1 Sulfur dioxide (SO_2) is produced when some fossil fuels are burned.

Which of the following statements is true?

A Sulfur dioxide can be removed from waste gases in a power station by an acid-base reaction with calcium oxide. ⬭

B Sulfur dioxide is insoluble in water. ⬭

C Sulfur dioxide is a basic oxide. ⬭

D Sulfur dioxide is an ionic compound. ⬭

(Total 1 mark)

2 Tetradecane ($C_{14}H_{30}$) 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?

A $C_{14}H_{30} \longrightarrow C_6H_{14} + C_4H_8 + 2C_2H_4$ ⬭

B $C_{14}H_{30} \longrightarrow C_6H_{14} + C_6H_{12} + C_2H_4$ ⬭

C $C_{14}H_{30} \longrightarrow C_5H_{12} + 3C_3H_6$ ⬭

D $C_{14}H_{30} \longrightarrow C_6H_{14} + C_2H_6 + 2C_3H_6$ ⬭

(Total 1 mark)

3 Which of these substances does **not** contribute to the greenhouse effect?

A Unburned hydrocarbons. ⬭

B Carbon dioxide. ⬭

C Water vapour. ⬭

D Nitrogen. ⬭

(Total 1 mark)

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

A $C_2H_4Br_2$ ⬭

B HBr ⬭

C H_2 ⬭

D C_4H_{10} ⬭

(Total 1 mark)

5 The percentage by mass of carbon is 83.3% in

A propane.

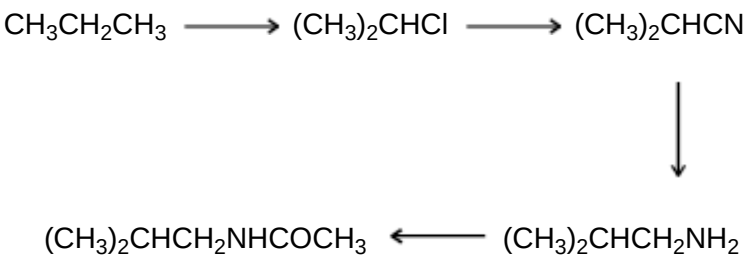
B butane.

C pentane.

D hexane.

(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 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)

8 An alkane contains 30 hydrogen atoms per molecule. Its empirical formula is

A C_6H_{15}

B C_7H_{15}

C $C_{14}H_{30}$

D $C_{15}H_{30}$

(Total 1 mark)

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

A $CH_4 + Cl\bullet \rightarrow CH_3\bullet + HCl$

B $CH_3\bullet + HCl \rightarrow CH_3Cl + H\bullet$

C $CH_3\bullet + Cl_2 \rightarrow CH_3Cl + Cl\bullet$

D $CH_3Cl + Cl\bullet \rightarrow CH_2Cl\bullet + HCl$

(Total 1 mark)

10 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)

11 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 ⬭

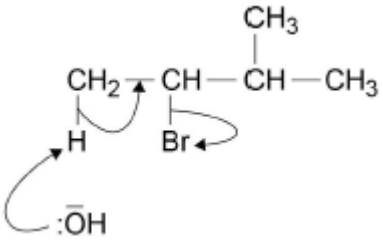
C Nucleophilic addition ⬭

D Nucleophilic substitution ⬭

(Total 1 mark)

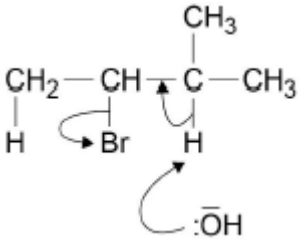
12 Which of the following is a correct mechanism for the formation of 2-methylbut-2-ene from 2-bromo-3-methylbutane?

