

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.

- Which of the following is an incorrect statement about light?
 - Light is wave-like.
 - The technical term for light is electromagnetic radiation.
 - Light is particle-like.
 - The wavelength of light increases as the frequency of light increases.
 - None of the above.
- An atom that absorbs a photon of light is in the:
 - Ground state.
 - Excited state.
 - Stable state.
 - Positive state.
 - None of the above
- The statement "no two electrons can have the same set of 4 quantum numbers" refers to:
 - The Aufbau Principle
 - Hund's Rule
 - The Pauli Exclusion Principle
 - The Heisenberg Uncertainty Principle
 - None of the above
- Electrons that participate in bonding are termed:
 - Core electrons.
 - Valence electrons.
 - Excited electrons.
 - Negative electrons.
 - None of the above
- Which of the following is the most polar bond?
 - F - F
 - O - F
 - S - F
 - Se - F
 - 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] 5s² 4d¹⁰ 5p⁶</u>	<u>8</u>	<u>D</u>
b.	P <u>[Ne] 3s² 3p³</u>	<u>5</u>	<u>P</u>
c.	S <u>[Ne] 3s² 3p⁴</u>	<u>6</u>	<u>P</u>
d.	Cr <u>[Ar] 4s¹ 3d⁵</u>	<u>6</u>	<u>P</u>
e.	Ga <u>[Ar] 4s² 3d¹⁰ 4p¹</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>

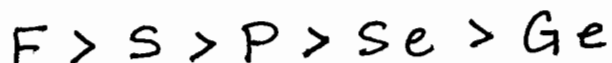
0
1
2
3

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.



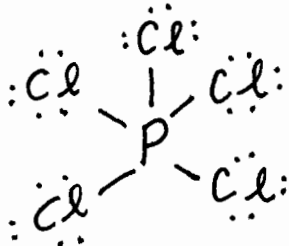
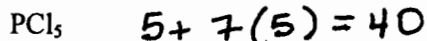
5. (10 pts) In Chapter 6, we studied how radiation interacts with the Earth's atmosphere. Pick a region of the earth's atmosphere (not the mesosphere) that we discussed in Chapter 6 and describe how light interacts with the molecules and the chemistry associated with it in 5 - 6 grammatically correct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

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

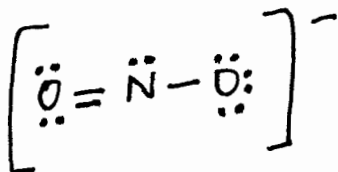
molecules or ions having the same number of valence electrons and the same Lewis structures.

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

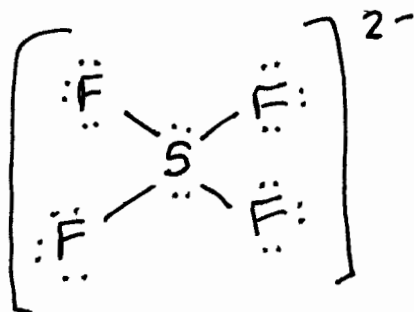
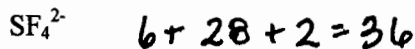
- Draw the correct Lewis Dot Structure.
- Give the AXE notation.
- Determine the molecular geometry.
- Determine the orbital geometry.
- Give the hybridization of the central atom.
- Determine if it is polar or nonpolar.



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



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: nonpolar