BEDOK VIEW SECONDARY SCHOOL
MID-YEAR EXAMINATION 2017

CANDIDATE NAME

REGISTER NUMBER

CLASS

SCIENCE (Chemistry)
Secondary 3 Express

5076/01
5078/01

Paper 1 Multiple Choice

8 May 2017

Paper 1 and 3: 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 and index number on the Answer Sheet in the spaces provided unless this has been done for you.

There are **twenty** questions in this section. 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 1 and 3 must be handed in separately.
You are advised to spend no more than 30 minutes on Paper 1.
You may proceed to answer Paper 3 as soon as you have completed Paper 3.

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

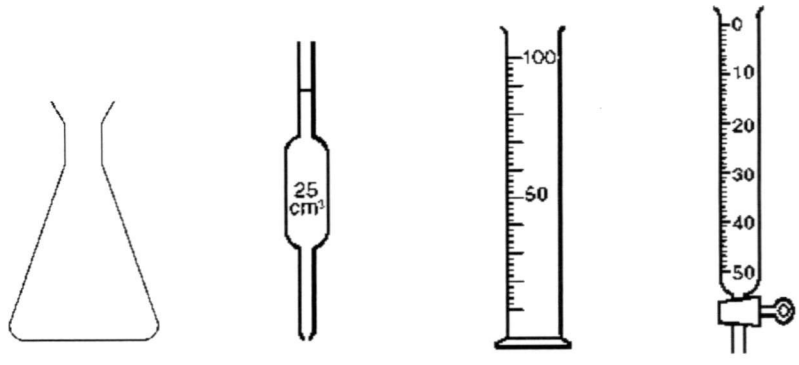
A copy of the Periodic Table is printed on page 8.

Setter: Mr. Hui Da Zun

This document consists of **8** printed pages.

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

1 The following pieces of apparatus are found in a Chemistry laboratory.

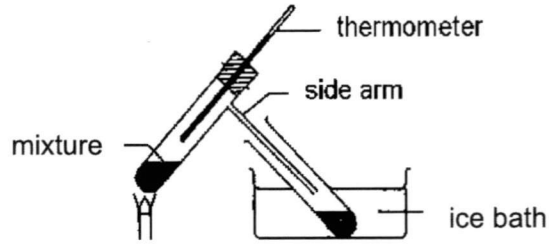


P Q R S

Which piece of apparatus is most suitable for measuring the given volume of liquid?

	approximately 25 cm^3	exactly 25.0 cm^3	exactly 25.1 cm^3
A	P	R	R
B	P	Q	S
C	R	Q	S
D	R	Q	P

2 The following laboratory setup is used to separate a solvent from a given mixture.



What is the **error** made in the above set-up?

A The bulb of the thermometer is placed at the wrong position.

B The side arm is of the wrong length.

C The solvent should be collected in a conical flask.

D The test-tube in the ice water should have a rubber bung to prevent the solvent from escaping.

3 A liquid is thought to be pure ethanol. What is the best way to test its purity?

A evaporate to dryness

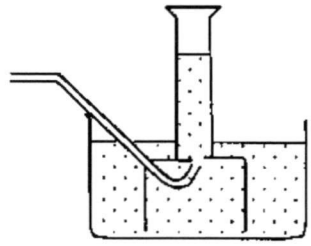
B note its colour

C measure its boiling point

D measure its mass

4 Gas X and Gas Y can be collected by using the apparatus as shown below.

Gas X



Gas Y

Which one of the following statements regarding Gas X and Gas Y is true?

A Gas X is denser than air, while Gas Y is insoluble in water.

B Gas X is insoluble in water, while Gas Y is denser than air.

C Gas X is less dense than air, while Gas Y is insoluble in water.

D Gas X is soluble in water, while Gas Y is insoluble in water.

5 Copper(II) chloride crystals can be separated from sand using the four steps shown below. Which of the following shows the steps in the correct order?

A dissolve → evaporate → filter → crystallise

B dissolve → filter → evaporate → crystallise

C filter → crystallise → evaporate → dissolve

D filter → evaporate → crystallise → dissolve

6 An inflated balloon will shrink if placed in a refrigerator. This is because the lower temperature causes the gas particles in the balloon to move

A faster and become closer together.

