



XINMIN SECONDARY SCHOOL
新民中學
SEKOLAH MENENGAH XINMIN

Weighted Assessment 1 2026

CANDIDATE NAME

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CLASS

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INDEX NUMBER

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CHEMISTRY

K324

Secondary 3 G3

Term 1 Week 8

Setter:

Vetter:

40 minutes

Candidates answer on the Question Paper.
No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your name, class and index number on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams, graphs or rough working.
Do not use staples, paper clips, glue or correction fluid.

Section A: Multiple Choice Questions (5 marks)

Answer **all** questions.

For each question, there are four possible answers **A**, **B**, **C** and **D**. Choose the one you consider correct and record your choice in the boxes at the end of the Section.
Each correct answer will score one mark. A mark will not be deducted for a wrong answer. Any rough working should be done in this booklet.

Section B: Structured Questions (10 marks)

Section C: Free Response Questions (15 marks)

Answer **all** questions.

The number of marks is given in brackets [] at the end of each question or part question.

The use of an approved scientific calculator is expected, where appropriate.

For Examiner's Use	
Section A	5
Section B	10
Section C	15
Total	30
Parent's Signature	

The Periodic Table of Elements

Group																	
1	2											13	14	15	16	17	18
Key proton (atomic) number atomic symbol name relative atomic mass							1 H hydrogen 1										2 He helium 4
												5 B boron 11	6 C carbon 12	7 N nitrogen 14	8 O oxygen 16	9 F fluorine 19	10 Ne neon 20
												13 Al aluminium 27	14 Si silicon 28	15 P phosphorus 31	16 S sulfur 32	17 Cl chlorine 35.5	18 Ar argon 40
3 Li lithium 7	4 Be beryllium 9																
11 Na sodium 23	12 Mg magnesium 24	3	4	5	6	7	8	9	10	11	12						
19 K potassium 39	20 Ca calcium 40	21 Sc scandium 45	22 Ti titanium 48	23 V vanadium 51	24 Cr chromium 52	25 Mn manganese 55	26 Fe iron 56	27 Co cobalt 59	28 Ni nickel 59	29 Cu copper 64	30 Zn zinc 65	31 Ga gallium 70	32 Ge germanium 73	33 As arsenic 75	34 Se selenium 79	35 Br bromine 80	36 Kr krypton 84
37 Rb rubidium 85	38 Sr strontium 88	39 Y yttrium 89	40 Zr zirconium 91	41 Nb niobium 93	42 Mo molybdenum 96	43 Tc technetium —	44 Ru ruthenium 101	45 Rh rhodium 103	46 Pd palladium 106	47 Ag silver 108	48 Cd cadmium 112	49 In indium 115	50 Sn tin 119	51 Sb antimony 122	52 Te tellurium 128	53 I iodine 127	54 Xe xenon 131
55 Cs caesium 133	56 Ba barium 137	57–71 lanthanoids	72 Hf hafnium 178	73 Ta tantalum 181	74 W tungsten 184	75 Re rhenium 186	76 Os osmium 190	77 Ir iridium 192	78 Pt platinum 195	79 Au gold 197	80 Hg mercury 201	81 Tl thallium 204	82 Pb lead 207	83 Bi bismuth 209	84 Po polonium —	85 At astatine —	86 Rn radon —
87 Fr francium —	88 Ra radium —	89–103 actinoids	104 Rf rutherfordium —	105 Db dubnium —	106 Sg seaborgium —	107 Bh bohrium —	108 Hs hassium —	109 Mt meitnerium —	110 Ds darmstadtium —	111 Rg roentgenium —	112 Cn copernicium —	113 Nh nihonium —	114 Fl flerovium —	115 Mc moscovium —	116 Lv livermorium —	117 Ts tennessine —	118 Og oganesson —

lanthanoids	57 La lanthanum 139	58 Ce cerium 140	59 Pr praseodymium 141	60 Nd neodymium 144	61 Pm promethium —	62 Sm samarium 150	63 Eu europium 152	64 Gd gadolinium 157	65 Tb terbium 159	66 Dy dysprosium 163	67 Ho holmium 165	68 Er erbium 167	69 Tm thulium 169	70 Yb ytterbium 173	71 Lu lutetium 175
actinoids	89 Ac actinium —	90 Th thorium 232	91 Pa protactinium 231	92 U uranium 238	93 Np neptunium —	94 Pu plutonium —	95 Am americium —	96 Cm curium —	97 Bk berkelium —	98 Cf californium —	99 Es einsteinium —	100 Fm fermium —	101 Md mendelevium —	102 No nobelium —	103 Lr lawrencium —

