

1 Which one of the following pairs of reagents reacts to form an organic product that shows only 2 peaks in its proton n.m.r. spectrum?

- A butan-2-ol and acidified potassium dichromate(VI)
- B ethanoyl chloride and methanol
- C propanoic acid and ethanol in the presence of concentrated sulphuric acid
- D ethene and hydrogen in the presence of nickel

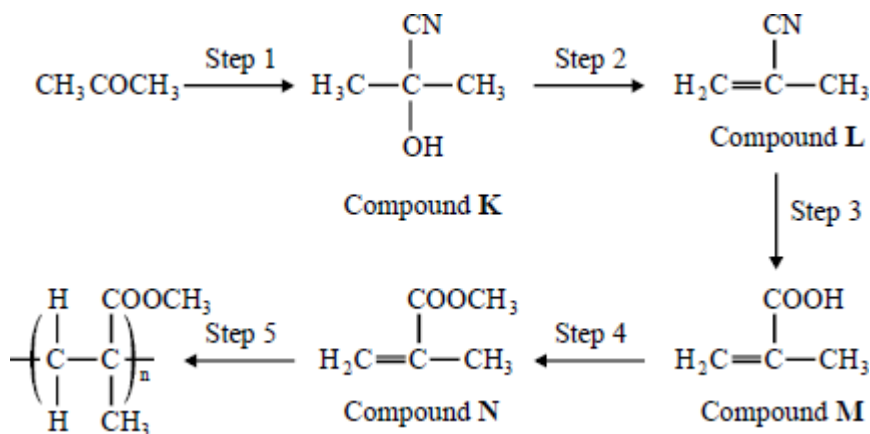
(Total 1 mark)

2 Which one of the following pairs reacts to form an organic product with only 2 singlets in its proton n.m.r. spectrum?

- A ethene and bromine
- B propan-2-ol and acidified potassium dichromate(VI)
- C ethanol and concentrated sulphuric acid
- D epoxyethane and water in the presence of dilute sulphuric acid

(Total 1 mark)

3 This question concerns the preparation of the plastic poly(methyl 2-methylpropenoate) (*Perspex*), starting from propanone.

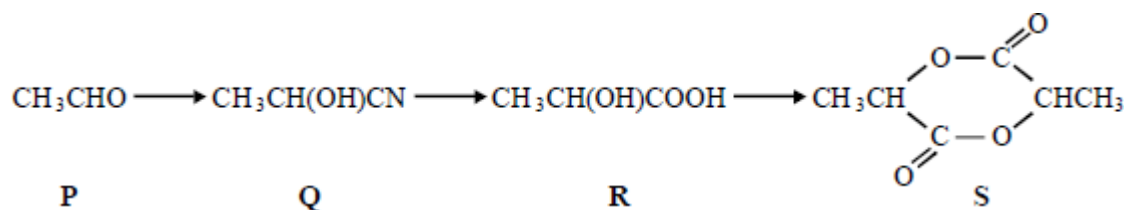


Which one of the following sets of reagents is **not** suitable for the step indicated?

- A Step 1 HCN (NaCN then dilute HCl)
- B Step 2 hot ethanolic KOH
- C Step 3 warm aqueous H<sub>2</sub>SO<sub>4</sub>
- D Step 4 CH<sub>3</sub>OH with an acid catalyst

(Total 1 mark)

4 This question refers to the reaction sequence below.

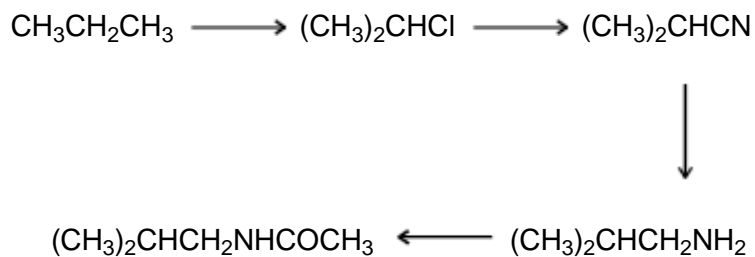


Which one of the following is **not** involved in the reaction sequence?

