Unacademy Atoms

ONE SHOT

#Bounceback

CHEMISTRY

HYDROCARBONS

Sakshi Vora

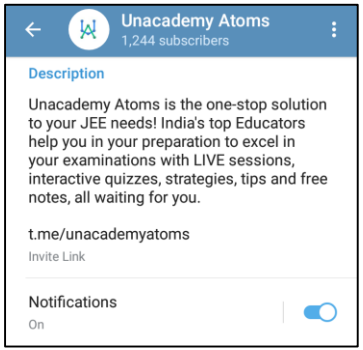
Unacademy Atoms

IIT - Roorkee

BounceBack

- 10th, 12th CBSE State Topper
- 7+ Years of Teaching Experience
- KVPY fellow

Telegram Channel



Sakshi Ganotra

Teaches in Chemistry · IIT JEE

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Sakshi Vora, IIT Roorkee CBSE State Topper in X and XII KVPY Fellow 7+ years of teaching experience

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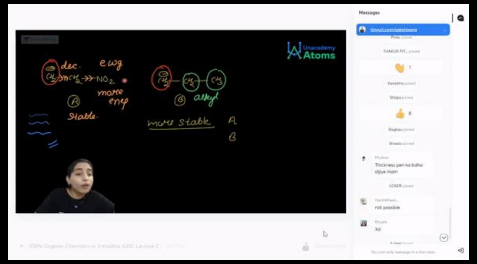

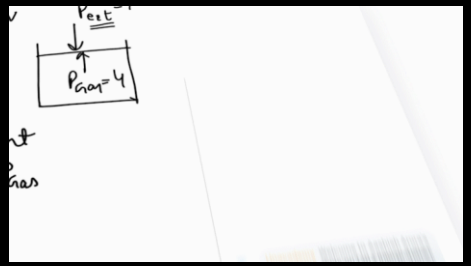

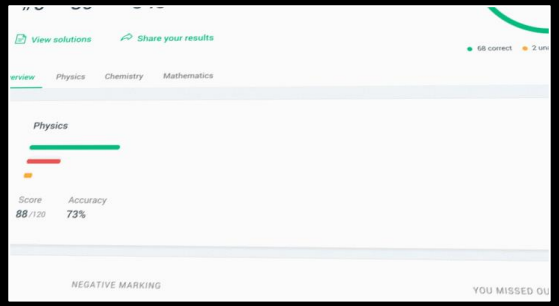

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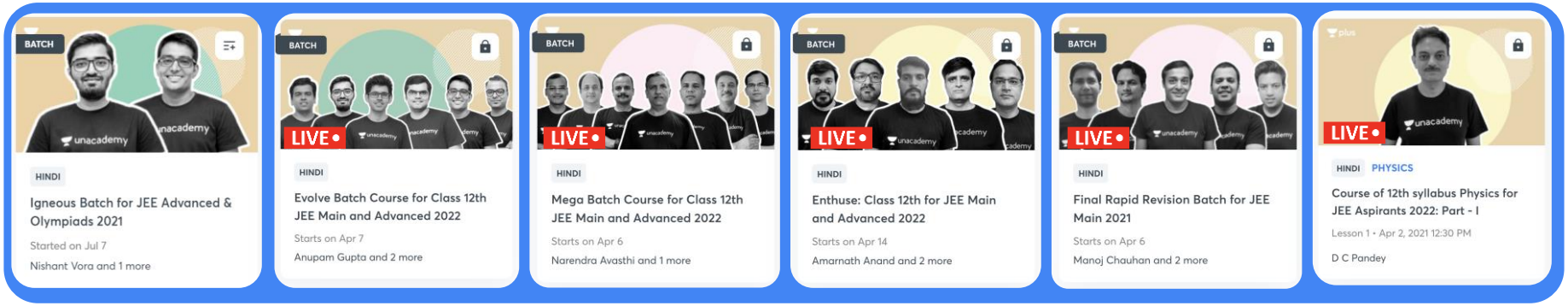

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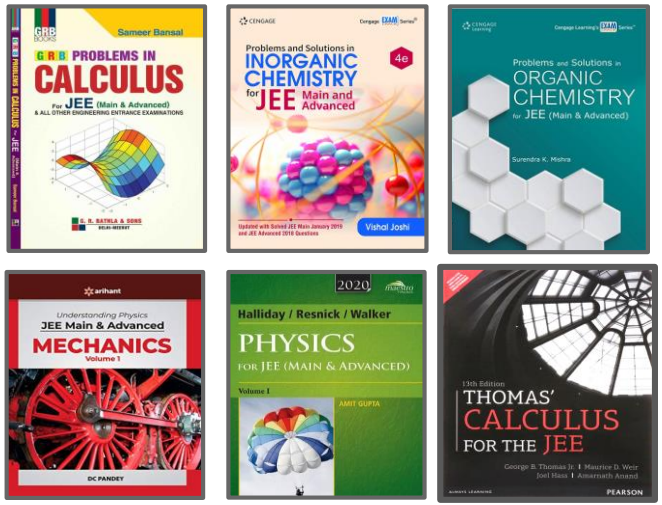

