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.

SECTION 1 — 25 marks

Attempt ALL questions

1. The average rate of a chemical reaction was calculated to be 5 $cm^3 s^{-1}$ 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

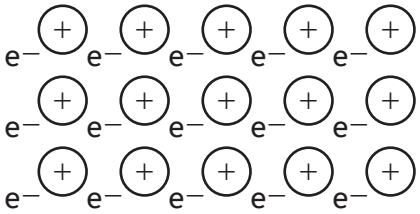
B NCl_3

C SCl_2

D FCl

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

A



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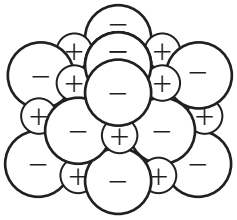

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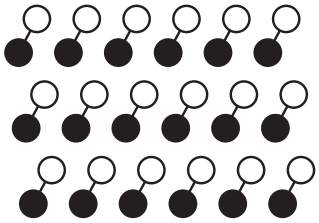

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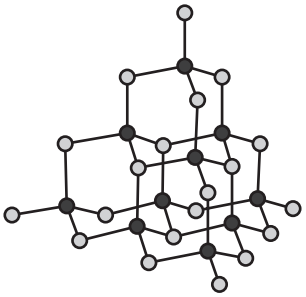


5. In which of the following compounds does the iron ion have a 3+ charge?

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

A FeO

B FeP

C $Fe(NO_3)_2$

D $Fe_3(PO_4)_2$

[Turn over

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

A $100\ cm^3$ of $1.00\ mol\,l^{-1}$

B $150\ cm^3$ of $0.75\ mol\,l^{-1}$

C $200\ cm^3$ of $0.60\ mol\,l^{-1}$

D $250\ cm^3$ 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.

$$(Na^+)_2CO_3^{2-}(aq) + 2H^+Cl^-(aq) \rightarrow 2Na^+Cl^-(aq) + H_2O(\ell) + CO_2(g)$$

The correct equation omitting the spectator ions is

A $H^+(aq) + OH^-(aq) \rightarrow H_2O(\ell)$

B $2H^+(aq) + CO_3^{2-}(aq) \rightarrow H_2O(\ell) + CO_2(g)$

C $2H^+(aq) + CO_3^{2-}(g) \rightarrow H_2O(\ell) + CO_2(g)$

D $Na^+(aq) + Cl^-(aq) \rightarrow Na^+Cl^-(aq)$

10. $CH_3CH(CH_3)CH_2C(CH_3)_2CH_3$

The name of the above compound is

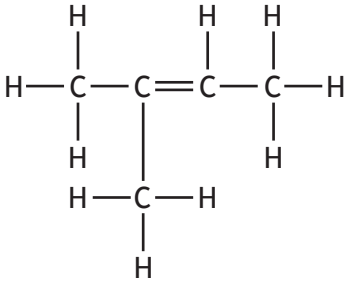
A 2,2,4-trimethylpentane

B 2,4,4-trimethylpentane

C 2,2,4-trimethylpentene

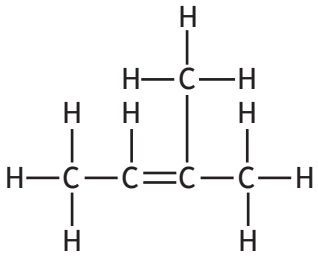
D 2,4,4-trimethylpentene.

11. The structure of 2-methylbut-2-ene is



Which of the following represents an isomer of 2-methylbut-2-ene?

A



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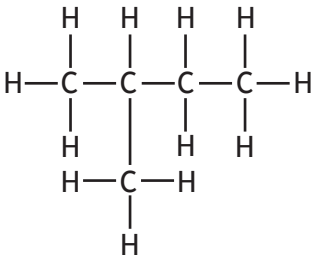

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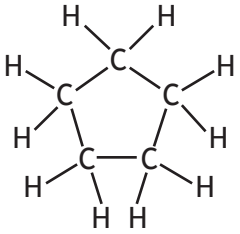

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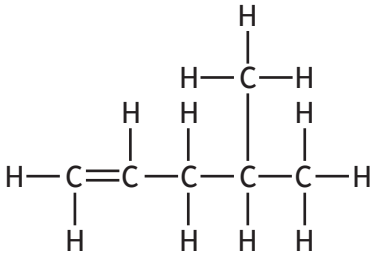


