



Catholic Junior College
JC 2 Preliminary Examinations
Higher 1

CHEMISTRY

8873/01

Paper 1 Multiple Choice

18 September 2025

1 hour

Additional Materials: Multiple Choice Answer Sheet
Data Booklet

READ THESE INSTRUCTIONS FIRST

Write your name, HT group and NRIC/FIN number on the Answer Sheet in the spaces provided.

Write in soft pencil.

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

There are **thirty** 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 in this booklet.

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

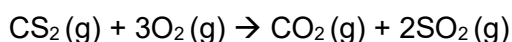
For each question there are **four** possible answers, **A**, **B**, **C** and **D**. Choose the **one** you consider to be correct.

- 1 *Use of the Data Booklet is relevant to this question.*

Which of the following contains 1 mole of the stated particle?

- A** gold atoms in 79 g of solid gold
- B** aqueous H^+ ions in 10 dm^3 of 0.10 mol dm^{-3} of H_2SO_4 solution
- C** hydrogen atoms in 6 dm^3 of methane gas at r.t.p.
- D** chlorine molecules in 22.4 dm^3 of chlorine gas at r.t.p.

- 2 Carbon disulphide vapour was burnt in oxygen according to the equation:



A fixed amount of carbon disulphide was completely burnt in 100 cm^3 of oxygen.
Upon cooling, the mixture of gases was treated with an excess of aqueous sodium hydroxide and the volume of gas reduced by 30 cm^3 .
All measurements were made at the same temperature and pressure.

What was the final volume of gas left?

- | | |
|----------------------------|----------------------------|
| A 10 cm^3 | B 30 cm^3 |
| C 40 cm^3 | D 70 cm^3 |

- 3 Element **X** can exist in a few oxidation states. It was found that 0.01 mol of X^{2+} requires 0.004 mol of acidified potassium manganate (VII), KMnO_4 for complete reaction.

What is the final oxidation state of **X** in the above reaction?

- | | | | |
|-------------|-------------|------------|-------------|
| A +4 | B +3 | C 0 | D -1 |
|-------------|-------------|------------|-------------|

- 4 *Use of the Data Booklet is relevant to this question.*

Which of the following has more neutrons than electrons and more electrons than protons?

- | | | | |
|-----------------------------|--------------------------------|-----------------------------|-------------------------------|
| A $^{37}\text{Cl}^-$ | B $^{48}\text{Ti}^{4+}$ | C $^{79}\text{Br}^+$ | D $^{32}\text{S}^{2-}$ |
|-----------------------------|--------------------------------|-----------------------------|-------------------------------|

5 What is the electronic configuration of Fe^{3+} ion?

- A $1s^2 2s^2 2p^6 3s^2 3p^6 3d^5$
 B $1s^2 2s^2 2p^6 3s^2 3p^6 3d^3 4s^2$
 C $1s^2 2s^2 2p^6 3s^2 3p^6 3d^6 4s^2$
 D $1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^1$

6 The successive ionisation energies (IE) of element **X** are given below:

IE/ kJ mol^{-1}	1 st	2 nd	3 rd	4 th	5 th	6 th	7 th	8 th
X	550	1065	4138	5500	6910	8760	10230	11800

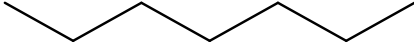
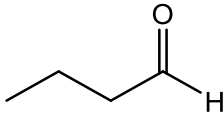
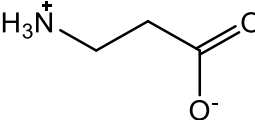
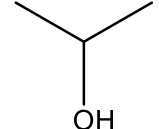
What is the likely formula of the compound that is formed when **X** reacts with fluorine?

- A **XF** B **XF₂** C **X₂F** D **X₂F₃**

7 In which pair of molecules is the bond angle in the first molecule smaller than that in the second molecule?

- A BF_3 and PH_3
 B BeCl_2 and H_2S
 C SO_3 and BCl_3
 D F_2O and SO_2

8 Which of the following correctly describes the dominant forces of attraction between two of the same compounds shown below?

	compound	dominant forces of attraction
A		covalent bonds
B		hydrogen bonding
C		ionic interaction
D		permanent dipole – permanent dipole

- 9 Which statements help to explain the fact that magnesium has a higher melting point than sodium?

- 1 Magnesium ions have more protons than sodium ions.
- 2 Magnesium ions have a greater charge than sodium ions.
- 3 Magnesium ions have a smaller ionic radius than sodium ions.

