

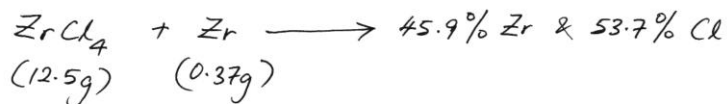
KSCP (2001/02) : Stoichiometry

$$Q_1(a)(i) \quad n_{Zr} : n_{Cl} = \frac{39.0}{91.224} : \frac{60.6}{35.4527} \quad \left(\begin{array}{l} Zr = 91.224 \\ Cl = 35.4527 \end{array} \right)$$

$$= 0.4275 : 1.7093$$

$$= 1 : 4$$

Empirical formula = $ZrCl_4$ (Ans)



$$n_{Zr} : n_{Cl} = \frac{45.9}{91.224} : \frac{53.7}{35.4527}$$

$$= 0.5032 : 1.5147$$

$$= 1 : \frac{1.5147}{0.5032}$$

$$= 1 : 3$$

Empirical formula : $ZrCl_3$ (Ans)

$$(ii) \quad (ZrCl_4)_n = 233.02$$

$$[91.224 + 4(35.4527)]n = 233.02$$

$$(233.03)n = 233.02$$

$$n = 1$$

Molecular formula : $ZrCl_4$ (Ans)

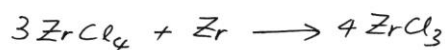
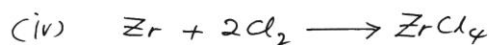
$$(iii) \quad (ZrCl_3)_n = 197.57$$

$$[91.224 + 3(35.4527)]n = 197.57$$

$$197.58n = 197.57$$

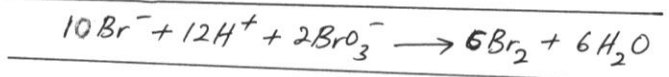
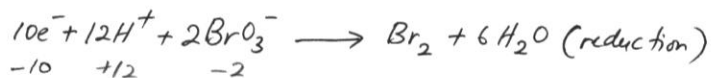
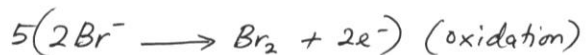
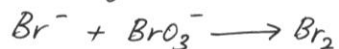
$$n = 1$$

Molecular formula = $ZrCl_3$ (Ans)



$$(v) \quad \left. \begin{array}{l} ZrCl_4 \\ +x-4=0 \\ x=+4 \end{array} \right\} \begin{array}{l} \text{oxidation} \\ \text{no for Zr} \\ = +4 \end{array} \quad \left. \begin{array}{l} ZrCl_3 \\ +x-3 \\ x=+3 \end{array} \right\} \begin{array}{l} \text{oxidation no.} \\ \text{for Zr} \\ = +3 \end{array}$$

Q₁(b) Balancing redox equation.



Q₁(c) $0.335\% = (4 \times 55.847) \text{ g}$

$$\therefore 100\% = \left(\frac{100 \times 4 \times 55.847}{0.335} \right) \text{ g}$$

$$= 66682.98$$

$$= 66683.0 \text{ g}$$

Relative molecular mass = 66683.0

of hemoglobin @ 6.7×10^4 (Ans)