بسم الله الرحمن الرحيم

مقابل هذا المجهود ارجو منكم الدعاء لي بالمغفرة ولابنائي الهداية والنجاح والتوفيق

أرجو ان يساعد هذا المجهود على مساعدة ابنائنا طلبة ال IGCSE الثانوية البريطانية وتحصيلهم على افضل واحسن واعلى الدرجات انشاء الله.
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IGCSE

CHEMISTRY

Answers to Examination Papers

June1993 - Nov. 2000

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June 93

Paper 2

1. (a) (i) Iron .
(ii) Graphite .
(iii) To prevent reaction between them .

(b) Magnesium oxide + carbon + chlorine → magnesium chloride + carbon monoxide

(c) Sodium , Aluminium .

(d) (i) a neutral particle, has the same mass as the proton, present in the nucleus .
(ii) An alloy is a mixture of metals produced by melting them together.
(iii) Magnesium oxide and carbon .

(e) Bodies of aircrafts, because the alloy is light and strong .

2. (a) (i) Oxygen .
(ii) because the product, copper (II) oxide, is black .
(iii) Copper + oxygen → copper (II) oxide

(b) (i) Magnesium .
(ii) Gold .

(c) (i) ~ 20 %
(ii) Volume of oxygen reacted = 80 - 65
= 15 cm^3

$$\% \text{ of oxygen} = \frac{15}{80} \times 100$$

$$= 18.75 \%$$

(iii) Maybe time is not enough for all the oxygen to react .

(d) (i) Nitrogen .
(ii) Water vapour, argon .
(iii) it will be extinguished .

(e) Sulphur dioxide and nitrogen oxides .

3. (a) (i) To speed up mixing .
(ii) For firing the kiln .
(iii) To ensure complete mixing .

(b) Take a sample of cement, add water to it, stirr and filter. To the filtrate, add acidified barium chloride solution. White ppt. is formed.

(c) (i) $CaCO_3 \longrightarrow CaO + CO_2$
(ii) Bubble the gas through lime water, turbidity appears .

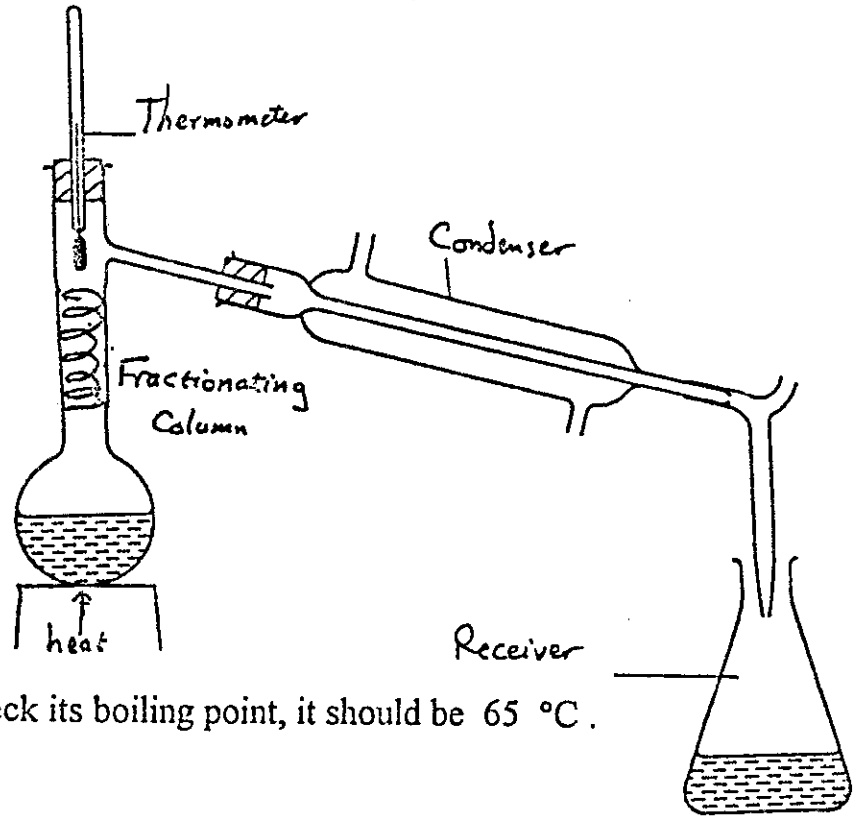
(d) (i) Reversible .
(ii)
(iii) As time goes by the mass increases until the increase stops (reaching a plateau) .

4. (a) (i) Fermentation .
(ii) 37 °C .
(iii) Yeast .

(b) Volume of methanol $= 1000 \times \frac{0.03}{100}$

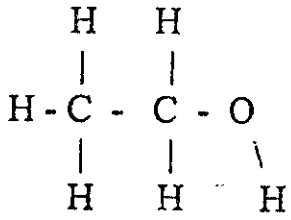
$= 0.3 \text{ cm}^3$

(c) (i)

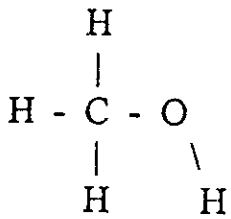


(ii) Check its boiling point, it should be 65 °C .

(d) (i)



ethanol



methanol

(ii) It is a family of organic compounds that have the same general formula and the same functional group .

(e) (i) Water vapour and carbon dioxide .

(ii) because there is a little amount of ethanol and a large amount of water .

5. (a) Nitrogen and oxygen .

(b) (i) Water is treated through filtration to get rid of suspended matter ; then sterilization to kill bacteria and germs .
(ii) by simple distillation .

(c) Powdered aluminium is added to a solution of nitrate and sodium hydroxide. When the mixture is warmed, ammonia gas will be given off. (turns damp red litmus paper blue) .

(d) (i) Nitrogen .
(ii) Potassium and phosphorus .

(e) (i) Effect of lightning on O_2 & N_2 in the atmosphere .
(ii) 1- Corrodes metal objects and buildings .
2- Increases soil acidity .
3- Destroys forests and crops .
4- Increases the acidity of lakes and rivers .

June 93

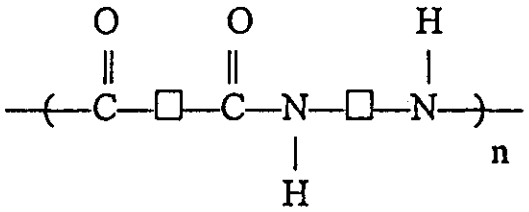
Paper 3

1. (a) (i) Crude oil .
   (ii) An ester .

   (b) (i) From fractional distillation of liquid air .
   (ii) 450 °C and 450 atom .
   (iii) Nitric acid .
   (iv) Example : $2NO + O_2 \longleftrightarrow 2\ NO_2$

   (c) (i) $Ag^+ + e^- \longrightarrow Ag$
   (ii) A reductant .
   (iii) More Ag^+ ions would have change to Ag atoms .
   (iv) • Increase in the concentration of the developer .
   • Increase the temperature .
   (v) Darker areas are the ones received more light. Therefore, more Ag^+ changed to Ag which is black .

2. (a) (i) because it works at lower temperature .
   (ii) • Powder .
   • Liquid .
   (iii) Carbohydrate .
   (iv) name : Nylon .
   Structure :



   (b) oil or fat and sodium hydroxide solution .

(c) (i) Can be decomposed by bacteria .

(ii) • Prevent accumulation of waste .
• Prevent emission of harmful gases when plastics are burnt.

(d) (i) • Chlorine .
• Sulphur dioxide .

(ii) x is 2 and y is 8 .

3. (a) (i) because copper atoms from the anode change to copper ions which dissolve in solution .

(ii) $Cu^{2+} + 2e^- \longrightarrow Cu$

(iii) Filtration .

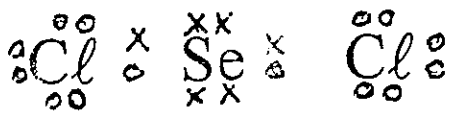
(iv) The alloy bronze contains copper and tin. This alloy is prefered to pure copper, because it is lighter.

(b) (i) 8 .

(ii) Se_8 .

(c) (i) 2, 8, 18, 8 .

(ii)



(iii) Sodium selenide, because it is an ionic compound .

(d) (i) Making fertilizers .

(ii) $H_2 Se O_4$

4. (a) (i) Layers of carbon atoms, each connected by three covalent bonds to three other atoms ; with the fourth electron of each atom is freely moving between the layers .

(ii) Diamond is hard because of the three dimension all covalently bonded structure. Graphite is soft because it consits of a layer that can slide .

(iii) because of the presence of free electrons .

(b) (i) The sun .
(ii) Put the carbide in water. Bubble the produced gas through orange bromine water. If immediate declourization occurs, this is from calcium carbide .
(iii) $C_2 H_4$

(c) (i) To react with impurities and change it to slag .
(ii) Sulphur dioxide .

(d) (i) 5 moles .
(ii) 2 .
(iii) 3 .

5. (a) (i) It does not react. It is inert .
(ii) because they have different bumbers of electrons in their outermost shells .

(b) (i) A white ppt. will be formed, then it will disappear in excess of NaOH soln.
(ii) Aluminium .
(iii) $Be^{2+} + 2\ \bar{O}H \longrightarrow Be(OH)_2$

(c) (i) because the metallic structure can sustain pressure and change its shape, since the fast moving electrons are binding it together .
(ii) Be has a lower m.p. than Cr.
(iii) Be has one oxidation state. Cr has many .

(d) (i) ^{12}C has 6 neutrons while ^{14}C has 8 neutrons .
(ii) Isotopes .
(iii) N .
(iv) • To cure cancer .
• To give energy for power stations .

June 93

Paper 6

1. 59 cm^3 .

2. Diffusion of the blue colour throughout the water, because of the dissolving (solution) of the crystal .

3. (a) because ammonia gas is harmful .
   (b) 1- He should have carried out the experiment in a fume hood .
   2- Gentle heating .
   (c) A bunsen burner .
   (d) To stir .
   (e) pouring the liquid away from the solid .
   (f) Put a spot of the solution on the base line of a chromatogram. Run the chromatogram. Several spots will appear, indicating the components of the orange dye .

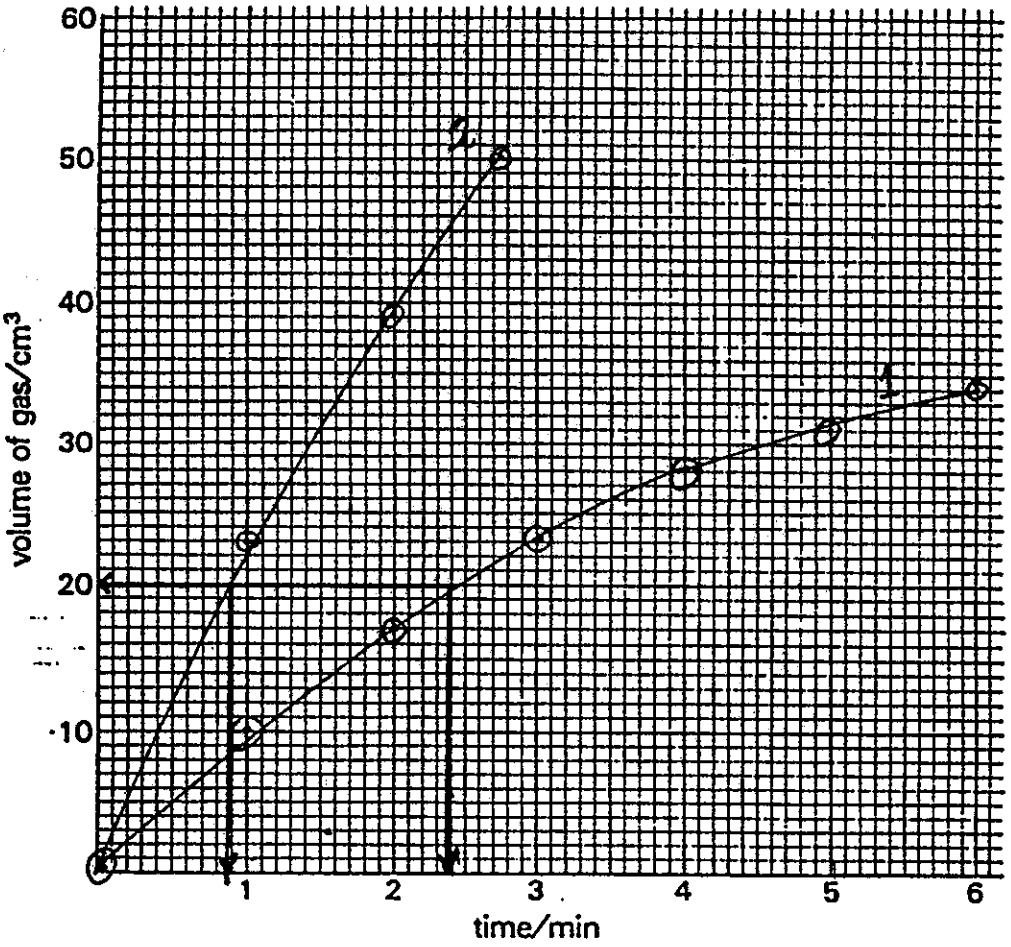
4. (a) (i) Part A : brown fumes .
   (ii) Part B : the universal indicator will turn red .
   (iii) Part C : red-brown solid will turn black .

   (b) (i) Part A : Nitrogen dioxide is formed .
   (ii) Part B : Nitrogen dioxide is an active gas .
   (iii) Part C : Copper is reacting with oxygen to form black copper (II) oxide .

5.

time / min	0	1	2	3	4	5	6
volume of gas / cm^3	0	10	17	23	28	31	34

(a)



(b) Experiment 1 : 2.4 min .
Experiment 2 : 0.9 min .

(c) Experiment 2 - It is obvious from the graph that more gas is collected at the same time .

(d) because the reactants are consumed, i.e., less concentration as time goes by .

(e) because one of the reactants is consumed .

(f) To prevent water from moving backwards from the measuring cylinder to the flask .

(g) Collect the gas in a gas syringe for more accurate readings, or, use a funnel with a tap to add the aqueous solution of substance A .

(h) (i) hydrogen .
(ii) Sulphuric acid .

6. (a)

Experiment	*Temperature / °C*		*Observations*
	initial	*maximum or minimum*	
1. Solid B was added to 25 cm^3 of water .	19.5	15.1	solid completely dissolved .
2. Solid C was added to 25 cm^3 of aqueous copper (II) sulphate .	20.6	30.9	a red / brown solid formed and the solution turned a lighter colour .
3. Solid D was added to 25 cm^3 of aqueous lead (II) nitrate .	21.0	21.5	a yellow precipitate formed .

(b) (i) Experiment 1 .
(ii) Experiment 2 .

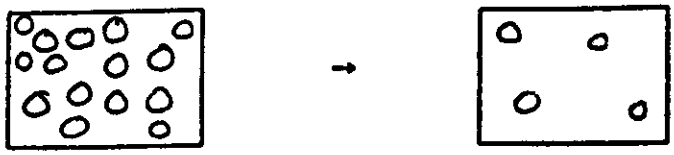
(c) Zinc . Zinc displaces copper from its salts .

(d) An iodide salt .

7. 1- Crush the tablet to powder .
2- Put the powder in a beaker containing 20 cm^3 of water. Stir and warm to speed up dissolving .
3- Filter .
4- Wash the residue on the filter paper by distilled water .
5- Dry the residue .
6- Weigh the dry residue. Its mass should be 500 mg. .

Paper 2

1. (a)



(b) (i) Dip a litmus paper in a sample of the swimming pool water. Bleaching occurs if chlorine is present .

(ii) Dip a universal indicator paper in a sample of the swimming pool water. The colour will indicate that ρ H = 7 (green) .

(iii) Carbon dioxide .

(c) (i) bromine Br_2 red-brown volatile liquid .

(ii) because they both have $7e^-$s in the outermost shell .

(d) (i) Ammonium chloride .

(ii) Add acidified silver nitrate solution to the sample of water. White ppt. will be formed if $C\ell$ ions are present .

2. (a) (i) The large surface exposed to air acts as a coolant .

(ii) 1- Petrol .
2- Kerosene .
3- Solar .

(iii) A hydrocarbon is a compound made of carbon and hydrogen only .

(iv) Bitumen

(b) Ethanol , Coke .

(c) (i) X = 16
Y = 34
(ii) An alkene contains at least one carbon carbon double bond, while an alkene has all single bonds .
(iii) Mix each of them with orange bromine water. Immediate decolourization occurs with the alkene .

(d) (i) Incomplete combustion is the burning of a substance in the presence of insufficient oxygen .
(ii) Carbon monoxide .

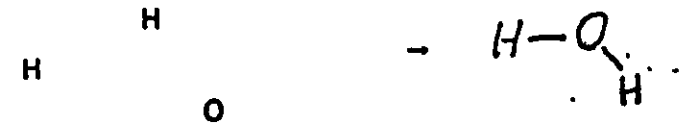
3. (a) Hydrogen .

(b) (i) 5 .
(ii) + 1 .
(iii) Zero .
(iv) because the number of electrons in it equals the number of protons .

(c)

(I) 3 atoms of hydrogen + 1 atom of nitrogen → 1 molecule of ammonia

(II) 2 atoms of hydrogen + 1 atom of oxygen → 1 molecule of water



(iii) 2 atoms of carbon + 6 atoms of hydrogen → 1 molecule of ethane

(d)
- The spreading of perfume particles in air .
- The spreading of one drop of black ink in water without stirring.

(e) (i) The one electron in the outermost shell of sodium atom is transferred to the outermost shell of chlorine atom .

(ii) Ionic bonding .

(f) (i) Two chlorine atoms approaching each other and become very close so that an electron from each atom is shared by the two to complete the octet in their outermost shells .

(ii) Covalent bonding .

4. (a) Limestone : calcium carbonate .
quicklime : calcium oxide .
slaked lime : calcium hydroxide .

(b) by filtration .

(c) Mass of magnesium $= 1000 \times \frac{0.13}{100}$
$= 1.3$ tonnes

(d) Pass the produced vapour over white anhydrous copper sulphate. It will turn blue .

(e) (i) Magnesium chloride and water .
(ii) Neutralization .

(f) (i) To conduct electricity by free ions .
(ii) The -ve electrode .
(iii) because Norway produces electricity cheaply from waterfalls .

5. (a) Nitrogen .

(b) (i) Bunsen burner .
(ii) $2\,H_2O \longrightarrow 2\,H_2 + O_2$
(iii) When all the solid disappears. **Or** when the volume of the gas becomes constant .
(iv) Expose a glowing splint to the gas. It will relight .

(c) (i) Nitric acid : HNO_3 .
Sulphuric acid : H_2SO_4 .
(ii) Hydrochloric acid : $HC\ell$.

(d) (i) Acetylene .
(ii) A process that gives out heat .
(iii) Steel industry . **Or** intensive care units .

Paper 3

1. (a) (i) $Zn + 2H^+ \longrightarrow Zn^{2+} + H_2$

(ii) Redox .

(iii) H_3As .

(iv) by cooling and compressing, hydrogen arsenide, a heavier gas, will be liquified first, leaving H_2 as a pure gas .

(b) (i) manganese + water → manganese oxide + hydrogen .

(ii) platinum + water → no reaction .

(iii) rubidium + water → rabidium hydroxide + hydrogen .

(c) (i) because it does not burn .

(ii) 2 g of H_2 occupies 24 dm^3

x g of H_2 occupies 1 dm^3

$$x = \frac{2\text{ g} \times 1\text{ dm}^3}{24\text{ dm}^3} = 0.083\text{ g}$$

(d) (i) carbon monoxide and oxides of nitrogen .

(ii) the reaction goes faster at high temperature .

(iii) Water .

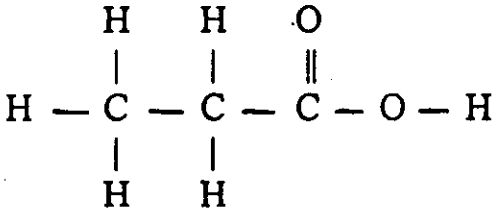
2. (a) (i) Ca^{2+}

(ii) 20

(iii) 10

(b) (i) Alcohols .

(ii)

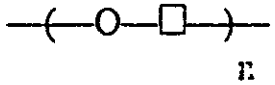


(c) (i) • The temperature should be the same .
• The surface area of the teeth should be the same .
(ii) graph C . because it shows that as pH increases "lower acid concentration" rate of reaction decreases .

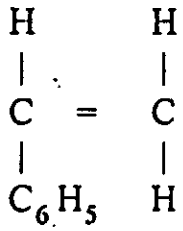
(d) (i) Mg^{2+} 

(ii) Magnesium oxide is basic .
Aluminium oxide is amphoteric .
Silicon (IV) oxide is acidic .
(iii) Sodium hydroxide soln.
(iv) Dilute hydrochloric acid .

3. (a) (i) Oxygen and water .
(ii) Tin is less active than iron. When iron is exposed it will be attacked. Zinc is more active than iron. Even if iron is exposed, zinc will react first, thus protecting iron from rusting.
(iii) Galvanization .
(iv) because it has a protective layer of $A\ell_2 O_3$.

(b) 

(c) • Sodium hydroxide solution .
• Amino acids .
• Chromotography .
(d) (i) Nonbiodegradable .
(ii) • phenylethene .



4. (a) (i) $(NH_4)_2\ CO_3 \longrightarrow CO_2 + 2\ NH_3 + H_2O$

(ii) • Sodium hydroxide solution and heat .
• A gas evolves which turns damp red litmus paper blue .

(iii) Hydrogen ions .

(iv) Fermentation .

(b) (i) because chlorine gas has a bleaching effect as is a disinfectant.

(ii) • brown colour is formed .
• chlorine is more active than iodine. A displacement occurs.

(iii) Add fluorine gas to it .

(c) (i) 53.8 %

(ii) Number of moles of sulphur $= \frac{26.9}{32} = 0.84$

Number of moles of oxygen $= \frac{53.8}{16} = 3.36$

(iii) $Na\ S\ O_4$

(iv) $Na_2\ S_2\ O_4$

5. (a) (i) By roasting Zn 5 to form zinc oxide. Reduction of Zn O by coke give molten zinc .

(ii) because it kills bacteria .

(b) (i) Add zinc oxide to worm sulphuric acid. Stir. Zn O will disappear. Continue addition and stirring until Zn O remains at the bottom. Unreacted. Filter. The filtrate is a solution of zinc sulphate .

(ii) • Red-brown ppt.
• Filtration .

(iii) Zinc is more active than Fe, Cu and Ca . Zinc will displace their ions from the solution and these metals precipitate
(iv) Sulphuric acid .

(c) (i) As a source of electricity .
(ii) A cell of Zn & Ag will have the highest voltage and Zn is the (+) end. A cell of Zn & Cu will have lesser voltage and Zn is the (+) end .

Paper 6

1. 172 seconds **Or** 2 min. and 52 seconds .

2. (a) Use a magnet. Nickel will move away with the magnet. Magnesium will not.

   (b) Add ethanol to the mixture. Warm and stir. Wax will dissolve. Filter. Magnesium will remain as a residue on the filter paper. Heat the filtrate to evaporate ethanol. Wax will remain .

3. Natural gas contain ethene, an unsaturated compound .

4. (a) Substance C : aqueous sodium hydroxide .
   (b) Substance D : An ammonium salt .
   (c) A bunsen burner .
   (d) because ammonia will react with sulphuric acid .
   (e) Mistake 1 : The delivery tubes in and out of the sulphuric acid flask. The inlet is short. The outlet is under the liquid surface .
   Mistake 2 : Ammonia is collected by downward delivery .

5. (a)

Experiment	*Solution*	*Diagram of hydrochloric acid* / cm^3
1	P	10.9
2	Q	21.6
3	R	6.1

   (b) Pink to colourless .

   (c) (i) R .
   (ii) Q .
   1- Q . 2- P . 3- R .

(d) A pipette .

(e) No, it will be less because the experiment will be carried out more accurately .

(f) Use a very sensitive type of universal indicator (or a pH meter). The solution which gives a colour that corresponds to the highest pH will be the more concentrated .

6. (a)

Tests	*Observations*
(a) Appearance Salt W Calcium carbonate	Pale green crystals ..... white .....
(b) Test on W An aqueous solution of W was divided into three equal portions. (i) An excess of aqueous sodium hydroxide was added to the first portion. The mixture was left to stand for a few minutes. (ii) An excess of aqueous ammonia was added to the second portion. (iii) A few drops of dilute hydrochloric acid and aqueous barium chloride were added to this portion.	 A dirty green precipitate formed which turned brown at the surface of the mixture. .... A dirty green ppt formed. .... A white precipitate formed.
(c) Tests on calcium carbonate A little hydrochloric acid was added to the calcium carbonate. The gas given off was tested with a lighted splint and then with limewater.	..... Effervescence of a gas. .... The lighted splint is put off. .... Lime water turned turbid. .....
The solution formed was divided into two portions: (i) An excess of aqueous sodium hydroxide was added. (ii) An excess of aqueous ammonia was added.	... (i) turbidity occurs. .... (ii) No effect. .....

(b) Iron (II) sulphate .
(c) Carbon dioxide .
(d) Calcium chloride .

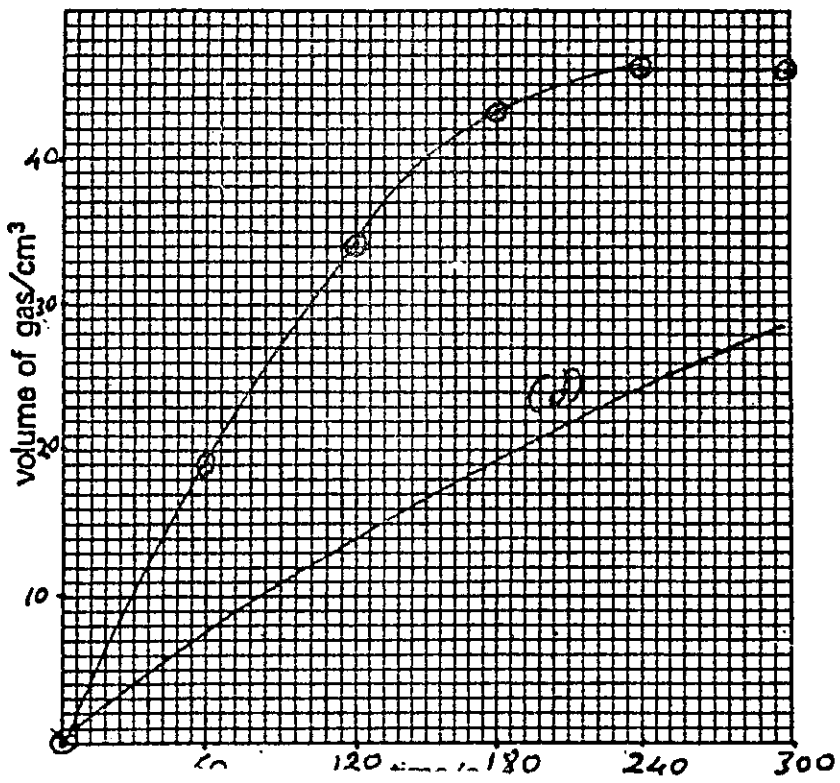
7. (a) 1- The same volume of hydrogen peroxide solution should be used .
2- The same concentration of hydrogen peroxide should be used.

(b) Use the same particle size of both catalysts .

(c) (i)

time / s	*total volume of oxygen / cm³*
0	Zero
60	19
120	34
180	43
240	46
300	46

(ii)



8. Put some copper (II) sulphate solution in two test tubes. Put in one of them zinc powder and put magnesium turnings in the other. Shake both for a few seconds. In both, the blue colour of the solution will fade and a red-brown residue is formed, indicating that both Zn and Mg are more active than copper. In a third test tube put zinc sulphate solution and a piece of magnesium turning, and shake. A dark grey residue will be formed, indicating that magnesium is more active than zinc.

$\therefore$ order of reactivity : Mg > Zn > Cu.

Paper 2

1. (a) Totalmass = 3.5 + 2.9 + 1.5 + 20
= 27.9 g

(b) reagents : silver nitrate solution, nitric acid
result : White ppt.

(c) (i) Group I .
(ii) The sodium atom loses the electron present in its outermost energy level .

(d) $C_6 H_{12} O_6$

(e) The pH scale measures the hydrogen ion concentration. As the pH increases, hydrogen ion concentration decreases .

(f) (i) sodium hydroxide + citric acid → sodium citrate + water
(ii) by the use of an indicator .
Or by measuring the pH (7 at the end of the reaction) .

2. (a) Add dilute hydrochloric acid to a sample of the ore . If effervescence occurs, it is cerrusite .

(b) (i) $2PbO + C \rightarrow 2Pb + CO_2$
(ii) Coke and air .
(iii) In a molten state at the bottom through a tap .

(c) (i) To increase the surface area .
(ii) Lead (II) nitrate .
(iii) Separation of any solid residue from the solution (filtration) .
(iv) From colourless solution to yellow ppt. .
(v) Lead (II) nitrate + potassium iodide → Lead (II) iodide + potassium nitrate

(vi) % of Lead $= \frac{1.25}{5.23} \times 100$

$= 23.9\ \%$

3. (a) Due to the incomplete combustion of wax. Oxygen was not available for all the carbon to react with .

(b) A process that gives out heat .

(c) It will melt suddenly (sharp m.p.) .

(d) (i) Gain of oxygen .
(ii) $4\,P + 5\,O_2 \longrightarrow P_4\,O_{10}$
(iii) ~ 20 %
(iv) Phosphorus will burn .
(v) To prevent its oxidation if it becomes in contact with air .

(e) (i) Pure nitrogen .
(ii) because it does not react with the filament .
(iii) W .
(iv) • Form coloured compounds .
• Act as catalysts .
• Heavy and hard .
(v) Conducting electricity .

4. (a) (i) Its oxide is not poisonous .
(ii) Dip a blue litmus paper in a sample of lemonade, it will turn red .

(b) (i) Exposure to moisture and air .
(ii) Brown flakes .
(iii) It should be stored in a dry place .
(iv) carbon .

(c) Iron III ions :
reagent : sodium hydroxide solution .
result : red-brown ppt.

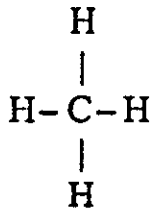
Aluminium ions :
reagent : sodium hydroxide solution .
result : white gelatinous ppt. soluble in excess .

(d) (i) Reusing of discarded substances .
(ii) To lower cost of production .
(iii) use a big magnet, steel cans will be attracted to it .

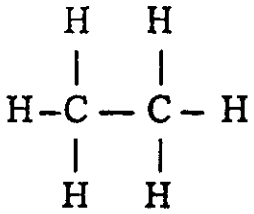
5. (a) A homologous series is a family of organic compounds that have the same general formula and the same functional group .

(b) Crude oil .

(c) (i) Methane



(ii) Ethane



(d) Methane, ethane, propane and butane .

(e) formula $C_8 H_{18}$
boiling point 125 °C .

(f) (i) • They give out a lot of heat when they burn .
• They are available .
(ii) methane + oxygen → carbon dioxide + water

(g) 1- Expose a lighted splint to heptane, it will burn .
2- Add heptane to a small amount of water, they will not mix .

Paper 3

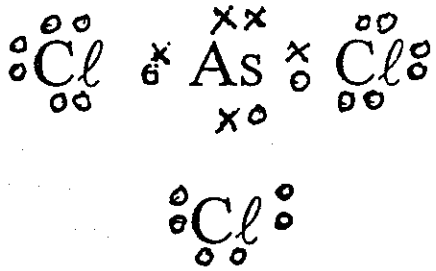
1. (a) (i) $As_2O_3 + 3C \longrightarrow 2As + 3CO$
   (ii) As_2O_3 .
   (iii) As_2O_3 .

   (b) (i) Atoms of the same element but have different number of neutrons .
   (ii) Shink but does not conduct electricity .

   (c) (i) 8 .
   (ii) • As an acidic oxide to form a salt and water .
   • As a basic oxide to form salt and water .

   (d) Ge As .

   (e)



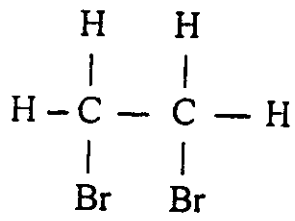
2. (a) gas . two atoms . 2 . 7 .

   (b) (i) OF_2 .
   (ii) Na_2PO_3F .

   (c) (i) By electrolysis. Chlorine is discharged at the positive electrode .
   (ii) $C\ell_2 + 2Br^- \longrightarrow 2C\ell^- + Br_2$
   (iii) Law pH means increasing H^+ concentration.
   By doing so, the backward reaction will be enhanced, forming more bromine .

(d) (i) ethene .

(ii)



(e) (i)

C	H	O
$\frac{38.7}{12}$	$\frac{9.7}{1}$	$\frac{51.6}{16}$
3.225 :	9.7 :	3.225
1 :	3 :	1

∴ Emperical Formula CH_3O

(ii) The molecular formula : $C_2H_6O_2$

3. (a) (i) Diamond and graphite .

(ii) By mixing soot with a hydrocarbon. Heat and stir to speed up dissolving fullerenes. Filter. Evaporate the filtrate till the point of crystallization. Cool. Filter and dry the crystals.

(iii) 60 .

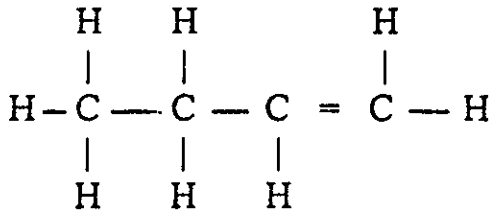
(b) (i) because of the presence of free electrons in their metallic structure .

(ii) Graphite .

(iii) Oxygen and carbon dioxide .

(c) (i) C_4H_8

(ii) • but-l-ene

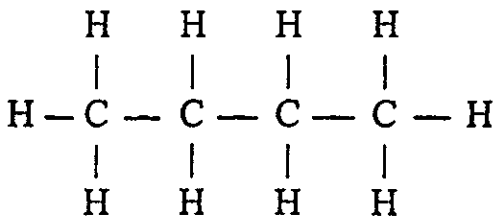


(d) (i) Propene + Hydrogen → propane .

(ii) $CH_3-CH=CH_2 + H_2O \rightarrow CH_3-CH(OH)-CH_3$

4. (a) (i) Fractional distillation .

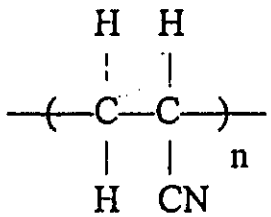
(ii) C_4H_{10} butane



(iii) Cracking .

(b) Air is cooled and compressed till it changes to liquid. Fractional distillation of liquid air will give pure oxygen .

(c)



(d) (i) polypropene .

(ii) ropes .

(e) (i) A family of nutrients composed of cpds containing C , H and O . The H and O are in 2 : 1 ratio .

(ii) because cotton sheets are biodegradable, while polyacrylonitrile sheets are not .

5. (a) (i) ZnS zin blende because (CO_3) or (FeS) have larger masses the (S) .

(ii) By roasting the ore to change it to ZnO . Then reacting ZnO with coke to produce molten zinc .

(b) (i) A fertilizer .

(ii) bases : ammonai .

(c) To make alloys with copper (brass) .

(d) (i) Zinc has high affinity to form ions by losing electrons. While copper has much less tendency to do so .

(ii) Zinc will lose electrons. The electrons will move through the wire and voltmeter to the cadmium electrode. The voltmeter will show that Zn is the + ve electrode .

(e) (i) Sodium nitrate $\xrightarrow{\text{heat}}$ sodium nitrate + oxygen

(ii) Zinc nitrate $\xrightarrow{\text{heat}}$ Zinc Oxide + nitrogen dioxide + oxygen.

Paper 6

1. (a) (i) a pipette .
(ii) a burertte .

(b) To accurately measure volumes of liquids .

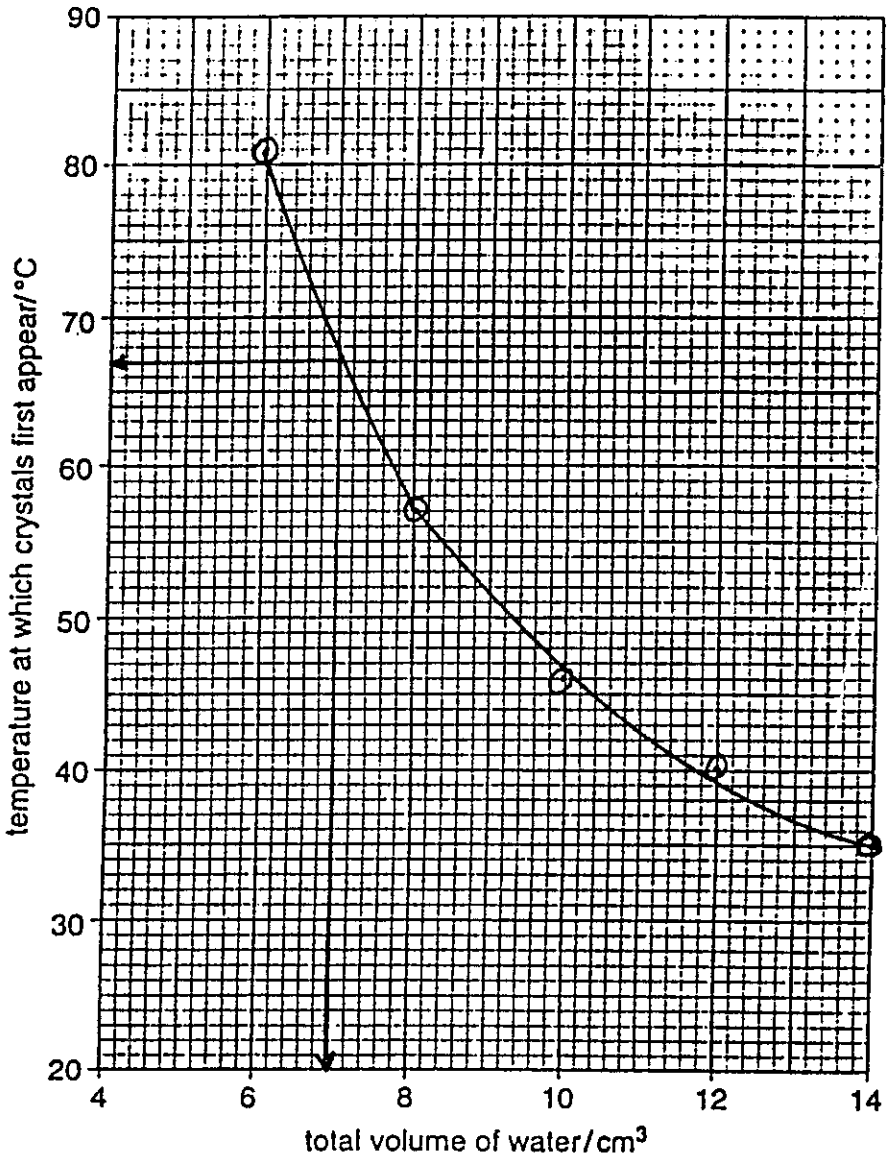
2. by fractional distillation, methanol will be collected first .

