General Chemistry Laboratory I

REPORT – 4 – (Oxidation Reduction Titration)

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Fill in the blanks.

Oxidation is a process in which the oxidation states of some element increases as electrons are lost. Electrons appear on the right side of a half-equation.

Reduction is a process in which the oxidation states of some element decreases as electrons are gained. Electrons appear on the left side of a half-equation.

Experimental

Oxidation

$C2O4^{\{2-\}} \rightarrow 2CO2 + 2e^-$

Reduction

$MnO_4^{\mp}8H^+ + 5e^- \rightarrow Mn^{\{2+\}} + 4H_2O$

Overall

$5C2O4^{\{2-\}} + 2MnO4^{\mp}16H^+ \rightarrow 10CO2 + 2Mn^{\{2+\}} + 8H2O$

Why an indicator is not used in the experiment?

Because $KMnO_4$ is self-indicating.

Calculation

In the experiment, a 0.7932 g of solid unknown requires 13.25 ml of 0.059 M KMnO4 titrantat the point color changes. Calculate the percent of sodium oxalate in the unknown sample.(Molecular Weight K2C2O4 = 166.22 g/mol)

Step – 1 Moles of $KMnO_4$

$n = M \times V = n_{\{KMnO_4\}} = 0.059 \times 0.01325 = 7.8175 \times 10^{-4}$ mole

Step 2 – Stoichiometry

$2\ MnO_4^- \rightarrow 5\ C_2O_4^{2-} \qquad 1\ MnO_4^- \rightarrow \frac{5}{2} = 2.5\ C_2O_4^{2-}$

Step 3 – Moles of oxalate

$n_{C_2O_4^{2-}}$

$= 2.5 \times 7.8175 \times 10^{-4}$

$= 1.9544 \times 10^{-3}$ mol

Step 4 – Mass of sodium oxalate

$m = n \times MM$

$= 1.9544 \times 10^{-3} \times 166.22$

$= 0.3249$ g

Step 5 – Percent in sample

$$\% = \frac{0.3249}{0.7932} \times 100$$

$= 40.96\%$

Conclusion

If some unknown sample is spilled and lost after weighing but before titration calculated percent oxalate will be too large. Because you record original large mass on the paper but you actually titrate a smaller mass. So the amount of oxalate seems larger relative to the falsely large mass you wrote which increases the percent value.