Answer on Question #51926-Physics-Field Theory

The difference between the principal specific heats of nitrogen is 300 J/kg °K and ratio of the two specific heats is 1.4. Then the CP is

1050 J/kg °K

650 J/kg °K

750 J/kg °K

150 J/kg °K

Solution

$$C_P - C_V = 300\frac{\mathrm{J}}{\mathrm{kg^\circ K}};\frac{C_P}{C_V} = 1.4.$$

$$\mathrm{C_P}\left(1-\frac{1}{\frac{C_P}{C_V}}\right) = C_P - C_V.$$

$$\mathrm{C_P} = \frac{C_P - C_V}{\left(1-\frac{1}{\frac{C_P}{C_V}}\right)} = \frac{300\frac{\mathrm{J}}{\mathrm{kg^\circ K}}}{1-\frac{1}{1.4}} = 1050\frac{\mathrm{J}}{\mathrm{kg^\circ K}}.$$

Answer: 1050 J/(kg°K).

17 CP and CV denote the molar specific heats of a gas at constant pressure and at constant volume respectively. If and CP/CV=γ, then CV is equal to

R/(γ−1)

(γ−1)/R

Nosolution

373.2oC

Solution

$$C_P - C_V = R; \frac{C_P}{C_V} = \gamma.$$

$$\mathrm{C_V}\left(\frac{C_P}{C_V} - 1\right) = R.$$

$$\mathrm{C_V} = \frac{R}{(\gamma - 1)}.$$

Answer: R/((γ-1)).

18 A gas is taken in a sealed container at 300 K. it is heated at constant volume to a temperature 600 K. the mean K.E. of its molecules is

Halved

Doubled

Tripled

Quadrupled

Solution

The mean K.E. of gas molecules $\sim T$. Thus $\frac{T'}{T} = \frac{600K}{300K} = 2$. So, it is doubled.

Answer: Doubled.

19 R.M.S velocity of a gas molecule of mass m at given temperature is proportional to

mo

m

$m^{\left(\frac{1}{2}\right)}$

$\frac{1}{m^{\left(\frac{1}{2}\right)}}$

Solution

R.M.S velocity of a gas molecule of mass m is

$$v_{rms} = \sqrt{\frac{3kT}{m}}.$$

So, R.M.S velocity of a gas molecule of mass m at given temperature is proportional to $\frac{1}{m^{\left(\frac{1}{2}\right)}}$.

Answer: 1/m^((1/2)).

20 The mean kinetic energy of one gram-mole of a perfect gas at absolute temperature T is

0.5kT

0.5RT

1.5kT

1.5RT

Solution

$$KE_{avg}(per\ mole) = \frac{3}{2}RT.$$

So, the mean kinetic energy of one gram-mole of a perfect gas at absolute temperature T is 1.5RT.

Answer: 1.5RT.