CHEMISTRY – 1.

MARKING SCHEME

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1.

(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)	(viii)	(ix)	(x)
D	D	E	C	D	B	A	E	D	D

@ 1 mark = 10 Marks

2.

(i)	(ii)	(iii)	(iv)	(v)
H	B	A	D	E

@ 1 mark = 05 Marks.

3. (a) (i) $C_{(s)} + O_{2(g)} \xrightarrow{\Delta} CO_{2(g)}$. 01 Mark

(ii) The coke (carbon), reacts with oxygen to form carbondioxide gas. 00½ mark

$C_{(s)} + O_{2(g)} \longrightarrow CO_{2(g)}$ 01 00½ mark

The formed CO_2, then reacts with excess Carbon (Coke) to produce carbon monoxide. 00½ mark

$C_{(s)} + CO_{2(g)} \xrightarrow{\Delta} 2CO_{(g)}$ 01 00½ mark

(iii) Calcium oxide + Silicon dioxide ⟶ Calcium silicate (Slag) 01½

(b)(i) Sublimation. 00½

(ii) Chromatography 00½

(iii) Fractional distillation 00½

Total = 07 marks

4. (a) This is because:-

(i) It wastes much soap as it does not easily form lather with soap.

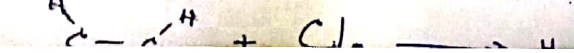
(ii) It forms scam with soap which leaves marks on clothes

(iii) It causes blockage in water pipes which may lead into bursting. @ 00½ = 02½ marks

(iv) It spoils the finishing of some fabrics

(v) It causes wastage of fuel as the lime scale deposited in boilers and Kettle, is poor heat conductor.

(b) (i) Addition reaction, is a chemical reaction in where two or more reactants, come together to form a single large product. for example 01½



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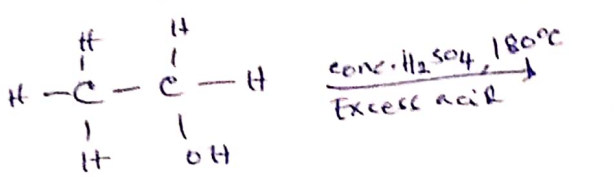
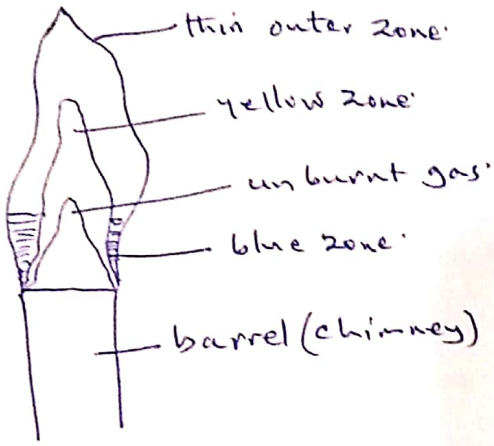
(ii) An elimination reaction, is a type of chemical reaction where several atoms either in pairs or groups are removed from a molecule. 01 mark



Ethanol

Ethylene. 01½ marks

5 (a)



Drawing = 01½

Labelling
any 4 labels @ 00½ = 02

Caption = 01½

05 marks

(b) (i) Malleable - ability to be made into sheets.

(ii) Ductile - ability to be drawn into wires.

(iii) Emulsion - a mixture of liquids that do not dissolve each other or mix well.

(iv) Element - is a single pure substance which can not be split into simpler substances by any chemical change. @ 00½ = 02 marks

Total = 07 marks

6 (a) (i) Because it reacts with ammonia gas to form ammonium sulphate. 00½

$$NH_{3(g)} + H_2SO_{4(aq)} \longrightarrow (NH_4)_2CO_{4(aq)}$$ 00½

(ii) Phenophthalein (P·O·P) indicator, is used in titrations involving weak acids where methyl orange, (M·O) can not be used. 01 mark

(iii) The glass stopers can be tightly fixed by solid sodium carbonate, Na_2CO_3. 00½

$$2NaOH_{(aq)} + CO_{2(g)} \longrightarrow Na_2CO_{3(s)} + H_2O$$ 00½

(b) (i) The atomic number (Z) of Q is 17, equal to the number of electrons.

