Hydrocarbons

Question1

Dehydration of an organic acid X with concentrated H_2SO_4 at 373 K gives H_2O and gas Y. The hybridisation of the carbon in Y and nature of Y are respectively.

TG EAPCET 2025 (Online) 2nd May Evening Shift

Options:

A.

sp^2, Neutral

B.

sp, Neutral

C.

sp^2, Acidic

D.

sp, Acidic

Answer: B

Solution:

The reaction involved is,

$$\underset{\substack{\text{(Organic acid)}\\ X}}{HCOOH} \xrightarrow[373\ K]{H_2SO_4} \underset{\text{(Gas Y)}}{CO\uparrow} + H_2O$$

Thus, the hybridisation of Y is sp and its nature is neutral.

Question2

Consider the given sequence of reactions,

$$C_2H_6 + \frac{3}{2}O_2 \xrightarrow[\Delta]{(CH,COO)_2Mn} X \xrightarrow{Na} Y$$

Electrolysis of aqueous solution of Y gives gases P and Q at anode. P and Q are respectively

TG EAPCET 2025 (Online) 2nd May Evening Shift

Options:

A.

C_2H_6, CO_2

B.

CH_4, CO_2

C.

C_2H_6, H_2

D.

CH_4, CO

Answer: A

Solution:

The complete reaction is as follows,

$$C_2H_6 + \frac{3}{2}O_2 \xrightarrow{(CH_3COO)_2Mn,\Delta} \underset{\text{(Product } X\text{)}}{2CH_3COOH} \xrightarrow{Na} \underset{\text{(Product } Y\text{)}}{CH_3COO^-}$$

Now Kolbe's electrolysis,

$$2CH_3COO^- \xrightarrow{\text{Electrolysis}} \underset{\substack{(P)\\ \text{Ethane}}}{C_2H_6} + \underset{\text{(Q gas)}}{2CO_2} + 2e^-$$

Question3

Which of the following is an example of electrophilic substitution reaction?

TG EAPCET 2025 (Online) 2nd May Evening Shift

Options:

A.

$CH_3CHO + HCN \longrightarrow CH_3CH(OH)CN$

B.

$(CH_3)_3CX + H_2O \longrightarrow (CH_3)_3C - OH + HX$

C.

$C_6H_6 + CH_3COCl \xrightarrow{AlCl_3} C_6H_5(COCH_3) + HCl$

D.

$BrCH_2CH_2Br + Zn \xrightarrow[\Delta]{\text{Alcohol}} CH_2 = CH_2 + ZnBr_2$

Answer: C

Solution:

Among the given options (c) is an example of electrophilic substitution reaction.

$C_6H_6 + CH_3COCl \xrightarrow{AlCl_3} C_6H_5(COCH_3) + HCl$

The given reaction is Friedal-Crafts acylation reaction, here the reaction of benzene with an arylhalide or acid anhydride is the presence of Lewis acid $(AlCl_3)$ yields acyl benzene. Here, the attacking reagent is as electrophile.

Question4

An alkene X on ozonolysis gives a mixture of simplest ketone (Y) and 3-pentanone. The IUPAC name of the alkene X is

TG EAPCET 2025 (Online) 2nd May Evening Shift

Options:

A.

2, 3-dimethylbut-2-ene

B.

3-ethyl-4-methylpent-3-ene

C.

3-ethyl-2-methylpent-2-ene

D.

2-methyl-3-ethylpent-2-ene

Answer: C

Solution:

The complete reaction is

$$\underset{\text{(Rectant x)}}{CH_3 - CH_2 - C(CH_3) = CH - CH_2 - CH_2 - CH_3} \xrightarrow[O_3]{Zn/H_2O} \underset{(Y)}{[CH_3 - CO - CH_3]} + [CH_3 - CH_2 - CO - CH_2 - CH_3]$$

The IUPAC name of $X =$ 3-ethyl-2-methylpent-2-ene

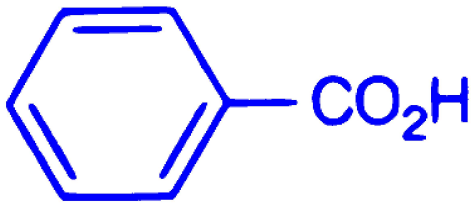
Question5

Ethylene on reaction with cold, dilute alkaline $KMnO_4$ at 273 K gives a compound ' P '. This on polymerisation with which of the following gives dacron?

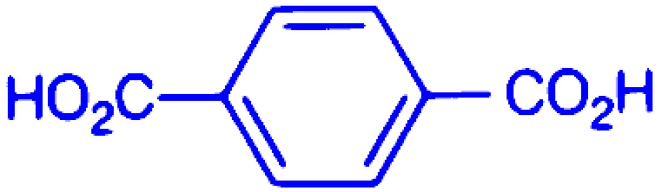
TG EAPCET 2025 (Online) 2nd May Evening Shift

Options:

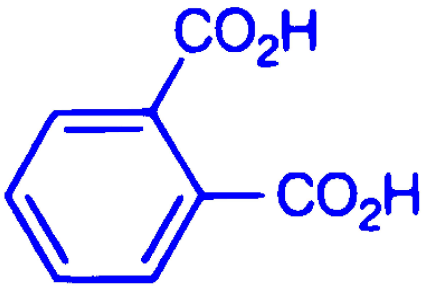
A.



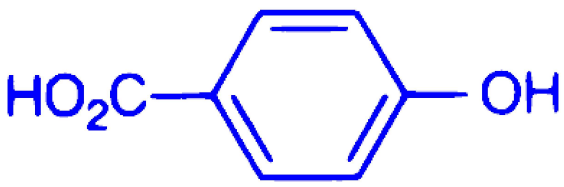
B.



