

Chemistry 121
Spring 2005
Test 3, FORM A

Name: _____

Instructions: You have 75 minutes to complete this 100-point exam. You may use a simple scientific calculator. No programmable calculators allowed.

I. Multiple Choice (15 pts, 3 points each) Carefully and clearly circle the best answer. If you circle two answers, *one of which is correct*, you will receive 1 point.

1. Which of the following atoms has the largest atomic radii?
 - a. S
 - b. P
 - c. Se
 - d. O
 - e. B

2. Which of the following terms is not used to describe light?
 - a. wavelength
 - b. frequency
 - c. amplitude
 - d. hybridization
 - e. None of the above.

3. The equation, $E = h\nu$, can be used to calculate the energy of _____.
 - a. An atom
 - b. An electron
 - c. An ion
 - d. A photon
 - e. None of the above

4. Which of the following energy level diagrams correctly depicts the 3d electrons in Fe?
 - a. $\uparrow\downarrow \uparrow \uparrow \uparrow \uparrow$
 - b. $\uparrow\downarrow \uparrow\downarrow \uparrow\downarrow _ _$
 - c. $\uparrow\downarrow \uparrow\downarrow _ _ _$
 - d. $\uparrow\downarrow \uparrow\downarrow \uparrow \uparrow _$
 - e. None of the above

5. Which of the following elements has the highest electron affinity?
 - a. Al
 - b. F
 - c. P
 - d. O
 - e. Si

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).

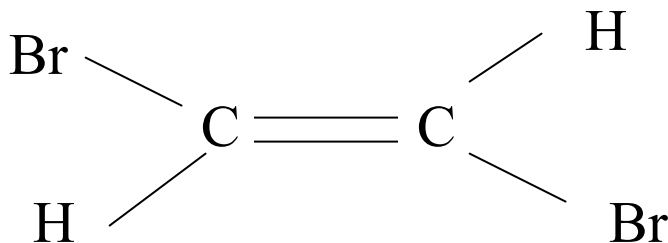
		<u>VE</u>	<u>P or D</u>
a. S ⁻²	_____	_____	_____
b. Si	_____	_____	_____
c. As	_____	_____	_____
d. Zn	_____	_____	_____
e. Cu	_____	_____	_____

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. $n = 3, l = 3, m_l = 2, m_s = -\frac{1}{2}$ _____
- b. 3d _____
- c. $n = 5, l = 0, m_l = 0, m_s = -\frac{1}{2}$ _____
- d. $n = 8, l = 4, m_l = -3, m_s = 1$ _____
- e. 1p _____

3. (5 pts) Write the following atoms in order of increasing ionization energy: P, Se, F, As and Rb.

4. (10 pts) Describe the bonding in the following molecule and indicate whether it is cis or trans.



5. (40 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: _____



AXE: _____
Molecular Geometry: _____
Orbital Geometry: _____
Hybridization: _____
Polar or Nonpolar: _____

6. (10 pts) Pick **ONE** of the following essay questions to answer in 4 – 5 grammatically correct sentences.
Make sure you include any pertinent chemical reactions.
- a. Explain how light interacts with molecules in the thermosphere and the importance of this interaction.
 - b. Describe the process of screening in a multi-electron atom.