STAWA
SCIENCE TEACHERS' ASSOCIATION OF WESTERN AUSTRALIA
EXPLORING CHEMISTRY STAGE 3

Oxidation and Reduction Set 21: Balancing Redox Equations

1. (a) $2I^- \rightarrow I_2 + 2e^-$
$C\ell_2 + 2e^- \rightarrow 2C\ell^-$
$2I^- + C\ell_2 \rightarrow I_2 + 2C\ell^-$

(b) $Cu \rightarrow Cu^{2+} + 2e-$
$Au^+ + e^- \rightarrow Au$ x 2
$Cu + 2Au^+ \rightarrow Cu^{2+} + 2Au$

(c) $Zn \rightarrow Zn^{2+} + 2e^-$
$Pb^{2+} + 2e^- \rightarrow Pb$
$Zn + Pb^{2+} \rightarrow Zn^{2+} + Pb$

(d) $Fe \rightarrow Fe^{2+} + 2e^-$
$2H^+ + 2e^- \rightarrow H_2$
$Fe + 2H^+ \rightarrow Fe^{2+} + H_2$

(e) $K \rightarrow K^+ + e^-$ x 2
$2H_2O + 2e^- \rightarrow H_2 + 2OH^-$
$2K + 2H_2O \rightarrow 2K^+ + H_2 + 2OH^-$

(f) $A\ell \rightarrow A\ell^{3+} + 3e^-$ x 2
$2H^+ + 2e^- \rightarrow H_2$ x 3
$2A\ell + 6H^+ \rightarrow 2A\ell^{3+} + 3H_2$

(g) $Pb \rightarrow Pb^{2+} + 2e^-$
$Cu^{2+} + 2e^- \rightarrow Cu$
$Pb + Cu^{2+} \rightarrow Pb^{2+} + Cu$

(h) $A\ell \rightarrow A\ell^{3+} + 3e^-$ x 2
$Zn^{2+} + 2e^- \rightarrow Zn$ x 3
$2A\ell + 3Zn^{2+} \rightarrow 2A\ell^{3+} + 3Zn$

(i) $Cu \rightarrow Cu^{2+} + 2e-$
$2NO_3^- + 4H^+ + 2e^- \rightarrow 2NO_2 + 2H_2O$
$Cu + 2NO_3^- + 4H^+ \rightarrow Cu^{2+} + 2NO_2 + 2H_2O$

(j) $SO_2 + 2H_2O + 6e^- \rightarrow SO_4^{2-} + 4H^+$
$OC\ell^- + 2H^+ + 3e^- \rightarrow C\ell^- + H_2O$ x 2
$SO_2 + 2OC\ell^- \rightarrow SO_4^{2-} + 2C\ell^-$

2. (a) $2I^- \rightarrow I_2 + 2e^-$

   (b) $S_2O_3^{2-} + 5H_2O \rightarrow 2SO_4^{2-} + 8e^- + 10H^+$

   (c) $S_2O_3^{2-} + 5H_2O + 4I_2 \rightarrow 2SO_4^{2-} + 10H^+ + 8I^-$

3. (a) $CH_3CH_2OH + H_2O \rightarrow CH_3COOH + 2H^+ + 2e^-$

   (b) $O_2 + 2H_2O + 4e^- \rightarrow 4OH^-$

   (b) $O_2 + 2H_2O + 8e^- \rightarrow 4OH^-$

   (c) $2CH_3CH_2OH + O_2 \rightarrow 2CH_3COOH$

4. (a) $C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O$

   (b) O_2 is reduced and C in the glucose is oxidised

   (c) O_2 is the oxidising agent, $C_6H_{12}O_6$ is the reducing agent

5. (a) Ox: $Mg \rightarrow Mg^{2+} + 2e^-$

   Red: $Ti^{4+} + 4e^- \rightarrow Ti$

   RedOx: $2Mg + TiC\ell_4 \rightarrow 2MgCl_2 + Ti$

   (b) $TiC\ell_4$ is reduced, Mg metal is oxidised

6. (a) $3NO_2 + H_2O \rightarrow 2HNO_3 + NO$

   (b) NO_2 is both

   (c) A disproportionation reaction