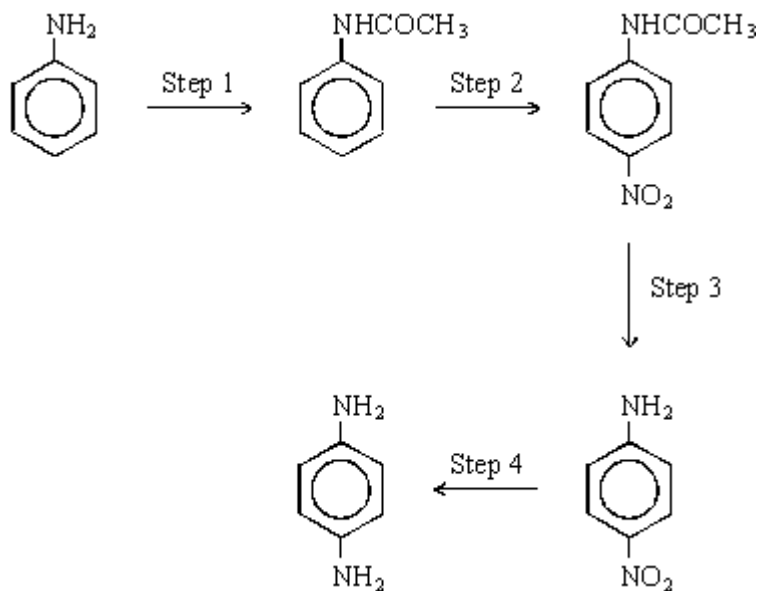


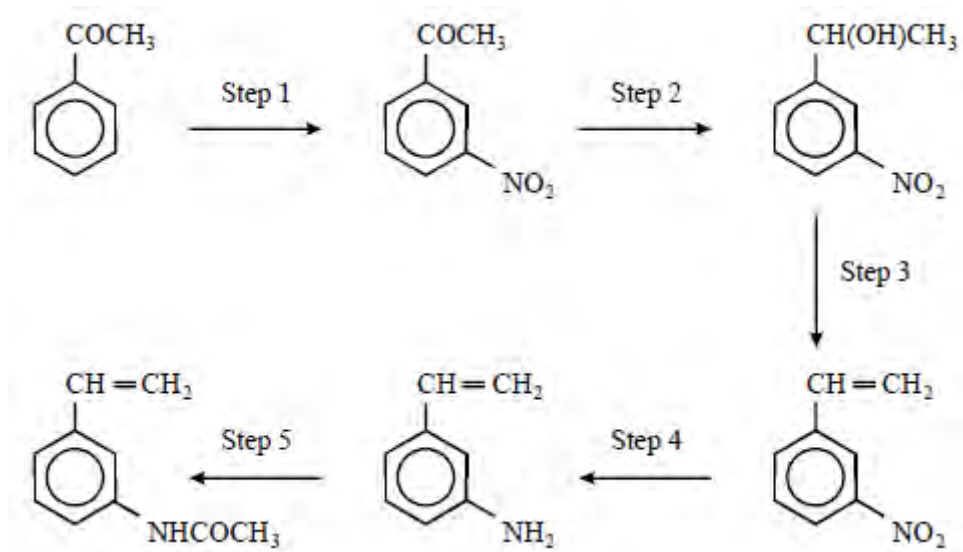
Q1. A possible synthesis of 1,4-diaminobenzene is shown below.