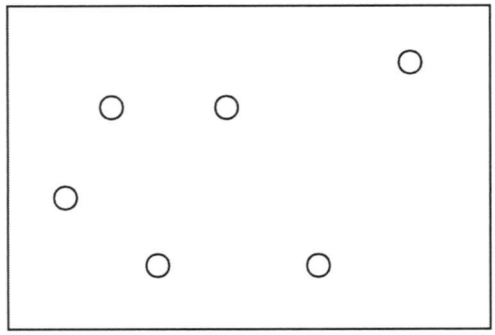
B faster and become further apart.

C slower and become closer together.

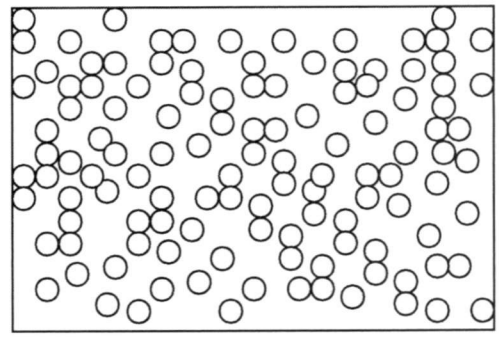
D slower and become further apart.

7 The diagram shows the arrangement of the particles in substance X at room pressure, but at two different temperatures.

At temperature of 150 °C



At temperature of 50 °C



Which substance could X be?

	melting point / °C	boiling point / °C
A	40	140
B	60	140
C	140	40
D	160	40

8 Some brown powder was dissolved in a test tube using distilled water. The solution formed was filtered, leaving a black residue on the filter paper. After evaporating the filtrate, orange crystals were formed. This analysis suggests that .....

A the black solid is an element.

B the brown powder is a mixture.

C the brown powder is a compound.

D the orange crystals are mixture.

9 A liquid boils at a temperature of 100 °C.

Which other property of the liquid proves that it is pure water?

A It does not leave a residue when boiled.

B It freezes at 0 °C.

C It is neither acidic nor alkaline.

D It turns white anhydrous copper(II) sulfate blue.

10 When heated steadily, an impure solid T starts melting at 109 °C and becomes completely molten at 113 °C. The melting points of four pure solids are given below.

Which one could be solid T?

A 105 °C **B** 109 °C **C** 113 °C **D** 115 °C

11 The elements L, M and N in the Periodic Table have consecutive increasing proton numbers. If M is a noble gas, then the formula for the ion of L is

A L^-

B L^{3-}

C L^+

D L^{3+}

12 The atoms $^{31}_{15}P$ and $^{32}_{16}S$ have the same

A nucleon number.

B number of electrons.

C number of neutrons.

D number of protons.

13 The formulae of the ions of some elements are shown below.

N^{3-} O^{2-} F^- Li^+ Mg^{2+}

Which of the following statements about these ions is correct?

A They all have more electrons than protons.

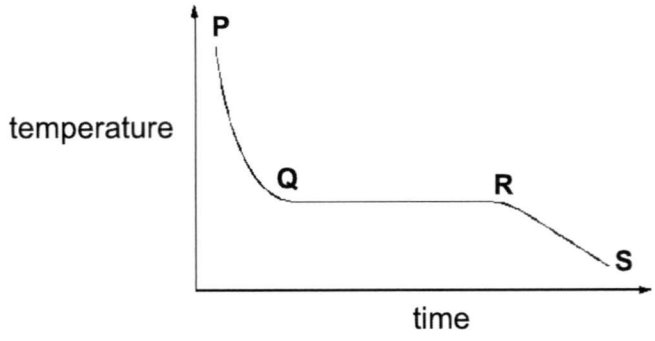
B They all have the same electronic structure as noble gases.

C They all have the same number of valence electrons.

D They all have the same number of neutrons in their nuclei.

14 A sample of a pure compound is heated until it is completely molten and the compound is then allowed to cool until it is completely solid again.

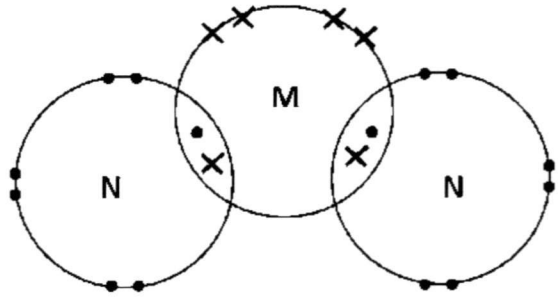
The graph shows how the temperature of the compound changes with time.



