



St Andrew's Junior College

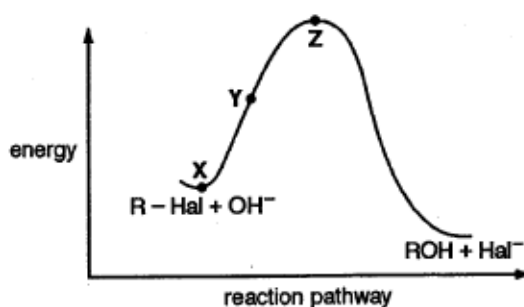
H2 Chemistry 2026

Tutorial 13: Halogen Derivatives

SELF-CHECK QUESTIONS

Mechanism

1. Halogenoalkanes react with aqueous alkali. One mechanism of this reaction has the reaction pathway diagram shown below.



Which statements are correct?

- 1 The reaction is an example of nucleophilic substitution.
- 2 Between **X** and **Y** the C-Hal bond will be lengthening.
- 3 The energy difference between **X** and **Z** represents the activation energy.

A 1, 2 and 3 **B** 1 and 2 **C** 2 and 3 **D** 1 only

Reactions of Halogenoalkanes

2. Write balanced equations and the reagents and conditions for the following conversions.

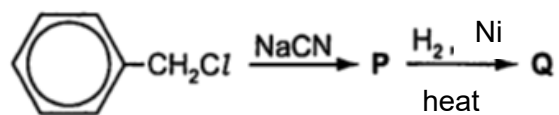
(a) $\text{CH}_3\text{CH}_2\text{Br}$ to $\text{CH}_3\text{CH}_2\text{NH}_2$ (1 step)

(b) $\text{CH}_3\text{CH}_2\text{Br}$ to $\text{CH}_3\text{CH}_2\text{COOH}$ (2 steps)

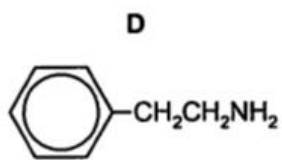
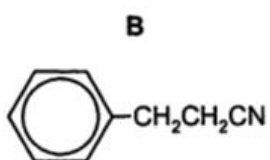
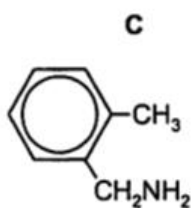
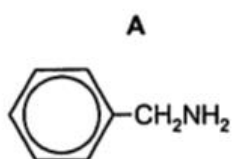
(c) $\text{CH}_3\text{CH}_2\text{Cl}$ to $\text{CH}_2(\text{OH})\text{CH}_2\text{OH}$ (2 steps)

(d) Benzene to 3-chloronitrobenzene (2 steps)

3. The diagram shows a reaction sequence.



What would be the product **Q**?



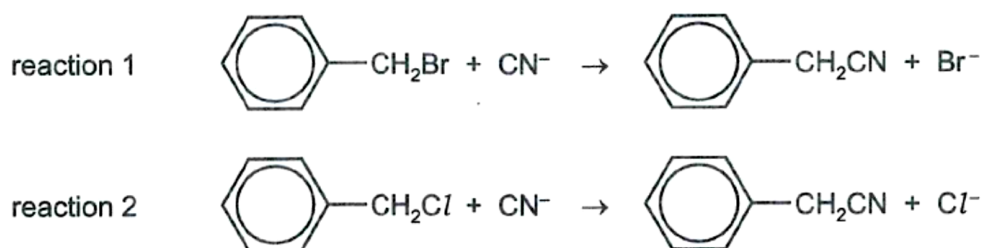
4. The reduction of a nitrile produced a compound of formula $C_3H_7NH_2$.

Which compound would be produced if the same nitrile was hydrolysed by heating with dilute hydrochloric acid?

- A $CH_3CH_2NH_2$
B CH_3CH_2OH
C $CH_3CH_2CO_2H$
D $(CH_3)_2CHCO_2H$

5. N16/1/25

The reactions below follow the same S_N1 mechanism.



Reaction 1 is faster than reaction 2, under identical conditions.

Which statement explains this difference?

- A Bromine is more electronegative than chlorine.
B The bromide ion is a stronger electrophile than the chloride ion.
C The C–Cl bond is more polar than the C–Br bond.
D The C–Cl bond is stronger than the C–Br bond.

6. Use of the Data Booklet is relevant to this question.

2-bromopropane reacts with the following.

- an aqueous solution of sodium hydroxide to form organic product **P**
- an ethanolic solution of sodium hydroxide to form organic product **Q**
- an ethanolic solution of sodium cyanide to form organic product **R**

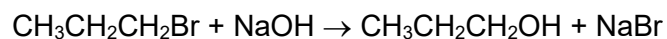
What is the order of increasing relative molecular masses, lowest to highest, of the organic products?

- A P Q R B Q P R C Q R P D R P Q

7. N17/1/24

During the preparation of many organic compounds, by-products are formed. This usually occurs because the reagent can react in more than one way depending on the conditions used or because the products formed may react with the reactants.

Propan-1-ol is produced by the reaction between 1-bromopropane and aqueous sodium hydroxide.

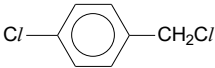


What could be a by-product of this reaction?

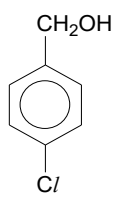
Hint: NaOH functions differently under aqueous and alcoholic (e.g. ethanolic) medium. This causes RX to undergo different types of reactions.

- 1 $\text{CH}_3\text{CH}=\text{CH}_2$
- 2 $\text{CH}_3\text{CH}_2\text{CH}_2\text{ONa}$
- 3 $\text{CH}_3\text{CH}(\text{OH})\text{CH}_3$

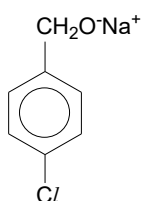
- A 1, 2 and 3 B 1 and 2 C 2 and 3 D 1 only

8. 4-chloro-1-(chloromethyl)benzene, , is boiled under reflux with an excess of aqueous sodium hydroxide. What is the main product?

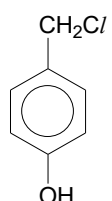
- A**



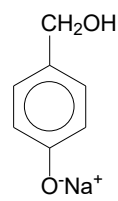
B



C

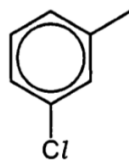


D

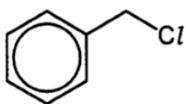


9. N17/1/23

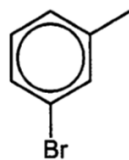
Equal amounts of compounds **W**, **X**, **Y** and **Z** are added separately to four test-tubes containing equal concentrations of ethanolic silver nitrate solution in a heated water bath. No precipitate forms in two of the tubes. In the two other tubes, precipitates formed at different rates.



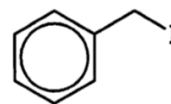
W



X



Y



Z

Which row is correct?

	compounds which do not form a precipitate	colour of the precipitate which forms the fastest
A	W and X	cream
B	W and X	yellow
C	W and Y	white
D	W and Y	yellow

Uses of Halogen Derivatives

10. Chlorofluorocarbons (CFCs) have been widely used in aerosols sprays, refrigerators and in making foamed plastics, but are now widely known to destroy ozone in the upper atmosphere.

What will **not** destroy ozone, and therefore can be used as a replacement for CFCs?

- A** CHBr_3
- B** CCl_3CBr_3
- C** CHCl/FCC/F_2
- D** $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_3$

Answers

1	3	4	5	6	7	8	9	10
A	D	C	D	B	D	A	D	D