PrepWiser.

PHYSICS · JEE MAIN

Thermometry & Calorimetry

Chapter-wise previous year questions, with answer key

33	2020–2025	4
PYQS	PAPERS	TOPICS

Calorimetry · Thermal Expansion · Temperature Scales · Specific and Latent Heat

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?

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Calorimetry · 7 PYQs

Q1 JEE Main 2025 · 8 Apr · Shift 2

Water falls from a height of 200 m into a pool. Calculate the rise in temperature of the water assuming no heat dissipation from the water in the pool.

(Take g = 10 m/s^2, specific heat of water = 4200 J/(kg K))

(A) 0.36 K

(B) 0.23 K

(C) 0.48 K

(D) 0.14 K

Step-by-step solution ▸ prepwiser.in/questions/aifUcGd8Xm

Q2 JEE Main 2025 · 23 Jan · Shift 1

A gun fires a lead bullet of temperature 300 K into a wooden block. The bullet having melting temperature of 600 K penetrates into the block and melts down. If the total heat required for the process is 625 J , then the mass of the bullet is _____ grams. (Latent heat of fusion of lead $= 2.5 \times 10^4 \mathrm{JKg}^{-1}$ and specific heat capacity of lead $= 125 \mathrm{JKg}^{-1}\ \mathrm{K}^{-1}$)

(A) 20

(B) 15

(C) 5

(D) 10

Step-by-step solution ▸ prepwiser.in/questions/rT3F5uxo46

Q3 JEE Main 2022 · 26 Jun · Shift 2

A geyser heats water flowing at a rate of 2.0 kg per minute from 30°C to 70°C. If geyser operates on a gas burner, the rate of combustion of fuel will be _____ g min^{-1}.

[Heat of combustion = 8 $\times$ 10^3 Jg^{-1}, Specific heat of water = 4.2 Jg^{-1} °C^{-1}]

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/-4gJLgwWmc

Q4 JEE Main 2022 · 25 Jun · Shift 2

A copper block of mass 5.0 kg is heated to a temperature of 500°C and is placed on a large ice block. What is the maximum amount of ice that can melt? [Specific heat of copper : 0.39 J g^{-1} °C^{-1} and latent heat of fusion of water : 335 J g^{-1}]

(A) 1.5 kg

(B) 5.8 kg

(C) 2.9 kg

(D) 3.8 kg

Step-by-step solution ▸ prepwiser.in/questions/2hQCnib9je

Q5 JEE Main 2020 · 4 Sep · Shift 1

The specific heat of water = 4200 J $kg^{-1}K^{-1}$ and the latent heat of ice = 3.4×10^5 J kg^{-1}. 100 grams of ice at 0^oC is placed in 200 g of water at 25^oC. The amount of ice that will melt as the temperature of water reaches 0^oC is close to (in grams) :

(A) 63.8 **(B)** 61.7

(C) 69.3 **(D)** 64.6

Step-by-step solution ▸ prepwiser.in/questions/hZsxoc3J_W

Q6 JEE Main 2020 · 3 Sep · Shift 2

A calorimeter of water equivalent 20 g contains 180 g of water at 25^oC. 'm' grams of steam at 100^oC is mixed in it till the temperature of the mixure is 31^oC. The value of 'm' is close to :
(Latent heat of water = 540 cal g^{-1}, specific heat of water = 1 cal g^{-1} $^oC^{-1}$)

(A) 2.6 **(B)** 2

(C) 4 **(D)** 3.2

Step-by-step solution ▸ prepwiser.in/questions/5b00I62G5e

Q7 JEE Main 2020 · 7 Jan · Shift 2

M grams of steam at 100^oC is mixed with 200 g of ice at its melting point in a thermally insulated container. If it produced liquid water at 40^oC [heat of vaporization of water is 540 cal/g and heat of fusion of ice is 80 cal/g] the value of M is ___

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/bFKPodNMO2

Thermal Expansion · 11 PYQs

Q8 JEE Main 2025 · 4 Apr · Shift 2

Consider a rectangular sheet of solid material of length $l = 9\text{cm}$ and width $\text{d} = 4\text{cm}$. The coefficient of linear expansion is $\alpha = 3.1 \times 10^{-5}\text{K}^{-1}$ at room temperature and one atmospheric pressure. The mass of sheet $m = 0.1\text{kg}$ and the specific heat capacity $C_\text{v} = 900\text{Jkg}^{-1}\text{K}^{-1}$. If the amount of heat supplied to the material is $8.1 \times 10^2\text{J}$ then change in area of the rectangular sheet is :

(A) $2.0 \times 10^{-6}\text{m}^2$ **(B)** $6.0 \times 10^{-7}\text{m}^2$

(C) $3.0 \times 10^{-7}\text{m}^2$ **(D)** $4.0 \times 10^{-7}\text{m}^2$

Step-by-step solution ▸ prepwiser.in/questions/zooSaXT_Nf

Q9 JEE Main 2023 · 24 Jan · Shift 1

A hole is drilled in a metal sheet. At 27°C, the diameter of hole is 5 cm. When the sheet is heated to 177°C, the change in the diameter of hole is $\text{d} \times 10^{-3}$ cm. The value of d will be _____ if coefficient of linear expansion of the metal is $1.6 \times 10^{-5}/^\circ\text{C}$.

