



National  
Qualifications  
SPECIMEN ONLY

**S813/76/12**

**Chemistry  
Paper 1 — Multiple choice**

Date — Not applicable

Duration — 40 minutes

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**Total marks — 25**

Attempt ALL questions.

**You may use a calculator.**

Instructions for the completion of Paper 1 are given on *page 02* of your answer booklet S813/76/02.

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

You may refer to the Chemistry Data Booklet for Higher and Advanced Higher.

Space for rough work is provided at the end of this booklet.

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



\* S 8 1 3 7 6 0 2 \*

**Total marks — 25**  
**Attempt ALL questions**

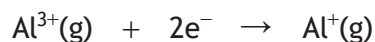
1. Which of the following elements, at room temperature, could be described as monatomic?

- A Argon
- B Boron
- C Iodine
- D Sulfur

2. The table shows the first three ionisation energies of aluminium.

<i>Ionisation energy (kJ mol<sup>-1</sup>)</i>		
1st	2nd	3rd
578	1817	2745

Using this information, what is the enthalpy change, in kJ mol<sup>-1</sup>, for the following reaction?



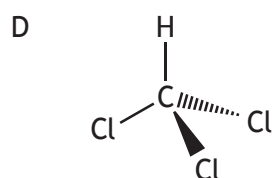
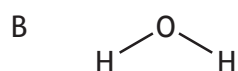
- A +2167
  - B -2167
  - C +4562
  - D -4562
3. Which element has the greatest attraction for bonding electrons?
- A Bromine
  - B Chlorine
  - C Lithium
  - D Sodium
4. Which of the following chlorides is likely to have the most ionic character?
- A BeCl<sub>2</sub>
  - B CaCl<sub>2</sub>
  - C CsCl
  - D LiCl

5. Which of the following elements would have the strongest London dispersion forces?

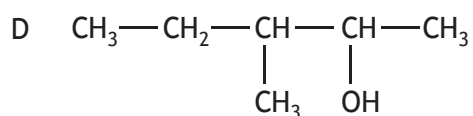
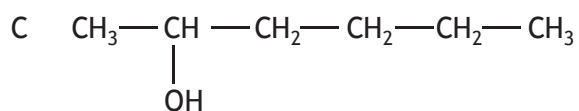
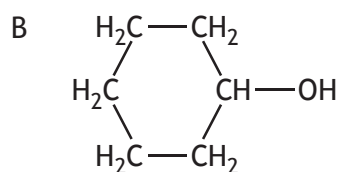
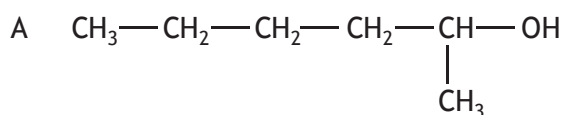
- A Argon
- B Chlorine
- C Nitrogen
- D Oxygen

6. The shapes of some common molecules are shown below and each contains at least one polar bond.

Which molecule is non-polar?

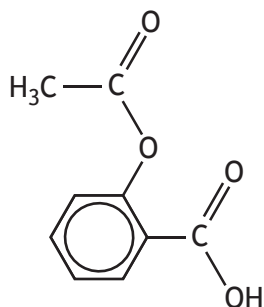


7. Which of the following is an isomer of hexan-2-ol?

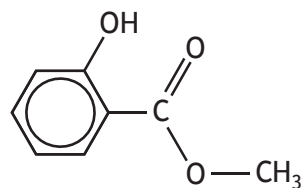


[Turn over

8. Aspirin and oil of wintergreen are used in medicine. Their structures are shown below.



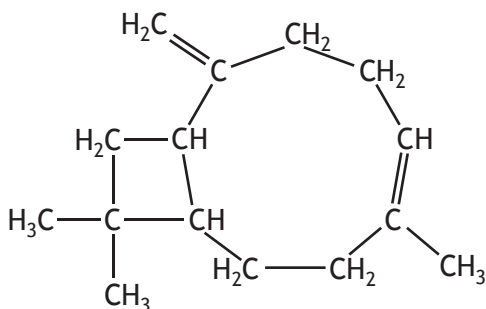
aspirin



oil of wintergreen

Identify the term which can be applied to aspirin but not to oil of wintergreen.

