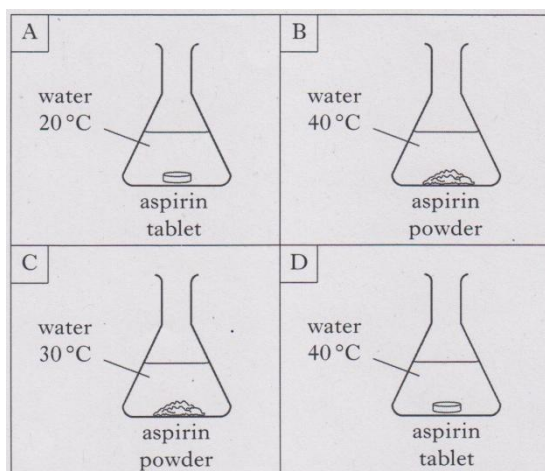
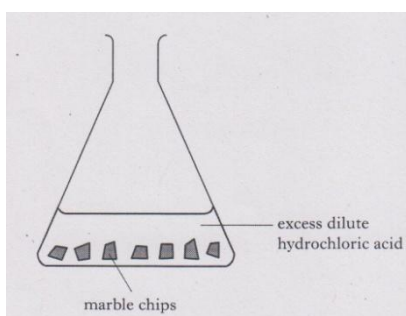


## Reaction Rates

1. A student set up four experiments to investigate the solubility of aspirin.



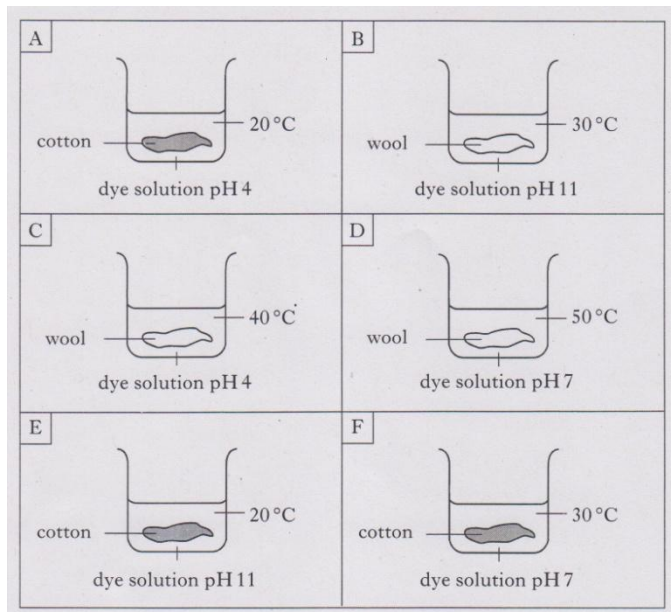
- (a) Identify the experiment in which the aspirin would take the longest time to dissolve.
- (b) Identify the **two** experiments which would be compared to show the effect of particle size on the speed of dissolving.
2. A student investigated the reaction between marble chips and excess dilute hydrochloric acid.



Which of the following will **not** increase the rate of this reaction?

- A. Increasing the volume of the acid
- B. Decreasing the size of the marble chips
- C. Decreasing the concentration of the acid
- D. Increasing the temperature of the acid.

