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PHYSICS · JEE MAIN

Thermal Properties of Matter

Previous Year Questions with answers

129 questions · **99** papers · **2002–2026** · newest paper first

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What is in this PDF: every Thermal Properties of Matter question we hold from past JEE Main and AIEEE papers, with its options and answer. Where an answer comes from a source other than the official final key, it says so next to the answer.

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Chapter at a glance

2%
of Physics questions, 2019–2026

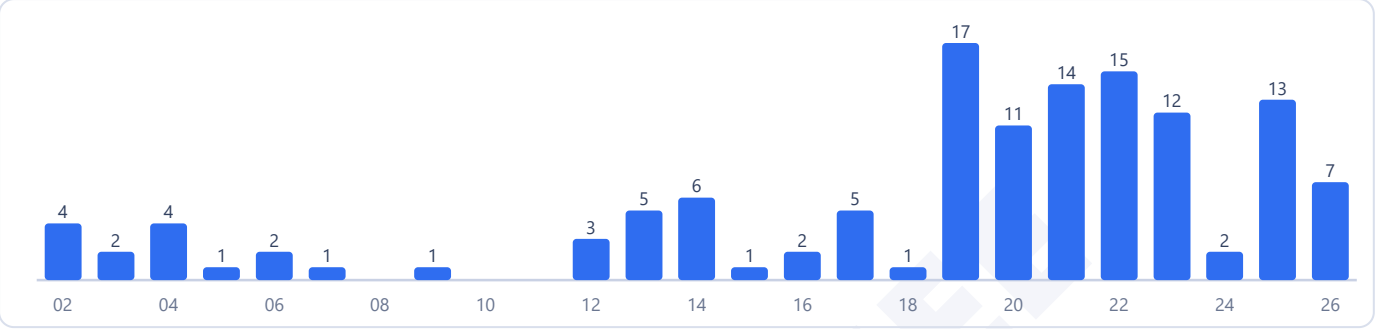
129
questions, 2002–2026

73 of 162
papers asked it, 2019–2026

106 / 23
MCQ / numerical, 2002–2026

Trend. Falling: 0.4 questions per paper in 2024–2026 against 0.7 in 2019–2023.

Questions per year



Counts are the questions we hold: 129 in 99 papers. No question in this chapter was found repeated across papers.

Most-asked topics in this chapter (2002–2026)



How often it comes up

Thermal Properties of Matter covers the foundational thermometric, calorimetric, and heat transfer principles in the JEE Main syllabus. Across the papers we hold from 2019 to 2026, it contributed **91 questions in 162 papers**, which corresponds to **0.6 questions per paper**, and was present in 73 of those 162 papers. That places it **26th of 29 Physics chapters** by volume over that eight-year period, representing 2.0% of all Physics questions asked.

The chapter's share has fallen since the AIEEE years. Between 2002 and 2018, it commanded 2.8% of the Physics section; across the last three exam years (2024 to 2026), it declined to 1.4%, giving 22 questions in 58 papers. The most question-heavy year in our archive was 2019, which registered 17 questions across 16 papers. Every exam cycle from 2019 onward has featured questions from this chapter, with appearances in 73 of the 162 papers in our set.

It is placed under Unit 7: Properties of Solids and Liquids in NTA's Class 11 framework, setting up the thermodynamic cycles and kinetic theories that follow later in the syllabus.

Most-asked topics

Between 2019 and 2026, question counts broke down across four topics:

- **Calorimetry**: 40 questions. Phase changes between ice, liquid water, and steam, latent heat balances, water equivalent of containers, and steady flow geysers.
- **Thermal Expansion**: 19 questions. Linear, superficial, and volumetric expansion of solids, bimetallic strips, and apparent liquid expansion in glass vessels.
- **Conduction**: 18 questions. Thermal resistance analogy with electrical circuits, junction temperatures in composite rods, and cylindrical insulation shells.

- **Radiation**: 14 questions. Stefan-Boltzmann law, Wien's displacement law, and Newton's law of cooling in convective environments.

The top three topics were tested in the 2026 exam season, while radiation questions appeared in 2025.

What the questions look like

Calorimetry problems revolve around thermal equilibrium equations. A typical setup adds sub-zero ice to warm water inside a calorimeter of known heat capacity, asking for the final mixture temperature or the residual ice mass. Students must perform an energy check first: calculate the heat needed to warm the ice to 0 °C and melt it, compare this against the heat released when water cools to 0 °C, and determine whether all ice melts. Continuous flow problems ask for the fuel consumption rate of a domestic gas geyser warming a known volumetric flow of cold inlet water.

Conduction problems apply Ohm's law to heat currents. When several metal rods of different lengths, cross-sections, and thermal conductivities are joined in series or parallel between fixed thermal reservoirs, students write heat current conservation at internal junctions to deduce intermediate temperatures.

Thermal expansion problems evaluate differential elongation. When two bars of different metals are joined end-to-end and heated through a temperature rise, you sum their individual length increases. In radiation, problems compare emissive powers of spherical bodies using Stefan's law, where radiated energy scales with the surface area and the fourth power of absolute temperature.

A notable portion of problems requires exact values: 23 of the 91 questions between 2019 and 2026 were numerical answer items with no choices provided.

How to practise it

Approach calorimetry by setting up an explicit energy balance ledger. Never write an equilibrium equation with an unknown final temperature until you have verified whether a phase transition completes. Calculate the energy required to reach the phase boundary first; if the available energy is insufficient to complete the latent heat exchange, the final temperature is locked at the transition point (such as 0 °C for an ice-water mixture).

In thermal conduction, convert each rod into an equivalent thermal resistance equal to length divided by the product of thermal conductivity and cross-sectional area. Treat temperature differences exactly like potential differences and heat flow rates like electric currents. Applying Kirchhoff's junction law at rod intersections makes finding interface temperatures painless.

For thermal radiation, remember that temperatures in the Stefan-Boltzmann law and Wien's displacement law must always be expressed in Kelvin. Convert degrees Celsius to absolute temperatures before raising them to the fourth power. For Newton's law of cooling, remember that it holds only for small temperature differences above ambient surroundings.

Q1 JEE Main 2026 · 5 Apr · Shift 2 · Numerical

The heat extracted out of x gram of water initially at 50 °C to cool it down to 0 °C is sufficient to evaporate $(1000 - x)$ gram of water also initially at 50 °C. The value of x (closest integer) is _____. (Take latent heat of water 2256 kJ/kg. K, specific heat capacity of water 4200 J/kg. K)

Numerical value type: the answer is a number.

Answer: 922. · Official NTA final key

Q2 JEE Main 2026 · 4 Apr · Shift 2 · MCQ

The temperature of a metal strip having coefficient of linear expansion α is increased from T_1 to T_2 resulting in increase of its length by ΔL_1. The temperature is further increased from T_2 to T_3 such that the increase in its length is ΔL_2.

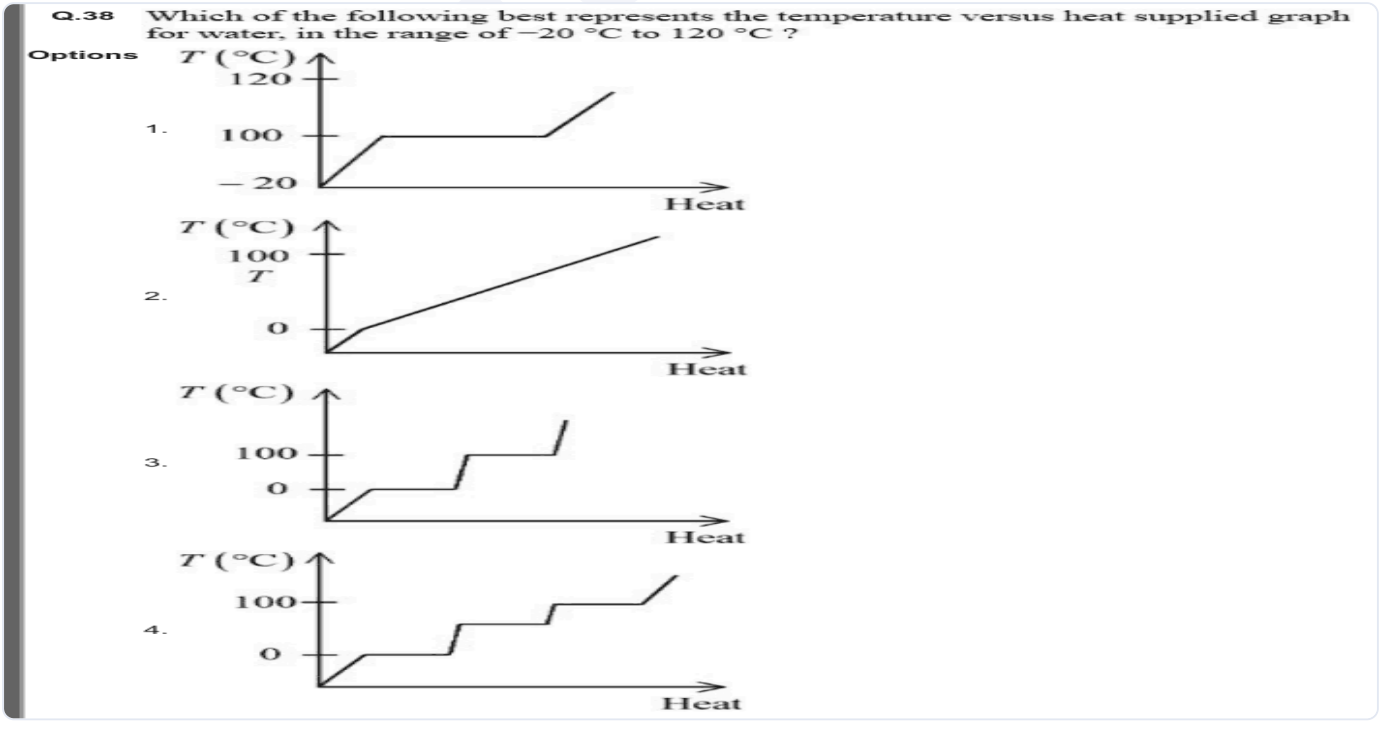
Given $T_3 + T_1 = 2T_2$ and $T_2 - T_1 = \Delta T$, the value of ΔL_2 is _____.

(A) $\Delta L_1 \left[1 + 2\alpha^2 (\Delta T)^2\right]$
(B) $\Delta L_1 \left[1 + \alpha^2 (\Delta T)^2\right]$
(C) $\Delta L_1 \left[1 + 2\alpha\, \Delta T\right]$
(D) $\Delta L_1 \left[1 + \alpha\, \Delta T\right]$

Answer: (D) $\Delta L_1 \left[1 + \alpha\, \Delta T\right]$ · Official NTA final key

Q3 JEE Main 2026 · 28 Jan · Shift 1 · MCQ

Which of the following best represents the temperature versus heat supplied graph for water, in the range of -20 °C to 120 °C ?



(A) *see figure*
(B) *see figure*
(C) *see figure*
(D) *see figure*

Answer: (C) · Official NTA final key

Q4 JEE Main 2026 · 28 Jan · Shift 1 MCQ

10 kg of ice at -10 °C is added to 100 kg of water to lower its temperature from 25 °C. Consider no heat exchange to surroundings. The decrement to the temperature of water is _____ °C.

(specific heat of ice = 2100 J/Kg.°C, specific heat of water = 4200 J/Kg.°C, latent heat of fusion of ice = 3.36×10^5 J/Kg)

(A) 15
(B) 10
(C) 11.6
(D) 6.67

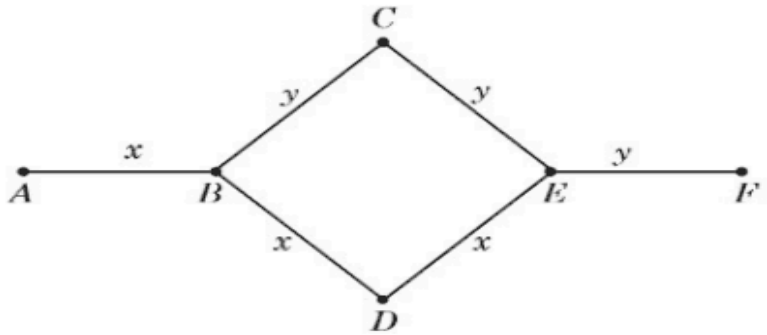
Answer: (B) 10 · Official NTA final key

Q5 JEE Main 2026 · 22 Jan · Shift 1 MCQ

Rods x and y of equal dimensions but of different materials are joined as shown in figure. Temperatures of end points A and F are maintained at 100 °C and 40 °C respectively. Given the thermal conductivity of rod x is three times of that of rod y, the temperature at junction points B and E are (close to):

(see the figure above)

Q.37 Rods x and y of equal dimensions but of different materials are joined as shown in figure. Temperatures of end points A and F are maintained at 100 °C and 40 °C respectively. Given the thermal conductivity of rod x is three times of that of rod y, the temperature at junction points B and E are (close to):



Options
1. 60 °C and 45 °C respectively
2. 89 °C and 73 °C respectively
3. 80 °C and 70 °C respectively
4. 80 °C and 60 °C respectively

(A) 60 °C and 45 °C respectively
(B) 89 °C and 73 °C respectively
(C) 80 °C and 70 °C respectively
(D) 80 °C and 60 °C respectively

Answer: (B) 89 °C and 73 °C respectively · Official NTA final key

Q6 JEE Main 2026 · 21 Jan · Shift 1 MCQ

An aluminium and steel rods having same lengths and cross-sections are joined to make total length of 120 cm at 30 °C. The coefficient of linear expansion of aluminium and steel are 24×10^{-6}/°C and 1.2×10^{-5}/°C, respectively. The length of this composite rod when its temperature is raised to 100 °C, is _____ cm.

