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SENG KANG SECONDARY SCHOOL 2025 PRELIMINARY EXAMINATION

SCIENCE (CHEMISTRY)

Secondary 4 Normal (Academic)

Paper 3 Multiple Choice

5105/03

5107/03

4 August 2025

Papers 3 and 4: 1 hour 15 minutes

Additional Materials: Multiple Choice Answer Sheet

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.

Do not use staples, paper clips, highlighters, glue or correction fluid.

Write your name and index number on all the work you hand in.

There are **twenty** questions in this paper. 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 **soft pencil** on the Multiple Choice Answer Sheet.

Read the instructions on the Answer Sheet very carefully.

Answers to Paper 3 and Paper 4 must be handed in separately.

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.

You are advised to spend no more than **30 minutes** on **Paper 3**.

You may proceed to answer Paper 4 as soon as you have completed Paper 3.

Any rough working should be done in this booklet.

A copy of the Periodic Table is printed on page 10.

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

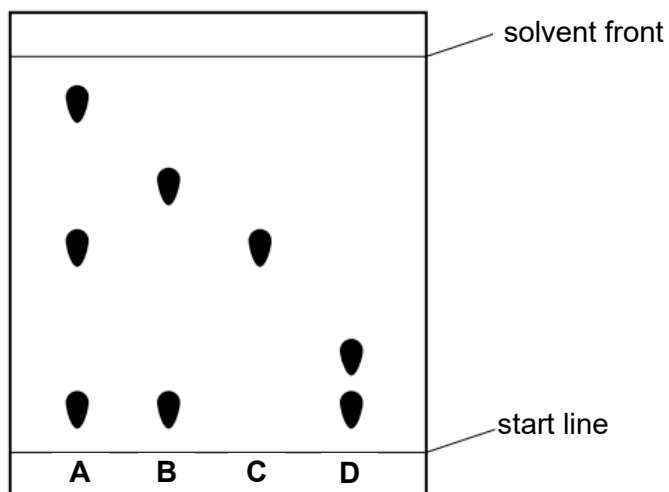
Parent's / Guardian's Signature:

This document consists of **9** printed pages and **1** blank page.

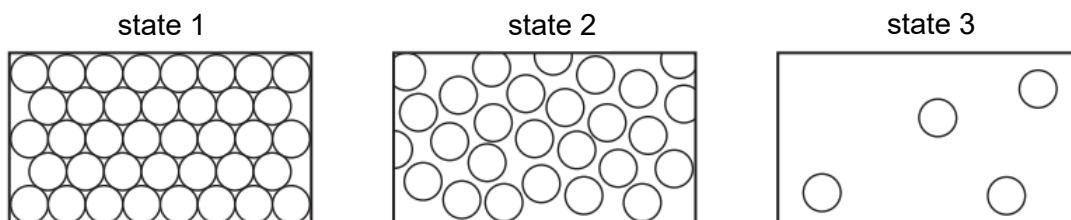
Do not turn over the page until you are told to do so.

[Turn over

- 1 Which dye on the chromatogram is a pure substance?



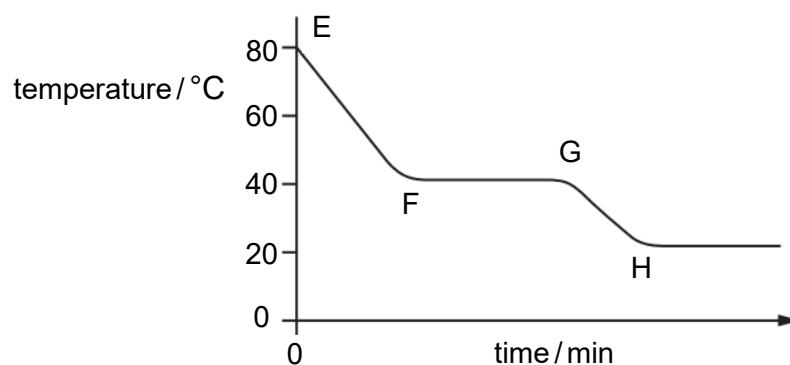
- 2 The three different states of matter are represented in the diagrams below.



Which statement is correct?

- A Particles in state 1 slide past one another.
 - B Particles in state 2 move about randomly and rapidly.
 - C State 1 changes to state 2 by melting.
 - D State 1 changes to state 3 by evaporation.
- 3 A gaseous substance is allowed to cool and its temperature is recorded over time.