C.

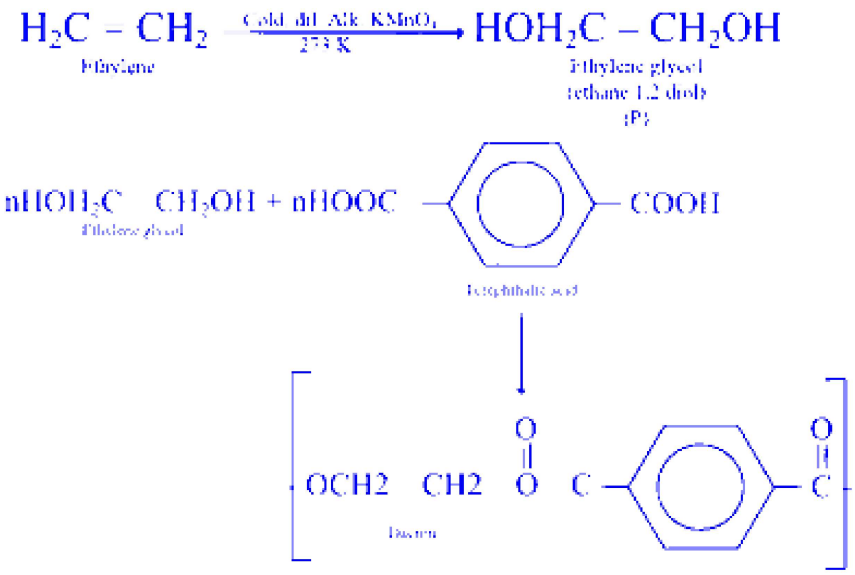


D.



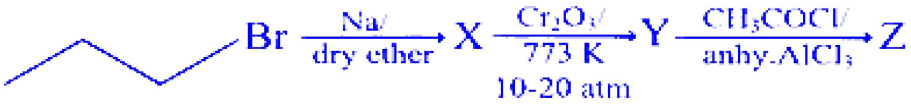
Answer: B

Solution:



Question6

Consider the following sequence of reaction. In ' Z ' the number of sp^3 carbons is ' a ' and sp^2 carbons is ' b '. Value of $(a+b)$ is



TG EAPCET 2025 (Online) 2nd May Morning Shift

Options:

A.

8

B.

7

C.

6

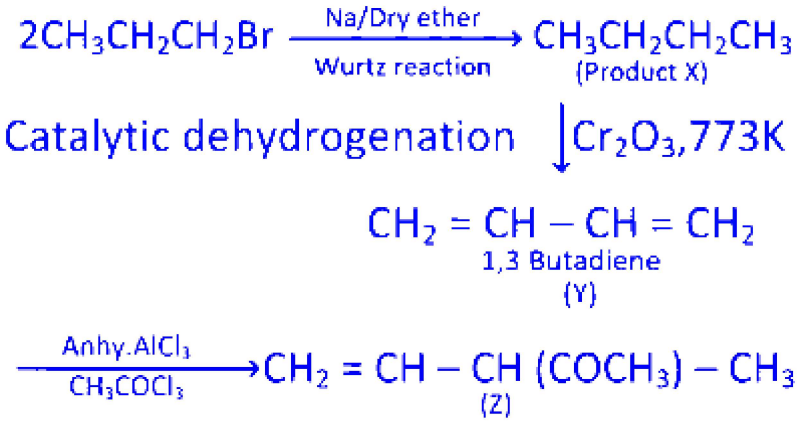
D.

9

Answer: A

Solution:

The complete reaction mechanism is as follows



So, in product Z, number of sp^2 carbon $(b) = 4$, number of sp^3 carbon $(a) = 4$

So, $a + b = 8$

Question7

For the alkyne with formula C_6H_{10}, the number of alkynes with acidic hydrogens is x and number of alkynes with no acidic hydrogens is y. x and y are respectively

TG EAPCET 2025 (Online) 2nd May Morning Shift

Options:

A.

2,5

B.

3,4

C.

4,3

D.

5,2

Answer: C

Solution:

Given that molecular formula is C_6H_{10}. First of all let us calculate the degree of unsaturation for C_6H_{10}.

$$So,\ \text{DBE} = \text{C} + 1\frac{-\text{H}}{2}$$

$$\text{DBE} = 6 + 1\frac{-10}{2} = 2$$

Here, DBE of 2 indicates the presence of one triple bond or two double bonds or one ring and one double bond. So, for alkynes let us see the structure with one triple bond.

Now, the possible number of alkyne monomers of C_6H_{10} are

Hex-1-yne (Terminal alkyne)

Hex-2-yne (Internal alkyne)

Hex-3-yne (Internal alkyne)

3-methyl pent-1-yne (Terminal alkyne)

4-methylpent-1-yne (Terminal alkyne)

4-methylpent-2-yne (Internal alkyne)

3, 3-Dimethyl but-1-yne (Terminal alkyne)

So, terminal alkynes contain acidic hydrogen while internal alkynes contains no acidic hydrogen. Thus x and y are 4,3 respectively.

Question8

$$(CH_3)_3CH \xrightarrow{KMnO_4} X \xrightarrow[573\ K]{Cu} Y$$

The number of sp^3 and sp^2 carbons in Y are respectively

TG EAPCET 2025 (Online) 2nd May Morning Shift

Options:

A.

3,1

B.

2,2

C.

