Candidate Name	Form Class	Index Number

ANG MO KIO SECONDARY SCHOOL
PRELIMINARY EXAMINATION 2025
SECONDARY FOUR EXPRESS

CHEMISTRY **6092/01**

Paper 1 Multiple Choice **2 September 2025**

1 hour

Setter: Mr Vincent Voo

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, class and index number on the Question Paper and on the Answer Sheet in the spaces provided.

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 separate Answer Sheet.

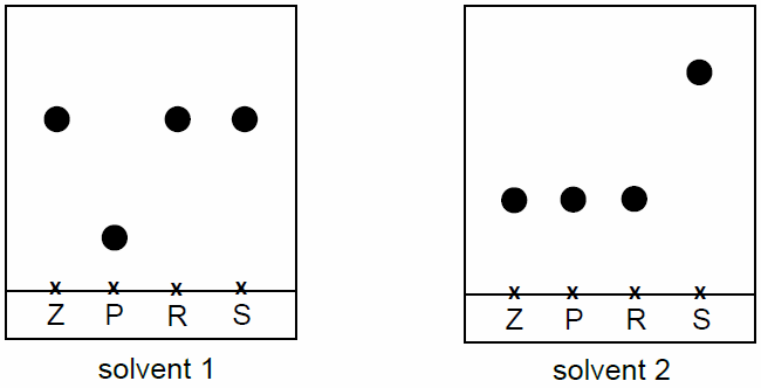
Read the instructions on the Answer Sheet very carefully.

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.
Any rough working should be done on this question paper.
A copy of the Periodic Table is printed on page 17.
The use of an approved scientific calculator is expected, where appropriate.

This document consists of **17** printed pages and **1** blank page.

[Turn Over

1 A student suspects that substance Z is one of three possible pure substances P, R or S. Two chromatograms of the four substances are obtained using different solvents. The diagrams show the results.



What could Z be?

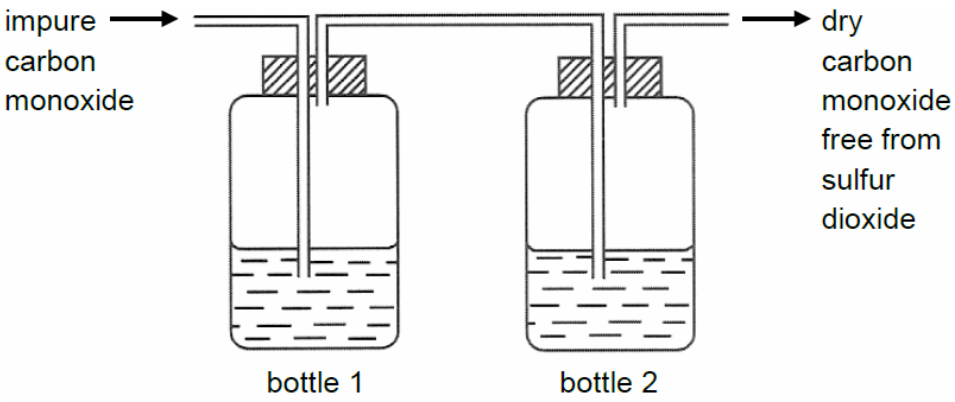
A R

B S

C Either P or S

D Neither P, R nor S

2 The apparatus shown is used to obtain a dry sample of carbon monoxide from a sample of the gas contaminated with sulfur dioxide gas.



Which shows the appropriate solutions in bottles 1 and 2 to collect a dry pure sample of carbon monoxide gas?

	bottle 1	bottle 2
A	aqueous sodium hydroxide	concentrated sulfuric acid
B	aqueous sodium hydroxide	dilute sulfuric acid
C	dilute sulfuric acid	aqueous sodium hydroxide
D	dilute sulfuric acid	concentrated sulfuric acid

3 The atmosphere of a newly discovered planet is composed of mainly argon, nitrogen and oxygen gas. The melting and boiling points of these gases are shown in the table.

gas	melting point / °C	boiling point / °C
argon	−189	−186
nitrogen	−210	−196
oxygen	−219	−183

What temperature should a sample of air from the newly discovered planet be cooled to if only liquid oxygen is to be obtained?