(A) 120.20
(B) 120.03
(C) 120.15
(D) 120.06

Answer: (C) 120.15 · Official NTA final key

Q7 JEE Main 2026 · 21 Jan · Shift 1 MCQ

A gas based geyser heats water flowing at the rate of 5.0 litres per minute from 27 °C to 87 °C. The rate of consumption of the gas is _____ g/s.
(Take heat of combustion of gas = 5.0×10^4 J/g) specific heat capacity of water = 4200 J/kg.°C

(A) 0.21
(B) 2.1
(C) 0.42
(D) 4.2

Answer: (C) 0.42 · Official NTA final key

Q8 JEE Main 2025 · 8 Apr · Shift 2 MCQ

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) 0.23 K
(B) 0.48 K
(C) 0.14 K
(D) 0.36 K

Answer: (B) 0.48 K · Key from source paper

Q9 JEE Main 2025 · 7 Apr · Shift 1 Numerical

A wire of length 10 cm and diameter 0.5 mm is used in a bulb. The temperature of the wire is $1727^{\circ}C$ and power radiated by the wire is 94.2 W. Its emissivity is $\frac{x}{8}$ where x = _____

(Given $\sigma = 6.0 \times 10^{-8} Wm^{-2}K^{-4}, \pi = 3.14$ and assume that the emissivity of wire material is same at all wavelength.)

Numerical value type: the answer is a number.

Answer: 5. · Key from source paper

Q10 JEE Main 2025 · 7 Apr · Shift 2 Numerical

Two cylindrical rods A and B made of different materials, are joined in a straight line. The ratios of lengths, radii and thermal conductivities of these rods are: $\frac{L_A}{L_B} = \frac{1}{2}, \frac{r_A}{r_B} = 2$ and $\frac{K_A}{K_B} = \frac{1}{2}$. The free ends of rods A and B are maintained at 400 K, 200 K, respectively. The temperature of rods interface is _____ K, when equilibrium is established.

Numerical value type: the answer is a number.

Answer: 360. · Key from source paper

Q11 JEE Main 2025 · 4 Apr · Shift 2 MCQ

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

(A) $6.0 \times 10^{-7} m^2$
(B) $3.0 \times 10^{-7} m^2$
(C) $2.0 \times 10^{-6} m^2$
(D) $4.0 \times 10^{-7} m^2$

Answer: (C) $2.0 \times 10^{-6} m^2$ · Key from source paper

Q12 JEE Main 2025 · 2 Apr · Shift 2 MCQ

Match List - I with List - II.

List - I	List - II
(A) Heat capacity of body	(I) Jkg^{-1}
(B) Specific heat capacity of body	(II) JK^{-1}
(C) Latent heat	(III) $Jkg^{-1}K^{-1}$
(D) Thermal conductivity	(IV) $Jm^{-1}K^{-1}s^{-1}$

Choose the correct answer from the options given below :

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

Answer: (D) (A)-(II), (B)-(III), (C)-(I), (D)-(IV) · Key from source paper

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Q13 JEE Main 2025 · 29 Jan · Shift 2 MCQ

The difference of temperature in a material can convert heat energy into electrical energy. To harvest the heat energy, the material should have

(A) high thermal conductivity and high electrical conductivity
(B) low thermal conductivity and low electrical conductivity
(C) high thermal conductivity and low electrical conductivity
(D) low thermal conductivity and high electrical conductivity

Answer: (D) low thermal conductivity and high electrical conductivity · Key from source paper

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Q14 JEE Main 2025 · 29 Jan · Shift 2 MCQ

A cup of coffee cools from 90°C to 80°C in t minutes when the room temperature is 20°C. The time taken by the similar cup of coffee to cool from 80°C to 60°C at the same room temperature is :

(A) $\frac{13}{10}$t
(B) $\frac{10}{13}$t
(C) $\frac{5}{13}$t
(D) $\frac{13}{5}$t

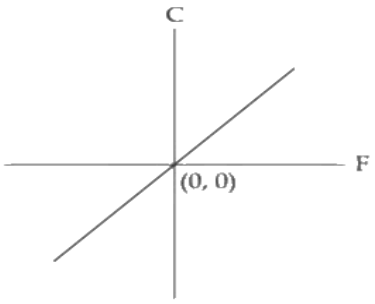
Answer: (D) $\frac{13}{5}$t · Key from source paper

Q15 JEE Main 2025 · 24 Jan · Shift 2 MCQ

Which of the following figure represents the relation between Celsius and Fahrenheit temperatures ?

Q26. Which of the following figure represents the relation between Celsius and Fahrenheit temperatures ?

(1)



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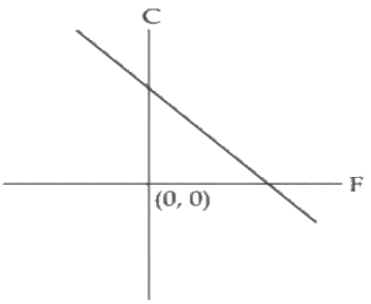

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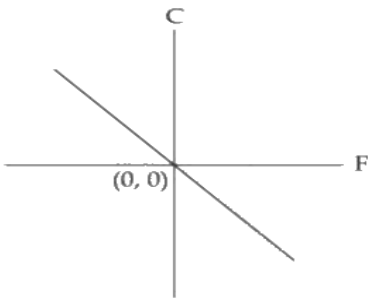

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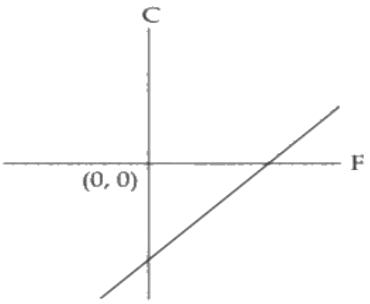


(A) *see figure*

(B) *see figure*

(C) *see figure*

(D) *see figure*

Answer: (D) · Key from source paper

Q16 JEE Main 2025 · 24 Jan · Shift 2 MCQ

The temperature of a body in air falls from 40°C to 24°C in 4 minutes. The temperature of the air is 16°C. The temperature of the body in the next 4 minutes will be:

(A) $\frac{14}{3}^{\circ}$C

(B) $\frac{42}{3}^{\circ}$C

(C) $\frac{28}{3}^{\circ}$C

(D) $\frac{56}{3}^{\circ}$C

Answer: (D) $\frac{56}{3}^{\circ}$C · Key from source paper

Q17 JEE Main 2025 · 23 Jan · Shift 1 MCQ

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) 10
(B) 20
(C) 5
(D) 15

Answer: (A) 10 · Key from source paper

Q18 JEE Main 2025 · 22 Jan · Shift 1 MCQ

An amount of ice of mass 10^{-3} kg and temperature -10°C is transformed to vapour of temperature 110°C by applying heat. The total amount of work required for this conversion is, (Take, specific heat of ice $= 2100 \mathrm{Jg}^{-1}\mathrm{K}^{-1}$, specific heat of water $= 4180 \mathrm{Jg}^{-1}\mathrm{K}^{-1}$, specific heat of steam $= 1920 \mathrm{Jg}^{-1}\mathrm{K}^{-1}$, Latent heat of ice $= 3.35 \times 10^{5}\ \mathrm{Jg}^{-1}$ and Latent heat of steam $= 2.25 \times 10^{6}\ \mathrm{Jg}^{-1}$)

(A) 3043 J
(B) 3024 J
(C) 3003 J
(D) 3022 J

Answer: (A) 3043 J · Key from source paper

Q19 JEE Main 2025 · 22 Jan · Shift 1 MCQ

Two spherical bodies of same materials having radii 0.2 m and 0.8 m are placed in same atmosphere. The temperature of the smaller body is 800 K and temperature of the bigger body is 400 K . If the energy radiated from the smaller body is E, the energy radiated from the bigger body is (assume, effect of the surrounding temperature to be negligible),

(A) 16 E
(B) E
(C) 64 E
(D) 256 E

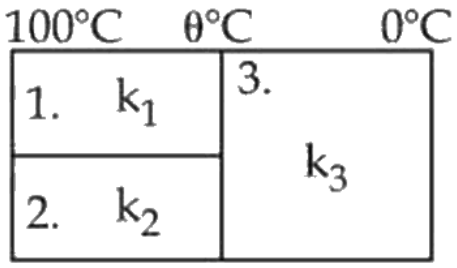
Answer: (B) E · Key from source paper

Q20 JEE Main 2025 · 22 Jan · Shift 1 Numerical

Three conductors of same length having thermal conductivity k_1, k_2 and k_3 are connected as shown in figure. Area of cross sections of 1st and 2nd conductor are same and for 3rd conductor it is double of the 1st conductor. The temperatures are given in the figure. In steady state condition, the value of θ is _____ $^{\circ}$C. (Given : $\mathrm{k}_1 = 60 \mathrm{Js}^{-1}\mathrm{m}^{-1}\mathrm{K}^{-1}$, $\mathrm{k}_2 = 120 \mathrm{Js}^{-1}\mathrm{m}^{-1}\mathrm{K}^{-1}$, $\mathrm{k}_3 = 135 \mathrm{Js}^{-1}\mathrm{m}^{-1}\mathrm{K}^{-1}$)

(see the figure above)

Q49. Three conductors of same length having thermal conductivity k_1, k_2 and k_3 are connected as shown in figure.



Area of cross sections of 1st and 2nd conductor are same and for 3rd conductor it is double of the 1st conductor. The temperatures are given in the figure. In steady state condition, the value of θ is _____ °C.
(Given : $k_1 = 60 Js^{-1} m^{-1} K^{-1}, k_2 = 120 Js^{-1} m^{-1} K^{-1}, k_3 = 135 Js^{-1} m^{-1} K^{-1}$)

Numerical value type: the answer is a number.

Answer: 40. · Key from source paper

Q21 JEE Main 2024 · 4 Apr · Shift 1 MCQ

On celcius scale the temperature of body increases by 40°C. The increase in temperature on Fahrenheit scale is :

(A) 68°F
(B) 75°F
(C) 72°F
(D) 70°F

Answer: (C) 72°F · Key from source paper

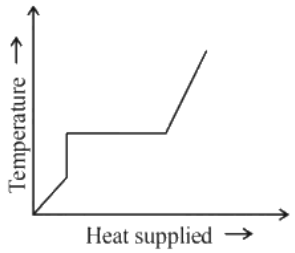
Q22 JEE Main 2024 · 30 Jan · Shift 2 MCQ

A block of ice at $-10°C$ is slowly heated and converted to steam at $100°C$. Which of the following curves represent the phenomenon qualitatively:

(see the figure above)

Q7. A block of ice at -10 °C is slowly heated and converted to steam at 100 °C. Which of the following curves represent the phenomenon qualitatively:

(1)



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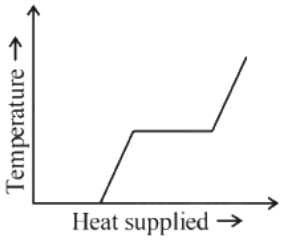

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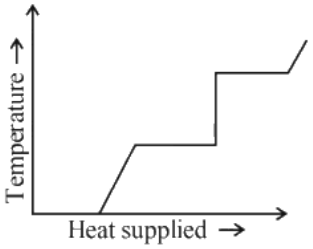

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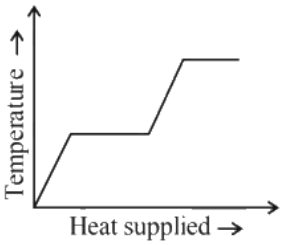


(A) *see figure*
(B) *see figure*
(C) *see figure*
(D) *see figure*

Answer: (D) · Key from source paper

Q23 JEE Main 2023 · 13 Apr · Shift 2 Numerical

Two plates A and B have thermal conductivities 84 W m^{-1} K^{-1} and 126 W m^{-1} K^{-1} respectively. They have same surface area and same thickness. They are placed in contact along their surfaces. If the temperatures of the outer surfaces of A and B are kept at 100°C and 0°C respectively, then the temperature of the surface of contact in steady state is _____ °C.

Numerical value type: the answer is a number.

