

I) Define the following:

- 1) **1<sup>st</sup> Ionization Energy**
- 2) **Electron Affinity**
- 3) **Square of  $\psi$**
- 4) **Degenerate (define and tell what orbitals are degenerate)**
- 5) **Pauli Exclusion Principle**
- 6) **Hund's Rule**
- 7) **Heisenberg's Uncertainty Principle**

II) Fill in the following Chart on the 4 Quantum Numbers:

<b>Letter</b>	<b>Rep. of Number</b>	<b>What It Stands For/ Describes</b>	<b>Range</b>
1.			
2.			
3.			
4.			

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III) Fill in the following Chart on the 4 Orbital Shapes:

**Basic Orbital (letter & number)    Basic Orbital (#of orientations)    Basic Orbital Shape**

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IV) Find the **frequency, energy, and wavelength** of a photon emitted when an excited hydrogen electron moves from the **5<sup>th</sup>** energy level to the **2<sup>nd</sup>** energy level. (**Include units.**)

Frequency = \_\_\_\_\_

Energy = \_\_\_\_\_

Wavelength = \_\_\_\_\_

V) Give the (long form) **electron configuration** and **orbital diagrams** of the following elements or ions:

**Ge**

**Tc**

**Al**

**Mn<sup>4+</sup>**

**S<sup>2-</sup>**

In the **above** electron configurations and orbital diagrams, give the 4 quantum numbers for the given electron: **Please circle the electron in the orbital diagram and write the quantum numbers below the boxes as well as in the blank (\_\_\_\_,\_\_\_\_,\_\_\_\_,\_\_\_\_) below.**

**27<sup>th</sup> e<sup>-</sup> in Ge** (\_\_\_\_,\_\_\_\_,\_\_\_\_,\_\_\_\_)

**Last e<sup>-</sup> in Tc** (\_\_\_\_,\_\_\_\_,\_\_\_\_,\_\_\_\_)

**7<sup>th</sup> e<sup>-</sup> in Al** (\_\_\_\_,\_\_\_\_,\_\_\_\_,\_\_\_\_)

**20<sup>th</sup> e<sup>-</sup> in Mn<sup>4+</sup>** (\_\_\_\_,\_\_\_\_,\_\_\_\_,\_\_\_\_)

**17<sup>th</sup> e<sup>-</sup> in S<sup>2-</sup>** (\_\_\_\_,\_\_\_\_,\_\_\_\_,\_\_\_\_)

VI) Give the Abbreviated (**Nobel Gas**) configuration for the following: (**DO NOT GIVE ORBITAL DIAGRAMS**)

Te

P<sup>3-</sup>

Cd<sup>+2</sup>

VII) Fill in the Chart below that describes the Trends of the Periodic Table:

	<b>Trend</b>	<b>Reason</b>
<b>Atomic Radii</b>	<b>Across:</b>	<b>Across:</b>
	<b>Down:</b>	<b>Down:</b>
<b>Ionization Energy</b>	<b>Across:</b>	<b>Across:</b>
	<b>Down:</b>	<b>Down:</b>
<b>Electron Affinity</b>	<b>Across:</b>	<b>Across:</b>
	<b>Down:</b>	<b>Down:</b>
<b>Ionic Radii</b>	<b>As +ion increases:</b>	<b>As +increases:</b>
	<b>As -ion increases:</b>	<b>As -ion increases:</b>
	<b>Down:</b>	<b>Down:</b>

**Helpful equations and constants:**

$$c = v \lambda \quad E = h v \quad E = -2.178 \times 10^{-18} \text{ J } (1/n_f^2 - 1/n_i^2)$$

$$h = 6.626 \times 10^{-34} \text{ J s} \quad c = 3.00 \times 10^8 \text{ m s}^{-1}$$

Name \_\_\_\_\_

(VIII) Multiple Choice Questions:

- 1) Which of the following has the largest **atomic radius**?
  - a) Ba
  - b) Mo
  - c) Ag
  - d) Sn
  - e) Se
  
- 2) Electrons in an orbital with the quantum number  $\ell = 3$  is a/an
  - a) d orbital
  - b) p orbital
  - c) f orbital
  - d) s orbital
  - e) g orbital
  
- 3) Which of the following sets of quantum numbers is not possible?
  - a) (4, 3, -2, +1/2)
  - b) (3, 2, -3, -1/2)
  - c) (3, 0, 0, +1/2)
  - d) (3, 3, 1, -1/2)
  - e) (2, 0, 0, -1/2)
  
- 4) What element has the smallest ionization energy?
  - a) Cl
  - b) Na
  - c) Be
  - d) K
  - e) As
  
- 5) What element has the largest ionization energy?
  - a) Ni
  - b) Al
  - c) Na
  - d) Kr
  - e) Bi
  
- 6) Which element has the largest radius?
  - a)  $\text{Na}^+$
  - b)  $\text{K}^+$
  - c)  $\text{Ca}^{2+}$
  - d)  $\text{Cl}^-$
  - e)  $\text{N}^{3-}$

- 7) Which of the following are **isoelectronic** to each other? (Pick 2 answers)
- a)  $F^-$
  - b)  $B^{2+}$
  - c)  $Mg^{2+}$
  - d)  $Li^+$
  - e)  $Cl^-$
- 8) What is the difference in the electron configuration of  $^{14}C$  and  $^{12}C$  ?
- a) Carbon-14 weighs more than Carbon-12.
  - b) Carbon-14 has more protons than Carbon-12.
  - c) Carbon-12 has fewer neutrons than Carbon-14.
  - d) There is no difference in the electron configuration between  $^{14}C$  and  $^{12}C$ .
- 9) In what orbital(s) do electrons ionize in Co when Co becomes a 2+ ion?
- a) 3d
  - b) 2s
  - c) 4s
  - d) 3p
- 10) The symbol  $E\psi$  represents
- a) The energy of an electron
  - b) The wave function of light
  - c) The photoelectric effect
  - d) An orbital's wave function