Avogadro’s Law

By: kashvi & zoya

What is avogadro's law? both

Avogadro's law proposes that when the temperature and pressure are the same, the volume equals to the same amount of molecules. If the number of molecules increase so will the volume of the object, only if the object is mutable. When the object is not flexible the, pressure in the object will change.

The equation for this law is $$\frac{V_1}{n_1} = \frac{V_2}{n_2}$$

V1 is the initial volume of the gas, n1 is the initial quantity of the gas in moles, V2 is the final volume of the gas and n2 is the final quantity of gas in moles

A good example of Avogadro's law being used in real life is blowing up a balloon or pumping air into a basketball. Blowing into a balloon you are simply increasing the number of molecules, which, as a result increases the volume of the balloon; therefore, the balloon expands.

Avogadro's number, is the number of particles in one mole of substance, this number is 6.022×1023 · mol−1

Historical background (zoya)

This law was first proposed in 1728 by Dalton Bernoulli, he came up wit a hypothesis stating that equal volumes-equal numbers. However, he did not go further in depth and study this hypothesis; in addition, he thought that this hypothesis will have little significance in explaining “the known physical and chemical facts about gases”. (chemistry.stackexchange) Avogadro provided substantial evidence to prove the law, however he was not the first one to propose it.

Difference between real and ideal gases -kashvi

An ideal gas does not have volume, and it can be considered as a point mass, which means that the particles mass is almost zero. Which, in other words, means that they have no mass and no definitive volume. A real gas is the complete opposite of an ideal gas. Real gases actually have a volume because real gases have molecules and atoms which take up more space in the particle than an ideal gas. Ideal gases do not have attractive or repulsive energy in their particles, there is also an absence of interparticle energy which leads to the kinetic energy will remain consistent. Whereas in real gases, the particles are non-elastic as real gases are made up of particles that attract each other actively even though the pressure is quite low. Unlinke real gases, when ideal gases' particles are colliding, they have elasticity and they have no energy involved and the pressure is quite high.

Simulation (zoya)

https://www.youtube.com/watch?v=LtRz2Sdt9ic

Application-kashvi

Avogadro’s law is used in our day to day life and we might not even realise it. As i mentioned before, blowing up a balloon and or pumping air into a basketball is a perfect example of Avogadro’s law.you are forcing molecules into it. This leads to the balloon/basketball inflating which shows us that the volume of the object is increasing because there are more molecules being pushed inside of it.

There are many more examples of the Avogadro law being used in our everyday life like our lungs, we are constantly breathing and our lungs expand as they take in more air, thus the volume of the lungs increase, and when we exhale, the volume of our lungs decrease.

Lastly, pumping air into a punctured tire, which is similar to pumping air into a basketball, it has less volume inside before you're forcing in the air molecules and as you force more molecules into the object, the volume of the object increases.

Exercises 1 – kashvi

A 6.0 L sample at 25°C and 2.00 atm of pressure contains 0.5 mole of a gas. If an additional 0.25 mole of gas at the same pressure and temperature are added, what is the final total volume of the gas?

Solution:

$$\frac{V_1}{n_1} = \frac{V_2}{n_2}$$

V1=6.0, n1= 0.5 mole. Add 0.25 mole

n2=n1+ 0.25 mole

n2= 0.5 + 0.25 mole

n2= 0.75mole

Find V2:

V2= 6.0 X 0.75/0.5

V2= 9L

Exercise 2 - zoya

11.2 L sample of gas is determined to contain 0.5 moles of nitrogen. At the same temperature and pressure, how many moles of gas would there be in a 20 L sample?

$V1$= 11.2 L $N1$= 0.5 moles

$V2$= 20 L $n2$= ?

$N2$= 20x0.5 / 11.2

= 0.89 moles

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