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MARKING SCHEME PAPER 1

1. Used in the manufacture of glass, treatment of hard water, making of baking powder preservation of soft drinks etc. (1mk)

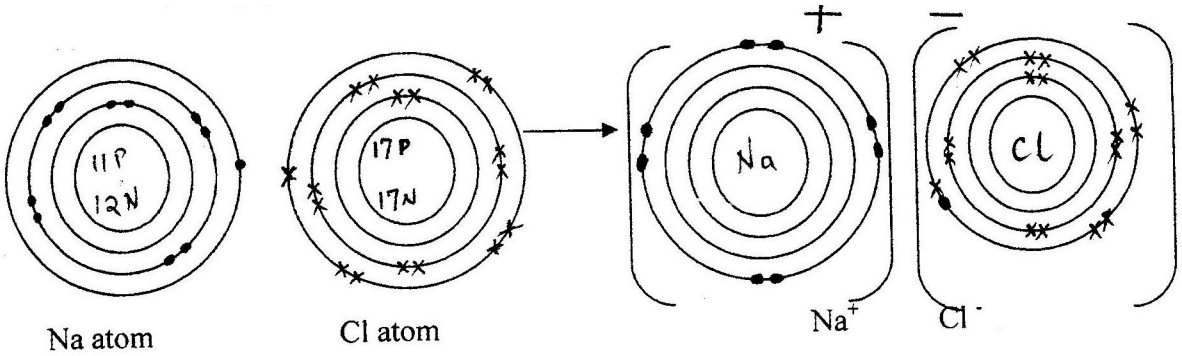
2. Hydrogen chloride reacts with calcium oxide in the presence of water to form calcium chloride.

$CaO(s) + 2HCl\ (g) \rightarrow CaCl_2(aq) + H_2O(l)$ (2mks)

3. (a) Carbon dioxide gas

(b) Temporary hard water dissolves hydrogen carbon salts which decomposes on heating to produce carbon dioxide

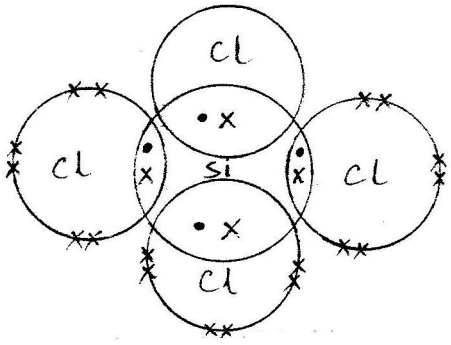
$$Ca(HCO_3)_2\ (aq) \xrightarrow{Heat} CaO_3(s) + H_2O(l) + CO_2(g)$$



4. Si = 2:8:4 Na = 2:8:1 and Cl = 2:8:7

a)

b)



Silicon (IV) Tetra Chloride

5. (a) (i) $ZnO(s) + H_2SO4(aq) \rightarrow ZnSO_4(aq) + H_2O(I)$

(ii) $ZnO(s) + 2NaOH(aq) \rightarrow Na_2ZnO_2(aq) + H_2O(l)$

(b) Basic oxide

6. (a) B and F

They are isotopes i.e. atoms of the same element with same mass number but different atomic number

(b) Mass number = Atomic number + No. of neutrons

7 = 3 + n

7 = 3n

N = 4

7. H-C ≡C- H+ C12 C ≡ C

Cl H

H Cl

1,2 Dichloro ethane

8. Let the oxidation state of S be X:

(a) H_2S: $2H^+ + S^x = 0$

+ 2 + x = 0

X = -2

(b) S_2O_3 = -2

2x + 3x -2 =2

2x + 6 = 2

2x = 4

X =2

9. $GCO_3(s) + 2HCI\ (aq) \rightarrow GCl_2(aq) + CO_2(g) + H_2O(l)$

1 mol 2 mol

Moles of acid used = $\frac{20}{1000} \times 1 = 0.02$ moles

Of the carbonate = ½ of acid = 0.01 moles

0.01 moles = 1 g

1 mole = $\frac{1 \times 1}{0.01} = 100g$

Molar mass of GCO_3 = G + 16 x 3

100 = G + 60

G = 40

R.A.M of G = 40

10. The reaction has stopped as substance H has all been converted to J yet the time is continuing

11. (a) $2NaOH(aq) + 2\ Cl_2(g) \rightarrow NaOCI_3\ (aq) + NaCl\ (aq) + H_2O(l)$

(b) Manufacture of bleaching agents

12. (a) Coke reduces lead (II) oxide to lead metal

$Pb(s) + C(s) \rightarrow Pb(s) + CO(g)$

(b) Limestone (calcium oxide) combine with Silica to form Calcium Silicate

$CaO(s) + SiO_2(s) \rightarrow CaSiO_3$

(c) Scrap iron reduces any remaining lead sulphide to lead metal

$Fe(s) + PbS(s) \rightarrow FeS(s) + Pb(s)$

13. From the equation:

1 mole of metane produces 890kj

Hence 890 Kj = 24 litres

111.25 KJ = 111.25 x 24 litres

= 3 litres

14.

