



National
Qualifications
2016

X713/76/02

**Chemistry
Section 1 — Questions**

WEDNESDAY, 18 MAY

9:00 AM – 11:30 AM

Instructions for the completion of Section 1 are given on *Page 02* of your question and answer booklet X713/76/01.

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

Reference may be made to the Chemistry Higher and Advanced Higher Data Booklet.

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 7 1 3 7 6 0 2 *

SECTION 1 — 20 marks

Attempt ALL questions

1. Particles with the same electron arrangement are said to be isoelectronic.

Which of the following compounds contains ions which are isoelectronic?

- A Na_2S
- B MgCl_2
- C KBr
- D CaCl_2

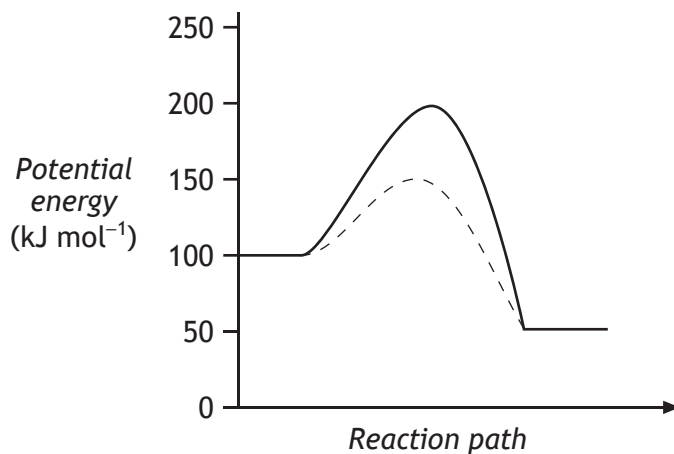
2. Which line in the table is correct for the polar covalent bond in hydrogen chloride?

	<i>Relative position of bonding electrons</i>	<i>Dipole notation</i>
A	$\text{H} \text{ --- } \div \text{ Cl}$	$\begin{matrix} \delta+ & \delta- \\ \text{H} \text{ --- } & \text{Cl} \end{matrix}$
B	$\text{H} \div \text{ --- } \text{Cl}$	$\begin{matrix} \delta+ & \delta- \\ \text{H} \text{ --- } & \text{Cl} \end{matrix}$
C	$\text{H} \text{ --- } \div \text{ Cl}$	$\begin{matrix} \delta- & \delta+ \\ \text{H} \text{ --- } & \text{Cl} \end{matrix}$
D	$\text{H} \div \text{ --- } \text{Cl}$	$\begin{matrix} \delta- & \delta+ \\ \text{H} \text{ --- } & \text{Cl} \end{matrix}$

3. Which of the following compounds has the greatest ionic character?

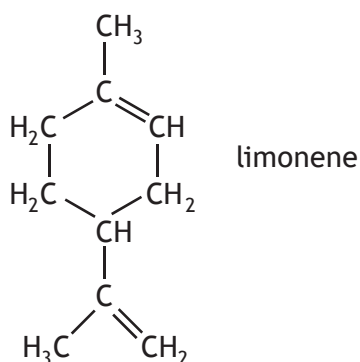
- A Caesium fluoride
- B Caesium iodide
- C Sodium fluoride
- D Sodium iodide

4. The diagram below shows the energy profiles for a reaction carried out with and without a catalyst.



What is the enthalpy change, in kJ mol⁻¹, for the catalysed reaction?

- A -100
 - B -50
 - C +50
 - D +100
5. Limonene is a terpene molecule present in lemons.



How many isoprene units are joined together in a limonene molecule?

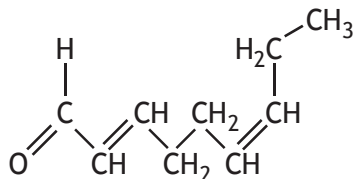
- A 1
- B 2
- C 3
- D 4

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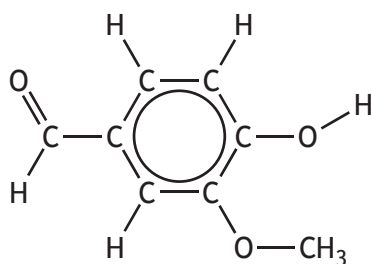
6. The following molecules give flavour to food.

Which of the following flavour molecules would be most likely to be retained in the food when the food is cooked in water?

