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BEDOK GREEN SECONDARY SCHOOL

4E5N**Preliminary Examination 2022****4E5N****SCIENCE (CHEMISTRY/BIOLOGY)****5078/1**

Paper 1 (Multiple Choice)

30 August 2022

1 hour

Additional Materials:
Multiple Choice Answer Sheet

READ THESE INSTRUCTIONS FIRST

Write your name, class and register number on all the work you hand in.
Write in dark blue or black pen.
Do not use staples, paper clips, glue or correction fluid.

There are **forty** 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 Multiple Choice Answer Sheet.

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

Any rough working should be done in this booklet.

A copy of the Data Sheet is printed on page 20.
A copy of the Periodic Table is printed on page 21.

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

This document consists of **21** printed pages including the cover page.

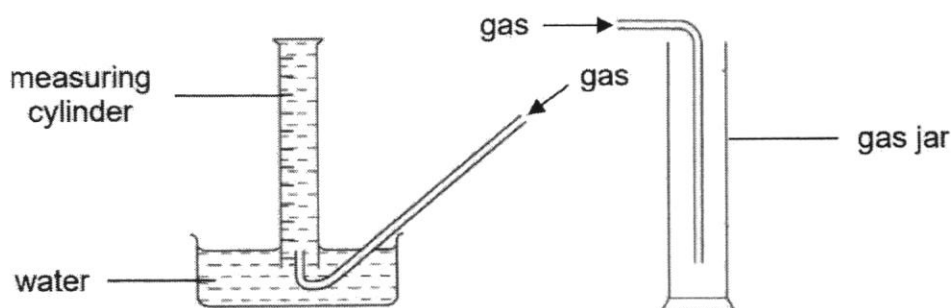
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[Turn Over

2

- 1 The diagram below shows two methods of collecting gases.



Which row gives the properties of a gas which can be collected by both methods?

	property 1	property 2
A	soluble in water	denser than air
B	soluble in water	less dense than air
C	insoluble in water	denser than air
D	insoluble in water	less dense than air

- 2 The table provides information of three solids, P, Q and R.

solid	stability to heat	solubility in alcohol	solubility in water
P	yes	no	no
Q	yes	yes	no
R	no	no	yes

The following steps could be carried out to separate substance R from a mixture of these three substances.

1. filtration
2. dissolving in water
3. dissolving in alcohol
4. evaporation to dryness
5. crystallization

Which option shows the correct order of steps?

- A** 2, 1, 5
B 2, 3, 1, 5
C 3, 1, 4
D 3, 1, 2, 4

- 3 The boiling points of some gases are given in the table.

element	nitrogen	xenon	oxygen
boiling point / °C	-196	-108	-183

A mixture of the three gases was cooled to -190°C.

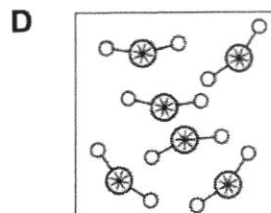
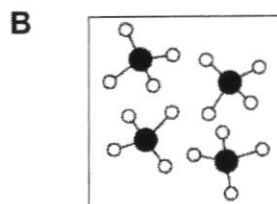
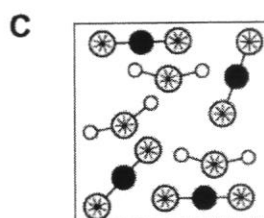
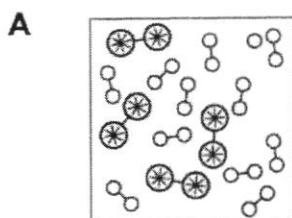
Which of the gases will be in liquid state?

- A nitrogen only
 B oxygen only
 C oxygen and xenon only
 D xenon only
- 4 The symbols for two ions are shown.

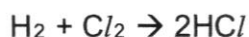


Which statement is correct?

- A Both ions contain the same number of electrons.
 B Both ions contain the same number of protons.
 C The fluoride ion contains more electrons than the sodium ion.
 D The fluoride ion contains more neutrons than the sodium ion.
- 5 Which diagram best represents a mixture of elements?



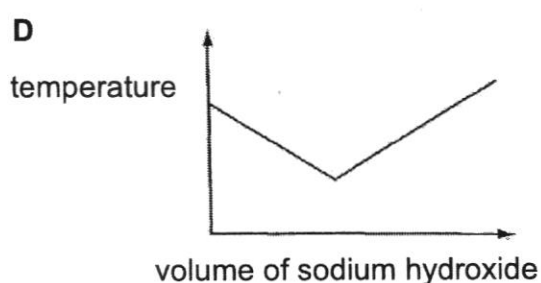
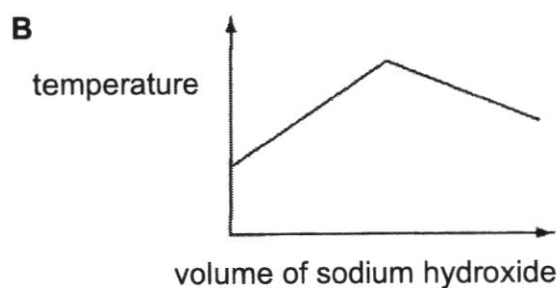
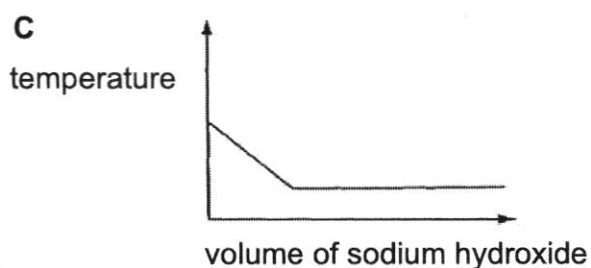
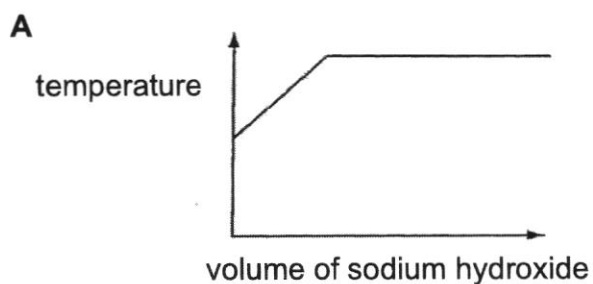
- 6 50 cm³ of hydrogen gas was reacted with 80 cm³ of chlorine gas to form hydrogen chloride gas.



