GCSE Science Examination Command Words and Examples to Illustrate

Below each explanation are examples, with answers in blue, which would gain full marks.

Calculate

Candidates should use numbers given in the question to work out the answer. They should always show their working, as it may be possible for the examiner to award some marks for the method even if the final answer is wrong.

Candidates should always give the units – sometimes a mark may be awarded for the correct units, even if the calculation is wrong.

Example: Biology

1 Each student collected data by using 10 quadrats.

These are the results for one student.

Quadrat number	Number of dandelions
1	3
2	3
3	6
4	2
5	1
6	2
7	0
8	3
9	2
10	0

Calculate the mean number of dandelions per quadrat counted by the student.

You should show clearly how you work out your answer.

3+3+6+2+1+2+0+3+2+0 = 22 .....

22/10 = 2.2 .....

Mean number of dandelions .....2.2.....

(2 marks)

Example: Chemistry

2 A drug amphetamine has the formula $C_9H_{13}N$

The relative molecular mass (M_r) of amphetamine is 135.

Calculate the percentage by mass of nitrogen in amphetamine.

Relative atomic mass: N = 14 C=12 H=1

Mass of N 1 x 14 = 14 .....

(14/135) x 100 = 10.37 .....

Percentage of nitrogen = 10.4 %
(2 marks)

Compare

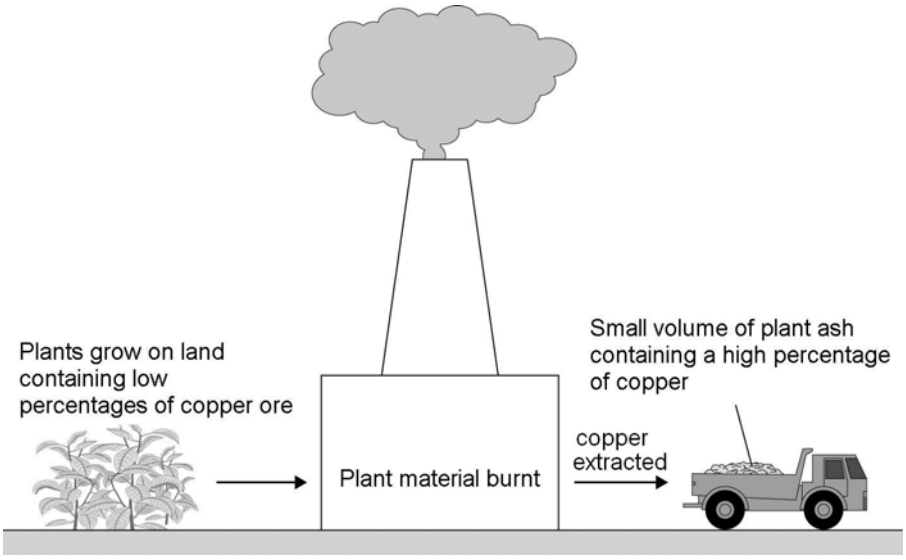
This requires the candidate to describe the similarities and/or differences between things, not just write about one. If candidates are asked to "compare x with y", they need to write down something about x **and** something about y, and should give a comparison.

Example: Chemistry

3 Copper is found in the Earth's crust as an ore containing copper sulfide. Large areas of land, where this ore was once quarried, are contaminated with low percentages of copper sulfide. Copper would be too expensive to extract from this contaminated land using the traditional method of quarrying and then heating in a furnace.

A new way to extract the copper from land that contains low percentages of copper ore is phytomining.

Phytomining uses plants. Plants are grown on this land and absorb copper compounds through their roots.



Compare the advantages of phytomining with the traditional method. Use the information given in the passage and the diagram.

The advantages of phytomining are that it would take less energy than the traditional method and it will be carbon neutral because the plants will take the same amount of carbon dioxide out of the atmosphere as they grow as they release when they are burnt.
On the other hand the traditional method is quicker as the plants take a long time to grow.

(2 marks)

Example: Physics

4 The water in a domestic hot water tank can be heated by solar panels on the roof or by using an electric immersion heater.

Compare the advantages and disadvantages of using solar energy to heat the water rather than using an electric immersion heater.

