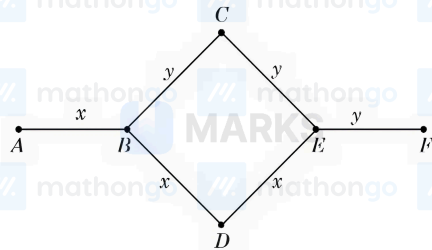


Q1. JEE Main 2026 (22 January Shift 1)

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):



- (1) 80°C and 70°C respectively
- (2) 80°C and 60°C respectively
- (3) 60°C and 45°C respectively
- (4) 89°C and 73°C respectively

Q2. JEE Main 2026 (21 January Shift 1)

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 $24 \times 10^{-6}/^\circ\text{C}$ and $1.2 \times 10^{-5}/^\circ\text{C}$, respectively. The length of this composite rod when its temperature is raised to 100°C , is ____ cm.

- (1) 120.20
- (2) 120.15
- (3) 120.06
- (4) 120.03

Q3. JEE Main 2026 (21 January Shift 1)

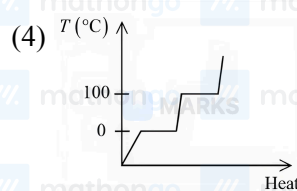
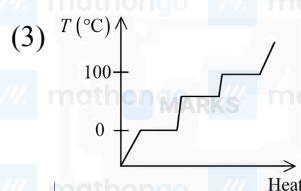
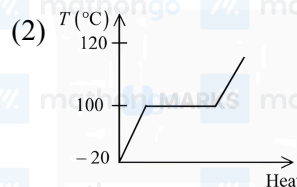
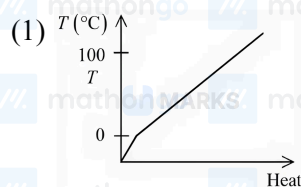
A gas based geyser heats water flowing at the rate of 5.0 litres per minute from 27°C to 87°C . The rate of consumption of the gas is ____ g/s.

(Take heat of combustion of gas = $5.0 \times 10^4 \text{ J/g}$) specific heat capacity of water = $4200 \text{ J/kg} \cdot ^\circ\text{C}$

- (1) 0.42
- (2) 2.1
- (3) 0.21
- (4) 4.2

Q4. JEE Main 2026 (28 January Shift 1)

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



Q5. JEE Main 2026 (28 January Shift 1)

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 _____ $^{\circ}\text{C}$.

(specific heat of ice = $2100 \text{ J/Kg} \cdot ^{\circ}\text{C}$, specific heat of water = $4200 \text{ J/Kg} \cdot ^{\circ}\text{C}$, latent heat of fusion of ice = $3.36 \times 10^5 \text{ J/Kg}$)

- (1) 6.67 (2) 11.6 (3) 15 (4) 10

Q6. JEE Main 2026 (24 January Shift 1)

A brass wire of length 2 m and radius 1 mm at 27°C is held taut between two rigid supports. Initially it was cooled to a temperature of -43°C creating a tension T in the wire. The temperature to which the wire has to be cooled in order to increase the tension in it to $1.4T$, is _____ $^{\circ}\text{C}$.

- (1) -86 (2) -65 (3) -71 (4) -80

ANSWERS AND SOLUTIONS

1. (4)

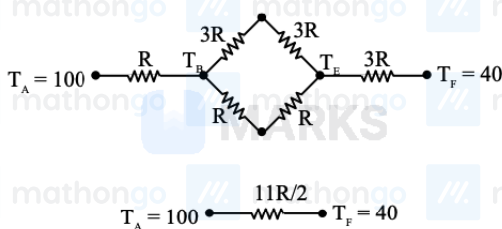
2. (2)

3. (1)

4. (4)

5. (4)

6. (3)

1. (4) Let $\left[R = \frac{\ell}{3KA} \right]$ 

$$\left[H = \frac{100 - 40}{\frac{11R}{2}} \right] \dots (1)$$

$$H = \frac{100 - T_B}{R} \dots (2)$$

$$H = \frac{T_E - 40}{3R} \dots (3)$$

using (1) and (2)

$$120 = 1100 - 11T_A$$

$$T_B = 89^\circ \text{C}$$

using (1) and (3)

$$T_E = 73^\circ \text{C}$$

2. (2) Total length at $30^\circ \text{C} = 120 \text{ cm}$, each rod = 60 cm

$$\alpha_{Al} = 24 \times 10^{-6}/^\circ \text{C}, \alpha_{Steel} = 1.2 \times 10^{-5}/^\circ \text{C}$$

$$\Delta T = 100 - 30 = 70^\circ \text{C}$$

$$\Delta L_{Al} = 60 \times 24 \times 10^{-6} \times 70 = 0.1008 \text{ cm}$$

$$\Delta L_{Steel} = 60 \times 1.2 \times 10^{-5} \times 70 = 0.0504 \text{ cm}$$

$$\text{Total expansion} = 0.1008 + 0.0504 = 0.1512 \text{ cm}$$

$$\text{Final length} = 120 + 0.1512 = 120.15 \text{ cm}$$

3. (1) Flow rate = $5.0 \text{ L/min} = 5.0 \text{ kg/min}$, $\Delta T = 87 - 27 = 60^\circ \text{C}$

$$\text{Heat required per minute: } Q = mc\Delta T = 5.0 \times 4200 \times 60 = 1.26 \times 10^6 \text{ J/min}$$

If m grams of gas consumed per minute:

$$m \times 5.0 \times 10^4 = 1.26 \times 10^6$$

$$m = \frac{1.26 \times 10^6}{5.0 \times 10^4} = 25.2 \text{ g/min}$$

$$\text{Rate} = \frac{25.2}{60} = 0.42 \text{ g/s}$$

4. (4) No solution.

5. (4) Heat available from water cooling 25°C to 0°C : $Q_{\text{available}} = 100 \times 4200 \times 25 = 10.5 \times 10^6 \text{ J}$.

Heat to warm ice from -10°C to 0°C : $Q_1 = 10 \times 2100 \times 10 = 0.21 \times 10^6 \text{ J}$.

Heat to melt ice at 0°C : $Q_2 = 10 \times 3.36 \times 10^5 = 3.36 \times 10^6 \text{ J}$.

Total needed: $0.21 + 3.36 = 3.57 \times 10^6 \text{ J}$.

Since available heat exceeds required heat, all ice melts. Remaining heat: $10.5 - 3.57 = 6.93 \times 10^6 \text{ J}$

warms 110 kg water: $\Delta T = \frac{6.93 \times 10^6}{110 \times 4200} = 15^{\circ}\text{C}$.

Final temperature: 15°C .

Decrement in water temperature: $25 - 15 = 10^{\circ}\text{C}$.

6. (3) Thermal stress in the wire is caused by contraction.

At -43°C , the temperature drop from 27°C is $\Delta T_1 = 70^{\circ}\text{C}$

It creates tension $T = Y A \alpha \Delta T_1$ where Y is Young's modulus and α is linear expansion coefficient.

For tension to increase to $1.4T$, the new temperature drop must be: $\Delta T_2 = 1.4 \times 70 = 98^{\circ}\text{C}$.

Required temperature: $T_3 = 27 - 98 = -71^{\circ}\text{C}$