Q1. Consider the reaction between propene and hydrogen bromide to form the major product.

Which species is formed in the mechanism of this reaction?

A $CH_3–C^+H–CH_2Br$ ⬭

B $CH_3–CHBr–C^+H_2$ ⬭

C $CH_3–C^+H–CH_3$ ⬭

D $CH_3–CH_2–C^+H_2$ ⬭

(Total 1 mark)

Q2. 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)

Q3. Which statement about ethene is correct?

A It has no geometric isomers because there is free rotation around the C=C bond. ⬭

B It reacts with HBr in a nucleophilic addition reaction. ⬭

C It burns in excess oxygen to produce carbon dioxide and water. ⬭

D The C=C bond is twice as strong as the C–C bond in ethane. ⬭

(Total 1 mark)

Q4. What is the major product of the reaction between but-1-ene and DBr?
(D is deuterium and represents ^{2}H)

A $CH_2DCH_2CH_2CH_2Br$ ⬭

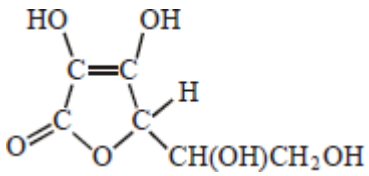
B $CH_2DCH_2CHBrCH_3$ ⬭

C $CH_3CH_2CHBrCH_2D$ ⬭

C $CH_3CH_2CHDCH_2Br$ ⬭

(Total 1 mark)

Q5. Which one of the following is **not** a correct statement about vitamin C, shown below?



A It is a cyclic ester.

B It can form a carboxylic acid on oxidation.

C It decolourises a solution of bromine in water.

D It is a planar molecule.

(Total 1 mark)

Q6. 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

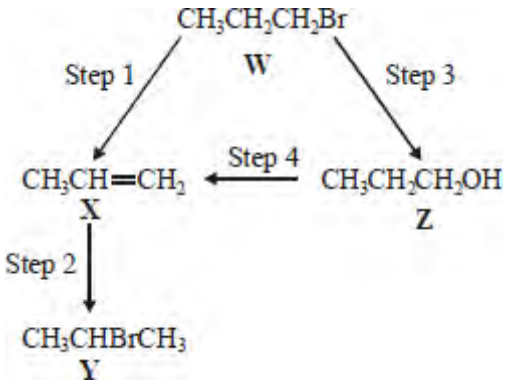
B reduction of pentan-3-one by warming with $NaBH_4$

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)

Q7. 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.

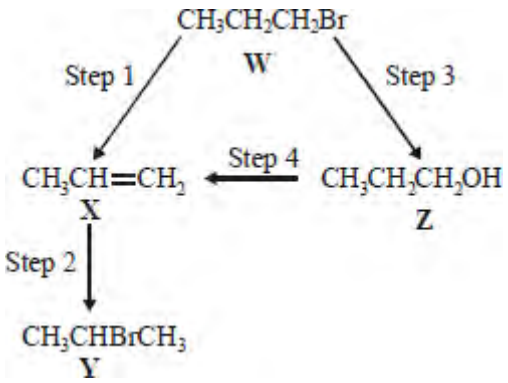
B Mild oxidation of **Z** produces a compound that reacts with Tollens' reagent, forming a silver mirror.

C **Z** reacts with ethanoic acid to produce the ester propyl ethanoate.

C **W** undergoes addition polymerisation to form poly(propene).

(Total 1 mark)

Q8. For this question refer to the reaction scheme below.



Which one of the following reagents would **not** bring about the reaction indicated?

A Step 1 : alcoholic KOH

B Step 2 : aqueous Br_2

C Step 3 : aqueous NaOH

C Step 4 : concentrated H_2SO_4

(Total 1 mark)

Q9. 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

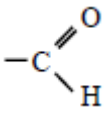
D 2 peaks with relative intensities 6 : 1

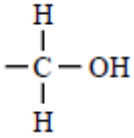
(Total 1 mark)

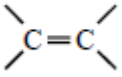
Q10. Certain chemical tests were performed on the pain-relief drug ibuprofen. The results of these tests are given in the table below.

