

Topic 3 –Redox Revision Notes

1) Introduction

- In redox reactions one element is reduced and another element is oxidised
- Oxidation loss of electrons, reduction is gain of electrons
- Reduction and oxidation must occur together because if one element loses electrons another element must gain them

a) Oxidation states

- Oxidation states allow us to work out which elements have been oxidised and reduced in a reaction. Oxidation states are also known as oxidation numbers
- Oxidation states are “charges” assigned to each element in a reaction
- The rules for assigning oxidation states are:
 - Elements are zero
 - In compounds, H is +1 and O is -2
 - In compounds, Group 1 elements are +1, Group 2 are +2, Group 6 are -2 and Group 7 are -1 (these are real charges)
 - In a neutral compound the oxidation states add up to 0
 - In an ion the oxidation states add up to the charge on the ion

Example 1

In NO_3^- the total oxidation state is -1
Each O has oxidation state -2, giving a total of -6
To make the total -1, N must have an oxidation state of +5

In NO_2^- the total oxidation state is -1
Each O has oxidation state -2, giving a total of -4
To make the total -1, N must have an oxidation state of +3

Example 2

There are 4 different chlorate ions (negatively charged ions containing Cl and O)
The formula of chlorate (VII) can be worked out using oxidation states
The Roman numeral indicates that Cl is in state +7
For an overall negative charge, 4 oxygens are needed, as this gives a total oxidation state of -8
The formula of chlorate (VII) is, therefore, ClO_4^-

b) Naming substances

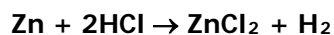
- Similar substances can be distinguished using oxidation states as part of their names e.g.

Formula	Oxidation state of S	Name
SO ₂	+4	Sulphur (IV) oxide
SO ₃	+6	Sulphur (VI) oxide
SO ₃ ²⁻	+4	Sulphate (IV) ion
SO ₄ ²⁻	+6	Sulphate (VI) ion
H ₂ SO ₃	+4	Sulphuric (IV) acid
H ₂ SO ₄	+6	Sulphuric (VI) acid

Personal note – I cannot bring myself to spell sulphur with an f but it will be spelt that way on an exam paper

c) Redox reactions

- As well as being loss of electrons, oxidation is also an increase in oxidation state
- As well as being gain of electrons, reduction is also a decrease in oxidation state
- In reactions, metals generally lose electrons to form positive ions with an increase in oxidation state
- In reactions, non-metals generally gain electrons to form negative ions with an decrease in oxidation state
- Metals undergo redox reactions with dilute hydrochloric and dilute sulphuric acids e.g.
- In both reactions, the metal dissolves and a gas is given off

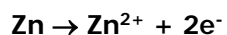


Zn goes from oxidation state 0 to +2

= oxidation

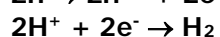
H goes from oxidation state +1 to 0

= reduction



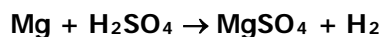
loss of electrons

= oxidation



gain of electrons

= reduction

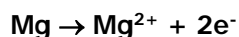


Mg goes from oxidation state 0 to +2

= oxidation

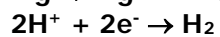
H goes from oxidation state +1 to 0

= reduction



loss of electrons

= oxidation



gain of electrons

= reduction