

## Unit 02 Review: Atomic Theory and Periodic Table Review

### Practice Multiple Choice Questions

- The number of neutrons in an atom of radioactive C – 14 is:
  - 6
  - 12
  - 8
  - 14
- When a radioactive nucleus emits a beta particle:
  - the atom's mass number increases by 1
  - the atomic number increases by 1
  - the atom's mass number decreases by 1
  - the atomic number decreases by 1
- Which of the following particles has the smallest mass?
  - an alpha particle
  - a proton
  - a beta particle
  - a neutron
- What is the mass number of an isotope of hydrogen consisting of 1 proton, 1 electron, and 2 neutrons?
  - 1
  - 2
  - 3
  - 4
- The average atomic mass reported on the Periodic Table for each element is:
  - the average of the mass numbers of all of the isotopes of that element
  - the mass number of the most abundant isotope of that element
  - the weighted average mass of all of the isotopes of that element
  - all of the above
- Three isotopes of element "X" occur in nature: 60.0% of the atoms have mass 110.0 u, 30.0% of atoms have mass 105.0 u and 10.0% of atoms have mass 100.0 u. Calculate the average atomic mass of element X.
  - 102.5 u
  - 107.5 u
  - 105.0 u
  - 315.0 u
- A single burst of light is released from an atom. Which statement explains what happened in the atom?
  - an electron changed from a particle to a wave
  - an electron moved from a higher to a lower energy level
  - an electron moved from a lower to a higher energy level
  - two electrons in the atom collided
- The characteristic bright line spectrum of an element is produced when:
  - the nucleus of the atom is excited
  - excited electrons drop back to lower energy levels
  - electrons are raised to higher energy levels
  - an atom emits a beta particle
- Which of the following was used to disprove Rutherford's model of the atom?
  - the cathode ray tube
  - the gold-foil experiment
  - the bright line spectrum of hydrogen
  - a Geiger counter used to detect radioactivity
- Why must we use the quantum mechanical theory to describe the location of electrons in an atom?
  - it is impossible to know both the location and orbit (trajectory) of an electron
  - all of the electrons in a principle quantum level are exactly the same distance from the nucleus
  - electrons attract each other
  - electrons lose energy as they move further from the nucleus
- When  $n = 3$ , you know that:
  - this energy level can hold a maximum of 36 electrons
  - there will be three different types of orbitals (sublevels) in this energy level
  - there will be 18 orbitals in this principal quantum level
  - all of the above

12. What is the maximum number of electrons that can occupy the 4p sublevel of an atom?  
a) 6  
b) 8  
c) 2  
d) 10
13. The maximum number of electrons in the 3d sublevel is:  
a) 6  
b) 8  
c) 2  
d) 10
14. Which two particles have the same electron configuration?  
a)  $\text{Cl}^{1-}$  and  $\text{F}^{1-}$   
b)  $\text{Cl}^{1-}$  and Ne  
c)  $\text{Cl}^{1-}$  and  $\text{Ca}^{2+}$   
d)  $\text{Cl}^{1-}$  and K
15. Which of the following provided evidence that electrons in atoms are found in discrete energy levels?  
a) patterns in their electronegativities  
b) patterns in their densities  
c) patterns in their atomic radii  
d) the bright line spectra that is unique to each element
16. What is the maximum number of electrons that can occupy the second principal energy level?  
a) 6  
b) 18  
c) 8  
d) 32
17. The structure of an alpha particle is the same as a(n):  
a) lithium atom  
b) hydrogen nucleus  
c) electron  
d) helium nucleus
18. What is the total number of electrons in a  $\text{Mg}^{2+}$  ion?  
a) 10  
b) 12  
c) 2  
d) 24
19. Which atom has the strongest attraction for a new electron?  
a) Cl  
b) Br  
c) F  
d) I
20. Which of the following particles has a negative charge?  
a) a lithium ion  
b) an aluminum ion  
c) an alpha particle  
d) a beta particle
21. What is the total number of orbitals in the first principal energy level?  
a) 1  
b) 3  
c) 2  
d) 4
22. Which element requires the **least** amount of energy to remove its outermost electron?  
a) Li  
b) Ba  
c) Mg  
d) Ca
23. The maximum number of electrons that can be held in any principal energy level (n) is equal to:  
a) n  
b)  $n^2$   
c) 2n  
d)  $2n^2$
24. How many types of orbitals are found in the fourth principal quantum level?  
a) 1  
b) 3  
c) 2  
d) 4
25. Which orbitals do electrons enter after the 4s orbital is filled?  
a) 4p  
b) 3d  
c) 4d  
d) 5s