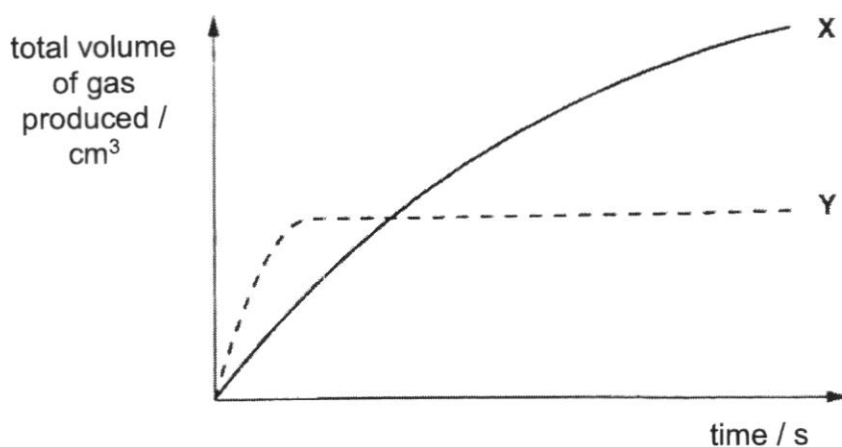
How much hydrogen chloride gas was formed from the reaction?

- A 50 cm³
 B 80 cm³
 C 100 cm³
 D 160 cm³
- 7 Which of the following compounds consists of covalent bonds only?
- A silver nitrate
 B carbon dioxide
 C magnesium oxide
 D ammonium carbonate
- 8 The reaction between aqueous potassium hydroxide and dilute hydrochloric acid is exothermic. Both the hydrochloric acid and potassium hydroxide are initially at room temperature.

Which graph shows how the temperature changes when aqueous potassium hydroxide is added to dilute hydrochloric acid until the alkali is present in excess?



- 9 What are the ions present in aluminium sulfate, $\text{Al}_2(\text{SO}_4)_3$?
- A Al^{2+} and SO_4^{2-}
B Al^{3+} and SO_4^{2-}
C Al^{2+} and SO_4^{3-}
D Al^{3+} and SO_4^{3-}
- 10 In which reaction does the oxidation state of iron remain unchanged?
- A $2\text{Fe} + 3\text{Cl}_2 \rightarrow 2\text{FeCl}_3$
B $2\text{FeCl}_2 + \text{Cl}_2 \rightarrow 2\text{FeCl}_3$
C $\text{Fe} + 2\text{FeCl}_3 \rightarrow 3\text{FeCl}_2$
D $\text{Fe}_2\text{O}_3 + 6\text{HCl} \rightarrow 2\text{FeCl}_3 + 3\text{H}_2\text{O}$
- 11 In the graph below, curve X represents the results of the reaction between 1.0 g of granulated zinc and an excess of acid at 30 °C.



Which changes will produce curve Y?

- A using 1.0 g of powdered zinc at 20 °C
B using 1.0 g of granulated zinc at 20 °C
C using 0.5 g of granulated zinc at 40 °C
D using 0.5 g of granulated zinc at 20 °C

- 12 The table below shows the properties of some elements W, X, Y and Z in period 3 of the Periodic Table.

	W	X	Y	Z
appearance at room temperature	yellow solid	yellowish-green gas	grey solid	grey solid
reaction with cold water	no reaction	slow reaction	fast reaction	violent reaction
nature of oxide	reacts with bases	reacts with bases	reacts with both acids and bases	reacts with acids

Which of the following shows the elements arranged in the Periodic Table in increasing proton number?

