ASUMBI GIRLS HIGH SCHOOL

POST -MOCK 1

AUGUST/SEPTEMBER 2022

CHEMISTRY PP2 MS

1 (a) T is more reactive than Q; T has more energy levels than Q hence larger atomic radius; the valence electrons in T are less strongly attracted to the nucleus hence easier to lose;
Owtte

(b) Cannot conduct in solid state, but can conduct in solution and molten states; T has giant ionic structure; in solid state the ions are held in the crystal lattice; in solution and molten states, the ions are free and mobile for electrical conductivity;

(c) R has higher melting and boiling points than S; both have molecular structures; but R ahs larger molecules than S; hence more van der waals forces which need more heat to break (compared to S);

(d) $Q^{+}_{(g)} \rightarrow Q^{2+}_{(g)} + e$;

(e) (i) Atomic radius of T is larger than its ionic radius; T forms ions by losing electrons; leading to lose of an entire energy level; hence ions have fewer energy levels than atoms;

(ii) Atomic radius of P is smaller than the ionic radius; P ionizes by gaining electrons hence increased electron-electron repulsion;

(f) Element Q has a larger atomic radius than R; for the same number of energy levels R has more protons than Q hence a stronger effective nuclear pull of valence electrons towards the nucleus;

(g) Oxide of Q has a higher MP and BP than the oxide of R; Q oxide has a giant ionic structure with strong ionic bonds which require more heat to break; R has a simple molecular structure; with weak van deer waals forces which require less heat to break;

2 (a) (i) Different crystalline forms of then same element in the same physical state;

(ii) Monoclinic sulphur;

(iii) – Prismatic / hexagonal in shape;
- Stable above 96°C;
- Needle-like in shape;
- Pale yellow in colour;
- Has a melting point of 119°C;
- Has a density of 1.98g/cm^3;

(b) (i) I. $S_{(s)} + Fe_{(s)} \rightarrow FeS_{(s)}$;
Heat must be on the arrow

II. $FeS_{(s)} + 2HCl_{(aq)} \rightarrow FeCl_{2(aq)} + H_2S_{(g)}$;

(ii) – Formation of a green solution;
- Colourless gas with a rotten egg smell;

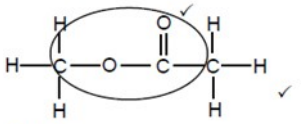
(iii) I. Brown fumes; yellow deposits; H2S is oxidized to sulphur; HNO_3 is reduced to NO_2 and H_2O;

II. Yellow solution changes tom a green solution, yellow solid // suspension; H_2S reduces Fe^{3+} to Fe^{2+}; while H_2S is reduced to S;

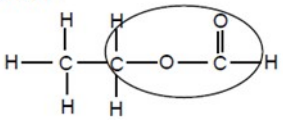
(iv) – Production of sulphur and sulhuric (VI) acid;
- Create inorganic sulphides for the manufacture of pharmaceuticals, pesticides, leather, dyes etc

3 (a) (i) A;
(ii) D;
(iii) B;
(iv) B;

(b) (i) Structural functional isomer



OR/OF



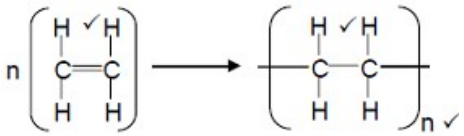
Mark whole structure

(ii) Any one of:
Methyl ethanoate;
OR
Ethylmethanoate;

(c) (i) A large molecule composed of smaller monomer units covalently bonded to each other in a repeating pattern;

(ii) Polyethene;
Accept Polyethylene/polythene

(iii) Equation



(d) (i) Hydrolysis/Substitution;

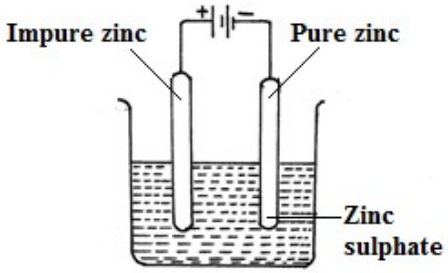
(ii) - Use concentrated strong base / NaOH / KOH / LiOH OR ethanolic / alcoholic strong base / NaOH / KOH / LiOH. / Use ethanol instead of water. / No water.
- Heat strongly;
Accept: Increase temperature;

4 (a) A – Roasting;
B – Reduction;

(b) B – C/ Coke;
C – $H_2SO_{4(aq)}$ / Dilute sulphuric VI acid;
D – Dilute H_2SO_4;