26. Neon atoms produce a characteristic bright line spectrum when their electrons:
- return to lower energy levels
  - orbit the nucleus in a single energy level
  - remain in their normal energy levels and move faster
  - remain in their normal energy levels and move slower
27. Which of the following best describes a Group II metal?
- it will react with water to produce a basic solution
  - it will react with acid to produce oxygen gas
  - it will tend to gain electrons to form an ion with a 2+ charge
  - all of the above
28. An element has the electron configuration:  $1s^2 2s^2 2p^6 3s^2 3p^4$ . You would expect that:
- the element will form ions with a 2+ charge
  - the element will react with water to produce an acidic solution
  - a solution of this element in water will change the colour of phenolphthalein to pink
  - all of the above will occur
29. An element has the electron configuration  $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2 4d^{10} 5p^6 6s^2$ . This element is found in:
- the fourth period and Group VIB
  - the fifth period and Group IIA
  - the sixth period and Group VIIB
  - the sixth period and Group IIA
30. An element has the electron configuration  $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2 4d^{10} 5p^6 6s^2 4f^{14} 5d^{10} 6p^6 7s^1$ . It is in:
- Group VIIB and the seventh period
  - Group 17 and the sixth period
  - Group IA and the seventh period
  - Group VIIA and the fifth period
31. When a non-metal oxide is dissolved in water and indicators are added to this solution:
- bromothymol blue will turn blue and phenolphthalein will turn pink
  - bromothymol blue will turn blue and phenolphthalein will turn colourless
  - bromothymol blue will turn yellow and phenolphthalein will turn pink
  - bromothymol blue will turn yellow and phenolphthalein will turn colourless
32. A clear, colourless gas "pops" when tested with a burning splint. The gas is:
- oxygen
  - hydrogen
  - carbon dioxide
  - helium
33. Which of the following metals is the most metallic?
- calcium
  - barium
  - titanium
  - platinum
34. Which of the following ions is isoelectronic with  $P^{3-}$ ?
- $Cl^{1+}$
  - $S^{2-}$
  - $K^{1-}$
  - $Y^{3-}$
35. Which of the following is/are isoelectronic with a  $Ca^{2+}$  ion?
- $K^{1+}$
  - Ar
  - $Cl^{1-}$
  - all of the above
36. The elements in the "s" block on the Periodic Table:
- will tend to lose electrons
  - will react with an acid to form hydrogen gas
  - will form positive ions
  - all of the above
37. Which Noble Gas is found in the fifth period?
- I
  - Xe
  - Kr
  - Rb
38. Which Alkaline Earth metal is located in the third period?
- Ca
  - Na
  - Sc
  - Mg