- A X, W, Y, Z
 B X, Y, W, Z
 C Z, Y, W, X
 D Z, X, Y, W
- 13 Steel is an alloy of iron with a very small percentage of carbon. Which statement is correct?
- A Carbon disrupts the metallic structure of iron.
 B Iron atoms are the same size as carbon atoms.
 C An increase in the percentage of carbon makes the steel softer.
 D A decrease in the percentage of carbon makes the steel more brittle.
- 14 Which of the following substances will react with hydrochloric acid to form a gas and water as two of the products?
- A calcium oxide
 B calcium nitrate
 C calcium hydroxide
 D calcium carbonate
- 15 The elements in Group I of the Periodic Table react with water. What is/are the product(s) formed in this reaction?
- A metal oxide only
 B metal hydroxide only
 C metal oxide and hydrogen
 D metal hydroxide and hydrogen

- 16 Which row shows the correct source of nitrogen dioxide and its adverse effect on the environment?

	source	effect on the environment
A	car exhausts	global warming
B	combustion of fossil fuels	global warming
C	lightning	acid rain
D	volcanoes	acid rain

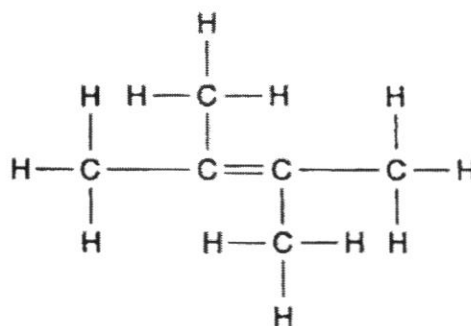
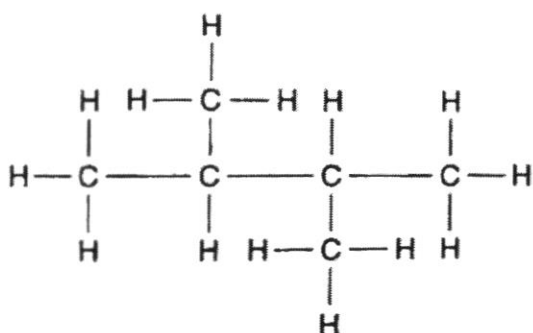
- 17 Which salt **cannot** be prepared by reacting a metal with dilute acid?

- A zinc nitrate
- B calcium chloride
- C copper(II) sulfate
- D magnesium chloride

- 18 In the fractional distillation of crude oil, which product has the highest boiling point?

- A diesel
- B kerosene
- C lubricating oil
- D petrol

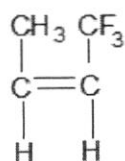
- 19 The structures of two compounds are shown below.



Which statement about these two compounds is correct?

- A They are both hydrocarbons.
- B They are both saturated compounds.
- C They have the same molecular formula.
- D They are from the same homologous series.

20 The structure of a monomer is shown.



What is the structure of the polymer formed by this monomer?

- A**
- $$\begin{array}{cccccc} \text{CH}_3 & \text{F} & \text{CH}_3 & \text{F} & \text{CH}_3 & \text{F} \\ | & | & | & | & | & | \\ -\text{C}- & \text{C}- & \text{C}- & \text{C}- & \text{C}- & \text{C}- \\ | & | & | & | & | & | \\ \text{H} & \text{F} & \text{H} & \text{F} & \text{H} & \text{F} \end{array}$$
- B**
- $$\begin{array}{cccccc} \text{CH}_3 & \text{CH}_3 & \text{CF}_3 & \text{CF}_3 & \text{CF}_3 & \text{CH}_3 \\ | & | & | & | & | & | \\ -\text{C}- & \text{C}- & \text{C}- & \text{C}- & \text{C}- & \text{C}- \\ | & | & | & | & | & | \\ \text{H} & \text{H} & \text{H} & \text{H} & \text{H} & \text{H} \end{array}$$
- C**
- $$\begin{array}{cccccc} \text{CH}_3 & \text{CF}_3 & \text{CH}_3 & \text{CF}_3 & \text{CH}_3 & \text{CF}_3 \\ | & | & | & | & | & | \\ -\text{C}- & \text{C}- & \text{C}- & \text{C}- & \text{C}- & \text{C}- \\ | & | & | & | & | & | \\ \text{H} & \text{H} & \text{H} & \text{H} & \text{H} & \text{H} \end{array}$$
- D**
- $$\begin{array}{cccccccccccc} \text{H} & & & \text{H} & \text{H} & & \text{H} & \text{H} & & \text{H} \\ | & & & | & | & & | & | & & | \\ -\text{C}- & \text{C}=\text{C}- & \text{C}- & \text{C}- & \text{C}- & \text{C}=\text{C}- & \text{C}- & \text{C}- & \text{C}=\text{C}- & \text{C}- \\ | & | & | & | & | & | & | & | & | & | \\ \text{H} & \text{H} & \text{H} & \text{F} & \text{H} & \text{H} & \text{H} & \text{F} & \text{H} & \text{F} \end{array}$$

End of Paper

Name:	Register Number:	Class:
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BEDOK GREEN SECONDARY SCHOOL

4E5N**Preliminary Examination 2022****4E5N****SCIENCE (CHEMISTRY)****5076/3****5078/3**

Paper 3 Chemistry

22 Aug 2022

1 h 15 min

No additional materials required.

READ THESE INSTRUCTIONS FIRST

Write your name, class and register number on all the work you hand in.

Write in dark blue or black pen.

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

Answer all questions in Section A and any **two** questions in Section B.

The number of marks is given in brackets is given in brackets [] at the end of each question or part question.

A copy of the Data Sheet is printed on page 17.

A copy of the Periodic Table is printed on page 18.

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

In calculations, you should show all the steps in your working, giving your answer at each stage.

For Examiner's Use	
Section A [45 marks]	
Section B [20 marks]	
Total [65 marks]	

This document consists of **18** printed pages including the cover page.