1,3

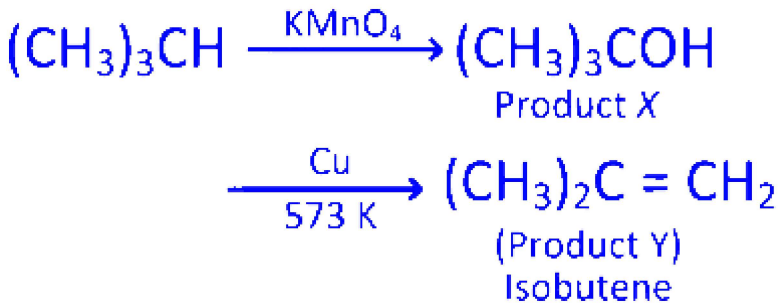
D.

4,0

Answer: C

Solution:

The complete reaction is as follows,



Number of sp^3 carbon $= 2$ (methyl group)

Number of sp^2 carbon $= 2$(double bond carbon)

Question9

Consider the following reaction sequence

$$\text{2-methylpropane} \xrightarrow{\text{KMnO}_4} X \xrightarrow[358\ \text{K}]{20\%\text{H}_3\text{PO}_4} Y \xrightarrow[\text{(ii)}\quad \text{Zn/H}_2\text{O}]{\text{(i)}\quad \text{O}_3} A + B.$$

What are A and B ?

TG EAPCET 2024 (Online) 11th May Morning Shift

Options:

A. $CH_3CH=O, CH_3CH=O$

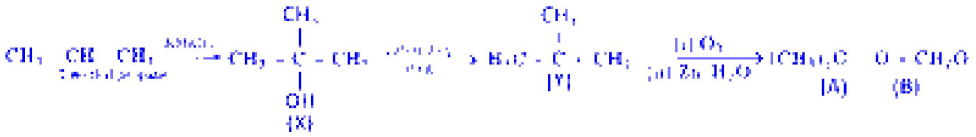
B. $(CH_3)_2C=O, CH_2=O$

C. $(CH_3)_2C=O, CH_3CH=O$

D. $CH_3CH=O, CH_2=O$

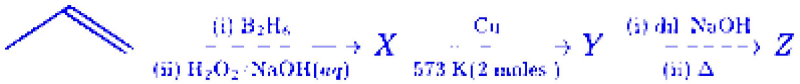
Answer: B

Solution:



Question10

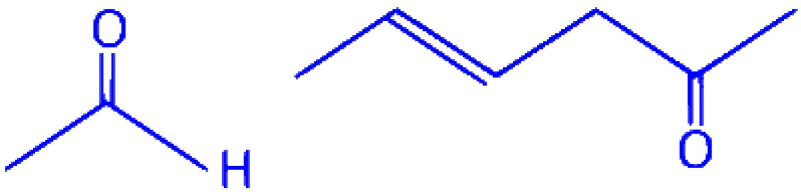
What are Y and Z respectively in the given reaction sequence?



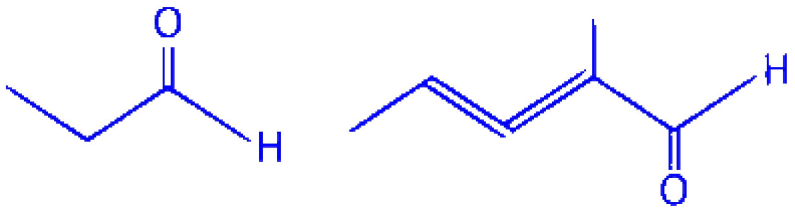
TG EAPCET 2024 (Online) 11th May Morning Shift

Options:

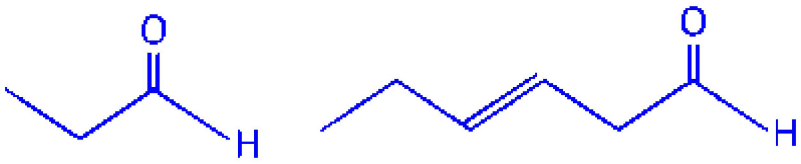
A.



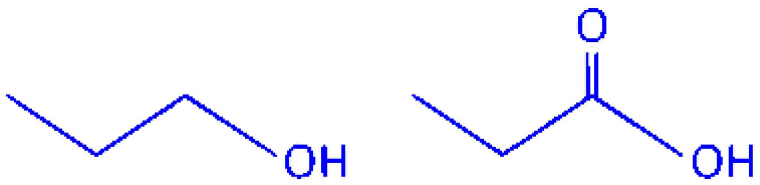
B.



C.



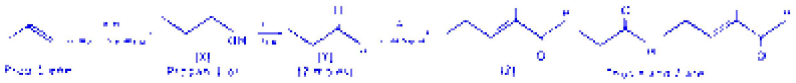
D.



Answer: B

Solution:

The complete reaction is as follows



respectively.

Question11

The alkane which is next to methane in homologous series can be prepared from which of the following reactions?

I. $2CH_3Br \xrightarrow[\text{Dry ether}]{\text{Na}}$

II. $CH_3COOH \xrightarrow[CaO,\Delta]{NaOH}$

III. $CH_3CH=CH_2 \xrightarrow{H_2/Pt}$ **IV.** $CH_3CH_2Br \xrightarrow[H^+]{Zn}$

TG EAPCET 2024 (Online) 10th May Evening Shift

Options:

A. I, IV only

B. II, III only

C. I,III only

D. II, IV only

Answer: A

Solution:

Next alkane to methane is ethane and it is prepared by reaction given in statement (I) and statement (IV). The reactions are

$2CH_3Br \xrightarrow{2Na} CH_3-CH_3+2NaBr$

$C_2H_5Br+2[H] \xrightarrow[H^+]{Zn} C_2H_6+HBr$

Question12

At high pressure and regulated supply of air, methane is heated with catalyst ' X to give methanol and with catalyst ' Y ' to give methanal. X and Y respectively are

TG EAPCET 2024 (Online) 10th May Evening Shift

Options:

A. MO_2O_3, Cu

B. Cu, Mo_2O_3

C. $V_2O_5, KMnO_4$

D. $KMnO_4, Cr_2O_3$

Answer: B

Solution:

When methane is heated with catalyst X (which is copper at 573 K) it gives methanol on methyl alcohol. When methane is reacted with O_2 in presence of MO_2O_3 then methanal (formaldehyde) is formed.

