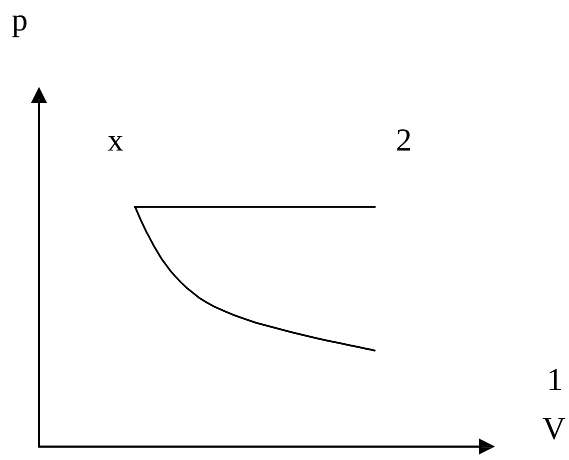

$P_1 V_1 = P_X V_X$ (3)

And $\frac{V_X}{T_X} = \frac{V_2}{T_2} = CONST$ (4)

From (3) into (4) then $\frac{P_1 V_1}{P_X T_X} = \frac{V_2}{T_2}$

But $P_X = P_2$, $T_X = T_1$, then

$\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2} = CONST \Rightarrow \frac{PV}{T} = CONST$

$\therefore \frac{Pv}{T} = const = R$, which is referred to characteristic gas constant, then for m kg of gas

$\frac{pmv}{T} = mR \Rightarrow \frac{pV}{T} = mR$

this is the characteristic equation of a perfect gas $\therefore PV = mRT$

Where

$R = \frac{R_m}{relative\ molcular\ mass}$

$R_m = 8314.3 \frac{J}{kgmol.K}$ is referred to as Universal gas constant

As an example for air $R = 287 \frac{J}{kg.K}$

.Ex

, Air, assume the atom2, H2kg of Co3 For different type of gases what is the volume of . 2N/m101325°C, pressure =15 standard atom. T=

، Sol

$\therefore PV = mRT$

Then

$$V_{CO_2} = \frac{MRT}{P} = \frac{3 * \frac{8314.3}{44} * (15+273)}{101325} = 1.6 m^3$$

$$V_{H_2} = \frac{MRT}{P} = \frac{3 * \frac{8314.3}{2} * (15+273)}{101325} = 3.54 m^3$$

$$V_{AIR} = \frac{MRT}{P} = \frac{3 * \frac{8314.3}{28.96} * (15+273)}{101325} = 2.448 m^3$$

٢. Specific heat capacity

١. Specific heat capacity at constant volume Cv; for unit mass

0w=Then2 =V1V

q-w=du

q=du=Cv dt~ its units is J/kg

Q=mCv dt~ its units is J

٢. spesific heat at constant pressure Cp

For unit mass

Q=Cp dT

q-w=du

q=w+du

Cp dT=w+Cv dt

But w=pdv

then

CpdT=Cv dT+pdv (a) dividing by dT then Cp=Cv +p dv/dt

then since v=specific volume But pv=RT

Pdv=RdT into equation a then

Cp=Cv+R

R=Cp-Cv

this equation verify that the characterstic gas constant is equal to the difference in specific heats.

Assuming that $\gamma = \frac{C_P}{C_V}$ then

$$\therefore C_P = \frac{C_p}{\gamma} + R$$

$$\gamma C_P = C_P + \gamma R$$

$$C_P(\gamma - 1) = \gamma R$$