

PHYSICS · JEE MAIN

Thermodynamics

Chapter-wise previous year questions, with answer key

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PYQS

2020–2025

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TOPICS

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Second Law and Entropy

Carnot Engine

Thermodynamic Processes

First Law of Thermodynamics

Heat Engines and Efficiency

Work Done in Processes

Kinetic Theory of Gases

Carnot Cycle

- 1 Attempt each question on paper first — they're grouped by topic, newest papers first.
- 2 Check yourself against the answer key at the end.
- 3 Got one wrong? Tap “Step-by-step solution” under it for the full working.

Stuck on a question?

Every question has a free step-by-step solution on PrepWiser — tap “Step-by-step solution” under it.

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Zeroth and First Law · 2 PYQs

Q1 JEE Main 2025 · 22 Jan · Shift 2

Given are statements for certain thermodynamic variables,

- (A) Internal energy, volume (V) and mass (M) are extensive variables.
- (B) Pressure (P), temperature (T) and density (ρ) are intensive variables.
- (C) Volume (V), temperature (T) and density (ρ) are intensive variables.
- (D) Mass (M), temperature (T) and internal energy are extensive variables.

Choose the correct answer from the options given below :

- (A) (C) and (D) Only
- (B) (A) and (B) Only
- (C) (D) and (A) Only
- (D) (B) and (C) Only

[Step-by-step solution ► prepwisser.in/questions/nvgl6Bsi1r](https://www.prepwisser.in/questions/nvgl6Bsi1r)

Q2 JEE Main 2023 · 8 Apr · Shift 1

Given below are two statements:

Statement I: If heat is added to a system, its temperature must increase.

Statement II: If positive work is done by a system in a thermodynamic process, its volume must increase.

In the light of the above statements, choose the correct answer from the options given below

- (A) Both Statement I and Statement II are true
- (B) Statement I is false but Statement II is true
- (C) Statement I is true but Statement II is false
- (D) Both Statement I and Statement II are false

[Step-by-step solution ► prepwisser.in/questions/TkvOqQ490h](https://www.prepwisser.in/questions/TkvOqQ490h)

Second Law and Entropy · 2 PYQs

Q3 JEE Main 2025 · 23 Jan · Shift 2

Water of mass m gram is slowly heated to increase the temperature from T_1 to T_2 . The change in entropy of the water, given specific heat of water is $1\text{Jkg}^{-1}\text{K}^{-1}$, is :

- (A) $m(T_2 - T_1)$
- (B) zero
- (C) $m \ln \left(\frac{T_1}{T_2} \right)$
- (D) $m \ln \left(\frac{T_2}{T_1} \right)$

[Step-by-step solution ► prepwisser.in/questions/LcZT2QcPGo](https://www.prepwisser.in/questions/LcZT2QcPGo)

Q4 JEE Main 2021 · 20 Jul · Shift 1

The entropy of any system is given by

$S = \alpha^2 \beta \ln \left[\frac{\mu k R}{J \beta^2} + 3 \right]$ where α and β are the constants. μ , J , k and R are no. of moles, mechanical equivalent of heat, Boltzmann constant and gas constant respectively.

[Take $S = \frac{dQ}{T}$]

Choose the incorrect option from the following :

- (A) α and J have the same dimensions.
- (B) S and α have different dimensions
- (C) S , β , k and μR have the same dimensions
- (D) α and k have the same dimensions

[Step-by-step solution ► prepwiser.in/questions/fNV314qA64](https://www.prepwiser.in/questions/fNV314qA64)

Carnot Engine · 18 PYQs

Q5 JEE Main 2023 · 12 Apr · Shift 1

An engine operating between the boiling and freezing points of water will have

- A. efficiency more than 27%.
- B. efficiency less than the efficiency of a Carnot engine operating between the same two temperatures.
- C. efficiency equal to 27%
- D. efficiency less than 27%

Choose the correct answer from the options given below:

- (A) B and C only
- (B) B and D only
- (C) B, C and D only
- (D) A and B only

[Step-by-step solution ► prepwiser.in/questions/a8uV_Uo7_0](https://www.prepwiser.in/questions/a8uV_Uo7_0)

Q6 JEE Main 2023 · 8 Apr · Shift 2

Work done by a Carnot engine operating between temperatures 127°C and 27°C is 2kJ . The amount of heat transferred to the engine by the reservoir is :

- (A) 8 kJ
- (B) 2 kJ
- (C) 4 kJ
- (D) 2.67 kJ

[Step-by-step solution ► prepwiser.in/questions/jjh-8a4FD5](https://www.prepwiser.in/questions/jjh-8a4FD5)

Q7 JEE Main 2023 · 1 Feb · Shift 2

A Carnot engine operating between two reservoirs has efficiency $\frac{1}{3}$. When the temperature of cold reservoir raised by x , its efficiency decreases to $\frac{1}{6}$. The value of x , if the temperature of hot reservoir is 99°C , will be :

- (A) 66 K
- (B) 62 K
- (C) 16.5 K
- (D) 33 K

[Step-by-step solution ► prepwiser.in/questions/-y7xk2Kc0d](https://www.prepwiser.in/questions/-y7xk2Kc0d)

Q8 JEE Main 2023 · 25 Jan · Shift 1

A Carnot engine with efficiency 50% takes heat from a source at 600 K. In order to increase the efficiency to 70%, keeping the temperature of sink same, the new temperature of the source will be :

- (A) 300 K (B) 1000 K
(C) 900 K (D) 360 K

Step-by-step solution ► [prepwiser.in/questions/IAvmOQep84](https://www.prepwiser.in/questions/IAvmOQep84)

Q9 JEE Main 2022 · 28 Jul · Shift 1

A Carnot engine has efficiency of 50%. If the temperature of sink is reduced by 40°C , its efficiency increases by 30%. The temperature of the source will be:

- (A) 166.7 K (B) 255.1 K
(C) 266.7 K (D) 367.7 K

Step-by-step solution ► [prepwiser.in/questions/3FVwCQVB7j](https://www.prepwiser.in/questions/3FVwCQVB7j)

Q10 JEE Main 2022 · 25 Jul · Shift 2

Let η_1 is the efficiency of an engine at $T_1 = 447^{\circ}\text{C}$ and $T_2 = 147^{\circ}\text{C}$ while η_2 is the efficiency at $T_1 = 947^{\circ}\text{C}$ and $T_2 = 47^{\circ}\text{C}$ The ratio $\frac{\eta_1}{\eta_2}$ will be :

- (A) 0.41 (B) 0.56
(C) 0.73 (D) 0.70

Step-by-step solution ► [prepwiser.in/questions/Ia_OLFx1G6](https://www.prepwiser.in/questions/Ia_OLFx1G6)

Q11 JEE Main 2022 · 29 Jun · Shift 1

300 cal. of heat is given to a heat engine and it rejects 225 cal. If source temperature is 227°C , then the temperature of sink will be _____ $^{\circ}\text{C}$.