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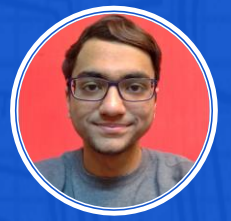

Amaiya singhal
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99.97

Adnan
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99.94

Tanmay Jain
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Kunal Lalwani
99.81

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99.75

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99.69

Mihir Agarwal
99.63

Akshat Tiwari
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99.50

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99.50

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99.48

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Sahil
99.38

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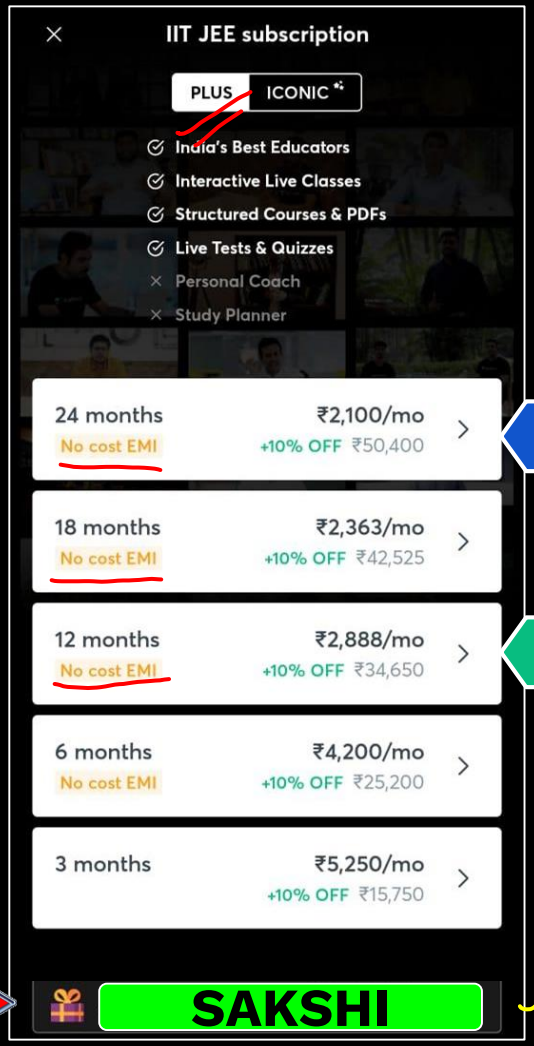
MIHIR PRAJAPATI
98.16



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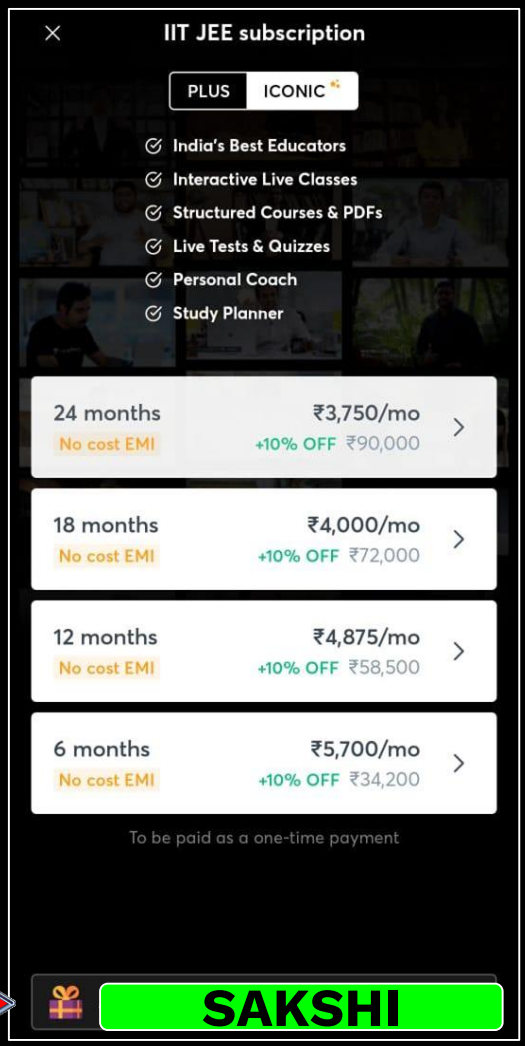

