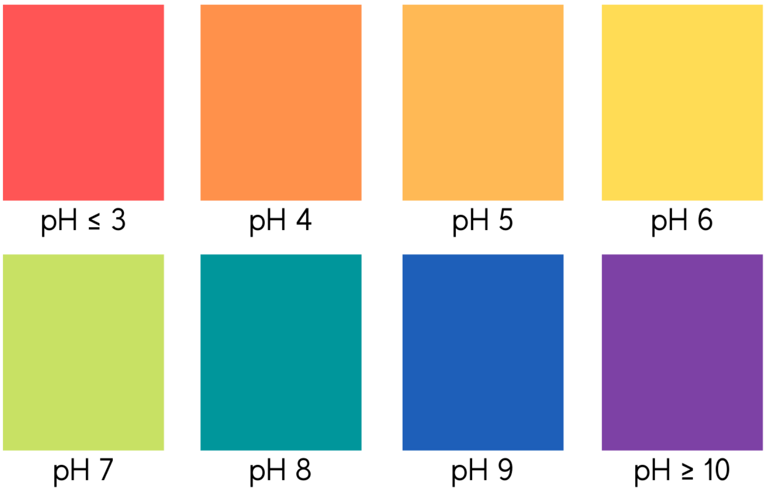
Universal Indicator Chart



1. **Why it's not safe to heat alcohols using bunsen burner**
   Alcohols are flammable

2. **How alcohols can be heated safely**
   Use a water bath/ oil bath/ electric heater

3. **How a condenser allows alcohol to be collected as a liquid in fractional distillation**
   It cools the vapour/ alcohol

4. **Suggest pH of a solution that turn universal indicator pH red**
   pH = 1

NOTE: When asked to identify the substance (from ion tests), state the name & formula of the individual ions in the substance

5. **Why is a conical flask rinsed during an experiment**
   To remove the residue from the previous experiment

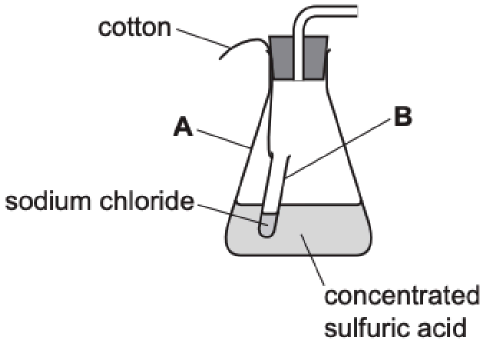
6. **Why does it not matter if a little distilled water is left in the conical flask after it has been rinsed**
   The volumes have already been measured, so the presence of distilled water doesn't affect results

NOTE:
A source of error in acid-base experiments: missing endpoint / misjudging colour change
Improvement: add the acid more slowly

7. **Copper (II) carbonate is placed in a boiling tube, excess dil. H2SO4 is added. Any gas produced was tested. Give observations**
   - Effervescence/fizzing
   - Blue solution is formed
   - Gas produced turns limewater
   - Milky

8.

The diagram shows some of the apparatus a teacher used to make hydrogen chloride gas and to measure the volume of gas made.



Describe how the reaction is started after the apparatus has been set up.
tilt the container / flask OR
lift bung (so tube falls over) (and then replace the bung)

9. **Safety precaution when working with toxic gases**
   Use a fume cupboard

10. **Safety precaution when working with concentrated acids**
    Wear gloves

11.

A student investigated the rate of the reaction between sodium metabisulfite and potassium iodate at different temperatures.

Five experiments were done at different temperatures.

(a) *Experiment 1*

- 70 cm^3 of aqueous potassium iodate was measured using a 100 cm^3 measuring cylinder and poured into a 250 cm^3 beaker.
- 5 cm^3 of aqueous starch was measured using a 10 cm^3 measuring cylinder and poured into the beaker containing the aqueous potassium iodate.
- 5 cm^3 of aqueous sodium metabisulfite was measured using a clean 10 cm^3 measuring cylinder and poured into the beaker. At the same time a stop-clock was started.
- The mixture was stirred until a sudden colour change was seen.
- The stop-clock was stopped and the temperature of the mixture in the beaker was measured using a thermometer.
- The beaker was rinsed with distilled water.

Experiment 2

- 70 cm^3 of aqueous potassium iodate was measured using a 100 cm^3 measuring cylinder and poured into a 250 cm^3 beaker.
- 5 cm^3 of aqueous starch was measured using a 10 cm^3 measuring cylinder and poured into the beaker containing the aqueous potassium iodate.
- The aqueous potassium iodate and starch mixture was warmed over a Bunsen burner until the temperature of the solution was about 35 °C. The beaker was then removed from above the Bunsen burner.
- 5 cm^3 of aqueous sodium metabisulfite was measured using a clean 10 cm^3 measuring cylinder and poured into the beaker. At the same time a stop-clock was started.
- The mixture was stirred until a sudden colour change was seen.
- The stop-clock was stopped and the temperature of the mixture in the beaker was measured using a thermometer.
- The beaker was rinsed with distilled water.

Experiment 3

- Experiment 2 was repeated but the aqueous potassium iodate and starch mixture was warmed until the temperature of the solution was about 40 °C.

Experiment 4

- Experiment 2 was repeated but the aqueous potassium iodate and starch mixture was warmed until the temperature of the solution was about 45 °C.

Experiment 5

- Experiment 2 was repeated but the aqueous potassium iodate and starch mixture was warmed until the temperature of the solution was about 50 °C.

Experiments are often repeated and the results compared to check that they are reliable. Suggest why this is difficult to do for these experiments

- It is difficult to get the temperatures exactly same

Suggest why the aqueous potassium iodate is warmed before the aqueous sodium metabisulfite is added rather than after it has been added.

- Otherwise the temperature would still be increasing/changing while it reacts

A polystyrene cup can be used instead of a beaker in this experiment. Explain the advantage of transferring warmed potassium iodate to a polystyrene cup rather than leaving it in the beaker.

- Polystyrene is an insulator/ prevents heat loss
- This would help to keep the temperature constant/ accurate

Suggest why it's not a good idea to put aqueous potassium iodate in a polystyrene cup before it is warmed.

Polystyrene would melt

12. **Name an item of apparatus that should be used to place a drop on chromatography paper**

    (dropping / teat) pipette / capillary tube / glass rod

13. **State when the paper should be removed from the solvent when carrying out chromatography**

    - When the solvent is near the top of the paper // almost at the top of the paper (new ms)

14.

A student investigated the temperature change when two different aqueous solutions of sodium hydroxide, solution **G** and solution **H**, reacted with dilute hydrochloric acid.

Two experiments were done.

