OCR (B) Chemistry GCSE

Ideas about Science

Flashcards

What is meant by the term hypothesis?

What is meant by the term hypothesis?

An initial idea or explanation being tested.

What is meant by the term prediction?

What is meant by the term prediction?

A suggestion of how a certain factor will affect the outcome of an experiment based on the hypothesis.

What are scientific explanations based on?

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Data analysis

Why is it important to use appropriate apparatus, materials and techniques when completing an experiment?

Why is it important to use appropriate apparatus, materials and techniques when completing an experiment?

To ensure data collected is precise, accurate and valid.

What do the terms precision, accuracy and validity mean?

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Accuracy - how close the value is to the true value.

Precision - how repeatable a measurement is.

Valid - how well the data reflects the hypothesis (variables must be controlled).

What pieces of apparatus could be used to measure variables in an experiment?

What pieces of apparatus could be used to measure variables in an experiment?

- Stopwatch
- Ruler
- Thermometer
- Pipette, measuring cylinder or burette

What apparatus could be used to contain a reaction mixture?

What apparatus could be used to contain a reaction mixture?

- Test tube
- Boiling tube
- Beaker
- Conical flask

Which three pieces of apparatus could be used to measure volume?

Which three pieces of apparatus could be used to measure volume?

- Measuring cylinder
- Gas syringe
- Burette

How can pH be measured?

How can pH be measured?

- Universal indicator
- pH meter

List four methods of analysis

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- Chromatography
- Flame tests
- Chemical tests
- Titration

How can you ensure the measurements collected during an experiment are valid?

How can you ensure the measurements collected during an experiment are valid?

- Factors (other than the dependent and independent variables) have been controlled.
- Independent - the variable being changed.
- Dependent - the variable being tested.

The effect of changing the concentration of acid on the rate of reaction between acid and marble chips is being investigated. What factors should be controlled to make the results valid?

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- Temperature
- Volume of acid
- Mass of marble chips
- Surface area of marble chips
- Type of acid (e.g. hydrochloric)

What must be considered when choosing the range of values used in an experiment?

What must be considered when choosing the range of values used in an experiment?

- Large enough to draw valid conclusions.
- Far enough apart so that trend can be seen.

How can hazards be minimised when conducting an experiment?

How can hazards be minimised when conducting an experiment?

- Use lower concentrations of solutions
- Wear safety goggles
- Wear gloves
- Use a fume hood
- Avoid touching hot equipment
- Keep loose clothing and hair away from flames

How can data be presented?

How can data be presented?

- Table
- Chart
- Graph

Where do units go when constructing a table to represent data?

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In the column heading only.

Give examples of SI units

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Metre (m)

Gram (g)

Joule (J)

Second (s)

Degree Celsius (°C)

Represent the following prefixes in standard form: tera, giga, mega, kilo, centi, milli, micro and nano

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Tera (T) - x 10^{12}

Giga (G) - x 10^{9}

Mega (M) - x 10^{6}

Kilo (k) - x 10^{3}

Centi (c) - x 10^{-2}

Milli (m) - x 10^{-3}

Micro (μ)- x 10^{-6}

Nano (n) - x 10^{-9}

When recording data, how many significant figures should be given?

When recording data, how many significant figures should be given?

- The number of significant figures should be consistent.
- Unless otherwise stated, typically 3 significant figures are given.

What are important points to consider when plotting a graph?

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- Appropriate scale
- Label axis
- Plot points carefully
- Line of best fit
- Indicate uncertainty (range bars)

What does the gradient of a graph showing mass produced and time represent?

What does the gradient of a graph showing mass produced and time represent?

Rate of reaction

What is interpolation?

What is interpolation?

Reading values from the graph that lie between two plotted data points.

What is extrapolation?

What is extrapolation?

Extending the line of the graph to find values outside the range.

What do the terms repeatability and reproducibility mean?

What do the terms repeatability and reproducibility mean?

Repeatability - obtaining similar results when the same person repeats the experiment with the same method and equipment.

Reproducibility - obtaining similar results when a different person completes an experiment. They may use a different method or equipment.

What is an outlier?

What is an outlier?

A result that is very different to the others.

Should an outlier be included in the data?

Should an outlier be included in the data?

Yes, unless there is a reason to explain the outlier .

e.g. measuring/recording error

Describe random and systematic errors

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Random error - unpredictable, human error.

Systematic error - results differ by the same amount each time. This could be due to a fixed error with measuring apparatus, environmental conditions or a method of observation.

What might cause a systematic error?

What might cause a systematic error?

- Equipment
- Environmental conditions
- Method of observation

How can the accuracy of an experiment be increased?

How can the accuracy of an experiment be increased?

Repeat the experiment and take more readings.

Do results with a small or large range have the greatest accuracy?

Do results with a small or large range have the greatest accuracy?

Small range

What does the term correlation mean?

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A relationship between two sets of data.

What are positive and negative correlations?

What are positive and negative correlations?

Positive correlation - both values increase.

Negative correlation - one value increases as the other decreases.

No correlation - no pattern in the data.

What is the difference between a correlation and a cause-effect link?

What is the difference between a correlation and a cause-effect link?

A correlation could be a coincidence or it could be caused by another factor. It doesn't show directly that the factor caused the outcome.

A cause-effect link is an explanation that explains the relationship.

What evidence caused the theory of the composition of Earth's early atmosphere to be modified?

What evidence caused the theory of the composition of Earth's early atmosphere to be modified?

- New discoveries of ancient rock.
- Fossil discoveries (new types and older fossils).

What new evidence caused the theory of the arrangement of the periodic table to be modified?

What new evidence caused the theory of the arrangement of the periodic table to be modified?

- Discovery of the proton
- Discovery of new elements

What is peer review?

What is peer review?

Other scientists evaluating new research related to their area of science.

Which three things are checked when research undergoes peer review?

Which three things are checked when research undergoes peer review?

Validity

Originality

Significance

What can models be used for?

What can models be used for?

- Solving problems
- Making predictions
- Developing explanations and understanding

Describe the following types of model: representational, spatial, descriptive, computational and mathematical

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- Representational: Shapes and analogies.
- Spatial: Three dimensional computational model showing predicted data.
- Descriptive: Words describe key features.
- Computational: Calculations carried out by a computer.
- Mathematical: Makes predictions using past data patterns, know relationships and calculations.

Give examples of how science and technology have positively impacted people's lives

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- Catalytic converters and gas scrubbers (lower pollution emissions).
- Fuel cells (electric cars).
- Composite materials (improve the properties of materials).
- Nanotechnology.
- Synthetic fertilisers (food production increases).
- Water purification (reduces transmission of waterborne diseases).
- Catalysts (reduced energy demand for industrial processes).

What is meant by the term risk?

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The chance that a hazard will cause harm.

Give an example of a risk that has arisen due to advancing science and technology

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Burning fossil fuels emits air pollutants and greenhouses gases. This lead to climate change and negative impacts on health.

What must be considered before making a decision?

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Benefits and risks

What is the difference between perceived and calculated risk?

(Higher only)

What is the difference between perceived and calculated risk? (Higher only)

Perceived risk is how risky people think something is whereas calculated risk is statistically estimated.

What are the four types of consequence and what do they effect?

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Personal - individuals

Social - groups of people

Economic - money

Environmental - land, air and water

What is meant by the phrase ethical issue?

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An issue that can't be resolved using science. It considers what is right and wrong.

Why should scientists communicate their work to a range of audiences?

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To allow decision making to be based on risks, benefits, costs and ethical issues.