Answer: 40. · Key from source paper

Q24 JEE Main 2023 · 12 Apr · Shift 1 MCQ

A body cools from 80°C to 60° in 5 minutes. The temperature for the surrounding is 20°C. The time it takes to cool from 60°C to 40°C is

(A) 450 s
(B) 420 s
(C) 500 s
(D) $\frac{25}{3}$ s

Answer: (C) 500 s · Key from source paper

Q25 JEE Main 2023 · 11 Apr · Shift 1 MCQ

On a temperature scale 'X', the boiling point of water is 65°X and the freezing point is -15°X. Assuming that the X scale is linear. The equivalent temperature corresponding to -95°X on the Fahrenheit scale would be

(A) -112°F
(B) -48°F
(C) -148°F
(D) -63°F

Answer: (C) -148°F · Key from source paper

Q26 JEE Main 2023 · 8 Apr · Shift 2 Numerical

A steel rod of length $1\ \mathrm{m}$ and cross-sectional area $10^{-4}\ \mathrm{m}^2$ is heated from $0^{\circ}\mathrm{C}$ to $200^{\circ}\mathrm{C}$ without being allowed to extend or bend. The compressive tension produced in the rod is _____ $\times 10^4\ \mathrm{N}$. (Given Young's modulus of steel $= 2 \times 10^{11}\ \mathrm{N\,m^{-2}}$, coefficient of linear expansion $= 10^{-5}\ \mathrm{K^{-1}}$)

Numerical value type: the answer is a number.

Answer: 4. · Key from source paper

Q27 JEE Main 2023 · 6 Apr · Shift 2 MCQ

A body cools in 7 minutes from $60^{\circ}\mathrm{C}$ to $40^{\circ}\mathrm{C}$. The temperature of the surrounding is $10^{\circ}\mathrm{C}$. The temperature of the body after the next 7 minutes will be

(A) $30^{\circ}\mathrm{C}$
(B) $32^{\circ}\mathrm{C}$
(C) $34^{\circ}\mathrm{C}$
(D) $28^{\circ}\mathrm{C}$

Answer: (D) $28^{\circ}\mathrm{C}$ · Key from source paper

Q28 JEE Main 2023 · 31 Jan · Shift 2 Numerical

A water heater of power 2000 W is used to heat water. The specific heat capacity of water is 4200 J kg $^{-1}$ K^{-1}. The efficiency of heater is 70%. Time required to heat 2 kg of water from 10°C to 60°C is _____ s.
(Assume that the specific heat capacity of water remains constant over the temperature range of the water).

Numerical value type: the answer is a number.

Answer: 300. · Key from source paper

Q29 JEE Main 2023 · 30 Jan · Shift 2 Numerical

A faulty thermometer reads 5°C in melting ice and 95°C in steam. The correct temperature on absolute scale will be _____ K when the faulty thermometer reads 41°C.

Numerical value type: the answer is a number.

Answer: 313. · Key from source paper

Q30 JEE Main 2023 · 29 Jan · Shift 1 Numerical

A body cools from $60^{\circ}\mathrm{C}$ to $40^{\circ}\mathrm{C}$ in 6 minutes. If, temperature of surroundings is $10^{\circ}\mathrm{C}$. Then, after the next 6 minutes, its temperature will be _____ $^{\circ}\mathrm{C}$.

Numerical value type: the answer is a number.

Answer: 28. · Key from source paper

Q31 JEE Main 2023 · 29 Jan · Shift 2 MCQ

Heat energy of 184 kJ is given to ice of mass 600 g at $-12\ ^{\circ}\mathrm{C}$, Specific heat of ice is $2222.3\ \mathrm{J\,kg^{-1}\,^{\circ}C^{-1}}$ and latent heat of ice is $336\ \mathrm{kJ\ kg^{-1}}$.
(A) Final temperature of system will be $0\ ^{\circ}\mathrm{C}$
(B) Final temperature of the system will be greater than $0\ ^{\circ}\mathrm{C}$
(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 D only
(B) B and D only
(C) A and E only
(D) A and C only

Answer: (A) A and D only · Key from source paper

Q32 JEE Main 2023 · 25 Jan · Shift 1 MCQ

A bowl filled with very hot soup cools from $98^{\circ}\mathrm{C}$ to $86^{\circ}\mathrm{C}$ in 2 minutes when the room temperature is $22^{\circ}\mathrm{C}$. How long it will take to cool from $75^{\circ}\mathrm{C}$ to $69^{\circ}\mathrm{C}$?

(A) 2 minute
(B) 1.4 minute
(C) 0.5 minute
(D) 1 minute

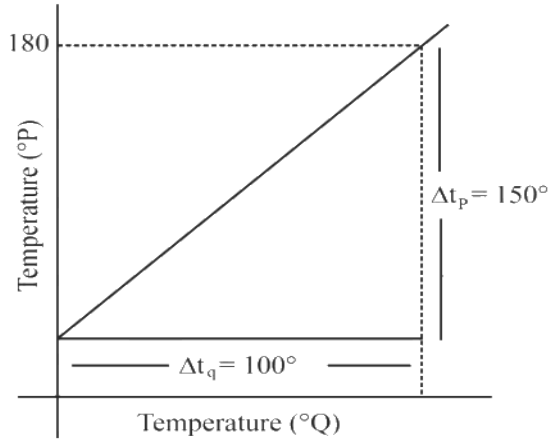
Answer: (B) 1.4 minute · Key from source paper

Q33 JEE Main 2023 · 25 Jan · Shift 2 MCQ

The graph between two temperature scales P and Q is shown in the figure. Between upper fixed point and lower fixed point there are 150 equal divisions of scale P and 100 divisions on scale Q. The relationship for conversion between the two scales is given by :

(see the figure above)

Q12. The graph between two temperature scales P and Q is shown in the figure. Between upper fixed point and lower fixed point there are 150 equal divisions of scale P and 100 divisions on scale Q. The relationship for conversion between the two scales is given by :



(1) $\frac{t_Q}{150} = \frac{t_P - 180}{100}$
(2) $\frac{t_Q}{100} = \frac{t_P - 30}{150}$
(3) $\frac{t_P}{180} = \frac{t_Q - 40}{100}$
(4) $\frac{t_Q}{100} = \frac{t_P - 180}{150}$

(A) $\frac{t_Q}{150} = \frac{t_P - 180}{100}$
(B) $\frac{t_Q}{100} = \frac{t_P - 30}{150}$
(C) $\frac{t_P}{180} = \frac{t_Q - 40}{100}$
(D) $\frac{t_Q}{100} = \frac{t_P - 180}{150}$

Answer: (B) $\frac{t_Q}{100} = \frac{t_P - 30}{150}$ · Key from source paper

Q34 JEE Main 2023 · 24 Jan · Shift 1 Numerical

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 $d \times 10^{-3}$ cm. The value of d will be _____, if coefficient of linear expansion of the metal is 1.6×10^{-5} /°C

Numerical value type: the answer is a number.

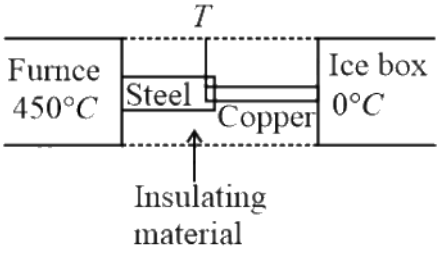
Answer: 12. · Key from source paper

Q35 JEE Main 2022 · 27 Jul · Shift 1 MCQ

If K_1 and K_2 are the thermal conductivities L_1 and L_2 are the lengths and A_1 and A_2 are the cross sectional areas of steel and copper rods respectively such that $\frac{K_2}{K_1}$ = 9, $\frac{A_1}{A_2}$ = 2, $\frac{L_1}{L_2}$ = 2. Then, for the arrangement as shown in the figure. The value of temperature T of the steel - copper junction in the

steady state will be
(see the figure above)

Q7. If K_1 and K_2 are the thermal conductivities L_1 and L_2 are the lengths and A_1 and A_2 are the cross sectional areas of steel and copper rods respectively such that $\frac{K_2}{K_1} = 9$, $\frac{A_1}{A_2} = 2$, $\frac{L_1}{L_2} = 2$. Then, for the arrangement as shown in the figure. The value of temperature T of the steel - copper junction in the steady state will be



(1) $18^\circ C$ (2) $14^\circ C$
(3) $45^\circ C$ (4) $150^\circ C$

(A) $18°C$
(B) $14°C$
(C) $45°C$
(D) $150°C$

Answer: (C) $45°C$ · Key from source paper

Q36 JEE Main 2022 · 27 Jul · Shift 1 MCQ

Read the following statements :
A. When small temperature difference between a liquid and its surrounding is doubled the rate of loss of heat of the liquid becomes twice.
B. Two bodies P and Q having equal surface areas are maintained at temperature $10°C$ and $20°C$. The thermal radiation emitted in a given time by P and Q are in the ratio 1 : 1.15
C. A carnot Engine working between 100 K and 400 K has an efficiency of 75%
D. When small temperature difference between a liquid and its surrounding is quadrupled, the rate of loss of heat of the liquid becomes twice.
Choose the correct answer from the options given below :

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

Answer: (A) A, B, C only · Key from source paper

Q37 JEE Main 2022 · 26 Jul · Shift 2 MCQ

An ice cube of dimensions $60\ \text{cm} \times 50\ \text{cm} \times 20\ \text{cm}$ is placed in an insulation box of wall thickness $1\ \text{cm}$. The box keeping the ice cube at $0°C$ of temperature is brought to a room of temperature $40°C$.

The rate of melting of ice is approximately: (Latent heat of fusion of ice is $3.4 \times 10^5\ \mathrm{J\ kg^{-1}}$ and thermal conducting of insulation wall is $0.05\ \mathrm{W\ m^{-1}\ {}^\circ C^{-1}}$)

(A) $61 \times 10^{-1}\ \mathrm{kg\ s^{-1}}$

(B) $61 \times 10^{-5}\ \mathrm{kg\ s^{-1}}$

(C) $208\ \mathrm{kg\ s^{-1}}$

(D) $30 \times 10^{-5}\ \mathrm{kg\ s^{-1}}$

Answer: (B) $61 \times 10^{-5}\ \mathrm{kg\ s^{-1}}$ · Key from source paper

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Q38 JEE Main 2022 · 25 Jul · Shift 1 Numerical

A unit scale is to be prepared whose length does not change with temperature and remains 20 cm, 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 40 cm and length of iron will be _____ cm.
$\alpha_{\text{iron}} = 1.2 \times 10^{-5}\ \mathrm{K^{-1}}$ and $\alpha_{\text{brass}} = 1.8 \times 10^{-5}\ \mathrm{K^{-1}}$.

Numerical value type: the answer is a number.

Answer: 60. · Key from source paper

Q39 JEE Main 2022 · 25 Jul · Shift 2 Numerical

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 $= 4200\ \mathrm{J\,kg^{-1}\,K^{-1}}$, Latent heat of ice $= 3.5 \times 10^5\ \mathrm{J\,kg^{-1}}$]

Numerical value type: the answer is a number.

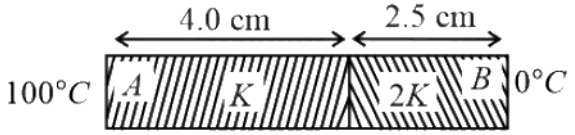
Answer: 90. · Key from source paper

Q40 JEE Main 2022 · 29 Jun · Shift 1 Numerical

As per the given figure, two plates A and B of thermal conductivity K and $2K$ are joined together to form a compound plate. The thickness of plates are $4.0\ \mathrm{cm}$ and $2.5\ \mathrm{cm}$ respectively and the area of cross-section is $120\ \mathrm{cm^2}$ for each plate. The equivalent thermal conductivity of the compound plate is $\left(1+\frac{5}{\alpha}\right)K$, then the value of α will be _____.

(see the figure above)

Q21. As per the given figure, two plates A and B of thermal conductivity K and $2K$ are joined together to form a compound plate. The thickness of plates are $4.0\ \mathrm{cm}$ and $2.5\ \mathrm{cm}$ respectively and the area of cross-section is $120\ \mathrm{cm^2}$ for each plate. The equivalent thermal conductivity of the compound plate is $\left(1+\frac{5}{\alpha}\right)K$, then the value of α will be _____ .



Numerical value type: the answer is a number.

