SECTION A (16 Marks)

1

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

(10)

2

LIST A	i	ii	iii	iv	v	vi
LIST B	D	E	B	C	A	F

(06)

SECTION B (54 marks)

3 (a) (i) A base is compound of oxide or hydroxide which reacts with an acid to form salt and water only WHILE Alkali is a soluble base (01)

(ii) An atom is a smallest particle of an element with all chemical properties of an element. WHILE Isotope is an atom of the same element with different number of neutron but the same number of proton. (01)

(b) Given Carbon = 52.2 %, H = 13 %, Oxygen = 34.18 %, V.D = 23

element	C	H	O
% composition	52.2	13	34.18 (01/2)
Divide by R.A.M	52.2/12 = 4.35	13/1 = 13	34.18/16 = 2.18 (01)
Divide by smallest	4.35/2.18 = 2	13/2.18 = 5.97	2.18/2.18 = 1 (01)
Ratio into whole Number	2	6	1 (01/2)

Empirical formula C_2H_6O (01)

MF = n (E.F)

But vapour density = $\frac{R.M.M}{2}$

$R.M.M = 2 \times V.D$

$= 2 \times 23$

$R.M.M = 46$ (01/2)

Therefore $n = \frac{R.M.M}{E.F.}$

$n = 46/46 = 1$ (01/2)

3 M.f = n(C$_x$H$_6$O) (½)

M.F = 1 [C$_2$H$_6$O]

M.F = C$_2$H$_6$O

∴ Molecular formula = C$_2$H$_6$O (½)

(c) Oxidation number of nitrogen in KNO$_3$

Let nitrogen be X

K = +1, O = −2, N = ?

+1 + X + −2(3) = 0

X + 1 + (−6) = 0 (½)

X − 6 + 1 = 0

X = +5.

∴ Oxidation number of Nitrogen in KNO$_3$ is +5 (½)

4. (a) Water treatment in industrial setting is vital to prevent water pollution and ensure the quality if water in the process of removing impurities, chemicals and contaminants (½)

- Water treatment minimizes environmental impact (pollution) (½)
- It promotes sustainable industrial practices. (½)

(b) To remove dissolved organic matter by precipitation process. (½)

5 (a) Ions present

$NaNO_{3(aq)} \longrightarrow Na^+_{(aq)}$

$H_2O_{(l)} \rightleftharpoons H^+_{(aq)} + OH^-_{(aq)}$ (½)

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at Cathode

$2H^+_{(aq)} + 2e^- \longrightarrow H_{2(g)}$

Removal of Hydrogen ion disturbs the ionic equilibrium of water. Thus water ionizes further to restore the equilibrium. The hydroxyl ions (OH^-) so formed combine with the incoming Na$^+$ ion to form NaOH. Thus the

5. (a) Cathodic liquid become basic (alkaline) (02)
of anode

$4OH^- \rightarrow 2H_2O + O_2 + 4e^-$

Removal of OH^- ion disturbs the ionic equilibrium of water. Thus water ionizes further to restore the equilibrium. The H^+ ion so formed combine with the incoming NO_3^- ions to form HNO_3. Thus the anodic liquid becomes acidic. (02)

The overall reaction equation becomes.

$4H^+_{(aq)} + 4OH^-_{(aq)} \rightarrow 2H_2O_{(l)} + 2H_{2(g)} + O_{2(g)}$ (01)

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

$4 \times 96500\,C \rightarrow 22400\,cm^3$

$? \rightarrow 300\,cm^3$

$= 5169.6\,C$ (01)

Mass of Copper liberated

from $Cu^{2+}_{(aq)} + 2e^- \rightarrow Cu_{(s)}$

$2 \times 96500\,C \rightarrow 63$

$5169.6\,C \rightarrow ?$

$= 1.71\,g$ (01)

Mass of silver liberated

from $Ag^+_{(aq)} + e^- \rightarrow Ag_{(s)}$

$96500\,C \rightarrow 108\,g$

$5169.6\,C \rightarrow ?$

$= 5.2857\,g$ (01)

6. (a) - Treating insects sting (01)
- Treating indigestion (01)
- Treating sewage system (01)
- Neutralizing pH (01)

6 (b) (i) 2.91 g of HX in 250 cm^3 is equivalent to $2.91 \times 4 = 11.64$ g (01½)
in 1 litre. Thus the concentration is 11.64 g/L