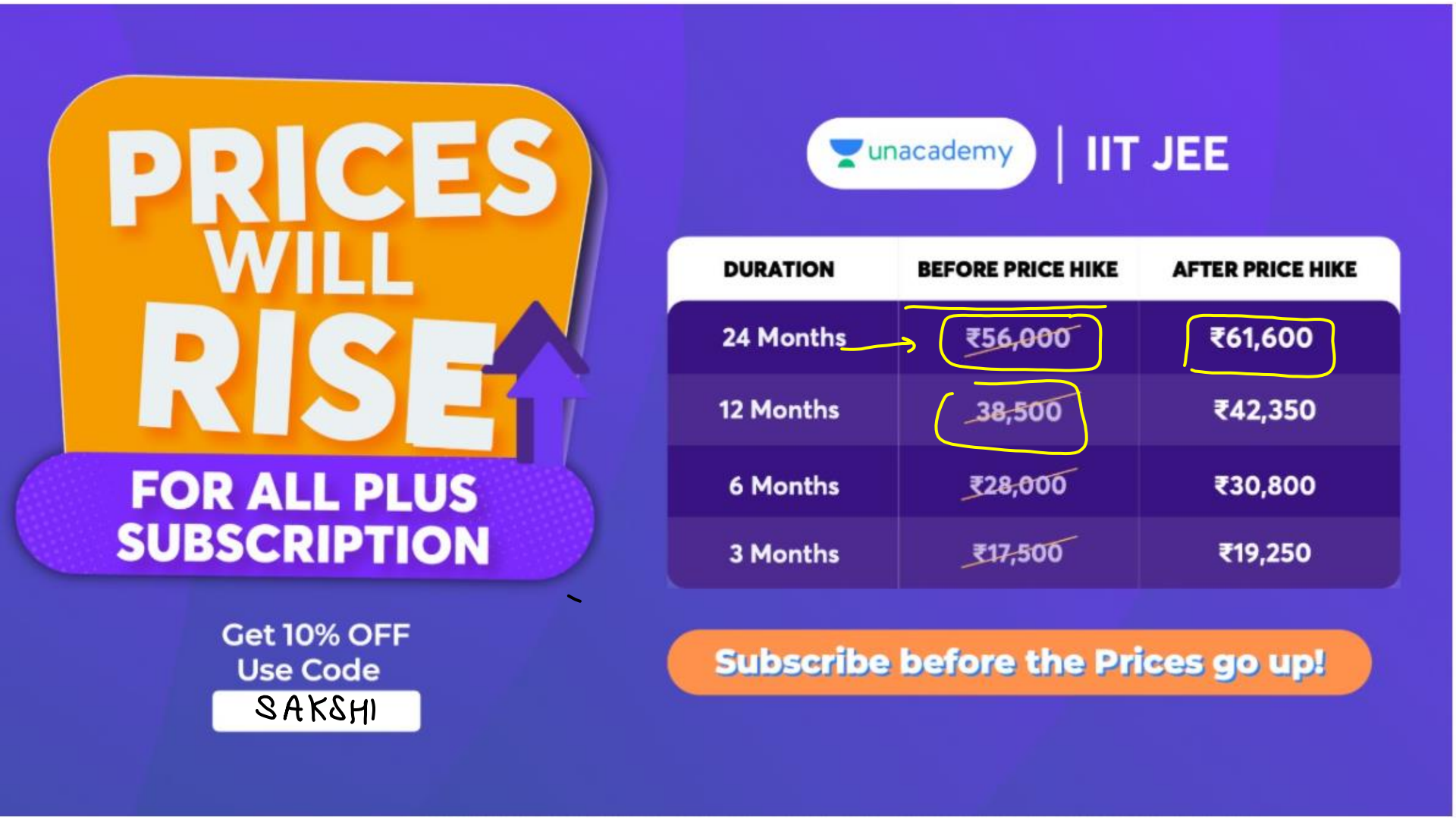
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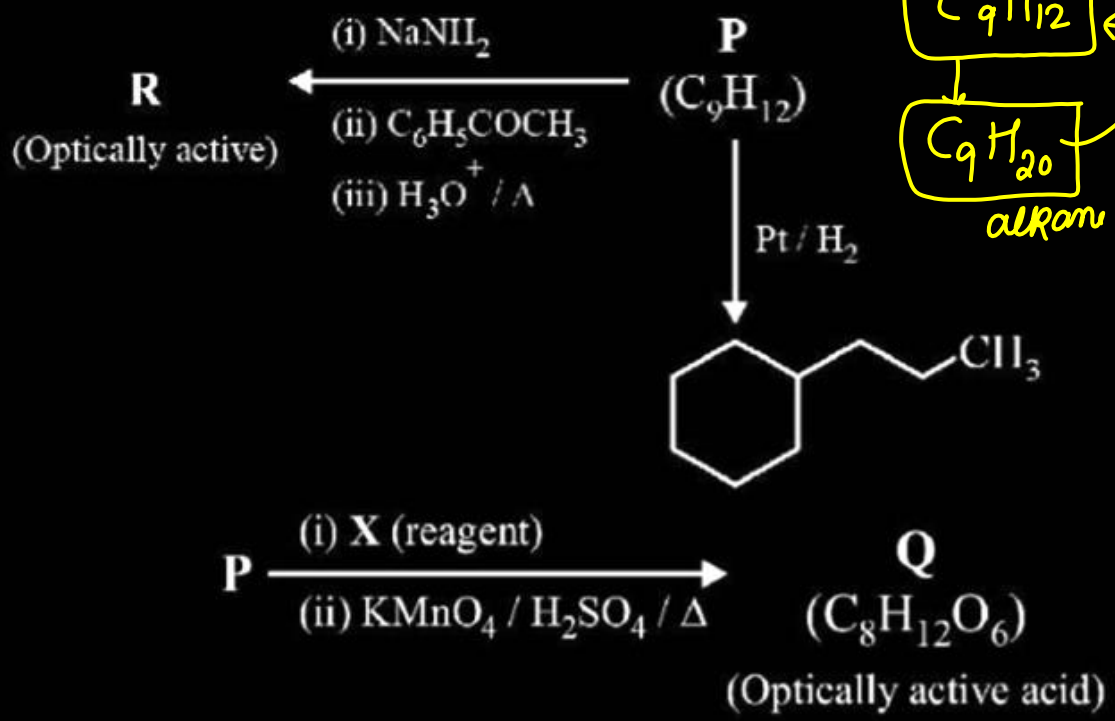
Consider the following transformations of a compound **P**.