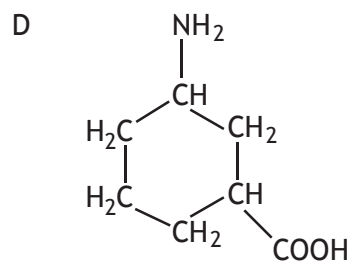
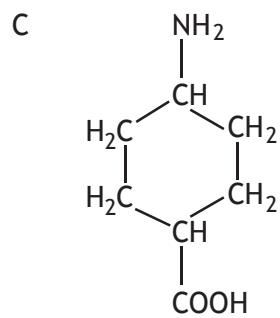
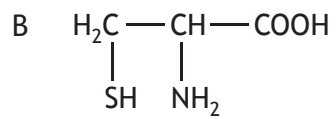
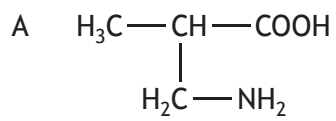
- A Aldehyde
  - B Ketone
  - C Ester
  - D Carboxylic acid
9. The structure of caryophyllene, which can be extracted from clove oil, is



Which of the following would be the best solvent for extracting caryophyllene?

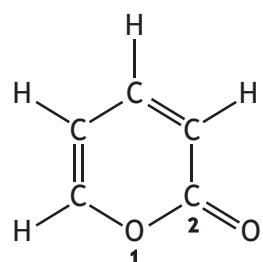
- A  $\text{CH}_3\text{—CH}_2\text{—CH}_2\text{—CH}_2\text{—CH}_2\text{—CH}_3$
- B  $\text{CH}_3\text{—CH}_2\text{—CH}_2\text{—CH}_2\text{—CH}_2\text{—CHO}$
- C  $\text{CH}_3\text{—CH}_2\text{—CH}_2\text{—CO—CH}_2\text{—CH}_3$
- D  $\text{HO—CH}_2\text{—CH}_2\text{—CH}_2\text{—CH}_2\text{—CH}_2\text{—CH}_3$

10. In  $\alpha$ -amino acids the amino group is on the carbon atom next to the carboxyl group.  
Which of the following is an  $\alpha$ -amino acid?

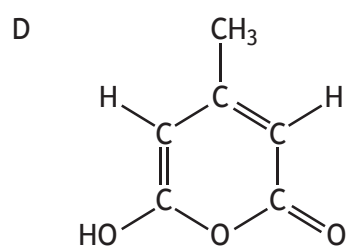
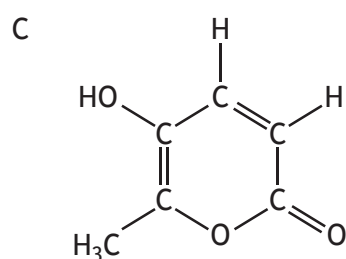
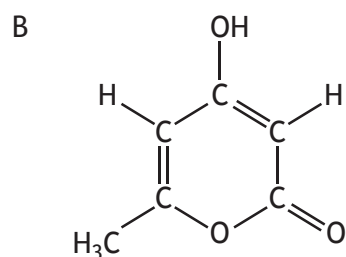
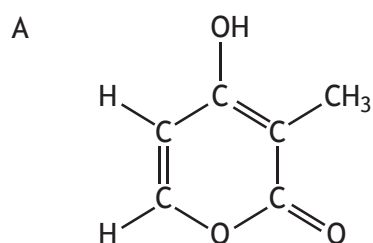


[Turn over

11. The 2-pyrones are esters used as flavourings and in perfumes. The name '2-pyrone' comes from the carbonyl group being in position 2 in the structure shown.



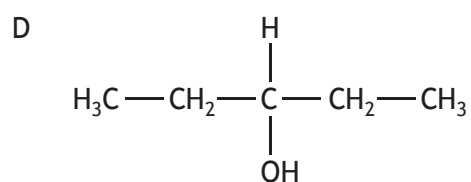
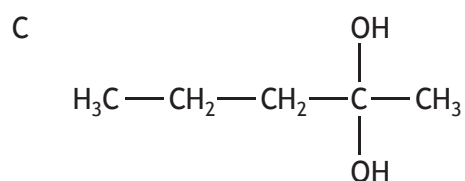
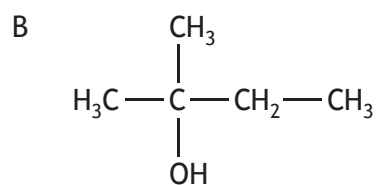
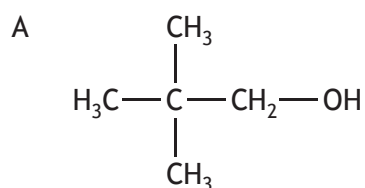
Which of the following structures is the pyrone responsible for the smell of chocolate, 4-hydroxy-6-methyl-2-pyrone?



