



Dr Clays A-level Chemistry

ORGANIC SYNTHESIS

Multiple Choice Qs



Organic Synthesis MULTIPLE CHOICE Qs

.Which one of the following is least likely to occur in the reaction between methane and chlorine?

- A $\text{CH}_4 + \text{Cl}\cdot \rightarrow \text{CH}_3\cdot + \text{HCl}$
B $\text{CH}_3\cdot + \text{HCl} \rightarrow \text{CH}_3\text{Cl} + \text{H}\cdot$
C $\text{CH}_3\cdot + \text{Cl}_2 \rightarrow \text{CH}_3\text{Cl} + \text{Cl}\cdot$
D $\text{CH}_3\text{Cl} + \text{Cl}\cdot \rightarrow \text{CH}_2\text{Cl}\cdot + \text{HCl}$

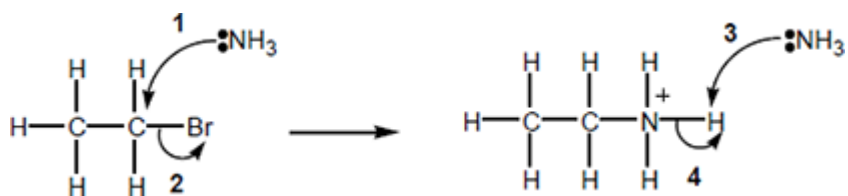
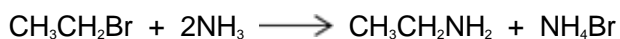
(Total 1 mark)

Q2. Which molecule is **not** produced when ethane reacts with bromine in the presence of ultraviolet light?

- A $\text{C}_2\text{H}_4\text{Br}_2$
B HBr
C H_2
D C_4H_{10}

(Total 1 mark)

Q3. This question is about a method that can be used to prepare ethylamine.



Which of the curly arrows in the mechanism is **not** correct?

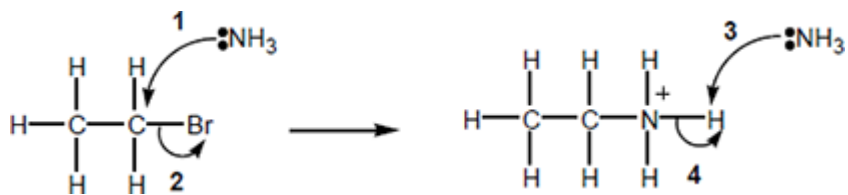
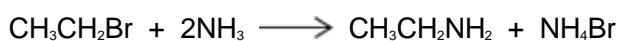
- A 1
B 2
C 3
D 4

(Total 1 mark)



Organic Synthesis MULTIPLE CHOICE Qs

Q4. This question is about a method that can be used to prepare ethylamine.



Which statement about the reaction is **not** correct?

- A** Ethylamine is a primary amine.
- B** The mechanism is a nucleophilic substitution.
- C** Using an excess of bromoethane will prevent further reaction to form a mixture of amine products.
- D** Ammonium bromide is an ionic compound.

(Total 1 mark)

Q5. Why are fluoroalkanes unreactive?

- A** Fluorine is highly electronegative.
- B** The F^- ion is very stable.
- C** They are polar molecules.
- D** The C-F bond is very strong.

(Total 1 mark)

Q6. Which one of the following statements explains best why fluoroalkanes are the least reactive haloalkanes?

- A** Fluorine is much more electronegative than carbon.
- B** The F^- ion is the most stable halide ion.
- C** The C-F bond is the most polar carbon-halogen bond.
- D** The C-F bond is the strongest carbon-halogen bond.

