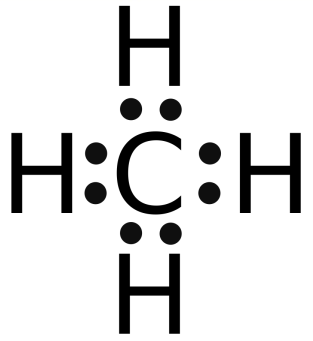
LEWIS DOT STRUCTURES

The unpaired electrons are available to form chemical bonds. The number of valence electrons (the electrons from the outer shell) not always will be equal to the valency of the elements (the number of bonds this element can potentially form).

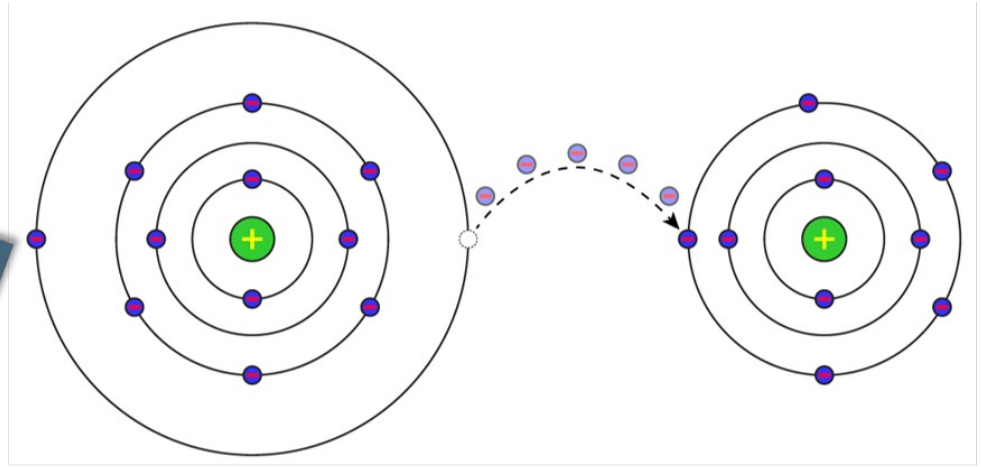
Atoms	Electronic Configuration	Lewis Symbol
sodium	$[Ne]3s^1$	Na ·
magnesium	$[Ne]3s^2$	· Mg ·
aluminum	$[Ne]3s^2 3p^1$	· Al ·
silicon	$[Ne]3s^2 3p^2$	· Si ·
phosphorus	$[Ne]3s^2 3p^3$	· P ·
sulfur	$[Ne]3s^2 3p^4$	: S ·
chlorine	$[Ne]3s^2 3p^5$	: Cl ·
argon	$[Ne]3s^2 3p^6$	: Ar :

Carbon · C ·

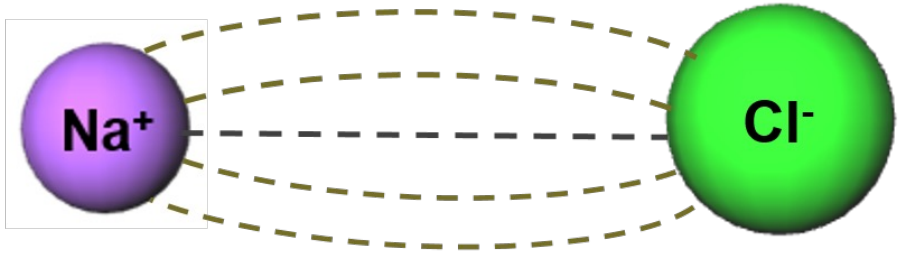


Which of the following is possible for ***the same element*** :

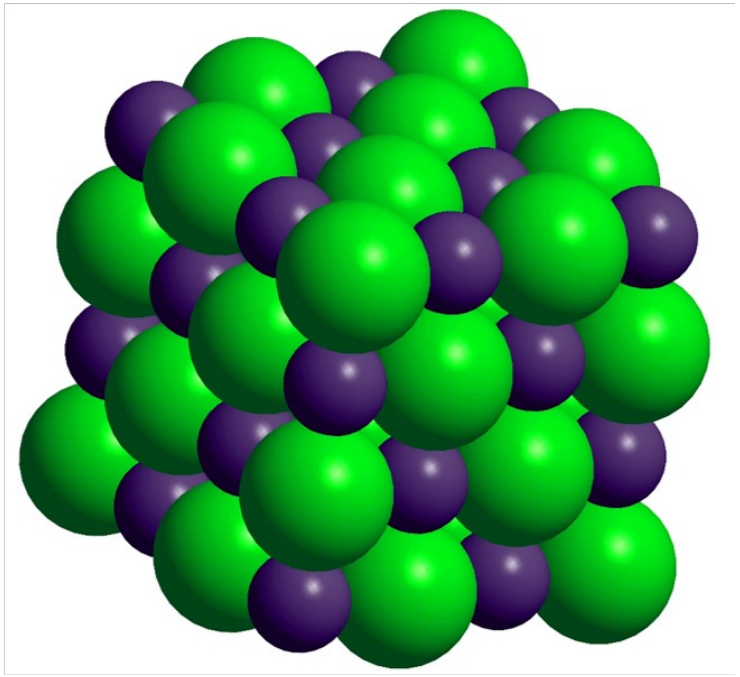
a) different number of **electrons**?
b) different number of **protons**?
c) different number of neutrons?



