# Balancing Redox Reactions

9. $\overset{0}{Cu} + \overset{+5\ -6}{NO_3^-} + \overset{+1}{H^+} \longrightarrow \overset{2+}{Cu^{2+}} + \overset{+4\ -2}{NO_2} + \overset{+1\ -2}{H_2O}$

$\overset{+4\ -4}{}$

$$Cu \longrightarrow Cu^{2+} + 2e^-$$

$$[2H^+ + NO_3^- + e^- \longrightarrow NO_2 + H_2O] \times 2$$

$$Cu \longrightarrow Cu^{2+} + 2e^-$$

$$4H^+ + 2NO_3^- + 2e^- \longrightarrow 2NO_2 + 2H_2O$$

$$4H^+ + 2NO_3^- + \cancel{2e^-} + Cu \longrightarrow Cu^{2+} + \cancel{2e^-} + 2NO_2 + 2H_2O$$

10. $\overset{+1\ -2}{N_2O} + \overset{+1\ -2}{ClO^-} \rightarrow \overset{-1}{Cl^-} + \overset{+4\ -2}{NO_2}$

$\overset{+2\ -2}{N_2O}$ $\overset{+1\ -2}{ClO^-}$ $\overset{+4\ -4}{NO_2}$

Oxid. $6OH^- + N_2O \rightarrow 2NO_2 + 6e^- + 3H_2O$

[Red. $H_2O + ClO^- + 2e^- \rightarrow Cl^- + 2OH^-$] x3

$6OH^- + N_2O + 3H_2O + 3ClO^- + 6e^- \rightarrow 2NO_2 + 6e^- + 3H_2O + 3Cl^- + 6OH^-$

$N_2O + 3ClO^- \rightarrow 2NO_2 + 3Cl^-$

Balance- $Cr_2O_7^{-2} + I^- \rightarrow Cr^{+3} + I_2$ (acidic)

# Faraday's Laws-Stoichiometry

The amount of product of an electrolysis reaction depends on -

1. Mass
2. Time
3. Electrical current

**Definitions -**

1 Coulomb = 1 Ampère x 1 sec.
(charge) (current)

Faraday's Constant 1 mol $e^-$ = 96 500 Coul.

Example- what mass of $Cu_{(s)}$ is deposited on a cathode dipped in $CuSO_{4\,(aq)}$ by a 5.0 A current for 30 min?

a) $30 \text{ min} \times \frac{60 \text{ s}}{1 \text{ min}} = 1800 \text{ s}$

b) $5.0 \text{ A} \times 1800 \text{ s} = 9000 \text{ C}$

c) $9000 \text{ C} \times \frac{1 \text{ mole}^-}{96\,500 \text{ C}} = 0.093 \text{ mole}^-$

Faraday's constant

d) Use $\frac{1}{2}$ rxn $Cu^{2+} + 2e^- \rightarrow Cu$

e) $0.093 \text{ mol } e^- \times \frac{1 \text{ mol Cu}}{2 \text{ mole}^-} = 0.047 \text{ mol Cu}$

f) $0.047 \text{ mol Cu} \times \frac{63.55 \text{ g Cu}}{1 \text{ mol Cu}} = 3.0 \text{ g Cu}$

periodic table

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