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FAJAR SECONDARY SCHOOL
2019 MID YEAR EXAMINATIONS
SECONDARY 3 EXPRESS

CANDIDATE NAME			
CLASS		INDEX NUMBER	

SCIENCE (CHEMISTRY) 5076/01
Paper 1

Setter: Mr Chew Cheng Boon
Additional Materials: OTAS Sheet

Date: 16 May 2019
Duration: 30 minutes

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 the Question Paper and OTAS 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 OTAS Sheet.

A copy of the Data Sheet is printed on page 8.
A copy of the Periodic Table is printed on page 10.

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.
Electronic calculators can be used in this paper.

The total of the marks for this paper is **20**.

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1 Which apparatus is most appropriate to measure 25.0 cm^3 of a liquid accurately?

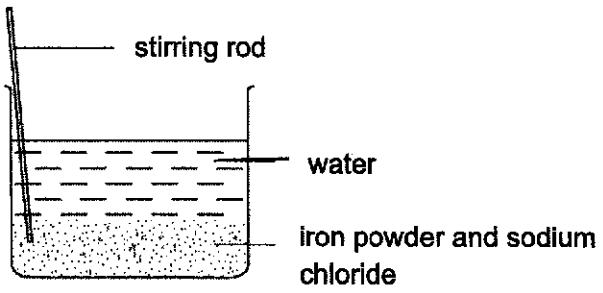
A beaker

B gas syringe

C measuring cylinder

D pipette

2 The diagram shows the first step in separating iron powder from sodium chloride.



What is the next step?

A evaporate the water

B filter the mixture

C freeze the mixture

D make a chromatogram

3 Which statement best describes a mixture?

A It boils at 100 °C.

B It is a black solid that melts at 45 °C.

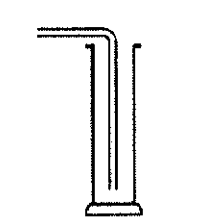
C It is a yellow liquid which can be separated into three portions by fractional distillation.

D It turns black upon heating.

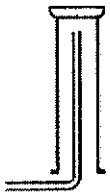
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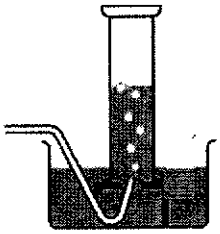
4 Which setup shown **cannot** be used to collect a sample of gas that is less dense than air and insoluble in water?



A



B



C



D

5 What is the formula of the compound removed from seawater by evaporation to dryness?

A CO_2

B H_2

C H_2O

D N_2

6 Which arrangement of electrons in an atom represents a non-metal?

A 2, 1

B 2, 2

C 2, 8, 3

D 2, 8, 4

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Refer to the description and table below for questions **7** and **8**.

The table shows the volume of oxygen that is collected in a gas syringe at half-minute intervals.

time / minute	0	0.5	1.0	1.5	2.0	2.5	3.0	3.5
volume / cm^3	0	16	28	40	50	58	66	66

7 When was the reaction complete?

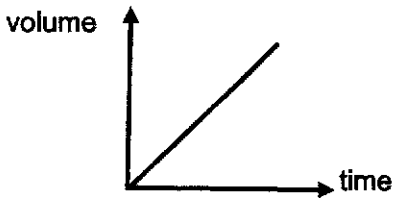
A after 0.5 minute

B after 1.5 minutes

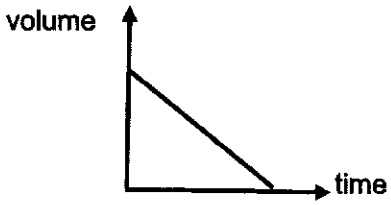
C after 2.0 minutes

D after 3.0 minutes

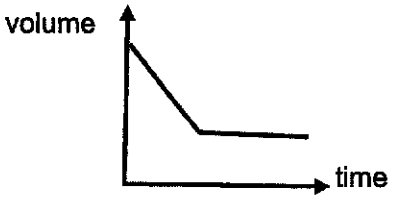
8 Which graph of volume against time best shows these results?



