

AQA GCSE PHYSICS (HIGHER) • 8463

PHYSICS



EXAM QUESTION PACK

4.3.2.1 INTERNAL ENERGY (PACK 3)

SCORE

/38

PERCENTAGE

%

STEMUP

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Q1.

Water exists as ice, water or steam.

- (a) Complete the sentences.

Choose the answers from the box.

ice	steam	water
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The particles are arranged in a regular pattern in _____.

The particles are close together but not in a pattern in _____.

The particles move quickly in all directions in _____.

(2)

- (b) Which will have the most internal energy?

Tick **one** box.

1 kg of ice

☐

1 kg of steam

☐

1 kg of water

☐

(1)

- (c) Which will have the lowest density?

Tick **one** box.

Ice

☐

Steam

☐

Water

☐

(1)

The image shows an iceberg floating in the sea.



- (d) The iceberg has a mass of 11 200 kg

The volume of the iceberg is 12.0 m³

Calculate the density of the iceberg.

Use the equation:

$$\text{density} = \frac{\text{mass}}{\text{volume}}$$

Density = _____ kg/m³

(2)

- (e) Explain why the iceberg will melt.

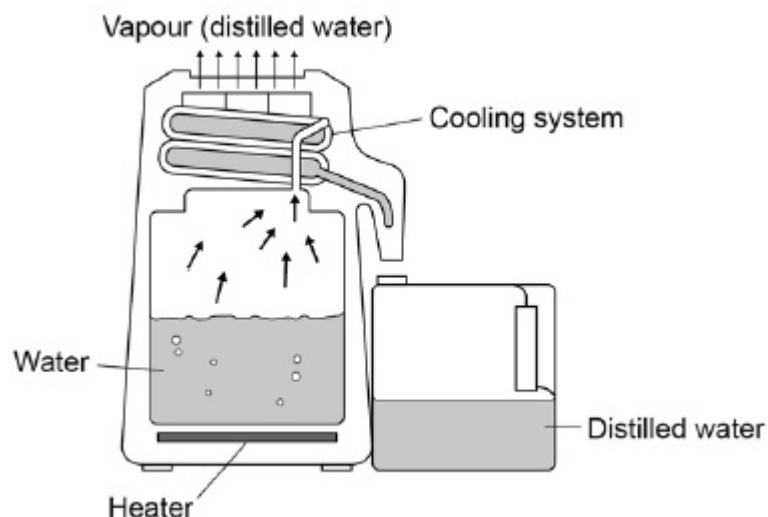
(2)

(Total 8 marks)

Q2.

Figure 1 shows a water distiller which is used to purify water.

Figure 1



The distiller boils water and then condenses most of the water vapour back to water.

- (a) The water distiller is filled with 5.0 kg of water at 20 °C

The specific heat capacity of water = 4 200 J/Kg °C

Calculate the energy needed to raise the temperature of the water to 100 °C

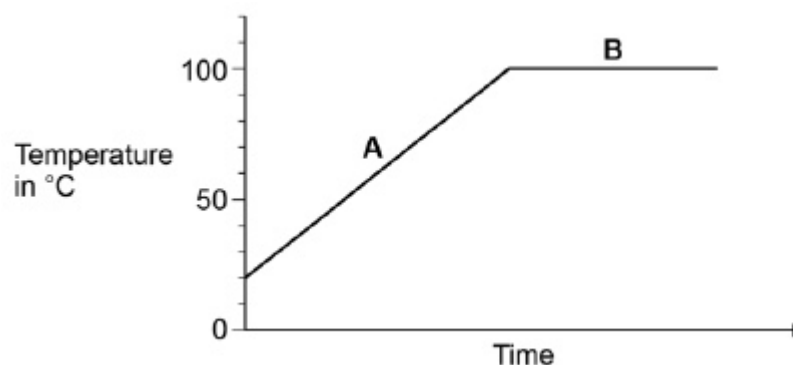
Use the Physics Equations sheet.

Energy = _____ J

(3)

Figure 2 shows how the temperature of the water in the distiller changes with time.

Figure 2



- (b) Energy is transferred to the water at a constant rate.

Explain why the graph is a different shape in parts **A** and **B**.

(3)

- (c) When the water drops to a low level, the heater automatically switches off.

Explain what problem would be caused if the heater did **not** automatically switch off.

(3)

- (d) The distiller is connected to the mains by a three-core cable.

The wires are covered by different coloured insulation.

What colour is the insulation covering each of the wires?

Live wire _____

Neutral wire _____

Earth wire _____

(2)

- (e) Which statement gives the purpose of the earth wire?

Tick **one** box.

It carries an alternating potential difference.

It melts if the current in the circuit is too high.

It provides a connection to complete the circuit.

☐
☐
☐

It stops the casing of the appliance becoming live.



(1)

- (f) The heating element has a power of 2.5 kW

The resistance of the heating element is $17\ \Omega$

Calculate the current in the heating element.

Give your answer to 2 significant figures.

Write any equations that you use.

Current = _____ A

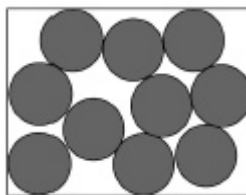
(5)

(Total 17 marks)

Q3.

Figure 1 shows a model of the particles in a liquid.