Electron Transfer between sodium, and chlorine.



Electrostatic attraction between sodium cation and chlorine anion.



Ionic Solid: Sodium Chloride. (Table Salt)

Oxidation – loss of electrons

Reduction – gain of electrons

Oxidation number

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

The oxidation number of an element in elemental form is 0 (e.g. pure copper).
Some elements have the same oxidation number in almost all their compounds, H +1 (except in metal hydrides, LiH where it's -1)..
Alkali metals (Li, Na etc.) have oxidation number +1.
Group 2 metals +2.
Fluorine -1.
Oxygen almost always -2.

$NaCl$ KCl
$CaCl_2$ CaO
Al_2O_3 Na_2O

Oxidation number is a formal concept. Generally, it's the most effective way to figure out chemical formulas of the compounds.

1. If the compound is ionic, the charges on the ions are the oxidation number, although the sign will go first. E.g. KCl, charges 1+ for K and 1- for Cl, oxidation number for K +1, for Cl -1. If the compound is covalent we will assign oxidation number, assuming that it's ionic. E.g. CH_4, for C oxidation number is -4, for hydrogen +1. The resulting oxidation number of the molecules – 0.
2. The most electronegative atom in a molecule is assigned a negative oxidation number. E.g. CO_2. It is covalent compound. O is the more electronegative element and it needs to gain 2 electrons to have a full outer shell, the oxidation number will be -2. Carbon oxidation number in this compound +4.
3. The oxidation number of atoms in an elemental form is 0. When the molecule is formed with the same element, the oxidation number of the element is 0. E.g. oxidation number of oxygen in O_2 is 0.
4. The elements in groups 1 and 2 have the group number as their oxidation number.
5. The maximum possible oxidation number for an element will be its group number for groups 1 and 2. For elements in groups 13-17 the oxidation number = the group number – 10. It is not possible to lose more electrons than there are in the outer shell.

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

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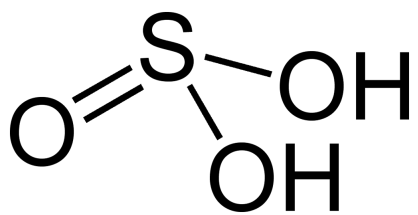
H +1, -1																He
Li +1	Be +2											B -3 +3	C -4 +2,+4	N -3 +1,+2,+3 ,+4,+5	O -2	F -1	Ne
Na +1	Mg +2											Al +3	Si +4	P -3 +3,+5	S -2 +4,+6	Cl -1 +1,+3, +5,+7	Ar
K +1	Ca +2				Cr +2,+3 +6	Mn +2,+3,+4 +6,+7	Fe +2,+3	Co +2,+3	Ni +2,+3	Cu +1,+2	Zn +2			As -3 +3,+5	Se -2 +4,+6	Br -1 +1,+3, +5,+7	Kr
Rb +1	Sr +2								Pd +2,+4	Ag +1			Sn +2,+4	Sb -3 +3,+5	Te -2 +4,+6	I -1 +1,+3, +5+,7	Xe
Cs +1	Ba +2								Pt +2,+4	Au +1,+3	Hg +1,+2		Pb +2,+4				Rn
Fr +1	Ra +2																

formula	systematic name
CuCl	copper(I) chloride
$CuCl_2$	copper(II) chloride
Hg_2Cl_2	mercury(I) chloride
HgO	mercury(II) oxide
FeS	iron(II) sulfide
Fe_2S_3	iron(III) sulfide



Sulfuric (IV) acid
H_2SO_3

Hydrogen peroxide H_2O_2

Structural formula H-O-O-H

Assigned charges on the atoms $H^{+1}O^{-1}O^{-1}H^{+1}$

Valency of oxygen?
Oxidation number (oxidation state) of oxygen?