A −180 °C

B −185 °C

C −187 °C

D −198 °C

4 Naturally occurring bromine has a relative atomic mass of 80 and consists entirely of two isotopes of relative isotopic masses 79 and 81.

What can be deduced about naturally-occurring bromine from this information only?

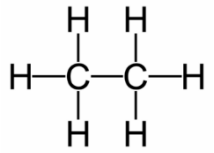
A Bromine isotopes have different numbers of protons.

B Naturally occurring bromine exist as atoms.

C The two isotopes of bromine exist in equal proportions in nature.

D There is a higher proportion of bromine-81 than bromine-79.

5 The diagram shows the structural formula of ethane.



How many electrons in a molecule of ethane are **not** involved in bonding?

A 2

B 4

C 7

D 14

6 The ion X^{3-} has three complete shells of electrons. There are 17 neutrons in its nucleus.

What is the relative atomic mass of X element?

A 31

B 32

C 35

D 38

7 The chemical formula of sodium chlorate is $NaClO_3$ and the chemical formula of thallium sulfate is $Tl_2(SO_4)_3$.

What is the chemical formula of thallium chlorate?

A $TlClO_3$

B $Tl(ClO_3)_2$

C $Tl(ClO_3)_3$

D $Tl_2(ClO_3)_3$

8 Which solution contains the greatest number of ions?

A 1 dm^3 of 0.1 mol/dm^3 $Al_2(SO_4)_3$

B 1 dm^3 of 0.2 mol/dm^3 NH_4NO_3

C 2 dm^3 of 0.1 mol/dm^3 $CaCl_2$

D 2 dm^3 of 0.2 mol/dm^3 KI

9 Excess nitric acid is reacted with 9.00 g of pure calcium oxide to produce 16.20 g of pure anhydrous calcium nitrate crystals.

$$2\ HNO_3 + CaO \rightarrow Ca(NO_3)_2 + H_2O$$

What is the percentage yield of calcium nitrate? [Ar: H, 1; N, 14; O, 16; Ca, 40]

A 34.1 %

B 55.6 %

C 61.5 %

D 72.0 %

10 192 g of copper metal is formed when an electric current is passed through a solution of copper(II) nitrate.

What is the mass of silver formed if the same electrical current is passed through a solution silver nitrate?

A 108 g

B 216 g

C 324 g

D 648 g

11 Which substance will react with dilute nitric acid to give a colourless solution only?

A calcium oxide

B iron(II) hydroxide

C sodium carbonate

D zinc metal

12 Which salt can be prepared by titration?

A aluminium chloride

B silver chloride

C sodium nitrate

D zinc sulfate

13 Elements X, Y and Z have consecutive proton numbers. Element Y exists as gaseous atoms.

Which statement is correct?

A Element X forms an amphoteric oxide when it reacts with oxygen.

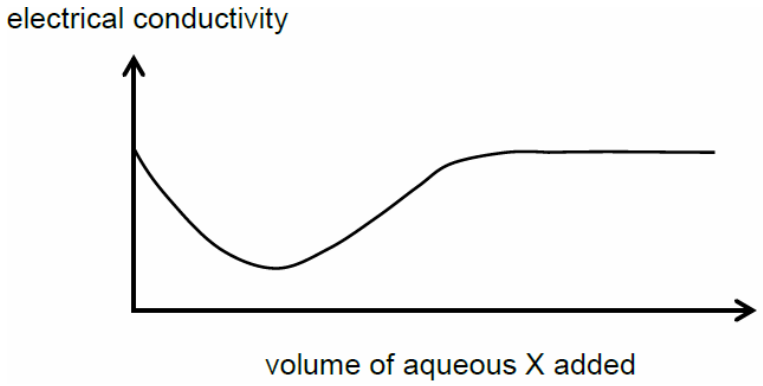
B Element Y forms a neutral oxide when it reacts with oxygen.

