



MINISTRY OF EDUCATION, SINGAPORE
in collaboration with
CAMBRIDGE ASSESSMENT INTERNATIONAL EDUCATION
General Certificate of Education Normal (Academic) Level

SCIENCE (CHEMISTRY)

5107/03

Paper 3 Multiple Choice

For examination from 2024

SPECIMEN PAPER

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, glue or correction fluid.

Write your name, Centre number and index number on the Answer Sheet in the spaces provided unless this has been done for you.

DO NOT WRITE ON ANY BARCODES.

There are **twenty** questions on 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 separate 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.

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

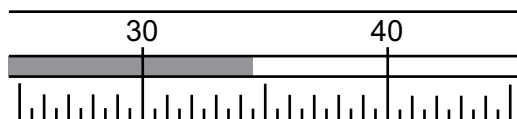


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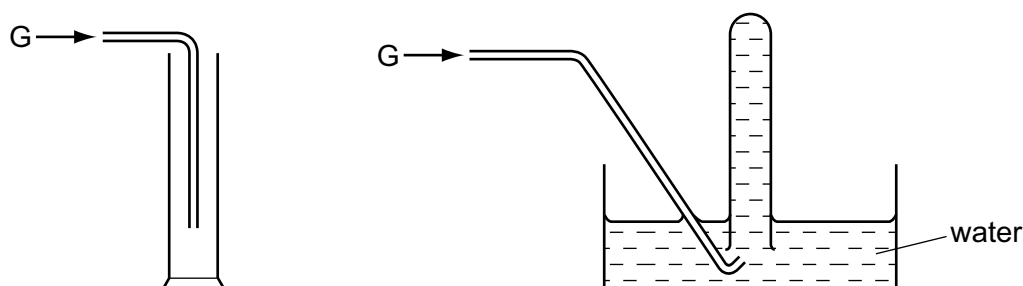
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- 1 The diagram shows part of a thermometer scale.



What is the reading on the thermometer?

- A** 34.5°C **B** 35.5°C **C** 39.0°C **D** 45.5°C
- 2 Two correct methods of collecting gas G are shown.



Which properties of gas G are shown by these collection methods?

	density of G	water solubility of G
A	less than air	high
B	less than air	low
C	more than air	high
D	more than air	low

- 3 A student is given a mixture of barium sulfate, copper(II) sulfate and water.

The table shows information about barium sulfate and copper(II) sulfate.

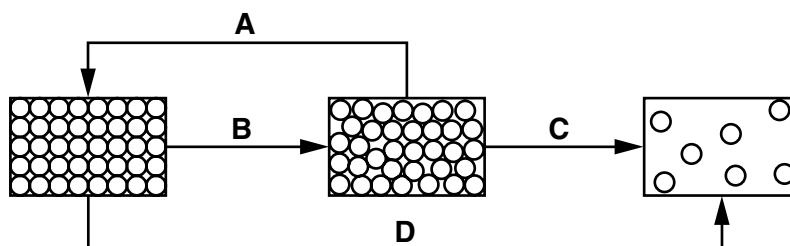
substance	solubility in water	state at room temperature
barium sulfate	insoluble	solid
copper(II) sulfate	soluble	solid

Which sequence of techniques can the student use to obtain copper(II) sulfate crystals from the mixture?

- A** crystallisation followed by distillation
B crystallisation followed by filtration
C distillation followed by crystallisation
D filtration followed by crystallisation

- 4 The diagram shows particles in a solid, a liquid and a gas.

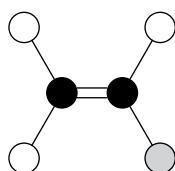
Which arrow represents boiling?



- 5 An atom of one isotope of phosphorus has the proton number 15 and the nucleon number 31.

What could an atom of a different isotope of phosphorus contain?

- A 16 neutrons B 17 neutrons C 16 protons D 31 protons
- 6 Which process changes a chlorine atom, Cl , into a chloride ion, Cl^- ?
- A electron gain
B electron loss
C proton gain
D proton loss
- 7 Benzoic acid has the molecular formula $C_7H_6O_2$.
- What is the relative molecular mass, M_r , of benzoic acid?
- A 15 B 29 C 111 D 122
- 8 The diagram shows a molecule of vinyl chloride.



key

- a carbon atom
● a chlorine atom
○ a hydrogen atom

What is the formula of vinyl chloride?

- A C_2H_3Cl B C_2HCl_3 C CH_3Cl_2 D CH_2Cl_3

- 9 What is the ratio of the number of moles of molecules in 71 g of gaseous chlorine to the number of moles of molecules in 4 g of gaseous hydrogen?