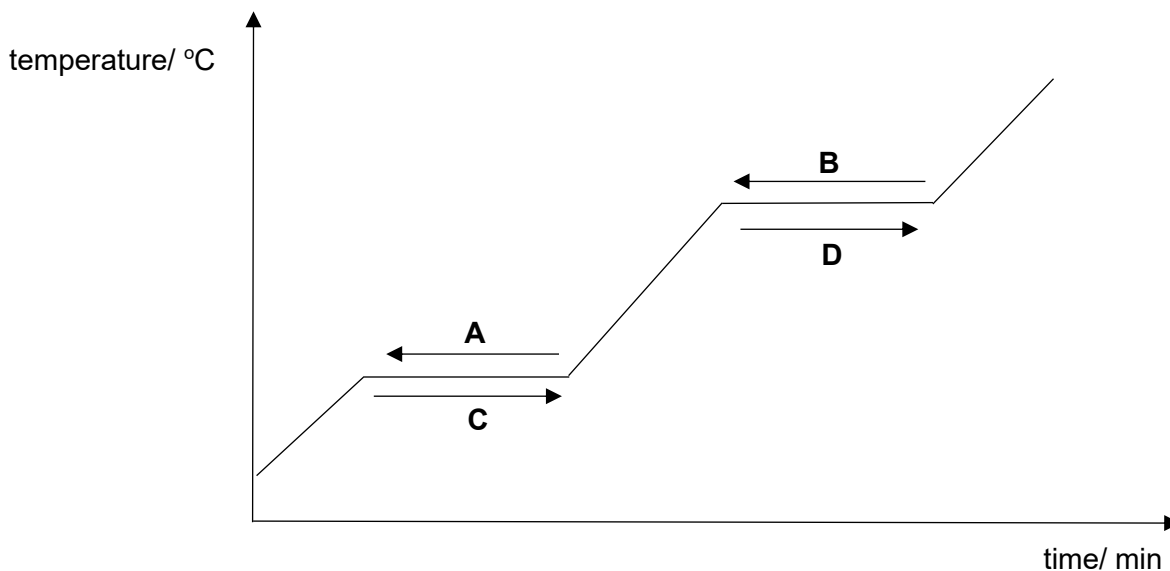
The volume of one mole of any gas is 24 dm³ at room temperature and pressure (r.t.p.).

The Avogadro constant, $L = 6.02 \times 10^{23} \text{ mol}^{-1}$

Section A [5 marks]Answer **all** questions.

Write your answers in the boxes provided at the end of the section.

- 1 The graph shows the temperature of a solid as it is heated.

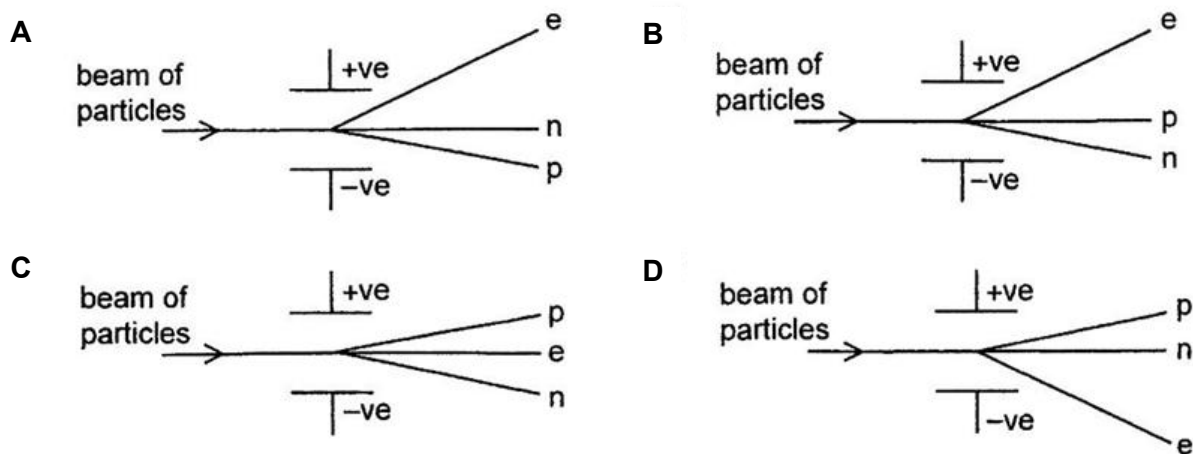


Which letter corresponds to the correct change of state?

