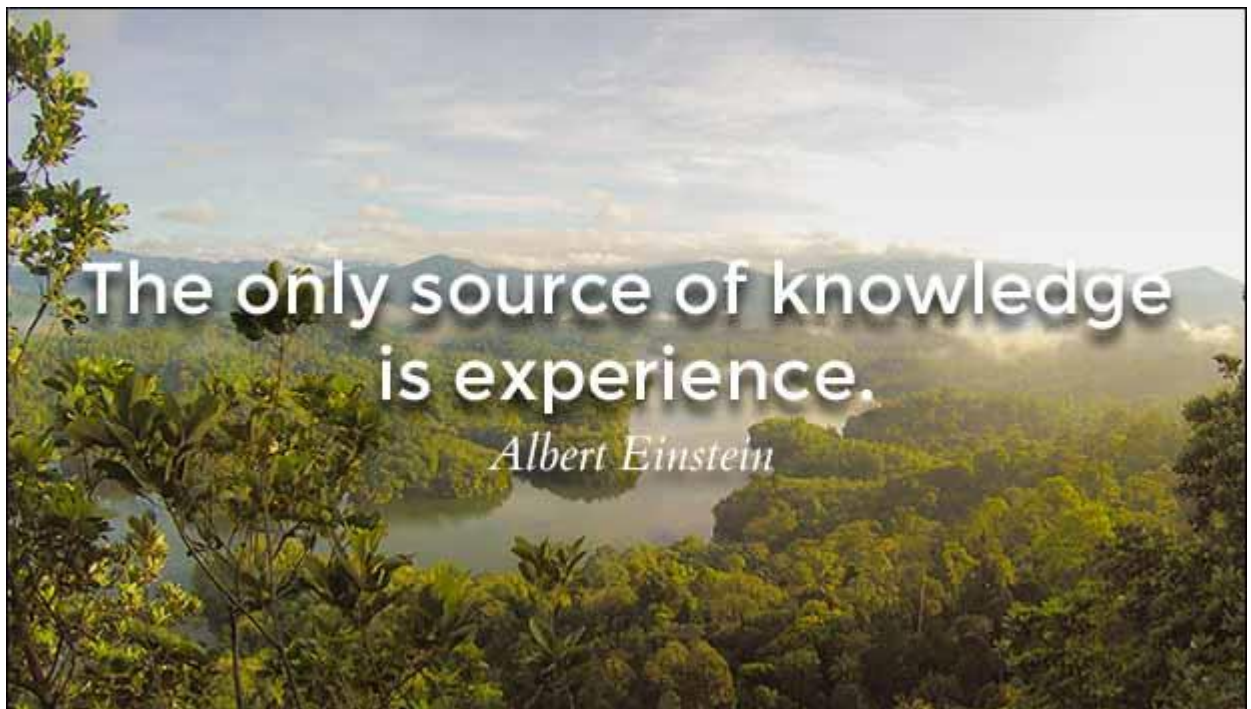


**ЧЕРКАСЬКИЙ НАЦІОНАЛЬНИЙ УНІВЕРСИТЕТ
ІМЕНІ БОГДАНА ХМЕЛЬНИЦЬКОГО
МІНІСТЕРСТВА ОСВІТИ І НАУКИ УКРАЇНИ**

**ENGLISH FOR POSTGRADUATES
IN NATURAL SCIENCES**



Міністерство освіти і науки України
Черкаський національний університет
імені Богдана Хмельницького

Англійська мова для аспірантів природничих спеціальностей

Черкаси – 2019

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*Затверджено до друку на засіданні вченої ради
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«Англійська мова для аспірантів природничих спеціальностей» призначається для вивчення дисципліни «Іноземною мовою» аспірантами природничих спеціальностей. Посібник включає зміст курсу, теми для опрацювання, граматичний довідник. Матеріал розраховано на 80 годин навчального навантаження (40 годин в першому семестрі та 40 годин у другому). Змістове наповнення курсу охоплює теми спеціального призначення (англійська мова для науковців), а також теми загального призначення.

Тематика посібника відповідає програмі з іноземної мови для аспірантів природничих спеціальностей.

