

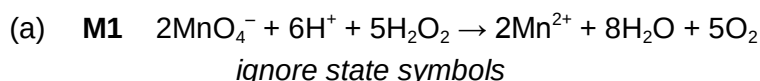
Name of the Student: _____

Max. Marks : 17 Marks

Time : 17 Minutes

Mark Schemes

Q1.



1

M2 $n(\text{MnO}_4^-) = \frac{0.020 \times 35.85}{1000} = 7.17 \times 10^{-4} \text{ (mol)}$

1

M3 $n(\text{H}_2\text{O}_2) = 7.17 \times 10^{-4} \times 5/2 = 1.793 \times 10^{-3} \text{ (mol)}$
 $M3 = M2 \times 5/2$

1

M4 $\text{conc}(\text{H}_2\text{O}_2 \text{ in sample}) = \frac{1.793 \times 10^{-3}}{25 \times 10^{-3}} = 0.0717 \text{ (mol dm}^{-3}\text{)}$
 $M4 = \frac{M3 \times 100}{25}$

1

M5 $\text{original conc of H}_2\text{O}_2 (= 0.0717 \times 20 = 1.43 \text{ (mol dm}^{-3}\text{)})$
 $M5 = \frac{M4 \times 100}{5}$
allow 1.43–1.44

1

alternative answer using 3:4 ratio given on question paper

$M3 = 7.17 \times 10^{-4} \times 4/3 = 9.56 \times 10^{-4}$

$M4 = 0.0382 \text{ (mol dm}^{-3}\text{)}$

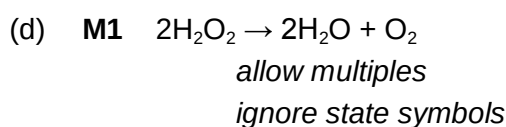
$M5 = 0.765 \text{ (mol dm}^{-3}\text{)}$

- (b) KMnO_4 is self-indicating
or
 KMnO_4 is no longer decolourised at end point
or
 (solution) changes (from colourless) to (pale) pink/purple at end point

1

(c) -1

1



1

M2 $V = 185 \times 10^{-6} \text{ (m}^3\text{)}$ and $P = 100\,000 \text{ (Pa)}$
unit conversions

1

M3 $n = \frac{PV}{RT} = \frac{100\,000 \times 185 \times 10^{-6}}{8.31 \times 298}$
rearrangement of ideal gas equation

1

M4 $n(\text{O}_2) = 7.47 \times 10^{-3} \text{ (mol)}$
calculation

1

M5 $n(\text{H}_2\text{O}_2) = (7.47 \times 10^{-3} \times 2) = 0.0149 \text{ mol}$
allow M4 $\times 2$ to 2 sig fig or more

1

if incorrect rearrangement in M3 can score M1, M2 and M5

(e) **M1** enthalpy (change) to break 1 mol bonds (in gaseous state)
allow heat energy (change) to break 1 mol bonds
allow the enthalpy needed to break 1 mol bonds
*do **not** accept enthalpy released*

1

M2 averaged over a range of compounds / molecules

1

M3 $-789 = 4(388) + 163 + 4(463) + 2(\text{O}-\text{O}) - 944 - 8(463)$
or $-789 = 4(388) + 163 + 2(\text{O}-) - 944 - 4(463)$
or $-789 = 3567 + 2(\text{O}-\text{O}) - 4648$
or $-789 = 1715 + 2(\text{O}-\text{O}) - 2796$

1

M4 $2(\text{O}-\text{O}) = \underline{292} \text{ (kJ mol}^{-1}\text{)}$

1

M5 $\text{O}-\text{O} = 146 \text{ (kJ mol}^{-1}\text{)}$
 $M5 = M4 \div 2$

1

[17]