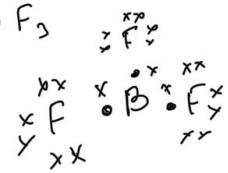
nitrogen trifluoride

NF_3

boron trifluoride

BF_3



Boron is exception + octet rule

Sulfur hexafluoride

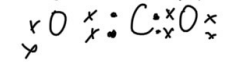
SF_6

el. + 6x7el.

Sulfur exception to octet rule

carbon dioxide

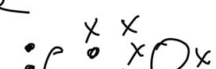
CO_2 4+12 16el.



$O=C=O$

* carbon monoxide

CO

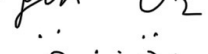


$|C \equiv O|$

one of the bond here - coordinate

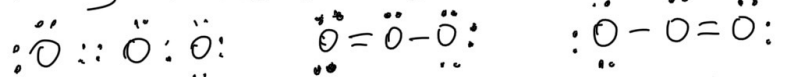
when two electrons come from the same atom to form a bond, such bond will be called coordinate.

oxygen O_2



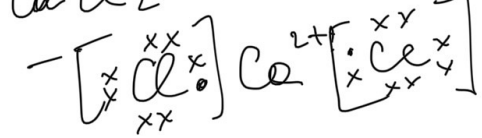
$|\bar{O}=\bar{O}|$ $O=O$

* ozon O_3 18 electrons

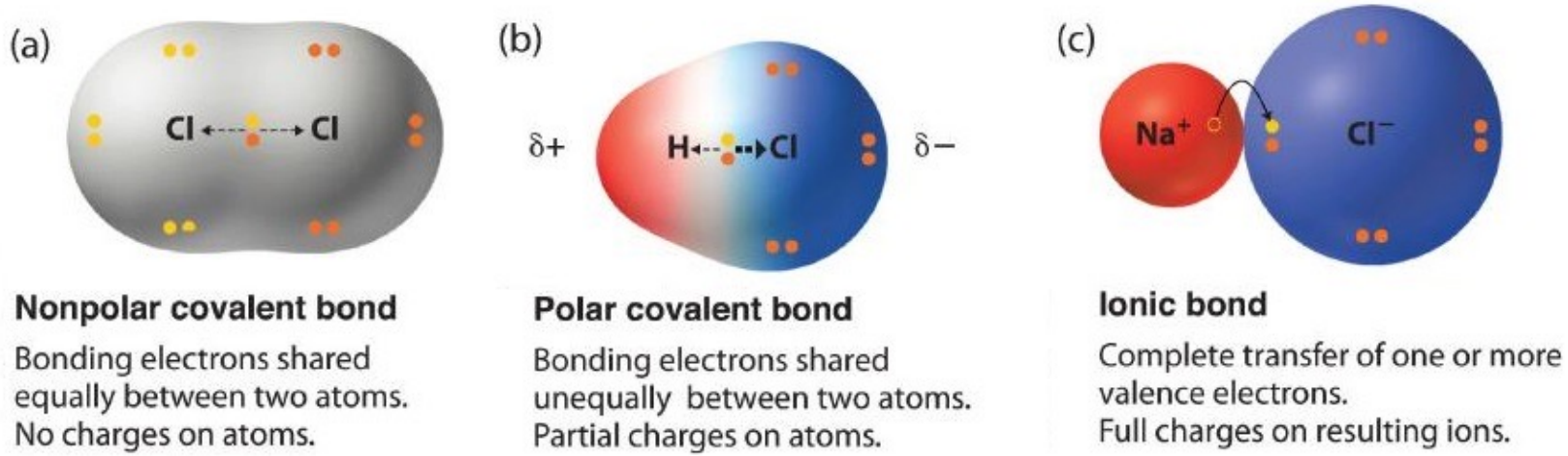


resonance structures

$CaCl_2$

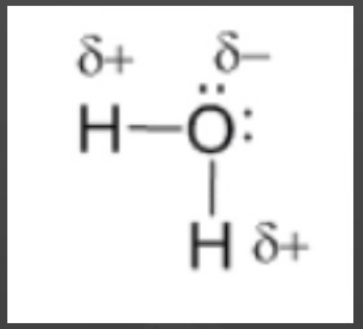


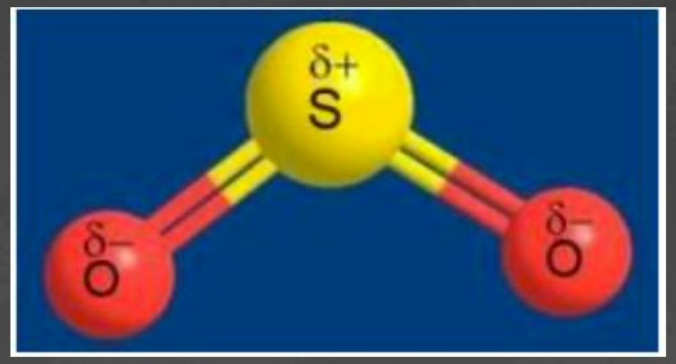
COVALENT BOND is atom bonding by shared pairs of electrons



Polar covalent bond

- It is an intermediate between covalent and ionic bonds and like for ionic bond it forms between different atoms

