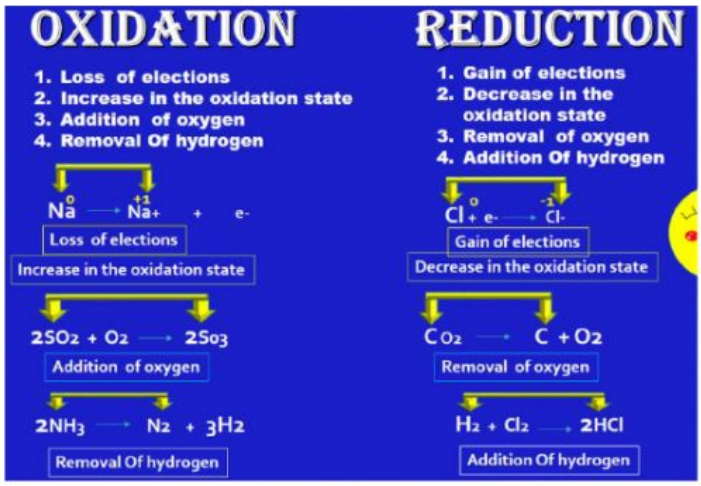
## Balancing redox equation (Ion inspection method)

1) Determine species undergo oxidation and reduction




2) Separate the half equation

3) Balance the metal at both sides

4) Balance non-metal other than H and O at both sides

5) Balance the O by adding H2O at the other side of equation

6) Balance the H by adding H+ at the other side

7) Balance the charge by adding e- at positive side

8) Combine both half equations by removing the e from both equations

9) Recheck

**Example 2 a) Balance the redox equation**

$$Au^{3+} + \quad I^{-} \rightarrow \quad Au + \quad I_2$$

1) Determine species undergo oxidation and reduction

$$Au^{3+} + \quad I^{-} \rightarrow \quad Au + \quad I_2$$

reaction

reaction

$Au^{3+}$ decreases its oxidation number to 0. $Au^{3+}$ is

$I^-$ increases its oxidation number to 0. $I^-$ is _

2) Separate the half equation

Oxidation: $I^- \longrightarrow I_2$

Reduction: $Au^{3+} \longrightarrow Au$

3) Balance the metal at both sides

Oxidation: $I^- \longrightarrow I_2$ (Do nothing, iodine is not a metal)

Reduction: $Au^{3+} \longrightarrow Au$ (Do nothing. Both sides are balanced)

4) Balance non-metal other than H and O at both sides

Oxidation: $I^- \longrightarrow I_2$

Reduction: $Au^{3+} \longrightarrow Au$ (Do nothing. Au are not non-metal)

5) Balance the O by adding $H_2O$ at the other side of equation

Oxidation: $2I^- \longrightarrow I_2$ (Skip this part because there is no O at both sides)

Reduction: $Au^{3+} \longrightarrow Au$ (Skip this part because there is no O at both sides)

6) Balance the H by adding H+ at the other side

Oxidation: $2I^- \longrightarrow I_2$ (Skip this part because there is no H at both sides)

Reduction: $Au^{3+} \longrightarrow Au$ (Skip this part because there is no H at both sides)

7) Balance the charge by adding e- at positive side

Oxidation: $2I^- \longrightarrow I_2 + 2e$

Charge for both sides are balanced

Reduction: $Au^{3+} + 3e^- \longrightarrow Au$

Charge for both sides are balanced

Initially, it is +3 on the left and 0 at the right hand side. Thus the charge is not balanced.

8) Combine both half equations by removing the e from both equations

Oxidation: $(2I^- \longrightarrow I_2 + 2e)$

Reduction: $(Au^{3+} + 3e^- \longrightarrow Au)$

Both half equations have same number of e. Thus, we can get the overall equation

Oxidation: $6I^- \longrightarrow 3I_2 + 6e$

Reduction: $2Au^{3+} + 6e \longrightarrow 2Au$

Overall equation: $I^- + Au^{3+} \longrightarrow I_2 + Au$

Recheck:

| | |
|---|---|
| I= | I= |
| Au= | Au= |
| Net Charge= | Net Charge= |