39. Which of the following lists of elements includes only Halogens?  
 a) N, O, F and Ne  
 b) Cl, Br, I and F  
 c) He, Ne, Ar, and Kr  
 d) Li, Na, K and Rb
40. Which of the following lists includes only elements from the D block?  
 a) Na, Mg, Li and Sr  
 b) C, N, P and Se  
 c) Cr, Ti, Ag and Zn  
 d) Ce, Eu, Th and U
41. In which "block" is silicon found on the Periodic Table?  
 a) the "s" block  
 b) the "p" block  
 c) the "d" block  
 d) the "f" block
42. Which Group on the Periodic Table has electron configurations that end in  $s^2p^5$ ?  
 a) Group IIA  
 b) Group VB  
 c) Group VIIA  
 d) Group VIIB
43. The metals Li, Na, K and Rb represent:  
 a) a period  
 b) a group  
 c) an octave  
 d) a heavy metal band
44. In which of the following do all of the particles have the same number of electrons?  
 a) F, Ne, Na  
 b)  $O^{2-}$ ,  $S^{2-}$ ,  $Se^{2-}$   
 c)  $Se^{2-}$ , Kr,  $Rb^{1+}$   
 d)  $Ca^{2+}$ ,  $Fe^{2+}$ ,  $Zn^{2+}$
45. Which of the electron configurations represents an element in the same Group as silicon?  
 a)  $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2 4d^{10} 5p^2$   
 b)  $1s^2 2s^2 2p^6 3s^2 3p^6$   
 c)  $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^2$   
 d)  $1s^2 2s^2 2p^4$
46. After the 5s orbital of an atom is filled, the next electron will be found in the:  
 a) 4d orbital  
 b) 5d orbital  
 c) 4f orbital  
 d) 5p orbital
47. Which of the following electron configurations is correct for zirconium (Zr)?  
 a)  $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2 4d^2$   
 b)  $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^2$   
 c)  $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2 4d^4$   
 d)  $1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 3f^2$
48. Which of the following electron configurations is correct for scandium?  
 a)  $1s^2 2s^2 2p^6 3s^2 3p^3$   
 b)  $1s^2 2s^2 2p^6 3s^2 3p^6 4s^3$   
 c)  $1s^2 2s^2 2p^6 3s^2 3p^6 3d^1$   
 d)  $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^1$
49. Which of the following orbitals does **not** exist?  
 a) 1s  
 b) 2p  
 c) 2d  
 d) 3p
50. The maximum number of electrons in the second principle quantum level is:  
 a) 2  
 b) 6  
 c) 8  
 d) 18
51. How many electrons can be designated (named) 3d?  
 a) 3  
 b) 6  
 c) 8  
 d) 10
52. How many electron-containing orbitals, in total, does a neutral strontium atom have in its ground state?  
 a) 38  
 b) 19  
 c) 18  
 d) 5

53. Which of the following electron configurations represents a non-metal?  
 a)  $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^6$  c)  $1s^2 2s^2 2p^6 3s^2 3p^6 4s^1$   
 b)  $1s^2 2s^2 2p^6 3s^2 3p^5$  d)  $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2 4d^{10} 5p^6 6s^2 4f^{11}$
54. Which of the following atoms has the highest electronegativity?  
 a) Ar c) Ca  
 b) Mg d) P
55. Which of the following statements is **incorrect**?  
 a) electronegativity decreases down a group c) atomic radius increases left to right across a period  
 b) atomic radius increases down a group d) first ionization energy decreases down a group
56. Which of the following explains why atomic radius decreases from left to right across a period?  
 I) increasing shielding effect  
 II) decreasing shielding effect  
 III) increasing  $Z_{eff}$   
 IV) decreasing  $Z_{eff}$   
 a) I and III c) II and IV  
 b) II and III d) III only
57. Which of the following explains why the reactivity of metals increases down a group?  
 I) increasing shielding effect  
 II) decreasing shielding effect  
 III) increasing  $Z_{eff}$   
 IV) decreasing  $Z_{eff}$   
 a) I only c) IV only  
 b) I and III d) I and IV
58. The greater the electronegativity of an element, the greater the tendency to:  
 a) gain electrons c) lose electrons  
 b) gain protons d) lose protons
59. Which of the following elements is the least metallic?  
 a) sodium c) potassium  
 b) rubidium d) cesium
60. Which of the following Group VIIA (Group 17) elements has the lowest tendency to gain electrons?  
 a) fluorine c) iodine  
 b) bromine d) chlorine
61. The element in Period 3 with the most metallic character is:  
 a) sodium c) aluminum  
 b) potassium d) phosphorus
62. The Alkaline Earth element having the largest atomic radius is found in Period:  
 a) 1 c) 2  
 b) 6 d) 7
63. The element in Period 3 that has the highest ionization energy is:  
 a) a Noble gas c) a halogen  
 b) an Alkali metal d) an Alkaline Earth metal
64. Which of the following elements has the highest electronegativity?  
 a) phosphorus c) sulfur  
 b) oxygen d) sodium