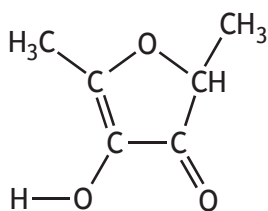
A



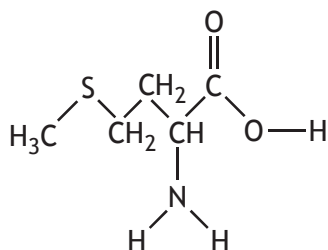
B



C



D

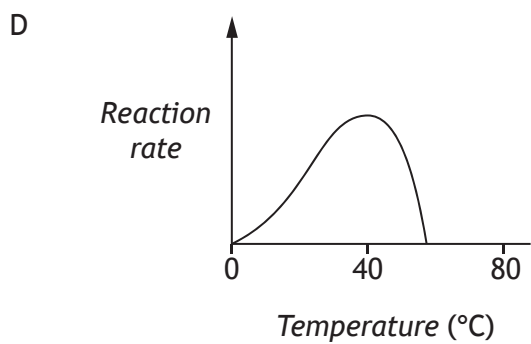
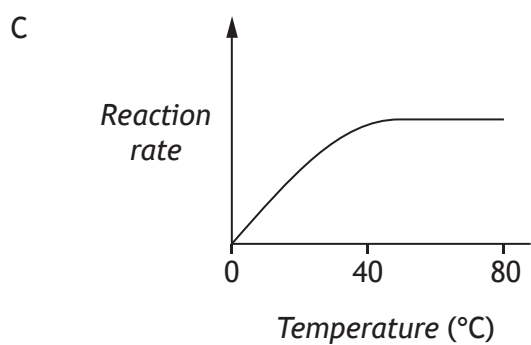
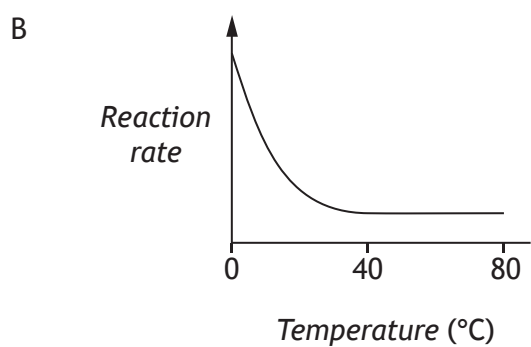
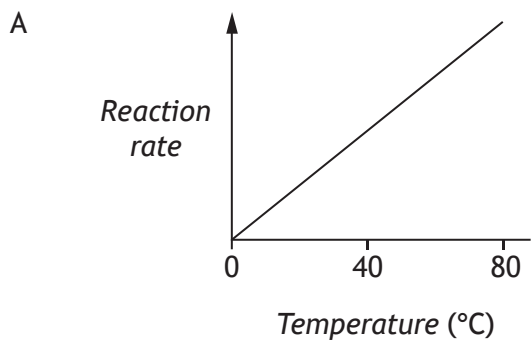


7. vegetable oil $\longrightarrow$ vegetable fat

Which of the following reactions brings about the above change?

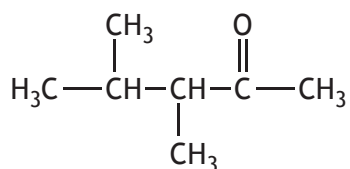
- A Hydrolysis
- B Condensation
- C Hydrogenation
- D Dehydrogenation

8. The rate of hydrolysis of protein, using an enzyme, was studied at different temperatures. Which of the following graphs would be obtained?



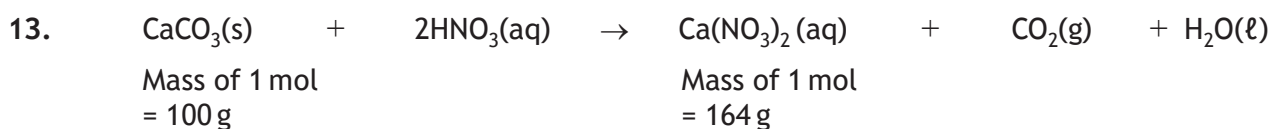
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9. Which of the following is the salt of a long-chain fatty acid?
- A Fat
 - B Oil
 - C Soap
 - D Glycerol
10. Emulsifiers for use in food are commonly made by reacting edible oils with
- A esters
 - B glycerol
 - C fatty acids
 - D amino acids.
11. The equation for the reduction reaction taking place when ethanal reacts with Tollens' reagent is
- A $\text{Cu}^{2+}(\text{aq}) + \text{e}^{-} \rightarrow \text{Cu}^{+}(\text{aq})$
 - B $\text{Ag}^{+}(\text{aq}) + \text{e}^{-} \rightarrow \text{Ag}(\text{s})$
 - C $\text{Cr}_2\text{O}_7^{2-}(\text{aq}) + 14\text{H}^{+}(\text{aq}) + 6\text{e}^{-} \rightarrow 2\text{Cr}^{3+}(\text{aq}) + 7\text{H}_2\text{O}(\ell)$
 - D $\text{MnO}_4^{-}(\text{aq}) + 8\text{H}^{+}(\text{aq}) + 5\text{e}^{-} \rightarrow \text{Mn}^{2+}(\text{aq}) + 4\text{H}_2\text{O}(\ell)$
12. The name of the compound with structure:



is

- A 2,3-dimethylpentan-4-one
- B 2,3-dimethylpentan-2-al
- C 3,4-dimethylpentan-2-one
- D 3,4-dimethylpentan-2-al.



