Ideal Gas Law

Name _____

1) Given the following sets of values, calculate the unknown quantity.

   a) P = 1.01 atm
      V = ?
      n = 0.00831 mol
      T = 25°C

   b) P = ?
      V = 0.602 L
      n = 0.00801 mol
      T = 311 K

2) At what temperature would 2.10 moles of N_2 gas have a pressure of 1.25 atm and in a 25.0 L tank?

3) When filling a weather balloon with gas you have to consider that the gas will expand greatly as it rises and the pressure decreases. Let's say you put about 10.0 moles of He gas into a balloon that can inflate to hold 5000.0L. Currently, the balloon is not full because of the high pressure on the ground. What is the pressure when the balloon rises to a point where the temperature is -10.0°C and the balloon has completely filled with the gas.

4) What volume is occupied by 5.03 g of O_2 at 28°C and a pressure of 0.998atm?

5) Calculate the pressure in a 212 Liter tank containing 23.3 kg of argon gas at 25°C?

Answers: 1a) 0.20 L   1b) 0.340 atm   2) 181 K   3) 0.043 atm   4) 3.9 L   5) 67.3 atm

Using the Ideal Gas Equation in Changing or Constant Environmental Conditions

1) If you were to take a volleyball scuba diving with you what would be its new volume if it started at the surface with a volume of 2.00L, under a pressure of 752.0 mmHg and a temperature of 20.0°C? On your dive you take it to a place where the pressure is 2943 mmHg, and the temperature is 0.245°C.

2) What is the volume of 1.00 mole of a gas at standard temperature and pressure?

3) A 113L sample of helium at 27°C is cooled at constant pressure to -78.0°C. Calculate the new volume of the helium.

4) What volume of He is occupied by 2.35 mol of He at 25°C and a pressure of 0.980 atm?

5) An aerosol can contains 400.0 ml of compressed gas at 5.2 atm pressure. When the gas is sprayed into a large plastic bag, the bag inflates to a volume of 2.14 L. What is the pressure of gas inside the plastic bag?

6) At what temperature does 16.3 g of nitrogen gas have a pressure of 1.25atm in a 25.0 L tank?

7) You decide to go on a long hot air balloon ride, so you decide to bring some shampoo to wash your hair with. However there is some gas inside the shampoo bottle when you start to climb into the basket at the beginning of your journey. In fact, because you are a good scientist you decide to constantly take measurements of your surroundings. The shampoo bottle contains 435ml of gas, under a pressure of 1.10 atm, at a temperature of 30.0°C. When you climb high into the air the bottle starts to expand eventually exploding and covering you and your companions with Pert Plus. Eager to explain this phenomenon you take some measurements: the pressure, you note, has dropped to 0.734 atm and the temperature has dropped to 5.00°C. To what new volume did the gas inside the bottle expand?

8) What mass of CO_2 is needed to fill an 80.0 L tank to a pressure of 150.0 atm at 27.0°C?

9) Have you ever wondered what the pressure is under the glass bell jar when the vacuum pump is turned on? One way to measure it would be to see how a balloon changes when it is inside. At the beginning of the experiment you note that the volume of the balloon is 560.0 mL under standard pressure. When you turn on the vacuum pump the balloon grows to 780.0 ml. What is the pressure under the bell jar at this point?

10) At what temperature does 5.00g of H_2 occupy a volume of 50.0 L at a pressure of 1.01 atm?

11) How many moles of gas would you have if you had a volume of 38.0L under a pressure of 1432 mmHg at standard temperature?

Answers: 1) 0.477 L   2) 22.4 L   3) 73 L   4) 59 L   5) 0.97 atm   6) 655 K or 418°C
7) 598 mL   8) 21,500 g or 21.5 kg   9) 0.7179 atm or 545.6 mmHg
10) 248 K or -24.9°C   11) 3.20 mol