AP Chemistry Summer Assignment 2021

This assignment is intended to be a review to get you ready to start working chemistry problems again. It is due the first day of class, and I recommend completing it in early August.   Show your work for all problems and use the correct number of significant figures in your answers.   Your process is more important than your final answer.   You should also check the Pre-AP Chemistry Summer Assignment to make sure you have memorized the necessary polyatomic ions.   You will have a test over this material on August 30.

1. Define chemical change and give an example.
2. When 87.7g is added to 73.841g, the result should be reported with _____ significant figures.   And when 87.7g is divided by 73.841mL the result should be reported with _____ significant figures.
3. Convert 0.3980 m to mm.
4. A scientist obtains the number 0.045006700 on a calculator. If this number actually has four (4) significant figures, how should it be written?
5. A sample of chemical X is found to contain 5.0 grams of oxygen, 10.0 grams of carbon, and 20.0 grams of nitrogen. The law of definite proportion would predict that a 70 gram sample of chemical X should contain how many grams of carbon?
6. Write the symbol for a calcium ion.   How many electrons does it have?   If the mass number is 41, then how many neutrons does it have?
7. You are given a compound with the formula MCl_3, in which M is a metal. You are told that the metal ion has 23 electrons. What is the identity of the metal?
8. Write the names of the following compounds: $FeSO_4, NaC_2H_3O_2, KNO_2, Ca(OH)_2$
9. The atomic mass of rhenium is 186.2. Given that 37.1% of natural rhenium is rhenium-185 (185 amu), what is the other stable isotope?
10. A sample of ammonia (NH_3) has a mass of 43.5 g. How many molecules are in this sample?
11. One molecule of a compound weighs 2.93×10^{-22} g. The molar mass of this compound is:
12. How many grams of potassium are in 27.8 g of K_2CrO_7?
13. A chloride of rhenium contains 63.6% rhenium. What is the formula of this compound?
14. Chlorous acid, $HClO_2$, contains what percent hydrogen by mass?
15. The empirical formula of a group of compounds is CHCl. Lindane, a powerful insecticide, is a member of this group. The molar mass of lindane is 290.8 g/mol. How many atoms of carbon does a molecule of lindane contain?
16. A 7.11-g sample of potassium chlorate was decomposed according to the following equation:
    $$2KClO_3 \rightarrow 2KCl + 3O_2$$ How many moles of oxygen are formed?
17. How many grams of $Ca(NO_3)_2$ can be produced by reacting excess HNO_3 with 6.33 g of $Ca(OH)_2$?
18. Suppose a reaction with $Ca_3(PO_4)_2$ and H_2SO_4 is carried out starting with 153 g of $Ca_3(PO_4)_2$ and 76.8 g of H_2SO_4. How many grams phosphoric acid will be produced?   How many grams of excess reactant remain unreacted after the reaction is complete?
19. The reaction of 11.9 g of $CHCl_3$ with excess chlorine produced 10.2 g of CCl_4, carbon tetrachloride:
    $$2CHCl_3 + 2Cl_2 \rightarrow 2CCl_4 + 2HCl$$ What is the percent yield?