A



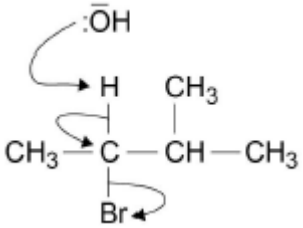
⬭

B



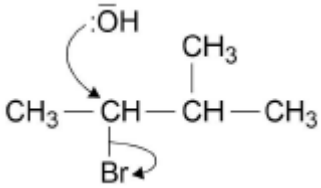
⬭

C



⬭

D

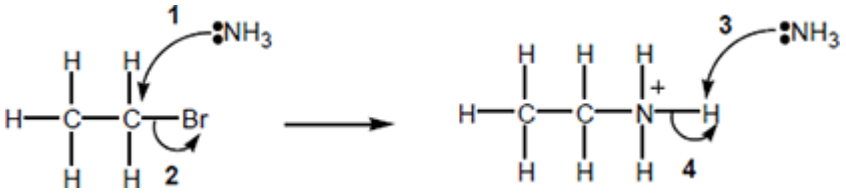


⬭

(Total 1 mark)

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

$$CH_3CH_2Br + 2NH_3 \longrightarrow CH_3CH_2NH_2 + NH_4Br$$



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

A 1 ⬭

B 2 ⬭

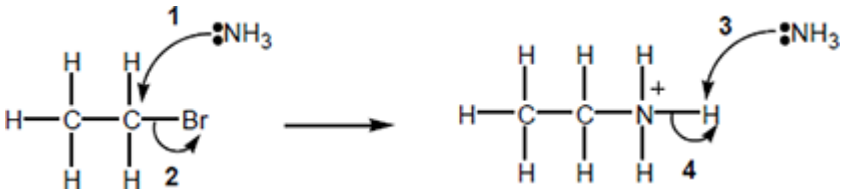
C 3 ⬭

D 4 ⬭

(Total 1 mark)

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

$$CH_3CH_2Br + 2NH_3 \longrightarrow CH_3CH_2NH_2 + NH_4Br$$



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)

15 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)

16 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)

17 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)

18 Which one of the following reactions does **not** involve donation of an electron pair?

A $H^+ + CH_3NH_2 \rightarrow CH_3NH_3^+$

B $AlCl_3 + Cl^- \rightarrow A1C1_4^-$

C $CH_3Cl + CN^- \rightarrow CH_3CN + Cl^-$

D $\frac{1}{2}Cl_2 + I^- \rightarrow Cl^- + \frac{1}{2}I_2$

(Total 1 mark)

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

A 2

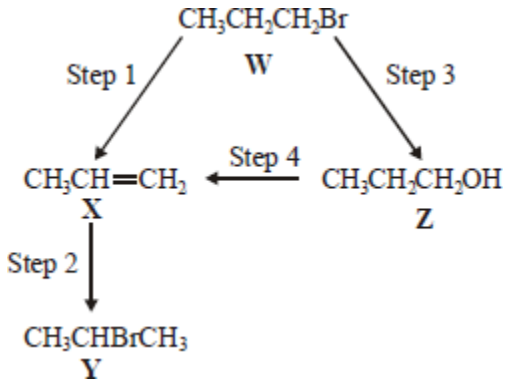
B 3

C 4

D 5

(Total 1 mark)

20 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.

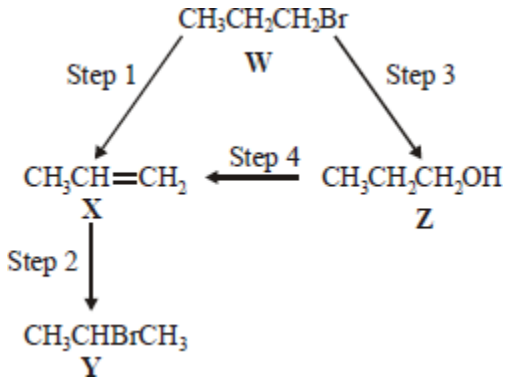
B Mild oxidation of **Z** produces a compound that reacts with Tollens' reagent, forming a silver mirror.

