1. A chemist compares the rates of hydrolysis of 1-chloropropane and 1-bromopropane in ethanol.

Which reagent in aqueous solution should be used?

A Silver chloride

B Silver nitrate

C Potassium chloride

D Potassium nitrate

Your answer ☐

[1]

2. Ethane reacts with chlorine by radical substitution to form chloroethane.

Which radical(s) is/are present in the mechanism?

1 H•

2 C*l*•

3 C_2H_5•

A 1, 2 and 3

B Only 1 and 2

C Only 2 and 3

D Only 1

Your answer ☐

[1]

3. The breakdown of ozone is catalysed by NO radicals.

Which equation is a propagation step in the mechanism for this process?

A $NO + O_2 \rightarrow N + O_3$

B $NO + O_2 \rightarrow NO_2 + O$

C $N + O_3 \rightarrow NO + O_2$

D $NO_2 + O \rightarrow NO + O_2$

Your answer ☐

[1]

4. This question is about the hydrolysis of haloalkanes.

(a) The rate of hydrolysis of a haloalkane depends on the halogen present.

State and explain how the halogen in the haloalkane affects the rate of hydrolysis.

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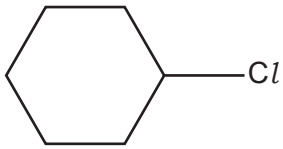
.....

..... **[2]**

(b) Chlorocyclohexane is hydrolysed with aqueous sodium hydroxide.

Outline the mechanism for this reaction.

Show curly arrows, relevant dipoles and the products.



[3]

(c) A student hydrolyses a haloalkane, **E**, using the following method.

- 0.0100 mol of haloalkane **E** is refluxed with excess NaOH(aq) to form a reaction mixture containing an organic product **F**.
- The reaction mixture is neutralised with dilute nitric acid.
- Excess $AgNO_3$(aq) is added to the reaction mixture. 1.88 g of a precipitate **G** forms.

Organic product, **F**, has a molar mass of 74.0 g mol^{-1} and has a chiral carbon atom.

(i) Draw a **labelled** diagram to show how the student would carry out the hydrolysis of haloalkane **E**.

[2]

(ii) Analyse the information to identify **E**, **F** and **G**.

Show your working.

[3]

5. Radical reactions are responsible for the catalysed breakdown of the ozone layer.

The overall equation is shown below.

$2O_3 \rightarrow 3O_2 \qquad \Delta_r H = -284\,\text{kJ mol}^{-1}$

The molar gas volume in the ozone layer is approximately $2.5\,\text{m}^3\,\text{mol}^{-1}$.

What is the energy released, in kJ, during the breakdown of $1.0\,\text{m}^3$ of ozone in the ozone layer?

A 56.8

B 113.6

C 355

D 710

Your answer ☐ **[1]**

6. Butane reacts with chlorine in the presence of ultraviolet radiation to form a mixture of organic products.

Which equation shows a propagation step in the mechanism for this reaction?

A $Cl_2 \rightarrow \bullet Cl + \bullet Cl$

B $\bullet Cl + \bullet C_4H_8Cl \rightarrow C_4H_8Cl_2$

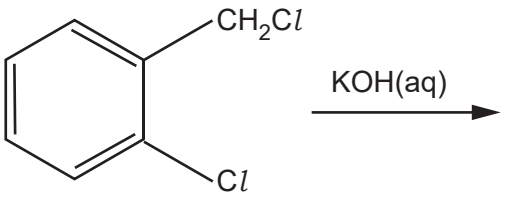
C $C_4H_9Cl + \bullet Cl \rightarrow C_4H_8Cl_2 + \bullet H$

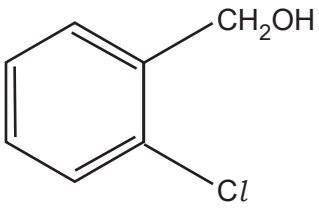
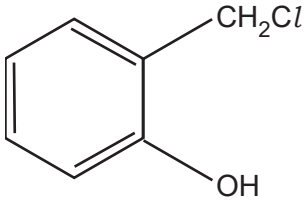
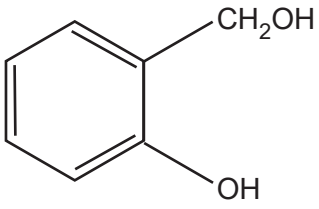
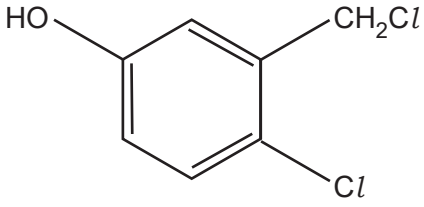
D $\bullet Cl + C_4H_9Cl \rightarrow \bullet C_4H_8Cl + HCl$

Your answer ☐

[1]

7. What is the organic product of the reaction below?



A	
B	
C	
D	

Your answer ☐

[1]