Gas Problems Set 9

1. What volume of carbon dioxide will be produced if 146 grams of hydrogen chloride are mixed with excess sodium carbonate at 25 C and 100 KPa? Assume the gas is collected over water.

Things to do to solve this problem:

a. Write a balanced equation

b. Convert grams of HCl to moles

c. Determine moles of gas produced

d. You will need to use the ideal gas law to calculate volume, so you will need to adjust the lab pressure by subtracting water vapor.

e. Use the ideal gas law to calculate the volume of gas produced.

51.2 liters

2.   If you want to create 650 liters of dry hydrogen at 25 C and 750 mm Hg, what mass of Al would you need to react with excess HCl?

Things to do to solve this problem:

a. Write a balanced equation

b. Convert liters of hydrogen to moles. You will need to use the ideal gas equation to do this.   (you might want to use 22.4 l/mole, but the relationship is only valid at STP. If you used 22.4, you would need to convert the 650 liters to STP).

c. Determine moles of Al needed

d. Convert moles of Al to grams.

472 g Al (note --- this answer assumes "dry gas" so I did not subtract the water vapor pressure. If you subtract water vapor pressure, your answer is 455 g Al).

3. What mass of potassium chlorate would be necessary to create 150 liters of oxygen **over water** at 20 C and 1.1 atm of pressure. Metallic chlorates decompose to make metallic chlorides and oxygen. Which one of the above thought sequences will you need to use?   Do it!   :)

549 grams

4. What volume of oxygen at 30 C and 780 mmHg can be produced over water from the decomposition of 250 grams of hydrogen peroxide?   Hydrogen peroxide (H_2O_2) decomposes into water and oxygen. Which one of the thought sequences will you need to use?

93.3 liters

Water Vapor Pressure Table					
T (°C)	P (mmHg)	T (°C)	P (mmHg)	T (°C	P (mmHg)
0.0	4.6	19.5	17.0	27.0	26.7
5.0	6.5	20.0	17.5	28.0	28.3
10.0	9.2	20.5	18.1	29.0	30.0
12.5	10.9	21.0	18.6	30.0	31.8
15.0	12.8	21.5	19.2	35.0	42.2
15.5	13.2	22.0	19.8	40.0	55.3
16.0	13.6	22.5	20.4	50.0	92.5
16.5	14.1	23.0	21.1	60.0	149.4
17.0	14.5	23.5	21.7	70.0	233.7
17.5	15.0	24.0	22.4	80.0	355.1
18.0	15.5	24.5	23.1	90.0	525.8
18.5	16.0	25.0	23.8	95.0	633.9
19.9	16.5	26.0	25.2	100.0	760.0