- A** freezing
 - B** vaporisation
 - C** condensation
 - D** melting
- 2 Which statement about evaporation and boiling is **not** true?
- A** Both evaporation and boiling involve the gain of energy by particles.
 - B** Evaporation is a slow process while boiling is a rapid process.
 - C** Evaporation occurs at the surface of the liquid while boiling occurs throughout the liquid.
 - D** Evaporation only occurs at room temperature, while boiling only occurs at the boiling point.

- 3 A beam of particles contains neutrons(n), protons(p) and electrons(e). The beam is passed between two charged plates.

Which diagram shows how the particles are affected by the plates?



- 4 A student compared these four particles, Mg^{2+} , Ne , O^{2-} and Al^{3+} .

Which conclusion about these four particles is correct?

- A They are isotopes of each other.
- B They have different number of electron shells.
- C They have the same number of electrons.
- D They have the same number of neutrons.

- 5 An ion, X^{2+} , has 10 electrons and 14 neutrons.

What is the mass number of X?

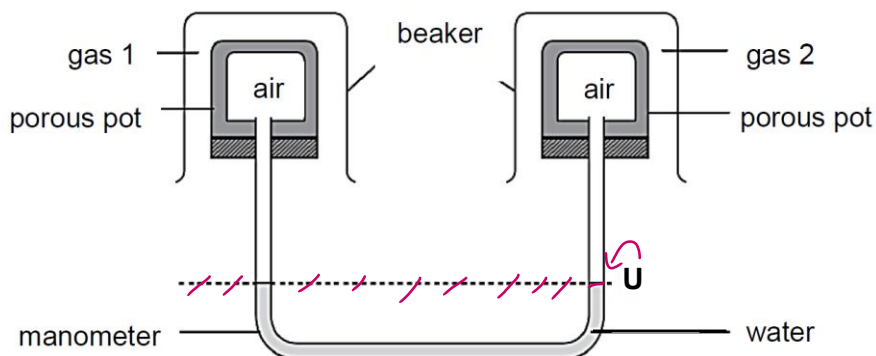
- A 12
- B 16
- C 22
- D 26

Question	1	2	3	4	5
Answer					

Section B [10 marks]Answer **all** questions.

Write your answers in the spaces provided.

- 6** Fig. 6.1 shows an experimental set-up consisting of two beakers, each containing a different gas, inverted over a porous pot containing air. The main component in air is nitrogen gas (N_2).

**Fig. 6.1**

Alice carried out two experiments using different gases, as shown in Table 6.1.

Table 6.1

experiment	gas 1	gas 2	water level at U		
			increases	remains the same	decreases
1	carbon dioxide (CO_2)	propane (C_3H_8)			
2	carbon dioxide (CO_2)	ammonia (NH_3)			

- (a) Put a tick (✓) in one box in each row of Table 6.1 to indicate how the water level at **U** will change. [2]

- (b) Explain your answer in (a) for experiment 2.

.....

.....

..... [2]

[Total: 4]

- 7 Air can be separated into different gases using the steps listed below.

- Step 1 Air is passed through a membrane to remove dust.
 Step 2 The air is cooled in stages until it reaches $-200\text{ }^{\circ}\text{C}$.
 Step 3 The cooled air is heated up and the gases are separated using fractional distillation.

The melting and boiling points of the various gases in air are shown in Table 7.1.

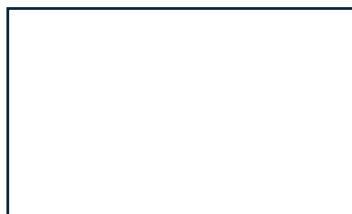
Table 7.1

gas	melting point/ $^{\circ}\text{C}$	boiling point/ $^{\circ}\text{C}$
nitrogen	-210	-196
oxygen	-219	-183
argon	-189	-186
carbon dioxide	sublimes at -79	

- (a) Using Table 7.1, name two gases that will be in the solid state in step 2.