(a) *Experiment 1*

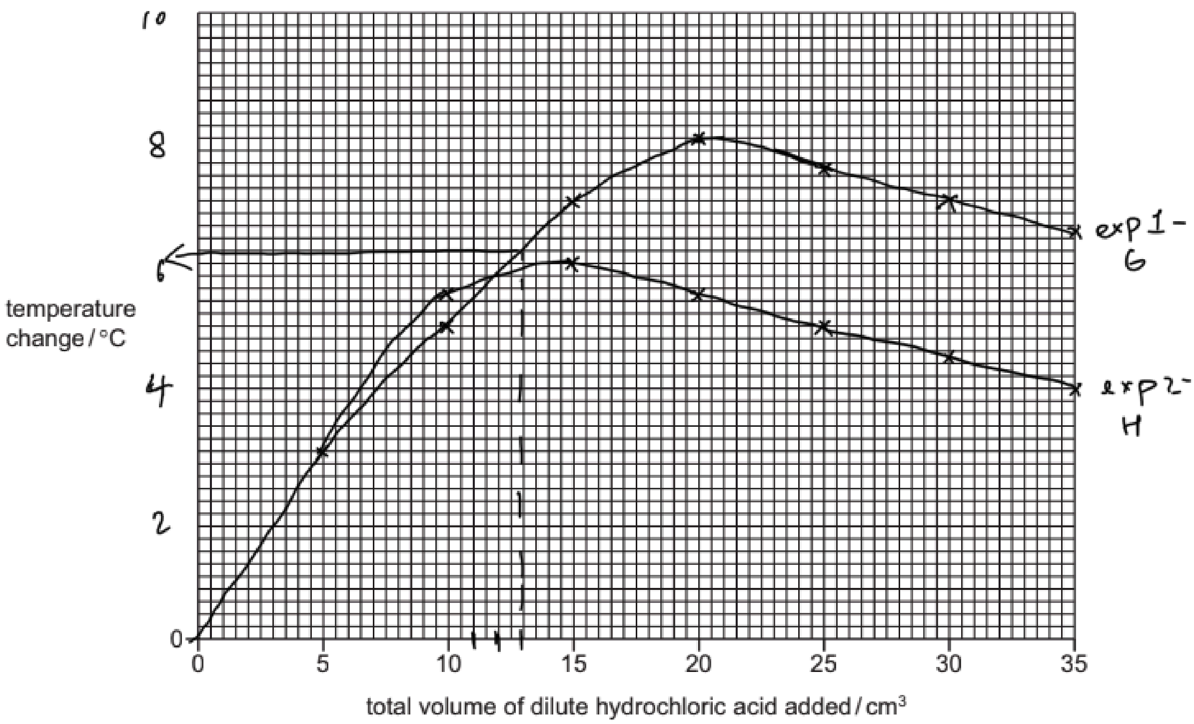
- A burette was rinsed with distilled water and then with dilute hydrochloric acid.
- The burette was filled with the dilute hydrochloric acid. The hydrochloric acid was then run out through the tap until the level was on the 0.00 cm^3 mark.
- A 50 cm^3 measuring cylinder was used to pour 20 cm^3 of solution **G** into a beaker.
- A thermometer was used to measure the initial temperature of solution **G**.
- 5 cm^3 of dilute hydrochloric acid was added from the burette into the beaker.
- The mixture in the beaker was stirred using the thermometer and the temperature of the mixture was measured.
- Another 5 cm^3 of dilute hydrochloric acid was added from the burette into the beaker.
- The mixture in the beaker was stirred using the thermometer and the temperature of the mixture was measured.
- 5 cm^3 portions of dilute hydrochloric acid continued to be added and the temperature measured until a total of 35 cm^3 of dilute hydrochloric acid had been added.

Experiment 2

- Experiment 1 was repeated using solution **H** instead of solution **G**.

(b) Complete a suitable scale on the *y*-axis and plot the results from Experiments 1 and 2 on the grid.

Draw two smooth line graphs. Both curves must start at (0,0). Clearly label your lines.



Explain why the temperature change decreases towards end of the experiment.
Reaction over // all G or H has been used up // excess HCl

Explain what conclusion about the concentrations of solution G and solution H can be made from the results.

- Solution G has a higher concentration than H
- As maximum temperature change is higher in experiment 1

NOTE: neutralisation is exothermic, so it would increase the temperature of the solution.

15. Advantage & disadvantage of using a burette

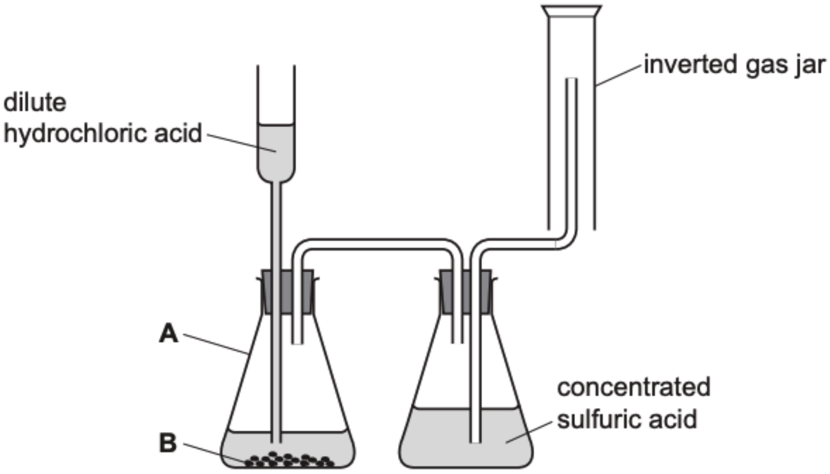
- Advantage: more accurate/ precise
- Disadvantage: takes more time/ slower

NOTE: when talking about results of cation test, along with “preceiptiate formed, doesn’t dissolve in excess or insoluble excess”, state that “the precipitate remains/does not redissolve”. If there is no reaction in any case, during a cation test, state: “no change” for the observation.

16.

Sulfur dioxide gas is toxic, denser than air and soluble in water. Sulfur dioxide gas can be made by adding dilute hydrochloric acid to solid sodium sulfite and heating the mixture. The gas made can be dried by passing it through concentrated sulfuric acid.

The diagram shows the apparatus a student used to try and collect some dry sulfur dioxide gas. There are **two** errors in the way the apparatus has been set up.



Identify 2 errors in the way the apparatus has been set up

- (tube linking flasks) should go into sulfuric acid / (tube from flask to gas jar) should not go into acid
- gas jar should not be inverted

17.

A student investigated how the solubility of sodium sulfate in water changes with temperature.

Eight experiments were done.

Experiment 1

- The mass of an empty evaporating basin was found.
- An excess of solid sodium sulfate was placed in a beaker.
- 100 cm^3 of cold water was added to the beaker.
- The mixture in the beaker was stirred and heated until it had reached a temperature of 15 °C. Some of the sodium sulfate had dissolved to form a saturated solution.
- A 25.0 cm^3 portion of the saturated solution was removed from the beaker and transferred to the evaporating basin.
- The evaporating basin was heated until no more steam could be seen and solid sodium sulfate remained in the evaporating basin.
- The mass of the evaporating basin and the solid sodium sulfate remaining was found.

Experiment 2

- Experiment 1 was repeated but the mixture in the beaker was heated to a higher temperature than in Experiment 1.

Experiment 3

- Experiment 2 was repeated but the mixture in the beaker was heated to a higher temperature than in Experiment 2.

Experiment 4

- Experiment 3 was repeated but the mixture in the beaker was heated to a higher temperature than in Experiment 3.

Experiment 5

- Experiment 4 was repeated but the mixture in the beaker was heated to a higher temperature than in Experiment 4.

Experiment 6

- Experiment 5 was repeated but the mixture in the beaker was heated to a higher temperature than in Experiment 5.

Experiment 7

- Experiment 6 was repeated but the mixture in the beaker was heated to a higher temperature than in Experiment 6.

Experiment 8

- Experiment 7 was repeated but the mixture in the beaker was heated to a higher temperature than in Experiment 7.

Suggest why it is important that excess sodium sulphate is added to water in the beaker.

To ensure a saturated solution is formed.

Suggest why the mixture was stirred as it was heated

To speed up dissolving

Suggest a way to ensure that all the water has been evaporated

- reheat and reweigh

- until mass stops changing

18. Suggest why hot water is used instead of cold water to dissolve sugar

So that the sugar dissolves faster

State why sugar solution is allowed to cool before yeast is added

fermentation occurs between 25 °C and 35 °C / enzymes denatured at high temperatures

Describe how the appearance of limewater changes as fermentation takes place.

Turns from colourless to milky

Describe how to tell that fermentation is complete.

There are no more bubbles in limewater

19. Give a chemical test for water and the expected observation if water is present.

- <u>Anhydrous</u> cobalt (II) chloride
- (changes from blue to) pink

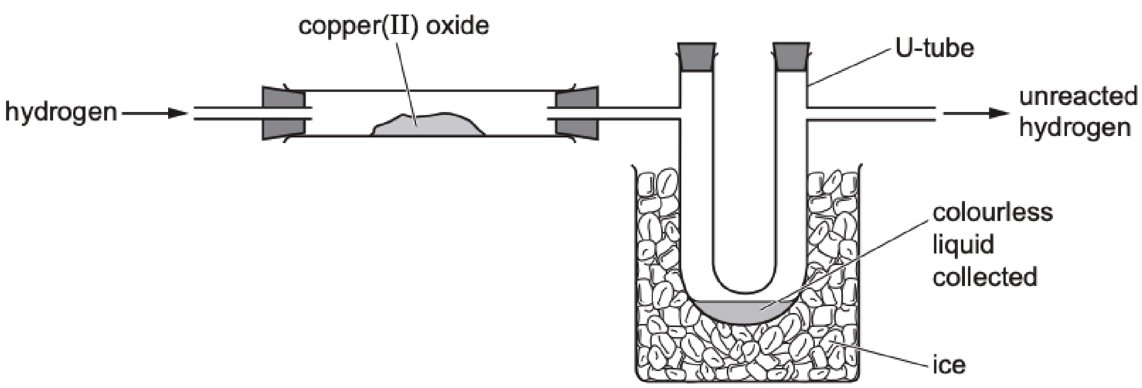
OR

- <u>anhydrous</u> copper(II) sulphate
- (changes from white to) blue

20.

