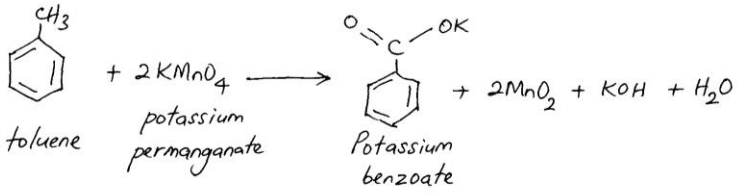
KTT 111 : Model Answers
Sem2 2005/2006 : Q1 : STOICHIOMETRY

Sem 2 (2005/2006) : Stoichiometry

Q5 (a)



toluene — Potassium benzoate

71% yield ≡ 11.5 g pot. benzoate

∴ 100% yield ≡ $\left(\frac{100 \times 11.5}{71}\right)$ g = 16.20 g

M_r (pot. benzoate) = 160.21 g mol^{-1})
M_r (toluene) = 92.14 g mol^{-1})

n (pot. benzoate) = $\left(\frac{16.20\ g}{160.21\ g\ mol^{-1}}\right)$ = 0.1011 moles

n (toluene) = n (pot. benzoate) = 0.1011 moles

∴ m (toluene) = (0.1011 × 92.14) g
= 9.3 g (Ans)

Q5 (b) $Ba(NO_3)_2(aq) + Na_2SO_4(aq) \longrightarrow BaSO_4(s) + 2NaNO_3(aq)$

∵ $M_r[Ba(NO_3)_2] = 261.34\ g\ mol^{-1}$

$n(Ba(NO_3)_2) = \left(\frac{82.0\ g}{261.34\ g\ mol^{-1}}\right) = 0.3138$ moles

$M_r(BaSO_4) = 233.3876\ g\ mol^{-1}$

$n_{BaSO_4} = n_{Ba(NO_3)_2} = (0.3138 \times 233.3876)$ g
= 73.23 g

∴ The theoretical mass of $BaSO_4$ = 73.23 g (Ans)

% yield = $\left(\frac{65.27}{73.23} \times 100\right)$ = 89.1 (Ans)

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Sem 2 (2005/2006) : Stoichiometry

Q5(c)(i) $6H^+ + 5H_2O_2 + 2MnO_4^- \longrightarrow 5O_2 + 2Mn^{2+} + 8H_2O$

$?g$ $17.60mL$ $0.02000M$ $M_r(H_2O_2) = 34.0148 g mol^{-1}$

$$\frac{n_{H_2O_2}}{n_{MnO_4^-}} = \frac{5}{2} \Rightarrow n_{H_2O_2} = \frac{5}{2} \times n_{MnO_4^-}$$

$$\left(\frac{m}{34.0148}\right) = \frac{5}{2} \times \frac{MV}{1000}$$

$$\frac{m}{34.0148} = \frac{5}{2} \times \frac{(0.02000M)(17.60mL)}{1000}$$

$$\therefore m_{H_2O_2} = \frac{5(0.02000)(17.60)(34.0148)}{2 \times 1000} g$$

$$= 0.02993 g \text{ (Ans)}$$

Q5(c)(ii) The percentage of H_2O_2 in the original solution $= \frac{0.02993}{1.000} \times 100\%$

$= 2.993\%$ (Ans)

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