# AP WORKSHEET 03DEF: Gas Laws II

1. If 5.0 g of nitrogen gas and 5.0 g of chlorine gas are injected in to a 2.0 L vessel at a temperature of 65 $^{o}$C, what will the partial pressure of each gas be? What will the total pressure in the container be? (3)

2. Which gas law allows the simple calculation of the total pressure in question #1? (1)

**In questions 3 and 4, assume 1.000 mol of any gas occupies 22.40 L at standard temperature and pressure (s.t.p).**

3. What volume of hydrogen gas is obtained when 23.00 g of zinc metal reacts with an excess of dilute sulfuric acid at s.t.p? (2)

$$Zn_{(s)} + H_2SO_{4(aq)} \rightarrow ZnSO_{4(aq)} + H_{2(g)}$$



4. What volume of oxygen, at s.t.p, is required to burn exactly 11.60 L of methane ($CH_{4(g)}$), according to the reaction below? (2)

$$CH_{4(g)} + 2O_{2(g)} \rightarrow CO_{2(g)} + 2H_2O_{(g)}$$

5. If a gas diffuses at 20% of the rate that hydrogen diffuses, what can be said about the relative mass of that gas? (1)

6. Which gas would you expect to effuse faster, helium or $SO_2$? (1)

7. Calculate and compare the $u_{rms}$ for helium and nitrogen gases at 25 ºC. Comment on the two values. (4)

$$u_{rms} = \sqrt{\frac{3RT}{M}}$$

8. If 3.21 moles of ammonia gas occupy 5.22 L at 50.0 ºC, calculate the pressure of the gas using the ideal gas equation **AND** by using the van der Waals equation. Compare each value to the actual measured pressure of 15.4 atm under these conditions, and comment upon the values. (4)

   R = 0.0821 L atm $K^{-1}$ $mol^{-1}$, for ammonia under these conditions, a = 4.17 atm $L^2$ $mol^{-2}$ and b = 0.0371 L $mol^{-1}$.

$$\left(P + \frac{an^2}{V^2}\right)(V - nb) = nRT$$