1) Define, or give a mathematical expression when applicable for, each of the following:
   a) Combined gas Law
   b) Dalton’s Law of partial pressures
   c) Molar volume

   (What is the expected numerical value (theoretical value) for the molar volume of a gas? Include the proper unit. Answer ___________)
   d) Standard temperature and pressure (STP)
   e) Vapor pressure

2) Explain the terms “wet gas” and “dry gas”.

3) Write a balanced equation for the reaction of Zn(s) with Dil HCl.

4) Why must the mass of zinc metal be no greater than 0.2400g?

5) How can you tell when the zinc metal has reacted completely?
   a) ________________________________
   b) ________________________________

6) What measure of precaution should you take when working with:
   a) Hydrogen gas
   b) Dil HCl

7) List **FOUR** sources of experimental error other than those due to incorrect reading of the scales.
   a) 
   b) 
   c) 
   d)
A 0.1358 g zinc metal reacts completely with Dil HCl to produce 52.20 ml of H₂ (g) at 22.0 °C. The hydrogen gas is collected over water at 22.0 °C and a barometric pressure of 755 mm Hg. The water vapor pressure at 22.0 °C is 19.8 mm Hg and the height of water column in the gas collecting tube is 12.0 cm (the density of mercury is 13.6 g/ml).

a) Write a balanced equation for the reaction of zinc metal with Dil HCl.

b) Calculate the number of moles hydrogen gas produced from the mass of Zn(s) given above. Setup:

Answer: 

c) What is the partial pressure of hydrogen gas expressed in mm Hg? Hint: Apply Dalton’s Law of partial pressures.

\[ P_{\text{atmospheric}} = P_{\text{hydrogen gas}} + P_{\text{water vapor}} + P_{\text{height of water column}} \]

Setup:

Answer: 

d) Calculate the ideal gas constant, R, in units of L.atm/mol.K. Setup:

Answer: 

e) Convert the volume of hydrogen gas collected into STP condition. Setup:

Answer: 

f) Calculate the molar volume of hydrogen gas. (You need the volume of H₂ at STP in step (e) and the corresponding number of moles in step (b) above. Setup:

Answer: 

g) Calculate the accuracy of the experimental molar volume. Setup:

Answer: 