Numerical answer — enter the value.

Step-by-step solution ► [prepwiser.in/questions/Z_6Maf6R9X](https://www.prepwiser.in/questions/Z_6Maf6R9X)

Q12 JEE Main 2022 · 27 Jun · Shift 1

In a carnot engine, the temperature of reservoir is 527°C and that of sink is 200 K. If the work done by the engine when it transfers heat from reservoir to sink is 12000 kJ, the quantity of heat absorbed by the engine from reservoir is _____ $\times 10^6$ J.

Numerical answer — enter the value.

Step-by-step solution ► [prepwiser.in/questions/mP3H0VLkwW](https://www.prepwiser.in/questions/mP3H0VLkwW)

Q13 JEE Main 2022 · 26 Jun · Shift 1

The efficiency of a Carnot's engine, working between steam point and ice point, will be :

- (A) 26.81% (B) 37.81%
(C) 47.81% (D) 57.81%

Step-by-step solution ► [prepwiser.in/questions/aRX2fNxkPo](https://www.prepwiser.in/questions/aRX2fNxkPo)

Q14 JEE Main 2022 · 26 Jun · Shift 2

A heat engine operates with the cold reservoir at temperature 324 K. The minimum temperature of the hot reservoir, if the heat engine takes 300 J heat from the hot reservoir and delivers 180 J heat to the cold reservoir per cycle, is _____ K.

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/4kjinZj_bFy](https://www.prepwiser.in/questions/4kjinZj_bFy)

Q15 JEE Main 2022 · 24 Jun · Shift 2

A Carnot engine takes 5000 kcal of heat from a reservoir at 727°C and gives heat to a sink at 127°C . The work done by the engine is

- (A) $3 \times 10^6 \text{ J}$
- (B) Zero
- (C) $12.6 \times 10^6 \text{ J}$
- (D) $8.4 \times 10^6 \text{ J}$

[Step-by-step solution ► prepwiser.in/questions/1L8dTtM1oG](https://www.prepwiser.in/questions/1L8dTtM1oG)

Q16 JEE Main 2022 · 24 Jun · Shift 1

A Carnot engine whose heat sinks at 27°C , has an efficiency of 25%. By how many degrees should the temperature of the source be changed to increase the efficiency by 100% of the original efficiency?

- (A) Increases by 18°C
- (B) Increases by 200°C
- (C) Increases by 120°C
- (D) Increases by 73°C

[Step-by-step solution ► prepwiser.in/questions/X_2R1r_QJj](https://www.prepwiser.in/questions/X_2R1r_QJj)

Q17 JEE Main 2021 · 31 Aug · Shift 1

A reversible engine has an efficiency of $\frac{1}{4}$. If the temperature of the sink is reduced by 58°C , its efficiency becomes double. Calculate the temperature of the sink :

- (A) 174°C
- (B) 280°C
- (C) 180.4°C
- (D) 382°C

[Step-by-step solution ► prepwiser.in/questions/vwSz4eChrz](https://www.prepwiser.in/questions/vwSz4eChrz)

Q18 JEE Main 2021 · 27 Aug · Shift 2

A heat engine operates between a cold reservoir at temperature $T_2 = 400 \text{ K}$ and a hot reservoir at temperature T_1 . It takes 300 J of heat from the hot reservoir and delivers 240 J of heat to the cold reservoir in a cycle. The minimum temperature of the hot reservoir has to be _____ K.

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/yetEM73Hmg](https://www.prepwiser.in/questions/yetEM73Hmg)

Q19 JEE Main 2021 · 25 Jul · Shift 2

A heat engine has an efficiency of $\frac{1}{6}$. When the temperature of sink is reduced by 62°C , its efficiency get doubled. The temperature of the source is :

- (A) 124°C
- (B) 37°C
- (C) 62°C
- (D) 99°C

[Step-by-step solution ► prepwiser.in/questions/-O2ojzmRb1](https://www.prepwiser.in/questions/-O2ojzmRb1)

Q20 JEE Main 2021 · 17 Mar · Shift 1

A Carnot's engine working between 400 K and 800 K has a work output of 1200 J per cycle. The amount of heat energy supplied to the engine from the source in each cycle is :

- (A) 2400 J (B) 1600 J
(C) 1800 J (D) 3200 J

Step-by-step solution ► [prepwiser.in/questions/_2FZhmw5_2](https://www.prepwiser.in/questions/_2FZhmw5_2)

Q21 JEE Main 2020 · 8 Jan · Shift 2

A carnot engine having an efficiency of $\frac{1}{10}$ is being used as a refrigerator. If the work done on the refrigerator is 10 J, the amount of heat absorbed from the reservoir at lower temperature is :

- (A) 90 J (B) 99 J
(C) 1 J (D) 100 J

Step-by-step solution ► [prepwiser.in/questions/XI3zAkd4BR](https://www.prepwiser.in/questions/XI3zAkd4BR)

Q22 JEE Main 2020 · 7 Jan · Shift 2

Two ideal Carnot engines operate in cascade (all heat given up by one engine is used by the other engine to produce work) between temperature, T_1 and T_2 . The temperature of the hot reservoir of the first engine is T_1 and the temperature of the cold reservoir of the second engine is T_2 . T is temperature of the sink of first engine which is also the source for the second which is also the source for the second engine. How is T related to T_1 and T_2 . If both engines perform equal amount of work?

- (A) $T = \frac{2T_1T_2}{T_1+T_2}$
(B) $T = \sqrt{T_1T_2}$
(C) $T = \frac{T_1+T_2}{2}$
(D) $T = 0$

Step-by-step solution ► [prepwiser.in/questions/BQFupH_sNN](https://www.prepwiser.in/questions/BQFupH_sNN)

Thermodynamic Processes · 35 PYQs

Q23 JEE Main 2025 · 8 Apr · Shift 2

A monoatomic gas having $\gamma = \frac{5}{3}$ is stored in a thermally insulated container and the gas is suddenly compressed to $\left(\frac{1}{8}\right)^{\text{th}}$ of its initial volume. The ratio of final pressure and initial pressure is:

(γ is the ratio of specific heats of the gas at constant pressure and at constant volume)

- (A) 16
(B) 32
(C) 28
(D) 40

Step-by-step solution ► [prepwiser.in/questions/e6JYQFNSac](https://www.prepwiser.in/questions/e6JYQFNSac)

Q24 JEE Main 2025 · 7 Apr · Shift 2

Match **List - I** with **List - II**.

