

# PYQSide

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

Max. Marks: 12

Questions: 3

### Section A (MCQ)

**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

Scan or tap for the full solution



**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)

**Q.3**  $\gamma_A$  is the specific heat ratio of monoatomic gas A having 3 translational degrees of freedom.  $\gamma_B$  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)

|       |   |   |  |  |  |  |  |  |  |  |  |
|-------|---|---|--|--|--|--|--|--|--|--|--|
| Ques. | 1 | 2 |  |  |  |  |  |  |  |  |  |
| Ans.  | 2 | 1 |  |  |  |  |  |  |  |  |  |

#### Section B (Numerical)

|       |   |  |  |  |  |  |  |  |  |  |  |
|-------|---|--|--|--|--|--|--|--|--|--|--|
| Ques. | 3 |  |  |  |  |  |  |  |  |  |  |
| Ans.  | 3 |  |  |  |  |  |  |  |  |  |  |