’t been so rapid?

**Ex. 21. Read the following text and do the exercises.**

**Kinetic Theory Of Matter**

*a. Fill in the gaps with the most suitable word*

Molecules are the building blocks of \_\_\_\_\_ and \_\_\_\_\_ and many \_\_\_\_\_ as well. Gases, liquids, and solids make up the three states of \_\_\_\_\_. According to some scientists, plasmas, which are gases, composed of charged particles, make up a \_\_\_\_\_ of \_\_\_\_\_. The same substance may be a solid, or a liquid, or a gas, depending upon the \_\_\_\_\_. Water, for example, is most familiar to us in the liquid form. When it freezes, it becomes a solid – \_\_\_\_\_. When it boils, it becomes a gas – \_\_\_\_\_. What is true of water is true of other \_\_\_\_\_.

*b. Fill in the gaps with the most suitable article*

Strictly speaking, then, it is not accurate to call this or that substance \_\_\_ solid, or \_\_\_ liquid, or \_\_\_ gas, because most substances can be found in one or another of \_\_\_ states of matter under certain conditions of temperature or pressure. However, most bodies are solids, or liquids, or gases under ordinary conditions, and we refer to them as such. Thus we call iron \_\_\_ solid, even though it will melt and become \_\_\_ liquid at \_\_\_ temperature of 1,535° Celsius. We call carbon dioxide \_\_\_ gas even though it can be transformed into \_\_\_ solid that we call dry ice.

Molecules are certainly quite unusual building blocks, for they are constantly in motion, except at \_\_\_ theoretical temperature that we call absolute zero, \_\_\_ equivalent of -273.16° Celsius. \_\_\_ laws, governing this motion, have been set in what is known as \_\_\_ *kinetic theory*, or *kinetic-molecular theory*, of matter. It offers \_\_\_ perfectly natural explanation for many phenomena that were once thought to be very mysterious.

*c. Fill in the gaps with a suitable preposition*

According \_\_\_ the kinetic theory, the molecules \_\_\_ a gas \_\_\_ a container are continually bumping \_\_\_ one another and also \_\_\_ the walls \_\_\_ the container. Imagine a half-dozen billiard balls, kept constantly \_\_\_ motion \_\_\_ a billiard table. Each ball will move \_\_\_ a straight line \_\_\_ it hits another ball or the side \_\_\_ the table. \_\_\_ such a collision, it will bounce off \_\_\_ an angle, moving \_\_\_ a new direction and often \_\_\_ a different speed. The gas molecules follow much the same sort \_\_\_ chaotic pattern, except that they move \_\_\_ the three dimensions \_\_\_ space and are not confined to the two dimensions of a table surface. We can see the effect \_\_\_ this constant movement of molecules \_\_\_ examining smoke \_\_\_ a microscope. We first admit the smoke \_\_\_ a closed container which has transparent windows. If we now illuminate the container \_\_\_ a bright light and examine it \_\_\_ the microscope, we shall be able to see the individual particles \_\_\_ smoke dancing \_\_\_ continually \_\_\_ an erratic way. The smoke particles move about \_\_\_ this manner because they are being constantly bombarded \_\_\_ the molecules \_\_\_ the gases that make up the air \_\_\_ the container. The perpetual dance \_\_\_ particles is called the *Brownian movement*, or motion, \_\_\_ Dr. Robert Brown (1773–1858), a 19th-century Scots scientist, who first showed how general this kind of movement is.

*d. Fill in the gaps with the following words*

motion    heat    energy    degree    force    quantity    substance

The rate at which the molecules move depends upon the \_\_\_\_\_ of hotness of a given \_\_\_\_\_. As a matter of fact, \_\_\_\_\_ is simply the kinetic \_\_\_\_\_, or energy of \_\_\_\_\_, of the molecules of a substance. If there is little heat in a given \_\_\_\_\_ of gas, the motion of the molecules is slow. If there is more heat, the molecules will dart to and fro more rapidly. They will strike the walls of the container more often and with greater \_\_\_\_\_.

**Ex. 22. Translate the following sentences into Ukrainian.**

1. If hydrogen were being used as the base of atomic weights this change would have required changes of almost all atomic weights by 0.03 %, instead of only that of hydrogen, because most atomic weights had been determined by comparison with oxygen. 2. If there were no order in the way in which atoms of different elements combine to form the molecules and crystals of compounds it would be necessary for us to memorize one by one the formulas of thousands of substances. 3. The crystals and the liquid are in equilibrium at the freezing point (melting point), and then they have exactly the same vapor pressure. If the two phases had different vapor pressures, the phase with the larger vapor pressure would continue to evaporate, and the vapor would continue to condense as the other phase, until the first phase had disappeared. 4. It is found by experiment and required by the kinetic theory that each of the components of a dilute gas mixture exerts the same pressure as if it were present alone in the entire volume. 5. Bohr suggested that the orbit of the electron in the normal hydrogen atom should be circular. 6. If the molecular weight were known, the volume of a given weight of a gas could be calculated directly from the perfect gas equation. 7. It is clear that the ions of a crystal of sodium chloride placed in water could dissociate away from the crystal far more easily than if the crystal were in air, since the electrostatic force bringing an ion back to the surface of the crystal from the aqueous solution is only 1/80 as strong as from air.