2.00 g of calcium carbonate (CaCO_3) was reacted with 200 cm^3 of 0.1 mol l^{-1} nitric acid (HNO_3).

Take the volume of 1 mole of carbon dioxide to be 24 litres.

In the reaction

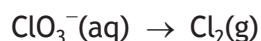
- A CaCO_3 is the limiting reactant
 - B an excess of 0.1 mol of nitric acid remains at the end of the reaction
 - C 1.64 g of calcium nitrate is produced by the reaction
 - D 480 cm^3 of carbon dioxide is produced by the reaction.
14. The mean bond enthalpy of a C – F bond is 484 kJ mol^{-1} .
In which of the processes is ΔH approximately equal to $+1936\text{ kJ mol}^{-1}$?
- A $\text{CF}_4(\text{g}) \rightarrow \text{C}(\text{s}) + 2\text{F}_2(\text{g})$
 - B $\text{CF}_4(\text{g}) \rightarrow \text{C}(\text{g}) + 4\text{F}(\text{g})$
 - C $\text{CF}_4(\text{g}) \rightarrow \text{C}(\text{g}) + 2\text{F}_2(\text{g})$
 - D $\text{CF}_4(\text{g}) \rightarrow \text{C}(\text{s}) + 4\text{F}(\text{g})$
15. In a reversible reaction, equilibrium is reached when
- A molecules of reactants cease to change 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.
16. Which of the following equations represents the enthalpy of combustion of propane?
- A $\text{C}_3\text{H}_8(\text{g}) + 5\text{O}_2(\text{g}) \rightarrow 3\text{CO}_2(\text{g}) + 4\text{H}_2\text{O}(\ell)$
 - B $\text{C}_3\text{H}_8(\text{g}) + \frac{7}{2}\text{O}_2(\text{g}) \rightarrow 3\text{CO}(\text{g}) + 4\text{H}_2\text{O}(\ell)$
 - C $\text{C}_3\text{H}_8(\text{g}) + 3\text{O}_2(\text{g}) \rightarrow 3\text{CO}_2(\text{g}) + 4\text{H}_2(\text{g})$
 - D $\text{C}_3\text{H}_8(\text{g}) + \frac{3}{2}\text{O}_2(\text{g}) \rightarrow 3\text{CO}(\text{g}) + 4\text{H}_2(\text{g})$

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17. An oxidising agent

- A gains electrons and is oxidised
- B loses electrons and is oxidised
- C gains electrons and is reduced
- D loses electrons and is reduced.

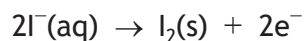
18. During a redox process in acid solution, chlorate ions, $\text{ClO}_3^-(\text{aq})$, are converted into chlorine, $\text{Cl}_2(\text{g})$.



The numbers of $\text{H}^+(\text{aq})$ and $\text{H}_2\text{O}(\ell)$ required to balance the ion-electron equation for the formation of 1 mol of $\text{Cl}_2(\text{g})$ are, respectively

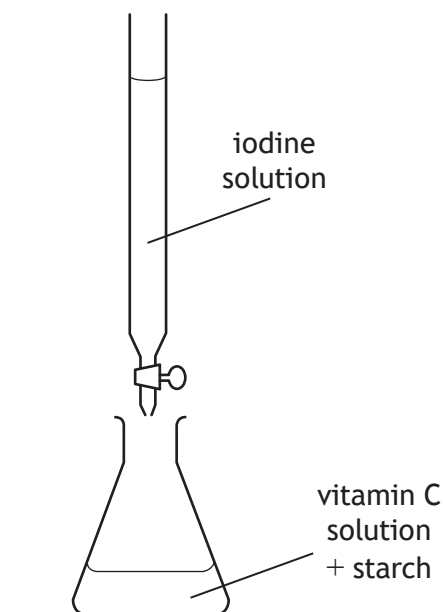
- A 3 and 6
- B 6 and 3
- C 6 and 12
- D 12 and 6.

19. Which of the following ions could be used to oxidise iodide ions to iodine?



- A $\text{SO}_4^{2-}(\text{aq})$
- B $\text{SO}_3^{2-}(\text{aq})$
- C $\text{Cr}^{3+}(\text{aq})$
- D $\text{Cr}_2\text{O}_7^{2-}(\text{aq})$

20.



A student was carrying out a titration to establish the concentration of vitamin C using iodine solution.

Which of the following would help the student achieve a precise end-point?

- A Placing a white tile underneath the conical flask
- B Using the bottom of the meniscus when reading the burette
- C Repeating titrations
- D Carrying out a rough titration first

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

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