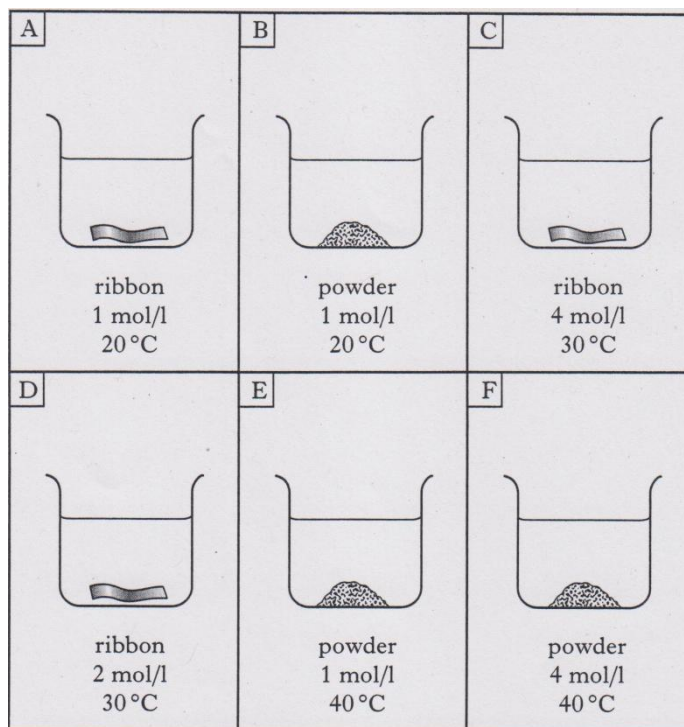
3. A teacher set up some experiments to investigate the dyeing of cloth.



(a) Identify the **two** experiments carried out under neutral conditions.

(b) Identify the **two** experiments which could be compared to show the effect of pH on the dyeing of cloth.

4. A student investigated the reaction between magnesium and dilute acid.



a) Identify the **two** experiments which could be compared to show the effect of concentration on the speed of reaction.

b) Identify the experiment with the fastest speed of reaction.

5. Which of the following pair which would produce hydrogen most slowly?

- A. Magnesium powder with 4 mol<sup>-1</sup> acid
- B. Magnesium ribbon with 2 mol<sup>-1</sup> acid
- C. Magnesium powder with 2 mol<sup>-1</sup> acid
- D. Magnesium ribbon with 4 mol<sup>-1</sup> acid

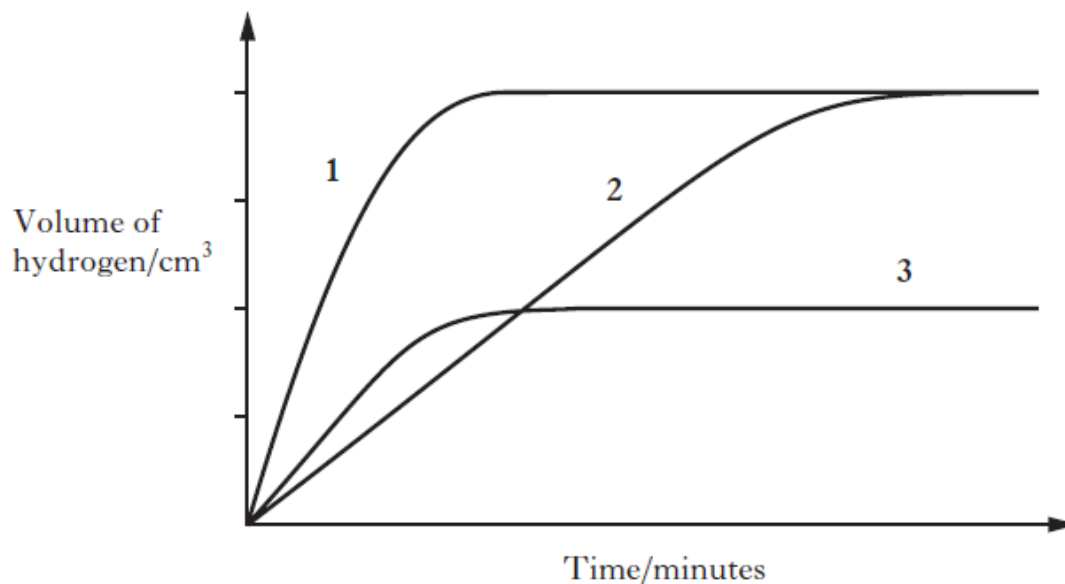
6. Several experiments were carried out using the same mass of manganese dioxide and the same volume of hydrogen peroxide solution.