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Cl (atom) 2, 8, 7

Cl^- (ion) 2, 8, 8

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(ii) Mass number (A) = No of protons + No of neutrons

$$A = p + n$$
$$= 2 + n$$
$$= 17 + 12$$
$$= 29.$$ 01 mark

(iii) Element Q is chlorine. It is ionized by gaining an electron. 01 mark

$Cl + \bar{e} \longrightarrow Cl^-$ 00½ mark

∴ The electronic configuration of Cl^- is 00½ mark

$Cl^- \Rightarrow$ ~~2:8:8~~ 2:8:8

2:8:8 not 8 ⇒ 2:8:7. 01 00½ mark

(= 07 marks)

7. (c) (i) upward delivery – because ammonia is less denser than air 01½ mark

(ii) Downward delivery – because chlorine gas is denser than air 01½ mark

(iii) collected over water by an upward delivery because hydrogen gas is less denser than water and also it is slightly soluble in water. 01½ marks

(b) (i) The red flowers will be bleached. 00½ mark

(ii) The hydrogen gas will burn with a "pop sound" 00½

(iii) Dense white fumes of ~~by~~ ammonium chloride will be observed. 00½ mark

(iv) The yellow acidified potassium dichromate solution will turn green as the dichromate (VI) is reduced to dichromate (III) 01 mark

Total = 07 marks

8. (a) (i) If the temperature of the system is lowered, the equilibrium position will shift to the right as the reaction is exothermic. 01½ marks

(ii) The equilibrium position will shift to the left as there is high concentration of hydrogen iodide which will decompose to form the reactants 01½ marks

(b) (i) Element A is sulphur 00½ mark

(ii) Catalyst B is Manganese (IV) oxide. 00½ mark

(iii) Acid C is sulphuric acid 00½ mark

(iii) $2SO_{2(g)} + O_{2(g)} \rightleftharpoons 2SO_{3(g)}$ 01½ mark

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9. Data given:

Mass of Al_2O_3 = 5.1g 0o1/2 mark

Molar mass of Al_2O_3 = (27×2) + (16×3) = 102g/mol 0o1/2 mark

No of moles of Al_2O_3 ⇒ $n = \frac{m}{Mr}$

$= \frac{5.1g}{102g/mol}$ 0o1/2 mark

$= 0.05 mol.$

Equation: $4Al_{(s)} + 3O_{2(g)} \longrightarrow 2Al_2O_3$ 0o1/2 mark

From this equation:

2mol of $Al_2O_3 \equiv$ 3mol of O_2. 0o1/2 mark

0.05mol of $Al_2O_3 \equiv$ X mol of O_2.

$X = \left(\frac{0.05 \times 3}{2}\right)$ mol. 0o1/2 mark

$= 0.075$ mol of O_2. 0o1/2 mark

Now:

$2KClO_{3(s)} \longrightarrow 2KCl_{(s)} + 3O_{2(g)}$ 0o1/2 mark

From this equation:

2mol $KClO_3 \equiv$ 3mol O_2. 0o1/2 mark

Y mol $KClO_3 \equiv$ 0.075mol of O_2.

$Y = \left(\frac{0.075 \times 2}{3}\right)$ mol 0o1/2 mark

$= 0.05$ mol

The mass of $KClO_3$ required. 0o1/2 mark

From $Y = \frac{m}{Mr}$ 0o1/2 mark

$m = Mr \times Y$ ⇒ Mr = molar mass of $KClO_3$

$= 122.4g/mol$. 0o1/2 mark

$= 122.4g/mol \times 0.05 mol$

$= 6.125g$

∴ Mass of $KClO_3$ required = 6.125g. 06 1/2 mark

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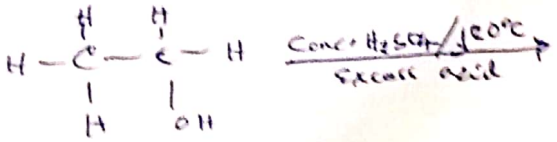
10. (a) (i) Alkanes
(ii) Alkenes @ ½ ⇒ 1½ marks
(iii) Alcohols

(b) (i) Methane
(ii) Ethene @ ½ ⇒ 1½ marks
(iii) Methanol.

(c) (i) The reaction is hydrogenation, ie addition of hydrogen atoms to unsaturated hydrocarbons in the presence eg. nickel catalyst at 200°C temperature. 1 mark

$$CH_2=CH_2 + H_{2(g)} \longrightarrow CH_3CH_3$$ ½ 1 mark

(ii) Alkene A compound of a series (ii), alcohol, can be converted a compound of series (ii), an alkene by dehydrogenation reaction using conc. H_2SO_4 at a temperature of 180°C. 1 mark



Ethanol

Ethene.

$+ H_2O$ 1 mark

(Total = 07 marks)

11. (a) (i) A mole is the amount of substance which contains as many particles as there are in 12g of Carbon-12 isotope. 1½ marks

(ii) A molar solution, M is the solution which contains one mole of a solute in 1dm³ of a solution ie 1M. 1½ marks

(b) - Concentration
- Temperature
- pressure
- Catalyst
- Surface area
- Light intensity.

Any 4 pts @ 1 mark. ⇒ 04 marks

(Total = 07 marks)

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12 (a) Volume of Cl_2 gas produced at STP = 2·5 litres 01/2

G·M·V at STP = 22·4 litres. 01/2

Ionic equation for production of Cl_2 at anode.

