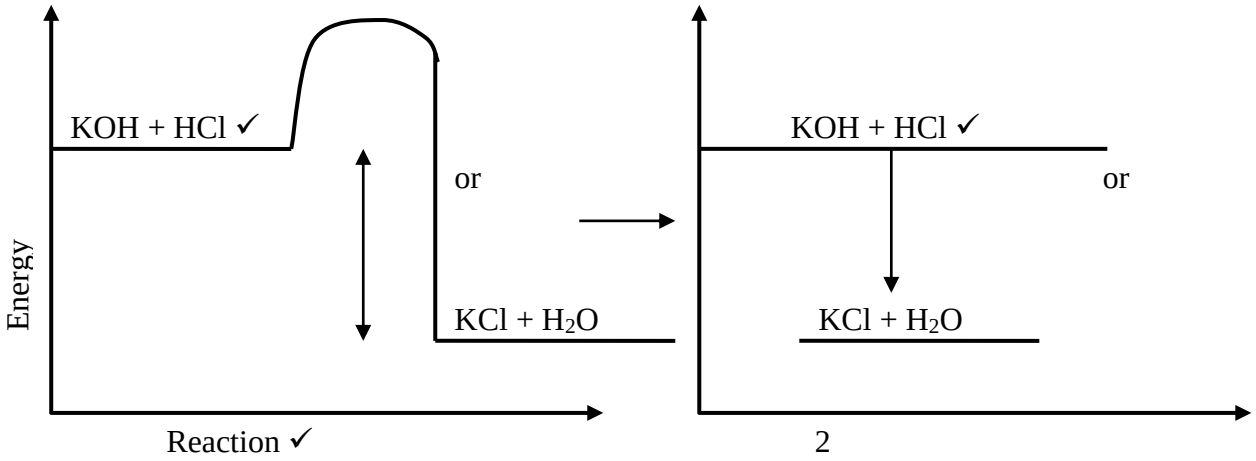
BONDO SUB-COUNTY SECONDARY SCHOOLS JOINT EVALUATION - 2015
233/2
CHEMISTRY
Paper 2
July/August - 2015
MARKING SCHEME

1. a) i) P and T; ✓1
   ii) Elements Q, R and S ✓1
   b) i) S; ✓ its boiling point is below room temperature ✓1
   ii) Element S; ✓1 it has a stable noble gas configuration and thus does not react ✓1
   c) i) $Q_2(SO_4)_3$ ✓1
   ii) $P_{(s)} + R_{2(g)} \longrightarrow P_2R$ ✓1
   d) Ionic // electrovalent; ✓1 there will be complete transfer of electrons from one element Q to another R ✓2
   e) Element T; ✓1
   f) Q has more valence electrons than P; ✓1 hence stronger metallic bond ✓1
2. a) i) To distribute heat evenly ✓1/ uniform mixture of reagents
   ii) Molar heat of neutralization is the heat evolved ✓1 when one mole of water is formed from the reaction between H^+ and OH^- ions
   iii) $H^+ + OH^- \longrightarrow H_2O_{(l)}$
   $H_3O^+ + OH^- \longrightarrow 2H_2O$
   b) i) $\Delta T = 30.9 - 24.5 = 6.40C$ ✓
   $\Delta H = 400 \times 4.2 \times 6.4 = 10{,}752Joule$
   $= -10752$ Joules ✓
   ii) Moles of KOH = $\frac{200\times1}{1000} = 0.2\,moles$ ✓
   0.2 moles = 10752
   1mole = 1 x 10752
   $\Delta H = -10.752kJ$ mole ✓2
   c) Molar heat will be lower ✓1 because ammonium hydroxide is a weak base than potassium hydroxide// ammonium hydroxide ionizes partially and some energy is used to ionize the remaining molecules.



3. a) i) Copper ✓ ½
   ii) Copper II oxide; ✓ ½

iii) Copper II sulphate and excess ✓ 1 copper II oxide

iv) Copper II sulphate solution; ✓ ½

b) i) Blue; T✓½

ii) Black; ✓ ½

c) i) I $Cu_{(s)} + O_{2(g)} \longrightarrow CuO_{(s)}$ ✓1

II $CuO_{(s)} + H_2SO_{4(aq)} \longrightarrow CuSO_{4(aq)} + H_2O_{(l)}$ ✓1

ii) Neutralizations ✓1

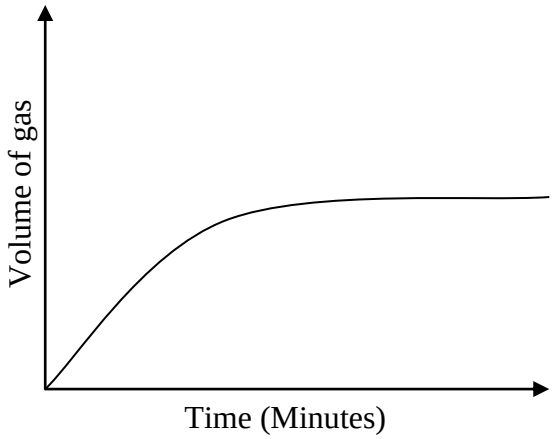
d) Copper II oxide ✓ it is easier to remove from the mixture than if the acid was inn excess ✓2

e) Warming // heating; ✓ to increase the rate of reaction by increasing the kinetic energy between the ✓2 acid and copper oxide particles that are reaching.