At which section(s) of the graph will both liquids and solid be present?

A P **B** P to Q **C** Q to R **D** S

15 The diagram shows the electron arrangement in a molecule of the compound MN_2.

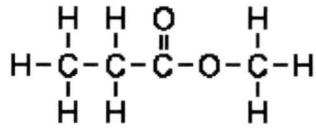


Which pair of elements could be M and N?

	M	N
A	calcium	oxygen
B	chlorine	oxygen
C	oxygen	calcium
D	oxygen	chlorine

16 Methyl propanoate is a chemical with sweet and fruity odour that can be found in perfumes and fragrances. It has a chemical formula $CH_3CH_2COOCH_3$. The bonding in a molecule of this compound is shown below.

What is the number of electrons involved in bonding?



A 13 **B** 14 **C** 26 **D** 28

17 Why are oxide ions negatively charged?

A They have the same number of protons and electrons.

B They have more protons than electrons.

C They have more electrons than protons.

D They have more neutrons than protons.

18 Which pair of elements is most likely to form a compound by sharing of electrons?

A chromium and oxygen

B carbon and magnesium

C sodium and calcium

D nitrogen and sulfur

19 A compound X contains chlorine and one other element.

Which property of X best indicates that the bonds in X are ionic?

A It conducts electricity in molten and aqueous state.

B It is brittle.

C It is slightly soluble in water.

D It is a solid at room temperature.

20 An ionic compound with a formula of X_2Y is formed.

Which statement is correct when this compound is formed?

A Each atom of X gives away two electrons.

B Each atom of X receives one electron.

C Each atom of Y gives away one electron.

D Each atom of Y receives two electrons.

End of Paper

The Periodic Table of the 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.).

BEDOK VIEW SECONDARY SCHOOL
MID-YEAR EXAMINATION 2017

CANDIDATE NAME

REGISTER NUMBER

CLASS

SCIENCE (Chemistry)
Secondary 3 Express

5076/03
5078/03

Paper 3 Theory

8 May 2017

Paper 1 and 3: 1 hour 15 minutes

Additional Materials: -

READ THESE INSTRUCTIONS FIRST

Information for Candidates

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

Answer all questions in Section A and any **one** question in Section B.
The use of an approved calculator is expected, where appropriate.
In calculations, you should show all the steps in your working, giving your answer at each stage.
You are expected to spend no longer than 30 minutes on Paper 1.
You may proceed to answer Paper 3 as soon as you have completed Paper 1.

At the end of the examination hand in your answers to Paper 1 and Paper 3 separately.
The number of marks is given in brackets [ ] at the end of each question or part question.

For Examiner's use	
Paper 1	/ 20
1	/ 12
2	/ 3
3	/ 5
4	/ 5
5	/ 5
6	/ 10
7	/ 10
Total	/ 60
% / Grade	/

A copy of the Periodic Table is printed on page 12.

Setter: Mr. Hui Da Zun

Parent's / Guardian's Signature: .....

This document consists of **10** printed pages and **1** blank page.

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

Section A

Answer **all** questions in the spaces provided.

For examiner's use

1 Fig. 1.1 shows the electron arrangement in the outer shells of five elements, P to T. All elements are from period 2 of the Periodic Table and they do not represent the symbol of the elements.

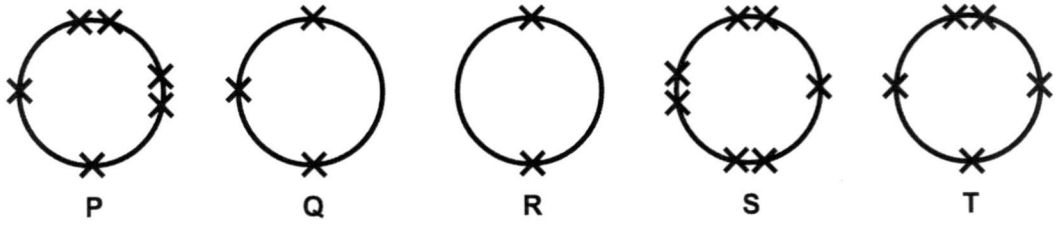


Fig. 1.1

Use the letters P to T to answer the following questions.

You may use each letter once, more than once or not at all.

(a) Which element is most likely to be non-metal?

..... [1]

(b) Which element lies in the same group as the element with an atomic number of 12?

