Exam 1

# Part 1: Multiple Choice (2 points each)

## Directions: Please circle the *best* answer for each of the following questions.

1. Two samples of sodium chloride were decomposed into their constituent elements. One sample produced 1.97 g of sodium and 3.03 g of chlorine. Which of the following could be the results of the decomposition of the other sample, being consistent with the law of definite proportions?
2. 4.82 g of sodium and 1.20 g of chlorine
3. 4.82 g of sodium and 14.5 g of chlorine
4. 4.82 g of sodium and 4.34 g of chlorine
5. 4.82 g of sodium and 7.42 g of chlorine
6. 4.82 g of sodium and 4.82 g of chlorine
7. Which chemical reaction is possible according to Dalton’s atomic theory?
8. CCl4 🡪 CH4
9. N2 + 3 H2 🡪 2 NH3
10. 2 H2 + O2 🡪 2 H2O + Au
11. K + Na 🡪 Li
12. Br2 🡪 I2
13. Select the best definition for wavelength
    1. the distance between two crests of an electromagnetic wave.
    2. the rate at which electromagnetic waves oscillate.
    3. the oscillations of electric and magnetic fields.
    4. the height of an oscillating electromagnetic wave.
    5. all of the above
14. Identify the generic outer electron configuration for the alkaline earth metals.
    1. ns2np6
    2. ns2np3
    3. ns1
    4. ns2np1
    5. ns2
15. Which of the following chemical reactions are not possible according to Dalton’s Atomic Theory?
    1. CCl4 🡪 CH4
    2. N2 + 3 H2 🡪 2 NH3
    3. 2 H2 + O2 🡪 2 H2O + Au
    4. a and c
    5. all of the above
16. Rank the following elements according to first ionization energy.
    1. Be > Mg > Ca > Sr
    2. Sr > Be > Ca > Mg
    3. Mg > Sr > Ca > Be
    4. Ca > Be > Sr > Mg
    5. Sr > Mg > Ca > Be
17. Which of the following mixtures could be mostly separated by use of decantation?
    1. Sugar and water
    2. Ball bearings and tennis balls
    3. Sand and salt
    4. Ball bearings and water
    5. c and d
18. How many sublevels are there in the n = 3 level?
    1. 1
    2. 2
    3. 3
    4. 9
    5. 18
19. Metals and nonmetals react with each other to form ions. A potassium atom \_\_\_\_\_ electron(s) to form a +1 ion.
    1. gains one
    2. gains two
    3. loses one
    4. loses two
    5. loses three
20. What color is iodine?
    1. Yellow
    2. White
    3. Brown
    4. Orange
    5. Purple

# Part 2: Short Answer

## Directions: Answer each of the following questions. Be sure to use complete sentences where appropriate. For full credit be sure to show all of your work.

1. Classify these atomic orbitals as s, p, or d according to their shape (3 points).



1. The CRC Handbook, a large reference book of chemical and physical data, lists two isotopes of silver (Z = 47). The atomic mass of 51.839% silver-107 is 106.9051 u. Through a typographical oversight, the atomic mass of the second isotope, silver-109, is not printed (13 points).
   1. Calculate that atomic mass, taking the tabulated atomic mass of silver of 107.8682 u.
   2. Identify the number of protons, neutrons, and electron in silver-109.
2. Identify the principal type of energy (kinetic or potential) exhibited by each of the following (5 points):
   1. A car parked on a hill. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   2. A car traveling at 60 miles per hour. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   3. Chemical energy. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   4. A falling rock. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   5. Compressed air in a tank. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. A car travels at 55 miles per hour and get 11 kilometers per liter of gasoline. How many gallons of gasoline are needed for a 3.0 hour trip (8 points)?
4. A 355 mL (12.0 fl oz) can of Diet Dr. Pepper contains 55 mg of sodium (2% of the daily recommended allowance). How many pounds of sodium are ingested if 7.7 x 102 gallons of Diet Dr. Pepper are consumed (7 points)?
5. AlBr3 is a white-yellow crystalline solid that has a melting point of 97.5 °C (10 points).
   1. Identify it as an ionic compound, covalent compound, or an acid. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   2. Name it. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   3. What is its melting point in degrees Fahrenheit?
   4. What is its melting point in Kelvin?
   5. List all the physical properties of AlBr3 found in the preceding narrative.
   6. List all the chemical properties of AlBr3 found in the preceding narrative.
6. Select the best of the three choices (4 points):
   1. largest atomic radius As O Ba
   2. smallest first ionization energy N F As
   3. greatest metallic character Br Cs Se
   4. lowest electronegativity value Cl S Li
7. For each of the elements below, identify the charge of its most common ion and name that ion (6 points):
   1. I \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   2. Li \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   3. S \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
8. A student wants to determine the density of an irregular solid, gold. The sample weighs 288.223 grams. The initial volume of the graduated cylinder is 10.4 mL and after the solid is added the volume is 24.9 mL (10 points).
   1. What is the volume of the solid?
   2. What is the density of the solid?
   3. Gold has a density of 19.3 g/mL. What is the percent error in the student’s density?
9. Correct the following names (6 points):

|  |  |
| --- | --- |
| Formula | Name |
| IF7 | Iodine heptaflouride |
| P4O6 | Phosphorus hexaoxide |
| HCl (aq) | Hydrochlorous acid |
| Cu3P2 | Copper phosphide |
| Zn3N2 | Zinc(II) nitride |
| KH | potassium hydrogen |

1. What is the complete and condensed ground state electron configuration for the following atoms (8 points):
   1. Nitrogen \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* 1. Titanium \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* 1. Oxide \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_