65. Which element has the highest ionization energy?  
a) barium  
b) calcium  
c) magnesium  
d) strontium
66. As you move down the Group VIIA (Group 17) from fluorine to astatine:  
a) electronegativity decreases and the atomic radius increases  
b) electronegativity decreases and the atomic radius decreases  
c) electronegativity increases and the atomic radius decreases  
d) electronegativity increases and the atomic radius increases
67. In a given period on the Periodic Table, the element with the lowest first ionization energy is always:  
a) an Alkaline Earth metal  
b) a halogen  
c) an Alkali metal  
d) a Noble gas
68. The atoms of the most reactive non-metals have:  
a) small atomic radii and high ionization energies  
b) large atomic radii and low ionization energies  
c) small atomic radii and low ionization energies  
d) large atomic radii and high ionization energies
69. Proceeding from left to right in Period 2 of the Periodic Table, the atomic radius of the elements generally:  
a) decreases  
b) remains the same  
c) increases  
d) increases to the middle, and then decreases
70. Which element in Period 3 has the highest first ionization energy?  
a) Na  
b) Cl  
c) Ar  
d) Mg
71. Which compound contains an alkali metal and a halogen?  
a)  $\text{CaCl}_2$   
b)  $\text{RbCl}$   
c)  $\text{CaS}$   
d)  $\text{Rb}_2\text{S}$
72. The atomic radius of magnesium is smaller than the atomic radius of sodium. This is mainly because the magnesium atom has:  
a) a larger net nuclear charge  
b) more principal energy levels  
c) a smaller net nuclear charge  
d) fewer principal energy levels
73. The pair of elements with the most similar chemical properties are:  
a) Mg and S  
b) Mg and Ca  
c) Ca and Br  
d) S and Ar
74. Which of the following elements has the lowest electronegativity?  
a) carbon  
b) nitrogen  
c) fluorine  
d) oxygen
75. Which of the following statements apply to most non-metals? They have:  
a) low ionization energy and good electrical conductivity  
b) high ionization energy and poor electrical conductivity  
c) low ionization energy and poor electrical conductivity  
d) high ionization energy and good electrical conductivity
76. Fluorine has a higher ionization energy than oxygen because fluorine has a:  
a) smaller net nuclear charge  
b) smaller shielding effect  
c) larger net nuclear charge  
d) larger shielding effect
77. Which element is the most malleable?  
a) gold  
b) sulfur  
c) hydrogen  
d) radon

78. Which is the most reactive non-metal on the Periodic Table of the Elements?  
a) Fr c) F  
b) I d) Cl
79. In Period 2, as the elements are considered from left to right, there is a decrease in:  
a) ionization energy c) average atomic mass  
b) metallic character d) electronegativity
80. Atoms of metallic elements tend to:  
a) gain electrons and form negative ions c) gain electrons and form positive ions  
b) lose electrons and form negative ions d) lose electrons and form positive ions
81. The reactivity of the Alkali metals generally increases with:  
a) increasing atomic radius c) increasing atomic number  
b) increasing shielding effect d) all of the above
82. Which electron configuration represents an element having the highest first ionization energy?  
a)  $1s^1$  c)  $1s^2$   
b)  $1s^2 2s^1$  d)  $1s^2 2s^2$
83. The amount of energy required to remove the outermost electron from an atom in the gaseous phase is the definition for:  
a) kinetic energy c) potential energy  
b) ionization energy d) electronegativity
84. How many types of orbitals are there in the third principal energy level?  
a) 1 c) 9  
b) 3 d) 18
85. The number of valence electrons in an atom with the electron configuration  $1s^2 2s^2 2p^6 3s^2 3p^4$  is:  
a) 6 c) 2  
b) 16 d) 4
86. An atom with the electron configuration  $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2 4d^{10} 5p^3$  is most likely to:  
a) gain three electrons to form a 3+ ion c) lose three electrons to form a 3+ ion  
b) gain three electrons to form a 3- ion d) lose three electrons to form a 3- ion
87. The total number of d orbitals in the third principal energy level is:  
a) 1 c) 5  
b) 3 d) 7
88. What is the electron configuration for a  $\text{Be}^{2+}$  ion?  
a)  $1s^1$  c)  $1s^2$   
b)  $1s^2 2s^1$  d)  $1s^2 2s^2$
89. According to the trends on the Periodic Table, which of the following metals is the most reactive?  
a) Co c) Cd  
b) Pt d) Os
90. Which statement best describes the pattern in electronegativity of elements on the Periodic Table?  
a) electronegativity increases as shielding effect increases  
b) electronegativity increases as reactivity of metals increases  
c) electronegativity increases as ionization energy decreases  
d) electronegativity increases as atomic radius decreases