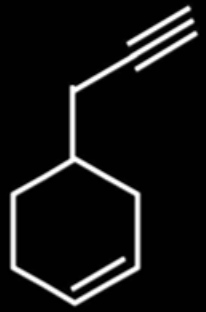


C_9H_{12} ← C_9H_{20} (alkane)

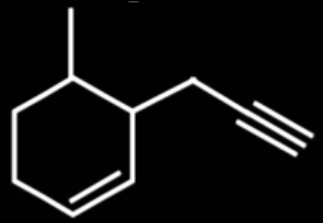
DOU = 20 − 12 = 8/2 = 4

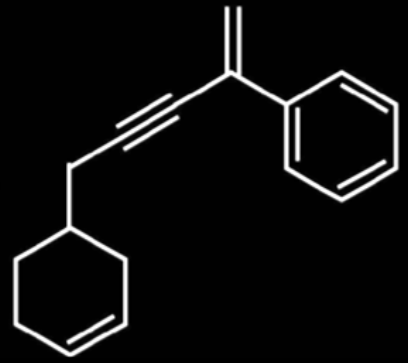
[Adv. 2020]

Choose the correct option(s).

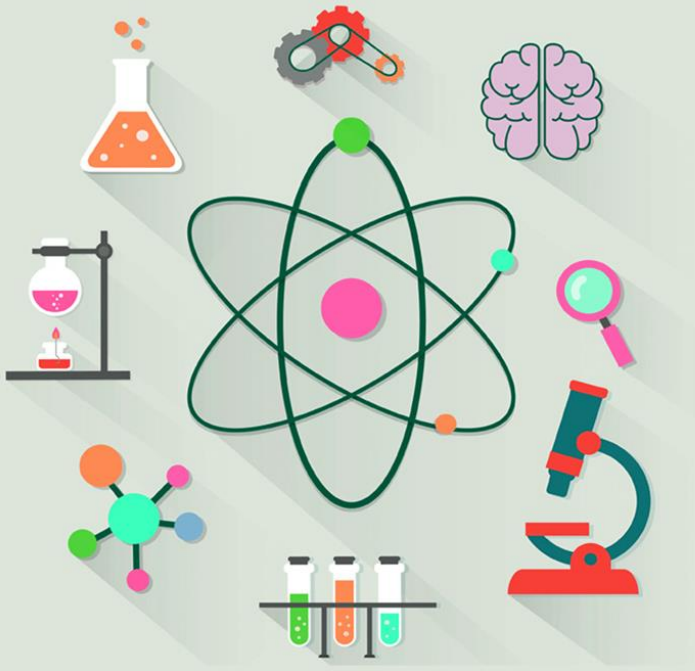
(a) **P** is 

(b) **X** is Pd-C/quinoline/H_2

(c) **P** is 

(d) **R** is 

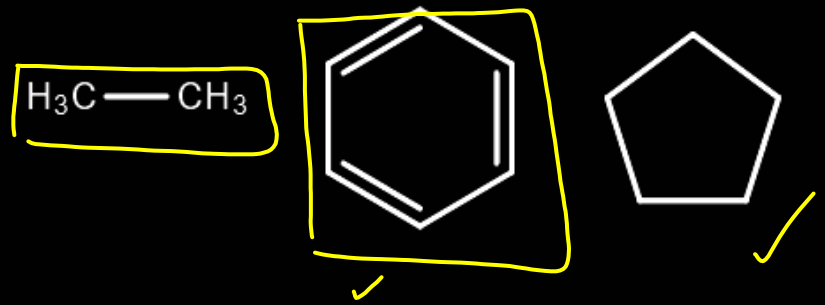
[Adv. 2020]



HYDROCARBONS

Hydrocarbon

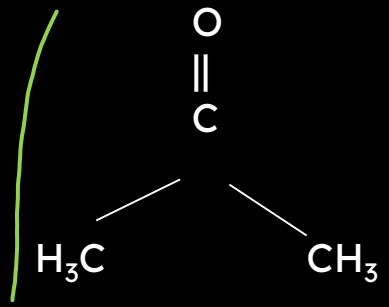
Compounds containing carbon and hydrogen only



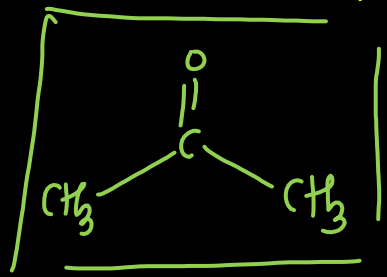
Are these compounds hydrocarbon?

$C_3H_4D_2$ a ✗

$C_3H_4Cl_2$ b ×



c



not

a) all
b) none
c) a only
d) b and c only

Alkanes

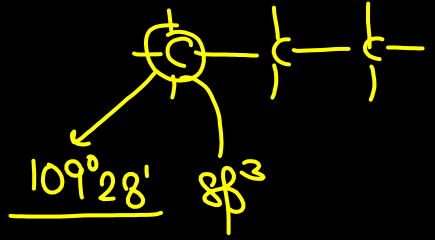
(i) The alkanes or the paraffins are the saturated hydrocarbons.

