Oxidation-Reduction
ANSWERS

Oxidation and Reduction

Oxidation and Reduction
STOP AND CHECK (PAGE 6)

- An oxidation reaction is one where the species loses electrons.
- A reduction reaction is one where the species gains electrons.
- A reduction reaction cannot just happen on it's own, an oxidation reaction will also be occurring at the same time due to the exchange of electrons.

Oxidation Numbers
QUICK QUESTIONS (PAGE 11)

Compound	Oxidation Number
Fe^{2+}	+2
Na^{+}	+1
O_2	0
Cr^{3+}	3+
Mg	0
$\mathbf{S}_4O_6^{-2}$	+2.5
$\mathbf{Mn}O_2^{-2}$	+4
$\mathbf{S}O_4^{2-}$	+6
$H_2\mathbf{P}O_4^{-}$	+5

Compound	Oxidation Number
$H_2\mathbf{O}_2$	+1
$\mathbf{Mn}O_4^{2-}$	+6
$\mathbf{Al}_2O_3$	+3
$\mathbf{Al}Cl_4^{-}$	+3
$O\mathbf{Cl}^{+}$	+3
$\mathbf{Cu}I_2$	+2
$\mathbf{Zn}(OH)_4^{2-}$	+2
$\mathbf{Mo}O_3$	+6
$\mathbf{Cr}O_3$	+6

SF_6	+6

Using Oxidation Numbers: Oxidants and Reactants

Using Oxidation Numbers

STOP AND CHECK (PAGE 14)

- You can identify which species is being oxidised or reduced in a reaction by a change in oxidation numbers. An increase in oxidation number indicates the species has undergone oxidation, whereas a decrease indicates the species has undergone reduction.
- The species that gets reduced is referred to as the oxidising agent/oxidant.
- The species that gets oxidised is referred to as the reducing agent/reductant.
- You cannot have a reduction reaction occur in isolation, as oxidation will also be occurring.

Using Oxidation Numbers

QUICK QUESTIONS (PAGE 14)

- $MnO_4^- + I^- \rightarrow I_2 + MnO_2$
  - Oxidant: I as the oxidation number decreases.
  - Reductant: Mn as the oxidation number increases.
- $Cl_2 + Br^- \rightarrow Cl^- + Br_2$
  - Oxidant: Cl as the oxidation number decreases.
  - Reductant: Br as the oxidation number increases.
- $Cr_2O_7^{2-} + Fe^{2+} \rightarrow Fe^{3+} + Cr^{3+}$
  - Oxidant: Cr as the oxidation number decreases.
  - Reductant: Fe as the oxidation number increases.
- $Mg^{2+} + H_2 \rightarrow H^+ + Mg$
  - Oxidant: Mg as the oxidation number decreases.
  - Reductant: H as the oxidation number increases.
- $H_2S + CO_2 \rightarrow C + SO_2^{2-}$
  - Oxidant: S as the oxidation number decreases.

    - Reductant: C as the oxidation number increases.
- $IO_3^- + I^- \rightarrow I_2$
    - Oxidant: I as the oxidation number decreases.
    - Reductant: I as the oxidation number increases.
    - Note: The I is both oxidising and reducing in the different species to create the diatomic iodine molecule.

Balancing Redox Equations

Half Reactions

STOP AND CHECK (PAGE 16)

- We split a redox reaction into half equations by what species are oxidised, and which are reduced.

Balancing Redox Equations

QUICK QUESTIONS (PAGE 24)

- $MnO_4^- + I^- \rightarrow I_2 + MnO_2$
    - $MnO_4^- \rightarrow MnO_2$
    - $I^- \rightarrow I_2$
- $Cl_2 + Br^- \rightarrow Cl^- + Br_2$
    - $Cl_2 \rightarrow Cl^-$
    - $Br^- \rightarrow Br_2$
- $Cr_2O_7^{2-} + Fe^{2+} \rightarrow Fe^{3+} + Cr^{3+}$
    - $Cr_2O_7^{2-} \rightarrow Cr^{3+}$
    - $Fe^{2+} \rightarrow Fe^{3+}$
- $Mg^{2+} + H_2 \rightarrow H^+ + Mg$
    - $Mg^{2+} \rightarrow Mg$
    - $H_2 \rightarrow H^+$
- $H_2S + CO_2 \rightarrow C + SO_2^{2-}$
    - $H_2S \rightarrow SO_2^{2-}$
    - $CO_2 \rightarrow C$

- $IO_3^- + I^- \rightarrow I_2$
    - $IO_3^- \rightarrow I_2$
    - $I^- \rightarrow I_2$