The complete reaction are as follows,

$$\underset{\text{Methane}}{2CH_4} + O_2 \xrightarrow[573\ \text{K}/100\ \text{atm}]{\text{Cu}} \underset{\text{Methanol}}{2CH_3OH}$$

$$\underset{\text{Methane}}{CH_4} + O_2 \xrightarrow[\Delta]{Mo_2O_3} \underset{\text{Methanal}}{HCHO} + H_2O$$

Question13

What is ' Y ' in the following set of reactions?

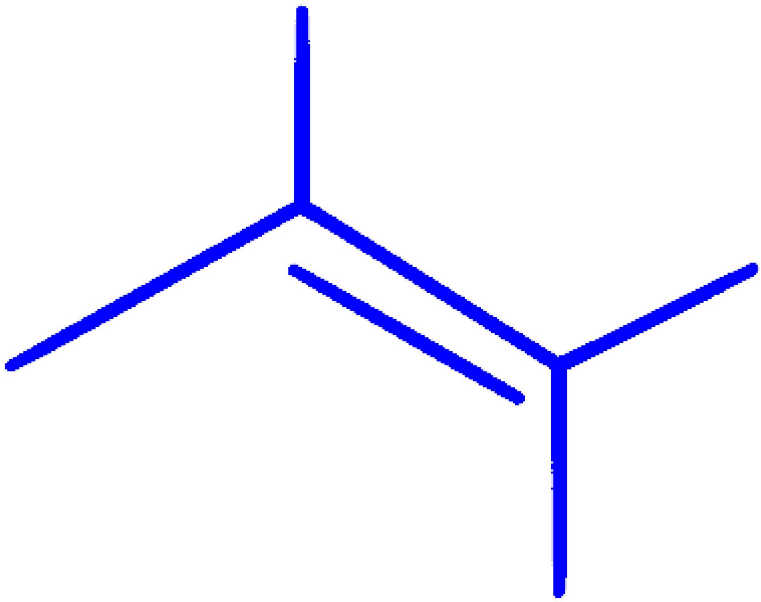
$$C_3H_4 \xrightarrow[\substack{Hg^{2+}/H^+ \\ 333\ \text{K}}]{H_2O} X \xleftarrow[(ii)\quad Zn+H_2O]{(i)\quad O_3} Y$$

TG EAPCET 2024 (Online) 10th May Evening Shift

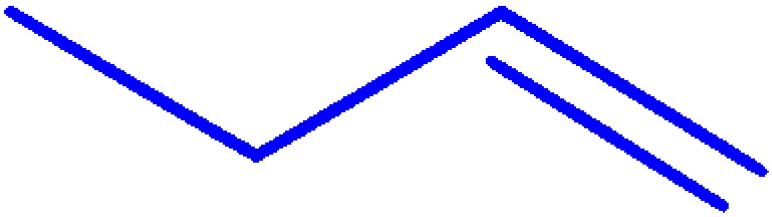
Options:

A.

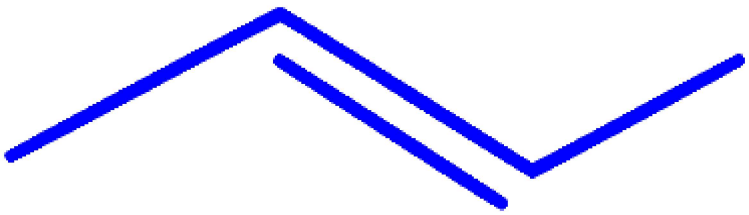
B.



C.



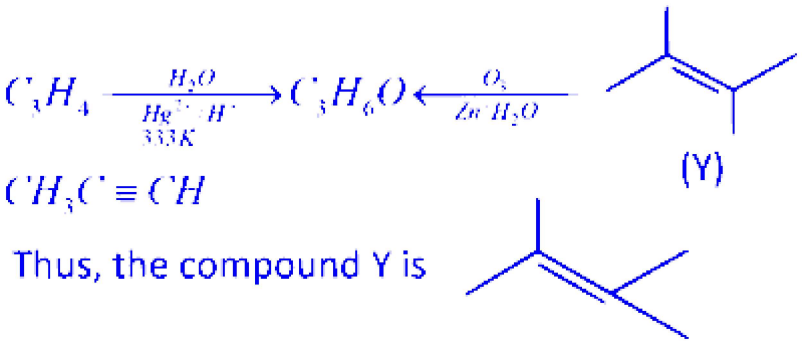
D.



Answer: B

Solution:

The complete reaction sequence is as follows



Question14

Compound ' A ' on heating with sodalime gives propane. Identify the compound ' A '.

