AP Chemistry 1st Term Assignment

Significant Figures (Sig Figs)

1. How many sig figs are in the following numbers?

   a) 0.0450 _____

   b) 790 _____

   c) 32.10 _____

2. Solve the following problems. Round your answer to the correct number of sig figs and use the correct unit on your answer.

   a) 825 cm x 32 cm x 0.248 cm _____

   b) $\frac{15.68\ g}{2.885\ mL}$ _____

Conversions (round answers correctly and show work with units)

3. Make the following conversions:

   a) 16.2 m to km

   b) 5.44 nL to mL

   c) 45.7 mm/s to km/hr

Density (round your answers to correct number of sig figs and show all work with units)

4. A cube of ruthenium metal 1.5 cm on a side has a mass of 42.0 g. What is the density in g/cm^3? Will ruthenium metal float on water?

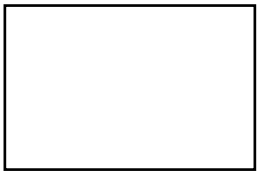
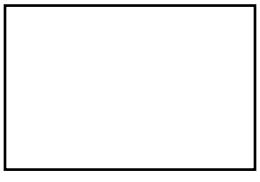
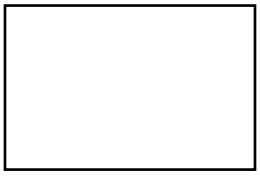
5. The density of bismuth metal is 9.8 g/cm^3. What is the mass of a sample of bismuth that displaces 65.8 mL of water?

6. Two spheres have the same mass. One floats on water, the other sinks. Which sphere has the greater diameter? Explain your answer.

Classification of Matter, Properties, and Changes

7. Define physical change and chemical change. Label each of the following as either physical or chemical:
    a) Cutting a piece of aluminum metal
    b) Melting wax
    c) Pulverizing ice
    d) Frying a potato
    e) Explosion of nitroglycerin
    f) Electrolysis of water

8. Define element, compound, and mixture. Draw pictures showing the particles in each type.

9. Name some common separation methods for pure substances and mixtures. Describe how they work.

Atoms and Average Atomic Mass

10. Write the isotopic symbol (showing both mass number and atomic number) for each of the isotopes below:
    a) Atomic number = 8, number of neutrons = 9

    b) The isotope of chlorine where the mass number = 37

    c) Atomic number = 27, mass number = 60

    d) The isotope of iodine with a mass number of 131

11. Would you expect each of the following atoms to gain or lose electrons when forming ions? What charge is most likely in each case?

    a) Na
    b) Sr
    c) P
    d) Ba
    e) I
    f) O
    g) Al
    h) S

12. For each of the following ions, indicate the number of protons and electrons.

    a) Fe^{2+}
    b) Fe^{3+}
    c) Ba^{2+}
    d) Cs^{+}
    e) S^{2-}
    f) P^{3-}
    g) Br^{-}
    h) N^{3-}

13. Write the full and noble gas shortcut electron configurations for the following elements:
    a) Bromine
    b) Molybdenum
    c) Iron
    d) sulfur

14. Magnesium consists of 3 naturally occurring isotopes with the masses 23.98504 amu, 24.98584 amu, and 25.98259 amu. The relative abundances of these three isotopes are 78.70%, 10.13 %, and 11.17% respectively. Calculate the average atomic mass.

Moles

15. Calculate the number of moles of the following: (SHOW WORK)

    a. 42.8 g of KNO_3

    b. 156 L of CO_2 at STP

c. 9.25×10^{26} molecules of $CaCl_2$

Percent Composition and Empirical Formula

16. Calculate the percent composition of $C_{12}H_{22}O_{11}$ (sugar). (Give the percent of each element.) Show all work.

17. A 0.941 g piece of magnesium metal is heated and reacts with oxygen. The resulting magnesium oxide weighs 1.560 g. Determine the percent composition of each element in the compound.

