Command words in GCSE Chemistry

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State, *describe*, *explain*, *evaluate*, *compare*, *discuss*. Command words tell you what you have to do in each question. Look out for these words in the GSCE Chemistry papers. Understanding what they mean and tailoring your answer to these instructions will both save you time and get you extra marks in the exam.

State

A *state* question is the most straightforward type of command-word question in the exam. To answer it, you simply have to recall a fact, definition or equation and write it down.

EXAMPLE. Lithium, sodium and potassium are in group 1 of the periodic table. State, in terms of the electrons in their atoms, what the atoms of lithium, sodium and potassium have in common. [1]

ANSWER. They all have 1 electron in their outer shell. [1]

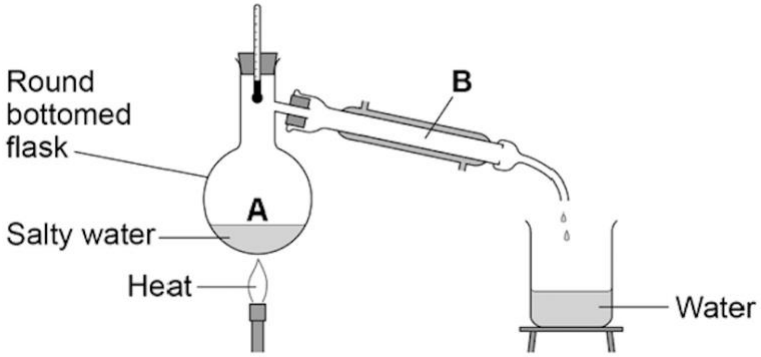
Describe

In a *describe* question, you simply have to ***say what you see*** (or what happened or what will happen). *You won't be awarded any marks for attempting to explain anything*. In both of the examples below, we have *underlined* the clues in the question that guide you towards exactly what the examiner would like you to describe.

EXAMPLE. Potassium forms an ionic compound with sulfur. *Describe* what happens when two atoms of potassium react with one atom of sulfur. *Give your answer in terms of electron transfer*. *Give the formulae of the ions formed*. [5]

ANSWER. Electrons are transferred from potassium to sulfur. [1] The two potassium atoms each lose one electron. [1] They form K^+ / 1+ ions. [1] Sulfur atoms gain 2 electrons. [1] Sulfur forms S^{2-} / 2- ions. [1]

EXAMPLE. A student removed water from salty water using the apparatus below. *Describe* how this technique works by *referring to the processes at A and B.*



ANSWER. Evaporation at A. [1] Condensation at B. [1]

Explain

Explain questions are usually more difficult (and so are normally awarded more marks) than describe questions. If a describe question asks you **what** happened, then the matching explain question will ask you **why** it happened.

EXAMPLE. Explain why an atom has no overall charge. Use the relative electrical charges of sub-atomic particles in your explanation. [2]

ANSWER. Because electrons are negative −1 and protons are positive +1. [1] The number of electrons is equal to the number of protons. [1]

Watching **My GCSE Science *videos***, doing lots of ***exam-style questions*** and reviewing the ***mark schemes*** will help you learn how to answer explain questions.

You may be asked to explain something which seems unfamiliar. The key here is to identify the part of the course that the question relates to and then apply your knowledge of physics to the unfamiliar context.

Calculate

In a *calculate* question, you will normally have to choose the correct equation to use, substitute the right numbers into the right places, and write down your final answer. You may also be asked to include the correct unit with your answer, or to write it to a certain number of significant figures.

EXAMPLE. Calculate the mass of 0.1 mole of SO_3 [2]

ANSWER. Relative formula mass of SO_3 = 32 + (16x3) = 80 [1]
Mass = (moles x relative formula mass) = 0.1 x 80 = 8g [1]

Evaluate

In an *evaluate* question, you have to write down the advantages (pros) and the disadvantages (cons) of something. But with the 6-mark question below, the examiner is looking for more than items to tick off on a mark scheme. To get full marks, you need to write a detailed and coherent argument, which considers a range of pros and cons and comes to a conclusion consistent with your reasoning and that shows that you have a good understanding of the key ideas.

