

Q1

0620/42/O/N/21/Q1(a)

Solid, Liquid & Gas

1 This question is about states of matter.

(a) Complete the table, using ticks (✓) and crosses (✗), to describe the properties of gases, liquids and solids.

state of matter	particles are touching	particles have random movement	particles are regularly arranged
gas			
liquid			
solid			

[3]

Q2

0620/42/O/N/25/Q1(a)

Solid, Liquid & Gas

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

(a) Complete Table 1.1 to describe the structures of solids, liquids and gases in terms of particle separation, particle arrangement and particle motion.

Table 1.1

state of matter	particle separation	particle arrangement	particle motion
solid	touching		
liquid			
gas		random	random

[3]

- 2 The table shows the melting points, boiling points and electrical conductivities of six substances, **D**, **E**, **F**, **G**, **H** and **I**.

substance	melting point /°C	boiling point /°C	conducts electricity when solid	conducts electricity when liquid
D	1083	2567	yes	yes
E	-117	79	no	no
F	3550	4827	no	no
G	119	445	no	no
H	-210	-196	no	no
I	801	1413	no	yes

- (a) Identify the substance, **D**, **E**, **F**, **G**, **H** or **I**, which is:

- (i) a liquid at 25 °C [1]
- (ii) a gas at 25 °C [1]
- (iii) a solid consisting of simple molecules at 25 °C. [1]

2 Table 2.1 shows the melting points, boiling points and electrical conductivities of seven substances, A, B, C, D, E, F and G.

Table 2.1

substance	melting point / °C	boiling point / °C	electrical conductivity when solid	electrical conductivity when molten
A	1600	2230	poor	poor
B	−219	−183	poor	poor
C	770	1420	poor	good
D	−39	357	good	good
E	−7	58	poor	poor
F	44	280	poor	poor
G	1085	2562	good	good

- (a) Identify which substance, A, B, C, D, E, F or G, is:
- (i) a gas at 25 °C

..... [1]
- (ii) a solid consisting of simple molecules at 25 °C

..... [1]
- (iii) a metal which is liquid at 25 °C.

..... [1]

Q5

0620/42/F/M/22/Q1(e)

Diffusion

Name the element which:

(e) is the gas with the slowest rate of diffusion at room temperature

..... [1]

Q6

0620/41/O/N/22/Q1(e)

Diffusion

1 The names of the elements of Period 2 of the Periodic Table are shown.

lithium beryllium boron carbon nitrogen oxygen fluorine neon

(e) has the highest rate of diffusion at room temperature

..... [1]

Q7

0620/41/O/N/24/Q1(e)

Diffusion



1 A list of chemical and physical processes, A to H, is shown.

- A combustion
- B diffusion
- C melting
- D neutralisation
- E photosynthesis
- F reversible reaction
- G roasting
- H thermal decomposition

(e) is caused by gas particles colliding with each other.

..... [1]

Q8

0620/42/F/M/21/Q2(c)(i)-(ii)

Diffusion

2 The elements shown are gases at room temperature and pressure.

hydrogen
nitrogen
oxygen
chlorine

(c) When separate samples of each of these gases are placed in a container they will diffuse.

(i) Describe why these gases diffuse.

..... [1]

(ii) State which of these four gases has the highest rate of diffusion.

Explain your answer.

gas

explanation

..... [2]

Q9

0620/42/F/M/23/Q1(e)(i)-(ii)

Diffusion

(e) All gases diffuse.

(i) Choose from the list of formulae the gas which diffuses most quickly.

Draw a circle around your answer.

CO CO₂ CH₄ NO₂ SO₂

[1]

(ii) Explain your answer to (i).

..... [1]

Q10

0620/42/F/M/24/Q5(a)

Diffusion

5 Butane and but-1-ene are colourless gases at room temperature and pressure.

(a) Suggest why but-1-ene diffuses quicker than butane.

..... [1]

(c) Gases diffuse.

(i) Describe, in terms of particles, why gases diffuse.

..... [1]

(ii) State what determines the relative rate of diffusion of gases at constant temperature.

..... [1]

Q12

0620/41/M/J/22/Q6(a)(v)

Heating & Cooling Curves

step 3 The zinc gas is cooled to form molten zinc.

