



National
Qualifications
2023

X813/75/02

**Chemistry
Section 1 — Questions**

FRIDAY, 12 MAY

1:00 PM – 3:30 PM

Instructions for the completion of Section 1 are given on *page 02* of your question and answer booklet X813/75/01.

Record your answers on the answer grid on *page 03* of your question and answer booklet.

You may refer to the Chemistry Data Booklet for National 5.

Before leaving the examination room you must give your question and answer booklet to the Invigilator; if you do not, you may lose all the marks for this paper.



* X 8 1 3 7 5 0 2 *

SECTION 1 — 25 marks

Attempt ALL questions

1. The average rate of a chemical reaction was calculated to be $5 \text{ cm}^3 \text{ s}^{-1}$ for the first 60 s of the reaction.

What volume of gas was collected in the first 60 s of the reaction?

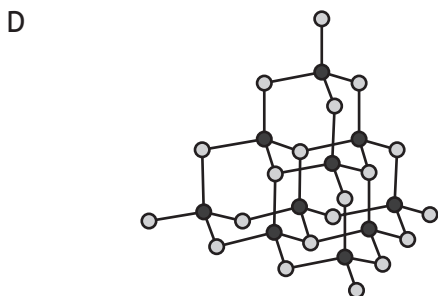
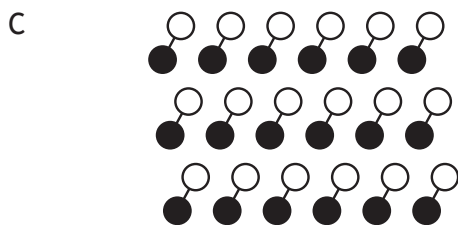
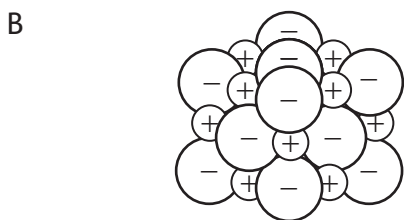
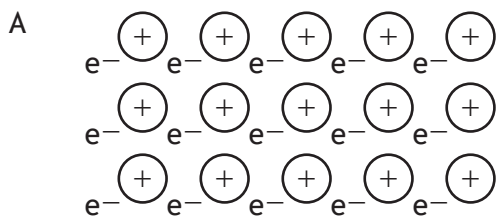
- A 0.08 cm^3
B 12 cm^3
C 55 cm^3
D 300 cm^3
2. Which line in the table correctly describes a proton?

| | Mass | Charge | Location |
|---|------|--------|---------------------|
| A | 1 | +1 | inside the nucleus |
| B | 0 | -1 | outside the nucleus |
| C | 1 | 0 | outside the nucleus |
| D | 0 | +1 | inside the nucleus |

3. Which of the following compounds forms molecules with an angular structure?

- A CCl_4
B NCl_3
C SCl_2
D FCl

4. Which of the following diagrams could be used to represent the structure of lithium fluoride?



5. In which of the following compounds does the iron ion have a 3+ charge?
You may wish to use the data booklet to help you.

- A FeO
- B FeP
- C Fe(NO₃)₂
- D Fe₃(PO₄)₂

[Turn over

6. Which solution contains the **least** number of moles of solute?

- A 100 cm³ of 1.00 mol l⁻¹
- B 150 cm³ of 0.75 mol l⁻¹
- C 200 cm³ of 0.60 mol l⁻¹
- D 250 cm³ of 0.25 mol l⁻¹

7. Which of the following substances, when shaken with water, would cause the pH of water to increase?

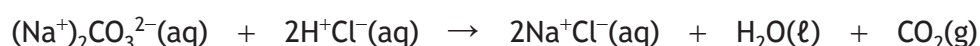
You may wish to use the data booklet to help you.

- A Aluminium oxide
- B Barium oxide
- C Nitrogen oxide
- D Hydrogen oxide

8. Nickel carbonate, nickel hydroxide and nickel metal all react with dilute sulfuric acid. Which of the following statements is true for all three reactions?

- A A gas is produced.
- B Water is produced.
- C Nickel sulfate is produced.
- D A neutralisation reaction takes place.