TG EAPCET 2024 (Online) 10th May Morning Shift

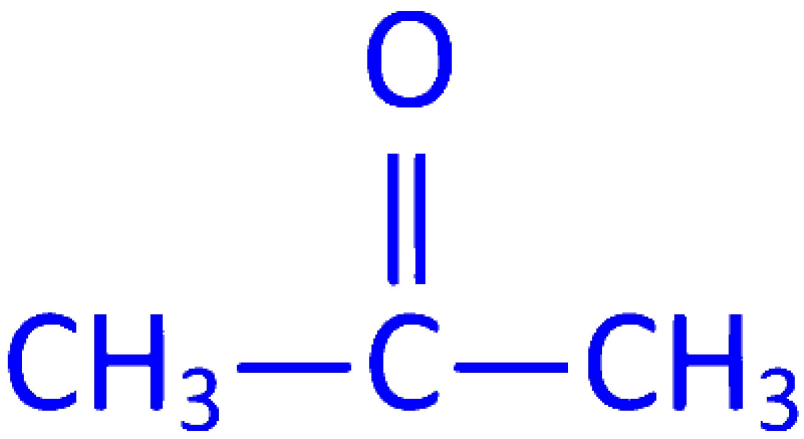
Options:

A. $CH_3 - CH_2 - CH_2 - OH$

B. $CH_3CH_2CO_2Na$

C. $CH_3CH_2CH_2CO_2Na$

D.



Answer: C

Solution:

The compound A is sodium butanoate.

When sodium salt of butanoic acid is heated with soda lime, it readily undergoes decarboxylation. The reaction is as follows,

$$\underset{\text{Sodium butanoate}}{CH_3CH_2CH_2COONa} + \underset{\text{Sodalime}}{(NaOH + CaO)} \longrightarrow Na_2CO_3 + \underset{\text{Propane}}{CH_3CH_2CH_3}$$

Question15

An alkene $X\,(C_4H_8)$ exhibits geometrical isomerism. Oxidation of A with $KMnO_4/H^+$gave Y. On heating sodium salt of Y with a mixture of NaOH and CaO gave Z. What is Z ?

TG EAPCET 2024 (Online) 9th May Morning Shift

Options:

A. CH_3CH_3

B. $CH_3CH_2CH_3$

C. $CH_3CH_2CH_2CH_3$

D. CH_4

Answer: D

Solution:

$$\underset{[X:C_4H_8]}{CH_3CH=CHCH_3} \xrightarrow[[O]]{KMnO_4/H^+} \underset{(Y)}{2CH_3COOH}$$

$$\Rightarrow \underset{(\text{ Sodium salt of } Y)}{CH_3COONa} \xrightarrow[\substack{(\text{Sodalime})\\ -Na_2CO_3}]{(NaOH+CaO)/\Delta} \underset{(Z)}{CH_4}$$

Note: But-2-ene $(CH_3CH=CH-CH_3)$ exhibits geometrical isomerism which undergoes oxidative cleavage of $C=C$ with $KMnO_4/H^+$to give Y.

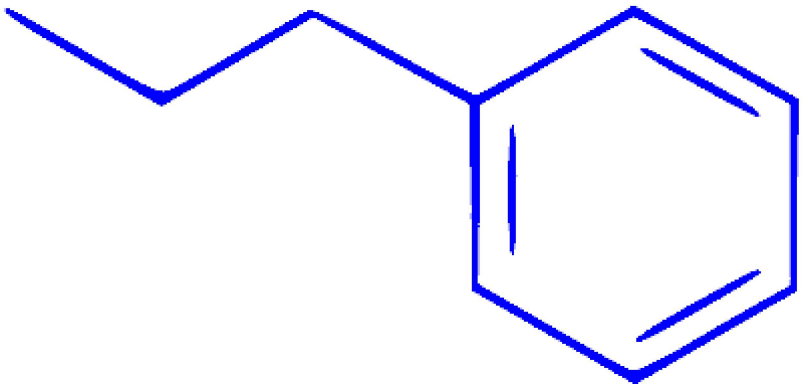
Question16

X and Z respectively in the following reaction sequence are $C_3H_6 \xrightarrow{X} Y \xrightarrow[AlCl_3]{C_6H_6} Z$ (Major project)

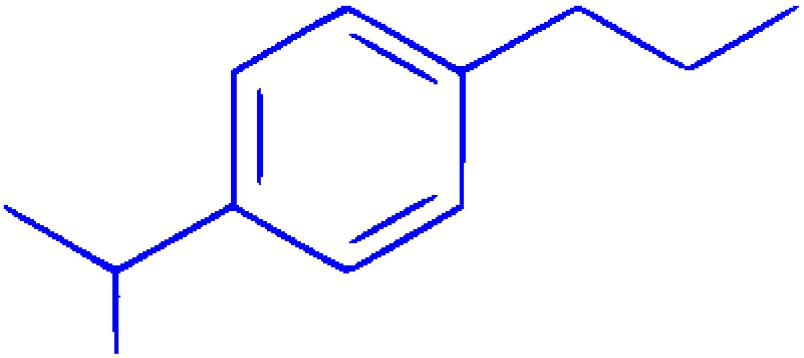
TG EAPCET 2024 (Online) 9th May Morning Shift

Options:

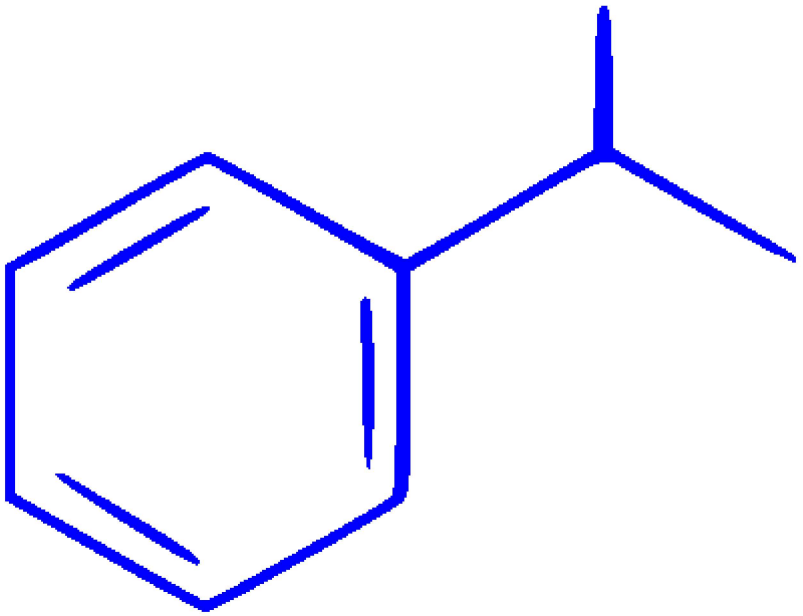
A.