- (v) State the name of the physical change occurring when zinc gas is converted into molten zinc.

..... [1]

Q13

0620/43/M/J/21/Q6(b)(ii)

Heating & Cooling Curves

- (ii) When zinc is extracted, it is formed as a gas.

The gaseous zinc is then converted into molten zinc.

State the name of this physical change.

..... [1]

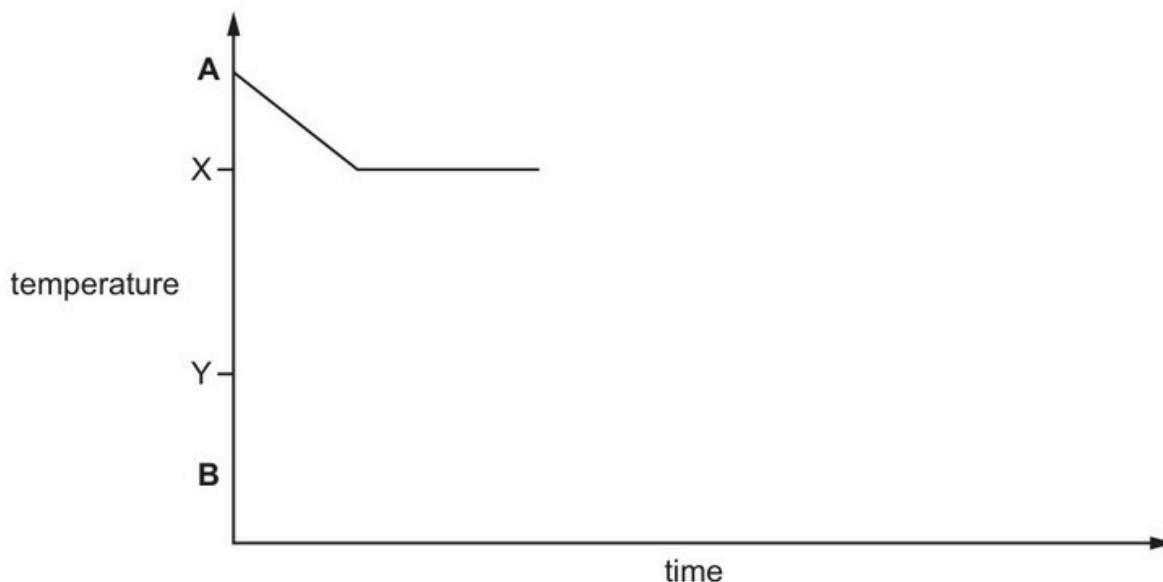
Q14

0620/42/O/N/21/Q1(c)

Heating & Cooling Curves

(c) A substance boils at temperature X and melts at temperature Y.

Complete the graph to show the change in temperature over time as the substance cools from temperature A to temperature B.



[2]

Q15

0620/41/M/J/22/Q6(a)(iv)

Heating & Cooling Curves

step 2 The zinc oxide is then reduced to zinc in a furnace. The zinc formed becomes a gas.

step 3 The zinc gas is cooled to form molten zinc.

(iv) Explain why the zinc forms a gas in **step 2** inside the furnace.

..... [1]

Q16

0620/41/M/J/24/Q6(b)(i)-(ii)

Heating & Cooling Curves

(b) Zinc is produced from zinc oxide in a furnace.

The zinc is produced as a gas. It then forms molten zinc.

(i) Suggest why the zinc produced inside the furnace is a gas.

..... [1]

(ii) State the name of the physical change that occurs when gaseous zinc is converted into molten zinc.

..... [1]

Q17

0620/42/O/N/21/Q1(b)(ii)

Boiling, Melting & Evaporation

(ii) Name the change of state when:

- a gas becomes a liquid
- a solid becomes a gas.

[2]

Q18

0620/42/O/N/25/Q1(b)

Boiling, Melting & Evaporation

(b) Substances can physically change.

Name each physical change:

- solid to liquid
- gas to liquid

Q19

0620/41/O/N/24/Q1(c)

Boiling, Melting & Evaporation



1 A list of chemical and physical processes, A to H, is shown.

- A combustion
- B diffusion
- C melting
- D neutralisation
- E photosynthesis
- F reversible reaction
- G roasting
- H thermal decomposition

(c) involves particles changing from fixed positions to being mobile, but still touching

..... [1]

Q20

0620/42/O/N/21/Q1(b)(i)

Boiling, Melting & Evaporation

- (i) Boiling and evaporation are two ways in which a liquid changes into a gas.