3. (i) B , (ii) C , (iii) D , (iv) A .

4. a - Aqueous copper (II) sulphate solution has a blue colour .
b - Pure water boils at 100 °C .
c - hexene decolourizes orange bromine water .
d - limewater turns milky when CO_2 is bubbled through a sample of it .

5. (a)

experiment	total volume of water / cm^3	temperature / °C
1	6	81
2	8	57
3	10	46
4	12	40
5	14	35



(b) Temperature : 67 °C .

(c) When all the solid disappeared .

(d) Lower temperatures will be recorded for the appearance of the first crystal, because crystallization occurs from supersaturated solutions.

(e) (i) 1- Water measurements .
2- Temperature measurements .

(ii) 1- the larger quantities of water and potassium nitrate to minimize error .
2- Do not speed up cooling for more accurate temperature measurements .

6. (a) (i) a universal indicator .

(ii) Insoluble in water. Therefore, it will settle down taking with it the suspended particles .

(iii) 1- He took one sample from one place. This is a wrong way of sampling .
2- pH 8 is weakly alkaline .

(b) He can take three pots and plant 5 beans in each, then add equal amounts of one of the fertilizers in one of the pots every day and add the same amount of water for each pot. He can then measure the growth of beans every day for ten days using a ruler to measure the length of the plant. The fertilizer which gives faster growth is the best one .

7.

tests	observations
(a) <u>on the filtrate</u> (i) To about 1 cm^3 of the filtrate, an equal volume of aqueous sodium hydroxide was added.	A white precipitate formed which dissolved in excess of the sodium hydroxide.
(ii) To another portion of the filtrate, an excess of aqueous ammonia was added.	A white precipitate formed which did not dissolve in the excess of aqueous ammonia.
(iii) To another portion of the filtrate, a few drops of dilute hydrochloric acid were added, followed by aqueous barium chloride.	A white precipitate formed.
(b) <u>on the residue on the filter paper</u> (i) colour of residue	..... Green .....
(ii) A little of the residue was put into a test-tube and dilute hydrochloric acid added. Any gases evolved were passed through limewater.	..... Effervescence occurs. .... Lime water turns turbid. .....

(c) B contains aluminium sulphate .

(d) B contains copper II carbonate .

8. Add to the mixture the specified volume of $KMnO_4$ solution and immediately turn the stop watch on. Shake continiously to ensure complete mixing. Stop the timing immediatly when decolourization occurs. Repeat the same procedure for experiments 2 and 5 .

Paper 2

1.

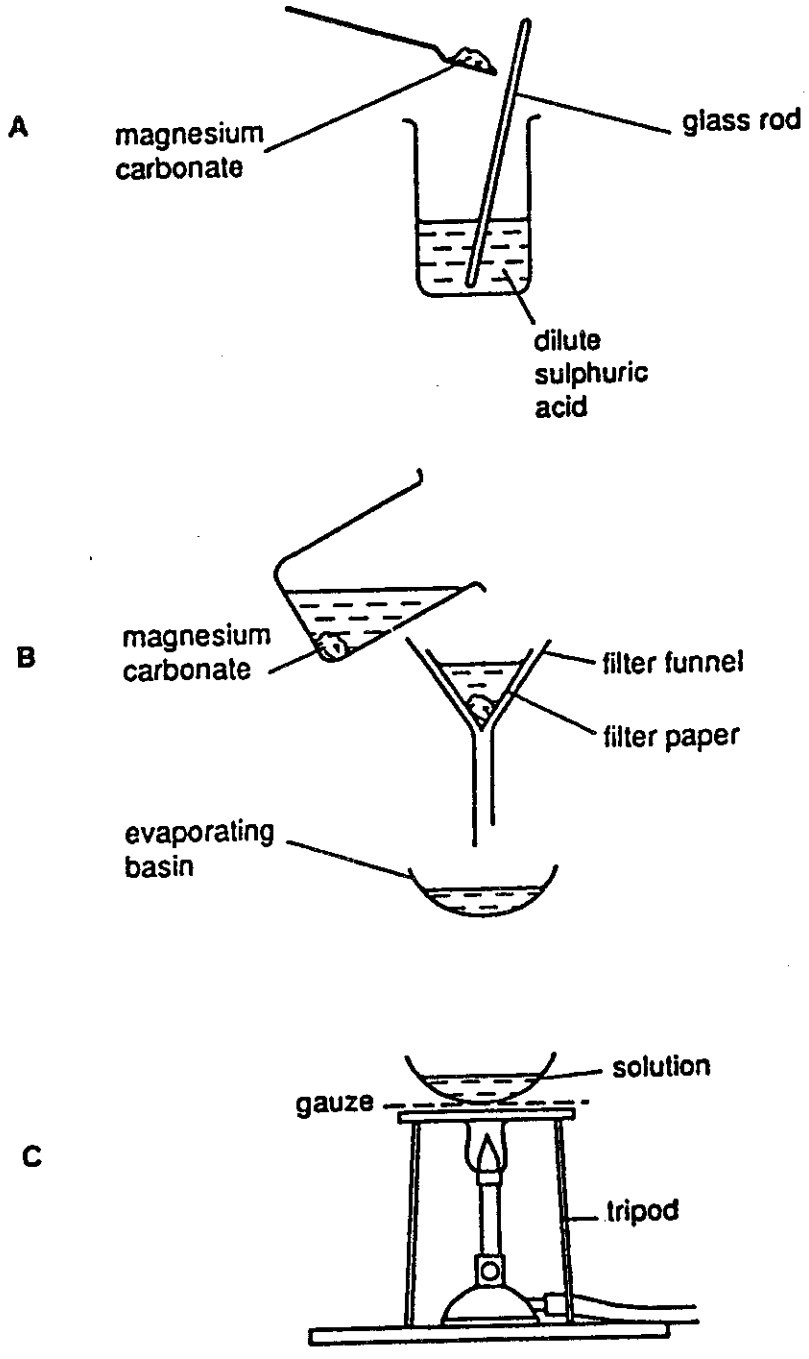


Fig. 1

(a) + carbon dioxide.

(b) (i) To avoid strong effervescence and losing the solution.

(ii) To get rid of carbon dioxide (or) to ensure complete mixing.

(c) (i) magnesium carbonate, (excess).
(ii) magnesium sulphate.

(d) Water of crystallization is lost by evaporation.

(e) 100 g of H_2O dissolve 71 g of salt at 20°C.
25 g of H_2O dissolve x g of salt at 20°C.

$$x = \frac{25\ g}{100\ g} \times 71\ g = 17.75\ g$$

(f) Yes, if the steam is condensed, or when drops of water are added M_gSO_4 it will take $7\ H_2O$ again.

2.

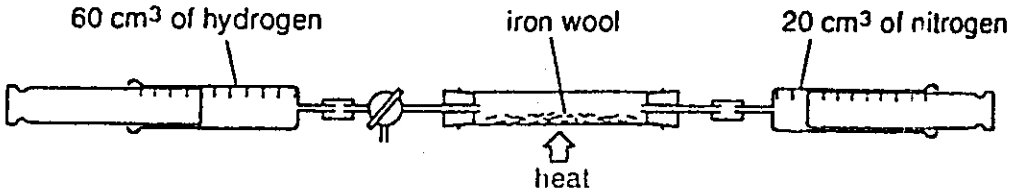


Fig. 2

(a) Exothermic.

(b) (i) It is a substance that change the rate of a reaction without being consumed.
(ii) To increase the surface area, and thus increases its effectiveness as a catalyst.
(iii) To avoid oxidation of iron.

(c) Expose a wet red litmus paper to the gas mixture. It will turn blue.

(d) (i) Because it contains nitrogen.
(ii) Because a solid is changing suddenly to gases which occupy much larger volume, hence explosion occurs.

(e) (i) It will burn with a pop.
(ii) Hydrogenation of oils to form saturated fats.

3. (a) $6PbO + O_2 \rightarrow 2Pb_3O_4$

(b) 1. Galvanization with zinc.
2. Cover it with grease.

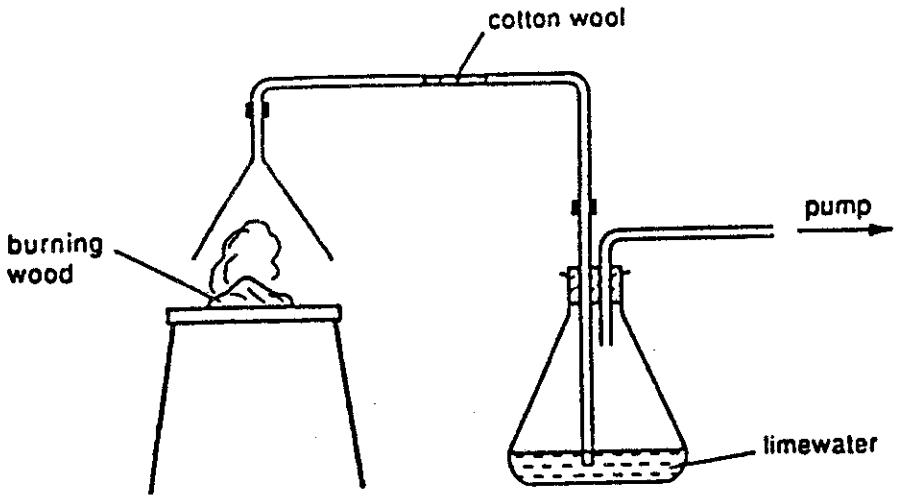
(c) (i) Expose a glowing splint to the evolved gas ; it will relight.
(ii) Expose a glowing splint to the evolved gas. If it does not relight, it means the decomposition is finished.

(d) (i) Expose a wet litmus paper to the evolved gas, bleaching will occur.
(ii) by the electrolysis of hot molten lead (II) chloride. Molten lead will be obtained at the -ve electrode (cathode).

(e) (i) X Magnesium does react with dilute hydrochloric acid.
Y Magnesium does react with water or steam.
Z Magnesium oxide is not reduced with carbon.
(ii) 1. Most reactive sodium.
2. Calcium.
3. Magnesium.
4. Iron.
5. Least reactive lead.

(f) (i) because they are toxic.
(ii) As a catalyst to produce high octane gasoline.

4.



(a) (i) To prevent solid particles from passing.
(ii) it turns milky.

(iii) More air will pass to the wood ; which means more oxygen i.e. faster burning.

(iv) Add the ash to a beaker containing water. Sake well. Take a drop of this solution by a glass rod and apply it to a red litmus paper. It will turn blue.

(b)

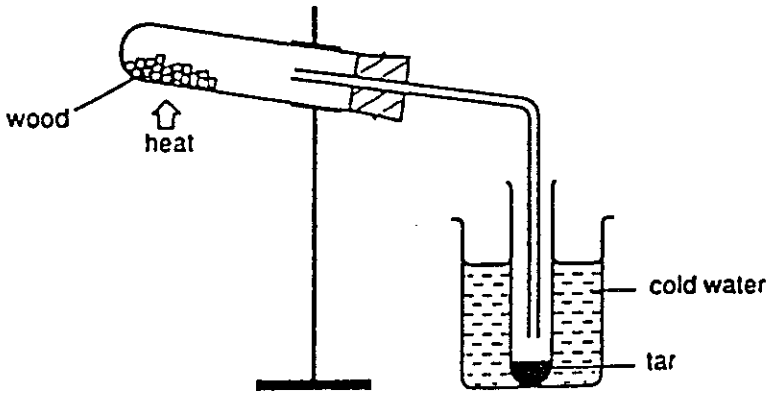


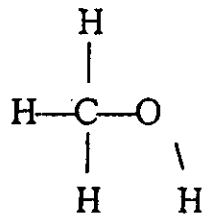
Fig. 4

0620/2 W94

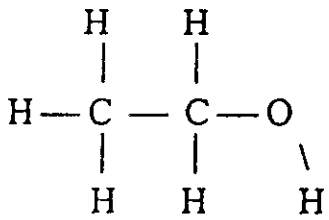
(i) Because of the lack of enough oxygen.

(ii) by fractional distillation. Methanol will boil and be collected first.

(c) (i)



methanol



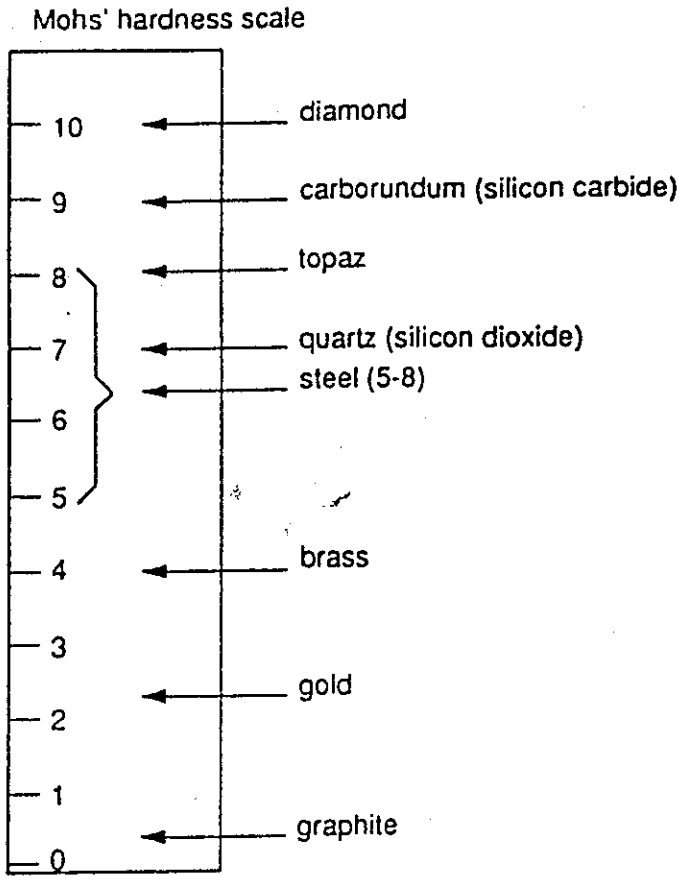
ethanol

(ii) It is a family of organic compounds that have the same general formula, the same functional group and the same chemical behaviour.

(iii) A solvent is a substance that can dissolve other compounds to form a solution.

(iv) In forming esters, (oi) as a fuel.

5.



(a) *Diamond* : Has a repeated tetrahedral structure, in which each carbon atom is bonded to four other carbon atom by very strong covalent bonds.
Graphite : In the form of layers weakly bonded together. In each layer, each carbon atom is strongly bonded to three other carbon atoms by strong covalent bonds.

(b) Diamond is hard because of the presence of four strong covalent bonds around every carbon atom, which forms a very strong tetrahedral structure.

Graphite is soft because of the presence of weak attraction between the layer of hexagons.

(c) (i) To cut glass (or) in drilling wells.

(ii) Pencils (or) Lubrication of machines.

(d) Due to difference in the amount of carbon present in its structure.

(e) Diamond, Gold and Graphite.

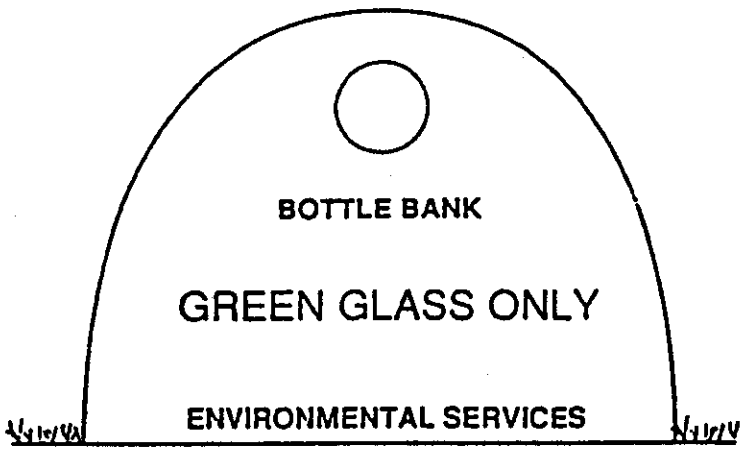
(f) Brass.

(g) By reacting silicon and carbon together at high temperature away from atmospher.

(h) Aluminium, Silicon, Oxygen, Hydrogen and Fluorine.

Paper 3

1.



material	*energy needed for original production, in* GJ/tonne	*energy saved by recycling* percentage %
aluminium	*250*	*95*
plastics	*100*	*88*
paper	*30*	*35*
glass	*16*	*5*

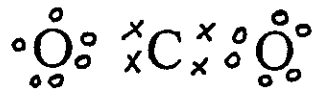
1 GJ = *1000 million joules*

(a) (i) 12.5 GJ
(ii) Solid aluminium oxide is mixed with cryolite ; the mixture is then melted and electrolysis occurs using graphite electrodes as the anode and graphite linning as the cathode. Molten Aluminium is then collected at the bottom.
(iii) Recycling saves electricity consumed in electrolysis.
(iv) because it has its own protective layer of $A\ell_2O_3$.

(b) (i) Displacement.
(ii) $+ CO_2$.

(c) (i) Diamond.
(ii) SiO_2 is hard solid, CO_2 is a gas at room temperature.

(iii)



(iv) *silicon atom* : Four.
oxygen atom : Two.

2.

DRIED APRICOTS

NUTRITIONAL INFORMATION

in 100 g of product

Protein	---------
Carbohydrates	40 g
Sugar	40 g
Fibre	15 g
Energy	732 kJ

Preservative E 220

Produce of Turkey

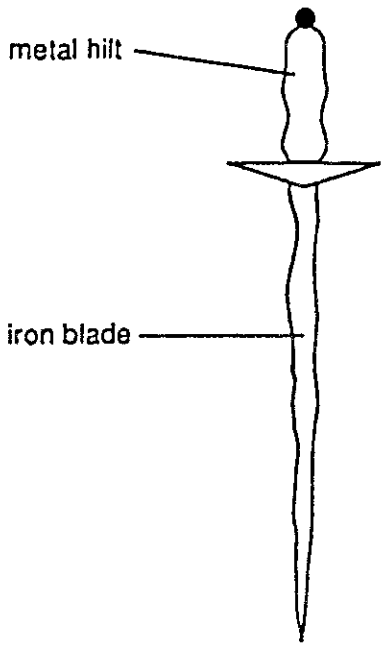
(a) (i) Fat.
(ii) 5 g.

(b) (i) by killing bacteria.
(ii) underground deposits.
(iii) for bleaching.

(c) (i) The purple colour disappears.
(ii) *Reagent* : acidified barium chloride solution.
Result : heavy white precipitate is formed.
(iii) *acid* : a substance that gives H^+ ions in solution.
weak acid : a substance that gives a little of H^+ in solution.
strong acid : a substance that gives a lot of H^+ in solution.

(d) By chromatography, using a locating agent.

3. (a)



(i) Any one of : Copper, Cobalt, Nickle, Aluminium.

(ii) The hilt was made of a metal which is less active than iron, e.g. copper. This made iron corrode faster near the hilt (acted as a sacrificial metal).

(iii) Stainless steel.
Chromium, carbon.

(b) Because the metallic structure allows the movement of metal atoms under pressure without breaking the structure.

(c) (i)

aqueous solution	iron	tin	scandium	mercury
iron(II) chloride		x	√	x
tin(II) chloride	√		√	x
scandium chloride	x	x		x
mercury(II) chloride	√	√	√	

√ = reaction occurred
x = no reaction

(ii) 1. Most reactive scandium.
2. Iron.
3. Tin.
4. Least reactive mercury.

(iii) $2Sc + 3S^{2+}n \rightarrow 2Sc^{3+} + 3Sn$

(d) (i) Silver and Copper.

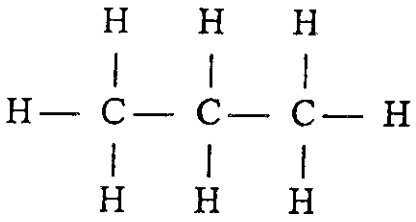
(ii) Initial mass of the sample, and the mass of the unreacted gold (residue).

4. (a) (i) Energy to break H-H = + 436 kJ
Energy to break Br-Br = + 190 kJ
Energy to make H-Br = - 366 kJ
Energy to make H-Br = - 366 kJ

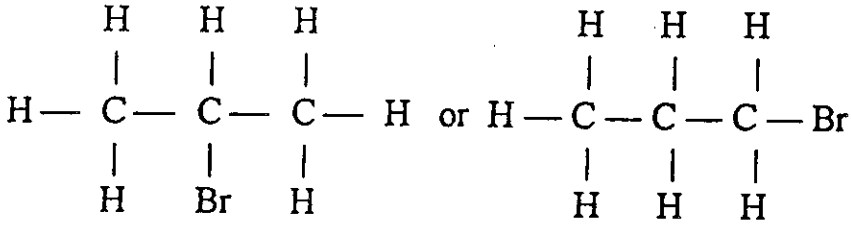
(ii) + (436 + 190) - (366 + 366) = - 106 kJ

(iii) Exothermic.

(b) (i)



(ii)



(iii) A reaction that needs light to occur.

(c) (i) $Pb^{2+} + 2\ Br^{-} \rightarrow Pb\ Br_{2(s)}$

(ii) To add exactly the stoichiometric amounts, since the concentration is the same.

(iii) Filter : to get rid of the water.
Wash : to get rid of any soluble impurities.

(d) 0.01 mole of PbBre is $= \frac{207+80+80}{0.01} = 3.67g$

$\therefore$ % yield $= \frac{2.21}{3.67} \times 100 = 60.2$ %

5.

element	*taken up by plant as*	*use*
nitrogen	NO_3^- or NH_4^+	to make amino acids and proteins
magnesium	Mg^{2+}	part of chlorophyll molecule
sulphur	SO_4^{2-}	to make protein containing sulphur
potassium	K^+	making enzymes

(a) (i) Phosphorus.
(ii) Because it captures the sunlight which is essential for the process of photosynthesis by which the plants form carbohydrates.
(iii) Enzymes are organic catalysts.

(b) (i) Hydrolysis (saponification).
(ii) Soap.

(c) The acid rain, which contains sulphuric acid, will supply the plants by more than its needs of the sulphate ions.

(d) (i) by heating vegetable proteins with an alkaline solution e.g. sodium hydroxide solution (or) by enzyme hydrolysis.
(ii) The peptide linkage.
(iii) The protein : is formed by polymerization of amino acids.
Nylon : is formed by polymerization of a diacid and a diamine.

Paper 6

1. (a) a burette.

   (b) a balance.

2. (a) Add the mixture to a beaker containing some water. Stir and warm. Filter. Wash the residue by water. Dry the residue.

   (b) Take the filtrate from (a) and put it in an evaporating basin. Heat gently to evaporate the solution till the point of crystallization. Cool. Filter. Dry the crystals between two filter papers.

3. (a) Bromine.

   (b) Potassium.

   (c) Copper (II) nitrate.

4. (a)

dilute acid used	*initial temperature of acid/℃*	*final temperature of acid/℃*	*observations*
sulphuric acid	26.0	26.0	evolution of gas for a few seconds which then stopped
hydrochloric acid	23.0	27.0	rapid evolution of gas
ethanoic acid	24.0	24.5	slow evolution of gas

(b) (i) Hydrochloric acid.

(ii) - Greater rise in temperature.
- Rapid evolution of gas.

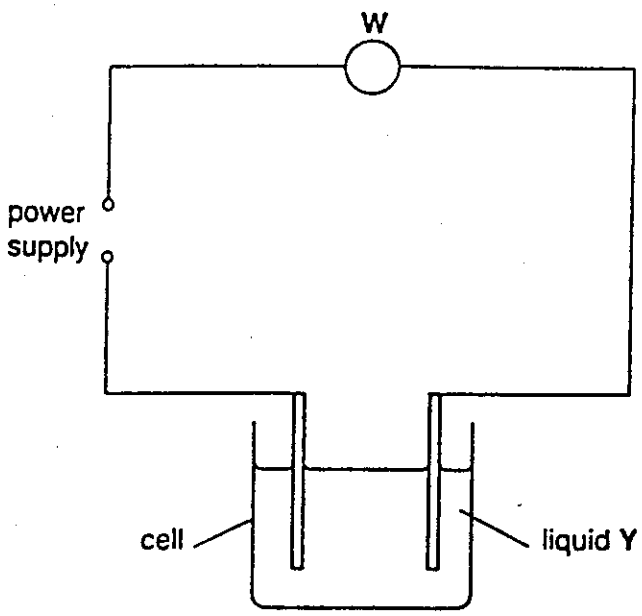
(c) (i)

initial temperature of acid/℃	*maximum temperature of acid/℃*
29.0	41.0

(ii) by the large rise in temperature.

(iii) Catalysis.

5.



(a) a lamp (or) a galvanometer.

(b) (i) a piece of copper.

(ii) the metal object.

(iii) copper (II) sulphate solution.

6. (a) (i) To ensure that any water formed later is coming from the dry solid itself.
(ii) Anhydrous calcium chloride.

(b) from the water of hydration.

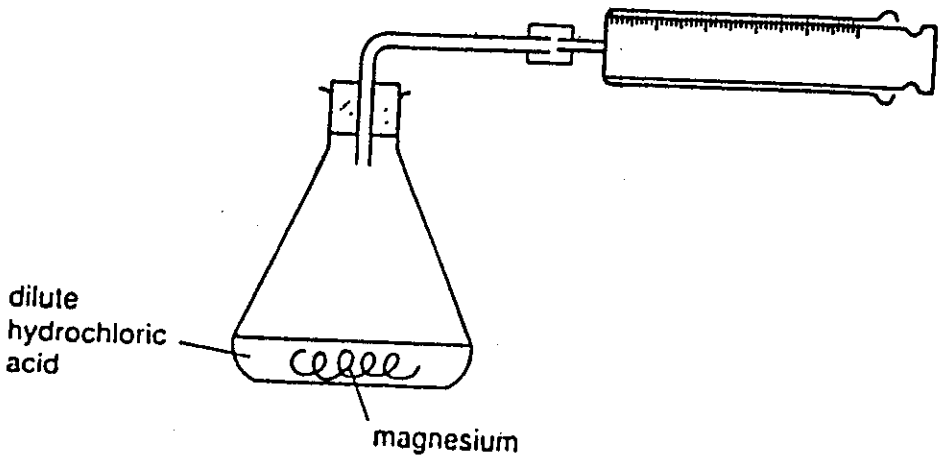
(c) (i) Hydrogen took oxygen from the oxide to form water.
(ii) Iron (III) oxide.

(d) (i) Iron metal.
(ii) Iron, oxygen.

7.

gas	*test on gas*	
	effect on damp litmus paper	*test with splint*
chlorine	*bleaching*	lighted splint goes out
oxygen	no effect	*relights a glowing splint*
ammonia	*turns blue*	lighted splint goes out
hydrogen	no effect	*burns with a squeaky pop.*

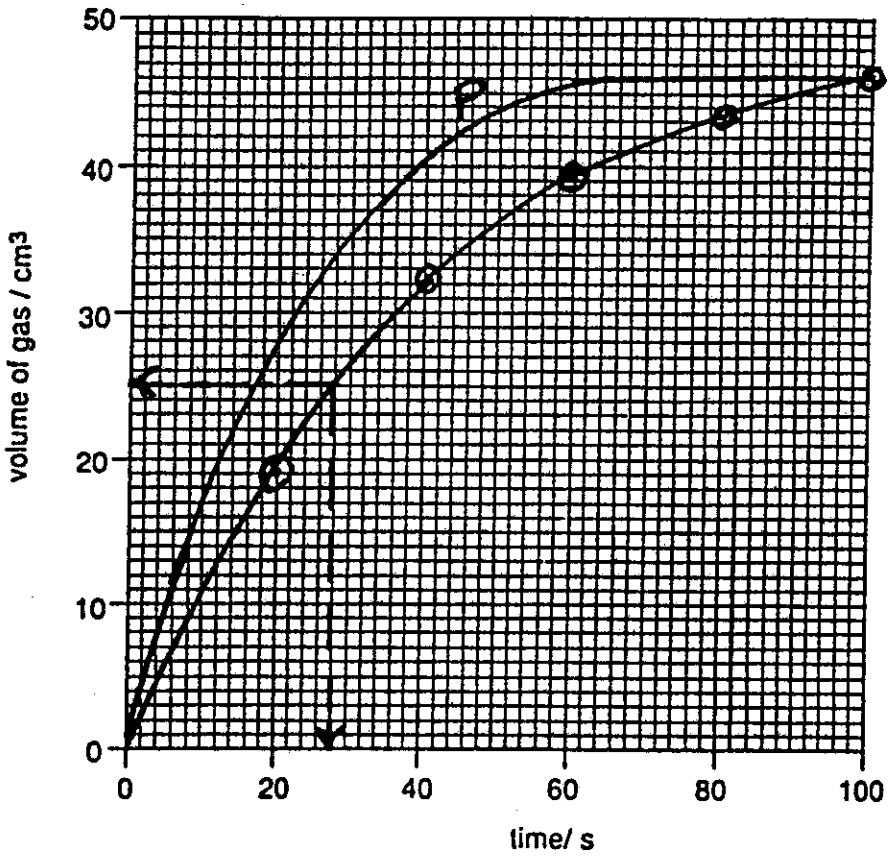
8.



(a)

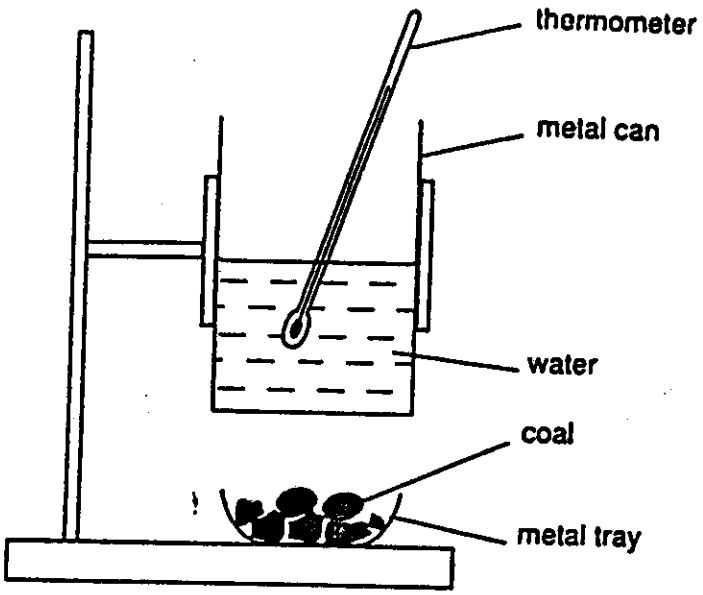
time/s	*volume of gas/cm^3*
0	*0*
20	*19*
40	*32*
60	*39*
80	*43*
100	*46*

(b)



(c) 28 seconds.

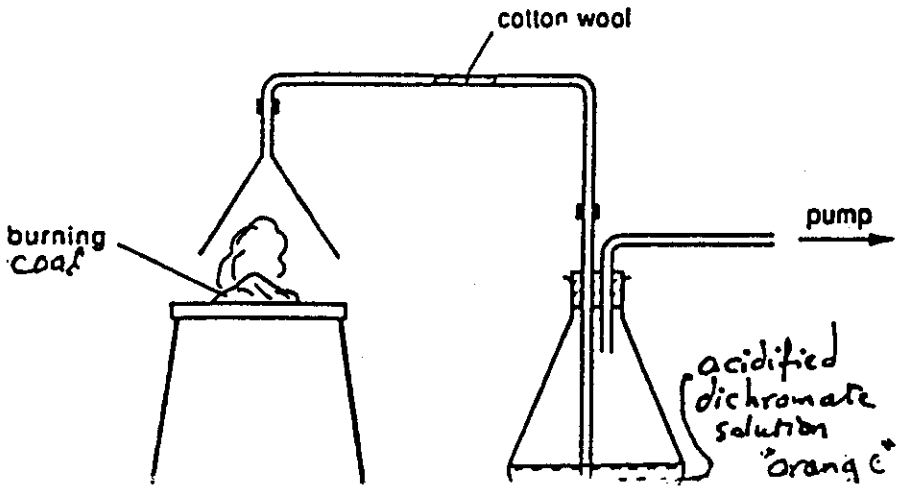
9. (a)



(i) - Mass of water.
- Initial and final temperatures.
- Mass of coal.

(ii) Any three of the following will do :
1. Size of coal lumps.
2. Distance between coal and the metal can.
3. Presence of moisture in coal.
4. Position of thermometer during reading.
5. Consistancy of stirring of water.

(b) Use the apparatus below and a stop watch. The coal which produces most sulphur dioxide will turn the dichromate solution from orange to green faster.



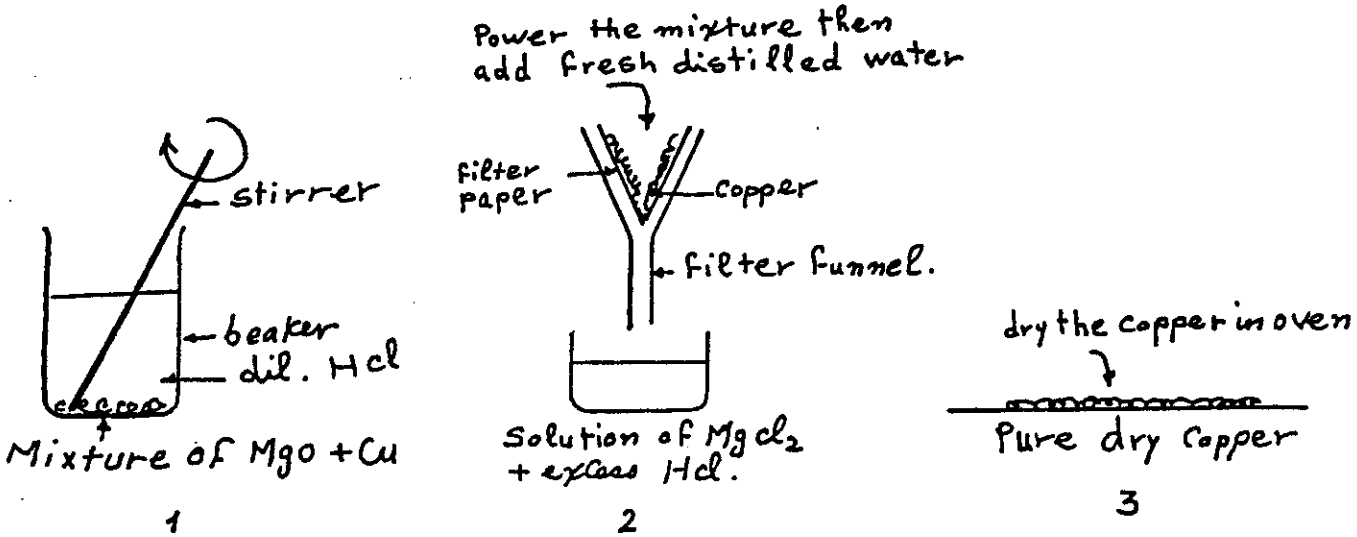
Paper 2

1. (a) (i) Magnesium + Copper (II) Oxide → Magnesium Oxide + Copper

(ii) CuO A black powder
MgO A white ash
Cu An orange metal (shiny solid)

(iii) Exothermic

(b)



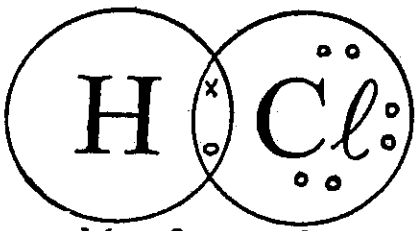
(c) Use it as a part of an electric circuit to light a lamp.

(d) 1. Copper is better conductor of electricity.
2. Copper is much less reactive.

2. (a) At the negative electrode (cathode).
(b) Expose a wet blue litmus paper to the gas. It will turn red then bleaching occurs.
(c) **test :** add acidified silver nitrate to a sample of the solution.
result : No ppt. is formed.

(d) (i) $H_2 + C\ell_2 \longrightarrow 2\ HC\ell$

(ii)



(e) (i) in the fuel cell or Manufacture of NH_3

(ii) Cracking of long chain petroleum fractions.

(f) $2NaOH + C\ell_2 \rightarrow NaC\ell + NaOC\ell + H_2O$

$6NaOH + 3C\ell_2 \rightarrow 5NaC\ell + NaC\ell O_3 + 3H_2O$

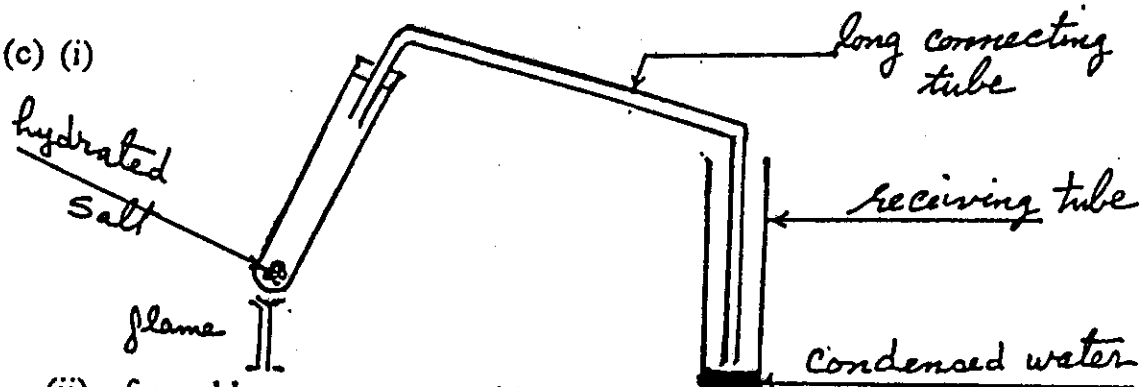
(g) (i) 1308 kg

(ii) Because water is also involved as in the original equation.

