

CHAPTER 28 AMINES

- 1 (a) Name the compound $(\text{CH}_3)_2\text{NH}$

.....
(1 mark)

- (b) $(\text{CH}_3)_2\text{NH}$ can be formed by the reaction of an excess of CH_3NH_2 with CH_3Br . Name and outline a mechanism for this reaction.

Name of mechanism

Mechanism

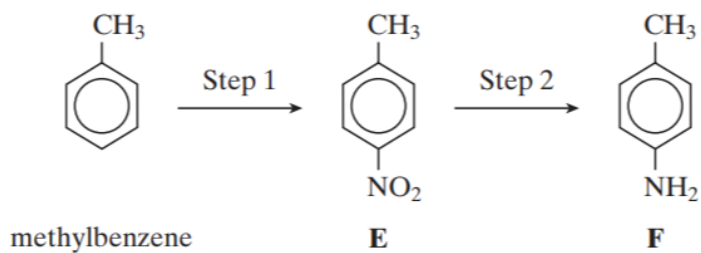
(5 marks)

- (c) Name the type of compound produced when a large excess of CH_3Br reacts with CH_3NH_2
Give a use for this type of compound.

Type of compound

Use
(2 marks)

2 Consider the following reaction sequence.



- (a) For Step 2, give a reagent or combination of reagents. Write an equation for this reaction using [H] to represent the reductant.

Reagent(s)

Equation

(2 marks)

- (b) Draw the structure of the species formed by **F** in an excess of hydrochloric acid.

(1 mark)

- (c) Compounds **G** and **H** are both monosubstituted benzenes and both are isomers of **F**. **G** is a primary amine and **H** is a secondary amine. Draw the structures of **G** and **H** below.

G

H

(2 marks)

- 3 (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, $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{Br}$.

Name of mechanism

Mechanism

(5 marks)

- (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.

Step 1

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Step 2

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(3 marks)

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

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(2 marks)

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

(1 mark)

4 Propylamine, $\text{CH}_3\text{CH}_2\text{CH}_2\text{NH}_2$, can be formed either by nucleophilic substitution or by reduction.

(a) Draw the structure of a compound which can undergo nucleophilic substitution to form propylamine.

(1 mark)

(b) Draw the structure of the nitrile which can be reduced to form propylamine.

(1 mark)

(c) State and explain which of the two routes to propylamine, by nucleophilic substitution or by reduction, gives the less pure product. Draw the structure of a compound formed as an impurity.

Route giving the less pure product

Explanation

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Structure of an impurity

(3 marks)

5 This question is about the primary amine $\text{CH}_3\text{CH}_2\text{CH}_2\text{NH}_2$

(a) The amine $\text{CH}_3\text{CH}_2\text{CH}_2\text{NH}_2$ reacts with CH_3COCl

Name and outline a mechanism for this reaction.

Give the IUPAC name of the organic product.

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.....
(6 marks)

(b) Isomers of $\text{CH}_3\text{CH}_2\text{CH}_2\text{NH}_2$ include another primary amine, a secondary amine and a tertiary amine.

Draw the structures of these **three** isomers.

Label each structure as primary, secondary or tertiary.

(3 marks)

- 6 (a) Name and outline a mechanism for the reaction of $\text{CH}_3\text{CH}_2\text{NH}_2$ with $\text{CH}_3\text{CH}_2\text{COCl}$
Name the amide formed.

(6 marks)

- (b) Haloalkanes such as CH_3Cl are used in organic synthesis.

Outline a three-step synthesis of $\text{CH}_3\text{CH}_2\text{NH}_2$ starting from methane. Your first step should involve the formation of CH_3Cl

In your answer, identify the product of the second step and give the reagents and conditions for each step.

Equations and mechanisms are **not** required.

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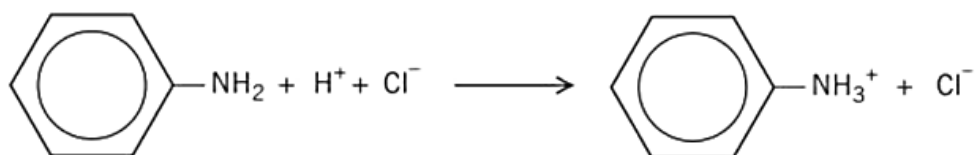
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(6 marks)

7 Consider the reaction shown below.



In this reaction phenylamine reacts with hydrochloric acid to form phenylammonium chloride.

(a) Explain how this reaction shows that phenylamine is a Brønsted-Lowry base.

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(1 mark)

(b) Explain why phenylammonium chloride is soluble in water.

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(1 mark)