Year	Mass (g)	
0	100	
5.2	50	1^{st} half- life
10.4	25	2^{nd} half- life
15.6	12.5	3^{rd} half - life

Let half- life be x

3x = 15.6

X=5.2 yrs

15. Graphite structure is layered with layers together by weak vander waals force.
These forces are easily broken making layers to slide over each other hence good lubricant

16. Increases atomic radius results in decrease of 1^{st} ionization energy
Increasing the radius, decreases the force of attraction from to the outermost electron.
Hence decreasing in the 1^{st} ionization energy down the group.

17. a) When the rate of forward reaction is equal to the rate of backward reaction.
b) The equilibrium shift to the right potassium hydroxide reacts with Carbon dioxide concentration of CO_2

18. a) Source of heat
b) The solid $pbBr_2$ melts to form pb2+ and 2Br- that conduct electric current in the circuit. Hence the bulb lights.

19. a) Molar heat of fusion
b) $-\Delta H^3$ process to exothermic (heat given out to the sourrounding)

20. M is a strong acid while L is a weak acid.M has many ions in solution that take part in a reaction forming more product that L with few ions in solution.

21. a) Nitric acid is volatile hence turns into vapour while sulphuric acid is non – volatile
b) Sodium nitrate
c) Manufacture of fertilizers eg:NH_4NO_3
Manufacture of explosive eg: TIN Any of the four
Manufacture of dyes and drugs
Treatment of metal

22. a) N is Sodium ethanoate (CH3COONa)while P is methane (CH4)
b) Substitution reaction

23. $C_{(s)} + O2_{(g)} \rightarrow 2CO_{(g)}$
$Fe_2O_3 + 3CO(g) \rightarrow 2Fe_{(s)} + 3CO_{2(g)}$

24. a) A yellow deposit of sulphur and a colourless liquid are formed.
b) The experiment should be performed in a fume chamber as both the reactants are poisonous.

25. a) Copper (II) ions
b) Tetra ammine copper ions (Complete salt)

26. No.of coulombs = 0.82 x 5 x 60 x 60
= 14760 coulombs
14760C = 2.65g
96500 C = $\frac{96500 \times 2.65}{14760}$ = 17.3255g

2.65g = 14760C

52g = $\frac{52 \times 14760}{1.65 \times 96500}$ =

27. a) Reduction

b) i) Removal of oxygen from a substance is a reduction

ii) Lead ion has gained electrons to become lead metal gain of electron(s) is a reduction.

c) Hydrogen sulphide

28.

Products	CO_2		H_2O	
Formula mass	44		18	
No. of moles		Mass / R.F.M		Mass / R.F.M
		$\frac{4.2}{44}$		$\frac{1.71}{18}$
		0.095		0.095
Mole ratio	=	1	:	1

The masses of carbon and hydrogen in CO_2 and H_2O formed

Products	Carbon (CO_2)	Hydrogen (H_2O)
	$\frac{12}{44} \times 4.2$	$\frac{2}{18} \times 1.71$
	1.145	0.19
No. of moles	$\frac{1.145}{12} = 0.095$	$\frac{0.19}{1} = 0.19$
Mole ration	$\frac{0.095}{0.95} = 1$	$\frac{0.19}{0.095} = 2$

Therefore the empirical formula is CH_2

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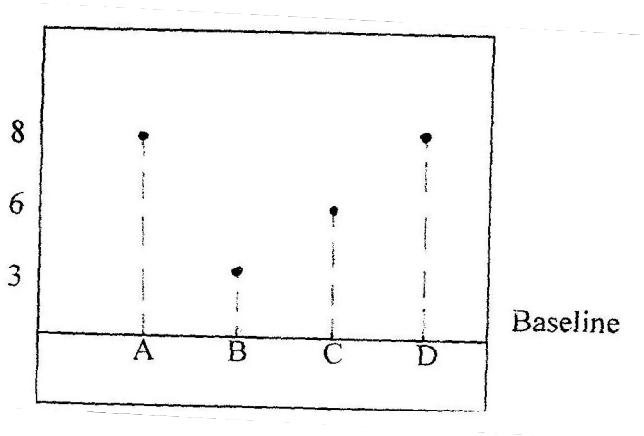
MARKING SCHEME PAPER 2