3. (a) Iron (II) sulphate, cobalt (II) chloride, and copper (II) sulphate.

(b) The transition metal salts.

(c) (i)



(ii) from blue to white

(iii) Test for its boiling point ; if it is 100°c , it is pure water.

(iv) A reversible process is a process that can easily go back and forth.

(d) Connect the solution (by immersing two wires into it) to an electric circuit with a lamp. If it lit, it means that this solution conducts electricity.

(e) add few drops of dil. HCℓ solution to a sample of this solution Efferverance occurs.

4. (a)

substance	*formula*	*chemical name*
sand	SiO_2	Silicon dioxide
limestone	$CaCO_3$	Calcium carbonate
charcoal	C	Carbon

(b) (i) Carbon dioxide

(ii) $C + O_2 \longrightarrow CO_2$

(iii) Carbon monoxide

(c) (i) sodium carbonate : limestone = 2 : 1

(ii) sodium carbonate = $\frac{35}{100} \times 100 = 23.33\ \%$

(d) **A** Beaker
B Conical flask
C Pipette
D Filtration Funnel

5. (a) Put it in an evaporating basin and heat gently to evaporate most of the water.

(b) (i) Sodium bromide + Chlorine → Sodium chloride + bromine

(ii) $C\ell_2$ is a pale green gas. Br_2 is a reddish brown gas. The colourless solution turns yellow then brown.

(iii) Simple distillation.

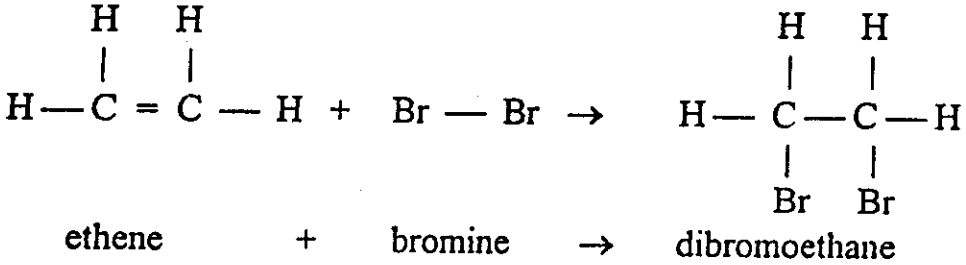
(c) A molecule contains two atoms.

(d) (i) C_2H_4

(ii) Br_2

(iii) $C_2H_4Br_2$

(iv)



(e) (i) It causes mental retardation.

(ii) carbon monoxide and sulphar dioxide.

Paper 3

1. (a) (i) Both conduct electricity.

(ii) K is soft while Ni is hard.
Ni is used as a catalyst. K is not.

(b) (i) $2NiO + C \rightarrow CO_2 + 2Ni$

(ii) Aluminium and Magnesium metal

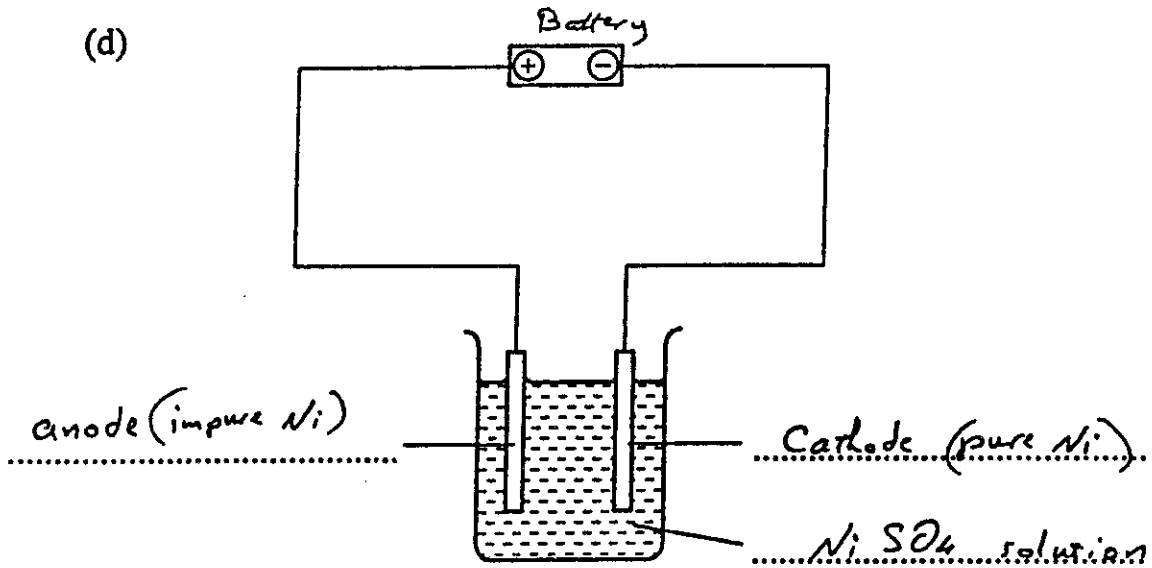
(c) (i) By heating.

(ii) Direct combination.

(iii) Easily evaporated.

(iv) Heat by condensing the vapours of the volatile Nickel carbonyℓ, leaving the impurities in the original container.

(d)



(e) Ni 59

$(CO)_n = (12 + 16)_n = 171 - 59$

$(28)_n = 112$

$n = \frac{112}{28} = 4$

2. (a)

	properties	*arrangement and movement of paricles*
solid	fixed shape and fixed volume	Closely packed, very restricted movement
liquid	fixed volume and takes the shape of the container	Not closely packed. Particles can moeve freely in the liquid phase

(b) (i) Particles gain energy by heating. They can overcome the forces attraction and move ; hence melts to the liquid phase.

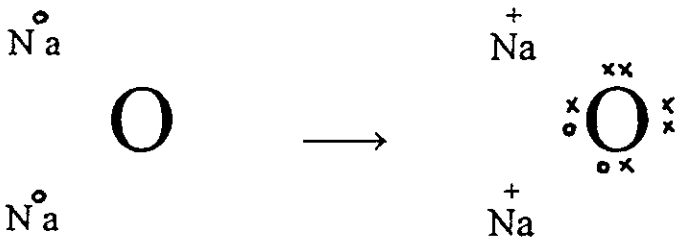
(ii) When the melting point is high and sharp, it is pure. If it is lower and in a range, it is impure.

(c) (i) The movement of the particles from areas of high concentration to areas of lower one.

(ii) Because hydrogen ions are lighter, they mover faster.

(iii) **test :** Dissolve in water and check with litmus.
result : Na_2O dissolves and turns red litmus blue.
SiO_2 will not dissolve.

(d)



3. (a) The plants collect CO_2 and light by chlorophyl and react them with water to form carbon compounds.

(b) (i) Calcium carbonate $\xrightarrow{\text{heat}}$ Calcium oxide + carbon dioxide

Calcium oxide + water $\longrightarrow$ Calcium hydoxide

(ii) - in construction.
- in the blast furnace for iron extraction.

(c) Calcium ethanoate

(d)

C	H	O
54.5	9.1	36.4
12	1	16
4.542	9.1	2.265
2 :	4 :	1

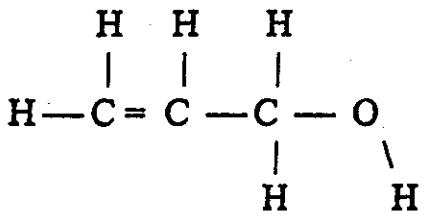
∴ The emperical formula of ethanol is : C_2H_4O

(e) (i) ethylethanoate $CH_3-COOC_2H_5$

(ii) An Alcohol

(iii) (C = C) a carbon - carbon double bond

(iv)



4. (a) (i) The rate will increase as more surface area of the metal will be in contact with bromine.

(ii) As conc^n of Br_2 solution increases, more Br_2 molecules are allowed to react / min.

(b) Carry out the experiment several times. In one experiment no stirring. In the second one slow stirring. In the third one fast stirring. Record the results, and compare.

(c) (i) **test** : Add dil. sodium hydroxide solution.
result for Fe^{2+} : Dirty green ppt. will be formed.
result for Fe^{3+} : Red brown ppt. will be formed.

(ii) $Fe + Br_2 \rightarrow Fe^{2+} + 2\,Br^-$

(d) (i) $Br_2 \rightarrow 2Br^-$, because it involves gaining of electrons.

(ii) Decrease, because the tendency of I_2 to change to I^- is slower than Br_2.

5. (a) (i) Sulpher deposits.

(ii) $SO_2 + \frac{1}{2} O_2 \Leftrightarrow SO_3$

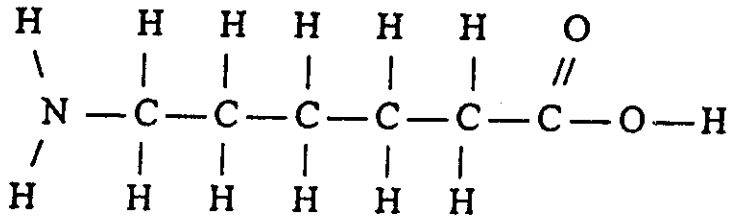
(iii) Vanadium (V) oxide.

(iv) By dissolving SO_3 in water, while absorbing the evolving heat.

(b) First : by roasting the ore to form ZnO .
Then react ZnO with carbon in a blast furnace like iron extraction.

(c) (i) –3
(ii) So the plant can absorb it.
(iii) A particle that attracts H^+.
(iv) Ammonium sulphate.

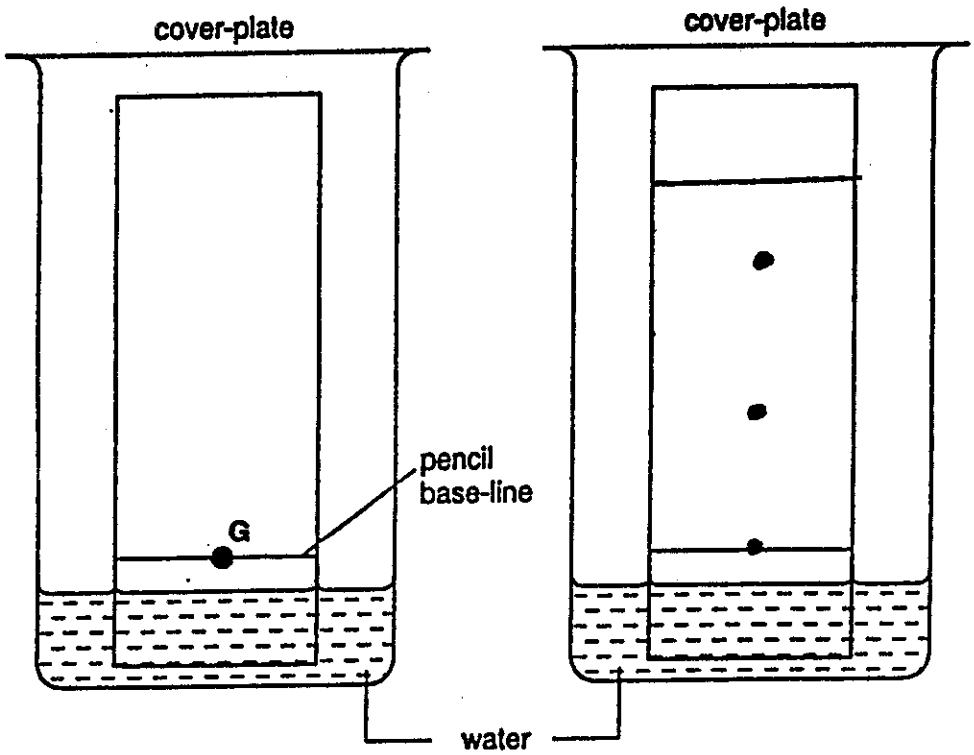
(d)



Paper 6

1. Time = 91 s

2. (a)



(b) Graphite is insoluble in water, while ink is. Pencil will not interfer with the chromotographic process while ink does.

(c) To avoid dissolving of the components in the water.

3. *Experiment 1*

(a) Mortar and pestle

(b) (i) Carbon
(ii) Water

(c) Pass the gas through lime water. Lime water will turn milky if the gas is carbon dioxide.

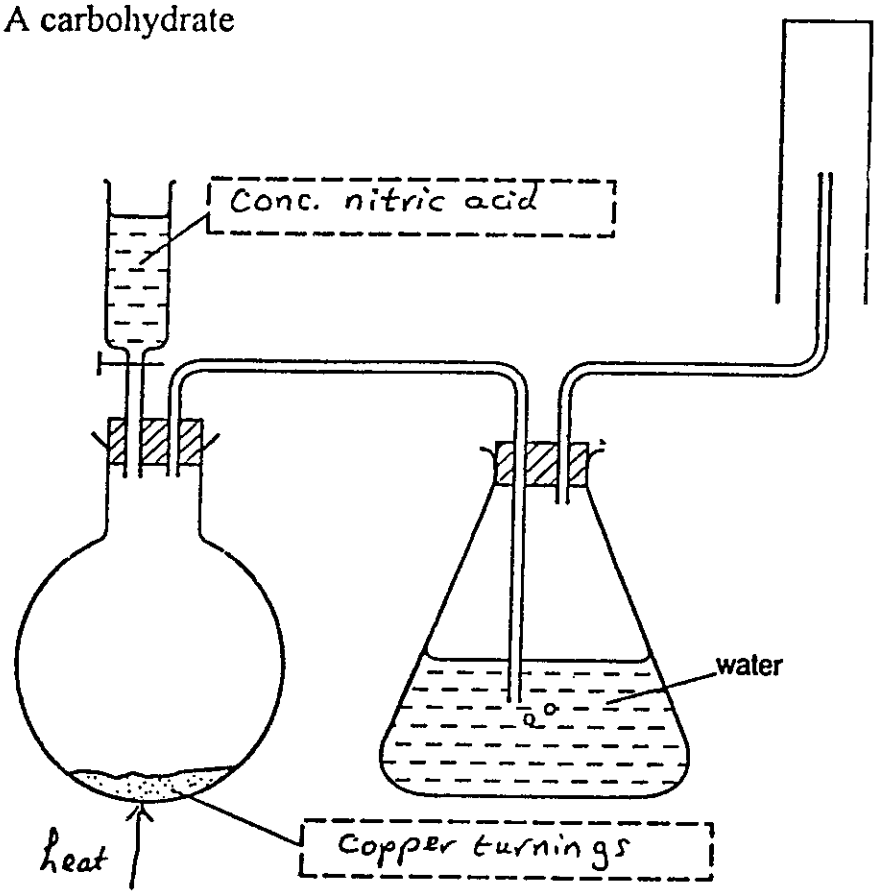
Experiment 2

(a) 37°C

(b) 1. Bubbles of a gas are formed.
2. Temperature rises.

(c) A carbohydrate

4. (a)



(b) Mistake 1. The gas is soluble in water , and it is bubbled through water.
Mistake 2. The gas is denser than air, while the mode of collection is upward delivery.

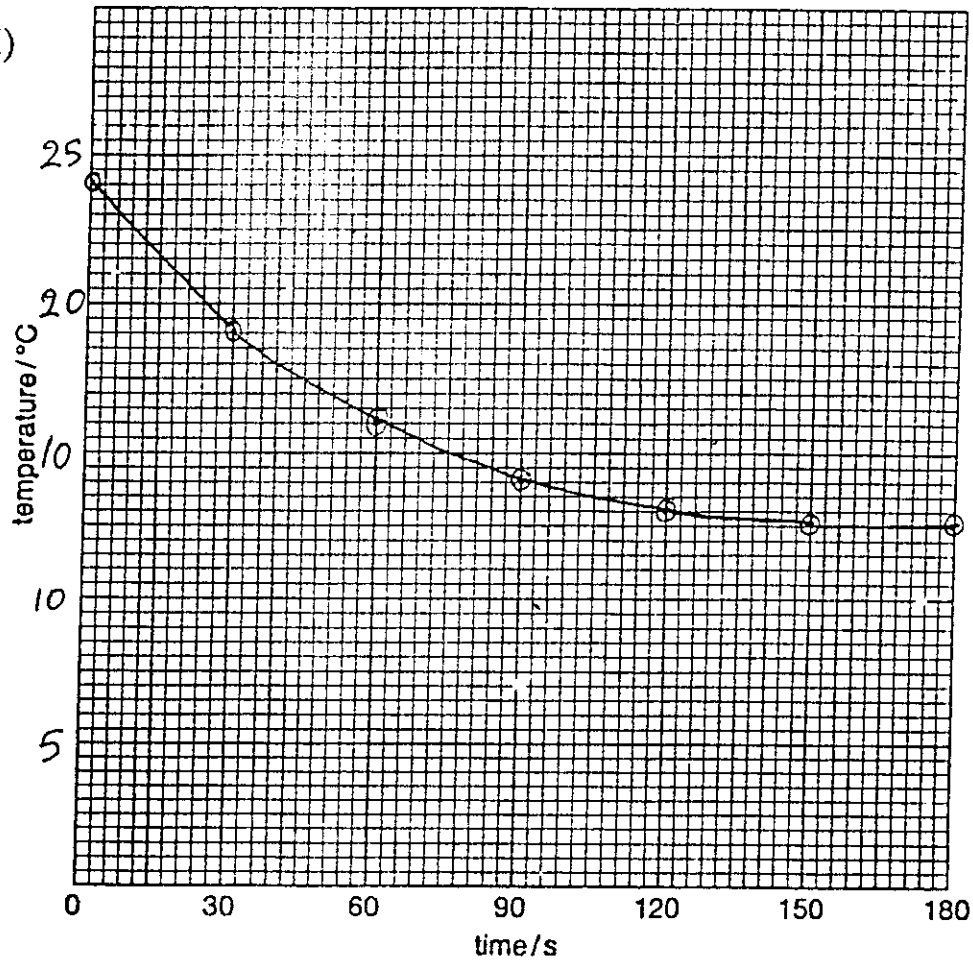
(c) 1. Add conc. HND_3 dropwise to avoid violent reaction.

2. Heat gently to maintain controlable rate of formation of nitrogen dioxide.

5.

temperature of liquid/ °C	24.0	19.0	16.0	14.0	13.0	12.5	12.5

(a) (i)

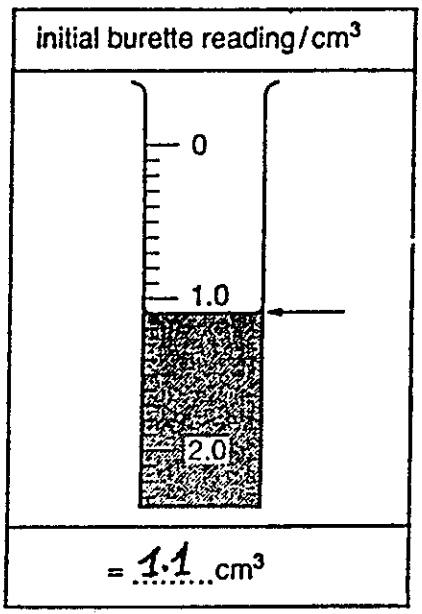


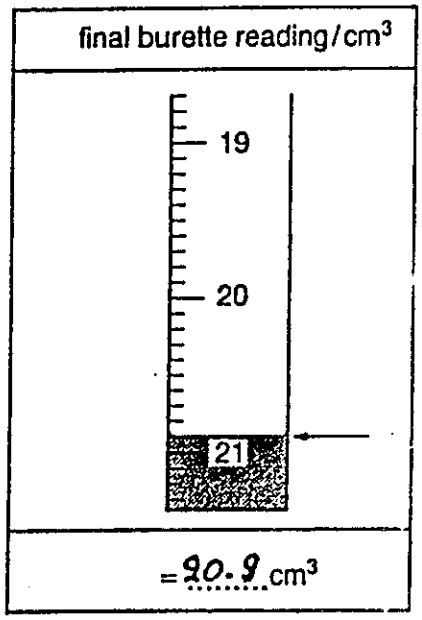
(iii) Energy is lost . Cooling occurs

(iv) Cover the polystyrene cup to minimize the heat transfer.

(v) 24°C The temperature of the solution will go back to normal in less than 1 hour as the reaction end in less than three minutes.

(b)





(i) Volume added/cm^3 = 20.9 – 1.1 = 19.8 cm_3

(ii) A pipette.

6. (c)

tests	*observations*
(iii) Universal Indicator was added to the third portion.	Colour turned red. pH 1
(iv) Few drops of dilute nitric acid were added to the fourth portion. Then aqueous silver nitrate was added.	A white ppt. is formed, turns dark in light.

(d) A salt of a non-transition metal.

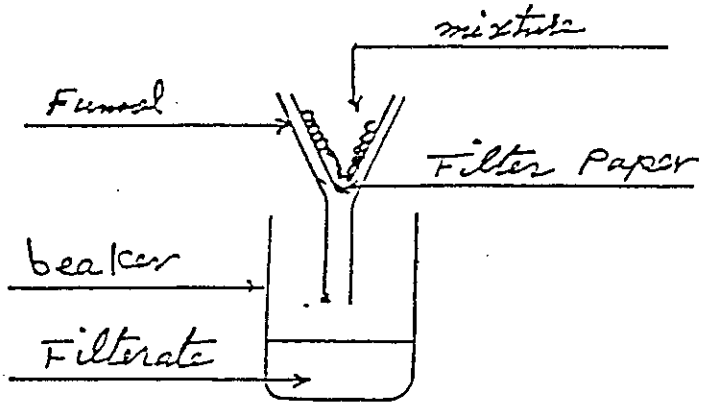
(e) - It has water of crystallization.
- It is easily decomposed by heating.

(f) C salt has $A\ell^{3+}$ ions in it.

(g) Aluminnium Chloride.

7. (a) Effervescence, due to the formation of carbon dioxide.

(b)



(c) Zinc. It is more active than copper, therefore, it will displace copper out of its salts.

(d) By electrolysis.

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Paper 2

1. (a) In the solid state, ions cannot move. While molten, ions can move.

   (b) (i) Carbon.
   (ii) The negative electrode (steel cathode).
   (iii) Chlorine and Fluorine.

   (c) (i) Because calcium is an active metal. It will react with O_2 and CO_2 of air.
   (ii) It will be lowered.

   (d) Magnesium and Barium.

   (e) Calcium chloride and Hydrogen.

   (f) (i) Calcium + water $\rightarrow$ Calcium hydroxide + Hydrogen
   (ii) When a fresh piece of calcium is added, no bubbles of hydrogen are formed.

2. (a) Neon and Helium.

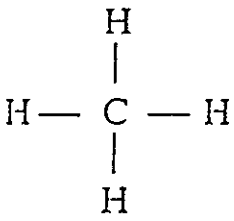
   (b) Expose a paper damped with hydrochloric acid solution to the sample. White cloud will be formed.

   (c) Bubble the sample through lime water. The lime water will turn milky.

   (d) (i) 79 %
   (ii) 19 %

   (e) No. Because there is neither water vapour nor oxygen in Saturn's atmosphere.

(f) (i)

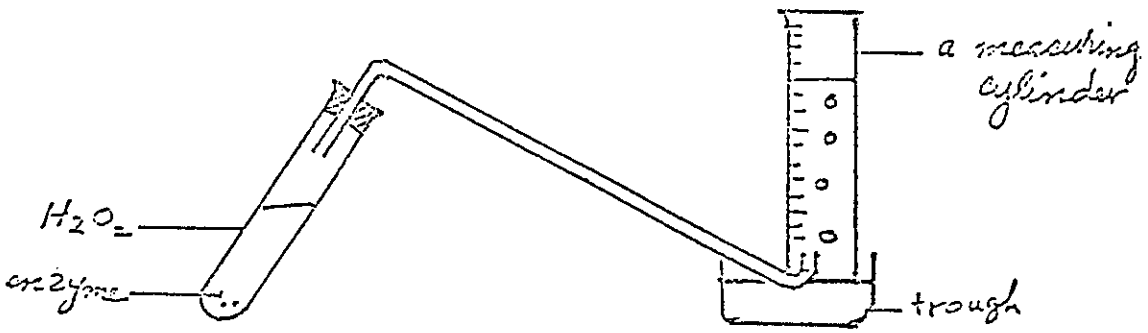


(ii) Gas.
(iii) Methane + Oxygen → Carbon dioxide + Water
(iv) Exothermic.

3. (a) A carbon compound.

(b) 1. Increase the temperature.
2. Increase the concentration of reactants.
3. Increase the surface area of solid reactants.

(c) (i) Oxygen.
(ii) Expose a glowing splint to the gas. It will glow in oxygen.
(iii)



(d) (i) 8 - 10
(ii) Simple distillation.
(iii) 1. Oxygen.
2. Boron.
3. Silicon.

4. (a) An isotope is an atom of the same element "same proton number". but different neutron number.

(b)

Nucleon (mass) number	222
number of protons	86
number of neutrons	136
number of electrons	86

(c) Group 6.

(d) neutrons 2
protons 2

(e) (i) It is an atom that lost or gained one or more electrons.
(ii) These atoms absorb radiation from the sun.

(f) The movement of particles from areas of high concentration to areas of low concentration.

(g) Cobalt 60 , to treat cancer.

(a) (i) Potassium and Aluminium.
(ii) to evaporate.
(iii) Take a sample of the solution. Add to it few drops of acidified barium chloride solution. White ppt. is formed.
(iv) Take a sample of this solution. Add few drops of NaOH solution. White gelatinous ppt. is formed. Add excess NaOH solution. The ppt. disappears.

(b) Aluminium + Potassium → Potassium + Aluminium
Chloride Chloride

(c) (i) Bauxite.
(ii) Aluminium Oxide.
(iii) As a flux.
(iv) Carbon.

(d) (i) Cleaned then melted and reshaped.
(ii) It will be decreased.

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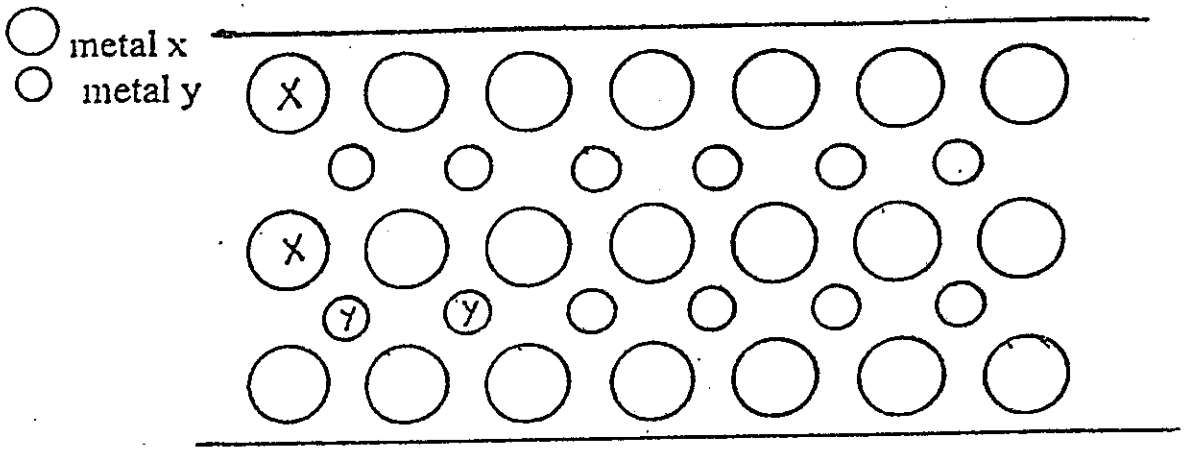
Paper 3

(a) (i) 3.
(ii) because they have the required properties.
(iii)



(b) (i) Uranium - 235.
(ii) Tracing Liquid - Surface levels.

(c) (i) Magnesium, because it displaced zirconium out of zirconium (IV) Chloride.

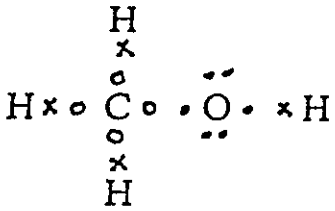
(ii) $Z_r + 2I_2 \underset{\text{higher temp.}}{\overset{\text{heat}}{\rightleftharpoons}} Z_rI_4$

(d) (i) Both are solids, with high melting point.
(ii) reagent *Add sodium hydroxide solution.*
result with silicon(IV) oxide *It will dissolve on heating.*
result with zirconium(IV) oxide *No reaction.*

(a) because they are liquids at room temperature.

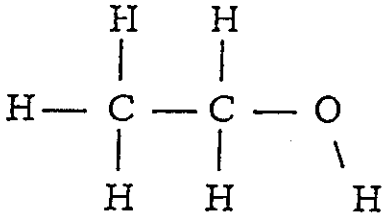
(b) (i) Candles or Lubricants.
(ii) Cracking.
(iii) by fractional distillation.

(c) (i)

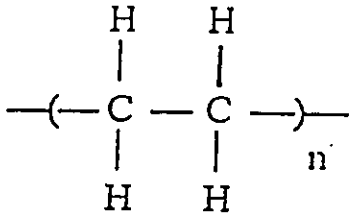


(ii) $2CH_4 + O_2 \longrightarrow C_2H_6 + \frac{1}{2}H_2O$

(iii)



ethanol



polyethene

(d) (i) because more collisions between reactant molecules occur due to higher kinetic energy.

(ii) (1) Increasing concentrations of reactants.
(2) Increasing surface area of solid reactants.

(e) (1) Temperature : ~ 500°C . (2) Pressure : ~ 300 Atmosphere .
(3) Catalyst : finely divided reduced iron on alumina.

(f) (i) Amino acids.

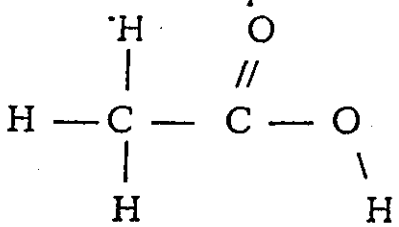
(ii) Use the technique of chromatography, by which separation can occur. Use spots of different known amino acids and run chromatography for them with the sample under the same conditions and compare Rf values to identify them.

(iii) Nylon.

3. (a) (i) Ethanol and carbon dioxide.

(ii) Oxidation of ethanol to ethanoic acid occurrs when the reaction mixture is exposed the oxygen of air.

(iii)



(iv) because sulphuric acid is a stronger acid "gives more ions" than ethanoic acid.

(b) (i) Iron.
(ii) hydrogen.
(iii) bigger, because zinc is more active than iron.

(c) (i) decrease in mass.

(ii) $Ag^{+}_{(aq)} + e^{-} \longrightarrow Ag_{(s)}$

(d) for portable, movable equipment.

(e) (i) exothermic.
(ii) because this chemical change gives out energy.

4. (a) (i) ~ 45°C.
(ii) because there is no general trend the densities of the other elements.
(iii) $2Cs_{(s)} + 2H_2O_{(\ell)} \longrightarrow 2CsOH_{(aq)} + H_2$
(iv) - Caesium floats & darts.
- It will catch fire.

(b) (i) XCl_3
(ii) No. Because elements of group V are generally nonmetals.
(iii) - It will have low melting point.
- It will not conduct electricity.

5. (a) To a beaker containing some dilute sulphuric acid solutions, add portions of copper carbonate while warming and stirring. Continue addition until the reaction stops. Filter. Evaporate the filtrate till the point of crystallization. Cool. Filter and dry the crystals.

(b) (i) A burette, a pipette and conical funnel.
Additional chemical : methyl orange indicator.
(ii) because copper (II) hydroxide is not soluble in water, while sodium hydroxide is.

(c) (i) 233g of $BaSO_4$ are 1 mole

1.165g of $BaSO_4$ are x mole.

$x = \frac{1.165 \times 1}{233} = 0.005$ mole

(ii) In the equation : ratio of $FeSO_4$ to $BaSO_4$

1 : 1

therefore, the # of moles of hydrated iron (II) salt is

= 0.005 mole.

(iii) 0.005 mole of $FeSO_4 \times H_2O$ is 1.390 g

$\therefore$ 1 mole of $FeSO_4.xH_2O$ is xg

$x = \frac{1 \times 1.390}{0.005} = 278$ g

(iv) Mass of water = 278 – 152 = 126 g

$\therefore$ number of moles of water = x

$x = \frac{126\ g}{18\ g}$

$x = 7$

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Paper 6

volume = 79 cm^3

In a beaker, add some dilute sulphuric acid. Add to it the Zn Cu mixture. Worm and stirr When bubbling stops, filter. Wash the copper pieces with distilled water and dry it in an oven.

(a) (i) A dehydrating agent.
(ii) To separate the dehydrated agent from reaction mixture.

(b) (i) Part B Colour change from black to orange.
Part C Bubbles of nitrogen gas are collected.

(c) To get rid of air.

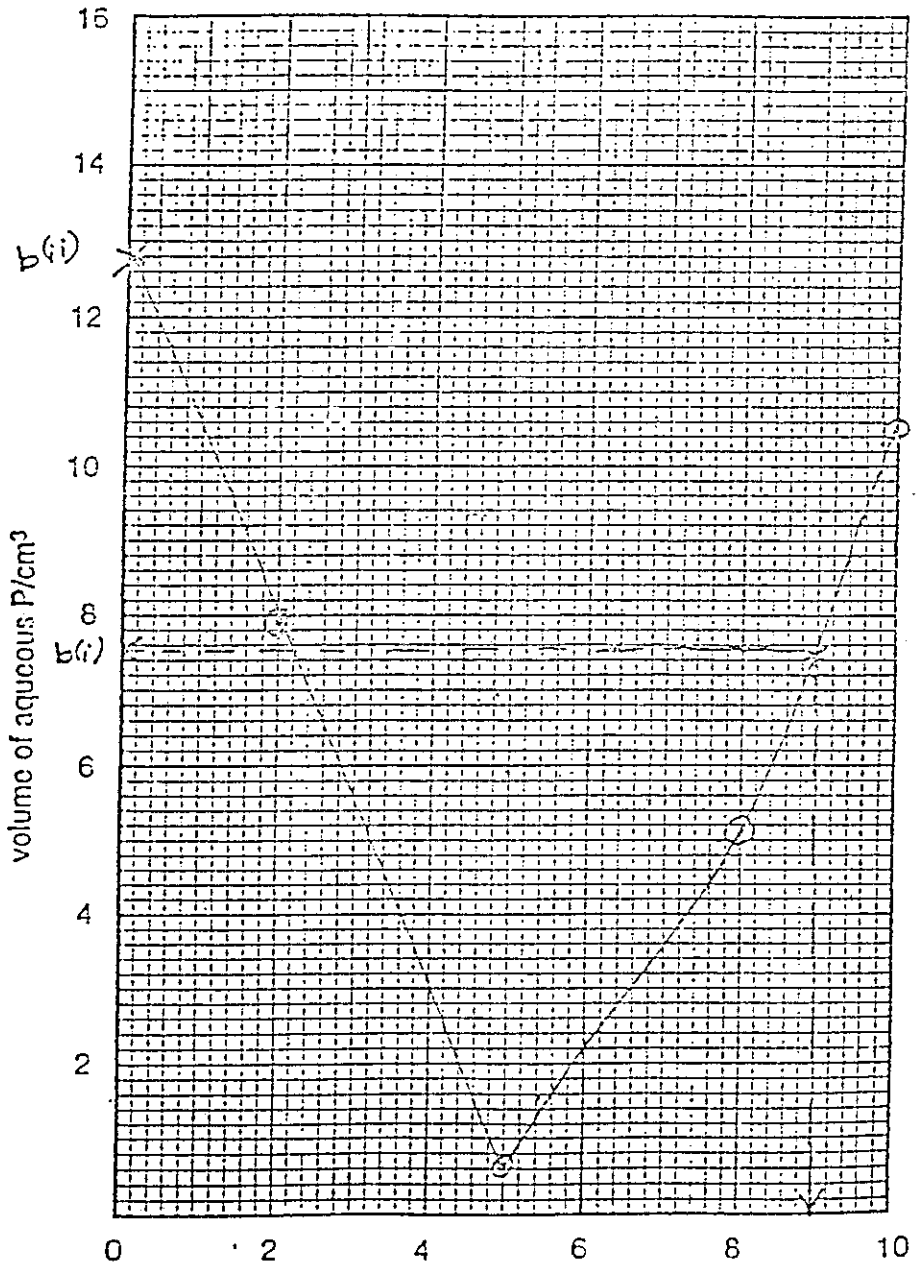
(d) Disconnect part C to avoid back suction.

Take one gram of sample # 1. Add it to a beaker containing 50 mℓ of water and a thermometer. Stirr and check for the maximum temperature. Repeat the experiment for the other 5 samples of lime. Record each result and choose the one that produced the largest rise in temperature.

Experiment 1 :	initial burette reading/cm^3	= 8.7 cm^3
	final burette reading/cm^3	= 19.2 cm^3
Experiment 2 :	initial burette reading/cm^3	= 29.4 cm^3
	final burette reading/cm^3	= 34.5 cm^3
Experiment 3 :	initial burette reading/cm^3	= 34.5 cm^3
	final burette reading/cm^3	= 35.1 cm^3
Experiment 4 :	initial burette reading/cm^3	= 35.1 cm^3
	final burette reading/cm^3	= 43 cm^3

Experiment number	*Volume of aqueous Q used/cm^3*	*Volume of aqueous P added/cm^3*
1	10	10.5
2	8	5.1
3	5	0.6
4	2	7.9

(ii)



(b) (i) 7.5 cm.
(ii) 12.7 cm.
(c) To make sure that there are no traces of reactants in it.
(d) More volume of P will be use, to add the same number of moles.

6.

tests	*observations*
(a) *tests on the filtrate:* (i) An equal volume of aqueous sodium hydroxide was added to about 1 cm^3 of the filtrate.	A rusty brown precipitate was found.
(ii) An excess of aqueous ammonia was added to another portion of the filtrate.	*A rusty brown precipitate was formed.*
(iii) A few drops of aqueous sodium hydroxide and a little aluminium powder were added to another portion of the filtrate.	A strong smelling gas was given off which turned red litmus blue.
(b) *tests on the residue on the filter paper.* (i) colour of residue.	white solid
(ii) A little of the residue was placed in a test-tube and dilute hydrochloric acid added. Any gasses given off were passed through lime water.	*Effervescence occurs.* *Turbidity occurs.*

(c) That is a sample of iron (III) nitrate.

(d) Carbon dioxide.