..... and [1]

- (b) In the box below, draw a particle diagram to represent nitrogen gas at $-300\text{ }^{\circ}\text{C}$.



Legend

○ particle of nitrogen gas

[1]

- (c) Describe, using Kinetic Particle Theory, the change in the movement and arrangement of oxygen particles as it is heated from $-200\text{ }^{\circ}\text{C}$ to $-180\text{ }^{\circ}\text{C}$.

.....

 [2]

- (d) Argon is used as a filler gas in light bulbs as it provides an inert environment and prevents unwanted reactions from happening.

Using its electronic configuration, explain why argon is able to provide an inert environment in light bulbs.

.....

..... [2]

[Total: 6]

Section C [15 marks]Answer **all** questions.

Write your answers in the spaces provided.

8 Isotopes of hydrogen and heavy water

There are three isotopes that hydrogen exists as, as shown in Table 8.1.

Table 8.1

isotope	number of protons	number of neutrons	number of electrons	nuclide notation
hydrogen	1	0	1	${}^1_1\text{H}$
deuterium	1	1	1	
tritium	1	2	1	

Heavy water, D_2O , is a form of water in which the hydrogen atoms are replaced by deuterium. Heavy water is used as a scientific tracer to monitor biological and chemical processes, as outlined in Table 8.2.

Table 8.2

Key Step	Description
1. Administration	D_2O is consumed, injected or introduced into a system, such as the human body.
2. Incorporation	As D_2O is chemically similar to H_2O , cells incorporate the deuterium atoms into newly synthesized molecules as they grow.
3. Detection	Scientists use analytical techniques such as Mass Spectrometry, which can detect atoms of different masses, to detect the presence of deuterium atoms.
4. Analysis	The rate and/or location of deuterium incorporation can be used to understand and monitor biological and chemical processes.

The ions of hydrogen

The hydrogen atom is highly reactive, and can form two types of ions, as shown in Table 8.3.

Table 8.3

name of ion	chemical symbol	number of electrons
hydrogen ion	H^+	
hydride ion	H^-	

1	2		
H			
Li			
Na		3	
K			
Rb			

[illegible]

Fig. 8.2

Fig. 8.3

- (a) (i)** Complete Table 8.1. [1]

- (ii) Using Table 8.1, explain why deuterium and tritium are said to be isotopes of hydrogen.

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- (iii) Explain why all three isotopes of hydrogen are electrically neutral.

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- (iv) Using your understanding of the properties of isotopes, explain why heavy water can be used as a scientific tracer to monitor biological and chemical processes.

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(b) (i) Complete Table 8.3. [1]

(ii) Draw the 'dot-and-cross' diagram of magnesium hydride, showing only the valence electrons.

[2]

(c) Scientists are divided whether hydrogen should belong to Group 1 or not, as shown in Fig. 8.2 and Fig. 8.3.

Using the information provided, discuss why this is so.

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[2]

[Total: 11]

- 9 Like main group metals, transition metals can react with non-metals to form compounds. An example of one such compound is silver chloride. Fig. 9.1 gives the structure of silver chloride, while Table 9.1 gives some physical properties of silver chloride.

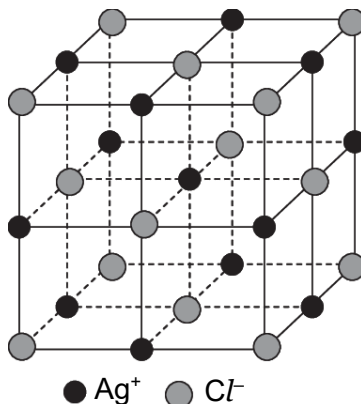


Fig. 9.1

Table 9.1

melting point / °C	455
boiling point / °C	1,547
electrical conductivity	does not conduct electricity in solid state, but conducts electricity in molten state
solubility	insoluble in water and ethanol

- (a) From Table 9.1, state one unexpected physical property of silver chloride.

..... [1]

- (b) Use ideas about structure and bonding to explain the melting and boiling points of silver chloride, as provided in Table 9.1.

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..... [3]

[Total: 4]

End of paper