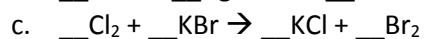
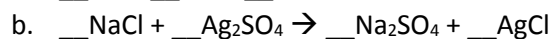


1. A combustion analysis is performed on 160.0 g of an unknown organic substance. If you collect 431.58 g of carbon dioxide and 176.71 g of water, what is the empirical formula of the unknown molecule? If the molecule has a molar mass of 228.42 g/mol, what is the molecular formula?
2. You have a sample of 25% (m/m) of 1,1-dibromoethane ($\text{C}_2\text{H}_4\text{Br}_2$) in dimethyl sulfoxide (DMSO). What is the concentration of $\text{C}_2\text{H}_4\text{Br}_2$ in moles per liter? DMSO has a density of 1.1 g/cm^3 and 1,1-dibromoethane has a density of 2.06 g/mL .
3. You need to use 300 g of butanoyl chloride ($\text{C}_4\text{H}_7\text{OCl}$) but you only have a solution of 30% (m/m) sample of butanoyl chloride in acetone. What volume of this solution would you need? The volume of butanoyl chloride is 1.03 g/mL and the density of acetone is 0.791 g/mL .
4. How many oxygen atoms are in a 55.7 g sample of iodous acid?
5. What is the mass percent of mercury in mercury (I) dichromate?
6. You have a 0.333 M solution of lithium phosphate and a 0.550 M solution of nickel (II) perchlorate. What volume of each solution would you need in order to produce 180.0 g of nickel (II) phosphate?
7. If cobalt metal reacts with iron(III) oxide to form cobalt (II) oxide and iron metal, what is the sum of the coefficients of the balanced reaction?
8. In the reaction in number 7, what is the reducing agent and what is the oxidizing agent?

9. You have a sample of a Grignard reagent. You put the reagent in a mass spectrometer and find that the sample is 18.02% C, 3.79% H, 18.24% Mg, and 59.95% Br. What is the empirical formula of the reagent?
10. Nitric acid reacts with copper metal to form copper (II) nitrate, nitrogen monoxide, and water. What is the sum of the coefficients of the balanced reaction?
11. You have a sample of 15 M hydrochloric acid. However for a reaction you wish to run in the lab, you need 100.0 mL of 0.500 M hydrochloric acid. What volume of the concentrated solution would you need to dilute to get the sample you need? How much water would you need to add to the concentrated solution to create the diluted solution?
12. Aluminum metal reacts with sulfuric acid to form aluminum sulfate and hydrogen gas. If you have 200.0 g of aluminum metal and 444 g of sulfuric acid, what mass of aluminum sulfate can be made? How much of the excess reactant will be left over?
13. You have 16.4 g of an unknown organic compound. If you combust the compound and collect 50.65011 g of carbon dioxide and 23.03673 g of water, what is the name of the organic compound you combusted? Assume the empirical and molecular formulas are the same. Note to get the correct answer for this one you need to keep the numbers really exact.
14. If aqueous lead (II) nitrate is mixed with aqueous sodium sulfate, does a precipitate form? If so, what is the precipitate?
15. Carbon tetrachloride reacts with hydrofluoric acid to produce dichlorodifluoromethane and hydrochloric acid. If 175.2 g of carbon tetrachloride reacts with 64.9 g hydrofluoric acid to produce 95.5 g of dichlorodifluoromethane, what is the percent yield for the reaction?

16. You have a 79 g sample of ozone (O_3). How many moles of ozone do you have? How many molecules of ozone do you have? How many atoms of oxygen do you have?

17. Balance the following reactions and tell what type of reaction it is



18. Write out the balanced net ionic equation for the reaction of cadmium (II) chloride with sodium sulfide

19. If you have 300 g of boiling water and mix it with 874 g of salt water at 273 K and mixed them together, what will be the final temperature of the mixture? Water has a specific heat of 4.184 J/gK and salt water has a specific heat of 3.50 J/gK.