

OpenStax	Learning Outcomes	
9.1	Identify and use units of pressure.	
9.1		Memorize the common pressure units and the conversion factors between pressure units.
9.1		Convert between pressure units.
9.1	Describe the simple gas laws qualitatively and quantitatively.	
9.2		Calculate values of pressure or volume using Boyle's Law.
9.2		Calculate values of volume or temperature using Charles' Law.
9.2		Calculate values of moles or volume using Avogadro's Law.
9.2		Use the ideal gas law equation to derive the simple gas laws.
9.2	Use the ideal gas law in calculations.	
9.2		Calculate values of P, V, n or T if given the other three using the ideal gas Law.
9.2		Complete calculations with the combined gas law
9.2		Define standard temperature and pressure (STP).
9.2, 9.3		Combine density calculations and molar mass calculations with the ideal gas law to determine the density or molar mass of a gas.
9.2, 9.3	Define and derive molar volume.	
9.2, 9.3		Use molar volume at STP as a conversion factor.
9.3		Use Avogadro's Law to do stoichiometry conversions in reactions involving gases.
9.3	Use Dalton's Law of partial pressure to calculate total pressure of a gas if given individual gas pressures and vice	
9.3		State Dalton's law of partial pressure and define all variables.
9.3		Define mole fraction
9.3		Calculate the mole fraction of a substance in a mixture.
9.3		Calculate partial pressure in terms of mole fraction and total pressure.
9.4	Describe the processes of diffusion and effusion of gases.	
9.4		Define diffusion and effusion.
9.4		Compare relative speeds of molecules and rates of effusion as a function of molar mass.
9.5	Use the kinetic molecular theory of a gas to explain the simple gas laws on the molecular level.	
9.5		Retell the statements of the Kinetic Molecular Theory of a Gas.
9.5		Recognize the equation for kinetic energy ($\frac{1}{2}mv^2$) and identify all variables.
9.5		Describe the qualitative relationship between variables in the rms velocity equation.
9.5		Describe the qualitative relationship between molar mass and average kinetic energy of gases.
9.5		Describe the qualitative relationship between temperature and average kinetic energy of gases.
9.5		Describe the relationship between rate of effusion and molar mass as explained by Graham's law.
9.5	Distinguish between real and ideal gases.	
9.6		Describe the conditions of pressure and temperature that distinguish a real gas from an ideal gas.
9.6		Explain qualitatively how the terms of the van der Waals equation account for the properties of a real gas.