9. Sodium carbonate can be used to neutralise hydrochloric acid.



The correct equation omitting the spectator ions is

- A $\text{H}^+(\text{aq}) + \text{OH}^-(\text{aq}) \rightarrow \text{H}_2\text{O}(\ell)$
- B $2\text{H}^+(\text{aq}) + \text{CO}_3^{2-}(\text{aq}) \rightarrow \text{H}_2\text{O}(\ell) + \text{CO}_2(\text{g})$
- C $2\text{H}^+(\text{aq}) + \text{CO}_3^{2-}(\text{g}) \rightarrow \text{H}_2\text{O}(\ell) + \text{CO}_2(\text{g})$
- D $\text{Na}^+(\text{aq}) + \text{Cl}^-(\text{aq}) \rightarrow \text{Na}^+\text{Cl}^-(\text{aq})$

10. $\text{CH}_3\text{CH}(\text{CH}_3)\text{CH}_2\text{C}(\text{CH}_3)_2\text{CH}_3$

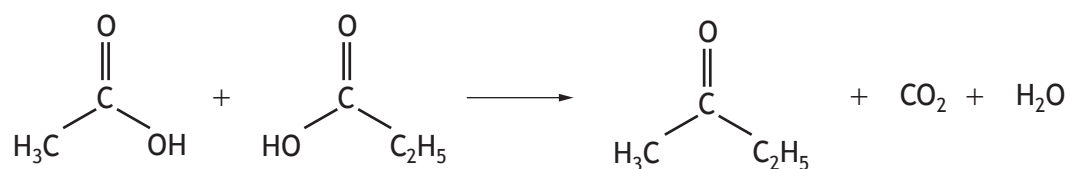
The name of the above compound is

- A 2,2,4-trimethylpentane
- B 2,4,4-trimethylpentane
- C 2,2,4-trimethylpentene
- D 2,4,4-trimethylpentene.

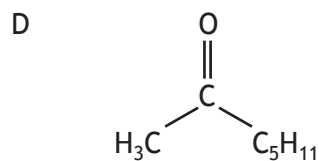
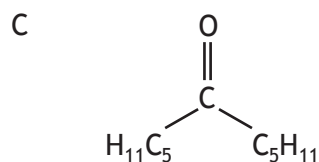
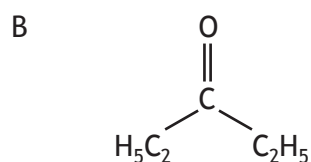
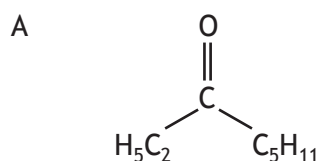
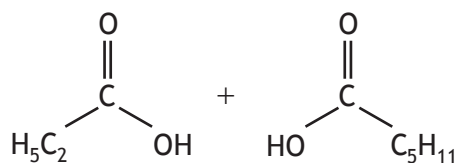
12. Which of the following would **not** be produced by an addition reaction of but-2-ene?

- A $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_3$
- B $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{OH}$
- C $\text{CH}_3\text{CH}(\text{OH})\text{CH}_2\text{CH}_3$
- D $\text{CH}_3\text{CHBrCHBrCH}_3$

13. Carboxylic acids can react to form compounds known as ketones.



Identify the ketone that can be formed by reacting the two carboxylic acids below.

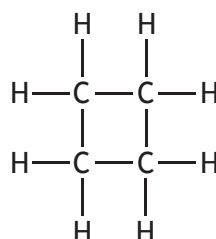
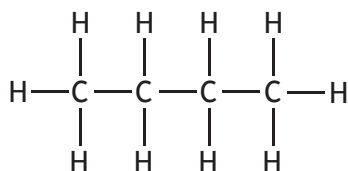


14. Which line in the table correctly describes methanol compared to octan-1-ol?

| | Formula mass | Solubility in water |
|---|--------------|---------------------|
| A | higher | lower |
| B | lower | lower |
| C | higher | higher |
| D | lower | higher |

15. Which of the following is correct for **both** of the molecules shown below?

You may wish to use the data booklet to help you.



- A They can be represented by the general formula C_nH_{2n} .
- B They have the same melting point.
- C They are soluble in water.
- D They are saturated.

16. Sodium methanoate is produced in the reaction of

- A sodium oxide and methanol
- B sodium chloride and methanoic acid
- C sodium oxide and methanoic acid
- D sodium and methanol.

[Turn over

17. Which line in the table shows the properties of a metal?

| | Melting point (°C) | Boiling point (°C) | Conducts electricity | |
|---|--------------------|--------------------|----------------------|--------|
| | | | Solid | Liquid |
| A | 30 | 2229 | yes | yes |
| B | -118 | 90 | no | no |
| C | 714 | 1412 | no | yes |
| D | 2077 | 4000 | no | no |

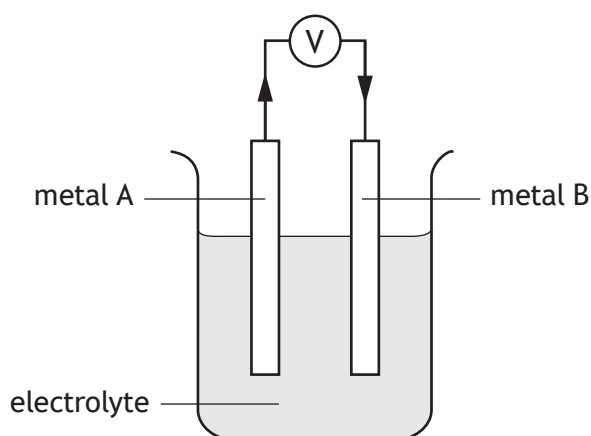
18. Information about the reactions of three different metals, X, Y and Z is given in the table.