f) Solution V is transformed into an evaporating dish; ✓ the filtrate is evaporated over a water bath till saturation ✓

g) The saturated solution is allowed to cool and crystallizes ✓ the mixture is poured off, and the salt crystals are then dried between filter papers. ✓

4. a)



P = 1
A = 1
C = 1
03

i) $490 \pm 10cm^3$ ✓1 shown on the graph ✓1

b) $\frac{620-540}{1}$ ✓1 = $80cm^3$ per ✓1 minute

c) Part of duralumin does not react with the acid ✓1 Since copper cannot react with dilute acid ✓1

d) Volume released from aluminium

= 640 – 2.5 = 638.75cm ✓1

$24,000cm^3$ = 1mole

Thus 638.75 = $\frac{638.75}{24000} \times 1$ ✓ ½ = 0.0266146 moles / Hydrogen gas

$2Al + 6HCl_{(aq)} \longrightarrow 2AlCl_3 + 3H_2$ ✓1

Mole ration of Aluminium : Hydrogen = 2 : 3

∴ moles of aluminium = 0.0266146 x 2/3 ✓ ½

= 0.0177431 moles

Mass of magnesium = 27 x 0.0177431 ✓1

= 0.4790637g

Percentage by mass of aluminium

$$= \frac{0.4790637}{0.5000000} \times 100 = 95.812\%$$

= 95.812% ✓1

5. a) No ions in the electrolyte had been discharged; ✓ and the anode would have completely dissolved; ✓1

b) Anode: $Cu_{(s)} \longrightarrow Cu^{2+}_{(aq)} + 2e$ ✓1

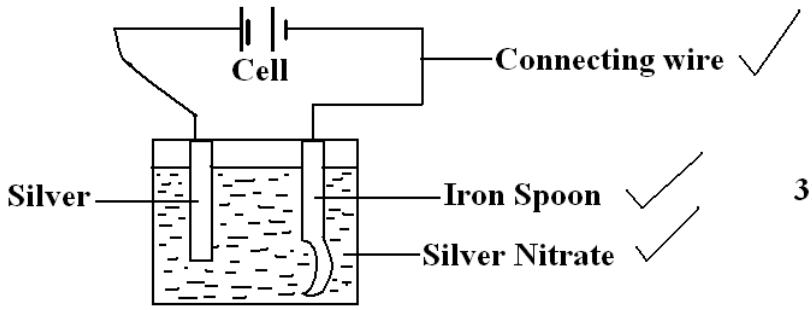
Cathode: $Cu^{2+}_{(aq)} + 2e \longrightarrow Cu_{(s)}$ ✓ 1

c) The colour of the electrolyte ✓1 does not change // blue colour persists: the copper ions discharge and reduced at the cathode are replaced by the dissolving anode such that ions in weight at the anode ✓ 1 is equal to gain at the cathode

d) Cathode $Cu^{2+}_{(aq)} + 2e \longrightarrow Cu_{(s)}$ ✓1

Anode $4OH^-_{(aq)} \longrightarrow 2H_2O_{(l)} + O_{2(g)} + 4e$ ✓ 1

e)



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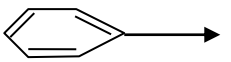
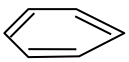
f) Ethanoic acid is a weak acid that ionizes only partially to release only few hydrogen ions; ✓1 The fewer ions for electrical conductivity result into less current; ✓1

6. a) Soaps are cleansing agents containing the carbohydrate ion; ✓ 1 soapless detergents are cleansing agent lacking the carboxylate group in which the carboxylate group of the soaps have been replaced by an allay/ sulphanate ✓1

b) i) Heating ✓1

ii) $CH_3(CH_2)_9CH = CH_2 +$  $\longrightarrow CH_3(CH_2)_9CH = CH$ ✓1 

iii) Dodecenebenzene sulphonate ✓1

c) i) Dodecenebenzene Sulphonate ✓1

ii) $CH_3(CH_2)_9CH = CH_2 +$ ⟶ $CH_3(CH_2)_9CH = CH_2 -$ $- OSO_3H$

d) i) Neutralization ✓1

ii) Sodium hydroxide ✓1

iii) Sodium dodecenebenzene sulphanate ✓1

e) i) To increase the cleansing properties of the detergent ✓1

ii) Results into release of phosphate ions in water sources leading to water pollution / eutrophication ✓1

f) i) Form insoluble salts of calcium and magnesium hence does not form scum with hard water (which would cause wastage of detergent and destructions of fabrics. ✓1

ii) The active ingredient such as allay/ benzene sulphorates are non-biodogradable, hence accumulate ✓1 in water sources and end up in bodies

