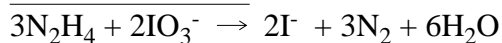
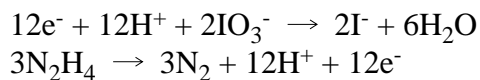
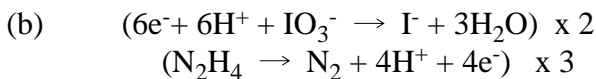


Reducing agent: HNO_2 Oxidizing agent: MnO_4^-



Reducing agent: N_2H_4 Oxidizing agent: IO_3^-

2. Let x be the oxidation number of the underlined element.

(a) $2x + 5(-2) + 2(-1) = 0$ $2x = 12$ $x = 6$ for S

(b) $2x + 4(1) = 0$ $2x = -4$ $x = -2$ for N

(c) $x + 2(2) + 4(-2) = 0$

$x = 4$ for V

(d) $x + 2(-2) = 1$

$x = 5$ for N

(e) $2x + 8(-1) + 2 = 0$ $2x = 6$ $x = 3$ for B

3. MW of $\text{C}_{10}\text{H}_8 = 128 \text{ g/mol}$ $\Delta T = 5.70 - 3.00 = 2.70^\circ\text{C}$

$$\Delta T = K_f m \quad 2.70 = 7.00 \times m \quad m = 0.386 \text{ mol/kg}$$

$$\text{mass of } \text{C}_{10}\text{H}_8 = 0.300 \text{ kg} \times \frac{0.386 \text{ mol}}{1 \text{ kg}} \times \frac{128 \text{ g}}{1 \text{ mol}} = 14.8 \text{ g}$$

4. $\Delta T = 2.33^\circ\text{C}$ $2.33 = 1.86 \times m$ $m = 1.25 \text{ mol/kg}$

$$0.100 \text{ kg} \times \frac{1.25 \text{ mol}}{1 \text{ kg}} = 0.125 \text{ mol}$$

$$\text{MW} = \text{g/mol} = \frac{22.0 \text{ g}}{0.125 \text{ mol}} = 176 \text{ g/mol}$$

5. For 37 g of HCl, there are $100 - 37 = 63 \text{ g H}_2\text{O}$ $\text{kg H}_2\text{O} = 0.063$

$$\text{moles HCl} = 37 \text{ g} \times \frac{1 \text{ mol}}{36.45 \text{ g}} = 1.015 \text{ mole}$$

$$\text{molality} = \frac{1.015 \text{ mol HCl}}{0.063 \text{ kg H}_2\text{O}} = 16 \text{ m}$$

6. For 1.5 moles NaCl, there are 1000 g H₂O

$$\text{mass NaCl} = 1.5 \text{ mol} \times \frac{58.45 \text{ g}}{1 \text{ mol}} = 87.7 \text{ g}$$

$$\text{total mass (solute + solvent)} = 1000 + 87.7 = 1087.7 \text{ g}$$

$$\% \text{ NaCl} = \frac{87.7 \text{ g}}{1087.7 \text{ g}} \times 100 = 8.1\%$$

7. In 1 L, there are 2 moles of LiBH₄

$$\text{mass of LiBH}_4 = 2.0 \text{ mol} \times \frac{21.8 \text{ g}}{1 \text{ mol}} = 43.6 \text{ g}$$

$$\text{mass of 1000 mL of solution} = 1000 \text{ mL} \times \frac{0.896 \text{ g}}{1 \text{ mL}} = 896 \text{ g}$$

$$\text{mass of THF} = 896 - 43.6 = 852.4 \text{ g} = 0.8524 \text{ kg}$$

$$\text{molality} = \frac{2.0 \text{ mol}}{0.8524 \text{ kg}} = 2.3 \text{ m}$$