Generating electricity for an immersion heater burns fossil fuels, which releases carbon dioxide into the atmosphere but solar energy doesn't release any extra carbon dioxide. Solar energy is a renewable energy source, which also means that we are conserving fossil fuels which are in danger of running out. Solar energy does have disadvantages because it needs the daylight and some countries don't have enough hours of sunlight, like Scotland in the winter. This means there will be times when not enough hot water is available for the household, whereas an immersion heater can supply hot water all of the time.

(6 marks)

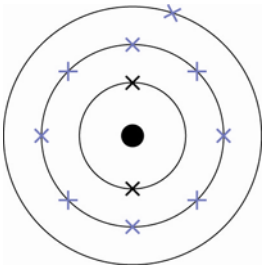
Complete

Answers should be written in the space provided, eg on a diagram, in spaces in a sentence or in a table.

Example: Chemistry

5 Use the periodic table on the data sheet to help you to answer this question.

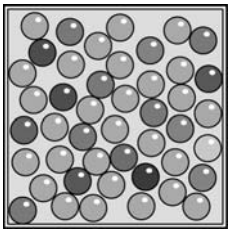
Complete the electronic structure of sodium.



(2 marks)

Example: Physics

6 Marbles inside a box can be used as a model for the particles in a solid, a liquid or a gas.



Complete the following sentences using words from the box. Each word can be used once, more than once or not at all.

gas	**liquid**	**solid**

(a) The particles in a solid vibrate about fixed positions.

(1 mark)

(b) The particles in a gas move at high speed in any direction.

(1 mark)

(c) The particles in a solid are arranged in a pattern.

(1 mark)

Describe

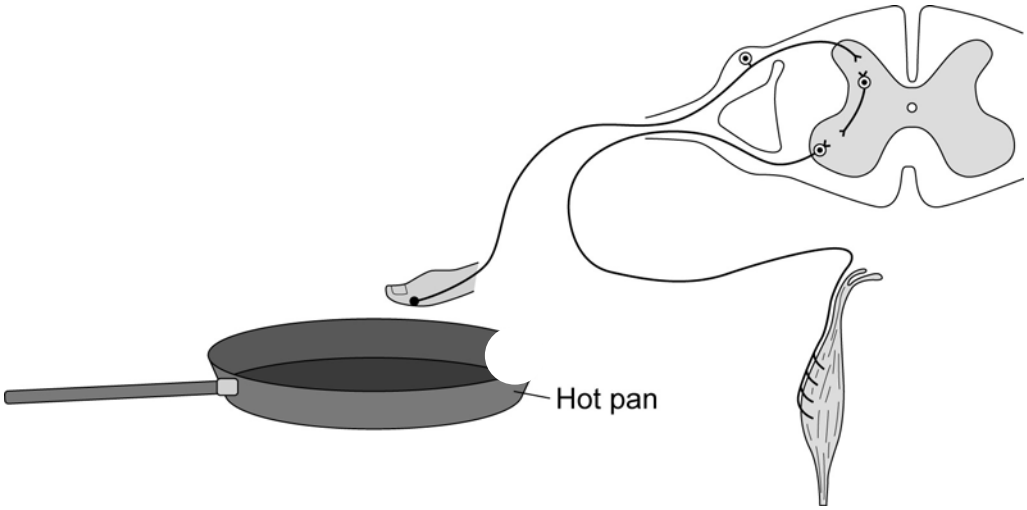
Candidates should recall some facts, events or process in an accurate way - for example an experiment they have done. They may need to give an account of what something looked like, or what happened, eg a trend in some data.

Example: Biology

7 A person accidentally touches a hot pan.

Her hand automatically moves away from the pan.

The diagram shows the structures involved in this action.



Describe fully how the structures shown in the diagram bring about this reflex action.

First of all the heat (stimulus) will be detected by the temperature receptors in the skin. The receptors will send an electrical impulse along the sensory neurone to the synapse in the spinal cord. A chemical messenger is released, which crosses the synapse space and triggers an impulse in the relay neurone. The same thing happens at the next synapse so that an impulse is sent down the motor neurone to the muscle, which is the effector. When the impulse reaches the muscle it causes the muscle to contract and pulls the hand away from the heat. This is a reflex action, which does not have to be processed via the brain.

