

## Academic Chemistry – Unit 2 Review

### Chapter 4 – Atomic Structure

1. Complete the chart for a **NEUTRAL** atom. Remember that isotopes of the same element are neutral as well.

Element	Atomic Number	# of Protons	# of Electrons	# of Neutrons	Mass Number	Isotope Symbol	Nuclear Symbol
Si	14			15			
B		5			10		
			9		19		
	92				235		
				48	84		
U				146			
						Xe-131	

2. Lead has 4 stable isotopes that occur in nature. Using the following data, calculate the average atomic mass of lead: Pb-204 (1.4%), Pb-206 (24.1%), Pb-207 (22.1%), Pb-208 (52.4%)

### Chapter 5 – Electrons in Atoms

- What is an orbital? How many orbitals are possible at each sublevel (s, p, d, f)?
- How many electrons can exist in the third energy level?
- Of these sublevels, 3p, 4s, 5d, 6s, which has the highest energy?
- How many electrons can be held in a 5d orbital? In a 3p? In a 2s?
- What elements are composed of atoms having the following electron configurations?:
  - $1s^2 2s^2 2p^6 3s^2 3p^4$
  - $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^1 4d^5$
- Write the electron configuration (longhand & shorthand) for:
  - Titanium
  - Gallium
- Write the orbital notation for:
  - Boron
  - Fluorine
  - Phosphorus
  - Germanium
  - Krypton
- Explain how electrons can go to a higher energy level. After they are at this higher energy level, what happens?
- Using the equation,  $c = \lambda f$  answer the following:
  - What is the value for the speed of light (c)?
  - What is the relationship between wavelength ( $\lambda$ ) and frequency (f)?
  - If the wavelength of blue light is  $4.00 \times 10^{-7}$  m, calculate its frequency.

## Chapter 6 – The Periodic Table

Read the following description to determine which element of the periodic table fits.

- \_\_\_\_\_ 1. In the 3<sup>rd</sup> period with 4 valence electrons.
- \_\_\_\_\_ 2. The representative element with the lowest ionization energy.
- \_\_\_\_\_ 3. Alkali element in period 5.
- \_\_\_\_\_ 4. Neutral atom with 20 electrons.
- \_\_\_\_\_ 5. Good conductor of electricity in period 3.
- \_\_\_\_\_ 6. In the 2<sup>nd</sup> period with 2 valence electrons
- \_\_\_\_\_ 7. Representative element with the highest ionization energy
- \_\_\_\_\_ 8. Halogen in period 4.
- \_\_\_\_\_ 9. Neutral atom with 30 electrons
- \_\_\_\_\_ 10. Poor conductor of electricity in period 5
- \_\_\_\_\_ 11. Noble gas in period 2
- \_\_\_\_\_ 12. Alkaline earth metal from period 5
- \_\_\_\_\_ 13. Halogen from period 2
- \_\_\_\_\_ 14. Metalloid from group 4A
- \_\_\_\_\_ 15. Non-metal from group 5A
- \_\_\_\_\_ 16. Metal from group 4A
- \_\_\_\_\_ 17. 2+ ion from period 2
- \_\_\_\_\_ 18. 2- ion from period 3
- \_\_\_\_\_ 19. 1+ ion from period 4
- \_\_\_\_\_ 20. 1+ ion with the largest radius
- \_\_\_\_\_ 21. 1- ion with the smallest radius
- \_\_\_\_\_ 22. Nobel gas with largest radius
- \_\_\_\_\_ 23. In period 3 with 5 valence electrons
- \_\_\_\_\_ 24. Metal in period 6 with 5 valence electrons
25. Element “X” has an electron configuration of  $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^4$ .
- What is the element?
  - What period is it in?
  - What group is it in?
  - Is it a metal, nonmetal, or metalloid?
  - Draw the Lewis dot structure for the atom.
  - List two other elements that would exhibit similar chemical behavior.
  - Does it need to gain or lose electrons to become stable?
  - How many electrons does it need to gain or lose?
  - When it becomes stable (an ion) what would be its charge?
26. An atom's electron configuration ends in  $5s^2 4d^{10} 5p^4$ . Identify the element and draw its Lewis dot structure.
27. Why is group 8A unique?

### Atomic Radius Trend

28. Rank the following elements by increasing atomic radius: carbon, aluminum, oxygen, potassium
29. Which atom is larger: astatine (At) or tellurium (Te) ... why?
30. Circle the atom in each pair that has the largest atomic radius.
- |       |    |      |   |       |    |
|-------|----|------|---|-------|----|
| a) Al | B  | b) S | O | c) Br | Cl |
| d) Na | Al | e) O | F | f) Mg | Ca |

### Ionization Energy Trend

31. Which has the greater first ionization energy:
- Na or K
  - Li or Be
  - Sn or As
32. Rank the following element by decreasing ionization energy: polonium, oxygen, sulfur, selenium

### Electronegativity Trend

33. Rank the following elements by increasing electronegativity: sulfur, oxygen, neon, aluminum.
34. Arrange oxygen, fluorine, and beryllium in order of increasing electronegativity.
35. Circle which element of the following pairs is the most electronegative:
- Ca, Ga
  - Li, O
  - Cl, S
  - Br, As

### Ion Size Trend

36. Would you expect a  $Cl^-$  ion to be larger or smaller than an  $Mg^{2+}$  ion? Explain.
37. Explain why the sulfide ion ( $S^{2-}$ ) is larger than the chloride ion ( $Cl^-$ ).
38. Circle which atom/ion has the larger ionic size:
- Li,  $Li^+$
  - $O^{2-}$ ,  $O^{-1}$
  - $Al^{+3}$ , Al
  - $Zr^{+2}$ ,  $Zr^{+3}$