

JEE MAIN KINETIC THEORY — PYQS

Max. Marks: 84

Questions: 21

Section A (MCQ) — 17 questions

- Q.1** Two closed vessels of same volume are joined through a narrow tube and both vessels are filled with air of pressure 90 kPa and temperature 400 K. Keeping the temperature of one vessel constant at 400 K the second vessel temperature is raised to 500 K. The final pressure in the vessels is _____ kPa.

[JEE Main 2026 (Online) 6th April Morning Shift]

- (1) 100 (2) 120 (3) 90 (4) 105

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- Q.2** If 2 mole of an ideal monoatomic gas at temperature T , is mixed with 6 mole of another ideal monoatomic gas at temperature $2T$ then the temperature of mixture is :

[JEE Main 2026 (Online) 6th April Evening Shift]

- (1) $\frac{5}{2}T$ (2) $\frac{5}{4}T$ (3) $\frac{7}{2}T$ (4) $\frac{7}{4}T$

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- Q.3** Given below are two statements: one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.

Assertion (A): Change in internal energy of a system containing n mole of ideal gas can be written as $\Delta U = nC_v(T_f - T_i) = \frac{nR}{\gamma - 1}(T_f - T_i)$, where $\gamma = \frac{C_p}{C_v}$,

T_i = initial temperature, T_f = final temperature.

Reason (R): Relation between degree of freedom f

and $\gamma (= C_p/C_v)$ is $\left(\gamma = 1 + \frac{2}{f}\right)$

Choose the correct answer from the options given below : [JEE Main 2026 (Online) 5th April Morning Shift]

- (1) Both (A) and (R) are true and (R) is the correct explanation of (A)
 (2) Both (A) and (R) are true but (R) is NOT the correct explanation of (A)
 (3) (A) is true but (R) is false
 (4) (A) is false but (R) is true

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- Q.4** An ideal gas at pressure P and temperature T is expanding such that $PT^3 = \text{constant}$. The coefficient of volume expansion of the gas is _____.

[JEE Main 2026 (Online) 5th April Evening Shift]

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

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- Q.5** One gas of n_1 mole of molecules at temperature T_1 , volume V_1 , and pressure P_1 , and another gas of n_2 mole of molecules at temperature T_2 , volume V_2 , and pressure P_2 , are mixed resulting in pressure P and volume V of the mixture. The temperature of the mixture is _____.

[JEE Main 2026 (Online) 4th April Morning Shift]

- (1) $\frac{(T_1 + T_2)}{2}$ (2) $\frac{T_1 T_2 P V}{T_2 P_1 V_1 + T_1 P_2 V_2}$
 (3) $\frac{(T_2 P_1 V_1 + T_1 P_2 V_2)}{T_1 T_2 P V}$ (4) $\frac{|T_1 - T_2|}{2}$

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- Q.6** Given below are two statements: one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.

Assertion (A): If the average kinetic energy of H_2 and O_2 molecules, kept in two different sized containers are same, then their temperatures will be same.

Reason (R): The r.m.s. speed of H_2 and O_2 molecules are same at same temperature.

Choose the correct answer from the options given below : [JEE Main 2026 (Online) 4th April Evening Shift]

- (1) Both (A) and (R) are true and (R) is the correct explanation of (A)
 (2) Both (A) and (R) are true but (R) is NOT the correct explanation of (A)
 (3) (A) is true but (R) is false
 (4) (A) is false but (R) is true

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- Q.7** A mixture of carbon dioxide and oxygen has volume 8310 cm^3 , temperature 300 K , pressure 100 kPa and mass 13.2 g . The number of moles of carbon dioxide and oxygen gases in the mixture respectively are _____.

(Assume both carbon dioxide and oxygen gases behave like ideal gases) [$R = 8.31 \text{ J/mol K}$]

[JEE Main 2026 (Online) 2nd April Evening Shift]

- (1) 0.15 and 0.18 (2) 0.25 and 0.08
(3) 0.21 and 0.12 (4) 0.13 and 0.20

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- Q.8** The mean free path of a molecule of diameter $5 \times 10^{-10} \text{ m}$ at the temperature 41°C and pressure $1.38 \times 10^5 \text{ Pa}$, is given as _____ m. (Given $k_B = 1.38 \times 10^{-23} \text{ J/K}$).

[JEE Main 2026 (Online) 28th January Evening Shift]

- (1) $2\sqrt{2} \times 10^{-10}$ (2) $10\sqrt{2} \times 10^{-8}$
(3) $2\sqrt{2} \times 10^{-8}$ (4) 2×10^{-8}

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- Q.9** Consider two boxes containing ideal gases A and B such that their temperatures, pressures and number densities are same. The molecular size of A is half of that of B and mass of molecule A is four times that of B. If the collision frequency in gas B is $32 \times 10^{18} / \text{s}$ then collision frequency in gas A is _____ /s.