- Some of the additives such as phosphates cause eutrophication hence excessive build up of algae (algal blooms) which change the water taste and odour and also reduce oxygen supply hence poor growth of aquatic organisms.
- Because of their high lathering tendency they cause excessive frothy and foaming in water sources especially after heavy rains

g) A molecule of the cleansing agent has polar ($-SO_3Na^+$); ✓ and non-polar parts (CH_3CH_2---); ✓ non-polar parts dissolves oil; ✓ and the mixture is agitated the oil droplets coagulate and can be washed away with water.

7. Air is passed through fillers to remove ✓ ½ dust particles. The remaining air is then passed through concentrated potassium hydroxide solution to remove carbon (IV) ✓ ½ oxide. The air is then cooled to -25^0C to remove water vapour ✓ ½ The remaining air is then compressed to 200atm pressure ✓ ½ Repeated compression and expansion cools the air to -200^0C where it liquefies ✓ ½ When liquid an is frictionally distilled ✓ ½ Nitrogen is obtained first ✓ ½ since it has the lowest body point ✓ ½

b) i) Gas J Sulphur (IV) oxide / SO_2

Gas K Nitrogen (IV) oxide /NO_2

ii) $NH_4NO_3 \xrightarrow{\text{heat}} 2H_2O_{(g)} + N_2O_{(g)}$

iii) $SO_{3(g)} + H_2SO_{4(g)} \longrightarrow H_2S_2O_{7(l)}$

iv) Vanadium (V) oxide

v) The conversion of J to R involves diseases in number of molecules hence decrease ✓ 1 in volume. Therefore high pressure increases the yield. ✓1

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233/3
CHEMISTRY PRACTICAL
Paper 3
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Table 1. b) A – ½ S – ½ P – 1 L – 1 = 3mks

ii) Table 2

I $\frac{Average Volume \times 0.2}{1000}$ = correct answer ✓ ½

II $\frac{Moles in ii) I above}{2}$ ✓ ½ = correct answers ✓ ½

III Ans in $\frac{II \times 100}{25}$ ✓ ½ = correct answers ✓ ½

IV Ans. In ii) III above ✓

V Ans in ii) IV – Ans in ii) II ✓ ½ = correct answers ✓ ½

VI Mole ratio II equation ✓ ½
Ans in ii) V

iii) Ans in VI ΔT x 50 x 4.3 = answer i) ✓ ½

$\frac{1}{Ans ii) VI} \times ans1$ ✓ ½ = -answer ii) J/mole ✓ ½

Or $-\frac{ans ii)}{1000}$ = - answer kJ/Mole

2.a)

Colourless filtrate ✓ White residue	Soluble salt and insoluble substance ✓

b)

White ✓ ½ precipitate soluble in excess ✓ ½	Al^{3+}, Zn^{2+}, Pb^{2+} or Ba^{2+} ✓ ½ each

c)

No white precipitate ✓ ½ No efferrescence ✓ ½	Pb^{2+} absent SO_3^{2-} or CO_3^{2-} absent ✓ ½ each

d)

White precipitate insoluble ✓ ½ in excess	Al^{3+} present ✓ ½

e)

White precipitate ✓ ½ insoluble on heating ✓ ½	SO_4^{2-} present ✓

f)

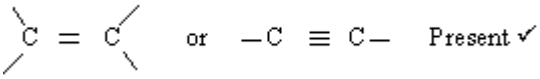
Efferrescence producing ✓ ½ colourless gas which change blue litmus to red ✓ ½	CO_3^{2-} Present ✓ ½

g)

White precipitate ✓ ½	Pb^{2+} present ✓ ½

Insoluble in excess ✓ ½	

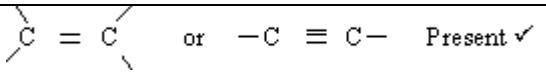
3. a)

White solid melts as ✓ ½ it burns with a yellow sooty flame	 Present ✓ Accept a long chain hydrocarbon // insalivated organic cpd

b)

Efferescence / Gas bubbles ✓ ½	H^+ // -COOH Present ✓ ½

c)

Purple acidified KMnO4 is decolourised ✓ ½	 Present ✓ Penalise fully for any contradiction eg RoH present