CIE Chemistry A Level

4.3.2 - Practical Skills for Paper 5 Planning

Flashcards

Why must you ensure that an experimental procedure is carried out safely?

Why must you ensure that an experimental procedure is carried out safely?

- To ensure that no risks are posed to the person carrying out the experiment.
- Possibly to ensure that results are valid. If the experiment is not being carried out safely, results may be affected.

Why might you plan to use a fume cupboard during an experiment?

Why might you plan to use a fume cupboard during an experiment?

To remove any harmful gases, vapours or dust produced during an experiment

What should be carried out when planning an experiment to ensure that the procedure is as safe as possible?

What should be carried out when planning an experiment to ensure that the procedure is as safe as possible?

A risk assessment

This identifies all the potential risks, allowing you to put precautions in place to reduce these risks. Actions that can be taken if the hazard arises should also be noted.

Why is it important that the most efficient experimental procedure is chosen?

Why is it important that the most efficient experimental procedure is chosen?

To achieve maximum productivity.

There would be as little waste and as few processes as possible to make the procedure quicker.

Which is more efficient: producing a product from a reversible reaction or a non-reversible reaction?

Which is more efficient: producing a product from a reversible reaction or a non-reversible reaction?

The non-reversible reaction because all of the reactants would be converted into products.

How the reliability of experimental results be increased?

How the reliability of experimental results be increased?

- Repeat the experiment to acquire more data.
- Identify and discard any anomalous results.
- Calculate the mean.

What is a hypothesis?

What is a hypothesis?

A prediction made before conducting an experiment based on limited evidence and used as a starting point for further investigation.

True or False?

‘A hypothesis can be proven to be true if enough data supports the statement.’

True or False? ‘A hypothesis can be proven to be true if enough data supports the statement.’

FALSE

A hypothesis can be supported by data but it can never be completely proven to be true.

Fill in the gap: ‘A hypothesis states a relationship between two _____’

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Variables

What are the independent and dependent variables?

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Independent variable - the factor that is changed during a scientific experiment.

Dependent variable - the factor that depends on/ is changed by the independent variable.

What are control variables?

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Factors which are kept the same throughout an experiment to ensure tha the test is fair.

An experiment is conducted to investigate the rate of reaction between an acid and a metal at different temperatures. What are the dependent and independent variables?

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Independent variable - temperature

Dependent variable - volume of gas produced

An experiment is conducted to investigate the rate of reaction between an acid and a metal at different temperatures. What variables should be controlled?

An experiment is conducted to investigate the rate of reaction between an acid and a metal at different temperatures. What variables should be controlled?

- Concentration of the acid
- Volume of the acid
- Mass of metal
- Surface area of the metal
- Presence / absence of a catalyst

Temperature is a control variable in an experiment. How could temperature be kept constant?

Temperature is a control variable in an experiment. How could temperature be kept constant?

Place the reaction vessel in a water bath. Water temperature changes much slower than air temperature meaning it is more constant.

What needs to be considered when devising an experimental method?

What needs to be considered when devising an experimental method?

- The independent and dependent variables
- The control variables
- The apparatus set up
- The techniques required
- The range of values you will test

Describe the steps involved in investigating the volume of acid required to neutralise a specific volume of alkali

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Acid-base titration:

1. Use a pipette and pipette filler to measure exactly 25 cm^3 of alkali. Place it in a conical flask with a few drops of indicator.
2. Fill the burette with the acid, ensuring there are no air bubbles in the tap. Note the initial volume.
3. Place the conical flask on a white tile under the burette.
4. Do a rough titration to identify the approximate point of neutralisation. Record the final volume in the burette.
5. Carry out further titrations, adding the acid dropwise around the point of neutralisation. Repeat until you get concordant results.

Suggest safety precautions that should be taken when carrying out a titration

Suggest safety precautions that should be taken when carrying out a titration

- Clear up any broken glassware or spillages immediately
- Fill burette below eye level to prevent chemicals splashing into your face and eyes
- Wear gloves and eye protection if using chemicals which are irritants

Describe the steps involved in measuring the enthalpy change of a neutralisation reaction

Describe the steps involved in measuring the enthalpy change of a neutralisation reaction

1. Measure the total mass of the acid and alkali, assuming that: 1 ml = 1 g.
2. Place the acid in a polystyrene cup. Use a thermometer to measure the initial temperature of the acid.
3. Add the alkali to the polystyrene cup and record the maximum temperature reached by the reaction mixture.
4. Use the equation $\Delta H = -mc\Delta T$ to calculate the enthalpy change (m=mass of acid and alkali, c=specific heat capacity and ΔT=temperature change).