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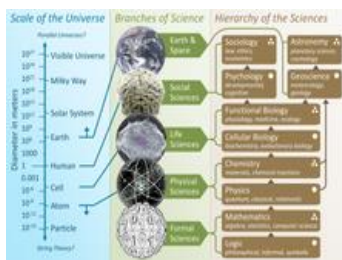
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UNIT I

Lesson 1

SCIENCE

Science Definition



Science is a systematic enterprise that creates, builds and organizes knowledge in the form of testable explanations and predictions about the universe.

Contemporary science is typically subdivided into the natural sciences which study the material world, the social sciences which study people and societies, and the formal sciences like mathematics. The formal sciences are often excluded as they do not depend on empirical observations. Disciplines which use science like engineering and medicine may also be considered to be applied sciences.

During the Middle Ages in the Middle East, foundations for the scientific method were laid by Alhazen in his *Book of Optics*.

From classical antiquity through the 19th century, science as a type of knowledge was more closely linked to philosophy than it is now and, in fact, in the Western world, the term "natural philosophy" encompassed fields of study that are today associated with science, such as astronomy, medicine, and physics.

In the 17th and 18th centuries scientists increasingly sought to formulate knowledge in terms of *laws of nature*. Over the course of the 19th century, the word "science" became increasingly associated with the scientific method itself, as a disciplined way to study the natural world. It was in the 19th century that scientific disciplines such as biology, chemistry, and physics reached their modern shapes. The same time period also included the origin of the terms "scientist" and "scientific community," the founding of scientific institutions, and increasing significance of the interactions with society and other aspects of culture

1. Find the equivalents in the text:

Систематична справа, перевірені пояснення, передбачення, бути розділеним, залежати від, закласти фундамент, бути тісно пов'язаним, охоплювати галузі дослідження (вивчення), намагатися (прагнути) все частіше, походження терміну, все більше значення, взаємодія.

2. Translate the following terms and terminological expressions:

Contemporary science, natural sciences, empirical observations, applied sciences, scientific method, scientist, scientific discipline, scientific community, scientific institutions.

3. Find the definitions of the notions:

Astronomy	the branch of science concerned with the nature and properties of matter and energy
Medicine	the study of living organisms
Physics	the branch of science that deals with celestial objects, space, and the physical universe as a whole

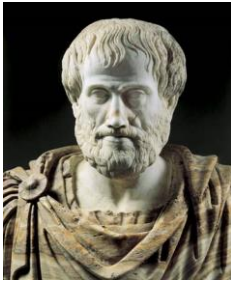
Biology	the branch of science that deals with the identification of the substances of which matter is composed
Chemistry	the science or practice of the diagnosis, treatment, and prevention of disease

4. Answer the following question:

1. What is science?
2. What is contemporary science typically subdivided into?
3. Why are the formal sciences often excluded?
4. What disciplines may also be considered to be applied sciences?
5. Whom was foundations for the scientific method laid by?
6. When was science as a type of knowledge more closely linked to philosophy?
7. When did biology, chemistry, and physics reach their modern shapes?

5. Read the text and put 4 questions to it; ask your friends to answer them:

Greek Philosopher



Aristotle was born in 384 BC, in Greece. He was an ancient Greek philosopher and scientist, one of the greatest intellectual figures of Western history.

Aristotle was the author of a philosophical and scientific system that became the framework and vehicle for both Christian Scholasticism and medieval Islamic philosophy.

Even after the intellectual revolutions of the Renaissance, the Reformation, and the Enlightenment, Aristotelian concepts remained embedded in Western thinking.

Aristotle died in 322 in Euboea.

6. Read and remember the model for annotation of the article:

Annotation

1. I was supposed to annotate the following article.
2. It was published in the British journal (magazine, newspaper) ...
3. The title (headline) of the article is ...
4. The author of the article is ...
(The article was written by a special correspondent of the journal).
5. The article represents a definite interest from the point of view ...
6. It gives facts (tables, diagrams, figures, schemes).
7. The article considers the problem of ...
8. It describes (discusses) ...
9. The article draws the reader's attention to ...
10. The author points out that ...
11. He stresses that ...
12. The writer analyses the achievements of ...
13. He approves ...
14. The key problem of the article is ...

15. To my mind (in my opinion) ...
16. The article is worth reading because the problem is of great interest (of good use, actual, informative).