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/JJFZM3jsDd

Q10 JEE Main 2022 · 25 Jul · Shift 1

A unit scale is to be prepared whose length does not change with temperature and remains 20cm, using a bimetallic strip made of brass and iron each of different length. The length of both components would change in such a way that difference between their lengths remains constant. If length of brass is 40cm and length of iron will be _____ cm. $\left(\alpha_{\text{iron}} = 1.2 \times 10^{-5}\text{K}^{-1} \text{ and } \alpha_{\text{brass}} = 1.8 \times 10^{-5}\text{K}^{-1}\right)$.

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/HWPZrNE4Zz

Q11 JEE Main 2022 · 29 Jun · Shift 2

At what temperature a gold ring of diameter 6.230 cm be heated so that it can be fitted on a wooden bangle of diameter 6.241 cm ? Both the diameters have been measured at room temperature (27°C).

(Given : coefficient of linear thermal expansion of gold $\alpha_L = 1.4 \times 10^{-5}\ \text{K}^{-1}$)

(A) 125.7°C

(B) 91.7°C

(C) 425.7°C

(D) 152.7°C

Step-by-step solution ▸ prepwiser.in/questions/PLYgg7fCs5

Q12 JEE Main 2022 · 25 Jun · Shift 2

A solid metallic cube having total surface area 24 m^2 is uniformly heated. If its temperature is increased by 10°C, calculate the increase in volume of the cube. (Given $\alpha = 5.0 \times 10^{-4}\ ^\circ\text{C}^{-1}$).

(A) $2.4 \times 10^6\ \text{cm}^3$

(B) $1.2 \times 10^5\ \text{cm}^3$

(C) $6.0 \times 10^4\ \text{cm}^3$

(D) $4.8 \times 10^5\ \text{cm}^3$

Step-by-step solution ▸ prepwiser.in/questions/fUsEkzImrh

Q13 JEE Main 2021 · 25 Feb · Shift 1

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

Assertion A : When a rod lying freely is heated, no thermal stress is developed in it.

Reason R : On heating, the length of the rod increases.

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

(A) A is true but R is false

(B) A is false but R is true

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

(D) Both A and R are true and R is the correct explanation of A

Step-by-step solution ▸ prepwiser.in/questions/OByUwITkOM

Q14 JEE Main 2021 · 24 Feb · Shift 1

Each side of a box made of metal sheet in cubic shape is 'a' at room temperature 'T', the coefficient of linear expansion of the metal sheet is 'α'. The metal sheet is heated uniformly, by a small temperature Δ T, so that its new temperature is T + ΔT. Calculate the increase in the volume of the metal box.

(A) $3a^3\alpha\Delta T$

(B) $4\pi a^3\alpha\Delta T$

(C) $\frac{4}{3}\pi a^3\alpha\Delta T$

(D) $4a^3\alpha\Delta T$

Step-by-step solution ▸ prepwiser.in/questions/iHjRzPBU8E

Q15 JEE Main 2020 · 3 Sep · Shift 1

A bakelite beaker has volume capacity of 500 cc at 30^oC. When it is partially filled with Vm volume (at 30^oC) of mercury, it is found that the unfilled volume of the beaker remains constant as temperature is varied. If $\gamma_{(beaker)} = 6 \times 10^{-6}\ {}^oC^{-1}$ and $\gamma_{(mercury)} = 1.5 \times 10^{-4}\ {}^oC^{-1}$, where γ is the coefficient of volume expansion, then V_m (in cc) is close to ____.

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/sl5ei6iyBm

Q16 JEE Main 2020 · 2 Sep · Shift 2

When the temperature of a metal wire is increased from 0^oC to 10^oC, its length increases by 0.02%. The percentage change in its mass density will be closest to :

(A) 0.008

(B) 0.06

(C) 0.8

(D) 2.3

Step-by-step solution ▸ prepwiser.in/questions/_LIrQyoUPK

Q17 JEE Main 2020 · 8 Jan · Shift 1

A leak proof cylinder of length 1m, made of a metal which has very low coefficient of expansion is floating vertically in water at 0°C such that its height above the water surface is 20 cm. When the temperature of water is increased to 4°C, the height of the cylinder above the water surface becomes 21 cm. The density of water at T = 4°C, relative to the density at T = 0°C is close to :