List - I	List - II
(A) Isothermal	(I) ΔW (work done) = 0
(B) Adiabatic	(II) ΔQ (supplied heat) = 0
(C) Isobaric	(III) ΔU (change in internal energy) $\neq 0$
(D) Isochoric	(IV) $\Delta U = 0$

Choose the **correct** answer from the options given below :

(A) (A)-(III), (B)-(II), (C)-(I), (D)-(IV)

(B) (A)-(II), (B)-(IV), (C)-(I), (D)-(III)

(C) (A)-(IV), (B)-(II), (C)-(III), (D)-(I)

(D) (A)-(IV), (B)-(I), (C)-(III), (D)-(II)

Step-by-step solution ► [prepwiser.in/questions/WM9VDNf1Rb](https://www.prepwiser.in/questions/WM9VDNf1Rb)

Q25 JEE Main 2025 · 3 Apr · Shift 1

A gas is kept in a container having walls which are thermally non-conducting. Initially the gas has a volume of 800cm^3 and temperature 27°C . The change in temperature when the gas is adiabatically compressed to 200cm^3 is:

(Take $\gamma = 1.5$; γ is the ratio of specific heats at constant pressure and at constant volume)

(A) 300 K

(B) 600 K

(C) 327 K

(D) 522 K

Step-by-step solution ► [prepwiser.in/questions/SLuvP83mwn](https://www.prepwiser.in/questions/SLuvP83mwn)

Q26 JEE Main 2025 · 2 Apr · Shift 2

Identify the characteristics of an adiabatic process in a monoatomic gas. (A) Internal energy is constant. (B) Work done in the process is equal to the change in internal energy. (C) The product of temperature and volume is a constant. (D) The product of pressure and volume is a constant. (E) The work done to change the temperature from T_1 to T_2 is proportional to $(T_2 - T_1)$. Choose the correct answer from the options given below :

(A) (B), (D) only

(B) (B), (E) only

(C) (A), (C), (E) only

(D) (A), (C), (D) only

Step-by-step solution ► [prepwiser.in/questions/XITAAAhFb](https://www.prepwiser.in/questions/XITAAAhFb)

Q27 JEE Main 2025 · 2 Apr · Shift 1

In an adiabatic process, which of the following statements is true?

(A) The internal energy of the gas decreases as the temperature increases

(B) The molar heat capacity is zero

(C) Work done by the gas equals the increase in internal energy

(D) The molar heat capacity is infinite

Step-by-step solution ► [prepwiser.in/questions/ctL14OIZ84](https://www.prepwiser.in/questions/ctL14OIZ84)

Q28 JEE Main 2025 · 29 Jan · Shift 1

The work done in an adiabatic change in an ideal gas depends upon only :

- (A) change in its pressure
- (B) change in its temperature
- (C) change in its specific heat
- (D) change in its volume

[Step-by-step solution ► prepwiser.in/questions/XRb_5cEgEI](https://www.prepwiser.in/questions/XRb_5cEgEI)

Q29 JEE Main 2025 · 24 Jan · Shift 1

An ideal gas goes from an initial state to final state. During the process, the pressure of gas increases linearly with temperature.

- A. The work done by gas during the process is zero.
- B. The heat added to gas is different from change in its internal energy.
- C. The volume of the gas is increased.
- D. The internal energy of the gas is increased.
- E. The process is isochoric (constant volume process)

Choose the correct answer from the options given below:

- | | |
|---------------|---------------------|
| (A) A, C Only | (B) A, D, E Only |
| (C) E Only | (D) A, B, C, D Only |

[Step-by-step solution ► prepwiser.in/questions/5uo6USQISZ](https://www.prepwiser.in/questions/5uo6USQISZ)

Q30 JEE Main 2025 · 24 Jan · Shift 2

Given below are two statements. One is labelled as Assertion (A) and the other is labelled as Reason (R).
Assertion (A) : In an insulated container, a gas is adiabatically shrunk to half of its initial volume. The temperature of the gas decreases.

Reason (R) : Free expansion of an ideal gas is an irreversible and an adiabatic process.

In the light of the above statements, choose the correct answer from the options given below :

- (A) Both (A) and (R) are true and (R) is the correct explanation of (A)
- (B) Both (A) and (R) are true but (R) is NOT the correct explanation of (A)
- (C) (A) is false but (R) is true
- (D) (A) is true but (R) is false

[Step-by-step solution ► prepwiser.in/questions/3vYIIIfDO2y](https://www.prepwiser.in/questions/3vYIIIfDO2y)

Q31 JEE Main 2025 · 23 Jan · Shift 1

An ideal gas initially at 0°C temperature, is compressed suddenly to one fourth of its volume. If the ratio of specific heat at constant pressure to that at constant volume is $3/2$, the change in temperature due to the thermodynamic process is _____ K.

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/Sv7HCEc3uz](https://www.prepwiser.in/questions/Sv7HCEc3uz)

Q32 JEE Main 2024 · 9 Apr · Shift 1

The volume of an ideal gas ($\gamma = 1.5$) is changed adiabatically from 5 litres to 4 litres. The ratio of initial pressure to final pressure is :

- (A) $\frac{4}{5}$ (B) $\frac{8}{5\sqrt{5}}$
(C) $\frac{2}{\sqrt{5}}$ (D) $\frac{16}{25}$

Step-by-step solution ► [prepwisser.in/questions/cvsU9GWF5J](https://www.prepwisser.in/questions/cvsU9GWF5J)

Q33 JEE Main 2024 · 9 Apr · Shift 1

A sample of 1 mole gas at temperature T is adiabatically expanded to double its volume. If adiabatic constant for the gas is $\gamma = \frac{3}{2}$, then the work done by the gas in the process is :

- (A) $RT[2 + \sqrt{2}]$
(B) $RT[2 - \sqrt{2}]$
(C) $\frac{R}{T}[2 - \sqrt{2}]$
(D) $\frac{T}{R}[2 + \sqrt{2}]$

Step-by-step solution ► [prepwisser.in/questions/Z-egvNSepb](https://www.prepwisser.in/questions/Z-egvNSepb)

Q34 JEE Main 2024 · 8 Apr · Shift 2

A diatomic gas ($\gamma = 1.4$) does 100J of work in an isobaric expansion. The heat given to the gas is :