(Total 1 mark)



Organic Synthesis MULTIPLE CHOICE Qs

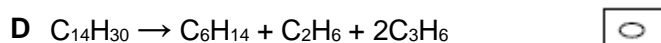
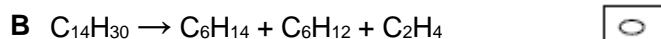
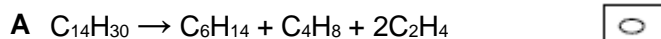
Q7. What is the major product of the reaction between but-1-ene and DBr?
(D is deuterium and represents ^2H)



(Total 1 mark)

Q8. Tetradecane ($\text{C}_{14}\text{H}_{30}$) is an alkane found in crude oil. When tetradecane is heated to a high temperature, one molecule of tetradecane decomposes to form one molecule of hexane and three more molecules.

Which of the following could represent this reaction?



(Total 1 mark)

Q9. Pentanenitrile can be made by reaction of 1-bromobutane with potassium cyanide.

Which of these is the correct name for the mechanism of this reaction?

A Electrophilic addition

B Electrophilic substitution

C Nucleophilic addition

D Nucleophilic substitution

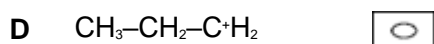
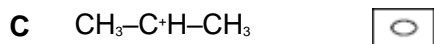
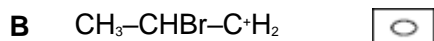
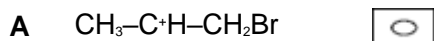
(Total 1 mark)



Organic Synthesis MULTIPLE CHOICE Qs

Q10. Consider the reaction between propene and hydrogen bromide to form the major product.

Which species is formed in the mechanism of this reaction?



(Total 1 mark)

Q11. How many different alkenes are formed when 2-bromo-3-methylbutane reacts with ethanolic potassium hydroxide?

A 2

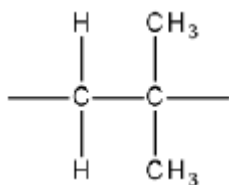
B 3

C 4

D 5

(Total 1 mark)

Q12. The repeating unit of a polymer is



Which of the following molecules would form a polymer containing this repeating unit?

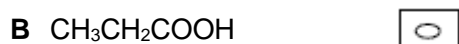


(Total 1 mark)



Organic Synthesis MULTIPLE CHOICE Qs

Q13. Which of the following compounds would form an orange-red precipitate when heated with Fehling's solution?



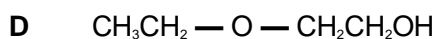
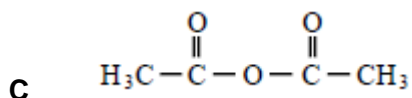
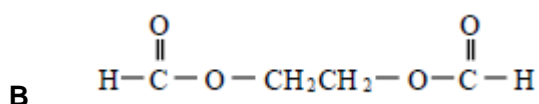
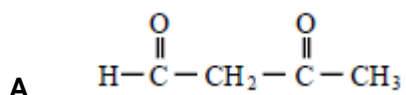
(Total 1 mark)

Q14. Which alcohol could **not** be produced by the reduction of an aldehyde or a ketone?



(Total 1 mark)

Q15. Which compound is formed by the reaction of ethane-1,2-diol with an acid?



(Total 1 mark)



Organic Synthesis MULTIPLE CHOICE Qs

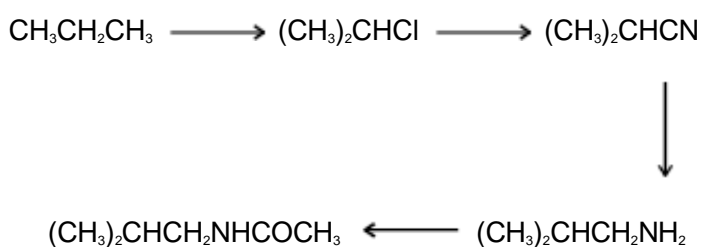
Q16. The compound lithium tetrahydridoaluminate(III), LiAlH_4 , is a useful reducing agent. It behaves in a similar fashion to NaBH_4 . Carbonyl compounds and carboxylic acids are reduced to alcohols. However, LiAlH_4 also reduces water in a violent reaction so that it must be used in an organic solvent.

