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SCH4U – Electronegativity & Polar Molecules

Describe the difference between a polar covalent bond and a non-polar covalent bond:

When do polar covalent bonds form?

Define electronegativity:

Atoms with _____ electronegativity values tend to pull shared electrons towards them.

Atoms with _____ electronegativity values give up their shared electrons easily.

Using arrows indicating increasing electronegativity values, show the trend for electronegativity on the periodic table:

Group (vertical)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Period (horizontal)																		
1	H 2.20																	He
2	Li 0.98	Be 1.57											B 2.04	C 2.55	N 3.04	O 3.44	F 3.98	Ne
3	Na 0.93	Mg 1.31											Al 1.61	Si 1.90	P 2.19	S 2.58	Cl 3.16	Ar
4	K 0.82	Ca 1.00	Sc 1.36	Ti 1.54	V 1.63	Cr 1.66	Mn 1.55	Fe 1.83	Co 1.88	Ni 1.91	Cu 1.90	Zn 1.65	Ga 1.81	Ge 2.01	As 2.18	Se 2.55	Br 2.96	Kr 3.00
5	Rb 0.82	Sr 0.95	Y 1.22	Zr 1.33	Nb 1.6	Mo 2.16	Tc 1.9	Ru 2.2	Rh 2.28	Pd 2.20	Ag 1.93	Cd 1.69	In 1.78	Sn 1.96	Sb 2.05	Te 2.1	I 2.66	Xe 2.60
6	Cs 0.79	Ba 0.89	*	Hf 1.3	Ta 1.5	W 2.36	Re 1.9	Os 2.2	Ir 2.20	Pt 2.28	Au 2.54	Hg 2.00	Tl 1.62	Pb 2.33	Bi 2.02	Po 2.0	At 2.2	Rn 2.2
7	Fr 0.7	Ra 0.9	**	Rf	Db	Sg	Bh	Hs	Mt	Ds	Rg	Uub	Uut	Uuq	Uup	Uuh	Uus	Uuo
Lanthanides	*	La 1.1	Ce 1.12	Pr 1.13	Nd 1.14	Pm 1.13	Sm 1.17	Eu 1.2	Gd 1.2	Tb 1.1	Dy 1.22	Ho 1.23	Er 1.24	Tm 1.25	Yb 1.1	Lu 1.27		
Actinides	**	Ac 1.1	Th 1.3	Pa 1.5	U 1.38	Np 1.36	Pu 1.28	Am 1.13	Cm 1.28	Bk 1.3	Cf 1.3	Es 1.3	Fm 1.3	Md 1.3	No 1.3	Lr 1.291		

Periodic table of electronegativity using the Pauling scale

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To determine the type of bond that forms between 2 atoms (ionic, polar covalent, non-polar covalent) you can calculate the_____

Large ΔEN indicates what type of bonds:_____ or _____
Small ΔEN indicates what type of bond:_____

Complete the following table:

ΔEN	Bond Type
< 0.5	
0.5 - 1.7	
> 1.7	

Determine the ΔEN and classify the type of bond that forms between potassium (K) and bromine (Br):

Determine the ΔEN and classify the type of bond that forms between nitrogen (N) and hydrogen (H):

In bonds that have a polar character, the more electronegative atom becomes slightly_____ and the atom with the lower electronegativity becomes slightly_____.

Define dipole:

Write the symbols for the negative end of a dipole and the positive end of a dipole:

When using an arrow to describe a dipole, the arrow points towards the _____ end.

Molecular Polarity

Bonds can be polar or non-polar, entire molecules can also either be polar or non-polar.

Describe why water from a tap would be attracted to a balloon that was rubbed on someone's head.

Draw the VSEPR predicted shape for H_2O and indicate the bond dipoles and net polarity of the molecule:

Non-polar molecules

Non-polar molecules have no _____

What affects the polarity of a molecule:

1.
2.

