AQA GCSE Combined Science - Trilogy | 8464

SPECIFICATION POINT 6.1.2.1

Energy transfers in a system

Past-paper questions

Tier	**Higher**
Question groups	**3**
Available paper years	**2018–2025**

Using this booklet

1. Answer the questions in order and show your working.
2. Original question numbers and marks are retained.
3. Print at actual size (100%) for measuring questions.
4. Use the companion answer booklet to check your work.

Name: _____ **Date:** _____

Whole questions are retained for context, so some parts assess other specification points. Current and legacy sources are labelled. Continue on extra paper if needed.

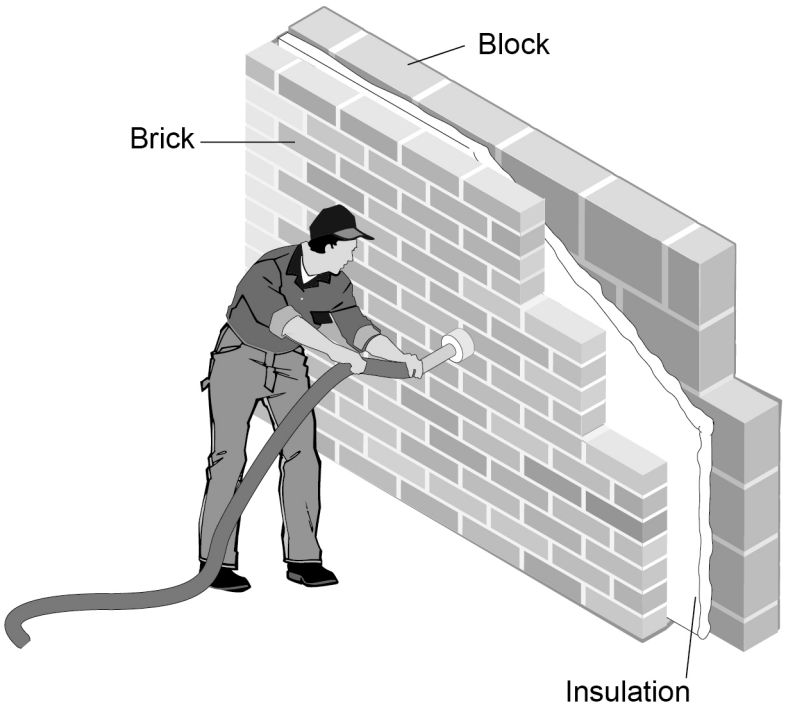
6.1.2.1 Energy transfers in a system

Question 01

June 2018 | 8464/P/1H | Original Q5

0 5 **Figure 7** shows cavity wall insulation being installed in the wall of a house.

Figure 7



0 5 . 1 Explain how the wall reduces unwanted energy transfers.

[3 marks]

Question 5 continues on the next page

6.1.2.1 Energy transfers in a system

Question 01 · continued

0 5 . 2 The cavity insulation was tested.

- The heating inside the house was switched off.
- The temperature inside the house was measured every 20 minutes for 2 hours.

Table 4 shows the results.

Table 4

Time in minutes	Temperature in °C
0	25.0
20	20.8
40	17.4
60	14.5
80	12.1
100	10.0
120	8.4

Determine the temperature inside the house after 30 minutes.

[2 marks]

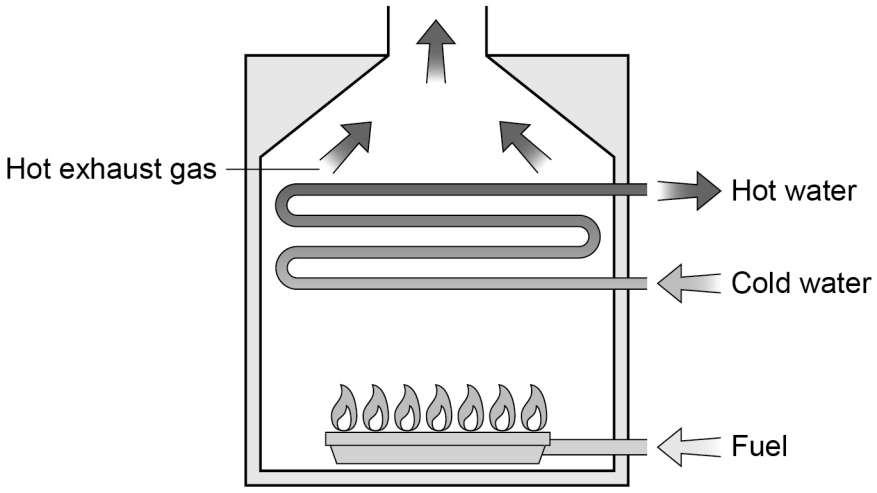
Temperature = _____ °C

6.1.2.1 Energy transfers in a system

Question 01 · continued

0 5 . 3 **Figure 8** shows the gas boiler used to heat the house.

