Specific heat capacity and specific latent heat

Physics Paper 1 calculations | AQA Combined Science 8464 and AQA GCSE Physics 8463 | 14 questions, 41 marks

GCSE science calculations

Scan for the solutions

Equations for this topic (cover this box to practise recalling them)

- change in thermal energy = mass × specific heat capacity × temperature change on the physics equation sheet
- thermal energy for a change of state = mass × specific latent heat on the physics equation sheet
- energy transferred = power × time learn this one

Name: _____ **Date:** _____ **Score:** _____ **/ 41**

1 Jack heats 2 kg of water in a saucepan. The temperature of the water rises by 30 °C.
The specific heat capacity of water is 4200 J/kg °C.
Calculate the change in thermal energy of the water.

(2 marks)

Answer _____

2 A block of ice of mass 0.5 kg is at 0 °C. It melts completely into water at 0 °C.
The specific latent heat of fusion of ice is 334 000 J/kg.
Calculate the thermal energy needed to melt the ice.

(2 marks)

Answer _____

3 An aluminium block has a mass of 3 kg. It is heated and its temperature rises by 15 °C.
The specific heat capacity of aluminium is 900 J/kg °C.
Calculate the change in thermal energy of the block.

(2 marks)

Answer _____

4 Zainab makes a cup of tea. She heats 250 g of water from 20 °C to 100 °C.
The specific heat capacity of water is 4200 J/kg °C.
Calculate the energy needed to heat the water.

(3 marks)

Answer _____

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5 A pan of water is boiling on a hob. 40 g of the water turns into steam.

The specific latent heat of vaporisation of water is 2 260 000 J/kg.

Calculate the thermal energy needed to turn this water into steam. Give your answer in kJ. (3 marks)

Answer _____

6 The copper base of a frying pan has a mass of 800 g. On the hob its temperature rises by 25 °C.

The specific heat capacity of copper is 385 J/kg °C.

Calculate the change in thermal energy of the copper. (3 marks)

Answer _____

7 In a Year 10 practical, Oliver uses an electric heater to heat a 1.0 kg metal block. The heater transfers 12 600 J of energy to the block. The temperature of the block rises from 21 °C to 35 °C.

Calculate the specific heat capacity of the metal. (3 marks)

Answer _____

8 An immersion heater transfers 630 000 J of energy to 5 kg of water. The water starts at 15 °C.

The specific heat capacity of water is 4200 J/kg °C. Assume all the energy is transferred to the water.

Calculate the final temperature of the water. (3 marks)

Answer _____

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9 In a lab, Nadia melts 0.15 kg of solid stearic acid at its melting point. It takes 29 850 J of thermal energy to melt all of it.

Calculate the specific latent heat of fusion of stearic acid.

(3 marks)

Answer _____

10 Water in a kettle is boiling at 100 °C. The kettle transfers a further 452 000 J of thermal energy to the water.

The specific latent heat of vaporisation of water is 2 260 000 J/kg. Assume all this energy is used to turn water into steam.

Calculate the mass of water turned into steam. Give your answer in grams.

(3 marks)

Answer _____

11 Ice cubes of total mass 0.5 kg are taken out of a freezer at −10 °C. They warm up to 0 °C and then all melt.

The specific heat capacity of ice is 2100 J/kg °C. The specific latent heat of fusion of ice is 334 000 J/kg.

Calculate the total thermal energy needed. Give your answer in standard form to 2 significant figures. Show your working.

(4 marks)

Answer _____

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12 Kemi fills a 2.0 kW kettle with 1.2 kg of water at 18 °C. She forgets to switch it off, so the water heats to 100 °C and then 0.1 kg of it boils away.

The specific heat capacity of water is 4200 J/kg °C. The specific latent heat of vaporisation of water is 2 260 000 J/kg. Assume all the energy from the kettle is transferred to the water.

a. Calculate the energy needed to heat the water from 18 °C to 100 °C.

b. Calculate the total time the kettle was switched on. Give your answer to 2 significant figures. Show your working.

(5 marks)

Answer _____

13 A tray of ice cubes at 0 °C has a total mass of 0.30 kg. The ice melts in a cool box and becomes water at 0 °C.

The specific latent heat of fusion of ice is 334 000 J/kg. The specific latent heat of vaporisation of water is 2 260 000 J/kg.

Calculate the thermal energy needed to melt all the ice.

(2 marks)

Answer _____

14 A saucepan of mass 0.35 kg contains 1.5 kg of soup. Yusuf heats the soup from 20 °C to 80 °C.

The specific heat capacity of the soup is 3800 J/kg °C.

Calculate the energy needed to heat the soup.

(3 marks)

Answer _____

End of questions | Total 41 marks

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