Hot copper(II) oxide reacts with hydrogen. The products are copper and steam.

The apparatus used to react copper(II) oxide with hydrogen is shown.



During the reaction the colour of the copper(II) oxide changes. State the colour change.

From black to brown

Identify the colourless liquid collected.

Water

Explain why the U-tube is in ice.

- To cool
- So that steam/ gas condenses/ turns into liquid

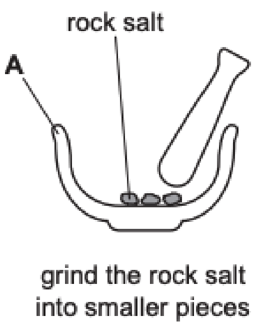
Large amounts of unreacted hydrogen should not be allowed to leave the laboratory. suggest why

flammable/ explosive

21. **A student investigated the temperature change when magnesium ribbon reacts with dilute sulfuric acid. Plot a graph of temperature change against length of magnesium ribbon. Draw a smooth line graph, making sure that your line passes through (0,0). Explain why the graph line must pass through (0,0)**

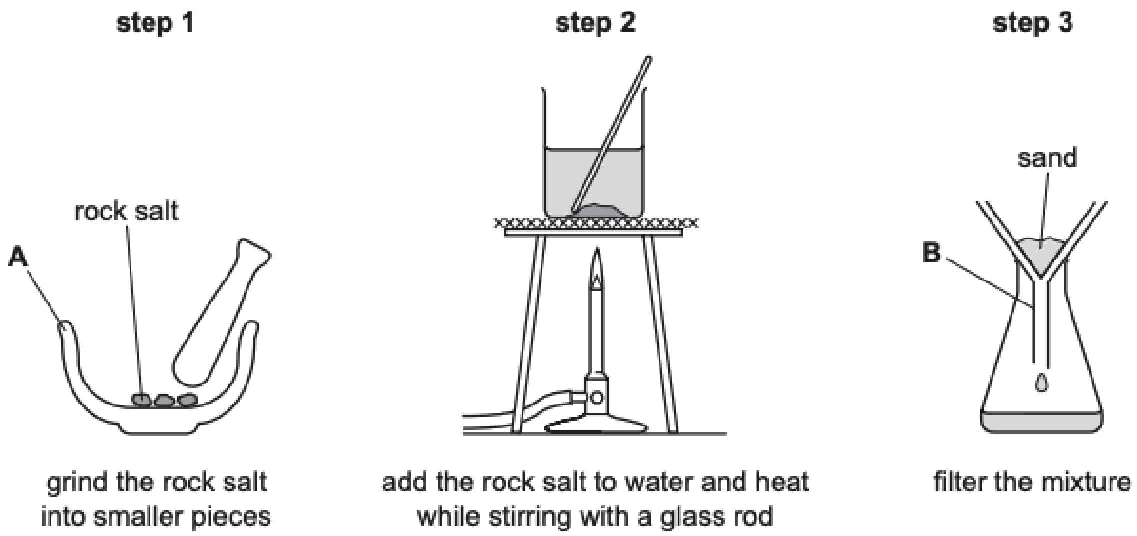
There is no reaction when no magnesium ribbon added

22. **name the apparatus labelled A**



Mortar

23.



Describe what the student must do after step 3 to obtain dry crystals of pure sodium chloride.

- Place in an evaporating basin and heat
- Until the point of crystallisation
- cool <u>and</u> filter <u>and</u> dry crystals with filter / absorbent paper

NOTE: when polystyrene cup is used, maximum temperature reached during the experiment will be higher, and vice versa when metal can is used.

24. Describe the appearance of solid potassium iodide

White

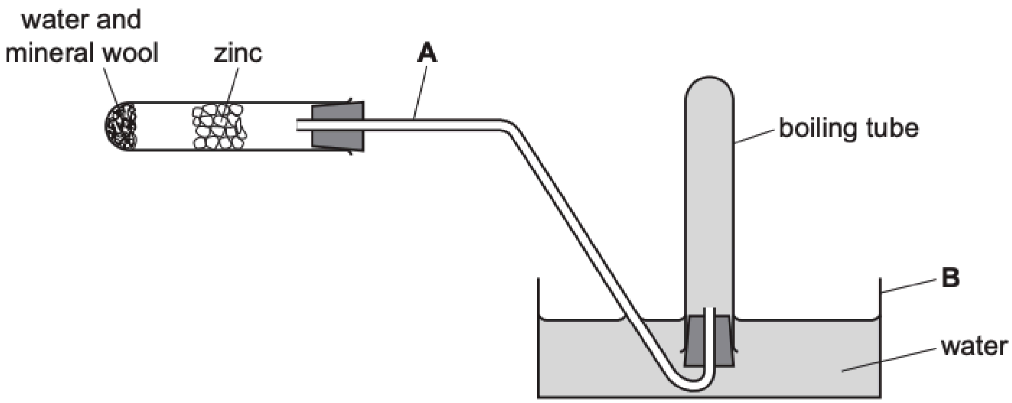
25. A few drops of aqueous bromine were added to solution of potassium iodide. State the observation

Turns brown/ orange/ yellow

26.

Hot zinc reacts with steam to make zinc oxide and hydrogen gas.

A student wanted to use the apparatus shown to react zinc with steam and to collect the hydrogen.



State the purpose of the mineral wool.

To hold/ absorb/ soak up the water

The apparatus shown is dangerous to use because of an error in the way it has been set up. Identify this error. Explain why this error makes it dangerous to use the apparatus.

<u>Error:</u> bung in (collecting) tube / the apparatus is sealed / water cannot get out of the boiling tube

<u>Explanation:</u> (pressure would increase and so the apparatus / tube would) explode / break

Add two arrows to the diagram to show the two places where the apparatus should be heated once the error in (c) has been corrected.

Arrows under the mineral wool and zinc

27. **Explain why universal indicator is not suitable for titrations**

    many colour changes / keeps changing colour / hard to determine the end point

28. **Why a pipette may not be used in a certain case**

    Pipette only measures a fixed volume

29. **Why apparatus is rinsed with distilled water**

    To remove traces of previous solution / solution A

    Why apparatus is rinsed with solution B

    To remove traces of distilled water

    Explain the effect that not rinsing the burette with solution B effects final burette reading

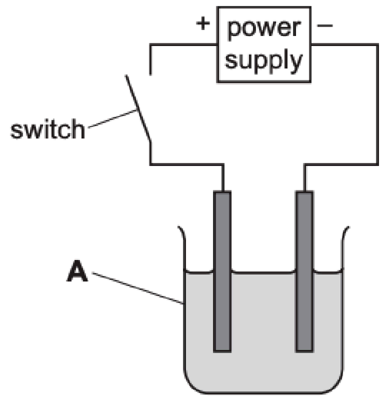
    - Final reading will be higher
    - Water dilutes solution B/ makes it less concentrated

30. **pH when universal indicator colour is orange**

    pH 4

31.

The diagram shows the apparatus used to pass an electric current through concentrated hydrochloric acid. Hydrogen and chlorine were formed at the electrodes.



The teacher doing this experiment wore safety glasses, gloves, had their hair tied back and stood up throughout the experiment. State one other safety precaution that should be taken when doing this experiment. Explain your answer.

