Ideal Gas Equation.

A gas which strictly obeys the gas laws is called as perfect or an ideal gas. The size of the molecule of an ideal gas is zero i.e. each molecule is a point mass with no dimension. There is no force of attraction or repulsion amongst the molecule of the gas. All real gases are not perfect gases. However at extremely low pressure and high temperature, the gases like hydrogen, nitrogen, helium etc. are nearly perfect gases.

The equation which relates the pressure (P), volume (V) and temperature (T) of the given state of an ideal gas is known as gas equation.

Ideal gas equations	
For 1 mole or NA molecule or M gram or 22.4 liters of gas	PV = RT
For μ mole of gas	PV = μRT
For 1 molecule of gas	$PV = \left(\frac{R}{N_A}\right)T = kT$
For N molecules of gas	PV = NkT
For 1 gm of gas	$PV = \left(\frac{R}{M}\right)T = rT$
for n gm of gas	PV = nrT

(1) Universal gas constant (R): Dimension $[ML^2T^{-2}\theta^{-1}]$

$$R = \frac{PV}{\mu T} = \frac{\text{Pressure} \times \text{Volume}}{\text{No. of moles} \times \text{Temperature}} = \frac{\text{Work done}}{\text{No. of moles} \times \text{Temperature}}$$

Thus universal gas constant signifies the work done by (or on) a gas per mole per kelvin.

S.T.P. value: $8.31\frac{Joule}{mole \times kelvin} = 1.98\frac{cal}{mole \times kelvin} = 0.8221\frac{litre \times atm}{mole \times kelvin}$

(2) Boltzman's constant (k): Dimension $[ML^2T^{-2}\theta^{-1}]$

$$k = \frac{R}{N} = \frac{8.31}{6.023 \times 10^{23}} = 1.38 \times 10^{-23} \ Joule/kelvin$$

(3) Specific gas constant (r): Dimension $[L^2 T^{-2} \theta^{-1}]$

$$r = \frac{R}{M}$$;Unit: $\frac{Joule}{gm \times kelvin}$

Since the value of M is different for different gases. Hence the value of r is different for different gases.