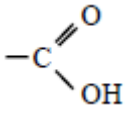
Test	**Result**
Aqueous sodium carbonate	Effervescence
Bromine water	Remained orange
Acidified potassium dichromate(VI) and heat	Remained orange
Fehling's solution and heat	Remained blue

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

A 

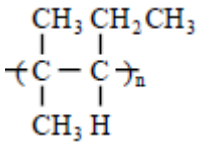
B 

C 

D 

(Total 1 mark)

Q11. The correct name for the alkene monomer which forms the polymer shown below is



A 2-methyl-3-ethylpropene

B 2-methylpent-2-ene

C 2-methylpent-3-ene

D 4-methylpent-2-ene

(Total 1 mark)

Q12. Which one of the following mechanisms is **not** involved in the reaction sequence below?

$CH_3CH_3 \rightarrow CH_3CH_2Cl \rightarrow CH_3CH_2OH \rightarrow CH_2{=}CH_2 \rightarrow CH_3CH_2Br$

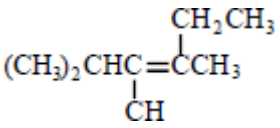
A electrophilic addition

B electrophilic substitution

C nucleophilic substitution

D free-radical substitution

(Total 1 mark)

Q13. The correct systematic name for  is

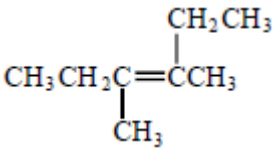
A 2-ethyl-3,4-dimethylpent-2-ene

B 4-ethyl-2,3-dimethylpent-3-ene

C 2,3,4-trirnethylhex-3-ene

D 3,4,5-trimethylhex-3-ene

(Total 1 mark)

Q14. The correct systematic name for  is

A 2,3-diethylbut-2-ene

B 2-ethyl-3-methylpent-2-ene

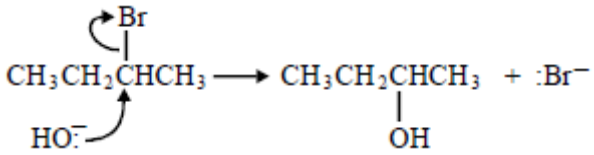
C 4-ethyl-3-methylpent-3-ene

D 3,4-dimethylhex-3-ene

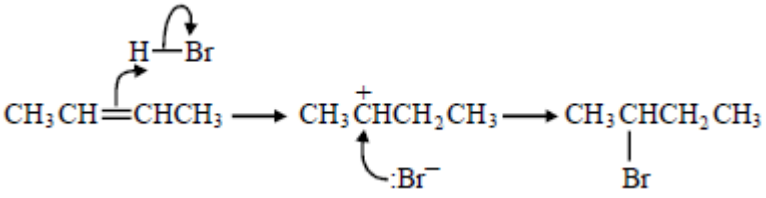
(Total 1 mark)

Q15. In which of the following is a curly arrow used incorrectly?

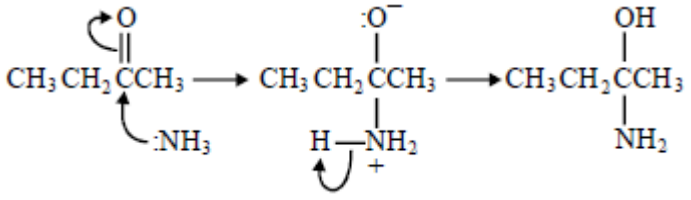
A



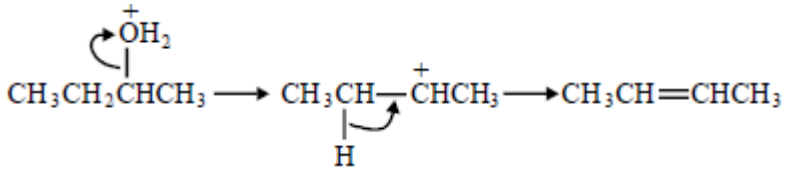
B



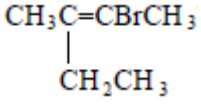
C



D



(Total 1 mark)

Q16. Which one of the following is the correct name for  ?

