**MARKING SCHEME**

**CHEMISTRY**

**Paper 1**

**MARCH/APRIL 2023**

1. (a) X 2.8.1 √½

 Y 2.8.2 √½

 W 2.8.5 √½

(b) W Y X √½

 Atomic radius decrease with increase in number of protons √1 /nuclear charge

1. (a) When the air hole is open √1

(b) Slip a white manila paper or wooden splint √½ and quickly √½ remove before it catches fire. The middle part burns uniformly. √1

 Accept the diagram which is well labeled.

1. (a) Property Nacl Alcl3

Bond ionic √½ covalent √½

Structure giant ionic √½ molecular √½

 (b) There is effervescence √½ Aluminium chloride hydrolyses in water forming acidic solution. √½

1. (a) Molten magnesium chloride has mobile ions √½ while sugar solution has molecules √½ /lack mobile ions.

(b)

|  |  |  |
| --- | --- | --- |
|  | Anode  | Cathode  |
| Observations  | Green-yellow gas | Grey solid  |
| Half-equations  | 2Cl$\begin{matrix}-\\(l)\end{matrix}$ Cl2(g) + 2e | Pb2+(l) + 2e Pb(s) |

 Penalize ½ for missing or wrong stare symbols.

1. (a) Ammonia gas/NH3(g) √1

(b) White precipitate formed that dissolves in excess. √1

Ammonia gas dissolves in aqueous solution to form ammonium hydroxide √½ which react with zinc ions forming zinc hydroxide √½ that dissolves in excess to form tetra ammine zinc (II) ion.

1. $\frac{\left(54 x 6\right)+\left(56x 92\right)+(57 x 2)}{100}$ √1

= 55.9 √1

No units

 Penalize fully when units are shown.

1. (a) The volume of a fixed mass of a gas is directly proportional to its absolute temperature at constant pressure. √1

(b) Increase in volume reduces the number √1. Collisions of gas molecules and the walls of the container causing a decrease in pressure. √1

1. (a) Sodium ethanoate √1/CH3 COONa

(b) (i) Ultra-violet light /sunlight.√1

 (ii) CH4(g) + 4Cl2(g) CCl4(g) + 4Hcl(g)√1

1. (a) Test (i) SO$\begin{matrix}2-\\3\end{matrix}$, SO$\begin{matrix}2-\\4\end{matrix}$ and CO$\begin{matrix}2-\\3\end{matrix}$ √1 present. at least two

Test (iii) A13+ √1 only penalize Pb2+

 (b) A13+  √½ penalize Pb2+

 SO$\begin{matrix}2-\\4\end{matrix}$ √½

1. Potassium hydroxide is a strong base √½ and dissociate /ionizes fully √½ giving more OH- ion √½

Ammonia is a weak base √½ hence ionizes partially in water.

1. (a) Iron (II) sulphide

 Dilute hydrochloric acid *mark as a pair for 1 mark.*

 NB: Any sulphide and dilute acid.

(b) Hydrogen sulphide

 Acidified potassium manganite (VII) is decoloured √½ and yellow deposit. √1

 Sulphur (IV) oxide

 Acidified potassium manganite (VII) is decolourised. √½

1. Mass of carbon in CO2 = $\frac{12}{44}$ x 5.28 = 1.44g √½

Mass of hydrogen in H2O = $\frac{2}{18}$ x 1.62 = 0.188 √½

Mass of oxygen = 2.58g – (1.44 + 0.18) = 0.96g √½

|  |  |  |
| --- | --- | --- |
| C  | H  | O  |
| $\frac{1.44}{12}$ $\frac{0.12}{0.06}$ 2 | $\frac{0.18}{1}$ $\frac{0.18}{0.06}$ 3 | $\frac{0.96}{16}$ √½$\frac{0.06}{0.06}$ √½1 |

 C2 H3 O1 √½

1. (a) Calcium oxide √1 Reject any other

(b) (i) Black Copper (II) oxide changes to brown copper metal √1

 (ii) Reducing agent √1

1. (a) Water √1

(b) Ethane √1

 (c) (i)

 

1. Drop a piece of sodium metal in distilled water √1 in a beaker, to the resulting solution add dilute nitric (IV) acid. √½ Evaporate √½ the resulting mixture to saturation and cool √½ for crystals to form, dry √½ crystals between filter papers.
2. (a) (i) Cold √½ and dilute √½ sodium hydroxide.

