ST. MARGARET'S SCHOOL (SECONDARY)

Preliminary Examinations 2023

CANDIDATE NAME

CLASS | | | | REGISTER NUMBER | | |

SCIENCE (PHYSICS,CHEMISTRY) **5105/03, 5107/03**

SCIENCE (CHEMISTRY,BIOLOGY)

17 August 2023

Paper 3 Multiple Choice

1 hour 15 minutes

Secondary 4 Normal (Academic)

Additional Materials: Multiple Choice Answer Sheet

READ THESE INSTRUCTIONS FIRST

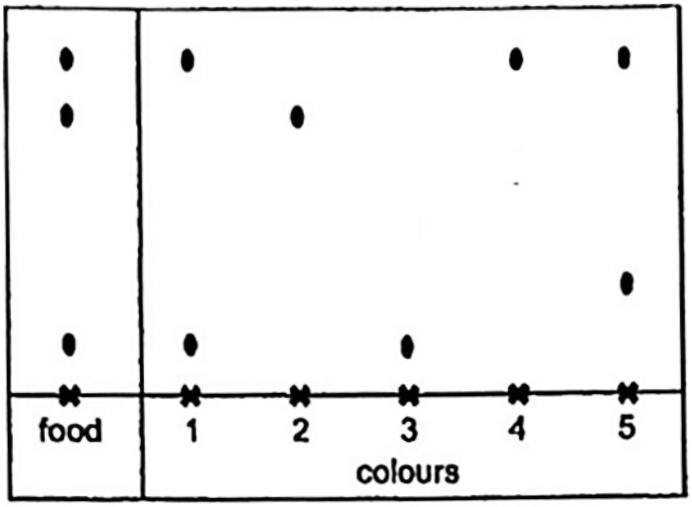
Write in soft pencil.
Do not use staples, paper clips, highlighters, glue or correction fluid.
Write your name, class and register number on the cover page and on the Answer Sheet in the spaces provided.

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.

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 had 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.

1 The diagram shows a chromatogram obtained by using a coloured food dye.



Which two colours are found in the food dye?

A 1 and 2

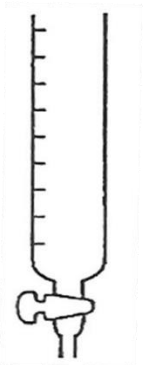
B 2 and 3

C 2 and 5

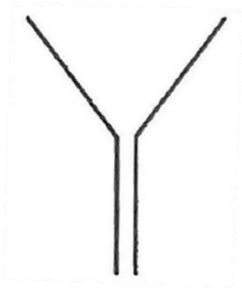
D 3 and 4

2 Four pieces of apparatus are shown.
Which apparatus is **not** used to measure the volume of a liquid?

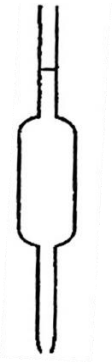
A



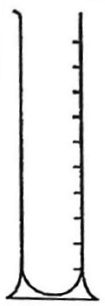
B



C



D



3. A student wants to separate a mixture of sand and salt. The first step is to stir this mixture in a beaker of water.
What are the next two steps?

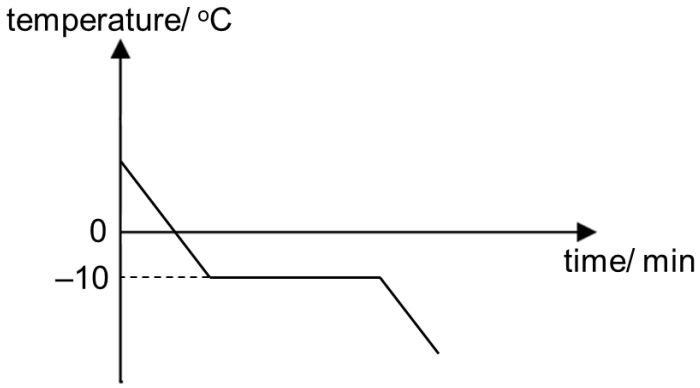
A crystallise, then carry out distillation

B crystallise, then carry out evaporation

C evaporate, then carry out distillation

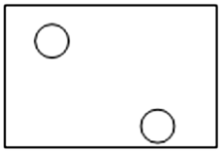
D filter, then crystallise

4 The graph shows a cooling curve of liquid **Z.**



Which diagram correctly shows the arrangement of particles in **Z** at –5 °C?