	Concentration of hydrogen peroxide solution (mol/l)	Temperature /°C	Form of manganese dioxide
A	0.5	20	powder
B	1.0	30	lump
C	1.5	20	lump
D	1.5	30	powder
E	0.5	20	lump
F	2.0	20	powder

- (a) Identify the **two** experiments which should be compared to show the effect of particle size on the speed of reaction.
- (b) Identify the experiment with the slowest speed of reaction.

7. A student carried out some experiments between zinc and excess  $1 \text{ mol l}^{-1}$  hydrochloric acid.

The graph shows the results of each experiment.



- (a) In which experiment did the reaction take longest to finish, 1, 2 or 3?
- (b) In all three experiments she kept the temperature the same and used the same volume of  $1 \text{ mol l}^{-1}$  hydrochloric acid.

Suggest one factor that could have been changed from experiment 1 to produce the results in experiment 2.

## Atomic Structure and Bonding

1. The names of some elements are shown.

A		B		C	
	Zinc		Sodium		Potassium
D		E		F	
	Magnesium		Calcium		Copper

- (c) Identify the element with the symbol K
- (d) Identify the element with the symbol Cu
- (e) Identify the element discovered in 1775
- (f) Identify the element discovered in 1807
- (g) Identify the element in the same group as magnesium

2. The names of some elements are shown.

A		B		C	
	Lithium		Sodium		Nickel
D		E		F	
	Argon		Calcium		Chlorine

- (c) Identify the alkali metal(s).
- (d) Identify the transition metal element.
- (e) Identify the noble gas.
- (f) Identify the halogen.

3. The names of some elements are shown.

A	Neon	B	Curium	C	Oxygen
D	Magnesium	E	Fluorine	F	Chlorine

- Identify the un-reactive element.
- Identify the element made by scientists.
- Identify the noble gas.
- Identify the two elements with similar chemical properties.

4. The names of some elements are shown.

A	Helium	B	Iron	C	Oxygen
D	Magnesium	E	Nitrogen	F	Zinc

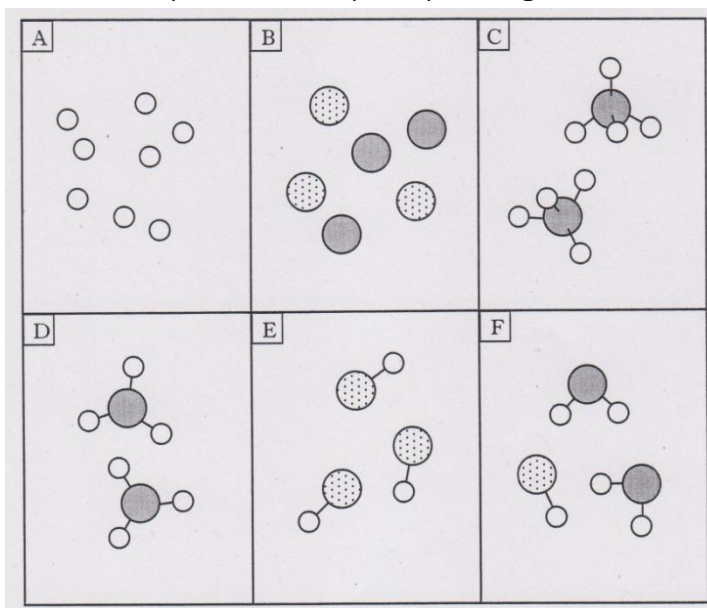
- Identify the element with the highest melting point.
- Identify the element that makes up approximately 80% of air.
- Identify the two elements that exist as diatomic molecules.
- Identify the two metal elements in the same row of the periodic table.

5. The diagram shows parts of the Periodic Table.  
The letters do not represent the symbols for the elements.

GROUP	1	2	3	4	5	6	7	0
					A		B	
		C						
				D				
								E
		F						

- Identify the element that has the electron arrangement 2,5
- Identify the two elements with similar chemical properties.
- Identify the noble gas.

6. Many substances can be represented by simple diagrams.



- Identify the diagram that could represent an element.
- Identify the diagram which contains only diatomic molecules.
- Identify the two diagrams that do not contain molecules.

