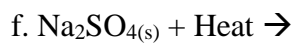
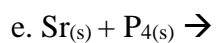
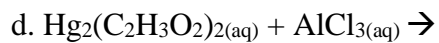
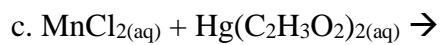


3. Write full balanced chemical reactions for the following or specify no reaction. Oxygen is always a gas and water is always a liquid. States of matter not needed for combination or decomposition reactions (3 points each).



4. A 0.1764 g sample of Sodium carbonate (Na_2CO_3) is added to a 140 μL sample of 12 M hydrochloric acid and diluted with water to a total volume of 25.00 mL in a volumetric flask (30 points).

a. Write a balanced reaction that will describe what happens when the Na_2CO_3 is added to the hydrochloric acid. (3 points)



b. What is the concentration of sodium carbonate in the volumetric flask after the water has been added, but before any carbonate has been consumed? (5 points)

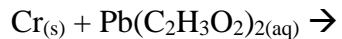
c. What is the concentration of hydrochloric acid in the volumetric flask after water has been added, but before any carbonate has been consumed? (5 points)

d. What is the limiting reagent in the reaction? (7 points)

e. If there are 24.4 L/mol of the gas at the temperature the reaction is performed, what is the theoretical yield for the gas in mL? (5 points)

f. If 18.9 mL of gas is collected, what is the % yield? (5 points)

5. Balance the following redox reactions in acidic solution. (10 points).



a. Balance the Equation

b. Write the half reactions

c. Indicate which element is oxidized and which is reduced

6. Methane (CH_4) may be able to replace gasoline as a source of fuel for vehicles. 655 g of methane could potentially replace 1 gallon of gasoline. What is the volume of 655 g CH_4 at 25°C and 745 torr?