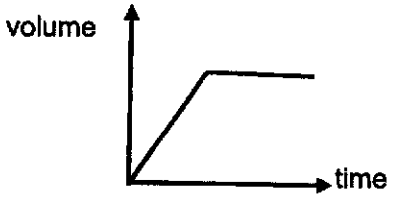
A



B



C



D

9 Two miscible liquids are separated using fractional distillation. One of them boils at 145 °C and the other boils at 15 °C. What could be the temperature reading on the thermometer when the first drop of the distillate is collected?

A 0 °C

B 15 °C

C 100 °C

D 145 °C

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10 Which formula contains the largest number of atoms?

A $AlPO_4$

B $Ba(OH)_2$

C $Ca(NO_3)_2$

D $MgCO_3$

11 Which group contains only one metal?

A carbon, hydrogen, lithium

B copper, magnesium, zinc

C oxygen, nitrogen, sulfur

D silver, mercury, chlorine

12 Of the first twenty elements listed in the Periodic Table, how many of them are poor conductors of electricity?

A 5

B 10

C 12

D 15

13 In which substance are the particles furthest apart?

A ice at 0 °C

B ethanol at 30 °C

C oxygen at – 300 °C

D steam at 100 °C

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14 In which change of state is heat energy taken in and a large change in volume is observed?

A boiling

B condensation

C freezing

D melting

15 Ethanol melts at -117 °C and boils at 78 °C. At which temperature is ethanol a liquid?

A - 140 °C

B - 110 °C

C 80 °C

D 150 °C

16 When **y** cm^3 of water and **y** cm^3 of ethanol are mixed, the total volume is less than **2y** cm^3. This is because

A the total mass is greater and pushes the molecules together.

B the water molecules evaporate away.

C the water molecules fit into spaces between the ethanol molecules.

D the water molecules react with the ethanol molecules.

17 Which pair of elements is **not** likely to form an ionic compound?

A calcium and oxygen

B copper and chlorine

C nitrogen and hydrogen

D potassium and bromine

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18 An atom is represented by the symbol $^{204}_{81}Q$. What does the nucleus of this atom contain?

A 81 neutrons and 123 protons

B 81 neutrons and 204 protons

C 81 protons and 123 neutrons

D 81 protons and 204 neutrons

19

property	symbol
exists as a gas under room condition	**X**
has 2 valence electrons	**Y**

Using the Periodic Table and the information given in the table above, what are **X** and **Y** most likely to be?

	X	Y
A	Cl	Mg
B	Li	Ca
C	Ne	O
D	O	S

20 An element with proton number 7 will have similar chemical properties with an element with proton number

A 5

B 8

C 15

D 17

- End of Paper -

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DATA SHEET
Colours of some common metal hydroxides

calcium hydroxide	white
copper(II) hydroxide	light blue
iron(II) hydroxide	green
iron(III) hydroxide	red-brown
lead(II) hydroxide	white
zinc(II) hydroxide	white

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The Periodic Table of 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.).

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2019 MID-YEAR EXAMINATIONS
SECONDARY 3 EXPRESS

CANDIDATE NAME

CLASS

INDEX NUMBER

SCIENCE (CHEMISTRY) 5076/03

Paper 3

Date: 07 May 2019

Setter: Mr Chew Cheng Boon

Duration: 1 hour 15 minutes

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 pencil for any diagrams, graphs, tables or rough working.
Do not use staples, paper clips, highlighters, glue or correction fluid.

Section A and B
Answer **all** questions in the spaces provided

The number of marks is given in brackets [ ] at the end of each question or part question.
In calculations, you should show all steps in your working, giving your answer at each stage.
A copy of the Periodic Table is attached on page 12.
The use of an approved scientific calculator is expected, where appropriate.

For Examiner's Use	
Paper 1	20
Paper 3 Section A	45
Paper 3 Section B	20
Total	85

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Section A [45 marks]

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

1 The list shows five common separation techniques.

- crystallisation
- simple distillation
- evaporation to dryness
- fractional distillation
- filtration

Choose from the list, the most suitable technique for the following separation.

(a) Obtaining pure water from a cup of coffee.

..... [1]

(b) Obtaining sugar from sugar solution.

..... [1]

(c) Removing dust particles from air.

..... [1]

(d) Obtaining kerosene from a mixture of kerosene and petrol.

..... [1]

(e) Obtaining salt from sea water.