(e) (i) It is not a transition metal.

7.

Liquid	*Chemical Test*
aqueous sodium chloride solution.	*Add acidified silver nitrate solution to a sample of the liquid. White ppt. is formed.*
dilute sulphuric acid	*Use blue litmus paper. It will turn red.*
ethanol	*Expose a sample of the liquid to a flame. It will catch fire.*
water	*Take few drops of the liquid and add it to white anhydrous copper (II) sulphate. It will turn blue.*

June 1996

Paper 2

1. (a) (i) $2Mg + O_2 \rightarrow 2MgO$

(ii) - White glow.
- Whit ash is formed.

(iii) - Insert a glowing splint in the jar. It will re-lit.

(b) (i) - Put some lime water in the jar.
- It will turn milky.

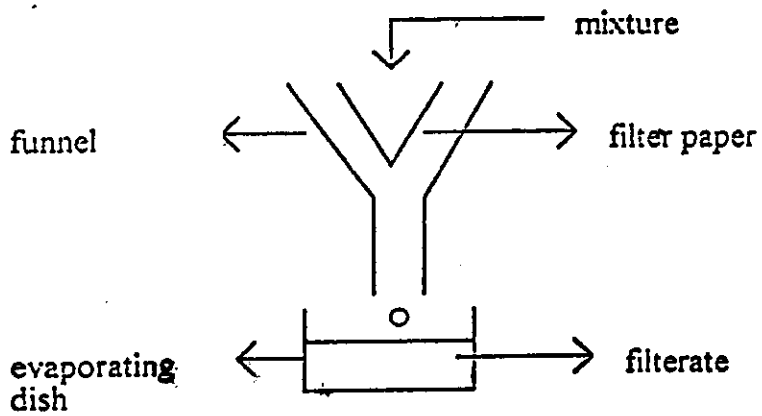
(ii) Magnesium carbide.

(iii) Magnesium carbonate.

(c) (i) Heat the reaction solution. Expose a wet red litmus paper to the vapours. It will change to blue.

(ii) Helium and Argon.

2. (a)



(b) to accelerate dissolving by increasing the surface area.

(c) (i)

mass of dish + rock salt	=	36.75 g
mass of dish + pure salt	=	36.25 g
mass of dish	=	35.25 g
mass of pure salt	=	*1.00* g
mass of rock salt	=	*1.50* g

(ii) percentage by mass of salt $= \frac{\text{mass of pure salt}}{\text{mass of rock salt}} \times 100$

$\frac{1.00}{1.50}\ \% = 66.67\ \%$

(d) (i) Na $C\ell$
(ii) White ppt.

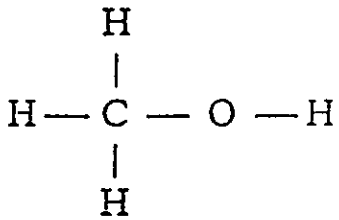
(e) (i) by transfer of electrons from the atoms of the metals to the atoms of the nonmetals.
(ii) by sharing electrons between atoms of nonmetals.

3. (a) Bubbles of a gas. Carbon dioxide is evolved.

(b) Distillation.

(c) (i) Add few drops of the sample to whit anhydrous cooper (II) sulphate. It will turn blue.
(ii) $CaO + H_2O \rightarrow Ca(OH)_2$

(d) (i)



(ii) Hydrogen and carbon.
(iii) C_5H_5N

4. (a) (i) Potassium, Nitrogen, Oxygen, Carbon, and Sulpher.
(ii) Nitrogen, Oxygen, Carbon and Sulpher.

(b) Add sodium hydroxide solution and aluminium powder to a sample of gum powder and boil. Expose a red litmus paper to the vapours. It will turn blue.

(c) (i) Oxidation is the process in which oxygen is added or an electron is removed.

(ii) K_2S Potassium sulphide.
N_2 Nitrogen.
CO_2 Carbon dioxide.

(iii) to increase the reaction rate to make the explosion.

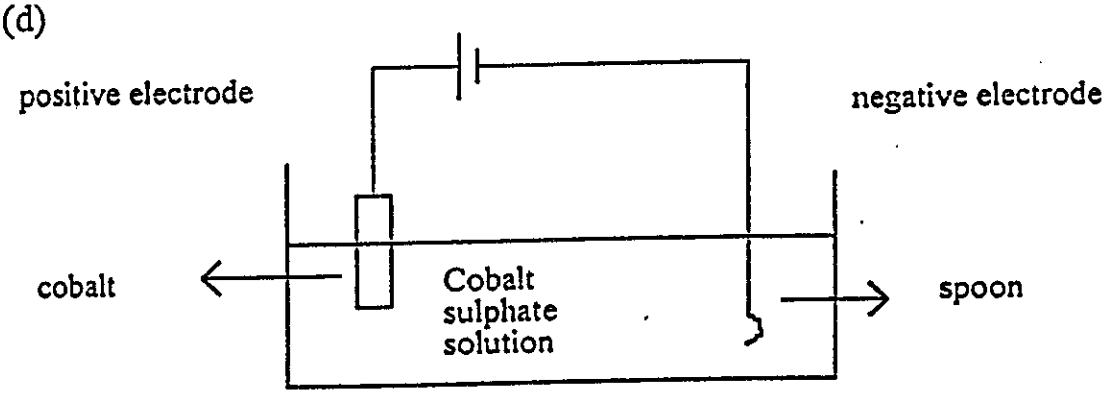
(d) (i) Group 1.
(ii) Put it in a dessicator containing a dehydrating agent (Conc. H_2SO_4 or anhydrous $CaC\ell_2$).

5. (a) (i) Cobalt Oxide + Hydrogen $\xrightarrow{\text{heat}}$ Cobalt + Water
(ii) Zinc.

(b) 1. From coloured compounds.
2. Act as catalysts.
3. Can have more than one oxidation number.

(c) (i) Cobalt + Hydrochloric acid → Cobalt (II) chloride + Hydrogen
(ii) Cobalt + Chlorine → Cobalt (III) chloride.

(d)



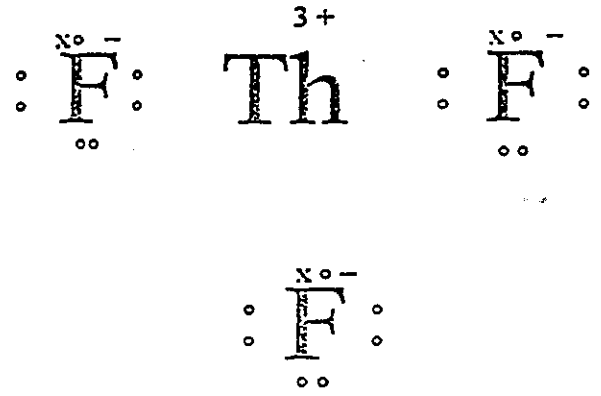
(e) (i) Atoms of the same element but have different numbers of neutrons.
(ii) Therapy of cancer.

June 1996

Paper 3

1. (a) (i) thallium (I) carbonate Th_2CO_3
thallium (III) oxide Th_2O_3

(ii)



(b) because of the reaction :

$$3\ ThC\ell \xrightarrow{light} ThC\ell_3 + Th_{(block)}$$

(c) (i) The pH paper to check the pH of each solution. The pH of 0.1 moℓ / dm^3 solution of thallium (I) hydroxide will be higher than that of ammonia.

(ii)

thallium(I) hydroxide + ammonium chloride → *thallium (I) chloride* + *ammonia* + water

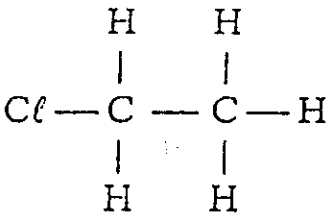
(iii) By titrating a sulphuric acid solution with thallium (I) hydroxide solution using methyl orange indicator. Record the volumes, then repeat the experiment without using the indicator. Evaporate the water gently to get the sample.

2. (a) $C_7H_{16} + 11\,O_2 \rightarrow 7\,CO_2 + 8\,H_2O$

(b) (i) Cracking.
High temperature and a catalyst.
$C_7H_{16} \rightarrow 2C_2H_4 + C_3H_8$

(ii) Hydrogen Chloride.

(iii)



(c) reagents ethane and chlorine
conditions indirect sunlight

(d) (i) Mass of lead in 100g of the compound = 64g
Mass of $(C_2H_5)_n$ in 100g of the compound = 36g
(ii) The number of moles of Pb in 100g of $Pb(C_2H_5)_n$ = 0.309
(iii) The mass of one mole of C_2H_5 = 29g
(iv) The number of moles of C_2H_5 in 100g of the compound= 1.24
(v) The mole ratio Pb: C_2H_5 is 1 : 4
(vi) The value of n is 4

3. (a) (i) By removing all impurities by oxidation in pure O_2. The add the required alloy to the 100 % pure iron.
(ii) Stainless steel, kitchen utensils.
(iii) To make it very hard to scratch.
(iv) Graphite.
(v) Hydrogen is lighter ; therefore it will diffuse faster. Consequently its ratio in the storage cylinder will decrease ; which will increase methane ratio.

(b) (i) $A\ell$ is light.
(ii) because of the protective thin layer of $A\ell_2O_3$.
(iii) Hard, High melting point, cannot conduct electricity.

4. (a) (i) Copper.
(ii) Zinc is more active than iron. therefore, it will act as a sacrificial metal and corrode instead of iron.

(b) Pure zinc wire.
Oxygen.
$Zn^{2+}_{(aq)} + 2e^- \rightarrow Zn_{(s)}$

(c) (i) $SO_{2(g)} + \frac{1}{2}O_2(g) \rightleftharpoons SO_{3(g)}$
(ii) By dissolving $SO_{3(g)}$ in conc. H_2SO_4 to form oleum then add oleum to large quantities of water.
(iii) Making fertilizers.

(d) *test* Add each powder to dil. HCℓ solution.
result with zinc oxide it will dissolve.
result with zinc carbonate Effervescence occurs.

5. (a) (i) Particles in air have large space between them. There is no fixed arrangement. These particles are free to move in all directions.
(ii) because the pressure can minimize the large space between particles in a gas. In a liquid space between particle is very little.

(b) (i) Potassium tends to lose one electron, while chlorine is ready to accept it to accept it to complete their outer most shell to 8 e^-s.
(ii) because it has 8 electrons in its outermost shell.

(c) by reacting the harmful gases from the car exhaust in the presence of a catalyst to form nitrogen, carbon dioxide and water.

(d) (i) Carbon dioxide.
(ii) Sulphur is one of the minor components of coal. When burnt, sulpher dioxide is formed, then is oxidized to SO_3. Slphuric acid is formed when SO_3 is dissolved in water, hence sulphate ions are formed.

June 1996

Paper 6

1. 69 seconds.

2. (a) Use a magnet, cobalt powder will be moved with the magnet away from the sulphur powder.

   (b) Put the mixture in a beaker containing ethanol. Warm and stir. Filter. Put the filtrate in an evaporating dish. Warm gently to evaporate the alcohol. Iodine crystals will be obtained upon cooling. Filter and dry the crystals.

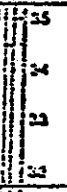
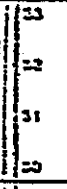
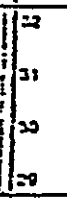
3. (a) (i) To make sure the solvent will not dissolve the colour of the cotton cloth.
   (ii) To insure that all solvents have the same contact time with stains.

   (b) (i) Black ink.
   (ii) Solvent B.
   (iii) Solvent C, because it does remove 6 types of stains.

   (c) Because many solvents are easily evaporated, and their vapours are poisonous.

4. (a) 19.1 cm^3.

(b) *Table of results*

Volume of acid A added/cm^3	temperature/°C
0	 25.0
5	 28.0
10	 30.5
15	 33.0
20	 34.5
25	 34.0
30	 32.5
35	 31.0
40	 29.0

(c) 9.9 cm^3.

(d)

Table of results

Volume of acid B added/cm^3	temperature/°C
0	25.0
5	32.0
10	36.5
15	36.0
20	34.0
25	32.5
30	31.0
35	30.0
40	29.0

(e) 34.5 °C

(g) Neutralization.

(h) (i) Experiment (2).
(ii) The acid is stronger, therefore, more heat is coming out.

(i) 25 °C, because this is the starting room temperature (ambient).

(f) Insulate the conical flask in which the reaction occurs, ore use a Styrofoam cup.

5.

tests	*observations*
(a) Describe the appearance of solution C.	yellow liquid
(b) Test a little of solution C with Universal Indicator paper. Record the pH.	colour red pH 2
(c) To 2 cm^3 of solution C, add a spatula measure of copper (II) carbonate. Leave the mixture to stand for one minute. Decant off the liquid and add an equal volume of aqueous ammonia. Now add an excess of aqueous ammonia.	Effervescence occurs and the solution turns blue. Blue ppt. occurs. The blue ppt. dissolves and deep blue colour appears.
(d) To 2 cm^3 of solution C, add an equal volume of aqueous sodium hydroxide. Now add a small piece of aluminium foil and warm the mixture carefully. Test any gases given off.	brown precipitate insoluble in excess The gas turns a wet red litmus paper blue.

(e) (i) Iron (III) nitrate.
(ii) Test (d).

6. Put about 10 grams of lead (II) carbonate in a crucible. Heat strongly. It will change to lead (II) oxide. Put the crucible in a glass tube. Connect the tube to a source of hydrogen gas. Pass the hydrogen gas and heat strongly. Molten lead will be formed in the crucible.

Nov. 96

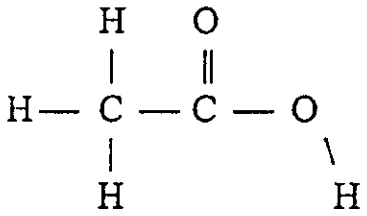
Paper 2

1. (a) Take a drop of the extract and apply it on the base line of a chromatogram. Put the chromatogram in a beaker containing same water and cover the beaker. After 5 minutes you can count the number of separated green chemicals.

(b) (i) Weakly acidic.
(ii) When an acid is mixed with an alkali to form salt and water.

(c) (i) $C_2 O_4 H_2$

(ii)



(iii) Sodium carbonate + Oxalic acid → Sodium oxalate + Carbon dioxide + Water

(d)

substance dissolved in water	colour when red cabbage extract is added
nitric acid	red
sodium hydroxide	blue
sulpher dioxide	*red*
potassium oxide	*blue*
ammonia	*blue*

2. (a) (i)

halogen	symbol	state	appearance
chlorine	*Cl*	gas	green-yellow
bromine	Br	liquid	red-brown
iodine	I	solid	dark brown

(ii) It means that each molecule is composed of two atoms combined together.

(b) sodium iodide + chlorine → sodium chloride + Iodine

(c) (i) Dissolve some iron (II) iodide in water. Add to some of this solution four drops of sodium hydroxide. Dirty green ppt. appears.
(ii) Add to some of the iron (II) iodide solution few drops of acidified silver nitrate solution. Yellow ppt. appears.
(iii) One electron moves from Na 2,8,1 to the iodine atom which has $7\bar{e}$ in the outer most shell, sodium becomes a positively charged ion while iodine becomes a negatively charged ion, each has $8\bar{e}$ in the outer most shell. Electrostatic attraction between the +ve and –ve ions makes the ionic bond.

(d) The hydrogen atom and the iodine atom contributes one electron each to share the pair of electrons. This pair belongs to both of them and unite them.

(e) To cure cancer.

3. (a) Natural gas, gasoline, kerosene.

(b) (i) because of the absence of oxygen.
(ii) Coke is mixed with iron ore, limestone and air. Coke reacts with air to form carbon monoxide which reduces iron oxides to iron.
(iii) because it is poisonous.

(c) (i) An organic compound containing carbon and hydrogen only.
(ii) Carbon dioxide and water.
(iii) 128.

(d) (i) Heat some of the aqueous layer. Expose a wet red litmus paper to the fumes. It will turn blue.
(ii) Nitrogen.

(e) Destroy forests and kill fish in lakes.

4. (a) (i) To allow ions to move.
(ii) The negative electrode (nail)
(iii) Potassium, if it is formed, will react immediately with water. Hydrogen will evolve instead.

(b) (i) Mix wood ashes with warm water and stirr. Filter, then evaporate the filtrate till the point of crystallization. Cool. Filter. Dry crystals.
(ii) Put few crystals of potassium carbonate in a test tube and add dil. hydrochloric acid. Effervescence occurs.
(iii) because it contains potassium.

(c) because the solution of their oxides in water is alkaline.

(d) protons 19
neutrons 21
electrons 19

5. (a) From blue to white.

(b) (i) 3000 g in 10×1000 cm^3
x in 500 cm^3

$$x = 3000\ g \times \frac{500 cm^3}{10000 cm^3} = 150\ g$$

(ii) 1. Stirring.
2. heating.
3. Crush them first to powder.

(c) (i) Alkaline, because copper sulphate is neutral and calcium hydroxide is alkaline.
(ii) copper (II) sulphate + calcium hydroxide → calcium sulphate + copper (II) hydroxide

Nov. 1996

Paper 3

1. (a) (i) by roasting in air

(ii) $2\,ZnO + C \longrightarrow CO_2 + 2\,Zn$

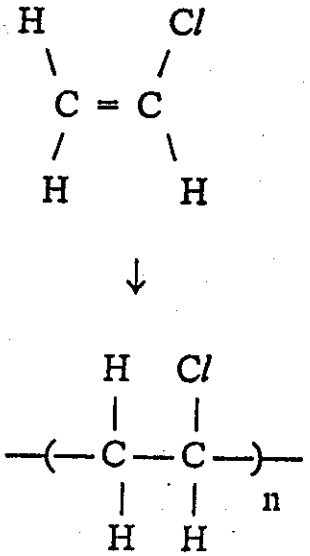
(iii) because of the wide difference in their b.p.

(b) (i) Uranium U^{235}

(ii) nucleon number is 119

proton number is 48

(c)



(d) (i) A white ppt. appears ; insoluble in excess.

(ii) A white ppt. appears ; soluble in excess.

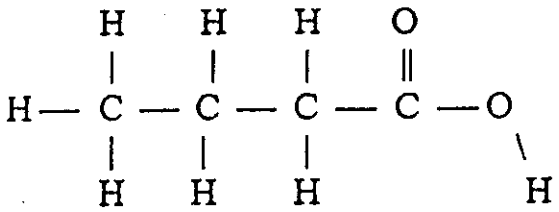
(e) Mix the two salt solutions. Yellow ppt. of CdS is formed. Filter and collect the ppt.

2. (a) (i) Amino acids
Monosacch rides

(ii) Ester linkage

(iii) Polyester

(b) (i) Butanoic acid



(ii) Add few drops of the alcohol to acidified potassium manganate (VII) and warm. If it is methanol the purple color disappears. No change with ethanol.

(c) $CH_3 - COOH \longrightarrow CO_2 + CH_4$

(d) • Produce cheap energy.
• Consumes harmful rubbish to produce useful gas.

3. (a) because of the formation of solid particles of the insoluble sulpher.

(b) (i) 2 moles of $HC\ell$ are in 1000 cm^3
x moles of $HC\ell$ are in 5 cm^3

$$x = 2 \text{ mole} \times \frac{5 \text{ cm}^3}{1000 \text{ cm}^3}$$

$$= 0.01 \text{ mole}$$

(ii) Thiosulphate : $HC\ell$ is 1 : 2 according to equation ; but we added 0.01 mole of each. Therefore, $HC\ell$ will be used up completely.

(iii) Number of $SO_2 = \frac{1}{2}$ no. of $HC\ell = 0.005$ moles

1 mole of SO_2 occupies 24 dm^3 at r.t.p.

$\therefore$ 0.005 moles SO_2 occupy x dm^3 at r.t.p.

$$x = \frac{0.005 \text{ mole}}{1 \text{ mole}} \times 24 \text{ dm}^3$$

$$= 0.12 \text{ dm}^3$$

(c) (i) A

(ii) because the concentration of thiosulphate in experiment A is double its concentration in B.

(d) As temperature increases, the kinetic energy of the particles increases which will lead to more collisions. This is why at 40 °C the reaction goes faster than at 23 °C.

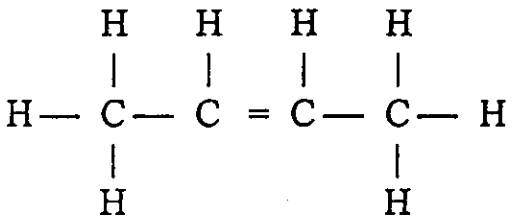
(e) (i) by burning sulphur in air ; ***or*** roasting sulphide ores.
(ii) preserving food, preparation of sulphuric acid.

4. (a) (i) $xC + xH = 78$

$12x + x = 78$

$x = \frac{78}{13} = 6$

(ii) Butene.

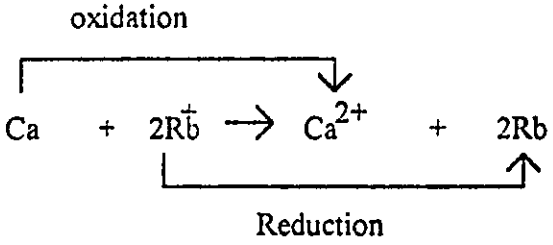


(iii) Bring a solution of each of the same concentration. Measure the pH of each. The pH of a sulphonic acid will be lower than that of a carboxylic acid.

(b) (i) reacting gases : nitrogen and Hydrogen
equation : $N_2 + 3H_2 \rightleftharpoons 2NH_3$
catalyst ; finely divided (powdered) iron an alumina.
(ii) • Preparation of fertilizers
• Preparation of nitric acid

(c) (i) Bauxite
(ii) Aluminium oxide
(Cryolite) Sodium Aluminium Fluoride

5. (a)



(b) (i) Photosynthesis
(ii) Battery

(c) (i) Hydrogen
(ii) Chlorine

(d) (i) because rubidium has one electron in the outermost shell and strontium has two electrons in the outermost shell.

(ii) rubidium hydroxide → No reaction
strontium hydroxide → Strontium oxide + water

(iii) $RbNO_3 \longrightarrow RbNO_2 + \frac{1}{2}O_2$

$Sr(NO_3)_2 \longrightarrow S_rO + 2NO_2 + \frac{1}{2}O_2$

Nov. 96

Paper 6

1. 52 cm^3

2. (a) A Funnel.
   B Flask.
   C Gas jar.

   (b) 1. Lighter than air.
   2. Insoluble in water *or* does not react with acids.

   (c) Hydrogen.

3. (a) To increase the surface area which speeds up the extraction.

   (b) To avoid accumulation of flammable ethanol.

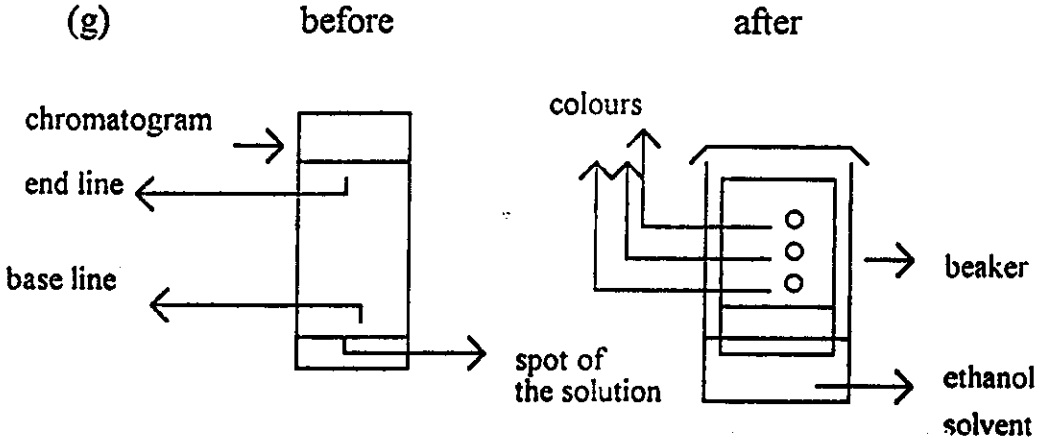
   (c) Wear gloves *or* use a fume hood.

   (d) Bunsen burner, tripode, wire gauze, knife and a chromatogram.

   (e) To cover the beaker during chromatography.

   (f) To pour the liquid away from a solid from a mixture of both.

   (g)



A spot of the solution is applied on the chromatogram at the base line. Put the chromatogram in a beaker that contains ethanol. Make sure that the solvent surface is below the base line. Cover the beaker and let the chromatogram run till the solvent front reaches the end line. Take the chromatogram out and let it dry. Count the number of spots.

4. Experiment 1

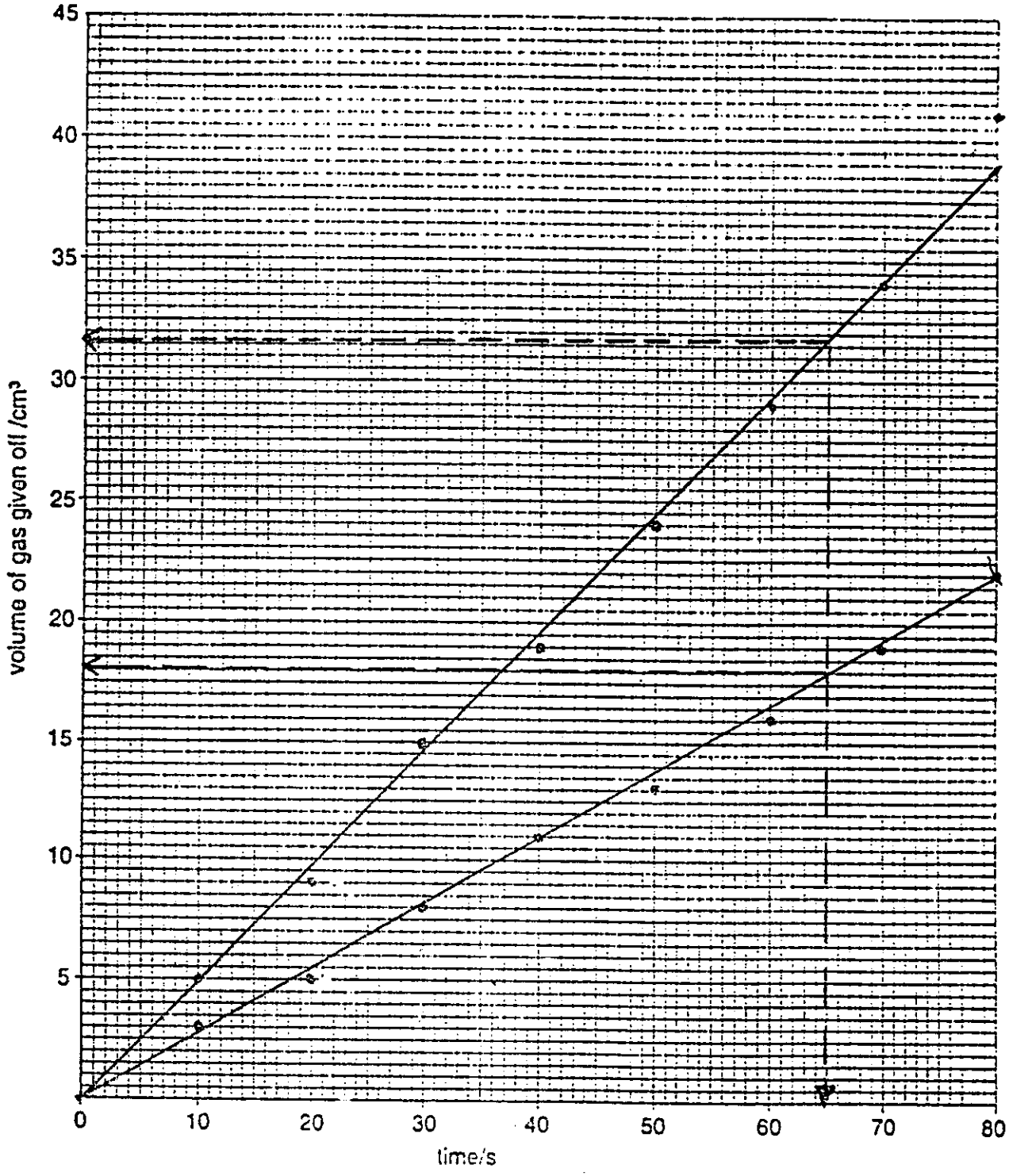
time/s	0	10	20	30	40	50	60	70	80
volume of gas / cm^3	0	5	9	15	19	24	29	34	41

Experiment 2

Table of Results

time/s	0	10	20	30	40	50	60	70	80
volume of gas / cm^3	0	3	5	8	11	13	16	19	22

(a)



(b) (i) 31.6 cm^3

(ii) 18 cm^3

(c) (i) Solution of experiment 1.
(ii) because it was more concentrated. This gives more particles the chance to collide and react with marble chips.

(d) (i) 1. Time of closing the bung.
2. Measuring the volume of the gas
more :
- error at measuring the time.
- error at measuring the volume of the acid.
- size of the marble chips could be different.
(ii) 1. Use a syringe to measure the volume of the gas.
2. Add the acid using a funnel with a tap.

5. (a) (i) White gelatinous ppt. appears.
The ppt. disappears.
(ii) The white gelatinous ppt. appears but it does not dissolve in excess.

(b) (i) black.

(c) Aluminium sulphate

(d) gas given off in (b)(ii) Oxygen.
gas given off in (b)(iii) Chlorine.

6. Tests are to examine the effect of strong heat

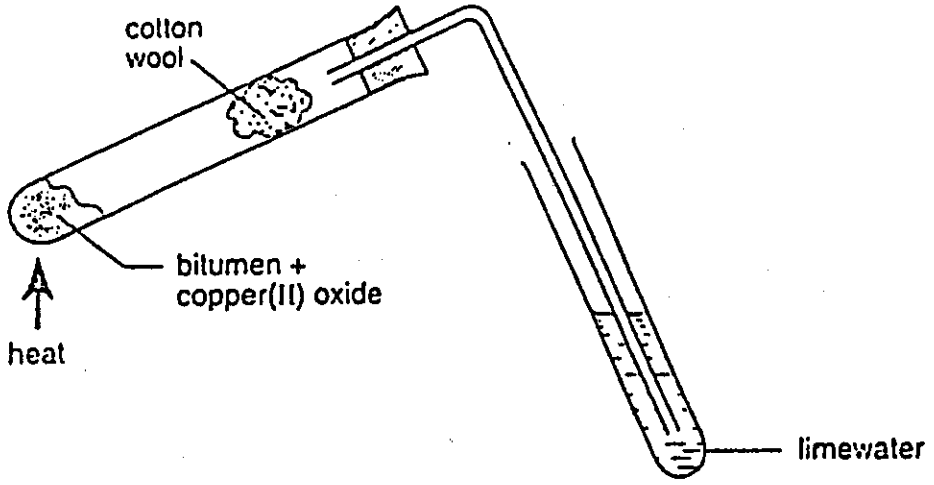
Metal	Observation
Copper	Long heating : black powder
Steel	Long heating : brown rust
Aluminium	Long heating : no observed change

Hold a piece of each metal with a tong. Expose it to a strong bunsen flame for 5 minutes. Observe the metal surface.

June 1997

Paper 2

1.



(a) It is the heaviest petroleum fraction, dark solid substance obtained from the fractional distillation of crude oil, the residue at the bottom.

(b) (i) Copper metal.
(ii) Connect it to an electrical circuit with a battery and a lamp. The lamp will be lit when the circuit is closed.

(c) (i) Carbon dioxide.
(ii) Carbon bitumen took oxygen from copper (II) oxide to form CO_2.

(d) Bitumen particles at copper (II) oxide particles jumped when heated.

(e) (i) Expose few drops to white anhydrous copper (II) sulphate. It will turn blue.
(ii) Measure the boiling point. It should be 100°C.
(iii) H_2O.
(iv) From the hydrocarbons in bitumen.

2. (a) structure 6
example Helium

(b) structure 3

(c) structure 8
example Oxygen

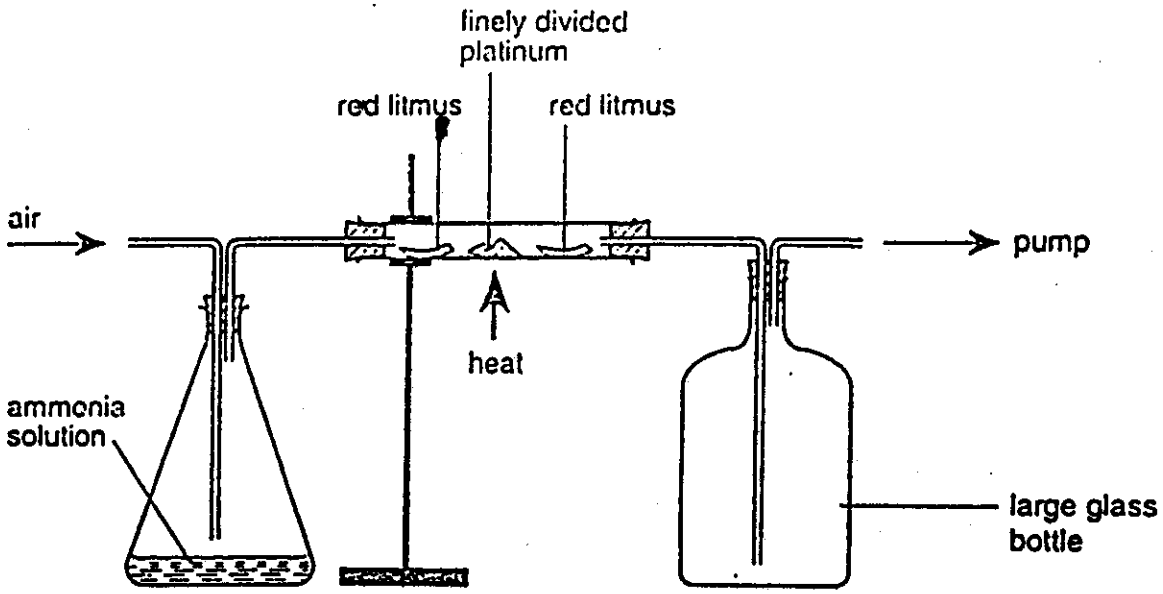
(d) structure 4
property Soft
explanation: Bonding within a layer is strong. Bonding between layers is weak. Layers slide when they touch a hard surface.

(e) structure 9
property Hard
explanation: Bonding in all directions is very strong. Therefore, it is not easy to break.

(f) structure 2

(g) (i) structure 7
example Sodium chloride

(ii) 

3. 

(a) (i) N 19 %
(ii) Nitrogen (II) oxide and water.
(iii) A substance that changes the rate of a chemical reaction.
(iv) To speed the reaction by increasing the surface area, which allows more contact between reacting particles.

(b) The first one, before the catalyst, changes to blue, indicating the passing of ammonia gas.
The second one, after the catalyst, does not change its colour, showing that all ammonia gas changed to nitrogen (II) oxide.

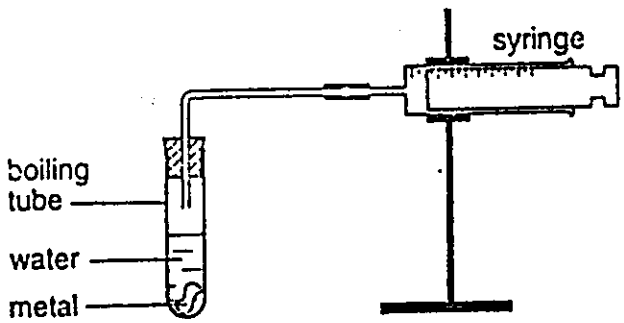
(c) Reversible means the reaction goes back and forth without completion at any direction.

(d) Add few drops of the acid to sodium carbonate. Effervescence occurs.

(e) (i) Because when it enters the environment and dissolves in water gives a very acidic solution. It is a component of acid rain which destroys forests.
(ii) Car exhaust.

4. (a) Group II.

(b)



(i) Hydrogen.
(ii) - Surface area should be kept the same
- Temperature of the reaction should be kept the same.
(iii) It shows that more hydrogen is formed, which means barium reacts faster than calcium.

(c) (i)
barium hydroxide + hydrochloric acid → barium chloride + water

(ii) Add 2 mℓ of barium chloride solution to 2 mℓ of a sulphate ion solution. A white ppt. of barium sulphate is formed.

(d) (i) Add small pieces of aluminium to 2 cm³ of barium nitrate solution and heat. Then add to the mixture 3 drops of sodium hydroxide solution and warm. Expose a moist red litmus paper to the evolving gas, it will turn blue.
(ii) Carbon dioxide and sulpher dioxide.
(iii) Carbon monoxide.

5. (a) (i)

halogen	state	colour
chlorine	*gas*	*yellow / green*
bromine	*liquid*	*brown*
iodine	solid	grey-black

(ii) Black , Solid.

(b) (i) Carbon , Hydrogen , Iodine , Nitrogen , Oxygen.
(ii) 34.

(c) (i) The reaction is exothermic.
(ii) By heating.
(iii) Dissolve some iron (II) iodide in water. Add few drops of acidified silver nitrate solution to it, yellow ppt. is formed.
(iv) Yes, because iron is a transition metal.

June 1997

Paper 3

1. (a) (i) Sodium hydroxide.
(ii) Salt of amino acid (Monomer).

(b) (i) Mass of empirical formula = 198

$\therefore \quad n = \frac{396}{198} = 2$

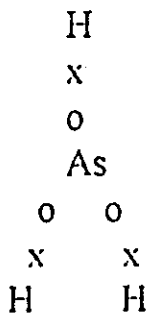
$\therefore$ M.F. is $As_4 \; O_6$

(ii) $As_2 \; O_5$

(iii) 1- It is a weakly acidic oxide.
2- It is a reducing agent.

