

2018-2019年第一学期(大学化学(II)-1) B卷
参考答案

一. 选择题

ACBCD CDDCC DCCBA ACDBA

二. 填空题

1. $r = k[A][B]$

2. 不变; 增大; 不确定; 减小; 增大; 不变

3. 光学; 动力; 电学

4. $[A]$; t ; $-k$

5. $k_1^\ominus / k_2^\ominus$

6. P_4

三. 简答题

1. (1) $r = k[NO]^2[H_2]$

(2) $\text{mol}^{-1} \cdot \text{dm}^3 \cdot \text{s}^{-1}$

2. (1) 絮凝; (2) 渗透压

3. (1) E_a, E_a' 均降低; (2) 不变; (3) 不变

4. $[(AgCl)_m \cdot nCl^- \cdot (n-x)K^+]^x \cdot xK^+$ 带负电

5. (1) 正 (2) 负

四. 计算题

1. $Q_I = 315.0 \text{ J}$ $W_I = 115.0 \text{ J}$ $W_{II} = -80.0 \text{ J}$

$$Q_{II} - W_{II} = Q_I - W_I$$

$$Q_{II} = Q_I - W_I + W_{II} = 315.0 - 115.0 + (-80.0) = 120.0 \text{ J}$$

2. (1) $\Delta_r H_m^\ominus = 0 + 62.44 - 2 \times 26.48 = 9.48 \text{ kJ} \cdot \text{mol}^{-1}$

$$\Delta_r S_m^\ominus = (0 + 260.49) - 2 \times 206.59 = -152.69 \text{ J} \cdot \text{mol}^{-1} \cdot \text{K}^{-1}$$

$$\Delta_r G_m^\ominus = \Delta_r H_m^\ominus - T \Delta_r S_m^\ominus$$

$$= 9.48 - 298.15 \times (-152.69) \times 10^{-3} = 55.00 \text{ kJ} \cdot \text{mol}^{-1} > 0$$

反应逆向进行

$$(2) \Delta_r G_m = \Delta_r G_m^\ominus + RT \ln Q$$

$$= 55.00 + 8.314 \times 298.15 \times 10^{-3} \ln \frac{10.0 \times 1.0}{100^2}$$

$$= 37.88 \text{ kJ} \cdot \text{mol}^{-1} > 0$$

反应逆向进行

$$(3) K^\ominus = \exp\left(-\frac{\Delta_r G_m^\ominus}{RT}\right) = \exp\left(-\frac{55.00 \times 10^3}{8.314 \times 298.15}\right) = 2.31 \times 10^{-10}$$

$$3. (1) P_{\text{总}} = P_{\text{CH}_4} + P_{\text{H}_2} + P_{\text{CO}} = 124.1 \text{ kPa} \quad P_0 = \frac{124.1}{3} = 41.4 \text{ kPa}$$

$$m = \frac{PVM}{RT} = \frac{41.4 \times 1.000 \times 46}{8.314 \times 777} = 0.29 \text{ (g)}$$

$$(2) P_0 - P' = 3P' = 103.8 \text{ kPa} \quad P' = 31.2 \text{ kPa}$$

$$P = P_0 - P' = 10.2 \text{ kPa}$$

$$\lg \frac{P}{P_0} = \frac{kt}{2.30} \quad \lg \frac{10.2}{41.4} = \frac{k \times 3155}{2.30} \quad k = 4.44 \times 10^{-4} \text{ s}^{-1}$$

$$t_{1/2} = 0.693 / (4.44 \times 10^{-4}) = 1.56 \times 10^3 \text{ (s)}$$

$$4. \ln \frac{k_2}{k_1} = \frac{E_a}{R} \left(\frac{1}{T_1} - \frac{1}{T_2} \right)$$

$$\ln \frac{4.98 \times 10^{-5}}{1.35 \times 10^{-5}} = \frac{E_a}{8.314} \left(\frac{1}{308} - \frac{1}{318} \right)$$

$$E_a = 106.29 \text{ kJ} \cdot \text{mol}^{-1}$$