(A) 1.04

(B) 1.26

(C) 1.01

(D) 1.03

Step-by-step solution ▸ prepwiser.in/questions/A-fEnM_suj

Q18 JEE Main 2020 · 7 Jan · Shift 1

A non-isotropic solid metal cube has coefficients of linear expansion as :
$5 \times 10^{-5}/^oC$ along the x-axis and $5 \times 10^{-6}/^oC$ along the y and the z-axis. If the coefficient of volume expansion of the solid is $C \times 10^{-6}/^oC$ then the value of C is

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/vq2S1FixaC

Temperature Scales · 5 PYQs

Q19 JEE Main 2024 · 4 Apr · Shift 1

The resistances of the platinum wire of a platinum resistance thermometer at the ice point and steam point are 8Ω and 10Ω respectively. After inserting in a hot bath of temperature $400^{\circ}\mathrm{C}$, the resistance of platinum wire is :

(A) 10 Ω

(B) 16 Ω

(C) 8 Ω

(D) 2 Ω

Step-by-step solution ▸ prepwiser.in/questions/BbdMKCNLtn

Q20 JEE Main 2024 · 4 Apr · Shift 1

On celcius scale the temperature of body increases by $40^{\circ}\mathrm{C}$. The increase in temperature on Fahrenheit scale is :

(A) $75^{\circ}\mathrm{F}$

(B) $70^{\circ}\mathrm{F}$

(C) $72^{\circ}\mathrm{F}$

(D) $68^{\circ}\mathrm{F}$

Step-by-step solution ▸ prepwiser.in/questions/yqYhCSFNwk

Q21 JEE Main 2023 · 11 Apr · Shift 1

On a temperature scale 'X', the boiling point of water is $65^{\circ}\mathrm{X}$ and the freezing point is $-15^{\circ}\mathrm{X}$. Assume that the X scale is linear. The equivalent temperature corresponding to $-95^{\circ}\mathrm{X}$ on the Farenheit scale would be:

(A) $-148^{\circ}\mathrm{F}$

(B) $-48^{\circ}\mathrm{F}$

(C) $-63^{\circ}\mathrm{F}$

(D) $-112^{\circ}\mathrm{F}$

Step-by-step solution ▸ prepwiser.in/questions/ovHbZarBsD

Q22 JEE Main 2023 · 30 Jan · Shift 2

A faulty thermometer reads $5^{\circ}\mathrm{C}$ in melting ice and $95^{\circ}\mathrm{C}$ in stream. The correct temperature on absolute scale will be _____ K when the faulty thermometer reads $41^{\circ}\mathrm{C}$.

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/rzJc2Bd1aB

Q23 JEE Main 2022 · 30 Jun · Shift 1

The pressure of the gas in a constant volume gas thermometer is 100 cm of mercury when placed in melting ice at 1 atm. When the bulb is placed in a liquid, the pressure becomes 180 cm of mercury. Temperature of the liquid is :

(Given 0°C = 273 K)

(A) 300 K

(B) 400 K

(C) 600 K

(D) 491 K

Step-by-step solution ▸ prepwiser.in/questions/ewAYDcDI0V

Specific and Latent Heat · 10 PYQs

Q24 JEE Main 2025 · 3 Apr · Shift 1

During the melting of a slab of ice at 273 K at atmospheric pressure :

(A) Internal energy of ice-water system remains unchanged.

(B) Positive work is done by the ice-water system on the atmosphere.

(C) Positive work is done on the ice-water system by the atmosphere.

(D) Internal energy of the ice-water system decreases.

Step-by-step solution ▸ prepwiser.in/questions/Ok39MaMgDv

Q25 JEE Main 2023 · 31 Jan · Shift 2

A water heater of power $2000\mathrm{W}$ is used to heat water. The specific heat capacity of water is $4200\mathrm{J\ kg^{-1}K^{-1}}$. The efficiency of heater is 70%. Time required to heat $2\mathrm{kg}$ of water from $10^{\circ}\mathrm{C}$ to $60^{\circ}\mathrm{C}$ is _____ s.

(Assume that the specific heat capacity of water remains constant over the temperature range of the water).

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/Xx_OfLEl7z

Q26 JEE Main 2023 · 29 Jan · Shift 2

Heat energy of 184 kJ is given to ice of mass 600 g at $-12^{\circ}\mathrm{C}$. Specific heat of ice is $2222.3\mathrm{Jkg^{-1^{\circ}}C^{-1}}$ and latent heat of ice in 336 $\mathrm{kJ/kg^{-1}}$

A. Final temperature of system will be 0°C.

B. Final temperature of the system will be greater than 0°C.

C. The final system will have a mixture of ice and water in the ratio of 5 : 1.

D. The final system will have a mixture of ice and water in the ratio of 1 : 5.

E. The final system will have water only.

Choose the correct answer from the options given below :

(A) A and E only

(B) B and D only

(C) A and C only

(D) A and D only

Step-by-step solution ▸ prepwiser.in/questions/BFNVKUapny

Q27 JEE Main 2022 · 25 Jul · Shift 2

A block of ice of mass 120 g at temperature 0°C is put in 300 g of water at 25°C. The x g of ice melts as the temperature of the water reaches 0°C. The value of x is _____.