Which one of the following can be reduced by LiAlH_4 to a primary alcohol?

- A**
- B**
- C**
- D**

(Total 1 mark)

Q17. Which one of the following types of reaction is **not** involved in the above sequence?



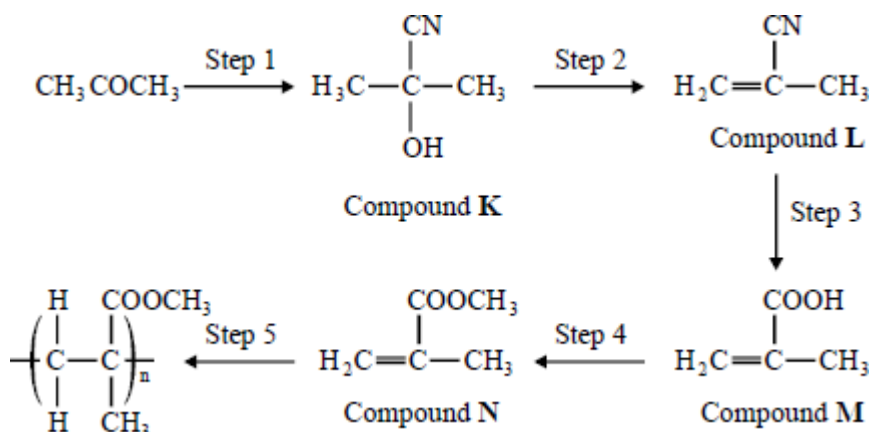
- A** halogenation
- B** acylation
- C** reduction
- D** oxidation

(Total 1 mark)



Organic Synthesis MULTIPLE CHOICE Qs

Q18. This question concerns the preparation of the plastic poly(methyl 2-methylpropenoate) (*Perspex*), starting from propanone.

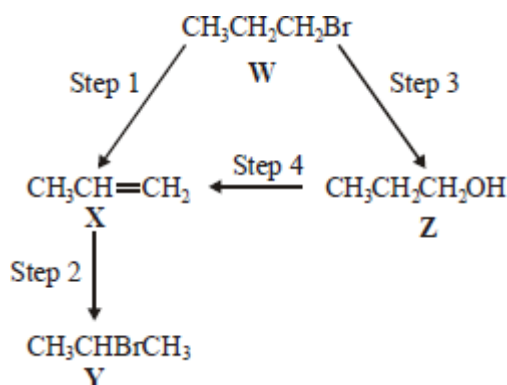


Which one of the following sets of reagents is **not** suitable for the step indicated?

- A Step 1 HCN (NaCN then dilute HCl)
- B Step 2 hot ethanolic KOH
- C Step 3 warm aqueous H_2SO_4
- D Step 4 CH_3OH with an acid catalyst

(Total 1 mark)

Q19. For this question refer to the reaction scheme below.



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

- A Reaction of **W** with sodium cyanide followed by hydrolysis of the resulting product gives propanoic acid.
- B Mild oxidation of **Z** produces a compound that reacts with Tollens' reagent, forming a silver mirror.
- C **Z** reacts with ethanoic acid to produce the ester propyl ethanoate.
- C **W** undergoes addition polymerisation to form poly(propene).

(Total 1 mark)



Organic Synthesis MULTIPLE CHOICE Qs

Q20. Which one of the following reactions will produce an organic compound that has optical isomers?

- A** dehydration of butan-2-ol by heating with concentrated sulphuric acid
- B** reduction of pentan-3-one by warming with NaBH_4
- C** addition of Br_2 to 3-bromopropene
- D** reduction of 2,3-dimethylpent-2-ene with H_2 in the presence of a nickel catalyst

(Total 1 mark)

Q21. In which one of the following mixtures does a redox reaction occur?

