KENYA NATIONAL EXAMINATION COUNCIL

KCSE 2009

CHEMISTRY

PAPER 2

MARKING SCHEME

1. (a) (i) $MnO_2 + 4HCl\ (aq) – MnCl_2\ (aq) + Cl_2(g) + 2\ H_2O(g)$

(ii) $KMnO_4$ / $CaOCl_2$ (aq) /PbO_2

(iii) Passing it through a U- tube containing dehydration calcium chloride (CaCl)

- Passing Chlorine gas through concentrated sulphuric acid in a flask.

(b) (i) Aluminium chloride – $AlCl_3$

(ii) $2Al(s) + 3\ Cl_2\ (g) \rightarrow 2\ AlCl_3(g)$

(iii) Moles of Al metal used = $\frac{0.84}{27}$

= 0.0311

Moles of Cl_2 gas = 0.0311 x 3/2

= 0.047

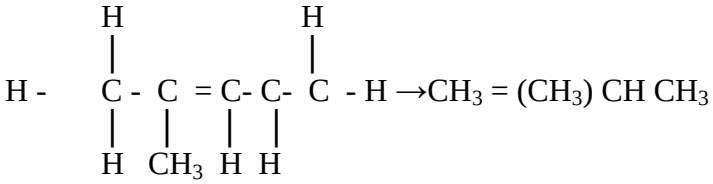
Vol of Cl_2 gas = 0.047 x 24

= 1.12 dm^3

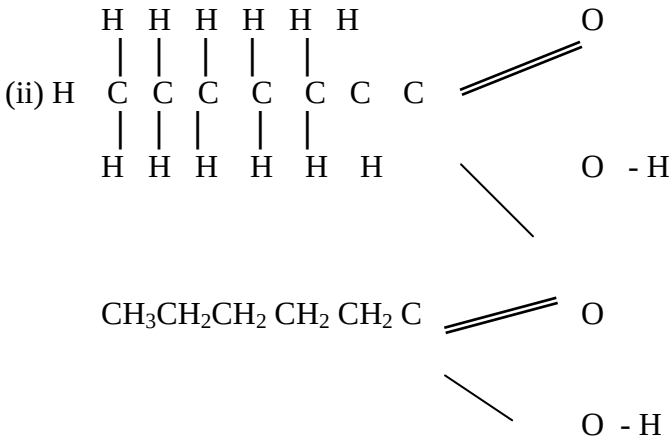
(iv)

- Prevent water moisture from entering the apparatus/ absorbing
- React with excess Chlorine/ prevent environmental pollution
- Prevent hydrolysis of Aluminium Chloride

2. (a) (i) 2 – methyl vut – 2- ene;



(ii)



(b)

- Determine the boiling points/ temperature of the two alkanols. Hexamol has a higher boiling point temperature.
- Add equal amounts of water to each pollow of alkanol and shake for hexanol, two layers of liquids are formed while for methanol a homogeneous solution is formed.
- Determine the density of the two alkanols. Hexanol is denser than methanol
- Refractive index, hexanol has a higher refractive index

(c) (i) (l) Esterification accept condensation

(ll) Cloroethane / $CH_3\ CH_2\ Cl/C_2\ H_sCl$

(ii) $CH_3\ CH_2ONa\ C_2H_5ONa$

(iii) Hydrogen gas

High temperature ($150^0 – 250^0C$) *Reject unspecified conditions*

High pressure (200 – 250 atm)

2 mks for any 2 conditions tied to correct reagent

Nickel catalyst

3. (i) $D(l)^{2+} + 2e^- \rightarrow D(S)$ (1 mk)

(ii) $2B+^-(l) \rightarrow Br_2(g) + 2e^-$ (-1/2 for wrong/ missing)

(ii) Carbon Graphite

It will not be attacked by/ react Bromine gas & D reacts with bromine vapours

(iii) Chlorine gas is poisonous/ toxic gas

(iv) (I) weigh the cathode before the start of the expt

Weigh cathode after the experiment / 90 minutes get the differences in weights

(II) $Q = It$ $Q = 0.4 \times 90 \times 60 = 2160C$ $RAM = \frac{2.31 \times 96500}{2160}$ ½ mk

1 mole of D = 96500

$2.31 = \frac{2160 \times RAM}{2 \times 96500}$ = 206.4 ½ mk

4. (a) (i) Channel / pump sea water into shallow ponds. Evaporation of water occur at the ponds sodium Chloride crystallizes out.