A



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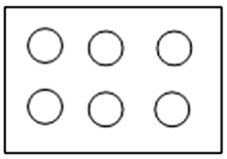

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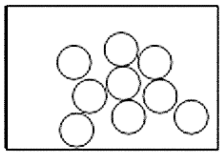

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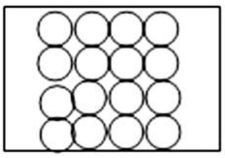


5 A group of students wrote four statements about compounds and mixtures.

1 Compounds have fixed compositions.
2 Compounds have variable melting points.
3 Mixtures can be separated easily using physical methods of separation.
4 Mixtures have fixed melting points.

Which statements are correct?

A 1 and 2

B 1 and 3

C 2 and 3

D 3 and 4

6 Which particle has a relative charge of –1?

A cation

B electron

C proton

D neutron

7 Which pair of substances have the electronic configuration 2,8,8?

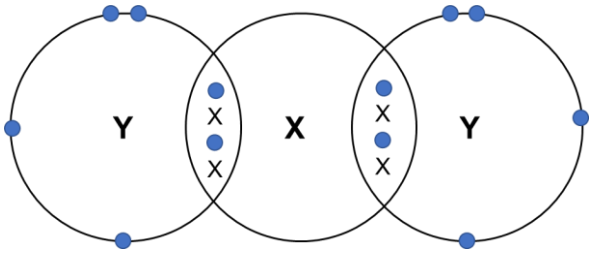
A Ar and Al^{3+}

B Cl^{-} and Ca^{2+}

C O^{2-} and Li^{+}

D S^{2-} and Mg^{2+}

8 The 'dot and cross' diagram shows a molecule formed between atoms **X** and **Y**.



Which statement is **incorrect**?

A Atom **X** shares 2 electrons with each atom **Y**.

B Atom **X** forms two covalent bonds with each atom **Y**.

C To form the molecule, atom **X** transfers two electrons to each atom **Y**.

D The structural formula of the molecule is **Y**=**X**=**Y**.

9 Which substance is likely to be an ionic compound?

	melting point/ ^{o}C	boiling point/ ^{o}C	conductor of electricity in solid state
A	–102	–34	good
B	–102	–34	poor
C	1535	2750	good
D	1535	2750	poor

10 Sodium and rubidium are Group I elements.
Which element has lower melting point and which element reacts less vigorously with water?

	lower melting point	less vigorous reaction with water
A	rubidium	rubidium
B	rubidium	sodium
C	sodium	rubidium
D	sodium	sodium

11 The chart shows the colour ranges of four different indicators.
Which indicator is blue in an acidic solution?

indicator	pH													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
A	yellow →							← blue						
B	red							←	blue →	←	yellow			
C		red					→	←			blue			
D		colourless									←	blue		

12 Which is a property of **all** metals?

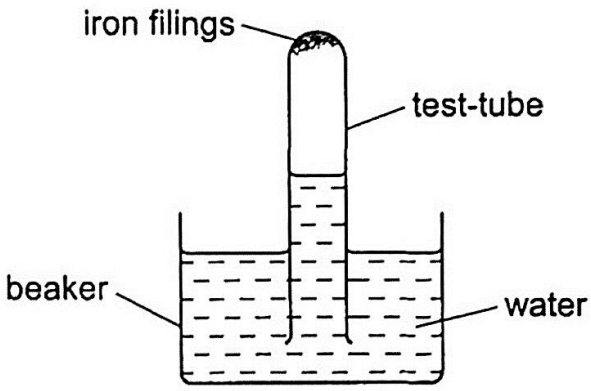
A good electrical conductivity

B hard

C high melting point

D react with acid

13 Iron filings are placed in a damp test-tube containing air.
The test-tube is placed in water and left for a week.



The water rises up the test-tube after a week.
Which substance did iron react with?