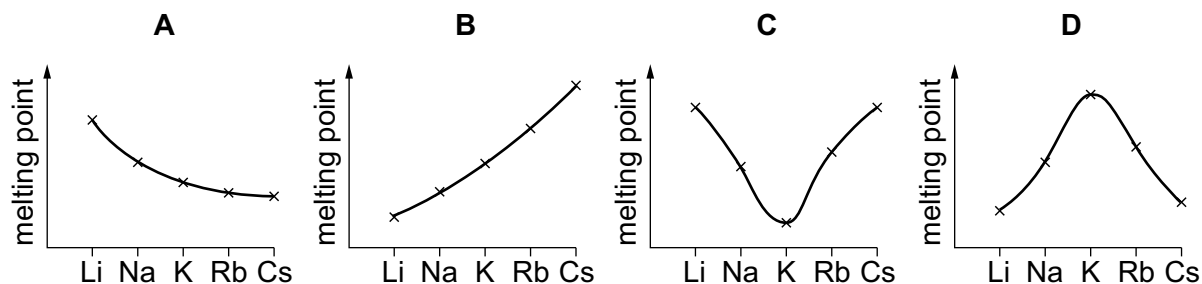
[Relative atomic masses: A_r : H, 1; Cl, 35.5]

- A** 1:1 **B** 1:2 **C** 1:4 **D** 71:4
- 10 Which two chemicals will react to make the salt copper(II) sulfate?
- A** copper and sulfur
- B** copper and dilute sulfuric acid
- C** copper(II) oxide and dilute hydrochloric acid
- D** copper(II) oxide and dilute sulfuric acid
- 11 The chart shows part of the Periodic Table. The elements X, Y and Z all have proton numbers of less than 20.

														X			Z		
														Y					

Which statement is correct?

- A** The proton number of X is the same as that of Z.
- B** The proton number of Z is three more than that of X.
- C** The proton number of Y is one more than that of X.
- D** The proton number of Y is eight less than that of X.
- 12 Which graph shows the trend in the melting points of the Group 1 metals?



13 Which property of a metal determines the method used to extract the metal from its ore?

- A the melting point of the metal
- B the position of the metal in the Periodic Table
- C the reactivity of the metal
- D the relative atomic mass, A_r , of the metal

14 A student added dilute hydrochloric acid to four metals and recorded the results.

Not all of the results are correct.

	results	
	metal	gas given off
1	silver	yes
2	calcium	yes
3	magnesium	no
4	zinc	yes

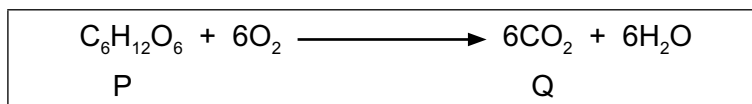
Which two results are correct?

- A 1 and 3 B 1 and 4 C 2 and 3 D 2 and 4

15 Which is the main source of biofuel?

- A crude oil
- B natural gas
- C plastic
- D sugarcane

16 The reaction shown occurs naturally.



Which descriptions of P and Q are correct?

	P is a hydrocarbon	Q is an acidic oxide
A	yes	yes
B	yes	no
C	no	yes
D	no	no

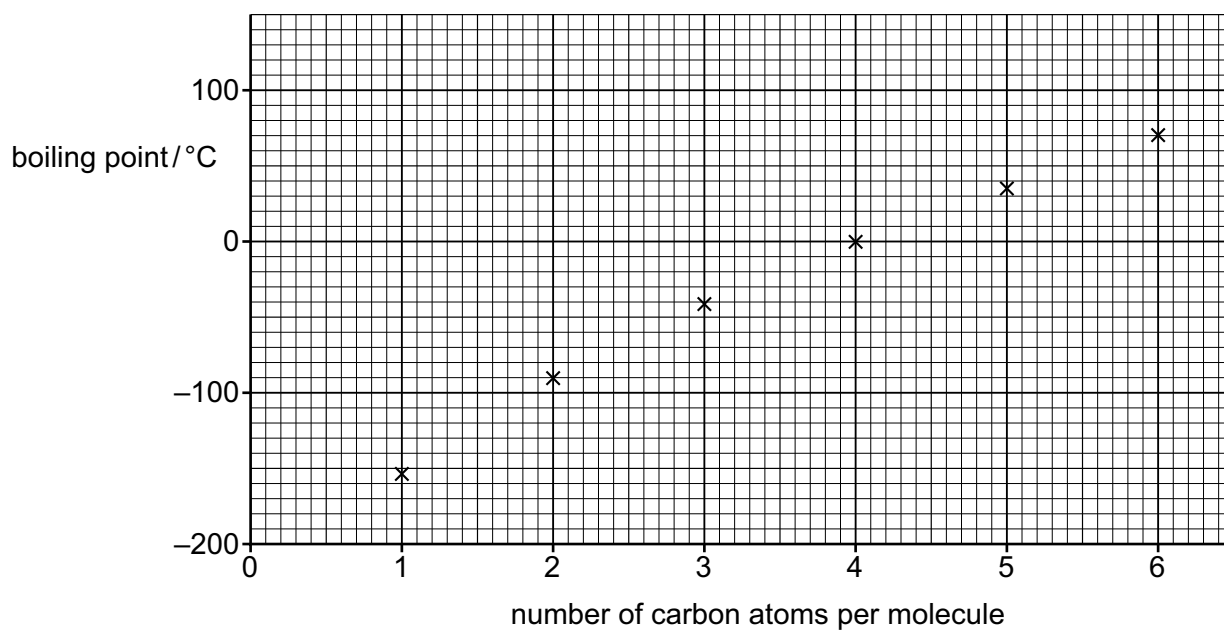
17 Some information about poly(ethene) is given.