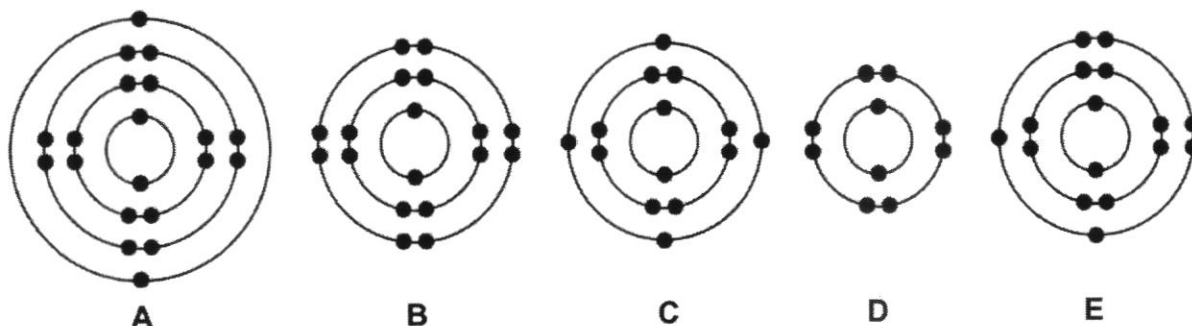
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Section A

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

- 1 The electronic configurations of five atoms are shown.



Use the letters **A, B, C, D** and **E** to answer the questions below.
Each letter may be used once, more than once or not at all.
Which electronic configuration represents

- (a) a sulfur atom?

..... [1]

- (b) an atom with a proton number of 14?

..... [1]

- (c) an atom of a noble gas with three electron shells?

..... [1]

- (d) an atom which forms an ion with a charge of 2+?

..... [1]

- 2 (a) Table 2.1 gives information about some atoms and ions. Complete the table.

Table 2.1

formula of atom or ion	name of particle	number of protons	number of electrons	number of neutrons
Na	sodium atom		11	12
O ²⁻		8		8
	nitride ion	7	10	7

[2]

- (b) Sodium reacts with a sufficient supply of oxygen to form sodium oxide. Draw 'dot and cross' diagrams to show the arrangement of the outer shell electrons in sodium oxide.

[Proton (atomic) number: Na, 11; O, 8]

[2]

- (c) Explain why sodium oxide is a solid at room temperature and pressure.

.....

.....

.....

.....

[3]

- 3 In 2016, the International Union of Pure and Applied Chemistry (IUPAC) has confirmed the names for the four newest elements to be added in Period 7 of the Periodic Table.

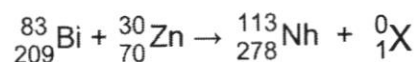
One of the new elements, discovered by a team of Japanese scientists, has been named nihonium (Nh), after the Japanese name for Japan - Nihon.

Fig 3.1 shows part of the Periodic Table and the position of nihonium.

III	IV	V	VI	VII	0
					2 He helium 4
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
31 Ga gallium 70	32 Ge germanium 73	33 As arsenic 75	34 Se selenium 79	35 Br bromine 80	36 Kr krypton 84
49 In indium 115	50 Sn tin 119	51 Sb antimony 122	52 Te tellurium 128	53 I iodine 127	54 Xe xenon 131
81 Tl thallium 204	82 Pb lead 207	83 Bi bismuth 209	84 Po polonium —	85 At astatine —	86 Rn radon —
113 Nh Nihonium 278					

Fig. 3.1

The element was discovered by colliding a thin layer of bismuth with zinc. The reaction produces particle **X**.



- (a) Suggest the identity of particle **X**.

..... [1]

- (b) Nihonium exists as three isotopes: nihonium-278, nihonium-282 and nihonium-285. Using the information given, compare and contrast the atomic and electronic structures of the three isotopes.
You may use Nh-278, Nh-282 and Nh-285 to represent the three isotopes.

.....

.....

.....

.....

.....

[3]

- (c) Another new element named tennessine (with symbol Ts) is placed close to nihonium in the Periodic Table. It has an atomic number of 117.

- (i) Predict the position of tennessine on the Periodic Table and write the symbol of tennessine on Fig 3.1.

[1]

- (ii) A student made a few predictions about tennessine. Which predictions about the properties of tennessine are true and which are false?

Put a tick (✓) in one box in each row

	true	false
Tennessine is a good conductor of electricity.		
Tennessine is a solid at room temperature and pressure.		
Tennessine is brown in colour.		
Tennessine is the least reactive element in its group.		

[2]

- 4 Some magnesium powder is added to dilute sulfuric acid in a test tube.

A colourless salt solution **R** is formed and a gas is given off. When more magnesium powder is added, the reaction continues for a while and then stops, leaving some magnesium powder in the test tube.

- (a) State the name of solution **R**.

..... [1]

- (b) Suggest why the reaction stops and identify the limiting reactant.

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

- (c) Describe how you would obtain dry crystals of salt **R** from solution **R**.