**G** Study the following grammar rule.

Present	У підрядних реченнях теперішнього та майбутнього часів після дієслова to wish використовуємо Past Indefinite або would + do	<i>I wish I <b>knew</b> everything.</i> <i>I wish I <b>were</b> a millionaire.</i> <i>He wishes he <b>would live</b> in London.</i>
Past	У підрядних реченнях минулого часу після to wish використовуємо Past Perfect або would + have done	<i>He wishes he <b>had taken</b> a taxi.</i> <i>They wish they <b>had been more accurate</b> during the experiment.</i> <i>She wished she <b>would have written</b> down the address.</i>

**Ex. 23. Open the brackets.**

1. I wish I (can) give up smoking 2. She wishes she (to see) him at yesterday's party. 3. I wish I (to pass) my driving test last Monday. 4. I wish I (not to forget) my friend's birthday yesterday. 5. The boy is sad. He wishes he (not to break) the window. 6. My aunt wishes she (to stay) at home last weekend. 7. He wishes he (to know) something about cars. 8. I wish it (to be) sunny. 9. I wish it (to be) sunny during our picnic last Saturday. 10. She wishes she (to live) in the Crimea. 11. My friend wishes he (not to do) that last night. 12. I wish I (to bring) my camera last summer. 13. I wish I (can) tell the future. 14. Do you wish you (to be) in the Guinness Book of Records? 15. Some people wish they (can) appear on a TV game show and become famous. 16. She often wishes things (to be) different.



**Ex. 24. Change the sentences using *wish* structure.**

1. Unfortunately they won't return before Christmas. 2. The student was sorry he had not studied the material better and had shown such poor knowledge at the examination. 3. It's a pity that you did not send for us last night. 4. It's a pity you are not with us these days. 5. My friend regrets not having entered the university. 6. He was sorry not to have had enough time to finish his paper. 7. It's a pity we shan't be able to reach home before tea-time. 8. I am sorry I made you upset by telling you this news. 9. What a pity you don't know enough physics.

**Ex. 25. Translate the following sentences into English.**

1. На жаль, вони про це ще нічого не знають. 2. На жаль, вони вже все про це знають. 3. Якщо б у нас зараз були канікули! 4. Ми пожалкували, що не дізналися про результати контрольної роботи відразу. 5. Шкода, що вас не цікавить цей предмет. 6. Шкода, що ви не звернули увагу на його попередження. 7. Він пожалкував, що кинув навчання в університеті. 8. На екзамені він пожалкував, що не відвідував лекції.

**Ex. 26. Before reading the text guess the answers for the following questions.**

1. Air is composed of ...
  - a) Oxygen
  - b) Oxygen and Nitrogen
  - c) Oxygen, Nitrogen and some other gases
2. Air at the sea level is slightly richer in ...
  - a) salts
  - b) oxygen
  - c) nitrogen
3. Air can be separated into compounds by ...
  - a) fractional distillation
  - b) heating
  - c) steam distillation
4. The formula of air is ...
  - a)  $N_4O$
  - b) too complicated to write here
  - c) impossible

**Text 3:**

**Air**

One can prove in several ways that air is not a chemical compound, but a mixture of nitrogen and oxygen with small amounts of other gases.

The composition of air varies slightly with elevation, being a little richer in oxygen and poorer in nitrogen at sea level than at elevations of a few miles. If it were a single compound, it would have a definite composition by weight.

Air is readily separated into its components by fractional distillation of liquid air. If it were a compound, it would all distil over in a single fraction at a definite temperature.

The air that surrounds us is about one fifth oxygen by volume. When cold water is slowly warmed, we see bubbles of “dissolved air” coming out of the solution. If we analyze such bubbles, we shall find that they are about one third oxygen by volume. The change in composition is due to the difference in the solubility of the gases that make up the mixture known as air. If air were a single compound, the bubbles that escape from the solution would have the same composition as those of the undissolved air.

The density and physical properties of air are precisely those that would be inferred from the proportions and physical properties of its component gases. If a chemical change occurred in mixing these gases to form air, there would be either a change in properties or a change in volume.

No chemical formula can be written that would exactly show the proportions in which nitrogen and oxygen are present in air. The nearest simple formula would be  $N_4O$ , but this would indicate far too great a density for air, and the proportion of oxygen in air is slightly greater than this formula indicates:

**Ex. 27. Give the name to each paragraph of the text.**

**Ex. 28. Render the text *Air*.**

**Ex. 29. Fill in the gaps and translate the sentences into Ukrainian.**

1. We could have got a new substance if the solution ... by heating (to be decomposed) 2. Were those two substances heated, the reactions between them ... more probable. (to be) 3. If we decompose water by the electric current, hydrogen and oxygen ... (to liberate) 4. If cold water were slowly warmed, we ... the bubbles of “dissolved air” coming out of the solution. (to observe)

**Ex. 30. Translate the continuation of the following sentences into English.**

1. If we analyzed the bubbles of dissolved air, (ми побачили б, що за об’ємом вони на одну третину складаються з кисню). 2. If we wrote the formula  $N_4O$  for air, (вона б не показувала точних співвідношень, у яких кисень та азот присутні у повітрі). 3. If the composition of air were analyzed at sea level, (можна було б побачити, що він трохи багатший на кисень і бідніший на азот, ніж на висоті у декілька миль). 4. If we separated air into its components, (ми б отримали кисень, азот та невелику кількість інших газів).

**Ex. 31. Translate the following sentences into Ukrainian.**

1. Calcium carbonate would have gradually decomposed had it been heated for a longer time. 2. Should the pressure exerted upon some definite quantity of a gas be doubled, the pressure exerted by the gas will also double. 3. The explosion of a mixture of hydrogen and chlorine might have occurred had the necessary precautions not been taken in time. 4. Should all things remain unchanged in nature, it would be easy to classify

different forms of matter by noting any characteristic properties they have. 5. Were the sodium chloride prepared by passing hydrogen chloride gas into a dilute solution of sodium hydroxide, much heat would evolve. 6. Calcium carbonate would have gradually decomposed had it been heated for a longer time at an appropriate temperature. 7. Had not the chemist made possible the production of fundamental materials, the plastics that are so widely used would never have existed. 8. Had the checking up of the experimental data not taken so much time, we should have completed our work long ago. 9. We could obtain iron from iron rust if we subjected it to the right conditions.