..... [1]

(c) Which element exists as diatomic molecules at room temperature and pressure?

..... [1]

(d) Elements T and S react to form a covalent compound with the formula TS_3. Draw a dot and cross diagram of the compound TS_3. Show only the valence electrons.

[2]

For examiner's use

(e) TS_3 and ammonia, NH_3, have similar structure. Predict which compound has a higher boiling point.

..... [1]

(f) Elements R and P react to form an ionic compound with the formula RP. Draw a dot and cross diagram of the compound RP. Show all the electrons.

[2]

(g) Explain in terms of structure and bonding, why TS_3 exists as a liquid while RP exists as a solid in room temperature and pressure.

.....

.....

.....

.....

..... [4]

[Total: 12]

For examiner's use

2 Figure 2.1 shows the analysis of naturally occurring chlorine.

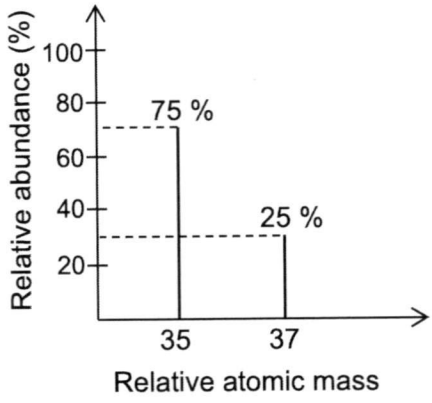


Figure 2.1

Using the information from the graph, calculate the relative atomic mass of a sample of naturally occurring chlorine. Leave your answer to 1 decimal place.

[3]

[Total: 3]

For examiner's use

3 Figure 3.1 represents particles in different substances.

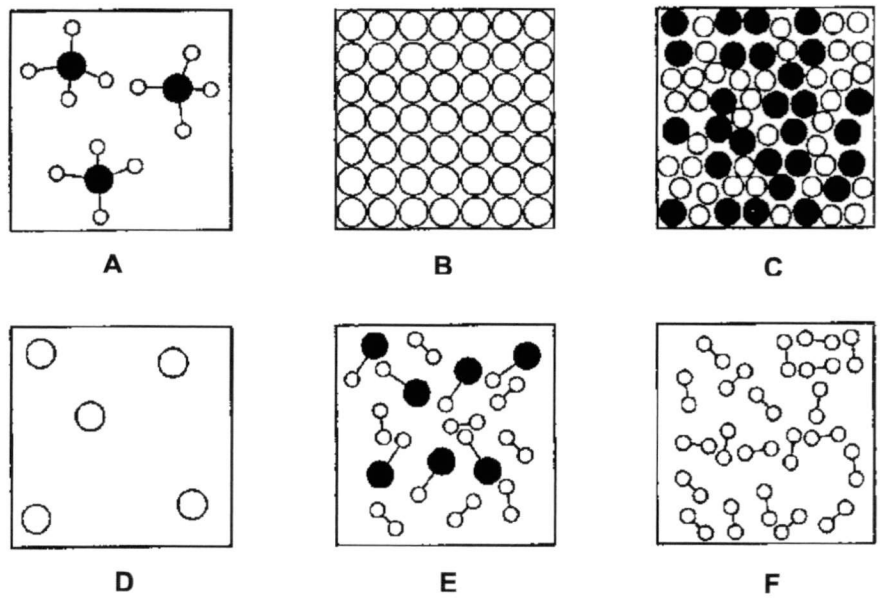


Fig. 3.1

Which of the diagrams A to F best represents a

(a) liquid element, ... [1]

(b) gaseous compound, ... [1]

(c) solid mixture, ... [1]

(d) liquid mixture, ... [1]

(e) solid element? ..... [1]

[Total: 5]

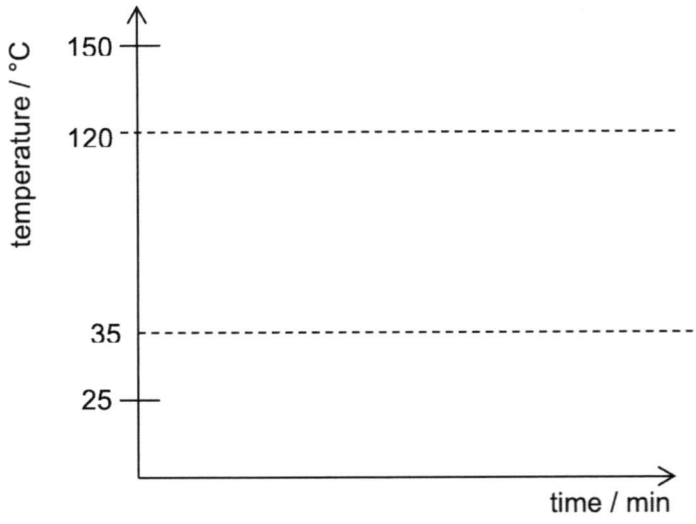
4 Table 4.1 shows the melting point and boiling points of three different substances, P, R and S.

