233/2

MARKING SCHEME

CHEMISTRY

PAPER 2

THEORY

1. a) i. Solid A Sulphur/ $S_{(s)}$

ii. Gas D Sulphur (IV) oxide/ $SO_{2(g)}$

iii. Solid Q Barium sulphate/ $BaSO_{4(s)}$

iv. Solution M Copper (II) nitrate/ $CO(NO_3)_{2(aq)}$

b) $2H_2O_{2(l)} \xrightarrow{MnO_2} 2H_2O_{(l)} + O2_{(g)}$

c)

i Solid G $4K_{(s)} + O_2 \longrightarrow 2K_2O_{(s)}$

ii Gas D $S(s) + O_{2\,(g)} \xrightarrow{Heat} SO_{2(g)}$

iii $Cu(s) + H_2SO_{4(aq)} \longrightarrow CuSO_{4(aq)} + H2O_{(l)}$

iv Relights a glowing splint

v $Ba^{2+}_{(aq)} + SO^{2-}_{(aq)} \longrightarrow BaSO_{4(s)}$

vi -Oxy- acetylene flame used in welding.

-Oxygen enriched air is used in hospitals by patients with breathing difficulties.

-When mixed with heliumit is used by mountain climbers and deep-sea divers.

-Remove iron impurities during steel making

- To burn fuelssuch as those used to for propelling rocket.

2. (a) (i) W and Z

Belong to the same chemical family.

(ii) X_2O_7

(i) X

Its ionic radius is larger than its atomic radius or has 1 electron in the outermost energy that can easily be lost.

(iv) Atomic radius of Z is smaller than that of Y because Z has a greater nuclear charge(more protons) that tends to pull its outer electrons more strongly inwardly reducing the size of the atom.

(b) (i) $2NaOH_{(aq)} + H_2SO_{4(aq)} \longrightarrow Na_2SO_{4(aq)} + H2O_{(l)}$

(ii) (I) No. of moles of acid used = $\left(\frac{40 \times 0.5}{100}\right)$ mole =0.02 (½mk)

Mole ratio Base: Acid = 2:1

No. of moles of base reacted = $\frac{[2 \times 0.02]}{1}$ = 0.04 mole. (½mk)

(II) 0.04mol in $100cm^3$ = $\frac{1000 \times 0.04}{100}$ = 0.4mol.

?----------$1000cm^3$

(III) Mass of NaOH in 1 litre of solution = (0.4x40)

= 1.6g (½mk)

Mass of unreacted substance = $(17.6\text{-}1.6)_g$ (½mk) = 16g (½mk)

3.(a) (i) Sodium hydroxide/potassium hydroxide

$NaOH_{(aq)} + CO_{2(g)}\ NaHCO_{3(aq)}$

(ii)Oxygen

(ii) Argon, Neon

(b) (i)From mole ratio NH_3 : NO : HNO_3

4 : 4 : 4

1 : 1 : 1

RFM of HNO_3 =1+14+48 =63

Moles of NH_3= $\frac{3200}{24000}\ \frac{3200}{24000}$ =0.1333……

Moles of HNO_3= 0.1333……

Mass of HNO_3= 0.1333 × 63= 9.3979. = 8.4

ii) % of nitrogen in urea $= \frac{28}{60}\frac{28}{60} \times 100 = 46.67\ \%$

% of nitrogen in $NH_4NO_3 = \frac{28}{80}\frac{28}{80} \times 100 = 35\%$

Urea is the best because it has higher % of nitrogen

(i) Magnesium oxide

-Magnesium nitride

(ii) $Mg_3N_{2(s)} + H_2O_{(l)} \longrightarrow Mg(OH)_{2(aq)} + NH_{3(g)}$

Production of ammonia which is basic hence litmus paper turns blue

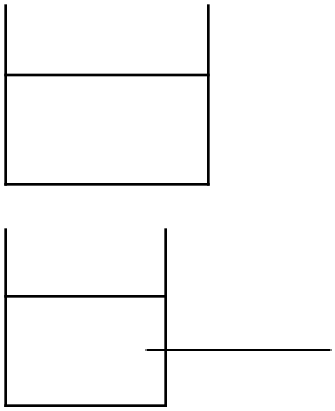
(iii)Nitrogen(IV)oxide

(iv)When used as anesthesia patients recovering from it laugh hysterically

4. a)C – has an E.M.F of 0.00_V and is used as the reference electrode (2marks)

b)F^- - has the highest positive E^{Θ}value and is used as the reference electrode. (2marks)