**Ex. 32. Translate the following sentences into English.**

1. Якщо б ми повільно нагрівали холодну воду, то ми б побачили бульбашки “розчиненого” повітря. 2. Воду потрібно кип’ятити, щоб вона не містила у собі мікробів. 3. Якщо б ми взяли іншу речовину, вона б не випарилася до того, як ми закінчили експеримент. 4. Якщо б атмосфера складалась з чистого кисню, корозія сталі та заліза проходила б так швидко, що їх використання стало б не практичним. 5. Якщо б магній був нагрітий до червоного кольору, він би відновив окис вуглецю. 6. Якщо б нам було потрібно зробити точні виміри, необхідно було б використати цей новий вимірювальний пристрій. 7. Якщо рідину охолодити, її молекули загублять енергію. 8. Якщо б це скло було прозорим, його можна було б використовувати у вікнах. 9. Це питання було б давно вивчено, якщо б ви йому допомогли. 10. Шкода, що цю речовину неможливо використовувати як ізолятор.

**Ex. 33. Make conditional sentences. Mind the mixed type.**

1. I shall go to the dentist because I have a toothache. If ... 2. He is groaning with pain now because he did not go to the dentist to have his tooth filled. If ... 3. She does not go to the polyclinic because she does not need any treatment. If ... 4. He will not go see the play as he was present at the dress rehearsal. If ... 5. He went to Kyiv specially to hear this famous singer because he is fond of him. If ... 6. We did not go to the cafeteria to have a glass of lemonade because we were not thirsty. If ... 7. She could not mend her dress herself because she had no needle. If ... 8. He is not a first-class sportsman now because he did not train enough last year. If ... 9. The students were active because they wanted to understand this difficult material. If ... 10. The students did not understand the homework because they were inattentive. If ... 11. The students worked hard and did well in their examinations. If ... 12. She won't try to enter the foreign languages department because she is not good at foreign languages. If ...

**Ex. 34\*. Translate the following sentences into Ukrainian.**

1. Had they taken into account the weight before heating they would have made less mistakes. 2. Thus, the deuterium, the nucleus of  $H^2$  could be considered to be built up from a proton and a neutron. 3. Had the condenser been placed in a direct current the current would have started flowing as though the condenser were not present. 4. Were water allowed to run back into the generator an explosion might result. 5. It is necessary that they should determine whether or not this inorganic

substance is contained in the sample to be analyzed. 6. It is necessary that atomic energy should be used only for peaceful purposes. 7. A reliable device for neutron storage could greatly simplify the procedure, so that only one detector would be needed. 8. It is desirable that the determination of the effect of glass composition should be made. 9. If no catalyst were employed in cracking, the process would be called "thermal cracking". 10. If the gas were colourless, we should not notice its formation; we should have noticed the formation of this gas if it hadn't been colourless. 11. If analytical balances were used the results would be much more precise. 12. If air were a single compound the bubbles escaping from the solution would have the same composition as those of undissolved air. 13. If the liquid were placed between the plates of a condenser and an electric field applied, the molecules would tend to orient themselves both to positive and negative plates. 14. Had water been purified carefully they wouldn't repeat the experiment. Remember: water has to be purified lest it should contain microbes. 15. If two liquids had been mutually insoluble, neither one would have lowered the vapour pressure of the other. 16. It is desirable that the sample should be weighed again as the weight does not confirm our data. 17. If a crucible filled with pure arsenic were heated to a temperature above the melting point of the arsenic, and the system were then allowed to cool, it would be noted that the temperature would increase steadily with time. 18. If pure lead were used the falling drops would solidify rather suddenly on reaching the temperature 327°C. 19. If we contemplated water in a glass, the water would appear optically uniform. At any rate, we cannot discern any difference in the appearance of the water at the bottom of the glass and on the surface. 20. If there was no order in the way in which atoms of different elements combine to form the molecules and crystals of compounds, it would be necessary for us to memorize one by one the formulas of thousands of substances. 21. If an electron were to be removed from the sodium atom, leaving only 10 electrons around the nucleus, the resulting particle would have a positive charge, this particle composed of a sodium nucleus and 10 electrons, being called a sodium ion. 22. If the absolute temperature were doubled, the speed of the molecules would increase. 23. If some iodine crystals are put into a flask, which is then stoppered and allowed to stand at room temperature it would soon be seen that the gas in the flask becomes violet in colour, showing that a quantity of iodine evaporated.

### Ex. 35. Check your Grammar.

1. If I ... the number I would phone him.
 

a. know	c. knew
b. had known	d. known
2. ... you a little bit more attentive you wouldn't miss them.
 

a. Were	c. Had been
b. Was	d. Are
3. If you had used that substance you ... your time
 

a. wouldn't waste	c. wouldn't have waste
b. won't waste	d. wouldn't have wasted
4. Take a sandwich ... you should be hungry.
 

a. lest	c. so that
---------	------------

- b. in order to  
5. If ... I wouldn't give up the university.  
a. I am at your place  
b. I were you  
6. Would you go to the conference, if I ... there  
a. didn't go  
b. wouldn't go  
7. She would have understood, if you ... her the situation.  
a. explained  
b. had explained  
8. I ... you last night but I didn't have your number  
a. would have phoned  
b. would phone  
9. It's cold here. I wish he ... the door open.  
a. doesn't leave  
b. wouldn't left  
10. ... a mixture, we would know its formula.  
a. Had not air been  
b. Were air not
- d. before  
c. I would be at your place  
d. I was in your position  
c. hadn't gone  
d. wouldn't have gone  
c. would have explained  
d. have explained  
c. phoned  
d. had phoned  
c. wouldn't leave  
d. hadn't left  
c. Would air not be  
d. Would air had not been

## Unit 9

*Grammar: Participle I; Participle II; WHEN, IF + Participle II; The Perfect Participle; The Absolute Participle Construction*