(ii) These are also called as "Paraffins' (Parum + Affinis i.e. less reactive).

(iii) General formula is C_nH_{2n+2}.

(iv) Hybridisation state of carbon is sp^3.

(vi) Bond angle is 109° 28.



Alkene

A. General formula : C_nH_{2n}.

B. The doubly bonded carbon atoms are sp^2 hybridized.

C. Geometry of unsaturated 'C' carbon is trigonal planar.

D. C = C bond length is 1.34 Å.

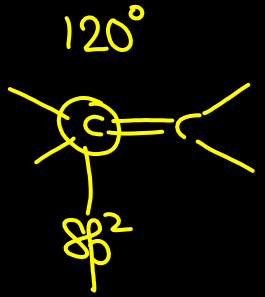
E. C = C bond energy is 143.1 Kcal mol^{-1}.

AIEEE

C — C

C = C 134 Å

C ≡ C



Alkynes

C_nH_{2n-2} 2 unsaturation

A. Alkynes are also called acetylenes because they are derivatives of acetylene, the simplest alkyne.

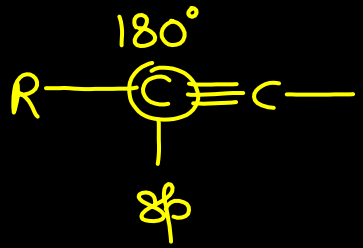
A. Bond angle in alkyne is 180°.

B. Their general formula is $C_n H_{2n-2}$.

C. C - C triple bond length is 1.20 Å.

H−C≡C−H

C_2H_2

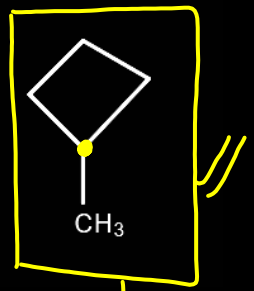


C≡C 121 Å

Cycloalkane

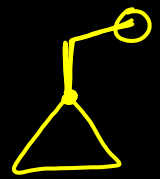
C_nH_{2n} $n \geq 3$

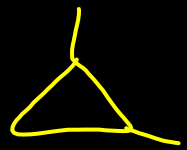
C_nH_{2n}



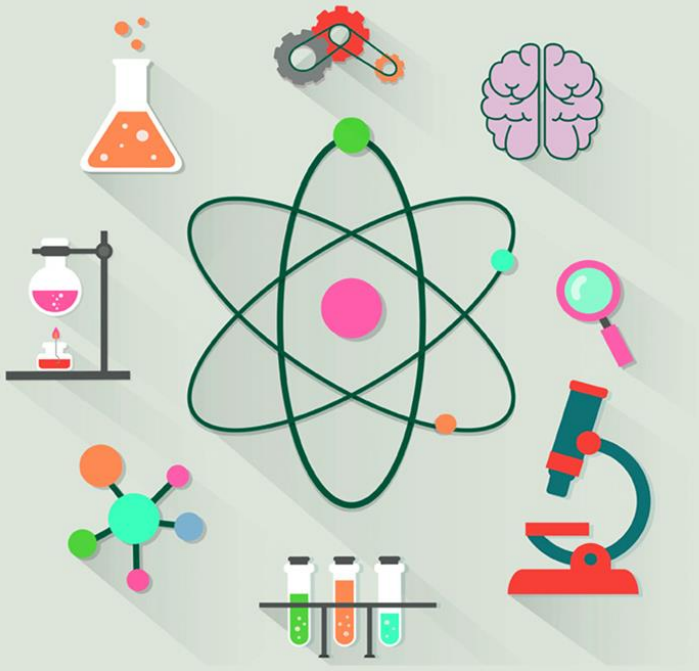
C_3H_6

C_4H_8





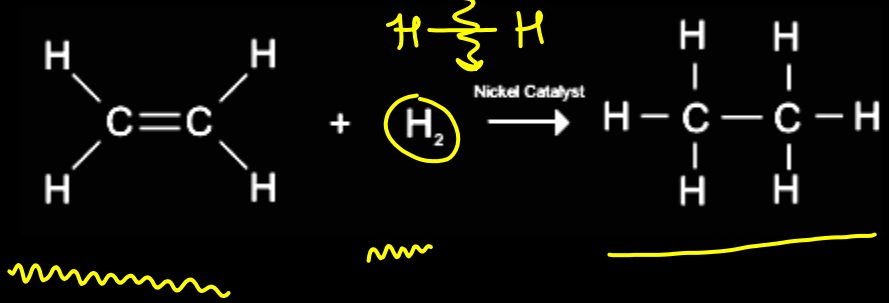
Yes or no



PREPARATION OF ALKANES

From ALKENES

By catalytic hydrogenation : Addition of H_2 on alkene takes in cis manner in the presence of Pt or Ni or Pd to give alkane.