12. Which of the following reactions can be classified as reduction?

- A  $\text{CH}_3\text{CH}_2\text{OH} \rightarrow \text{CH}_3\text{COOH}$   
B  $\text{CH}_3\text{CH}(\text{OH})\text{CH}_3 \rightarrow \text{CH}_3\text{COCH}_3$   
C  $\text{CH}_3\text{CH}_2\text{COCH}_3 \rightarrow \text{CH}_3\text{CH}_2\text{CH}(\text{OH})\text{CH}_3$   
D  $\text{CH}_3\text{CH}_2\text{CHO} \rightarrow \text{CH}_3\text{CH}_2\text{COOH}$

13. Which of the following structural formulae represents a tertiary alcohol?



[Turn over

14. A mixture of sodium bromide and sodium sulfate is known to contain 10 moles of sodium and 4 moles of bromide ions.

How many moles of sulfate ions are present?

- A 3
- B 4
- C 5
- D 6

15. 4.6 g of sodium is added to 4.8 litres of oxygen to form sodium oxide.

When the reaction is complete, which of the following statements will be true?

(Take the volume of 1 mole of oxygen to be 24 litres.)

- A 0.10 mol of oxygen will be left unreacted.
- B 0.10 mol of sodium will be left unreacted.
- C 0.15 mol of oxygen will be left unreacted.
- D 0.20 mol of sodium oxide will be formed.

16. A student obtained a certain volume of carbon dioxide by the reaction of 20 cm<sup>3</sup> of 2 mol l<sup>-1</sup> hydrochloric acid, HCl, with excess sodium carbonate.



The student carried out a similar experiment using sulfuric acid, H<sub>2</sub>SO<sub>4</sub>.



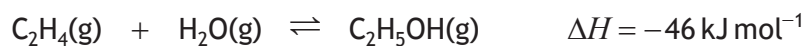
Which solution of sulfuric acid would give the same final volume of carbon dioxide when added to excess sodium carbonate?

- A 10 cm<sup>3</sup> of 2 mol l<sup>-1</sup>
- B 20 cm<sup>3</sup> of 2 mol l<sup>-1</sup>
- C 10 cm<sup>3</sup> of 4 mol l<sup>-1</sup>
- D 20 cm<sup>3</sup> of 4 mol l<sup>-1</sup>



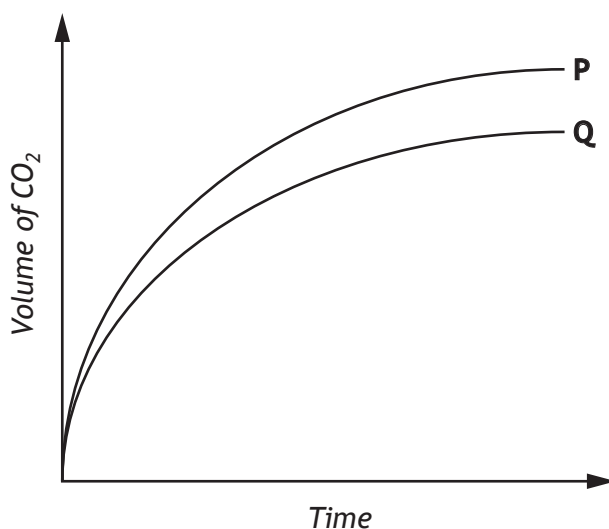
17. In a reversible reaction, equilibrium is reached when
- A molecules of reactants stop changing into molecules of products
  - B the concentrations of reactants and products are equal
  - C the concentrations of reactants and products are constant
  - D the activation energy of the forward reaction is equal to that of the reverse reaction.

18. Ethanol is manufactured by reacting ethene with steam.



Which set of conditions would give the best yield of ethanol at equilibrium?

- A High temperature, low pressure
  - B High temperature, high pressure
  - C Low temperature, high pressure
  - D Low temperature, low pressure
19. When copper carbonate is reacted with excess acid, carbon dioxide is produced. The curves shown were obtained under different conditions.

