Answer on Question #51925-Physics-Field Theory

Average kinetic energy of molecules is

Inversely proportional to absolute temperature

Independent of absolute temperature

Directly proportional to absolute temperature

Directly proportional to square root of temperature

Solution

Average kinetic energy of molecules in three dimensions is

$$E = \frac{3}{2}kT.$$

So, average kinetic energy of molecules is directly proportional to absolute temperature.

Answer: Directly proportional to absolute temperature.

12 The specific heat of a gas in isothermal process is ?

0

Negative

constant

Infinite

Solution

From the definition of heat capacity it follows that if the addition or removal of heat during an isothermal process does not lead to a change in system temperature, the heat capacity c_T is infinitely large:

$$c_T = \pm\infty$$

(the plus sign corresponds to addition of heat to a system, the minus sign indicates the removal of heat from a system).

Answer: Infinite.

13 Latent heat of ice is ?

Less than external latent heat of fusion

Equal to external latent heat of fusion

More than external latent heat of fusion

Twice the external latent heat of fusion

Solution

Latent heat of ice is more than external latent heat of fusion.

Answer: More than external latent heat of fusion.

14 The r.m.s. velocity of the molecules in the sample of helium is 5/7th that of the molecules in the sample of hydrogen. If the temperature of the hydrogen sample is 0°C that of helium is

0°C

0°K

273°C

100°C

Solution

The formula for r.m.s. velocity is

$$v_{rms} = \sqrt{\frac{3RT}{M}},$$

where M is molar mass of gas, T is temperature, R is gas constant.

So,

$$\frac{v_{rms}(He_2)}{v_{rms}(H_2)} = \sqrt{\frac{T(He_2)}{T(H_2)}\frac{M(H_2)}{M(He_2)}}.$$

Thus, the temperature of the helium is

$$T(He_2) = T(H_2)\left(\frac{v_{rms}(He_2)}{v_{rms}(H_2)}\right)^2 \frac{M(He_2)}{M(H_2)} = (0+273)K\left(\frac{5}{7}\right)^2 \frac{8}{2} = 546K = 273°\text{C}.$$

Answer: 273°C.

15 Mean square velocity of five molecules of velocities 2 m/s, 3 m/s, 4 m/s, 5 m/s and 6 m/s is in m2/s2?

10

18

20

15

Solution

Mean square velocity of five molecules of velocities is

$$\frac{2^2 + 3^2 + 4^2 + 5^2 + 6^2}{5} = 18\frac{m^2}{s^2}.$$

Answer: 18.