A 2-bromo-3-methylpent-2-ene

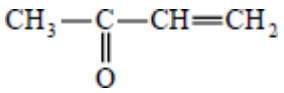
B 2-bromo-3-ethylbut-2-ene

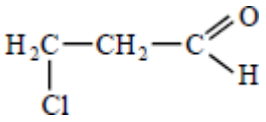
C 3-bromo-2-ethylbut-2-ene

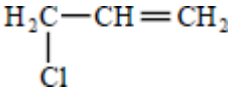
D 4-bromo-3-methylpent-3-ene

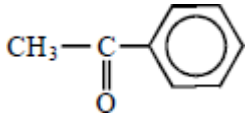
(Total 1 mark)

Q17. Which one of the following can react both by nucleophilic addition and by nucleophilic substitution?

A 

B 

C 

D 

(Total 1 mark)

Q18. Which one of the following does **not** contain any delocalised electrons?

A poly(propene)

B benzene

C graphite

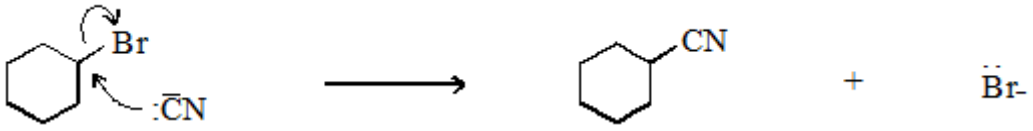
D sodium

(Total 1 mark)

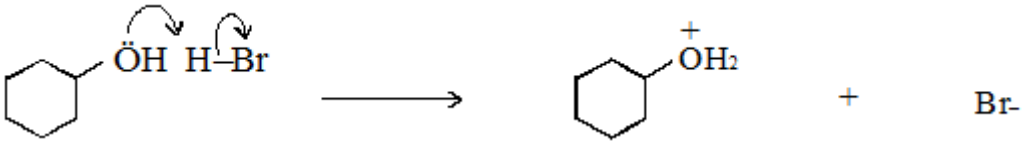
Q19. In which one of the following are the curly arrows **not** used correctly?

A

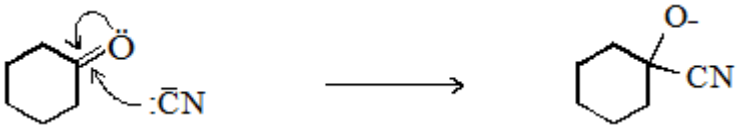
B



C



D



(Total 1 mark)

Q20. Which one of the following does **not** represent an oxidation?

A propene → propane

B propan-l-ol → propanal

C propan-l-ol → propanoic acid

D propanal → propanoic acid

(Total 1 mark)

Q21. 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)

Q22. Which one of the following reactions involves nucleophilic addition?

A $CH_3CH = CH_2 + HBr \rightarrow CH_3CHBrCH_3$

B $CH_3CH_2CH_3 + Cl_2 \rightarrow CH_3CHClCH_3 + HCl$

C $CH_3CH_2CH_2Br + NaOH \rightarrow CH_3CH_2CH_2OH + NaBr$

D $CH_3CH_2CHO + HCN \rightarrow CH_3CH_2CH(OH)CN$

(Total 1 mark)

Q23. Which one of the following conversions does **not** represent a reduction?

A propene → propane

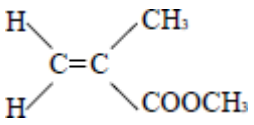
B propanal → propan-l-ol

C propanal → propanoic acid

D propanone → propane

(Total 1 mark)

Q24. The structure of the molecule of methyl 2-methylpropenoate is shown below.



Which one of the following statements concerning this compound is **not** true?

A It displays geometrical isomerism.

B It forms an addition polymer.

C It undergoes reduction.

D It decolourises bromine.

(Total 1 mark)