..... [1]

[Total : 5]

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2 Table 2.1 lists the number of protons, neutrons and electrons in six different atoms, **A** to **F**.

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Table 2.1

atom	number of protons	number of neutrons	number of electrons
A	6	6	6
B	3	4	3
C	12	14	12
D	12	12	12
E	18	22	18
F	20	20	20

Use the information in Table 2.1 to answer the following questions.

(a) Which atom has a nucleon number of 12? ..... [1]

(b) Which atoms are isotopes of the same element?

..... and ..... [1]

(c) State the electronic configuration of **F**. ..... [1]

(d) Which atom has a stable octet configuration? ..... [1]

(e) Which atom has the least number of valence electron(s)? ..... [1]

(f) Which atom forms an ion with a single positive charge? ..... [1]

(g) Can **D** conduct electricity? Give a brief explanation for your answer.

.....

..... [2]

[Total: 8]

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3 (a) Table 3.1 shows three substances.
Classify them as element, compound or mixture, and name the elements found in the substance.

Table 3.1

substance	classification (element, compound or mixture)	elements found in this substance
carbon dioxide		
air		
rust		

[6]

(b) Information about four substances **W**, **X**, **Y** and **Z** is given below.

W: A white solid formed by strongly heating magnesium in oxygen.

X: A gas used by living things during respiration.

Y: A solid with non-uniform distribution of black and yellow colouration. The black particles are attracted by a magnet but not the white particles.

Z: A solid with constant composition and produces two elements when heated strongly.

Classifing each of **W**, **X**, **Y** and **Z** as an element or a compound or a mixture by placing a tick in the appropriate column in Table 3.2.

Table 3.2

	element	compound	mixture
W			
X			
Y			
Z			

[4]

[Total: 10]

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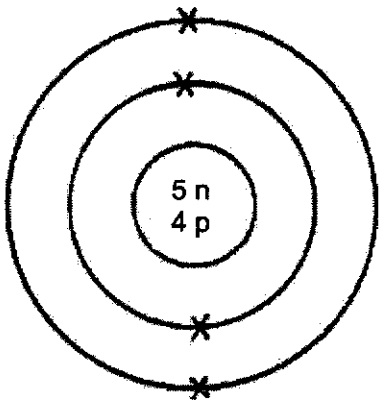
4 **(a)** Complete Table 4.1 concerning the three different sub-atomic particles present in atoms.

Table 4.1

	relative mass	relative charge
proton		
electron		
neutron		

[3]

(b) Fig 4.2 shows the structure of an atom of element **W**.



x = electrons

n = neutrons

p = protons

Fig. 4.2

(i) Using the Periodic Table as a guide, name the element **W**.

..... [1]

(ii) Using the Periodic Table, name another element that has similar chemical properties as the element **W**. Explain your answer.

.....

..... [2]

(iii) Write the formula of the compound formed when element **W** combines with oxygen.

..... [1]

[Total: 7]

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Fig. 5.1 is used to separate a mixture of sea water.

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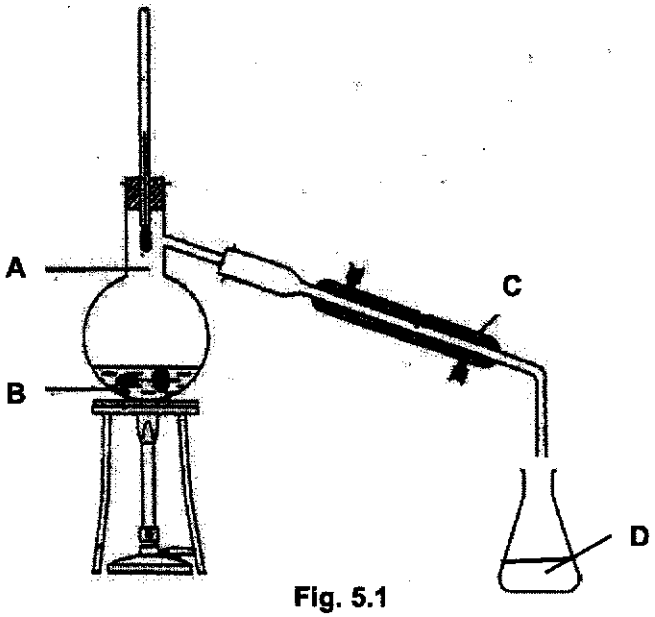


Fig. 5.1

(a) What are the two main physical processes that occur during the separation?