## Unit 2 Review: Atomic Theory and Periodic Table

- Definitions. Be able to **write full definitions** for the following terms. Include an additional piece of information or an example:

|                     |                   |                   |              |
|---------------------|-------------------|-------------------|--------------|
| atomic number       | electronegativity | ionization energy | mass number  |
| average atomic mass | element           | isoelectronic     | orbital      |
| atomic radius       | ion               | isotope           | radioisotope |
- Review the material from “Review Questions for Atomic Theory Quiz #1”. You will be asked to write out definitions only from the terms listed above. You need to understand and be able to apply the other terms.
- Why, for some elements, can a lack of reactivity be a desirable property? (see Lab #2) Give 2 examples.
- Silicon has the following three isotopes: the most abundant (92.23%) is Si-28 with an actual atomic mass of 27.9769 u; 4.67% is Si-29 with an actual atomic mass of 28.9765 u and rest is Si-30 with an actual atomic mass of 29.9738 u. What is the average atomic mass of silicon? (answer: 28.09 u)
- Write the balanced nuclear equations for the following nuclear reactions:
  - plutonium-238 undergoes alpha decay
  - lead-214 undergoes beta decay
  - oxygen-18 undergoes beta decay
  - thorium-230 undergoes alpha decay
  - thorium-234 undergoes beta decay
- Review the material from “Practice Questions: The Quantum Mechanical Model of the Atom”.
- What is the essential difference between the model of the atom proposed by Bohr and the Quantum Mechanical Model?
- Explain the significance of:
  - the number of protons in an atom’s nucleus
  - the number of neutrons in an atom’s nucleus
  - the number and arrangement of electrons in an atom
- Explain why all of the isotopes of an element have the same **chemical** reactivity.
- Draw a flow chart showing how changes in atomic theory have centred around discoveries about electrons.
- State Heisenberg’s Uncertainty Principle. How is this related to the Quantum Theory?
- What does “n” represent? Which atomic model(s) include “n”?
- Answer the following questions about electron arrangement in atoms
  - The number of different types of orbitals when  $n = 5$  is \_\_\_\_\_.
  - The number of “s” orbitals in the seventh main energy level ( $n = 7$ ) is \_\_\_\_\_.
  - The maximum number of electrons that can fit in the third energy level ( $n = 3$ ) is \_\_\_\_\_.
  - The number of electrons that can be held in the 5-p orbitals ( $n = 5$ ) is \_\_\_\_\_.
  - The number of different types of orbitals when  $n = 3$  is \_\_\_\_\_.
  - The number of “p” orbitals in the fourth main energy level ( $n = 4$ ) is \_\_\_\_\_.
  - The maximum number of electrons that can fit in the fifth energy level ( $n = 5$ ) is \_\_\_\_\_.
  - The number of electrons that can be held in the 3-d orbitals ( $n = 3$ ) is \_\_\_\_\_.
  - The number of different types of orbitals when  $n = 4$  is \_\_\_\_\_.
  - The maximum number of electrons that can fit in the second energy level ( $n = 2$ ) is \_\_\_\_\_.
- Write electron configurations for:
  - aluminum
  - bromine
  - cesium



