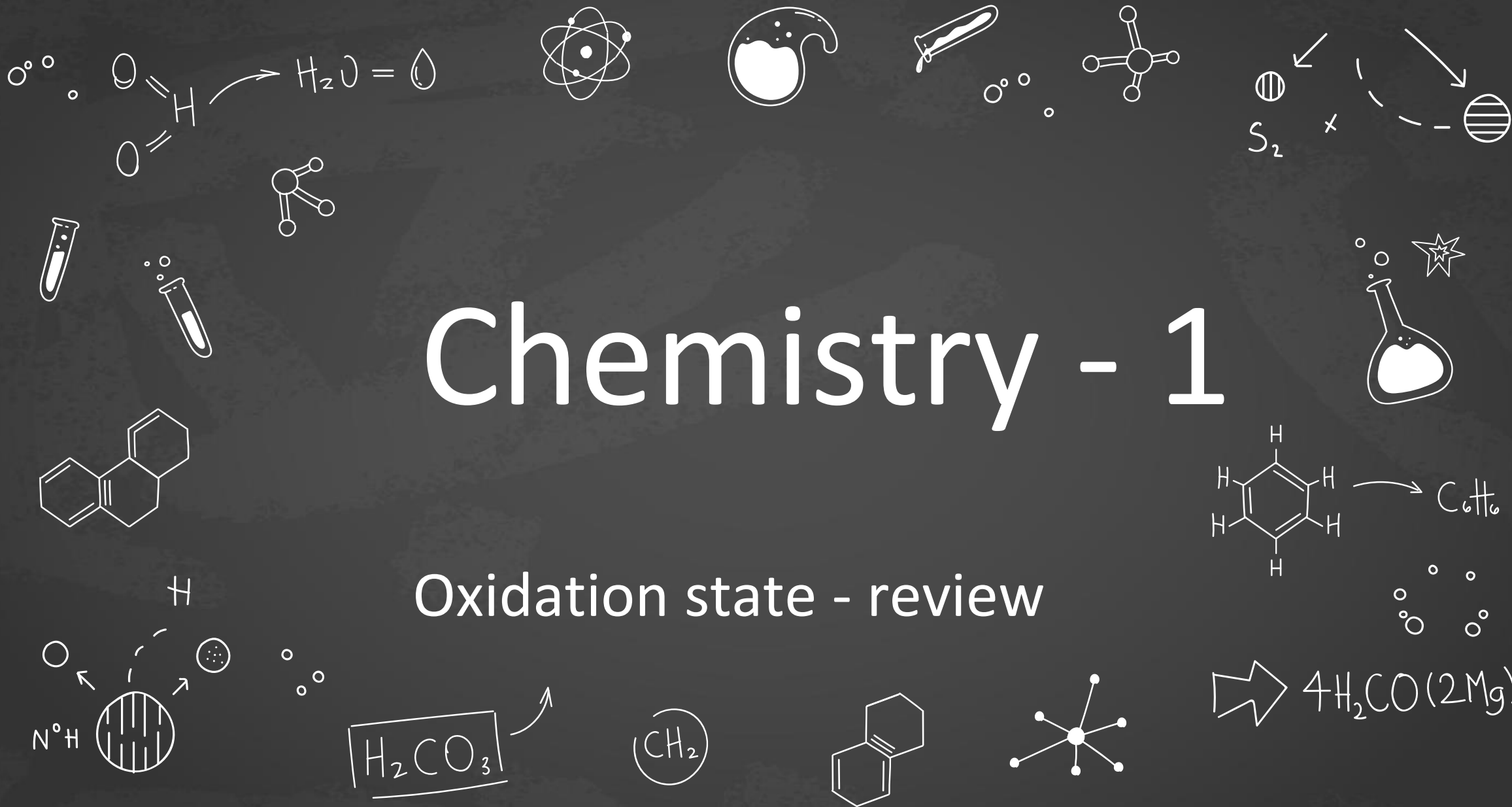
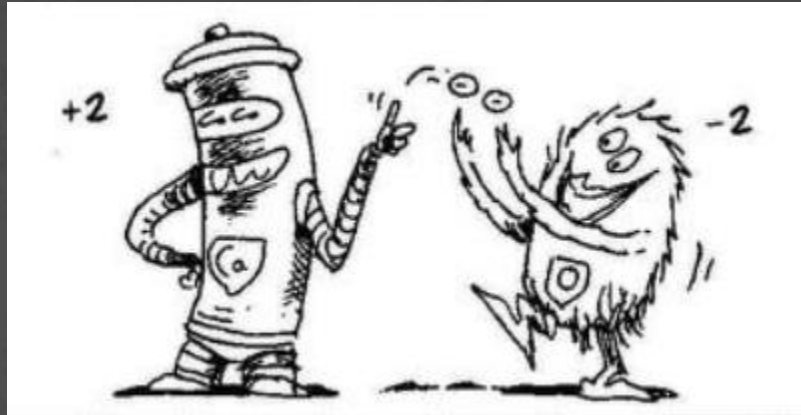


Chemistry - 1

Oxidation state - review



The **oxidation state**, sometimes referred to as **oxidation number**, describes the degree of oxidation (loss of electrons) of an atom in a chemical bond.