The results are shown on the graph.



Between which time interval is the substance undergoing condensation?

- A E to F
- B F to G
- C G to H
- D H to I

- 4 The nuclide notation of a chlorine atom is shown below.



Which statements about the atom are correct?

- 1 The number of electrons is 17.
- 2 The number of nucleons is 20.
- 3 The number of protons is 17.
- 4 The number of valence electrons is 8.

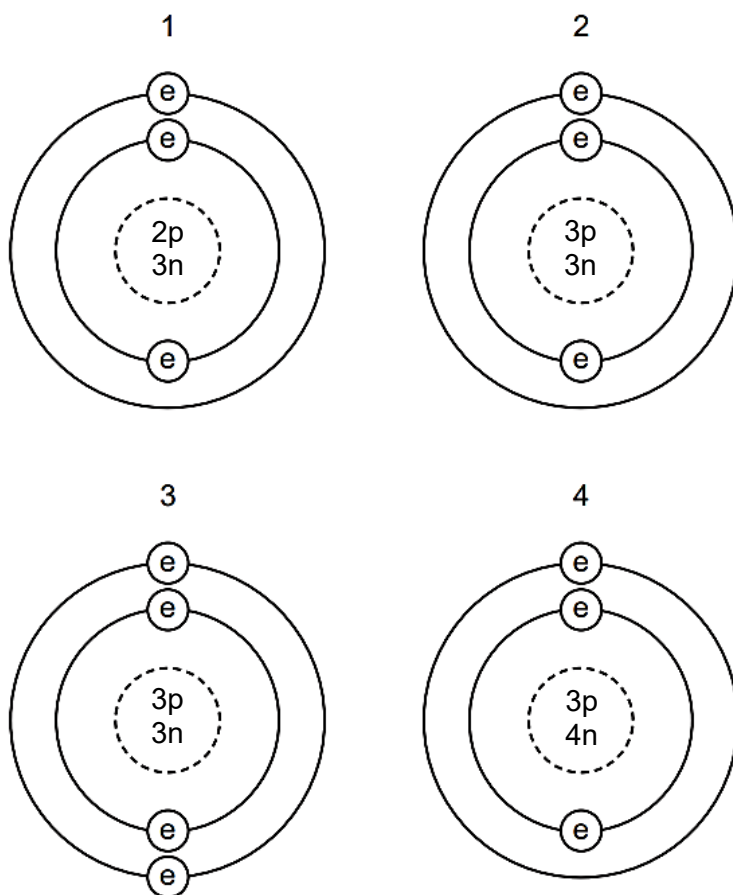
A 1 and 2

B 1 and 3

C 2 and 3

D 2 and 4

- 5 The atomic structures of four particles are shown below.



key

⊙ = an electron

n = a neutron

p = a proton

⊖ = nucleus

Which two particles are isotopes of one another?

A 1 and 2

B 1 and 3

C 2 and 3

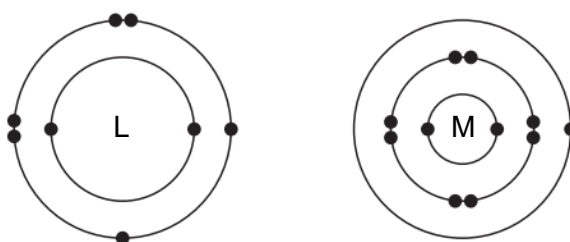
D 2 and 4

- 6 Simple molecular structures have a low boiling point.

Which statement best explains this property?

- A There are strong covalent bonds between its atoms.
- B There are strong electrostatic forces of attraction between its oppositely charged ions.
- C There are weak covalent bonds between its atoms.
- D There are weak intermolecular forces of attraction between its molecules.

- 7 The electronic structures of two atoms are shown.



Which row describes what happens to the electrons in the outer shells and the type of bonding when atoms of L and M form a compound?