15. Distinguish between a group and a period on the Periodic Table.
16. Understand how electron configurations are related to an element's position on the Periodic Table.
- What is the last term for the electron configuration of calcium? \_\_\_\_\_
  - Which group does rubidium belong to? \_\_\_\_\_ Which period? \_\_\_\_\_
  - What is the last term for the electron configuration of sulfur? \_\_\_\_\_
  - Which group does iodine belong to? \_\_\_\_\_ Which period? \_\_\_\_\_
  - How many electrons are in the outer energy level of fluorine? \_\_\_\_\_
  - Which group does argon belong to? \_\_\_\_\_ Which period? \_\_\_\_\_
17. Be able to write ionization reactions for metals and non-metals.
- Write electron configurations to show the **ionization reactions** for Na, Ca, Al, S, Cl, O, and P.
  - List three ions that are isoelectronic with Ne: \_\_\_\_\_, \_\_\_\_\_ and \_\_\_\_\_
  - List three atoms or ions that are isoelectronic with  $\text{Na}^{1+}$  \_\_\_\_\_, \_\_\_\_\_ & \_\_\_\_\_
18. Be able to predict physical and chemical properties of metals and non-metals. Include the following:
- when a metal reacts with water, the type of solution that is produced
  - when a metal reacts with acid, the type of gas that is produced
  - when a non-metal reacts with water, the type of solution that is produced
19. Be familiar with the elements from different groups. Prepare a chart summarizing the properties of the elements of Group I, Group II, Group VII and Group VIII with regard to:
- Group's common name
  - metal or non-metal
  - usual state(s) at room temperature
  - malleable or brittle
  - conductor or non-conductor of electricity
  - does it react with air?
  - does it react with water? what are the products?
  - does it produce an acidic, basic or neutral solution when dissolved in water?
20. Explain how the electron arrangement of the elements of Group I is related to the chemical properties of the Group I elements.
21. Explain how the electron arrangement of the elements of Group VIIA (Group 17) is related to the chemical properties of these elements.
22. Use the concepts of shielding effect and net nuclear attraction to explain the following trends on the Periodic Table. Discuss the trends within a period, and within a group.
- electronegativity
  - reactivity of metals
  - reactivity of non-metals
  - ionization energy
  - atomic radius
23. Use the concepts of shielding effect net nuclear attraction to explain why:
- oxygen is more reactive than selenium
  - argon has a smaller atomic radius than sodium
  - copper is more electronegative than calcium
  - it takes more energy to remove an electron from a nitrogen atom than from a phosphorus atom
  - strontium is more reactive than calcium
24. We have used two chemical indicators in this course, so far: phenolphthalein (phth) and bromothymol blue. Describe what you will see when each is added to the following solutions:
- a metal added to water
  - a metal oxide in water
  - a non-metal in water
  - a non-metal oxide in water

25. For the following **theoretical** elements on the Periodic Table, answer these questions:

|    |    |  |  |  |    |  |  |  |  |  |  |  |  |    |  |    |  |    |
|----|----|--|--|--|----|--|--|--|--|--|--|--|--|----|--|----|--|----|
| Rx |    |  |  |  |    |  |  |  |  |  |  |  |  |    |  |    |  |    |
|    | Go |  |  |  |    |  |  |  |  |  |  |  |  | Fy |  | Tt |  |    |
|    |    |  |  |  |    |  |  |  |  |  |  |  |  |    |  |    |  | Bn |
| Lu |    |  |  |  | Pi |  |  |  |  |  |  |  |  | Xr |  |    |  |    |
|    |    |  |  |  |    |  |  |  |  |  |  |  |  |    |  | Ci |  |    |
|    | Fn |  |  |  |    |  |  |  |  |  |  |  |  |    |  |    |  |    |

- Write the electron configurations for Go, Tt and Xr.
- Which is more reactive: Fn or Go? Explain.
- Which is the largest atom: Lu, Pi or Xr? Explain.
- Which is more reactive: Tt, Ci or Bn? Explain.
- Which element has the lowest ionization energy: Go, Fy or Tt? Explain.
- Which element will tend to lose electrons most easily: Lu, Pi or Xr? Explain.
- Which element will have the strongest attraction for a new electron: Fy, Xr, Tt, Ci or Bn? Explain.
- What gas is produced when Fn reacts with water?
- When Fn reacts with water, will the resulting solution be acidic, basic or neutral? Explain.
- What ion will Tt tend to form during chemical reactions? Lu? Go?
- Write the chemical formula of the metal oxide that will be produced when Lu reacts with oxygen.
- How many valence electrons does the neutral atom of Fn have? Tt? Pi?
- Which two elements could be metalloids?

