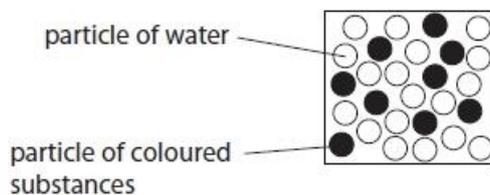


Questions

Q1.

An ink is a mixture of coloured substances dissolved in water.

The particles in the ink in the flask can be shown as in Figure 10.

**Figure 10**

In the boxes below, draw the arrangement of particles that would be expected at **A** and **B** shown in Figure 9.

(2)

particles at **A**particles at **B****(Total for question = 2 marks)**

Q2.

A substance is heated at a constant rate and its temperature is taken every minute. During the heating, the substance undergoes one change of state.

The results are shown on the graph in Figure 5.

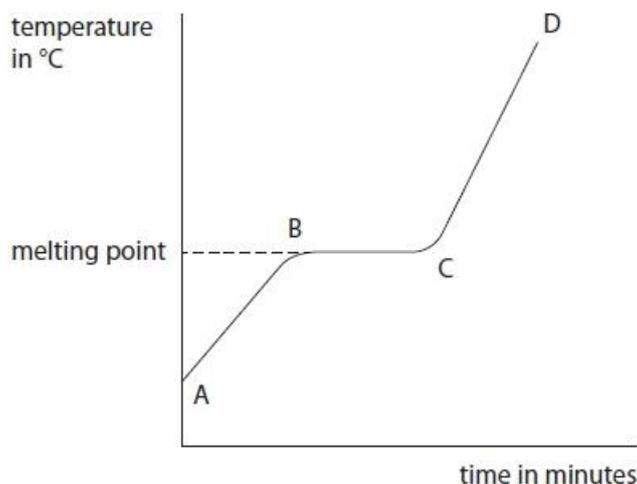


Figure 5

Explain the shape of the graph in terms of the changes in the movement and arrangement of the particles as the substance is heated.

(4)

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(Total for question = 4 marks)

Q3.

An ink is a mixture of coloured substances dissolved in water.

Changes of state between the three states of matter are shown in Figure 11.



Figure 11

The changes shown are physical changes.

Explain why these changes are called physical changes rather than chemical changes.

(2)

.....

.....

.....

.....

(Total for question = 2 marks)

Q4.

Figure 3 shows a metal spoon and two test tubes being heated in a water bath. One test tube contains a piece of chocolate, the other some liquid egg white.

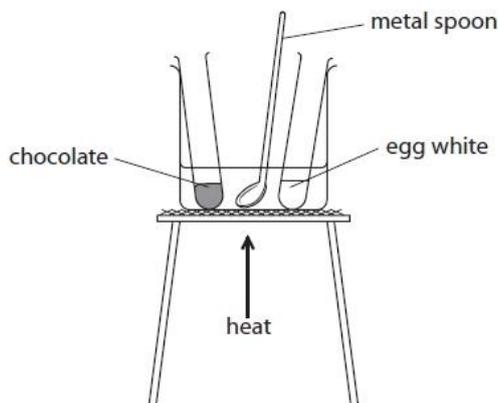


Figure 3

After heating, the spoon, the chocolate and the egg white are allowed to cool to room temperature.

Figure 4 shows the state of the three different substances before heating, when hot and after cooling.

substance	before heating	when hot	after cooling
metal spoon	solid	solid	solid
chocolate	solid	liquid	solid
egg white	liquid	solid	solid

Figure 4

Describe the differences in the arrangement and movement of the particles in a solid and in a liquid.

(2)

difference in arrangement of particles

.....

.....

.....

difference in movement of particles

.....

.....

.....

(Total for question = 2 marks)

Q5.

Figure 5 shows the changes of state for gallium and the arrangement of particles in liquid gallium.