- Precaution: use a fume cupboard
- Explanation: chlorine is toxic

32. Solid Q was zinc carbonate. Solid Q was placed in a boiling tube. About 10cm3 of dilute sulfuric acid was added to the boiling tube. Any gas produced was tested. State the observation

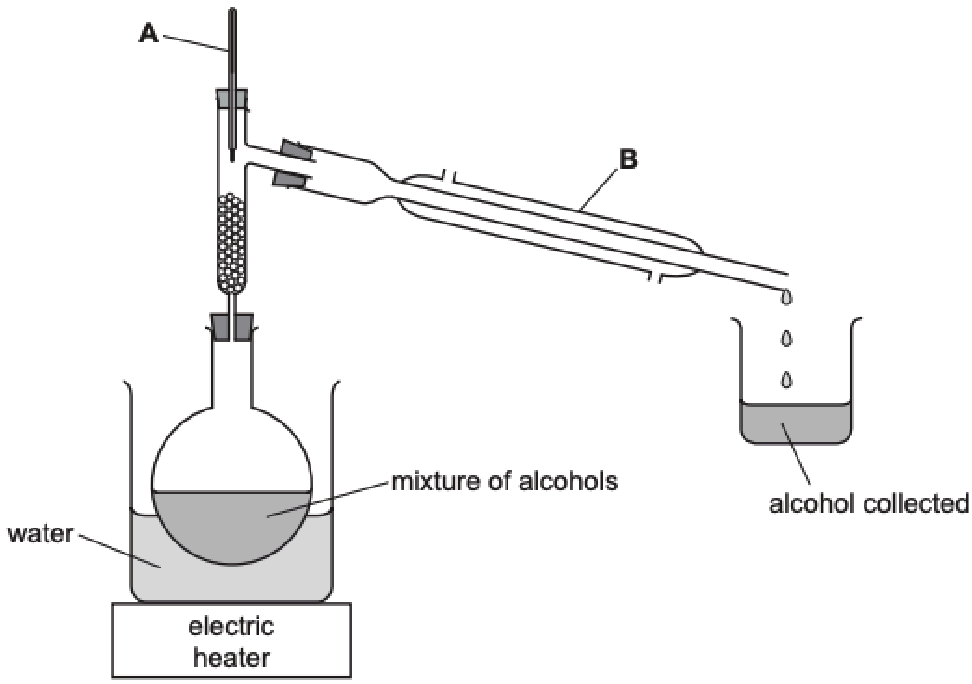
- effervescence/ fizzing/ bubbling
- Some of the solid dissolves/ disappears // colourless solution
- Limewater turns milky

33.

The table gives the boiling points of four alcohols.

alcohol	boiling point/°C
butanol	117
ethanol	79
pentanol	138
propanol	97

The apparatus shown can be used to obtain propanol from a mixture containing butanol, ethanol, pentanol and propanol.



Describe how propanol can be obtained from the mixture. Use data from the table.

- heat to remove the ethanol
- collect propanol at 97 °C

Explain why the apparatus in the diagram cannot be used to obtain butanol from the mixture.

water boils at 100 °C / water bath will not go above 100 °C OR
butanol boils at over 100 °C / butanol boils at 117 °C

34.

A student investigated the mass of lead(II) iodide precipitate formed when aqueous potassium iodide reacts with aqueous lead(II) nitrate.

The equation for the reaction is shown.

$$2KI(aq) + Pb(NO_3)_2(aq) \rightarrow PbI_2(s) + 2KNO_3(aq)$$

The student did seven experiments.

Experiment 1

- Using a 50 cm^3 measuring cylinder, 25 cm^3 of aqueous potassium iodide was poured into a beaker.
- Using a clean 50 cm^3 measuring cylinder, 10 cm^3 of aqueous lead(II) nitrate was added to the aqueous potassium iodide in the beaker. The solutions were mixed together.
- The mass of the precipitate of lead(II) iodide formed was found.

Experiment 2

- Experiment 1 was repeated using a larger volume of aqueous lead(II) nitrate than in Experiment 1.

Experiment 3

- Experiment 1 was repeated using a larger volume of aqueous lead(II) nitrate than in Experiment 2.

Experiment 4

- Experiment 1 was repeated using a larger volume of aqueous lead(II) nitrate than in Experiment 3.

Experiment 5

- Experiment 1 was repeated using a larger volume of aqueous lead(II) nitrate than in Experiment 4.

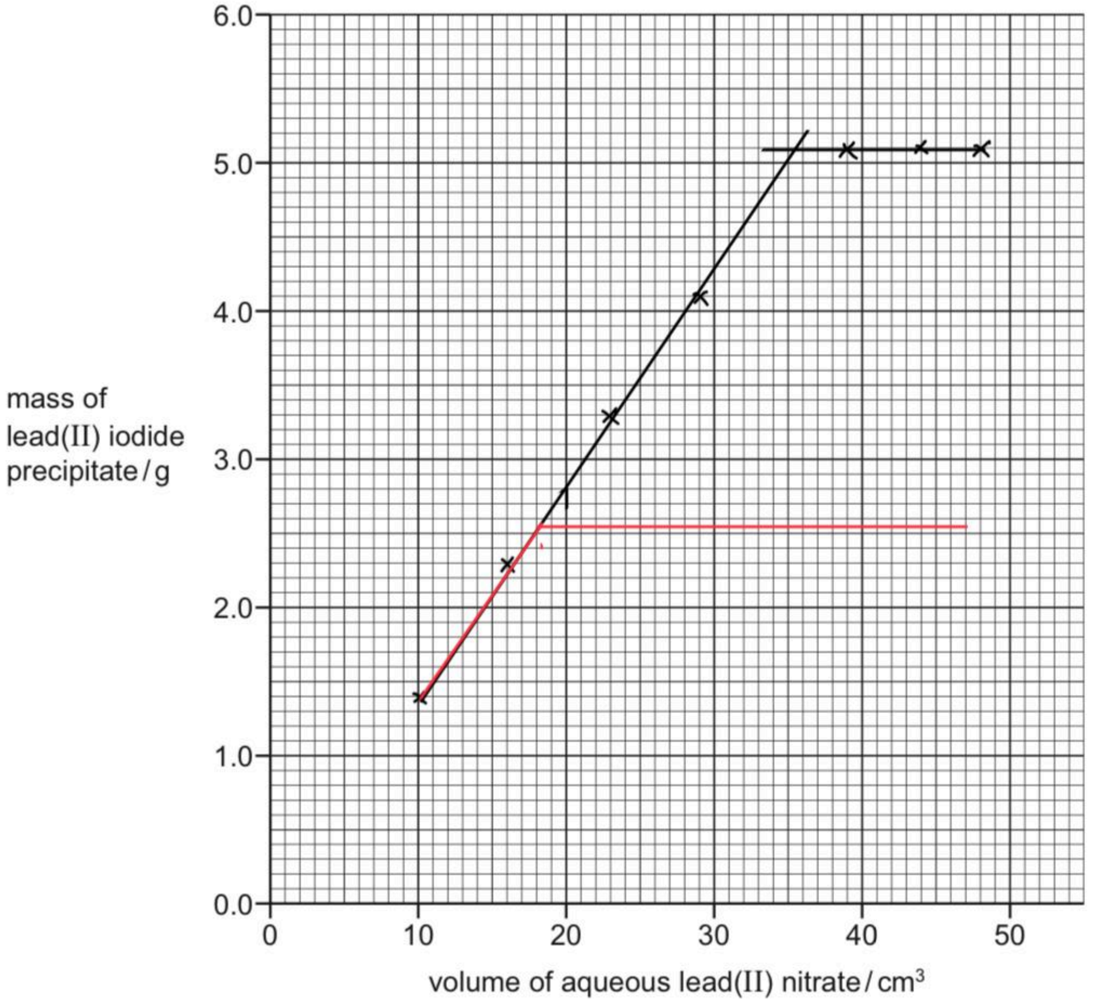
Experiment 6

- Experiment 1 was repeated using a larger volume of aqueous lead(II) nitrate than in Experiment 5.

Experiment 7

- Experiment 1 was repeated using a larger volume of aqueous lead(II) nitrate than in Experiment 6.

Plot the results from Experiments 1 to 7 on the grid. Draw two straight lines through the points. Extend your straight lines so that they meet.



Sketch on the grid the graph you would expect if all of the experiments were repeated using aqueous potassium iodide with half the concentration.

