Chapter 14
Gas Laws Study Guide

Definitions

Describe Boyle's Law. Give an example.
Describe Charles' Law. Give an example.
Describe Gay-Lussac's Law. Give an example.
Describe the combined gas laws. Why is the combined gas laws formula convenient to have?
Describe an ideal gas. List the 5 properties.
Describe a manometer.

Questions

Answer the following.

1. What are the four variables that are used to describe a gas?
2. What law describes the pressure of multiple gases in a shared container?
3. Define the term mole. How many particles of any kind does one mole represent?
4. Describe how a gas moves from one end of a room to another.
5. What are the values of STP (in mmHg, kPa, atm).
6. Under what conditions do gases deviate from ideal behavior?
7. Name the correct gas law for each of the following:
   a) the total pressure of a mixture of gas = the sum of the individual pressures of each gas
   b) the air in a scuba diver's lungs moves rapidly into their blood stream when they surface too quickly
   c) a soda can explodes in a hot car

Convert the following

1. 700mmHg to atm.
2. 470K to ^{o}C
3. 45^{o}C to K
4. 3.2atm to mmHg

Calculations

Solve the following problems:

1. A quantity of gas has a volume of 321L at 23^{o}C and 700mmHg of pressure. If the conditions are changed to STP, what will the new volume be? (Combined Gas Law)
2. A quantity of gas has a volume of 250L at 40^{o}C. If the gas is heated to 120^{o}C, what will the new volume be? Which law describes this change?
3. If a sample of gas at constant temperature has its pressure doubled, what will happen to its volume?
4. A 10L gas container is designed to hold gases with a pressure of up to 5000mmHg. If a gas sample that has a pressure of 600mmHg at -20^{o}C is placed in the container, at what temperature will the container burst? (Gay-Lussac's Law)
5. If a sample of gas at constant volume has its pressure reduced by ½, what happens to its temperature?
6. If the mercury level in the manometer arm attached to the gas sample is 45mm lower than the level open to the atmosphere, what is the pressure of the gas sample if the atmospheric pressure is 0.95 atm?
7. Derive the value of R (Universal Gas Law Constant) using psi. as your unit of pressure.
8. A gas whose behavior closely resembles that of an ideal gas has a volume of 3.00L at a temperature of 25^{o}C and a pressure of 800mm Hg. (Ideal Gas Law)
   a) How many moles are in the sample?
9. A gas whose behavior closely resembles that of an ideal gas has a volume of 4.00L at a temperature of -15^{o}C and a pressure of 730mm Hg. (Ideal Gas Law)
   a) How many moles are in the sample?
   b) How many molecules are in the sample?
10. Suppose you have a 4L container of oxygen gas at 2 atmospheres pressure and a 1L container of nitrogen gas at 2 atmosphere pressure. If you transfer the oxygen to the container holding the nitrogen,
    a) what pressure would the oxygen exert?
    b) what would be the total pressure exerted by the mixture? (Dalton's Law of Partial Pressure)