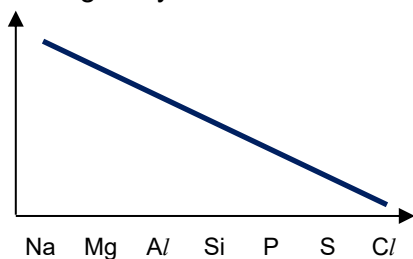
A 1, 2 and 3 B 2 and 3 C 2 only D 1 only

- 10 Which of the following sets of substances consists of simple molecular structure, giant ionic structure and giant covalent structure?

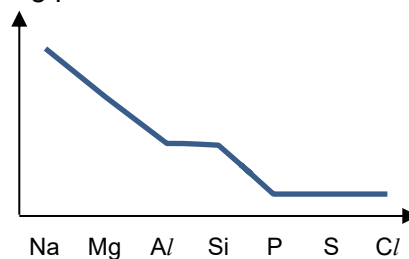
- A SiCl_4 , MgCl_2 , C(graphite)
- B AlF_3 , MgCl_2 , C(graphite)
- C MgCl_2 , SO_2 , SiCl_4
- D Al_2O_3 , Cu, PCl_5

- 11 Which of the following shows the correct trend for Period 3 elements?

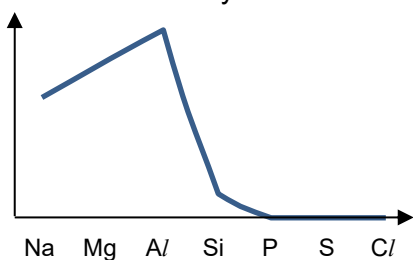
A electronegativity



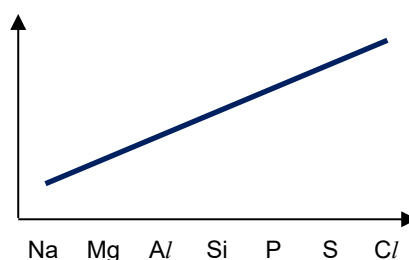
B boiling point



C electrical conductivity



D ionic radius



- 12** The chloride of an element **R** of the third period is a solid at room temperature which dissolves in water to form a slightly acidic solution of pH 6.5.
Which group of the periodic table does **R** belong to?

A 1 **B** 2 **C** 13 **D** 14

- 13** Which statements are true about the elements in Group 1 of the Periodic Table?

- 1** They are oxidising agents.
2 Their electronegativities decrease down the Group.
3 Their ionic radii increase down the Group.

A 1, 2 and 3 **B** 2 and 3 **C** 2 only **D** 1 only

- 14** Which equation correctly shows the standard enthalpy change of formation of water?

- A** $2 \text{H(g)} + \text{O(g)} \rightarrow \text{H}_2\text{O(l)}$
B $\text{H}_2\text{(g)} + \frac{1}{2} \text{O}_2\text{(g)} \rightarrow \text{H}_2\text{O(g)}$
C $\text{H}_2\text{(g)} + \frac{1}{2} \text{O}_2\text{(g)} \rightarrow \text{H}_2\text{O(l)}$
D $\text{H}^+\text{(aq)} + \text{OH}^-\text{(aq)} \rightarrow \text{H}_2\text{O(l)}$

- 15** The table shows the enthalpy change of neutralisation, ΔH_n , for various acids and bases.

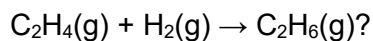
acid	base	$\Delta H_n / \text{kJ mol}^{-1}$
hydrochloric acid	potassium hydroxide	-57.0
X	potassium hydroxide	-55.5
hydrochloric acid	Y	-53.0
nitric acid	Z	-57.4

What is the identity of **X**, **Y** and **Z** respectively?

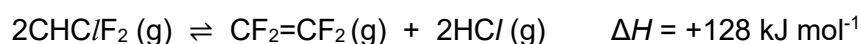
- | | X | Y | Z |
|----------|---------------|---------------------|-------------------|
| A | sulfuric acid | aqueous ammonia | calcium hydroxide |
| B | ethanoic acid | aqueous ammonia | calcium hydroxide |
| C | ethanoic acid | potassium hydroxide | aqueous ammonia |
| D | sulfuric acid | potassium hydroxide | aqueous ammonia |

- 16 The enthalpy changes of formation (at 298 K) of gaseous ethene (C_2H_4) and gaseous ethane (C_2H_6) are $+52 \text{ kJ mol}^{-1}$ and -85 kJ mol^{-1} respectively.

