Chemistry Paper 1 revision

Making salts

All salts contain a positive ion. (Comes from a metal, metal oxide, metal carbonate or metal hydroxide.)

Salts also contain a negative ion. (Comes from the acid?)

Example: $CuSO_4$

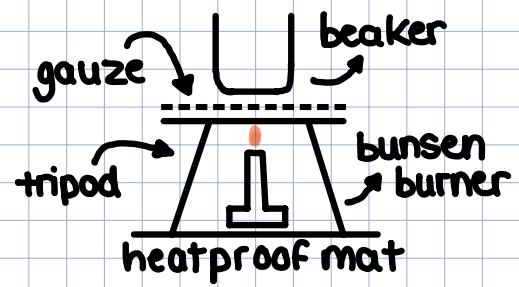
positive ion = Cu^{2+}

- copper
- copper oxide
- copper carbonate
- copper hydroxide

negative ion = SO_4^{2-}

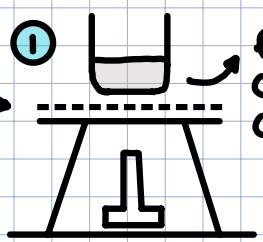
- sulphuric acid

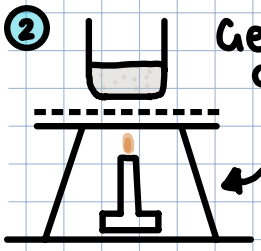
Equipment:



Method:

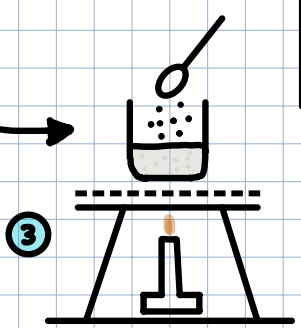
Start with a fixed volume of dilute sulphuric acid. This is the limiting reactant.



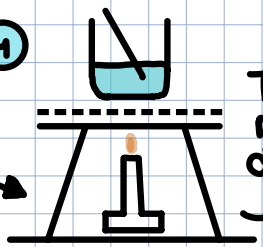


Gently heat the acid until it is almost boiling.

Then use a spatula to add copper oxide.



Then stir the solution with a glass rod.



The copper oxide will react and seem to disappear. It will also turn a blue colour.

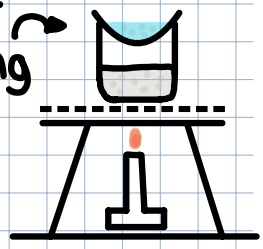
continue adding copper oxide until it is in excess. Stop adding copper oxide if some powder remains after stirring.

At this point the reaction has stopped.

The solution is now neutral.

Filter out remaining copper oxide.

Use an evaporating basin on the tripod to get the copper sulphate crystals.



What are salts?

copper sulphate crystals:

blue in colour

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REQUIRED PRACTICALS:

- C4 - Making salts
- C4 - Neutralisation
- C4 - Electrolysis
- C5 - Temperature changes

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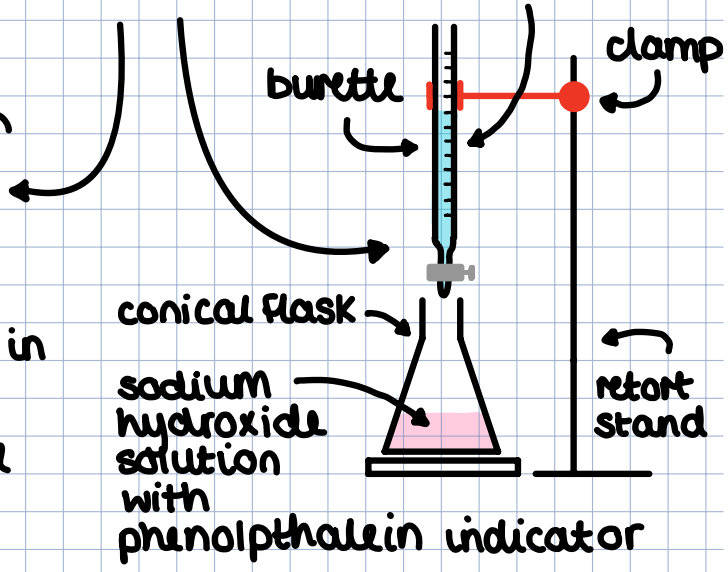
Neutralisation

To neutralise an alkali an acid is used. For this practical the alkali used is sodium hydroxide and the acid is sulfuric acid.

This process is called a titration.