(6 marks)

Example: Physics

8 A star goes through a life cycle.

Describe the life cycle of a star like the Sun.

In the beginning dust particles and gases are pulled together by the force of gravity. As the atoms of hydrogen gas are forced together the nuclei collide and nuclear fusion begins. The star becomes stable as the forces acting inwards and the forces acting outwards are balanced. Eventually it runs out of hydrogen so the star starts to cool and becomes a red giant. Then it starts to shrink under its own gravity and as the material comes closer together the temperature rises and the star glows much brighter as a white dwarf.

(6 marks)

Evaluate

Candidates should use information supplied or their own knowledge and understanding to consider the evidence for and against and draw conclusions.
This goes further than "compare". For example, they may be given a passage to read and told to "Evaluate the benefits of using system x and system y".
This means they will need to write down some of the pros and cons for both systems, **AND** then state which one is better and why. The candidate should complete their answer with a conclusion.

Example: Biology

9 Read the information about the trialling of the first contraceptive pill.

> The Pill was developed by a team of scientists led by Gregory Pincus. The team needed to carry out large scale trials on humans.
>
> In the summer of 1955, Pincus visited the island of Puerto Rico. Puerto Rico is one of the most densely populated areas in the world. Officials supported birth control as a form of population control. The women in Puerto Rico were mainly poor and uneducated.
>
> The scientists selected a pill with a high dose of hormones. The Pill was found to be 100 % effective when taken properly. But 17 % of the women in the study complained of side effects.
>
> The women in the trial had been told only that they were taking a drug that prevented pregnancy. They had not been told that the Pill was experimental or that there was a chance of dangerous side effects.

Evaluate the issues involved with methods used by Pincus in trialling the contraceptive pill.

This trial involved large numbers so that would have given valid results. It was also a good trial of the general population because if poor uneducated women could make it work it would be reliable. However, the trial was not very ethical by today's standards because we don't know that the women gave informed consent, and they were not told it was experimental or that there could be side effects. The trial was not well designed as there was no placebo control group and they did not do pre-trials to find the best dose and check for side effects. I believe that this was an unethical trial.

(6 marks)

Example: Chemistry

10 This information about biodiesel was printed in a magazine.

Almost all of the crops we eat can be converted into fuel for cars.
Vegetable oils can be used as biodiesel. Diesel from crude oil is called fossil diesel.
When either biodiesel or fossil diesel burn they both produce similar amounts of carbon dioxide. Both types of diesel produce carbon monoxide. However, biodiesel produces fewer carbon particles and less sulphur dioxide.

Use the information from the magazine and your knowledge and understanding to evaluate the use of biodiesel compared with fossil diesel as a fuel for cars.

Fossil diesel is mainly used because it is quick to produce from crude oil and so far is cheaper than biodiesel.
However, biodiesel has a lot to recommend it as it is a renewable resource whereas crude oil is running out. It is carbon neutral as well as it takes in the same amount of carbon dioxide when the plants are growing as it gives out when burnt as fuel.
Although burning biodiesel does produce the same amounts of both carbon dioxide and carbon monoxide as fossil diesel, there is less sulfur dioxide so there will be less acid rain, and less carbon particles which cause global dimming. Also waste oils can be used up to produce fuel.
Overall I think we should be using more biodiesel as it is important for us all to reduce our carbon footprint in an effort to halt global warming.

(5 marks)