7. The grid shows the names of some substances.

A	Argon	B	Crude Oil	C	Sodium
D	Air	E	Carbon	F	Zinc

- (a) Identify the two non-metal elements.  
 (b) Identify the two mixtures.

8. There are many compounds of potassium.

A	Potassium Sulphate	B	Potassium Chloride
C	Potassium Sulphite	D	Potassium Nitrate

Identify the compound which does not contain oxygen.

9. A student made the following statements about the particles found in an atom.

A	Relative mass = 1
B	Charge = zero
C	Found outside the nucleus
D	Charge = 1+
E	Charge = 1-

Identify the two statements which apply to both a proton and a neutron.

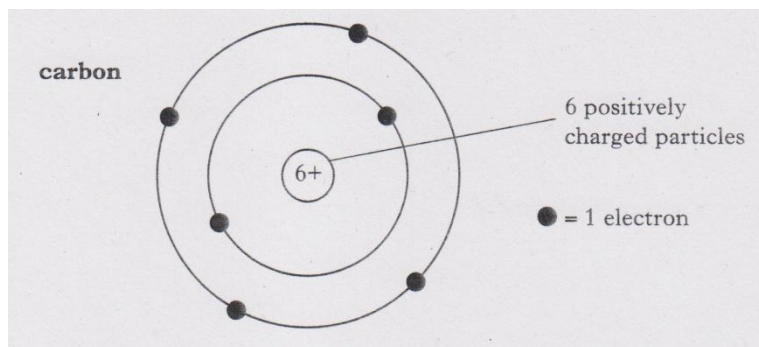


10. Atoms are made up of protons, neutrons and electrons.

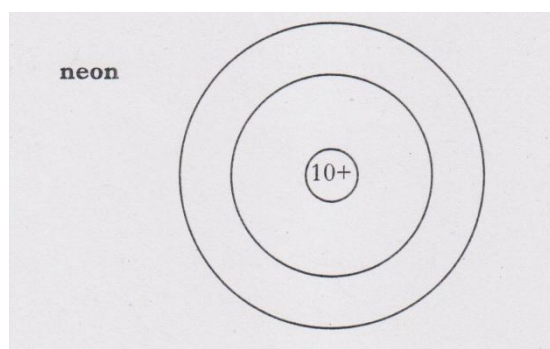
A	The number of protons
B	The number of neutrons
C	The number of electrons
D	The number of outer electrons
E	The number of protons plus neutrons

- (a) Identify two numbers that are the same in a neutral atom.
- (b) Identify the mass number of an atom.

