Problem set for Exam 1 Chemistry 102

Know definitions of basic terminology

1. Complete table:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 12.3 km | m | x | 26.2 L | cm3 |
| 235 cm | m | x | 2384g | kg |
| 0.22 L | L | x | 27.23 cc | mL |

1. Define the number of significant figures:

3.200\*107 => 0.00230700 => 102000 =>

5.700\*10-6 => 200.000 => 107.30020 =>

1. Please write the following numbers using scientific notations:

0.0000527 = 7236.470\*10-5 = 127584\*10-2 =

78560.07\*106 = 54000000\*10-6 = 0.000245\*103

0.000735\*10-2 = 0.00245\*10-3 =

1. Please fill the empty cells in the table:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Atomic symbol | Atomic Number | Protons | Neutrons | electrons | Isotope mass | Isotope notation $$$$ |
| F |  |  |  |  |  |  |
|  | 45 |  | 58 |  |  |  |
|  |  |  | 118 | 79 |  |  |
|  |  | 76 | 114 |  |  |  |
|  |  | 82 |  | 80 | 207 |  |

1. The boiling temperature of ethyl alcohol is 78oC.
	1. What is the boiling temperature in oF?
	2. What is the boiling temperature in K?
2. Please write full, short hand electron configuration and number of valence electrons for **Sr**:
3. Oil of wintergreen is the methyl ester of hydroxybenzoic acid. Its chemical formula is C8H8O3.
4. Calculate the molar mass of oil of wintergreen.
5. Calculate the mass of 3.82 moles of oil of wintergreen.
6. Calculate the number of molecules of oil of wintergreen in a sample containing 8.36 x 10-4 mol of oil of wintergreen.
7. A gem has a mass of 6.37g. When the gem is placed in a graduated cylinder containing 2.00 mL of water, the water level rises to 4.17 mL. What is the density of the gem in g/mL?
8. Draw Lewis Electron Dot Structures for the following atoms/molecules.
	1. N
	2. PCl3 (Phosphorous is the central atom)
	3. HCN (Carbon atom is in the center.)
9. During a workout at the gym, you set the treadmill at a pace f 65.0 m/min. How many minutes will you walk if you cover a distance of 6347 ft?
10. Name the following compounds

|  |  |  |  |
| --- | --- | --- | --- |
|  | Cation name | Anion name | Compound name |
| Ba(NO3)2 |  |  |  |
| Fe(OH)3 |  |  |  |
| Ag2S |  |  |  |
| P2S3 |  |  |  |

1. Give the correct formula for the following compounds

|  |  |  |  |
| --- | --- | --- | --- |
|  | Cation formula | Anion formula | Compound formula |
| Ammonium chloride |  |  |  |
| Lead(IV) sulfate |  |  |  |
| Aluminum oxide |  |  |  |
| Tetrasulfur octabromide |  |  |  |

1. An 800 mg sample of a radioactive isotope decays for 20 days. At the end of the 20 days, 50 mg of the sample remain. What is the half-life of the isotope?
2. A ruby gemstone contains 52.7% aluminum, 47.1% oxygen, and small traces of chromium. If the ruby was found to contain 0.125 g of aluminum, what is the mass of the ruby?
3. Write the correct nuclear equation for the
4. Decay of At-218 $\left(\right)$ by alpha particle emission
5. Decay of $$ by beta particle emission
6. Decay of sulfur-31 by Positron emission
7. Predict the orbital or molecular geometry of the numbered atoms:
8. Molecular geometry N1\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
9. Molecular geometry C2\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
10. Molecular geometry O3\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
11. Orbital geometry C4\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
12. Balance the following equation**:**

\_\_\_\_ Mg(NO3)2 *(aq)* + \_\_\_\_ Li3PO4*(aq)* → \_\_\_\_ Mg3(PO4)2 (s) + \_\_\_\_ LiNO3 (aq)

1. Write the balanced molecular (1), total ionic (2), and net ionic equations (3) for the reaction. Assume that all soluble reactants are added in the form of aqueous solutions. Indicate precipitates that are formed. If no reaction occurs, then write **NO RXN**, and do not write a balanced equation. Be sure to **balance** your equations and include your **physical states**

 molecular:

\_\_\_\_MgCl2 *(aq)* + \_\_\_\_Ag(NO3) *(aq)* →

Total ionic:

Net ionic:

1. A package of trail mix contains 9.2 g of fat, 13 g of carbohydrate, and 4.2 g of protein.
	1. How many Nutritional Calories will you consume if you eat the entire bag how many kilojoules?

|  |  |
| --- | --- |
| food type | Calories |
| carbohydrate | 4.0 |
| fat | 9.0 |
| protein | 4.0 |

Total Calories =

Total kilojoules =

* 1. What percentage of the calories in the package of trail mix comes from fat?
1. Column A lists a substance. In Column B, list whether the substance is an element (E), a compound (C), a Heterogeneous Mixture (HM), or a homogeneous mixture (S). In Column C, list TWO physical properties of the substance.

|  |  |  |
| --- | --- | --- |
| **Column A** | Column B | Column C (anything similar) |
| 1. Summer Sausage |  |  |
| 2. Steam |  |  |
| 3. Salt Water |  |  |
| 4. Pencil lead (Pb) |  |  |
| 5. Dirt |  |  |
| 6. Pepsi  |  |  |
| 7. Silver (Ag) |  |  |
| 8. Toothpaste (Na2HPO4) |  |  |
| 9. A burrito  |  |  |
| 10. Italian Dressing  |  |  |
| 11. Chicken Soup |  |  |
| 12. Lemonade  |  |  |

1. Match each diagram with its correct description. Diagrams will be used once.

A B C D E

\_\_\_\_1. Pure Element

\_\_\_\_2. Mixture of two elements

\_\_\_\_3. Pure compound

\_\_\_\_4. Mixture of two compounds

\_\_\_\_5. Mixture of a compound and an element.

1. The specific heat of copper is 0.0920 cal/g °C, and the specific heat of silver is 0.0562 cal/g °C. If 100 cal of heat is added to one g of each metal at 25 °C, what is the expected result?

A) The copper will reach a higher temperature.

B) The silver will reach a higher temperature.

C) The two samples will reach the same temperature.

D) The copper will reach a temperature lower than 25 °C.

E) The silver will soften.

1. How many oxygen atoms are in hydroxyapatite, Ca5(PO4)3OH, a major compound in human bones and teeth?

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 1. 1
 | 1. 3
 | 1. 4
 | 1. 5
 | 1. 13
 |

1. The following figure shows a(an):

|  |  |  |
| --- | --- | --- |
| 1. f orbital
 | 1. d orbital
 | 1. s orbital
 |
| 1. p orbital
 | 1. none of the above
 |

25. What kind of change (chemical, physical or nuclear) is described by each of the following examples?

|  |  |  |
| --- | --- | --- |
|  | **a)** a worn tire  |  |
|  | **b)** limewater that turns white |  |
|  | **c)** a bracelet that tarnishes |  |
|  | **d)** the fission of a uranium nucleus  |  |
|  | **e)** rusting iron |  |
|  | **f)** mercury that expands in hot weather |  |
|  | **g)** the fusion of the nuclei of several atoms  |  |
|  | **h)** food being transformed into energy ransforment en énergie.  |  |
|  | **i)** salt dissolving in water |  |
|  | **j)** radium emitting radiation |  |