Describe how some molecules with bond dipoles can be non-polar:

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Complete the following table:

Non-polar molecular structures with bond dipoles

Molecule Description	General Example	Specific Example
	B-A-B	
		SO_3
Tetrahedral with 4 identical bonds		

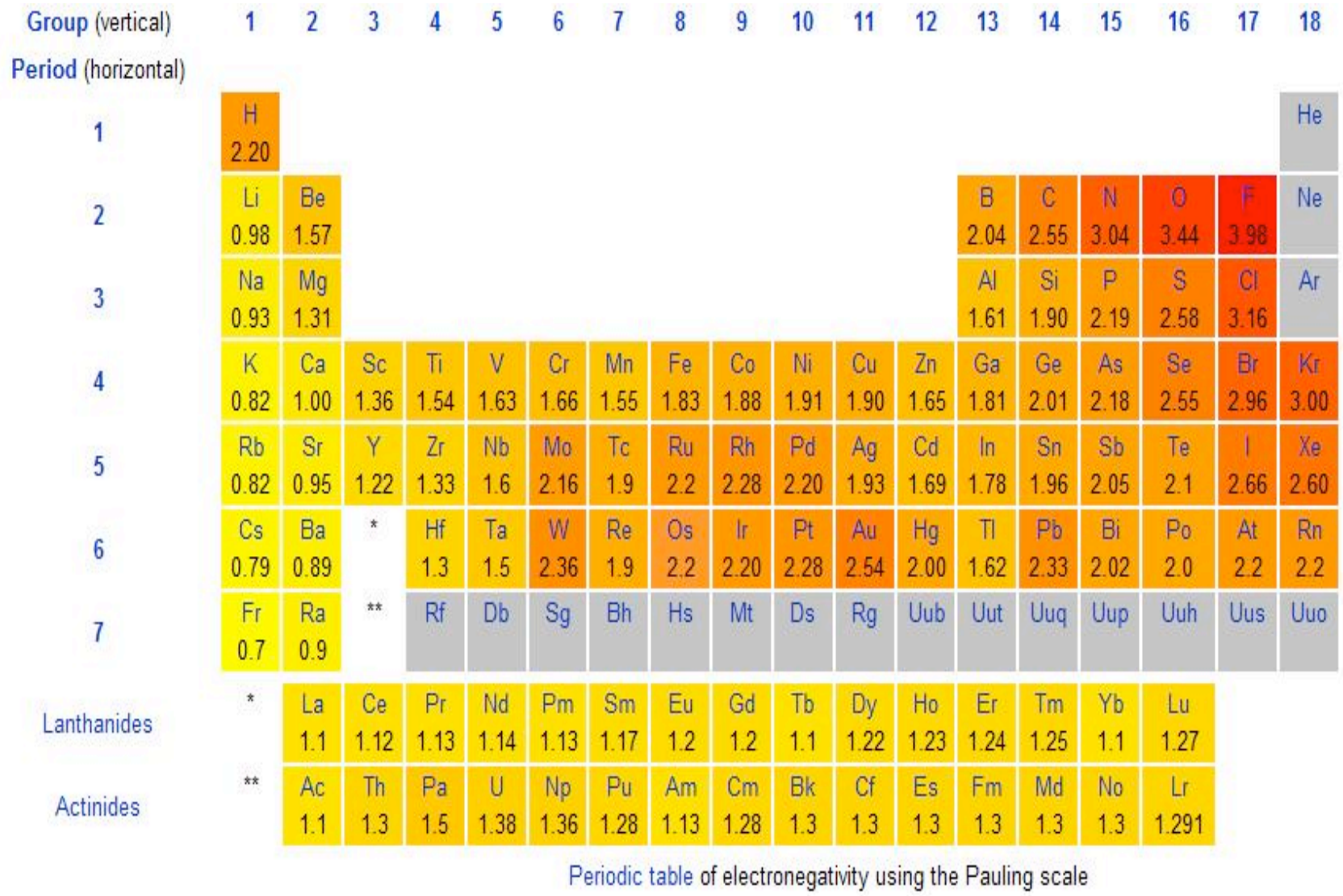
<u>Determining the net polarity of a molecule:</u>

1. Draw the Lewis structure.
2. Determine the predicted shape of the molecule using VSEPR.
3. Identify the electronegativity of each atom in the molecule and determine the partial charges in the molecule.
4. Draw bond dipoles and determine whether the molecule has a net dipole.

Predict the polarity of NH_3

Predict the polarity of CF_4

Predict the polarity of SF_2



Periodic table of electronegativity using the Pauling scale