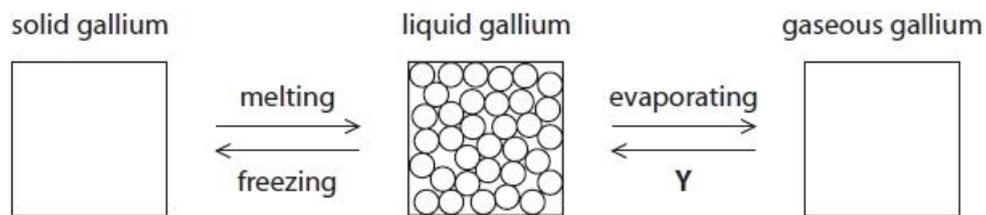


Figure 5

(i) Complete the boxes for solid gallium and gaseous gallium by drawing the arrangement of the particles in each of these physical states.

(2)

(ii) Give the name of the change of state labelled Y in Figure 5.

(1)

.....

(Total for question = 3 marks)

Q6.

If liquid water is cooled below 0 °C it turns into the solid, ice.

(i) Give the name for the change of state from liquid to solid.

(1)

.....

(ii) Here are five statements about ice and water.

Place ticks in boxes by the **two** statements that are correct.

(2)

the molecules move faster in water than in ice	
the molecules are more randomly arranged in ice than in water	
the molecules start moving when water becomes ice	
the molecules are arranged regularly in ice but not in water	
the molecules have more energy in ice than in water	

(Total for question = 3 marks)

Q7.

The three states of matter are solid, liquid and gas.

What is the name of the change of state when a liquid changes into a solid?

(1)

- A** condensation
- B** evaporation
- C** freezing
- D** melting

(Total for question = 1 mark)

Q8.

Aluminium is a metal.

Aluminium is used in overhead power lines.

The power lines are supported by pylons as shown in Figure 3.

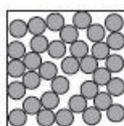


Figure 3

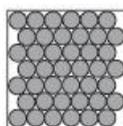
Answer the question with a cross in the box you think is correct . If you change your mind about an answer, put a line through the box and then mark your new answer with a cross .

(i) Which diagram shows the arrangement of the atoms in the aluminium metal?

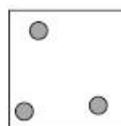
(1)



A



B



C

(ii) Overhead power lines are made of aluminium with a steel core, as shown in Figure 4.

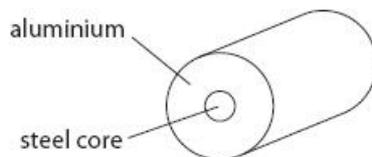


Figure 4

Figure 5 shows some properties of steel and aluminium.

property	steel	aluminium
density (g cm^{-3})	7.87	2.70
relative strength	high	low

Figure 5

Explain why the power lines are made of aluminium with a steel core rather than pure aluminium.

(2)

.....

.....

.....

.....

.....

.....

(Total for question = 3 marks)

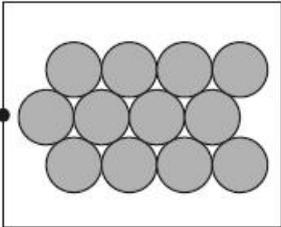
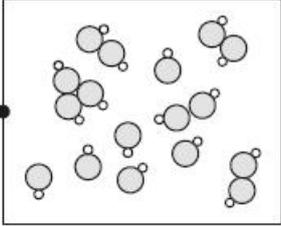
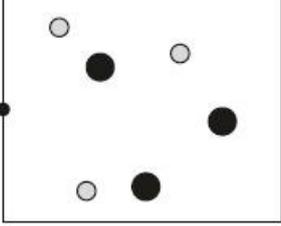
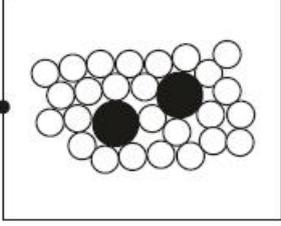
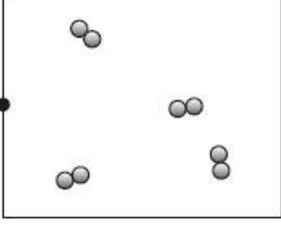
Q9.