- A esterification
- B hydrolysis
- C nucleophilic addition
- D reduction

(Total 1 mark)

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

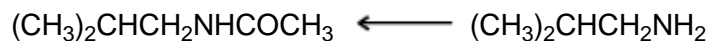
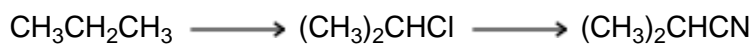


- A halogenation
- B acylation
- C reduction
- D oxidation

(Total 1 mark)

6

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

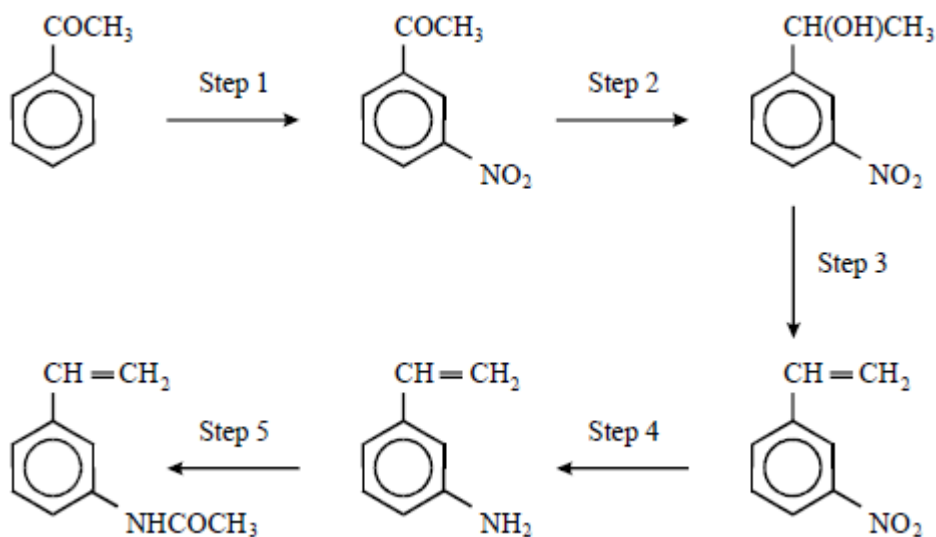


- A free-radical substitution
- B nucleophilic substitution
- C elimination
- D nucleophilic addition-elimination

(Total 1 mark)

7

Refer to the following reaction sequence:



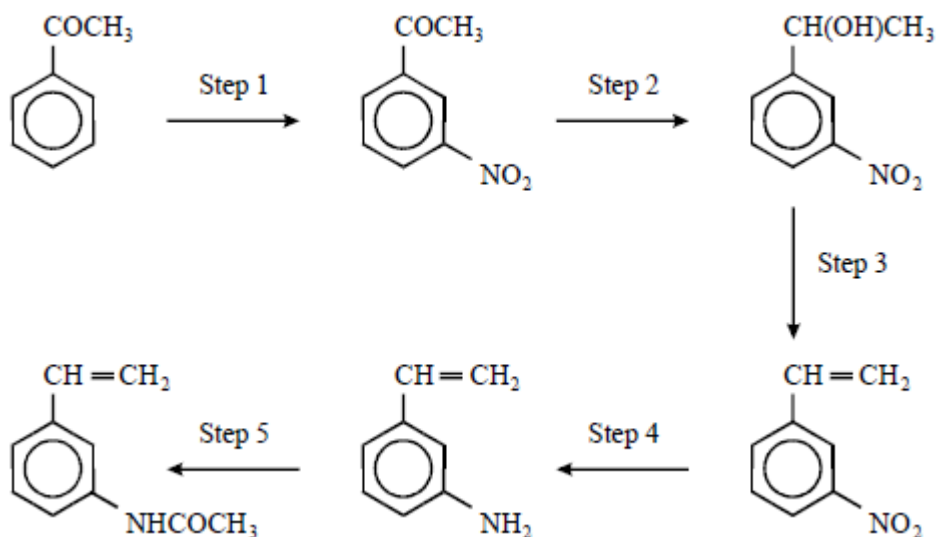
Which one of the following types of reaction is **not** involved in the above sequence?

