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Chemistry
Standard level
Paper 2

18 May 2026

Zone A morning | **Zone B** morning | **Zone C** morning

Session number

1 hour 30 minutes

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Instructions to students

- Write your session number in the boxes above.
- Do not open this examination paper until instructed to do so.
- Answer all questions.
- Answers must be written within the answer boxes provided.
- A calculator is required for this paper.
- A clean copy of the **chemistry data booklet** is required for this paper.
- The maximum mark for this examination paper is **[50 marks]**.



Answer **all** questions. Answers must be written within the answer boxes provided.

1. Hydrobromic acid, HBr(aq) , and hydrochloric acid, HCl(aq) , are strong acids and methanoic acid, HCOOH(aq) , is a weak acid.

(a) 20.0 cm^3 of $0.250 \text{ mol dm}^{-3}$ HBr(aq) was titrated with potassium hydroxide solution, KOH(aq) .

- (i) Calculate the initial pH of the hydrobromic acid. Use section 1 of the data booklet. [1]

- (ii) Write the equation for the neutralization reaction between HBr(aq) and KOH(aq) . [1]

- (iii) Calculate the amount, in mol, of KOH(aq) needed to neutralize the solution of HBr(aq) . Use section 1 of the data booklet. [1]

- (iv) Calculate the volume of $0.220 \text{ mol dm}^{-3}$ KOH(aq) required for neutralization. Use section 1 of the data booklet. [1]

(This question continues on the following page)



(Question 1 continued)

- (v) Suggest one method, and the expected result, that could distinguish between unlabelled solutions of HBr(aq) and HCOOH(aq) of the same concentration. [2]

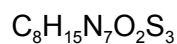
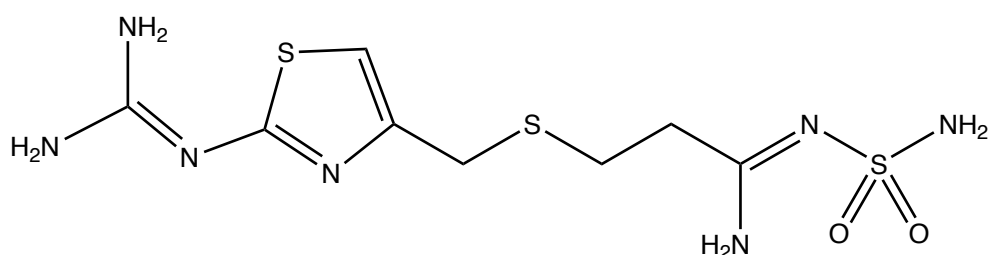
Method:

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Expected result:

.....

- (b) Famotidine is a drug that reduces the production of stomach acid which contains HCl(aq).



$$M_r = 337.51$$

Calculate the percentage by mass of nitrogen in a molecule of famotidine. Use section 7 of the data booklet.

[1]

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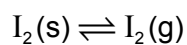
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2. Iodine occurs naturally in seawater.

- (a) Iodine crystals, $I_2(s)$, were placed in a sealed flask. Some of the solid turned into purple vapour as equilibrium was reached.



- (i) State the name of the change from $I_2(s)$ to $I_2(g)$, and the type of force which is overcome. [2]

Change of state:

Type of force:

- (ii) Explain why the purple vapour became darker as temperature increased. [2]

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- (iii) Explain why the pressure in the flask increased as temperature increased. [2]

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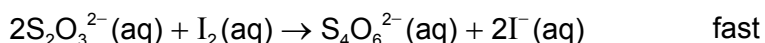
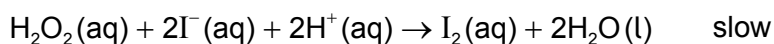


(Question 2 continued)

- (iv) At equilibrium, 2.05×10^{-3} g of iodine was present as vapour in a 500 cm^3 flask at 25°C .

