

Name: _____

Part I. Multiple Choice:

1. The bonding in which of the following compounds is the most covalent?

- A. CaO
- B. NaF
- C. CO
- D. F₂
- E. HCl

2. The orbital that has the quantum numbers $n=3$, $l=2$, $m_l=0$ is:

- A. 2s
- B. 3s
- C. 3p
- D. 3d
- E. 4d

3. Which of the following pairs of atoms/ions is isoelectronic?

- A. O⁻², S⁻²
- B. Na, Na⁺¹
- C. Br⁻¹, Kr
- D. Cu, Zn
- E. none of these

4. In an atom of helium, an electron that undergoes a transition from the 6th energy shell to the 2nd energy shell will cause which of the following to occur?

- A. Absorption of a photon
- B. Emission of a photon
- C. Loss of kinetic energy
- D. Gain of kinetic energy
- E. None of these

5. All halogens have the following number of valence electrons:

- A. 2
- B. 3
- C. 5
- D. 7
- E. none of these

6. Order the elements S, Cl, and F in terms of increasing atomic radii.

- A. S, Cl, F
- B. Cl, F, S
- C. F, S, Cl
- D. F, Cl, S
- E. S, F, Cl

7. 550 nm electromagnetic radiation is in what region of the electromagnetic spectrum?

- A. Ultraviolet
- B. Visible
- C. Infrared
- D. Microwave
- E. X-ray

8. Circle the correct answer for each of the following:

a) The lowest **2nd** ionization energy: Mg, Li, Be

b) The greatest (most exothermic) electron affinity: As, Se, Br

Part II. Short Answers: *To get full credit you must show all your work!*

9. What volume of concentrated sulfuric acid (18.0 M) is needed to make 50.0 mL of 2.00 M H_2SO_4 solution?

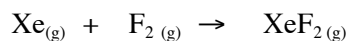
10. It requires 3.86×10^5 kJ/mol of energy to eject electrons from the surface of a certain metal. What is the maximum wavelength of electromagnetic radiation that can supply this amount of energy?

11. Give the electron configuration for the following atoms and ions (condensed notation is OK).

P _____

Ti²⁺ _____

12. Xenon difluoride can be prepared from elemental xenon and fluorine:



Calculate the enthalpy change, ΔH_f° , for this reaction knowing that the bond dissociation energies are 131 kJ/mol for a Xe–F bond and 159 kJ/mol for an F–F bond.

13. What is the energy of *one mole* of radio wave photons with a wavelength of 95.6 meters?

14. For laughing gas, N_2O ...

a) Draw a valid Lewis structure below (connectivity N–N–O). Assign formal charges to all atoms.

b) Draw two additional resonance structures of the structure you drew in part 'a'. Assign formal charges to all atoms.

c) Circle the single structure above (from the three structures in parts 'a' and 'b') that most closely represents the true structure of N_2O and briefly explain your choice.

15. Complete the following Table:

Chemical Formula: SiF ₄	Chemical Formula: NO ₂ ⁺
Lewis Structure:	Lewis Structure: (<i>nitrogen is the central atom</i>)
Molecular Geometry: (words only, you do <u>not</u> have to draw the molecule in three dimensions)	Molecular Geometry: (words only, you do <u>not</u> have to draw the molecule in three dimensions)
Molecular Polarity (yes/no):	Molecular Polarity (yes/no):
Bond Angle for F–Si–F	Bond Angle for O–N–O

Chemical Formula: ClF ₃	Chemical Formula: BCl ₃
Lewis Structure: (<i>chlorine is the central atom</i>)	Lewis Structure:
Molecular Geometry: (words only, you do <u>not</u> have to draw the molecule in three dimensions)	Molecular Geometry: (words only, you do <u>not</u> have to draw the molecule in three dimensions)
Molecular Polarity (yes/no):	Molecular Polarity (yes/no):
Bond Angle for F–Cl–F	Bond Angle for Cl–B–Cl