(ii) $V_1 \times M_1 \times 1 = 25 \times 0.108 \times 1$ from
$M_1 V_1 n_2 = M_2 V_2 n_1$
$22.5 \times M_1 \times 1 = 25 \times 0.108 \times 1$
$M_1 = 0.12$ mol/dm^3
∴ Concentration of HX = 0.12 mol/L (01½)

(iii) 0.12 moles has a mass of 11.64 g.
1 mole has a mass of $\frac{11.64}{0.12} = 97$ g (01)
∴ The
The molar mass of HX is 97 g/mol. (01)

7- (a) During extraction of sodium metal from its ore
- Calcium chloride is added to the ore (01)
- Calcium chloride lowers the melting point of sodium chloride ore from 774°C to about 600°C (01)
- Coke (carbon) burns in oxygen to produce carbon monoxide which is the main reducing agent, reducing Iron (II) oxide to spongy iron. (01)
- Limestone ($CaCO_3$) decomposes to produce quicklime (CaO) which combines with silicon dioxide to form calcium silicate ($CaSiO_3$) which then combines with impurities to form slag. (01)

(b) (i) Given the reaction between $(AgNO_3)_{(aq)}$ and $CaCl_{2(aq)}$
$2AgNO_{3(aq)} + CaCl_{2(aq)} \longrightarrow Ca(NO_3)_{2(aq)} + 2AgCl_{(s)}$ (02)

(ii) Usefulness of molecular equations over word equation.
- Molecular equation shows the composition of the reactants involved and the products formed.
- Molecular equations uses small space with alot of information contained.

7 (b) (ii) o Molecular equation shows the physical state of the species involved

o Molecular equation shows the conditions for the reaction to take place, example heat or catalyst

(03)

8 (a) (i) Given methyl propane and butane

$CH_3CH(CH_3)CH_3$ (methyl propane)

$CH_3CH_2CH_2CH_3$ (butane)

Boiling points increase with an increase in number of Carbon atoms (molecular mass) in the chain. Methyl propane and butane have the same molecular mass but methyl propane has lower boiling point since its branched. Branching reduces the physical closeness of the atoms in the chain hence reducing its boiling point Compared to straight chain. (01)

(ii) Petrol is by product of Crude oil, specifically hydrocarbon. The first members of hydrocarbons serve as fuels which are highly flammable coming in contact or close with ignition sources may cause fire accident (01)

(b) (i) Name of reaction is Cracking (01)

(ii) Uses of products

Ethene (C_2H_4) : production of polyethene (plastic), manufacture of chemicals eg ethanol (01)

Higher alkanes ($C_{13}H_{28}$) : Used as lubricants, in detergents and as fuels (01)

Octane (C_8H_{18}) : As fuel component in gasoline, used as solvent, chemical intermediate (01)

Propene (C_3H_6) : production of propylene (Plastic), fuel additive, refrigerant (01)

SECTION C (30 Marks)

9 (a) $MnO_2 + 4NaCl + 2H_2SO_4 \rightarrow MnCl_2 + 2Na_2SO_4 + 2H_2O + Cl_2$ (01)

(b) (i) The gas is denser than air (02)

(ii) oxidizing agent to oxidize HCl from the reaction between NaCl and Conc. H_2SO_4 to form Cl_2 (02)

(iii) Poisonous nature of the gas prepared (02)

(i) Bleaching agent and domestic antiseptic formation eg $Ca(OCl)_2$, NaOCl (02)

(ii) manufacture of weed killers in agricultural activities eg metal chlorides (02)

(iii) Manufacturing of PVC from hydrogen chlorides (02)

(iv) Manufacturing of Hydrochloric acid. (02)

eg $H_2 + Cl_2 \rightarrow 2HCl$

10 Introduction

Meaning of fertilizer (02½)

Types of fertilizers

Main body

- Broad casting methods (02)
- Placement method (02)
- Side dressing application (02)
- Foliar spraying (02)
- Dip application (02)

Conclusion

Advantages of fertilizers (02½)

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11 Introduction:

Meaning of water pollution. (02½)

Main body

effects of water pollution

- Water borne diseases
- Excessive growth of water weeds

11 • killing of aquatic organisms.
• Disruption of aquatic habitat ecology and marine organisms physiology
• Exposure to mercury from use of contaminated water has serious effects to human and animal health (10)
• Rise in temperature can kill aquatic organisms
• Lead poisoning can cause toxicity to the aquatic organisms.
• Chromium exposure from contaminated water cause lung cancer, nosal and sinus cancers, severe dermatitis

Conclusion - (02½)

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