- (A) 150 J (B) 490 J
(C) 350 J (D) 250 J

Step-by-step solution ► [prepwisser.in/questions/2CuEv7UxD7](https://www.prepwisser.in/questions/2CuEv7UxD7)

Q35 JEE Main 2024 · 5 Apr · Shift 2

During an adiabatic process, if the pressure of a gas is found to be proportional to the cube of its absolute temperature, then the ratio of $\frac{C_p}{C_v}$ for the gas is :

- (A) $\frac{5}{3}$ (B) $\frac{3}{2}$
(C) $\frac{7}{5}$ (D) $\frac{9}{7}$

Step-by-step solution ► [prepwisser.in/questions/vYe_6zNjT8](https://www.prepwisser.in/questions/vYe_6zNjT8)

Q36 JEE Main 2024 · 27 Jan · Shift 2

During an adiabatic process, the pressure of a gas is found to be proportional to the cube of its absolute temperature. The ratio of $\frac{C_p}{C_v}$ for the gas is :

- (A) $\frac{7}{5}$ (B) $\frac{3}{2}$
(C) $\frac{9}{7}$ (D) $\frac{5}{3}$

Step-by-step solution ► [prepwisser.in/questions/3ftEMITho](https://www.prepwisser.in/questions/3ftEMITho)

Q37 JEE Main 2023 · 13 Apr · Shift 2

The initial pressure and volume of an ideal gas are P_0 and V_0 . The final pressure of the gas when the gas is suddenly compressed to volume $\frac{V_0}{4}$ will be :

(Given γ = ratio of specific heats at constant pressure and at constant volume)

- (A) $P_0(4)^{\frac{1}{\gamma}}$ (B) P_0
(C) $4P_0$ (D) $P_0(4)^{\gamma}$

Step-by-step solution ► [prepwisser.in/questions/o2Kq3S0cVV](https://www.prepwisser.in/questions/o2Kq3S0cVV)

Q38 JEE Main 2023 · 11 Apr · Shift 2

The Thermodynamic process, in which internal energy of the system remains constant is

- (A) Isobaric (B) Isochoric
(C) Adiabatic (D) Isothermal

[Step-by-step solution ► prepwisser.in/questions/CnjRtGGD91](https://www.prepwisser.in/questions/CnjRtGGD91)

Q39 JEE Main 2023 · 10 Apr · Shift 2

A gas is compressed adiabatically, which one of the following statement is NOT true.

- (A) There is no heat supplied to the system
(B) The temperature of the gas increases.
(C) There is no change in the internal energy
(D) The change in the internal energy is equal to the work done on the gas.

[Step-by-step solution ► prepwisser.in/questions/zdnsyJ_dl9](https://www.prepwisser.in/questions/zdnsyJ_dl9)

Q40 JEE Main 2023 · 10 Apr · Shift 1

Consider two containers A and B containing monoatomic gases at the same Pressure (P), Volume (V) and Temperature (T). The gas in A is compressed isothermally to $\frac{1}{8}$ of its original volume while the gas in B is compressed adiabatically to $\frac{1}{8}$ of its original volume. The ratio of final pressure of gas in B to that of gas in A is

- (A) $\frac{1}{8}$ (B) $8^{\frac{3}{2}}$
(C) 4 (D) 8

[Step-by-step solution ► prepwisser.in/questions/xTb5HzJsU1](https://www.prepwisser.in/questions/xTb5HzJsU1)

Q41 JEE Main 2023 · 31 Jan · Shift 2

A hypothetical gas expands adiabatically such that its volume changes from 08 litres to 27 litres. If the ratio of final pressure of the gas to initial pressure of the gas is $\frac{16}{81}$. Then the ratio of $\frac{C_p}{C_v}$ will be.

- (A) $\frac{3}{1}$ (B) $\frac{4}{3}$
(C) $\frac{1}{2}$ (D) $\frac{3}{2}$

[Step-by-step solution ► prepwisser.in/questions/xLkAzq-AXp](https://www.prepwisser.in/questions/xLkAzq-AXp)

Q42 JEE Main 2023 · 30 Jan · Shift 1

Heat is given to an ideal gas in an isothermal process.

- A. Internal energy of the gas will decrease.
B. Internal energy of the gas will increase.
C. Internal energy of the gas will not change.
D. The gas will do positive work.
E. The gas will do negative work.

Choose the correct answer from the options given below :

- (A) B and D only (B) C and E only
(C) A and E only (D) C and D only

[Step-by-step solution ► prepwisser.in/questions/cq8wtcAFSS](https://www.prepwisser.in/questions/cq8wtcAFSS)

Q43 JEE Main 2022 · 29 Jul · Shift 1

The pressure P_1 and density d_1 of diatomic gas ($\gamma = \frac{7}{5}$) changes suddenly to $P_2 (> P_1)$ and d_2 respectively during an adiabatic process. The temperature of the gas increases and becomes _____ times of its initial temperature. (given $\frac{d_2}{d_1} = 32$)

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/SgMvKh9DCE](https://www.prepwiser.in/questions/SgMvKh9DCE)

Q44 JEE Main 2022 · 26 Jul · Shift 1

A monoatomic gas at pressure P and volume V is suddenly compressed to one eighth of its original volume. The final pressure at constant entropy will be :

- (A) P (B) $8P$
(C) $32P$ (D) $64P$

[Step-by-step solution ► prepwiser.in/questions/FdvFKnInqe](https://www.prepwiser.in/questions/FdvFKnInqe)

Q45 JEE Main 2022 · 30 Jun · Shift 1

A sample of monoatomic gas is taken at initial pressure of 75 kPa. The volume of the gas is then compressed from 1200 cm^3 to 150 cm^3 adiabatically. In this process, the value of workdone on the gas will be :

- (A) 79 J (B) 405 J
(C) 4050 J (D) 9590 J

[Step-by-step solution ► prepwiser.in/questions/yhvfCT546r](https://www.prepwiser.in/questions/yhvfCT546r)

Q46 JEE Main 2022 · 24 Jun · Shift 2

A monoatomic gas performs a work of $\frac{Q}{4}$ where Q is the heat supplied to it. The molar heat capacity of the gas will be _____ R during this transformation. Where R is the gas constant.

