

Q1

5070/21/O/N/22/Q2(a)(ii)

Solid, Liquid & Gas

(ii) Describe the motion and separation of the particles in a gas.

motion

separation

[2]

Q2

5070/22/O/N/22/Q2(c)

Solid, Liquid & Gas

(c) Bromine is a liquid at room temperature.

Describe the arrangement and separation of the particles in a liquid.

arrangement

separation

[2]

Q3

5070/21/O/N/23/Q5(a)(iii)

Solid, Liquid & Gas

(iii) Compound A is a solid at 20 °C.

Describe the motion and arrangement of the particles in a solid.

motion

arrangement

[2]

Q4

5070/22/O/N/23/Q5(a)(iv)

Solid, Liquid & Gas

(iv) Compound **A** is a liquid at room temperature.

Describe the motion and separation of the particles in a liquid.

motion

separation

[2]

Q5

5070/21/O/N/24/Q7(a)(iv)

Solid, Liquid & Gas

(iv) Magnesium is a solid at room temperature.

Describe the motion and separation of the particles in a solid.

motion

.....

separation

.....

[2]

- (ii) Ethanoic acid is a liquid at room temperature.

Describe the arrangement and motion of the particles in a liquid.

arrangement

.....

motion

.....

[2]

(f) A sample of neon has a volume of 21 dm^3 at room temperature and pressure.

(i) The temperature of the sample is increased.

The pressure remains constant.

Describe and explain, using kinetic particle theory, what happens to the volume of the sample.

.....
..... [1]

(ii) The pressure of the sample is increased.

The temperature remains constant.

Describe and explain, using kinetic particle theory, what happens to the volume of the sample.

.....
..... [1]

(e) A sample of oxygen has a volume of 11.5 dm^3 at room temperature and pressure.

(i) The temperature of the sample is decreased.

The pressure remains constant.

Describe and explain, using kinetic particle theory, what happens to the volume of the sample.

.....
..... [1]

(ii) The pressure of the sample is decreased.

The temperature remains constant.

Describe and explain, using kinetic particle theory, what happens to the volume of the sample.

.....
..... [1]

- (d) A sample of hydrogen is put into a gas syringe. The end of the gas syringe is then blocked so that no gas can escape.

Explain, using kinetic particle theory, why decreasing the pressure in the gas syringe increases the volume of gas when the temperature stays the same.

.....

..... [1]

[Total: 8]

- (d) A sample of carbon dioxide is put into a gas syringe. The end of the gas syringe is then blocked so that no gas can escape.

Explain, using kinetic particle theory, why increasing the pressure in the gas syringe decreases the volume of gas when the temperature stays the same.

.....

..... [1]

[Total: 8]

Q11

5070/21/M/J/24/Q7(a)

Solid, Liquid & Gas

- (a) A sample of chlorine has a volume of 240 cm^3 at room temperature and pressure.

The pressure of the sample is increased at room temperature.

Describe and explain, in terms of kinetic particle theory, what happens to the volume of the sample.

.....

.....

.....

[2]

Q12

5070/22/M/J/24/Q7(a)

Solid, Liquid & Gas

- (a) A sample of oxygen has a volume of 540 cm^3 at room temperature and pressure.

The temperature of the sample is increased but the pressure is unchanged.

Describe and explain, in terms of kinetic particle theory, what happens to the volume of the sample.

.....

.....

.....

..... [2]

Q13

5070/22/M/J/23/Q2(c)(i)

Diffusion

(c) The rate of diffusion of fluorine gas is greater than that of chlorine gas under the same conditions of temperature and pressure.

(i) State what is meant by the term diffusion.

.....

.....

..... [1]

Q14

5070/22/M/J/24/Q7(c)

Diffusion

(c) Describe diffusion in terms of kinetic particle theory.

.....

..... [1]

Q15

5070/21/M/J/23/Q9(e)(i)-(ii)

Diffusion

- (e) The rate of diffusion of nitrogen dioxide, $\text{NO}_2(\text{g})$, is less than that of nitrogen monoxide, $\text{NO}(\text{g})$, under the same conditions of temperature and pressure.

- (i) Explain why the rate of diffusion of $\text{NO}_2(\text{g})$ is less than that of $\text{NO}(\text{g})$ under the same conditions.

.....

 [1]

- (ii) The rate of diffusion of nitrogen monoxide decreases as the temperature decreases.

Suggest why using ideas about kinetic particle theory.

.....
 [1]

[Total: 8]

Q16

5070/22/M/J/23/Q2(c)(ii)-(iii)

Diffusion

- (ii) Explain why the rate of diffusion of fluorine is greater than that of chlorine under the same conditions.

.....

 [1]

- (iii) The rate of diffusion of fluorine increases as the temperature increases.

Suggest why using ideas about kinetic particle theory.

.....
 [1]

[Total: 8]

Q17

5070/21/M/J/24/Q7(c)

Diffusion

- (c) At the same temperature and pressure, the rate of diffusion of chlorine gas is greater than that of iodine gas.

Explain why.

.....