- A** ethanal and Tollens' reagent
- B** ethanoyl chloride and ethanol
- C** ethanal and hydrogen cyanide
- D** ethanoic acid and sodium hydroxide

(Total 1 mark)

Q22. Which one of the following statements about but-2-enal, $\text{CH}_3\text{CH}=\text{CHCHO}$, is **not** true?

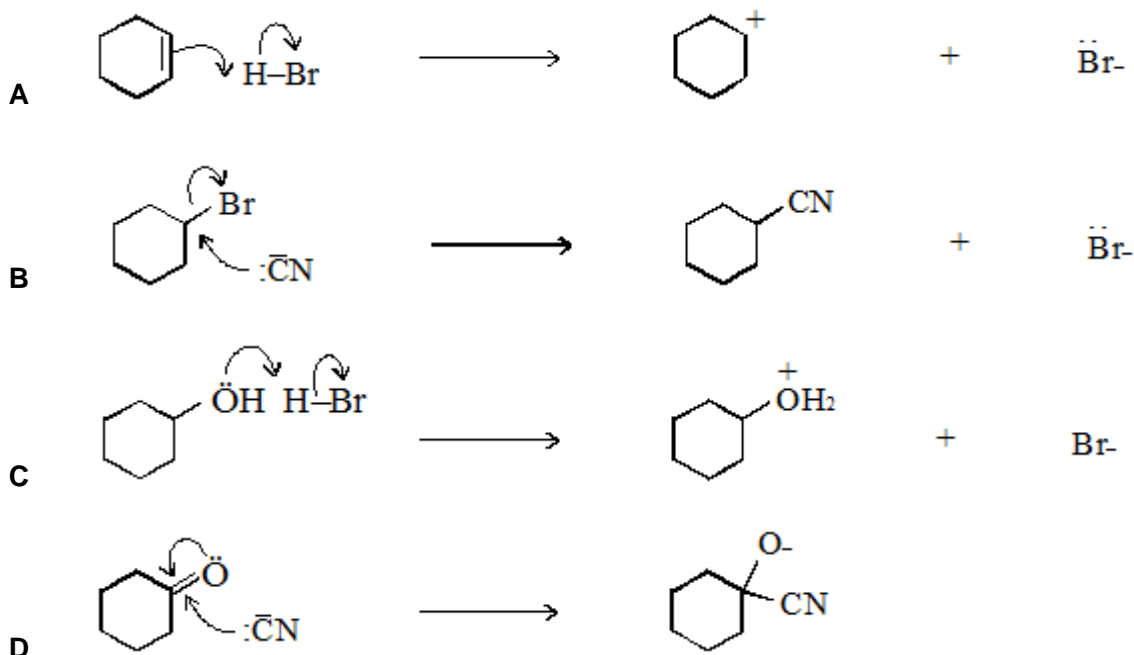
- A** It has stereoisomers.
- B** It shows a strong absorption in the infra-red at about 1700 cm^{-1} .
- C** It will turn an acidified solution of potassium dichromate(VI) green.
- D** It can be dehydrated by concentrated sulphuric acid.

(Total 1 mark)



Organic Synthesis MULTIPLE CHOICE Qs

Q23. In which one of the following are the curly arrows **not** used correctly?



(Total 1 mark)

Q24. Which one of the following is **not** a suitable method for the preparation of ethanol?

- A oxidation of ethane
- B hydration of ethene
- C reduction of ethanal
- D hydrolysis of bromoethane

(Total 1 mark)

Q25. Which one of the following would **not** reduce an acidified aqueous solution of potassium dichromate(VI)?