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/WmapWpEXNx](https://www.prepwiser.in/questions/WmapWpEXNx)

Q47 JEE Main 2021 · 31 Aug · Shift 1

For an ideal gas the instantaneous change in pressure ' p ' with volume ' v ' is given by the equation $\frac{dp}{dv} = -ap$. If $p = p_0$ at $v = 0$ is the given boundary condition, then the maximum temperature one mole of gas can attain is : (Here R is the gas constant)

- (A) $\frac{p_0}{aeR}$ (B) $\frac{ap_0}{eR}$
(C) infinity (D) 0°C

[Step-by-step solution ► prepwiser.in/questions/4-5zP6_ejb](https://www.prepwiser.in/questions/4-5zP6_ejb)

Q48 JEE Main 2021 · 31 Aug · Shift 2

A sample of gas with $\gamma = 1.5$ is taken through an adiabatic process in which the volume is compressed from 1200 cm^3 to 300 cm^3 . If the initial pressure is 200 kPa. The absolute value of the workdone by the gas in the process = _____ J.

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/RcNPrs4iXS](https://www.prepwiser.in/questions/RcNPrs4iXS)

Q49 JEE Main 2021 · 27 Aug · Shift 1

An ideal gas is expanding such that $PT^3 = \text{constant}$. The coefficient of volume expansion of the gas is :

- (A) $\frac{1}{T}$ (B) $\frac{2}{T}$
(C) $\frac{4}{T}$ (D) $\frac{3}{T}$

[Step-by-step solution ► prepwiser.in/questions/7itVW_g_zj](https://www.prepwiser.in/questions/7itVW_g_zj)

Q50 JEE Main 2021 · 25 Jul · Shift 1

A monoatomic ideal gas, initially at temperature T_1 is enclosed in a cylinder fitted with a frictionless piston. The gas is allowed to expand adiabatically to a temperature T_2 by releasing the piston suddenly. If l_1 and l_2 are the lengths of the gas column, before and after the expansion respectively, then the value of $\frac{T_1}{T_2}$ will be :

- (A) $\left(\frac{l_1}{l_2}\right)^{\frac{2}{3}}$
(B) $\left(\frac{l_2}{l_1}\right)^{\frac{2}{3}}$
(C) $\frac{l_2}{l_1}$
(D) $\frac{l_1}{l_2}$

[Step-by-step solution ► prepwiser.in/questions/zd3A5Z2C6b](https://www.prepwiser.in/questions/zd3A5Z2C6b)

Q51 JEE Main 2021 · 18 Mar · Shift 2

For an adiabatic expansion of an ideal gas, the fractional change in its pressure is equal to (where γ is the ratio of specific heats) :

- (A) $-\frac{1}{\gamma} \frac{dV}{V}$ (B) $-\gamma \frac{dV}{V}$
(C) $-\gamma \frac{dV}{V}$ (D) $\frac{dV}{V}$

[Step-by-step solution ► prepwiser.in/questions/-GrN9Wqnb-](https://www.prepwiser.in/questions/-GrN9Wqnb-)

Q52 JEE Main 2021 · 24 Feb · Shift 1

Match List I with List II.

List I

List II

- (a) Isothermal (i) Pressure constant
(b) Isochoric (ii) Temperature constant
(c) Adiabatic (iii) Volume constant
(d) Isobaric (iv) Heat content is constant

Choose the correct answer from the options given below :

- (A) (a) - (ii), (b) - (iii), (c) - (iv), (d) - (i)
(B) (a) - (ii), (b) - (iv), (c) - (iii), (d) - (i)
(C) (a) - (iii), (b) - (ii), (c) - (i), (d) - (iv)
(D) (a) - (i), (b) - (iii), (c) - (ii), (d) - (iv)

[Step-by-step solution ► prepwiser.in/questions/uML0VmbPA2](https://www.prepwiser.in/questions/uML0VmbPA2)

Q53 JEE Main 2020 · 5 Sep · Shift 2

In an adiabatic process, the density of a diatomic gas becomes 32 times its initial value. The final pressure of the gas is found to be n times the initial pressure. The value of n is :

- (A) 128 (B) 32
(C) 326 (D) $\frac{1}{32}$

Step-by-step solution ► [prepwisser.in/questions/SQZPGvRMIC](https://www.prepwisser.in/questions/SQZPGvRMIC)

Q54 JEE Main 2020 · 4 Sep · Shift 2

Match the thermodynamic processes taking place in a system with the correct conditions. In the table : ΔQ is the heat supplied, ΔW is the work done and ΔU is change in internal energy of the system.

Process	Condition
(I) Adiabatic	(1) $\Delta W = 0$
(II) Isothermal	(2) $\Delta Q = 0$
(III) Isochoric	(3) $\Delta U \neq 0, \Delta W \neq 0, \Delta Q \neq 0$
(IV) Isobaric	(4) $\Delta U = 0$

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

Step-by-step solution ► [prepwisser.in/questions/83EO-W434o](https://www.prepwisser.in/questions/83EO-W434o)

Q55 JEE Main 2020 · 3 Sep · Shift 1

A balloon filled with helium (32°C and 1.7 atm.) bursts. Immediately afterwards the expansion of helium can be considered as

- (A) Irreversible adiabatic (B) Reversible adiabatic
(C) Irreversible isothermal (D) Reversible isothermal

Step-by-step solution ► [prepwisser.in/questions/ewgEPyAPBA](https://www.prepwisser.in/questions/ewgEPyAPBA)

Q56 JEE Main 2020 · 2 Sep · Shift 1

An engine takes in 5 moles of air at 20°C and 1 atm. and compresses it adiabatically to $1/10^{\text{th}}$ of the original volume. Assuming air to be a diatomic ideal gas made up of rigid molecules, the change in its internal energy during this process comes out to be $X \text{ kJ.}$ The value of X to the nearest integer is_____.

Numerical answer — enter the value.

Step-by-step solution ► [prepwisser.in/questions/e3eLRS5wBM](https://www.prepwisser.in/questions/e3eLRS5wBM)

Q57 JEE Main 2020 · 9 Jan · Shift 2

Starting at temperature 300 K, one mole of an ideal diatomic gas ($\gamma = 1.4$) is first compressed adiabatically from volume V_1 to $V_2 = \frac{V_1}{16}$. It is then allowed to expand isobarically to volume $2V_2$. If all the processes are the quasi-static then the final temperature of the gas (in $^\circ\text{K}$) is (to the nearest integer) ____.

Numerical answer — enter the value.

[Step-by-step solution](https://www.prepwiser.in/questions/SgppVGHQHd) ► [prepwiser.in/questions/SgppVGHQHd](https://www.prepwiser.in/questions/SgppVGHQHd)

First Law of Thermodynamics · 20 PYQs

Q58 JEE Main 2025 · 24 Jan · Shift 1

The temperature of 1 mole of an ideal monoatomic gas is increased by 50°C at constant pressure. The total heat added and change in internal energy are E_1 and E_2 , respectively. If $\frac{E_1}{E_2} = \frac{x}{9}$ then the value of x is _____.