hydrogenation E_A

H—H BE ↑

Heterogeneous Catalysis

(i) Raney Ni

(ii) Ni/Δ

(iii) Pt

(iv) PtO_2

(v) Pd

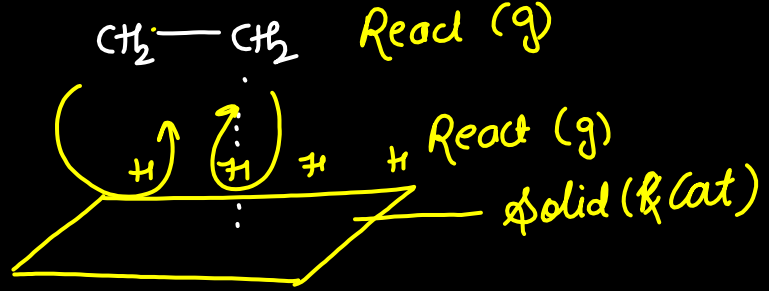
(vi) Pd-C

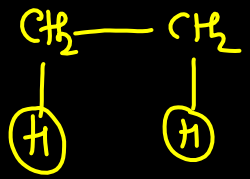
(vii) Ru

(viii) Rh

(ix)

adsorb



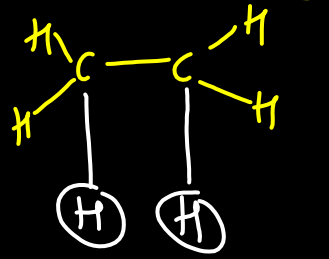


Mechanism of Hydrogenation

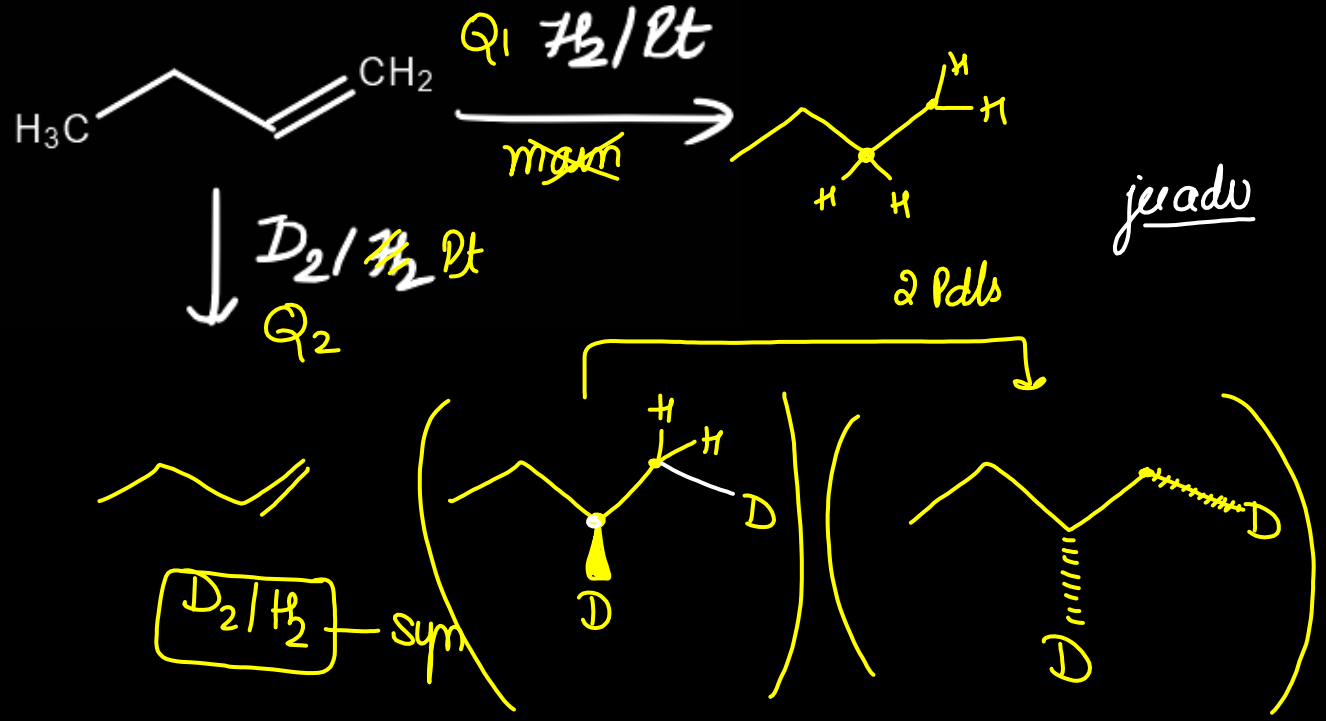
1. Syn addition occurs ⟹
2. Hydrogenation is a surface phenomenon
3. Rate of hydrogenation is inversely proportional to steric crowding