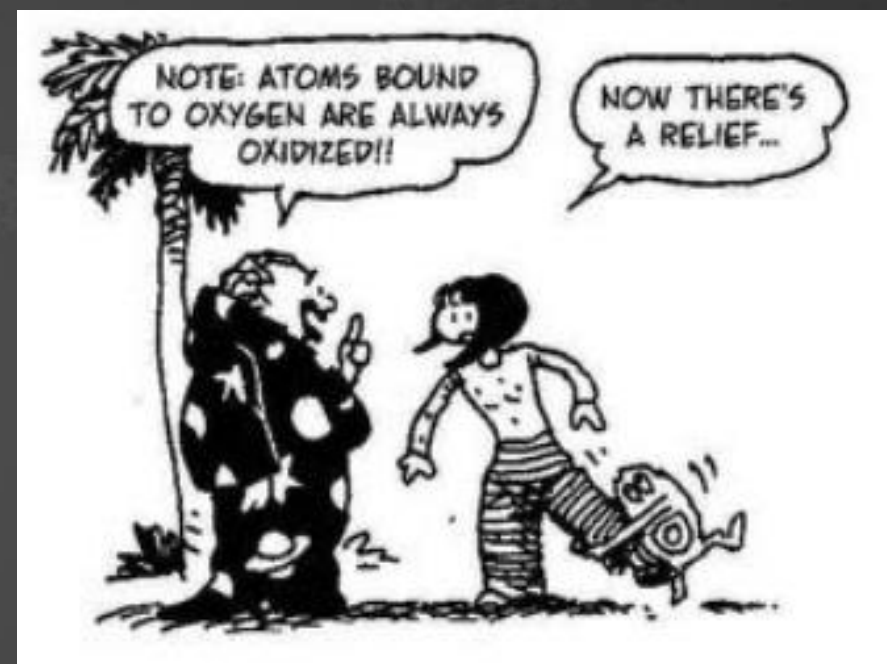
The oxidation state, which may be positive, negative or zero, is the hypothetical charge that an atom would have if all bonds to atoms of different elements were 100% ionic, with no covalent component.

This is never exactly true for real bonds.

To reach the state of a noble gas, elements transfer their electrons to other elements with stronger electron accepting properties.

$1s^2 2s^2 2p^6$	Oxidation state
<u>Ne</u>	0
O^{2-}	-2
F^-	-1
Na^+	+1
Mg^{2+}	+2

$1s^2 2s^2 2p^6 3s^2 3p^6$	Oxidation state
<u>Ar</u>	0
S^{2-}	-2
Cl^-	-1
K^+	+1
Ca^{2+}	+2



An atoms oxidation number depends on the other atoms around it. For instance in HCl, chlorine acquires one electron (for an oxidation state of -1) because Cl is more electronegative (~ 3.0) than hydrogen (~2.1). But in the perchlorate ion, ClO_4^- , chlorine has an oxidation state of +7. All its valence electrons go to oxygen, which is even more electronegative (~3.5) than chlorine.



- 1) The oxidation state of any unbound atom is 0
- 2) The oxidation number of any single atom ion is equal to its charge: H^+ (+), Fe^{3+} (+3), F^- (-), Na^+ (+); in a polyatomic ion, the oxidation numbers add up to the charge of the ion.
- 3) Some elements have the same oxidation number in almost all their compounds:
 - H: +1 (except in metal hydrides like NaH, where it's -1)
 - Fluorine: -1
 - Oxygen: almost always -2
- 4) In a neutral compound, the oxidation numbers add up to zero
- 5) If the oxidation number of an atom increases in a chemical reaction "it was Oxidized", if it decreases "it was Reduced"

Let's consider H_2SO_3 (sulfurous acid)

The oxidation state, which may be positive, negative or zero, is the hypothetical charge that an atom would have if all bonds to atoms of different elements were 100% ionic, with no covalent component.

Element	Electronegativity	Element	Electronegativity
Cs	0.79	H	2.20
K	0.82	C	2.55
Na	0.93	S	2.58
Li	0.98	I	2.66
Ca	1.00	Br	2.96
Mg	1.31	N	3.04
Be	1.57	Cl	3.16
Si	1.90	O	3.44
B	2.04	F	3.98
P	2.19		

The valence is the number of electron pairs that binds the atom with other atoms

Element	Valence	Element	Valence
H	I	Ba	II
Na	I	O	II
K	I	Zn	II
Ag	I	Sn	II (IV)
F	I	Pb	II (IV)
Cl	I (III, V, VII)	Fe	II, III
Br	I (III, V, VII)	Cr	III, VI
I	I (III, V, VII)	S	II, IV, VI
Hg	I, II	Al	III
Cu	I, II	N	III (IV)
Be	II	P	III, V
Mg	II	C	IV
Ca	II	Si	IV (II)