

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.

1. (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 _____ | _____ | _____ |
2. (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.
- a. $n = 4, l = 3, m_l = 4, m_s = -1/2$ _____
- b. $3f$ _____
- c. $n = 5, l = 0, m_l = 0, m_s = -1/2$ _____
3. (5 pts) Write the following atoms in order of increasing atomic radii: Si, B, Ba, Zr and Zn.
4. (5 pts) Write the following atoms in order of decreasing ionization energy: S, F, Se, Ge and P.
5. (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: _____