IMF – worksheet 1 (add to next year's online research project)

Answer the following worksheet online (where possible) and where not possible – write the answers in the back of your chemistry book.

Due Date:

Recap from grade 10

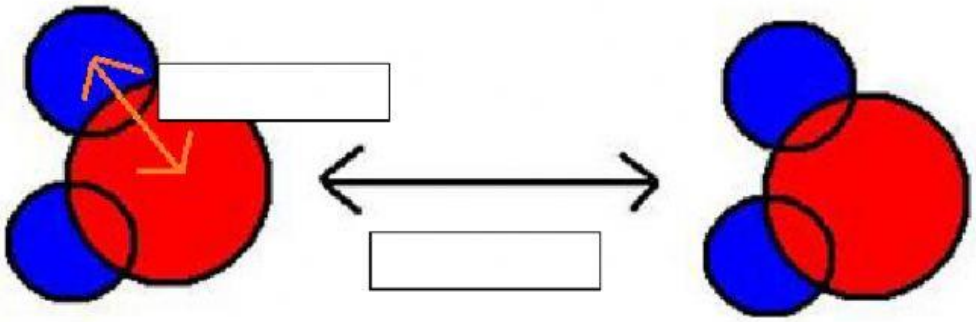
1) Enter the correct number into the table below

Element	group no	no of valence electrons
Li	1	1
Mg		
Al		
O		
Br		
Ar		
N		
S		

Intramolecular bonding

2) Label which is the intermolecular and intramolecular bond in the water molecules below.

Intermolecular | Intramolecular



3) The 3 types of **intra**molecular bonding you studied in gr 10 are listed below.

Drag the correct description to the table below.

Occurs between a metal and a non-metal

Occurs inside a metal

Occurs between non-metals

Consists of positive atomic kernels and delocalised electrons

Involves a sharing of electrons pair/s

Involves one atom losing electrons and the other gaining electrons

	Between which molecules does force occur	Description of intramolecular bond
Ionic		
Covalent		
Metallic		

4) Draw the Lewis structure showing the formation of the following ionic compounds

***Remember that in ionic bonding the metal always gives off electron/s and the non-metal always gains electron/s.**

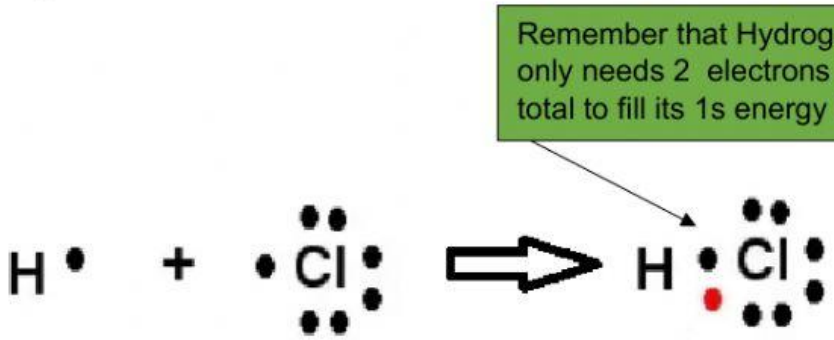
		Lewis structure
4.1	NaCl	Eg) 
4.2	LiBr	
4.3	NaF	
4.4	$MgCl_2$	
4.5	CaBr	
4.6	CaO	
4.7	Al_2O_3	
4.8	KCl	
4.9	$BeCl_2$	
4.10	LiCl	

5) What is the relationship between the group no and the no of valence electrons of any element?