(c) (i) $Cu^{2+} + AsO_3^{3-} \rightarrow Cu3(AsO_3)_2$

(ii)



(d) As : C : H

$\frac{62.5}{75} \quad \frac{30.0}{12} \quad \frac{7.5}{1}$

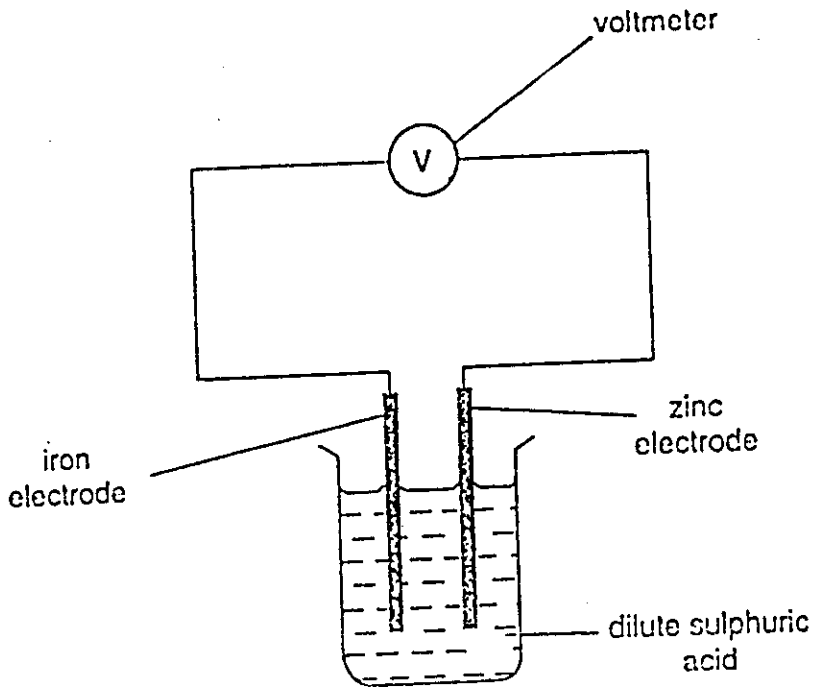
$\frac{0.833}{0.833} \quad \frac{2.5}{0.833} \quad \frac{7.5}{0.833}$

1 : 3 : 9

$\therefore$ The empirical formula of this compound is : As C_3 H_9 .

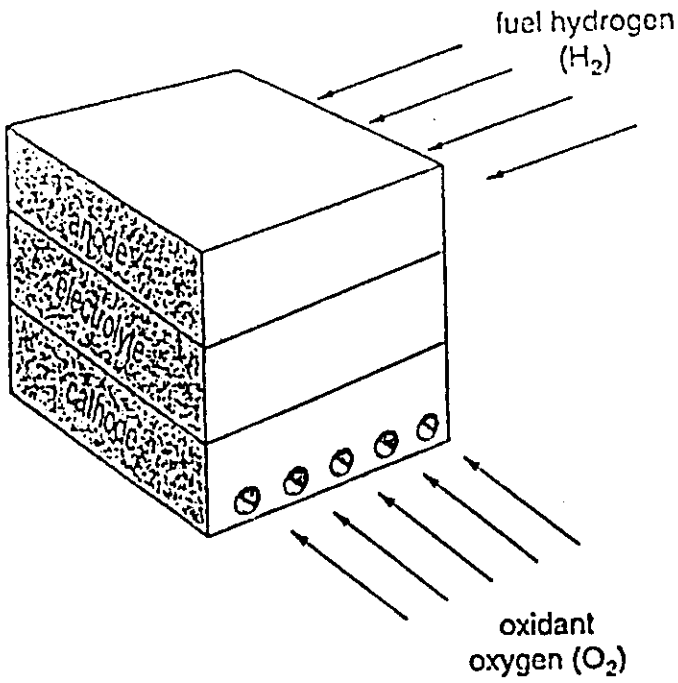
2. (a) Exothermic, because a cell should give out energy.

(b)



(i) Zn
(ii) Hydrogen.
(iii) Increase, because the potential difference between Zn and Cu is greater than that between Zn and Fe.

(c)



(i) $O_2 + 4e^- \longrightarrow 2O^{2-}$

(ii) $H_2 \longrightarrow 2H^+ + 2e^-$

(d) By fractional distillation of liquid air. Air is first liquified by cooling under high pressure, then liquid air is distilled "fractional distillation". The oxygen fraction is collected separately.

(e) (i) A saturated hydrocarbon.
(ii) Producing (2 O) moles of hydrogen.
At r.t.p. 1 mole of H_2 occupies 24 dm^3.
$\therefore$ 20 moles occupy $20 \times 24 = 480$ dm^3

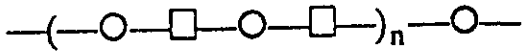
3. (a) (i) To allow for the movement of ions.
(ii) Hydrogen at the cathode, and O_2 mixed with some $C\ell_2$ at the anode.

(b) (i) Reduction.
(ii) Magnesium and magnesium oxide.
(iii) Magnesium chloride.
(iv) Filtration.

(c) (i) Carbon
(ii) - High melting point.
- Does not conduct electricity.

(d) (i) Potassium has one electron in the outermost shell and tends to lose it (2 . 8. 8. 1), while chlorine has $7e^-$ in the outermost shell (2. 8. 7) and tends to gain one more electron in order to have a stable octet.
(ii) Both have one electron in the outermost shell and they tend to lose it.

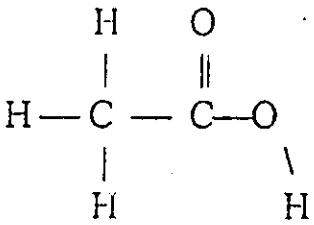
4. (a) A process of polymerization is carried out by losing a water molecule between each two sugar molecules to form a long chain polymer.



(b) (i) Add one drop of the oil to 2 m/ of bromine water and shake. Decolorization occurs.

(ii) - Sodium hydroxide
- ester —(— COO —)— carboxylate

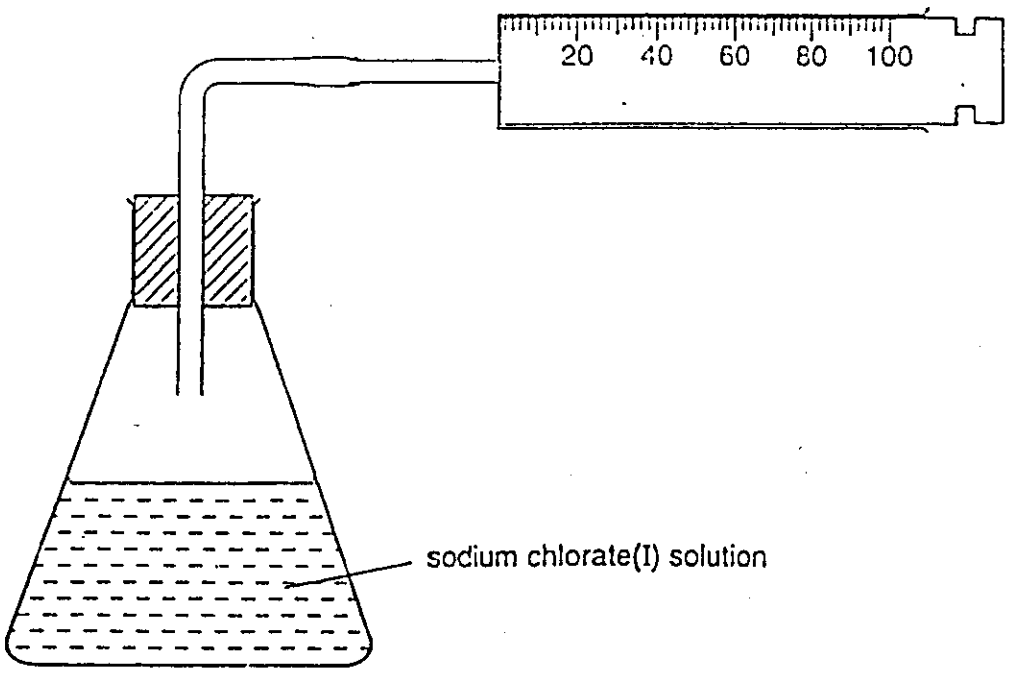
(iii) - Ethanol.
- Ethanoic acid.
-



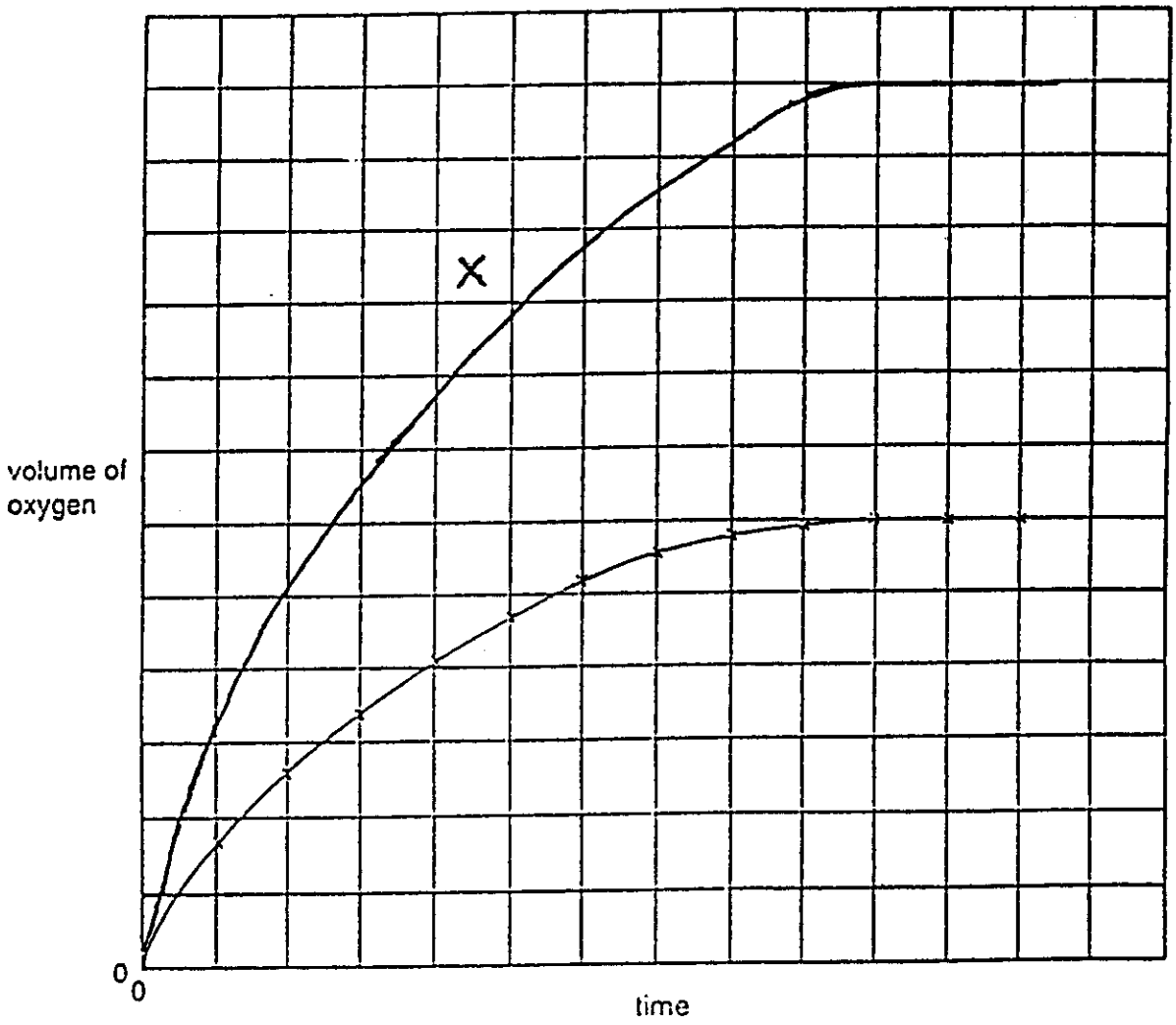
(c) (i) Strong effervescence with sulphuric acid
Weak effervescence with ethanoic acid

(ii) A strong acid (sulphuric acid) faster because it has more free H^+ ions. Weaker acid has lesser free H^+ ions; therefore, it reacts slower.

5. (a)



The results were plotted to give a graph.



(i) Add few drops of acidified silver nitrate solution. White ppt. is formed.
(ii) Getting slower.
(iii) Because concentrations of reactants are decreasing by time.

(b) The clear solution turns dark brown.

(c) (i) Sodium hydroxide.
(ii) Green ppt.
(iii) Reddish-brown.

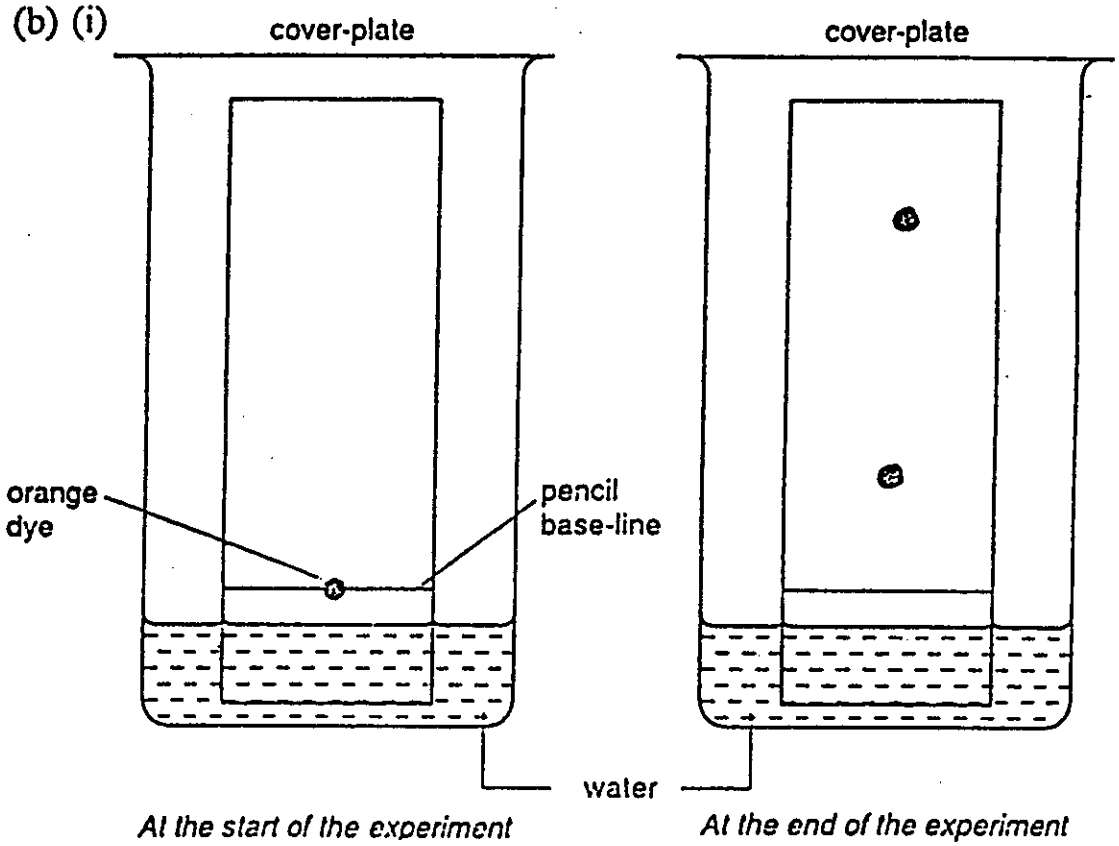
(d) Oxygen has higher rate of diffusion than chlorine. Therefore, more oxygen can pass through the porous tube.

June 1997

Paper 6

1. (a) (i) measuring cylinder.
(ii) a balance.

(b) (i)



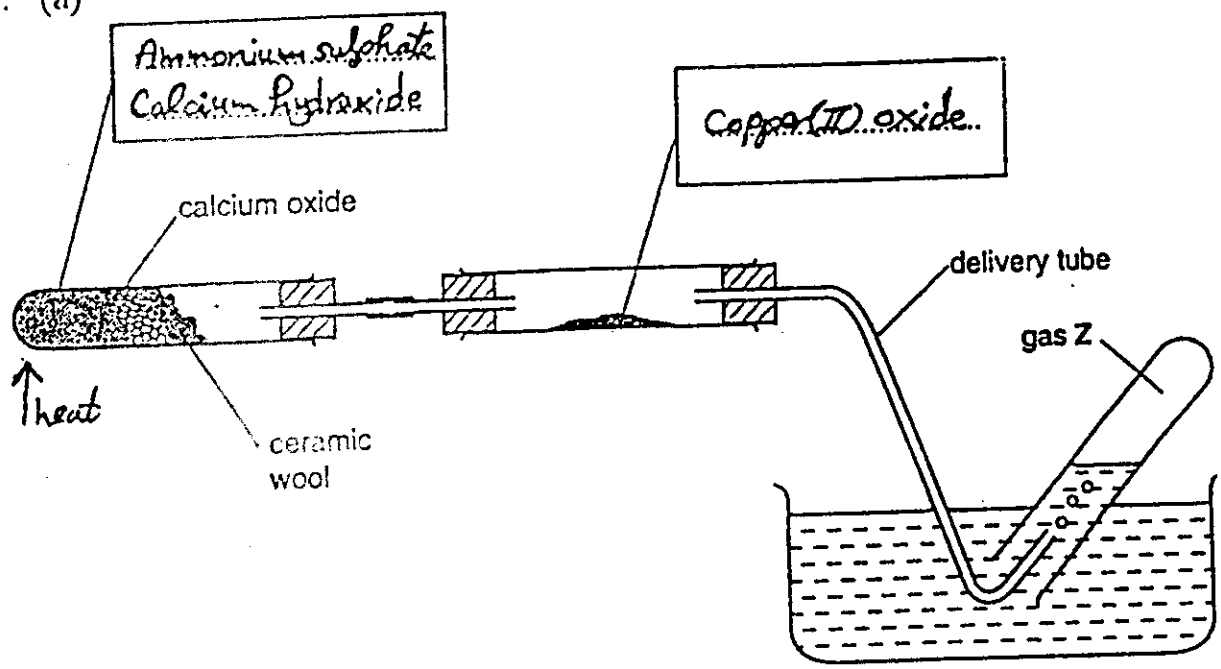
(ii) Pencil will not interfere with chromatography because graphite is <u>not</u> water soluble. Ink is water soluble, it will interfere.

2. (a) Chlorine

(b) Ethanol.

(c) Nitrate of a transition metal.
Iron (II) nitrate.

3. (a)



(b) (i) A drying agent.
(ii) To prevent solids from spreading and contaminating the rest of the apparatus.

(c) (i) Black.
(ii) Brown-Red.

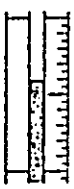
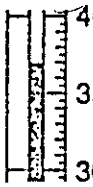
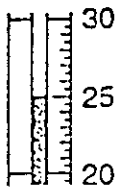
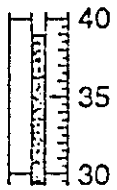
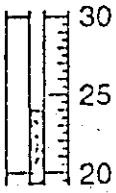
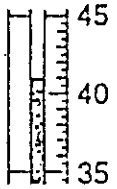
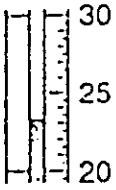
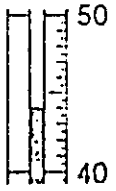
(d) Nitrogen (II) Oxide.

(e) To avoid back suction where water goes backward into the apparatus.

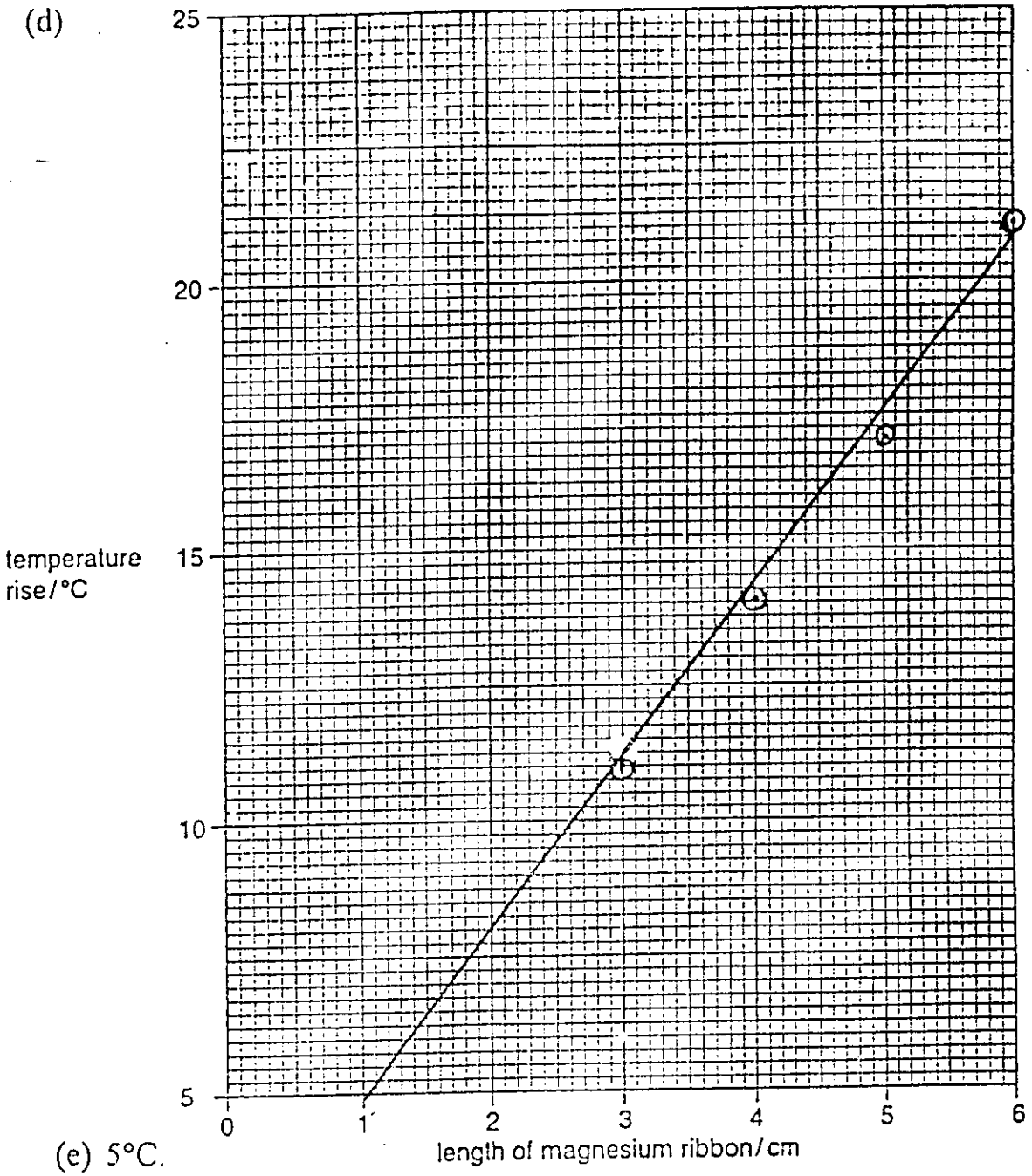
4. (a) Hydrogen

(b) *Experiment* 1
- = 25.5°C.
- = 35.0°C.
- = 9.5°C.

Experiment 2

experiment	*length of ribbon*	*initial temperature of acid/°C*		*maximum temperature reached/°C*		*temperature rise/°C*
2	3 cm		26.0		37.0	11.0
3	4 cm		25.0		39.0	14.0
4	5 cm		24.0		41.0	17.0
5	6 cm		23.0		44.0	21.0

(d)



(e) 5°C.

(f) Exothermic.

(g) 1. Bubble of an evolving gas.
2. The magnesium ribbon diminishes.

(h) 23.0°C. The solution temperature will fall back to the ambient temperature.

(i) Use an insulated (styrofoam) cup instead of the boiling tube.

5. (a) To speed up dissolving. It was allowed to cool to allow for normal filtration.

(b) A measuring cylinder.

(c) No traces of liquid are seen in the container.
Take a sample of the solid with spatula, and press it on a filter paper. If no wet spot is formed, all the water had been evaporated.

6.

Tests	*Observations*
tests on the filtrate (a) To the solution, a few drops of nitric acid and then aqueous lead (II) nitrate was added.	yellow precipitate
tests on the solid on the filter paper (b) (i) Colour of solid. (ii) A little of the solid was put into a test-tube and dilute hydrochloric acid added. Any gasses evolved were passed through limewater. The contents of the test-tube were kept for part (c).	*White* *Effervescence* ***Limewater turns milky.***

Tests	*Observations*
(c) The contents of the test-tube were divided into two equal portions.	
(i) To the first portion, an equal volume of aqueous sodium hydroxide was added	*White ppt. is formed*
An excess of aqueous sodium hydroxide was then added.	*White ppt. disappeared*
(ii) To the second portion, an equal volume of aqueous ammonia was then added.	*White ppt. is formed*
An excess of aqueous ammonia was then added.	*White ppt. dissolved.*

(d) It has the iodide ion (I^-).

(e) 1. No ppt. will be formed with sodium hydroxide solution.

2. For Co^{++} ions : Flame test : brick-red colour.

Nov. 1997

Paper 2

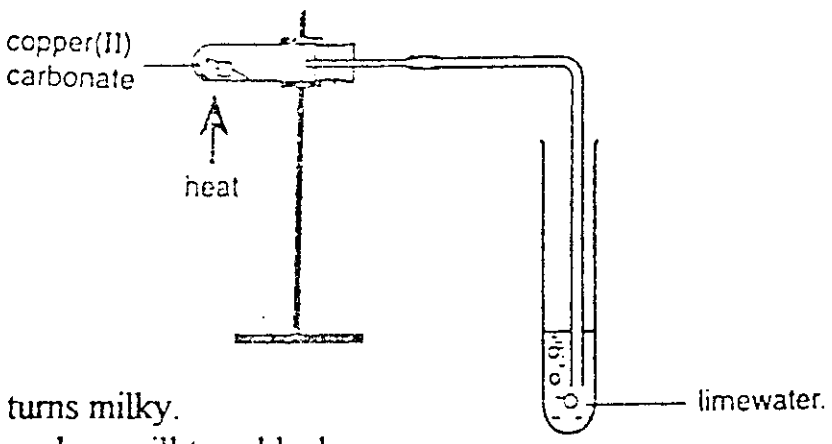
1. (a) (i) Potassium, Chlorine, Oxygen.
(ii) Sulpher Dioxide.

(b) (i) It is a macro molecule formed by combining small molecules called monomers.
(ii) Carbon dioxide and water.

(c) (i) Petroleum.
(ii) Fractional distillation.
(iii) A compound contains carbon and hydrogen only.

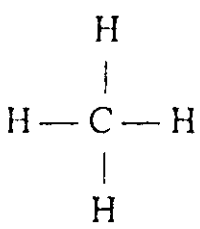
(d) Exothermic.

2. (a) (i)



(ii) It turns milky.
(iii) Its colour will turn black.

(b) (i)



(ii) Methane + copper (II) oxide → water + carbon dioxide + copper

(iii) Carbon , Hydrogen
(iv) Reduction is the process of gaining electrons.

(c) Carbon monoxide.
It is a toxic substance because it combines with the hemoglobin of the blood.

(d) It is a homogeneous mixture of metals.

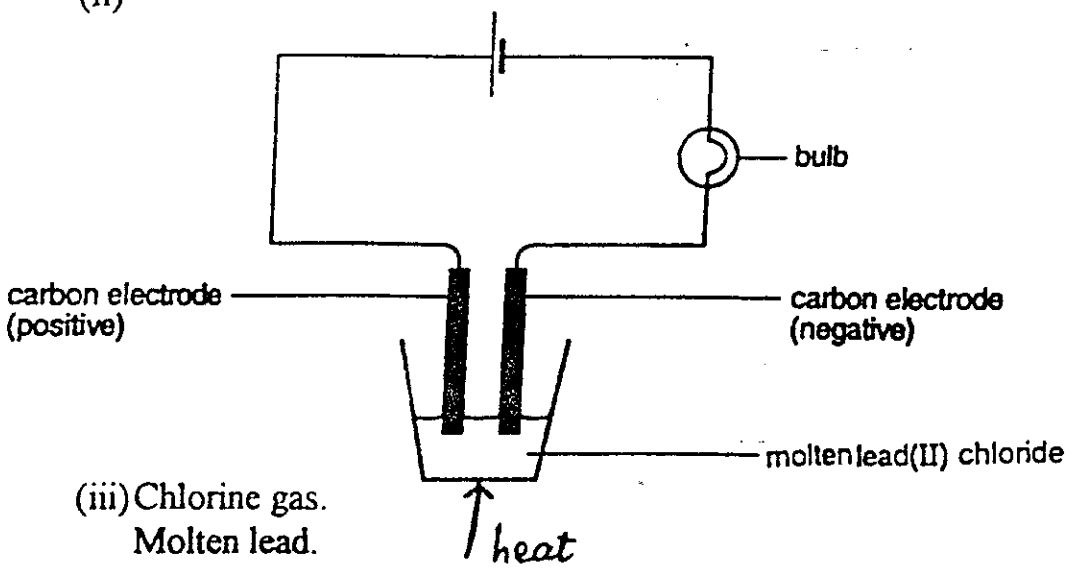
(e) - It does not rust easily.
- It is abundant.
- It can be obtained in economical quantities.

3. (a) (i) It is the reaction between an acid and a base to form salt and water.
(ii) Lead (II) oxide + nitric acid → Lead (II) nitrate + water
(iii) To stir
(iv) When Lead (II) oxide settles down, stops disappearing.

(b) Filtration.

(c) Hydrochloric acid + Lead (II) nitrate → Lead (II) chloride + water

(d) (i) To allow for the movement of ions.
(ii)



(iii) Chlorine gas.
Molten lead.

4. (a) Expose a glowing splint to a sample of the gas, it will relight.

(b) To condense the volatile nitrogen dioxide.

(c) Dissolve some of the salt in water, add the aluminium and some sodium hydroxide solution and boil. The evolved vapours will turn a wet red litmus paper to blue.

(d) 1- Burns the green leaves and trees.
2- Turns the water of the lakes acidic.
3- Destroys the statues and monuments.

(e) Sodium.
Copper.

(f) (i) 1- have more than one oxidation state.
2- have cloured salts.
3- have high density.
(ii) Carbon.
High temperature, carbon and iron (III) oxide in a homogenous powdered mixture.
(iii) Haematite.

5. (a) 120 g in 100 cm^3
$\therefore$ x g in 25 cm^3

$$x = 120\ g \times \frac{25cm^3}{100cm^3} = 30\ g.$$

(b) Dissolve the salt in water in a test tube. Add to it 2 mℓ of acidified silver nitrate solution. A yellow ppt. is formed.

(c) It decreases.

(d) (i) Expose a wet litmus paper to the gas. The colour disappears. Bleaching occurs.
(ii) The solution turns brown.

(e) (i) Because water will react violently with potassium.

(ii) Titrate 25 ml of potassium hydroxide solution against hydroiodic acid solution in the presence of an indicator (ph. ph.) Record the volume of hydroiodic acid. Repeat the experiment without the indicator. Evaporate most of the water.
Allow the solution to cool. Filter then dry the crystals.

(f) One electron leaves the outermost shell of potassium atom to an iodine atom, forming apotassiumion (+ ve) and an iodide ion (- ve). Electrostatic attraction between them forms the ionic bond.

Nov. 1997

Paper 3

1. (a) (i) Brass.
   (ii) Stronger.

   (b) (i) tin (IV) oxide + iron → tin + iron (III) oxide
   (ii) $Fe + SnC\ell_2 \rightarrow FeC\ell_2 + Sn$
   $Sn + CuSO_4 \rightarrow SnSO_4 + Cu$
   $Sn + Fe^{2+} \rightarrow$ No reaction

   (c) (i) Tin.
   (ii) $4O^-H \rightarrow 2H_2O + O_2 + 4\,e^-$
   (iii) Sulphuric acid.

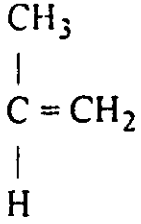
   (d) (i) Covalent.
   (ii) Each of the four bonds is attached to another carbon atom at the corners of the tetrahedral structure.
   (iii) Valence electrons leaving the atoms of the metal to form a pool in which ions of the metal are embedded.
   (iv) The white tin, because it has free electron.

2. (a) (i) Light increases the rate of reduction.
   (ii) $Ag^+ + e^- \rightarrow Ag$

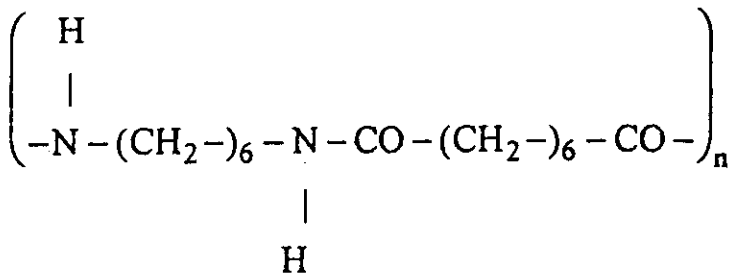
   (b) (i) 310 seconds.
   (ii) As temperature decreases, velocity of particles decreases and hence reaction rate decreases.
   (iii) Time decreases, because as concentration increases, more collision occurs, and hence reaction rate increases.
   (iv) Smaller particle size means more surface area, which means ions are exposed for reaction, and hence faster reaction.

3. (a) • When burnt, they produce toxic gases.
   • They are not biodegradable.

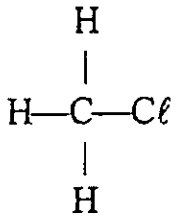
(b) (i) name Propane
Structure



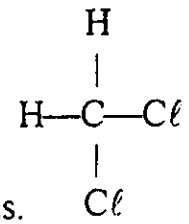
(ii)



(c) (i) Sunlight.
(ii) chloromethane,



dichloromethane.



(d) (i) Fractional distillations.
(ii) $C_4H_{10} + 2C_3H_6$

(e) (i) Butanol.
(ii) $C_3H_6 + Br_2 \rightarrow C_3H_6Br_2$
Dirbromopropene

4. (a) 58 protons 82 neutrons and 58 electrons.

(b) (i) 2, 8, 3
(ii) because it has only 3 electrons in its outermost shell. When it loses these 3e, it will acquire the stable 2, 8 structure.

(c) (i) Graphite.
(ii) The negative electrode.

(d) because it is coated with a protective layer of its oxide.

(e) (i) cerium + water → cerium hydroxide + hydrogen
(ii) cerium nitrate → cerium oxide + oxygen + nitrogen dioxide

(f) Number of moles of cerium atoms used :
1 mole of cerium atom, is 140 g
x mole of cerium atom, is 4.2 g

$$\therefore x = 1 \text{ mole} \times \frac{4.2\text{g}}{140\text{g}}$$

$$= 0.03 \text{ mole}$$

Mass of oxygen that reacted :
$= 5.16 - 4.2$
$= 0.96$ g

Number of moles of oxygen atoms in oxide :
1 mole of oxygen atom, is 16 g
x mole of oxygen atom, is 0.96 g

$$\therefore x = 1 \text{ mole} \times \frac{0.96\text{g}}{16\text{g}}$$

$$= 0.06 \text{ mole}$$

Ratio by moles of cerium atoms to oxygen atoms :

Ce		O
3	:	6
1	:	2

Formula of this oxide of cerium is :

$$Ce\,O_2$$

5. (a) (i) Carbon
(ii) The electric spark causes a combination reaction of nitrogen and oxygen of the air coming into the engine.

(iii) because it causes the reaction of other pollutants to form carbon dioxide and nitrogen gas.

(b) (i) - Sulphur dioxide.
- burning coal and chemical industries.

(ii) because another "sacrificial" metal is consuming most of the pollutant that causes acid rain.

(c) (i) $C_6H_{12}O_6 \rightarrow 2C_2H_5OH + 2CO_2$

(ii) The presence of yeast at temperature around 37°C.

(d) (i) Reversible.

(ii) It will decrease.

Nov. 1997

Paper 6

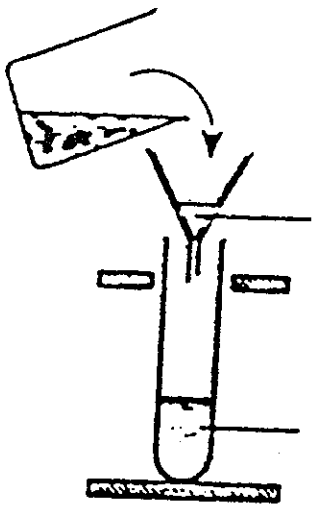
1. (i) Dropper.
   (ii) Beaker.
   (iii) Tong.

2. (a) A battery.

   (b) (i) Pure silver.
   (ii) The ornament.
   (iii) Silver nitrate.

3. (a) To dissolve all water-soluble substances.

   (b)

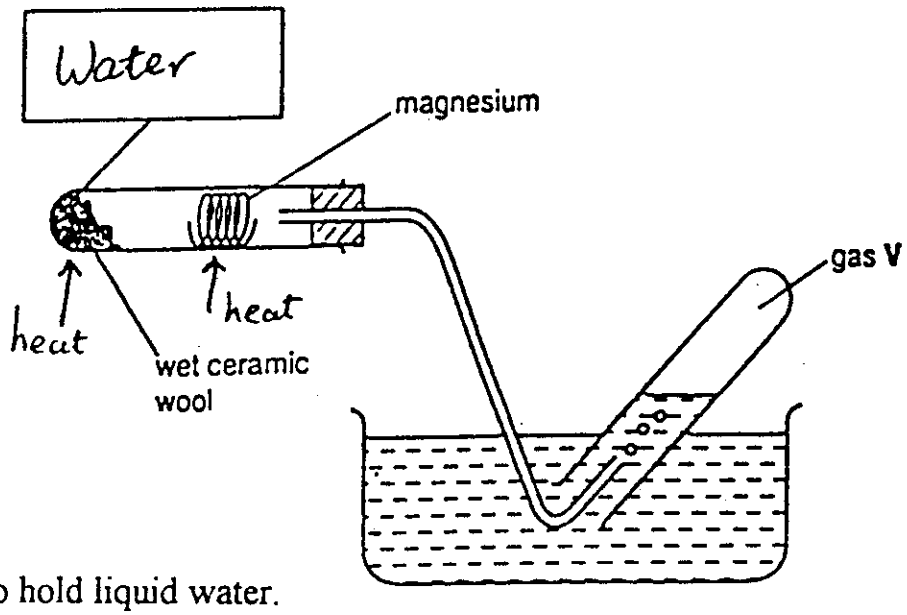


   (c) A solid insoluble substance.

   (d) An evaporating basin and a bunsen burner.

   (e) Measuring the melting point.

4.



(b) To hold liquid water.

(c) (i) metallic gray.
(ii) white powder.