**Study the following grammar rule.**

## Forms of the Participle I

	Active	Passive
Non-Perfect	doing	being done
Perfect	having done	having been done

## The Usage of Participles I and II

Participle I Simple (doing) – виражає одночасність дій	
Вживається:	
1. як обставина	
a) часу	(While) <b>Conducting</b> this experiment, be very careful.
b) причини	<b>Knowing</b> this law, you can easily solve this task. <b>Not visiting</b> him that day, we didn't know he had made a report at the conference

c) способу дії або супутніх обставин 2. як означення	<i>They were in the laboratory <b>conducting</b> an experiment.</i> <i>The professor was standing in the lecture hall <b>looking</b> thoughtfully at the audience.</i> <i>The student <b>translating</b> the article knows English very well.</i> <i>The substance <b>being investigated</b> can be used in the experiment.</i>
Participle I Perfect (having done) – виражає попередність дії	
Вживається як обставина: а) причини в) часу	<i><b>Not having found</b> the composition of the substance, the scientists couldn't compare it with other substances.</i> <i><b>Having learned</b> the methods of preparation of oxygen, let us study its main reactions.</i>
Participle I Perfect не вживається як означення	<i>Everybody knows the name of the person <b>who</b> made this great discovery.</i>
Participle II (done, helped) – має значення пасивного стану	
Вживається як а) означення б) способу дії або супутніх обставин	<i>The article <b>translated</b> was sent to him.</i> <i>Hydrogen burns readily in the air and the product <b>formed</b> is water</i> <i>When <b>heated</b>, this substance dissolves</i>

### Ex. 1. Study the following words and remember them.

Accelerator [qk'selqretq], adjacent [q'tʃei(q)nt], adsorbent [xd'sʌb(q)nt], alkali [ʌskqʃai], alloy [ʌʃoi], alter [ʌltq], alteration [ʌltq'reiʃ(e)n], beam [bi:m], brass [bra:s], diagnostics [ˈdaɪqg'nɒstiks], dispense [dis'pens], emulsion [i'mʌʃʌs(q)n], ethyl [eʃil], exert [ig'zWt], inversely [in'vq:ʃi], isotope [ˈaɪsqʊtʊp], lime [laim], milestone [ˈmaɪstqʊn], nuclide [ˈnju:klaɪd], rod [rɒd], viscosity [vis'kɒsiti]

### Ex. 2. Read the sentences, state the functions of the Participles. Translate the sentences.

- A The man writing something at the table is my friend. 2. Preparing for the examination, I studied several books written by the professors working at the University. 3. Opening the door, I saw several students who were reading newspapers. 4. This metal located all over the world has a low-melting point. 5. Elements arranged according to a definite system compose a table. 6. When combined with this gas hydrogen burns in the air.



- B 1. The ten most common elements presented in Table 1 compose the solid crust of the earth. 2. Oxygen forms compounds with all the elements but the inert gases. The compounds formed chemists call oxides. A few such as titanium and mercury, form oxides very slowly, even when heated. 3. The article written by one of the specialists for our magazines the other day contains some important information. 4. Most of the specialists working at the problem spoken so much about are chemists of our University. 5. The article so often referred to contained new data.

**Ex. 3. Change the following sentences using participial constructions.**

1. All the people who live in this house are students. 2. The woman who is speaking now is our secretary. 3. The apparatus that stands on the table in the corner of the laboratory is quite new. 4. The young man who helps the professor in his experiments studies at the evening school for laboratory workers. 5. People who take books from the library must return them in time. 6. There are many students in our department who take part in all kinds of extracurricular activities. 7. As he now felt more at ease, the man spoke in a louder voice. 8. Since he knew who the man was, Robert was very pleased to have the chance of talking to him. 9. As he thought that it was his brother at the window, Steve decided to open it. 10. As the people were afraid of falling into a ditch in the darkness at any moment, they felt their way about very carefully. 11. Since he needed a shelter for the night, Peter decided to go to the neighbours' house.

**Ex. 4. Open the brackets choosing the correct forms of the Participles.**

1. A positively (charging, charged) particle having the mass of the electron was discovered in 1932. 2. The scientist found that X-rays (produced, producing) were complex. 3. According to this theory (dealt with, dealing with) atomic structure the nucleus is a very small, compact, central part of an atom. 4. Oppositely (charged, charging) particles exert forces of attraction on one another. 5. Elements (composed, composing) of atoms containing only one or two valence electrons usually form positive ions. 6. (Investigated, investigating, having investigated) this phenomenon the scientists can make some important conclusions. 7. The work (doing, done) by these research-workers resulted in many new discoveries. 8. The ions (involving, involved) can be used as a highly sensitive detector of radiation. 9. The investigation (followed, following) by many experiments was of great importance. 10. The nuclei (formed, forming) in this reaction are unstable.

**Ex. 5. Do you know what these people did for science? Match the name of a scientist and the achievement made by him.**

- |                |  |
|----------------|--|
| 1 H.Becquerel  | A The discovery of artificial radioactivity                                  |
| 2 E.Rutherford | B The discovery of natural radioactivity                                     |
| 3 J.Chadwick   | C The development of the apparatus for the detection of radioactive nuclides |
| 4 Geiger       | D The discovery of neutron   |
| 5 the Curie    | E The achievement of an artificial nuclear transformation                    |

## Text 1:

### Radioactivity

The discovery of natural radioactivity by the French researcher Henri Becquerel ushered in a new era in science and technology. This phenomenon is based on the principle that substances occurring in nature, such as uranium and radium, are transformed into other chemical elements, independently of influences from outside, emitting different kinds of radiations which blacken a photographic plate as this is done by the rays of light.

In the decades following this discovery thousands of scientists in many countries of the world have systematically investigated the essence and the application of radioactivity and of the radiation emitted by radioactive nuclides.

The basic practical and theoretical work done by the Curies, the work by E. Rutherford who achieved an artificial nuclear transformation, the development of apparatus for the detection of radioactive nuclides by Geiger and Muller, the discovery of neutron by the English physicist J. Chadwick, the discovery of the artificial radioactivity by the Curies and the discoveries of some other scientists are the milestones in the history of radioactivity.