Table 4.1

substance	melting point / °C	boiling point / °C	physical state	
			at 25 °C	at 100 °C
P	-236	-98		
R	35	120		
S	23	95		

(a) Complete the table for the physical states of the substances. [3]

(b) An impure sample of substance R is heated from 25 °C to 150 °C. Sketch, on the axes below, the heating curve that would be obtained for this impure sample.



[2]

[Total: 5]

5 Suggest an apparatus most suitable for the following experiments.

(a) Collect and measure the volume of carbon dioxide gas produced.

..... [1]

(b) Measure 25.4 cm^3 of acid solution accurately.

..... [1]

(c) Separate a mixture of sand and water.

..... [1]

(d) Measure the melting point of sugar crystals.

..... [1]

(e) Add 25.0 cm^3 of water to a beaker.

..... [1]

[Total: 5]

Section B

Answer any **one** question from this section in the spaces provided.

For examiner's use

6 Three white solids, camphor, sodium chloride and sugar have been mixed together by accident.
The solubilities of these three solids in two different solvents are shown in the table. Ether and ethanol are volatile liquids with boiling points of 36 °C and 78 °C respectively.

substance	solvent	
	ethanol	ether
camphor	soluble	soluble
sodium chloride	insoluble	insoluble
sugar	soluble	insoluble

A student is asked to recover sugar crystals from this mixture. The steps that he takes are illustrated in the diagram in Fig. 6.1

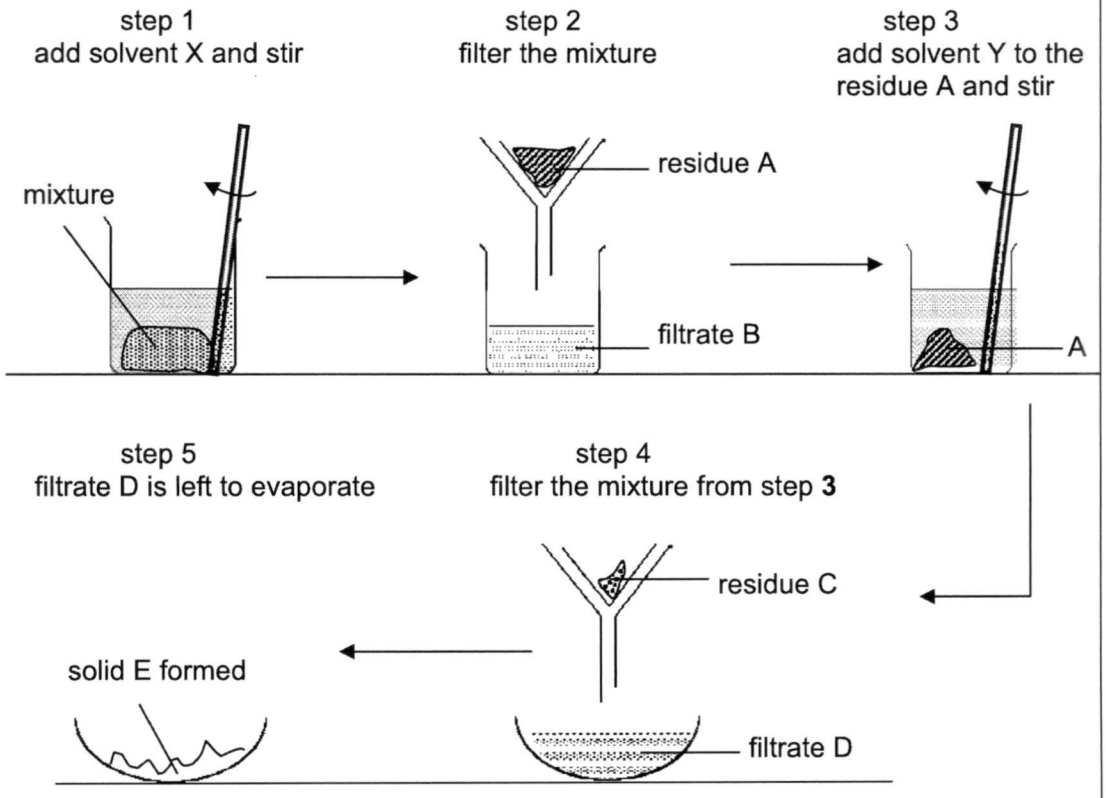


Fig. 6.1

(a) **(i)** Which solvent is X?