(d) (i) Hydrogen.
(ii) Expose a lighted splint to the gas, it will burn with a pop.

(e) because of back suction.

5. (a) 0.9

(b) 24.6
(i) 23.7
(ii) Balance.

(c) 1.1
12.9
11.8

(d) (i) yellow to orange.
(ii) Neutralization.
(iii) 1.

(iv) 1- Concentration of acid A is less than concentration of acid B.
2 - Acid A is weaker than acid B.

(e) - 49.2 cm^3.
- because this volumes contains double the amount of the acid.

(f) Measure the 20 cm^3 sample of distilled water by a pipette.

6.

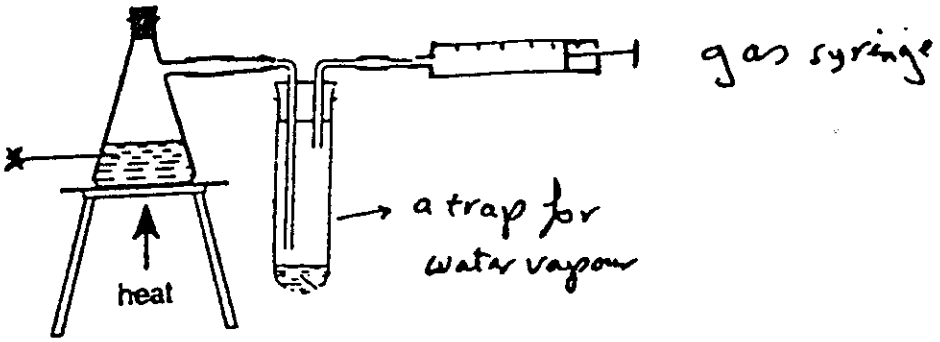
Observations
(a) White ppt. appears.
(b) pale blue precipitate pH = 8 – 9 black solid formed the solid dissolved and a blue solution is formed.
(c) pale blue ppt. the ppt. dissolves to form dark blue solution.

(d) Ammonia.

(e) Copper (II) oxide.

(f) Copper.

7. (a)



(b) No more gas is added to the syringe.

June 1998

Paper 2

1 – (a) (i) Chromatography

(ii) C

(iii) A and D

(b) (i) Near each other with not fixed shape

motion Moving slowly

(ii) Far and disordered

moving fast

(c) (i) Iron (II) sulphate

(ii) 1. Can have more than one oxidation state

2. Form coloured compounds

(iii) Iron and sulphuric acid

(iv) - Colour change from green to white

- Vapor appears and condenses at the upper end of the test tube.

2 – (a) test: bubbleit through lime water

result: turbidity appears.

(b) because the reaction is exothermic

(c) To react with impurities to form slag

(d) (i) by thermal decomposition

(ii) in construction industry

(iii) 74

(iv) pH = 12

3 - (a) 1. Light

2. Hard

(b) (i) $TiO_2 + 2C + 2Cl_2 \rightarrow Ticl_4 + 2CO$

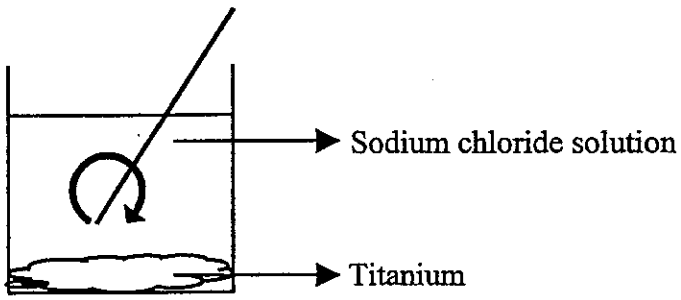
(ii) Oxidation

(iii) Titanium (IV) chloride + sodium ⟶ titanium + sodium chloride

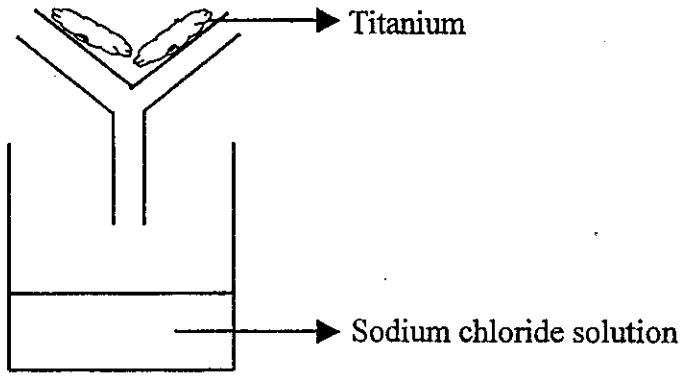
(iv) Magnesium

(v) To prevent reaction of sodium with air

(c) – Add water and stirr ⟶ sodium chloride will dissolve



- Filter to separate



(d) (i) It is a solid solution of several metals made by mixing them in liquid state.

(ii) In order to obtain the desired properties.

(iii) Light.

4 – (a) 17

(b) Covalent

(c) 1. Increase temperature.

2. Increase concentration (pressure).

3. Add a catalyst.

(d) A white ppt. Appears, then disappears on excess ammonia solution.

(e) (i) To improve crop production.

(ii) because it is a gas, it will scape.

(iii) Nitrogen and phosphorus.

(f) Molecules of ammonia are gaining energy and jumping (evaporating) from the liquid phase to the gas phase, then diffuse throughout the room.

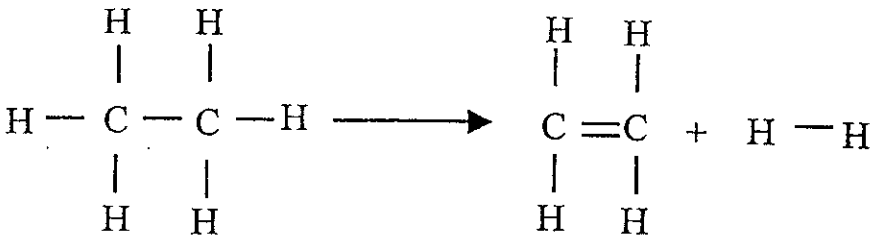
5 – (a) Bitumen

(b) The fraction with the lowest boiling point moves up faster than the heavier one.

(c) Paving roads

(d) (i) Breaking larger molecules to form smaller ones.

(ii)



ethane ethene hydrogen

(iii) test: bubble ethene through bromine water.

result: Orange colour fades away.

(e) (i) C_2H_6O

(ii) To speed up the reaction.

(iii) Fermentation.

(f) (i) Coal

(ii) - Acid rain

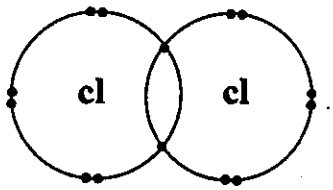
- Global warming.

6 – (a) Bromine and Chlorine.

(b) Does not conduct electricity.

(c) (i) 7

(ii)



(d) (i) $2\,Na + cl_2 \rightarrow 2\,Nacl$

(ii) Ionic

(iii) because on the solid state ions are fixed in place; while in the liquid state ions can freely move.

(e) (i) to be molten.

(ii) Graphite.

(iii) Liquid Lead.

June 1998

Paper 3

1 – (a) (i) D $CU_2(OH)_3Cl$ 213.5 59.5

(ii) Add product B to dil. Hcl. Effervescence of a gas that turns lime water milky.

(iii) Add dilute silver nitrate solution. White ppt. Occurs.

(b) (i) Carbon.

(ii) B, because the % of Cu produced is 56.83, nearest to B.

(c) (i) Blue ppt. will be formed first, then it will dissolve in excess producing deep blue solution.

(ii) Brass.

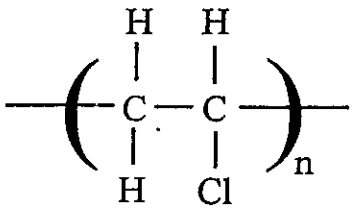
(d) Because they have the metallic structure that allows the atoms to slide in a sea of electrons.

2 - (a) (i) Sulphur dioxide.

(ii) for sterilization.

(iii) Soap.

(iv)



(b) (i) Hydrogen.

(ii) $2Cl^- \rightarrow Cl_2 + 2e^-$

(iii) By removing H^+ and Cl^- ions, what is left is Na^+ and OH ions.

(c) (i) Sodium by droxide solution reacts with Al_2O_3 to form the soluble salt sodium aluminate. Filtration with separe the in soluble impurity Fe_2O_3.

(ii) Oxygen and Carbon dioxide.

(iii) because the metal surface is covered by a protective layer of the metal oxide.

3 – (a) (i) Use a syringe and a watch to follow the production of CO_2 over time.

(ii) The heat give out increases the rate.

(iii) The increasing concentration of ethanol kills the fermenting bacteria.

(b) (i) CH_2O

(ii) ..... + water.

(iii) test: add bromine water to the two acids.

result: fast decolourization occurs with acrylic acid. No reaction with lactic acid

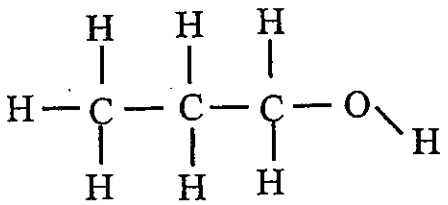
(iv) add dil. Sodium carbonate solution.

Effervescence occurs.

(v) Ethanol

(c) (i) Propene

(ii)



(iii) Addition reaction.

4 – (a) (i) Nitric acid.

(ii) Potassium nitrate $\xrightarrow{\text{Heat}}$ Potassium Oxide + Oxygen + nitrogen dioxide.

(b) (i) because it uses cheaper substances.

(ii) Underground deposits.

(iii) Vanadium (V) oxide.

(iv) It will produce more SO_3

(v) It is dissolved in sulphuric acid to form Oleum, which gives sulphuric acid by dilution.

(vi)Use 1 : In fertilizer production.

Use 2 In detergent production.

(c) (i) 0.05 moles

(ii) 0.05 moles

(iii) 12.5 g

(iv) Percentage yield = $\frac{7.3g}{12.5g} \times 100 = 58.4\%$

5 – (a) (i) Yellow gas.

(ii) same number of electrons in the valence outermost shell.

Different number of electron shells.

(b) (i) Add few drops of dilut HCl solution gradually stirr. Check with a pH mater till it reads 3.5

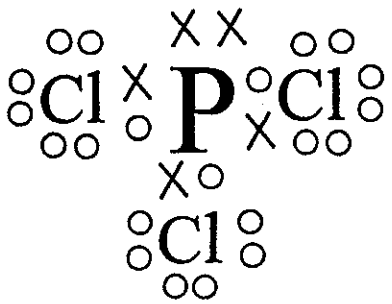
(ii) Because it involves an electron transfer from the reducing agent, $B\bar{r}$, to the oxidizing agent, Cl,

(c) (i) C, because it has low melting point and zero electrical conductivty.

(ii) Element x could be Sodium.

Element z could be Calcium

(d)



June 1998

Paper 6

1 – (a) balance

(b) burette

2 – (a)

	temperature / °C		temperature difference / °C
	initial	final	
zinc	21	32	11
copper	26	26	0
magnesium	24	52	28

(b) most reactive Magnesium

Zinc

least reactive Copper

(c) Displacement

3 – (a) Bunzen burner

(b) (i) Iodine

(ii) Lead

(c) Lead metal connected the two electrodes at the bottom of the test tube.

(e) 1. Wear Safety glasses

2. Conduct it in a fume hood

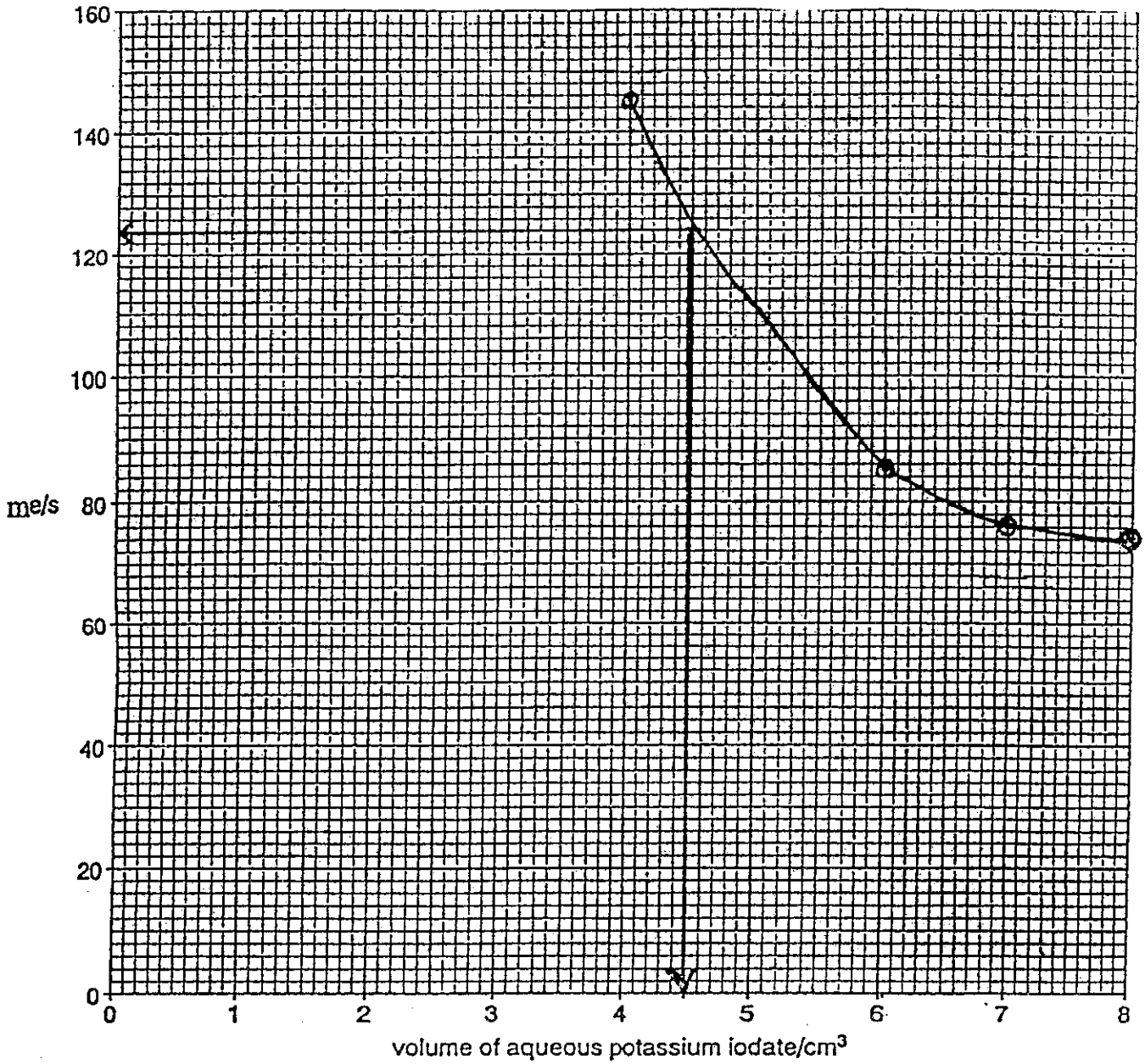
4 – time for blue colour to appear / s : 1.(145)

2.(85)

3.(76)

4.(74)

(a)



(b) 124 seconds

(c) (i) number 1

(ii) Because it contains the lowest concentration of potassium iodate.

(d) To examine change that occurs in reaction rate when the concentration of potassium iodate changes.

(e) To allow recording the time when iodine concentration reaches certain value.

(f) Effect: it will take less time in each case.

Explanation: Particles will move faster at a higher temperature. That means more collisions and faster reactions.

(g) Improvement: Use a styrofoam cup instead of a beaker

Explanation: Heat will be insulated.

5 – (b) Colourless pH 7

(c) (ii) No reaction

Two layers

(d) (i) White ppt. appears

The white ppt. disappears

(ii) White ppt. appears

The white ppt. disappears.

(e) it will burn. It will catch fire.

(f) No flame.

(g) C is Zinc bromide.

6 – (a) To make sure that all the acid is consumed.

(b) Bubbles stop.

(c) residue: Magnesium

filtrate: magnesium sulphate solution.

(d) Few drops to be cooled on a glass rod.

(e) precaution: put the crystals on a watch glass and in a dessicator

explanation: To make sure it is dried.

(f) Magnesium oxide is soluble in water. A burette and an indicator would be used.

7 – **Chromatography:**

- Apply one drop of the lemon drink at the starting line of the chromatogram.
- put the chromatogram in a beaker containing water. Make sure that the water surface is below the spot.
- Cover the beaker..
- When the front reaches the end line, take out the chromatogram.
- Let it dry for 10 minutes

Observation : Two yellow spots.

Conclusion : The lemon drink contains only two yellow substances.

November 1998

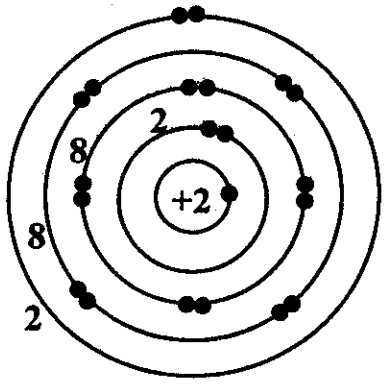
Paper 2

1- (a) Water.
(b) Argon and Neon.
(c) Oxygen.
(d) (i) 100 – 78 – 1 = 21
(ii) Welding of metals.
(e) 1. Pollutant: Carbon monoxide.
Source : In complete combustion of fuels.
2. Pollutant: Sulpher dioxide.
Source : Burning of coal.
(f) (i) Oxygen and Water.
(ii) 1. Cathodic protection.
2. Coating with inert substance.
(g) (i) Carbon dioxide.
(ii) Carbon dioxide.
(iii) Iron.

2- (a) The melting point decreases down the group.
(b) Rubidium.
(c) (i) Lithium reacts slowly with water without catching fire.
(ii) Lithium + water ⟶ Lithium Hydroxide + hydrogen.
(iii) test: Dip a red litmus paper in the solution.
result: it tarns blue.
(iv) sodium hydroxide + hydrochloric acid ⟶ sodium chloride + water.
(v) By evaporating the solution.
(d) A- Burette.
B- Measuring cylinder.

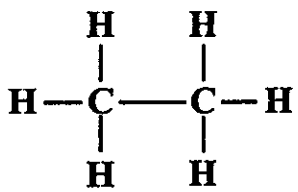
3- (a) name: Electrons.
charge: - Ve
(b) Carbon.
(c) (i) Nuclear Reactors.
(ii) It is an atom of the element that can have more than one mass number.
Or can have different numbers of meutrons.
(iii) Cancer treatment.
(iv) Number of neutrons: 143.

(d)



4- (a) To insulate and protect it.
(b) (i) it is the process by which a giant molecule is formed by the combination of small organic molecules.
(ii) A small organic molecule from its combination with other monomers a polymer is formed.
(c) (i) Expensive.
(ii) Better conductor of electricity.
(iii) Aluminium is lighter.
(d) To fortify the cable. Give more stringth.
(e) An alloy.

5- (a) Alkanes.
(b) (i) Boiling point increases.
(ii) 300 kelvins (K)
(c) Methane.
(d) (i) ethane + Oxygen $\longrightarrow$ carbon + water dioxide
(ii) Exothermic.
(iii)



(e) Because they follow one general molecular formula CnH_{2n+2}
(f) (i) D.
(ii) Because it has a double bond.
(iii) Ethanoic acid.

6- (a) $\frac{140g}{200g} \times 100 = 70\%$

(b) $Al_2O_3 + 2NaOH \rightarrow 2NaAlO_2 + H_2O$

(c) (i) Heated.

(ii) As a flux.

(iii) $O_{2(g)} + C_{(s)} \rightarrow CO_{2(g)}$

(d) (i) Electrons.

(ii) test: Expose a lighted splint to the gas.

result: The gas burns with a pop.

(iii) A white gelatinous ppt is formed first, then disappears in excess.

(e) To minimize the consumption of natural resources.

(f) (i) It is formed of two different elements.

(ii) When molten, charged particles can move and hence transfer electric currents; which is not possible in solid state.

(iii) Small molecules have very weak forces of attraction between them.

(iv) Because it is a giant structure.

(v) Because it is formed of layers that can slide upon each other.

November 1998

Paper 3

1- (a) (i) The plant takes water from soil and carbon dioxide from the air and react them together in the presence of sunlight and chlorophyl as a catalyst, to produce glucose and oxygen, according to the following equation:

$$6CO_{2(g)} + 6H_2O_{(l)} \xrightarrow{sunlight} C_6H_{12}O_{6(aq)} + 6O_{2(g)}$$

(ii) It is a combination reaction in which to molecules are reacting to produce a large molecule and a small one.

(iii)

(b) (i) $Fe_2O_3 + 3CO \rightarrow 2Fe + 3CO_2$

(ii) Added oxygen reacts with carbon to form carbon dioxide gas which escapes. Oxygen also reacts with silicon to form silica, which will then react with calcium carbonate to form slag. Slag float, on molten steel and can be easily collected.

(c) (i) $C_6H_5 - CH = CH_2$

(ii) Petroleum oil.

(d) (i) Natural fibres are biodegradable.

(ii) Cheaper.

2- (a) (i) Atoms are very close to each other. Valence electrons left each atom to form a pool of electrons that belong to the whole structur, in which there are isles of metals ions.

(ii) Conducting electricity.

(b) (i) A liquid.

(ii) solid: Particles are very close and arranged in an orderly manner.
gaseous: Molecules are far away from each other and scattered without order.

(c)

(d) (i) - High temperature: 400°C
- A catalyst: iron powder.
(ii) The reaction will move backward.

3- (a) (i) Potassium chromate (VI)
(ii) $C_2H_5OH_{(l)} + O_{2(g)} \rightarrow CH_3 - COOH_{(l)} + H_2O_{(l)}$
(b) (i) Butane.
(ii) 1. All members have the same functional group.
2. All members have the same general chemical properties.
(c) (i) because hydrochloric acid is a strong acid, while ethanoic acid is a weak one
(ii) As temperature increases, the kinetic energy of the particles increases which results in more collisions, and hence faster reaction rate.
(iii) - Increase the acid concentration.
- Increase the surface area of magnesium.
(d) name: Ethyl ethanoate.
Formula: $CH_3 - COOC_2H_5$

4- (a) (i) Caesium (cesium).
(ii) barium + water $\longrightarrow$ barium hydroxide + hydrogen.
(b) the formula of barium sulphate is: $BaSO_4$
the formula of barium phosphate is: $Ba_3(PO_4)_2$
(c) $BaCO_3 \rightarrow BaO + CO_2$
$2Ba(NO_3)_2 \rightarrow 2BaO + 4NO_2 + O_2$
(d) (i) $3Ba \rightarrow 3Ba^{2+} + 6e^-$
$2Am^{3+} + 6e^- \rightarrow 2Am$
(ii) A barium atom changing to a barium ion.
(e) (i) 0.003 mole.
(ii) 0.003 mole.
(iii) 197g
(iv) 0.591g
(v) 48 %

1 mole occupies 24 dm^3
x mole ..... 0.120 dm^3

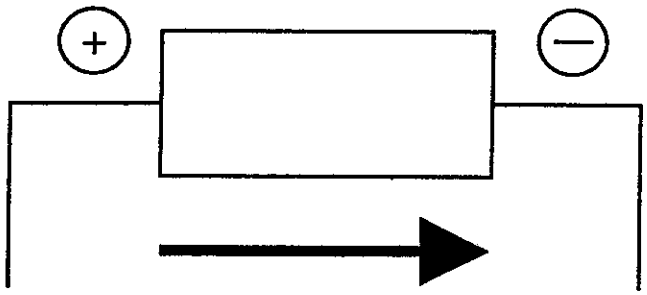
$$x = \frac{1mol \times 0.120dm^3}{24dm^3} = 0.003$$

1 mole $\longrightarrow$ 197 g
0.003 mole $\longrightarrow$ x g

$$x = \frac{3}{1000} \times \frac{197}{1} = 0.591$$

$$\%purity = \frac{0.591g}{1.23g} \times 100 = 48.0\%$$

5- (a) (i)



(ii) Endothermic, because it needs electric energy to separate the ions of molten KBR.

(iii) Electrons move from the negative pole of the battary to the cathode of the electrolytic cell, and consumed by potassium ions.

(iv) copper metal formed / copper metal consumed.

(b) (i) Hydrogen.

$$Mg_{(s)} \rightarrow Mg^{2+}_{(aq)} + 2e^{-}$$

(ii) Magnesium is more active than steel. Therefore it will act as a sacrificial metal and react instead, thus protecting the steel pipe line.

(iii) The pale green color disappears.

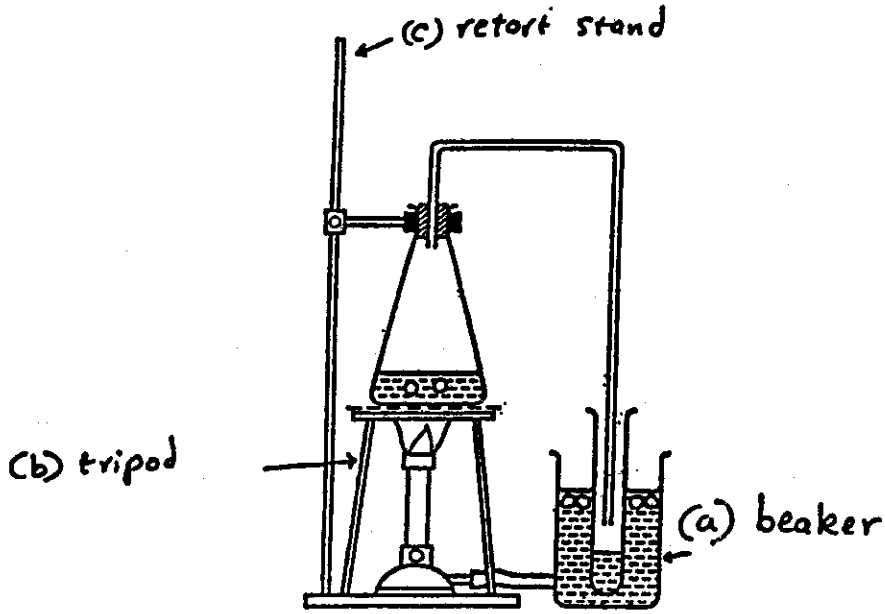
The piece of magnesium becomes smaller.

Temperature would increase.

November 1998

Paper 6

1-



2- The forged bank note ink includes the same inks that were found on the premises of suspect 1 and suspect 3, but not suspect 2.

3- (a) Double displacement.
(b) Filter the reaction mixture. Lead (II) iodide will remain on the filter paper; wash it with distilled water several times. Transfere the filter paper with Lead (II) nitrate on it to a desiccator to dry.

4- **Experiment 1:**
final temperature = 22.5°C
initial temperature = 22.0°C
temperature difference = 0.5°C
Experiment 2:
final temperature = 19.0°C
initial temperature = 21.0°C
temperature difference = 2.0°C
Experiment 3:
final temperature = 14.0°C
initial temperature = 19.0°C
temperature difference = 5.0°C
(a) Experiment 1.

(b) Enothermic.
(c) To make sure that it is clean.
(d) Different compounds are dissolved.
Experiment 5:
experiment number (4) time taken for graph grid to disappear/s = 86
experiment number (4) time taken for graph grid to disappear/s = 44
(e) Pall yellow ppt is formed.
(f) (i) Experiment 4
(ii) Because the concentration of sodium thiosulphate is lesser (half) than its concentration in experiment 5.
(g) effect: Time taken for the grid to disappear will be less.
explanation: As temperature increases, reaction rate increases.
(h) improvement: Use burettes to measure volumes.
explanation: More accurate measurements.

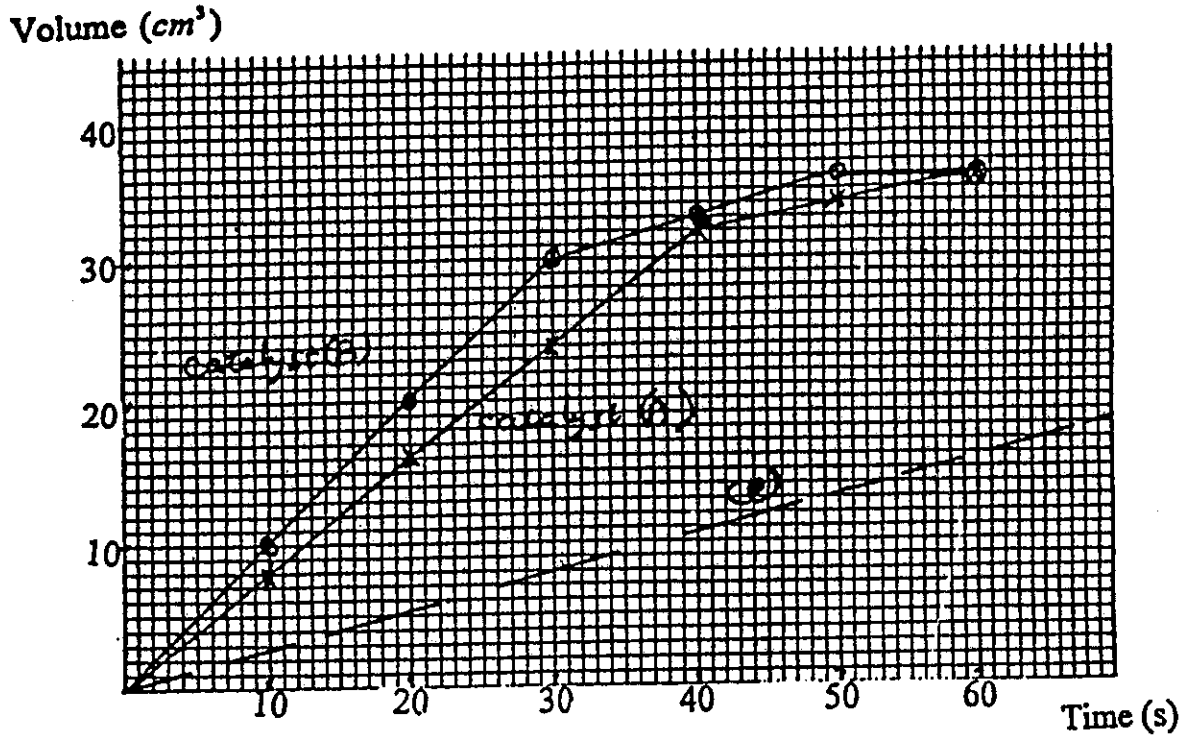
5- (a) observations: red/brown precipitate: The damp universal indicator paper turns blue.
(e) observations: White ppt appears.
(f) Ammonia.
(g) It has iron(III) in it.
(h) Hydrogen.
(i) Iron (III) ions are reduced to iron (II) ions by Zn/H_2SO_4 mixture in test (c).

6- Put 10g of crushed sample of old concrete in a beaker.
Add 100 ml of dilute HCl solution and stirr. After effervescence subsides, filter. Wash the residue on the filter paper with distilled water. Dry the residue; then weigh it.
Weight + of formed calcium carbonate = 10 g – weight of residue.

7-(a)

Time/s	Volume of oxygen/cm^3	
	With catalyst A	With catalyst B
0	0.0	0.0
10	8	10
20	16	20
30	24	30
40	32	33
50	34	36
60	36	36

(b) 143



(c) catalyst: B
reason: More volume at the same time, means faster reaction.

(d) because it is the end of the reaction where we started with the same volume of hydrogen peroxide.

June 1999

Paper 2

1- a) 1. Washing.
2. Cooking.

b) 100°c.

c) Test: Add few drops of water to white anhydrous copper (II) sulphete.
Result: It turns blue.

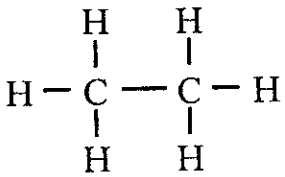
d) (i) Test: Add few drops of dilute NaOH soln.
Result: Red brown gelatinous ppt. is formed.
(ii) Nitrogen and Oxygen.

e) (i) To sterilize water.
(ii) To neutralize the acidity.

f) Sand and stones are acting as a huge filter. While water is passing through the stones, large suspended objects are captured. Small suspended matter is captured while water is passing through the sand.

2- a) As a fuel.

b)



c) (i) A substance that is formed mainly of carbon and hydrogen.
(ii) Plastics.

d) (i) To speed up the reaction.
(ii) In general, as temperature increases, reaction rate increases.
(iii) Water, carbon monoxide, carbon dioxide, and carbon.
(iv) During the process of fuel burning, sulphur reacts with oxygen to form sulphur dioxide (SO_2). Sulphur dioxide in the atmosphere is harmful to human health and also causes acidic rains which kill the plants and aquatic life.
(v) Breaking down larger molecules to form smaller ones.

3- a) Arrangement: random arrangement.
Motion: slowly and freely within the liquid phase.

b) (i) Colourless to brown.
(ii) chlorine + potassium iodide ⟶ potassium chloride + iodine.

c) (i) Colour: Yellow.
State: Gas.
(ii) -100°c
(iii) F_2

d) (i) F = 19 C = 12
$\therefore (4 \times 19) + (2 \times 12) = 76 + 24 = 100$
(ii) Polymerization.

4- a) Exothermic.

b) $C_{(s)} + S_{(s)} + 2O_{2(g)} \rightarrow CO_{2(g)} + SO_{2(g)}$

c) To increase the surface area; and hence speed up the reaction.

d) (i) 45.

(ii) Carbon dioxide and water.

e) (i) By adding water to the mixture and stirr. Lactose will dissolve leaving suspended sulphur. Filtar to separate sulphur. Evaporate the water gently to obtain lactose.

(ii) Potassium nitrate is an ionic compound. When dissolved in water, ions become free to move; therefore conducts electricity.

(iii) Lactose is an organic covalent compound. It has no ions.

f) (i) Test: Add dilute sodium hydroxide solution.
Result: A blue ppt. is formed.

(ii) Test: Add dilute acidified salver nitrate solution.
Result: A white ppt. is formed.

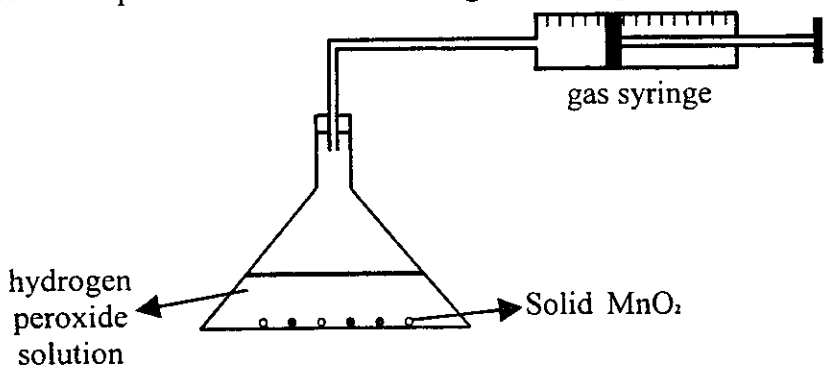
g) magnesium + steam ⟶ magnesium oxide + hydrogen.

5- a) 10g in 100g of soln.
xg in 500g of soln.

$$\therefore x = 10\,g \times \frac{500\,g}{100\,g} = 50\,g$$

b) * Add 0.5 g of manganese (IV) oxide powder to 100 ml of hydrogen peroxide solution. Immediately install the apparatus shown below and record the volume of oxygen evolved every 20 seconds.

* Repeat the experiment without adding the manganese (IV) oxide.

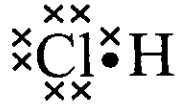


c) (i) Lead sulphate.

(ii) Oil paints become brighter.

6- a) Ammonium chloride.

b) Molecules of ammonia and hydrogen chloride in the gas phase diffuse. Molecules of ammonia diffuse faster than those of hydrogen chloride because molecules of ammonia are lighter.

c) 

d) $\underline{2}HCl + Zn \longrightarrow ZnCl_2 + \underline{H_2}$

June 1999

Paper 3

1- a) (i) Islands of ions embeded in a sea of electrons.
(ii) Ions of a metal can slide easily within the sea of electrons.
b) Sulphur trioxide can be formed from SO_2 in the atmosphere. SO_3 reacts readily with basic lead (II) carbonate to form lead (II) sulphate.
c) (i) Add few drops of the liquid to white anhydrous copper (II) sulphate. It will turn blue.
(ii) Bubble the produced gas through lime water. Turbidity occurs.
(iii) Sodium hydroxide is an alkali. An alkali reacts with acidic oxides, such as CO_2.
d) The mass of one mole of CO_2 = 44g.
Number of moles of CO_2 formed = 0.024 moles.
Number of moles of H_2O formed = 0.012 moles.
Therefore x = 2 and y = 1
The formula for the basic carbonate is $2PbCO_3.Pb(OH)_2$.

2- a) (i) Kerosene.
(ii) Carbon dioxide and sulphur dioxide. Combusion of hydrogen gives only water, which is a very useful substance.
b) raw material: water
Electrolysis of water will produce hydrogen at the cathode and oxygen at the anode by passing an electric current through a very diluted hydrochloric acid solution using inert electrodes.
c) (i) because as temperature increases, the kinetic energy of the molecules increases, and hence the rate of collision increases.
(ii) These molecules lose most of its kinetic energy. Therefore forces of attraction between them become dominant and bring them closer.
d) (i) It will shift the equilibrium backward.
(ii) It will compress the volume. Therefore, it will move the reaction toward lesser volume, meaning the product (methanol).
(iii) At equilibrium, lower temperature means more methanol, because heat will be absorbed faster and this will shift the equilbrium toward forming more methanol.

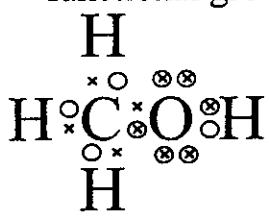
3- a) (i)

Name	Formula	Mass of one mole /g	Heat of combustion / kj per mole
butanol	$CH_3CH_2CH_2CH_2OH$	74	-2670

(ii) Members have the same general chemical properties, and the same functional group.

(iii) Structural isomers are compounds that differ only in the position of the functional groups.

b)

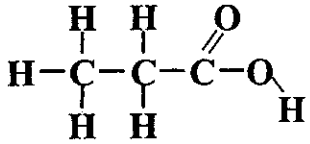


c) (i) Hydrolysis, by boiling with dilute acid.