1. a) (i)



(ii) A and C

b) Since NH_4CL_4 sublimes but CaCl2 does not ; sublimation process would do .Heat the mixture.Ammonium chloride sublimates into vapour and condenses on the cooler part of the heating tube.Calcium chloride will remain on the bottom of the heating tube.

c) i) Fractional distillation

ii) Separating funnel method

Since the tow liquids are immiscible, pour both the liquids in a separating funnel and allow to settle, the denser liquid will settle down and the less dense will form a second layer on top. Open the tape and run out the liquid in the bottom layer leaving the liquid in the second layer in the funnel.

2. a) Brine(Sodium Chloride)

b) i) $2NaOH_{(aq)} + H_2SO_4\,9_{(aq)} \rightarrow Na_2SO_{4(aq)} + 2H_2O_{(l)}$

2 Mol 1 Mol

ii) No. of moles of H_2SO_4 used = $\frac{40}{1000}$ x 0.5 moles

= 0.02 moles

No. of moles of NaOH = 0.02 x 2

= 0.04 moles

0.5 x 2 mole = 1.0 moles will react with 1 litre of the solution of the acid

100 cm^3 = 0.04 moles of NaOH

1000 cm^2 = $\frac{0.04 \times 1000}{100}$ = 0.4 moles

Molar mass of NaOH = 23 +16 +1

= 40

1 mole = 40

0.4 moles = 0.4 x 40

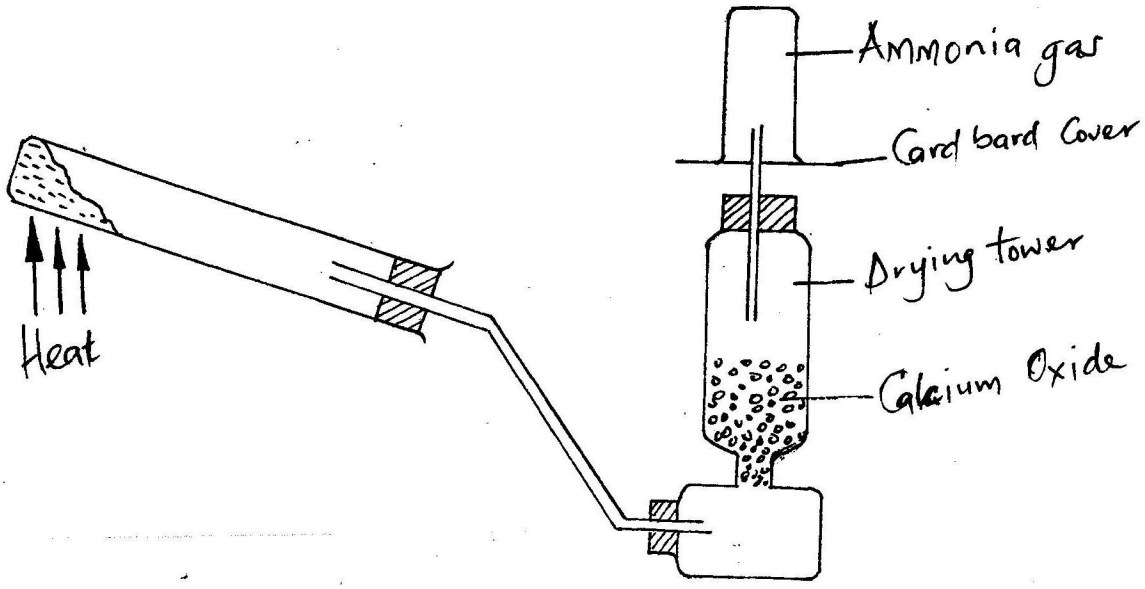
= 16g

Mass of the unreacted = 17.6 – 16

= 1.6g

c) i) M is ammonium chloride

ii)



d) i) Black Copper (II) oxide turned to reddish brown which is copper metal
ii) Ammonia acts a reducing agent.
iii) Manufacture of nitrogenous fertilizers, nitric acid, refrigerant in ships and hydrazine that is used as rocket fuel.