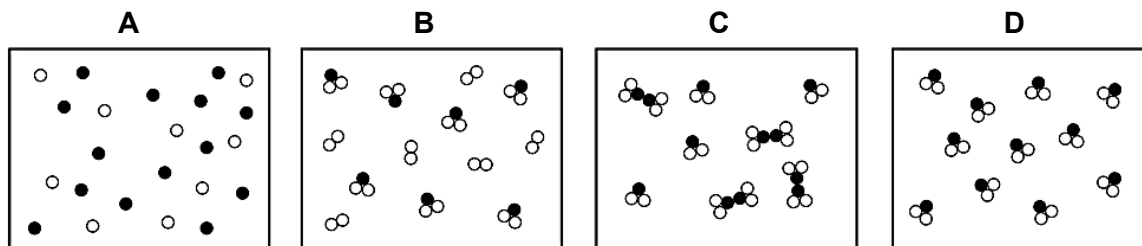
	electrons are	type of bond
A	lost / gained	covalent
B	lost / gained	ionic
C	shared	covalent
D	shared	ionic

- 8 The formulae of two ionic compounds of iron are Fe_2O_3 and FeCl_2 .

What are the charges of the iron ions in these compounds?

	Fe_2O_3	FeCl_2
A	2+	3+
B	3+	2+
C	6+	2-
D	2-	6+

- 9 Which diagram represents a mixture of two compounds?



- 10 Which is a property of all metals?

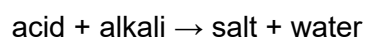
- A They are soluble in water.
- B They conduct electricity.
- C They have high densities.
- D They have high melting points.

- 11 The relative atomic mass of bromine is 80.

When determining relative atomic mass, which particle is the mass of a bromine atom compared to?

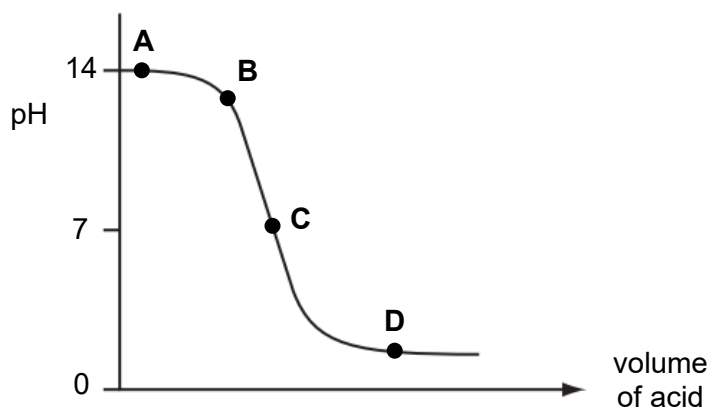
- A a carbon-12 atom
- B a hydrogen-1 atom
- C a neutron
- D a proton

- 12 The equation of a reaction between an acid and alkali is shown.



The graph shows how the pH changes as an acid is added to an alkali.

Which letter represents the area of the graph where only salt and acid are present?



- 13 Four substances are listed below.

Which of the substance(s) can be reacted with sulfuric acid to form copper(II) sulfate?

- 1 copper
- 2 copper(II) carbonate
- 3 copper(II) hydroxide
- 4 copper(II) nitrate

- A** 1 only **B** 2 and 3 **C** 1, 2 and 3 **D** 2, 3 and 4

- 14 M and N are elements in Group 1 of the Periodic Table.

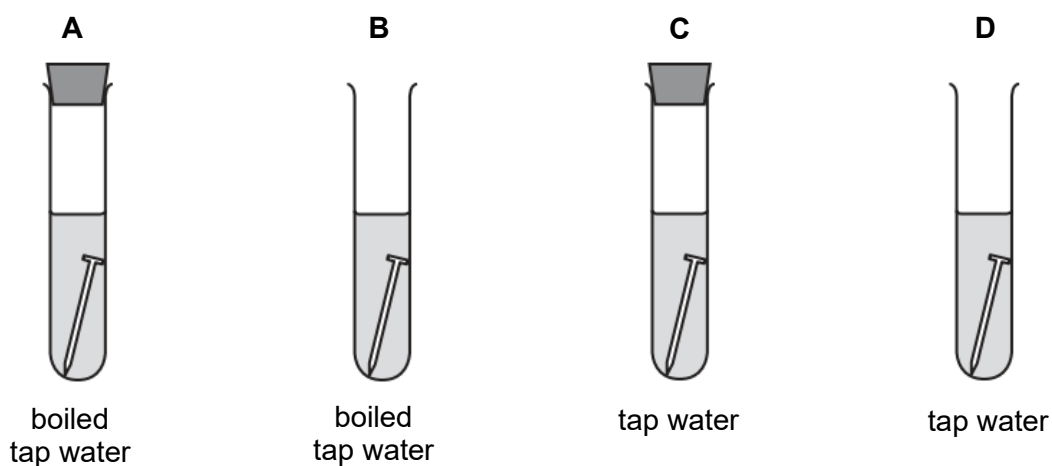
M has a melting point of 63°C . N has a melting point of 98°C .