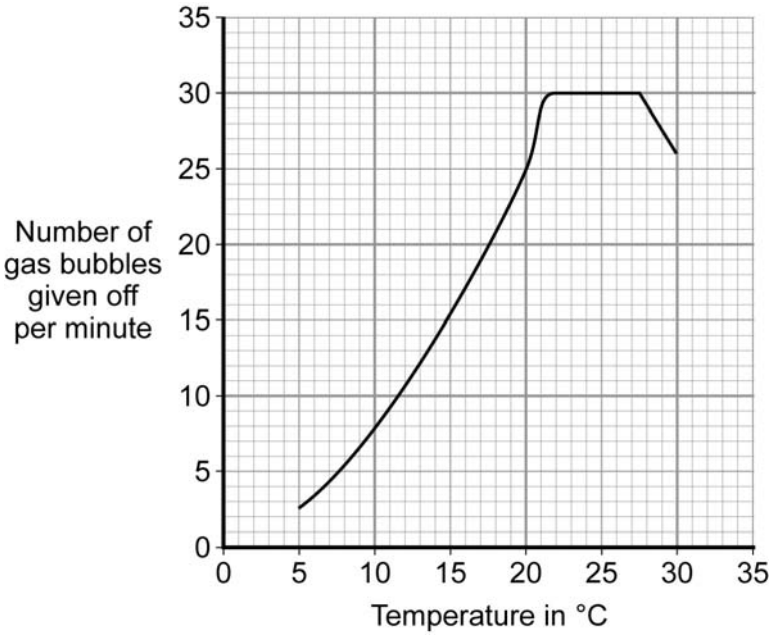
Explain

Candidates should make something clear, or state the reasons for something happening.
The points in the answer **must** be linked coherently and logically.
The answer should **not** be a simple list of reasons.

Example: Biology

11 Some students investigated the effect of temperature on the rate of photosynthesis in pond weed. They set up the apparatus and altered the temperature using ice and hot water. They counted the number of bubbles given off in a minute at different temperatures.

The graph shows the students' results.



Explain the shape of the graph between 22 °C and 27 °C.

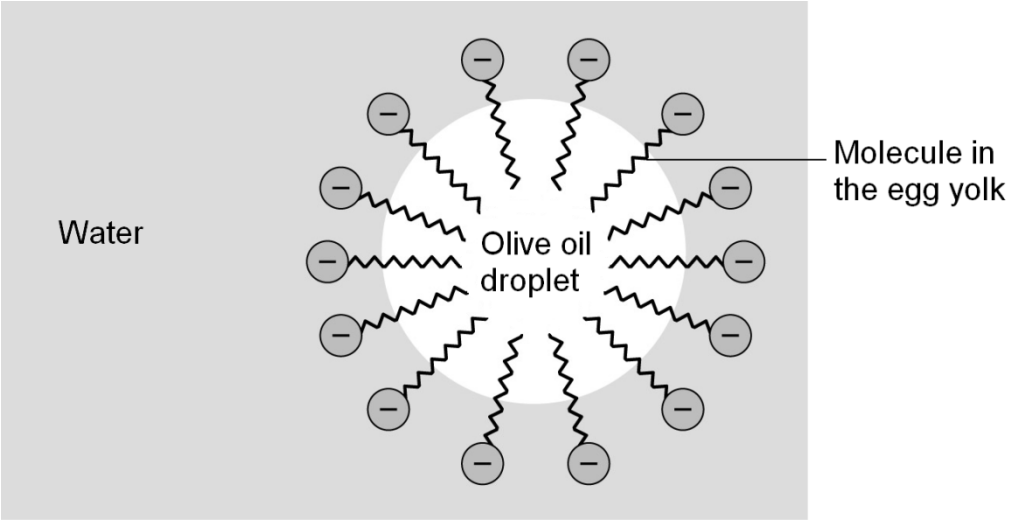
By the time the temperature is 22ºC the photosynthesis enzymes are working at maximum rate for the conditions and the graph is flat. It means that either light intensity or carbon dioxide are rate limiting at that stage, not temperature.

(2 marks)

Example: Chemistry

12 A mixture of the olive oil, water and egg yolk was shaken and left to stand. The olive oil and water do not separate.

The diagram shows a simple model of how a stable mixture of olive oil and water is produced by the addition of egg yolk.



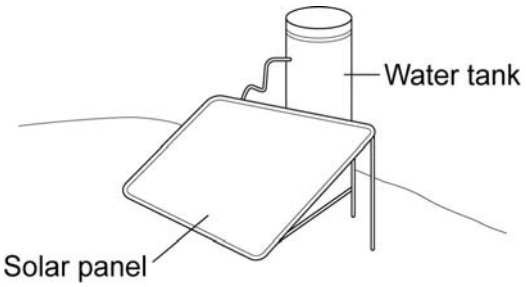
Use this simple model to explain how the molecules in the egg yolk are able to produce a stable mixture of olive oil and water.