 (ii) Sodium hypochlorite (NaOCl) dissociates √½ giving out nascent oxygen √½ to the dye causing it to bleach.

 (b) Introduce a glass rod dipped in concentrated ammonia solution, √½ white fumes formed. √½

1.



1. Moles of Al2 (SO4)3 sulphate = $\frac{6.84}{342}$ = 0.02 moles √½

Molarity = $\frac{0.02 x 1000}{400}$ = 0.05m √½

Al2 (SO4)3(a) 2 Al$\begin{matrix}3+\\(aq)\end{matrix}$ + 3 SO4$\begin{matrix}2-\\09\end{matrix}$√½

Molarity of SO$\begin{matrix}2-\\4\end{matrix}$ = 0.05 x 3 = 0.15m √½

Number of SO$\begin{matrix}2-\\4\end{matrix}$ = 0.15 x 6.0 x 1023 √½

 = 9.0 x 1022 ions √½

 Accept alternative method

1. Burning magnesium √

Continues to burn, √½ a mixture of white solid and black specks formed. √½ Heat √½ produced decomposes carbon (IV) oxide to carbon and oxygen. √½

Burning splint

It extinguished/put off √½ carbon (IV) oxide does not support combustion. √½

1. (a)



(c) Water molecule has lone pair of electrons which it can dissolve to H+ √1

1. Heat zinc sulphate to saturation √½ and allow saturated solution to cool √½ for crystals to form.
2. 2 C2H6(g) + 5 O2(g) 4 CO2(g) + 6 H2O(l) √1

Volume of Ethane burned = $\frac{2 x 40}{5}$ = 16cm3 √½

Volume of ethane remaining = 120 – 16 = 104cm3√½

Volume of carbon (IV) oxide formed = $\frac{4 x 40}{5}$ = 32cm3

1. Brown fumes evolved, √1 carbon reduces nitric (V) acid to Nitrogen (IV) oxide √½ and water and carbon is oxidized to carbon (IV) oxide √½
2. (a) Mg(H CO3)2 √½

Ca (HCO3)2 √½

 (b) Contain calcium ions √1 required in bone formation and strengthening of teeth/ improve taste.

 (c) Mg(H CO3)2(aq) Mg CO3(s) + CO2(g) + H2O(l)

 Or

 Ca (HCO3)2(aq) COCO3(s) + CO2(g) + H2O(l)

 Penalize ½ mark for missing or wrong symbol.

1. (i) No effervescence /No bubbles √½

Hydrogen chloride gas in methylbenzene is not ionized. √½

 (ii) Effervescence/ Bubbles of gas √½

 Hydrogen chloride gas in methylbenzene ionizes and it is acidic. √½

1. (a) It is the heat change when one mole of a substance dissolves in water to form infinitely dilute solution / very dilute. √1

(b) Heat change = $\frac{50}{1000}$ x 4.2 kJ/Kg/K x 7 √½

 = 1.47KJ √½

 Moles of copper (II) sulphate = $\frac{50 x 0.2 }{1000}$ √½

 = 0.01 moles √½

 Molar heat of displacement of Copper (II) ions

 $\frac{1 x 1.47}{0.01}$ √½ = -147 KJ/mole√½

* ΔH(-) sign must be shown and units must be correct.
* Penalize fully if missing.
1. (a) Vanadium (V) oxide √1 or

Platinum

 (b) Reaction between Sulphur (VI) oxide and water is highly exothermic √1 and hence boil the acid

1. (a) Heat absorbed is used to weaken the forces √1 of attraction between the particles resulting in change of state.

Accept intermolecular forces.

 (b) (i) Latent heat of vaporization √½

 (ii) It is negative √1

1. Mass of saturated solution = (26.8g – 15.86g)

= 10.94g √½

 Mass of a solute = (16.86 – 15.86)g

 = 1g √½

 Mass of solvent = 10.94g – 1g = 9.94g √½

 If 1g 9.94g of water

 ? 60g of water

 =$\left(\frac{60 x 1}{9.94}\right)$ = 6.03g √½

 Mass of saturated solution = (60 + 6.03)g √½ = 66.03g √½