C Element Z forms a basic oxide when it reacts with oxygen.

D Neither the oxides of X, Y nor Z reacts with an acid to form a salt.

14 In an experiment, aqueous X is added slowly to aqueous barium hydroxide. The change in

the electrical conductivity of the reactant mixture is as shown.



What could X be?

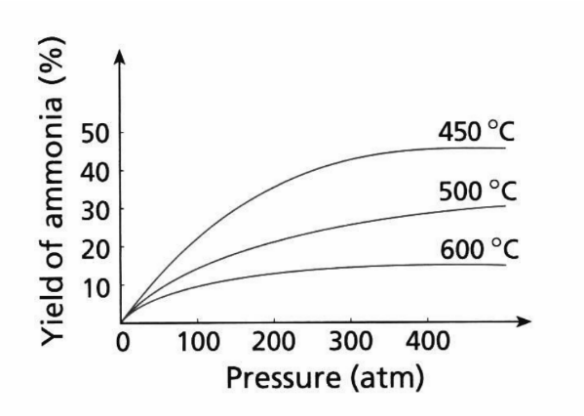
A aqueous ammonia

B hydrochloric acid

C iron(II) sulfate

D potassium chloride

15 The graph shows the effects of pressure and temperature on the yield of ammonia in the Haber Process to manufacture ammonia.



What will be the effect of increasing the temperature but keeping pressure constant on the production of ammonia?

A Ammonia is produced at an increased rate and its yield increases.

B Ammonia is produced at an increased rate but its yield decreases.

C Ammonia is produced at a decreased rate but its yield increases.

D Ammonia is produced at a decreased rate and its yield decreases.

16 Which statement about the manufacturing of ammonia by the Haber Process is not true?

A A high temperature of 450 °C is used.

B It is not possible to obtain 100 % yield of ammonia.

C Nickel catalyst is used to increase the speed of reaction.

D Nitrogen is reduced by hydrogen.

17 Aqueous zinc sulfate is added to excess aqueous barium chloride during an experiment. The precipitate formed is then removed by filtration.

What are the ions present in the filtrate?

A Ba^{2+} and SO_4^{2-}

B Zn^{2+} and Cl^-

C Zn^{2+}, SO_4^{2-} and Cl^-

D Zn^{2+}, Ba^{2+} and Cl^-

18 A series of tests was carried out on an aqueous solution of sodium carbonate and the results were recorded in a table.

Which test should be repeated because of an incorrect observation entered in the table?

	test	observation
A	add barium chloride solution	white precipitate formed
B	add copper(II) chloride solution	green precipitate formed
C	add potassium hydroxide solution	white precipitate formed
D	add dilute sulfuric acid	effervescence occurred

19 A brown precipitate is formed when excess sodium hydroxide is added to solution S. The resulting mixture is heated, and no gas is formed. Aluminium foil is then added to the warmed mixture. A gas that turns damp red litmus paper blue is given off.

Which ions could be present in solution S?

A Fe^{2+} and NO_3^-

B Fe^{3+} and NO_3^-

C Fe^{3+}, NH_4^+ and NO_3^-

D NH_4^+ and I^-

20 Which method will not slow down the rusting process of an iron nail?

A Electroplate the iron nail with silver metal.

B Coat the surface of the iron nail with paint.

C Submerge the iron nail in oil.

D Weld a piece of copper metal to the iron nail.

21 The equations shown represent the reactions of a metal M and its oxide.

$$M + 2\,HCl \rightarrow MCl_2 + H_2$$
$$2\,M + O_2 \rightarrow 2\,MO$$
$$2\,MO + C \rightarrow \text{no reaction}$$

What could metal M be?