The molecules in the egg yolk have a “head” part that dissolves in water, but a long “tail” part that dissolves in oil. A large number of these molecules surround the oil droplet and so it can stay suspended in the water as an emulsion which is stable. The egg yolk molecules act as an emulsifier.

(3 marks)

Example: Physics

13 The picture shows one type of solar water heater. Water from the tank is slowly pumped through copper pipes inside the solar panel where the water is heated by energy from the Sun.



Explain why the copper pipes inside the solar panel are painted black.

Because black is a good absorber of the radiation from the sun and so in a given time more of the sun’s energy will be captured and transferred into the water, making it hotter.

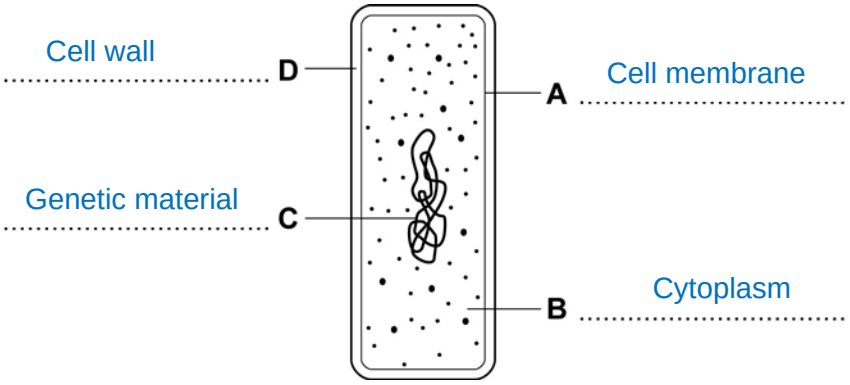
(2 marks)

State, give, name, write down

Only a short answer is required, not an explanation or a description. Often it can be answered with a single word, phrase or sentence.
If the question asks the candidate to state, give, or write down **one** (or **two** etc) examples, they should write down **only** the specified number of answers, or they may lose marks for any wrong examples given.

Example: Biology

14 The diagram shows a bacterium.

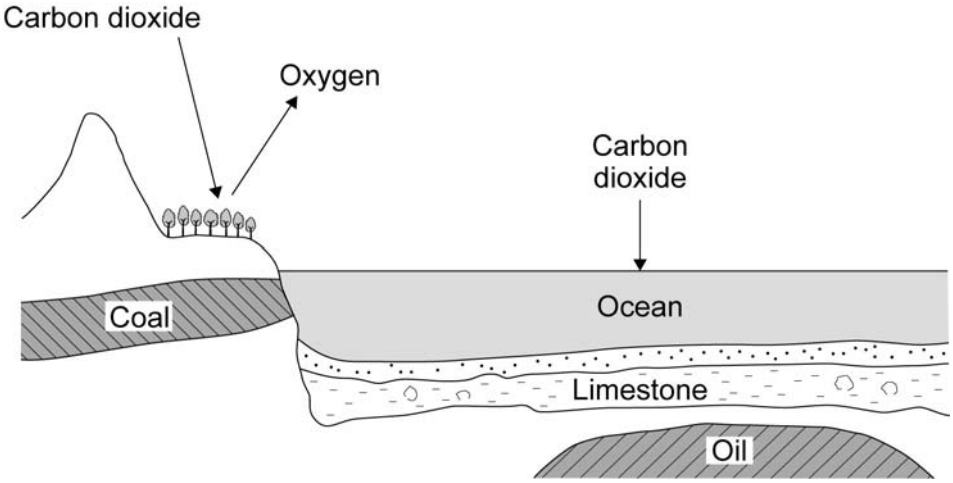


Name the structures labelled **A**, **B**, **C** and **D**.

(4 marks)

Example: Chemistry

15 The diagram shows part of the Earth and ways that carbon dioxide can be removed from the Earth's atmosphere.



Give **three** ways that carbon dioxide can be removed from the Earth's atmosphere.

1. It is taken in by plants to use in photosynthesis.

2. It dissolves in the oceans.

3. It is used by marine organisms to make skeletons and shells which fall to the bottom of the sea and eventually get covered up and compressed to make limestone.