addition of atoms/gps
(same side)
~~cis~~ syn

Rate of hydrogenation $\propto \frac{1}{SH}$

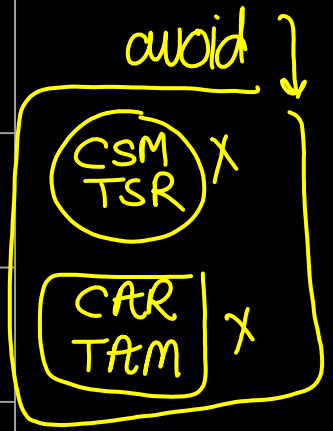


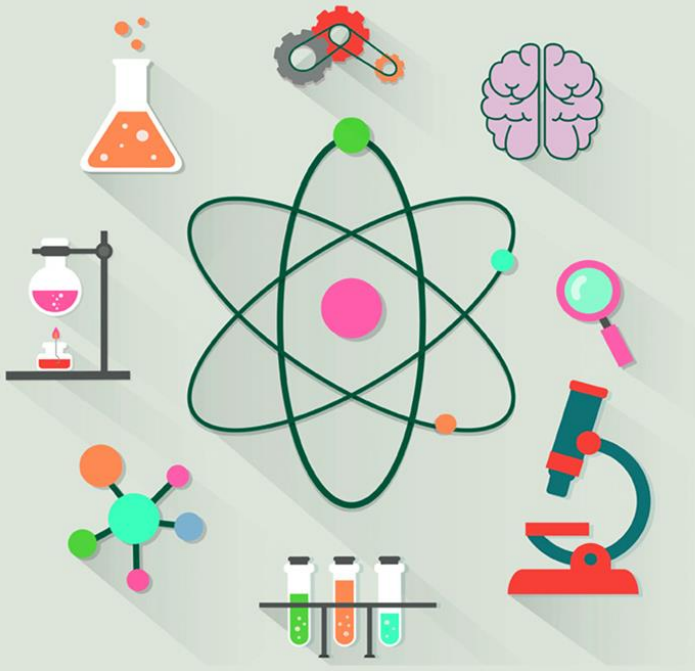
Predict the total number of products of hydrogenation



Stereochemistry of addition reactions

Type of Alkene	Addition	PRODUCT Unsymmetrical	PRODUCT Symmetrical
Cis	Syn (cis)	Erythro ±	Erythro (Meso)
Trans	Anti (Trans)	Erythro ±	Erythro (Meso)
Cis	Anti (Trans)	Threo ±	Threo ±
Trans	Syn (Cis)	Threo ±	Threo ±

