Internal energy and energy transfer – GCSE CS Physics

1. No.3

0 3 A piece of steel is heated until it has all melted.

0 3 . 1 Calculate the change in thermal energy when the temperature of the piece of steel is increased by 50 °C.

mass of steel = 4.0 kg

specific heat capacity of steel = 420 J/kg °C

Use the equation:

change in thermal energy = mass × specific heat capacity × temperature change

[2 marks]

_____

_____

_____

Change in thermal energy = _____ J

0 3 . 2 The internal energy of the steel increases as the steel is heated.

What is meant by 'internal energy of the steel'?

[1 mark]

Tick (✓) **one** box.

The change in energy of the steel particles as the steel melts. ☐

The energy added to the steel particles as they are heated. ☐

The total kinetic energy and potential energy of the steel particles. ☐

0 3 . 3 Solid steel cannot be poured.

Which statement about the particles in a solid gives the reason why?

[1 mark]

Tick (✓) **one** box.

The number of particles always stays the same. ☐

The particles are close together. ☐

The particles are in fixed positions. ☐

The particles have a fixed size. ☐

0 3 . 4 Complete the sentence.

Choose the answer from the box.

[1 mark]

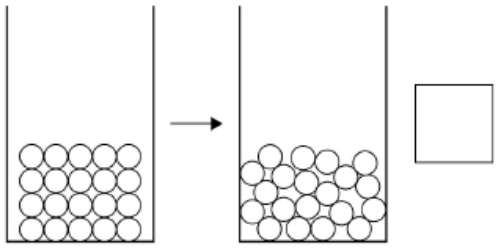
decreases	**stays the same**	**increases**

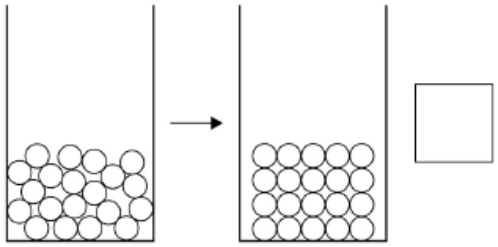
As the piece of solid steel melts, the mass of the steel _____.

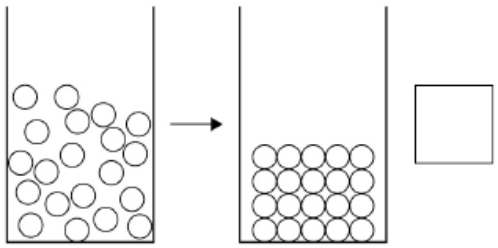
0 3 . 5 Which diagram shows how the arrangement of particles changes when a solid melts and becomes a liquid?

[1 mark]

Tick (✓) **one** box.







0 3 . 6 The density of steel decreases as it melts.

How does the spacing of the particles change as the steel melts?

[1 mark]

0 3 . 7 Complete the sentence.

Choose the answer from the box.

[1 mark]

chemical	permanent	physical

Melting is an example of a _____ change.

0 3 . 8 Steel is a mixture of iron and a small amount of carbon.

Table 1 shows the mass of carbon in 1.0 kg of different types of steel.

Table 1

Type of steel	Mass of carbon in 1.0 kg of steel
Low carbon	2.0 g
Medium carbon	4.5 g
High carbon	7.0 g

A 4.0 kg piece of steel contains 18 grams of carbon.

Determine which type of steel the 4.0 kg piece is made from.

You should include a calculation in your answer.

[3 marks]

Type of steel _____

0 3 . 9 The 4.0 kg piece of solid steel was heated until it reached its melting point.

The additional energy required to melt the piece of steel was 280 000 J.

Calculate the specific latent heat of fusion of the steel.

Use the Physics Equations Sheet.

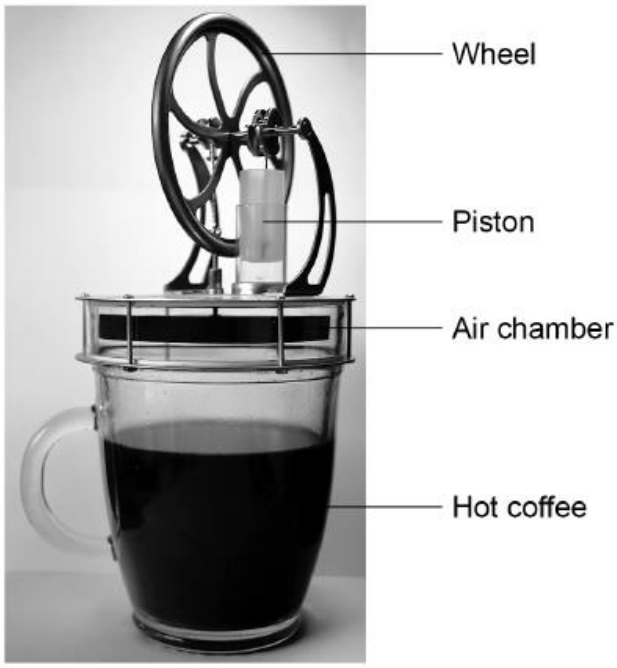
[3 marks]

Specific latent heat of fusion of steel = _____ J/kg

2. No.6

0 6 **Figure 12** shows a device that uses a mug of hot coffee to turn a wheel.

Figure 12



0 6 . 1 The hot coffee increases the temperature of the air in the chamber.

Explain how the pressure in the chamber changes.

[3 marks]

0 6 . 2 For the device to work, the air in the chamber must increase in temperature quickly.

Explain why the bottom of the air chamber is made of metal rather than plastic.

[2 marks]

0 6 . 3 The mass of air in the chamber is constant.

What property of air allows a small change in internal energy to cause a large temperature change to the air in the chamber?

[1 mark]

0 6 . 4 The changes in pressure in the air chamber cause the wheel to turn.

Suggest **one** way to increase the speed at which the wheel turns.

[1 mark]

0 6 . 5 The temperature of the coffee decreases as the device is used.

The initial temperature of the coffee was 76 °C.

The internal energy of the coffee decreased by 15 kJ.

density of coffee = 1.1×10^3 kg/m^3

volume of coffee = 1.9×10^{-4} m^3

specific heat capacity of coffee = 4200 J/kg °C

Calculate the final temperature of the coffee.

Use the Physics Equations Sheet.

[6 marks]

Final temperature of the coffee = _____ °C