Unit 4 Exam Review: Chapter 9, 10, 12, and 13

Chapter 9: Electrons in Atoms on the Periodic Table

1. Describe the electromagnetic spectrum and draw the entirety of it with corresponding labels.

2. Arrange these three types of electromagnetic radiation – visible light, X-rays, and microwaves – in order of increasing:
   Wavelength:

   Frequency:

   Energy per Photon:

3. How does the rainbow compare to the electromagnetic spectrum in terms of frequency and wavelength?

4. Provide the electron configuration for the following elements on the periodic table:

   Co:

   Cd:

   S:

5. How many electrons are unpaired in the orbitals of iron? You will probably need to draw the orbital diagram for iron using arrows.

6. Write the ground state electron configuration for the magnesium atom.

7. How can you differentiate between core electrons and valence electrons without writing the entirety of an atom's electron configuration?

8. Explain a quantum number (n). What does this number represent?

Chapter 10: Chemical Bonding

1. What is the octet rule (duets)?

2. What are resonance structures?

3. What is the difference between electron groups and bonding groups?

4. Discuss the rules of increasing atomic size and list the following elements in order of increasing atomic size: Se, N, Li, Cd, Sc.

5. Write the Lewis structure for each element: N, C, O, Cl, Ar.

6. Describe what occurs when two nonmetals are bonded together.

7. Describe what occurs when one metal and one nonmetal are bonded together.

Steps for Drawing Lewis Structures:

1. Sum the valence electrons from all atoms.
2. Write the symbols for the atoms to show which atoms are attached to which and connect them with a single bond.
    - Hydrogen is always terminal.
    - The halogens are always terminal.
    - Carbon is often the central atom.
3. Complete the octet of the atoms bonded to the central atom.
4. Place any leftover electrons on the central atom, even if doing so results in more than an octet.
5. If there are not enough atoms to ensure each element has a full octet, try multiple bonds.

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8. Write the Lewis structure for the following compounds, state their molecular geometry and their bond angles:

CO_2 SO_2

CCl_4 NH_4^+

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NO_3^-

PCl_3

H_2CO

H_2O

9. What is electronegativity?

10. Compare bond strength.

11. Why do oil and water not mix?

12. What is the universal solvent?

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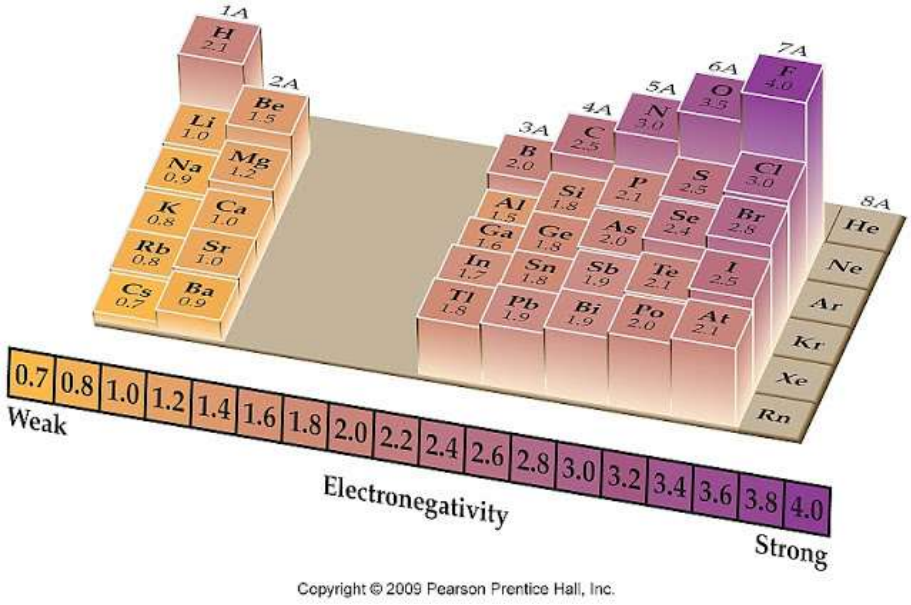
Electronegativity and Bond Character

Electronegativity	Bond Character
2.0 +	
0.41-1.9	
0-0.4	

The Electronegativity Periodic Table:



Use the table values to determine what type of bond will form:

1. Sr and O _____
2. Cl and Br _____
3. H and F _____
4. Na and S _____
5. Br and Br _____

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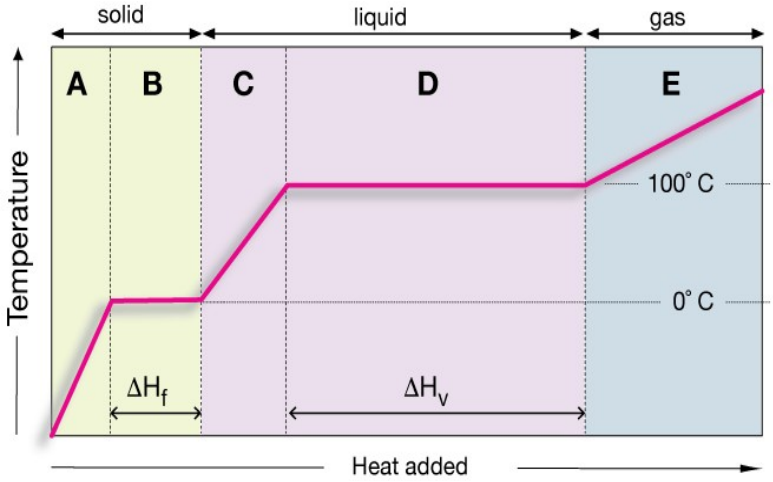
Chapter 12 & 13: Liquids, Solids, and Intermolecular Forces

1. What properties does water have from strong intermolecular forces?

2. Explain the heating curve of water:



3. What is a dipole moment?

10. How does soap work?

11. Describe the difference in molecular motion between solids, liquids, and gases.

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12. Define surface tension, capillary action and viscosity.

13. What factors increase the rate of vaporization?

14. What is vapor pressure and how is it affected by temperature and intermolecular forces?

15. Explain the terms 'endothermic' and 'exothermic' using phase changes.

16. What are the three types of intermolecular forces, and how do they compare in strength?

17. How do you determine if a molecule has dipole–dipole forces?

18. Why does water have a high boiling point despite its low molar mass?

19. Define a saturated, unsaturated, and a supersaturated solution.

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20. Why is water less dense as a solid than as a liquid?

21. If intermolecular forces increase, what happens to the following:

Boiling/Melting Point _____	Capillary _____
Viscosity _____	Vapor Pressure _____
Surface Tension _____	Evaporation Rate _____

22. Define hydrogen bonding. What is an example?

23. What intermolecular interaction is exhibited by all chemicals?

24. List properties and examples of the following intermolecular forces:
    - Ionic
    - Molecular
    - Covalent Network Solids
    - Metallic