

Chemistry 121
Fall 2004
Test 3, FORM A

Name: KEY

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).

		#VE	P or D
a.	I <u>$[Kr] 5s^2 4d^{10} 5p^6$</u>	<u>8</u>	<u>D</u>
b.	P <u>$[Ne] 3s^2 3p^3$</u>	<u>5</u>	<u>P</u>
c.	S <u>$[Ne] 3s^2 3p^4$</u>	<u>6</u>	<u>P</u>
d.	Cr <u>$[Ar] 4s^1 3d^5$</u>	<u>6</u>	<u>P</u>
e.	Ga <u>$[Ar] 4s^2 3d^{10} 4p^1$</u>	<u>3</u>	<u>P</u>

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.

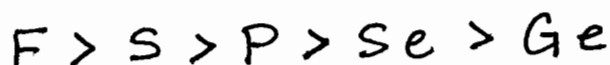
a.	$n = 4, l = 3, m_l = 4, m_s = -\frac{1}{2}$	<u>no, m_l cannot be $> l$</u>
b.	3f	<u>no, $l = 3$ and $l \neq n$</u>
c.	$n = 5, l = 0, m_l = 0, m_s = -\frac{1}{2}$	<u>yes</u>

0
1
2
3
s
p
d
f

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.



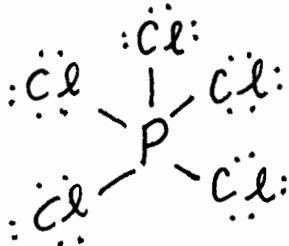
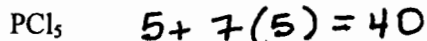
5. (10 pts) In Chapter 6, we studied how radiation interacts with the Earth's atmosphere. Pick a region of the earth's atmosphere (not the mesosphere) that we discussed in Chapter 6 and describe how light interacts with the molecules and the chemistry associated with it in 5 - 6 grammatically correct sentences. **Make sure you include any pertinent chemical reactions.**

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

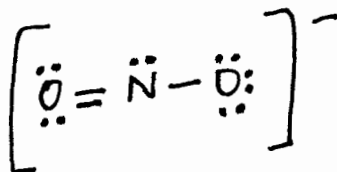
molecules or ions having the same number of valence electrons and the same Lewis structures.

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

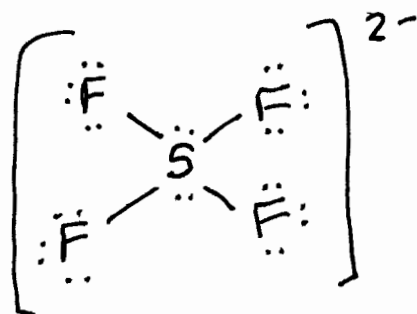
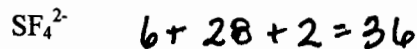
- Draw the correct Lewis Dot Structure.
- Give the AXE notation.
- Determine the molecular geometry.
- Determine the orbital geometry.
- Give the hybridization of the central atom.
- Determine if it is polar or nonpolar.



AXE: AX_5
Molecular Geometry: trigonal bipyramidal
Orbital Geometry: trigonal bipyramidal
Hybridization: sp^3d
Polar or Nonpolar: non polar



AXE: AX_2E
Molecular Geometry: bent
Orbital Geometry: trigonal planar
Hybridization: sp^2
Polar or Nonpolar: polar



AXE: AX_4E_2
Molecular Geometry: square planar
Orbital Geometry: octahedral
Hybridization: sp^3d^2
Polar or Nonpolar: non polar