Year 11 Chemistry ***SOLUTIONS***

Equations and Calculations

Checkup

1.

(a)

(i) $CuI_{3\,(aq)} + HgBr_{2\,(aq)} \rightarrow CuBr_{3\,(aq)} + HgI_{2\,(s)}$

(ii) $Cu^{3+}_{(aq)} + I^{-}_{(aq)} + Hg^{2+}_{(aq)} + Br^{-}_{(aq)} \rightarrow Cu^{3+}_{(aq)} + Br^{-}_{(aq)} + HgI_{2\,(s)}$

(iii) $2I^{-}_{(aq)} + Hg^{2+}_{(aq)} \rightarrow HgI_{2\,(s)}$

(b)

(i) $(NH_4)_2CO_{3\,(aq)} + Al_2(SO_4)_{3\,(aq)} \rightarrow (NH_4)_2SO_{4\,(aq)} + Al_2(CO_3)_{3\,(s)}$

(ii) $NH_4^{+}{}_{(aq)} + CO_3^{2-}{}_{(aq)} + Al^{3+}_{(aq)} + SO_4^{2-}{}_{(aq)} \rightarrow NH_4^{+}{}_{(aq)} + SO_4^{2-}{}_{(aq)} + Al_2(CO_3)_{3\,(s)}$

(iii) $3CO_3^{2-}{}_{(aq)} + 2Al^{3+}_{(aq)} \rightarrow Al_2(CO_3)_{3\,(s)}$

2.

(a) $\mathbf{2}Mg + O_2 \rightarrow \mathbf{2}MgO$

(b) $n_{Mg} = \dfrac{m_{Mg}}{M_{Mg}} = \dfrac{13.5}{24.31} = 0.555 \text{ mol}$

(c) Mole ratio $\dfrac{n_{O_2}}{n_{Mg}} = \dfrac{1}{2}$

$\therefore n_{O_2} = \dfrac{1}{2} \times n_{Mg} = \dfrac{1}{2} \times 0.555 = 0.278 \text{ mol}$

(d) $m_{O_2} = n_{O_2} \times M_{O_2} = 0.278 \times 32.00 = 8.89 \text{ g}$

Bonus:

$Cu + \mathbf{4}HNO_3 \rightarrow Cu(NO_3)_2 + \mathbf{2}NO_2 + \mathbf{2}H_2O$

$n_{HNO_3} = C_{HNO_3} \times V_{HNO_3} = 2.0 \times 0.050 = 0.10 \text{ mol}$

$\dfrac{n_{NO_2}}{n_{HNO_3}} = \dfrac{2}{4}$

$\therefore n_{NO_2} = \dfrac{2}{4} \times n_{HNO_3} = \dfrac{2}{4} \times 0.10 = 0.050 \text{ mol}$

$m_{NO_2} = n_{NO_2} \times M_{NO_2} = 0.050 \times 46.01 = 2.3 \text{ g}$