Calculate the pressure, in kPa, in the flask due to the iodine vapour. [3]

- (b) An ‘iodine clock’ experiment involves two reactions occurring at the same time.



When the $\text{S}_2\text{O}_3^{2-}$ has all reacted, excess I_2 reacts with starch indicator to produce a dark blue complex.

- (i) Deduce the oxidation state of O in H_2O_2 . [1]

- (ii) Write a redox half-equation for the conversion of $\text{S}_2\text{O}_3^{2-}$ to $\text{S}_4\text{O}_6^{2-}$. [1]

- (iii) Suggest one change that would decrease the time for the dark blue colour to appear. [1]

(This question continues on the following page)



(Question 2 continued)

- (c) Outline what is known about the electron configuration of an iodine atom from its position in the periodic table.

[2]

Information from group number:

.....

Information from period number:

.....



3. Metals are widely used in industry.

(a) Aluminium is used by itself and in alloys.

(i) Describe the structure of aluminium and the forces holding the metal together. [2]

Structure:
.....
.....
Forces:
.....
.....

(ii) Explain why aluminium is malleable. [1]

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(iii) Explain why aluminium has a higher melting point than magnesium. [2]

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(This question continues on the following page)



(Question 3 continued)

(b) An alloy of aluminium and lithium is used in aerospace applications.

(i) Suggest why the addition of lithium creates a material that is stronger and less flexible than aluminium alone.

[2]

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(ii) Suggest why adding lithium to aluminium is a good choice for an aerospace alloy.

[1]

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(This question continues on the following page)



(Question 3 continued)

(c) Lithium is a reactive metal.

(i) Write an equation for the reaction between lithium and water, including state symbols.

[2]

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(ii) Describe an **observation** from the reaction in (c)(i).

[1]

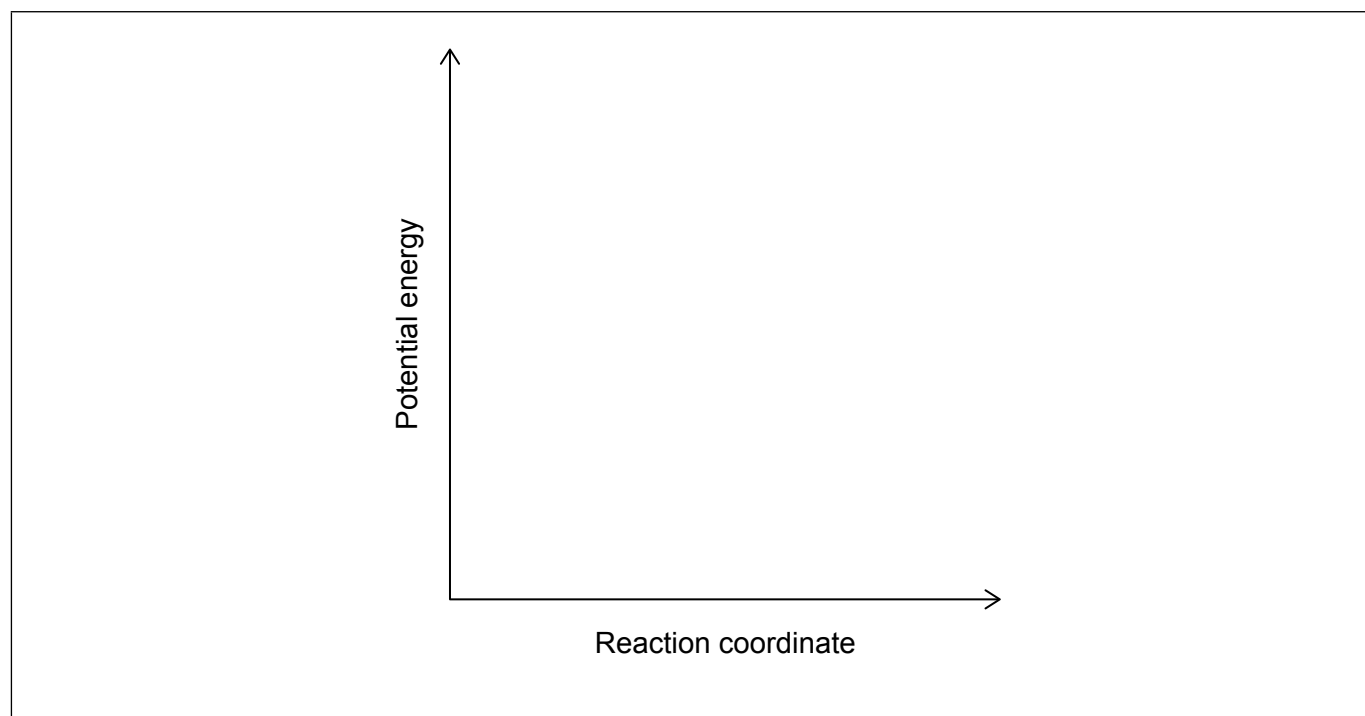
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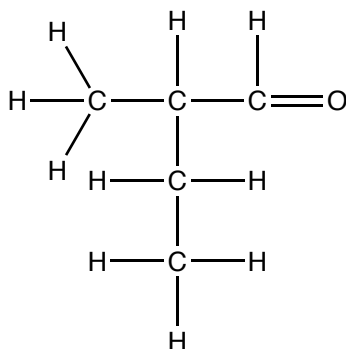
(iii) Sketch an energy profile for the reaction between lithium and water, showing activation energy, E_a and enthalpy change of reaction, ΔH .