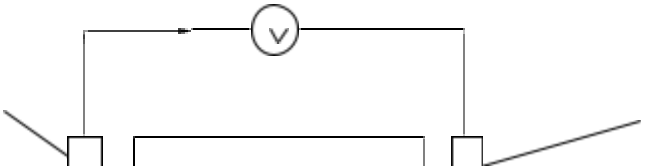
c) neat diagram



$D_{(s)}$

$D^{2+}_{(aq)}$

$B_{(s)}$



B dipped in $B^{2+}_{(aq)}$ 1/2mk
D sipped in $D^{2+}_{(aq)}$ 1/2mk
Salt bridge 1/2mk
Voltmeter present 1/2mk
Workability 1mk

Salt bridge

$B^{2+}_{(aq)}$

d)overall potential = E^{Θ} – E^{Θ} oxides

= $^{+}$O. 340 – (-2.38v) E^{Θ} = 12.72v

e) (i) $Pb_{(s)} \longrightarrow Pb^{2+}_{(aq)} + 2e^{-}$ (1mark)

(ii) Q = It (3marks)

= 4 x (18 x 60 + 15)

= 4380c

2F ~~1mole~~ pb

2 x 96500C 207g Pb

4380C x

$X = \frac{4380 \times 207}{2 \times 96500} = 4.6977 \frac{4380 \times 207}{2 \times 96500} = 4.6977$

5(a) (i) S - Sodium propanoate

T -Polypropene

H- propene/ prop-1-ene

K -propylethanoate

(ii) – As a dehydrating agent

_ As a catalyst

(iii)

Step	Condition	reagents
I	warming	Ethanoic acid; conc H_2SO_4
II	Room temperature	Sodium metal

(iv) _Esterification

_Neutralisation

(v) Making crates; carpet; plastic bottles; chairs; ropes

(vi) $CH_3CH_2COOH + NaOHCH_3CH_2COONa + H_2O$

$2CH_3CH_3 + 5O_2 \longrightarrow 2CO_2+6H_2O$

b) 2-methylbut-1,3-diene

6 (a)

Pressure (atmospheres)	10	8	5	2	1
Volume (cm^3)	160	200	320	800	1600
Reciprocal of pressure ($^1/_p$)	0.10	0.23	0.20	0.50	1.00

(b) Graph Total 4 marks

Scale 1 mark

Plotting - If more than 4 values are plotted, award 2 marks (max)
-If 3 values are plotted, award 1 mark
- If less than 3 values are plotted, award 0 mark

Line graph from the origin 1 mark

Volume against reciprocal of pressure

(a)

Pressure (atmospheres)	10	8	5	2	1
Volume (cm^3)	160	200	320	800	1600
Reciprocal of pressure ($^1/_p$)	0.10	0.23	0.20	0.50	1.00