The field of application of radioactive nuclides in chemistry, physics, biology, agriculture, medicine and industry has rapidly expanded. One of the most interesting fields of applications of radioactivity is the determination of the age of carbonaceous materials, that is materials containing carbon, by measurement of their radioactivity due to carbon 14.

This technique of radiocarbon dating permits the dating of samples containing carbon with an accuracy of around 200 years.

At the present time the method involved can be applied to materials that are about 25,000 years old.

Today the range of application of radioactive nuclides comprises all branches of research work. Thus, for example, certain medical examinations call for short lived radioactive nuclides in order that the human organism should not be exposed too long a period of time to radiation, whereas a radioactive nuclide which excites the luminescent material should have a long half-life.

Investigations into the reaction mechanisms in chemistry, researches in the field of physics, the explanation of vital processes in plants, animals and man, diagnostics of diseases of the human body, the testing of metallic and ceramic materials are but a few fields of science and technology which today, 91 years after the discovery of radioactivity, cannot dispense with radioactive nuclides and the radiation emitted by them.

It should be added that a considerable number of research problems has only become soluble by the use of radioactive nuclides.

**Ex. 6. Look through the text again and find the sentences where the author describes:**

- the principle of natural radioactivity

- radioactive nuclides application
- application of radioactive nuclides in medicine
- the limitation of usage

**Ex. 7. Think if the following statements are true or false.**

1. Natural radioactivity is based on the principle that artificially made substances can be transformed into other chemical elements.
2. Natural radioactive elements can blacken a photographic plate whereas artificial ones can not.
3. Geiger was the one to invent the device of radioactive nuclides detection.
4. One of the most interesting application of radioactive nuclides is the dating of carbon containing samples.
5. Only a few branches of science can apply radioactive nuclides.
6. Nowadays scientists can apply just a limited possibility of radioactive nuclide.

**Ex. 8. Find in the text English equivalents of the following words and word combinations.**

- |                           |                                 |
|---------------------------|---------------------------------|
| 1. оголосити про          | 9. визначення віку за допомогою |
| 2. незалежно              | ізотопів вуглецю                |
| 3. випромінювати          | 10. зразок                      |
| 4. затемнювати            | 11. таким чином                 |
| 5. сутність               | 12. медичні аналізи             |
| 6. виявлення              | 13. період напіврозпаду         |
| 7. штучна радіоактивність | 14. обходитися без              |
| 8. віха                   | 15. значна кількість            |
|                           | 16.                             |
|                           | 17. той, що можна вирішити      |

**Ex. 9. Match the Ukrainian words and word combinations from the exercise above with their English equivalents.**

- |                         |                              |
|-------------------------|------------------------------|
| (a) half-life           | (i) radiocarbon dating       |
| (b) detection           | (j) artificial radioactivity |
| (c) usher in            | (k) emit                     |
| (d) sample              | (l) thus                     |
| (e) considerable number | (m) soluble                  |
| (f) essence             | (n) medical examination      |
| (g) independently       | (o) milestone                |
| (h) dispense with       | (p) blacken                  |

**Ex. 10. Answer the following questions:**

1. Who discovered the phenomenon of radioactivity?
2. What is the phenomenon of radioactivity based on?
3. What are the milestones in the history of radioactivity?

4. Where can radioactivity be applied?
5. What is the most interesting field of applications of radioactivity?
6. Where are radioactive nuclides applied now?

**Ex. 11. Open the brackets choosing the correct forms of the Participles. Translate the sentences into Ukrainian.**

1. Much could be (writing, written) about the application of nuclides. 2. Many experiments have been (carrying out, carried out) in the field of radioactivity. 3. The work (doing, done) by the scientists was of great significance. 4. Many of the above-mentioned applications of radioactive nuclides or of the radiation (emitting, emitted) by them are directly or indirectly connected with industry. 5. A mechanical method was (substituting, substituted) by a new one. 6. This type of radiation consists of a current of positively (charged, charging) particles. 7. This discovery (following, followed) by many experiments was of great use to chemists. 8. The two substances (investigating, investigated) were homogeneous. 9. The man (speaking, spoken of) was the first to discover this phenomenon.

**Ex. 12. Translate the following sentences into English using Participial constructions.**

1. Деякі речовини природного походження, такі як уран або радій, можуть перетворюватись на інші хімічні елементи, випромінюючи при цьому радіацію.
2. Робота, що була проведена Кюрі, має важливе теоретичне значення.
3. Матеріали, що містять вуглець, можна проаналізувати для визначення віку.
4. Через те, що деякі радіоактивні нукліди мають короткий період напіврозпаду, вони можуть використовуватись у медичних цілях.
5. Тільки після винаходу радіоактивних нуклідів людство спромоглося вирішити значну кількість задач.

**Ex. 13. Open the brackets choosing the correct forms of the Participles:**

1. When (heating, having heated) this substance, one should be very careful. 2. (Investigated, having investigated, investigating) all the properties of new water, they could understand the mystery of silvery clouds. 3. The (dissolving, dissolved, having dissolved) materials may be soluble solids, liquids or gases. 4. Water (using, used, having used) in steam boilers, should be free from substances that cause corrosion. 5. (Purified, having purified, purifying) the water from the substance that cause corrosion, we can use it in steam boilers.

**Ex. 14. Translate into Ukrainian paying attention to the Participles.**

1. Some adsorbents may contain sufficient acid or alkali to alter the pH of the water being treated. 2. Having been compressed the air is to be cooled. 3. Having been composed of liquid particles emulsions disperse in other liquids. 4. Being used in

different fields of chemistry, industry and medicine colloid chemistry becomes increasingly important. 5. When placed in a liquid, the corresponding solids will swell first and then slowly go into solution.

