Name_____Date_____Hour_____

Ionic Vs Covalent Practice

Use the periodic table to complete the chart below.

Element Name	Type of Element	Number of Protons	Number of Electrons	Number of Valence Electrons	Number of electrons needed to fulfill Octet Rule.
1. Sodium					
2. Lithium					
3. Beryllium					
4. Chlorine					
5. Fluorine					
6. Oxygen					
7. Phosphorus					
8. Neon					
9. Hydrogen					
10. Carbon					
11. Selenium					
12. Nitrogen					
13. Sulfur					
14. Krypton					
15. Aluminum					

16. Using the information from the chart above, what pattern do you notice in metallic vs nonmetallic elements?

17. Transition elements can form multiple ions, based on their type and location within the periodic table, what charge do you think will most of these metals take? Why?

Chemical Bonding Worksheet

Ionic Bond	between a Metal and Non-Metal	(M + NM)
Covalent Bond	between a Non-Metal and Non-Metal	(NM + NM)
Metallic Bond	between a Metal and Metal	(M+ M)

Determine if the elements in the following compounds are metals or non-metals. Describe the type of bonding that occurs in the compound.

Compound	Element 1 (metal or non-metal?)	Element 2 (metal or non-metal?)	Bond Type
NO_2	N = non-metal	O = non-metal	covalent
18. NaCl			
19. SO_2			
20. PO_4^{3-}			
21. $MgBr_2$			
22. CaO			
23. H_2O			
24. NH_4^{1+}			
25. Cu-Zn alloy			
26. O_2			
27. $CuCl_2$			
28. NO_2^{2-}			

Electronegativity and Bonding

Electronegativity is a measure of how strongly atoms attract bonding electrons to themselves. The higher the electronegativity, the greater an atom's attraction for electrons. The most electronegative element is fluorine, followed by oxygen, chlorine and nitrogen. The least electronegative elements are francium, cesium, rubidium, and potassium. A scale of calculated electronegativity values for each element is shown in Figure 1, this scale was developed by the American chemist Linus Pauling.

Through his experiments and research Pauling determined that fluorine was the most electronegative element on the periodic table, and assigned it a value of 3.98 or 4. Atoms with high electronegativity tend to form negative ions and atoms with a lower electronegativity tend to form positive ions. In general, electronegativity of elements increases as you look from the top of a group to the bottom and as you look from left to right across a period. Noble gases as a rule do not have electronegativity values, these compounds do not readily bond with other elements because their valence shell is already full.

You have read about two different types of bonds, ionic and covalent. Ionic bonds simply involve a transfer of electrons from one atom to another, i.e. one atom has a great enough attraction for electrons to strip them from the other. In a covalent bond the valence electrons are shared, but not all elements share electrons equally. When two atoms share electrons evenly, their electronegativity difference is zero and we say it is a **nonpolar covalent bond** or simply a nonpolar bond. When one atom has a greater "attraction" for electrons than the other the electrons are shared unequally between the pair, this results in a **polar covalent bond** or simple a polar bond. An electronegativity of 0.4 or less results in a nonpolar bond, a electronegativity difference between 1.7 and 0.4 results in a polar covalent bond, and a difference of greater than 1.7 results in an ionic bond.

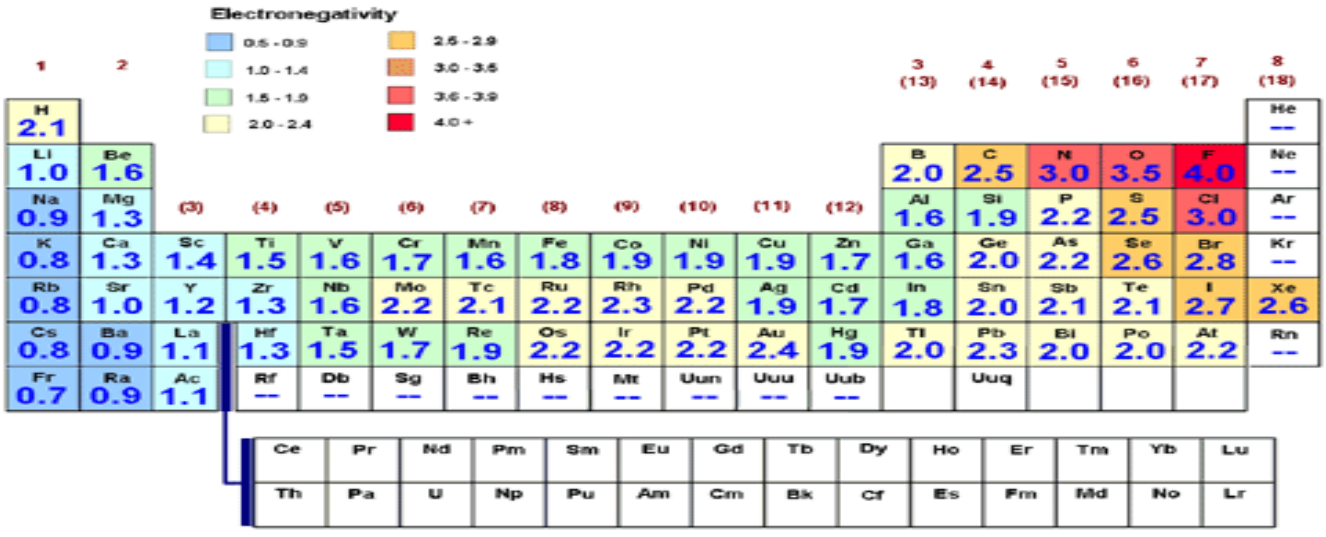
To determine the specific type of bond formed between two elements we look at each element's electronegativity value and calculate the difference between them. The difference, ΔEN, is compared to a range to determine the specific bond type.

29. Which group of elements have the lowest electronegativity values? What name is given to this group of elements?

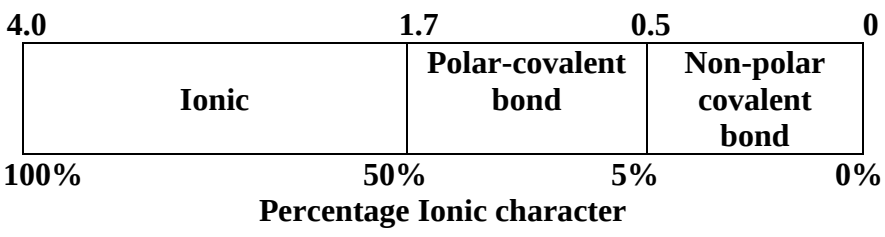
30. Look at Figure 1, what pattern in electronegativity to you see for metals? For nonmetals?

31. Why is there no electronegativity values for most of the noble gases?

32. Which group of elements has the highest electronegativity values? What name is given to this group of elements?



Difference in electronegativity, ΔEN,



Use the Figure 1 to determine the specific type of bond would be found between the following pairs of elements.

Bonding between	More electronegative element and value	Less electronegative element and value	Difference in electronegativity	Bond Type
33. Sulfur and Hydrogen				
34. Sulfur and cesium				
35. Chlorine and Bromine				
36. Calcium and chlorine				
37. Oxygen and hydrogen				
38. Nitrogen and hydrogen				
39. Iodine and iodine				
40. Copper and sulfur				
41. Hydrogen and fluorine				
42. Carbon and oxygen				