

Exercise 6.1a(H)

Electronegativity & Bond Types

Name: _____

Date: _____ Per: _____

Electronegativity is a measure of an atom's ability to attract electrons in a chemical bond. Each element is assigned a value on the Pauling scale based on its bond energy. Fluorine (the most electronegative element) is assigned a value of 4.0, and cesium and francium (the least electronegative elements) are assigned values of just 0.7. The Pauling scale has no units.

When two atoms have the same electronegativity, they share electrons equally and form a completely non-polar covalent bond. The greater the difference in electronegativity (ΔEN), the more the electrons are attracted to one atom in the bond. As that attraction increases, the bond becomes more *polar* with the electrons spending most of their time near the more electronegative atom. If the difference is great enough, the electron is considered to be transferred to the stronger atom and an *ionic bond* occurs.

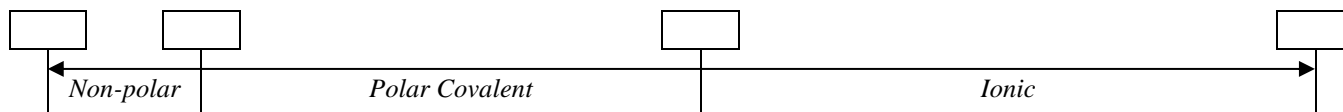
DIRECTIONS: Answer the following in the space provided.

- Generally, the electronegativity of atoms _____ as the atomic number increases from left to right across a period of the periodic table and _____ as the period number increases down a family.
- When two atoms have the same electronegativity, they form a(n) _____ bond. As the difference in electronegativity increases the bond becomes _____. If the difference is high enough, a(n) _____ bond will form as electrons are transferred between atoms.
- How are ionic bonds and covalent bonds different? _____

- How does a polar covalent bond differ from a non-polar covalent bond? _____

- How do electronegativity values help determine the polarity of a bond? _____

- Fill in the values to complete the following table for predicting bond type based on differences in electronegativity.



- What is the relationship between electronegativity and bond polarity? _____

- Using position in the Periodic Table as the criterion (do not look at a table or chart of electronegativity values), arrange the elements in each of the following groups in order of increasing electronegativity. Use the < symbol in your arrangement.
 - (F, C, N, O) _____
 - (Cl, F, I, Br) _____
 - (O, S, F) _____
 - (Cs, Ca, Cu, S, Se, Cl) _____
 - (As, F, Sb, Cl, S, Se) _____
- Complete the table by predicting the type of bond between the following elements **only** using the periodic table.

	Elements	Bond Type (Ionic or Covalent)
a.	Beryllium and Fluorine	
b.	Selenium and Chlorine	
c.	Strontium and Sulfur	

	Elements	Bond Type (Ionic or Covalent)
d.	Potassium and Iodine	
e.	Sulfur and Iodine	
f.	Magnesium and Chlorine	

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Table of Pauling Electronegativity Values

IA												VIIIA						
1	H 2.1															He 2		
2	Li 1.0	Be 1.5											B 2.0	C 2.5	N 3.0	O 3.5	F 4.0	Ne 10
3	Na 0.9	Mg 1.2											Al 1.5	Si 1.8	P 2.1	S 2.5	Cl 3.0	Ar 18
4	K 0.8	Ca 1.0	Sc 1.3	Ti 1.5	V 1.6	Cr 1.6	Mn 1.5	Fe 1.8	Co 1.8	Ni 1.8	Cu 1.9	Zn 1.6	Ga 1.6	Ge 1.8	As 2.0	Se 2.4	Br 2.8	Kr 36
5	Rb 0.8	Sr 1.0	Y 1.2	Zr 1.4	Nb 1.6	Mo 1.8	Tc 1.9	Ru 2.2	Rh 2.2	Pd 2.2	Ag 1.9	Cd 1.8	In 1.8	Sn 1.8	Sb 1.9	Te 2.1	I 2.5	Xe 54
6	Cs 0.7	Ba 0.9	La	Hf 1.4	Ta 1.6	W 1.8	Re 1.9	Os 2.2	Ir 2.2	Pt 2.2	Au 1.9	Hg 1.8	Tl 1.8	Pb 1.9	Bi 1.9	Po 2.0	At 2.2	Rn 86
7	Fr 0.7	Ra 0.9	Ac	Rf	Db	Sg	Bh	Hs	Mt									

10. For each of the following bonds, determine if it is covalent, polar covalent, or ionic. Show your work by listing the electronegativities for each atom and ΔEN 's for each bond. Draw the bond and indicate polarity using (\rightarrow).

Atom 1	Atom 2	$ \Delta EN $	Bond Type? (I), (PC) or (NPC)	Bond Polarity Diagram
H	Cl			
EN:	EN:			
H	H			
EN:	EN:			
Al	Fe			
EN:	EN:			
C	O			
EN:	EN:			
Ca	O			
EN:	EN:			
Cl	Cl			
EN:	EN:			
P	Si			
EN:	EN:			
P	N			
EN:	EN:			
Cs	O			
EN:	EN:			
Li	Cl			
EN:	EN:			

11. Arrange these bonded pairs in order of increasing polarity from the least polar (1) to the most polar (6).

C – H

C – S

H – F

C – N

C – O

H – Br