KNOCKHARDY NOTES

A LEVEL CHEMISTRY

OXIDATION STATES

AT A GLANCE

The concept of Oxidation States allows one to ...

- tell if oxidation or reduction has taken place
- work out which species have been oxidised / reduced
- construct half equations and balance redox equations.

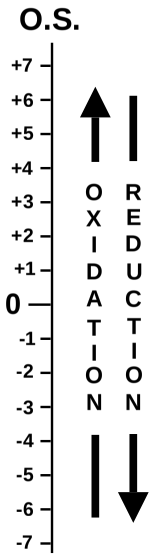
ASSIGNING VALUES

Atoms and simple ions	The number of electrons which must be added or removed (each -1) to achieve neutrality.
Molecules	Sum of oxidation states adds up to zero.
Complex ions	Sum of oxidation states adds up to the charge on the ion
Metals	Oxidation states are positive; usually the Group No. If more than one O.S. then the highest = Group No.
Non-Metals	Usually negative in compounds but can theoretically be anything up to the Group No.

USEFUL VALUES TO KNOW - In compounds, one needs to know one value to work out another. H, O and F are useful as they are commonly found in many species.

Element	*Usual O.S.*	*Other possible Oxidation States*		
H	**+1**	-1 in NaH	0 in H_2	-
O	**-2**	-1 in H_2O_2	0 in O_2	+2 in F_2O
F	**-1**	0 in F_2	-	-

REDOX	When reduction and oxidation take place.	
Oxidation	Removal of electrons;	
	species will get ...	less negative
		more positive
Reduction	Gain of electrons;	
	species will get ...	more negative
		less positive



Oxidation **I**s the **L**oss

Reduction **I**s the **G**ain of electrons

OIL RIG

BALANCING HALF EQUATIONS

① Work out the **formula** of the species before and after the change.

② Work out the **oxidation state** of the element before and after the change.

③ Add **electrons** to one side of equation so that the oxidation states balance.

④ If the charges on all the species (ions and electrons) do not balance ... add sufficient **H^+ ions** to one of the sides to balance the charges.

⑤ If the equation still doesn't balance, add **water molecules** to one side

CONSTRUCTING BALANCED REDOX EQUATIONS

① Write out the two half equations
② Multiply either/both equations so that the electrons in both balance
③ Add the two equations together and cancel out the electrons
④ Cancel anything else which appears on both sides of the equation