Figure 8



Describe how different energy stores are changed by the boiler.

[3 marks]

0 5 . 4 To heat the house, the boiler transfers 15 MJ of energy in 10 minutes.

Calculate the power of the boiler.

Write any equation that you use.

[4 marks]

Power = _____ W

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6.1.2.1 Energy transfers in a system

Question 02

November 2020 | 8464/P/1H | Original Q5

0 5 Ice cream is made by cooling a mixture of liquid ingredients until they freeze.

0 5 . 1 Which statement describes the motion of the particles in solid ice cream?

[1 mark]

Tick (✓) **one** box.

They are stationary. ☐

They move freely. ☐

They vibrate about fixed positions. ☐

0 5 . 2 How do the kinetic energy and the potential energy of the particles change as a liquid is cooled and frozen?

[1 mark]

Tick (✓) **one** box.

Kinetic energy	**Potential energy**	
Decreases	Decreases	☐
Decreases	Does not change	☐
Does not change	Decreases	☐
Does not change	Does not change	☐

6.1.2.1 Energy transfers in a system

Question 02 · continued

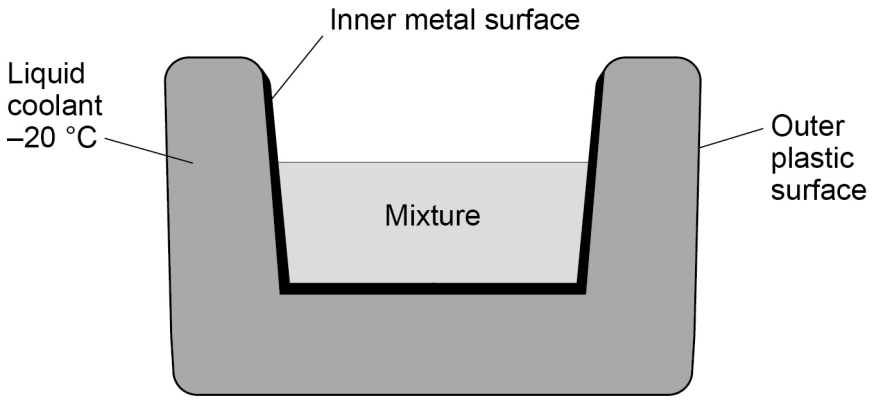
Figure 6 shows a bowl used for making ice cream.

The walls of the bowl contain a liquid coolant.

The bowl is cooled to –20 °C before the mixture is put in the bowl.

The bowl causes the mixture to cool down and freeze.

Figure 6



0 5 . 3 Explain why the different thermal conductivities of metal and plastic are important in the design of the bowl.

[4 marks]

Metal _____

_____

_____

_____

Plastic _____

_____

_____

_____

Question 5 continues on the next page

6.1.2.1 Energy transfers in a system

Question 02 · continued

0 5 . 4 The liquid coolant has a freezing point below –20 °C

Explain **one** other property that the liquid coolant should have.

[2 marks]

6.1.2.1 Energy transfers in a system

Question 02 · continued

0 5 . 5 The initial temperature of the mixture was +20 °C. The mixture froze at –1.5 °C.

A total of 165 kJ of internal energy was transferred from the mixture to cool and freeze it.

specific heat capacity of the mixture = 3500 J/kg °C

specific latent heat of fusion of the mixture = 255 000 J/kg

Calculate the mass of the mixture.

Give your answer to 2 significant figures.

[6 marks]

Mass (2 significant figures) = _____ kg

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6.1.2.1 Energy transfers in a system

Question 03

June 2025 | 8464/P/1H | Original Q2

0 2 A student investigated the specific heat capacity of aluminium.

The student used an electric heater to increase the temperature of an aluminium block.

The student measured the:

- mass of the block
- energy transferred to the block
- temperature change of the block.

Table 1 shows the results.

Table 1

Mass in kilograms	0.75
Energy transferred in joules	13 800
Temperature change in °C	20

0 2 . 1 Calculate the specific heat capacity of aluminium.

Use the Physics Equations Sheet.

[3 marks]

Specific heat capacity = _____ J/kg °C

6.1.2.1 Energy transfers in a system

Question 03 · continued

0 2 . 2 Describe a method the student could have used to obtain the results in **Table 1**.

[6 marks]

Extra space

Question 2 continues on the next page

6.1.2.1 Energy transfers in a system

Question 03 · continued

0 2 . 3 Wrapping the aluminium block in insulation makes the value for the specific heat capacity of aluminium more accurate.

Which are **two** reasons why?

[2 marks]

Tick (✓) **two** boxes.

- The amount of wasted energy is less. ☐
- The energy transferred to the aluminium block is greater. ☐
- The insulation heats the aluminium block. ☐
- The power of the electric heater increases. ☐
- The temperature increase of the aluminium block is greater. ☐

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