Describe **two** differences between boiling and evaporation.

1

2

[2]

Q21

0620/41/M/J/21/Q3(f)(i)

Boiling, Melting & Evaporation

- (f) The melting points and boiling points of chlorine and potassium chloride are shown.

	melting point /°C	boiling point /°C
chlorine	−101	−35
potassium chloride	770	1500

- (i) Deduce the physical state of chlorine at -75°C . Use the data in the table to explain your answer.

physical state

explanation

.....

[2]

Q22

0620/43/M/J/21/Q3(f)(i)

Boiling, Melting & Evaporation

- (f) The melting points and boiling points of fluorine and sodium fluoride are shown.

	melting point /°C	boiling point /°C
fluorine	−220	−188
sodium fluoride	993	1695

- (i) Deduce the physical state of fluorine at −195 °C. Use the data in the table to explain your answer.

physical state

explanation

..... [2]

Q23

0620/41/M/J/24/Q3(b)(iii)

Boiling, Melting & Evaporation

- (b) Some properties of sodium, fluorine and sodium fluoride are shown in Table 3.1.

Table 3.1

	melting point /°C	boiling point /°C	conduction of electricity when solid	conduction of electricity in aqueous solution
sodium	98	883	good	
fluorine	−220	−188	poor	
sodium fluoride	993	1695	poor	good

- (iii) Deduce the physical state of fluorine at −200 °C. Use the data in Table 3.1 to explain your answer.

physical state

explanation

..... [2]

- (a) Some properties of graphite, oxygen and carbon monoxide are shown in Table 3.1.

Table 3.1

	melting point /°C	boiling point /°C	conduction of electricity when solid
graphite	3652	4827	good
oxygen	−218	−183	poor
carbon monoxide	−199	−191	poor

- (iii) Deduce the physical state of carbon monoxide at -195°C . Use the data in Table 3.1 to explain your answer.

physical state

explanation

.....

[2]

Q1

0620/42/O/N/21/Q1(a)

Solid, Liquid & Gas

1(a)	1 mark for each correct row			3
	State	touching	random movement	
	Gas		✓	
	Liquid	✓	✓	
	Solid	✓		

Q2

0620/42/O/N/25/Q1(a)

Solid, Liquid & Gas

1(a)		particle separation	particle arrangement	particle motion	3
	solid		uniform	vibrate	
	liquid	touching	random	random	
	gas	apart			

Q3

0620/43/O/N/22/Q2(a)(i)-(iii)

Solid, Liquid & Gas

2(a)(i)	E	1
2(a)(ii)	H	1
2(a)(iii)	G	1

Q4

0620/43/O/N/25/Q2(a)(i)-(iii)

Solid, Liquid & Gas

2(a)(i)	B	1
2(a)(ii)	F	1
2(a)(iii)	D	1

MARKING SCHEME - DIFFUSION - EASY

Q5

0620/42/F/M/22/Q1(e)

Diffusion

1(e)	chlorine	1
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Q6

0620/41/O/N/22/Q1(e)

Diffusion

1(e)	neon	1
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Q7

0620/41/O/N/24/Q1(e)

Diffusion

1(e)	B	1

MARKING SCHEME - DIFFUSION - HARD

Q8 0620/42/F/M/21/Q2(c)(i)-(ii)

Diffusion

2(c)(i)	random motion of molecules / particles	1
2(c)(ii)	hydrogen lowest (relative) molecular mass	2

Q9 0620/42/F/M/23/Q1(e)(i)-(ii)

Diffusion

1(e)(i)	CH ₄	1
1(e)(ii)	lowest relative molecular mass	1

Q10 0620/42/F/M/24/Q5(a)

Diffusion

5(a)	(but-1-ene) has a lower relative molecular mass	1
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Q11	0620/42/O/N/25/Q1(c)(i)-(ii)	Diffusion
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1(c)(i)	motion / movement of particles	1
1(c)(ii)	relative molecular mass	1

