Redox

Oxidation Numbers

Oxidation state (number)
This is similar to valency. It is the number of electrons involved in bonding.

Rules for assigning oxidation state (number), ON
1) ON of atoms in uncombined **elements** is zero.

Compounds
2) For simple ions, ON = charge on ion.
3) In a compound or ion with more than one element, the most electronegative has a -ve ON.
4) F always has ON of -1.
5) O has ON = -2.
6) H has ON =+1.
7) The sum of the ON's in a compound = O.
8) In compound ions, the sum of the ON's = the charge on the ion.

Roman Numerals are used to indicate the magnitude of the oxidation state of an element, when a name may be ambiguous. eg nitrate(III) = NO_2^- and nitrate(V) = NO_3^-. The (III) and the (V) refer to the oxidation state of nitrogen.

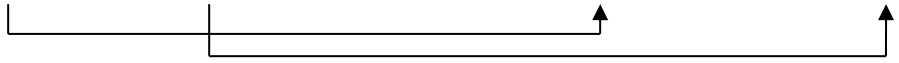
Writing Formulae using oxidation numbers:
The oxidation numbers of all the elements in a compound must add up to zero. eg for Ca^{2+} and Cl^-, in order to add up to zero, two Cl^- ions are required. So the formula is $CaCl_2$.

Redox Reactions

Oxidation involves **loss of electrons, reduction** involves **gain.**
Oxidation involves **an increase in ON, reduction** involves **a decrease.**

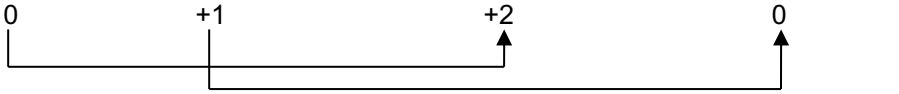
Metals generally form ions by losing electrons with an increase in oxidation number to form positive ions.
Non-metals generally react by gaining electrons with a decrease in oxidation number to form negative ions**.**
Redox reactions of metals and acids:

Zinc	+	Hydrochloric acid	→	Zinc chloride	+	hydrogen
Zn	+	2HCl	→	$ZnCl_2$	+	H_2
0		+1 -1		+2 -1		0



Zn oxidation number has increased by +2 so has been oxidised. H oxidation number has decreased by -1 so has been reduced. Cl oxidation number has not changed.

Zinc	+	sulfuric acid	→	Zinc sulfate	+	hydrogen
Zn	+	H_2SO_4	→	$ZnSO_4$	+	H_2
0		+1		+2		0



Zn oxidation number has increased by +2 so has been oxidised. H oxidation number has decreased by -1 so has been reduced. The ON of S and O have not changed.
You need to be able to interpret and make predictions from redox reactions in terms of ON and electron loss and gain.