**Ex. 15. Translate the following sentences paying attention to the meanings of the word "learn":**

1. He carried out a number of experiments as he wanted **to learn** all the properties of the water. 2. We **have learned** that he teaches at the Chemico-Technological Institute. 3. The first-year students **learn** physics, mathematics, and some other subjects. 4. **Having learned** the weight of hydrogen and oxygen, the research-workers could determine the ratio of two elements. 5. If you want to investigate all the properties of this element, first of all **learn** its atomic weight.

**Ex. 21. Translate the following sentences into Ukrainian.**

- A 1. The elements involved varied in their properties greatly. 2. The rate of the reaction depends on the nature of the substance involved. 3. The acid involved acted as a catalyst. 4. The importance of the technique involved was evident to everyone.
- B 1. The lecture followed by practical hours took place in our club. 2. These rays uninfluenced by the magnetic field were examined by our workers. 3. The substance affected by a magnetic field must be a metal. 4. The analysis followed by an examination gave unexpected results.
- C 1. When asked about this work, he couldn't answer anything. 2. If carried out carefully, the experiment can give reliable data. 3. When shown this chart, pay attention to the figures. 1. When the composition of the substance had been determined, the scientists compared it with some other substances. 2. When they had investigated all the properties, they could state that these gases were harmful. 3. After they had separated nitrogen from other gases, they obtained it in nearly pure condition. 4. When he had found the needed solvent, he could continue his experiment.

**Ex. 16. Before reading the text match the word and its definition**

- |               |  |
|---------------|--|
| 1 accelerator | A a branch of production or manufacture  |
| 2 beam        | B direction a stream of high-speed particles   |
| 3 bombardment | C living being with interdependent parts   |
| 4 detector    | D apparatus for imparting high speeds to charged particles   |
| 5 industry    | E place of origination   |
| 6 isotope     | F ray or shaft of light or radiation   |
| 7 organism    | G artificial radioactive isotope which can be followed through the body by the radiation it produces |
| 8 research    | H one of two or more forms of an element differing from  |

		each other in relative atomic mass, and in nuclear but not chemical properties
9	source	I systematic investigation and study of materials, sources, etc., in order to establish facts and reach conclusions
10	tracer	J discoverer

## Text 2:

### Radioisotopes

An isotope is one of two or more atoms having the same number of protons in the nucleus (i.e., a number of the same chemical species and therefore exhibiting the same chemical properties), but having different atomic weights and sometimes exhibiting different radioactive properties. Isotopes are either radioactive, in which case they dissipate energy through the emission of radiation, or stable, i.e. non-radioactive.

Physicists have identified more than 800 radioisotopes. Some of them occur naturally. Most of radioisotopes are produced artificially by bombardment stable isotopes with beams of neutrons from nuclear reactions or with beams of protons or other light nuclei from particle accelerators. When a stable nucleus absorbs one of the incident particles, it becomes a different, usually radioactive nucleus.

Radioisotopes are widely used in industry and research. In some cases the radiation is used as a source of energy (as in nuclear batteries), as a thickness-measuring instrument, as a food sterilizer, as a "super X-ray" to detect flaws in metal castings, and in medicine. Since radioisotopes are chemically identical with stable isotopes of the same element, they are widely used as "tracers" in biochemical research. The tracers can be followed through the organism by means of a radiation detector.

#### Ex. 17. Translate the following international words.

isotope, radioisotope, emission, proton, physicist, to accelerate, acceleration, biochemistry, biochemical, organism, energy, detector

#### Ex. 18. Find five pairs of antonyms.

same, radioactive, artificial, stable, absorb, unstable, non-radioactive, different, to emit, natural

#### Ex. 19. Match the following word combinations and their translation.

A: 1. atoms having the same number of protons in the nucleus; 2. to exhibit the same chemical properties; 3. atoms having different atomic weight; 4. atoms exhibiting different radioactive properties; 5. to occur naturally

a) атоми, що виявляють різні радіоактивні властивості; b) проявляти однакові хімічні властивості; c) атоми, що мають однакову кількість протонів у ядрі; d) траплятися у природному виді; e) атоми, що мають різну атомну вагу



B: 1. to be produced artificially; 2. beams of neutrons from nuclear reactions; 3. particle accelerators; 4. a radioactive nucleus; 5. to be widely used in industry and research

а) широко використовуватись у промисловості та в наукових дослідженнях;  
б) радіоактивне ядро; с) прискорювачі ядерних частинок; д) отримувати штучним шляхом; е) пучки нейтронів від ядерних реакцій

**Ex. 20. Answer the following questions.**

- 1) What is an isotope?
- 2) What kinds of isotopes are there?
- 3) How many isotopes have been identified by physicists?
- 4) In what way are most of the radioisotopes produced?
- 5) Where are radioisotopes widely used?
- 6) Why are radioisotopes used as tracers in biochemical research?

**Ex. 22. Before reading the text think and choose what answer is not correct.**

1. If you heat an iron sample? It will ...
  - (a) melt
  - (b) change its properties temporary
  - (c) change its composition
2. What would happen if we stop heating water?
  - (a) it would cool
  - (b) it would cool and freeze
  - (c) It would evaporate
3. What should happen so that we didn't have a chemical change?
  - (a) acid should evaporate after heating
  - (b) acid should dissolve an iron sample and evaporate
  - (c) acid should be diluted with water and heated

**Text 3:**

**Chemical And Physical Changes**

An iron rod held in the fire long enough increases in energy content until it becomes too hot to hold in the unprotected hand. Nevertheless the rod is still iron, and when cooled to its original temperature, its properties are just as they were before.

The heating and the subsequent cooling of the rod are examples of physical changes.

A physical change may result in a more or less temporary alteration of a few of the properties of a substance involved, but no change of composition results from it and most of the altered properties usually regain their former value.

Changes of this type are numerous and many of them are familiar to everyone. As an example we may take the behaviour of ice when it is heated.

At first when heated the ice melts, when further heated, the liquid water boils forming the gaseous water (or the steam, as it is usually called). If the steam is cooled, the process is re-verses – when cooled sufficiently, the ice results. The substance

present in every instance was water. This experiment shows that there are three physical states in which the substance may exist.