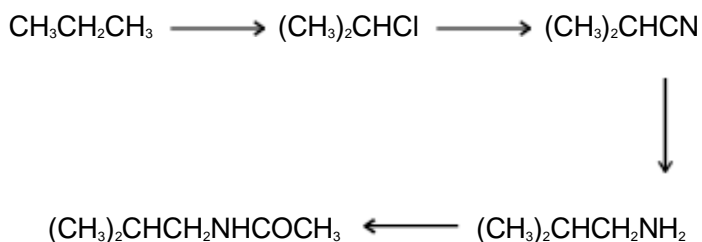
- A CH_3COOH
- B Zn
- C CH_3CHO
- D $\text{Fe}^{2+}(\text{aq})$

(Total 1 mark)



Organic Synthesis MULTIPLE CHOICE Qs

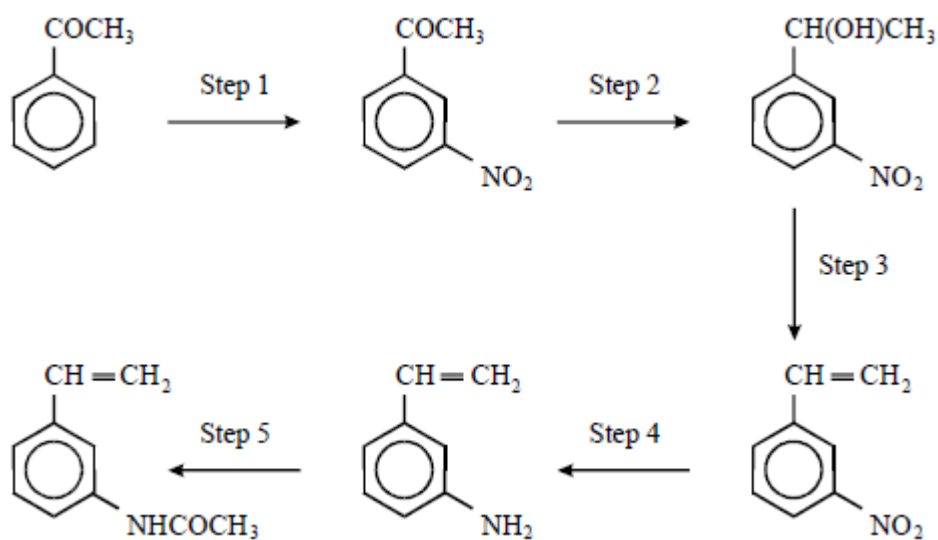
Q26. Which one of the following types of reaction mechanism is **not** involved in the above sequence?



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

(Total 1 mark)

Q27. Refer to the following reaction sequence:



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

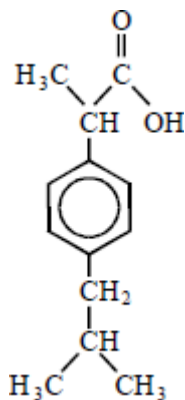
- A acylation
- B oxidation
- C reduction
- D dehydration

(Total 1 mark)



Organic Synthesis MULTIPLE CHOICE Qs

Q28. Ibuprofen is a drug used as an alternative to aspirin for the relief of pain, fever and inflammation. The structure of ibuprofen is shown below.