- (a) Identify a suitable reagent or combination of reagents for Step 1. Name and outline a mechanism for the reaction. (6)
- (b) Identify a suitable reagent or combination of reagents for Step 2. Name and outline a mechanism for the reaction. (6)
- (c) Identify a suitable reagent or combination of reagents for Step 4. Draw the repeating unit of the polymer formed by reaction of 1,4-diaminobenzene with pentanedioic acid. (3)

(Total 15 marks)

Q2. Refer to the following reaction sequence:

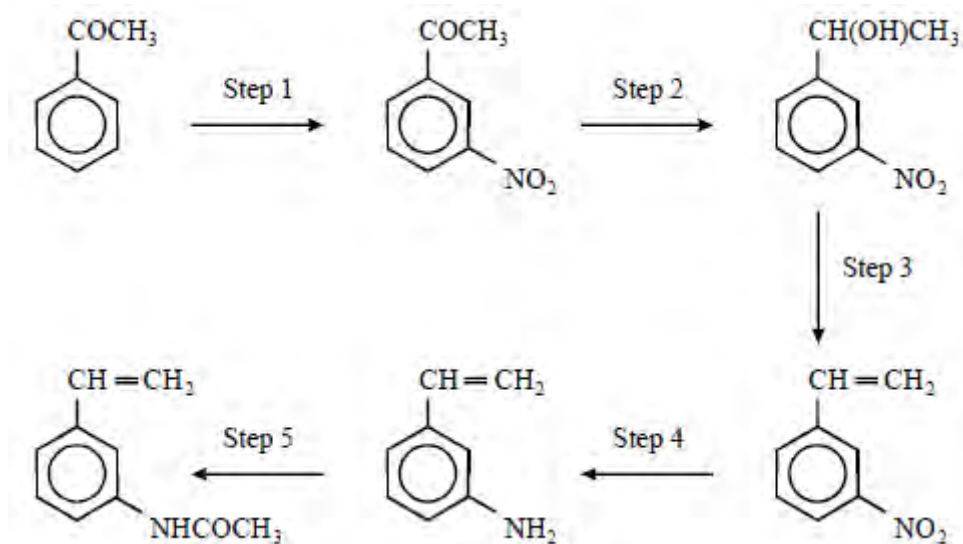


Which one of the following would be the most appropriate to carry out Step 2?

- A H_2 / Ni
- B Sn / HCl
- C NaBH_4
- D Fe / HCl

(Total 1 mark)

Q3. Refer to the following reaction sequence:



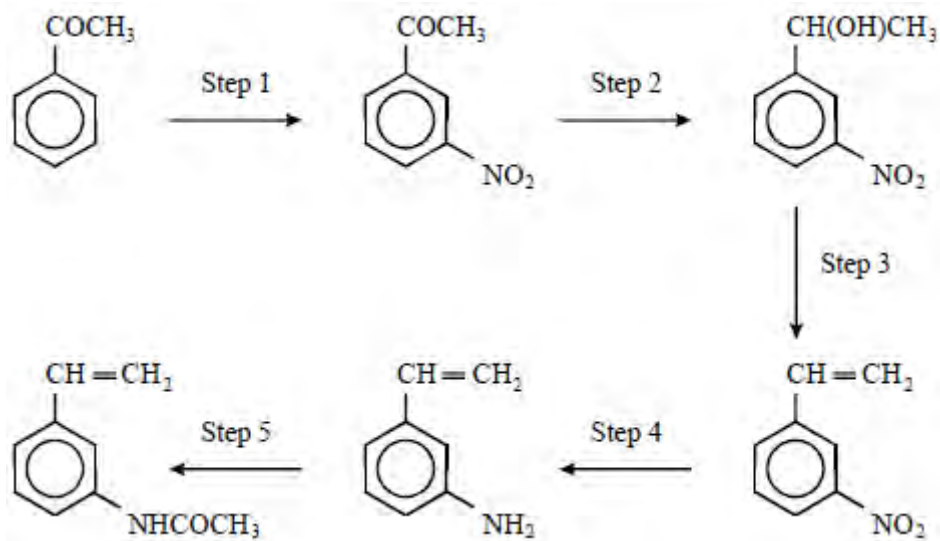
Which one of the following types of reaction mechanism is **not** involved in the above sequence?