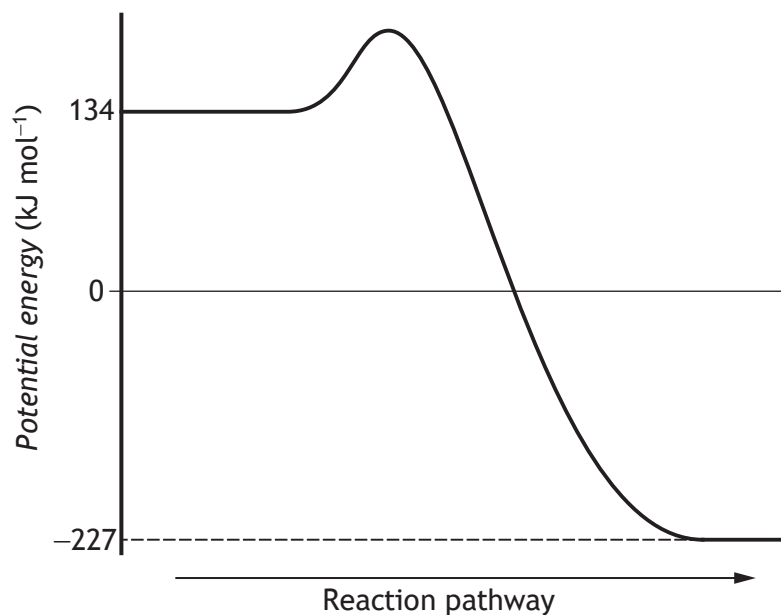


The change from P to Q could be brought about by

- A increasing the concentration of the acid
- B decreasing the mass of copper carbonate
- C decreasing the particle size of the copper carbonate
- D adding a catalyst.

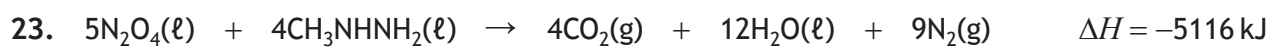
[Turn over

20. The potential energy diagram for a reaction is shown.



$\Delta H$ , in  $\text{kJ mol}^{-1}$ , for the forward reaction is

- A +361
  - B -93
  - C -227
  - D -361
21. Which of the following is **not** a correct statement about the effect of a catalyst?  
The catalyst
- A provides energy so that more molecules have successful collisions
  - B lowers the energy that molecules need for successful collisions
  - C provides an alternative route to the products
  - D allows more molecules to have energies greater than the activation energy.
22. Which of the following equations represents an enthalpy of combustion?
- A  $\text{C}_2\text{H}_6(\text{g}) + 3\frac{1}{2}\text{O}_2(\text{g}) \rightarrow 2\text{CO}_2(\text{g}) + 3\text{H}_2\text{O}(\ell)$
  - B  $\text{C}_2\text{H}_5\text{OH}(\ell) + \text{O}_2(\text{g}) \rightarrow \text{CH}_3\text{COOH}(\ell) + \text{H}_2\text{O}(\ell)$
  - C  $\text{CH}_3\text{CHO}(\ell) + \frac{1}{2}\text{O}_2(\text{g}) \rightarrow \text{CH}_3\text{COOH}(\ell)$
  - D  $\text{CH}_4(\text{g}) + 1\frac{1}{2}\text{O}_2(\text{g}) \rightarrow \text{CO}(\text{g}) + 2\text{H}_2\text{O}(\ell)$

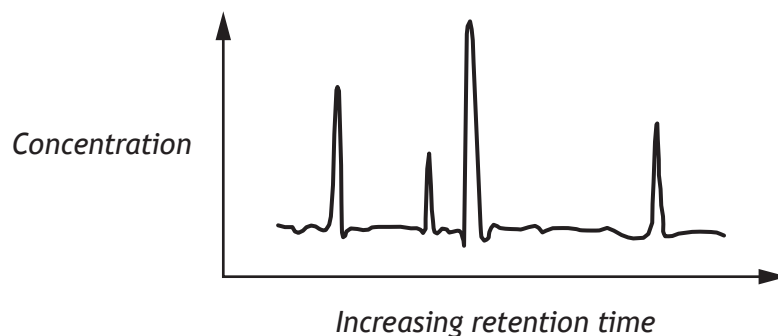


The energy released when 2 moles of each reactant are mixed and ignited is

- A 2046 kJ
- B 2558 kJ
- C 4093 kJ
- D 5116 kJ.

[Turn over

24. A chemist analysed a mixture of four dyes A, B, C and D using gas-liquid chromatography. In this technique, compounds are separated depending on their polarity, with the most polar having the longest retention times. The chromatogram obtained is shown below.