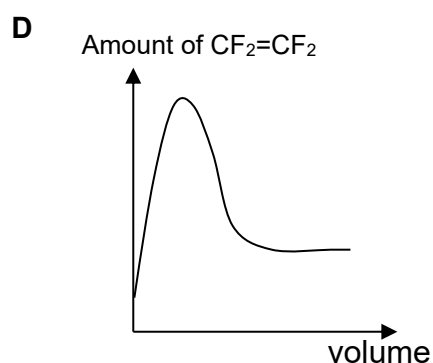
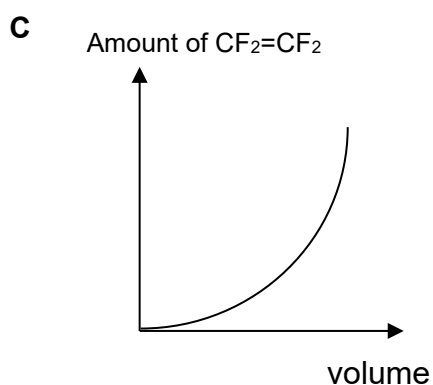
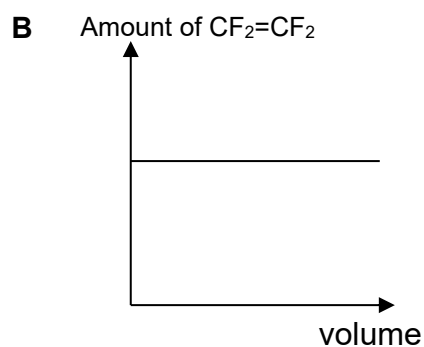
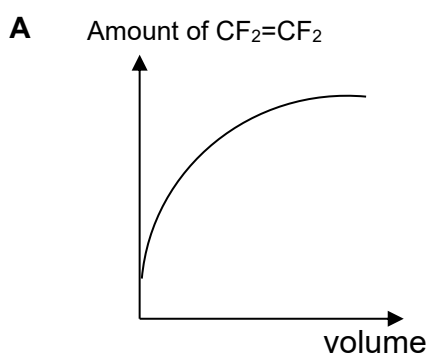
What is the enthalpy change of reaction (at 298 K) for the process



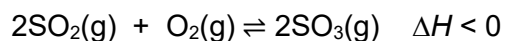
- A** $+137 \text{ kJmol}^{-1}$ **B** $+33 \text{ kJmol}^{-1}$ **C** -137 kJmol^{-1} **D** -33 kJmol^{-1}
- 17 What is meant by a reaction in dynamic equilibrium?
- A** An equilibrium that is constantly changing its position.
B An equilibrium that can take place in both an open and closed system.
C An equilibrium where the activation energy for the forward reaction is low.
D An equilibrium where the rate of the forward and reverse reactions is the same.
- 18 Given the following equilibrium,



Which of the following graphs best describes how the amount of $\text{CF}_2=\text{CF}_2(\text{g})$ varies with the volume of the system at constant temperature?



- 19 An equilibrium is represented by the following equation:

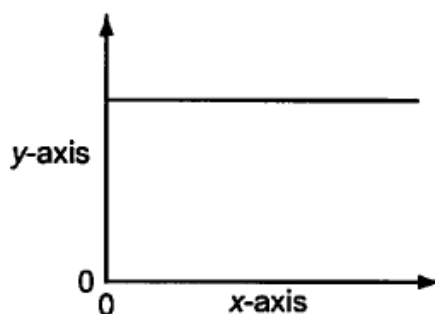


Which of the following changes would increase both the percentage yield of $\text{SO}_3(\text{g})$ and the value of the equilibrium constant?

- A** increasing the amount of $\text{O}_2(\text{g})$
B decreasing the amount of $\text{O}_2(\text{g})$
C decreasing the temperature
D increasing the temperature
- 20 The rate of decay of a radioactive isotope (a first order reaction) was found to decrease from 200 counts per minute to 12.5 counts per minute after 48 hours.
 What is the half-life of this isotope?

- A** 6 hours **B** 12 hours **C** 18 hours **D** 24 hours

- 21 The reaction $\text{A} \rightarrow \text{B}$ was found to be a zero order reaction.
 What would be the x and y axes that would give rise to the following graph?



	y-axis	x-axis
A	rate	concentration
B	concentration	rate
C	concentration	time
D	time	concentration

22 Which statements about the rate constant are correct?

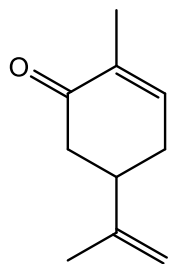
- 1 The rate constant increases when a catalyst is used.
- 2 The rate constant increases when temperature is increased.
- 3 The rate constant increases when concentration of reactants are increased.

A 1, 2 and 3 B 3 only C 1 and 2 only D 1 only

23 Which of the following statements about graphene is not true?

- A Graphene has instantaneous dipole – induced dipole forces of attraction between layers.
- B Graphene is able to conduct electricity.
- C Graphene is macromolecular.
- D There is a trigonal planar geometry around each carbon atom.

