

12/15

Very Good

Time: 10'

Chem 205
Drop Quiz 2

Friday, March 9, 2012
H. Deeb

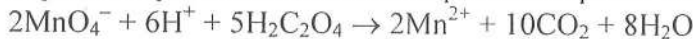
Name:



1. What is the oxidation number of Cl in ClO_4^- ?

ox. nb of O is -2, $\Rightarrow 4(-2) + \text{o.n}(\text{Cl}) = -1 \Rightarrow -8 + \text{o.n}(\text{Cl}) = -1$
 $\Rightarrow \text{o.n}(\text{Cl}) = -1 + 8 = +7$ (3)

2. Oxalic acid ($\text{H}_2\text{C}_2\text{O}_4$, molar mass = 90.04 g/mol) is present in many plants and vegetables. 24.0 mL of 0.0100 M KMnO_4 solution is needed to titrate 1.00 g of impure sample of $\text{H}_2\text{C}_2\text{O}_4$ to the equivalence point. The equation is:



a) What is the number of moles of oxalic acid titrated?

KMnO_4 $\left\{ \begin{array}{l} V = 24 \text{ mL} \\ M = 0.0100 \end{array} \right.$

$M = \frac{n}{V} \Rightarrow n = M \cdot V$
 $= 0.0100 \times 24 \times 10^{-3}$
 $= 2.4 \times 10^{-4} \text{ mole.}$

$2n(\text{H}_2\text{C}_2\text{O}_4) = 5n(\text{MnO}_4^-)$
 $\Rightarrow n(\text{H}_2\text{C}_2\text{O}_4) = \frac{5n(\text{MnO}_4^-)}{2}$
 $= \frac{5 \times 2.4 \times 10^{-4}}{2}$
 $= 6 \times 10^{-4} \text{ mole.}$ (3)



Acc. to stoichiometry and at equivalence

b) What is the percent by mass of $\text{H}_2\text{C}_2\text{O}_4$ in the sample?

$\% = \frac{M \text{ of } \text{H}_2\text{C}_2\text{O}_4 \times 100}{M \text{ of unknown}} = \frac{0.05 \times 100}{1} = 0.05 \times 100 = 5\%$

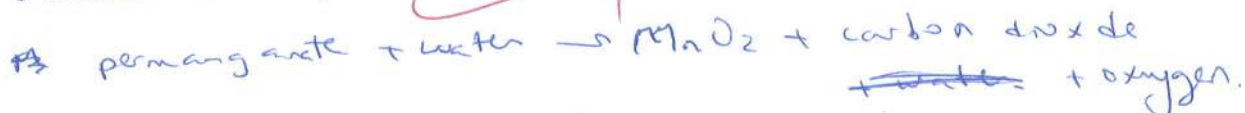
$M_{\text{H}_2\text{C}_2\text{O}_4} = n \times M_{\text{molar}}$
 $= 6 \times 10^{-4} \times 90.04$
 $= 0.05 \text{ g.}$ (3)

c) What is the reducing agent in the above reaction?

$4(-2) + \text{Mn} = -1$ o.n of Mn^{2+} is +2
 $\text{Mn} = -1 + 8$
 $\text{o.n}(\text{Mn}) = +7$
oxidation $\rightarrow (+7 \rightarrow +2)$
 \Rightarrow reduction \Rightarrow Mn is oxidizing agent.
 $\Rightarrow \text{H}_2\text{C}_2\text{O}_4$ is reducing agent. (3)

3. A potassium permanganate aqueous solution that is old prepared is often characterized by the presence of suspended brown solid particles. What are these particles, and how they are formed?

These particles are MnO_2 (brown particles).
They are formed when KMnO_4 reacts w/ water (oxidized water) since it's ~~not~~ MnO_4^- is unstable in aqueous solution. (2)





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Chem 205
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Friday, Feb. 22, 2013
H. Deeb

Name: _____

1. What is the oxidation number of Cr in K_2CrO_4 ?

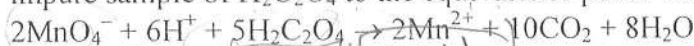
$$2(+1) + Cr + 4(-2) = 0$$

$$2 + Cr - 8 = 0$$

$Cr = +6$

$2 \times 1 + 1 \times Cr - 4 \times 2 = 0$
 $2 + Cr - 8 = 0$
 $Cr = +6$

2. Oxalic acid ($H_2C_2O_4$, molar mass = 90.04 g/mol) is present in many plants and vegetables. 24.0 mL of 0.0100 M $KMnO_4$ solution is needed to titrate 1.00 g of impure sample of $H_2C_2O_4$ to the equivalence point. The equation is:



2×0.01 2.4×10^{-4} 0.01
a) What is the number of moles of oxalic acid titrated?

$$\frac{n_{MnO_4^-}}{2} = \frac{n_{H_2C_2O_4}}{5}$$

$$n_{H_2C_2O_4} = \frac{5 n_{MnO_4^-}}{2} = \frac{5 \times 0.0100 \times 24.0 \times 10^{-3}}{2} = 6.00 \times 10^{-4}$$

b) What is the percent by mass of $H_2C_2O_4$ in the sample?

$$\frac{m_{H_2C_2O_4}}{m_{\text{sample}}} \times 100 = \frac{6.00 \times 10^{-4} \times 90.04}{1.00} \times 100 = 5.40\%$$

$$\% = \frac{0.0540 \times 100}{1} = 5.40\%$$

$$M_{H_2C_2O_4} = \frac{m}{n} \Rightarrow m = n \times M = 6.00 \times 10^{-4} \times 90.04 = 0.0540 \text{ g}$$

c) What will be the change in color at the end point in this titration? (assume that the $KMnO_4$ is added using the buret)

The color will be pink at the end point.
Initial color? (colorless)

d) Write the balanced oxidation half reaction involved.

