Chem 1104 - 2018 Summer Problem Set #2

1. Naturally occurring iron consists of the following four isotopes:

Isotope	% Abundance	Mass(amu)
Fe-54	5.82	53.9396
Fe-56	91.66	55.9349
Fe-57	2.19	56.9354
Fe-58	0.33	57.9333

Calculate the average atomic mass of iron from the data.

2. The average atomic mass of copper is 63.546 amu. The two naturally occurring isotopes of copper have the following masses: Cu-63, 62.9298 amu; Cu-65, 64.9278 amu. Calculate the percent Cu-63 and Cu-65 in naturally occurring copper.

3. Write formulas or give the name for the following ions:
a) iron(II) ions, b) acetate ions, c) carbonate ions, d) Ag^{+}, e) NH_4^{+}, f) Br^{-}, g) SO_4^{2-}, h) PO_4^{3-}

4. Name or write the chemical formula for the following ionic compounds.
a) calcium oxide, b) magnesium sulfate, c) sodium iodide, d) nickel(II) acetate, e) ammonium nitrate, f) potassium nitrate, g) $Ca_3(PO_4)_2$, h) Cr_2O_3, i) $Fe_2(SO_4)_3$, j) $Zn(OH)_2$, k) FeS, l) $CuBr_2$

5. How many moles and how many molecules are in 75.0 g of a) H_2, b) H_2O, c) H_2SO_4 d) H_2O_2

6. How many moles of atoms are contained in each of the following masses?
a) 59.4 g of oxygen, b) 83.7 g of silver, c) 4.00 g of gold.

7. A sample of a pure element that had a mass of 1.00 g was found to contain 1.50×10^{22} atoms. What is the atomic mass of the element? What is the element?

8. Calculate the percent composition of the following compounds:
a) CaO, b) Al_2O_3, c) CrO_3, d) $NaHCO_3$(baking soda)

9. Calculate the number of moles in 5.00 g of the compounds listed in question#8.

10. Calculate the number of oxygen atoms in 160 g of SO_2.

11. A compound used to make paper contains 59.9% titanium and 40.1% oxygen by mass. What is the simplest formula for the compound?

12. A 2.317 g sample of an oxide of iron was found to contain 1.677 g of iron and 0.640 g of oxygen. What is the simplest formula for this oxide used in audio/video cassettes?

13. A compound was found to contain 49.0 %C, 2.75 %H, and 48.2 %Cl. If this comound has a molar mass of 147 g/mole determine the molecular formula of this compound.

Answer Set for Chem 1104-2018 Summer Problem Set #2

1. 55.85 amu

2. % Abundance of Cu-63 is 69.2% and Cu-65 is 30.8%.

3.a) Fe^{2+}, b) $C_2H_3O_2^-$, c) CO_3^{2-}, d) silver ions, e) ammonium ions, f) bromide ions, g) sulfate ions, h) phosphate ions

4.a) CaO, b) $MgSO_4$, c) NaI, d) $Ni(C_2H_3O_2)_2$, e) NH_4NO_3, f) KNO_3, g) calcium phosphate, h) chromium(III) oxide, i) iron(III) sulfate or ferric sulfate, j) zinc hydroxide, k) iron(II) sulfide or ferrous sulfide, l) copper(II) bromide orcupric bromide

5. a) 37.1 mol H_2, 2.23×10^{25} molecules H_2 b) 4.17 mol H_2O, 2.51×10^{24} molecules H_2O
c) 0.765 mol H_2SO_4, 4.61×1023 molecules H_2SO_4 d) 2.20 mol H_2O_2, 1.33×10^{24} molecules H_2O_2

6.a) 3.71 mol O, b) 0.776 mol Ag, c) 0.0203 mol Au

7. The element has an atomic mass of 40.1 g/mole and is thus Ca.

8.a) %Ca = 71.47%, %O = 28.53%; b) %Al = 52.92%, %O = 47.08%; c) %Cr = 52.00%, %O = 48.00%; d) %Na = 27.37%, %H = 1.20%, %C = 14.30%, %O = 57.13%

9.a) 0.0892 mol CaO, b) 0.0490 mol Al_2O_3, c) 0.0500 mol CrO_3, d) 0.0595 mol $NaHCO_3$

10. 3.0×10^{24} O atoms

11. TiO_2

12. Fe_3O_4

13. $C_6H_4Cl_2$