Figure 1



- (a) Give **one** similarity and **one** difference you would see in **Figure 1** if it showed the same substance as a gas.

Similarity _____

Difference _____

(2)

(b) Describe **two** limitations of the model shown in **Figure 1**.

1. _____

2. _____

(2)

(c) Explain why substances have different melting points.

(2)

(d) Some fire extinguishers contain liquid carbon dioxide.

Suggest how carbon dioxide gas can be changed to liquid carbon dioxide without reducing its temperature.

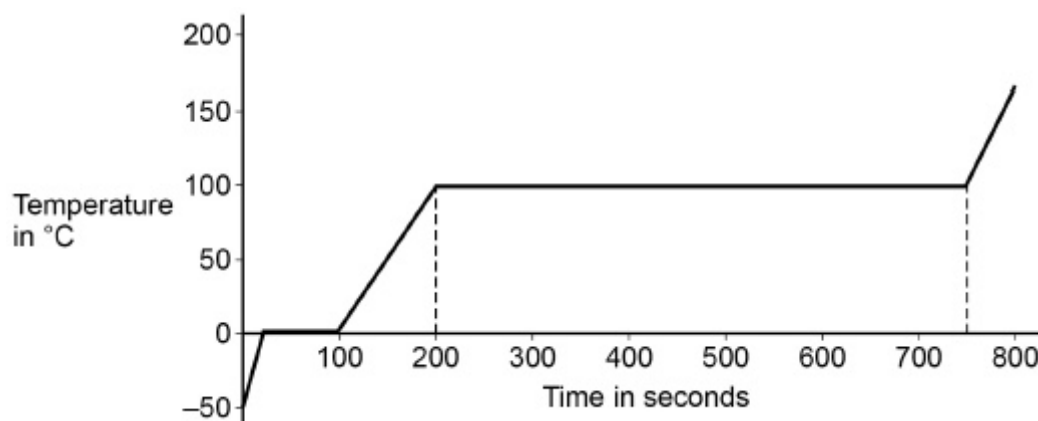
(1)

Ice was heated at a constant rate.

Eventually all the ice changed to a gas.

Figure 2 shows how the temperature changed over 800 seconds.

Figure 2



(e) What change of state occurs between 200 seconds and 750 seconds?

(1)

- (f) Explain how **Figure 2** shows that the specific latent heat of vaporisation is greater than the specific latent heat of fusion.

Use data from **Figure 2**.

(2)

- (g) 1695 kJ of energy is transferred to water at 100 °C

The specific latent heat of vaporisation of water is $2.260 \times 10^6 \text{ J / kg}$

Calculate the mass of water changed into a gas at 100 °C

Use the Physics Equations Sheet.

Mass of water = _____ kg

(3)

(Total 13 marks)

Mark schemes

Q1.

- (a) ice
water
steam

allow 1 mark for 1 or 2 correct answers

2

- (b) 1 kg of steam

1

- (c) steam

1

- (d) $\rho = 11\,200 / 12.0$

1

$$\rho = 933 \text{ (kg/m}^3\text{)}$$

an answer of 933 (kg/m³) scores 2 marks

1

- (e) the internal energy of the iceberg increases

allow there is a temperature difference between ice and water / air

1

because

therefore

energy is transferred from the sea/water to the ice(berg)

1

[8]

Q2.

- (a) 80

1

$$E = 5.0 \times 4200 \times 80$$

1

$$E = 1\,700\,000 \text{ (J)}$$

an answer of 1 700 000 (J) or

1 680 000 (J) scores 3 marks

allow 1 680 000

1

- (b) in part **A** the increase in internal energy raises the temperature of the water

1

in part **B** the increase in internal energy changes the state

1

without changing the temperature

1

- (c) the heater would continue to transfer energy which would not be transferred to the water 1
- so would raise the temperature of the device 1
- causing it to be damaged 1
- (d) brown
- blue
- green and yellow stripes
allow 1 mark for 2 correct 2
- (e) it stops the casing of the appliance becoming live 1
- (f) $P = I^2 R$
- $I = \sqrt{(P/R)}$ 1
- $P = 2\,500 \text{ (W)}$ 1
- $I = \sqrt{(2\,500 / 17)}$ 1
- $I = 12.1267812$ 1
- $I = 12 \text{ (A)}$
an answer of 12 (A) scores 5 marks 1
- [17]**

Q3.

- (a) (similarity) same size / shape particles 1
- (difference) further apart / fewer in same area
allow none / not many touching 1
- (b) any **two** from:
- no movement shown
 - atoms / molecules / ions / particles are not solid spheres
 - no forces between the spheres
 - only 2D
- 2
- (c) • different forces between particles
allow substances have different types of bond 1

• (so) different amounts of energy required (to break forces)	1
(d) high(er) pressure (within fire extinguisher)	1
(e) liquid to gas	1
(f) (change from solid to liquid) 80 seconds	
and	
(change from liquid to gas) takes 550 seconds	1
(therefore) takes longer so more (thermal) energy is supplied (to change state)	1
(g) $1\,695\,000 = m \times 2.260 \times 10^6$	1
$m = \frac{1\,695\,000}{2.260 \times 10^6}$	1
0.75	
<i>an answer of 0.75 scores 3 marks</i> <i>allow conversion of kJ to J</i>	1
	[13]