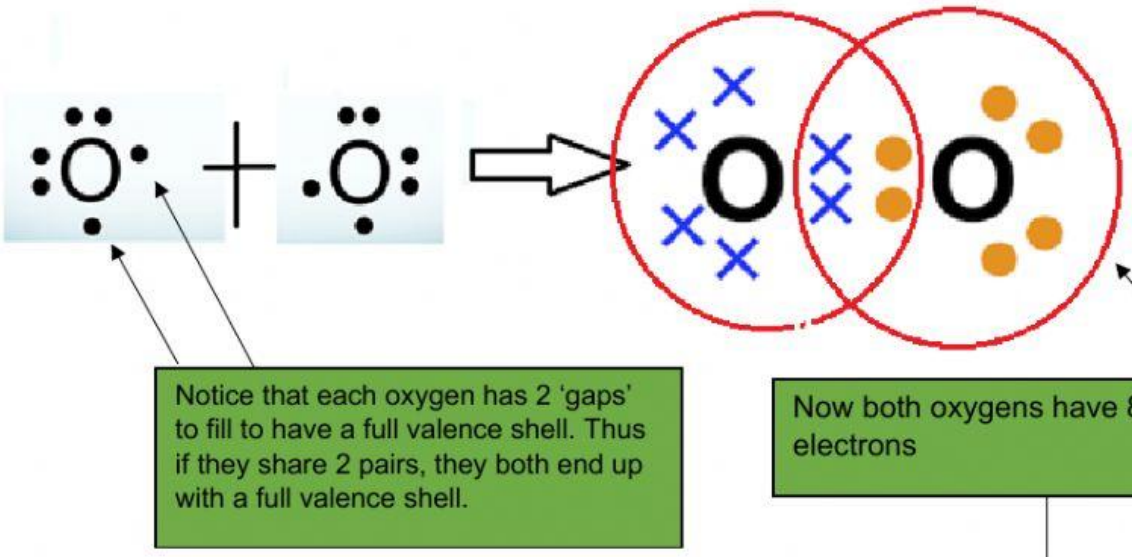
Group number is _____ ___ the number of valence electrons

6) Draw the lewis structure for the following covalent molecules into the back of your chemistry book:

6.1) HCl

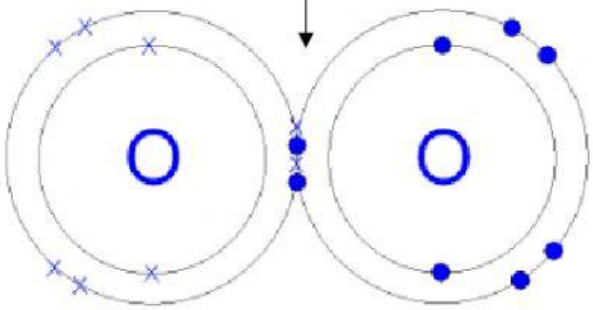


6.2) O_2



Notice that each oxygen has 2 'gaps' to fill to have a full valence shell. Thus if they share 2 pairs, they both end up with a full valence shell.

Now both oxygens have 8 valence electrons



6.3) H_2

6.4) H_2O

6.5) CO_2

6.6) CH_4

6.7) NH_3

6.8) H_2S

6.9) CH_3F

6.10) N_2

6.11) HF

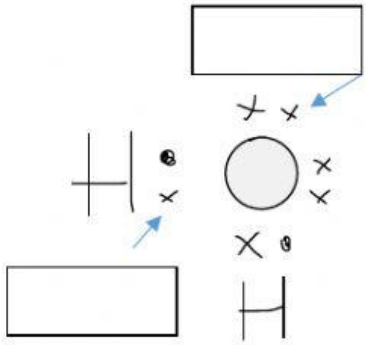
7) Define the following terms in your chemistry book:

Chemical bond	
Covalent bond	
Bonding pair	
Lone pair	
Electronegativity	

8) Draw the lewis structure of a H_2O molecule and circle the bonding pair/s and the lone pair/s of electrons. (remember to label each)

Lone pair

Bonding pair



Polarity

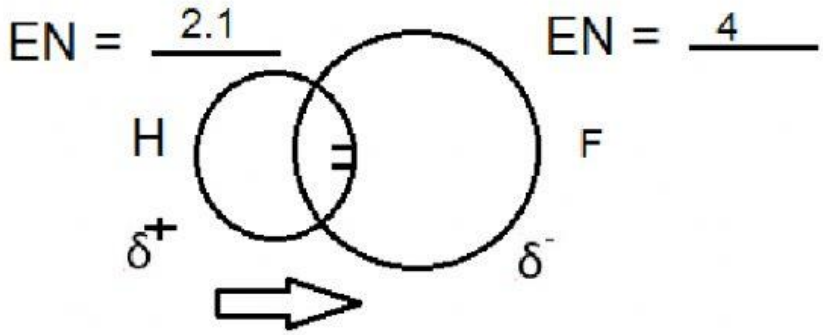
Watch the following video on polarity before you continue 😊

https://www.youtube.com/watch?v=PVL24HAesnc

Example

Below is a HF molecule. The electronegativitiy (EN) of each atom has been written next to it. Since the Fluorine has a greater electronegativity than the H, the F ends up having a greater force of attraction on the shared electrons. The electrons as a result end of leaning more towards the Fluorine side of the molecule. (However they never leave the shared orbitals, and are still shared between the 2 atoms.)