24 Carvone is the main active ingredient of the flavouring agent oil of spearmint.



carvone

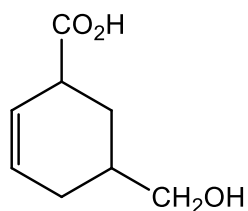
Which of the following reactions will **not** be applicable for Carvone?

- A Addition of $\text{H}_2(\text{g})$
- B Addition of Br_2 in hexane
- C Reduction
- D Elimination

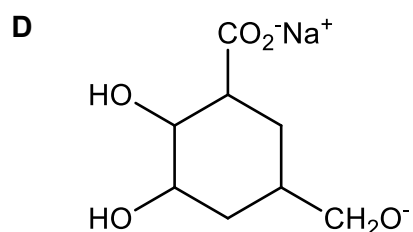
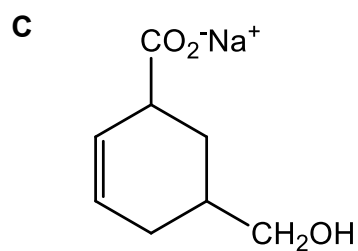
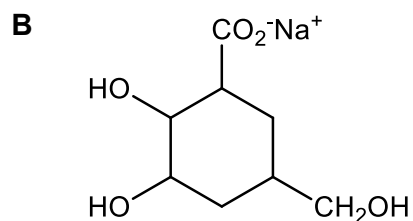
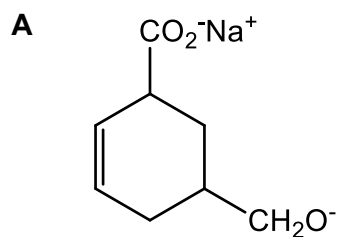
25 How many structural isomers can $\text{C}_4\text{H}_9\text{Cl}$ form?

A 3 B 4 C 5 D 6

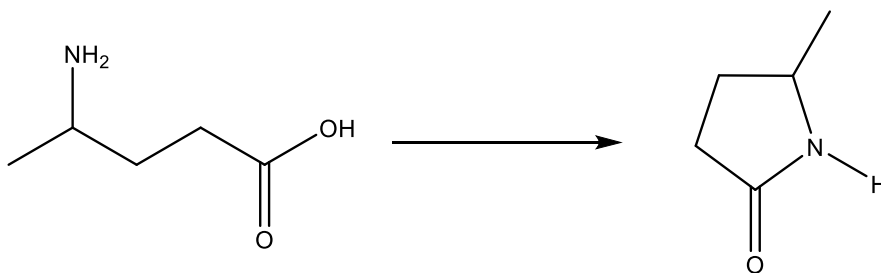
- 26 Excess aqueous sodium hydroxide is added to the molecule shown as follows.



Which structure represents the organic ion produced?



- 27 What conditions are necessary for the following reaction to take place?

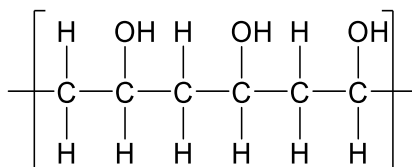


- A** NaOH(aq), heat under reflux
B concentrated H_2SO_4 , heat under reflux
C presence of DCC
D acidified KMnO_4 , heat under reflux

- 28** High density polyethylene (HDPE) is commonly used as shampoo bottles while low density polyethylene (LDPE) is used in plastic bags.
Which statement is true regarding HDPE and LDPE?

A HDPE is a thermoset polymer while LDPE is a thermoplastic polymer.
B HDPE has more branching in its polymer chains than LDPE.
C HDPE has stronger hydrogen bonding between its polymer chains compared to the instantaneous dipole – induced dipole forces between LDPE chains.
D HDPE has more closely packed polymer chains compared to LDPE.

- 29** Poly(vinyl alcohol), PVA, is a common ingredient used in eye drops and has the structure shown below.



Which of the following statements about PVA are correct?

- 1** It is soluble in water.
2 It is an addition polymer.

3 It can be made from poly(vinyl acetate), $\left[\begin{array}{cc} \text{H} & \text{OCOCH}_3 \\ | & | \\ -\text{C} & -\text{C}- \\ | & | \\ \text{H} & \text{H} \end{array} \right]_n$.

A 1, 2 and 3 **B** 1 and 2 only **C** 2 and 3 only **D** 1 only

- 30** Plastic bottles can be used to store acids and bases, but not all plastics are suitable for this purpose.
Which of the following plastics should not be used to store acids or bases?

- 1** polymethylpentene
2 poly(propene)
3 poly(ethylene terephthalate)

A 2 only **B** 3 only
C 1 and 3 only **D** 1 and 2 only