A copper

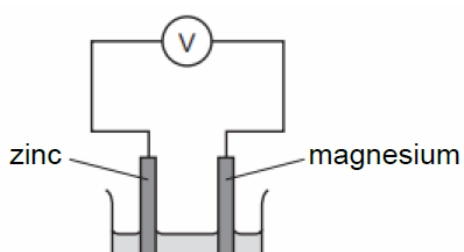
B magnesium

C silver

D zinc

22 Which setup will generate the highest voltage?

A



B

C

D

23 Which electrolyte will require two moles of electrons to produce one mole of metal during electrolysis?

A aqueous sodium chloride

B aqueous zinc chloride

C molten magnesium chloride

D molten aluminium chloride

24 Why are Group 1 metals generally more reactive than Group 2 metals?

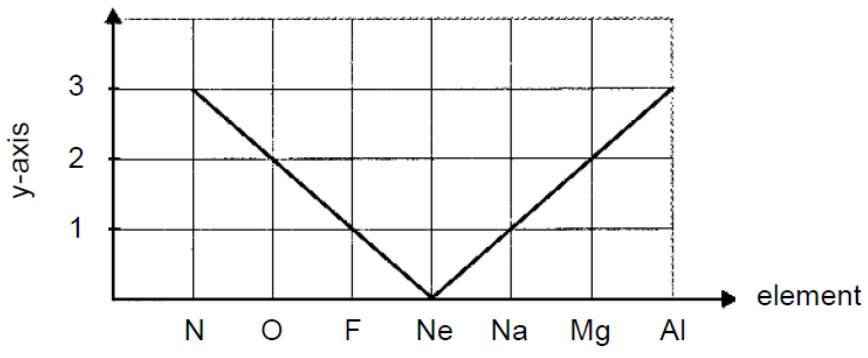
A Group 1 metals have lower melting and boiling points than Group 2 metals.

B Group 1 metals have a greater tendency to form ions than Group 2 metals.

C Group 1 metal ions are less stable than Group 2 metal ions.

D The layer of metal oxide is more soluble on Group 1 metals than Group 2 metals.

25 The graph shows the information of seven elements in the Periodic Table.



Which property should the y-axis be?

A atomic number

B number of electron shells

C number of valence electrons

D valency of element

26 Some properties of elements in the Periodic Table are listed.

1 metallic character

2 number of electron shells in an atom

3 number of protons in an atom

4 total number of electrons in an atom

Which two properties increase across a period of the Periodic Table?

A 1 and 2

B 1 and 3

C 2 and 4

D 3 and 4

27 The following sequence shows the steps in the conversion of calcium phosphate, $Ca_3(PO_4)_2$, to phosphorus acid, H_3PO_3.

$$Ca_3(PO_4)_2 \rightarrow P_4 \rightarrow P_4O_6 \rightarrow H_3PO_3$$

What are the respective oxidation numbers of phosphorus in the above sequence?

A +5, 0, +3, +3

B +5, −3, +3, +3

C +6, −3, +3, +1

D +6, −4, +3, +4

28 Which reaction shows a redox reaction?

A $2\ AgNO_3\ (aq) + FeCl_2\ (aq) \rightarrow 2\ AgCl\ (s) + Fe(NO_3)_2\ (aq)$

B $CaO\ (s) + CO_2\ (g) \rightarrow CaCO_3\ (s)$

C $Cu(NO_3)_2\ (aq) + Mg\ (s) \rightarrow Mg(NO_3)_2\ (aq) + Cu\ (s)$

D $2\ NaOH\ (aq) + H_2SO_4\ (aq) \rightarrow Na_2SO_4\ (aq) + 2\ H_2O\ (l)$

29 The equation represents the reaction between copper(II) oxide and ammonia.

$$3CuO + 2NH_3 \rightarrow 3Cu + N_2 + 3H_2O$$

Which statement about the reaction is true?

A Cu^{2+} ions gain electrons.

B Cu is the reducing agent.

C NH_3 is reduced.

D Oxidation state of hydrogen decreases from +3 to +2.

30 Dilute sulfuric acid is reacted with zinc oxide and copper(II) oxide separately during an experiment.

In what way are the two reactions similar?

A A coloured precipitate is formed in both reactions.

B A coloured solution is formed in both reactions.

C Both reactions are redox reactions.

D Temperature increases in both reactions.