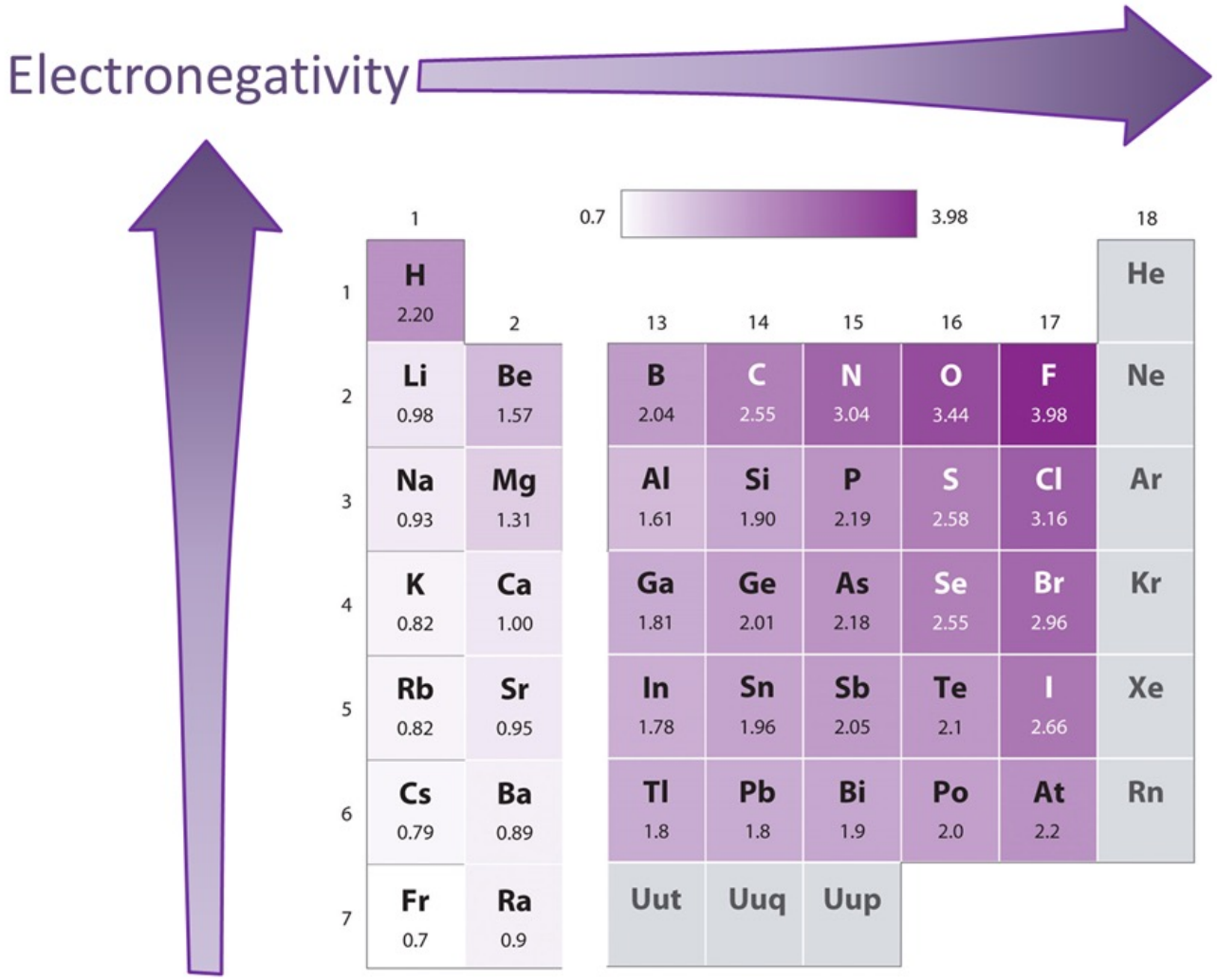




SO_2 molecule with polar covalent bond

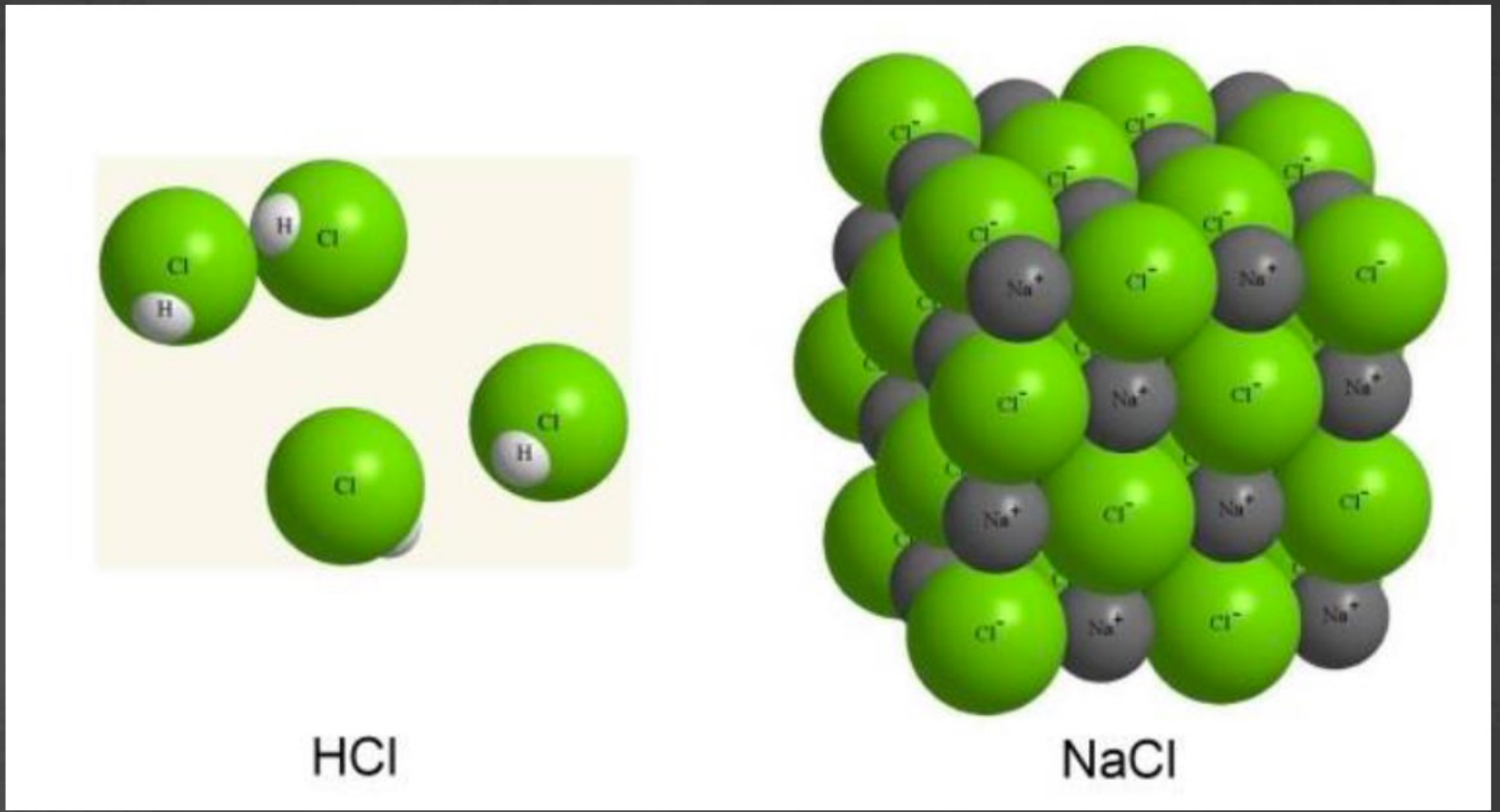
Electronegativity is a relative ability of atoms to attract electrons while binding to other atoms. It is an ability to polarize a covalent bond