The three states of matter are solid, liquid and gas.

The diagrams below show particles in five different structures.
The different circles show different particles.

Draw one straight line from each substance to its structure.

(2)

substance	particles in structures
<div style="border: 1px solid black; padding: 5px; display: inline-block;">solid zinc metal, Zn(s)</div>	
	
	
<div style="border: 1px solid black; padding: 5px; display: inline-block;">hydrogen gas, H₂(g)</div>	
	

(Total for question = 2 marks)

Q10.

Which of the following substances will be a solid at 20 °C and will melt when placed in a beaker of hot water at 80 °C?

(1)

	melting point in °C	boiling point in °C
<input type="checkbox"/> A	122	249
<input type="checkbox"/> B	-7	59
<input type="checkbox"/> C	30	2403
<input type="checkbox"/> D	-32	27

(Total for question = 1 mark)

Q11.

The three states of matter are solid, liquid and gas.

A gas was left to cool to form a liquid.

Figure 1 shows how the temperature of the substance changed with time.

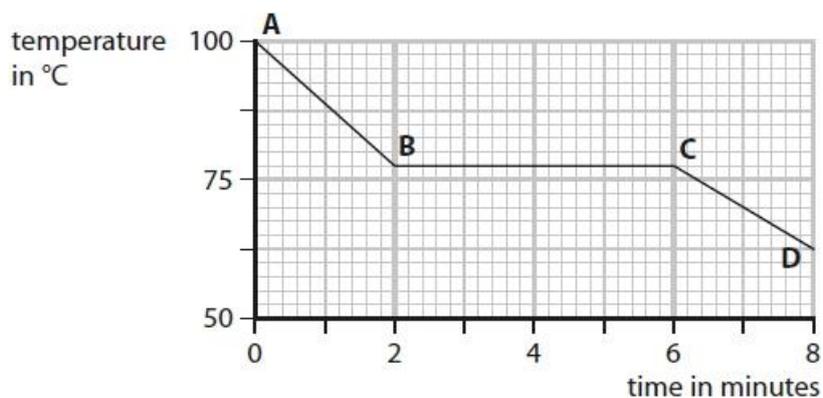


Figure 1

From **A** to **B** the substance is a gas.

From **C** to **D** the substance is a liquid.

(i) State the time when the gas first started to form a liquid.

(1)

..... minutes

(ii) Calculate the number of minutes it took from the gas first starting to form a liquid until the substance was completely liquid.

(1)

.....

..... minutes

(Total for question = 2 marks)

Q12.

The three states of matter are solid, liquid and gas.

Figure 2 shows the melting points and boiling points of four substances, **W**, **X**, **Y** and **Z**.

substance	melting point in °C	boiling point in °C
W	-220	-188
X	-101	-34
Y	-7	59
Z	114	184

Figure 2

Using the information in Figure 2

(i) give the letter of the substance that is a solid at 20 °C

(1)

.....

(ii) give the letter of a substance that is a liquid at 50 °C

(1)

.....

(Total for question = 2 marks)

Q13.

Some questions must be answered with a cross in a box (☒). If you change your mind about an answer, put a line through the box (☒) and then mark your new answer with a cross (☒).

Figure 3 shows a metal spoon and two test tubes being heated in a water bath.

One test tube contains a piece of chocolate, the other some liquid egg white.

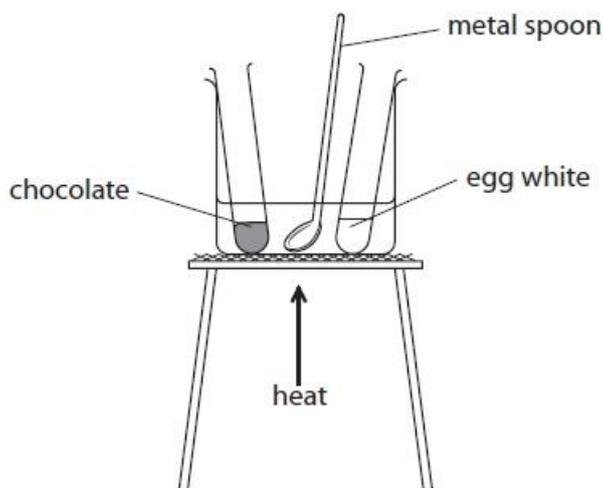


Figure 3

After heating, the spoon, the chocolate and the egg white are allowed to cool to room temperature.