Which statement is correct?

- A** M has less electron shells than N.
- B** M has more protons than N.
- C** N has more valence electrons than M.
- D** N is more reactive than M.

- 15 Four different test-tubes containing water and an identical iron nail are left for 2 weeks.

Which nail will show the **least** amount of rusting?



- 16** P, Q, R and S are four different metals.

P reacts with steam and acid but not with cold water.

Q does **not** react with acids.

R reacts slowly with cold water.

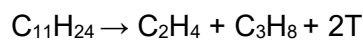
S reacts explosively with cold water.

Which row shows the order of reactivity for the four metals?

	least reactive				most reactive
A	Q	P	R	S	
B	Q	R	P	S	
C	S	P	R	Q	
D	S	R	P	Q	

- 17** An organic compound, $C_{11}H_{24}$ undergoes cracking to produce ethene, propane and another compound, T.

The equation of the reaction is shown.



Which row describes T?

	formula of T	T belongs to the homologous series
A	C_3H_6	alkane
B	C_3H_6	alkene
C	C_6H_{12}	alkane
D	C_6H_{12}	alkene

- 18** The structural formula of linoleic acid is shown.

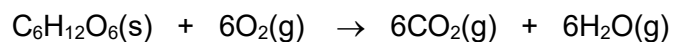


Which row shows the correct information about linoleic acid?

- A** polyunsaturated compound
- B** polyunsaturated hydrocarbon
- C** saturated compound
- D** saturated hydrocarbon

- 19** The carbon cycle describes the continual movement of carbon atoms from the Earth to the atmosphere and back to the Earth.

The equation shows one of the chemical reactions involved in the carbon cycle.



Which process does the equation represent?

- A** combustion
 - B** decomposition
 - C** photosynthesis
 - D** respiration
- 20** Which row identifies pollutant gases produced by the combustion of fossil fuels?

	carbon monoxide	nitrogen dioxide	sulfur dioxide
A	✓	✓	✓
B	X	✓	✓
C	✓	✓	X
D	✓	X	X

~ END OF PAPER ~

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The Periodic Table of Elements

Periodic Table of Elements																			
Group												13	14	15	16	17	18		
1	2											13	14	15	16	17	18		
Key proton (atomic) number atomic symbol name relative atomic mass							1											2	
							H											He	
							hydrogen											helium	
1												1						4	
3	4											5	6	7	8	9	10		
Li	Be											B	C	N	O	F	Ne		
lithium	beryllium											boron	carbon	nitrogen	oxygen	fluorine	neon		
7	9											11	12	13	14	15	16	17	18
Na	Mg											Al	Si	P	S	Cl	Ar		
sodium	magnesium											aluminium	silicon	phosphorus	sulfur	chlorine	argon		
23	24	3	4	5	6	7	8	9	10	11	12	27	28	31	32	35.5	40		
19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36		
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr		
potassium	calcium	scandium	titanium	vanadium	chromium	manganese	iron	cobalt	nickel	copper	zinc	gallium	germanium	arsenic	selenium	bromine	krypton		
39	40	45	48	51	52	55	56	59	59	64	65	70	73	75	79	80	84		
37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54		
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe		
rubidium	strontium	yttrium	zirconium	niobium	molybdenum	technetium	ruthenium	rhodium	palladium	silver	cadmium	indium	tin	antimony	tellurium	iodine	xenon		
85	88	89	91	93	96	—	101	103	106	108	112	115	119	122	128	127	131		
55	56	57–71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86		
Cs	Ba	lanthanoids	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn		
caesium	barium		hafnium	tantalum	tungsten	rhenium	osmium	iridium	platinum	gold	mercury	thallium	lead	bismuth	polonium	astatine	radon		
133	137		178	181	184	186	190	192	195	197	201	204	207	209	—	—	—		
87	88	89–103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118		
Fr	Ra	actinoids	Rf	Db	Sg	Bh	Hs	Mt	Ds	Rg	Cn	Nh	Fl	Mc	Lv	Ts	Og		
francium	radium		rutherfordium	dubnium	seaborgium	bohrium	hassium	meitnerium	darmstadtium	roentgenium	copernicium	nihonium	flerovium	moscovium	livermorium	tennessine	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, $L = 6.02 \times 10^{23} \text{ mol}^{-1}$