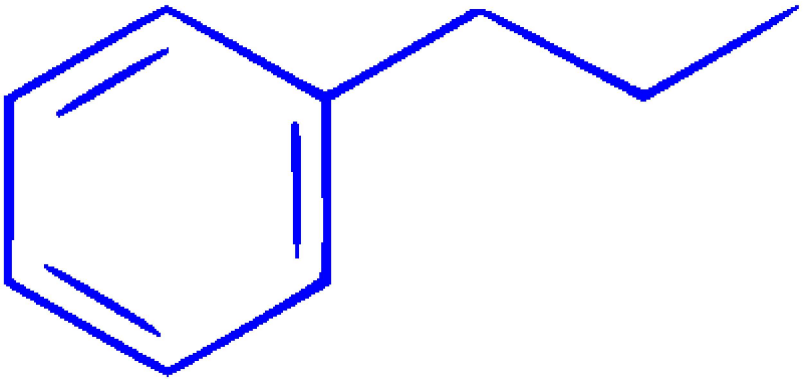
B.



C.



D.



Answer: C

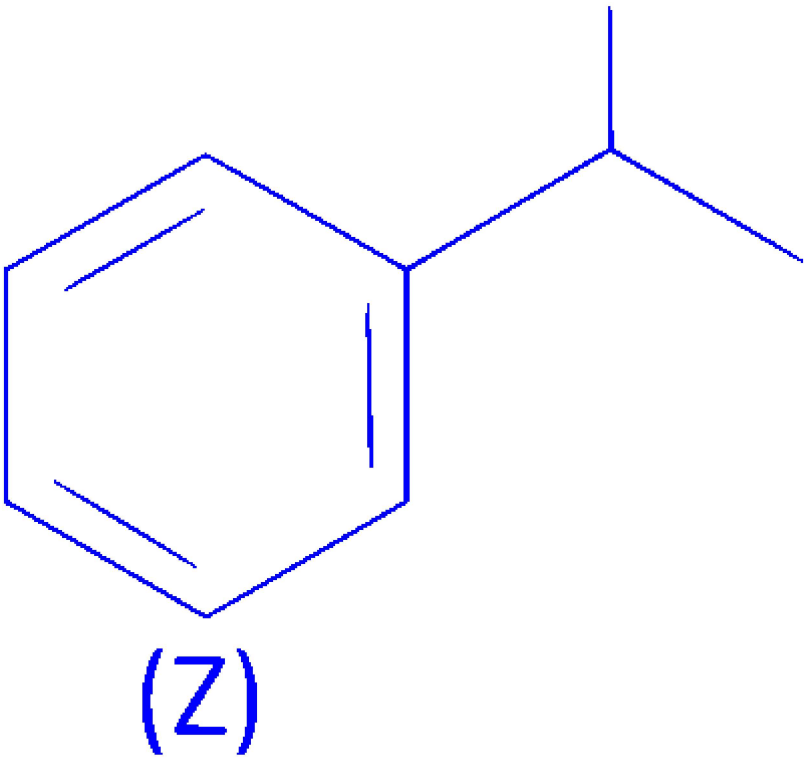
Solution:

The complete reaction is as follows,

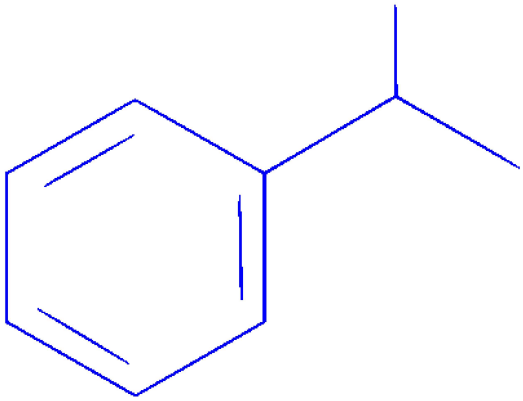
$CH_3 - CH = CH_2$

$(C_3H_6) \xrightarrow[(X)]{\text{HBr}/R\text{OOR, Kharasch affect}}$

$\underset{(Y)}{C_3H_7Br} \underset{AlCl_3}{C_6H_6}$



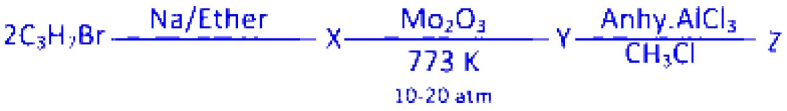
Thus X and Z repactively are$HBr/ROOR$ and(X)



(Z)

