



Vocabulary: Ideal Gas Law



Vocabulary

- **Atmosphere (atm)** – a unit of pressure that represents the force exerted by the atmosphere at sea level under standard conditions.
 - 1 atm represents 101,325 newtons of force acting on a 1 square meter area.
 - 1 atm is equal to 101.325 kPa, 760 torr, or 14.7 pounds per square inch.
 - 1 atm of pressure will cause a mercury barometer to rise exactly 760 mm.
- **Avogadro's law** – a law stating that the volume (V) of a gas is directly proportional to the number of particles, or moles (n) of the gas, at constant pressure and temperature.
 - As the amount of gas increases, its volume increases as long as pressure and temperature remain unchanged.
 - Avogadro's law can be expressed as $V \propto n$, which shows that volume and amount of gas are directly proportional. Since V increases at the same rate as n , this expression can be rewritten as $V_1 n_2 = V_2 n_1$.
- **Boyle's law** – a law stating that the volume (V) of a fixed amount of gas is inversely proportional to the pressure (P) acting on the gas, at constant temperature.
 - As the pressure on a gas increases, its volume decreases as long as temperature remains unchanged.
 - Boyle's law can be expressed as $V \propto 1/P$, which shows that V and P are inversely proportional. Since V decreases at the same rate that P increases, this expression can be rewritten as $P_1 V_1 = P_2 V_2$.
- **Charles's law** – a law stating that the volume (V) of a fixed amount of gas is directly proportional to the absolute temperature (T) of the gas, at constant pressure.
 - As the temperature of a gas increases, its volume increases as long as pressure remains unchanged.
 - Charles's Law can be expressed as $V \propto T$, which shows that V and T are directly proportional. Since V increases at the same rate as T , this expression can be rewritten as $V_1 T_2 = V_2 T_1$.
- **Dependent variable** – the variable in an experiment that is being tested, which changes in response to changes in other variables.
 - For example, if an experiment is designed to test the effect of light on plant growth, the amount of plant growth would be the dependent variable.
- **Directly proportional** – a mathematical relationship in which a change in one variable causes a change in another variable at the same rate and in the same direction.



- Gay-Lussac's law – a law stating that the pressure (P) of a fixed amount of gas is directly proportional to the absolute temperature (T) of the gas, at constant volume.
 - As the temperature of a gas increases, its pressure increases as long as the volume remains unchanged.
 - Gay-Lussac's law can be expressed as $P \propto T$, which shows that P and T are directly proportional. Since P increases at the same rate as T , this expression can be rewritten as $P_1 T_2 = P_2 T_1$.
- Ideal gas – a theoretical gas in which the molecules experience no attractive forces between themselves, have zero volume, and always undergo perfectly elastic collisions.
 - In normal laboratory conditions, real gases behave very much like ideal gases and any deviations from the predictions of the ideal gas law will be negligible.
- Ideal gas constant (R) – the proportionality constant used in the ideal gas law, equal to 0.08206 L·atm/K·mol or 8.314 L·kPa/K·mol.
- Ideal gas law – the gas law that postulates the relationship between pressure, volume, temperature, and moles of a gas. The formula for the ideal gas law is $PV = nRT$.
- Independent variable – the variable in an experiment that is being changed, which potentially causes changes in the dependent variable.
 - For example, if an experiment is designed to test the effect of light on plant growth, the amount of light would be the independent variable, since it causes changes in the amount of plant growth (the dependent variable).
- Inversely proportional – a mathematical relationship in which an increase in one variable causes a decrease in another variable at the same rate.
- Kelvin temperature scale – the SI temperature scale, also referred to as the absolute temperature scale, which is based on molecular motion.
 - Absolute zero (0 K or $-273\text{ }^\circ\text{C}$) is the coldest possible theoretical temperature.
- Kilopascal (kPa) – a unit of pressure equivalent to 1,000 newtons per square meter. 101.325 kPa is equivalent to 1 atmosphere (atm).
- Mole – the SI unit of amount of substance; one mole contains 6.022×10^{23} particles.
- Pressure – the application of force over a particular area ($P = F/A$). The pressure exerted by a confined gas is due to the collision of molecules with the walls of its container.
- Proportionality – an expression that indicates a directly proportional relationship between two variables, denoted by the symbol “ \propto .”
- STP – standard temperature and pressure: $0\text{ }^\circ\text{C}$ (273 K) and 1 atm (101.325 kPa).
 - STP represents normal atmospheric conditions at sea level.
- Volume – the amount of space occupied by a substance, typically expressed in liters (L).

