

AQA GCSE Physics: Specific Heat Capacity & Thermal Energy Calculations

Question 1: The Warming Water

A kettle heats 1 kg of water from 20°C to 100°C. The specific heat capacity of water is 4200 J/kg°C.

- Calculate the change in thermal energy of the water.

Question 2: The Cooling Metal

A 500g block of aluminium cools from 100°C to 20°C. The specific heat capacity of aluminium is 900 J/kg°C.

- Calculate the change in thermal energy of the aluminium block.

Question 3: The Heated Iron

An iron with a mass of 1.5 kg is heated from 20°C to 180°C. The specific heat capacity of iron is 450 J/kg°C.

- Calculate the change in thermal energy of the iron.

Question 4: The Mystery Metal

A 2 kg block of an unknown metal requires 10,000 J of energy to raise its temperature by 10°C.

- What is the specific heat capacity of the unknown metal?

Question 5: The Mixed Water

1 kg of water at 80°C is mixed with 1 kg of water at 20°C. (Assume the specific heat capacity of water is 4200 J/kg°C, and no energy is lost to the surroundings).

- What is the final temperature of the mixture? (Hint: The heat lost by the hot water equals the heat gained by the cold water)

Question 6: The Chocolate Challenge

A student wants to melt 100g of chocolate with a specific heat capacity of 1500 J/kg°C. The chocolate starts at 20°C and needs to reach 40°C to melt.

- How much thermal energy is required to melt the chocolate?

Question 7: The Efficient Kettle

An energy-efficient kettle claims to heat 1 kg of water from 10°C to 100°C using only 350,000 J of electrical energy.

- Calculate the efficiency of the kettle. (Remember that efficiency = (useful energy output / total energy input) * 100%)

Question 8: The Solar Panel

A solar panel is used to heat 5 kg of water in a tank. The water temperature increases from 15°C to 35°C. The specific heat capacity of water is 4200 J/kg°C.

- How much thermal energy is transferred to the water?

Question 9: The Cooling Experiment

A student conducts an experiment to investigate the cooling of different materials. They heat a 200g block of copper to 100°C and then allow it to cool to room temperature (20°C). The specific heat capacity of copper is 385 J/kg°C.

- Calculate the thermal energy lost by the copper block as it cools.

Question 10: The Hot Drink

A person drinks 250g of a hot drink with a specific heat capacity of 4000 J/kg°C. The drink cools from 80°C to 37°C (body temperature) inside the person's body.

- How much thermal energy is transferred to the person's body?