7. Make an annotation of the article;

Alhazen

Encyclopaedia Britannica



Ibn al-Haytham, Latinized as **Alhazen**, (born in 965, Iraq—died in. 1040, Cairo, Egypt) was a mathematician and astronomer who made significant contributions to the principles of optics and the use of scientific experiments.

Conflicting stories are told about the life of Ibn al-Haytham, particularly concerning his scheme to regulate the Nile. In one version, told by the historian Ibn al-Qifṭī (d. 1248), Ibn al-Haytham was invited by al-Ḥākim (reigned 996–1021; also known as “The Mad Caliph”) to Egypt to demonstrate his claim that he could regulate the Nile. However, after personally reconnoitering near the southern border of Egypt, Ibn al-Haytham confessed his inability to engineer such a project. Although still given an official position by the caliph, Ibn al-Haytham began to fear for his life, so he feigned madness and was confined to his own home until the end of al-Ḥākim’s caliphate. Ibn al-Qifṭī also reports that Ibn al-Haytham then earned a living in Egypt largely by copying manuscripts; in fact, he claimed to possess a manuscript in Ibn al-Haytham’s handwriting from 1040.

There are three lists of Ibn al-Haytham’s writings, the first of which comes with his autobiography (1027), that collectively enumerate almost 100 works. It has recently been plausibly argued that there were two Ibn al-Haythams: al-Ḥasan ibn al-Ḥasan, the mathematician who wrote on optics, and Muḥammad ibn al-Ḥasan, the astronomer-philosopher who wrote the autobiography and the works in the first and second lists.

Ibn al-Haytham’s greatest work, “Optics,” appears to have been neglected in the East until the commentary on it by the mathematician Kamāl al-Dīn Abu’l Ḥasan Muḥammad ibn al-Ḥasan al-Fārisī (d. 1320). A Latin translation of it—sometimes literal and sometimes interpretative—was made by an unknown scholar, probably early in the 13th century. The work had a major influence not only on 13th-century thinkers such as Roger Bacon but also on later scientists such as the astronomer Johannes Kepler (1571–1630). There were several Latin translations of the “Configuration of the World,” a book which influenced Georg Peurbach (1423–61) among others.

Planning a career in science

(from Cambridge English for Scientists by Tamzen Armer)

8. In pairs, discuss the following questions.

1. Why did you choose a career in science?
2. What field of science are you currently working or studying in?
3. What would you like to do next in your work or studies?

9. Eriko is from Japan and will soon complete a PhD in biotechnology in London. She is discussing the next stage in her career with her supervisor, Susana. Listen to part of their conversation and tick the options which interest her and put a cross next to the options which do not.



- teaching (undergraduate) students
- doing post-doctoral research
- supervising a research team
- finding a permanent position at a university
- discussing theory
- doing practical fieldwork
- staying in London
- finding a well-paid job

Susana: ... and have you thought about what you'll do once the PhD is finished?

Eriko: I don't think of much else! It's actually rather scary. I know I don't want to abandon science and become an accountant, but beyond that ...

Susana: Well, let's start with a simple choice. Academia or industry?

Eriko: Oh, easy - academia. I've really enjoyed the teaching I've done, so I don't want to give that up.

Susana: But in industry you could supervise more junior researchers. You wouldn't have to give up teaching.

Eriko: No, but it's different. I find it really interesting to explain quite complex topics. Supervising people would be more practical. I really love communicating the theory side of things.

Susana: Well, yes ... but I don't think working in industry rules that out. It would just be different. You would also be out in the field more. Someone would pay you to go to real disasters to try the robots out.

Eriko: Hm. That's true. But I'm not so interested in doing that. As long as I have time to do work on developing the robots in the lab, that's fine for me. I do really want to teach though. I actually quite enjoy preparing lectures and thinking of creative ways to get the information across.

Susana: Really? OK, so assuming you go for academia ...

Eriko: I'd like to get a post-doc position first.

Susana: OK. And any idea who you'd like to work with? Or where you're looking at?

Eriko: Not really ... I'm going to leave here, though.

Susana: Oh? You don't like London? The university?

Eriko: No, I do ... but I did my Master's here, part-time, while I was working as a research assistant in the lab. And then I transferred to the PhD while still working. So, basically I've done everything here, and I really think I should change, move on.