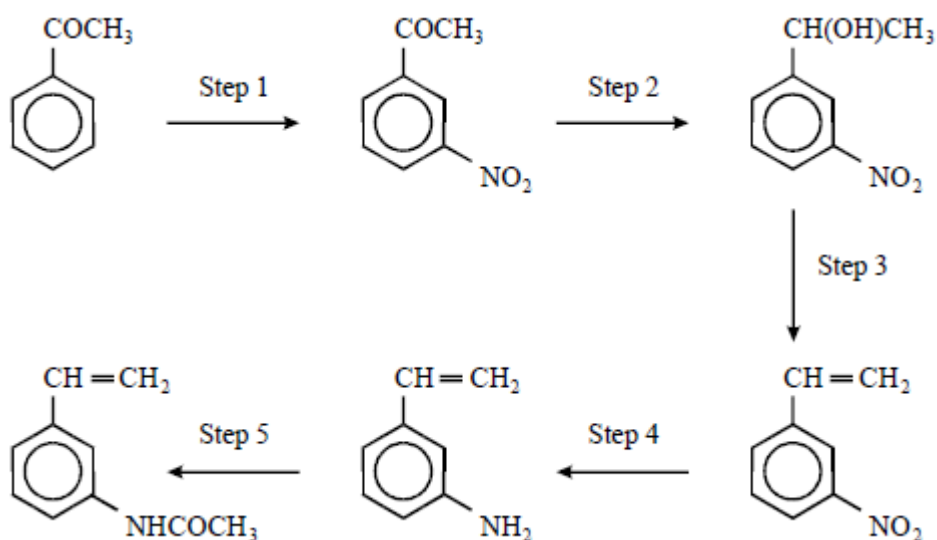


Which one of the following statements is **not** correct?

- A** It has optical isomers.
- B** It liberates carbon dioxide with sodium carbonate solution.
- D** It undergoes esterification with ethanol.
- D** It undergoes oxidation with acidified potassium dichromate(VI).

(Total 1 mark)

Q29. Refer to the following reaction sequence:



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

- A** H₂ / Ni
- B** Sn / HCl
- C** NaBH₄
- D** Fe / HCl

(Total 1 mark)



Organic Synthesis MULTIPLE CHOICE Qs

Q30. Which statement about *E*-1,2-dichloroethene is correct?

- A** It has the same boiling point as *Z*-1,2-dichloroethene.
- B** It forms a polymer with the same repeating unit as *Z*-1,2-dichloroethene.
- C** It has the same IR spectrum as *Z*-1,2-dichloroethene in the range 400–1500 cm⁻¹.
- D** It has a molecular ion peak different from that of *Z*-1,2-dichloroethene in its mass spectrum.

(Total 1 mark)

Q31. Which statement about ethanal is correct?

- A** It reacts with Tollens' reagent to form silver.
- B** It has a higher boiling point than ethanol.
- C** Its empirical and molecular formulas are different.
- D** It belongs to a homologous series with general formula C_nH_{2n+1}O

(Total 1 mark)



Dr Clays A-level Chemistry

Organic Synthesis MULTIPLE CHOICE Qs

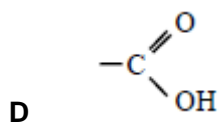
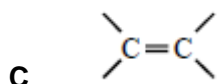
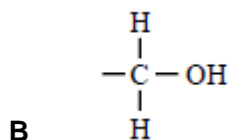
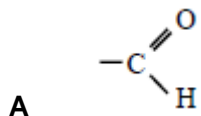


Organic Synthesis MULTIPLE CHOICE Qs

Q32. Certain chemical tests were performed on the pain-relief drug ibuprofen. The results of these tests are given in the table below.

Test	Result
Aqueous sodium carbonate	Effervescence
Bromine water	Remained orange
Acidified potassium dichromate(VI) and heat	Remained orange
Fehling's solution and heat	Remained blue

Which one of the following functional groups do these results suggest that ibuprofen contains?



(Total 1 mark)

Q33. Which one of the following will undergo nucleophilic addition?

- A** hex-3-ene
- B** hexan-3-one
- C** 3-bromohexane
- D** hexan-3-ol

(Total 1 mark)

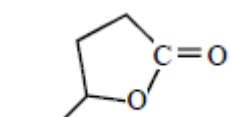


Organic Synthesis MULTIPLE CHOICE Qs

Q34. On reduction, a racemate can be formed by

- A** $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CHO}$
- B** $\text{CH}_3\text{CH}_2\text{CH}_2\text{COCH}_3$
- C** $\text{CH}_3\text{CH}_2\text{COCH}_2\text{CH}_3$
- D** $\text{CH}_3\text{CH}=\text{CHCH}_2\text{CHO}$

(Total 1 mark)