[JEE Main 2026 (Online) 22nd January Evening Shift]

- (1) 8×10^{18} (2) 2×10^{18}
(3) 32×10^{18} (4) 4×10^{18}

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- Q.10** The r.m.s. speed of oxygen molecules at 47°C is equal to that of the hydrogen molecules kept at _____ $^\circ\text{C}$. (Mass of oxygen molecule/mass of hydrogen molecule = 32/2)

[JEE Main 2026 (Online) 21st January Evening Shift]

- (1) -100 (2) -253 (3) -20 (4) -235

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- Q.11** Match the List I with List II

List - I		List - II	
A.	Triatomic rigid gas	I.	$\frac{C_p}{C_v} = \frac{5}{3}$
B.	Diatomic non-rigid gas	II.	$\frac{C_p}{C_v} = \frac{7}{5}$
C.	Monoatomic gas	III.	$\frac{C_p}{C_v} = \frac{4}{3}$
D.	Diatomic rigid gas	IV.	$\frac{C_p}{C_v} = \frac{9}{7}$

Choose the correct answer from the options given below: [JEE Main 2025 (Online) 7th April Morning Shift]

- (1) A-III, B-IV, C-I, D-II (2) A-II, B-IV, C-I, D-III
(3) A-IV, B-II, C-III, D-I (4) A-III, B-II, C-IV, D-I

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- Q.12** The helium and argon are put in the flask at the same room temperature (300 K). The ratio of average kinetic energies (per molecule) of helium and argon is:

(Given: Molar mass of helium = 4 g/mol , Molar mass of argon = 40 g/mol)

[JEE Main 2025 (Online) 7th April Evening Shift]

- (1) $1 : \sqrt{10}$ (2) 10:1
(3) 1:10 (4) 1:1

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- Q.13** The mean free path and the average speed of oxygen molecules at 300 K and 1 atm are $3 \times 10^{-7} \text{ m}$ and 600 m/s , respectively. Find the frequency of its collisions.

[JEE Main 2025 (Online) 4th April Morning Shift]

- (1) $5 \times 10^8 / \text{s}$ (2) $9 \times 10^5 / \text{s}$
(3) $2 \times 10^{10} / \text{s}$ (4) $2 \times 10^9 / \text{s}$

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- Q.14** There are two vessels filled with an ideal gas where volume of one is double the volume of the other. The large vessel contains the gas at 8 kPa at 1000 K while the smaller vessel contains the gas at 7 kPa at 500 K . If the vessels are connected to each other by a thin tube allowing the gas to flow and the temperature of both vessels is maintained at 600 K , at steady state the pressure in the vessels will be (in kPa).

[JEE Main 2025 (Online) 4th April Evening Shift]

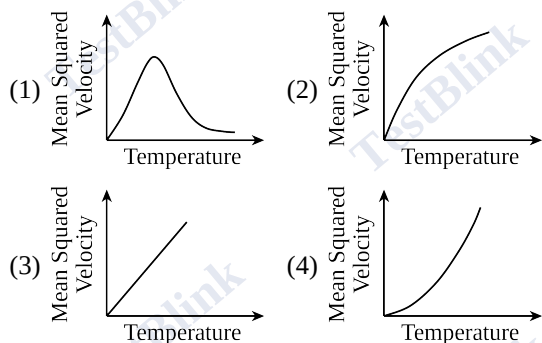
- (1) 24 (2) 4.4 (3) 18 (4) 6

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- Q.15** For a particular ideal gas which of the following graphs represents the variation of mean squared velocity of the gas molecules with temperature?

[JEE Main 2025 (Online) 28th January Morning Shift]



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- Q.16** The ratio of vapour densities of two gases at the same temperature is $\frac{4}{25}$, then the ratio of r.m.s. velocities will be :

[JEE Main 2025 (Online) 28th January Evening Shift]

- (1) $\frac{5}{2}$ (2) $\frac{25}{4}$ (3) $\frac{4}{25}$ (4) $\frac{2}{5}$

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- Q.17** The kinetic energy of translation of the molecules in 50 g of CO_2 gas at 17°C is :

[JEE Main 2025 (Online) 28th January Evening Shift]

- (1) 4205.5 J (2) 3582.7 J (3) 3986.3 J (4) 4102.8 J

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Section B (Numerical) — 4 questions

- Q.18** An insulated cylinder of volume 60 cm^3 is filled with a gas at 27°C and 2 atmospheric pressure. Then the gas is compressed making the final volume as 20 cm^3 while allowing the temperature to rise to 77°C . The final pressure is _____ atmospheric pressure.

[JEE Main 2026 (Online) 22nd January Evening Shift]

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- Q.19** γ_A is the specific heat ratio of monoatomic gas A having 3 translational degrees of freedom. γ_B is the specific heat ratio of polyatomic gas B having 3 translational, 3 rotational degrees of freedom and 1 vibrational mode. If $\frac{\gamma_A}{\gamma_B} = \left(1 + \frac{1}{n}\right)$, then the value of n is _____.

[JEE Main 2025 (Online) 2nd April Morning Shift]

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- Q.20** The internal energy of air in $4 \text{ m} \times 4 \text{ m} \times 3 \text{ m}$ sized room at 1 atmospheric pressure will be _____ $\times 10^6 \text{ J}$
(Consider air as diatomic molecule)

[JEE Main 2025 (Online) 2nd April Evening Shift]

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- Q.21** A container of fixed volume contains a gas at 27°C . To double the pressure of the gas, the temperature of gas should be raised to _____ $^\circ\text{C}$.

[JEE Main 2025 (Online) 29th January Morning Shift]

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ANSWER KEY

Section A (MCQ) — 17 questions

Ques.	1	2	3	4	5	6	7	8	9	10	11
Ans.	1	4	2	3	2	3	3	3	4	2	1
Ques.	12	13	14	15	16	17					
Ans.	4	4	4	3	1	4					

Section B (Numerical) — 4 questions

Ques.	18	19	20	21			
Ans.	7	3	12	327			