31 When a piece of calcium metal is added to dilute hydrochloric acid, the reaction is observed to be faster after 60 seconds from the start of the experiment than at the initial stage of the reaction.

What could be the possible explanation for this observation?

A The concentration of the acid increases as the reaction progresses.

B The particle size of the metal becomes smaller as the reaction progresses.

C The reaction becomes faster as hydrochloric acid acts as a catalyst.

D The reaction produces heat which increases the temperature of the acid.

32 Methane reacts very slowly with air at room temperature. However, methane ignites readily when palladium, a transition metal, is added to the methane-air mixture.

What is the purpose of palladium in the reaction?

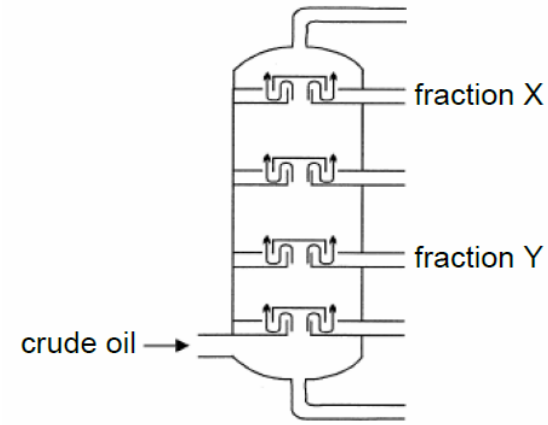
A It increases the enthalpy change of the reaction.

B It increases the flammability of methane.

C It lowers the activation energy of the reaction.

D It lowers the energy level of the reactants.

33 The diagram shows how crude oil is separated into fractions.



Which statement about fractions X and Y is correct?

A Fraction X burns more easily and has a lower boiling point than fraction Y.

B Fraction X burns more easily and has a higher boiling point than fraction Y.

C Fraction X burns less easily and has a lower boiling point than fraction Y.

D Fraction X burns less easily and has a higher boiling point than fraction Y.

34 Which statement best explains why bioethanol obtained from sugarcane plants is considered renewable?

A Bioethanol is formed by fermenting sugar from sugarcane plants.

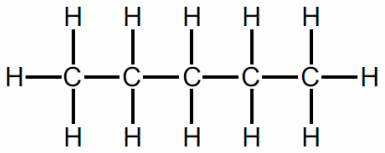
B Bioethanol is considered to be a carbon neutral biofuel.

C Sugarcane plants can be regrown and replaced within a short period of time.

D Sugarcane plants take in carbon dioxide during photosynthesis.

35 The diagrams show the structures of five hydrocarbons.

1



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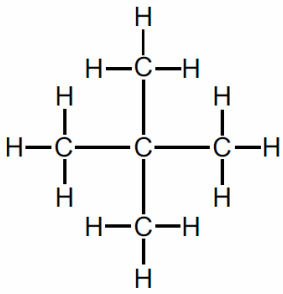

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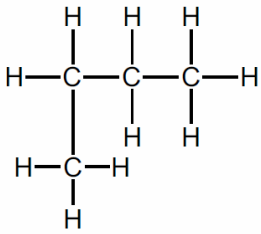

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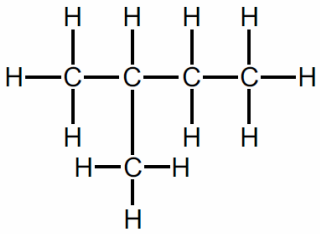

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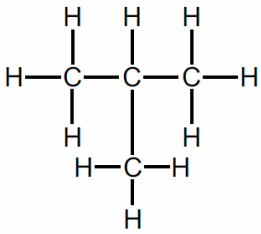


Which hydrocarbons are isomers of each other?

