

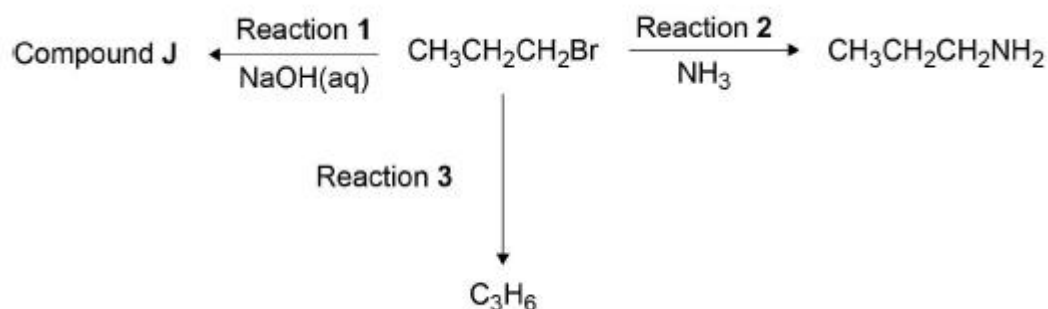
Name of the Student: _____

Max. Marks : 22 Marks

Time : 22 Minutes

Q1.

The diagram shows some compounds made from a halogenoalkane.



- (a) Draw the displayed formula of compound J.

(1)

- (b) Name the mechanism for Reaction 2 and give an essential condition used to ensure that $\text{CH}_3\text{CH}_2\text{CH}_2\text{NH}_2$ is the major product.

Name of mechanism _____

Condition _____

(2)

- (c) Calculate the mass, in grams, of $\text{CH}_3\text{CH}_2\text{CH}_2\text{NH}_2$ produced from 25.2 g of $\text{CH}_3\text{CH}_2\text{CH}_2\text{Br}$ in Reaction 2 assuming a 75.0% yield.

Give your answer to the appropriate number of significant figures.

- (d) When Reaction **2** is carried out under different conditions, a compound with molecular formula $C_9H_{21}N$ is produced.

Draw the skeletal formula of the compound.

Identify the functional group in the compound including its classification.

Skeletal formula

Functional group including classification _____

(2)

- (e) Identify the reagent and conditions used in Reaction **3**.

(1)

- (f) Name and outline a mechanism for Reaction **3**.

Name of mechanism _____

Mechanism

(4)

(Total 13 marks)

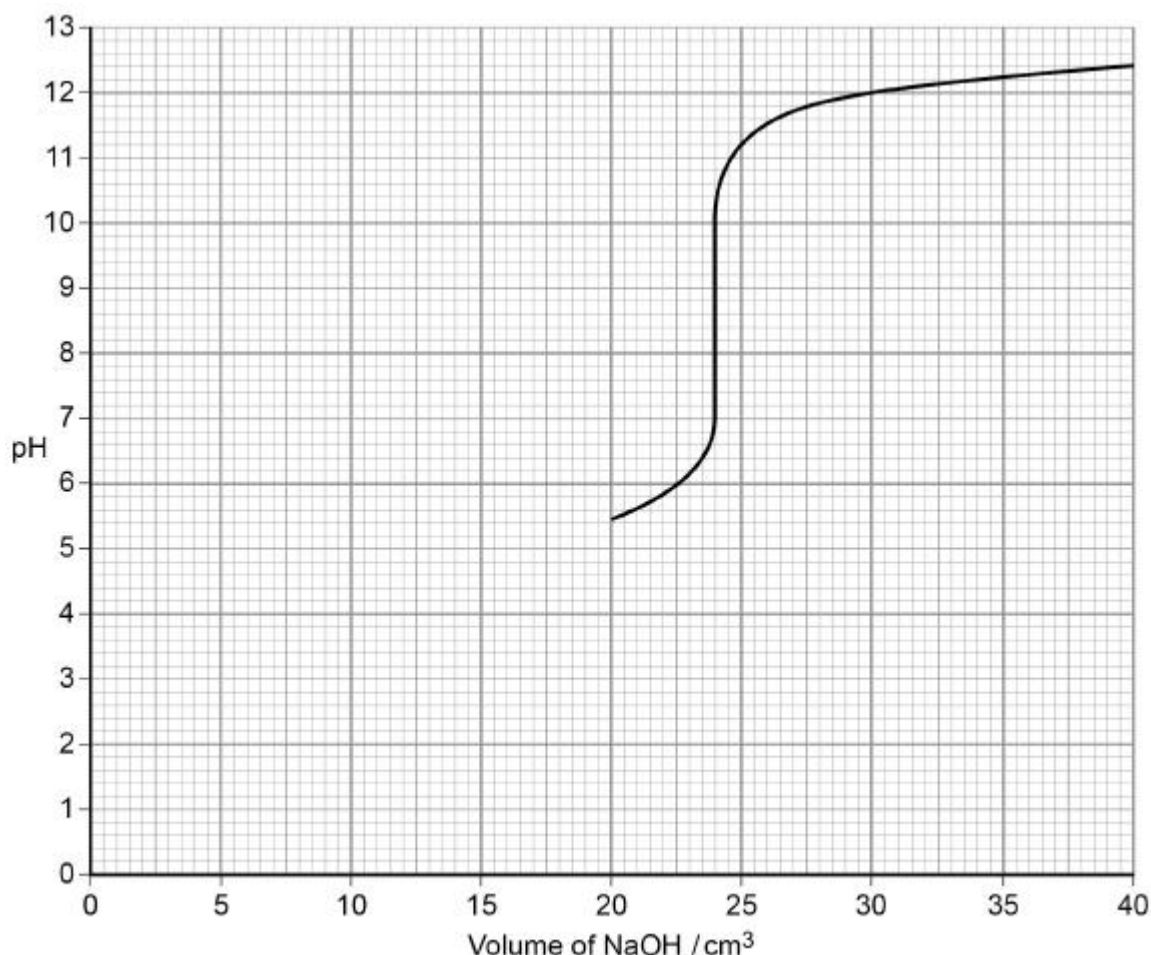
Q2.

A $0.100 \text{ mol dm}^{-3}$ solution of sodium hydroxide was gradually added to 25.0 cm^3 of a solution of a weak acid, HX, in the presence of a suitable indicator.

A graph was plotted of pH against the volume of sodium hydroxide solution, as shown in the figure below.

The first pH reading was taken after 20.0 cm^3 of sodium hydroxide solution had been added.

The acid dissociation constant of HX, $K_a = 2.62 \times 10^{-5} \text{ mol dm}^{-3}$



- (a) The pH range of an indicator is the range over which it changes colour.

Suggest the pH range of a suitable indicator for this titration.

(1)

- (b) Give the expression for the acid dissociation constant of HX.

$K_a =$

(1)

- (c) Calculate the concentration of HX in the original solution.

Concentration _____ mol dm⁻³ (2)

- (d) Calculate the pH of the solution of HX before the addition of any sodium hydroxide.

(If you were unable to calculate a value for the concentration of HX in part (c) you should use a value of 0.600 mol dm⁻³ in this calculation. This is not the correct value.)

pH of HX _____ (2)

- (e) Calculate the pH of the solution when half of the acid has reacted.

pH of solution _____ (1)

- (f) Plot your answers to part (d) and part (e) on the grid in the figure above.

Use these points to sketch the missing part of the curve between 0 and 20 cm³ of NaOH solution added.

(2)
(Total 9 marks)