

JAG03 Unit 2

Task 1 The scientific method

a) The scientific method is a process in which experimental observations are used to answer questions. Complete the collocations for describing the stages in the scientific method using the words and phrases in the list below.

a hypothesis an experiment (x2) conclusions data (x3) the question

- Analyse _____
- Collect _____
- Conduct (run) _____
- Define _____
- Design _____
- Draw _____
- Interpret _____
- Formulate _____

b) Number the stages above in the order you would normally do them.

c) Read this extract and check your answers to b.

Most scientists are motivated by a basic curiosity about how things work. Geologists are excited by the thrill of *discovering* something previously unknown about how the world works. These discoveries drive them to continue their work. Given that we know little about internal and external processes that form and maintain our world, how do we go about *studying* it? The creativity and insight that may result in scientific breakthroughs often begin with asking questions pertinent to a problem of interest to the *investigators*. If little is known about the topic or process being studied, they will first try to conceptually understand what is going on by making careful observations in the field or, perhaps, in a laboratory. On the basis of his or her observations, a scientist may then develop a question or a series of questions about those observations. Next, the investigator will suggest an answer or several possible answers to the question. The possible answer is a hypothesis to be tested. A hypothesis can be tested by designing an experiment that involves data collection, organisation and analysis. After collection and analysis of the data, the scientist interprets the data and draws a conclusion. The conclusion is then compared with the hypothesis, and the hypothesis may be rejected or tentatively accepted. If all hypotheses suggested to answer a particular question are rejected, then new hypotheses are developed and tested.

d) Read the extract again to find the nouns of the verbs below. Which word/s use/s the same form for the verb and the noun?

analyse – collect – design – observe – discover – investigate

e) Can you think of synonyms to the words in italics?

f) Watch a video on the scientific method.

The Scientific Method: Steps, Terms and Examples
(<https://www.youtube.com/watch?v=BVf11wat2y8>)

Is there only one scientific method?

Watch again and find more collocations for the words *hypothesis* and *conclusion*.

g) Critical thinking in the sciences is disciplined thinking. In order to help think critically, it is useful to consider some intellectual standards. Can you match them with the questions they address?

Significance Logic Relevance Precision Clarity Fairness

- Do our arguments make sense and follow from the evidence we have collected? _____
Do we understand the degree of exactness to which we measure the phenomena? _____
Have we considered other points of view? _____
Is the problem we are addressing an important one? _____
Have we stated our arguments clearly? _____
How well is our argument connected to the problem we are investigating? _____

**h) Suggest the steps in exploring the following question:
*Where does beach sand come from?***

i) What is the difference between a hypothesis and a theory? Complete the gaps with one of the expressions below:

conclusively current evidence likely proof statement sufficient

If a hypothesis withstands the testing of a (1) number of experiments, it may be accepted as a theory. A theory is a strong scientific (2) that the hypothesis supporting the theory is (3) to be true but has not been proved (4) New (5) often disproves existing hypotheses or scientific theory: absolute (6) of scientific theory is not possible. Thus, much of the work of science is to develop and test hypotheses, striving to reject (7) hypotheses and to develop better ones.

(adapted from Armer, T. *Cambridge English for Scientists*. CUP, 2011.
Montgomery, C.W. *Environmental Geology*. McGraw-Hill, Education, 2013.)

Task 2 Speaking: Academic vocabulary

Explain the difference between the sentences in each pair.

- | | |
|--------------------------------------------------|----------------------------------------------|
| 1. Graig's article supports Park's theory. | Graig's article challenges Park's theory. |
| 2. Describe the new tax regulations. | Discuss the new tax regulations. |
| 3. Ruffalo provides new data. | Ruffalo considers new data. |
| 4. Johansson conducted four sets of experiments. | Johansson examined four sets of experiments. |
| 5. Lee established why such changes occur. | Lee investigated why such changes occur. |
| 6. Downey assumed that the data were reliable. | Downey proved that the data were reliable. |

(McCarthy, M.; O'Dell, F. *Academic Vocabulary In Use*. Cambridge University Press, 2008.)

Task 3 Revision of tenses

Choose the correct answer:

1. Geologists usually *study* / *are studying* geology, although backgrounds in physics, chemistry, biology, and other sciences are also useful.
2. Boston College *looks for* / *is looking for* an international programme coordinator.
3. In the Earth sciences, as Norton *is noting* / *notes*, monitoring phenomena through time is particularly important.
4. Hansen in her recent study suggests that attitudes towards work amongst young people *are changing* / *change*.
5. The team *searched* / *were searching* among the wreckage of the ship when a huge wave swept one of the rescuers out to sea.
6. Albert Einstein once *has stated* / *stated* that the most important aspect of science is imagination.
7. Western science *has begun* / *began* with the ancient Greeks, who believed that there was order in the universe and that events in nature could be predicted.
8. More than 250,000 Chinese immigrants *arrived* / *have arrived* in South Africa since 1994.
9. No higher temperature *was* / *has been* recorded on earth since then.
10. So far, James *has written* / *has been writing* 25 pages of his diploma thesis.
11. A team of Russian scientists *has just completed* / *have just been completing* a five-year study of the behavioural patterns of three Siberian wolf packs.
12. Construction companies *have built* / *have been building* a new village outside Perpignan for past three years.
13. Professor Bernard knew immediately that her team *makes* / *had made* a significant discovery.
14. The students *have just left* / *had just left* the laboratory when the fire broke out, so there were no injuries.
15. May I start my presentation? Thank you. Today *I will* / *I'm going to* talk about water conservation.
16. By this time next year, it is possible that the company *will export* / *will be exporting* thousands of tractors to China.

(adapted from Paterson, K. *Oxford Grammar for EAP*. OUP, 2013.)