| Metal | Reaction with | | |
|-------|---------------|-------------|-------------|
| | Oxygen | Dilute acid | Water |
| X | reacts | reacts | no reaction |
| Y | reacts | no reaction | no reaction |
| Z | reacts | reacts | reacts |

Which of the following correctly shows the metals in order of increasing reactivity?

- A X, Y, Z
- B Y, X, Z
- C Z, X, Y
- D Z, Y, X

19. An electrochemical cell was set up by joining two metals, **A** and **B**, in an electrolyte as shown.



The direction of electron flow is from metal **A** to metal **B**.

Which line in the table is correct for this cell?

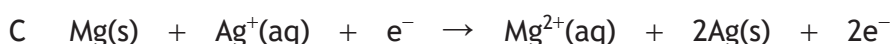
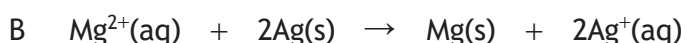
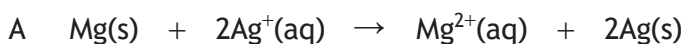
You may wish to use the data booklet to help you.

| | Metal A | Metal B |
|---|-----------|-----------|
| A | nickel | zinc |
| B | zinc | aluminium |
| C | aluminium | magnesium |
| D | aluminium | nickel |

20. The ion-electron equations for the reduction of magnesium ions and silver(I) ions are



The redox equation for the overall reaction is



[Turn over

21. Which line in the table correctly identifies the reactant and product for the industrial process?

| | Industrial process | Reactant | Product |
|---|--------------------|-------------|-------------|
| A | Haber | ammonia | nitric acid |
| B | Ostwald | ammonia | nitrogen |
| C | Haber | nitrogen | ammonia |
| D | Ostwald | nitric acid | ammonia |

22. An atom of ^{227}Th decays by a series of alpha emissions to form an atom of ^{211}Pb . How many alpha particles are released in this decay process?

- A 2
- B 3
- C 4
- D 5

23. Which salt **cannot** be prepared by a precipitation reaction?

You may wish to use the data booklet to help you.

- A Barium sulfate
- B Lead(II) sulfate
- C Calcium chloride
- D Silver chloride

24. The Benedict's test and the iodine test are commonly used to identify the presence of glucose and starch.

The results of these tests are shown.

| Test | Result for glucose | Result for starch |
|-----------------|--------------------|---------------------|
| Benedict's test | blue to orange | no change |
| Iodine test | no change | brown to blue/black |

Flame tests can be used to identify the presence of some metal ions.

An unknown mixture was tested and the following results obtained.

| Test | Result for unknown mixture |
|-----------------|----------------------------|
| Benedict's test | blue to orange |
| Iodine test | no change |
| Flame test | yellow flame |

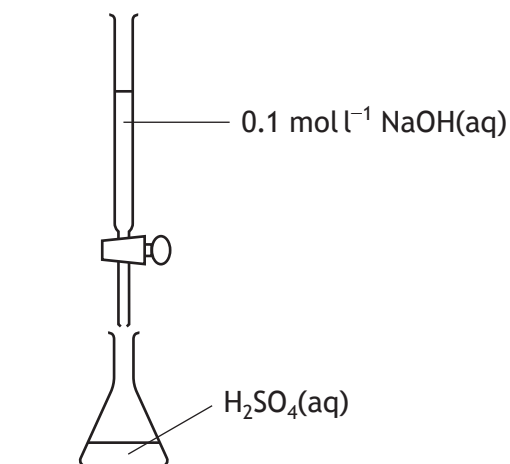
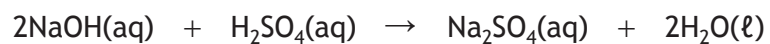
Which of the following mixtures could give the results shown?

You may wish to use the data booklet to help you.

- A Glucose and sodium chloride
- B Starch and sodium chloride
- C Glucose and strontium chloride
- D Starch and strontium chloride

[Turn over

25. A titration was carried out to neutralise 0.002 mol of sulfuric acid solution, H_2SO_4 .



The number of moles of $\text{NaOH}(\text{aq})$ required to neutralise the acid is

- A 0.05
- B 0.004
- C 0.002
- D 0.001

[END OF SECTION 1. NOW ATTEMPT THE QUESTIONS IN SECTION 2 OF
YOUR QUESTION AND ANSWER BOOKLET]