11. An atom can be represented by a simple diagram.

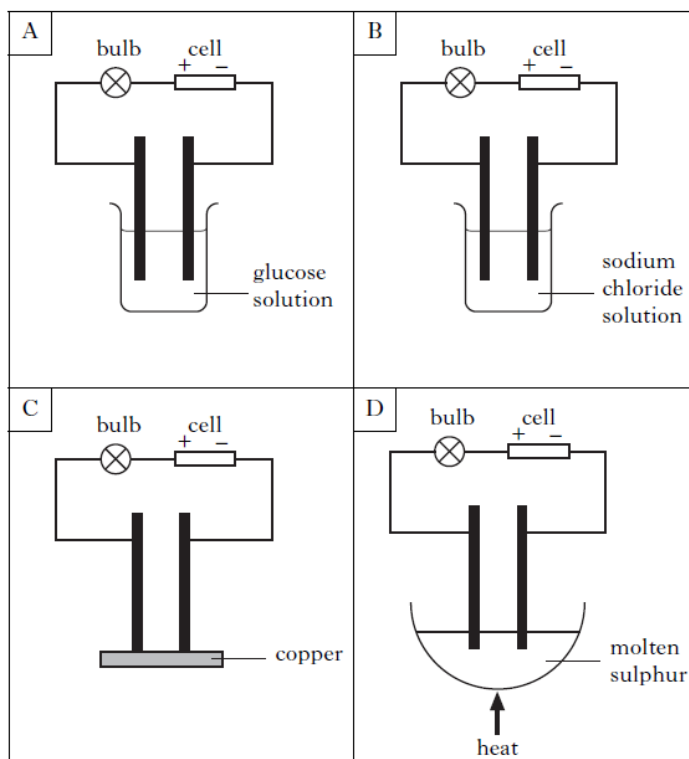


- (a) Name the structure at the centre of an atom where the positively charged particles are found.
- (b) Name the structure that surrounds the centre of an atom where the negatively charged particles are found.
- (c) Complete the diagram below to show the structure of a neon atom.



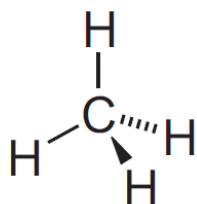
## Bonding, structure and properties

1) A teacher set up an experiment to investigate electrical conductivity.



Identify the **two** experiments in which the bulb will light.

2) Natural gas is made up mainly of Methane molecules.



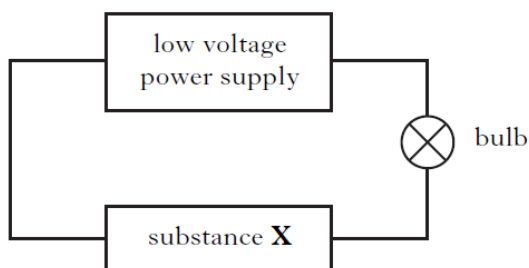
What holds the atoms together in a methane molecule?

3) The periodic table shows the names of the elements.

A	nitrogen	B	lithium	C	aluminium
D	sodium	E	oxygen	F	platinum

Identify the two elements that form a covalent compound.

4) A technician set up an experiment to investigate electrical conductivity.



Substance X	
A	molten metal
B	covalent liquid
C	ionic solution
D	ionic solid
E	solid metal

Identify the **two** experiments in which the bulb would not light.

5) The grid shows the formula for some compounds.

A	$\text{CuCl}_2$	B	$\text{Na}_2\text{O}$	C	$\text{LiF}$
D	$\text{SO}_2$	E	$\text{BaF}_2$	F	$\text{SiCl}_4$

Identify the **two** compounds that exist as molecules.

6) The table gives some information about substances.

Substance	Conducts as	
	a solid	a liquid
A	yes	yes
B	no	yes
C	no	no
D	no	yes
E	no	no

- Identify the metal
- Identify the **two** covalent substances

7) Why do atoms form bonds?

8) Explain what a covalent bond is.

9) What does the word molecule mean?

## Writing Formulae and Equations

1. Write the formula for the following compounds
  - (a) Carbon bromide
  - (b) Magnesium nitride
  - (c) Silicon oxide
  - (d) Boron sulphide
  - (e) Nitrogen hydride
2. Write formula for the following compounds
  - (a) Sulphur monochloride
  - (b) Germanium tetrachloride
  - (c) Diphosphorus trioxide
  - (d) Chlorine dioxide
  - (e) Dinitrogen oxide
3. Write formula for the following compounds
  - (a) Strontium carbonate
  - (b) Potassium dichromate
  - (c) Lithium phosphate
  - (d) Potassium hydrogencarbonate
  - (e) Ammonium hydrogensulphate
4. Write the formula for the following compounds
  - (a) Nickel (II) sulphide
  - (b) Vanadium (V) oxide
  - (c) Uranium (VI) fluoride
  - (d) Lead (IV) sulphide
  - (e) Manganese (VII) oxide
5. Write word equations for the following reactions
  - (a) Lithium burning in oxygen to produce lithium oxide
  - (b) Carbon monoxide burning in oxygen to make carbon dioxide
  - (c) Hydrogen sulphide burning in oxygen to form sulphur dioxide.
  - (d) Hydrogen reaction with chlorine to form hydrogen chloride
  - (e) Lithium reacting with bromine to form lithium bromide.