(c) $ZnO_{(s)} + C_{(s)} \rightarrow Zn_{(s)} + CO_{(g)}$

(d) Diagrams



- Dip Zinc rods in a solution of $ZnSO_{4(aq)}$;
- Complete circuit where anode dissolves (impure Zinc) and pure Zinc is discharged at the cathode;

(e) - Cases in dry cells;
- Galvanizing iron sheets;
- Making alloys (Brass i.e. copper and Zinc)
Any two)

5 (a) Calculation
$\Delta H = \Sigma \Delta_f H$ products $- \Sigma \Delta_f H$ reactants or a correct cycle
Hence = $(2 \times -680) + (6 \times -269) - (x) = -2889$
$x = 2889 - 1360 - 1614 = -85$ (kJ mol^{-1})

(b) (i) To reduce heat loss to the surrounding;
Reject to stop // prevent heat loss;

(ii)Addition of acid into water will lead to an exothermic reaction; the heat energy evolved would cause vapourization of the acid which may cause acid burns; adding acid to water ensures the denser acid sinks to the bottom of the container so that no surface vapourization (which may be dangerous) occurs;
Owtte;

(iii) – Avoid spurting of the acid;
- Ensure the acid sinks faster to the bottom of the container;

(iv) $\Delta H = MC\Delta T$;
Total volume = 50 cm^3+ 2cm^{-3} = 52cm^3;
Note: addition of liquid into a liquid causes a change in volume;
Mass = 52 cm^3 x 1gcm^{-3} = 52g = 0.051kg;
Heat change = 0.052 x 4.2 x 1;
=- 0.2184 kJ;
Mass of sulphuric acid = 2 x 1.84 = 3.68g;
Thus 3.68g = -0.2184 kJ;
Then 98g = $\frac{98 \times 0.2184}{3.68}$ = -5.8085 kJ per mole;
Penalize ½ mark for wrong or missing sign // SI unit;

6 (a) (i) Galvanic (cell)/Voltaic (cell);

(ii) Indicates phase boundary / Interphase / phase separator;

(iii) $Fe^{2+}_{(aq)} \rightarrow Fe^{3+}_{(aq)} + e^-$;

(iv) Calculation:
$E^{\Theta} = E^{\Theta}$reduction $- E^{\Theta}$oxidation
$0.03V = E^{\Theta}$reduction $- 0.77$
E^{Θ}reduction $= 0.03 + 0.77$
$= +0.80V$
Thus X is silver;
Accept any other correct formula.

(b) (i) Solution or a melt that allow current to pass through and is decomposed. √1

(ii) I. G: Oxygen gas;
II. H: Hydrogen gas;

(ii) Concentration increases because OH^- ions and H^+ ions are discharged; hence continuous dissciationofwaterr from the electrolyte;

(iii) Calculation
$2H^+_{(aq)} + 2e \rightarrow H_{2(g)}$
Q = 0.72 x 15 x 60C.
= 738C;
2 x 96,500C → 24dm^3
738C → $\frac{24 \times 738}{193,000}$ dm^3
= 0.0918dm^3 (91.8cm^3)

7 (a) (i) A substance formed when a cation from an alkali reacts with an anion from an acid;

(ii) $(KAl(SO_4)_2.12H_2O$;
$[Fe(NH_4)_2(SO_4).6H_2O$;

$Na_2CO_3.NaHCO_3.2H_2O$;

(b) (i) – Add water to the mixture and stir;
- Filter to obtain potassium nitrate solution as the filtrate;
- Heat the filtrate until saturated;
- Allow saturated solution to cool and crystallize;
- Pour off the mother liquor;
- Dry the crystals between filter papers;

(ii) Series of tests

Test	**Procedure**	**Observations**	**Conclusion / explanation**
1	To the green solid add drops of dilute nitric (V) acid / hydrochloric acid / sulphuric (VI) acid;	Effervescence of a colourless odourles gass that extinguishes a glowing splint;	Production of carbon (IV) oxide confirms presence of carbonate
2	To a sample of the solution from test 1 add aqueous sodium hydroxide dropwise till in excess	Blue nprecipitate that is insoluble in excess;	Formation of copper (II) hydroxide which is blue in colour;
3	To a sample / portion of solution from test 1 add drops of aqueous ammonia dropwise till in excess	Blue precipitate soluble in excess to form a deep blue solution;	Formation of blue copper (II) hydroxide with little ammonia which dissolves in excess ammonia to form a deep blue solution of tetra amine copper (II) ions;

(c) Calculation:
Mass of solvent: 50 – 2.7 = 47.3g
Thus if 47.3g → 2.7g of salt;
Then 100g → $\frac{100 \times 2.7}{47.3}$ = 5.7082g/100g of solvet;