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

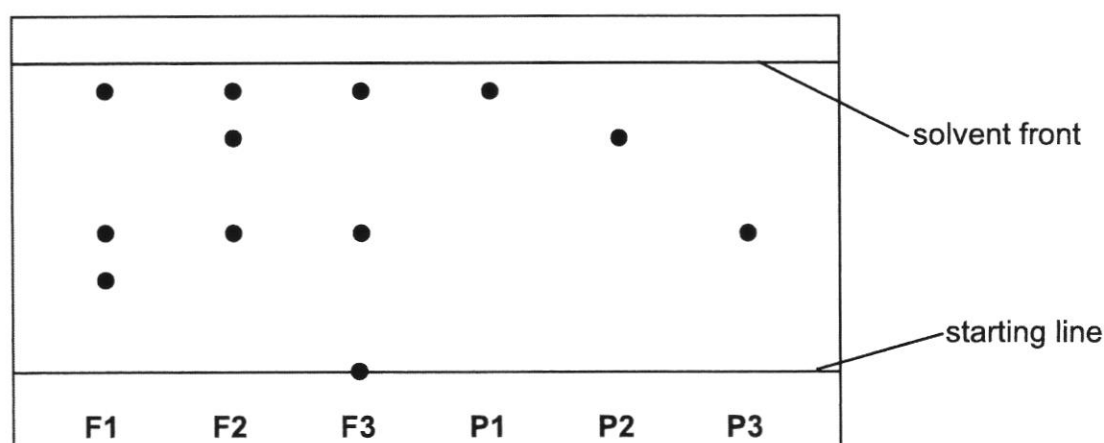
- 5 A student investigates the pigments found in some fruits. She obtains some coloured fruit extracts from the following:

F1 pumpkins
F2 watermelons
F3 cherries

She places a spot of each extract on chromatography paper together with spots of three pigments usually found in fruits.

P1 beta-carotene (yellow-orange pigment)
P2 lycopene (red pigment)
P3 anthocyanin (blue-purple pigment)

The diagram below shows the chromatogram at the end of the experiment.



- (a) (i) Based on the chromatogram given above, state if each statement is true or false.
 If the statement is **true**, put a **T** in the box. If the statement is **false**, put a **F** in the box.

Lycopene is not present in pumpkins, watermelons and cherries.

☐

Anthocyanin is present in cherries only.

☐

Both pumpkins and watermelons contain a pigment other than beta-carotene, lycopene and anthocyanin.

☐

[3]

- (ii) Rewrite one of the false statements in part (a)(i) to make it correct.

..... [1]

- (b) (i) How many different pigments are present in pumpkins and watermelons?

..... [1]

- (ii) Suggest a reason why there is a spot on the starting line in the chromatogram for cherries.

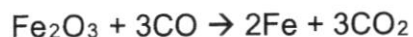
.....
 [1]

- (iii) Is the fruit extract from cherries pure? Give a reason for your answer.

.....
 [2]

- 6 Metals are extracted from their ores using different methods. In the extraction of iron, haematite, coke and limestone are added to the Blast Furnace.

In the industry, iron is obtained from the ore haematite, Fe_2O_3 , through a reaction with carbon monoxide.



Calculate the mass of iron, that can be obtained when 16 000 g of Fe_2O_3 react with excess carbon monoxide.

[Relative atomic masses: Ar: C, 12; O, 16; Fe, 56]

[3]