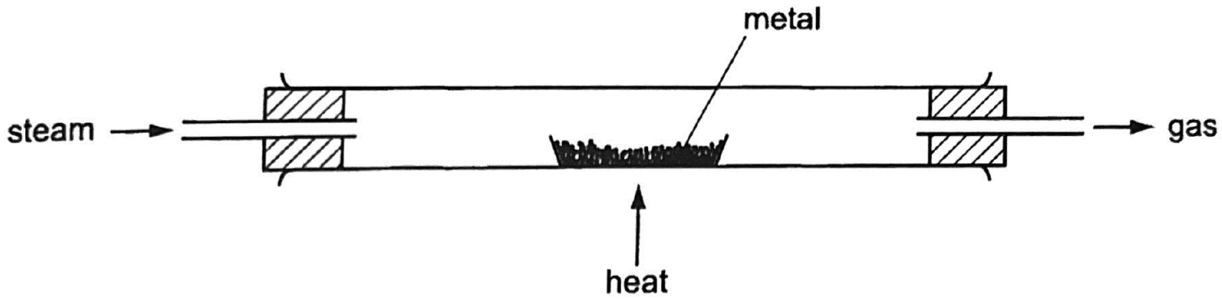
A carbon dioxide

B nitrogen

C oxygen

D water

14 The diagram shows apparatus used to test the reactivity of copper, magnesium and zinc with steam.



Which metals react with steam to form hydrogen gas?

	copper	magnesium	zinc
A	✓	×	✓
B	×	✓	✓
C	✓	×	×
D	×	✓	×

Legend:
✓ - reacts
× - no reaction

15 The equation shows the reaction that occurs when ethanol burns in air.

$$C_2H_5OH + xO_2 \rightarrow yCO_2 + zH_2O$$

What are the values of x, y and z that are needed to balance this equation?

	x	y	z
A	2	2	2
B	2	2	3
C	2	3	3
D	3	2	3

16 Air is a mixture of gases.
Which gas is present in the greatest amount in exhaled air?

A carbon dioxide

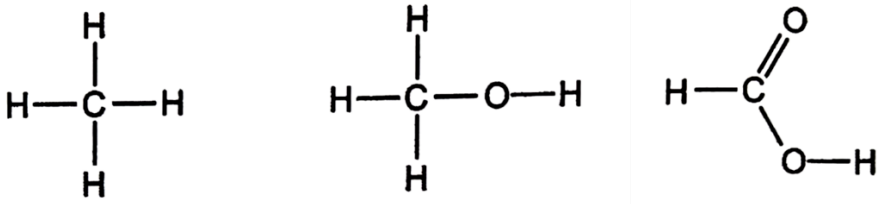
B hydrogen

C nitrogen

D oxygen

17 Which set of diagrams shows three substances that are all in the same homologous series?

A



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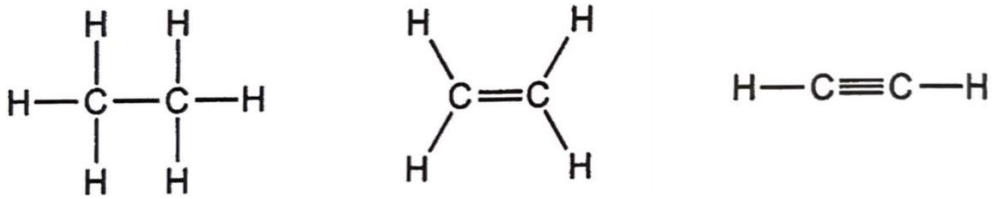

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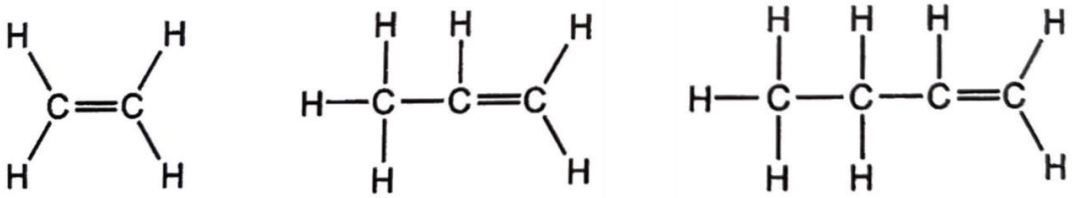