- A electrophilic addition

- B electrophilic substitution
- C addition-elimination
- D elimination

(Total 1 mark)

Q4. Refer to the following reaction sequence:

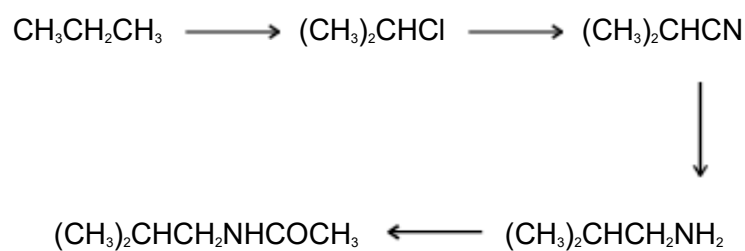


Which one of the following types of reaction is **not** involved in the above sequence?

- A acylation
- B oxidation
- C reduction
- D dehydration

(Total 1 mark)

Q5. Which one of the following types of reaction mechanism is **not** involved in the above sequence?



- A free-radical substitution
- B nucleophilic substitution
- C elimination
- D nucleophilic addition-elimination

(Total 1 mark)

Q6. (a) **P**, **Q** and **R** have the molecular formula C_6H_{12} .

All three are branched-chain molecules and none is cyclic.

P can represent a pair of optical isomers.

Q can represent a pair of geometrical isomers.

R can represent another pair of geometrical isomers different from **Q**.

Draw one possible structure for one of the isomers of each of **P**, **Q** and **R**.

Structure of **P**

Structure of **Q**

Structure of **R**

(3)

(b) Butanone reacts with reagent **S** to form compound **T** which exists as a racemic mixture. Dehydration of **T** forms **U**, C_5H_7N , which can represent a pair of geometrical isomers.

(i) State the meaning of the term *racemic mixture* and suggest why such a mixture is formed in this reaction.

Racemic mixture

.....

Explanation.....

.....
.....

(ii) Identify reagent **S**, and draw a structural formula for each of **T** and **U**.

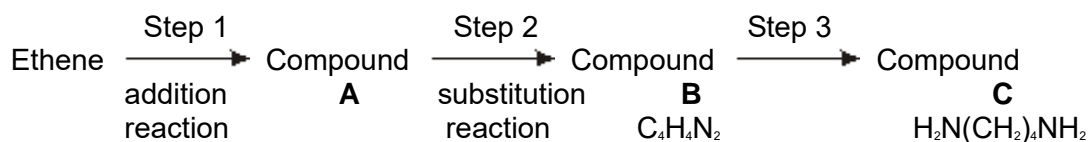
Reagent **S**

Compound **T**

Compound **U**

(6)
(Total 9 marks)

Q7.(a) Compound **C**, $\text{H}_2\text{N}(\text{CH}_2)_4\text{NH}_2$, can be synthesised from ethene in three steps as shown below.



Name compound **C** and draw a structure for each of compounds **A** and **B**.
State the reagent(s) required for each step and name the type of reaction involved in the conversion of **B** into **C**.

(7)

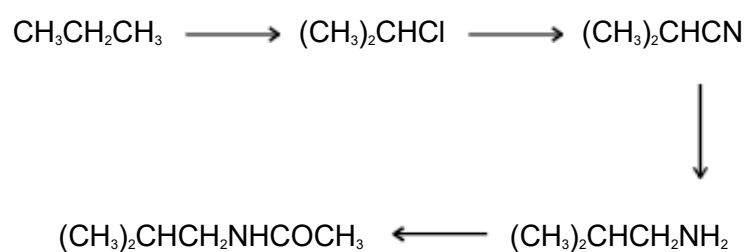
(b) Draw the repeating unit of the polyamide formed when **C** reacts with hexanedioic acid. Discuss the interactions between the chains of the polyamide.

(4)

- (c) Explain why polyamides are degraded by sodium hydroxide whereas polymers such as poly(ethene) are not.

(3)
(Total 14 marks)

Q8. Which one of the following types of reaction is **not** involved in the above sequence?



- A** halogenation
- B** acylation
- C** reduction
- D** oxidation

(Total 1 mark)