Figure 4 shows the state of the three different substances before heating, when hot and after cooling.

substance	before heating	when hot	after cooling
metal spoon	solid	solid	solid
chocolate	solid	liquid	solid
egg white	liquid	solid	solid

Figure 4

What name is given to the process when the chocolate changes from a solid to a liquid?

- ☒ A condensing
 ☒ B evaporating
 ☒ C freezing
 ☒ D melting

(1)

(Total for question = 1 mark)

Mark Scheme

Q1.

Question Number	Answer	Additional guidance	Mark
	<p>particles at A: white circles only, none touching (1)</p> <p>particles at B: white circles only, randomly arranged, more circles than in A (1)</p>	<p>reject 'strings' of particles</p> <p>if black circles are present in both boxes allow 1 mark if arrangement of particles in both boxes is otherwise correct.</p>	<p>(2)</p> <p>AO 2 1</p>

Q2.

Question Number	Answer	Additional guidance	Mark
	<p>An explanation linking</p> <p>from B to C: graph flat because</p> <ul style="list-style-type: none"> particles in solid use energy to {break out of lattice / break (intermolecular) bonds (between particles) / particles becoming randomly arranged / turn solid to liquid} (1) <p>and any three from</p> <p>from A to B: graph rises because</p> <ul style="list-style-type: none"> particles in solid in a lattice / fixed (mean) positions (1) vibrate more (rapidly) (as temperature increases) (1) <p>from C to D: graph rises because</p> <ul style="list-style-type: none"> particles in liquid move past one another / randomly (1) particles move more (rapidly) (as temperature increases) (1) 	<p>may be shown as a diagram / on graph</p> <p>may be shown as a diagram / on graph ignore references to gas / evaporation / boil</p>	<p>(4)</p> <p>AO 3 2a AO 3 2b</p>

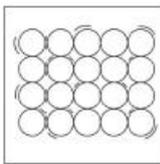
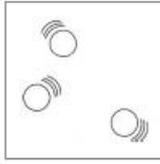
Q3.

Question Number	Answer	Additional guidance	Mark
	<p>An explanation linking</p> <ul style="list-style-type: none"> physical changes do not result in formation of a new substance / chemical change results in formation of a new substance (1) physical change is easily reversed / chemical change is not easily reversed (1) 	<p>allow no chemical reaction has taken place</p> <p>ignore you can see the change</p>	<p>(2)</p> <p>AO 1 1</p>

Q4.

Question number	Answer	Additional guidance	Mark
	<p><u>Arrangement – 1 mark max</u></p> <p>in a solid (particles are):</p> <ul style="list-style-type: none"> regularly arranged/ close(r) / in lattice / fixed (position) (1) <p>OR</p> <p>in a liquid (particles are):</p> <ul style="list-style-type: none"> randomly arranged / further apart (1) <p><u>Movement – 1 mark max</u></p> <p>in a solid (particles):</p> <ul style="list-style-type: none"> vibrate / do not move (around) (1) <p>OR</p> <p>In a liquid (particles):</p> <ul style="list-style-type: none"> move (1) 	<p>answer for one state will be taken to imply opposite for other; but if both given, both must be correct</p> <p>OR one correct and one an ignore</p> <p>allow uniformly arranged / in a fixed shape / (tightly) packed together / in lines / in layers / in rows / ordered / organised</p> <p>ignore compact(ed) / attached / bonded / particles touching</p> <p>allow spread out / space between particles</p> <p>reject do not move much</p> <p>“They” is assumed to mean particles</p> <p>allow suitable diagrams</p> <p>allow answers in either space</p>	<p>(2)</p> <p>AO1-1</p>

Q5.