Bond's polarity depends on the difference in electronegativity between two atoms. Bigger differences mean more polarity, with a difference of 2 or more being considered ionic. Atoms with similar electronegativities will form covalent bonds. Atoms with widely different electronegativities will form ionic bonds.

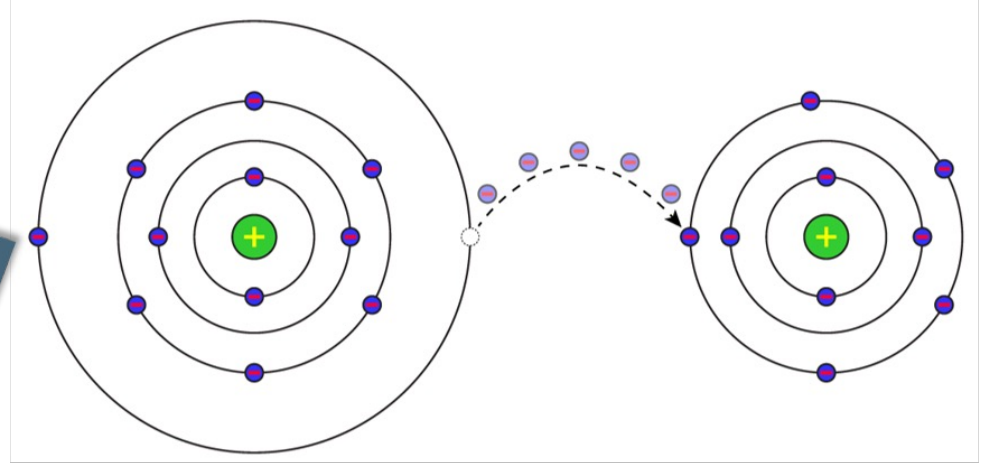


ptable.com

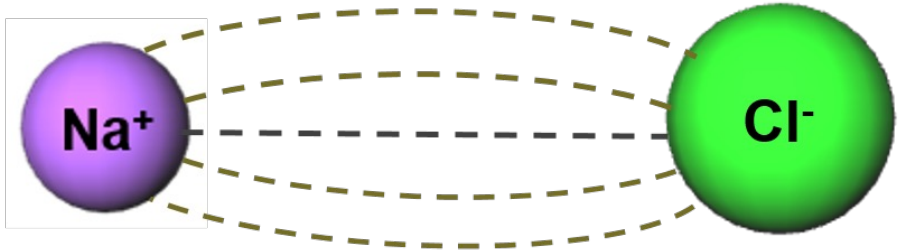
H : H
Cl : Cl
H :Cl
Na^+Cl^-



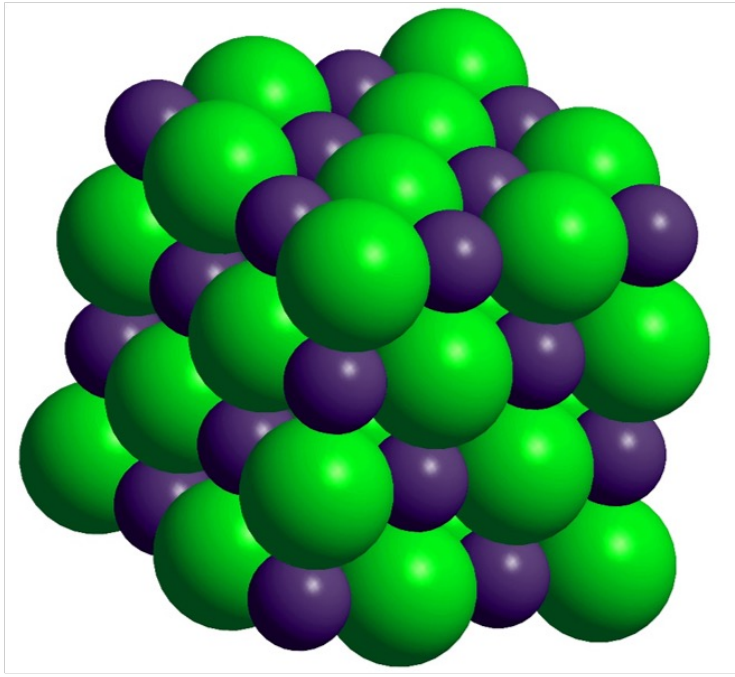
- Increased bond polarity results in different properties of the substance - hydrogen chloride (polar covalent bond) is a gas at room temperature while sodium chloride(ionic bond between the atoms) is a solid crystalline substance



Electron Transfer between sodium, and chlorine.