(ii) By adding yeast to a sugar solution as keeping it at 37°c. Fermenting bacteria will change sugar into ethanol and carbon dioxide.

d) name Propanoic acid.

Structural formula



4- a) Bleaching.

b) (i) Add few drops of barium chloride to few drops of this water. White ppt. appears.

(ii) Using a piece of limestone, effervescence occurs.

c) (i) To speed up the reaction by having larger surface area.

(ii) Sulphur dioxide and air at 400°c in the presence of vanadium (V) oxide as a catalyst reacting to form sulphur trioxide.

(iii) $SO_3 + H_2SO_4 \rightarrow H_2S_2O_7$

$H_2S_2O_7 + H_2O \rightarrow 2H_2SO_4$

d) (i) Manufacture of detergents.

(ii) Potassium and Phosphorus.

(iii) A base is a substance that reacts with an acid to form salt and water.

5- a) number of electrons 53

number of neutrons 72

b) (i) Because elements of the same group have the same number of valence electrons.

(ii) Due to the difference in the number of valence electrons.

(iii)

oxide	Type of oxide	Reaction with acid	Reaction with alkali
magnesium	basic	R	NR
aluminium	amphoteric	R	R
silicon (IV) ocide	acidic	NR	R

c) (i) the strontium ion, Sr^{++} or Sr^{2+}

the phosphide ion, P^{---} or P^{3-}

(ii) Write the formula for strontium phosphide Sr_3P_2

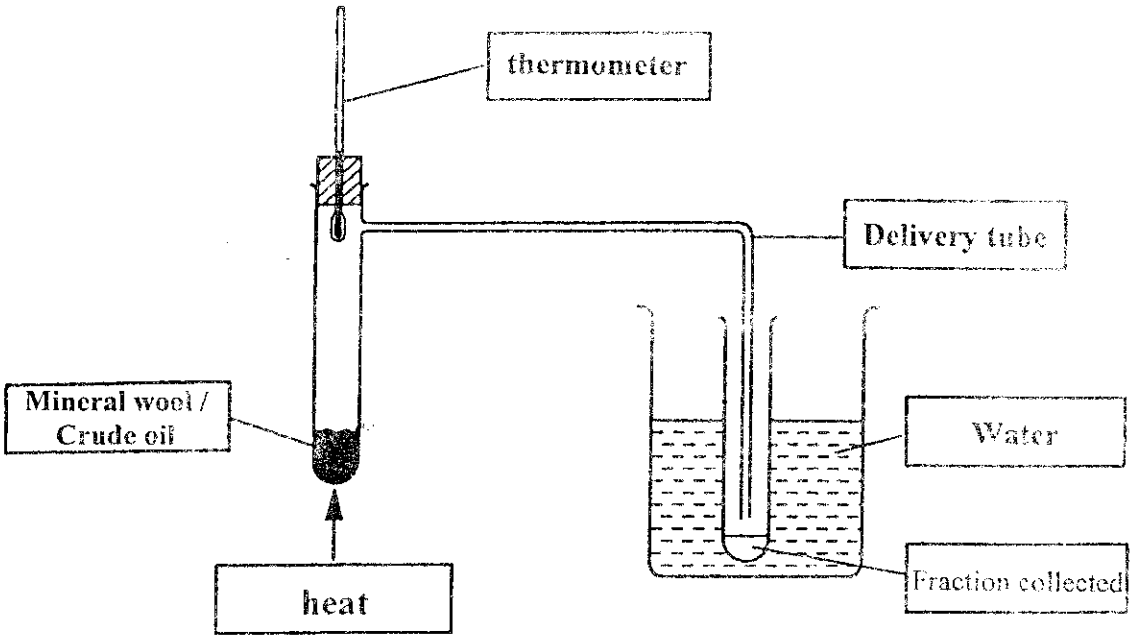
d) (i) Rubidium.

(ii) potassium + water ⟶ potassium hydroxide + hydrogen.

June 1999

Paper 6

1- a)



b) To cool and condense vapours.

c) To measure the temperature of the produced vapours.

2- a) It turns dark brown (rusty).

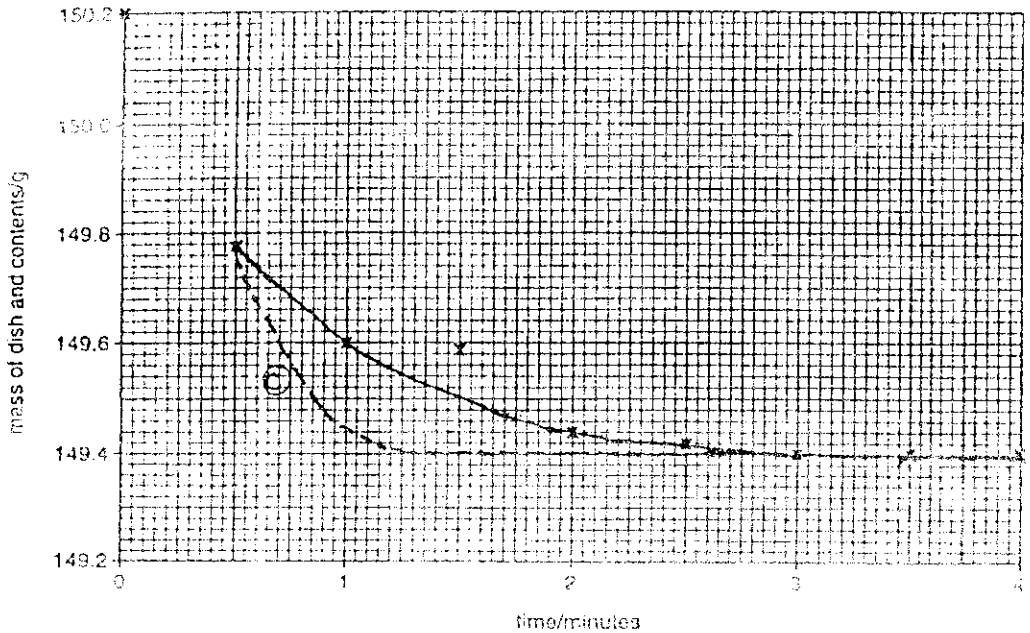
b) level of water: Higher.

explanation: Oxygen in air is consumed due to oxidation.

c) result of test: it will extinguish.

explanation: there is no oxygen in this sample of air.

3- a) (i)



(ii) The one taken after 1.5 minutes. Because it is not on the smooth surve.

b) (i) 3 minutes.

(ii) 0.77 g.

d) A conical flask.

4- a) 1. Add powdered copper (II) carbonate to a solution of dilute nitric acid in a beaker.

2. Stir the mixture. Bubbles of CO_2 are formed.

3. Continue the addition of copper (II) carbonate until the reaction ceased (no more bubbles).

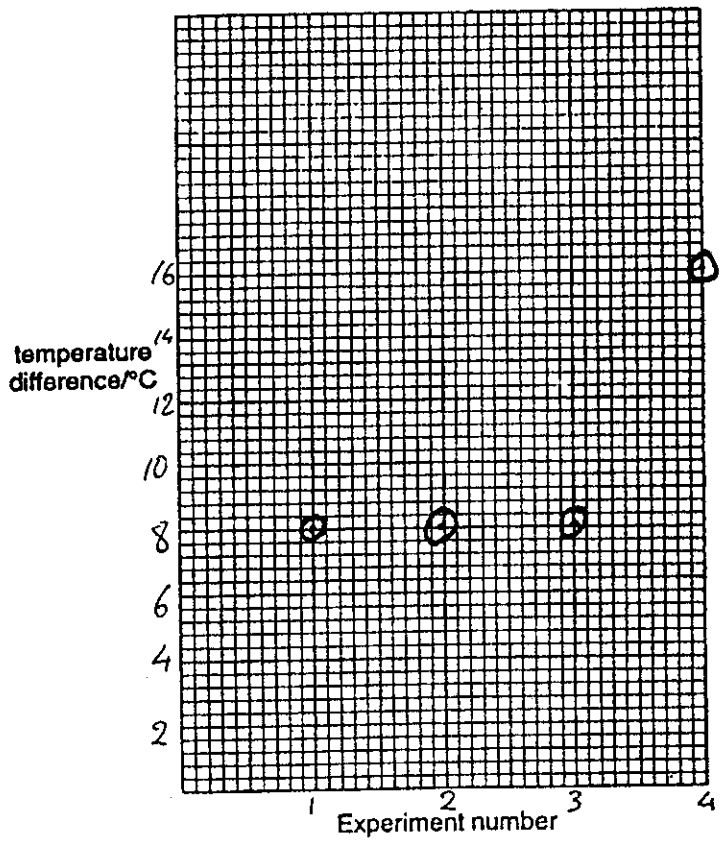
4. Filter the reaction mixture and receive the filtrate in an evaporating basin.

5. Heat to evaporate the water till dryness to obtain the powdered salt of copper (II) nitrate.

5-

Experiment	Initial temperature of acid / °c	Maximum temperature reached / °c	Temperature difference / °c	PH of final mixture
1	23.0	31.0	8.0	7
2	21.0	29.0	8.0	14
3	24.0	32.0	8.0	3
4	26.0	42.0	16	7

a)



b) (i) The temperature change is the same in each of these experiments.
(ii) in experiment 1, Neutralization occurs.
in experiment 2, Sodium hydroxide solution labelled B is highly concentrated.

c) Neutralization.

d) (i) Temperature change in experiment 4 is double that of experiment 2.
(ii) More neutralization occurs in experiment number 4.

e) 26.0°c . The plastic cup is not a very good insulator. Heat will be transferred to the atmosphere and the temperature of the solution will be room temp.

f) Use a styrofoam cup with a lid.

	thermometer Diagram	**temperature / °C**
Initial temperature of hydrochloric acid =		23.0
Maximum temperature reached by mixture =		28.0
Temperature difference =	5.0	

g) (i) experiment: 1
explanation: The use of double the volume in experiment 5 cooled the temperature down.

h) temperature rise: 5.0
explanation: The same as in (g). the presence of more water decreases the temperature change.

6- b) White ppt. formed.

d) (i) effervesce occurs and a clear solution is formed.

f) Slightly acidic.

g) It contains chloride ions

h) (i) Barium carbonate.
(ii) Barium carbonate reacted with dilute hydrochloric acid to form carbon dioxide "effervesence" and a clear solution of barium chloride.

i) (i) Ammonia.
(ii) Nitrate.

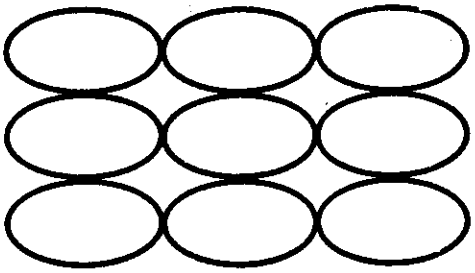
7- Plan; Use the measuring cylinder to measure 100 cm^3 of water. Pour it in the copper can. Put the balance with the spirit burner on it "full with methanol" on the stand. Hold the copper can with the stand. Light the burner. Continue heating the water and stirring with the thermometer, until the balance shows that 1.0g of methanol is burnt. Record the water temperature.
Repeat the same procedure for ethanol . compare the results.

November 1999

Paper 2

1- (a) (i) helium.
(ii) iron and nickel.
(iii) ammonia and carbon dioxide.

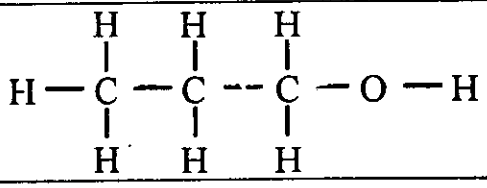
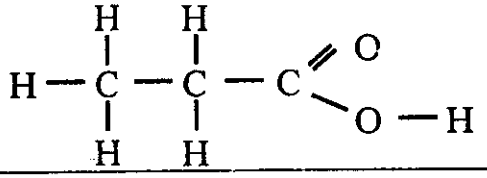
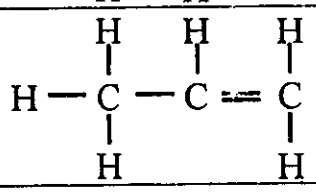
(b)



(c) (i) A solid has definite shape, a gas has not.
(ii) test : Expose a wet red litmus paper to the gas.
result : it will turn blue.

(d) (i) Protons.
(ii) Sodium.
(iii) I
(iv) Because it lost one electron from its outermost shell.

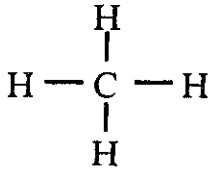
2- (a)

compound	Structure of compound	Type of compound
B		alcohol
C		acid
D		alkene

(b) hydrogen and oxygen.

(c) C_3H_8

(d)



(e) D.

(f) By heating petroleum fractions in the presence of a catalyst.

3- (a) Fractional distillation.

(b) Organic compounds contains carbon and hydrogen only.

(c) $CH_4 + \underline{2}O_2 \rightarrow CO_2 + \underline{2}H_2O$.

(d) (i) Very reactive.
(ii) The alloy has higher melting point than pure aluminium.

(e) sulphuric acid + aluminium ⟶ aluminium sulphate + hydrogen.
Or : The alloy is stronger than pure aluminium.

(f) (i) a substance that eases friction.
(ii) an organic compound containing
a carbon – carbon double bond $(>C=H<)$

4- (a) Hematite.

(b) (i) $2C + O_2 \rightarrow 2CO$.
(ii) C.

(c) (i) Iron (III) oxide + carbon monoxide ⟶ iron + carbon dioxide.
(ii) Accepting electrons.

(d) (i) A reversible reaction.
(ii) Test : bubble the gas through lime water.
Result : turbidity occurs.
(iii) Slag is floating above molten iron.

(e) (i) in making utensiles.
(ii) does not rust easily.
(iii) carbon.

5- (a) (i) Higher melting point.
(ii) Lower melting point Or more expensive.
(iii) better electrical conductivity.
(iv) cheaper.

(b) boiling point , solubility.

(c) It reacts with dilute acids.

(d) (i) It is an inert gas.
(ii) Helium.

(e) Atoms of solid tungsten absorb heat and gain enough kinetic energy to overcome the forces of attraction between them and move away to melt. Atoms of liquid tungsten also absorb enough heat to gain kinetic energy and overcome the forces of attraction between them to be able to jump from the liquid phase to gas phase, i.e. evaporate.

6- (a) (i) An anode.
(ii) A cathode.

(b) conducting electricity.

(c) to act as an insulator.

(d) (i) NaCl.
(ii) a solid dissolved in a liquid.
(iii) acid : Hydrochloric acid.
Alkali : Sodium chloride.
(iv) Mix 50ml of 1M solution of hydrochloric acid with 50ml of 1M sodium hydroxide solution. Evaporate till you reach the point of crystallization. Cool and then filter.

(e) Hydrogen.

(f) sodium hydroxide solution turns red litmus blue &
sodium hydroxide solution is alkaline.

(g)

formula of a chlorine molecule	Cl_2
state of chlorine at room temperature	gas
colour of chlorine	yellowish green
atomic number of chlorine	17
A use of chlorine	Bleaching

November 1999

Paper 3

1- (a) (i) By roasting it in air.

(ii) Zinc oxide + carbon $\longrightarrow$ carbon dioxide + Zinc.

(iii) The cathode is made from : Pure zinc wire.
The anode is made from : impure zinc mass.
The electrolyte is aqueous : zinc (II) sulphate.

(iv) Galvanising steel and forming brass.

(b) (i) Because its affinity to oxygen is greater than that of carbon.

(ii) Aluminium salts are insoluble in water.

(c) (i) Zinc nitrate $\xrightarrow{\text{heat}}$ zinc (II) oxide + nitrogen dioxide + oxygen.

(ii) the quantity of the salt decreases.

2- (a) (i) Chlorophyll captures the light energy and acts as a catalyst in the photo-synthesis of sugar from water and carbon dioxide.

(ii) technique : Chromatography.
description : By applying a spot of the solution on a chromatogram and allowing the solvent to migrate upward; separation of various pigments occurs.

(b) deduction : Oxalic acid is weaker than hydrochloric acid.
Deduction : Oxalic acid is a reducing agent. Or : Oxalic acid can be oxidized by potassium manganate (VII)
Oxalic acid is a dibasic acid. Or : Oxalic acid has two H^+

(c) Add 20.0 ml of 1M oxalic acid solution to 40.0 ml of the 1M sodium hydroxide solution. Evaporate the solution in an evaporating dish till it reaches the point of crystallization. Cool the solution. Crystals will be formed. Filter, then dry the crystals in a drying oven.

(d) (i)

C	H	O
$\frac{26.7}{12}$	$\frac{2.2}{1}$	$\frac{71.1}{16}$
$\frac{2.225}{2.2}$	$\frac{2.2}{2.2}$	$\frac{4.44}{2.2}$
1.01	1.00	2.02
1	1	2

therefore, the empirical formula of oxalic acid is CHO_2

(ii) Mass of the empirical formula = 12 + 1 + 32 = 45

$$n = \frac{90}{45} = 2$$

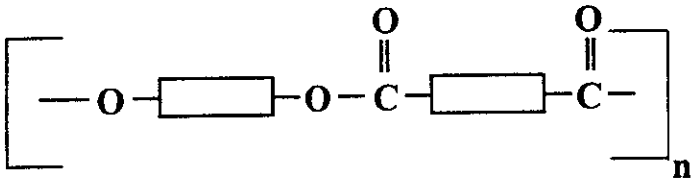
$\therefore$ The molecular formula is $C_2H_2O_4$

3- (a) (i) Ca^{2+} O^{2-}

(ii) It is a giant molecule with covalent bonds. It is formed of repeated tetrahedral units where silicon atom is in the centere surrounded by oxygen atoms.

(b) (i) Ethanol and Ethanoic acid.

(ii)

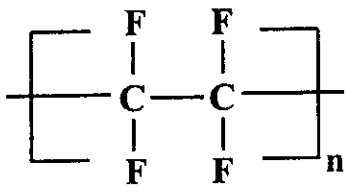


(c) reagent used : Dilute hydrochoric acid.
result of test : white ppt. turned grey in light.

(d) (i) Neon in neon lamps.

(ii) The outermost electron shell of krypton is totally filled, it does not need to share any electrons, while the nitrogen atom is in need of compensating for the of 3 electrons to complete its octet.

4- (a) (i)



(ii) Molecules of oxygen and nitrogen are lighter than carbon dioxide. Therefore, they can diffuse faster.

(b) (i) Measure the loss in mass against time by putting the reaction flask on an electronic balance.

(ii) 1.5 mol / dm^3.

(iii) because calcium carbonate is in the form of powder. This allows more surface area, which makes the reaction faster.

(c) (i) because it absorbs heat.

(ii) 1. Add more heat.
2. Remove carbon dioxide.

(d) (i) Nitrogen and oxygen in air react due to the energy from the electric spark of the spark plugs in the car engine.

(ii) By reacting them together in the pres ce of a catalyst to form nitrogen and carbon dioxide gases.

5- (a) (i) The grey piece of zinc disappears. The blue colour of the solution fades away. A reddish ppt. appears.

(ii) $Cu^{2+}_{(aq)} + 2e^- \rightarrow Cu_{(s)}$

(iii) Zinc. The more reactive metal kicks the less active from its salts. Or : Zinc has higher ability to form positive ions than copper.

(b) (i) Fluorine.

(ii) Their ability to form negative ions.

(iii) Iodine and sulphur.

(c) (i) type of reaction : Substitution.

organic product : Chloroethane.

(ii) name of product : 1,2 – dibromoethane.

equation : $CH_2 = CH_2 + Br_2 \rightarrow BrCH_2 - CH_2Br$

observations : The red colour of bromine disappears immediatlly.

(iii) Water Or chlorine Or iodine Or hydrogen.

November 1999

Paper 6

1-(i) C. (ii) A.
(iii) B. (iv) D.

2- (a) Add water to the mixture and stir. Filter. Put the filter paper with the residue on it in an oven to dry.

(b) Put the filtrate in an evaporating basin and heat gently. Evaporate till the point of crystallization. Cool. Filter to separate the crystals, and then dry it.

3- chlorine dissolved in water : Apply the liquid on wet blue litmus paper. It will turn red then bleaching occurs.

pure water : Apply a drop of the liquid on white anhydrous copper (II) sulphate. It will turn blue.

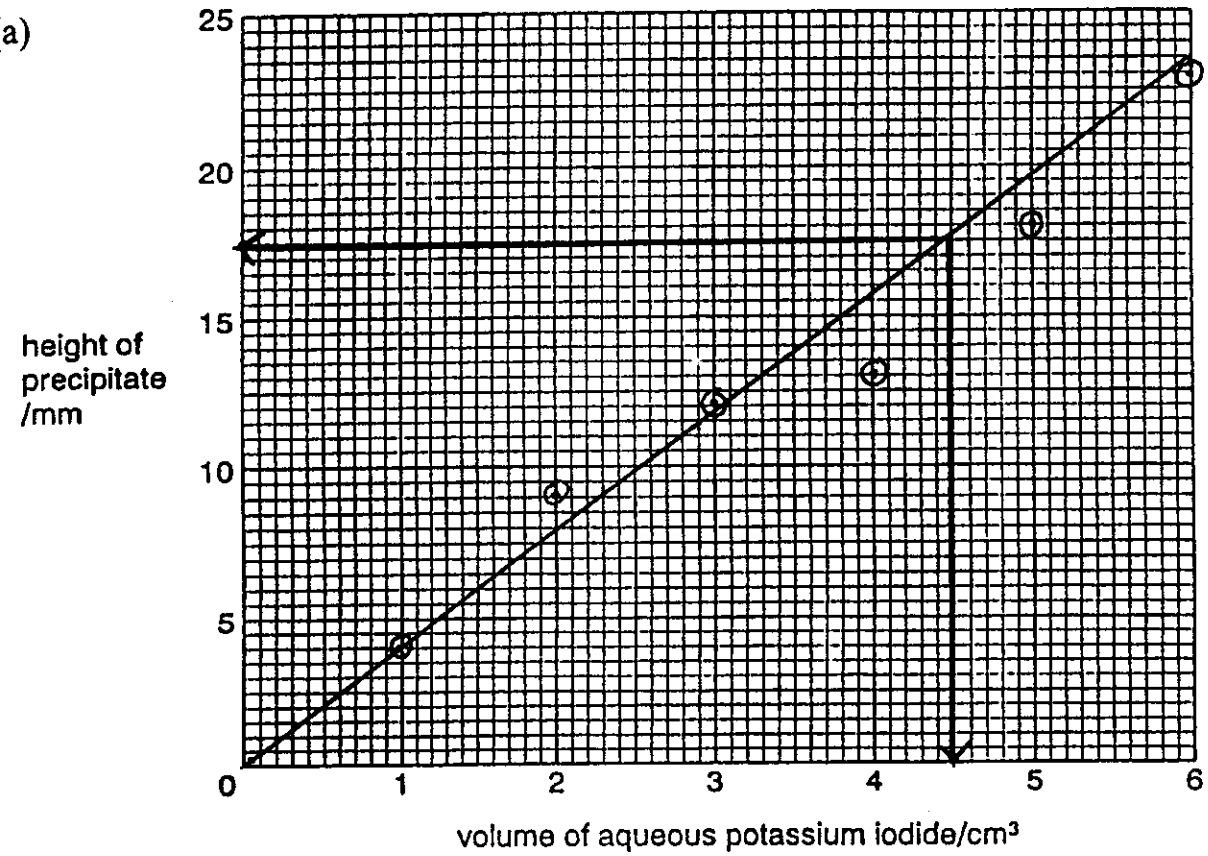
Pentene : Add a drop of the liquid to 1 ml of bromine water solution. Decolorization occurs immediately.

aqueous ammonia : Apply a drop of the liquid to a red litmus paper. It will turn blue.

4-

Test-tube number	1	2	3	4	5	6
Volume of aqueous potassium iodide/cm^3	1	2	3	4	5	6
Height of precipitate/mm	4	9	12	13	18	23

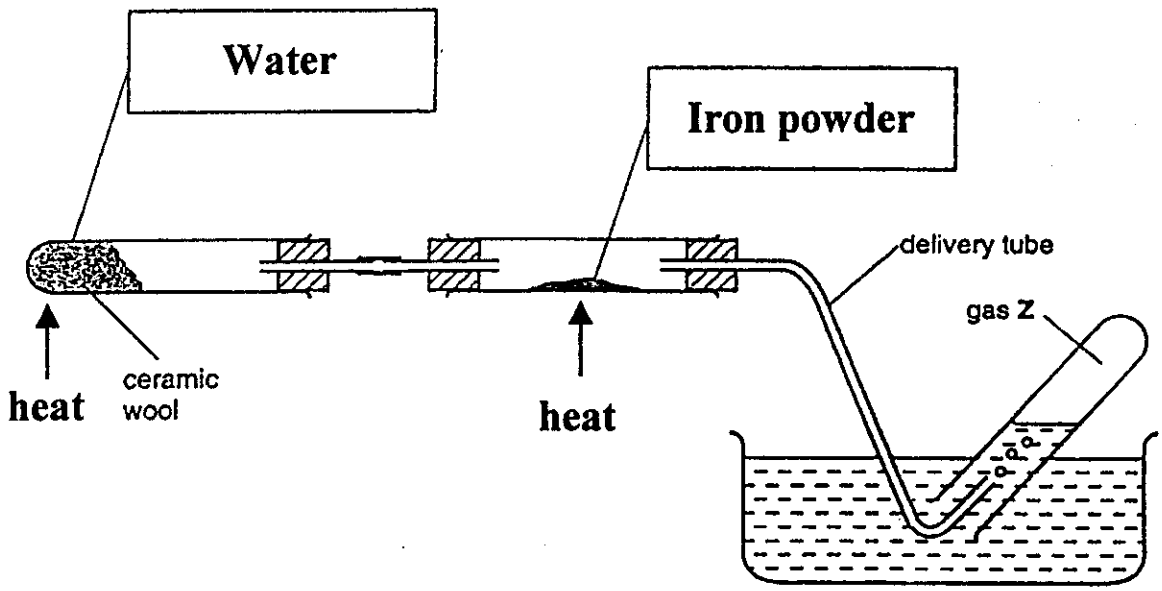
(a)



(b) 17.5 m.
(c) A yellow ppt. is formed immediately.
(d) Potassium iodide + lead (II) nitrate ⟶ Potassium nitrate + lead (II) iodide.
(e) A white ppt. of lead (II) chloride will be formed immediately.
(f) The heights will increase "doubles"
(g) (i) Use another burette to add the potassium iodide solution. Or use pipettes to measure the needed volumes.
(ii) improvement : Use measuring cylinders instead of test tubes.
Explanation : This way there will be no need for a ruler. The heights can be measured directly.

5- (b) (i) observations: A blue ppt. is formed , No change.
(ii) observations: A blue ppt. is formed , The blue ppt. disappears. Deep blue soln. is formed.
(c) observations: Colourless.
(d) (i) observations: White ppt. is formed , No change.
(ii) observations: No change , No change.

6- (a)



(b) To hold water.
(c) Hydrigen.

7- apparatus A beaker, a burette a glass rod,
plan of investigation Crush the tablet F and put it in the beaker. Put hydrochloric acid dropwise to the crushed tablet F. stir. Add the drops of the acid untill effervescence stops. Record the volume of the consumed acid.
Repeat the same procedure for tablet G.
Compare the two volumes. The one that consumed more acid is the best at neutralising it.

June 2000

Paper 2

1- (a) (i) Cl
(ii) Na
(iii) He
(iv) Ar

(b) 1. The small piece of sodium floats.
2. It darts in every directs.
3. It melts and disappears.
4. Sparks occurs with sound.

(c)

element	boiling point / C°	reaction with water	electronic structure
lithium	1342	steady reaction	2.1
sodium	1050	rapid reaction	2.8.1
potassium	760	very fast reaction	2.8.8.1

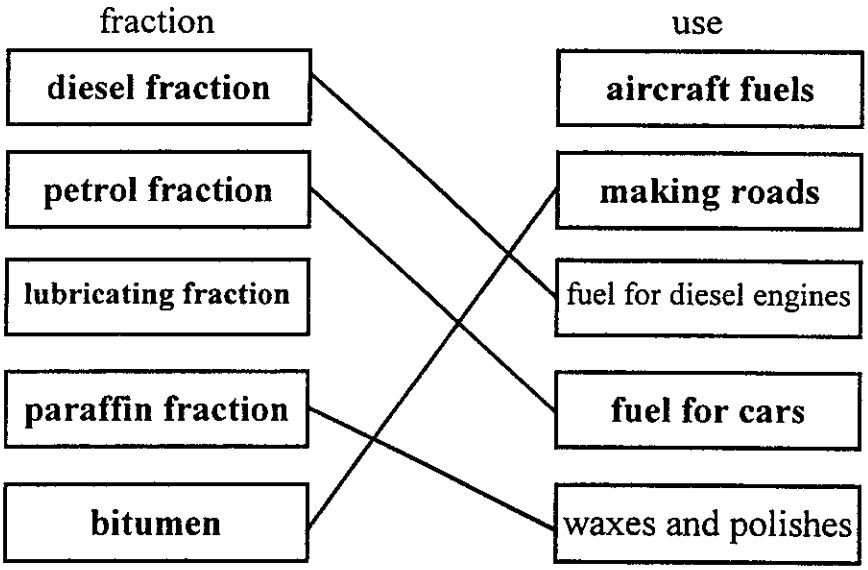
(d) (i) Ionic.
(ii) KCl.
(iii) No moving charged particles.
(iv) White ppt. is formed, which dissolves in ammonia solution.

2- (a) structure 1 B
structure 2 D

(b) (i) A part of the petroleum that can be collected at a close range of boiling point.
(ii) Fractional distillation.
(iii) vaporised, changed from liquid to gas.
condensed. Changed from gas to liquid.
(iv) Boiling point.

(c) (i) 1. High temperature.
2. The presence of a catalyst.
(ii) Ethene.

(d)



3- (a) (i) To form a cover coating.
(ii) to prevent corrosion.
(iii) A.

(b) 1. Shiny.
2. Conduct electricity.
3. Malleable and ductile.

(c) (i) Sulphur dioxide.
(ii) O_2

(d) 5 T produce 4 T of Zn
20 T produce x T of Zn

$\therefore x = \frac{20}{5} \times 4$ mass of zinc 16 tonnes.

(e) (i) A
(ii) D
(iii) C

(f) (i) Removal of oxygen.
(ii) CO.

4- (a) It is a substance composed of two or more components not chemically combined and can be separated by physical means.

(b) A pure substance formed by the chemical combination of two or more elements.

(c) (i) Endothermic reaction.
(ii) Carbon dioxide.

(d) (i) slaked lime.
(ii) 10
(iii) Put a drop of aqueous calcium hydroxide solution of a red litmus paper. It will turn blue.

(e) (i) test : bubble it throuy lime water.
result : Lime water will turn milky.
(ii) PH 7 at the surface : all calcium hydroxide reacted.
PH 9 inside near the surface : some calcium hydroxide reacted, but some still there.
PH 13 deep inside : all calcium hydroxide still there.

5- (a) (i) Condenser.
(ii) 99 °C
(iii) Limonene floats on the surface of the water.

(b) (i) $C_{10}H_{16}$
(ii) It decolourise the red-orange colour.
(iii) The presence of the two double bonds.
(iv) Carbon dioxide and Water.

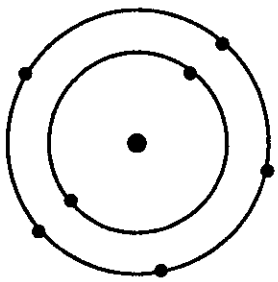
6- (a) (i) radioactive, Unstable atoms eject particles and releases energy.
(ii) isotope, Atoms of the same element with different number of neutrons.

(b) To treat cancer.

(c)

Type of particle	Type of charge on the particle	Number of particles present
proton	+ ve	6
neutron	No charge	8
electron	- ve	6

(d) (i) 14
(ii)



(iii) Phosphorous.

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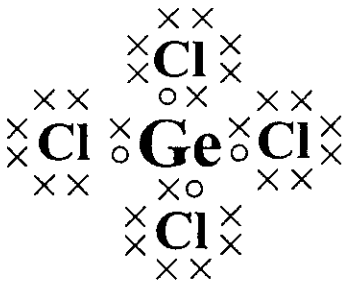
Paper 3

1- (a) - Hard
- High melting point.

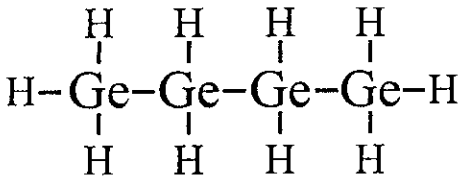
(b) because its structure is different. It is formed of layers that slide on each other by friction.

(c)



(d) (i) Ge_nH_{2n+2}

(ii)



(e) (i) Roducing agent, because it did reduce Fe^{3+} to Fe^{2+} ions.
(ii) test : Add sodium hydroxide solution.
result for iron (III) salt : reddish brown ppt.
result for iron (II) salt : dirty green ppt.

2- (a) Air is cooled down to - 200°C. liquid air is then distilled. Fractional distillation gives nitrogen at -196°C.

(b) Through partial oxidation at high temperature using a catalyst.

(c) (i) It decreases.
(ii) Move to the right.
(iii) As pressure increases, volume increases, and the reaction mixture tends to occupy lesser volume, Which means forming more ammonia.
(iv) Increasing preasure means lesser volume. This will allow more collisions between particles; which means increasing reaction rate.

(d) (i) Fertilizer.

(ii) - Add one drop of phenolphaline indicator.
- Dropwise, add dilute sulphuric acid solution and stirr until the colour disappears.
- Evaporate the solution till it reaches the point of crystallization.
- Cool the solution.
- Filer and dry the crystals.

(e) (i) Nitrogen oxides are formed due to the reaction between nitrogen and oxygen at high temperature.

(ii) $6NO_2 + 8NH_3 \rightarrow 7N_2 + 12H_2O$

(iii) Before adding ammonia PH of the flue gases is acidic. The right amount of ammonia will give flue gases of PH = 7.

3- (a) Burning of wood produces carbon dioxide, which is retaken by the newly planted trees. It is a natural cycle.

(b) (i) Add bromine water to a test tube containing one drop of whole oil, and shake. The red-brown colour disappears.

(ii) by adding hot sodium hydroxide solution, a saponification reaction occurs.

(iii) unsaturated hydrocarbon + Hydrogen $\longrightarrow$ saturated hydrocarbon

(c) Rate of diffusion $\alpha \dfrac{1}{MolarMass}$

Therefore, hydrogen will diffuse faster. Accordingly, the percentage of hydrogen in the diffused mixture will be higher.

(d) (i) - Good conductor of electricity.
- does not corrode easily.

(ii) - Good insulator.
- Non-biodegradable.

4- (a) - At cathode : $Cu^{2+}_{(aq)} + 2e^- \rightarrow Cu_{(s)}$ cathode gains mass.

- At anode : $Cu_{(s)} \rightarrow Cu^{2+}_{(aq)} + 2e^-$ anode loses mass.

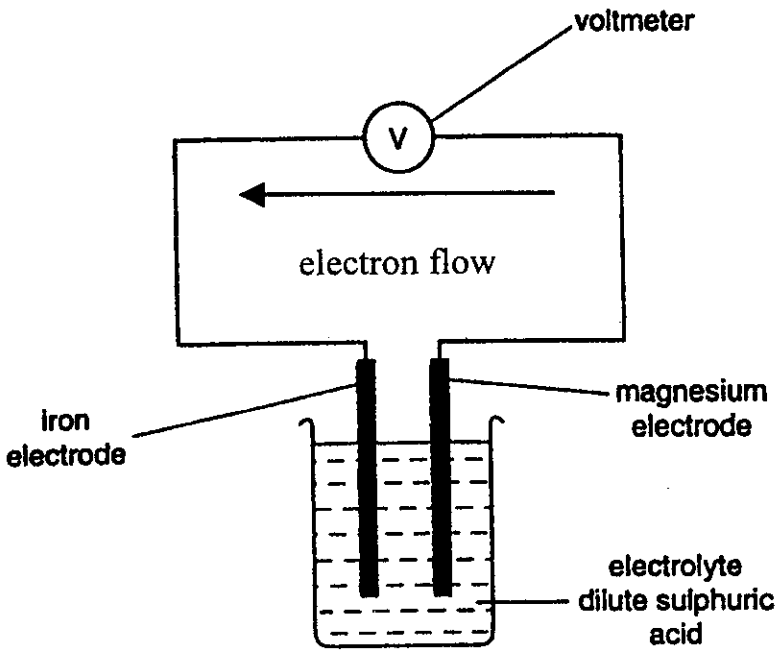
- The concentration of the solution remains the same because all what is happening is that the anode is passing its mass to the cathode.

(b) (i) The blue colour of Cu^{2+} ions disappears and a reddish-golden powder appears.

(ii) A blue ppt. appears, that does not dissolve in excess.

(c) (i) Adevice that produces electricity through a chemical reaction.

(ii)



(d) (i) number of moles of CuO formed =

mass of 1 mole of CuO is 80 g

mass of x mole of CuO is 4.80 g

$\therefore$ x = 1 mole x $\frac{4.80}{80}$ = 0.06 mole.

Mass of Cu in CuO :

80 g of CuO contains 64 g of Cu

4.8 g of CuO contains x g of Cu

$\therefore$ x = 4.8 g x $\frac{64}{80}$ = 3.84 g

(ii) From the reaction stoichioetry : $2CuO_{(s)}$ is 0.06 mole

$\therefore$ $4NO_{2(g)}$ are 0.12 mole and $O_{2(g)}$ is 0.03 mole

$\therefore$ total of moles of gas formed = 0.12 + 0.03 = 0.15 moles

Volume of gas formed at r.t.p. :

1 mole of a gas occupies 24 dm^3 at r.t.p.

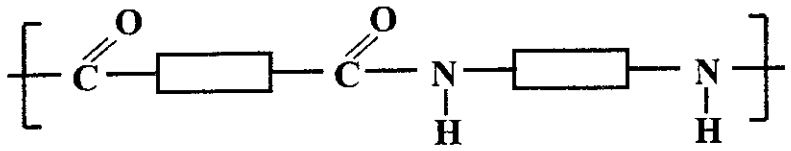
0.15 moles occupy x dm^3

$\therefore$ x = $\frac{0.15 moles}{1 mole}$ x 24 dm^3 = 3.6 dm^3

5- (a) (i) Ester linkage.

