02 Kinetic Particle Theory

Set B Exam practice

Name	Time 50 minutes	Total 27 marks	Score ____ / 27

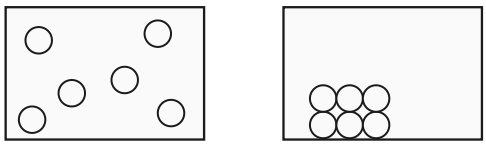
Marks by notes section For the marker: total each row. A score below the target means that section of the notes needs revising.

Notes section	Questions	Marks	Target	Score
2 Changes of State and Curves	1, 7, 8, 10	14	9	
4 Diffusion	2, 3, 4, 5, 6, 9	13	8	

A Multiple choice

6 MARKS

1 The diagram shows the spacing of the particles in a substance Z at two different temperatures. Which of the following could be substance Z?



at 232 °C at 179 °C

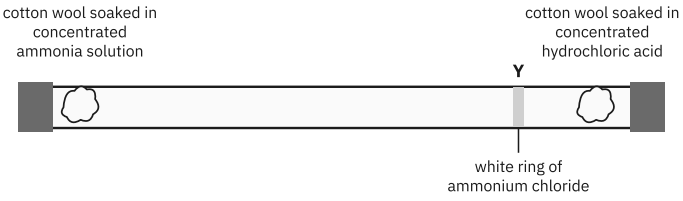
	melting point / °C	boiling point / °C
A	−21	−9
B	160	210
C	183	253
D	194	229

/1

Answer ☐ [1]

Source: 2023 GESS Sec 3 End-of-Year P1 Q7

2 The apparatus shown is set up. Molecules of ammonia and hydrogen chloride react to form ammonium chloride. After 20 minutes, a white ring of ammonium chloride is seen at position Y. Which statement best explains this observation?



A Molecules in ammonia diffuse more slowly because they have a larger mass than molecules of hydrogen chloride.

B Molecules in ammonia diffuse more quickly because they have a larger mass than molecules of hydrogen chloride.

C Molecules in ammonia diffuse more slowly because they have a smaller mass than molecules of hydrogen chloride.

D Molecules in ammonia diffuse more quickly because they have a smaller mass than molecules of hydrogen chloride.

Answer ☐ [1]

/1

Source: 2023 XMS Sec 3 WA1 P1 Q4

3 Bromine gas and air are mixed together to form a homogeneous mixture in a closed vessel. Bromine has a higher density than air. What will be observed after several hours?

A The two gases remain mixed.

B The two gases separate, a layer of air above bromine gas.

C The two gases separate, a layer of bromine gas above air.

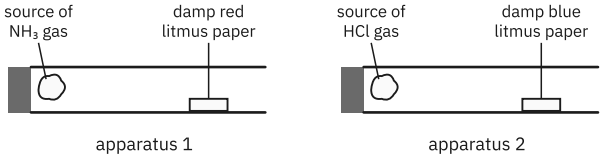
D There is insufficient information, as it depends on the proportion of each gas in the vessel at the beginning.

Answer ☐ [1]

/1

Source: 2024 CHS Sec 3 End-of-Year Section A Q6

4 A student investigated the diffusion of two gases, NH_3 and HCl. Two sets of apparatus were set up as shown at room temperature and pressure. The damp red litmus paper in apparatus 1 changed colour after 30 seconds. How long did it take for the damp blue litmus paper to change colour in apparatus 2?



A 21 seconds

B 30 seconds

C 64 seconds

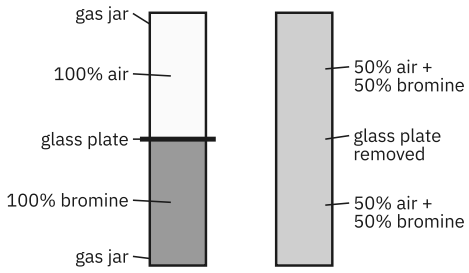
D The damp blue litmus paper would not change colour.

Answer ☐ [1]

/1

Source: 2024 CHS Sec 3 End-of-Year Section A Q7

5 When the glass plate is removed from the set-up on the left, the colour of the gas becomes the same in both jars after several days, as shown on the right. Which statement best explains the appearance after a few days?



A Heavier particles sink while lighter particles rise.

B Both the air and bromine particles diffuse at the same rate.

C There are as many air particles as bromine particles in each jar.

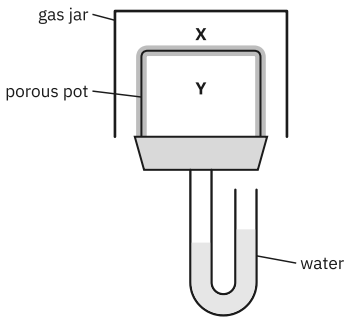
D Both the air and bromine particles move randomly.

/1

Answer ☐ [1]

Source: 2020 XMS Sec 3 WA1 P1 Q1

6 Gas X is in the gas jar and gas Y is in the porous pot. Which pair of gases will cause the water level in the left side of the tube to fall?



	X	Y
A	N_2	CO
B	Ne	F_2
C	SO_2	NO_2
D	Cl_2	CO_2

/1

Answer ☐ [1]

Source: 2020 XMS Sec 3 WA1 P1 Q4

B Structured questions

21 MARKS

7 The figure shows the heating curve for a substance X.

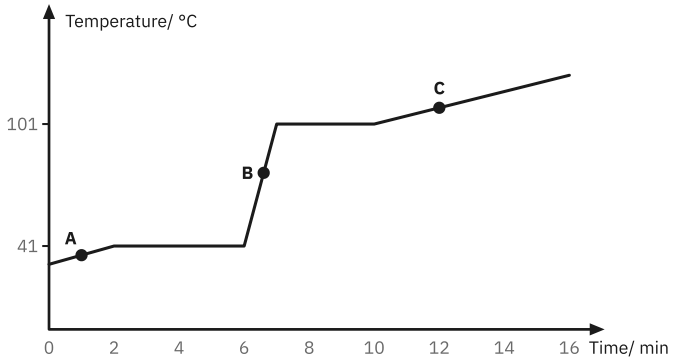


Fig. 1

(a) Describe, in terms of the kinetic particle theory, the movement and arrangement of the particles of substance X at point A.