[Use specific heat capacity of water = 4200 $\mathrm{Jkg^{-1}K^{-1}}$, Latent heat of ice = 3.5×10^5 $\mathrm{Jkg^{-1}}$]

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/iQSNCYpVl3

Q28 JEE Main 2022 · 27 Jun · Shift 2

A lead bullet penetrates into a solid object and melts. Assuming that 40% of its kinetic energy is used to heat it, the initial speed of bullet is :

(Given : initial temperature of the bullet = 127°C, Melting point of the bullet = 327°C, Latent heat of fusion of lead = 2.5×10^4 J kg^{-1}, Specific heat capacity of lead = 125 J/kg K)

(A) 125 ms^{-1}

(B) 500 ms^{-1}

(C) 250 ms^{-1}

(D) 600 ms^{-1}

Step-by-step solution ▸ prepwiser.in/questions/hNtYO9jbkm

Q29 JEE Main 2022 · 25 Jun · Shift 1

A steam engine intakes 50 g of steam at 100°C per minute and cools it down to 20°C. If latent heat of vaporization of steam is 540 cal g^{-1}, then the heat rejected by the steam engine per minute is _____ $\times 10^3$ cal.

(Given : specific heat capacity of water : 1 cal g^{-1} $°C^{-1}$)

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/iJXlfVRnQm

Q30 JEE Main 2022 · 24 Jun · Shift 2

A 100 g of iron nail is hit by a 1.5 kg hammer striking at a velocity of 60 ms^{-1}. What will be the rise in the temperature of the nail if one fourth of energy of the hammer goes into heating the nail?

[Specific heat capacity of iron = 0.42 Jg^{-1} $°C^{-1}$]

(A) 675°C

(B) 1600°C

(C) 16.07°C

(D) 6.75°C

Step-by-step solution ▸ prepwiser.in/questions/6PppFD7VpO

Q31 JEE Main 2021 · 1 Sep · Shift 2

Due to cold weather a 1 m water pipe of cross-sectional area 1 cm^2 is filled with ice at $-10°C$. Resistive heating is used to melt the ice. Current of 0.5A is passed through 4 kΩ resistance. Assuming that all the heat produced is used for melting, what is the minimum time required? (Given latent heat of fusion for water/ice = 3.33×10^5 J kg^{-1}, specific heat of ice = 2×10^3 J kg^{-1} and density of ice = 10^3 kg/m^3

(A) 0.353 s

(B) 35.3 s

(C) 3.53 s

(D) 70.6 s

Step-by-step solution ▸ prepwiser.in/questions/y3r2bsr3xq

Q32 JEE Main 2021 · 27 Aug · Shift 2

The height of victoria falls is 63 m. What is the difference in temperature of water at the top and at the bottom of fall?

[Given 1 cal = 4.2 J and specific heat of water = 1 cal $g^{-1}\,{}^{\circ}0C^{-1}$]

(A) 0.147° C

(B) 14.76° C

(C) 1.476° C

(D) 0.014° C

Step-by-step solution ▸ prepwiser.in/questions/tXDGO8m4Cu

Q33 JEE Main 2020 · 5 Sep · Shift 1

A bullet of mass 5 g, travelling with a speed of 210 m/s, strikes a fixed wooden target. One half of its kinetic energy is converted into heat in the bullet while the other half is converted into heat in the wood. The rise of temperature of the bullet if the specific heat of its material is 0.030 cal/(g – ^{o}C) (1 cal = 4.2 × 10^{7} ergs) close to :

(A) 87.5 ^{o}C

(B) 83.3 ^{o}C

(C) 38.4 ^{o}C

(D) 119.2 ^{o}C

Step-by-step solution ▸ prepwiser.in/questions/kgyaNzp9Y3

Answer key — Thermometry & Calorimetry

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

1 **C**	2 **D**	3 **42**	4 **C**	5 **B**	6 **B**	7 **40**	8 **A**
9 **12**	10 **60**	11 **D**	12 **B**	13 **C**	14 **A**	15 **20**	16 **B**
17 **C**	18 **60**	19 **B**	20 **C**	21 **A**	22 **313**	23 **D**	24 **C**
25 **300**	26 **D**	27 **90**	28 **B**	29 **31**	30 **C**	31 **B**	32 **A**
33 **A**							

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