..... and ..... [2]

(b) Why are boiling stones added to **B**?

..... [1]

(c) State the purpose of the water in apparatus **C**.

..... [1]

(d) Sketch a diagram in the box below to show how the particles are arranged at point **A**.

[1]

(e) Two samples are taken, one from point **B** and another from point **D**. Each is placed in a separate evaporating dish and heated to dryness.
What would you observe on each of the two evaporating dishes at the end of the heating? Give a brief explanation on the difference in the observation.

.....

.....

..... [2]

[Total: 7]

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The red colouring matter in a fizzy drink was extracted by a solvent.
Two drops of the red solution were placed at the centre of a circular filter paper and allowed to dry.
Drops of pure solvent were slowly added to the centre of the filter paper.
After some time, four coloured circles were seen, as shown in the Fig. 6.1.

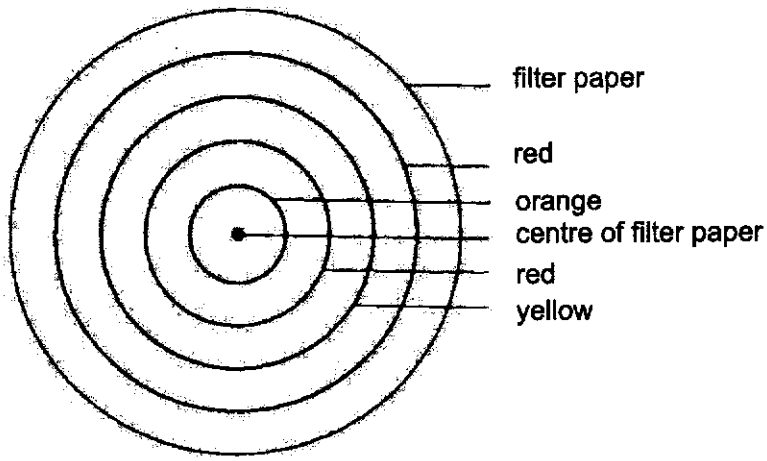


Fig. 6.1

(i) Name the separation technique described above.

..... [1]

(ii) Name an apparatus that can be used to drop the solvent onto the filter paper.

..... [1]

(iii) How many different dyes are there in the fizzy drink?

..... [1]

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(b) An alternative setup for this experiment is shown in Fig. 6.2.
In this case, a strip of filter paper was used and the filter paper was dipped into the same solvent.

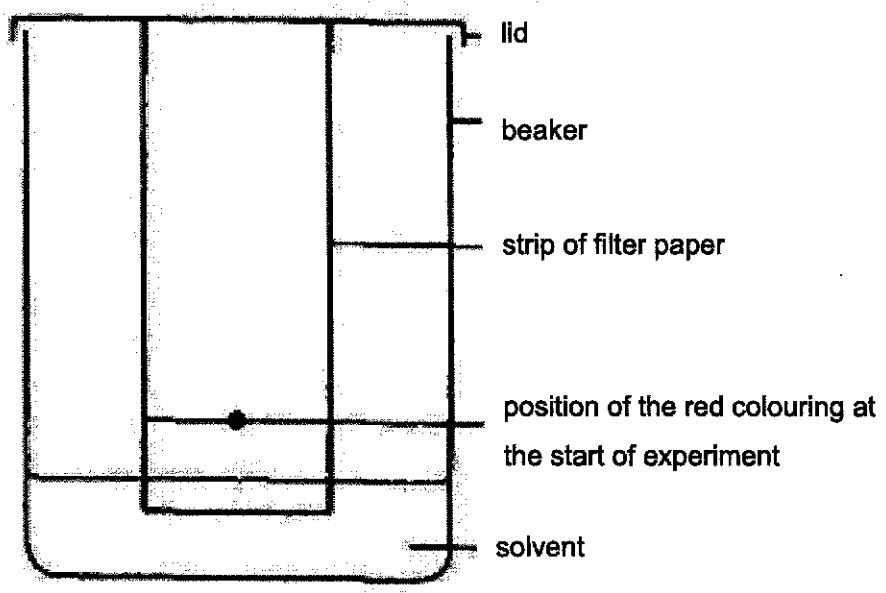


Fig. 6.2

Draw and label on Fig. 6.2 to show the results you would expect if the set up was left until the solvent reached nearly to the top of the filter paper. [2]

In preparing the chromatography, the following instructions were given.
Suggest a reason for each instruction.