- maximum mass of precipitate is 2.55 g 1
- maximum mass reached at half volume of plotted graph

NOTE: when iron (II) sulphate is added to HCl, there is no change/ no reaction

35. Suggest how a sample of copper could be obtained from a solution of copper(II) nitrate. Explain your suggestion.

- Add magnesium / zinc / iron
- More reactive metal / displacement reaction

36. Why using a burette instead of measuring cylinder may not increase the accuracy of experiment in some cases

- Burette would add the liquid more slowly // slower addition of solution

- Measurements of time/ results would be less accurate

37. Improvement of accuracy of an experiment involving heat

- Improvement: insulation/ lid
- Explanation: to reduce heat losses

38. Aqueous sodium hydroxide and a small piece of aluminium foil were added to solid lithium nitrate. The mixture was heated and the gas produced was tested. State the observations.

- bubbles/ fizz
- Red litmus paper
- Turns blue

39.

tests on solid **Q**	observations
The appearance of solid **Q** was studied.	pink crystals
Solid **Q** was heated in a hard glass test-tube.	condensation formed at the top of the test-tube
Dilute nitric acid and aqueous silver nitrate were added to an aqueous solution of solid **Q**.	white precipitate

What conclusions can you draw about the identity of solid Q?

- Transition metal
- Chloride

40. Suggest the appearance of the product formed when magnesium ribbon is burned in air.

White ash/ powder

The product from burning the magnesium ribbon in air was added to water and heated. The solution formed was tested with Universal Indicator solution. Suggest why the product was heated after it had been added to water. Explain your answer.

- To dissolve(more solid) / makes a solution
- Increases speed / make dissolve completely

State one safety precaution that should be taken when magnesium is burned in air.

Goggles / blue glass

41. How to improve reliability of results in an experiment

Repeat <u>and</u> compare results / take average

42.

tests on solid **O**	observations
The appearance of solid **O** was studied.	white crystals
Distilled water was added to some of solid **O** to form solution **O**. Solution **O** was divided into two equal portions in two test-tubes. **test 1** An excess of aqueous sodium hydroxide was added to the first portion of solution **O**.	no reaction
test 2 Dilute nitric acid and aqueous silver nitrate were added to the second portion of solution **O**.	white precipitate
test 3 A flame test was done on the rest of solid **O**.	lilac colour

What conclusion can you draw about the identity of solid O from test 1?

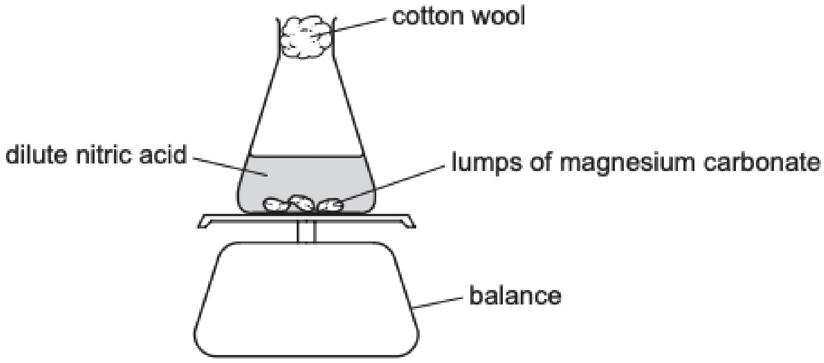
Group I cation present

43. How could the purity of the sodium chloride obtained be checked?

Melting point

44.

A student investigated the rate of reaction between dilute nitric acid and lumps of magnesium carbonate. The apparatus shown was used.



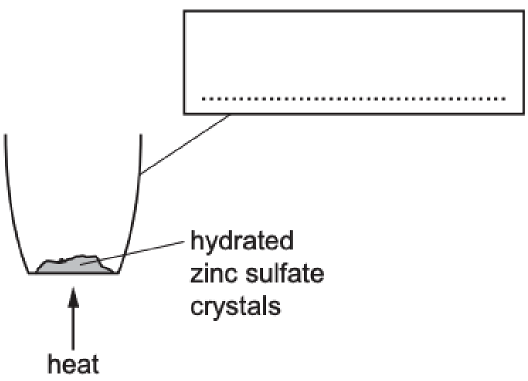
Purpose of cotton wool

- To allow gas to escape
- To prevent loss of acid

Suggest why cotton wool is placed in the neck of the flask rather than leaving the flask open.

To prevent/ trap/ stop spray of acid

45.



B

Name the apparatus used

Crucible

What position should the air hole of the Bunsen burner be in when heating the hydrated zinc sulphate crystals in B?

Open

46. In an acid-base experiment, suggest how volume of acid would differ if the experiment was repeated using 25cm3 base instead of 50cm3

- Half the volume of acid
- Because only half as many moles of base present

47. A few drops of aqueous zinc sulphate were added to a portion of solution of NaOH in a test-tube. The test-tube was shaken to mix the solutions. State the observation

- white precipitate
- clears / dissolves

An excess of aqueous zinc sulphate was added to the mixture

white precipitate

48.

tests on liquid **U**	observations
The appearance of liquid **U** was studied.	colourless, pleasant smelling
A few drops of liquid **U** were placed on to a watch glass. The surface of the liquid was touched with a lighted splint.	burned with a blue flame

What conclusion can be drawn about liquid U?

organic/ fuel/ flammable

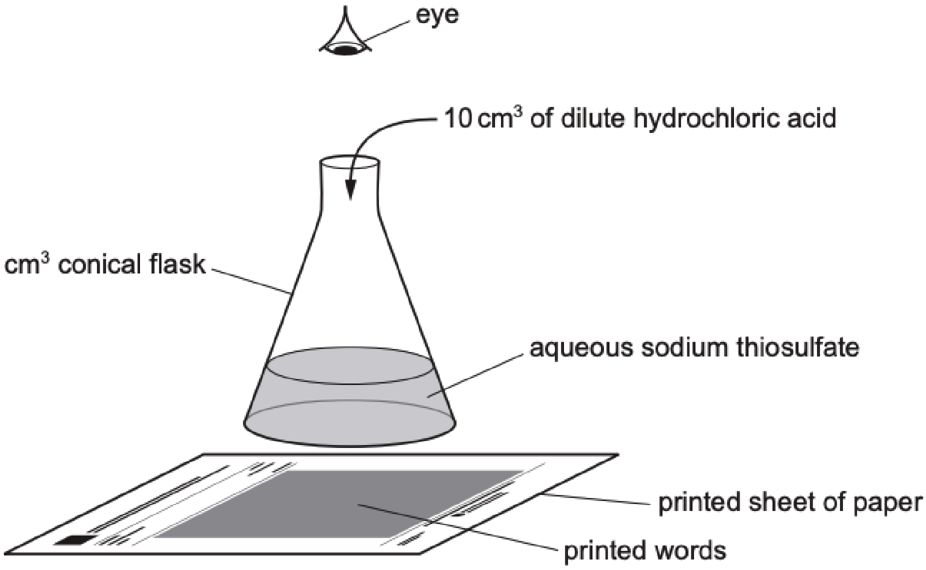
49. Suggest temperature of solution if left for 2 hours

- (specified room temperature)
- Because heat is lost to the surroundings

50.

A student investigated the rate of reaction between dilute hydrochloric acid and aqueous sodium thiosulfate. When these chemicals react they form a precipitate which makes the solution go cloudy. The formation of this precipitate can be used to show how fast the reaction proceeds.

Five experiments were done using the apparatus shown.



Time taken for the words to disappear is measured.

Suggest the effect on the results of using a 100cm3 conical flask instead of a 250cm3 conical flask. Explain your answer.

- times would be shorter
- depth of solution is greater

Sketch on the grid the graph you would expect if all of the experiments were repeated at a lower temperature. Clearly label your graph.

sketch curve roughly same shape and above original

51.

A student investigated the reaction between dilute hydrochloric acid and an aqueous solution of sodium carbonate labelled solution **L**.

Three experiments were done.

Experiment 1

- A measuring cylinder was used to pour 25 cm^3 of solution **L** into a conical flask.
- Ten drops of thymolphthalein indicator were added to the conical flask.
- A burette was filled up to the 0.0 cm^3 mark with dilute hydrochloric acid.
- Dilute hydrochloric acid was added from the burette to the conical flask until the solution just changed to colourless at the end-point of the titration.

	Experiment 1
final burette reading / cm^3	11.6
initial burette reading / cm^3	0.0
difference / cm^3	11.6

Experiment 2

- Ten drops of methyl orange indicator were added to the solution in the conical flask from Experiment 1.
- Dilute hydrochloric acid was added from the burette to the conical flask until the solution just changed colour.