7 Fig. 7.1 describes some of the properties and reactions of several substances.

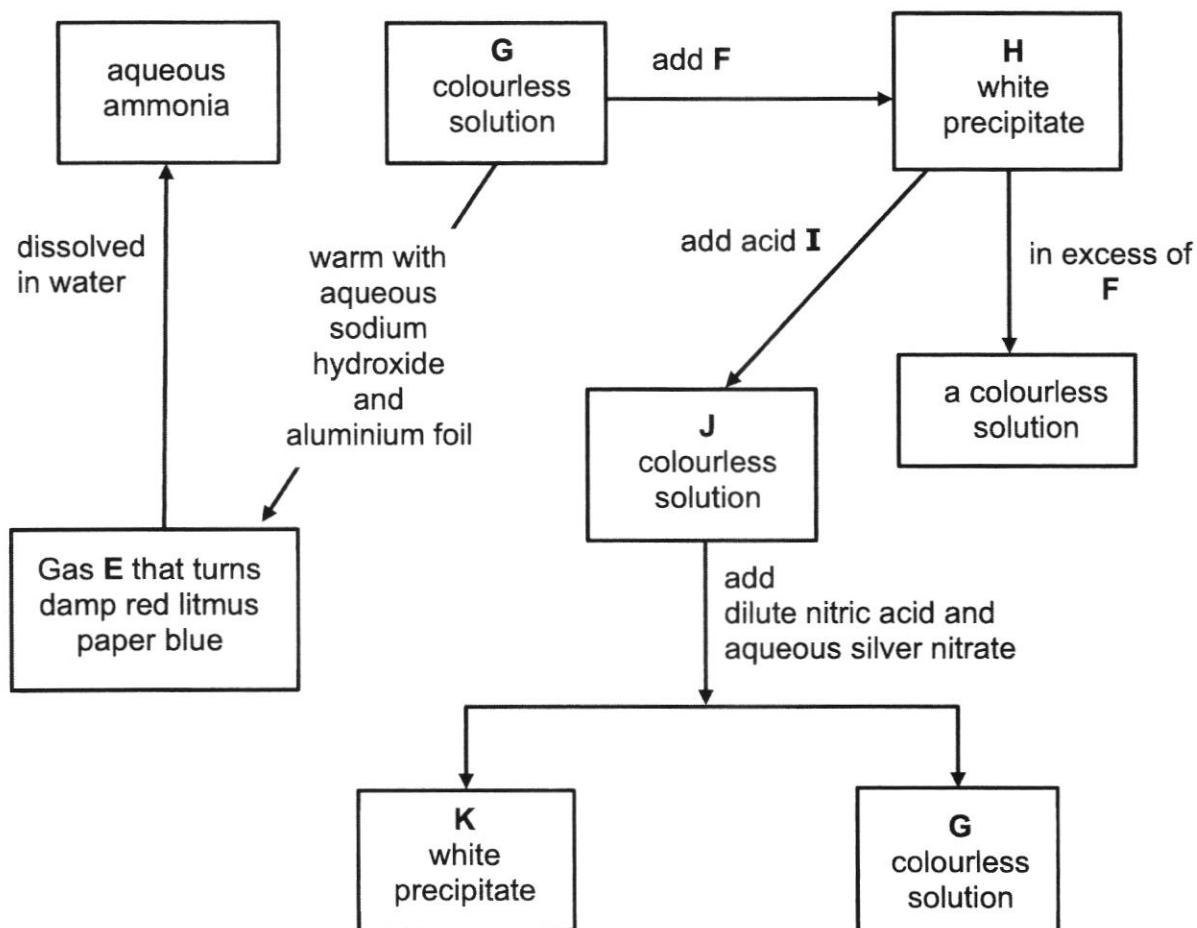


Fig. 7.1

(a) Identify each of **G**, **H**, **I**, **J** and **K**.

G

H

I

J

K

[5]

(b) Write a balanced chemical equation with state symbols for the reaction between compound **J** and silver nitrate.

.....

[3]

- (c) Instead of damp red litmus paper, dry litmus paper was used to test for gas **E**. Predict and explain if the same result will be obtained.

.....

.....

.....

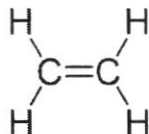
[3]

End of Section A

Section B

Answer any **two** questions from this section in the spaces provided.

- 8 The diagram shows the structure of an unsaturated molecule **A**.



- (a) Name molecule **A**.

..... [1]

- (b) Describe a test to show that molecule **A** is unsaturated and the observations you would expect to make.

test

.....

observation

..... [2]

- (c) Molecule **A** undergoes an addition reaction with steam to form molecule **B**, CH_3OH . Molecule **B** can also be formed by a process called fermentation.

- (i) Suggest the identity of molecule **B**.

..... [1]

- (ii) Draw the structure of the molecule **B**.

[1]

- (iii) State the conditions for the process of fermentation.

..... [1]

- (d) Molecule **A** can be obtained from crude oil. The equation below shows another process where molecule **A** can be obtained from decane, $C_{10}H_{22}$.



- (i) Name this process.

..... [1]

- (ii) Give the molecular formula of molecule **D**.

..... [1]

- (iii) Molecule **A**, like other fuels, can undergo complete combustion.
Write a balanced chemical equation for the complete combustion of molecule **A**.

..... [2]

- 9 (a) (i) In 20 cm³ of aqueous solution, there is 10.6 g of sodium carbonate, Na₂CO₃.
Calculate the concentration of the solution in g /dm³ and in mol/dm³.

concentration: g/dm³ [1]

concentration: mol/dm³ [1]

- (ii) 20 cm³ of sodium carbonate solution from (a)(i) reacted with sulfuric acid of concentration 0.5 mol/dm³. The equation below shows the reaction that occurred.



Calculate the volume of sulfuric acid required to react completely with the sodium carbonate solution.

volume: dm³ [2]

- (b) Salts have many uses and can be prepared using different methods. However, a good chemist must be able to choose the best method to prepare any given salt.

To prepare two salts, **X** and **Y**, a chemist uses two different methods. The chemist prepares **X** by adding excess metal carbonate to an acid and prepares **Y** by precipitation.

Using only the information given, state one difference in physical property between **X** and **Y**.

..... [1]

- (c) Sodium phosphate, Na_3PO_4 , is a soluble salt, used as a water softener in washing powders.

It is made by reacting dilute phosphoric acid, H_3PO_4 , with an alkali.

- (i) Name the alkali which reacts with phosphoric acid to form sodium phosphate.

..... [1]

- (ii) Write the ionic equation for this reaction.

..... [1]

- (iii) Given the solutions of phosphoric acid and the alkali in (c)(i), a suitable indicator and standard laboratory apparatus, explain how you would obtain a solution of sodium phosphate.

.....

 [3]

10 Ore is natural rock that contains desirable minerals, typically metals, that can be extracted from it.

(a) Metal ores are generally a mixture of acidic impurities and metal oxides, metal sulfides, metal silicates, native metals or noble metals. Native metals are metals that are found pure in its metallic form in nature.

(i) Based on the metal reactivity series, state one metal that can be considered as a native metal.

..... [1]

(ii) Suggest why native metals can also be called “noble metals”.

..... [1]

(c) Table 8.1 shows examples of some important ores, the chemical names of the minerals found in the ore, and their chemical formula.

