The specific heat of a substance at its boiling point or melting point

Is 0

Is infinity

Is negative

lies between 0 and 1

Solution

The specific heat of a substance at its boiling point or melting point is infinity, because $\Delta T = 0$ but $\Delta Q \neq 0$ at these points in the formula for specific heat:

$$C = \frac{\Delta Q}{m\Delta T} \sim \frac{1}{\Delta T} \to \infty.$$

Answer: infinity.

2 A unit mass of solid converted to liquid at its melting point. Heat is required for this process is

Specific heat

Latent heat of vaporization

Latent heat of fusion

External latent heat

Solution

Latent heat of fusion is the amount of heat required to convert a unit mass of a solid at its melting point into a liquid. Thus, Heat is required for this process is latent heat of fusion.

Answer: Latent heat of fusion.

3 At a certain temperature, hydrogen molecules have r.m.s. velocity of 3 km/s. what is the r.m.s velocity of the oxygen molecules at the same temperature?

0.25 km/s

0.5 km/s

0.75 km/s

0.6 km/s

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,

$$\frac{v_{rms}(O_2)}{v_{rms}(H_2)} = \sqrt{\frac{M(H_2)}{M(O_2)}}.$$

Thus, the r.m.s velocity of the oxygen molecules is

$$v_{rms}(O_2) = v_{rms}(H_2)\sqrt{\frac{M(H_2)}{M(O_2)}} = 3\,\frac{km}{s}\sqrt{\frac{2}{32}} = 0.75\,\frac{km}{s}.$$

Answer: $0.75\frac{km}{s}$.

4 Which one of the following quantities can be zero on an average for the molecules of an ideal gas in equilibrium?

Kinetic energy

Density

Momentum

Speed

Solution

Average momentum of the molecules of an ideal gas in equilibrium can be zero, because it depends of direction and when we take an average:

$$\langle \vec{p} \rangle = \frac{\sum \vec{p}_i}{N} = \vec{0}.$$

It is because that all directions are equivalent.

Answer: Momentum.