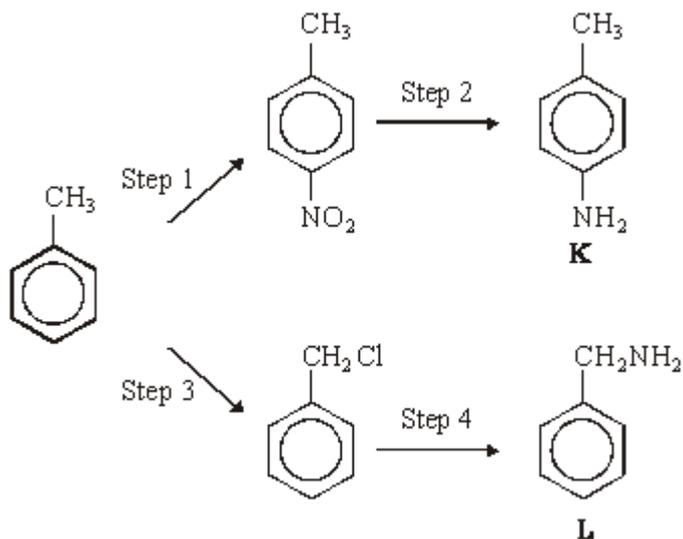


Q1. The following reaction scheme shows the formation of two amines, **K** and **L**, from methylbenzene.



- (a) (i) Give the reagents needed to carry out Step 1. Write an equation for the formation from these reagents of the inorganic species which reacts with methylbenzene.

Reagents

Equation

- (ii) Name and outline a mechanism for the reaction between this inorganic species and methylbenzene.

Name of mechanism

Mechanism

- (b) Give a suitable reagent or combination of reagents for Step 2.

(7)

.....

(1)

- (c) (i) Give the reagent for Step 4 and state a condition to ensure that the primary amine is the major product.

Reagent

Condition

- (ii) Name and outline a mechanism for Step 4.

Name of mechanism

Mechanism

(7)
(Total 15 marks)

- Q2.(a)** Outline a mechanism for the reaction of $\text{CH}_3\text{CH}_2\text{CH}_2\text{CHO}$ with HCN and name the product.

Mechanism

Name of product

(5)

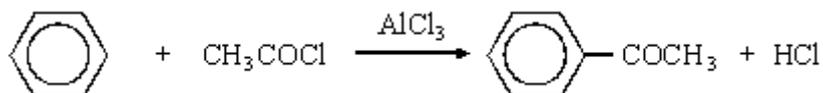
- (b) Outline a mechanism for the reaction of CH_3OH with $\text{CH}_3\text{CH}_2\text{COCl}$ and name the organic product.

Mechanism

Name of organic product

(5)

- (c) An equation for the formation of phenylethanone is shown below. In this reaction a reactive intermediate is formed from ethanoyl chloride. This intermediate then reacts with benzene.



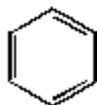
- (i) Give the formula of the reactive intermediate.

.....

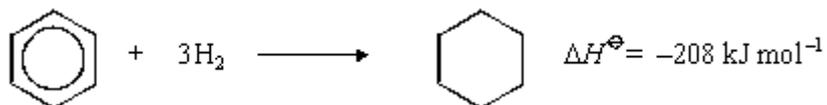
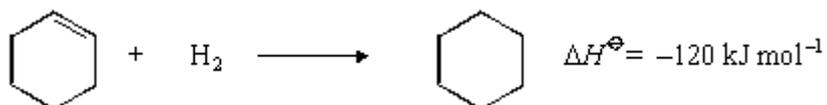
- (ii) Outline a mechanism for the reaction of this intermediate with benzene to form phenylethanone.

(4)
(Total 14 marks)

- Q3. (a) Use the following data to show the stability of benzene relative to the hypothetical cyclohexa-1,3,5-triene.

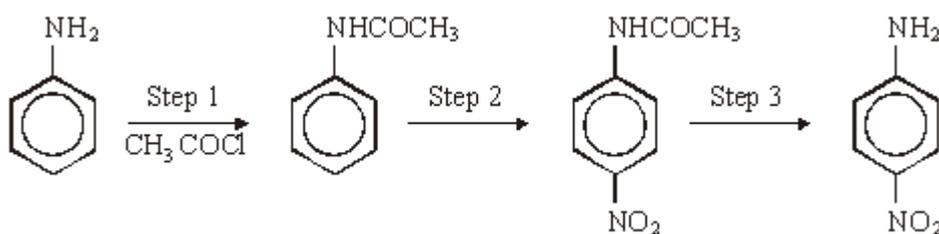


Give a reason for this difference in stability.



(4)

- (b) Consider the following reaction sequence which starts from phenylamine.



- (i) State and explain the difference in base strength between phenylamine and ammonia.
- (ii) Name and outline a mechanism for the reaction in Step 1 and name the organic product of Step 1.
- (iii) The mechanism of Step 2 involves attack by an electrophile. Give the reagents used in this step and write an equation showing the formation of the electrophile.
Outline a mechanism for the reaction of this electrophile with benzene.

- (iv) Name the type of linkage which is broken in Step 3 and suggest a suitable reagent for this reaction.

(17)
(Total 21 marks)