	Experiment 2
final burette reading / cm^3	23.6
initial burette reading / cm^3	12.0
difference / cm^3	11.6

Experiment 3

- The conical flask was emptied and rinsed with distilled water.
- Experiment 1 was repeated using methyl orange indicator instead of thymolphthalein indicator and adding dilute hydrochloric acid from the burette to the conical flask until the solution just changed colour.

	Experiment 3
final burette reading / cm^3	24.1
initial burette reading / cm^3	0.9
difference / cm^3	23.2

What would be the effect on the results if solution L were warmed before adding the dilute hydrochloric acid? Give a reason for your answer.

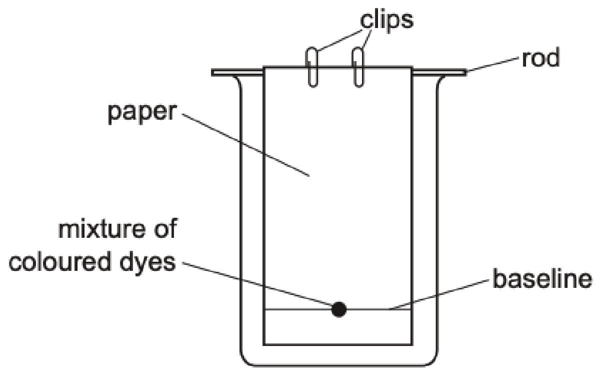
- Effect: no effect
- Explanation: no change in concentration of the reactants

Suggest why the volumes of dilute hydrochloric acid used in Experiments 1 and 3 are different.

Different indicator used

52.

A student used paper chromatography to separate a mixture of coloured dyes. The diagram shows the apparatus used.



Suggest a suitable solvent that could be used.

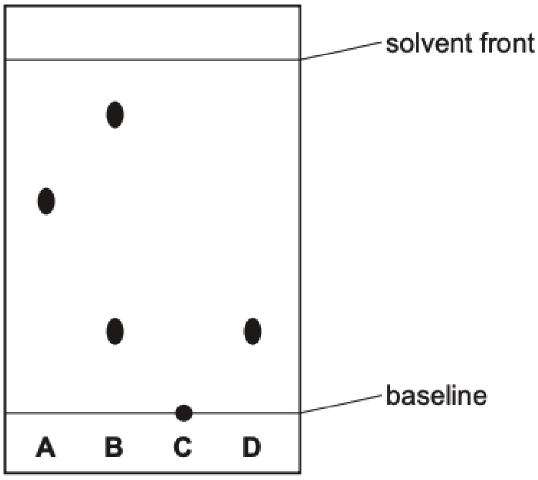
Water

The clips hold the paper in position. Why is this important for the chromatography experiment?

So that the mixture of dyes is always above the level of solvent/ not in contact/does not run/dissolve in solvent

53.

The diagram shows the chromatogram obtained from four dyes, **A**, **B**, **C** and **D**.



Give 2 conclusions that can be drawn from dye B

- It contains 2 substances
- It contains D

Suggest why dye C remained on the baseline

Insoluble

NOTE: for diagram of filtration, draw a filter funnel lined with filter paper

54. Conclusion about solid if there is no change observed when dil. HNO3 and Aq. AgNO3 are added to it

It is not a halide/ does not contain chloride, bromide or iodide ions (newer ms)

55.

tests	observations
test 1 Gently heat half of solid **E** in a boiling tube.	a solution forms, steam is given off and condensation forms at the top of the tube
test 2 Dissolve the remaining solid **E** in water to form solution **E**. Divide solution **E** into three portions. To the first portion of solution **E**, add aqueous sodium hydroxide dropwise and then in excess.	a brown precipitate forms which remains when excess is added
test 3 Warm the product of **test 2** and test any gas produced.	the gas turns red litmus paper blue
test 4 To the second portion of solution **E**, add 1 cm depth of dilute nitric acid followed by a few drops of aqueous silver nitrate.	no change
test 5 To the third portion of solution **E**, add 1 cm depth of dilute nitric acid followed by a few drops of aqueous barium nitrate.	white precipitate

Identify the 3 ions in solid E

- ammonium / NH4+
- iron(III) / Fe3+
- sulfate / SO42-

56. Name the method of separation that can be used to obtain solid sodium chloride from an aqueous solution of sodium chloride.

crystallisation (of sodium chloride) / evaporation (of water)

57.

A student investigates the temperature change when solid citric acid reacts with solid sodium carbonate.

The student does six experiments.

(a) Experiment 1

- Place 5.0 g of solid sodium carbonate in a 100 cm^3 beaker.
- Use a thermometer to stir the solid sodium carbonate for 30 seconds. Measure the temperature of the solid sodium carbonate.

Experiment 2

- Add 1.0 g of solid citric acid to the solid sodium carbonate in the beaker from Experiment 1.
- Use the thermometer to stir the mixture for 30 seconds. Measure the temperature of the mixture.
- Rinse the beaker and thermometer with water.

Experiment 3

- Place 5.0 g of solid sodium carbonate in the 100 cm^3 beaker.
- Add 2.0 g of solid citric acid to the solid sodium carbonate in the beaker.
- Use the thermometer to stir the mixture for 30 seconds. Measure the temperature of the mixture.
- Rinse the beaker and thermometer with water.

Experiment 4

- Repeat Experiment 3, using 4.0 g of solid citric acid instead of 2.0 g.

Experiment 5

- Repeat Experiment 4, using 5.0 g of solid citric acid instead of 4.0 g.

Experiment 6

- Repeat Experiment 5, using 6.0 g of solid citric acid instead of 5.0 g.

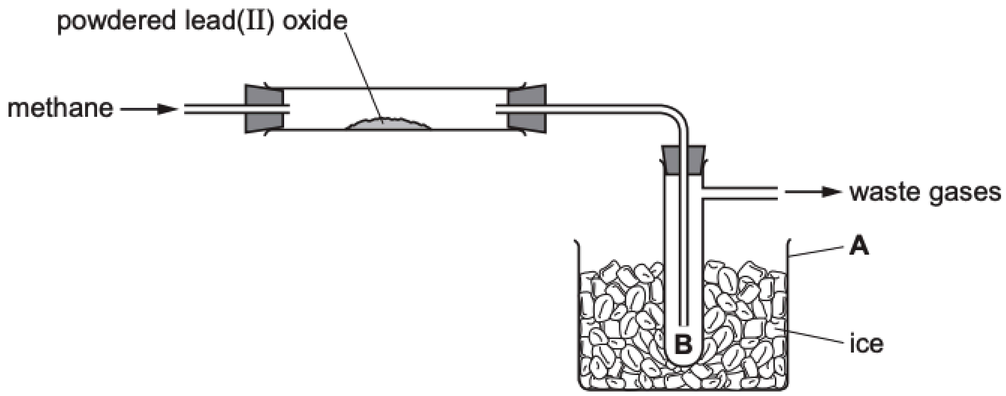
Suggest why the solid sodium carbonate and solid citric acid are stirred before the temperature is measured.

- so that the sodium carbonate and citric acid mix together
- so they react
- so the temperature is the same throughout the mixture

Explain why using a polystyrene cup in place of the glass beaker would increase the accuracy of the results.

- Provides insulation/ prevents heat losses
- Reduces heat being gained from the surroundings / keeps temperature lower / stops temperature going up // stops temperature going up / reduces increase in temperature (after reaction has ended)

58.