Question number	Answer	Additional guidance	Mark
(i)	  <p>solid (1) (regular arrangement and touching)</p> <p>gas (1) (widely spaced, fewer shown)</p>		(2)

Question number	Answer	Additional guidance	Mark
(ii)	condensing / condensation		(1)

Q6.

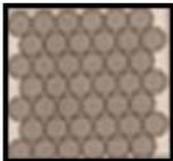
Question number	Answer	Additional guidance	Mark
(i)	freezing / solidifying / solidification	ignore frozen	(1) AO1

Question number	Answer	Mark										
(ii)	<table border="1"> <tbody> <tr> <td>the molecules move faster in water than in ice</td> <td>✓ (1)</td> </tr> <tr> <td>the molecules are more randomly arranged in ice than in water</td> <td></td> </tr> <tr> <td>the molecules start moving when water becomes ice</td> <td></td> </tr> <tr> <td>the molecules are arranged regularly in ice but not in water</td> <td>✓ (1)</td> </tr> <tr> <td>the molecules have more energy in ice than in water</td> <td></td> </tr> </tbody> </table> <p>Allow any marks in the boxes. If three boxes are ticked, give one mark only if both correct boxes are ticked If four or five boxes ticked, no marks awarded</p>	the molecules move faster in water than in ice	✓ (1)	the molecules are more randomly arranged in ice than in water		the molecules start moving when water becomes ice		the molecules are arranged regularly in ice but not in water	✓ (1)	the molecules have more energy in ice than in water		(2) AO1
the molecules move faster in water than in ice	✓ (1)											
the molecules are more randomly arranged in ice than in water												
the molecules start moving when water becomes ice												
the molecules are arranged regularly in ice but not in water	✓ (1)											
the molecules have more energy in ice than in water												

Q7.

Question number	Answer	Mark
	<p>C freezing The only correct answer is C.</p> <p>A is incorrect because condensation is when a gas changes into a liquid. B is incorrect because evaporation is when a liquid changes into a gas. D is incorrect because melting is when a solid changes into liquid.</p>	(1)

Q8.

Question number	Answer	Mark
(i)	 <p>B</p>	(1)

Question number	Answer	Additional guidance	Mark
(ii)	<p>An explanation that combines identification via a judgment of relevant information (1 mark) to reach a conclusion via justification/reasoning (1 mark):</p> <p>aluminium has a low strength / steel has {high strength/is strong} (1)</p> <p>steel is added to make the powerline strong(er) (1)</p>	<p>ignore references to cost</p> <p>ignore references to electrical conduction</p>	(2)

Q9.

Question Number	Answer	Mark
	<p>substance</p> <p>particles in structures</p> <p>Each line 1 mark Do not award mark if more than one line joins the left hand boxes with those on the right (2)</p>	(2)

Q10.

Question Number	Answer	Mark
	<p>C 30 2403</p> <p>The only correct answer is C</p> <p><i>A is not correct because it will be a solid above 80 °C</i></p> <p><i>B is not correct because it will be a liquid at 20 °C and gas at 80 °C</i></p> <p><i>D is not correct because it will be a liquid at 20 °C and gas at 80 °C</i></p>	<p>(1)</p> <p>AO 1 1</p>

Q11.

Question number	Answer	Mark
(i)	2 / two (minutes)	(1)

Question number	Answer	Additional guidance	Mark
(ii)	$6 - 2 (= 4) / 4$ / four	any other manipulation of numbers leading to the answer 4 scores 0	(1)

Q12.

Question number	Answer	Additional guidance	Mark
(i)	Z	allow z	(1)
(ii)	Y	allow y	(1)

Q13.

Question number	Answer	Mark
	D melting is the only correct answer A is not correct as condensing is gas to liquid B is not correct as evaporating is liquid to gas C is not correct as freezing is liquid to solid	(1) AO1-1