..... [1]

- (b) When heated at atmospheric pressure, iodine changes directly into a gas without becoming a liquid.

Describe the changes in particle separation, arrangement and motion during this change.

separation

.....

arrangement

.....

motion

.....

[3]

(b) Sulfur is a gas above 445 °C.

Describe the changes in particle separation, arrangement and motion when a sample of sulfur gas is cooled down to room temperature.

separation

.....

arrangement

.....

motion

.....

[3]

(a) The table shows some properties of the Group IV elements.

element	density at room temperature in g/cm ³	melting point in °C	boiling point in °C
carbon (diamond)		3550	4827
silicon	2.34	1410	2355
germanium	5.35	937	2830
tin		232	2260
lead	11.34	328	1740

(iii) Predict the state of silicon at 1600 °C.
Give a reason for your answer.

.....
..... [1]

2 The table shows some information about elements in Group V.

element	electronic configuration	melting point / °C	boiling point / °C
nitrogen	2, 5	-210	-196
phosphorus		44	280
arsenic	2, 8, 18, 5	817	613
antimony	2, 8, 18, 18, 5	630	1380
bismuth	2, 8, 18, 32, 18, 5		

(c) Use information from the table to explain why antimony is a liquid at 1000 °C.

.....
.....
..... [1]

Q22

5070/22/M/J/22/Q2(c)

Boiling, Melting & Evaporation

2 The table shows some information about elements in Group VI.

element	electronic configuration	melting point / °C	density in g/cm ³
oxygen	2, 6	–218	0.0013
sulfur		113	2.1
selenium	2, 8, 18, 6	217	4.8
tellurium	2, 8, 18, 18, 6	450	6.3
polonium	2, 8, 18, 32, 18, 6	254	

(c) Sulfur has a boiling point of 445 °C.

Predict the physical state of sulfur at 200 °C.

Explain your answer.

physical state

explanation

.....

[1]

Q23

5070/21/M/J/25/Q6(a)(i)-(ii)

Boiling, Melting & Evaporation

(a) The melting point of chlorine is –101 °C and the boiling point is –35 °C.

(i) Explain why chlorine is a liquid at –50 °C.

.....

..... [1]

(ii) Describe the arrangement and motion of chlorine molecules at –50 °C.

.....

.....

.....

..... [3]

(a) The melting point of bromine is -7°C and the boiling point is 59°C .

(i) Explain why bromine is a solid at -50°C .

.....
 [1]

(ii) Describe the arrangement and motion of bromine molecules at -50°C .

.....

 [3]

Q25

5070/21/O/N/25/Q4(a)(i)-(ii)

Boiling, Melting & Evaporation

(a) Bromine has a low boiling point. It is a liquid at room temperature.

(i) Describe the arrangement and motion of molecules in liquid bromine.

.....

.....

.....

..... [2]

(ii) Explain why bromine has a low boiling point.

Use ideas about structure and bonding.

.....

..... [1]

Q26

5070/22/O/N/25/Q4(a)(i)-(ii)

Boiling, Melting & Evaporation

(a) Fluorine has a low boiling point. It is a gas at room temperature.

(i) Describe the arrangement and motion of molecules in fluorine gas.

.....

.....

.....

..... [2]

(ii) Explain why fluorine is a gas at room temperature.

Use ideas about structure and bonding.

.....

..... [1]

MARKING SCHEME - SOLID, LIQUID & GAS - EASY

Q1

5070/21/O/N/22/Q2(a)(ii)

Solid, Liquid & Gas

2(a)(ii)	<i>motion:</i> random / fast / rapid (1) <i>separation:</i> far apart (1)	2
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Q2

5070/22/O/N/22/Q2(c)

Solid, Liquid & Gas

2(c)	<i>arrangement:</i> random / not ordered (1) <i>separation:</i> close together / (some) particles touching (1)	2
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Q3

5070/21/O/N/23/Q5(a)(iii)

Solid, Liquid & Gas

5(a)(iii)	<i>motion:</i> vibrating (1) <i>arrangement:</i> regular (1)	2
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MARKING SCHEME - SOLID, LIQUID & GAS - EASY

Q4**5070/22/O/N/23/Q5(a)(iv)**

Solid, Liquid & Gas

5(a)(iv)	motion: sliding over each other / slipping over each other (1)	2
	separation: close together (1)	

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Q5**5070/21/O/N/24/Q7(a)(iv)**

Solid, Liquid & Gas

7(a)(iv)	motion: only vibrates (1)	2
	separation: touching (1)	

Q6**5070/22/O/N/24/Q7(e)(ii)**

Solid, Liquid & Gas

7(e)(ii)	arrangement: irregular (1)	2
	motion: sliding over each other (1)	

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MARKING SCHEME - SOLID, LIQUID & GAS - HARD

Q7

5070/21/M/J/21/Q2(f)(i)-(ii)

Solid, Liquid & Gas

2(f)(i)	volume increases AND particles move faster / particles spread out more / particles move further apart	1
2(f)(ii)	volume decreases AND particles move closer together / distance between particles decreases	1

Q8

5070/22/M/J/21/Q2(e)(i)-(ii)