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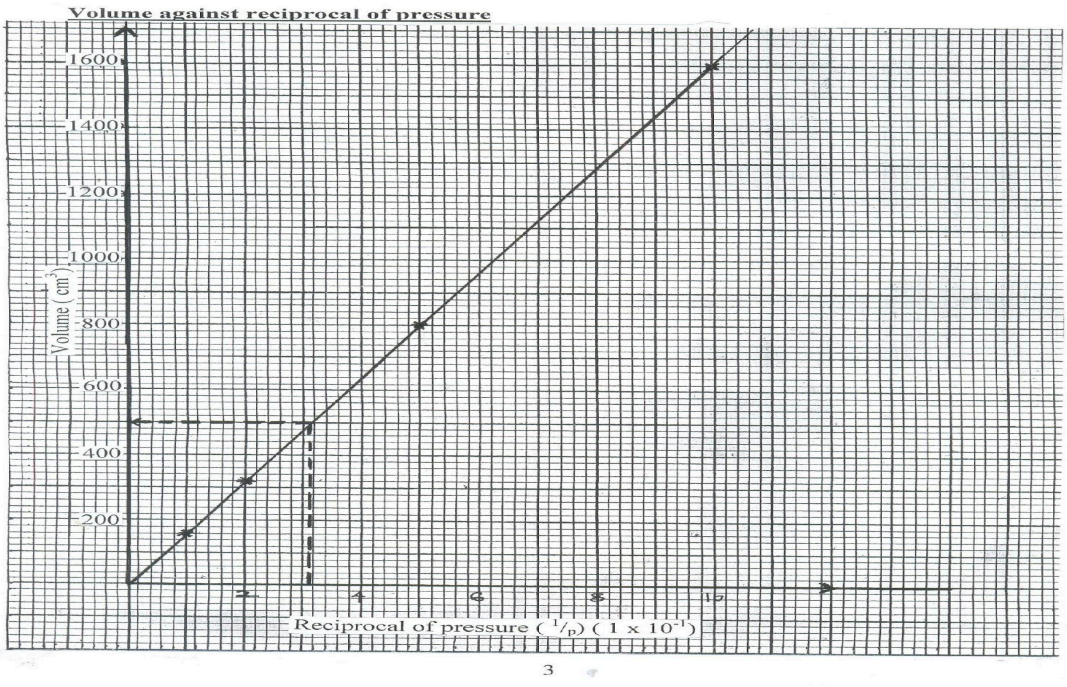

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(d) Correct value from the graph = 1 mark $500 \pm 10cm^3$
Plotted line on the graph = 1 mark

(e) Volume and the reciprocal of pressure are directly proportional

(e) R.M.M (Mr) of CO = 12 + 16 = 28
R.M.M (Mr) of CO_2 = 12 + 32 = 44

$$\frac{RCO}{RCO_2} = \frac{\sqrt{MrCO_2}}{MrCO\ \sqrt{}\ ½}$$

$$\frac{RCO}{RCO_2} = \sqrt{\frac{44}{28}}\quad \sqrt{}\ ½$$

$$\frac{RCO}{RCO_2} = 1.254\quad \sqrt{}\ ½$$

CO diffuses 1.254 times faster than CO_2

7.(a) Crush the one powder and react with $HNO_3(aq)$ free the ions; filter to obtain a filtrate, the filtrate in a test tube, add drops of HCl/NaCl/KI; A white precipitate /yellow precipitate formed confirms present

(b) i) gas K is Sulphur (IV) oxide

ii) $2CuFeS_{2(s)} + 4O_{2(g)} Cu_2S_{(s)} + 3SO_{2(g)} + 2FeO_{(s)}$

Fe^{2+}

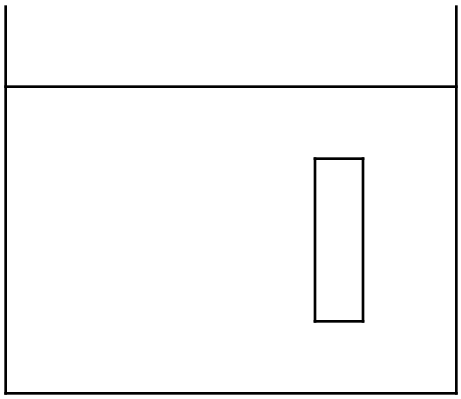
CO_2/CO (1 mark)

Reducton//Redox

Cu^{2+}reduced to Cu if coke oxidesed to Co/Co2

C)

Battery



Anode
Impure copper

Cathode purecopper
sheet

Copper(II)sulphate
solution\Cu2+(aq)

Sludge

d) Rfm for $CuFeS_2$=63.5+56+64=183.5

CuFeS2	Cu
183.5	63.5

810Kg $\frac{810\times63.5}{183.5}$ $\frac{810\times63.5}{183.5}$ = 280.3Kg

%Purity = $\frac{210\times100}{280.3}$ $\frac{210\times100}{280.3}$ = 74.92%