

College Chemistry

Lesson: 4/8/2020

Learning Topic:

Students will be able to explain and use the Ideal Gas Law.

Prior Knowledge Questions

1. If I initially have 4.0 L of a gas at a pressure of 1.1 atm, what will the volume be if I increase the pressure to 3.4 atm?
2. A toy balloon has an internal pressure of 1.05 atm and a volume of 5.0 L. If the temperature where the balloon is released is 250°C, what will happen to the volume when the balloon rises to an altitude where the pressure is 0.65 atm and the temperature is -150°C?

Answers to Prior Knowledge Questions

1. $(1.1 \text{ atm})(4.0 \text{ L}) = (3.4 \text{ atm})(x \text{ L})$

$$x = 1.3 \text{ L}$$

2. $(1.05 \text{ atm})(5.0 \text{ L})/(293 \text{ K}) = (0.65 \text{ atm})(x \text{ L})/(258 \text{ K})$

$$x = 7.0 \text{ L}$$

Learning Material

Read:

[What is the Ideal Gas Law?](#)

Watch the following videos:

[Video 1](#)

[Video 2](#)

Learning Material Continued

Notice in the videos that the presenter stresses that there are a variety of ways to measure pressure. Thus, you will need to make sure that your gas constant matches your current pressure. Please note the pressure equivalencies and the two values that R can be used.

- Pressure equivalencies:
 - $1 \text{ atm} = 101.3 \text{ kPa} = 760 \text{ mm Hg} = 760 \text{ torr}$
- Gas Constant (R):
 - $R = 8.31 \text{ L}\cdot\text{kPa}/(\text{K}\cdot\text{mol}) = 0.821 \text{ L}\cdot\text{atm}/(\text{K}\cdot\text{mol})$

Practice Problems:

1. How many molecules are there in 985 mL of nitrogen at 0.0° C and 1.00×10^{-6} mm Hg?
2. Calculate the mass of 15.0 L of NH_3 at 27° C and 900. mm Hg.
3. An empty flask has a mass of 47.392 g and 47.816 g when filled with acetone vapor at 100.° C and 745 mm Hg. If the volume of the flask is 247.3 mL, what is the molar mass of the acetone?
4. Calculate the density in g/L of 478 mL of krypton at 47° C and 671 mm Hg.

Answer Key

1. 3.48×10^{13} N₂ molecules
2. 12.3 g NH₃
3. 53.6 g/mol
4. 2.82 g/L

Extensions to Learning:

Extra information:

[Gas laws and kinetic molecular theory](#)

Practice Worksheets:

[Gases and their laws](#)

Based on this lesson do the following worksheets.

- Ideal gas law worksheet
- Ideal Gas Law I:
- Ideal Gas Law II