6. Write formula equations for the following reactions

(a) Sodium + Chlorine  $\longrightarrow$  Sodium Chloride

(b) Magnesium + Fluorine  $\longrightarrow$  Magnesium Fluoride

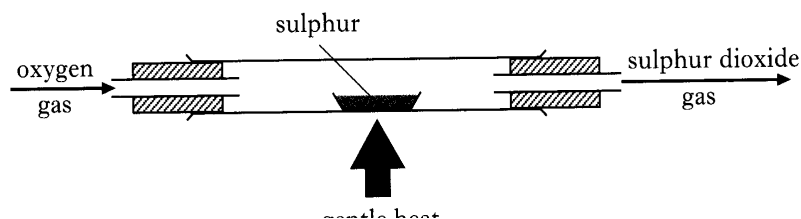
(c) Aluminium + Iodine  $\longrightarrow$  Aluminium Iodide

(d) Carbon + Oxygen  $\longrightarrow$  Carbon Dioxide

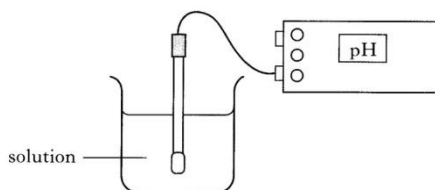
(e) Lithium + Water  $\longrightarrow$  Lithium Hydroxide + Hydrogen

## Acids and alkalis

1. The non-metal sulphur reacts with oxygen to produce sulphur dioxide.



- a) Write a balanced equation, using symbols and formulae, for the reaction between sulphur and oxygen.
- b) What type of bonding is present in sulphur dioxide?
- c) Sulphur dioxide dissolves in water. Suggest a pH for the solution.
2. The pH of a solution can be found using a pH meter



The pH values of some solutions are shown in the table.

Solution	pH
vinegar	3
cola	5
fruit juice	5
bleach	9
detergent	8

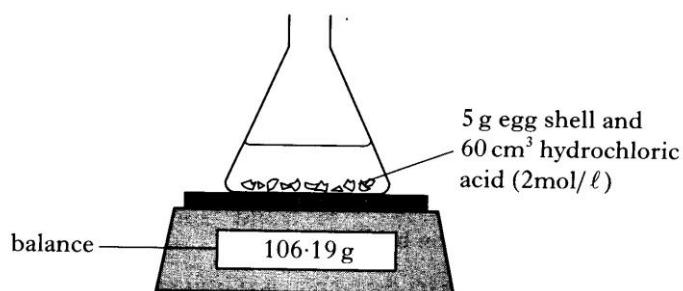
- a) Name the **two** alkaline solutions in the table.
- b) Name the ion found in all acid solutions.
- c) What pH value would pure water have?
- d) When magnesium is reacted with vinegar, hydrogen gas is given off. What is the test for hydrogen gas?

2. Egg shells and sea shells contain calcium carbonate.

Calcium carbonate reacts with dilute hydrochloric acid to produce carbon dioxide gas.

- State the test for carbon dioxide.
- Adam wanted to find out which type of shell contained the most calcium carbonate.

He set up the experiment shown below.



State **two** ways in which Adam would know when the reaction had finished.

- Adam repeated the experiment using 5g sea shell. Here are his results.

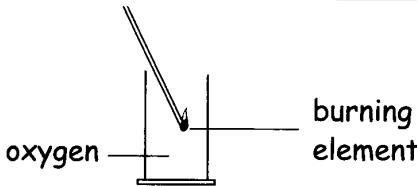
	Sea shell	Egg shell
Balance reading at start /g	106.19	106.19
Balance reading at end /g	104.22	104.01

Which type of shell contained the most calcium carbonate?



4. The workcard below gives details of an experiment

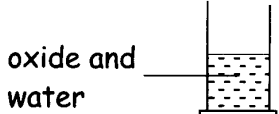
Burn element in oxygen.



oxygen

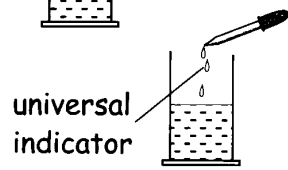
burning element

Add water to the oxide formed.



oxide and water

Add universal indicator.



universal indicator

Compare the colour of the indicator with a pH chart.