(i) The starting line should be drawn with a pencil rather than with ink.

..... [1]

(ii) At the end of the experiment, the solvent front should be near the top of paper.

..... [1]

(c) State one advantage of using chromatography over other techniques in separating mixtures.

..... [1]

[Total: 8]

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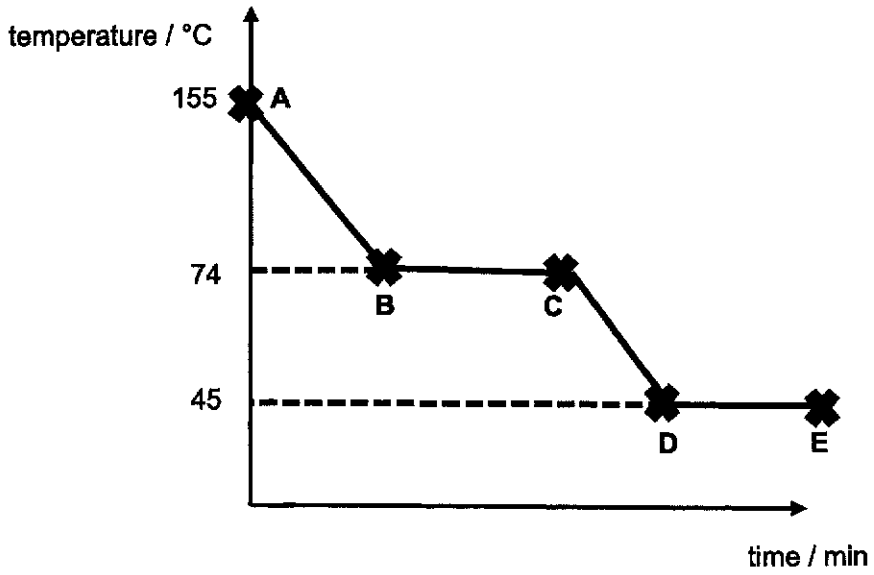
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Section B [20 marks]

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

1 A solid **M** was heated until it completely melted and turned to a gas. It was then allowed to cool slowly.
The graph shows how the temperature of **M** changed as it cooled.



(a) Based on the graph, state the melting point and boiling point of **M**.

melting point of **M**: .....°C [1]

boiling point of **M**: .....°C [1]

(b) Describe how the arrangement and movement of the particles of **M** differ at points **A** and **E**.

.....

.....

.....

..... [2]

(c) From the graphical results, explain if **M** is a pure substance.

.....

..... [2]

(d) Deduce the physical state(s) of **M** at the region **BC**.

..... [1]

[Turn Over

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(e) Explain why there is no change in temperature during the period **DE**.

For Examiner's Use

.....

.....

..... [2]

(f) Suggest a reason why substance **M** cannot be water.

.....

..... [1]

[Total: 10]

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B2 Aluminium fluoride, AlF_3 is a solid compound that has a melting point of 1291 °C.

(a) Name the type of bonding present in aluminium fluoride, AlF_3.

..... [1]

(b) Using a 'dot and cross' diagram, show the electronic structure of aluminium fluoride. Your diagram should show the arrangement of all the electrons.

[2]

(c) Explain why the bonding in aluminium fluoride gives rise to the following properties.

(i) A very high melting point.

.....

.....

..... [2]

(ii) High electrical conductivity when molten, but not when in the solid state.

.....

.....

.....

..... [3]

(d) Suggest a solvent in which aluminium fluoride is soluble in.

..... [1]

(e) Name another element that undergoes the same type of bonding when combining with aluminium.

..... [1]

[Total: 10]

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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										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.).