Numerical answer — enter the value.

[Step-by-step solution](https://www.prepwiser.in/questions/D1u6pviEUU) ► [prepwiser.in/questions/D1u6pviEUU](https://www.prepwiser.in/questions/D1u6pviEUU)

Q59 JEE Main 2024 · 6 Apr · Shift 1

The specific heat at constant pressure of a real gas obeying $PV^2 = RT$ equation is:

- | | |
|--------------------------|-------------------------|
| (A) R | (B) $C_V + R$ |
| (C) $C_V + \frac{R}{2V}$ | (D) $\frac{R}{3} + C_V$ |

[Step-by-step solution](https://www.prepwiser.in/questions/3MVbTxewj) ► [prepwiser.in/questions/3MVbTxewj](https://www.prepwiser.in/questions/3MVbTxewj)

Q60 JEE Main 2024 · 6 Apr · Shift 2

A total of 48J heat is given to one mole of helium kept in a cylinder. The temperature of helium increases by 2°C . The work done by the gas is: Given, $R = 8.3\text{JK}^{-1}\text{mol}^{-1}$.

- | | |
|------------|------------|
| (A) 23.1 J | (B) 48 J |
| (C) 24.9 J | (D) 72.9 J |

[Step-by-step solution](https://www.prepwiser.in/questions/d2jZZN5CmD) ► [prepwiser.in/questions/d2jZZN5CmD](https://www.prepwiser.in/questions/d2jZZN5CmD)

Q61 JEE Main 2024 · 1 Feb · Shift 2

A diatomic gas ($\gamma = 1.4$) does 200J of work when it is expanded isobarically. The heat given to the gas in the process is :

- | | |
|----------|----------|
| (A) 800J | (B) 600J |
| (C) 700J | (D) 850J |

[Step-by-step solution](https://www.prepwiser.in/questions/EhN0hD3oUa) ► [prepwiser.in/questions/EhN0hD3oUa](https://www.prepwiser.in/questions/EhN0hD3oUa)

Q62 JEE Main 2024 · 27 Jan · Shift 1

0.08kg air is heated at constant volume through 5°C . The specific heat of air at constant volume is $0.17\text{kcal/kg}^\circ\text{C}$ and $J = 4.18\text{ joule/cal}$. The change in its internal energy is approximately.

- | | |
|-----------|-----------|
| (A) 318 J | (B) 298 J |
| (C) 284 J | (D) 142 J |

[Step-by-step solution](https://www.prepwiser.in/questions/HFViLYp_oj) ► [prepwiser.in/questions/HFViLYp_oj](https://www.prepwiser.in/questions/HFViLYp_oj)

Q63 JEE Main 2023 · 11 Apr · Shift 1

1kg of water at 100°C is converted into steam at 100°C by boiling at atmospheric pressure. The volume of water changes from $1.00 \times 10^{-3}\text{m}^3$ as a liquid to 1.671m^3 as steam. The change in internal energy of the system during the process will be

(Given latent heat of vaporisation = 2257kJ/kg , Atmospheric pressure = $1 \times 10^5\text{Pa}$)

- (A) + 2090 kJ (B) – 2426 kJ
(C) + 2476 kJ (D) – 2090 kJ

Step-by-step solution ► [prepwisar.in/questions/ilqe4l-EhK](https://www.prepwisar.in/questions/ilqe4l-EhK)

Q64 JEE Main 2023 · 6 Apr · Shift 1

A source supplies heat to a system at the rate of 1000W . If the system performs work at a rate of 200W . The rate at which internal energy of the system increases is

- (A) 600 W (B) 1200 W
(C) 500 W (D) 800 W

Step-by-step solution ► [prepwisar.in/questions/oiRft-Cmh2](https://www.prepwisar.in/questions/oiRft-Cmh2)

Q65 JEE Main 2023 · 31 Jan · Shift 2

Heat energy of 735J is given to a diatomic gas allowing the gas to expand at constant pressure. Each gas molecule rotates around an internal axis but do not oscillate. The increase in the internal energy of the gas will be :

- (A) 572J (B) 441J
(C) 525J (D) 735J

Step-by-step solution ► [prepwisar.in/questions/W09cDznaE9](https://www.prepwisar.in/questions/W09cDznaE9)

Q66 JEE Main 2023 · 29 Jan · Shift 1

Given below are two statements: One is labelled as Assertion A and the other is labelled as Reason R.

Assertion A: If dQ and dW represent the heat supplied to the system and the work done on the system respectively. Then according to the first law of thermodynamics $dQ = dU - dW$.

Reason R: First law of thermodynamics is based on law of conservation of energy.

In the light of the above statements, choose the correct answer from the options given below:

- (A) Both A and R are correct but R is not the correct explanation of A
(B) Both A and R are correct and R is the correct explanation of A
(C) A is correct but R is not correct
(D) A is not correct but R is correct

Step-by-step solution ► [prepwisar.in/questions/x2er_UOmX_](https://www.prepwisar.in/questions/x2er_UOmX_)

Q67 JEE Main 2023 · 24 Jan · Shift 1

1 g of a liquid is converted to vapour at $3 \times 10^5\text{ Pa}$ pressure. If 10% of the heat supplied is used for increasing the volume by 1600 cm^3 during this phase change, then the increase in internal energy in the process will be :

- (A) 4800 J (B) 4320 J
(C) 432000 J (D) $4.32 \times 10^8\text{ J}$

Step-by-step solution ► [prepwisar.in/questions/9zbz5txE9a](https://www.prepwisar.in/questions/9zbz5txE9a)

Q68 JEE Main 2022 · 28 Jul · Shift 2

At a certain temperature, the degrees of freedom per molecule for gas is 8. The gas performs 150 J of work when it expands under constant pressure. The amount of heat absorbed by the gas will be _____ J.

Numerical answer — enter the value.

[Step-by-step solution ► prepwisser.in/questions/xfmkacFg69](https://www.prepwisser.in/questions/xfmkacFg69)

Q69 JEE Main 2022 · 26 Jul · Shift 1

7 mol of a certain monoatomic ideal gas undergoes a temperature increase of 40K at constant pressure. The increase in the internal energy of the gas in this process is :

(Given $R = 8.3 \text{ JK}^{-1}\text{mol}^{-1}$)

(A) 5810 J

(B) 3486 J

(C) 11620 J

(D) 6972 J

[Step-by-step solution ► prepwisser.in/questions/X02eIF9Z1t](https://www.prepwisser.in/questions/X02eIF9Z1t)

Q70 JEE Main 2022 · 29 Jun · Shift 1

A cylinder of fixed capacity of 44.8 litres contains helium gas at standard temperature and pressure. The amount of heat needed to raise the temperature of gas in the cylinder by 20.0°C will be :

(Given gas constant $R = 8.3 \text{ JK}^{-1}\text{mol}^{-1}$)

(A) 249 J

(B) 415 J

(C) 498 J

(D) 830 J

[Step-by-step solution ► prepwisser.in/questions/kBTNK4URme](https://www.prepwisser.in/questions/kBTNK4URme)

Q71 JEE Main 2022 · 27 Jun · Shift 2

A diatomic gas ($\gamma = 1.4$) does 400J of work when it is expanded isobarically. The heat given to the gas in the process is _____ J.