..... [1]

(ii) Which solvent is Y?

..... [1]

(b) What substance(s) is/are present in the following?

residue A : ..... [1]

filtrate B : ..... [1]

residue C : ..... [1]

filtrate D : ..... [1]

(c) The substance E is sugar crystals. Explain briefly why the crystals cannot be obtained by heating to dryness?

.....

..... [1]

(d) Describe in detail how a dry sample of substance E could be obtained from filtrate D.

.....

.....

.....

.....

..... [3]

[Total: 10]

7 A student used chromatography to investigate the dyes in a food colouring. Ethanol was used as the solvent to carry the dyes up the paper. Fig 7.1 shows the results of the chromatogram.

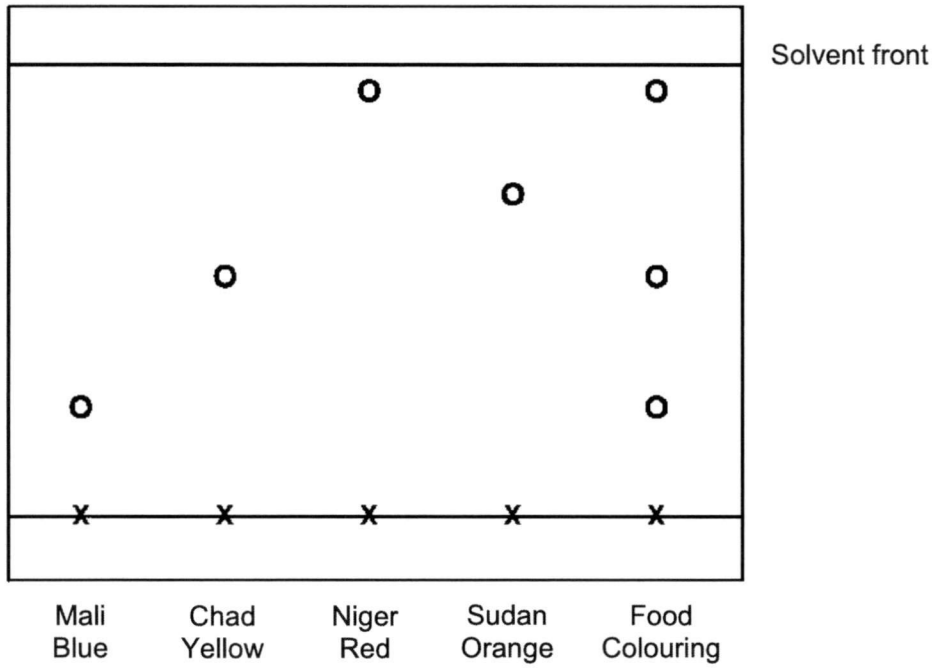


Fig 7.1

(a) State which dye is the most soluble in ethanol.

..... [1]

(b) State which dye is the least soluble in ethanol.

..... [1]

(c) State which dye is not present in the food colouring.

..... [1]

(d) State which physical property is the separation of the dye dependant on.

..... [1]

