

Chemistry 121  
Fall 2004  
Test 3, FORM A

Name: \_\_\_\_\_

Instructions: You have 50 minutes to complete this 100-point exam. You may use a simple scientific calculator. No programmable calculators allowed.

**I. MULTIPLE CHOICE:** (25 pts, 5 points each) Carefully and clearly circle the best answer. If you circle two answers, *one of which is correct*, you will receive 3 points.

1. Which of the following is an incorrect statement about light?
  - a. Light is wave-like.
  - b. The technical term for light is electromagnetic radiation.
  - c. Light is particle-like.
  - d. The wavelength of light increases as the frequency of light increases.
  - e. None of the above.
  
2. An atom that absorbs a photon of light is in the:
  - a. Ground state.
  - b. Excited state.
  - c. Stable state.
  - d. Positive state.
  - e. None of the above
  
3. The statement “no two electrons can have the same set of 4 quantum numbers” refers to:
  - a. The Aufbau Principle
  - b. Hund’s Rule
  - c. The Pauli Exclusion Principle
  - d. The Heisenberg Uncertainty Principle
  - e. None of the above
  
4. Electrons that participate in bonding are termed:
  - a. Core electrons.
  - b. Valence electrons.
  - c. Excited electrons.
  - d. Negative electrons.
  - e. None of the above
  
5. Which of the following is the most polar bond?
  - a. F - F
  - b. O - F
  - c. S - F
  - d. Se - F
  - e. Te - F

**II. Short Answer and Calculations** (85 pts): Clearly indicate your answer in the space provided. Partial credit will be given for correct work. If I cannot read the work, it will not be graded.

- (15 pts) Write the **NOBLE GAS** electron configuration for the following atoms and ions, indicate the number of valence electrons (VE) and determine if they are paramagnetic (P) or diamagnetic (D).

		<u>#VE</u>	<u>P or D</u>
a.	I _____	_____	_____
b.	P _____	_____	_____
c.	S _____	_____	_____
d.	Cr _____	_____	_____
e.	Ga _____	_____	_____
- (15 pts) Indicate whether or not the following quantum numbers or orbitals can exist using Y for yes and N for no. For those that cannot exist, explain why.
  - $n = 4, l = 3, m_l = 4, m_s = -1/2$  \_\_\_\_\_
  - 3f \_\_\_\_\_
  - $n = 5, l = 0, m_l = 0, m_s = -1/2$  \_\_\_\_\_
- (5 pts) Write the following atoms in order of increasing atomic radii: Si, B, Ba, Zr and Zn.
- (5 pts) Write the following atoms in order of decreasing ionization energy: S, F, Se, Ge and P.
- (10 pts) In Chapter 6, we studied how radiation interacts with the Earth's atmosphere. Pick a region of the earth's atmosphere (not the mesosphere) that we discussed in Chapter 6 and describe how light interacts with the molecules and the chemistry associated with it in 5 - 6 grammatically correct sentences. **Make sure you include any pertinent chemical reactions.**

6. (5 pts) Define the following: isoelectronic species.

7. (30 pts) For each of the following molecules or ions,

- (a) Draw the correct Lewis Dot Structure.
- (b) Give the AXE notation.
- (c) Determine the molecular geometry.
- (d) Determine the orbital geometry.
- (e) Give the hybridization of the central atom.
- (f) Determine if it is polar or nonpolar.



AXE: \_\_\_\_\_  
Molecular Geometry: \_\_\_\_\_  
Orbital Geometry: \_\_\_\_\_  
Hybridization: \_\_\_\_\_  
Polar or Nonpolar: \_\_\_\_\_



AXE: \_\_\_\_\_  
Molecular Geometry: \_\_\_\_\_  
Orbital Geometry: \_\_\_\_\_  
Hybridization: \_\_\_\_\_  
Polar or Nonpolar: \_\_\_\_\_



AXE: \_\_\_\_\_  
Molecular Geometry: \_\_\_\_\_  
Orbital Geometry: \_\_\_\_\_  
Hybridization: \_\_\_\_\_  
Polar or Nonpolar: \_\_\_\_\_