**Chemistry Pretest 1.2     2015 Version          Show all work. Use loose leaf.**
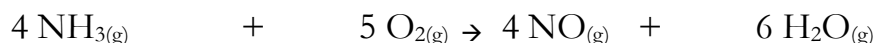
1.       If a closed vessel (constant volume)'s temperature goes from $0^0C$ to 546 K, what will happen to its pressure? It was originally under 20.00 kPa.

2.       Use diagrams of molecules in cylinders (with pistons) to show that if pressure is halved, volume doubles.

3.       Consider the first step in the industrial production of nitric acid:

   $4 NH_{3(g)}$          +          $5 O_{2(g)} \rightarrow 4 NO_{(g)}$   +          $6 H_2O_{(g)}$

   a)       What is the most oxygen (in liters at STP) that could react with 68.0 g of $NH_{3(g)}$?

   b)       In burning ammonia, the STP equivalent of 224 L of oxygen were consumed. How many grams of NO must be contended with at STP?

4.       Acetylene reacts with oxygen according to the following equation.

   $2 C_2H_{2(g)} + 5 O_{2(g} \rightarrow 4 CO_{2(g)} + 2 H_2O_{(g)}$
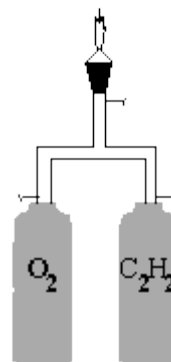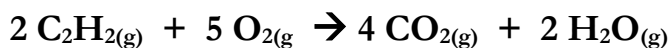


In an *oxyacetylene blow torch*, steel cylinders containing acetylene and oxygen are connected through hoses that join together, and then connect to a nozzle.  The mixture is combusted and produces a flame capable of cutting through metal.

When a steel cylinder of oxygen with a volume of 14.5 L was used to supply oxygen to an oxyacetylene torch, the pressure in the oxygen cylinder changed from $2.080 \times 10^3$ kPa to $2.010 \times 10^3$ kPa.  The temperature of both cylinders was 22.0°C at the times of both pressure readings.

What mass of acetylene was combusted from the other cylinder?

5.     Use $\dfrac{P_1 V_1}{n_1 T_1} = \dfrac{P_2 V_2}{n_2 T_2}$ to come up with 4 linear relationships between two variables.

Mention the constants in each case.

6.     What is the density of argon at $-50.0°$ C and 200.0 kPa?

7.     A student wants to triple the pressure of an ideal gas, while decreasing the volume by a factor of 0.80 and increasing the temperature from 200.0 K to 250.0K. If there were 2.0 moles of gas originally in the gas tank, should he remove gas? Add gas? Explain.

8.     Using the idea that each Pa of pressure is exactly 1 $N/m^2$ and that pressure in Pa = (9.8 N/kg)*mass /area, find the minimum pressure of a tire , knowing that four tires have to support a 2001 kg van ? The area of contact for each tire is 205 $cm^2$. Express your answer in psi's, knowing that exactly one psi =6.89475729 kPa.

9.     Hydrogen chloride (HCl) can form from the following reaction:

$2\ NaCl + H_2SO_4 \rightarrow Na_2SO_4 + 2\ HCl_{(g)}$
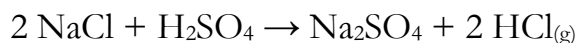
As the gas forms, it is cooled to 20.0 °C, and it first passes through a 0.20  L tank of water, and whatever does not dissolve escapes into a lab that holds 125 000 L of air at 101.3 kPa.
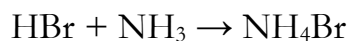
Will there be enough HCl to kill someone if 400.0 g of $H_2SO_4$ react?



HCl$_{(aq)}$ and HCl$_{(g)}$

HCl$_{(g)}$
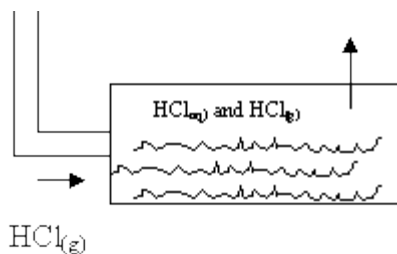
Lethal dose of HCl is 0.0018 g /L of air.

At 20.0 °C, the solubility of HCl in water is 720 g/L.

10.    If 2.0 L of HBr gas are mixed with 6.0 L of $NH_3$ gas, what is the most $NH_4Br$ gas that can form, if all gases are measured under the same conditions? Show why.

        $HBr + NH_3 \rightarrow NH_4Br$

**11.**    Given: $2\ NH_{3(g)} + 4\ O_{3(g)} \rightarrow NH_4NO_3 + 4\ O_{2(g)} + H_2O_{(l)}$

If all three gases' volumes are measured at the same pressure and temperature, and if we mix 1.00 L of ammonia ($NH_{3(g)}$) with 1.00 L of ozone($O_{3(g)}$) what is the greatest volume of oxygen($O_{2(g)}$) that will be produced? Will any of the reactants be in excess?

12    Click here for extra problem and solution.