

Q1. (a) Methylamine is a weak Brønsted-Lowry base and can be used in aqueous solution with one other substance to prepare a basic buffer.

(i) Explain the term *Brønsted-Lowry base* and write an equation for the reaction of methylamine with water to produce an alkaline solution.

Brønsted-Lowry base

Equation

(ii) Suggest a substance that could be added to aqueous methylamine to produce a basic buffer.

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(iii) Explain how the buffer solution in part (a)(ii) is able to resist a change in pH when a small amount of sodium hydroxide is added.

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(5)

(b) Explain why methylamine is a stronger base than ammonia.

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(2)

(c) A cation is formed when methylamine reacts with a large excess of bromoethane. Name the mechanism involved in the reaction and draw the structure of the cation formed.

Name of mechanism

Structure

(2)
(Total 9 marks)

Q2. (a) Synthetic polyamides are produced by the reaction of dicarboxylic acids with compounds such as $\text{H}_2\text{N}(\text{CH}_2)_6\text{NH}_2$

(i) Name the compound $\text{H}_2\text{N}(\text{CH}_2)_6\text{NH}_2$

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(ii) Give the repeating unit in the polyamide nylon 6,6.

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(2)

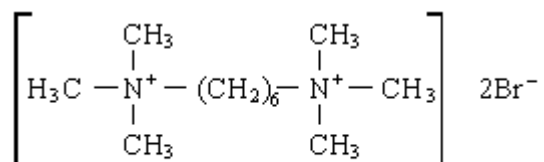
(b) Synthetic polyamides have structures similar to those found in proteins.

(i) Draw the structure of 2-aminopropanoic acid.

(ii) Draw the organic product formed by the condensation of two molecules of 2-aminopropanoic acid.

(2)

- (c) Compounds like $\text{H}_2\text{N}(\text{CH}_2)_6\text{NH}_2$ are also used to make ionic compounds such as **X**, shown below.



Compound **X**

- (i) **X** belongs to the same type of compound as $(\text{CH}_3)_4\text{N}^+\text{Br}^-$. Name this **type** of compound.

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- (ii) State a reagent which could produce **X** from $\text{H}_2\text{N}(\text{CH}_2)_6\text{NH}_2$ and give a necessary condition to ensure that **X** is the major product.

Reagent

Condition

- (iii) Name the mechanism involved in this reaction to form **X**.

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(4)
(Total 8 marks)