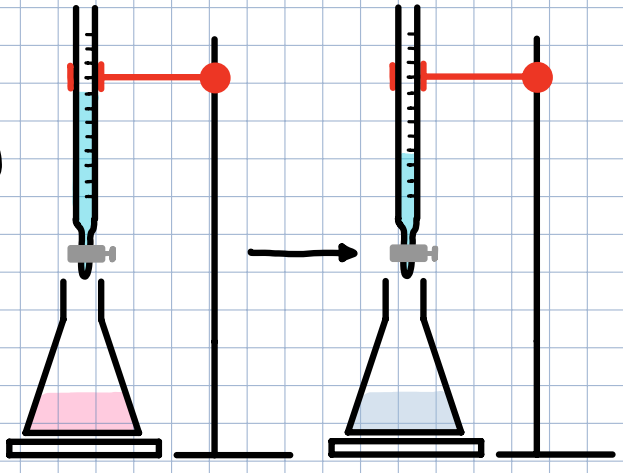
Equipment:

dilute sulfuric acid
dilute sodium hydroxide solution
phenolpthalein indicator (pink in alkaline and colourless in acid)
a burette to measure the sulfuric acid
a volumetric pipette and pipette filler
a stand and funnel
a conical flask for the reaction to take place in
a white tile so the colour change can be observed
safety goggles because the acids and alkali are both irritants



Method:

1) Use the volumetric pipette to add 25cm^3 of sodium hydroxide into the conical flask.
2) Add a few drops of phenolpthalein into the conical flask.
3) Put the burette in the stand and ensure the tap is closed.
4) Carefully pour the sulfuric acid into the burette using a funnel.
5) Place the conical flask on the white tile and place the burette over the conical flask.
6) Use the burette tap to slowly add the sulfuric acid to the conical flask, making sure you swirl the conical flask regularly (to allow the contents to be fully combined).
7) When the solution changes from pink to colourless, close the tap and record the final volume of the sulfuric acid in the burette.
8) Repeat the experiment a minimum of 3 times to ensure accurate results.



pink → colourless

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Electrolysis

Aim: To investigate what happens when aqueous solutions are electrolysed using inert electrodes.

Equipment list:

- 0.5M copper (II) chloride solution
- 0.5M sodium chloride solution
- A petri dish lid with bored holes
- Two carbon rod electrodes with support bungs
- Two crocodile/4mm plug leads
- Low voltage power supply
- Blue litmus paper
- Forceps

Method:

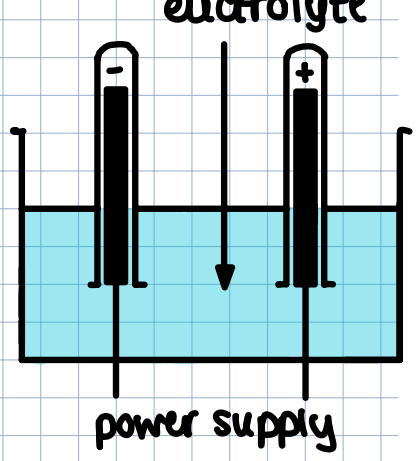
1) Add about 50cm^3 of copper chloride solution to a beaker.
2) Add the lid and insert electrodes through the holes making sure the electrodes don't touch.
3) Attach crocodile leads to the electrode and connect the rods to the DC terminals of a low voltage power supply.
4) Set the power supply to 4V and switch the power supply on.
5) Using the forceps hold the litmus paper near the positive electrode.
6) After a few minutes turn the power supply off and observe the negative electrode.
7) Record observations at the electrodes.
8) Repeat the experiment with sodium chloride.

Results:

Solution	anode +			cathode -		
	observations	element formed	state	observations	element formed	state
copper (II) chloride	bubbles of gas bleached litmus paper	chlorine	gas	brown/red solid coating on rod	copper	solid
sodium chloride	bubbles of gas bleached litmus paper	chlorine	gas	bubbles of gas (more rapid production)	hydrogen	gas

Safety precautions

- safety goggles must be worn.
- Room should be well ventilated because large quantities of chlorine gas is toxic.



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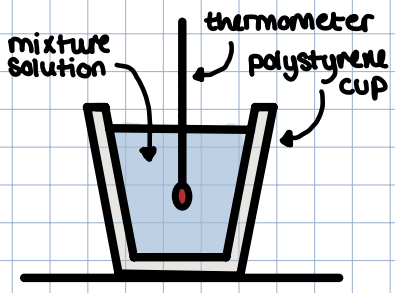
Temperature changes

Aim: to investigate the variables that affect temperature change in chemical reactions.



Equipment list:

- 2m hydrochloric acid
- 2m sodium hydroxide solution
- polystyrene cups and lids with thermometer holes
- thermometers

Method:

1) measure 25cm^3 of hydrochloric acid into a polystyrene cup.
2) (Optional): Place the cup into a beaker to make it more stable.
3) Measure and record the temperature of the hydrochloric acid.
4) Measure 5cm^3 of sodium hydroxide solution and add it to the cup.
5) Quickly put a lid on the cup and stir the solution with the thermometer through the hole in the lid.
6) When the temperature recorded on the thermometer becomes fairly constant, record the temperature.
7) Repeat steps 4-5 to add further 5cm^3 amounts of sodium hydroxide to the cup. A minimum total of 40cm^3 needs to be added.
8) Repeat steps 1-7 to ensure reliability of results.
9) Calculate the mean maximum temperature reached for each of the sodium hydroxide volumes.

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Safety precautions:

- Wear safety goggles