EXAMPLE. Evaluate the production and use of bottles made from soda-lime glass and those made from HD poly(ethene). Use the information given and your knowledge and understanding to justify your choice of material for milk bottles. [6]

	Glass milk bottle	**Plastic milk bottle**
Raw materials	Sand, limestone, salt	Crude oil
Bottle material	Soda-lime glass	HD poly(ethene)
Initial stage in production of bottle material	Limestone and salt used to produce sodium carbonate.	Production of naphtha fraction.
Maximum temperature in production process	1600 °C	850 °C
Number of times bottle can be used for milk	25	1
Size(s) of bottle	0.5 dm^3	0.5 dm^3, 1 dm^3, 2 dm^3, 3 dm^3
Percentage (%) of recycled material used in new bottles	50 %	10 %

ANSWER. There are two stages in production of soda-lime glass. The second stage involves heating sand, limestone and sodium carbonate. In HDPE there are three stages in production. *[The first stage is given in the question, so use your knowledge here to show that you understand the process]*. The second stage involves cracking of naphtha to obtain ethene and the third stage involves the polymerisation of ethane.

Fewer stages in glass production may be quicker. The higher temperature in glass manufacture may require more energy. Glass bottles can be reused although there may be costs associated with the collection/cleaning for reuse. Glass can be recycled into new products. Plastic has greater range of sizes. Both are produced from limited raw materials. Since a higher percentage of recycled materials is used to make new bottles, I would choose glass as it conserves raw materials.

Compare

In a *compare* question, you have to write down the similarities and the differences between two (or more) things. Generally, a mark scheme will award the same number of marks for the similarities and differences, so be sure to include both.

EXAMPLE. In the periodic table, the transition elements and Group 1 elements are metals. Use your own knowledge to compare the chemical and physical properties of transition elements and Group 1 elements. [6]

ANSWER.

Physical properties

Transition elements
- high melting points
- high densities
- strong / hard

Group 1
- low melting points
- low densities
- soft

Chemical properties

Transition elements
- low reactivity/react slowly (with water or oxygen)
- used as catalysts
- ions with different charges
- coloured compounds

Group 1
- very reactive/react (quickly) with water/non-metals
- not used as catalysts
- only forms a +1 ion
- white/colourless compounds

Discuss

Discuss questions can be tricky since they are more open-ended than most other types of questions. To answer them successfully, you should have a good knowledge of the question topic and pay close attention to the wording of the question and the number of marks available.

EXAMPLE. Diesel is the fuel used in most bus engines. Research is being carried out into the use of hydrogen, instead of diesel, as a fuel for buses. *Discuss* the *advantages* and *disadvantages* of using hydrogen, rather than diesel, as a fuel for buses. [6]

ANSWER. *[Your answer does not have to include all the points in the mark scheme, but must demonstrate your understanding of scientific ideas in a clear, coherent and logical structure].*

The advantages of using hydrogen instead of diesel are:

There is plenty of water/raw material for hydrogen production while there are limited supplies of crude oil used to produce diesel [1]. Hydrogen produces only water as waste, while diesel also produces carbon dioxide emissions that may cause global warming. [1] When diesel undergoes incomplete combustion, it produces carbon and/or carbon monoxide. Carbon is formed as soot, which makes objects dirty and carbon monoxide is a toxic gas. [1]

The disadvantages of using hydrogen instead of diesel are:
Hydrogen gas has to be manufactured. If the energy/electricity needed to produce hydrogen is from non-renewable resources, this produces carbon dioxide, which may cause global warming. [1] Hydrogen is expensive to produce. [1] Stronger / heavier / bigger fuel tanks are needed to transport hydrogen. [1] Hydrogen is flammable, and there are problems with storing large volumes of flammable gas. Because hydrogen is a gas, it leaks easily if the fuel system is damaged. [1] The number of distribution outlets where hydrogen can be bought is limited. [1]