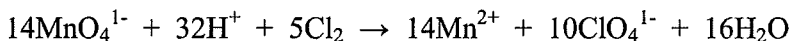


CHEM 1210
 Optional Quiz version 1
 Redox, equivalents and electrochemistry

Name: ANSWERS

1) Given the following balanced redox reaction:



a) How many electrons are transferred in the reaction? 14x5=70

b) What is the reduction agent? Cl₂

c) 100.0 mg of Cl₂ reacts with 25.8 mL of KMnO₄ solution, what is the normality of the KMnO₄ solution.

$$100 \text{ mg} \times \frac{1 \text{ mol}}{70.906 \text{ g}} \times \frac{14 \text{ e}^-}{1 \text{ mol}} = 19.74 \text{ mmol e}^-$$

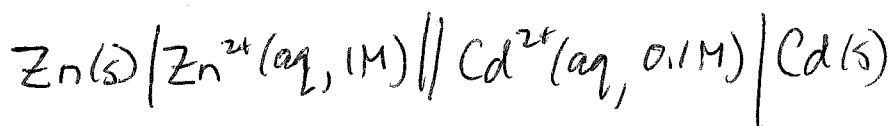
$$\frac{19.74 \text{ mmol e}^-}{25.8 \text{ mL}} = \boxed{0.765 \text{ N}}$$

$$8\text{H}_2\text{O} + \text{Cl}_2 \rightarrow 2\text{ClO}_4^- + 16\text{H}^+ + 14\text{e}^-$$

2) An electrochemical cell is made by immersing a piece of Cd metal into a solution of 0.100 M CdSO₄ and a Zn electrode into a solution of 1.00 M ZnSO₄ and placing a salt bridge to allow ion flow between the two solutions.

The reduction potential for Cd is -0.403 V and for Zn is -0.762 V

a) Write the standard cell notation for the functional galvanic cell.



b) Determine the cell voltage for the given conditions.

$$\text{Zn} \rightarrow \text{Zn}^{2+}(1\text{M}) + 2\text{e}^- \quad Q = \frac{1}{0.1} = 10$$

$$\text{Cd}^{2+}(0.1) + 2\text{e}^- \rightarrow \text{Cd(s)}$$

$$E^\circ = 0.762 - 0.403 = 0.359 \text{ V}$$

$$E = 0.359 - \frac{0.059159}{2} \log(10) = \boxed{0.329 \text{ V}}$$

c) Determine the equilibrium constant for the reaction.

$$E^\circ = \frac{0.059159}{2} \log K \Rightarrow \boxed{K = 1.37 \times 10^{12}}$$

turn over.....

3) a) How much time is required to plate 1.00 g of silver metal from a 1.00 M solution of AgNO_3 using a current of 2.50 A?

$$1\text{g} \times \frac{1\text{mol}}{107.87\text{g}} \times \frac{1e^-}{1\text{mol}} \times \frac{96485.3365\text{ coul}}{1\text{mol}} \times \frac{1\text{S}}{2.5\text{ coul}} = \boxed{358\text{S}}$$

b) How does the amount of time required change if the AgNO_3 solution is 2.00 M?

Time should not be affected by a change in $[\text{AgNO}_3]$.

turn over.....