(ii) 1. $NH_3(g) + CO_2(g) + H_2O(w) \rightarrow NH_4HCO_3(aq)$

2. $NH_4HCO_3(aq) + NaCl(aq) \rightarrow NaHCO_2(s) + NH_4Cl(aq)$

(iii)

1. Filtration
2. Heating

(iv) I. $NaCO_3(s) + H_2SO_4(aq) \rightarrow N_aSO_4(aq) + CO_2(g) + H_2O(l)$

Moles of $H_2SO_4 = \frac{40 \times 0.5}{1,000}$

$= 0.02$

Moles of Na_2CO_3 = Moles of $H_2SO_4 = 0.02$

Mass of $Na_2CO_3 = 0.02 \times 106$

2.12 (g)

Percentage purity = $\frac{(2.12 \times 100)}{2.15}$ %

= 98. 6%

II. Mass of $Na_2CO_3 = 0.02 \times 106$

= 2.12 g

Percentage purity = $\frac{(2.12 \times 100\%)}{2 .15}$

= 98. 6%

b. - Used in textile industries - used in photography

- Manufacture of glass - Making anti acid drugs

- Softening hard water - In paper industries

- Making of detergents - As a food additive

5. (a)

(i) I. Condensation

II. Melting

(ii) Iodine, Benzoic acid, Camphos, Dry Ice. Solid Co_2 Naphthalene

(iii) $H_2O(g) \rightarrow H_2O(g)$

(b)

(i) Van des waals and hydrogen bonding

II Van des waals forces

(ii) I. The separation distance is smaller during fusion than during vaporization hence requires much lower energy than in vaporization and vice versa.

II. Heating time NP is far much less than heating time in QR/ Heating time

(c)

(i) Hydrogen burns to produce steam which is a non pollutant/ does not cause pollution to the environment

- Hydrogen has a high energy content hence very small amount produce a lot of heat energy

- Hydrogen is renewable hence cannot be exhausted/ used completed.

(ii) It can easily explore when burning/ highly flammable unlike fossils fuels expensive.

6. (a)

Ion	Number of protons	Number of neutrons	Mass Number	Electron arrangement
W	17 ½ mark	20	37 ½ mark	2.8.8
X4+	14	14 ½ mark	28	2.8 ½ mark

(b) (i) Sodium burns with a yellow flame & yellow white/ solid powder is formed while copper burn with a blue green flame & black powder/ silic is formed.

(ii) Sodium darts on the surface of water / rapid fast effervescence (fast production of bubbles; solution becomes pink immediately.

Magnesium sinks in water/ slow (production of bubbles) effervescence/ solution becomes pink gradually.

(c) Magnesium it has a higher nuclear charge which pulls outer electrons more strongly

(d) i. $^{238}_{920}$ u it is the most abundant

(ii) $\frac{0.01 \times 2.34 + 0{,}72 \times 235 + 238 \times 99.27}{100}$

$(2.34 + 169.2 + 236.2626)/100$ ½ mk

$= \frac{23797.80}{100}$

$= 237.978$ ½ mk

(iii) $^{235}_{92}U \rightarrow ^{231}_{90}Th + ^{4}_{2}He$

(iv) Control thickness of paper

(a) Coke/ coal/ Charcoal/ Carbon

(b) $C_{(s)} + CO_2\ (g) \rightarrow 2\ CO_{(g)}$

(c) The reaction between coke/ coal and the hot air is highly exothermic

(d) Slog is immiscible with molten iron

(e) Nitrogen (iv) oxide gas forms acid rain. Which corrodes metallic materials and destroys vegetation the environment.

(f) (i) By passing/ blowing oxygen into molten iron which converts carbon into carbon (iv) Oxide

(ii) To increase the tensile strength/ making the iron less brittle/ making it more malleable / making it more ductile.