- Poly(ethene) is used to make plastic bags.
- Poly(ethene) plastic bags in landfill sites do not readily decompose.
- Poly(ethene) molecules contain only carbon and hydrogen atoms.

Which statement about poly(ethene) is correct?

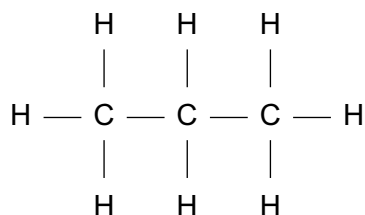
- A** It is biodegradable.
- B** It is combustible.
- C** It is unsaturated.
- D** It reacts with water.

- 18 The graph shows how the boiling point of some hydrocarbons depends on the number of carbon atoms in their molecules.

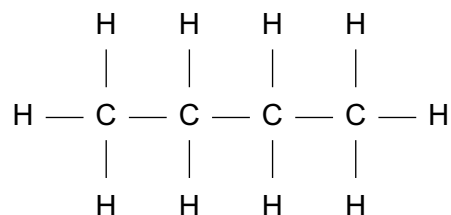


Which hydrocarbon is an alkane with a boiling point close to 0 °C?

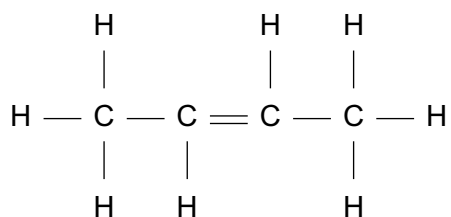
A



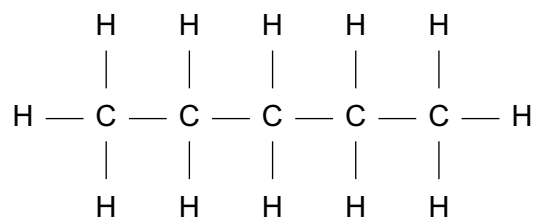
B



C



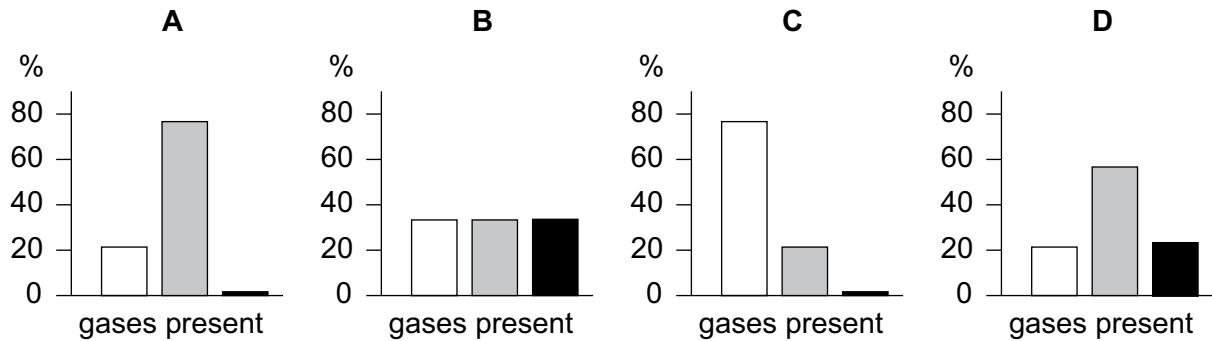
D



19 Which bar chart shows the percentage composition of clean air?

key

□ = nitrogen gas ▒ = oxygen gas ■ = other gases



20 Which gas is the main cause of damage to stonework on the outside of buildings?

- A carbon dioxide
- B carbon monoxide
- C nitrogen
- D sulfur dioxide

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The Periodic Table of Elements

Group																																															
1	2																	18																													
3 Li lithium 7	4 Be beryllium 9	Key proton (atomic) number atomic symbol name relative atomic mass																2 He helium 4																													
11 Na sodium 23	12 Mg magnesium 24	1 H hydrogen 1	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	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 oganeson —	119 La lanthanum 139	120 Ce cerium 140	121 Pr praseodymium 141	122 Nd neodymium 144	123 Pm promethium —	124 Sm samarium 150	125 Eu europium 152	126 Gd gadolinium 157	127 Tb terbium 159	128 Dy dysprosium 163	129 Ho holmium 165	130 Er erbium 167	131 Tm thulium 169	132 Yb ytterbium 173	133 Lu lutetium 175	134 Ac actinium —	135 Th thorium 232	136 Pa protactinium 231	137 U uranium 238	138 Np neptunium —	139 Pu plutonium —	140 Am americium —	141 Cm curium —	142 Bk berkelium —	143 Cf californium —	144 Es einsteinium —	145 Fm fermium —	146 Md mendelevium —	147 No nobelium —	148 Lr lawrencium —

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

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