### Random Questions:

- How many valence electrons do nitrogen and phosphorus have?
- How many elements are there in the fourth period of the Periodic Table?
- The atomic number of a mythical element called "Tassium" (Ts) is 117.
  - What is the probable electron configuration of Tassium?
  - In which family (group) will Tassium be found? In which period will Tassium be found?
- Metals tend to \_\_\_\_\_ electrons, while non-metals tend to \_\_\_\_\_ electrons.
- The elements whose electron configurations end in  $s^2p^6$  belong to which group on the P.T.?
- Identify the most metallic element on the Periodic Table. To which family does it belong?
- Identify the most non-metallic element on the Periodic Table. To which family does it belong?
- In a family of metals, where are the most reactive elements located?
- Which group contains the elements that have the highest ionization energy? The lowest ionization energy?
- Which element in each group has the largest atomic radius? a) B, Li, or F b) K, Li or Na
- Which element in each group has the lowest ionization energy? a) B, Li, or F b) K, Li or Na
- What ion will each of the following elements most likely form? Mg, Cl, N, Ar, Al, S, Na
- When calcium reacts with water, the solution produced is (acidic, basic).
- The gas produced when lithium reacts with water is \_\_\_\_\_.
- Magnesium oxide solution turns bromothymol blue what colour? \_\_\_\_\_
- The element in Group II with the highest ionization energy is \_\_\_\_\_.
- The most reactive halogen is \_\_\_\_\_.
- A solution of bromine in water is (acidic, basic). Bromothymol blue will turn \_\_\_\_\_.
- Non-metals generally form (positive, negative) ions.
- The most stable electron configurations are found for Group \_\_\_\_\_
- Cesium is more reactive than lithium. Explain this in terms of their electron arrangements.
- Fluorine is more reactive than chlorine. Explain this in terms of their electron arrangements.
- In which energy level are the valence electrons of each of the following elements found? I, Ca, Ga, F, Fr.
- Li, Na and K all react similarly because of their similar \_\_\_\_\_

## Atomic Theory and Periodic Table Review (cont.)

1. Complete the chart:

| Name of Element | Symbol for Element | Atomic Number | Number of Protons | Number of Electrons | Number of Neutrons | Mass Number | Total Electric Charge |
|-----------------|--------------------|---------------|-------------------|---------------------|--------------------|-------------|-----------------------|
| Phosphorus      |                    |               |                   |                     | 23                 |             | 3 -                   |
|                 |                    | 25            |                   | 23                  |                    | 56          |                       |
|                 |                    |               | 12                |                     | 14                 |             | 0                     |
|                 | F-19               |               |                   | 10                  |                    |             |                       |
|                 |                    | 18            |                   |                     | 21                 |             | 0                     |
|                 | Mg-27              |               |                   |                     |                    |             | 2 +                   |
| Scandium        |                    |               |                   | 18                  | 23                 |             |                       |
|                 |                    |               |                   | 21                  | 32                 |             | 4 +                   |
|                 |                    |               | 34                | 36                  |                    | 79          |                       |
|                 |                    |               |                   | 18                  | 19                 |             | 2 -                   |

2. Complete the chart:

| Quantum Level (Principal Energy Level) | Maximum Number of Electrons that can fit in this Quantum Level | Total Number of Orbitals in this Quantum Level | How Many Types of Orbitals are there in this Quantum Level | Names of the Orbitals in this Quantum Level |
|--|--|--|--|---|
| 1                                      |  |  |  |   |
| 2                                      |  |  |  |   |
| 3                                      |  |  |  |   |
| 4                                      |  |  |  |   |
| 5                                      |  |  |  |   |
| n                                      |  |  |  |   |

3. Circle the element in each pair that has the **highest** electronegativity:

- |             |    |           |              |    |          |
|-------------|----|-----------|--------------|----|----------|
| a) lithium  | or | cesium    | d) titanium  | or | cobalt   |
| b) fluorine | or | bromine   | e) boron     | or | nitrogen |
| c) calcium  | or | beryllium | f) potassium | or | chlorine |

4. Circle the element in each pair that has the **largest** atomic radius

- |            |    |          |              |    |          |
|------------|----|----------|--------------|----|----------|
| a) calcium | or | sulfur   | d) strontium | or | bromine  |
| b) barium  | or | vanadium | e) zinc or   | or | rubidium |
| c) neon    | or | lithium  | f) potassium | or | scandium |

5. Circle the element in each pair that has the **lowest** ionization energy

- |            |    |           |             |    |          |
|------------|----|-----------|-------------|----|----------|
| a) argon   | or | boron     | d) calcium  | or | iron     |
| b) barium  | or | magnesium | e) silicon  | or | chlorine |
| c) lithium | or | sodium    | f) chlorine | or | selenium |

6. Circle the element in each pair that is the **most** reactive

- |             |    |           |              |    |          |
|-------------|----|-----------|--------------|----|----------|
| a) sodium   | or | potassium | e) barium    | or | scandium |
| b) scandium | or | cobalt    | f) strontium | or | cesium   |
| c) iodine   | or | fluorine  | g) oxygen    | or | selenium |
| d) lead     | or | radon     | h) argon     | or | sodium   |