Susana: You're quite right. Going somewhere else is a very good idea – I hadn't realised you'd been here for so many years.

Eriko: I came on a student visa nine years ago and never went back. Anyway, applications for a couple of interesting post-docs at Cambridge close early next month.

Susana: They get earlier every year! I'll look over them before you send them off, if you like.

Eriko: That'd be great. I doubt they'll want me, but I might as well give it a go. And then I'm meeting a couple of people from the University of Glasgow at the conference next month. Just for a chat.

Susana: Well, it sounds like you're doing the right things. So then you'd be looking at a full-time position in higher education after that?

Eriko: Yes.

Susana: And all the paperwork doesn't put you off?

Eriko: Well. I don't actually mind it that much. So no, it doesn't bother me.

Susana: And the money? You're not tempted by the salaries in industry?

Eriko: Not at all. Well, maybe a bit. But there are more important things than money. I know I'm not going to get rich this way. But industry work? I really don't think it's for me.

Susana: But it's good to know it's there as a possibility.

Eriko: That's true - if things don't work out ...

10. You will hear eight sentences from Eriko and Susana's conversation. Listen and complete the first row of the table by writing the number of each sentence (1 -8) in the correct column.

Talking about... likes or dislikes	past experiences	future (more certain)	future (possible)

1. And then I'm meeting a couple of people from the University of Glasgow at the conference next month.
2. But I did my Master's here, part-time, while I was working as a research assistant in the lab.
3. But I'm not so interested in doing that.
4. But in industry you could supervise more junior researchers.
5. I find it really interesting to explain quite complex topics.
6. I'm going to leave here, though.
7. So, basically I've done everything here.

8. You would also be out in the field more.

11. Look at the underlined phrases in the conversation. Put the underlined phrases into the correct part of the second row of the table in Exercise 10.

12. Think about your career in science and make notes on:

- what you enjoy most about working in your scientific field
- what you would like to do (and not like to do) next in your career
- which of your past and present experiences are most relevant to your future in science

13. In pairs, take turns to interview your partner about his/her career path in science. Use the phrases from Exercise 12 to help you.



Discussion point

LANGUAGES AND LANGUAGE LEARNING

*(from Headway Students' Book
Upperintermediate by John and Liz Soars. Oxford
English)*

14. Answer the questions using the list below:

1. Which language in the world is spoken by most people?
2. Which language has the largest vocabulary?
3. Which is the oldest written language?
4. Which sub-continent has the largest number of languages?
5. Which language has no irregular verbs?
6. Which language has the most letters in its alphabet?
7. In which language is the largest encyclopedia printed?

It is ...

Spanish / Cambodian / English / Egyptian / Esperanto / Mandarin Chinese / Indian

15. Read the information and check your guesses:

1. Mandarin Chinese is spoken by 700 million people (70% of the population of China). English is the most widespread, with 400 million speakers.
2. English has the largest vocabulary, with approximately 500,000 words and 300,000 technical terms.
3. The oldest written language is Egyptian, which is 5000 years old.
4. India has the most languages, with 845.
5. There are no irregular verbs in Esperanto, an artificial language invented in 1887.
6. Cambodian has 72 letters.
7. The largest encyclopedia is printed in Spanish.

Grammar

16. Оберіть одну чи множину іменників (Див.: Граматичний довідник. §1):

1. Two (child/children) were playing on the doorstep.
2. A (woman/women) looked round the corner of the house.
3. The (room/rooms) was large, and had faded Morris wallpaper.
4. A tall (man/men) of about fifty-seven came into sight.
5. But (people/peoples) who read my books know what he's like.

17. Утворіть вищий чи найвищий ступінь прикметників (Див.: Граматичний довідник. §2):

1. She has been to Britain, her English is (good) than mine.
2. His illness was (serious) than we thought.
3. My toothache is (painful) than it was yesterday.
4. It is the (cheap) restaurant in the town.
5. She is the (intelligent) students in the group.

18. Поставте дієслово в дужках у правильну форму the Present Indefinite Tense (Див.: Граматичний довідник. §3):

1. His wife (to be) a fine lady from London.
2. His wife (to have) a headache and has gone to lie down.
3. Her father (to work) at one of the local farms.
4. Life (to be) full of surprises.
5. Well, they (to seem) a very nice young couple.
6. She (to wait) for him to return.