3. a) i) G^{2+}
ii) $G_{(s)} + H^{2+}{}_{(aq)} \rightarrow G^{2+}{}_{(aq)} + H_{(s)}$
iii) $E_o - E_R =$ + 0.34 – (-0.44)
= 0.34 + 0.44 = 0.78 Volts

b) i) H
ii) Pure water does not contain ions or to make the water ionize
iii) Chlorine is not used because the chlorine ions will react the electrode due to its high reactivity level.

c) 144750 Coulombs = $\frac{144750 \text{ Faraday}}{96500}$
= 1.5 Faraday
2 Faraday yield = 64 g of copper
1.5 Faradays = 48 g copper

4. a) The number 52 represents mass number i.e.: the sum of the number of protons and neutrons in an atom of an element.
N = 20 = 2: 8: 8 : 2 p = 17 = 2:8:7

b) i) $N + p_2 \rightarrow Np2$
ii) P,R and S
P is a non – metal while R and S are metals, arranged in the order of S,R and P from left to right form metals (S and R) but increases from left to right for non – metal (p)
iii) S, it is a metal and is the one having the largest atomic radius

which decreases from left to right for metal of the same period.

iv) p and u

C) i) I – ionic II – Metallic

ii) IV – sulphur has molecular bond which require less energy to break, hence low MP and Bp

5. a) To remove any oxide film on it i.e. layer of magnesium oxide.

b) A white solid formed which is magnesium oxide

c) The increase in mass was due to the oxygen which combines with magnesium.

d) $2Mg_{(s)} + O_{2(g)}$ heat $2MgO_{(s)}$

e) The filtrate is magnesium hydroxide which is an alkaline.
There was not change in blue litmus paper but red litmus paper turned blue.

19. From equation in (d)
1 Mole of Magnesium atom combines with a mole of oxygen atom.

OR

	Mg		Oxygen
Mass	2.4		1.6
Molar mass	24		16
No. of moles	$\frac{2.4}{24} = 0.1$		$\frac{1.6}{16} = 0.1$ moles
Mole ratio	1	:	1

No. of moles of oxygen used = $\frac{1.6}{16} = 0.1$ moles

1 mole = $24{,}000cm^3$

0.1 mole = $24{,}000 \times 0.1$

Volume of oxygen used = $2{,}400cm^3$

6. a) i) V1 : $CH_3CH_2CH_2C(=O)-OH$ and

V3 : $CH_3CH_2CH_2C(=O)-OH$

ii) V2 : $CH_3CH_2CH = CH_2$ and V5 : $CH_3CH_2CH_2CH_3$

iii) V4 : $CH_3CH_2CH = CH_2$

It is unsaturated compound and during polymerization the double bond is broken to allow another monomer to combine.

(b)

	Advantage	Disadvantage
R – COO- Na+	They are cheaper compared to soap detergents	Forms a scum with water containing calcium and magnesium ions
$R - SO_3 - Na^+$	They do not form with Ca^{2+} and Mg	They are made from petroleu products or vegetable oils wh are expensive.

(c) (i) Easters

(ii) $C_2H_4O_2(aq) + C_2H_5OH(l) \rightarrow CH_3COOC_2H_3(l) + H_2O(l)$

(iii) Used as solvents
In the manufacture of drugs and chemicals

In flavouring and preservation of food
In manufacture of synthetic fibres

(iv) $2CH_3COOH(aq) + K_2CO_3(aq) \rightarrow 2CH_3COOK(aq) + CO_2(g) + H_2O(l)$

(d (i) Natural fibres include rubber, cellulose, wool, starch, silk etc.

(ii) Advantage; can be made into complicated shapes more easily, less expensive, not affected by acids. Alkalis, water and air, less dense and stronger.

7. (a) (i) graphite or titanium. They do not react with chlorine gas

(ii) A steel diaphragm is suspended between the electrodes

(iii) $2Cl^-(aq) \quad 2Cl_2(g) + 2e$

(b) (i) calcium chloride ($CaCl_2$)

(ii) It is economical i.e reducing cost of production

(c) hydrogen is preferentially discharged at the expense of sodium.
At the anode, hydroxyl ions will be prefentially discharged at expense of chlorine gas.

(d) $2Na(s) + O_2(g) \quad Na_2O_2(s)$

$Na(s) + O_2(g) \quad Na_2O$

(e) Making Sodium compounds e.g. Sodium Cyanide, NaCN, which is used in the extraction of gold, make lead alloy, sodium & Potassium alloy is used as a "coolant" in nuclear reactors. (Accept any two)