[2]



4. Organic compounds are the main constituents of living organisms.

(a) Compound **X** is found in plant and animal cells.



Compound **X**

(i) State the IUPAC name of compound **X**. [1]

.....

(ii) State the name of the C=O functional group in compound **X**. [1]

.....

(iii) Predict the H–C=O bond angle in compound **X**. [1]

.....

(iv) Sketch the full structural formula of the product formed from the reaction of compound **X** with a reducing agent. [1]

(This question continues on the following page)



(Question 4 continued)

(b) 1-Bromopropane is used as a solvent and a building block for organic molecules.

- (i) Predict the organic product formed when 1-bromopropane reacts with hydroxide ions. [1]

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- (ii) Deduce, with a reason, the reaction type in (b)(i). [1]

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(c) Ethane reacts with chlorine gas in the presence of UV radiation to produce chlorinated hydrocarbons.

- (i) Explain, using an equation, the homolytic fission of chlorine. [1]

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- (ii) Explain, using two equations, the propagation steps for the reaction between ethane and chlorine. [2]

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(This question continues on the following page)



(Question 4 continued)

- (d) Ethene can be reduced by hydrogen gas in the presence of a nickel catalyst at 150 °C.

Outline how the catalyst increases the reaction rate.

[2]

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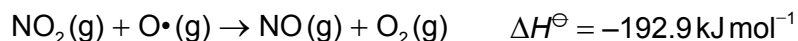
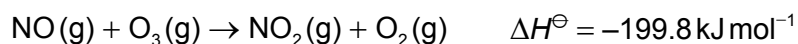
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5. Nitrogen(II) oxide reacts with ozone in the stratosphere.



- (a) Determine the enthalpy change, in kJ mol^{-1} , for the overall reaction. [2]

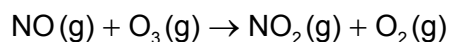
Overall reaction:

.....

$\Delta H_{\text{reaction}}$:

.....

- (b) Calculate the enthalpy change, in kJ mol^{-1} , for the first reaction.



Use section 12 of the data booklet and the information provided.

[3]

Bond	Bond enthalpy / kJ mol^{-1}
Between N and O in NO molecule	632
Between N and O in NO_2 molecule	469
Between O and O in O_3 molecule	302

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