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

(Total 1 mark)

8

Refer to the following reaction sequence:



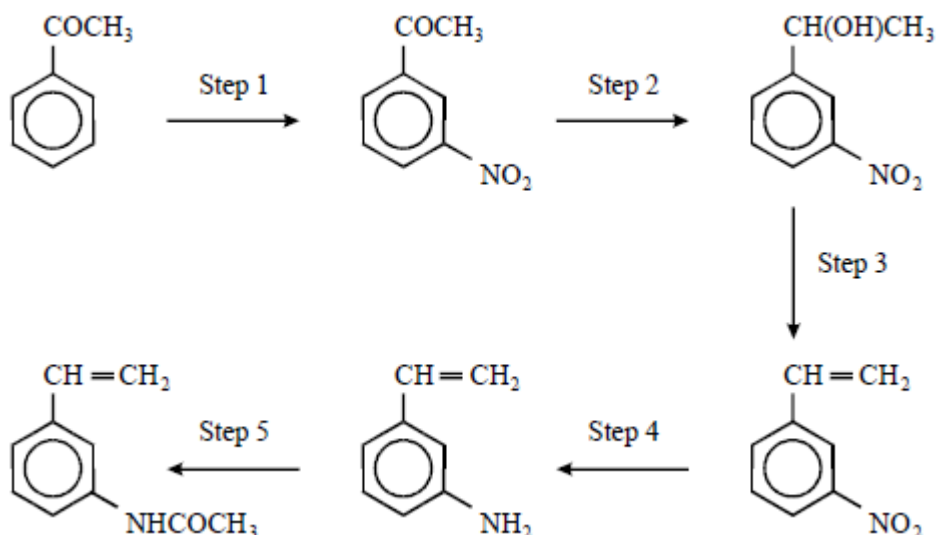
Which one of the following types of reaction mechanism is **not** involved in the above sequence?

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

(Total 1 mark)

9

Refer to the following reaction sequence:



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

- A  $\text{H}_2 / \text{Ni}$
- B  $\text{Sn} / \text{HCl}$
- C  $\text{NaBH}_4$
- D  $\text{Fe} / \text{HCl}$

(Total 1 mark)

10

Which amine has only **three** peaks in its proton NMR spectrum?

- A Methylamine
- B Trimethylamine
- C Diethylamine
- D Propylamine

(Total 1 mark)

11

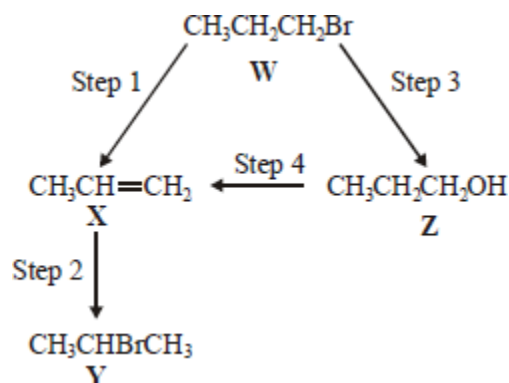
Which one of the following does **not** have a singlet peak in its proton n.m.r. spectrum?

- A butyl methanoate
- B propyl ethanoate
- C ethyl propanoate
- C methyl butanoate

(Total 1 mark)

12

For this question refer to the reaction scheme below.



Which one of the following statements is **not** correct?

- A **W** and **Y** are structural isomers.
- B **Z** is a primary alcohol.
- C **Y** gives two peaks in its proton n.m.r. spectrum.
- C **X** has geometrical isomers.

(Total 1 mark)

13

Which one of the following has a singlet peak in its proton n.m.r. spectrum?

- A ethyl propanoate
- B propyl methanoate
- C hexan-3-one
- D 2-chlorobutane

(Total 1 mark)

14

Propene reacts with hydrogen bromide to form a mixture of saturated organic products. The proton n.m.r. spectrum of the major organic product has

- A 3 peaks with relative intensities 3 : 2 : 2
- B 2 peaks with relative intensities 3 : 4
- C 3 peaks with relative intensities 3 : 1 : 3
- D 2 peaks with relative intensities 6 : 1

(Total 1 mark)

15

How many peaks will be observed in the low-resolution proton n.m.r. spectrum of  $(\text{CH}_3)_2\text{CHCOO}(\text{CH}_2)_3\text{CH}_3$ ?

- A 4
- B 5
- C 6
- D 7

(Total 1 mark)

Mark schemes

**B**  
**1**

[1]

**D**  
**2**

[1]

**B**  
**3**

[1]

**D**  
**4**

[1]

**D**  
**5**

[1]

**C**  
**6**

[1]

**B**  
**7**

[1]

**A**  
**8**

[1]

**C**  
**9**

[1]

**10**

**C**

[1]

**C**  
**11**

[1]

**D**  
**12**

[1]

**B**  
**13**

[1]

**D**  
**14**

[1]

**C**  
**15**

[1]