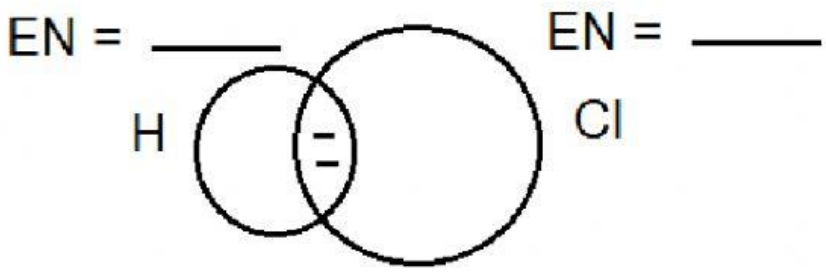
As a result the Fluorine ends up being slightly (δ) negatively charged and the hydrogen ends up slightly positively charged.



The molecule as a result is called a **polar molecule**, since it has 2 opposite ends (one positive and one negative end)

9. Below is a HCl molecule.

9.1 Insert the missing values or words into the space provided.



Choose the correct option for the following:

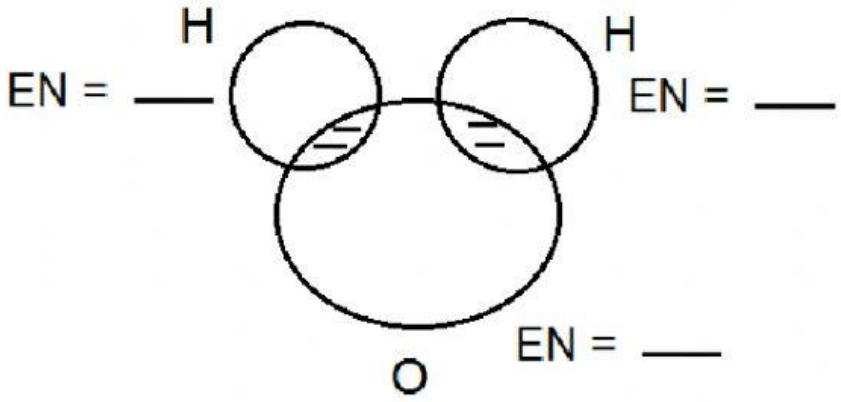
Since the Cl has a 9.2.1_____(greater/smaller) EN value then Hydrogen, it will have a 9.2.2_____ (greater smaller) pull on the shared electrons.

Thus the electrons lean more towards the 9.2.3 _____ (hydrogen/chlorine side of the atom.)

As a result the Cl atom ends up with a slightly 9.3.4_____(positive/negative) charge and the H ends up with a slightly 9.3.5_____(positive/negative) charge.

The molecule is said to be 9.3.6 _____ (polar/ non polar).

10.1 Insert the missing values or words into the spaces provided



Choose the correct option for the following:

Since the hydrogen has a 10.2.1_____(greater/smaller) EN value then the oxygen, it will have a 10.2.2_____ (greater smaller) pull on the shared electrons.

Thus the electrons lean more towards the 10.2.3 _____ (hydrogen/oxygen side of the atom.)

As a result the Hydrogen atom ends up with a slightly 10.3.4_____(positive/negative) charge and the Oxygen ends up with a slightly 10.3.5_____(positive/negative) charge.

The molecule is said to be 10.3.6 _____ (polar/ non polar).

Shape of molecules

Notice something about the shape of the water molecule: it was bent not linear, why?

When you draw the lewis structure, you notice that water has 2 bonding pairs and 2 lone pairs.

All the electrons want to repel each other, since they all have the same charge, however some electrons exert a greater force of repulsion than others.