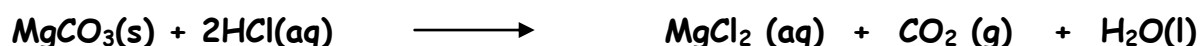
- a) What would be the pH of the solution if the element burned was  
i) carbon? ii) sodium?
- b) Suggest a reason why the pH of aluminium oxide could not be measured.  
(You may wish to use page 5 of the data booklet.)
- c) Write a balanced equation, using symbols and formulae, for the reaction between sodium and oxygen.
- Q5. The box shows the names of some common ionic compounds.

ammonium chloride	copper carbonate	potassium chloride
calcium nitrate	magnesium sulphate	sodium hydroxide

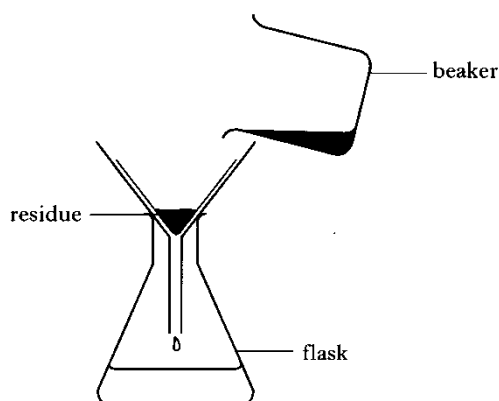
- a) Which two of these compounds are bases?
- b) Which of these compounds is a salt formed from sulphuric acid?
- c) Which of these ionic compounds dissolves in water to form an alkaline solution?
- d) Identify the compound that could be prepared by precipitation.  
(You may wish to refer to page 5 of the data booklet)

6. Fish cannot survive in lochs if acid rain makes the pH of the water too low.
- Which gas is the major cause of acid rain.
  - Which ion causes the water in the loch to be acidic?
  - Name a substance which could be added to the loch to increase the pH of the water.

7. Lee added magnesium carbonate to dilute hydrochloric acid in a beaker until no more reacts



The contents of the beaker were then filtered.



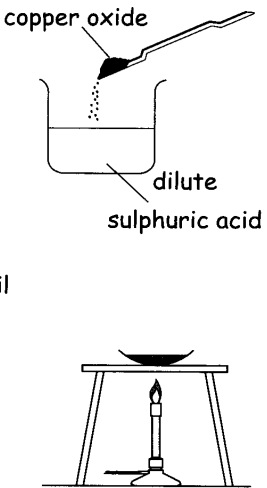
- What kind of reaction is shown by the balanced equation?
  - Which compound shown in the balanced equation is the residue?
  - Which two compounds would be present in the flask?
  - How would Lee know when the reaction had stopped?
  - In the reaction 0.05 moles of  $\text{MgCO}_3$  was reacted.  
What mass is present in 0.05 moles of  $\text{MgCO}_3$ ?
8. How many moles are present in  $200 \text{ cm}^3$  of a  $0.5 \text{ mol/l}$  solution of sodium chloride
9. What volume of  $0.5 \text{ mol/l}$  sulphuric acid will be required to exactly neutralise  $100 \text{ ml}$  of  $0.6 \text{ mol/l}$  potassium hydroxide solution.

11. Laurie carried out an experiment to make copper sulphate crystals.

**Preparing Copper Sulphate Crystals**

Instructions:

1. Measure 40 cm<sup>3</sup> of dilute sulphuric acid into a clean beaker.
2. Carefully add a spatulaful of copper oxide to the beaker and stir with a stirring rod.
3. Continue to add the copper oxide until no more reacts.
4. Remove the excess copper oxide.
5. Boil the solution for 30 seconds then leave it to cool and crystallise.

