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— **TUITION** —

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CHEMISTRY

INORGANIC CHEMISTRY II

Level & Board	AQA (A-LEVEL)
TOPIC:	AMINES
PAPER TYPE:	QUESTION PAPER - 2
TOTAL QUESTIONS	10
TOTAL MARKS	46

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Amines - 2

1. 1,6-Diaminohexane can be formed in a two-stage synthesis starting from 1,4-dibromobutane.

(a) Suggest the reagent and a condition for each stage in this alternative synthesis.

(3)

(b) Explain why 3-aminopentane is a stronger base than ammonia.

(2)

(c) Justify the statement that there are no chiral centres in 3-aminopentane.

(1)

2. What type of reaction is used to convert $(\text{CH}_3)_3\text{N}$ into the cationic surfactant $[(\text{CH}_3)_3\text{N}(\text{CH}_2)_{15}\text{CH}_3]\text{Cl}$?

- A. Bronsted–Lowry acid-base reaction
- B. Nucleophilic addition
- C. Nucleophilic addition-elimination
- D. Nucleophilic substitution

(1)

3. This question is about amines.

(a) Explain why butylamine is a stronger base than ammonia.

(1)

(b) Identify a substance that could be added to aqueous butylamine to produce a basic buffer solution.

(3)

(c) Draw the structure of a tertiary amine which is an isomer of butylamine.

(1)

4. Which one of the following reactions does not involve donation of an electron pair?

- A. $\text{H}^+ + \text{CH}_3\text{NH}_2 \rightarrow \text{CH}_3\text{NH}_3^+$
B. $\text{AlCl}_3 + \text{Cl}^- \rightarrow \text{AlCl}_4^-$
C. $\text{CH}_3\text{Cl} + \text{CN}^- \rightarrow \text{CH}_3\text{CN} + \text{Cl}^-$
D. $\frac{1}{2} \text{Cl}_2 + \text{I}^- \rightarrow \text{Cl}^- + \frac{1}{2} \text{I}_2$

(1)

5. This question is about amines.

(a) Name and outline a mechanism for the formation of butylamine, $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{NH}_2$, by the reaction of ammonia with 1-bromobutane, $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{Br}$.

(5)

(b) Butylamine can also be prepared in a two-step synthesis starting from 1-bromopropane, $\text{CH}_3\text{CH}_2\text{CH}_2\text{Br}$.

Write an equation for each of the two steps in this synthesis.

(3)

6. Outline a mechanism for the formation of ethylamine from bromoethane.

State why the ethylamine formed is contaminated with other amines.

Suggest how the reaction conditions could be modified to minimise this contamination.

(6)

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

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

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(1)

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

(1)

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8. Synthetic polyamides have structures similar to those found in proteins.

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

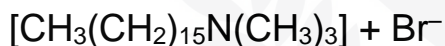
(2)

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

(2)

9. Cetrимide is used as an antiseptic.

Cetrимide



Name this type of compound.

Give the reagent that must be added to $\text{CH}_3(\text{CH}_2)_{15}\text{NH}_2$ to make cetrимide and state the reaction conditions.

Name the type of mechanism involved in this reaction.

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(4)

10. The amine $\text{CH}_3\text{CH}_2\text{CH}_2\text{NH}_2$ can be prepared by two different routes.

Route A is a two-stage process and starts from $\text{CH}_3\text{CH}_2\text{Br}$.

Route B is a one-stage process and starts from $\text{CH}_3\text{CH}_2\text{CH}_2\text{Br}$.

(a) Identify the intermediate compound in Route A.

Give the reagents and conditions for both stages in Route A and the single stage in Route B.



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(7)

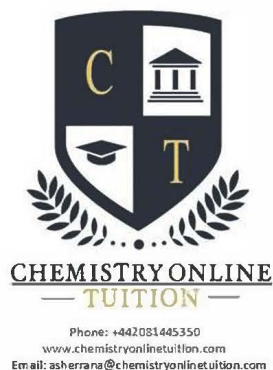
(b) Give one disadvantage of Route A and one disadvantage of Route B.

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(2)



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