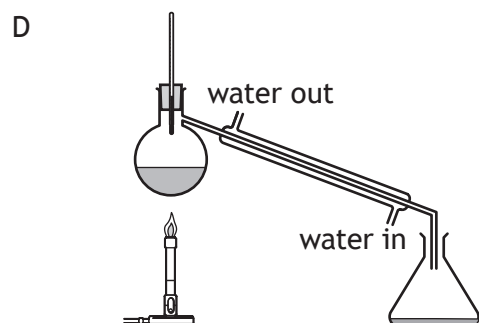
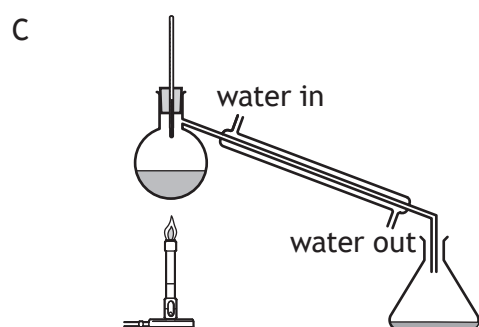
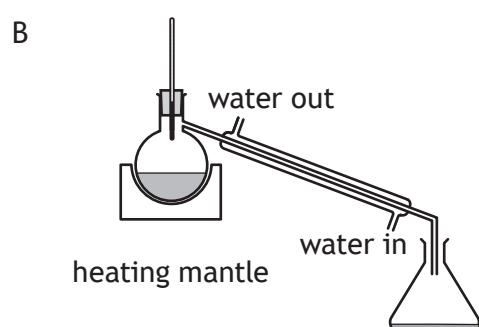
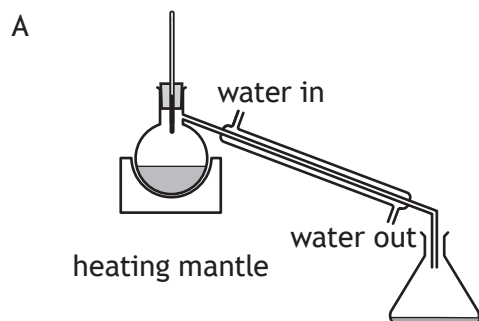


Which of the following compounds was present in greatest concentration?

Dye	Structure
A	
B	
C	
D	

25. Ethanol and ethanoic acid are flammable liquids.

Which of the following diagrams shows the correct set up for the separation of ethanol from ethanoic acid?



[END OF SPECIMEN QUESTION PAPER]

SPACE FOR ROUGH WORK

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Mark

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**S813/76/02**

**Chemistry  
Paper 1 — Multiple choice  
Answer booklet**

Date — Not applicable

Duration — 40 minutes



Fill in these boxes and read what is printed below.

Full name of centre

--

Town

--

Forename(s)

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Surname

--

Number of seat

--

Date of birth

Day

--	--

Month

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Year

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Scottish candidate number

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Instructions for the completion of Paper 1 are given on *page 02*.

Record your answers on the answer grid on *page 03*.

Use **blue** or **black** ink.

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





The questions for Paper 1 are contained in the question paper S813/76/12.

Read these and record your answers on the answer grid on *page 03*.

Use **blue** or **black** ink. Do NOT use gel pens or pencil.

1. The answer to each question is **either** A, B, C or D. Decide what your answer is, then fill in the appropriate bubble (see sample question below).
2. There is **only one correct** answer to each question.
3. Any rough working should be done on the space for rough work at the end of the question paper S813/76/12.

### Sample question

To show that the ink in a ball-pen consists of a mixture of dyes, the method of separation would be:

- A fractional distillation
- B chromatography
- C fractional crystallisation
- D filtration.

The correct answer is **B** — chromatography. The answer **B** bubble has been clearly filled in (see below).

A	B	C	D
<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>

### Changing an answer

If you decide to change your answer, cancel your first answer by putting a cross through it (see below) and fill in the answer you want. The answer below has been changed to **D**.

A	B	C	D
<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>

If you then decide to change back to an answer you have already scored out, put a tick (✓) to the **right** of the answer you want, as shown below:

A	B	C	D	or	A	B	C	D
<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>		<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>





	A	B	C	D
1	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
7	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
8	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
9	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
10	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
11	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
12	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
13	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
14	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
15	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
16	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
17	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
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21	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
22	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
23	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
24	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
25	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>





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**S813/76/12**

**Chemistry  
Paper 1 — Multiple choice**

## Marking Instructions

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**Marking instructions for each question**

<b>Question</b>	<b>Answer</b>	<b>Max mark</b>
1.	A	1
2.	D	1
3.	B	1
4.	C	1
5.	B	1
6.	C	1
7.	D	1
8.	D	1
9.	A	1
10.	B	1
11.	B	1
12.	C	1
13.	B	1
14.	A	1
15.	C	1
16.	A	1
17.	C	1
18.	C	1
19.	B	1
20.	D	1
21.	A	1
22.	A	1
23.	A	1
24.	D	1
25.	B	1

**[END OF SPECIMEN MARKING INSTRUCTIONS]**