Question17

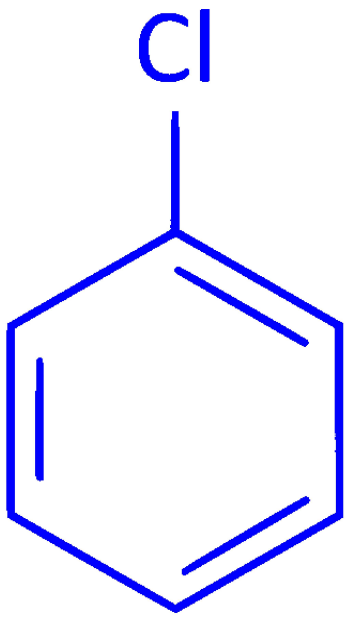
Identify ' Z ' in the following reaction sequence



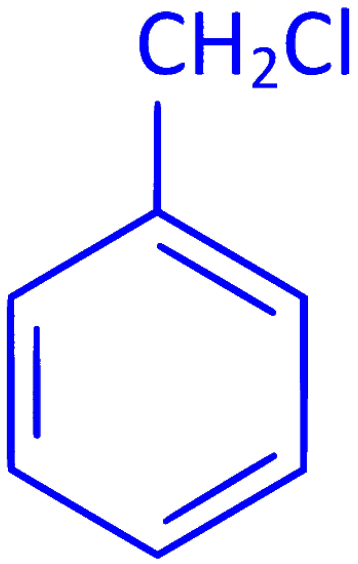
TS EAMCET 2023 (Online) 12th May Evening Shift

Options:

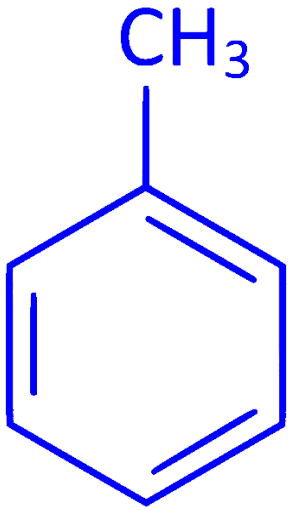
A.



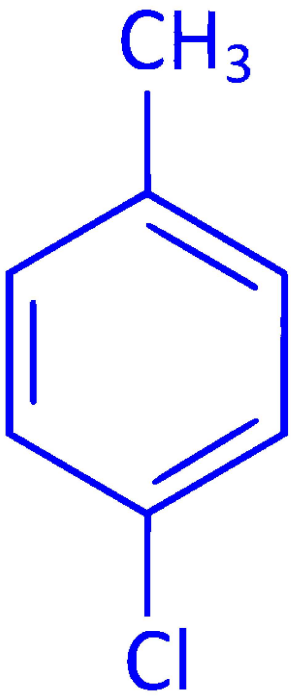
B.



C.



D.

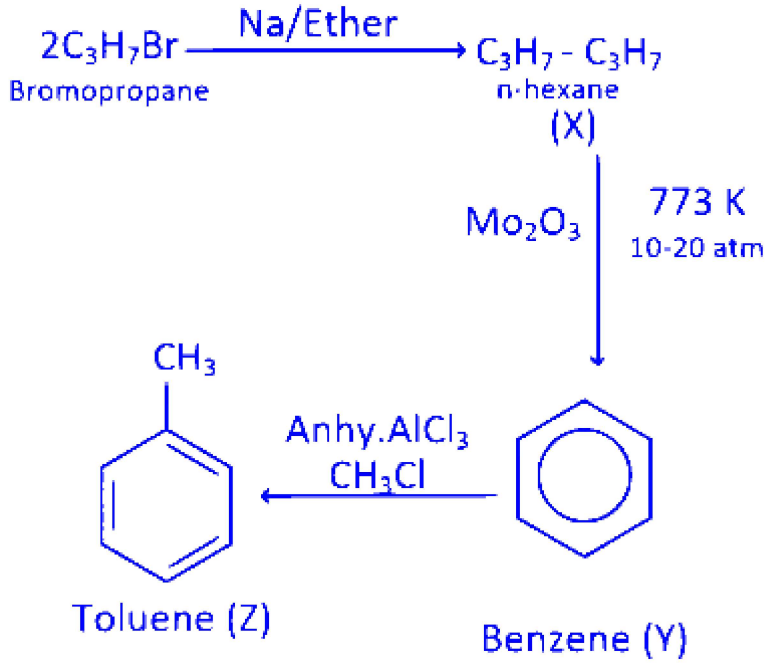


Answer: C

Solution:

2 molecules of bromopropane when treated with sodium (Na) in presence of ether to give n-hexane (X).
(X) reacts with Mo_2O_3 at high temperature 773 K and pressure $10-20$ atm to give benzene (Y) as product.
Further (Y) reacts with methyl chloride in presence of anhy. $AlCl_3$ to give methylbenzene or toluene (Z).

The reaction is as follows:



Question18

I. $(CH_3)_2C=CH_2 \xrightarrow{KMnO_4/H^+} X + CO_2 + H_2O$

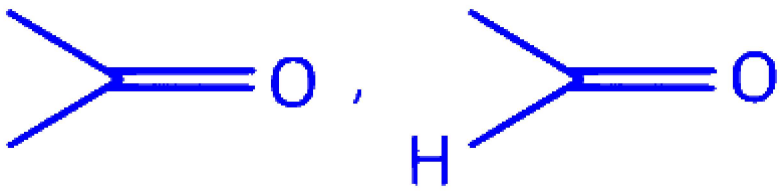
II. $CH_3-CH=CH-CH_3 \xrightarrow{KMnO_4/H^+} Y$

The functional groups in X and Y are respectively.