Describe a procedure that could be followed to investigate the rate of reaction between a magnesium ribbon and different concentrations of HCl

Describe a procedure that could be followed to investigate the rate of reaction between a magnesium ribbon and different concentrations of HCl

Apparatus can either involve a gas syringe or an upside down water-filled measuring cylinder in a water trough.

1. Measure exactly 25 cm^3 of the first concentration of HCl and place in a conical flask.
2. Add the magnesium ribbon to the flask and immediately place a bung in the flask (this should be connected to the gas collection vessel).
3. Record the total volume of gas produced after 30 seconds.
4. Repeat the experiment using the different concentrations of hydrochloric acid.

What apparatus is required to oxidise ethanol to produce a carboxylic acid?

What apparatus is required to oxidise ethanol to produce a carboxylic acid?

A vertical condenser (for reflux).

Why might a pipette be used instead of a measuring cylinder to measure a volume of solution?

Why might a pipette be used instead of a measuring cylinder to measure a volume of solution?

A pipette is much more accurate and precise than a measuring cylinder.

When measuring 20 cm^3, should a 25 cm^3 or 50 cm^3 measuring cylinder be used?

When measuring 20 cm^3, should a 25 cm^3 or 50 cm^3 measuring cylinder be used?

The 25 cm^3 measuring cylinder should be used as there will be a lower percentage error in the measurement.

What apparatus can be used to measure the volume of gas produced during an experiment?

What apparatus can be used to measure the volume of gas produced during an experiment?

- Gas syringe
- Upside down water-filled measuring cylinder in a water trough

List the apparatus required for an acid-alkali titration and explain their purpose

List the apparatus required for an acid-alkali titration and explain their purpose

- Burette (to accurately measure the volume of solution added)
- Pipette and pipette filler (to measure the exact volume to be neutralised)
- Clamp and stand (to hold burette)
- Funnel (for pouring a solution into the burette)
- White tile (to make the colour change easier to see)
- Conical flask (to hold reactants, allows swirling)
- Dropping pipette (to add indicator)

What type of flask should be used when oxidising ethanol?

What type of flask should be used when oxidising ethanol?

A round bottomed flask should be used when heating liquids because it allows more uniform heating of the solution.

What precautions should be taken when using a Bunsen burner?

What precautions should be taken when using a Bunsen burner?

- Tie hair back and wear safety goggles.
- Make sure the orange safety flame is on when not in use.
- Turn off the gas when the flame is not lit.
- Remove any flammable chemicals from the laboratory.
- Keep the laboratory well ventilated.

Why is it important that glassware is handled carefully?

Why is it important that glassware is handled carefully?

Glassware is fragile so careful handling is required to avoid breakages.

If glassware breaks during an experiment, hazardous chemicals may be spilled.

It is important that there are no small cracks in glassware as this would allow gas to escape. This may affect the results of an experiment (e.g. when measuring the volume of gas produced).

What can be used to analyse the potential risk of chemicals used in the reaction?

What can be used to analyse the potential risk of chemicals used in the reaction?

Hazard symbols on containers of chemicals indicate the risks posed by that chemical.

Give examples of chemical hazard that you may come across in the laboratory

Give examples of chemical hazard that you may come across in the laboratory

- Irritant
- Corrosive
- Harmful to the environment
- Flammable
- Health hazard

What do these hazard symbols mean?

What do these hazard symbols mean?

Environmental hazard

Corrosive

How can corrosive chemicals be handled safely?

How can corrosive chemicals be handled safely?

Avoid contact with skin by wearing gloves.

Wear safety goggles to avoid the chemical splashing in your eyes.

Clear up any spillages immediately.

What is the most suitable way to record data during an experiment?

What is the most suitable way to record data during an experiment?

In a data table

When creating a table to display results, where should the units go?

When creating a table to display results, where should the units go?

In the column heading with the quantity

E.g.

Mass of copper carbonate/ g	Volume of CO_2 produced/ cm^3
1.0	5
1.5	10

Notice that values in each column are given to the same number of decimal places

What degree of precision should results be given to?

What degree of precision should results be given to?

The degree of precision should be the reflect the measuring apparatus used.

E.g. if a measuring cylinder is calibrated at $1.0cm^3$, volumes should be recorded to the nearest $0.5cm^3$.

What data / observations can be recorded during an experiment?

What data / observations can be recorded during an experiment?

Colour change

Change in solubility

Change in quantity of material

What is a control experiment?

What is a control experiment?

All factors are the same as the experiment but the value of the independent variable is zero

Why are control experiments done?

Why are control experiments done?

To verify that it is the independent variable (rather than another factor) affecting the dependent variable

How can data from an experiment be used to reach a conclusion?

How can data from an experiment be used to reach a conclusion?

Quantitative data can be plotted on a graph. The trend can be discussed and a conclusion can be made about whether it supports the original hypothesis.