Electrostatic attraction between sodium cation and chlorine anion.



Ionic Solid: Sodium Chloride. (Table Salt)

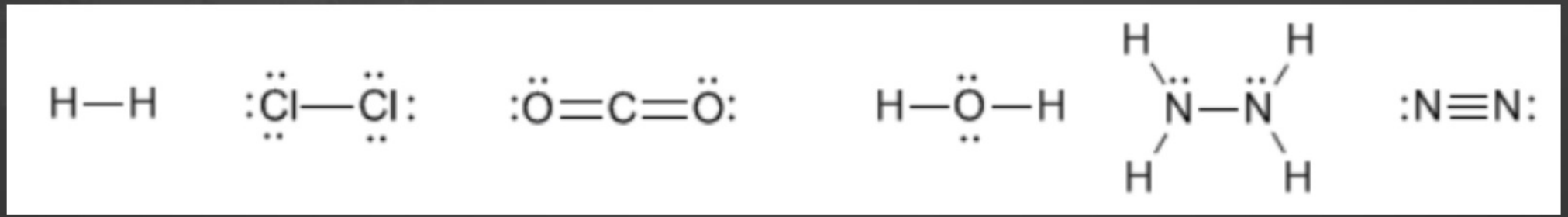
Some substances do not form separate molecules but make a continues network of repeating atoms (metals) or units (e.g. quartz). In this case the formulas of such matter are those of the repeating units – Cu, or SiO_2

Valence

The valence or valency of an element is a measure of its combining power with other atoms when it forms molecules

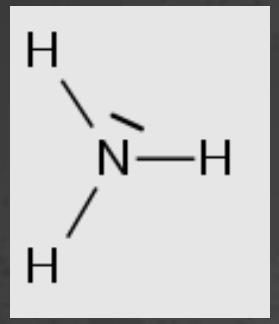
Or

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



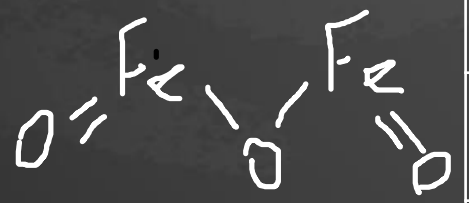
The valence is the number of electron pairs that binds the atom with other atoms

NH_3



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)

