

Chemistry 121
Spring 2004
Test 3
FORM A

Name: _____

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

I. MULTIPLE CHOICE: (30 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. What type of orbital is designated $n = 3, l = 2, m_l = 0$?
 - a. 2s
 - b. 3s
 - c. 3p
 - d. 3d

2. What is the maximum number of orbitals possible when $l = 1$?
 - a. Zero
 - b. One
 - c. Three
 - d. Five

3. When $l = 3$, what set of orbitals is designated?
 - a. f
 - b. p
 - c. s
 - d. d

4. The lowest-energy state of an atom is called its _____.
 - a. wave function
 - b. node
 - c. ground state
 - d. orbital

5. The quantum number m_l represents the _____.
 - a. number of valence electrons.
 - b. shape of the orbital.
 - c. orientation of the orbital.
 - d. momentum of the electron.

6. Which of the following elements is a d-block element?
 - a. Copper
 - b. Chlorine
 - c. Aluminum
 - d. Sodium

7. What element has the electron configuration $1s^2 2s^2 2p^6 3s^2 3p^3$?
 - a. C

- b. N
 - c. O
 - d. F
8. Which of the following atoms has the largest radius?
- a. C
 - b. N
 - c. Si
 - d. P
9. Which of the following atoms has the largest ionization energy?
- a. P
 - b. N
 - c. S
 - d. O
10. Which of the following bonds is more polar?
- a. Si – C
 - b. Si – N
 - c. Si – O
 - d. Si – F

II. Short Answer and Calculations (80 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. (10 pts) Please indicate whether or not the following orbitals can exist. (Y or N)
- a. 3s _____
 - b. 4f _____
 - c. 4p _____
 - d. 2d _____
 - e. 3f _____
2. (5pts) What two properties of electrons make it impossible to pinpoint their exact location? (The Heisenberg Uncertainty Principle)
- a. _____
 - b. _____
3. (10 pts) Write the noble gas electron configurations for the following atoms or ions and determine whether they are diamagnetic or paramagnetic. Dia or Para?
- a. Sc _____
 - b. Cr _____
 - c. Si _____

d. S^{2-} _____

e. Br _____

4. (40 pts) For each of the following molecules,

- Draw the correct Lewis Dot Structure.
- Give the AXE notation.
- Determine the molecular geometry.
- Determine the orbital geometry.
- Give the hybridization of the central atom.
- Determine if it is polar or nonpolar.

IF_3

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

PH_3

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

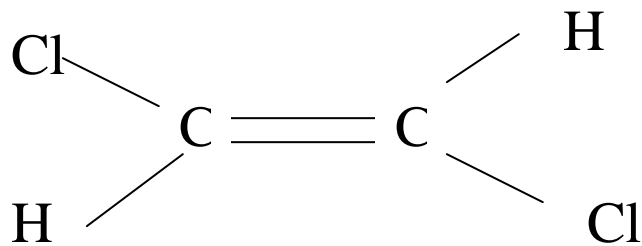
H_2S

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



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

5. (5 pts) Describe the bonding in the following molecule and indicate whether it is *cis* or *trans*.



6. (10 pts) In Chapter 6, we discussed how radiation interacts with the Earth's atmosphere. Pick a region of the earth's atmosphere (no the mesosphere) that we discussed and describe the chemistry associated with it in 3-4 **grammatically correct** sentences. Make sure you include any pertinent chemical reactions.