Solid, Liquid & Gas

2(e)(i)	volume decreases AND particles move slower / particles less spread out / particles closer together	1
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2(e)(ii)	volume increases AND particles move further apart / particles more spread out / distance between particles increases	1
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Q9

5070/21/O/N/23/Q3(d)

Solid, Liquid & Gas

3(d)	the particles move further apart	1
Question	Answer	Marks

MARKING SCHEME - SOLID, LIQUID & GAS - HARD

Q10

5070/22/O/N/23/Q3(d)

Solid, Liquid & Gas

3(d)	the particles are (pushed) closer together	1
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Q11

5070/21/M/J/24/Q7(a)

Solid, Liquid & Gas

7(a)	volume decreases (1) particles move closer to one another / distance between particles decreases (1)	2
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Q12

5070/22/M/J/24/Q7(a)

Solid, Liquid & Gas

7(a)	volume increases (1) particles spread (out) / distance between particles increases (1)	2
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MARKING SCHEME - DIFFUSION - EASY

Q13	5070/22/M/J/23/Q2(c)(i)	Diffusion
2(c)(i)	(net) movement of (any) particles or substance from high concentration to low concentration (1)	1

Q14	5070/22/M/J/24/Q7(c)	Diffusion
7(c)	particles move from high concentration to low concentration	1

MARKING SCHEME - DIFFUSION - HARD

Q15

5070/21/M/J/23/Q9(e)(i)-(ii)

Diffusion

9(e)(i)	NO ₂ has a higher (relative) molecular mass / molecule has more mass (1)	1
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9(e)(ii)	(NO) molecules move slower / (NO) molecules have less kinetic energy (1)	1
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Question	Answer	Marks
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Q16

5070/22/M/J/23/Q2(c)(ii)-(iii)

Diffusion

2(c)(ii)	fluorine has a lower (relative) molecular mass / fluorine molecules have less mass (1)	1
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2(c)(iii)	(fluorine) molecules or particles move faster / (fluorine) molecules have more kinetic energy (1)	1
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Q17

5070/21/M/J/24/Q7(c)

Diffusion

7(c)	chlorine has a lower (relative) molecular mass / chlorine molecules have less mass	1
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MARKING SCHEME - HEATING & COOLING CURVES - EASY

Q18

5070/21/M/J/24/Q7(b)

Heating & Cooling Curves

7(b)	particle separation – move apart (1) arrangement – ordered to random (1) motion – vibrating to moving from one place to another (1)	3
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MARKING SCHEME - HEATING & COOLING CURVES - HARD

Q19

5070/22/M/J/24/Q7(b)

Heating & Cooling Curves

7(b)	particle separation – move closer together (1) arrangement – random to an ordered (1) motion – moving from one place to another to vibrating (1)	3
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MARKING SCHEME - BOILING, MELTING & EVAPORATION - EASY

Q20

5070/21/O/N/21/Q10(a)(iii)

Boiling, Melting & Evaporation

10(a)(iii)	liquid AND 1600 (°C) is lower than the boiling point AND 1600 (°C) is higher than the melting point	1
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Q21

5070/21/M/J/22/Q2(c)

Boiling, Melting & Evaporation

2(c)	melting point is below 1000 °C and boiling point is above 1000 °C / 1000 °C is between the melting point and the boiling point	1
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Q22

5070/22/M/J/22/Q2(c)

Boiling, Melting & Evaporation

2(c)	liquid because melting point is below 200 °C and boiling point is above 200 °C / 200 °C is between the melting point and the boiling point	1
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MARKING SCHEME - BOILING, MELTING & EVAPORATION - EASY

Q23

5070/21/M/J/25/Q6(a)(i)-(ii)

Boiling, Melting & Evaporation

6(a)(i)	–50 °C is higher than melting point and lower than boiling point / 50° is between the melting point and boiling point	1
6(a)(ii)	particles are touching each other / particles are very close to one another (1) particles are not in a pattern / arrangement is random (1) particles flow over one another (1)	3

Q24

5070/22/M/J/25/Q6(a)(i)-(ii)

Boiling, Melting & Evaporation

6(a)(i)	–50 °C is lower than melting point	1
6(a)(ii)	particles are touching each other / particles are very close to one another (1) particles are in a pattern / arrangement is ordered (1) particles are vibrating (1)	3

MARKING SCHEME - BOILING, MELTING & EVAPORATION - HARD

Q25

5070/21/O/N/25/Q4(a)(i)-(ii)

Boiling, Melting & Evaporation

4(a)(i)	Any two from: particles are touching each other / particles are very close to one another (1) random (arrangement) (1) particles flow/move over one another (1)	2
4(a)(ii)	weak intermolecular forces	1

Q26

5070/22/O/N/25/Q4(a)(i)-(ii)

Boiling, Melting & Evaporation

4(a)(i)	Any two from: M1 random (arrangement) (1) M2 (molecules are spread) far apart (1) M3 (molecules are) moving (very) fast (1) M4 random (motion)	2
4(a)(ii)	weak intermolecular forces	1