(3 marks)

Suggest

This term is used in questions where candidates need to apply their knowledge and understanding to a new situation. Often there may be more than one correct answer as candidates are expected to base their answers on scientific knowledge and/or principles.

Example: Chemistry

16 Using sun creams containing nano-sized particles is beneficial because they absorb harmful radiation.

Suggest **one** possible risk of using these sun creams.

The particles might be small enough to pass through the skin and they might be toxic inside the body.

(1 mark)

Example: Physics

17 Scientific research carried out in 13 countries has tried to find out if there are any links between using a mobile phone and developing different types of cancer.

About 13 000 people, half with cancer and half in good health, were interviewed about their mobile phone use.

Suggest why people in good health were interviewed.

This could be a control group so that the researchers had a group with no cancer to compare their results with.

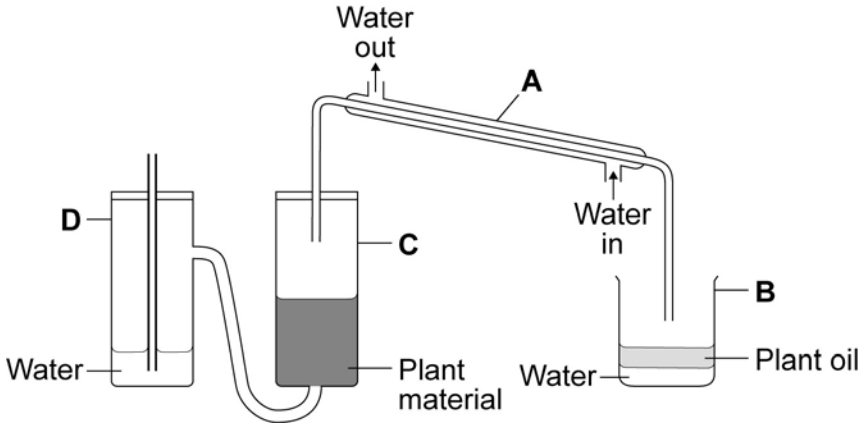
(1 mark)

Use the information in the passage/diagram/graph/table to…

The answer **must** be based on the information given in the question. Unless the information given in the question is used, no marks can be given.

Example: Chemistry

18 The diagram shows some apparatus used to obtain oil from plant material.



Four parts of the apparatus are labelled, **A**, **B**, **C** and **D**.

Use the information in the diagram to complete the sentences.

Steam is made in part [D]

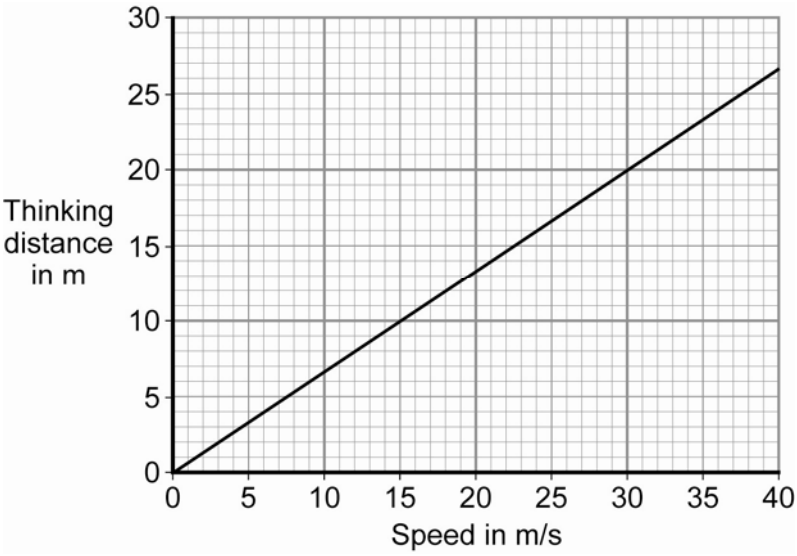
Oil from the plant material is vaporised in part [C]

Steam and oil vapour are condensed in part [A]

(3 marks)

Example: Physics

19 The graph shows that speed affects thinking distance



Use the graph to find the thinking distance for a car driven at 30 m/s.

Thinking distance = 20 m

(1 mark)