

## Work Session 9: Atomic Properties and Chemical Bonds

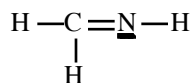
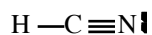
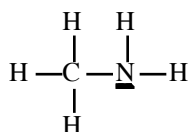
1. Distinguish between ionic, covalent, and metallic bonding in terms of which portions of the periodic table participate in each type of bonding, and the general properties of the resulting products of the bonding.
2. Where do polar covalent compounds fit into the bonding types?
3. Indicate whether the following compounds have ionic, covalent, or polar covalent bonding.  
SrCl<sub>2</sub>          NCl<sub>3</sub>          OCl<sub>2</sub>          CO<sub>2</sub>          CS<sub>2</sub>          CaC<sub>2</sub>
4. Some of the substances in question 3 have high melting points, some have low melting points. Which ones are which? Why?
5. Why are metals malleable and ionic compounds brittle?
6. Na and Mg each form compounds with F<sub>2</sub> and O<sub>2</sub>. What are the formulas of the four compounds? Which would have the strongest lattice energy? What are the periodic trends in lattice energy?
7. The Born-Haber cycle considers more than just lattice energy. Explain the steps involved in the Born-Haber cycle.

8. What forces of attraction and of repulsion cause covalent bonds to be of a particular length?

9. What is bond order?

10. How does bond order influence bond length and bond strength?

11. Arrange the following in order of carbon to nitrogen bond energy. Also indicate the order of bond length.



12. Which of the bonds in the molecules above are polar covalent?

13. Electronegativity can be used to calculate oxidation numbers. The more electronegative atom gets a minus, the less electronegative atom a plus, for each bond between them. The algebraic sum of the pluses and minuses on each atom gives the oxidation number. Using this method, hydrogen is +1 in each compound in question 11. What are the oxidation numbers of C and N in each compound?

(Note: An easy way to do this is to change each bond line into an arrow pointing at the more electronegative atom. Each arrow head gives a (-) to the atom it touches, each arrow tail gives a (+) to the atom it touches. Add together the pluses and minuses.)

14. How is electronegativity related to atomic size?