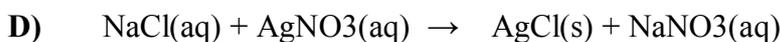
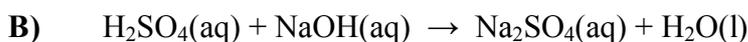
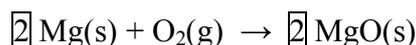
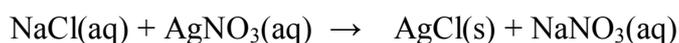
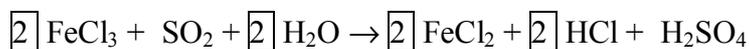
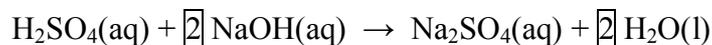


Olimpíadas de Química⁺ 2006

Soluções

1. Química Básica

A)



E) 1 mol MgO consome 0,5 mol O₂

$$8,0 \text{ g} / 40,3 \text{ g mol}^{-1} = 0,1985 \text{ mol}$$

$$0,1985 \times 0,5 \times 32 = 3,2 \text{ g}$$

2. Uma breve história do Universo

A) $T = 10^{10} \text{ K}$

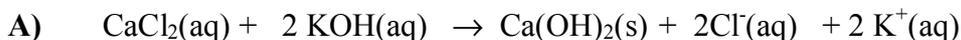
B) $t = (10^{10} / 3000)^2 = 1,11 \times 10^{13} \text{ s} = 3,5 \times 10^5 \text{ anos}$

C) $t = (10^{10} / 1000)^2 = 1,0 \times 10^{14} \text{ s} = 3,2 \times 10^6 \text{ anos}$

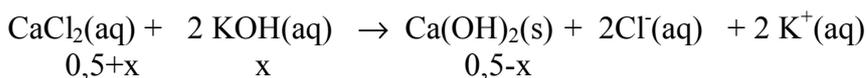
D) $T = 10^{10} / (3 \times 10^8 \times 365,25 \times 24 \times 60 \times 60)^{1/2} = 103 \text{ K}$

E) $T = 10^{10} / (15 \times 10^9 \times 365,25 \times 24 \times 60 \times 60)^{1/2} = 15 \text{ K}$

3. Solubilidade de sais de cálcio



B) Após mistura, $[\text{Ca}^{2+}] = [\text{OH}^-] = 1,0 \text{ mol dm}^{-3}$



$$K_s = 6,5 \times 10^{-6} = (0,5+x) x^2 \approx 0,5x^2$$

$$x \approx 3,6 \times 10^{-3}$$

$$\text{Ca}(\text{OH})_2 \text{ formado } (0,5 - 3,6 \times 10^{-3}) \times 0,2 = 0,099 \text{ mol}$$

$$\text{Massa} = 0,099 \times 74,1 = 7,34 \text{ g}$$

C) $[\text{Ca}^{2+}] = 9,0 \times 10^{-3}$

$$\text{pH} = 12, [\text{OH}^-] = 1,0 \times 10^{-2}$$

$$Q = [\text{Ca}^{2+}][\text{OH}^-]^2 = 9,0 \times 10^{-3} \times (1,0 \times 10^{-2})^2 = 9,0 \cdot 10^{-7}$$

$Q < K_s$, logo não há formação de precipitado.

4. Nível de Ozono no ar



B)

C) $7,76 \times 10^{-7} \text{ mol dm}^{-3} \times 0,010 \text{ dm}^{-3} = 7,76 \times 10^{-9} \text{ mol de O}_3(\text{g})$

D) Volume de ar = $250 \text{ mL min}^{-1} \times 30 \text{ min} = 7500 \text{ mL} = 7,5 \text{ dm}^{-3}$
 Concentração = $7,76 \times 10^{-9} \text{ mol} / 7,5 \text{ dm}^{-3} = 1,03 \cdot 10^{-9} \text{ mol dm}^{-3}$

5. Ligação química

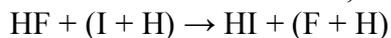
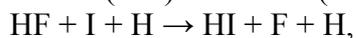
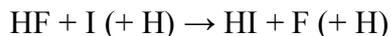
A – 85 pm (HF) e 160 pm (HI)

B – 1080 kJ mol^{-1}

C – -800 kJ mol^{-1}

D – 350-400 pm, porque a energia já não depende de r para valores superiores.

E – Somando H de ambos os lados da equação,



$$-1840 + (-840) \rightarrow -1640 + (-760), -2680 \rightarrow -2400$$

$$E_{\text{final}} - E_{\text{inicial}} = -2400 + 2680 = 280 \text{ kJ mol}^{-1}$$