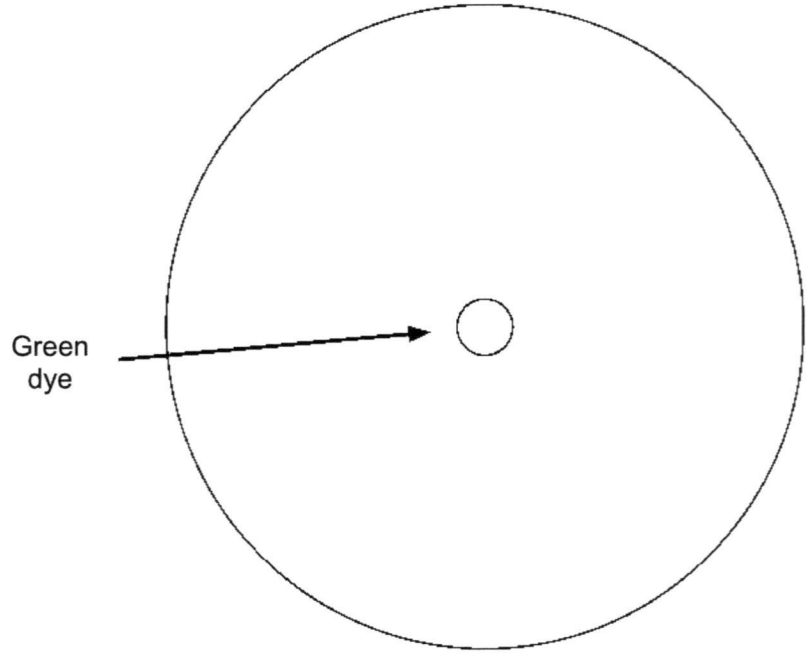
(e) Explain why the experiment should be allowed to proceed until the solvent front is near the top of the paper.

..... [1]

(f) Explain why the start line must be drawn using pencil.

..... [1]

(g) A green dye was thought to consist of Mali Blue and Chad Yellow. A spot of the dye was placed in the centre of a piece of circular filter paper and ethanol was dropped on it so that the dyes spread out. Draw the final appearance of the filter paper and label the lines to identify the components of the dye.

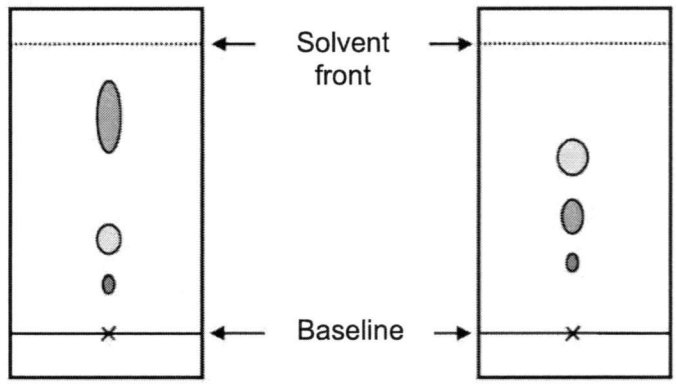


[2]

(h) Name a piece of apparatus that can be used to add the solvent onto the centre of the filter paper.

..... [1]

(i) Two students carried out a chromatography analysis of a sample of the same food colouring. The chromatograms obtained are shown below.



Suggest a reason why the chromatograms are different?

.....

..... [1]

[Total: 10]

End of Paper

The Periodic Table of the Elements

Group I	Group II											Group III	Group IV	Group V	Group VI	Group VII	Group 0
							1 H hydrogen 1										2 He helium 4
3 Li lithium 7	4 Be beryllium 9											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 –		

Key

proton (atomic) number
atomic symbol
name
relative atomic mass

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.).

BEDOK VIEW SECONDARY SCHOOL
2017 MYE 3E / SCIENCE (CHEMISTRY) 5076/5078

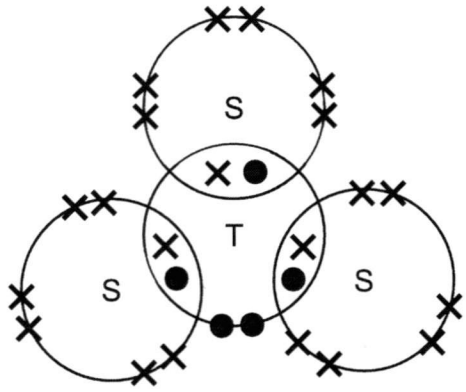
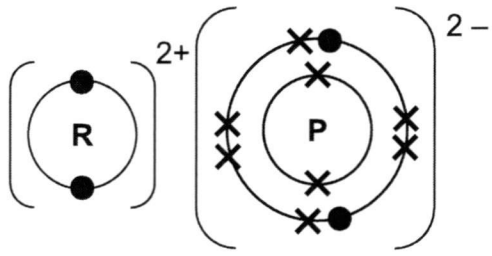
Paper 1