Answer: 21. · Key from source paper

Q41 JEE Main 2022 · 29 Jun · Shift 2 MCQ

At what temperature a gold ring of diameter $6.230\ \text{cm}$ be heated so that it can be fitted on a wooden bangle of diameter $6.241\ \text{cm}$? 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

Answer: (D) 152.7°C · Key from source paper

Q42 JEE Main 2022 · 27 Jun · Shift 2 MCQ

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 $= 127^\circ\text{C}$,
Melting point of the bullet $= 327^\circ\text{C}$,
Latent heat of fusion of lead $= 2.5 \times 10^4\ \text{J kg}^{-1}$,
Specific heat capacity of lead $= 125\ \text{J kg K}^{-1}$)

(A) $125\ \text{m s}^{-1}$
(B) $500\ \text{m s}^{-1}$
(C) $250\ \text{m s}^{-1}$
(D) $600\ \text{m s}^{-1}$

Answer: (B) $500\ \text{m s}^{-1}$ · Key from source paper

Q43 JEE Main 2022 · 26 Jun · Shift 2 Numerical

A geyser heats water flowing at a rate of $2.0\ \text{kg}$ 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 $= 8 \times 10^3\ \text{J g}^{-1}$, Specific heat of water $= 4.2\ \text{J g}^{-1\circ}\text{C}^{-1}$]

Numerical value type: the answer is a number.

Answer: 42. · Key from source paper

Q44 JEE Main 2022 · 25 Jun · Shift 1 Numerical

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

Numerical value type: the answer is a number.

Answer: 31. · Key from source paper

Q45 JEE Main 2022 · 25 Jun · Shift 2 MCQ

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

(A) $2.4 \times 10^{6}\ \mathrm{cm}^3$
(B) $1.2 \times 10^{5}\ \mathrm{cm}^3$
(C) $6 \times 10^{4}\ \mathrm{cm}^3$
(D) $4.8 \times 10^{5}\ \mathrm{cm}^3$

Answer: (B) $1.2 \times 10^{5}\ \mathrm{cm}^3$ · Key from source paper

Q46 JEE Main 2022 · 25 Jun · Shift 2 MCQ

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

(A) $1.5\ \mathrm{kg}$
(B) $5.8\ \mathrm{kg}$
(C) $2.9\ \mathrm{kg}$
(D) $3.8\ \mathrm{kg}$

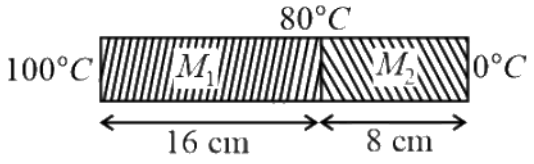
Answer: (C) $2.9\ \mathrm{kg}$ · Key from source paper

Q47 JEE Main 2022 · 24 Jun · Shift 1 MCQ

Two metallic blocks M_1 and M_2 of same area of cross-section are connected to each other (as shown in figure). If the thermal conductivity of M_2 is K then the thermal conductivity of M_1 will be : [Assume steady state heat conduction]

(see the figure above)

Q8. Two metallic blocks M_1 and M_2 of same area of cross-section are connected to each other (as shown in figure). If the thermal conductivity of M_2 is K then the thermal conductivity of M_1 will be : [Assume steady state heat conduction]



(1) $10K$
(2) $8K$
(3) $12.5K$
(4) $2K$

(A) $10K$
(B) $8K$
(C) $12.5K$
(D) $2K$

Answer: (B) $8K$ · Key from source paper

Q48 JEE Main 2022 · 24 Jun · Shift 2 MCQ

A $100\ \mathrm{g}$ of iron nail is hit by a $1.5\ \mathrm{kg}$ hammer striking at a velocity of $60\ \mathrm{ms}^{-1}$. 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 $= 0.42\ \mathrm{Jg}^{-1}\,^{\circ}\mathrm{C}^{-1}$]

(A) $16.07^{\circ}\mathrm{C}$
(B) $6.75^{\circ}\mathrm{C}$
(C) $1600^{\circ}\mathrm{C}$
(D) $675^{\circ}\mathrm{C}$

Answer: (A) $16.07^{\circ}\mathrm{C}$ · Key from source paper

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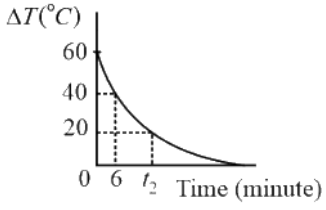
Q49 JEE Main 2022 · 24 Jun · Shift 2 Numerical

In an experiment to verify Newton's law of cooling. a graph is plotted between. the temperature difference (ΔT) of the water and surroundings and time as shown in figure. The initial temperature of water is taken as $80^{\circ}\mathrm{C}$. The value of t_2 as mentioned in the graph will be
(see the figure above)

Q22. In an experiment to verify Newton's law of cooling. a graph is plotted between. the temperature difference (ΔT) of the water and surroundings and time as shown in figure. The initial temperature of water is taken as $80^{\circ}\mathrm{C}$. The value of t_2 as mentioned in the graph will be



Numerical value type: the answer is a number.

Answer: 16. · Key from source paper

Q50 JEE Main 2021 · 1 Sep · Shift 2 MCQ

Due to cold weather, a 1 m water pipe of cross-sectional area 1 cm^2 is filled with ice at $-10\ ^{\circ}\mathrm{C}$. Resistive heating is used to melt the ice. Current of 0.5 A is passed through $4\ \mathrm{k}\Omega$ 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 $= 3.33 \times 10^5\ \mathrm{J\ kg}^{-1}$, specific heat of ice $= 2 \times 10^3\ \mathrm{J\ kg}^{-1}\ ^{\circ}\mathrm{C}^{-1}$ and density of ice $= 10^3\ \mathrm{kg\ m}^{-3}$)

(A) 3.53 s
(B) 0.353 s
(C) 35.3 s
(D) 70.6 s

Answer: (C) 35.3 s · Key from source paper

Q51 JEE Main 2021 · 1 Sep · Shift 2 Numerical

A steel rod with $y = 2.0 \times 10^{11}$ N m^{-2} and $\alpha = 10^{-5}$ °C^{-1} of length 4 m and area of cross-section 10 cm^2 is heated from 0°C to 400°C without being allowed to extend. The tension produced in the rod is $x \times 10^5$ N where the value of x is _____.

Numerical value type: the answer is a number.

Answer: 8. · Key from source paper

Q52 JEE Main 2021 · 31 Aug · Shift 2 MCQ

Two thin metallic spherical shells of radii r_1 and r_2 $r_1 < r_2$ are placed with their centres coinciding. A material of thermal conductivity K is filled in the space between the shells. The inner shell is maintained at temperature θ_1 and the outer shell at temperature θ_2 $\theta_1 < \theta_2$. The rate at which heat flows radially through the material is :

(A) $\frac{K\theta_2-\theta_1}{r_2-r_1}$
(B) $\frac{K\theta_2-\theta_1 r_2-r_1}{4\pi r_1 r_2}$
(C) $\frac{\pi K r_1 r_2 \theta_2-\theta_1}{r_2-r_1}$
(D) $\frac{4\pi K r_1 r_2 \theta_2-\theta_1}{r_2-r_1}$

Answer: (D) $\frac{4\pi K r_1 r_2 \theta_2-\theta_1}{r_2-r_1}$ · Key from source paper

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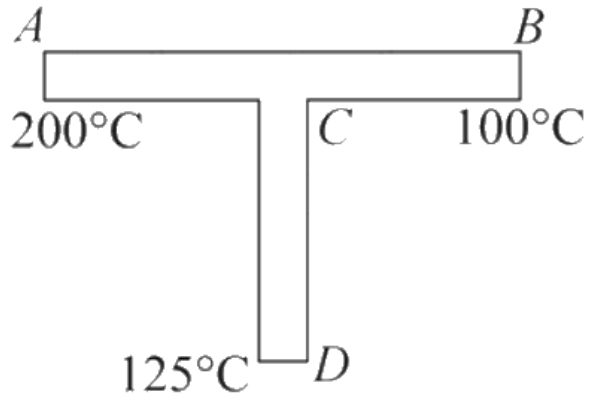
Q53 JEE Main 2021 · 27 Aug · Shift 1 Numerical

A rod CD of thermal resistance 10.0 KW^{-1} is joined at the middle of an identical rod AB as shown in figure. The ends A, B and D are maintained at 200°C, 100°C and 125°C respectively. The heat current in CD is P W. The value of P is

(see the figure above)

Q24. A rod CD of thermal resistance $10.0\,\mathrm{KW}^{-1}$ is joined at the middle of an identical rod AB as shown in figure. The ends A, B and D are maintained at $200^{\circ}\mathrm{C}, 100^{\circ}\mathrm{C}$ and $125^{\circ}\mathrm{C}$ respectively. The heat current in CD is P W. The value of P is



Numerical value type: the answer is a number.

Answer: 2. · Key from source paper

Q54 JEE Main 2021 · 27 Aug · Shift 2 MCQ

The height of victoria's falls is $63\ \mathrm{m}$. What is the difference in the temperature of water at the top and at the bottom of the fall? [Given $1\ \mathrm{cal} = 4.2\ \mathrm{J}$ and specific heat of water $= 1\ \mathrm{cal\ g^{-1}\,^{\circ}C^{-1}}$]

(A) $14.76\ ^{\circ}\mathrm{C}$
(B) $1.476\ ^{\circ}\mathrm{C}$
(C) $0.147\ ^{\circ}\mathrm{C}$
(D) $0.014\ ^{\circ}\mathrm{C}$

Answer: (C) $0.147\ ^{\circ}\mathrm{C}$ · Key from source paper

Q55 JEE Main 2021 · 26 Aug · Shift 2 MCQ

The temperature of equal masses of three different liquids x, y and z are $10^{\circ}\mathrm{C}$, $20^{\circ}\mathrm{C}$ and $30^{\circ}\mathrm{C}$ respectively. The temperature of mixture when x is mixed with y is $16^{\circ}\mathrm{C}$ and that when y is mixed with z is $26^{\circ}\mathrm{C}$. The temperature of mixture when x and z are mixed will be :

(A) $25.62^{\circ}\mathrm{C}$
(B) $20.28^{\circ}\mathrm{C}$
(C) $28.32^{\circ}\mathrm{C}$
(D) $23.84^{\circ}\mathrm{C}$

Answer: (D) $23.84^{\circ}\mathrm{C}$ · Key from source paper

Q56 JEE Main 2021 · 27 Jul · Shift 1 MCQ

A body takes $4\ \mathrm{min}$ to cool from $61^{\circ}\mathrm{C}$ to $59^{\circ}\mathrm{C}$. If the temperature of the surroundings is $30^{\circ}\mathrm{C}$, the time taken by the body to cool from $51^{\circ}\mathrm{C}$ to $49^{\circ}\mathrm{C}$ is:

(A) 4 min.
(B) 3 min.
(C) 8 min.
(D) 6 min.

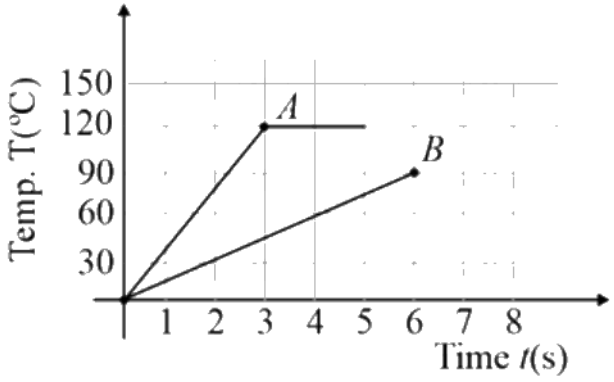
Answer: (D) 6 min. · Key from source paper

Q57 JEE Main 2021 · 25 Jul · Shift 1 MCQ

Two different metal bodies A and B of equal mass are heated at a uniform rate under similar conditions. The variation of temperature of the bodies is graphically represented as shown in the figure. The ratio of specific heat capacities is:

(see the figure above)

Q7. Two different metal bodies A and B of equal mass are heated at a uniform rate under similar conditions. The variation of temperature of the bodies is graphically represented as shown in the figure. The ratio of specific heat capacities is:



(1) $\frac{8}{3}$
(2) $\frac{3}{8}$
(3) $\frac{3}{4}$
(4) $\frac{4}{3}$

(A) $\frac{8}{3}$
(B) $\frac{3}{8}$
(C) $\frac{3}{4}$
(D) $\frac{4}{3}$

Answer: (B) $\frac{3}{8}$ · Key from source paper

Q58 JEE Main 2021 · 22 Jul · Shift 1 Numerical

In 5 minutes, a body cools from 75 °C to 65 °C at room temperature of 25 °C. The temperature of body at the end of next 5 minutes is _____ °C.

Numerical value type: the answer is a number.

