

Kinetic Theory

NEET previous year questions · Physics

6 questions from the official papers: NEET 2026 (1), Re-NEET 2026 (2), NEET 2020 (3). Each is followed by its answer and a worked solution written by BrainIt. Generated on 23 October 2026.



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1. NEET 2026 · Q7

A flask contains argon and chlorine in the ratio of 2 : 1 by mass. The temperature of the mixture is 27°C. The ratio of root mean square speed of the molecules of the two gases $\left(\frac{v_{rms}^{Ar}}{v_{rms}^{Cl}}\right)$ is: (Atomic mass of argon = 40.0 u and molecular mass of chlorine = 70.0 u)

- (1) $\frac{\sqrt{7}}{2}$ (2) $\frac{7}{4}$
(3) $\frac{7}{2}$ (4) $\frac{2}{\sqrt{7}}$

Answer (1)

Sol. Since $v_{rms} = \sqrt{\frac{3RT}{M}}$, at the same temperature
 $v_{rms} \propto \frac{1}{\sqrt{M}}$. Therefore $\frac{v_{rms}^{Ar}}{v_{rms}^{Cl}} = \sqrt{\frac{M_{Cl}}{M_{Ar}}} = \sqrt{\frac{70}{40}} = \frac{\sqrt{7}}{2}$, option (1). The 2:1 mass ratio of the gases does not affect the rms speed, which depends only on temperature and molar mass.

2. Re-NEET 2026 · Q2

The mean free path of molecules in an ideal gas *A* is half that of another ideal gas *B*. The diameter of the spherical molecules of gas *A* is twice the diameter of the molecules of *B*. If number densities of the gases *A* and *B* are n_A and n_B , respectively, the correct option is:

- (1) $n_A = n_B$ (2) $n_A = 2n_B$
(3) $n_A = \frac{1}{4}n_B$ (4) $n_A = \frac{1}{2}n_B$

Answer (4)

Sol. Mean free path is $\lambda = \frac{1}{\sqrt{2}n\pi d^2}$, so $\lambda \propto \frac{1}{d^2n}$. Taking the ratio, $\frac{\lambda_A}{\lambda_B} = \frac{d_B^2 n_B}{d_A^2 n_A}$. Substituting $\lambda_A/\lambda_B = \frac{1}{2}$ and $d_A = 2d_B$ gives $\frac{1}{2} = \frac{n_B}{4n_A}$, hence $n_A = \frac{1}{2}n_B$. NCERT Class 11, Kinetic Theory (mean free path).

3. Re-NEET 2026 · Q45

An ideal gas is made of polyatomic molecules. Each of the molecules has three translational, three rotational and *f* number of vibrational modes. If the ratio of heat capacities C_P/C_V of the gas is 8/7, then the value of *f* is:

- (1) 4 (2) 3 (3) 2 (4) 1

Answer (1)

Sol. Equipartition assigns $\frac{1}{2}k_B T$ to each translational and rotational mode but a full $k_B T$ to each vibrational mode, so $C_V = \frac{R}{2}(3 + 3 + 2f) = (3 + f)R$ and $C_P = C_V + R = (4 + f)R$. Setting $\frac{4+f}{3+f} = \frac{8}{7}$ gives $28 + 7f = 24 + 8f$, so $f = 4$. NCERT Class 11, Kinetic Theory (law of equipartition of energy).

4. NEET 2020 · Q150

A cylinder contains hydrogen gas at pressure of 249 kPa and temperature 27°C. Its density is ($R = 8.3 \text{ J mol}^{-1} \text{ K}^{-1}$)

- (1) 0.2 kg m^{-3} (2) 0.1 kg m^{-3}
(3) 0.02 kg m^{-3} (4) 0.5 kg m^{-3}

Answer (1)

Sol. The density ρ of an ideal gas is given by $\rho = \frac{P \times M}{R \times T}$, where *P* is the pressure, *M* is the molar mass, *R* is the gas constant, and *T* is the temperature in Kelvin. Substituting the values, $P = 249 \times 10^3 \text{ Pa}$, $M = 2 \times 10^{-3} \text{ kg/mol}$, $R = 8.3 \text{ J/mol K}$, and $T = 27 + 273 = 300 \text{ K}$, we get $\rho = \frac{249 \times 10^3 \times 2 \times 10^{-3}}{8.3 \times 300} \approx 0.2 \text{ kg/m}^3$. Chapter: Kinetic Theory.

5. NEET 2020 · Q157

The mean free path for a gas, with molecular diameter d and number density n can be expressed as

- (1) $1/(\sqrt{2} n \pi d^2)$
- (2) $1/(\sqrt{2} n^2 \pi d^2)$
- (3) $1/(\sqrt{2} n^2 \pi^2 d^2)$
- (4) $1/(\sqrt{2} n \pi d)$

Answer (1)

Sol. The kinetic-theory expression for mean free path is $\lambda = 1/(\sqrt{2} n \pi d^2)$, where n is number density and d is molecular diameter. Chapter: Kinetic Theory.

6. NEET 2020 · Q178

The average thermal energy for a mono-atomic gas is (k_B is Boltzmann constant and T , absolute temperature)

- (1) $(3/2)k_B T$
- (2) $(5/2)k_B T$
- (3) $(7/2)k_B T$
- (4) $(1/2)k_B T$

Answer (1)

Sol. The average thermal energy for a mono-atomic gas is given by $\frac{3}{2}k_B T$. This is derived from the equipartition theorem, which states that each degree of freedom contributes $\frac{1}{2}k_B T$ to the energy, and a mono-atomic gas has three translational degrees of freedom. Chapter: Kinetic Theory.

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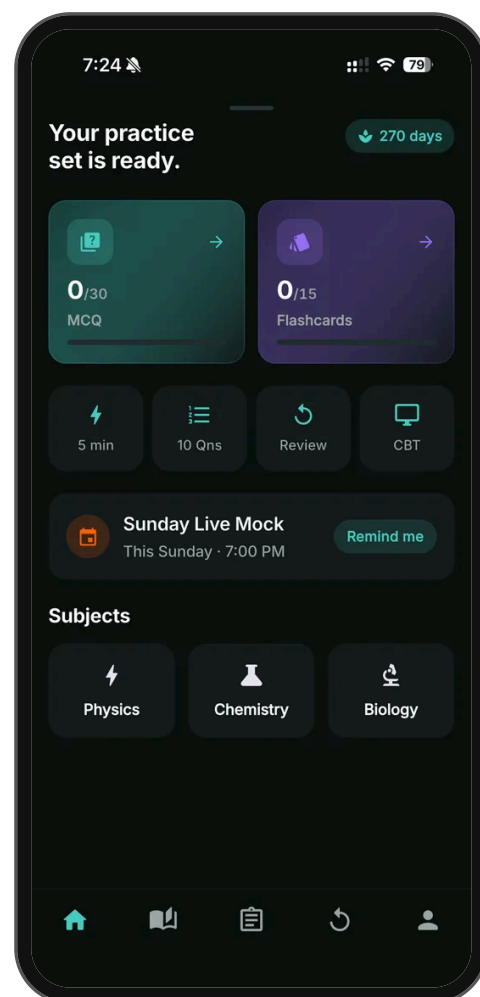
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