Fe_2O_3



CuO Cu = O

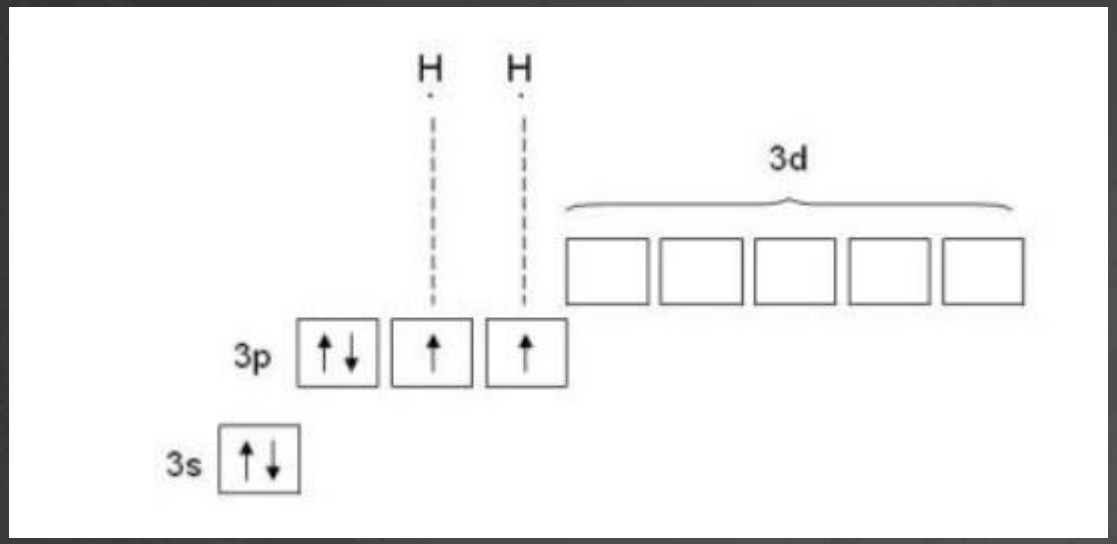
Cu_2O Cu – O – Cu

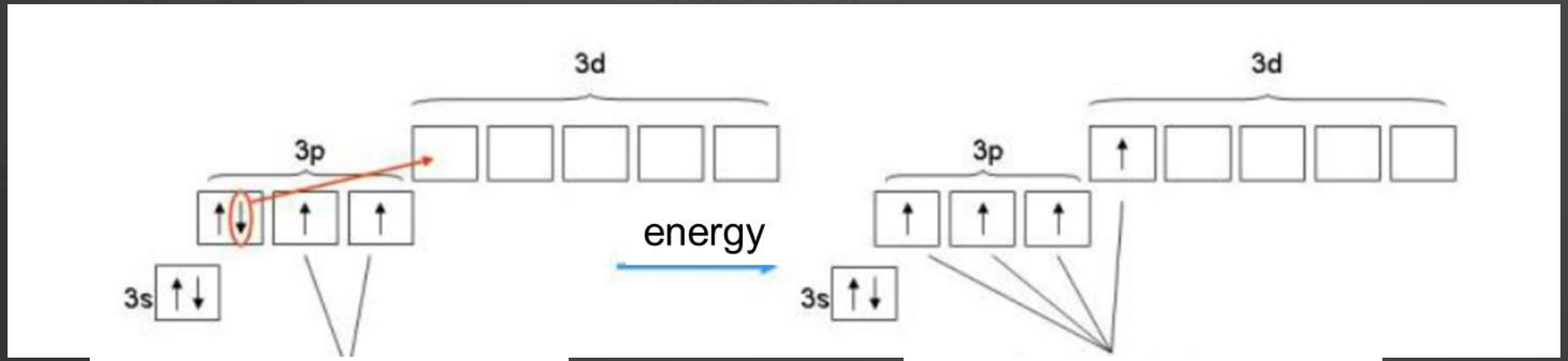
Let’s consider $_{16}S$

$2H + S = H_2S$

$2O + S = SO_2$

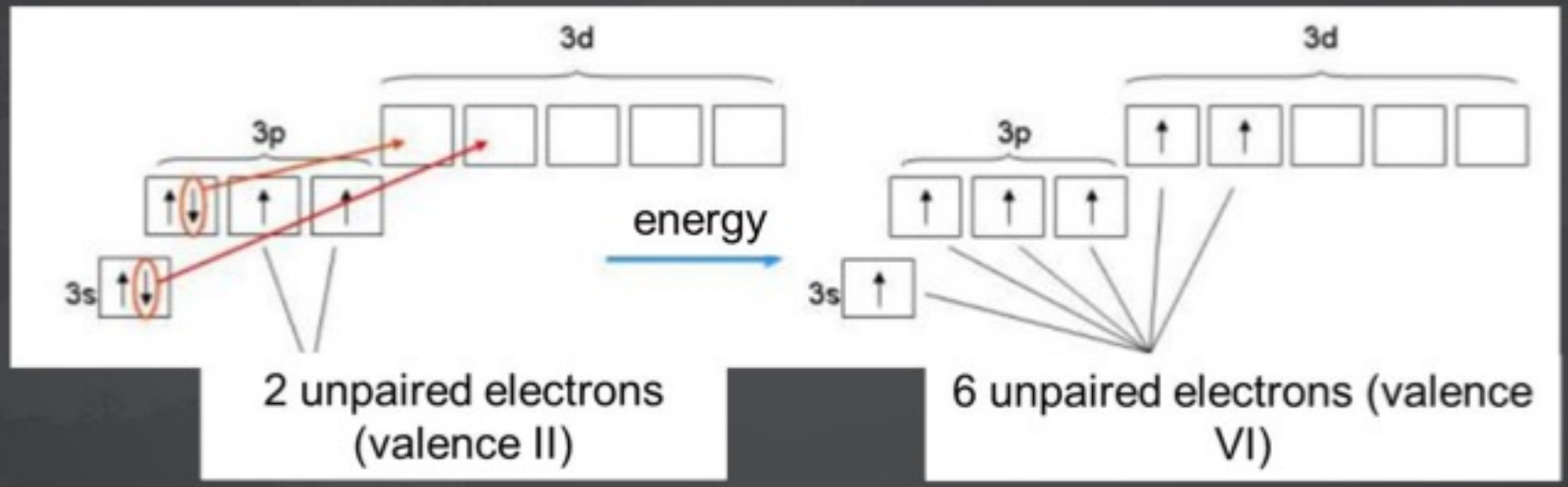
$3O + S = SO_3$

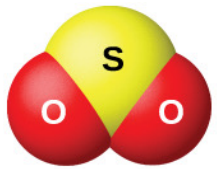


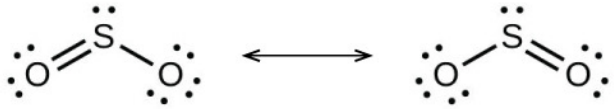


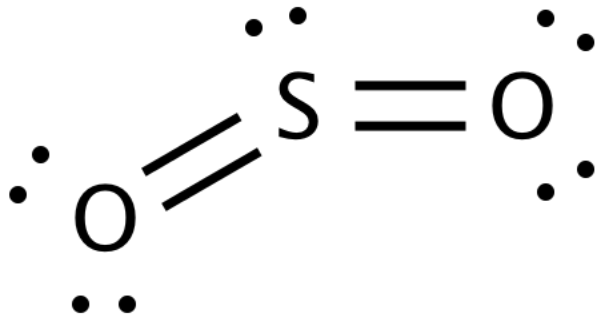
2 unpaired electrons
(valence II)

4 unpaired electrons
(valence IV)


3d
3p
3s
energy
2 unpaired electrons
(valence II)
3d
3p
3s
6 unpaired electrons (valence
VI)







Two different Lewis structures are possible.
1. We stick to the octet rule. We see that each atom has 4 pairs of electrons. Single bond between sulfur and oxygen is coordinate (both electrons come from sulfur). The first structures differ in position of double bond and are called resonance structure. The actual structure is usually described as a hybrid of the two resonance structures.

2. Sulfur can expand its octet. Oxygens can achieve an octet by forming a double bond (remember, each “dash” equals an electron pair, 4 bonds = 8 electrons). Sulfur has 6 electrons in its outer shell, when it forms two double bond, the sulfur will have 10 electrons in its outer shell, so called extended octet. This is possible for elements in period 3 and beyond because they have d orbitals available for bonding.

This class uses the materials from the following books: Larry Gonick and Graig Criddle “The cartoon guide to chemistry”
Manyuilov and Rodionov “Chemistry for children and adults”
Steve Owen “Chemistry for the IB diploma”
Chris McMullen “Understand basic Chemistry concepts”