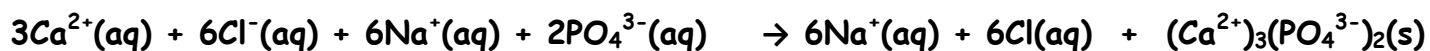


The diagram shows a beaker containing a liquid labeled 'dilute sulphuric acid'. A spatula is shown pouring a dark powder labeled 'copper oxide' into the beaker. Below the beaker, a Bunsen burner is placed on a tripod stand, indicating the next step is to heat the solution.

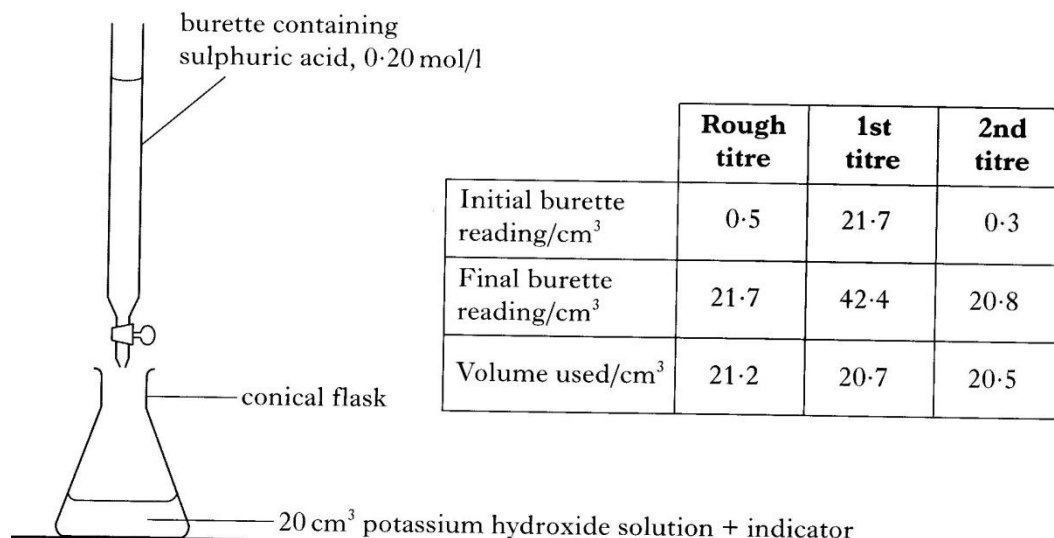
- a) Name the type of chemical reaction taking place between the copper oxide and the dilute sulphuric acid.
  - b) How is the excess copper oxide removed in step 4?
  - c) Why would copper sulphate not be made by adding copper metal to dilute sulphuric acid?
12. The balanced equation for the reaction of zinc with hydrochloric acid is
- $$\text{Zn} + 2\text{HCl} \longrightarrow \text{ZnCl}_2 + \text{H}_2$$
- a) Calculate the mass of zinc required to produce 0.5 mole of hydrogen.
  - b) Calculate the mass of hydrogen produced when 3.275 g of zinc reacts with excess hydrochloric acid.

13. Bones are formed when calcium ions and phosphate ions combine to form insoluble calcium phosphate,  $\text{Ca}_3(\text{PO}_4)_2$ .

This reaction can be reproduced in the laboratory by adding a solution of calcium chloride to a solution of sodium phosphate.

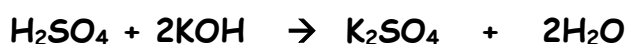


- Write the formula for the spectator ions.
  - What name is given to this type of reaction?
  - What technique could be used to remove the calcium phosphate from the mixture?
14. A pupil carried out a titration using the chemicals and apparatus shown below.



- How would the pupil know when to stop adding acid from the burette.
- What average volume should be used to calculate the number of moles of sulphuric acid required to neutralise the potassium hydroxide solution?
- Calculate the number of moles of sulphuric acid in this average volume.

The equation for the titration is:



- Re-write the equation omitting the spectator ions.
- Calculate the number of moles of potassium hydroxide in 20cm<sup>3</sup> of the potassium hydroxide solution.