Table 8.1

ore names	name of minerals found in ore	chemical formula of minerals
acanthite	silver sulfide	Ag_2S
barite	barium sulfate	BaSO_4
sapphire	aluminium oxide	Al_2O_3
beryl	beryllium aluminium cyclosilicate	$\text{Be}_3\text{Al}_2\text{Si}_6\text{O}_{18}$
haematite	iron(III) oxide	Fe_2O_3
scheelite	calcium tungstate	CaWO_4

With reference to Table 8.1,

(i) state which mineral is most likely able to react with both hydrochloric acid and sodium hydroxide,

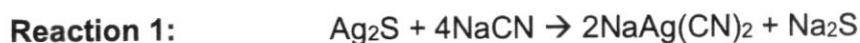
..... [1]

(ii) deduce the formula of a tungstate ion in calcium tungstate.

..... [1]

- (d) The extraction of silver is known as the cyanide process. The silver ore is crushed, concentrated and treated with sodium cyanide solution to produce sodium argento cyanide, $\text{NaAg}(\text{CN})_2$. The product formed is reacted with zinc dust to precipitate silver.

The equations for the reactions are shown below.



Reaction 2:



- (i) Complete **reaction 2** by balancing the equation. [1]

- (ii) Reaction 2 is a displacement reaction.
Explain why zinc was used to precipitate silver from sodium argento cyanide.

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

- (iii) Explain, using Collision Theory, why zinc dust was used instead of zinc pellets.

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

- (e) State, with reason, whether the cyanide process in part (d) or the smelting of haematite in the extraction of iron releases less pollutants to the atmosphere.

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

End of Paper

BEDOK GREEN SECONDARY SCHOOL
PRELIMINARY EXAMINATION 2022
SCIENCE (CHEMISTRY)
5076, 5078

Setter: Siti Nadiah

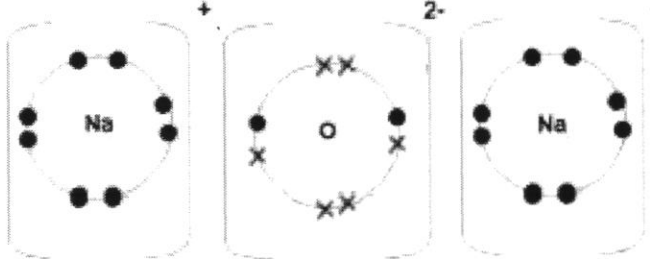
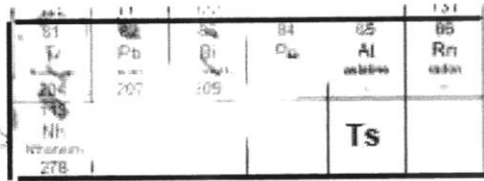
PAPER 1

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

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

PAPER 3

1	(a) E (b) C (c) B (d) A	1 1 1 1																				
2(a)	<table><tr><th>formula of atom or ion</th><th>name of particle</th><th>number of protons</th><th>number of electrons</th><th>number of neutrons</th></tr><tr><td>Na</td><td>sodium atom</td><td>11</td><td>11</td><td>12</td></tr><tr><td>O²⁻</td><td>oxide ion</td><td>8</td><td>10</td><td>8</td></tr><tr><td>N³⁻</td><td>nitride ion</td><td>7</td><td>10</td><td>7</td></tr></table> 1 m for every 2 correct answers	formula of atom or ion	name of particle	number of protons	number of electrons	number of neutrons	Na	sodium atom	11	11	12	O ²⁻	oxide ion	8	10	8	N ³⁻	nitride ion	7	10	7	2
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N ³⁻	nitride ion	7	10	7																		

2(b)	 key: ● electron of sodium X electron of oxygen	2															
2(c)	It is a solid as it has a high melting point. A large amount of energy is required to overcome the strong electrostatic forces of attraction between the sodium and oxide ions.	1 1 1															
3(a)	Neutron	1															
3(b)	All three isotopes have 113 protons. All three isotopes have 3 valence electrons, with 7 electron shells. Nh-278 has 165 neutrons, Nh-282 has 169 neutrons while Nh-285 has 172 neutrons. <i>Award the following if answers are generic.</i> They have the same number of neutrons, different number of protons They have the same electronic configurations same number of valence electrons/same number of electrons.	1 1 1 1 1															
3(c)	(i)  (ii) <table border="1" data-bbox="486 1355 1284 1713"> <thead> <tr> <th></th><th>true</th><th>false</th></tr> </thead> <tbody> <tr> <td>Tennessine is a good conductor of electricity.</td><td></td><td>✓</td></tr> <tr> <td>Tennessine is a solid at room temperature and pressure.</td><td>✓</td><td></td></tr> <tr> <td>Tennessine is brown in colour.</td><td></td><td>✓</td></tr> <tr> <td>Tennessine is the least reactive element in its group.</td><td>✓</td><td></td></tr> </tbody> </table>		true	false	Tennessine is a good conductor of electricity.		✓	Tennessine is a solid at room temperature and pressure.	✓		Tennessine is brown in colour.		✓	Tennessine is the least reactive element in its group.	✓		1 2
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Tennessine is brown in colour.		✓															
Tennessine is the least reactive element in its group.	✓																
4	a) Magnesium sulfate	1 1															