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Paper 1 [20 marks]

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
D	B	C	A	C	D	D	D	B	C

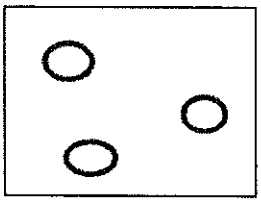
Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20
A	C	D	A	B	C	C	C	A	C

Paper 2

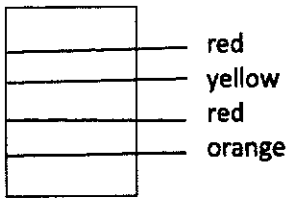
Section A [45 marks]

Question No	Answer	Marks allocation
1 (a)	simple distillation	1
(b)	crystallisation	1
(c)	filtration	1
(d)	fractional distillation	1
(e)	evaporation to dryness	1
		Total: 5 marks
2 (a)	A	1
(b)	C and D	1
(c)	2. 8. 8. 2	1
(d)	E	1
(e)	B	1
(f)	B	1
(g)	Yes, It has 2 valence electrons and is therefore a metal. Metals conduct electricity or Magnesium has proton number 12 which is a metal	1 1
		Total: 8 marks

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3 (a)	Carbon dioxide	compound	carbon, oxygen	award 1 mark for each correct answer.
	Air	mixture	nitrogen, rare gases, oxygen	
	rust	compound	iron, oxygen	
				Total: 6 marks
(b)	**W**		compound	Award 1 mark for each correct answer
	X		element	
	Y		mixture	
	Z		compound	
				Total: 4 marks
4 (a)	proton	1	+1	1 mark for each correct row of answers
	electron	1/1840	-1	
	Neutron	1	0	
				Total: 3 marks
(b) (i)	beryllium			1
(ii)	Any element in Group II except Be			1
	It has the same number of valence electrons			1
(iii)	WO			1
				Total: 4 marks
5 (a)	condensation and evaporation			2
(b)	to make the boiling smooth			1
(c)	To condense the incoming hot vapour into a liquid.			1
(d)				1
(e)	Evaporating dish from point B contain residue as sea water contains dissolved salt.			1
	Evaporating dish from point D does not contain any residue as distilled water is chemically pure / free from any dissolved substances.			1
				Total : 7 marks

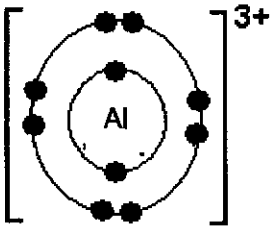
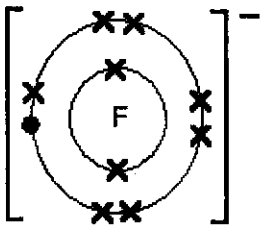
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6 (a) (i)	paper chromatography	1
(ii)	plastic dropper	1
(iii)	4	1
		Total : 3 marks
6 (b)		Award 1 mark for any 2 correct answers. [2]
(i)	The graphite in pencil lead is insoluble in the solvent.	1
(ii)	To ensure good separation of all the dyes.	1
(iii)	Fast/need only small amount of sample/ no heat is involved.	1
		Total : 5 marks

Section B: [20 marks]

1 (a)	Melting point = 45 °C Boiling point = 74 °C	1 1
(b)	At **A**, particles are far apart without any orderly arrangement. At **E**, particles are closely packed in orderly arrangement At **A**, particles move randomly at great speeds. At **E**, the particles vibrate about a fixed position	1 1
(c)	M is a pure substance as it has a sharp and fixed mp and bp.	1 1
(d)	Gas and liquid states	1
(e)	Energy is used to bring the particles closely packed together instead of giving out to surrounding.	1 1
(f)	Bp and mp are not 100 °C and 0 °C respectively	1
		Total : 10 marks

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2(a)	Ionic bonding	1
(b)	Correct aluminium ion with 3+ positive charge  Correct 3 fluoride ions with 1- negative charge  3	1 1
(c) (i)	Strong electrostatic force of attraction between oppositely charged ions.\ A lot of energy is needed to overcome this strong force.	1 1
(ii)	In molten state, oppositely charged ions are mobile They serve as charge carrier to conduct electricity. In solid state, the ions are fixed in rigid structure and they are not free to move.	1 1 1
(d)	Water	1
(e)	Any non-metallic element except Group IV or Group 0 elements.	1
		Total: 10 marks

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