Answer: 57. · Key from source paper

Q59 JEE Main 2021 · 17 Mar · Shift 1 MCQ

Two identical metal wires of thermal conductivities K_1 and K_2 respectively are connected in series. The effective thermal conductivity of the combination is:

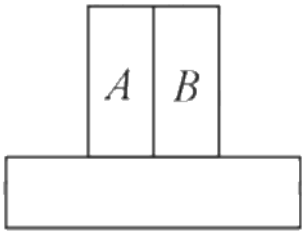
(A) $\frac{2K_1K_2}{K_1+K_2}$
(B) $\frac{K_1+K_2}{2K_1K_2}$
(C) $\frac{K_1+K_2}{K_1K_2}$
(D) $\frac{K_1K_2}{K_1+K_2}$

Answer: (A) $\frac{2K_1K_2}{K_1+K_2}$ · Key from source paper

Q60 JEE Main 2021 · 16 Mar · Shift 2 MCQ

A bimetallic strip consists of metals A and B. It is mounted rigidly as shown. The metal A has higher coefficient of expansion compared to that of metal B. When the bimetallic strip is placed in a cold both, it will :
(see the figure above)

Q6. A bimetallic strip consists of metals A and B. It is mounted rigidly as shown. The metal A has higher coefficient of expansion compared to that of metal B. When the bimetallic strip is placed in a cold both, it will :



(1) Bend towards the right
(2) Not bend but shrink
(3) Neither bend nor shrink
(4) Bend towards the left

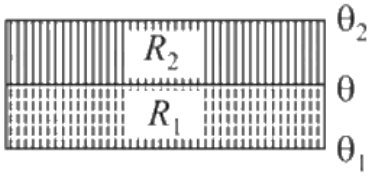
(A) Bend towards the right
(B) Not bend but shrink
(C) Neither bend nor shrink
(D) Bend towards the left

Answer: (D) Bend towards the left · Key from source paper

Q61 JEE Main 2021 · 26 Feb · Shift 1 MCQ

The temperature θ at the junction of two insulating sheets, having thermal resistances R_1 and R_2 as well as top and bottom temperatures θ_1 and θ_2 (as shown in figure) is given by :
(see the figure above)

Q10. The temperature θ at the junction of two insulating sheets, having thermal resistances R_1 and R_2 as well as top and bottom temperatures θ_1 and θ_2 (as shown in figure) is given by :



(1) $\frac{\theta_1 R_2 - \theta_2 R_1}{R_2 - R_1}$
(2) $\frac{\theta_2 R_2 - \theta_1 R_1}{R_2 - R_1}$
(3) $\frac{\theta_1 R_2 + \theta_2 R_1}{R_1 + R_2}$
(4) $\frac{\theta_1 R_1 + \theta_2 R_2}{R_1 + R_2}$

(A) $\frac{\theta_1 R_2 - \theta_2 R_1}{R_2 - R_1}$
(B) $\frac{\theta_2 R_2 - \theta_1 R_1}{R_2 - R_1}$
(C) $\frac{\theta_1 R_2 + \theta_2 R_1}{R_1 + R_2}$
(D) $\frac{\theta_1 R_1 + \theta_2 R_2}{R_1 + R_2}$

Answer: (C) $\frac{\theta_1 R_2 + \theta_2 R_1}{R_1 + R_2}$ · Key from source paper

Q62 JEE Main 2021 · 25 Feb · Shift 1 MCQ

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

Answer: (C) Both A and R are true but R is NOT the correct explanation of A · Key from source paper

Q63 JEE Main 2021 · 24 Feb · Shift 1 MCQ

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 ΔT, so that its new temperature is $T + \Delta T$. Calculate the increase in the volume of the metal box.

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

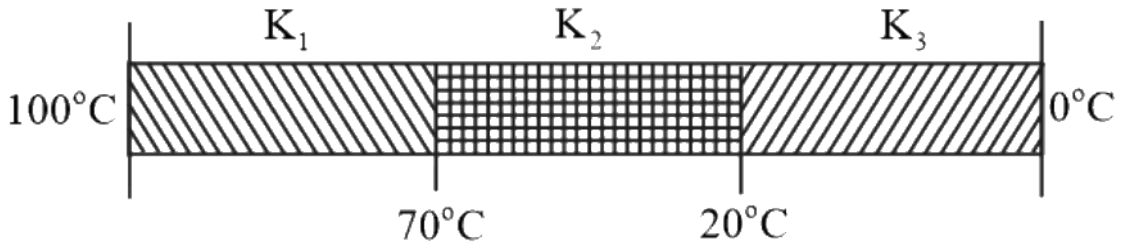
Answer: (B) $3a^3\alpha\Delta T$ · Key from source paper

Q64 JEE Main 2020 · 6 Sep · Shift 2 MCQ

Three rods of identical cross-section and length are made of three different materials of thermal conductivity K_1, K_2 and K_3, respectively. They are joined together at their ends to make a long rod (see figure). One end of the long rod is maintained at $100^\circ\mathrm{C}$ and the other at $0^\circ\mathrm{C}$ (see figure). If the joints of the rod are at $70^\circ\mathrm{C}$ and $20^\circ\mathrm{C}$ in steady and there is no loss of energy from the surface of the rod, the correct relationship between K_1, K_2 and K_3 is :

(see the figure above)

Q7. Three rods of identical cross-section and length are made of three different materials of thermal conductivity K_1, K_2 and K_3, respectively. They are joined together at their ends to make a long rod (see figure). One end of the long rod is maintained at $100^\circ\mathrm{C}$ and the other at $0^\circ\mathrm{C}$ (see figure). If the joints of the rod are at $70^\circ\mathrm{C}$ and $20^\circ\mathrm{C}$ in steady and there is no loss of energy from the surface of the rod, the correct relationship between K_1, K_2 and K_3 is :



(1) $K_1 : K_3 = 2 : 3$, $K_2 : K_3 = 2 : 5$

(2) $K_1 < K_2 < K_3$

(3) $K_1 : K_2 = 5 : 2$, $K_1 : K_3 = 3 : 5$

(4) $K_1 > K_2 > K_3$

(A) $K_1 : K_3 = 2 : 3$, $K_2 : K_3 = 2 : 5$

(B) $K_1 < K_2 < K_3$

(C) $K_1 : K_2 = 5 : 2$, $K_1 : K_3 = 3 : 5$

(D) $K_1 > K_2 > K_3$

Answer: (A) $K_1 : K_3 = 2 : 3$, $K_2 : K_3 = 2 : 5$ · Key from source paper

Q65 JEE Main 2020 · 5 Sep · Shift 1 MCQ

A bullet of mass 5 gram, travelling with a speed of 210 m s^{-1} strikes a fixed wooden target. One half of its kinetic energy is converted into heat in the wood. The rise of temperature of the bullet if the specific heat of its material is 0. 030 (gram $^\circ$C)$^{-1}$ (1 calorie = 4 .2 $\times 10^7$ ergs) close to :

(A) 5 ° C

(B) 3 ° C

(C) 2 ° C

(D) 4 ° C

Answer: (A)

1. 5°C

· Key from source paper

Q66 JEE Main 2020 · 5 Sep · Shift 2 MCQ

Two different wires having lengths L_1 and L_2 and respective temperature coefficient of linear expansion α_1 and α_2, are joined end-to-end. Then the effective temperature coefficient of linear expansion is :

(A) $\frac{\alpha_1 L_1+\alpha_2 L_2}{L_1+L_2}$

(B) $2\sqrt{\alpha_1\alpha_2}$

(C) $\frac{\alpha_1+\alpha_2}{2}$

(D) $4\frac{\alpha_1\alpha_2}{\alpha_1+\alpha_2}\frac{L_2L_1}{(L_2+L_1)^2}$

Answer: (A) $\frac{\alpha_1 L_1+\alpha_2 L_2}{L_1+L_2}$ · Key from source paper

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Q67 JEE Main 2020 · 4 Sep · Shift 1 MCQ

The specific heat of water = $4200\ \mathrm{J\ kg^{-1}\ K^{-1}}$ and the latent heat of ice = $3.4\times10^5\ \mathrm{J\ kg^{-1}}$. 100 grams of ice at $0\ ^\circ\mathrm{C}$ is placed in 200 g of water at $25\ ^\circ\mathrm{C}$. The amount of ice that will melt as the temperature of water reaches $0\ ^\circ\mathrm{C}$ is close to (in grams)

(A) 61.7

(B) 63.8

(C) 69.3

(D) 64.6

Answer: (A) 61.7 · Key from source paper

Q68 JEE Main 2020 · 3 Sep · Shift 1 Numerical

A bakelite beaker has volume capacity of $500\ \mathrm{cc}$ at $30^\circ\mathrm{C}$. When it is partially filled with $\mathrm{V_m}$ volume (at $30^\circ\mathrm{C}$) of mercury, it is found that the unfilled volume of the beaker remains constant as temperature is varied. If $\gamma_{(\mathrm{beaker})}=6\times10^{-6}\ ^\circ\mathrm{C^{-1}}$ and $\gamma_{(\mathrm{mercury})}=1.5\times10^{-4}\ ^\circ\mathrm{C^{-1}}$, where γ is the coefficient of volume expansion, then $\mathrm{V_m}$ (in cc) is close to _____

Numerical value type: the answer is a number.

Answer: 20. · Key from source paper

Q69 JEE Main 2020 · 3 Sep · Shift 2 MCQ

A metallic sphere cools from $50\ ^\circ\mathrm{C}$ to $40\ ^\circ\mathrm{C}$ in $300\ \mathrm{s}$. If atmospheric temperature around is $20\ ^\circ\mathrm{C}$, then the sphere's temperature after the nest 5 minutes will be close to:

(A) $31\ ^\circ\mathrm{C}$
(B) $33\ ^\circ\mathrm{C}$
(C) $28\ ^\circ\mathrm{C}$
(D) $35\ ^\circ\mathrm{C}$

Answer: (B) $33\ ^\circ\mathrm{C}$ · Key from source paper

Q70 JEE Main 2020 · 3 Sep · Shift 2 MCQ

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

(A) 2
(B) 4
(C) 3.2
(D) 2.6

Answer: (A) 2 · Key from source paper

Q71 JEE Main 2020 · 2 Sep · Shift 2 MCQ

When the temperature of a metal wire is increased from $0^\circ\mathrm{C}$ to $10^\circ\mathrm{C}$, its length increases by 0.02% .The percentage change in its mass density will be closed to:

(A) 0.06
(B) 2.3
(C) 0.008
(D) 0.8

Answer: (A) 0.06 · Key from source paper

Q72 JEE Main 2020 · 8 Jan · Shift 2 Numerical

Three containers C_1, C_2 and C_3 have water at different temperatures. The table below shows the final temperature T when different amounts of water (given in liters) are taken from each container and mixed (assume no loss of heat during the process)

(see the figure above)

The value of θ (in $^\circ\mathrm{C}$ to the nearest integer) is_____

EdLoop JEE

Q23. Three containers C_1, C_2 and C_3 have water at different temperatures. The table below shows the final temperature T when different amounts of water (given in liters) are taken from each container and mixed (assume no loss of heat during the process)

C_1	C_2	C_3	T
$1l$	$2l$	$--$	60°C
$--$	$1l$	$2l$	30°C
$2l$	$--$	$1l$	60°C
$1l$	$1l$	$1l$	θ

The value of θ (in $^\circ\text{C}$ to the nearest integer) is_____

Numerical value type: the answer is a number.

Answer: 50. · Key from source paper

Q73 JEE Main 2020 · 7 Jan · Shift 1 Numerical

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

Numerical value type: the answer is a number.

Answer: 60. · Key from source paper

Q74 JEE Main 2020 · 7 Jan · Shift 2 Numerical

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

Numerical value type: the answer is a number.