Identify apparatus labelled A

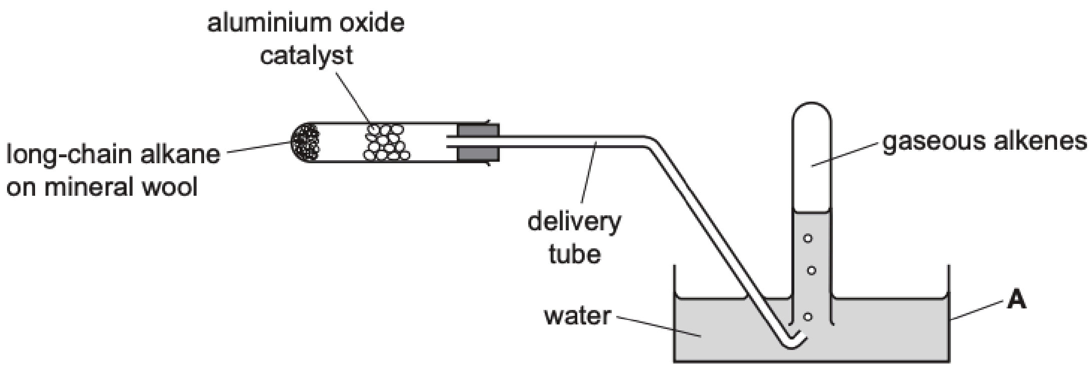
Beaker

59. Describe how to do flame test

- Use of wire/ splint to get the substance into flame
- Putting sample INTO flame <u>and</u> Bunsen flame is roaring/ blue/ non-luminous/ hot

60.

Long-chain alkanes can be broken down into shorter chain alkanes and gaseous alkenes. Vapour from a long-chain alkane is passed over a very hot catalyst and the gases formed are collected over water. The apparatus used is shown in Fig. 1.1.



The gas collected is tested using aqueous bromine. Alkenes turn aqueous bromine from orange to colourless. When the first few bubbles of gas collected are tested, the aqueous bromine does not change colour. Explain why.

The first few bubbles are air.

As soon as the experiment is over and the heating is stopped, the delivery tube must be removed from the water. Explain what happens if the delivery tube is not removed from the water as soon as heating is stopped.

- Suck back/ water goes into the tube
- test-tube/ boiling tube breaks/ cracks

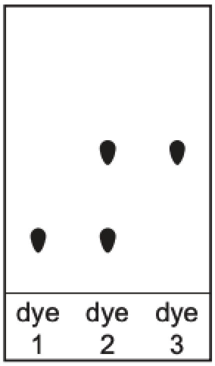
61. Explain disadvantages of adding water in 1.0cm3 potions rather than 0.5cm3 portions

- fewer points / less data / fewer results
- poor(er) graph

62. Advantage of using a burette rather than a volumetric pipette

Burette can measure variable volumes // volumetric pipette can only measure fixed volume

63. Results of a chromatography experiment:

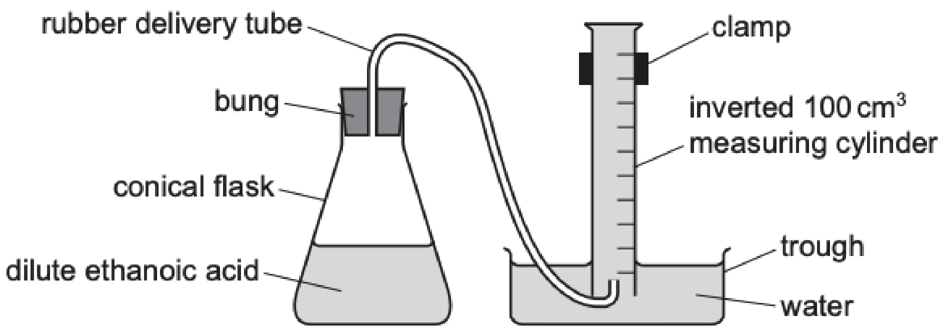


Conclusions that can be made

- dye 1 and dye 3 are pure substances / contain only 1 colour / substance
- dye 2 contains dye 1 and dye 3
- all of the dyes were soluble

64.

Copper(II) carbonate reacts with dilute acids to make carbon dioxide gas.
Malachite is a mineral that contains copper(II) carbonate.
A student investigates the rate of reaction between powdered malachite and dilute ethanoic acid at different temperatures. The student does six experiments.



The time taken to collect 100cm3 of gas is measured

Most of the gas collected in the measuring cylinder is air rather than carbon dioxide. Explain why air is collected in the measuring cylinder.
displaced / pushed out of flask by carbon dioxide

Explain why this doesn't affect accuracy of results
the volume of air displaced is the same as the volume of carbon dioxide

During each experiment, the temperature of the acid slowly decreases. Give reason why this happens and suggest a change to the apparatus to minimise the temperature decrease.

- Reason: heat lost (to surroundings) / glass / flask is not a good insulator / glass / flask conducts / absorbs heat
- Change: insulate (the flask) // place in water bath (kept at the starting temperature of the acid)

65. **Explain why it is important that a particular reactant is in excess**
    To ensure that all of the other reactant reacts

66. **Residue of silicon(IV) oxide is washed. Describe 2 additional steps required to find the percentage of silicon(IV) oxide in substance.**
    - Dry
    - Determine the mass

67. **Explain how temperature recorded would differ if polystyrene cup is used in place of boiling tube**
    - temperature: higher / greater / bigger
    - explanation: polystyrene is a better insulator than glass

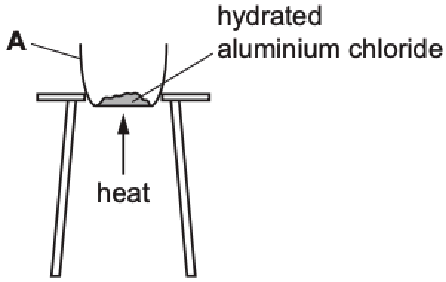
68. **Explain why volumetric pipette cannot be used in place of burette in a scenario**
    (volumetric) pipettes not available in those sizes / (volumetric) pipettes do not measure variable volumes

69. **Describe how Bunsen burner is adjusted to make flame as hot as possible**
    air hole (fully) open

70.

Hydrated aluminium chloride is a white solid. When heated very strongly, hydrated aluminium chloride produces steam, hydrogen chloride gas and aluminium oxide. Hydrogen chloride gas is toxic and aluminium oxide is a white solid.

A teacher heats a sample of hydrated aluminium chloride using the apparatus shown in Fig. 1.1.



Explain why mass of apparatus A and its contents decreases during experiment

steam / water (of crystallisation) / hydrogen chloride / gases

<u>and</u>

leave / escape / released / given off / lost

71. Describe a test to show that water is not pure

- Test: (measure) boiling point / freezing point
- Result: not 100°C / not 0°C

72.

A student investigates the reaction between dilute hydrochloric acid and aqueous sodium hydroxide.

The student does two experiments.

Experiment 1

- Fill a burette with aqueous sodium hydroxide and run some of the aqueous sodium hydroxide out of the burette so that the level is on the burette scale.
- Record the initial burette reading.
- Use a measuring cylinder to pour 25 cm^3 of dilute hydrochloric acid into a conical flask.
- Stand the conical flask on a white tile.
- Add five drops of methyl orange indicator to the conical flask.
- Slowly add aqueous sodium hydroxide from the burette to the conical flask, while swirling the flask, until the solution just changes colour.
- Record the final burette reading.

Experiment 2

- Empty the conical flask and rinse it with distilled water.
- Refill the burette with aqueous sodium hydroxide.
- Record the initial burette reading.
- Use the measuring cylinder to pour 25 cm^3 of dilute hydrochloric acid into the conical flask.
- Add 0.50 g of calcium carbonate powder to the conical flask and swirl the flask.
- Stand the conical flask on the white tile.
- Add five drops of methyl orange indicator to the conical flask.
- Slowly add aqueous sodium hydroxide from the burette to the conical flask, while swirling the flask, until the solution just changes colour.
- Record the final burette reading.

The conical flask is rinsed with water after experiment 1. It is not dried after being rinsed with water. State how drying the conical flask affects volume of aq. NaOH needed to reach the end-point. Explain your answer.

- no change
- water does not change amount of acid / acid is measured with measuring cylinder

Explain why different volumes of aqueous sodium hydroxide are needed in Experiment 1 and Experiment 2.

the calcium carbonate reacts with / neutralises (some of) the acid (so there is less acid left)

NOTE: remember to state unit!