MARKING SCHEME - HEATING & COOLING CURVES - EASY

Q12	0620/41/M/J/22/Q6(a)(v)	Heating & Cooling Curves
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6(a)(v)	condensation / condensing / condense	1
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Q13	0620/43/M/J/21/Q6(b)(ii)	Heating & Cooling Curves
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6(b)(ii)	condensation/condensing	1
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MARKING SCHEME - HEATING & COOLING CURVES - HARD

Q14 **0620/42/O/N/21/Q1(c)** Heating & Cooling Curves

1(c)	one horizontal line level with Y (1) two separate decreases before and after horizontal line (1)	2
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Q15 **0620/41/M/J/22/Q6(a)(iv)** Heating & Cooling Curves

6(a)(iv)	the temperature in the furnace is above or higher than the boiling point of zinc OR the boiling point of zinc is below or less than the temperature of the furnace	1
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Q16 **0620/41/M/J/24/Q6(b)(i)-(ii)** Heating & Cooling Curves

6(b)(i)	the temperature in the furnace is above or higher than the boiling point of zinc ORA OR the boiling point of zinc is below or less than the temperature of the furnace ORA	1
6(b)(ii)	condensation / condensing	1

MARKING SCHEME - BOILING, MELTING & EVAPORATION - EASY

Q17		0620/42/O/N/21/Q1(b)(ii)		Boiling, Melting & Evaporation	
	1(b)(ii)	condensation (1) sublimation (1)			2

Q18		0620/42/O/N/25/Q1(b)		Boiling, Melting & Evaporation	
	1(b)	M1 melting M2 condensing / condensation			

Q19		0620/41/O/N/24/Q1(c)		Boiling, Melting & Evaporation	
	1(c)	C			1

MARKING SCHEME - BOILING, MELTING & EVAPORATION - HARD

Q20 **0620/42/O/N/21/Q1(b)(i)**

Boiling, Melting & Evaporation

1(b)(i)	boiling happens at a specific temperature (1) boiling has bubbles (1)	2
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Q21 **0620/41/M/J/21/Q3(f)(i)**

Boiling, Melting & Evaporation

3(f)(i)	liquid (1) BOTH melting point is below -75°C AND boiling point is above -75°C OR BOTH -75°C is higher than -101°C / melting point AND lower than -35°C / boiling point OR -75°C is between melting point or -101°C and boiling point or -35°C	2
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Q22 **0620/43/M/J/21/Q3(f)(i)**

Boiling, Melting & Evaporation

3(f)(i)	liquid (1) BOTH melting point is below -195°C and boiling point is above -195°C OR -195°C is in between melting point and boiling point / -220°C and -188°C (1) OR BOTH -195°C is higher than -220°C / melting point AND lower than -188°C / boiling point	2
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MARKING SCHEME - BOILING, MELTING & EVAPORATION - HARD (CONT.)

Q23

0620/41/M/J/24/Q3(b)(iii)

Boiling, Melting & Evaporation

3(b)(iii)	M1 liquid(1) M2 BOTH melting point is below $-200\text{ }^{\circ}\text{C}$ AND boiling point is above $-200\text{ }^{\circ}\text{C}$(1) OR BOTH $-200\text{ }^{\circ}\text{C}$ is higher than $-220\text{ }^{\circ}\text{C}$/ melting point AND lower than $-188\text{ }^{\circ}\text{C}$/ boiling point(1) OR $-200\text{ }^{\circ}\text{C}$ is between melting point or $-220\text{ }^{\circ}\text{C}$ and boiling point or $-188\text{ }^{\circ}\text{C}$(1)	2
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Q24

0620/43/M/J/24/Q3(a)(iii)

Boiling, Melting & Evaporation

3(a)(iii)	M1 liquid M2 melting point is below $-195\text{ }^{\circ}\text{C}$ and boiling point is above $-195\text{ }^{\circ}\text{C}$ or $-195\text{ }^{\circ}\text{C}$ is higher than $-199\text{ }^{\circ}\text{C}$ / melting point and lower than $-191\text{ }^{\circ}\text{C}$ / boiling point or $-195\text{ }^{\circ}\text{C}$ is in between melting point / $-199\text{ }^{\circ}\text{C}$ and boiling point / $-191\text{ }^{\circ}\text{C}$	2
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