19. Поставте дієслова в дужках у правильну форму the Past Indefinite Tense (Див.: Граматичний довідник. §4):

1. I (to see) my friends yesterday and (to accept) their invitation.
2. I (to write) to my cousin three weeks ago and (to get) no reply.
3. He (to meet) you both in here about two month ago.
4. I (to call) you at five, but you (to be) not in.
5. I (to teach) that girl to drive myself when she (to be) fifteen.
6. I should like to tell you what (to happen) eighteen months ago.

Lesson 2

Science History



Science in a broad sense existed before the modern era, and in many historical civilizations. Modern science is distinct in its approach and successful in its results: 'modern science' now defines what science is in the strictest sense of the term.

Science in its original sense is a word for a type of knowledge, rather than a specialized word for the pursuit of such knowledge. In particular, it is one of the types of knowledge which people can communicate to each other and share. For example, knowledge about the

working of natural things was gathered long before recorded history and led to the development of complex abstract thinking. This is shown by the construction of complex calendars, techniques for making poisonous plants edible, and buildings such as the pyramids. However, no consistent distinction was made between knowledge of such things which are true in every community and other types of communal knowledge, such as mythologies and legal systems.

Aristotle maintained the sharp distinction between science and the practical knowledge of artisans, treating theoretical speculation as the highest type of human activity, practical thinking about good living as something less lofty, and the knowledge of artisans as something only suitable for the lower classes. In contrast to modern science, Aristotle's influential emphasis was upon the "theoretical" steps of deducing universal rules from raw data, and did not treat the gathering of experience and raw data as part of science itself.

1. Find the English equivalents:

В широкому розумінні, бути відмінним (несхожим), найбільш точне розуміння, традиційне розуміння, прагнення знань, привести до розвитку, отруйні рослини, робити їстівним, послідовна (відповідна) відмінність, суспільні знання, підтримувати чітку відмінність, практичні знання ремісників, розглядати теоретичні міркування, величний (піднесений), виведення правил, необроблені дані.

2. Translate the following words and word-combinations:

Historical civilizations, approach, to define the term, in particular, to communicate knowledge, to share knowledge, recorded history, abstract thinking, the construction of complex calendars, mythologies, legal systems, theoretical speculation, in contrast to, gathering of experience.

3. Say true or false:

1. Science did not exist in ancient historical civilizations.
2. Science is the pursuit of knowledge.
3. Knowledge about the working of natural things was gathered long before recorded history.
4. Aristotle treated practical thinking as the highest type of human activity.
5. did not treat the gathering of experience and raw data as part of science itself.

4. Answer the following questions:

1. When was science originated?
2. What is science in its original sense?
3. What did knowledge about the working of natural things lead to?
4. Was any consistent distinction made between knowledge of such things which are true in every community and other types of communal knowledge, such as mythologies and legal systems?
5. What did Aristotle treat as the highest type of human activity?

5. Read the text; put 4 questions to it; ask your friends to answer them:

Aristotle's Science



In Aristotle's terminology, "natural philosophy" is a branch of philosophy examining the phenomena of the natural world, and includes fields that would be regarded today as physics, biology and other natural sciences. In modern times, the scope of *philosophy* has become limited to more generic or abstract inquiries, such as ethics and metaphysics, in which logic plays a major role. Today's philosophy tends to exclude empirical study of the natural world by means of the scientific method. In contrast, Aristotle's philosophical endeavors encompassed virtually all facets of intellectual inquiry.

In the larger sense of the word, Aristotle makes philosophy coextensive with reasoning, which he also would describe as "science". Note, however, that his use of the term *science* carries a different meaning than that covered by the term "scientific method". For Aristotle, "all science is either practical, poetical or theoretical" (*Metaphysics* 1025b25). By practical science, he means ethics and politics; by poetical science, he means the study of poetry and the other fine arts; by theoretical science, he means physics, mathematics and metaphysics.

6. Make an annotation of the article:

Early Cultures

From History of Science in Early Cultures

In prehistoric times, advice and knowledge was passed from generation to generation in an oral tradition. For example, the domestication of maize for agriculture has been dated to about 9,000 years ago in southern Mexico, before the development of writing systems. Similarly, archaeological evidence indicates the development of astronomical knowledge in preliterate societies.