Investigations

1. <u>**Order of reactivity of metals that react with acid to form gas**</u>

MP1 React metals with (named) acid in suitable container (beaker / flask / test-tube)

MP2,MP3,MP4 <u>Fair test</u>

- same / specified / stated / known volume of acid

- some / known / stated concentration of acid
- same / known / stated / measured (start) temperature of acid
- same / stated / specified mass or moles of metal

MP5 Measurement (any of the following)
- time until all solid gone
- time until set volume of gas collected
- measure volume of gas after a set time
- measure temperature after reaction over / after a fixed time / highest temperature

MP6 conclusion (any of the following)
- shortest time is most reactive
- largest volume of gas in set time is most reactive
- largest temperature / highest temperature change is most reactive

2. **Acid-base reactions**

Titration: To find which solution contains the most concentrated alkali
- **MP1** stated / known / equal volumes of each solution
- **MP2** measured with appropriate (named) apparatus (pipette / measuring cylinder / burette) into a beaker or flask
- **MP3** (named) indicator added
- **MP4** add (named) acid to solution in flask from a burette
- **MP5** until indicator changes colour; correct end-point colour for indicator stated
- **MP6** recorded / measured start and end reading on burette; calculate volume acid added
- **MP7** biggest volume of acid used has most concentrated alkali

To find concentration of an alkali
- **MP1** (named) acid in burette
- **MP2** known / stated volume of alkali in named container (beaker / flask)
- **MP3** (named) indicator added to flask
- **MP4** add (named) acid to solution in flask from a burette, gradually/ dropwise
- **MP5** until indicator changes colour; correct end-point colour for indicator stated
- **MP6** recorded / measured start and end reading on burette; calculate volume acid added
- **MP7** calculation using volumes and concentration of the acid

<u>To find which substance contains greatest percentage of a carbonate (reacts with acid to form carbon dioxide)</u>

- **MP1** known / stated / equal masses of substances
- **MP2** place in suitable container (flask / boiling tube / test-tube)
- **MP3** add acid
- **MP4** to excess / until no more fizzing
- **MP5** collect gas
- **MP6** in gas syringe or by downward displacement in measuring cylinder
- **MP7** measure volume of gas
- **MP8** largest volume of gas has most carbonate

3. **<u>Salt preparation</u>**

Insoluble base and acid to form soluble salt

- **MP1** add (insoluble base) to (acid) in a suitable container
- **MP2** (insoluble base) is in excess
- **MP3** the mixture is stirred / mixed
- **MP4** the acid / mixture is heated/warmed
- **MP5** filter to remove (insoluble base)
- **MP6** heat filtrate / solution / leave to evaporate (<u>reject</u> heat to dryness)
- **MP7** filter out crystals / description of drying crystals

4. **<u>Rate of reaction</u>**

Between magnesium ribbon and dilute sulfuric acid

- **MP1** Mg added to sulfuric acid
- **MP2** In a suitable container with ability to have a bung
- **MP3** methods of measuring gas volume (gas syringe, downward displacement of water using a measuring cylinder)
- **MP4** Start timer / timing (when added together)
- **MP5** measure volume of gas
- **MP6** at set time / at end of experiment / at (regular) known intervals
- **MP7** rate = volume ÷ time

Effect of temperature on the rate of decomposition of aqueous hydrogen peroxide by manganese (IV) oxide catalyst. hydrogen peroxide → water + oxygen.

- **MP1** known / stated volume of hydrogen peroxide
- **MP2** add known / stated mass of catalyst
- **MP3** reaction done in a suitable container (test-tube / boiling tube / flask)
- **MP4** collect gas made in suitable graduated container
- **MP5** measure volume after set time
- **MP6** repeat at higher / different temperature(s)

- **MP7** higher volume (in set time) is faster rate

5. <u>Percentage mass of substance</u>

   Percentage mass of silica in toothpaste, where all other substances react with acid.

   - **MP1** weigh / known mass of toothpaste
   - **MP2** add (named) acid
   - **MP3** excess acid / until no more fizzing
   - **MP4** filter
   - **MP5** wash and dry residue / silica
   - **MP6** weigh residue / silica
   - **MP7** percentage mass = (mass silica / initial mass) × 100(%)

6. <u>Solubility</u>

   Of solid substance in water at different temperatures

   - **MP1** known / stated volume of water
   - **MP2** add known / stated mass of solid in excess
   - **MP3** water and solute combined in a suitable (named) container (test-tube / boiling tube / beaker / flask / polystyrene cup)
   - **MP4** stir / mix / shake
   - **MP5** filter
   - **MP6** dry <u>and</u> weigh residue (ignore washing)
   - **MP7** repeat at other temperature(s)
   - **MP8** mass dissolved = initial mass – final mass // smallest mass of residue means greatest solubility at that temperature

   Of solid substance in different solvents (ethanol & water)

   - **MP1** known / stated volume of water and ethanol
   - **MP2** add known / stated mass of solid in excess
   - **MP3** water and solute combined in a suitable (named) container (test-tube / boiling **tube** / beaker / flask / polystyrene cup)
   - **MP4** stir / mix / shake
   - **MP5** filter
   - **MP6** dry and weigh residue (ignore washing)
   - **MP7** method repeated for both ethanol and water
   - **MP8** mass dissolved = initial mass – final mass // smallest mass of residue means solvent in which it is most soluble

7. <u>Capacity of substance to absorb water - which substance can absorb most water</u>

   - **MP1** known / stated mass of substance
   - **MP2** add excess water

- **MP3** stir / mix with water
- **MP4** filter to obtain solid substance/ excess water
- **MP6** weight solid/ residue
- **MP7** mass of water absorbed = final mass - initial mass

8. **Obtaining pure samples of substances**

Example 1:

name of compound	solubility in water	solubility in propanone
copper(II) sulfate	soluble	insoluble
cetyl alcohol	insoluble	soluble
silicon dioxide	insoluble	insoluble

- **MP1** add water (to dissolve copper sulfate) and later add propanone (to dissolve cetyl alcohol)
- **MP2** stir / swirl / mix
- **MP3** filter (to remove silicon dioxide and cetyl alcohol)
- **MP4** evaporate solvent from filtrate or description. This must be done for the solutions obtained using both solvents.
- **MP5** filter and wash / rinse residue after adding the second solvent
- **MP6** dry residue (silicon dioxide)

Example 2:

substance	state at room temperature	physical property
sodium carbonate	solid	melts at 858 °C
ethanol	liquid	boils at 78 °C
limonene	liquid	boils at 176 °C

- **MP1** filter (to obtain sodium carbonate)
- **MP2** heat the filtrate
- **MP3** using a Bunsen / electric heater / oil bath
- **MP4** in a suitable container (flask / boiling tube / test-tube)
- **MP5** ethanol boils / evaporates first / at 78 °C
- **MP6** limonene boils next / at 176 °C (and collects / condenses) / is the residue
- **MP7** use of the term (fractional) distillation
- **MP8** use of a condenser

9. **Exothermic vs. endothermic reaction**

2 solids react with acid. Determine which reaction is exothermic & which is endothermic. Determine which energy change is greater.

- **MP1** Measured volume of (named) acid
- **MP2** Use of suitable container (e.g. test tube / beaker / flask / plastic cup)
- **MP3** Initial temperature of acid
- **MP4** Add known mass of first solid
- **MP5** Final temperature of mixture / Calculate temperature change
- **MP6** Repeat with same mass / moles of next solid
- **MP7** Bigger temperature change is bigger energy change
- **MP8** Temperature increase is exothermic / temperature decrease is endothermic process

10. <u>**Functions of chemicals**</u>

Example 1: Extract coloured substances from leaves and test to see if they work as pH indicator

- **MP1** crush / grind leaves
- **MP2** using pestle & mortar
- **MP3** add ethanol to ground up leaves and stir/ mix
- **MP4** filter and split sample into two
- **MP6** add (named) acid to one portion
- **MP7** add (named) alkali to second portion
- **MP8** samples colour will change/ look for colour change

Example 2: Determine which two solvents is better to use to remove paint.

- **MP1** Coat/paint glass slide(or any suitable inert material)
- **MP2** With same amount / thickness of paint
- **MP3** (leave to) dry
- **MP4** Add controlled amount / drops of first solvent
- **MP5** Until paint / coating removed
- **MP6** Count drops / measure volume
- **MP7** Repeat with next solvent
- **MP8** Comparison / conclusion

11. <u>**Chromatography**</u>

To extract and separate coloured pigment in leaves.

- **MP1** cut leaves into small pieces
- **MP2** grind / crush with sand / ethanol
- **MP3** using pestle/mortar
- **MP4** decant / pour-off / filter liquid
- **MP5** chromatography

- **MP6** apply extract to paper (in correct location)
- **MP7** description of separating colours