[Turn over

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

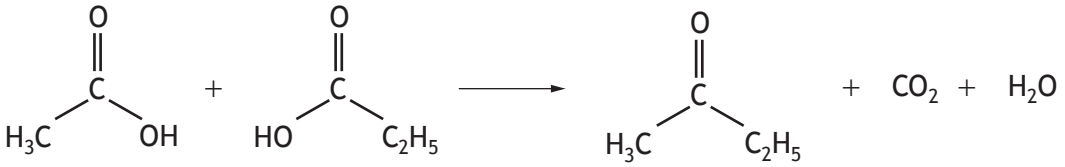
A $CH_3CH_2CH_2CH_3$

B $CH_3CH_2CH_2CH_2OH$

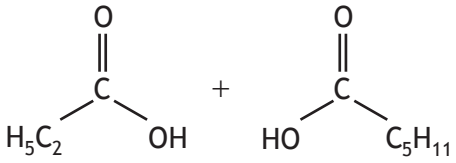
C $CH_3CH(OH)CH_2CH_3$

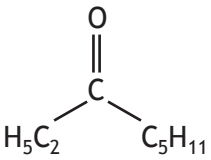
D $CH_3CHBrCHBrCH_3$

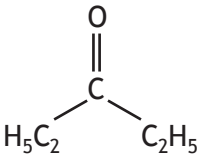
13. Carboxylic acids can react to form compounds known as ketones.

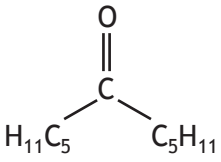


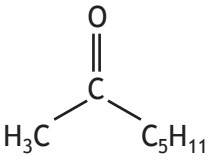
Identify the ketone that can be formed by reacting the two carboxylic acids below.



A 

B 

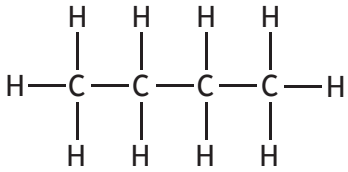
C 

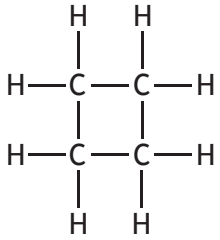
D 

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.

	Reaction with		
Metal	**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?

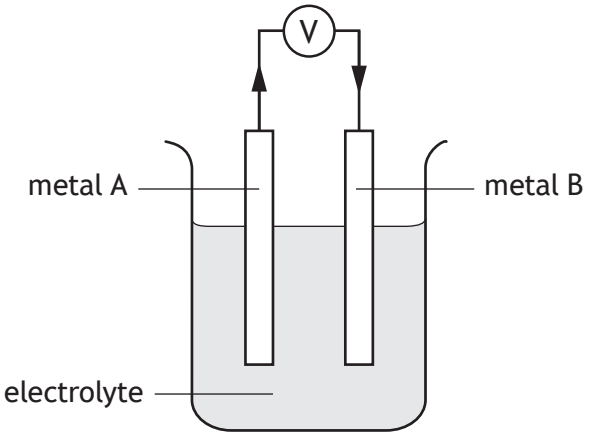
A X, Y, Z

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

$$Mg^{2+}(aq) + 2e^- \rightarrow Mg(s)$$
$$Ag^{+}(aq) + e^- \rightarrow Ag(s)$$

The redox equation for the overall reaction is

A $Mg(s) + 2Ag^{+}(aq) \rightarrow Mg^{2+}(aq) + 2Ag(s)$

B $Mg^{2+}(aq) + 2Ag(s) \rightarrow Mg(s) + 2Ag^{+}(aq)$

C $Mg(s) + Ag^{+}(aq) + e^- \rightarrow Mg^{2+}(aq) + 2Ag(s) + 2e^-$

D $Mg^{2+}(aq) + 2Ag(s) + 2e^- \rightarrow Mg(s) + Ag^{+}(aq) + e^-$

[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

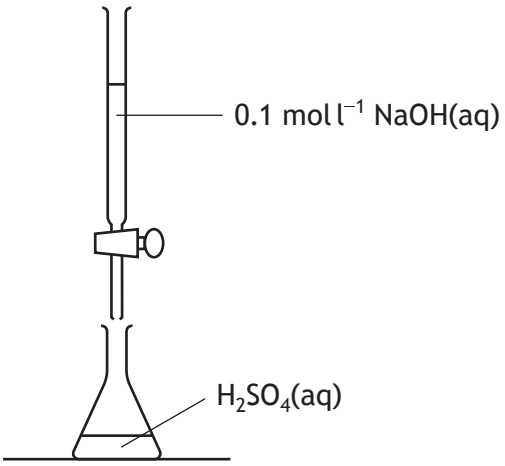
C Glucose and strontium chloride

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.

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



The number of moles of NaOH(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]