

PQ 14 Heat

Q

Q1

- **How much heat is needed to raise the temperature of a block of copper (weighing 0.5 kg) from 0°C to 100° C ? (for copper, c = 386 J / kg °C)**

Q2

- **How much heat is needed to raise the temperature of 0.5 kg of water from 0°C to 100° C? (for water, $c = 4186 \text{ J / kg } ^\circ\text{C}$)**

Q3

- **What would be the final temperature of a mixture of 100 g of water at 90°C and 600 g of water at 20°C ?**

Q4

- **What would be the final temperature if a 2 kg piece of lead at 200°C is inserted in a container with 10 kg of water at 50°C ? (for lead, $c = 128 \text{ J / kg } ^\circ\text{C}$)**

Q5

- How much heat is needed to transform 500g of ice at $-20\text{ }^{\circ}\text{C}$ into water at $50\text{ }^{\circ}\text{C}$?

Q6

- **a)** 4 kg of water (at 25 °C) and 2 kg of ice (at 0 °C) are mixed inside an isolated container. What is the final temperature ? Is there any ice left?
- **b)** What happens if there is only 1 kg of ice?

Q7

- Calculate the amount of heat needed to increase the temperature of 250g of water from 20°C to 56°C.

Q8

- Calculate the specific heat capacity of copper given that 204.75 J of energy raises the temperature of 15g of copper from 25° to 60°.

Q9

- 216 J of energy is required to raise the temperature of aluminium from 15° to 35°C. Calculate the mass of aluminium. (Specific Heat Capacity of aluminium is 0.90 J°C⁻¹g⁻¹).

Q10

- The initial temperature of 150g of ethanol was 22°C. What will be the final temperature of the ethanol if 3240 J was needed to raise the temperature of the ethanol?
(Specific heat capacity of ethanol is $2.44 \text{ J}^\circ\text{C}^{-1}\text{g}^{-1}$).

Q11

- How much water at 50°C is needed to just melt 2.2 kg of ice at 0°C ?

Q12

- How much water at 32°C is needed to just melt 1.5 kg of ice at -10°C ?

Q13

- How much steam at 100° is needed to just melt 5 kg of ice at -15°C ?

Q14

- A copper cup holds some cold water at 4°C . The copper cup weighs 140g while the water weighs 80g. If 100g of hot water, at 90°C is added, what will be the final temperature of the water?

Q15

- A kettle uses 160kJ of energy to heat the water in it from 25°C to 100°C.
- How much water is in the kettle in kg?

Q16

- A chemist uses a Bunsen burner to heat some ethanol in a beaker. If the energy input is 2.5kJ and the temperature change is 21°C to 32°C, find the mass of ethanol that was heated in kg.

Q17

- A spinning bicycle wheel needs to be brought to a stop by a rubber brake block. Assuming the wheel has 500J of kinetic energy that is all absorbed by the brake and that the mass of the block is 25g, how much will the temperature of the block rise by in °C?

Q18

- A convection heater is used to heat the air in a house. If it is on for 15 minutes and transfers 2000kJ of heat energy to the air, find the increase in temperature of the air in °C if there is 124kg of air in the room.

Q19

- An electrical circuit malfunctions and starts to overheat. The copper wire of the circuit has a mass of 3g and it increases in temperature from 20°C to 60°C.
- How much energy is transferred to the wire in joules?

Q20

An alloy of unknown composition is heated to $137\text{ }^{\circ}\text{C}$ and placed into 100.0 g of water at $25.0\text{ }^{\circ}\text{C}$. If the final temperature of the water was $36.4\text{ }^{\circ}\text{C}$, and the alloy weighed 2.71 g , what is the specific heat capacity of the alloy? The specific heat of water is $4.184\text{ J/g}^{\circ}\text{C}$.