Numerical answer — enter the value.

[Step-by-step solution ► prepwisser.in/questions/ko88h12so0](https://www.prepwisser.in/questions/ko88h12so0)

Q72 JEE Main 2021 · 1 Sep · Shift 2

The temperature of 3.00 mol of an ideal diatomic gas is increased by 40.0°C without changing the pressure of the gas. The molecules in the gas rotate but do not oscillate. If the ratio of change in internal energy of the gas to the amount of workdone by the gas is $\frac{x}{10}$. Then the value of x (round off to the nearest integer) is _____. (Given $R = 8.31 \text{ J mol}^{-1} \text{ K}^{-1}$)

Numerical answer — enter the value.

[Step-by-step solution ► prepwisser.in/questions/GlykHBbSG9](https://www.prepwisser.in/questions/GlykHBbSG9)

Q73 JEE Main 2021 · 26 Aug · Shift 1

An electric appliance supplies 6000 J/min heat to the system. If the system delivers a power of 90W. How long it would take to increase the internal energy by 2.5×10^3 J ?

- (A) 2.5×10^2 s
- (B) 4.1×10^1 s
- (C) 2.4×10^3 s
- (D) 2.5×10^1 s

[Step-by-step solution ► prepwiser.in/questions/jnNMK32Aiv](https://www.prepwiser.in/questions/jnNMK32Aiv)

Q74 JEE Main 2021 · 20 Jul · Shift 1

The amount of heat needed to raise the temperature of 4 moles of rigid diatomic gas from 0°C to 50°C when no work is done is _____. (R is the universal gas constant).

- (A) 500 R
- (B) 250 R
- (C) 750 R
- (D) 175 R

[Step-by-step solution ► prepwiser.in/questions/ePBYjC8uH7](https://www.prepwiser.in/questions/ePBYjC8uH7)

Q75 JEE Main 2021 · 16 Mar · Shift 1

In thermodynamics, heat and work are :

- (A) Path functions
- (B) Point functions
- (C) Extensive thermodynamics state variables
- (D) Intensive thermodynamic state variables

[Step-by-step solution ► prepwiser.in/questions/7qe3-Ft3Qx](https://www.prepwiser.in/questions/7qe3-Ft3Qx)

Q76 JEE Main 2021 · 26 Feb · Shift 2

1 mole of rigid diatomic gas performs a work of $\frac{Q}{5}$ when heat Q is supplied to it. The molar heat capacity of the gas during this transformation is $\frac{xR}{8}$. The value of x is _____. [R = universal gas constant]

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/q-o1WzVCxK](https://www.prepwiser.in/questions/q-o1WzVCxK)

Q77 JEE Main 2021 · 25 Feb · Shift 1

A diatomic gas, having $C_p = \frac{7}{2}R$ and $C_v = \frac{5}{2}R$, is heated at constant pressure. The ratio $dU : dQ : dW$:

- (A) 5 : 7 : 3
- (B) 3 : 7 : 2
- (C) 5 : 7 : 2
- (D) 3 : 5 : 2

[Step-by-step solution ► prepwiser.in/questions/_xWx-aiS9](https://www.prepwiser.in/questions/_xWx-aiS9)

Heat Engines and Efficiency · 5 PYQs

Q78 JEE Main 2023 · 30 Jan · Shift 2

Given below are two statements: one is labelled as Assertion **A** and the other is labelled as Reason **R**

Assertion A: Efficiency of a reversible heat engine will be highest at -273°C temperature of cold reservoir.

Reason R: The efficiency of Carnot's engine depends not only on the temperature of the cold reservoir but it depends on the temperature of the hot reservoir too and is given as $\eta = \left(1 - \frac{T_2}{T_1}\right)$

In the light of the above statements, choose the correct answer from the options given below

- (A) Both **A** and **R** are true and **R** is the correct explanation of **A**
- (B) Both **A** and **R** are true but **R** is NOT the correct explanation of **A**
- (C) A is false but **R** is true
- (D) A is true but **R** is false

[Step-by-step solution ► prepwiser.in/questions/tbzMDICH1M](https://www.prepwiser.in/questions/tbzMDICH1M)

Q79 JEE Main 2021 · 26 Aug · Shift 2

A refrigerator consumes an average 35W power to operate between temperature -10°C to 25°C . If there is no loss of energy then how much average heat per second does it transfer?

- (A) 263 J/s
- (B) 298 J/s
- (C) 350 J/s
- (D) 35 J/s

[Step-by-step solution ► prepwiser.in/questions/JSFqdOqyw0](https://www.prepwiser.in/questions/JSFqdOqyw0)

Q80 JEE Main 2021 · 16 Mar · Shift 2

For an ideal heat engine, the temperature of the source is 127°C . In order to have 60% efficiency the temperature of the sink should be _____ $^{\circ}\text{C}$. (Round off to the Nearest Integer)

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/c5KeslY8-G](https://www.prepwiser.in/questions/c5KeslY8-G)

Q81 JEE Main 2021 · 25 Feb · Shift 2

A reversible heat engine converts one-fourth of the heat input into work. When the temperature of the sink is reduced by 52K, its efficiency is doubled. The temperature in Kelvin of the source will be _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/71WCHHA3iE](https://www.prepwiser.in/questions/71WCHHA3iE)

Q82 JEE Main 2020 · 2 Sep · Shift 2

A heat engine is involved with exchange of heat of 1915 J, -40J , $+125\text{J}$ and $-Q\text{J}$, during one cycle achieving an efficiency of 50.0%. The value of Q is

- (A) 980 J
- (B) 40 J
- (C) 400 J
- (D) 640 J

[Step-by-step solution ► prepwiser.in/questions/CEhD2hSJrV](https://www.prepwiser.in/questions/CEhD2hSJrV)

Q83 JEE Main 2024 · 4 Apr · Shift 2

A sample of gas at temperature T is adiabatically expanded to double its volume. Adiabatic constant for the gas is $\gamma = 3/2$. The work done by the gas in the process is:

