14/15 Very Good

Time: 10' **Chem 205** **Friday, March 9, 2012**
Drop Quiz 2 **H. Deeb**

Name:

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

ox. nb of O is -2, => 4(-2) + o.n(Cl) = -1 => -8 + o.n(Cl) = -1
=> o.n(Cl) = -1 + 8 = +7 (3)

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:
$2MnO_4^- + 6H^+ + 5H_2C_2O_4 \rightarrow 2Mn^{2+} + 10CO_2 + 8H_2O$

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

$KMnO_4$ | V = 24 ml, M = 0.0100

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

Acc. to stochiometry and at equivalence
$\frac{n \text{ of } (KMnO_4)}{2} = \frac{n(H_2C_2O_4)}{5} \Rightarrow$

$2n(H_2C_2O_4) = 5\,n(MnO_4)$
$\Rightarrow n\,H_2C_2O_4 = \frac{5 \times n\,MnO_4}{2}$
$= \frac{5 \times 2.4 \times 10^{-4}}{2}$
$= 6 \times 10^{-4}$ mole. (5)

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

% mass $= \frac{M \text{ of } H_2C_2O_4}{M \text{ of unknown}} \times 100 = \frac{0.05}{1} \times 100 = 0.05\,g \times 100$
$= 5\%$ (3)

$M_{H_2C_2O_4} = n \times M_{mm}$
$= 6 \times 10^{-4} \times 90.04$
$= 0.05$ g.

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

4(-2) + Mn = -1 (3)
Mn = -1 + 8
o.n(Mn) = +7

o.n of Mn^{2+} is +2
oxidation nb $(+7 \rightarrow +2)$
=> reduction => Mn is oxidizing agent
=> $H_2C_2O_4$ is reducing agent.

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? (2)

These particles are MnO_2 (brown particles).
They are formed when MnO_4 reacts w water (oxidizes water) since ~~it's~~ ~~water~~ MnO_4 is unstable in aqeous solution.

permanganate + water → MnO_2 + carbon dioxide ~~+ water~~ + oxygen.

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Time: 10' | Chem 205 Drop Quiz 2 | 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. 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:

$2MnO_4^- + 6H^+ + 5H_2C_2O_4 \rightarrow 2Mn^{2+} + 10CO_2 + 8H_2O$

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?

$n_{H_2C_2O_4} = \frac{m}{M} \Rightarrow m = n \times M = 6{,}00 \times 10^{-4} \times 90{,}04$

$= 0{,}0540$ g.

$\% = \frac{0{,}0540 \times 100}{1} = 5{,}40$

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? (-1)

d) Write the balanced oxidation half reaction involved.

$H_2C_2O_4 \rightarrow 2CO_2 + 2H^+ + 2e^-$ (-1)

$MnO_4^- + 8H^+ \rightarrow Mn^{2+} + 4H_2O$