18. A compound contains 21.6% sodium, 33.3% chlorine, and 45.1% oxygen. Determine the empirical formula of the compound.

Nomenclature

19. Name or write the formula for these binary compounds of two nonmetals:
    a) IF_7_____
    b) N_2O_4_____
    c) PCl_3_____
    d) Dinitrogen pentoxide_____
    e) Tetrarsenic decoxide_____
    f) Disulfur dichloride_____
20. Name these binary ionic compounds:
    a) $AlCl_3$_____
    b) KI_____
    c) CaF_2_____
    d) Magnesium oxide_____
    e) Strontium bromide_____
    f) Aluminum oxide_____
21. Name or write the formula for these binary compounds with transition metals of variable charges (use roman numerals):
    a) $CuCl_2$_____
    b) $PbCl_4$_____
    c) AuI_3_____
    d) Iron (III) oxide_____
    e) Copper (II) sulfide_____
    f) Cobalt (III) phophide_____
22. Name or write the formula for these compounds with polyatomic ions:
    a) $Fe(NO_3)_3$_____
    b) $Ca(ClO_3)_2$_____
    c) KNO_2_____
    d) Copper (I) dichromate_____
    e) Copper (I) sulfate_____
    f) Sodium hydrogen carbonate_
23. Name or write the formula for these acids using the correct naming rules:
    a) HCl_____
    b) HI_____
    c) H_2SO_3_____
    d) HF_____
    e) $HClO_4$_____
    f) H_3PO_4_____
    g) Oxalic acid_____
    h) Sulfuric acid_____
    i) Nitrous acid_____
    j) Carbonic acid_____
    k) Acetic acid_____
    l) Chromic acid_____
24. Name these compounds appropriately:
    a) CO_____
    b) NI_3_____
    c) $LiMnO_4$_____
    d) $CuCr_2O_7$_____
    e) FeF_3_____
    f) NH_4CN_____
    g) HClO_____
    h) $KC_2H_3O_2$_____
    i) HIO_3_____
    j) OF_2_____
    k) SO_2_____
    l) HF_____
    m) MnS_____

25. Write the chemical formulas for these compounds:
    a) Tin (IV) phosphide_____
    b) Magnesium hydroxide____
    c) Sulfurous acid_____
    d) Potassium nitride_____
    e) Gallium arsenide_____
    f) Zinc fluoride_____
    g) Copper (II) cyanide_____
    h) Sodium peroxide_____
    i) Lithium silicate_____
    j) Chromium (III) carbonate_
    k) Dichromic acid_____

Reactions

26. Balance the following and equations and tell what type of reaction it is (combination/synthesis, decomposition, single replacement, double replacement, or combustion)

    a) ___ KNO_3 → ___ KNO_2 + ___ O_2 Type: _____

    b) ___ $AgNO_3$ + ___ K_2SO_4 → ___ Ag_2SO_4 + ___ KNO_3 Type: _____

    c) ___ CH_3NH_2 + ___ O_2 → ___ CO_2 + ___H_2O + ___ N_2 Type: _____

    d) ___ N_2O_5 + ___ H_2O → ___HNO_3 Type: _____

    e) ___ Na + ___ $Zn(NO_3)_2$ → ___ Zn + ___ $NaNO_3$ Type: _____

27. What are diatomic elements? List the 7.

Stoichiometry, Limiting Reagent, and Percent Yield

28. Using the following equation:

    $2\ NaOH + H_2SO_4 \rightarrow 2\ H_2O + Na_2SO_4$

    How many grams of sodium sulfate will be formed if you start with 200 grams of sodium hydroxide and you have an excess of sulfuric acid?

29. Using the following equation:

$$Pb(SO_4)_2 + 4\ LiNO_3 \rightarrow Pb(NO_3)_4 + 2\ Li_2SO_4$$

How many grams of lithium nitrate will be needed to make 250 grams of lithium sulfate, assuming that you have an adequate amount of lead (IV) sulfate to do the reaction?

30. Determine the grams of sodium chloride produced when 10.0 g of sodium react with 10.0 g of chlorine gas according to the equation: $2\ Na + Cl_2 \rightarrow 2\ NaCl$

31. Determine the mass of lithium hydroxide produced when 50.0g of lithium are reacted with 45.0g of water according to the equation: $2\ Li + 2\ H_2O \rightarrow 2\ LiOH + H_2$

32. 50.0 g of sodium sulfide and 35.0 g of silver nitrate react according the equation $Na_2S + 2AgNO_3 \rightarrow Ag_2S + 2NaNO_3$.
    a) Which is the limiting reagent?

    b) What mass of the excess reagent remains?

    c) What mass of silver sulfide would precipitate?

33. Determine the percent yield of water produced when 68.3 g of hydrogen reacts with 85.4g of oxygen and 86.4g of water are collected. $2\ H_2 + O_2 \rightarrow 2\ H_2O$