The following pairs of electrons repel each other, in order of most to least repulsive forces:

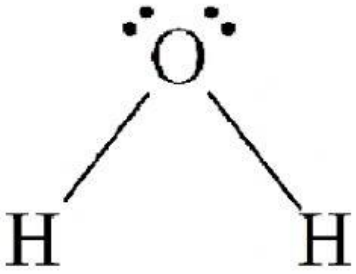
Lone pair- lone pair,

lone pair-bonding pair

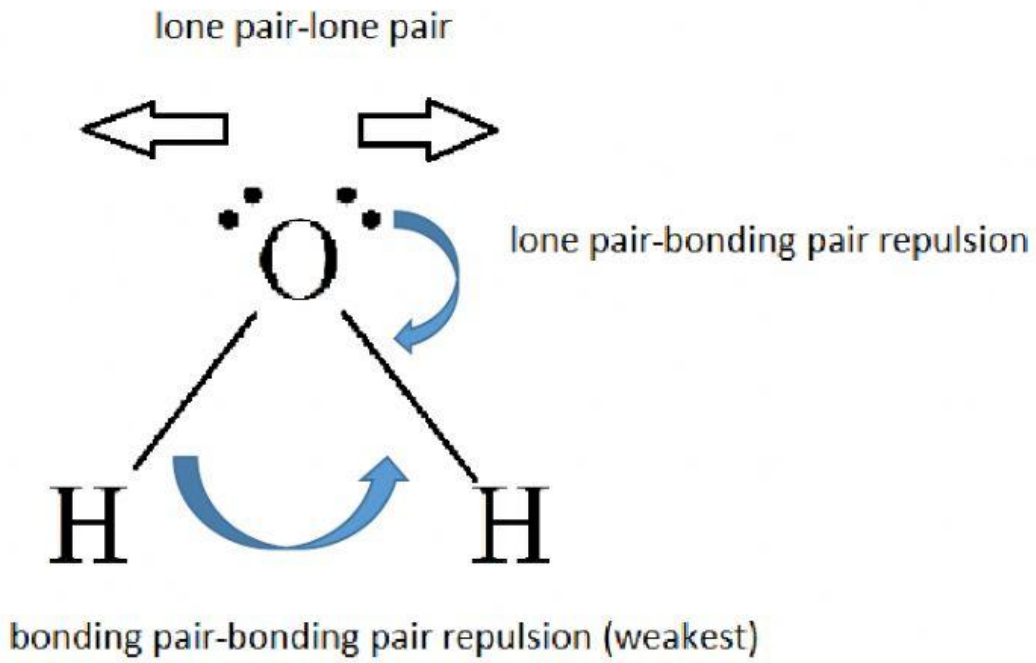
bonding pair-bonding pair

repulsion decreases

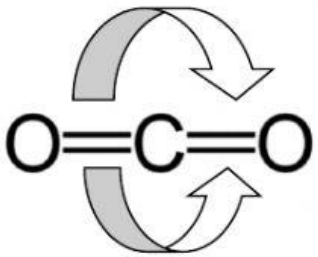
Thus since water has 2 lone pairs, the force of repulsion between the lone pair- lone pair is the greatest, forcing the 2 bonding pairs closer together.



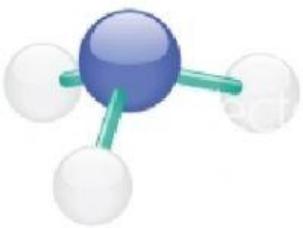
The lone-pair-bonding pair exerts a weaker force of repulsion and the bonding pair-bonding pair exerts the weakest repulsive force.

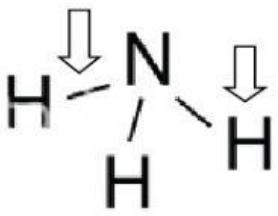


Now consider the CO_2 molecule. The Carbon atom has zero lone pairs on it, thus there is no lone pair-lone pair repulsion. In addition, the two bonding pair repel each other with equal strength, thus the molecule ends up being linear.



Now consider the ammonia molecule. It has only one lone pair, thus there is no lone pair-lone pair repulsion. The strongest repulsive force become the lone pair-bonding pair repulsion now. Then the bonding pair-bonding pair repulsion is the weakest repulsive force.





Thus ammonia ends up having a trigonal pyramidal shape.