

OCR (B) Chemistry GCSE

C7.3 - How are scientific explanations developed?

Flashcards

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What is a correlation?



What is a correlation?

A correlation is a relationship between two variables in which when there is a change in one factor, there is often a change in another factor. However, this does not necessarily mean one factor is **causing** the change in the other - correlation does not imply causation.



Give examples of a positive correlation.



Give examples of a positive correlation.

- Increasing CO₂ emissions is correlated with rising global temperatures.
- Absorption of carcinogenic chemical compounds (through eating, drinking, breathing, cosmetic application) is positively correlated with incidence of cancer.



Explain the difference between a scientific theory and a scientific explanation.



Explain the difference between a scientific theory and a scientific explanation.

A scientific theory is a general explanation which can be applied to many situations or examples. Scientific theories are usually widely accepted by scientists.

In contrast, a scientific explanation is a way of explaining a phenomenon or event by applying the theory to a particular situation.



How does new evidence affect a hypothesis?



How does new evidence affect a hypothesis?

New evidence can lead to the modification of a hypothesis to account for the new findings. Over time, the additional of evidence that increases confidence in the hypothesis leads to the hypothesis becoming a universally accepted theory or explanation e.g. the oxygen theory of combustion (succeeding the phlogiston theory of combustion).



How can technological advances affect existing scientific explanations and theories?



How can technological advances affect existing scientific explanations and theories?

Technological developments can mean new observations are made and new data can be collected. For example, advances in telescoping allowed us to look at how other planets were accelerating away from us, providing new evidence supporting the 'big bang' theory.



What is 'peer review' in science?



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Peer review is the process by which other scientists check new research or findings (which are about to be published in scientific journals) to evaluate the experiments. The 'peers' check to make sure the experiments are valid, original and of high quality (accurate, precise, repeatable etc.).



Why might scientists be hesitant to accept new findings or claims?



Why might scientists be hesitant to accept new findings or claims?

New findings and data have to be carefully checked to ensure it is valid. If the results cannot be repeated by the same group or reproduced by a different team, the scientific community is less likely to accept the claims as scientific knowledge.



Outline what is meant by a 'scientific model'.



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Models are ways of explaining ideas.

They identify the features and the rules of a system.



How can scientific models be used?



How can scientific models be used?

1. To help explain and teach scientific ideas.
2. To predict possible outcomes of the system.



Name the types of scientific model.



Name the types of scientific model.

- Representational models, which use physical analogies and spatial representations to explain ideas visually.
- Descriptive models, which describe the event or phenomenon in words.
- Mathematical models, which use patterns in data already collected and knowledge of scientific relationships to make predictions.



Outline the benefits and limitations of using scientific models.



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Benefits:

- They can be used to explain ideas in different ways.
- They can be used to investigate situations and predict outcomes without practical or ethical limitations.

Limitations:

- Predictive models cannot be accurate for all situations as they are often approximations or estimations. This is particularly true if the data the predictions are based on are incomplete or inaccurate.
- These models are often simplified at the expense of accuracy (for example, structural formulas and ball-and-stick models of molecules are widely used but completely ignore what chemists know from quantum mechanics about the nature of matter at the subatomic level).

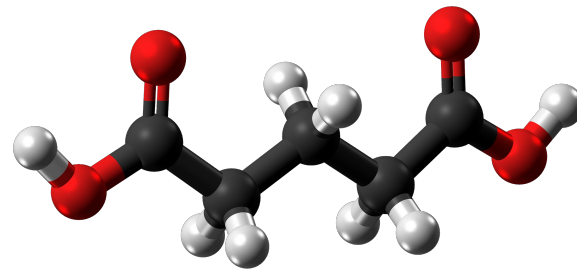


Give examples of scientific models in chemistry.



Give examples of scientific models in chemistry.

- Ball-and-stick atomic model
 - Does not show how covalent bonds are formed or that bonds are forces, not 'sticks'
- Lattice model representing bonding between metal ions
 - Oversimplified as only shows one layer of ions and does not show that the delocalised electrons are constantly moving.



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