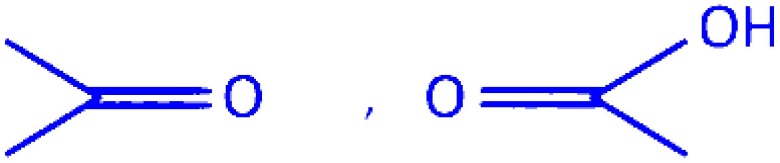
TS EAMCET 2023 (Online) 12th May Morning Shift

Options:

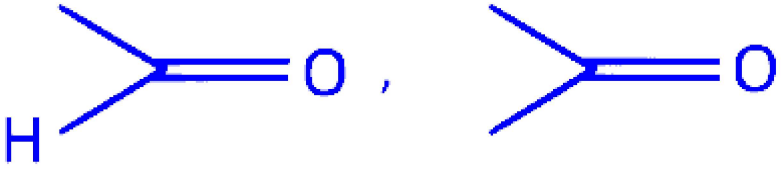
A.



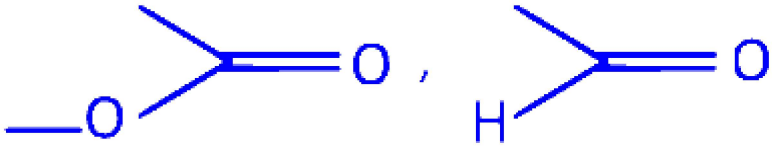
B.



C.



D.



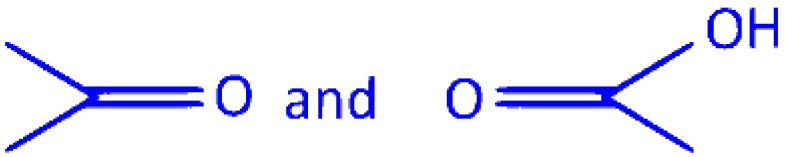
Answer: B

Solution:

$$\text{I. } (CH_3)_2C{=}CH_2 \xrightarrow{KMnO_4/H^+} \underset{(x)}{CH_3COCH_3} + CO_2 + H_2O$$

$$\text{II. } CH_3{-}CH{=}CH{-}CH_3 \xrightarrow{KMnO_4/H^+} \underset{(Y)}{2CH_3COOH}$$

Thus, the functional group in X and Y are



Question19

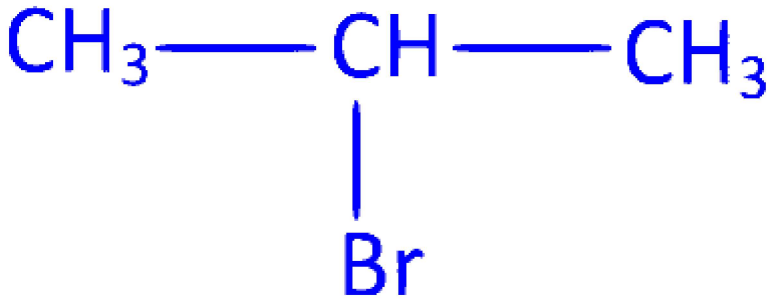
Identify the major product B in the given sequence of reactions.

$$CH_3{-}C{\equiv}CH \xrightarrow[Pd/C]{H_2} A \xrightarrow[HBr]{(C_6H_5CO)_2O_2} B$$

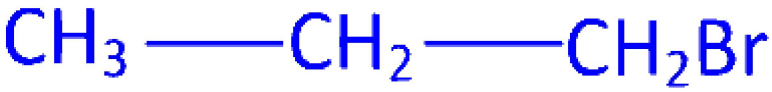
TS EAMCET 2023 (Online) 12th May Morning Shift

Options:

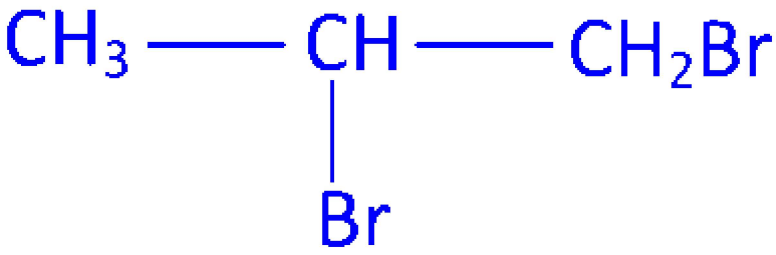
A.



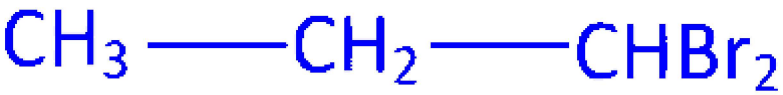
B.



C.

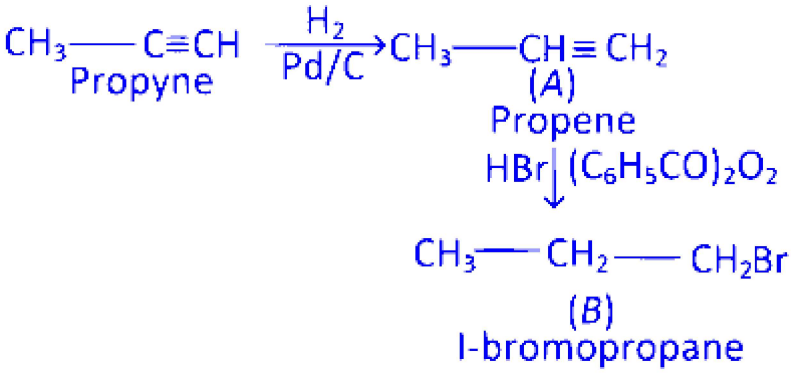


D.



Answer: B

Solution:



The major product (B) will be formed as per anti-Markownikoff's addition.