

JEE MAIN KINETIC THEORY — DEGREES OF FREEDOM AND SPECIFIC HEAT CAPACITIES — PYQS

Max. Marks: 12
Questions: 3

Section A (MCQ) — 2 questions

Q.1 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.2 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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Section B (Numerical) — 1 question

Q.3 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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ANSWER KEY

Section A (MCQ) — 2 questions

Ques.	1	2												
Ans.	2	1												

Section B (Numerical) — 1 question

Ques.	3													
Ans.	3													