	b) The limiting reactant is sulfuric acid. The reaction stopped as all the sulfuric acid has completely reacted. c) heat solution R to saturation; allow the saturated solution to cool and crystallise; filter the mixture to obtain crystals of salt R; pat dry the crystals of salt R between pieces of filter paper	1 1 1									
5(a)	(i) <table border="1"> <tr> <td>Lycopene is not present in pumpkins, watermelons and cherries.</td> <td>F</td> <td>1</td> </tr> <tr> <td>Anthocyanin is present in cherries only.</td> <td>F</td> <td>1</td> </tr> <tr> <td>Both pumpkins and watermelons contain a pigment other than beta-carotene, lycopene and anthocyanin.</td> <td>F</td> <td>1</td> </tr> </table> (ii) Lycopene is present only in watermelons. / lycopene is not present in pumpkins and cherries. Anthocyanin is present in pumpkins, watermelons and cherries. Pumpkins, watermelons and cherries contain a pigment other than beta-carotene, lycopene and anthocyanin. Any one of the corrected statements.	Lycopene is not present in pumpkins, watermelons and cherries.	F	1	Anthocyanin is present in cherries only.	F	1	Both pumpkins and watermelons contain a pigment other than beta-carotene, lycopene and anthocyanin.	F	1	1 1 1 1
Lycopene is not present in pumpkins, watermelons and cherries.	F	1									
Anthocyanin is present in cherries only.	F	1									
Both pumpkins and watermelons contain a pigment other than beta-carotene, lycopene and anthocyanin.	F	1									
5(b)	(i) 4 (ii) there is a pigment present in cherries that is insoluble in the solvent used (iii) no; there are three spots of pigments present in the extract of cherries	1 1 1 1									
6	No. of moles of $\text{Fe}_2\text{O}_3 = 16\,000 / (56 \times 2 + 16 \times 3)$ = 100 moles No. of moles of Fe = 100×2 = 200 moles Mass of Fe = 200×56 = 11200 g	3									

7(a)	G	Zinc nitrate	5
	H	Zinc hydroxide	
	I	Hydrochloric acid	
	J	Zinc chloride	
	K	Silver chloride	
	1 m for each correct answer		
7(b)	$\text{ZnCl}_2(\text{aq}) + 2\text{AgNO}_3(\text{aq}) \rightarrow \text{Zn}(\text{NO}_3)_2(\text{aq}) + 2\text{AgCl}(\text{s})$ [1] for correct formula of reactants and products [1] for correct balancing [1] correct state symbols		3
7(c)	The result will not be the same.		1
	There is no water present to dissolve the ammonia gas in order to dissociate into hydroxide ions.		1
			1

Section B (30 marks)

8(a)	ethene	1
8(b)	test	
	Bubble molecule A into aqueous bromine.	1
	Observation	
	Reddish brown aqueous bromine decolourises.	1
8(c)	(i) Ethanol	1
	$ \begin{array}{c} \text{H} \quad \text{H} \\ \quad \\ \text{H}-\text{C}-\text{C}-\text{O}-\text{H} \\ \quad \\ \text{H} \quad \text{H} \end{array} $	1
	(ii)	
	(iii) 37°C, yeast, absence of air	1
8(d)	(i) Cracking	1
	(ii) C_4H_{10}	1
	(iii) $\text{C}_2\text{H}_4 + 3\text{O}_2 \rightarrow 2\text{CO}_2 + 2\text{H}_2\text{O}$	2
	1 m – chemical equation	
	1m - balanced	

9(a)	(i) $10.6 \div 0.02 = 530 \text{ g/dm}^3$ $530 \div [(23(2)+12+3(16))] = 5 \text{ mol/dm}^3$	1 1
	(ii) no of mol of sodium carbonate = 5×0.02 = 0.1 no of mol of acid = $0.1 \div \text{volume of acid}$ = $0.1 \div 0.5$ = 0.2 dm^3	1 1
9(b)	Solubility of the substances in water OR X is soluble in water but Y is not soluble in water	1
9(c)	(i) sodium hydroxide (ii) $\text{OH}^- + \text{H}^+ \rightarrow \text{H}_2\text{O}$ (iii) 1. Fill the burette with alkali and take note of the initial reading. 2. Pipette a fixed volume (25.0 cm^3) of dilute acid into the conical flask. 3. Add one or two drops of a suitable indicator (methyl orange) to the solution in the conical flask. 4. Titrate the acid with the alkali with constant swirling until the indicator turns from red to orange. Record the volume of alkali added. 5. Repeat the titration using the same volume of alkali and acid, but without the indicator to get the solution of sodium phosphate. All points: 3 m Missing 1 point: minus 1 m missing more than 3 points: 0 m	1 1 3
10(a)	Gold/silver	1
10(b)	Noble metals are unreactive / resistant to (corrosion / oxidation).	1
10(c)	(i) aluminium oxide (ii) WO_4^{2-}	1 1
10(d)	(i) $2 \text{ NaAg(CN)}_2 + \dots \text{Zn} \rightarrow \dots \text{Na}_2\text{Zn(CN)}_4 + 2 \text{ Ag}$ (ii) Zinc is more reactive than silver. Therefore, it is able to displace silver from sodium argento cyanide. (iii) Zinc dust has a smaller particle size compared to zinc pellets, thus, having a larger exposed surface area. This increases the frequency of effective collision between reactants and in turn increases the speed of reaction.	1 1 1 1
10(e)	Cyanide process. It does not produce carbon monoxide gas or any other gaseous pollutants as a by product, unlike smelting of haematite.	1 1