

HW 9 – December 4

1. 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.
 - 1.1. To determine the oxidation state of atoms in a molecule we assign the negative charge to the more electronegative atom and positive charge to the less electronegative (more electropositive) atom. The total charge in a molecule is 0. The total charge in an ion is equal to the charge of the ion.
 - 1.2. The oxidation state of H is almost always (+1, except in metal hydrides like NaH, where it is (-1)), the oxidation state of F is (-1), that of O is almost always (-2).
 - 1.2.1. E.g. in carbon dioxide CO₂ the oxidation states of C is (+4) since there are two oxygens with oxidation state of (-2) each and the molecule is not charged. We write: C⁴⁺O²⁻₂
 - 1.3. Write the oxidation state of **each** atom in the following molecules:
 - a) Fe₂O₃,
 - b) FeO,
 - c) N₂,
 - d) CaO,
 - e) HNO₃
 - f) SiO₂
 - g) P₂O₅
 - h) (SO₄)²⁻
 - i) (PO₄)³⁻

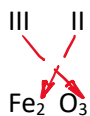
Electronegativity:

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		

2. **The valence** is the number of electron pairs that binds the atom with other atoms. We learned how to determine the valence using “octet rule”. For some common elements it may be useful to remember their valences. The table below gives valences of some common elements. (The

numbers in parentheses show possible valences for elements that may exhibit more than a single valence.)

The valence can be used to write down chemical formulas. E.g. if we want to write down the formula of Fe (III) compound with oxygen (iron oxide) we can write down the elements symbol with their valences on top and then move the valences to the opposite elements as their indexes:



Valences of some common elements

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)

2.1. Using valences of elements write down formulas of a) Ag and Cl, b) Cu (II) and O, c) P (V) with oxygen.