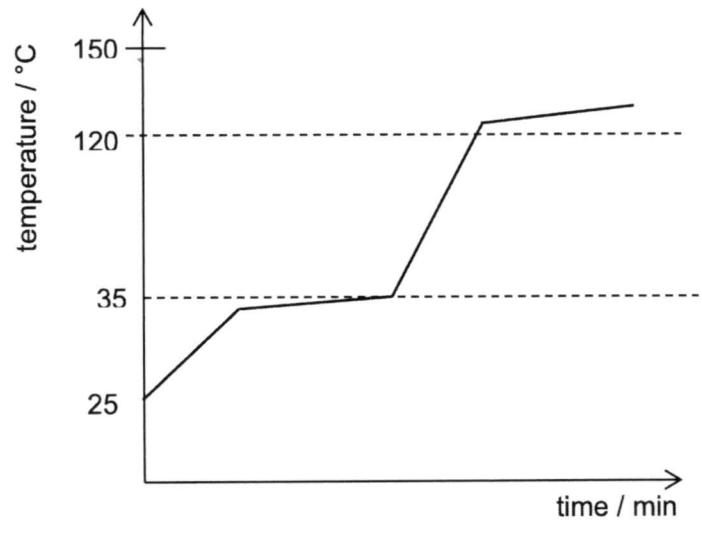
1	2	3	4	5	6	7	8	9	10
C	A	C	C	B	C	A	B	B	D

11	12	13	14	15	16	17	18	19	20
A	C	B	C	D	D	C	D	A	D

Paper 2

/ – or
A – accept
R – reject
CAO – correct answer only
ECF – error carry forward; only award marks for working, no marks for incorrect final answer
OWTTE – or words to that effect

Q/No.	Answer	Comments/ Instructions	Marks
1a	P / S / T	CAO	B1
b	R	CAO	B1
c	P / S / T	CAO	B1
d		CAO 1M for correct electron arrangement of T 1M for correct electron arrangement of S	B2
e	TS_3.	CAO	B1
f		CAO 1M for each correct ion.	B2

g	TS_3 is a covalent compound, it has **simple covalent structure with weak intermolecular forces of attraction between each molecule.** Hence **little amount of energy is required to break these bond**. Therefore TS_3 exists as a liquid. RP is an ionic compound, it has **giant crystal lattice structure with strong electrostatic forces of attraction between each ion.** Hence **large amount of energy is required to break these bonds.** Therefore RP exists as a solid.	OWTTE	B1 B1 B1 B1
2	$\frac{75}{100}\times 35+\frac{25}{100}\times 37$ $=35.5$	CAO	M2 A1
3 a	F	CAO	B1
b	A	CAO	B1
c	C	CAO	B1
d	E	CAO	B1
e	B	CAO	B1
4a	<table><tr><th>substance</th><th colspan="2">physical state</th></tr><tr><th></th><th>at 25 °C</th><th>at 100 °C</th></tr><tr><td>**P**</td><td>gas</td><td>gas</td></tr><tr><td>**R**</td><td>solid</td><td>liquid</td></tr><tr><td>**S**</td><td>liquid</td><td>gas</td></tr></table>	CAO 1M for each correct row	B3
b		CAO 1M for melting point lower than 35 °C 1M for boiling point more than 120 °C No constant melting/boiling point.	B2

5a	Gas syringe	CAO	B1
b	Burette	CAO	B1
c	Filter funnel	CAO	B1
d	Thermometer	CAO	B1
e	Pipette	CAO	A1
6ai	Ether	CAO	B1
aii	Ethanol	CAO	B1
b	Residue A: sodium chloride + sugar Filtrate B: camphor solution Residue C: sodium chloride Filtrate D: sugar solution	CAO	B1 B1 B1 B1
c	Sugar will decompose upon heating at high temperature.	OWTTE	B1
d	Heat filtrate D to **saturation** using a water bath. Let the saturated solution **cool to room temperature/crystals start to form.** **Filter and dry** the crystals using filter paper.	OWTTE	B1 B1 B1
7a	Niger Red	CAO	B1
b	Mali Blue	O	B1
c	Sudan Orange	CAO	B1
d	Solubility in the solvent.	CAO	B1
e	To allow the components of the dye to be separated properly.	OWTTE	B1
f	So that the ink does not contaminate with the dye.	OWTTE	B1
g	Two rings drawn. Chad Yellow on the outer ring. Mali Blue on the inner ring.	1M for each correct ring.	B2
h	Dropper	CAO	B1
i	Different solvent was used.	OWTTE	B1