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..... **[2]**

(b) State how long it took for substance X to completely change from a solid into a gas.

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

(c) Compare the forces of attraction between the particles and the kinetic energy of the particles at point B and at point C.

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..... **[2]**

/5

Source: 2023 GESS Sec 3 End-of-Year P2 A8

8 Z is a covalent substance. In an experiment, a sample of pure solid Z was continuously heated for 9 minutes. The figure shows how the temperature of the sample changed over time.

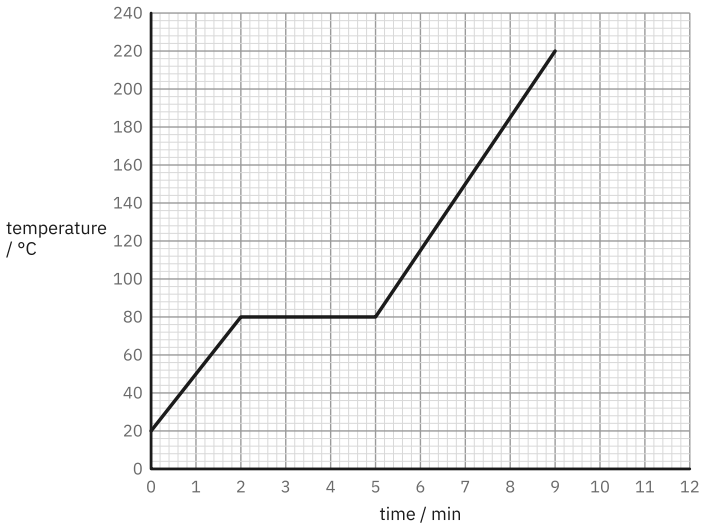


Fig. 2

(a) What is the melting point of pure Z?

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

(b) The sample of pure Z was continuously heated between 2 minutes and 5 minutes. Explain, in terms of attractive forces, why there was no increase in the temperature of the sample between 2 minutes and 5 minutes.

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

(c) Describe how the movement of particles of pure Z changed from 0 to 2 minutes.

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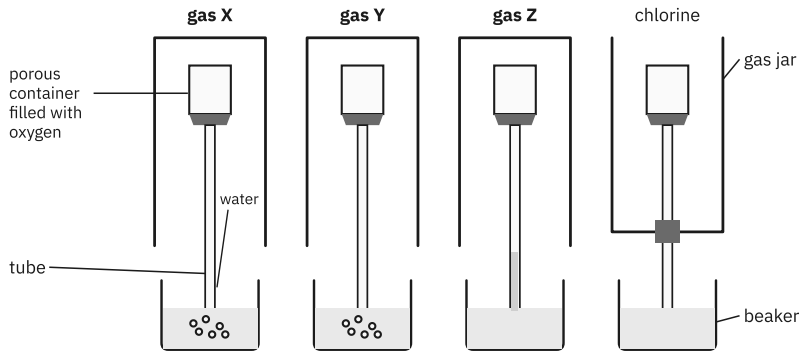
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/4

Source: 2024 CHS Sec 3 End-of-Year Section B Q2

9 A student conducted an experiment with the apparatus set-up below. Three unknown gases, X, Y, Z and chlorine gas are compared to oxygen gas. All the porous containers are filled with oxygen gas.



(a) Explain why bubbles are observed in the water for the set-ups containing gases X and Y.

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..... **[3]**

(b) No bubbles were observed in the set-up containing gas Z. A small amount of water was seen to rise up the tube. Suggest a possible identity of gas Z.

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

(c) Suggest why the gas jar containing chlorine was arranged the opposite way from the other gas jars containing gases X, Y and Z.

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

(d) The experiment was conducted at 25 °C. State and explain what would be observed if the experiment was conducted at 50 °C instead.

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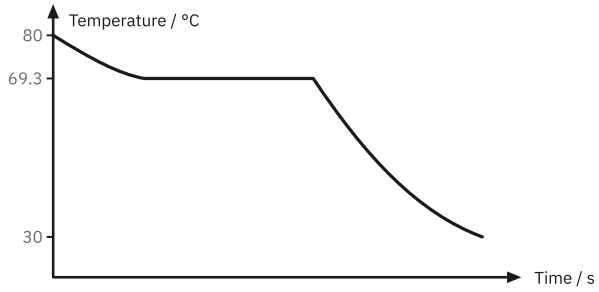
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..... **[3]**

/8

Source: 2023 GESS Sec 3 End-of-Year P2 A4

10 Pure stearic acid melts at 69.3 °C and boils at 361 °C. A solid sample of stearic acid was heated to 80 °C and allowed to cool to 30 °C. The graph of temperature against time for the cooling process is shown below.



(a) Describe the changes in movement and arrangement of the stearic acid particles as the temperature decreases from 80 °C to 68 °C.

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..... **[2]**

(b) A pure sample of stearic acid was heated from 350 °C to 370 °C. State and explain, in terms of the kinetic particle theory, the change in state that occurred.

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/4

Source: SJI 2020 Year 3 End-of-Year P2 A2(a) and (c)