$2Cl^-_{(aq)} \longrightarrow Cl_{2(g)} + 2\bar{e}$ 00 1/2

↓ 1 mole. ↓ 2F.

$\Rightarrow$ 2F ≡ 1 mole.

2F ≡ 22·4 litres of Cl_2.

or 1F ≡ 11·2 litres of Cl_2. 00 1/2

xF ≡ 2·5 litres of Cl_2.

~~x = 4F x 1 ÷ 2~~

$x = \frac{1F \times 2{\cdot}5 \text{ litres}}{11{\cdot}2 \text{ litres}}$ 01

= 0·223F. 00 1/2

Volume of oxygen produced.

Equation for production of O_2. 00 1/2

$4OH^-_{(aq)} \longrightarrow 2H_2O_{(l)} + O_{2(g)} + 4\bar{e}$

↓ 1 mole ↓ 4F.

4F ≡ 1 mole of O_2.

4F ≡ 22·4 litres of O_2.

i.e 1F ≡ 5·6 litres of O_2. 00 1/2

0·223F ≡ x litres of O_2.

$x = \frac{0{\cdot}223F \times 5{\cdot}6 \text{ litres}}{1F}$. 00 1/2

= 1·2488 litres of O_2. 00 1/2

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(b) Equation for deposition of copper

$Cu^{2+} + 2e^- \longrightarrow Cu$

$2F \longrightarrow 64g$ of Cu.

or $1F \longrightarrow 32g$ of Cu. 00½

$0.223F \longrightarrow Xg$ of Cu.

$$X = \frac{0.223F \times 32g}{1F} \quad 00\tfrac{1}{2}$$

$= 7.136g$ of Cu. 00½

∴ Mass of Copper produced = 7.136g. (Total = 07 marks)

13. Importance of neutralization reaction:

- Treating insect stings
- Relieving indigestion.
- Neutralizing accidental spills
- Treating factory wastes
- Reducing acid rain
- Management of soil pH.

Introd. = 02½ marks
Any 5 pts @ 02 marks
Conclusion = 02½ marks
15 marks

14. (i) From the equation:-

$N_{2(g)} + 3H_{2(g)} \rightleftharpoons 2NH_{3(g)}$ 00½

1 mol of N_2, requires 3 mol of H_2 for complete reaction

ie for 3 mol of N_2 present to react completely, it requires $3 \times 3 = 9$ mol of H_2 00½ but unfortunately, there are only 5 mol 00½ of H_2 available. Thus, H_2 is present in small amount. 00½

(ii) Since hydrogen gas is present in small amount, it will get finished while some amount of nitrogen gas will remain unreacted 00½ as it is present in large amount. 01

Let the amount of $N_{2(g)}$ reacted with H_2 be X

From the equation 00½

$N_{2(g)} + 3H_{2(g)} \rightleftharpoons 2NH_{3(g)}$ 00½

1 mol $N_2 \equiv$ 3 mol H_2

X mol $N_2 \equiv$ 5 mol H_2 00½

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$X = \left(\frac{1 \times 5}{3}\right)$ mol

$= 1.6667$ mol. 00½

The amount of N_2 reacted with 5 mol of $H_2 = 1.6667$ mol

The amount of N_2 left unreacted (Y) 00½

= Amount of N_2 introduced − amount of N_2 reacted

$Y = 3\text{mol} - 1.667\text{mol}$ 00½

$= 1.3333$ mol 00½

Mass of N_2 left unreacted (m). 00½

From number of moles (n) = $\frac{m}{Mr}$ 00½

Then $m = Mr \times n$. where Mr = molar mass of N_2

$= 28 \times 1.3333$ = 28g/mol. 00½

$= 37.3324$ g. 00½

∴ Mass of N_2 left in the container = 37.3324g. 00½

(ii) Let the number of moles of NH_3 produced be Y

From the equation: $N_{2(g)} + 3H_{2(g)} \rightleftharpoons 2NH_{3(g)}$ 00½

2 mol of $NH_3 \equiv$ 3 mol H_2 00½

Y mol of $NH_3 \equiv$ 5 mol H_2.

$Y = \left(\frac{2 \times 5}{3}\right)$ mol. 00½

$= 3.3333$ mol.

∴ The number of moles of NH_3 produced = 3.3333 mol. 00½

(iii) Let the volume of NH_3 produced at STP be V 00½

Number of moles of NH_3 produced (n) = 3.3333 mol.

GMV at STP = $22.4\,dm^3/mol$. 00½

From $n = \frac{V}{GMV}$ 00½

$V = n \times GMV$ 00½

$= 3.3333 \times 22.4\,dm^3/mol$. 00½

$= 74.6667\,dm^3$. 00½

∴ The volume of NH_3 produced at STP = $74.67\,dm^3$

01 mark

Total

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