A 2 and 4

B 1, 2 and 4

C 2, 4 and 5

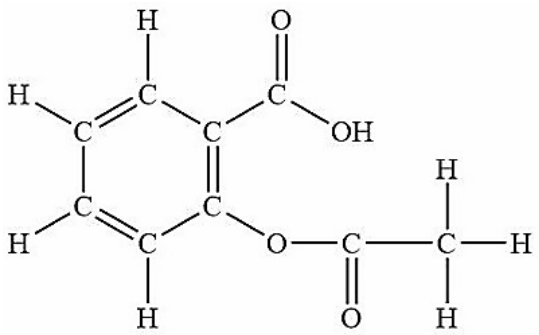
D 3, 4 and 5

36 Hydrogen gas is required in the production of margarine using vegetable oils.

Which of the following correctly lists the nature of the vegetable oils, the type of reaction occurring and the catalyst used?

	nature of vegetable oil	type of reaction	catalyst used
A	saturated compound	addition reaction	nickel
B	unsaturated compound	substitution reaction	iron
C	saturated compound	substitution reaction	iron
D	unsaturated compound	addition reaction	nickel

37 Aspirin is a drug which is used as a general pain killer. The diagram shows the structural formula of aspirin.



Which statement about aspirin is not correct?

A It has a low melting point.

B It is formed from an alcohol and a carboxylic acid.

C It decolourises acidified aqueous potassium manganate(VII).

D It produces hydrogen gas when magnesium is added to its aqueous solution.

38 Which natural resource is being depleted by the manufacture of plastics?

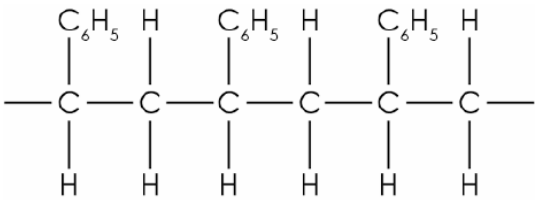
A air

B fossil fuels

C metal ores

D water

39 The diagram shows the structure of a polymer.



What is the empirical formula of the monomers that are used to make this polymer?

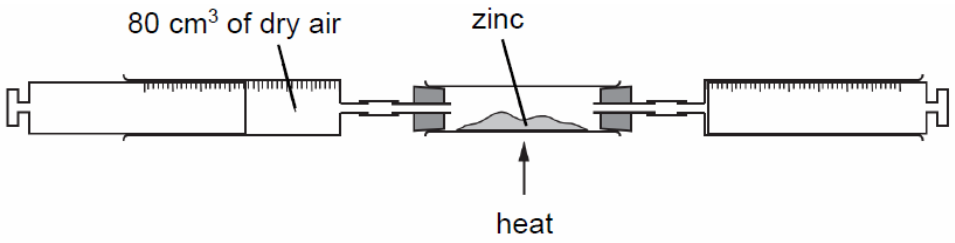
A CH

B CH_2

C CH_3

D C_3H_4

40 A 80 cm^3 sample of dry air is trapped in a gas syringe. The air is slowly passed over heated excess zinc in a tube until there is no further change in the volume of air.



What is the final volume of air in the gas syringe?

A 16 cm^3

B 60 cm^3

C 64 cm^3

D 76 cm^3

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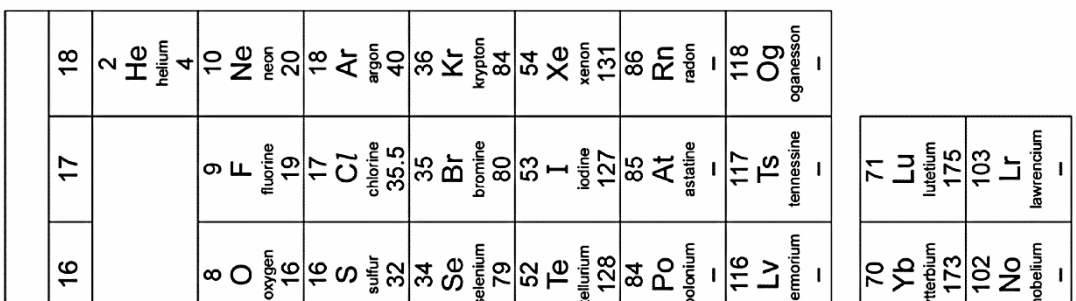

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