Answer: 40. · Key from source paper

Q75 JEE Main 2019 · 12 Apr · Shift 1 MCQ

When M_1 gram of ice at -10^oC (specific heat $= 0.5\ \text{cal g}^{-1}\ ^\text{o}\text{C}^{-1}$) is added to M_2 gram of water at $50\ ^o\text{C}$, finally no ice is left and the water is at $0\ ^o\text{C}$. The value of latent heat of ice, in cal g^{-1} is:

(A) $\frac{50M_2}{M_1}$

(B) $\frac{5M_1}{M_2} - 50$

(C) $\frac{5M_2}{M_1} - 5$

(D) $\frac{50M_2}{M_1} - 5$

Answer: (D) $\frac{50M_2}{M_1} - 5$ · Key from source paper

Q76 JEE Main 2019 · 12 Apr · Shift 2 MCQ

A uniform cylindrical rod of length L and radius r, is made from a material whose Young's modulus of Elasticity equals Y. When this rod is heated by temperature T and simultaneously subjected to a net longutudinal compressive force F, its length remains unchanged. The coefficient of volume expansion, of the material of the rod, is (nearly) equal to:

(A) $F/\left(3\pi r^2 YT\right)$
(B) $9F/\left(\pi r^2 YT\right)$
(C) $6F/\left(\pi r^2 YT\right)$
(D) $3F/\left(\pi r^2 YT\right)$

Answer: (D) $3F/\left(\pi r^2 YT\right)$ · Key from source paper

Q77 JEE Main 2019 · 12 Apr · Shift 2 MCQ

1 kg of water, at $20\ ^\circ\mathrm{C}$ is heated in an electric kettle whose heating element has a mean (temperature averaged) resistance of $20\ \Omega$. The rms voltage in the mains is 200 V. Ignoring heat loss from the kettle, time taken for water to evaporate fully is close to
[Specific heat of water = $4200\ \mathrm{J\ kg^{-1}\ ^\circ C^{-1}}$ Latent heat of water = $2260\ \mathrm{kJ\ kg^{-1}}$]

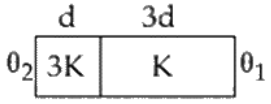
(A) 3 min
(B) 16 min
(C) 22 min
(D) 10 min

Answer: (C) 22 min · Key from source paper

Q78 JEE Main 2019 · 9 Apr · Shift 2 MCQ

Two materials having coefficients of thermal conductivity 3K and K and thickness d and 3d respectively, are joined to form a slab as shown in the figure. The temperatures of the outer surfaces are θ_2 and θ_1 respectively, ($\theta_2 > \theta_1$). The temperature at the interface is
(see the figure above)

Q10. Two materials having coefficients of thermal conductivity 3K and K and thickness d and 3d respectively, are joined to form a slab as shown in the figure. The temperatures of the outer surfaces are θ_2 and θ_1 respectively, $(\theta_2 > \theta_1)$. The temperature at the interface is



(1) $\frac{\theta_2+\theta_1}{2}$
(2) $\frac{\theta_1}{6}+\frac{5\theta_2}{6}$
(3) $\frac{\theta_1}{3}+\frac{2\theta_2}{3}$
(4) $\frac{\theta_1}{10}+\frac{9\theta_2}{10}$

(A) $\frac{\theta_2+\theta_1}{2}$
(B) $\frac{\theta_1}{6}+\frac{5\theta_2}{6}$
(C) $\frac{\theta_1}{3}+\frac{2\theta_2}{3}$
(D) $\frac{\theta_1}{10}+\frac{9\theta_2}{10}$

Answer: (D) $\frac{\theta_1}{10}+\frac{9\theta_2}{10}$ · Key from source paper

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Q79 JEE Main 2019 · 9 Apr · Shift 2 MCQ

A massless spring (k = 800 N/m), attached with a mass (500 g) is completely immersed in 1 kg of water. The spring is stretched by 2 cm and released so that it starts vibrating. What would be the order of magnitude of the change in the temperature of water when the vibrations stop completely? (Assume that the water container and spring receive negligible heat and specific heat of mass = 400 J/kg K, specific heat of water = 4184 J/kg K)

(A) 10^{-5} K
(B) 10^{-1} K
(C) 10^{-3} K
(D) 10^{-4} K

Answer: (A) 10^{-5} K · Key from source paper

Q80 JEE Main 2019 · 8 Apr · Shift 1 MCQ

A thermally insulated vessel contains 150 g of water at 0°C. Then the air from the vessel is pumped out adiabatically. A fraction of water turns into ice and the rest evaporates at 0°C itself. The mass of evaporated water will be closest to: (Latent heat of vaporization of water $= 2.10 \times 10^6\ \mathrm{J\,kg^{-1}}$ and Latent heat of Fusion of water $= 3.36 \times 10^5\ \mathrm{J\,kg^{-1}}$)

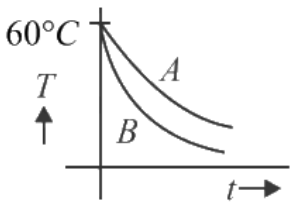
(A) 35 g
(B) 20 g
(C) 130 g
(D) 150 g

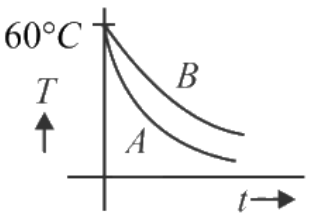
Answer: (B) 20 g · Key from source paper

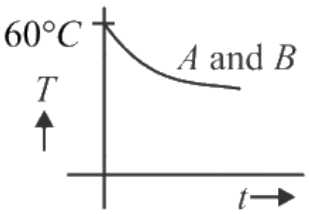
Q81 JEE Main 2019 · 8 Apr · Shift 1 MCQ

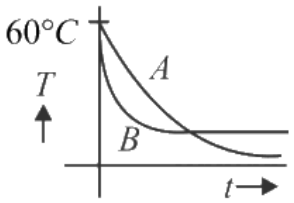
Two identical beakers A and B contain equal volumes of two different liquids at 60°C each and left to cool down. Liquid in A has density of $8 \times 10^2\ \mathrm{kg\ m^{-3}}$ and specific heat of 2000 $\mathrm{J\,kg^{-1}K^{-1}}$ while the liquid in B has density $10^3\ \mathrm{kg\ m^{-3}}$ and specific heat of 4000 $\mathrm{J\,kg^{-1}K^{-1}}$. Which of the following best describes their temperature versus time graph schematically? (assume the emissivity of both the beakers to be the same)

Q12. Two identical beakers A and B contain equal volumes of two different liquids at 60°C each and left to cool down. Liquid in A has density of 8×10^2 kg m^{-3} and specific heat of 2000 J kg^{-1}K^{-1} while the liquid in B has density 10^3 kg m^{-3} and specific heat of 4000 J kg^{-1}K^{-1}. Which of the following best describes their temperature versus time graph schematically? (assume the emissivity of both the beakers to be the same)

(1) 

(2) 

(3) 

(4) 

(A) *see figure*
(B) *see figure*
(C) *see figure*
(D) *see figure*

Answer: (B) · Key from source paper

Q82 JEE Main 2019 · 12 Jan · Shift 1 MCQ

A cylinder of radius R is surrounded by a cylindrical shell of inner radius R and outer radius $2R$. The thermal conductivity of the material of the inner cylinder is K_1 and that of the outer cylinder is K_2. Assuming no loss of heat, the effective thermal conductivity of the system for heat flowing along the length of the cylinder is:

(A) $\frac{2K_1+3K_2}{5}$
(B) $\frac{K_1+K_2}{2}$
(C) $K_1 + K_2$
(D) $\frac{K_1+3K_2}{4}$

Answer: (D) $\frac{K_1+3K_2}{4}$ · Key from source paper

Q83 JEE Main 2019 · 11 Jan · Shift 1 MCQ

Ice at -20°C is added to 50 g of water at 40°C, When the temperature of the mixture reaches 0°C, it is found that 20 g of ice is still unmelted. The amount of ice added to the water was close to (Specific heat of water = 4.2 J/g/°C Specific heat of Ice = 2.1 J/g/°C Heat of fusion of water at 0°C = 334 J/g)

(A) 50 g
(B) 100 g
(C) 60 g
(D) 40 g

Answer: (D) 40 g · Key from source paper

Q84 JEE Main 2019 · 11 Jan · Shift 2 MCQ

Two rods A and B of identical dimensions are at temperature 30°C. If A is heated upto 180°C and B upto T°C, then the new lengths are the same. If the ratio of the coefficients of linear expansion of A and B is 4 : 3, then the value of T is

(A) 230°C
(B) 270°C
(C) 200°C
(D) 250°C

Answer: (A) 230°C · Key from source paper

Q85 JEE Main 2019 · 11 Jan · Shift 2 MCQ

A thermometer graduated according to a linear scale reads a value x_0 when in contact with boiling water, and $x_0/3$ when in contact with ice. What is the temperature of an object in °C, if this thermometer in the contact with the object reads $x_0/2$?

(A) 25
(B) 60
(C) 40
(D) 35

Answer: (A) 25 · Key from source paper

Q86 JEE Main 2019 · 11 Jan · Shift 2 MCQ

When 100 g of a liquid A at 100°C is added to 50 g of a liquid B at temperature 75°C, the temperature of the mixture becomes 90°C. The temperature of the mixture, if 100 g of liquid A at 100 °C is added to 50 g of liquid B at 50°C, will be:

(A) 85°C
(B) 60°C
(C) 80°C
(D) 70°C

Answer: (C) 80°C · Key from source paper

Q87 JEE Main 2019 · 11 Jan · Shift 2 MCQ

A metal ball of mass 0.1 kg is heated upto 500°C and dropped into a vessel of heat capacity 800JK^{-1} and containing 0.5 kg water. The initial temperature of water and vessel is 30°C. What is the approximate percentage increment in the temperature of the water? [Specific Heat Capacities of water and metal are, respectively, 4200Jkg^{-1}K^{-1} and 400Jkg^{-1}K^{-1}]

(A) 15%
(B) 30%
(C) 25%
(D) 20%

Answer: (D) 20% · Key from source paper

Q88 JEE Main 2019 · 10 Jan · Shift 1 MCQ

A heat source at $T = 10^3$ K is connected to another heat reservoir at $T = 10^2$ K by a copper slab which is 1 m thick. Given that the thermal conductivity of copper is 0.1 W K^{-1} m^{-1}, the energy flux through it in the steady-state is:

(A) 65 W m^{-2}
(B) 120 W m^{-2}
(C) 90 W m^{-2}
(D) 200 W m^{-2}

Answer: (C) 90 W m^{-2} · Key from source paper

Q89 JEE Main 2019 · 10 Jan · Shift 2 MCQ

An unknown metal of mass $192\ g$ heated to a temperature of $100^{\circ}C$ was immersed into a brass calorimeter of mass $128\ g$ containing $240\ g$ of water at a temperature of $8.4^{o}C$. Calculate the specific heat of the unknown metal if water temperature stabilizes at $21.5^{o}C$. (Specific heat of brass is $394 J\ kg^{-1}K^{-1}$)

(A) $916\ J\ kg^{-1}K^{-1}$
(B) $458\ J\ kg^{-1}K^{-1}$
(C) $654\ J\ kg^{-1}K^{-1}$
(D) $1232\ J\ kg^{-1}K^{-1}$

Answer: (A) $916\ J\ kg^{-1}K^{-1}$ · Key from source paper

Q90 JEE Main 2019 · 9 Jan · Shift 1 MCQ

A rod, of length L at room temperature and uniform area of cross section A, is made of a metal having coefficient of linear expansion $\alpha\ /^{\circ}C$ It is observed that an external compressive force F is applied on each of its ends, prevents any change in the length of the rod, when its temperature rises by ΔT K Young's modulus, Y for this metal is:

(A) $\frac{F}{A\alpha\Delta T - 273}$
(B) $\frac{2F}{A\alpha\Delta T}$
(C) $\frac{F}{A\alpha\Delta T}$
(D) $\frac{F}{2A\,\alpha\Delta T}$

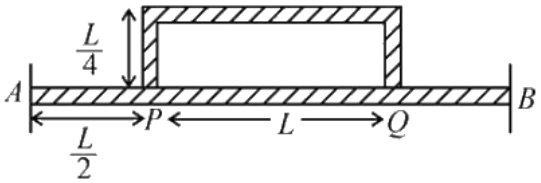
Answer: (C) $\frac{F}{A\alpha\Delta T}$ · Key from source paper

Q91 JEE Main 2019 · 9 Jan · Shift 1 MCQ

Temperature difference of $120°C$ is maintained between two ends of a uniform rod AB of length $2L$. Another bent rod PQ, of same cross-section as AB and length $\frac{3L}{2}$, is connected across AB (See figure). In steady state, temperature difference between P and Q will be close to:

(see the figure above)

Q11. Temperature difference of 120^oC is maintained between two ends of a uniform rod AB of length $2L$. Another bent rod PQ, of same cross-section as AB and length $\frac{3L}{2}$, is connected across AB (See figure). In steady state, temperature difference between P and Q will be close to:



(1) 45^oC (2) 35^oC
(3) 60^oC (4) 75^oC

(A) $45°C$
(B) $35°C$
(C) $60°C$
(D) $75°C$

Answer: (A) $45°C$ · Key from source paper

Q92 JEE Main 2018 · 15 Apr · Shift 2 MCQ

A body takes 10 minutes to cool from $60°\mathrm{C}$ to $50°\mathrm{C}$. The temperature of surroundings is constant at $25°\mathrm{C}$. Then, the temperature of the body after next 10 minutes will be approximately

(A) $43°\mathrm{C}$
(B) $47°\mathrm{C}$
(C) $41°\mathrm{C}$
(D) $45°\mathrm{C}$

Answer: (A) $43°\mathrm{C}$ · Key from source paper

Q93 JEE Main 2017 · 9 Apr · Online MCQ

A steel rail of length 5 m and area of cross section $40\ \mathrm{cm}^2$ is prevented from expanding along its length while the temperature rises by $10^\circ\mathrm{C}$. If coefficient of linear expansion and Young's modulus of steel are $1.2 \times 10^{-5}\ \mathrm{K}^{-1}$ and $2 \times 10^{11}\ \mathrm{N\,m}^{-2}$ respectively, the force developed in the rail is approximately:

(A) 2×10^7 N
(B) 2×10^9 N
(C) 3×10^{-5} N
(D) 1×10^5 N

Answer: (D) 1×10^5 N · Key from source paper

Q94 JEE Main 2017 · 8 Apr · Online MCQ

A compressive force, F is applied at the two ends of a long thin steel rod. It is heated, simultaneously, such that its temperature increases by ΔT. The net change in its length is zero. Let l be the length of the rod, A its area of cross-section, Y its Young's modulus, and α its coefficient of linear expansion. Then, F is equal to:

(A) $lAY\alpha\,\Delta T$
(B) $AY\alpha\,\Delta T$
(C) $\frac{AY}{\alpha\Delta T}$
(D) $l^2Y\alpha\,\Delta T$

Answer: (B) $AY\alpha\,\Delta T$ · Key from source paper

Q95 JEE Main 2017 · 8 Apr · Online MCQ

In an experiment, a sphere of aluminium of mass 0.20 kg is heated up to $150^\circ\mathrm{C}$. Immediately, it is put into water of volume 150 cc at $27^\circ\mathrm{C}$ kept in a calorimeter of water equivalent to 0.025 kg. The final temperature of the system is $40^\circ\mathrm{C}$. The specific heat of the aluminium is (take 4.2 Joule = 1 calorie)

(A) $434\ \mathrm{J\ kg^{-1}\ ^\circ C}$
(B) $378\ \mathrm{J\ kg^{-1}\ ^\circ C}$
(C) $315\ \mathrm{J\ kg^{-1}\ ^\circ C}$
(D) $476\ \mathrm{J\ kg^{-1}\ ^\circ C}$

Answer: (A) $434\ \mathrm{J\ kg^{-1}\ ^\circ C}$ · Key from source paper

Q96 JEE Main 2017 · 2 Apr · Offline MCQ

A copper ball of mass $100\ \mathrm{g}$ is at a temperature T. It is dropped in a copper calorimeter of mass $100\ \mathrm{g}$, filled with $170\ \mathrm{g}$ of water at room temperature. Subsequently, the temperature of the system is found to be $75^\circ\mathrm{C}$. T is given by:
(Given: room temperature $= 30^\circ\mathrm{C}$, specific heat of copper $= 0.1\ \mathrm{cal\ g^{-1}\ ^\circ C^{-1}}$)

(A) $825^{\circ}\mathrm{C}$
(B) $800^{\circ}\mathrm{C}$
(C) $885^{\circ}\mathrm{C}$
(D) $1250^{\circ}\mathrm{C}$

Answer: (C) $885^{\circ}\mathrm{C}$ · Key from source paper

Q97 JEE Main 2017 · 2 Apr · Offline MCQ

An external pressure P is applied on a cube at $0^{\circ}\mathrm{C}$ so that it is equally compressed from all sides. K is the bulk modulus of the material of the cube and α is its coefficient of linear expansion. Suppose we want to bring the cube to its original size by heating. The temperature should be raised by:

(A) $3PK\alpha$
(B) $\frac{P}{3\alpha K}$
(C) $\frac{P}{\alpha K}$
(D) $\frac{3\alpha}{PK}$

Answer: (B) $\frac{P}{3\alpha K}$ · Key from source paper

Q98 JEE Main 2016 · 9 Apr · Online MCQ

A simple pendulum made of a bob of mass m and a metallic wire of a negligible mass has a time period of 2 s at $T = 0^{\circ}\mathrm{C}$. If the temperature of the wire is increased, and the corresponding change in its time period is plotted against its temperature, the resulting graph is a line of slope S. If the coefficient of linear expansion of metal is α, then the value of S is

(A) $\frac{\alpha}{2}$
(B) 2α
(C) α
(D) $\frac{1}{\alpha}$

Answer: (C) α · Key from source paper

Q99 JEE Main 2016 · 3 Apr · Offline MCQ

A pendulum clock loses 12 s a day if the temperature is 40° C and gains 4s a day if the temperature is 20° C. The temperature at which the clock will show correct time, and the co-efficient of linear expansion (α) of the metal of the pendulum shaft are respectively:

(A) $30^{\circ}\mathrm{C}$; $\alpha = 1.85 \times 10^{-3}$ /°C
(B) $55^{\circ}\mathrm{C}$; $\alpha = 1.85 \times 10^{-2}$ /°C
(C) $25^{\circ}\mathrm{C}$; $\alpha = 1.85 \times 10^{-5}$ /°C
(D) $60^{\circ}\mathrm{C}$; $\alpha = 1.85 \times 10^{-4}$ /°C

Answer: (C) $25^{\circ}\mathrm{C}$; $\alpha = 1.85 \times 10^{-5}$ /°C · Key from source paper

Q100 JEE Main 2015 · 11 Apr · Online MCQ

An experiment takes 10 min to raise the temperature of water in a container from $0^{\circ}\mathrm{C}$ to $100^{\circ}\mathrm{C}$ and another 55 min to convert it totally into steam by a heater supplying heat at a uniform rate. Neglecting the specific heat of the container and taking specific heat of the water to be 1 cal $(\mathrm{g}^{\circ}\mathrm{C})^{-1}$, the heat of vaporization according to this experiment will come out to be:

(A) 530 cal g^{-1}
(B) 550 cal g^{-1}
(C) 540 cal g^{-1}
(D) 560 cal g^{-1}

Answer: (B) 550 cal g^{-1} · Key from source paper

Q101 JEE Main 2014 · 19 Apr · Online MCQ

A black coloured solid sphere of radius R and mass M is inside a cavity with a vacuum inside. The walls of the cavity are maintained at temperature T_0. The initial temperature of the sphere is $3T_0$. If the specific heat of the material of the sphere varies as αT^3 per unit mass with the temperature T of the sphere, where α is a constant, then the time taken for the sphere to cool down to temperature $2T_0$ will be (σ is Stefan Boltzman constant)

(A) $\frac{M\alpha}{16\pi R^2\sigma}\ln\left(\frac{3}{2}\right)$
(B) $\frac{M\alpha}{16\pi R^2\sigma}\ln\left(\frac{16}{3}\right)$
(C) $\frac{M\alpha}{4\pi R^2\sigma}\ln\left(\frac{3}{2}\right)$
(D) $\frac{M\alpha}{4\pi R^2\sigma}\ln\left(\frac{16}{3}\right)$

Answer: (B) $\frac{M\alpha}{16\pi R^2\sigma}\ln\left(\frac{16}{3}\right)$ · Key from source paper

Q102 JEE Main 2014 · 12 Apr · Online MCQ

Hot water cools from $60^{\circ}\mathrm{C}$ to $50^{\circ}\mathrm{C}$ in the first 10 minutes and to $42^{\circ}\mathrm{C}$ in the next 10 minutes. The temperature of the surroundings is:

(A) $25^{\circ}\mathrm{C}$
(B) $10^{\circ}\mathrm{C}$
(C) $15^{\circ}\mathrm{C}$
(D) $20^{\circ}\mathrm{C}$

Answer: (B) $10^{\circ}\mathrm{C}$ · Key from source paper

Q103 JEE Main 2014 · 11 Apr · Online MCQ

A hot body, obeying Newton's law of cooling is cooling down from its peak value $80^{\circ}\mathrm{C}$ to an ambient temperature of $30^{\circ}\mathrm{C}$. It takes 5 minutes in cooling down from $80^{\circ}\mathrm{C}$ to $40^{\circ}\mathrm{C}$. How much time will it take to cool down from $62^{\circ}\mathrm{C}$ to $32^{\circ}\mathrm{C}$? (Given $\ln 2 = 0.693$, $\ln 5 = 1.609$)

(A) 3.75 minutes
(B) 8.6 minutes
(C) 9.6 minutes
(D) 6.5 minutes

Answer: (B) 8.6 minutes · Key from source paper

Q104 JEE Main 2014 · 9 Apr · Online MCQ

Water of volume 2 L in a closed container is heated with a coil of 1 kW. While water is heated, the container loses energy at a rate of 160 J/s. In how much time will the temperature of water rise from $27^{\circ}\mathrm{C}$ to $77^{\circ}\mathrm{C}$? (Specific heat of water is 4.2 kJ/kg and that of the container is negligible).

(A) 8 min 20 s
(B) 7 min
(C) 14 min
(D) 6 min 2 s

Answer: (A) 8 min 20 s · Key from source paper

Q105 JEE Main 2014 · 6 Apr · Offline MCQ

The pressure that has to be applied to the ends of a steel wire of length 10 cm to keep its length constant when its temperature is raised by $100\,^{\circ}\mathrm{C}$ is :
(For steel, Young's modulus is 2×10^{11} N m^{-2} and coefficient of thermal expansion is 1.1×10^{-5} K^{-1})

(A) 2.2×10^{8} Pa
(B) 2.2×10^{9} Pa
(C) 2.2×10^{7} Pa
(D) 2.2×10^{6} Pa

Answer: (A) 2.2×10^{8} Pa · Key from source paper

Q106 JEE Main 2014 · 6 Apr · Offline MCQ

Three rods of Copper, Brass and Steel are welded together to form a Y-shaped structure. Area of cross-section of each rod is 4 cm^2. End of copper rod is maintained at $100^{\circ}\mathrm{C}$. Where as ends of brass and steel are kept at $0^{\circ}\mathrm{C}$. Lengths of the copper, brass and steel rods are 46, 13 and 12 cms respectively. The rods are thermally insulated from surroundings except at ends. Thermal conductivities of copper, brass and steel are 0.92, 0.26 and 0.12 CGS units respectively. Rate of heat flow through copper rod is :

(A) 1.2 Cal/s
(B) 2.4 Cal/s
(C) 4.8 Cal/s
(D) 6.0 Cal/s

Answer: (C) 4.8 Cal/s · Key from source paper

Q107 JEE Main 2013 · 25 Apr · Online MCQ

A mass of 50 g of water in a closed vessel, with surroundings at a constant temperature takes 2 minutes to cool from 30°C to 25°C. A mass of 100 g of another liquid in an identical vessel with identical surroundings takes the same time to cool from 30°C to 25°C. The specific heat of the liquid is : (The water equivalent of the vessel is 30 g.)

(A) 2.0kcal/kg
(B) 7kcal/kg
(C) 3kcal/kg
(D) 0.5kcal/kg

Answer: (D) 0.5kcal/kg · Key from source paper

Q108 JEE Main 2013 · 23 Apr · Online MCQ

The ratio of the coefficient of volume expansion of a glass container to that of a viscous liquid kept inside the container is $1:4$. What fraction of the inner volume of the container should the liquid occupy so that the volume of the remaining vacant space will be same at all temperatures ?

(A) $2:5$
(B) $1:4$
(C) $1:64$
(D) $1:8$

Answer: (B) $1:4$ · Key from source paper

Q109 JEE Main 2013 · 23 Apr · Online MCQ

500 g of water and 100 g of ice at 0°C are in a calorimeter whose water equivalent is 40 g.10 g of steam at 100°C is added to it. Then water in the calorimeter is : (Latent heat of ice = 80cal/g, Latent heat of steam = 540cal/g)

(A) 580 g
(B) 590 g
(C) 600 g
(D) 610 g

Answer: (B) 590 g · Key from source paper

Q110 JEE Main 2013 · 9 Apr · Online MCQ

On a linear temperature scale Y, water freezes at $-160^{\circ}\mathrm{Y}$ and boils at $-50^{\circ}\mathrm{Y}$. On this Y scale, a temperature of 340 K would be read as : (water freezes at 273 K and boils at 373 K)

(A) $-73.7^{\circ}\mathrm{Y}$

(B) $-233.7^{\circ}\mathrm{Y}$

(C) $-86.3^{\circ}\mathrm{Y}$

(D) $-106.3^{\circ}\mathrm{Y}$

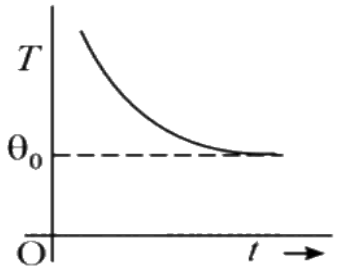
Answer: (C) $-86.3^{\circ}\mathrm{Y}$ · Key from source paper

Q111 JEE Main 2013 · 7 Apr · Offline MCQ

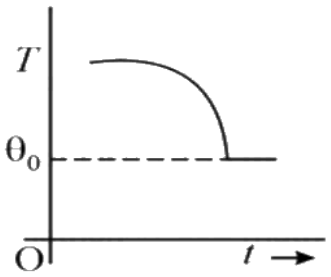
If a piece of metal is heated to temperature θ and then allowed to cool in a room which is at temperature θ_0, the graph between the temperature T of the metal and time t will be closest to :

Q8. If a piece of metal is heated to temperature θ and then allowed to cool in a room which is at temperature θ_0, the graph between the temperature T of the metal and time t will be closest to :

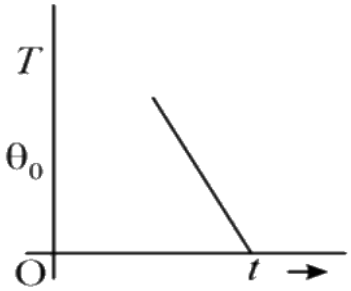
(1)



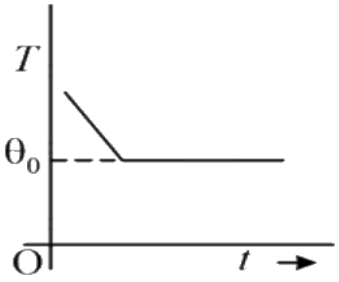
(2)