Q35. Acid hydrolysis of  produces

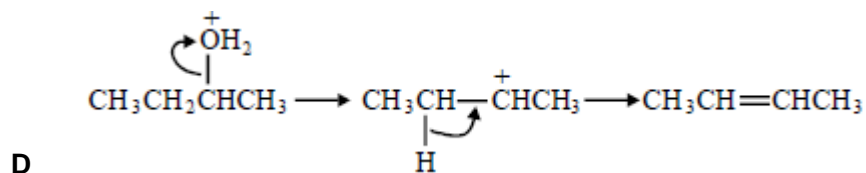
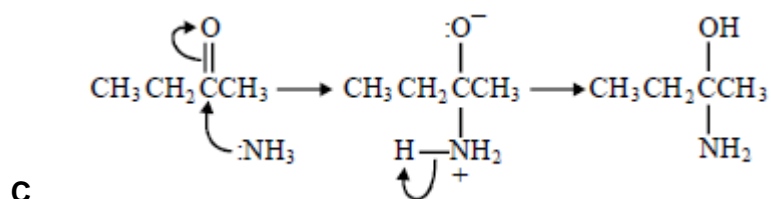
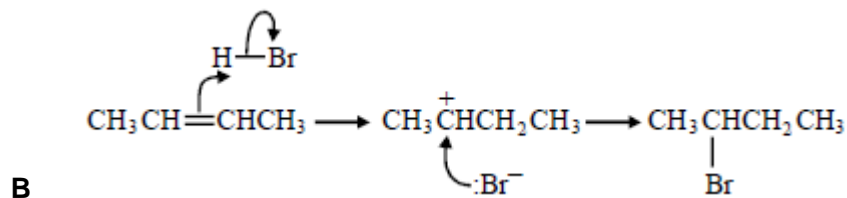
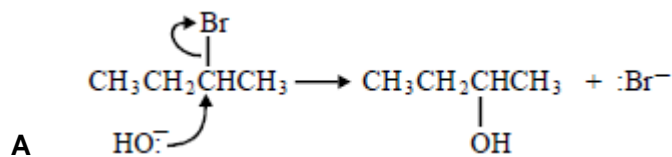
- A** $\text{CH}_3\text{CH}(\text{OH})\text{CH}_2\text{CH}_2\text{COOH}$
- B** $\text{CH}_2(\text{OH})\text{CH}_2\text{CH}_2\text{CH}_2\text{COOH}$
- C** $\text{CH}_3\text{CH}(\text{OH})\text{CH}_2\text{CH}_2\text{OCHO}$
- D** $\text{CH}_2(\text{OH})\text{CH}_2\text{CH}_2\text{CH}_2\text{OCHO}$

(Total 1 mark)



Organic Synthesis MULTIPLE CHOICE Qs

Q36. In which of the following is a curly arrow used incorrectly?



(Total 1 mark)



Organic Synthesis MULTIPLE CHOICE Qs

M1.B

[1]

M2.C

[1]

M3.D

[1]

M4.C

[1]

M5.D

[1]

M6.D

[1]

M7.C

[1]

M8.A

[1]



Organic Synthesis MULTIPLE CHOICE Qs

M9.D

[1]

M10.C

[1]

M11.A

[1]

M12.D

[1]

M13.C

[1]

M14.B

[1]

M15.B

[1]

M16.B

[1]

M17.D

[1]

M18.B

[1]



Organic Synthesis MULTIPLE CHOICE Qs

M19.A

[1]

M20.D

[1]

M21.A

[1]

M22.D

[1]

M23.D

[1]

M24.A

[1]

M25.A

[1]

M26.C

[1]

M27.B

[1]



Organic Synthesis MULTIPLE CHOICE Qs

M28.D

[1]

M29.C

[1]

M30.B

[1]

M31.A

[1]

M32.D

[1]

M33.B

[1]

M34.B

[1]

M35.A

[1]

M36.C



Organic Synthesis MULTIPLE CHOICE Qs