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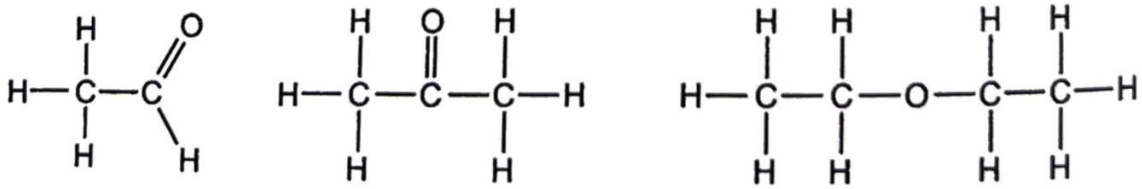
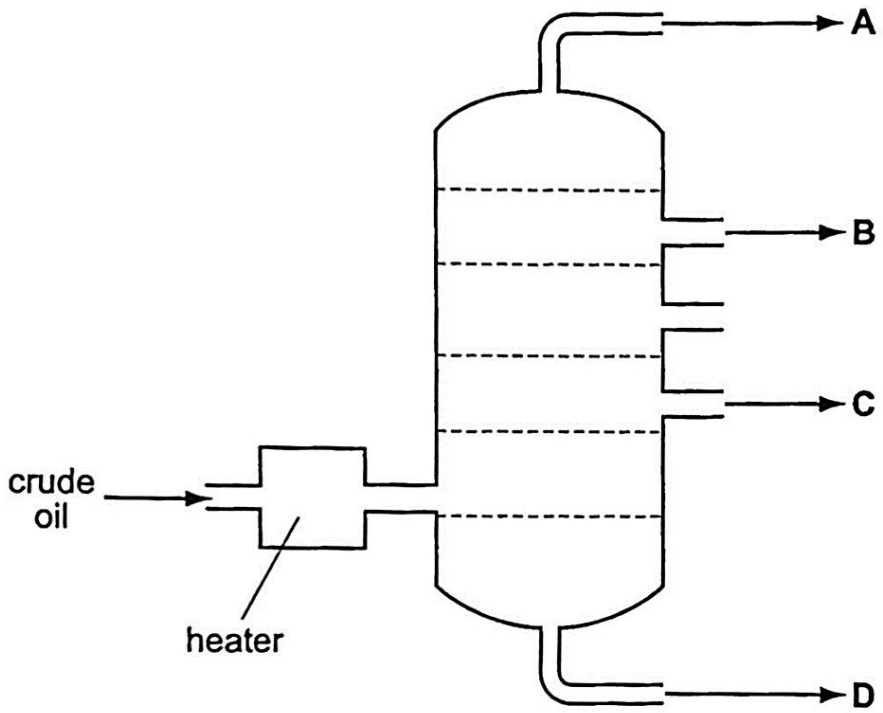


18 The diagram shows a fractionating column.
Which fraction is used for making roads?



19 Which reaction is an example of the cracking of an alkane?

A $3C_2H_4 \rightarrow C_6H_{12}$

B $C_6H_{12} + H_2 \rightarrow C_6H_{14}$

C $C_6H_{14} \rightarrow 6C + 7H_2$

D $C_6H_{14} \rightarrow C_2H_4 + C_4H_{10}$

20 Compound **Y** has the formula $CH_3CH_2CH{=}CH_2$.
Which row accurately describes **Y**?

	type of compound	colour change when aqueous bromine is added
A	saturated	red-brown to colourless
B	saturated	colourless to red-brown
C	unsaturated	red-brown to colourless
D	unsaturated	colourless to red-brown

The Periodic Table of Elements

Group																	
I	II											III	IV	V	VI	VII	0
							1 H hydrogen 1										2 He helium 4
3 Li lithium 7	4 Be beryllium 9		**Key** proton (atomic) number atomic symbol name relative atomic mass									5 B boron 11	6 C carbon 12	7 N nitrogen 14	8 O oxygen 16	9 F fluorine 19	10 Ne neon 20
11 Na sodium 23	12 Mg magnesium 24											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 –		114 Fl flerovium –		116 Lv livermorium –		

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 dm^3 at room temperature and pressure (r.t.p.).