The Ideal Gas Law

Name: _____

1) Calculate the value of the universal gas constant (R) for 30 g of NO, occupying 22.4 L of volume at standard temperature and pressure, in the units of psi L/mol K.

2) What is the volume occupied by 0.005 moles of an ideal gas under 1500 torr of pressure and at a temperature of 300 $^\circ$C?

3) 25.0 g of water is heated to 230 $^\circ$F and is confined to a volume of 150 ml. What is the pressure inside the container.

4) How many grams of chloroform, $CHCl_3$, are required to fill a 200 ml flask at 373 K and a pressure of 750 torr?

5) At what temperature is 8.70 grams of CO_2, when it is placed in a 500 ml container at 2500 torr of pressure?

6) Helium is collected at a high pressure of 210 psi. A 80 L tank is filled at the freezing point of water. How many moles of He gas are collected?

7) From problem #6, suppose the tank was emptied, and allowed to disperse at room temperature and pressure, approximately 77 $^\circ$F and .98 atm. Using the amount of moles collected, what volume would the gas occupy? How many 2 liter balloons would this fill?

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8) A gas at constant volume is cooled to a final temperature of 89 K. The initial pressure was 102.3 psi and the final pressure was 100 kPa. What was the initial temperature.

9) A gas at constant pressure is cooled to a temperature well below the freezing point of water. The initial volume was 50 ml. The temperature started at 50 $^\circ$C, and was cooled to -250 $^\circ$C. What was the final volume of the gas.

10) A 30 g sample of propane is allowed to heat from 293 K to 310 K on a summer's day as the pressure increases from 0.94 atm to 1.04 atm. Assuming the gas is confined and allowed to expand as necessary
a) use the ideal gas law to determine the volume of gas initially in the sample.

b) use the ideal gas law to determine the volume of gas after the sample is heated.

c) use the combined gas law to determine the final volume of the gas. Does it agree with part (b)? (Use answer to part A to solve for final volume)

Answers:
1) 1.206 psi L/mol K. 2) 0.119 L   3) 291 atm   4) 0.77 g   5) 101 K   6) 51 mol
7) 636.6 balloons   8) 628 K   9) 3.6 mL   10) a) 17.4 L   b) 16.7 L   c) yes