The development of writing enabled knowledge to be stored and communicated across generations with much greater fidelity. Combined with the development of agriculture, which allowed for a surplus of food, it became possible for early civilizations to develop, because more time and effort could be devoted to tasks (other than food production) than hunter-gatherers or early subsistence farmers had available. This surplus allowed a community to support individuals who did things other than work towards bare survival. These other tasks included systematic studies of nature, study of written information gathered and recorded by others, and often of adding to that body of information.

Many ancient civilizations collected astronomical information in a systematic manner through simple observation. Though they had no knowledge of the real physical structure of the planets and stars, many theoretical explanations were proposed. Basic facts about human physiology were known in some places, and alchemy was practiced in several civilizations. Considerable observation of macroscopic flora and fauna was also performed.

Applying for research funding

(from *Cambridge English for Scientists* by Tamzen Armer)

7. Read the following extract from a website and then, in pairs, answer the questions below.

1. Can an organisation apply for this scholarship?
2. Would you be interested in applying for SARF? Why / why not?
3. What information might you need to include on your application form?
4. What are the advantages of attracting scientists 'with future potential for leadership in their field' to a country?

About _____

The Sheridan Australian Research Fellowship (SARF) aims to develop science in Australia by attracting outstanding scientists in their field to continue their research in an Australian university or research institution. SARF fellowships are awarded to individual scientists with future potential for leadership in their field. Successful applicants receive a 5-year grant covering salary, travel and relocation costs.

8. Eriko has decided to apply to SARF and has downloaded an application form. Look at the list of sections on the form (1 -1 0) and match each one to Eriko's notes on the information she needs to provide(a-j).

Sheridan Australian Research Fellowship

APPLICATION FORM

1. APPLICANT
2. CURRENT APPOINTMENT AND ADDRESS
3. LOCATION OF PROPOSED STUDY
4. SPONSOR'S RECOMMENDATION
5. DEPARTMENTAL SUPPORT
6. PROJECT TITLE
7. PROJECT SUMMARY
8. DETAILS OF PROPOSED RESEARCH
9. BUDGET
10. NOMINATED REFEREE WITH PERSONAL KNOWLEDGE OF APPLICANT
 - a) an explanation of how I'll do research and why it is important
 - b) a short description of what I'll research
 - c) a statement from a senior researcher explaining why I'm a suitable applicant
 - d) how much I plan to spend on my research
 - e) the job I do now
 - f) the name of someone to support my application
 - g) what I'll call my research
 - h) permission from my head of faculty to use his/her resources
 - i) where I plan to study
 - j) my personal info

9. Section 7 of the form asks applicants to write a project summary of their research proposal. Think about a research project in your area. In pairs, take turns to summarise the project following the instructions (1 -6) below.

1. State the aims of your research.
2. Define what the problem is.
3. Explain why your topic is worth researching.
4. Say what the expected outcomes of the research are.
5. Outline the procedures you will follow.
6. Outline how you will limit your investigation.

Discussion point

Ages of Man

(from Headway Students' Book Upperintermediate by John and Liz Soars. Oxford English)



10. People in developed countries can expect to live for over seventy years. Suggest age groups for the following people and ages:

- 0 - ____ - a baby (babyhood)
____ - 13 – a child (childhood)
13 - ____ - a teenager (the teenage years)
____ - ____ - an adult (adulthood)
____ - ____ - a middle-aged person (middle age)
____ - ____ - an old person (old age)

11. Try to answer the following questions:

1. What are some of the joys and problems of each age?
2. Are you happy with your present age?
3. How do you feel about growing older?

Grammar

12. Зробіть речення негативними:

1. Usually my friend repeats these rules before the examination.
2. They know everyone in this densely populated district.
3. The teacher repeated the instructions twice.
4. Ronald took his English exam last Monday.
5. Steven broke his leg some months ago.

13. Поставте запитання до виділених слів:

1. Devonshire is a very lovely place *when it doesn't rain*.
2. I know *some exciting stories* about domestic animals.
3. Jane lost her way *because it was dark*.
4. Students usually get ready for the lessons *in the library*.
5. *Alex* took part in the concert.