($\mu = 1$ mole)

- (A) $RT[2\sqrt{2} - 1]$ (B) $RT[2 - \sqrt{2}]$
(C) $RT[1 - 2\sqrt{2}]$ (D) $RT[\sqrt{2} - 2]$

[Step-by-step solution](#) ► [prepwisar.in/questions/IN3IOZ1j1m](https://www.prepwisar.in/questions/IN3IOZ1j1m)

Q84 JEE Main 2024 · 1 Feb · Shift 1

The pressure and volume of an ideal gas are related as $PV^{\frac{3}{2}} = K$ (Constant). The work done when the gas is taken from state $A (P_1, V_1, T_1)$ to state $B (P_2, V_2, T_2)$ is :

- (A) $2 (P_2\sqrt{V_2} - P_1\sqrt{V_1})$
(B) $2 (\sqrt{P_1}V_1 - \sqrt{P_2}V_2)$
(C) $2 (P_2V_2 - P_1V_1)$
(D) $2 (P_1V_1 - P_2V_2)$

[Step-by-step solution](#) ► [prepwisar.in/questions/mjkj5v2YCU](https://www.prepwisar.in/questions/mjkj5v2YCU)

Q85 JEE Main 2023 · 1 Feb · Shift 1

A sample of gas at temperature T is adiabatically expanded to double its volume. The work done by the gas in the process is (given, $\gamma = \frac{3}{2}$) :

- (A) $W = TR[\sqrt{2} - 2]$ (B) $W = \frac{T}{R}[\sqrt{2} - 2]$
(C) $W = \frac{R}{T}[2 - \sqrt{2}]$ (D) $W = RT[2 - \sqrt{2}]$

[Step-by-step solution](#) ► [prepwisar.in/questions/dwIdrD8Ksf](https://www.prepwisar.in/questions/dwIdrD8Ksf)

Q86 JEE Main 2022 · 28 Jun · Shift 1

Given below are two statements :

Statement I : When μ amount of an ideal gas undergoes adiabatic change from state (P_1, V_1, T_1) to state (P_2, V_2, T_2) , then work done is $W = \frac{\mu R(T_2 - T_1)}{1 - \gamma}$, where $\gamma = \frac{C_p}{C_v}$ and R = universal gas constant.

Statement II : In the above case, when work is done on the gas, the temperature of the gas would rise.

Choose the correct answer from the options given below :

- (A) Both Statement I and Statement II are true.
(B) Both Statement I and Statement II are false.
(C) Statement I is true but Statement II is false.
(D) Statement I is false but Statement II is true.

[Step-by-step solution](#) ► [prepwisar.in/questions/pUwPqSM1zV](https://www.prepwisar.in/questions/pUwPqSM1zV)

Q87 JEE Main 2021 · 26 Feb · Shift 2

The volume V of a given mass of monoatomic gas changes with temperature T according to the relation $V = KT^{\frac{2}{3}}$. The workdone when temperature changes by 90K will be xR . The value of x is _____. [R = universal gas constant]

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/Hsmt0cHpxV](https://www.prepwiser.in/questions/Hsmt0cHpxV)

Q88 JEE Main 2021 · 25 Feb · Shift 1

In a certain thermodynamical process, the pressure of a gas depends on its volume as kV^3 . The work done when the temperature changes from 100°C to 300°C will be _____ nR , where n denotes number of moles of a gas.

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/yTWUAKgnsp](https://www.prepwiser.in/questions/yTWUAKgnsp)

Q89 JEE Main 2020 · 7 Jan · Shift 1

A litre of dry air at STP expands adiabatically to a volume of 3 litres. If $\gamma = 1.40$, the work done by air is : ($3^{1.4} = 4.6555$) [Take air to be an ideal gas]

- (A) 60.7 J (B) 100.8 J
(C) 90.5 J (D) 48 J

[Step-by-step solution ► prepwiser.in/questions/WYQ_dBcZ-H](https://www.prepwiser.in/questions/WYQ_dBcZ-H)

Kinetic Theory of Gases · 1 PYQs

Q90 JEE Main 2022 · 26 Jun · Shift 1

A thermally insulated vessel contains an ideal gas of molecular mass M and ratio of specific heats 1.4 . Vessel is moving with speed v and is suddenly brought to rest. Assuming no heat is lost to the surrounding and vessel temperature of the gas increases by :

(R = universal gas constant)

- (A) $\frac{Mv^2}{7R}$ (B) $\frac{Mv^2}{5R}$
(C) $2\frac{Mv^2}{7R}$ (D) $7\frac{Mv^2}{5R}$

[Step-by-step solution ► prepwiser.in/questions/CeQzgKGSNm](https://www.prepwiser.in/questions/CeQzgKGSNm)

Carnot Cycle · 1 PYQs

Q91 JEE Main 2025 · 28 Jan · Shift 1

A Carnot engine (E) is working between two temperatures 473 K and 273 K . In a new system two engines - engine E_1 works between 473 K to 373 K and engine E_2 works between 373 K to 273 K . If η_{12} , η_1 and η_2 are the efficiencies of the engines E , E_1 and E_2 , respectively, then

- (A) $\eta_{12} = \eta_1\eta_2$
(B) $\eta_{12} = \eta_1 + \eta_2$
(C) $\eta_{12} \geq \eta_1 + \eta_2$
(D) $\eta_{12} < \eta_1 + \eta_2$

[Step-by-step solution ► prepwiser.in/questions/KcPSK7Bbh7](https://www.prepwiser.in/questions/KcPSK7Bbh7)

Answer key — Thermodynamics

Numbers match the question numbers above. For full working, open the solution link under each question.

1	B	2	B	3	D	4	D	5	B	6	A	7	B	8	B
9	C	10	B	11	102	12	16	13	A	14	540	15	C	16	B
17	A	18	500	19	D	20	A	21	A	22	C	23	B	24	C
25	A	26	B	27	B	28	B	29	B	30	C	31	273	32	B
33	B	34	C	35	B	36	B	37	D	38	D	39	C	40	C
41	B	42	D	43	4	44	C	45	B	46	2	47	A	48	480
49	C	50	B	51	C	52	A	53	A	54	B	55	A	56	46
57	1818	58	15	59	C	60	A	61	C	62	C	63	A	64	D
65	C	66	B	67	B	68	750	69	B	70	C	71	1400	72	25
73	A	74	A	75	A	76	25	77	C	78	A	79	A	80	-113
81	208	82	A	83	B	84	D	85	D	86	A	87	60	88	50
89	C	90	B	91	D										

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