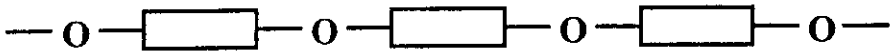
(ii) Esters , Fats , Oils.

(b)



(c) (i) Carbon, Hydrogen and Oxygen.

(ii)



(d) (i) As a fuel.

(ii) To prevent interference with the experiment.

(iii) The solution of the sugars is colourless.
Resorcinol will develop the colours.

(iv) Do the same experiment with one added drop of the hdrolyzed starch solution on the datum line. Only one spot with R_f value will match glucose.

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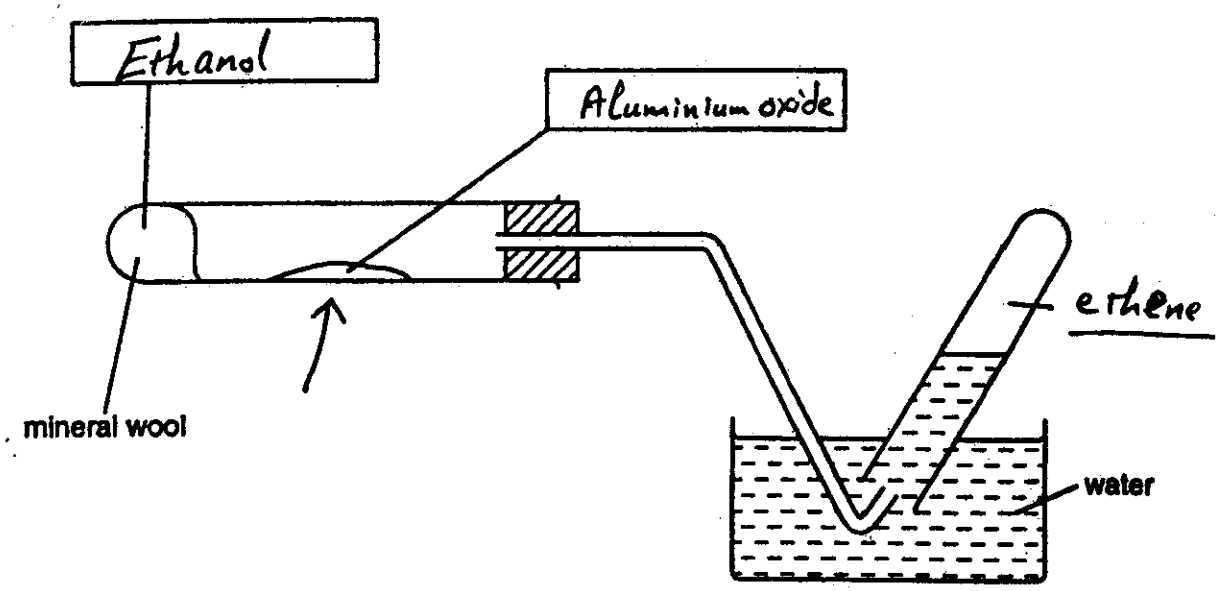
Paper 6

1- (a) A Bunsen Burner.
B Tripode.
C Wire Gauze.
D Crucible.

(b) 1. Magnesium burns with a bright flame.
2. White ash is formed.

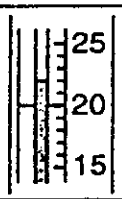
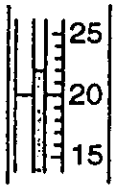
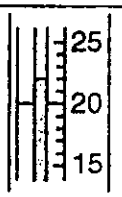
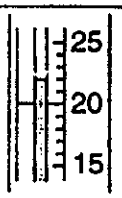
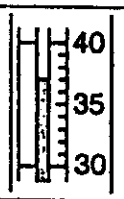
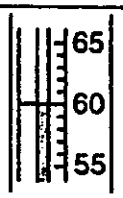
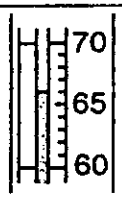
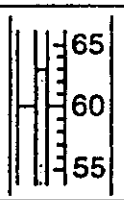
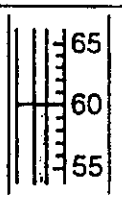
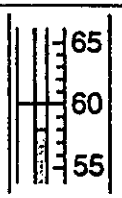
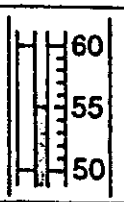
2-
(a)
(b)
(c)



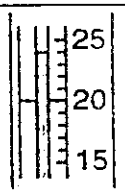
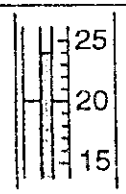
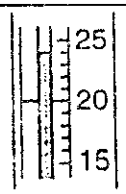
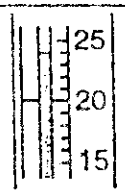
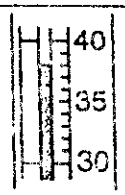
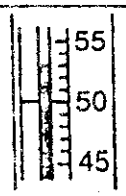
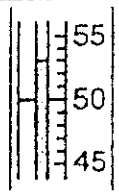
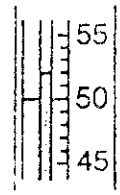
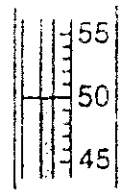
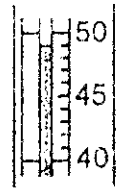
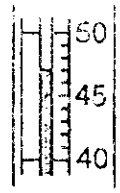
(d) When the heating stops, hot ethanol vapour will condense and back suction occurs.

(e) red-orange to colourless.

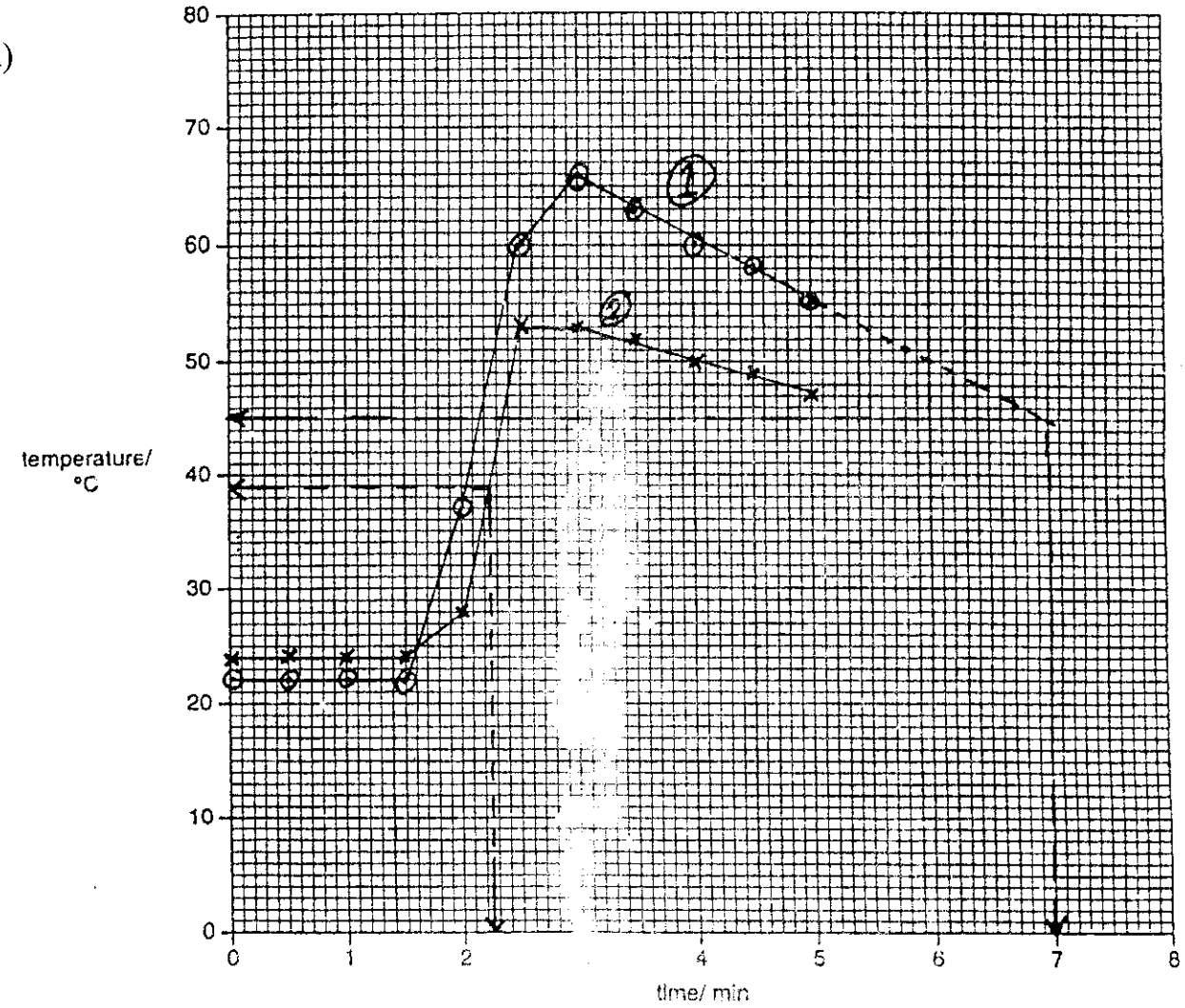
3- Experiment 1

time/min	0.0	0.5	1.0	1.5	2.0	2.5
thermometer diagram						
temperature/°C	22	22	22	22	37	60
time/min	3.0	3.5	4.0	4.5	5.0	
thermometer diagram						
temperature/°C	66	63	60	58	55	

Experiment 2

time/min	0.0	0.5	1.0	1.5	2.0	2.5
thermometer diagram						
temperature/°C	24	24	24	24	38	53
time/min	3.0	3.5	4.0	4.5	5.0	
thermometer diagram						
temperature/°C	53	52	50	49	47	

(a)



(b) (i) 45° C

(ii) At 2.25 min the temp. is 39° C

(c) Displacement.

(d) (i)In both cases the temperature is rapidly increasing then gradually decreasing. Temperature change is larger in expert 1 than in experiment 2.
(ii) Zinc is more active than the metal used in experiment 2.

(e) 24° C. temperature of the reaction mixture will go back to room temperature.
(f) Use a styrofoam cup and a lid.
(g) identity of G Iron.
reason Less active than zinc, and Fe^{2+} reacts with NaOH to give a green ppt.

4- (a) colour : Red pH : 1
(c) White ppt. that dissolves in ammonia solution.
(d) It turns limewater milky.
(f) Chlorine.
(g)Carbon dioxide.
(h)Zinc.

5- (a) 1.Carry the experiment in a fume hood.
2. Wear safety goggles.
(b) Loss of mass generally occurs over time.
(c) 1. Mass loss is greater in graph A than in graph B.
2. Mass loss continues to increase after 12 hours in graph A ; while it slows and almost stops in graph B.

6- (a) C Burette.
D Pipette.
(b) Fill the burette with O.I.M hydrochloric acid solution. Use the pipette to transfer 10 ml of the alkaline solution into a beaker. Add one drop of phenolphalein indicator; the solution will turn pink. Dropwise add the acid from the burette to the beaker and swrill until the colour disappears. Record the burette reading. Repeat the experiment three times.
Do the same for the second liquid oven cleaner. The liquid oven cleaner that is neutralized by larger volume of acid contains higher concentration of alkali.

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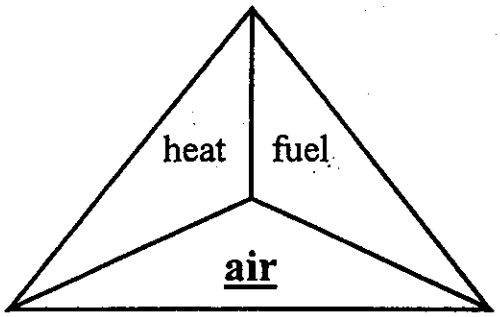
Paper 2

1- (a)



(b) Exothermic.

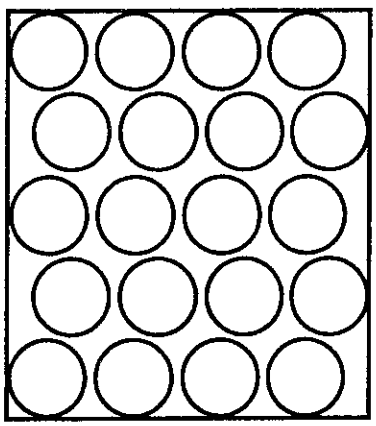
(c) (i) B.
(ii) D.
(iii) C.

(d) (i) It cools down the burning wood, coal or paper.

(ii) $2Al + 3H_2O \rightarrow Al_2O_3 + 6H_2$

(iii) Because the reaction produces hydrogen, which is extremely flammable "explosive".

(e) (i)



Close and irrigular

(ii) Because winds can blow it away.

2- (a) Jewlery , electrodes.

(b) To speed up the chemical reaction.

(c) (i) most reactive: magnesium
zinc
iron
least reactive: platinum

(ii) magnesium + hydrochloric acid ⟶ magnesium chloride + hydrogen.

(iii) platinum has a higher density than magnesium.
Magnesium has a lower boiling point than platinum.

(d) (i) poisoning by reacting with blood haemoglobin.
(ii) form acid rains.
(iii) cause brain damage.

3- (a) 78 - 79 %

(b) Oxygen and carbon dioxide.

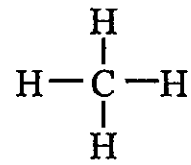
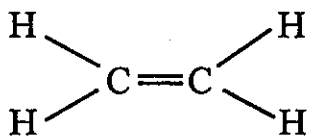
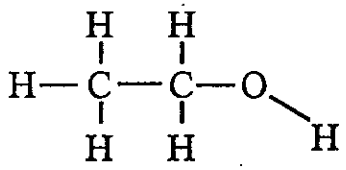
(c) (i) A reversible reaction.
(ii) gas.

(d) (i) Speed the growth process.
(ii) Potassium.
(iii) Ammonium ion.

(e) test : Add excess of sodium hydroxide solution, then add aluminium powder and boil. Expose the evolved gas to a red wet litmus paper.
result : It will turn blue.

(f) (i) It involves removal of oxygen from the nitrate ion.
(ii) It is an organic compound that acts as a catalyst.

4- (a)

compound	molecular formula	Structure (showing all atoms and bonds)	use
methane	CH_4		Fuel
ethene	C_2H_4		Preparation of polymers
ethanol	C_2H_5OH		solven + and fuel

(b) Covalent.

(c) $(2 \times 12) + (4 \times 1) = 24 + 4 = 28$

(d) The ratio between the mass of an atom of the element and the mass of an isotope carbon $^{12}_{6}C$.

(e) (i) A group of organic compounds that has the same functional group.

(ii) Apart from burning, propane is generally unreactive.

(iii) $C_3H_8 + 5O_2 \rightarrow 3CO_2 + 4H_2O$

5- (a) (i) corrode: reacts with the metal.

(ii) effervescence: strong bubbling.

(b) D.

(c) (i) The volume of gas will decrease.

(ii) The volume of gas will increase.

(iii) The volume of gas will increase.

(d) (i) B. (ii) B. (iii) C.

(iv) A. (v) B.

(e) 1- Take a known volume of aqueous sodium hydroxide by a pipette and transfer it to a conical flask, then add drops of methyl orange. The solution will turn yellow.

2- Fill the burette with hydrochloric acid.

3- Titrate the acid slowly against the sodium hydroxide solution, till the colour changes to pink. Measure the volume of the acid. Repeat for accuracy

4- Repeat the experiment without using the indicator.

5- Transfer the solution to an evaporating dish. Heat till it reaches the point of crystallising.

6- Cool, filter and dry the crystals by a filter paper.

6- (a) It is the simplest substance that cannot be broken into simpler substances by chemical processes.

(b) Four.

(c) Large covalent molecules.

(d) (i) It is very hard.

(ii) The presence of strong covalent bonds between all carbon atoms in the diamond structure makes it very hard to break.

(iii) Silicon and carbon are in the same group (IV); therefore they have similar properties and can produce molecules of similar structures.

(e) Graphite structure is formed of layer that can slide among each other; therefore it is used as a lubricant.

(f) (i) It conducts electricity.

(ii) Chlorine gas.

Hydrogen gas.

(iii) 

(iv) magnesium carbonate + hydrochloric acid ⟶ Magnesium chloride + carbon dioxide + water.

November 2000

Paper 3

1- (a) (i) number of electrons: 18
number of protons: 21
number of neutrons: 24
(ii) 2, 8, 8.

(b) (i) $3Ca + 2Sc^{3+} \rightarrow 3Ca^{2+} + 2Sc$
(ii) The change of calcium metal to calcium positive ions; because it involves loss of electrons.
(iii) reaction at cathode: $Sc^{3+} + 3e^{-} \rightarrow Sc$
reaction at anode: $Cl^{-} \rightarrow Cl + e^{-}$

(c) The density of titanium is higher than 3 g $/cm^3$. Its compounds are coloured. It has more than one valency.

(d) One mole of $Sc_2Si_2O_7$ will give **2** moles of Sc.
43g of $Sc_2Si_2O_7$ will produce **0.333** moles of Sc.
43g of $Sc_2Si_2O_7$ will produce **15** g of Sc.

Details: percentage yield of scandium $= \frac{12g}{15g} \times 100 = 80\%$

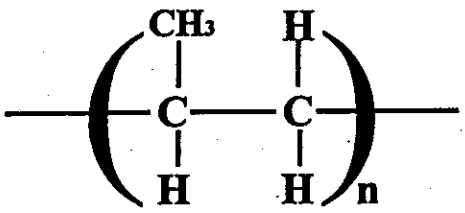
1 mole of $Sc_2Si_2O_7$ is 258g
$\therefore$ x mole of $Sc_2Si_2O_7$ are 43g

x = 1 mole x $\frac{43g}{258g}$ = 0.167 g mole.

43 g of $Sc_2Si_2O_7$ will produce (2 x 0.167) moles of Sc.
1 mole of Sc is 45 g
$\therefore$ 0.333 moles of Sc are x g

x = $\frac{0.333mole}{1mole} \times 45g$ = 15 g

2- (a) (i) Addition polymerization.
(ii)



(b) (i) Steel is made by the oxygen process. The furnace is filled with hot impure iron and oxygen is blown onto the metal. This process converts all impurities to their oxides. CO_2 and SO_2 evolve and other oxides combine with the added limeston to form slag.

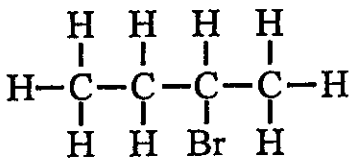
(ii) It means coating with zinc, by dipping in or spraying zinc. Zinc is more reactive than iron; therefore it will corrode first.

(c) (i) calcium in calcium carbonate, + 2
silicon in this oxide? + 4

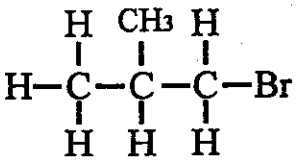
(ii) calcium, 2, 8, 8, 2.
Silicon? 2, 8, 4.

(iii) - Calcium can easily loose the two extra electrons to attain the stable electronic configuration of 2, 8, 8.
- It is very difficult for silicon to loose or gain 4 electrons to have an octet in its outermost shell. Therefore it will share and form covalent compounds.

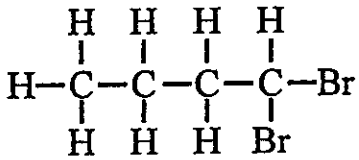
3- (a) (i)



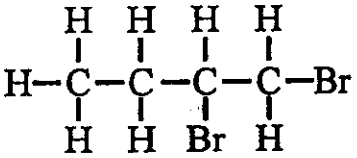
OR

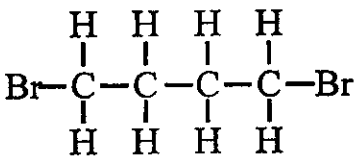


(ii)



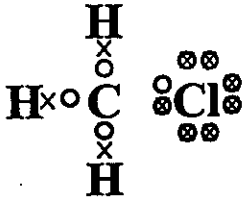
OR





(iii) Butene and Bromine.

(b)



(c) (i) 1 – butanol.

(ii) reagent used: Acidified silver nitrate.
Result of test: Pale yellow ppt.

(iii) The halide ions in solution were iodine ions, changed to iodine.

(d) (i) iodobutane — most reactive
bromobutane ↓
chlorobutane — least reactive

(ii) because the concentration of the organic halide in experiment A is half that in experiment B.

4- (a) (i) magnesium + sulphonic acid ⟶ magnesium sulphonate + **hydrogen**.

sodium Carbomate + sulphonic acid ⟶ **sodium sulphonate** + **carbon dioxide** + water.

(ii) $(RSO_3)_2$ Mg.

(iii) By dissolving sulphur trioxide in concentrated sulphuric acid.

(iv) By adding it to large amounts of cooled water.

(b) By mixing a solution of lead (II) nitrate with a solution with sodium sulphate. A white ppt of lead (II) sulphate will be formed. Filter wash the ppt. and dry it.

(c) It reacts with oxygen to form selenium dioxide, an acidic oxide. It reacts with hydrogen to form hydrogen selenide.

(d) (i) Photosyntesis.

(ii) Plant material = sugar (glucose)

By fermenting glucose solution, using enzyme zymase in the yeast, at 35 – 40 ° C. Ethanol is then extracted from the reaction mixture by fractional distillation.

5- (a) Put the bright green crystals in test tube, and heat it until it turns yellow. Cool, then add few drops of water. It will turn green, indicating that the reaction is reversible.

(b) Put 100g of the solution in an evaporating dish. Slowly evaporate the solution till dryness. Weigh the residue. If the mass of the residue is 26g, it means that the percentage of water is 74 %

(c) (i) observation: Effervescence.
test: Pass the evolved gass through lime water.
result: Lime water will turn milky.

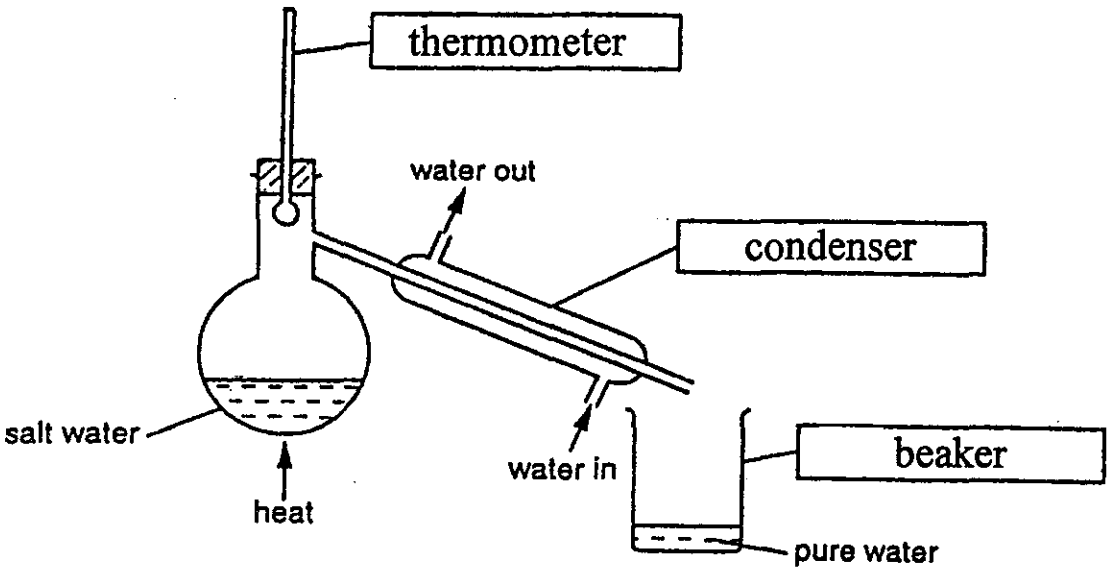
(ii) reagent: Take a sample on a platinum wire. Put it in the blue part of the flame.
result: The colour of the flame turns or angere.
reagent: sodium carbonate solution.
result: white ppt. is formed.

(d) By titrating the solution of the acid against 10 ml of 0.1 M sodium hydroxide using an indicator. If the end point appeared when 10 ml of the acid were added, this means that it is of the type HY. If it appeared at 20 ml, it means that the acid is of the type H_2Y.

November 2000

Paper 6

1- (a)



(b) Distillation.

(c) test: Add one drop of the liquid to white anhydrous copper (II) sulphate.
Result: It will turn blue.

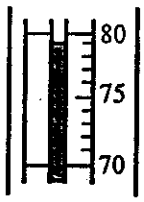
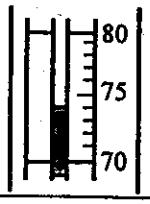
2- (a) Electrode B is the positive electrode, because negative chloride ions are attracted to it.

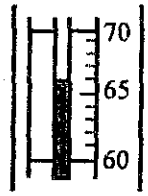
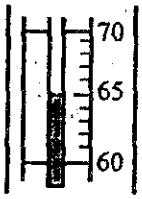
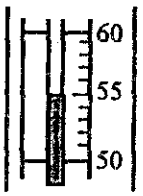
(b) Sodium ions.

(c) 1. Sodium.
2. Chlorine.

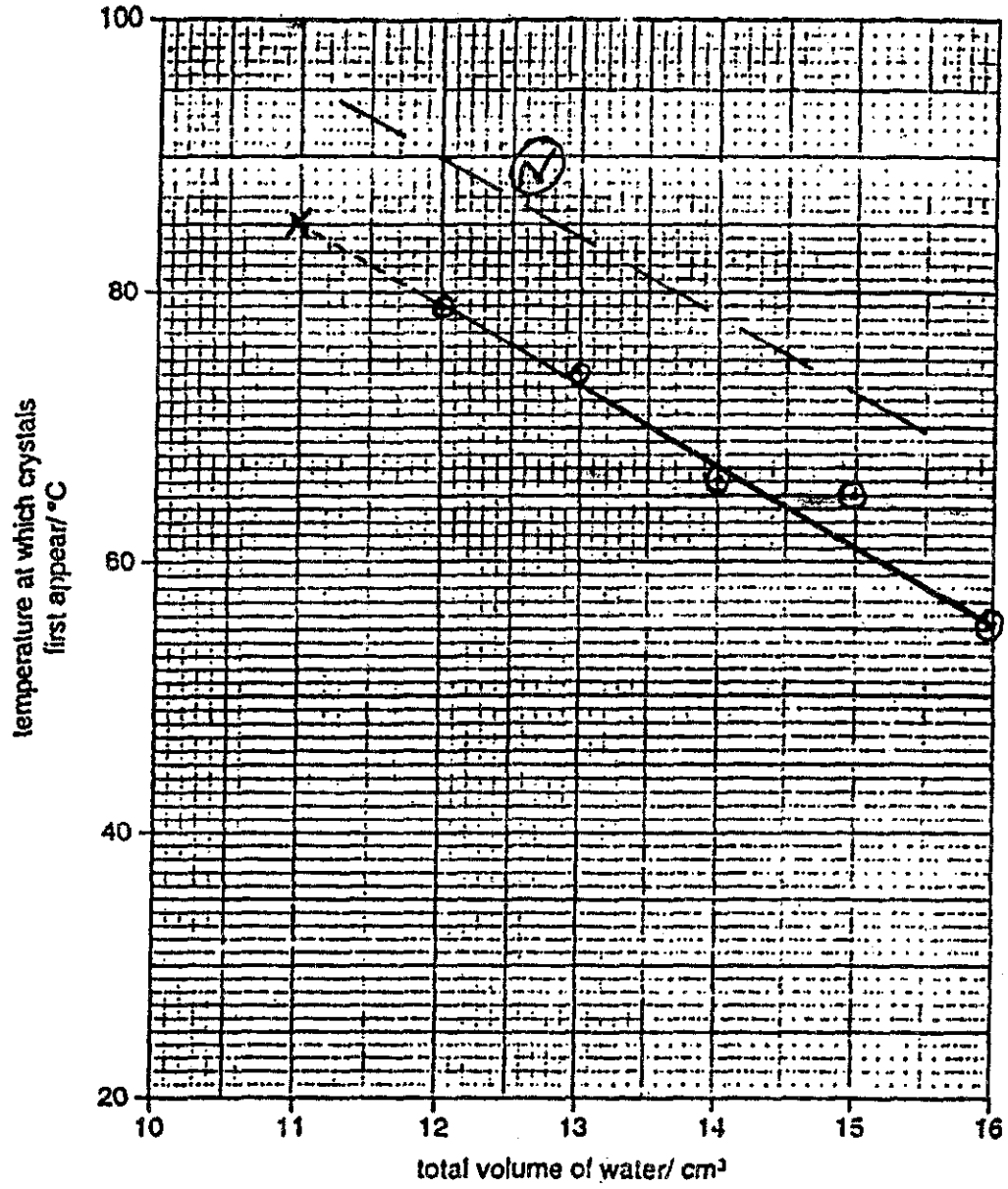
(d) - Pale green gas evolves. OR
- The mass of the cathode increases.

3- Table of results:

experiment	total volume of water / cm^3	thermometer diagrams	Temperature at which crystals first appear /° C
1	12.0		79
2	13.0		74

3	14.0		66
4	15.0		65
5	16.0		55

(a)



(b) (i) 85° C.

(c) When all crystals disappear.

(d) Temperatures at which crystals first appear will be much lower, because the mass of the salt in one ml of solution is decreased by 50 %.

(e) (i) Experiment # 4.
(ii) improvement: Leave the boiling tube to cool down in air.
Explanation: ensure consistency in cooling.

4- (a) Colourless solution.

(b) colour: blue. pH: 10.

(c) (i) blue ppt. appears.
(ii) 1. Blue ppt disappears and solution turns dark blue.

(e) No visible reaction.
Aluminium powder disappears.

(f) - No visible reaction. - No visible reaction.

(g) Ammonia.

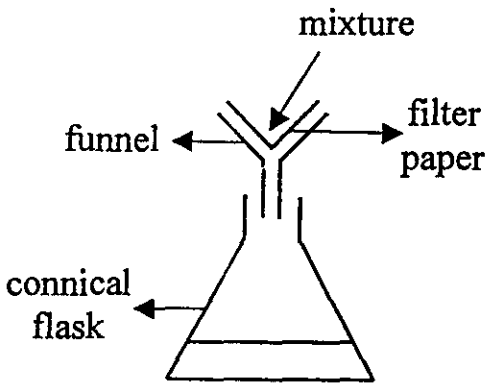
(h) Calcium Nitrate.

5- (a) To speed up the reaction.

(b) Metal spatula would react with the acid.

(c) .. because excess of zinc oxide is added.

(d)



(e) Take a drop of the heated solution on a glass rod away. If crystals appears on it, it means that the point if crystallising hat been reached.

(f) To avoid dehydration.

(g) No heating is required. Zinc carbonate will readily react with sulphunic acid with effervescence.

6- 1. Weigh an egg shell. Record its mass (M_1).
2. Gradully add it to a beaker containing hydrochloric acid. Stir until you add it all and effervescence subsides.
3. Filter.
4. Transfer the filtrate to the evaporating dish.
5. Gently evaporate till dryness. Let the dish to cool.
6. Weigh the calcium chloride obtained from the reaction (M_2)
7. Use the following stoichiometry:

$$CaCO_3 + 2HCl \rightarrow CaCl_2 + CO_2 + H_2O$$

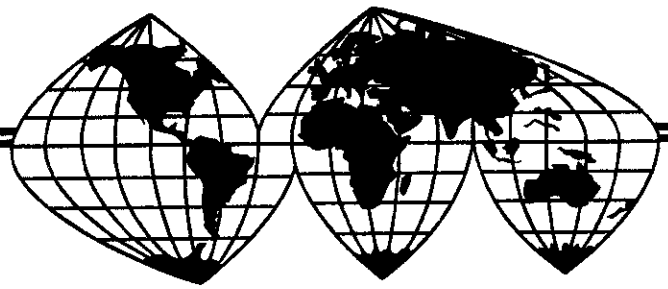
100g 111g

$\therefore$ 100g of $CaCO_3$ produce 111g $CaCl_2$

$\therefore$ (M_3) g of $CaCO_3$ produce (M_2) g $CaCl_2$

$$M_3 = M_2 g \times \frac{100g}{111g}$$

$$\therefore \% \text{ of } CaCO_3 \text{ in egg shells} = \frac{M_3}{M_1} \times 100$$



IGCSE

CHEMISTRY

Answers to Examination Paper 1

June 94

1	B	11	B	21	D	31	C
2	D	12	D	22	A	32	D
3	A	13	A	23	B	33	C
4	D	14	A	24	C	34	A
5	B	15	C	25	C	35	B
6	D	16	C	26	D	36	D
7	C	17	A	27	D	37	D
8	A	18	B	28	C	38	B
9	C	19	B	29	C	39	A
10	B	20	C	30	C	40	B

Nov. 94

1	D	11	B	21	B	31	C
2	D	12	C	22	D	32	B
3	B	13	D	23	A	33	C
4	B	14	A	24	C	34	B
5	A	15	A	25	B	35	C
6	C	16	C	26	A	36	D
7	D	17	A	27	C	37	C
8	C	18	C	28	D	38	B
9	C	19	C	29	B	39	A
10	B	20	A	30	D	40	D

June 95

1	B	11	D	21	D	31	C
2	D	12	B	22	D	32	A
3	C	13	C	23	B	33	C
4	A	14	B	24	B	34	B
5	B	15	B	25	C	35	B
6	B	16	D	26	A	36	C
7	D	17	B	27	A	37	A
8	A	18	C	28	A	38	A
9	C	19	D	29	A	39	B
10	A	20	A	30	C	40	C

Nov. 95

1	B	11	D	21	A	31	D
2	C	12	B	22	C	32	D
3	D	13	A	23	D	33	C
4	D	14	D	24	B	34	A
5	B	15	C	25	B	35	B
6	D	16	C	26	C	36	B
7	A	17	D	27	B	37	D
8	C	18	C	28	D	38	A
9	A	19	C	29	B	39	B
10	B	20	B	30	D	40	C

June 96

1	A	11	A	21	D	31	D
2	D	12	C	22	B	32	D
3	B	13	C	23	B	33	D
4	D	14	A	24	B	34	B
5	A	15	B	25	C	35	C
6	D	16	C	26	B	36	D
7	A	17	D	27	B	37	D
8	A	18	B	28	B	38	B
9	C	19	D	29	C	39	D
10	B	20	D	30	B	40	C

Nov. 96

1	A	11	C	21	A	31	D
2	D	12	C	22	B	32	D
3	A	13	A	23	D	33	A
4	B	14	C	24	A	34	C
5	C	15	A	25	B	35	B
6	B	16	D	26	B	36	D
7	C	17	C	27	B	37	D
8	C	18	B	28	A	38	D
9	C	19	D	29	D	39	A
10	B	20	D	30	D	40	A

June 1997

Paper 1

1	C	11	C	21	D	31	D
2	B	12	A	22	B	32	B
3	D	13	D	23	C	33	A
4	B	14	D	24	D	34	C
5	D	15	B	25	D	35	B
6	B	16	C	26	B	36	C
7	A	17	B	27	D	37	A
8	B	18	C	28	B	38	A
9	A	19	B	29	C	39	C
10	D	20	A	30	B	40	B

Nov. 1997

Paper 1

1	C	11	C	21	C	31	D
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3	D	13	A	23	B	33	B
4	A	14	B	24	D	34	C
5	B	15	B	25	A	35	C
6	A	16	D	26	A	36	C
7	B	17	A	27	C	37	D
8	B	18	D	28	A	38	D
9	D	19	C	29	C	39	B
10	A	20	A	30	C	40	B

June 1998

Paper 1

1	B	11	C	21	B	31	D
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3	A	13	A	23	B	33	A
4	D	14	D	24	D	34	B
5	B	15	A	25	C	35	B
6	A	16	A	26	B	36	B
7	A	17	C	27	D	37	A
8	A	18	A	28	D	38	A
9	B	19	A	29	A	39	C
10	D	20	C	30	B	40	C

November 1998

Paper 1

1	A	11	A	21	D	31	A
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3	B	13	D	23	D	33	C
4	B	14	C	24	A	34	A
5	B	15	A	25	C	35	A
6	C	16	B	26	B	36	A
7	C	17	A	27	D	37	A
8	B	18	C	28	C	38	C
9	D	19	C	29	B	39	C
10	B	20	B	30	D	40	D

June 1999

Paper 1

1	D	11	A	21	C	31	B
2	B	12	B	22	D	32	C
3	C	13	A	23	A	33	B
4	D	14	D	24	A	34	C
5	A	15	D	25	B	35	B
6	B	16	D	26	A	36	D
7	D	17	C	27	A	37	C
8	A	18	C	28	C	38	B
9	B	19	D	29	A	39	A
10	C	20	A	30	C	40	B

November 1999

Paper 1

1	A	11	A	21	C	31	D
2	D	12	A	22	C	32	D
3	D	13	C	23	A	33	A
4	D	14	B	24	D	34	B
5	B	15	B	25	C	35	B
6	A	16	D	26	B	36	B
7	A	17	A	27	D	37	D
8	D	18	C	28	C	38	C
9	C	19	B	29	C	39	A
10	B	20	B	30	C	40	A

June 2000

Paper 1

1	**B**	**11**	**C**	**21**	**A**	**31**	**B**
2	**B**	**12**	**A**	**22**	**D**	**32**	**A**
3	**C**	**13**	**B**	**23**	**B**	**33**	**C**
4	**D**	**14**	**A**	**24**	**B**	**34**	**C**
5	**B**	**15**	**C**	**25**	**A**	**35**	**C**
6	**A**	**16**	**B**	**26**	**B**	**36**	**D**
7	**C**	**17**	**D**	**27**	**A**	**37**	**C**
8	**C**	**18**	**A**	**28**	**A**	**38**	**B**
9	**D**	**19**	**A**	**29**	**D**	**39**	**C**
10	**B**	**20**	**D**	**30**	**A**	**40**	**D**

November 2000

Paper 1

1	C	11	A	21	D	31	B
2	B	12	A	22	A	32	D
3	D	13	D	23	B	33	B
4	B	14	B	24	A	34	C
5	B	15	A	25	A	35	D
6	C	16	D	26	A	36	B
7	C	17	C	27	D	37	A
8	D	18	A	28	C	38	B
9	D	19	C	29	C	39	A
10	A	20	D	30	D	40	C