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

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

(Total 1 mark)

21 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

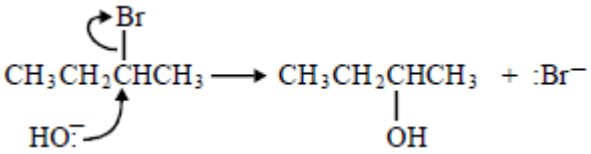
C Step 3 : aqueous NaOH

C Step 4 : concentrated H_2SO_4

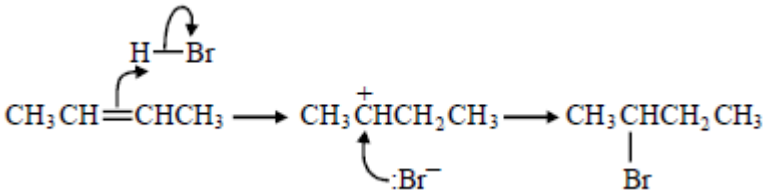
(Total 1 mark)

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

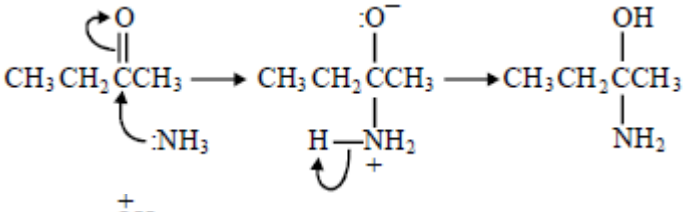
A



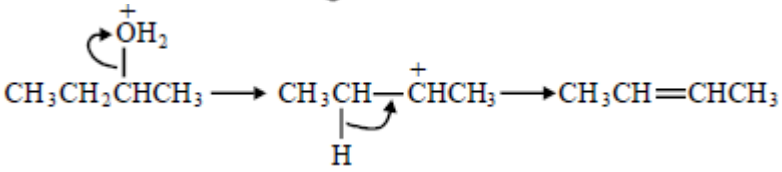
B



C

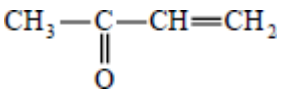


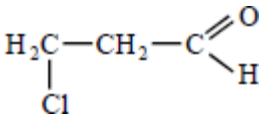
D

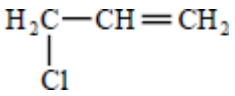


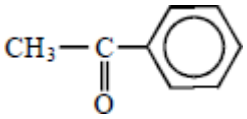
(Total 1 mark)

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

A 

B 

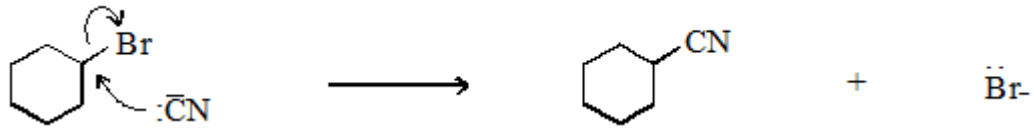
C 

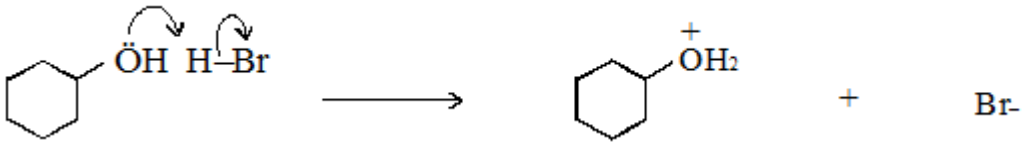
D 

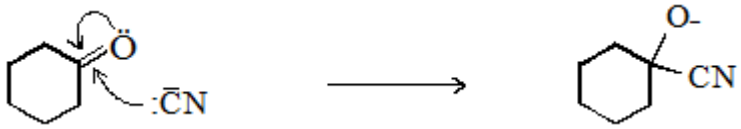
(Total 1 mark)

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

A 

B 

C 

D 

(Total 1 mark)

25 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)

Mark schemes

1	A	[1]
2	A	[1]
3	D	[1]
4	C	[1]
5	C	[1]
6	C	[1]
7	B	[1]
8	B	[1]
9	B	[1]
10	D	[1]
11	D	[1]
12	B	[1]
13	D	[1]
14	C	[1]
15	D	[1]
16	A	[1]
17	D	[1]
18	D	[1]

19	A	[1]
20	A	[1]
21	B	[1]
22	C	[1]
23	B	[1]
24	D	[1]
25	A	[1]