If the rod concerned is placed in a container of hydrochloric acid, it will be noted that bubbles begin to form on the rod. If the rod involved is left in the acid for some time, the evolution of gas will continue. When examined, it will be found that the rod has diminished in mass or disappeared altogether. The liquid in the container if examined will have a greenish colour.

If evaporated, a mass of greenish crystals will be obtained. The crystals will have totally different properties. This is an example of a chemical change. So, a chemical change may be called a chemical reaction or simply a reaction, the substances entering into a chemical reaction are called reactants.

Phenomena accompanied by radical changes of substances are called chemical phenomena.

**Ex. 23. Translate the following questions into English and answer them.**

1. Коли залізний прут набуває підвищення вмісту енергії?
2. Що трапиться, якщо залізний прут остигне до своєї первинної температури?
3. Які приклади фізичних змін ви знаєте?
4. Які види змін відомі кожному?
5. Що трапиться з льодом, якщо його нагріти?
6. Коли на пруті починають утворюватись бульбашки?
7. Коли прут зникне зовсім?
8. Що таке хімічне перетворення?

**Ex. 24. Open the brackets translating the Ukrainian words into English:**

1. An iron rod (що був нагрітий) in the fire increases in energy content. 2. (При охолодженні) to the original temperature the substance becomes solid. 3. The question (що було розглянуто/ про який йшла мова) was discussed at the last meeting. 4. The new experiment (про який йшла мова) so much will be carried out again very soon. 5. The piece of ice (що було поміщено) in the water began to melt. 6. (Під час нагрівання) ice melts. 7. The text (що було переписано) by him was very useful in our work. 8. The new device (що був показаний) by our professor was very interesting. 9. (При випаровуванні) a mass of greenish crystals will be obtained. 10. The work (що було виконано) in time was very important.

**Ex. 25. Translate the following sentences paying attention to the Absolute Participle Construction.**

- A. 1. Molecules are constantly in a rapid motion, the motion becoming more rapid with an increase of temperature. 2. Two objects being at the same temperature, the average energy of motion of their molecules is the same. 3. The temperature, being raised, the kinetic energy is increased. 4. Zinc is used in making alloys, brass being the most important of them. 5. When the reaction was performed at higher temperatures the main products were ethyl chloride and p-

aminobenzenesulfonic acid, the latter probably resulting from rearrangement of phenylsulfonic acid.

- B. 1. The "drops" of rubber are suspended in water, when first obtained from the plant, the system resembling an emulsion. 2. Emulsion may "cream", i.e., separate into layers of aqueous phase with a concentrated layer of oil droplets floating on top, the rate depending primarily on the viscosity of the aqueous phase, the size of droplets, etc. 3. The emulsifier being a solubilizing agent for the monomer, the rate of polymerization varies with the emulsifier content. 4. Most of the accelerators used today are derivatives of carbon disulfide, the commonest one being mercaptobenzothiazole. 5. The rate of polymerization varies with the emulsifier content, the emulsifier being a solubilizing agent for the monomer.
- C. 1. Water being poured upon lumps of burnt lime, large quantities of heat involved. 2. In its compounds carbon has valencies of 4, 3 and 2, the first being by far the most numerous. 3. The gas being colourless, we shall not be able to notice its formation. 4. Hydrogen being the lightest of elements, its density is the smallest of all substances. 5. The formula of the compound being known, we can calculate its molecular weight. 6. Hydrogen burns with almost colourless flame, water being produced. 7. Chlorine is fairly soluble in water, the solution having the same colour as the gas. 8. A strong acid having, been used, the substance dissolved entirely. 9. There are three known products of the reaction of  $\text{HgCl}_2$  with ammonia, the proportion of any one of them depending on the conditions of the reaction. 10. The platinum metals are rare elements, platinum itself being the commonest.

**Ex. 26. Change the sentences according to the given models:**

Model I: As my work is very difficult, he helps me.

My work being very difficult, he helps me.

1. As the range of application of stable isotopes is very wide, the scientists are greatly interested in it. 2. As this machine works well, we can use it at our plant. 3. Since the speed of light is extremely great, we cannot measure it by ordinary means. 4. As their lectures begin in the morning, they are free at five o'clock.

Model II: When radioactivity had been discovered, science made great progress in atomic physics.

Radioactivity having been discovered, science made great progress in atomic physics.

1. When all the properties of the element had been discovered, it was much easier to use it. 2. After the new computer had been built, they could calculate the acceleration of the particles. 3. When the solution had been evaporated, they began to examine the residue left.

**Ex. 27\*. Revision of the Participles. Translate the following sentences.**

1. This behaviour can be understood in the light of the formation reaction in which the electric fields of completed molecules or ions interact with adjacent ions or