(3)



(4)



(A) *see figure*

(B) *see figure*

(C) *see figure*

(D) *see figure*

Answer: (A) · Key from source paper

Q112 AIEEE 2012 · 19 May · Online MCQ

A large cylindrical rod of length L is made by joining two identical rods of copper and steel of length $\left(\frac{L}{2}\right)$ each. The rods are completely insulated from the surroundings. If the free end of copper rod is maintained at $100^{\circ}\mathrm{C}$ and that of steel at $0^{\circ}\mathrm{C}$ then the temperature of junction is (Thermal conductivity of copper is 9 times that of steel)

(A) 90°C
(B) 50°C
(C) 10°C
(D) 67°C

Answer: (A) 90°C · Key from source paper

Q113 AIEEE 2012 · 7 May · Online MCQ

The heat radiated per unit area in 1 hour by a furnace whose temperature is 3000 K is ($\sigma = 5.7 \times 10^{-8}\ \text{W m}^{-2}\,\text{K}^{-4}$)

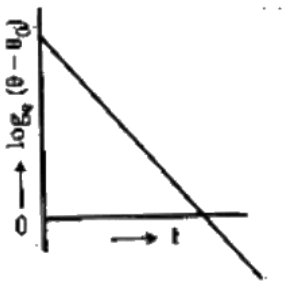
(A) 1.7×10^{10} J
(B) 1.1×10^{12} J
(C) 2.8×10^{8} J
(D) 4.6×10^{6} J

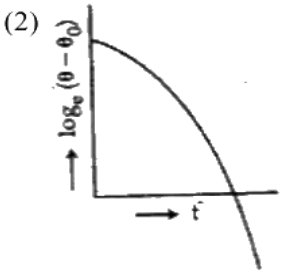
Answer: (A) 1.7×10^{10} J · Key from source paper

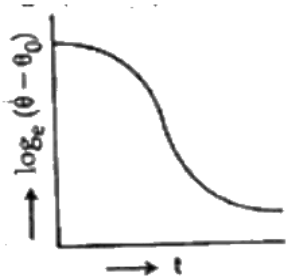
Q114 AIEEE 2012 · Offline MCQ

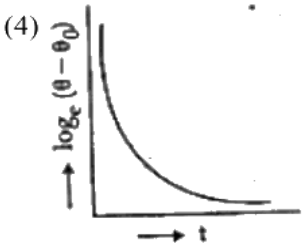
A liquid in a beaker has temperature $\theta(t)$ at time t and θ_0 is temperature of surroundings, then according to Newton's law of cooling the correct graph between $\log_e(\theta - \theta_0)$ and t is

Q9. A liquid in a beaker has temperature $\theta(t)$ at time t and θ_0 is temperature of surroundings, then according to Newton's law of cooling the correct graph between $\log_e(\theta - \theta_0)$ and t is

(1) 

(2) 

(3) 

(4) 

(A) *see figure*
(B) *see figure*
(C) *see figure*
(D) *see figure*

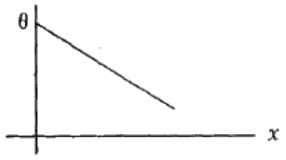
Answer: (A) · Key from source paper

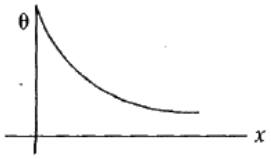
Q115 AIEEE 2009 MCQ

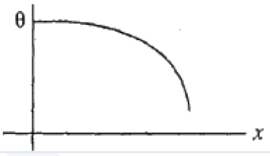
A long metallic bar is carrying heat from one of its ends to the other end under steady-state. The variation of temperature θ along the length x of the bar from its hot end is best described by which of the following figure.

Q6. A long metallic bar is carrying heat from one of its ends to the other end under steady-state. The variation of temperature θ along the length x of the bar from its hot end is best described by which of the following figure.

(1) 

(2) 

(3) 

(4) 

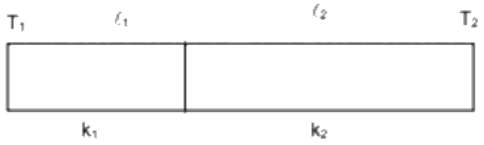
(A) *see figure*
(B) *see figure*
(C) *see figure*
(D) *see figure*

Answer: (B) · Key from source paper

Q116 AIEEE 2007 MCQ

see figure

Q11. One end of a thermally insulated rod is kept at a temperature T_1 and the other at T_2. The rod is composed of two sections of lengths ℓ_1 and ℓ_2 and thermal conductivities k_1 and k_2 respectively. The temperature at the



interface of the two sections is

(1) $(k_2\ell_2T_1 + k_1\ell_1T_2)/(k_1\ell_1 + k_2\ell_2)$
(2) $(k_2\ell_1T_1 + k_1\ell_1T_2)/(k_2\ell_1 + k_1\ell_2)$
(3) $(k_1\ell_2T_1 + k_2\ell_1T_2)/(k_1\ell_2 + k_2\ell_1)$
(4) $(k_1\ell_1T_1 + k_2\ell_2T_2)/(k_1\ell_1 + k_2\ell_2)$

(A) $(k_2\ell_2T_1 + k_1\ell_1T_2)/(k_1\ell_1 + k_2\ell_2)$
(B) $(k_2\ell_1T_1 + k_1\ell_2T_2)/(k_2\ell_1 + k_1\ell_2)$
(C) $(k_1\ell_2T_1 + k_2\ell_1T_2)/(k_1\ell_2 + k_2\ell_1)$
(D) $(k_1\ell_1T_1 + k_2\ell_2T_2)/(k_1\ell_1 + k_2\ell_2)$

Answer: (C) $(k_1\ell_2T_1 + k_2\ell_1T_2)/(k_1\ell_2 + k_2\ell_1)$ · Key from source paper

Q117 AIEEE 2006 MCQ

Assuming the sun to be a spherical body of radius R at a temperature of TK, evaluate the total radiant power, incident on Earth, at a distance r from the Sun.

(A) $\frac{R^2\sigma T^4}{r^2}$
(B) $\frac{4\pi r_0^2 R^2\sigma T^4}{r^2}$
(C) $\frac{\pi r_0^2 R^2\sigma T^4}{r^2}$
(D) $\frac{r_0^2 R^2\sigma T^4}{4\pi r^2}$

Answer: (C) $\frac{\pi r_0^2 R^2\sigma T^4}{r^2}$ · Key from source paper

Q118 AIEEE 2006 MCQ

A thermocouple is made from two metals, Antimony and Bismuth. If one junction of the couple is kept hot and the other is kept cold then, an electric current will

(A) flow from Antimony to Bismuth at the cold junction
(B) flow from Antimony to Bismuth at the hot junction
(C) flow from Bismuth to Antimony at the cold junction
(D) not flow through the thermocouple

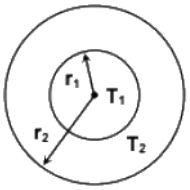
Answer: (A) flow from Antimony to Bismuth at the cold junction · Key from source paper

Q119 AIEEE 2005 MCQ

The figure shows a system of two concentric spheres of radii r_1 and r_2 and kept at temperatures T_1 and T_2 respectively. The radial rate of flow of heat in a substance between the two concentric sphere is proportional to

(see the figure above)

Q29. The figure shows a system of two concentric spheres of radii r_1 and r_2 and kept at temperatures T_1 and T_2 respectively. The radial rate of flow of heat in a substance between the two concentric sphere is proportional to



(1) $\frac{r_2-r_1}{r_1r_2}$
(2) $\ln\left(\frac{r_2}{r_1}\right)$
(3) $\frac{r_1r_2}{r_2-r_1}$
(4) $\ln(r_2-r_1)$

(A) $\frac{r_2-r_1}{r_1r_2}$
(B) $\ln\left(\frac{r_2}{r_1}\right)$
(C) $\frac{r_1r_2}{r_2-r_1}$
(D) $\ln(r_2-r_1)$

Answer: (C) $\frac{r_1r_2}{r_2-r_1}$ · Key from source paper

Q120 AIEEE 2004 MCQ

If the temperature of the sun were to increase from T to $2T$ and its radius from R to $2R$, then the ratio of the radiant energy received on earth to what it was previously will be

(A) 4
(B) 16
(C) 32
(D) 64

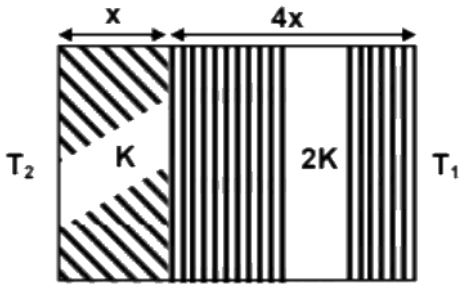
Answer: (D) 64 · Key from source paper

Q121 AIEEE 2004 MCQ

The temperature of two outer surfaces of a composite slab, consisting of two materials having coefficients of thermal conductivity K and $2K$ and thickness x and $4x$, respectively are T_2 and T_1 ($T_2 > T_1$). The rate of heat transfer through the slab, in a steady state is $\left(\frac{A(T_2-T_1)K}{x}\right) f$, with f equal to

(see the figure above)

Q27. The temperature of two outer surfaces of a composite slab, consisting of two materials having coefficients of thermal conductivity K and $2K$ and thickness x and $4x$, respectively are T_2 and T_1 $(T_2 > T_1)$. The rate of heat transfer through the slab, in a steady state is $\left(\frac{A(T_2-T_1)K}{x}\right)f$, with f equal to



(1) 1
(2) 1/2
(3) 2/3
(4) 1/3

(A) 1
(B) 1/2
(C) 2/3
(D) 1/3

Answer: (D) 1/3 · Key from source paper

Q122 AIEEE 2004 MCQ

Time taken by a 836 W heater to heat one litre of water from $10^\circ C$ to $40^\circ C$ is

(A) 50 s
(B) 100 s
(C) 150 s
(D) 200 s

Answer: (C) 150 s · Key from source paper

Q123 AIEEE 2004 MCQ

The thermo emf of a thermocouple varies with the temperature θ of the hot junction as E = aθ + bθ^2 in volts where the ratio a/b is $700^\circ C$. If the cold junction is kept at $0^\circ C$, then the neutral temperature is

(A) $700^\circ C$
(B) $350^\circ C$
(C) $1400^\circ C$
(D) no neutral temperature is possible for this thermocouple.

Answer: (D) no neutral temperature is possible for this thermocouple. · Key from source paper

Q124 AIEEE 2003 MCQ

According to Newton's law of cooling, the rate of cooling of a body is proportional to $(\Delta\theta)^{\mathrm{n}}$, where $\Delta\theta$ is the difference of the temperature of the body and the surroundings, and n is equal to

(A) two
(B) three
(C) four
(D) one

Answer: (D) one · Key from source paper

Q125 AIEEE 2003 MCQ

The thermo e.m.f. of a thermo-couple is $25\,\mu\mathrm{V}/^{\circ}\mathrm{C}$ at room temperature. A galvanometer of 40 ohm resistance, capable of detecting current as low as 10^{-5} A, is connected with the thermo couple. The smallest temperature difference that can be detected by this sytem is

(A) $16^{\circ}\mathrm{C}$
(B) $12^{\circ}\mathrm{C}$
(C) $8^{\circ}\mathrm{C}$
(D) $20^{\circ}\mathrm{C}$

Answer: (A) $16^{\circ}\mathrm{C}$ · Key from source paper

Q126 AIEEE 2002 MCQ

Heat given to a body which raises its temperature by $1^{\circ}\mathrm{C}$ is

(A) water equivalent
(B) thermal capacity
(C) specific heat
(D) temperature gradient

Answer: (B) thermal capacity · Key from source paper

Q127 AIEEE 2002 MCQ

Which of the following is more close to a black body?

(A) black board paint
(B) green leaves
(C) black holes
(D) red roses

Answer: (A) black board paint · Key from source paper

EdLoop JEE

Q128 AIEEE 2002 MCQ

Two spheres of the same material have radii 1 m and 4 m and temperatures 4000 K and 2000 K respectively. The ratio of the energy radiated per second by the first sphere to that by the second is

(A) 1 : 1
(B) 16 : 1
(C) 4 : 1
(D) 5 : 3

Answer: (A) 1 : 1 · Key from source paper

Q129 AIEEE 2002 MCQ

If θ_i, is the inversion temperature, θ_n is the neutral temperature, θ_c is the temperature of the cold junction, then

(A) $\theta_i + \theta_c = \theta_n$
(B) $\theta_i - \theta_c = 2\theta_n$
(C) $\frac{\theta_i+\theta_c}{2} = \theta_n$
(D) $\theta_c - \theta_i = 2\theta_n$

Answer: (C) $\frac{\theta_i+\theta_c}{2} = \theta_n$ · Key from source paper

EdLoop JEE