Molar Specific Heat

- specific heat is a measure of how easy it is to change the temp. of a material

- Energy required to produce a 1°C temp change in 1mole of a gas

Internal Energy

- Sum of all individual molecular kinetic energies.

$$E_{internal} = n N_A E_{k_{avg}}$$

$$= n N_A \frac{3}{2} k T$$

$$N = n N_A$$

$$k = \frac{R}{N_A}$$

$$E_{int} = \frac{3}{2} n R T$$

T = temp. (K)

n = # moles

$R = 8.31 \frac{J}{mol\,K}$

Substance Specific heat (c)

$$Q = m c \Delta T$$

Ideal monatomic Gass

Gas Specific heat (C_V) at constant volume

Amount

$$Q = n C_V \Delta T$$

n, like m, specifies the amount of the material

$W = 0$ for constant volume process

Since $\Delta E_{int} = Q - W$

$$\frac{3}{2} n R \Delta T = n C_V \Delta T - 0$$

$$C_V = \frac{3}{2} R = 12.5 \ \frac{J}{mol\,K}$$

$$\Delta E_{int} = n C_V \Delta T$$

ideal gas for any process

why? $C_V = \frac{3}{2} R$

Ideal Monatomic Gas
specific heat (c_p) at constant pressure

$$Q = n C_p \Delta T$$

$$W = P \Delta V = n R \Delta T$$

$$\Delta E_{int} = Q - W$$

$$\cancel{n} C_V \cancel{\Delta T} = \cancel{n} C_p \cancel{\Delta T} - \cancel{n} R \cancel{\Delta T}$$

$$C_V = C_p - R$$

or

$$C_p = C_V + R$$