molecules, thus forming compounds of a higher order. 2. Based on the laws of conservation we can formulate chemical equations with a somewhat greater measure of justification. 3. Depending on their chemical compositions, solvents are divided into polar and non-polar solvents, and intermediary types, non-polar solvents being organic hydrocarbons. 4. The pressure exerted on the walls of a container by a gas is entirely due to collisions that take place between the moving molecules and the walls. 5. All of the carbonions described are powerful nucleophiles, they being used for the reactions given below. 6. When considering the stability of equilibrium, we should start from some definition and, using this, investigate the given system, the investigation might proceed in two ways. 7. Some of the compounds involved have not been reported previously, additional data being reported in the appendix referred to in this report. 8. The results obtained for the analyses of a group of synthetic mixtures were as satisfactory as those obtained from other group methods. 9. All the processes described above take place – more or less simultaneously, the hydrolysis of acetylchlorine resulting from a combined action of all the functional groups. 10. This indicates that the carbon dioxide evolved on heating results solely from the decomposition of carboxyl groups referred to earlier, one carboxyl group giving one mole of carbon dioxide. 11. The temperature remaining constant, the volume of a given mass of a gas is inversely proportional to the pressure to which it is subjected. 12. Having replaced some of the details of the new device they could get better results which were of great importance for the research concerned. 13. The results obtained were in good agreement with the values involved. 14. A small amount of common salt when added to water will be taken up by the water and become invisible. 15. Having examined the new work carried out by our research workers we could say that various lines of technological progress, ranging from the invention of new devices to the development of some industrial chemical processes were characterized by a steady improvement. 16. The terms insisted on in this statement are to be discussed again. 17. The data derived are to be found in table 5, they being reliable. It's obvious from the results given above. 18. Surrounding the nucleus were electrons, their number depending upon the atom. 19. The experiment spoken of is to be carried out again. 20. Substances thought of as radioactive should be treated carefully. 21. The conference attended by our students was devoted to the pollution problem. 22. When solving a non-linear problem described by differential equation, we must first design the computing diagram of the machine. 23. The temperature having been raised, the vapour began forming again. 24. Any neutrons and protons left over after the formation of maximum number of alpha-particles are looked upon simply as being present in the nucleus.

**Ex. 28. Translate the following sentences into English.**

1. Повітря, що нас оточує, на п'яту частину складається з кисню.
2. При розчиненні ця речовина залишається безбарвною.
3. Сильно концентрований розчин той, що містить більше розчиненої речовини, ніж розчинника.
4. Найбільш широко використовувані спектральні прилади включають у себе видиме ультрафіолетове й інфрачервоне поглинання.

5. Водень добре горить у повітрі, а продуктом, що формується, є вода.
6. Число атомів, що оточують даний атом, називається координаційним числом цього атома.
7. На радіоактивність елементу не впливає присутність інших елементів, зв'язаних із ним.
8. Кисень, який було отримано електролізом води, значно чистіший, ніж той, що було отримано з рідкого повітря.
9. Будь-який елемент при взаємодії з киснем утворює оксид.
10. Багато речовин мають зовсім інші властивості після охолодження до дуже низької температури.
11. Суміш, що нагрівається у колбі, невдовзі закипить.
12. Нагрівши розчин до потрібної температури, ми використали його вдруге.
13. Через те, що водень – найлегший елемент, його густина найменша серед усіх речовин.
14. Вуглець зустрічається у двох кристалічних формах – алмаза та графіту, причому алмаз є найтвердішим з усіх відомих речовин.
15. Пряме окислення пероксидсульфатом зазвичай проходить повільно, але стає швидким у присутності каталізатора, причому звичайним каталізатором є іони срібла.

## Ex. 29. Test your Grammar.

1. ... substances do not settle if the solution is not supersaturated.  
 a. Dissolving                      b. Dissolved                      c. Having dissolved
2. The temperature ... to as absolute zero is  $-273^{\circ}\text{C}$   
 a. referring                      b. having been referred                      c. referred
3. ... potassium chlorate yields oxygen  
 a. Having heated                      b. When heated                      c. After heated
4. ... the concentrated solution of naphthalene in hexane we obtain white precipitation of pure naphthalene.  
 a. Having cooled                      b. Cooled                      c. Being cooled
5. ... for a long time the liquid becomes viscous.  
 a. Being heated                      b. Heating                      c. Having heated
6. A strong acid ..., the substance dissolves entirely.  
 a. used                      b. using                      c. having been used
7. The gas ... colourless, we'll not be able to notice its formation.  
 a. being                      b. been                      c. having been
8. The substance ... contained a small amount of hydrogen.  
 a. obtained                      b. being obtained                      c. having obtained
9. The formula of the compound ..., we can calculate its molecular weigh.  
 a. known                      b. being known                      c. having known
10. ... concentrated sulphuric acid reacts with metals.  
 a. Having heated                      b. Heated                      c. When heated

## ДОДАТОК

### List of irregular verbs

be	was/ were	been
beat	beat	beat
become	became	become
begin	began	begun
bite	bit	bitten
blow	blew	blown
break	broke	broken
bring	brought	brought
build	built	built
burst	burst	burst
buy	bought	bought
catch	caught	caught
choose	chose	chosen
come	came	come
cost	cost	cost
cut	cut	cut
deal	dealt	dealt
do	did	done
draw	drew	drawn
drink	drank	drunk
drive	drove	driven
eat	ate	eaten
fall	fell	fallen
feed	fed	fed
feel	felt	felt
fight	fought	fought
find	found	found
fly	flew	flown
forbid	forbade	forbidden
forget	forgot	forgotten
forgive	forgave	forgiven
freeze	froze	frozen
get	got	got
give	gave	given
go	went	gone
grow	grew	grown
hang	hung	hung
have	had	had
hear	heard	heard
hide	hid	hidden
hold	held	held



hurt	hurt	hurt
keep	kept	kept
know	knew	known
lay	laid	laid
lead	led	led
leave	left	left
lend	lent	lent
let	let	let
lie	lay	lain
light	lit	lit
lose	lost	lost
make	made	made
mean	meant	meant
meet	met	met
pay	paid	paid
put	put	put
read	read	read
ring	rang	rung
rise	rose	risen
run	ran	run
say	said	said
see	saw	seen
seek	sought	sought
sell	sold	sold
send	sent	sent
set	set	set
shake	shook	shaken
shine	shone	shone
show	showed	shown
shut	shut	shut
sing	sang	sung
sink	sank	sunk
sit	sat	sat
sleep	slept	slept
slide	slid	slid
speak	spoke	spoken
spend	spent	spent
split	split	split
spread	spread	spread
stand	stood	stood
steal	stole	stolen
stock	stuck	stuck
strike	struck	struck

swim	swam	swum
take	took	taken
teach	taught	taught
tear	tore	torn
tell	told	told
think	thought	thought
throw	threw	thrown
understand	understood	understood
wake	woke	woken
wear	wore	worn
win	won	won
write	wrote	written

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