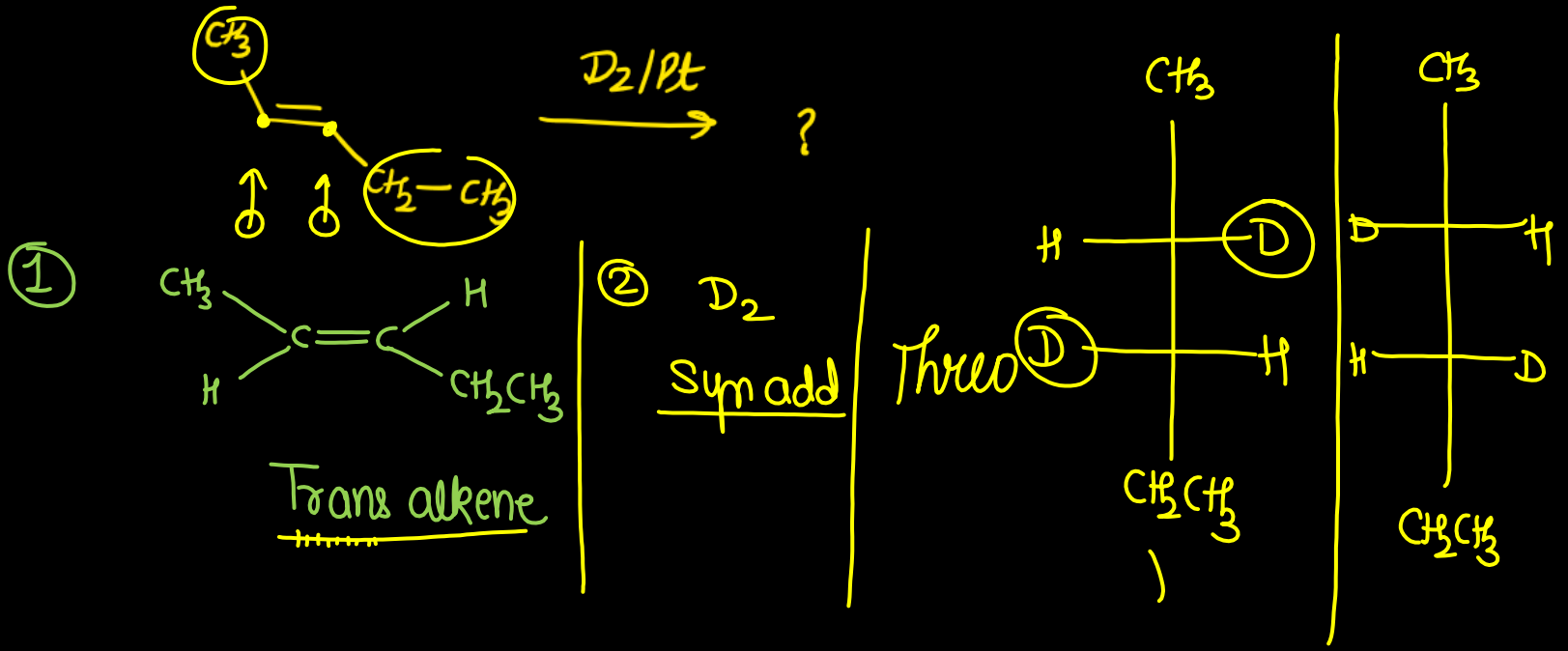




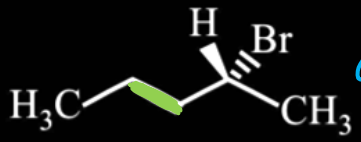
PRACTICE QUESTIONS

Predict the total number of products of hydrogenation

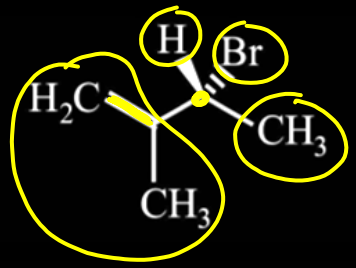
(how many Pdts)



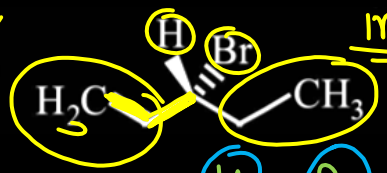
Compound(s) that on hydrogenation produce(s) optically inactive compound(s) is (are)

(a) 

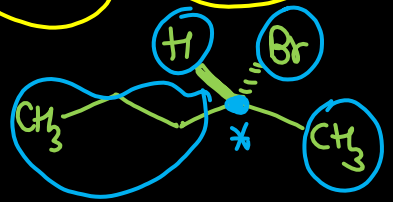
active

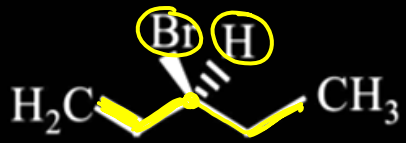
(c) 

active

(b) 

inactive.

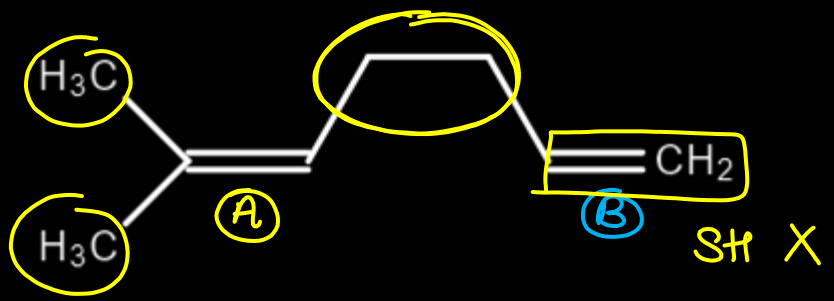
a) 

(d) 

inactive

B/D

[Adv. 2015]



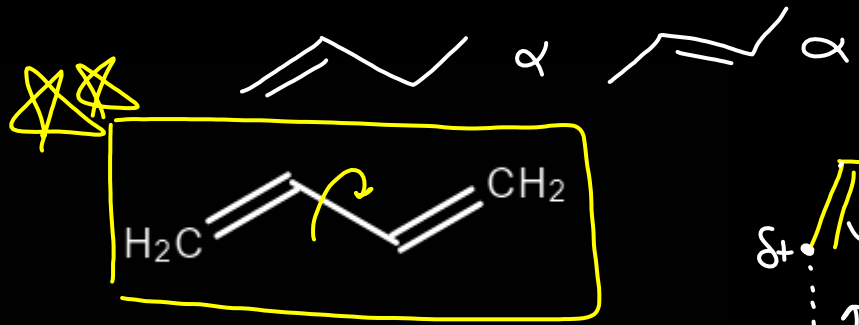
1eq

1 eq H_2/Pd

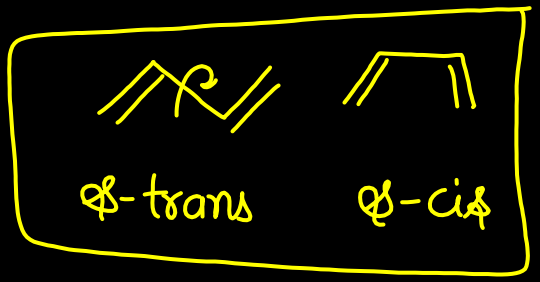
SH X

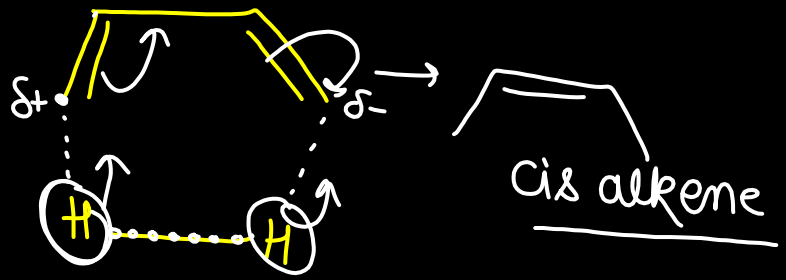
1, 4 addition reactions on alkenes

- 1, 4 addition takes place in conjugated dienes if diene is present in s-cis form
- A 6 membered cyclic transition state is formed
- Always cis alkene will be formed

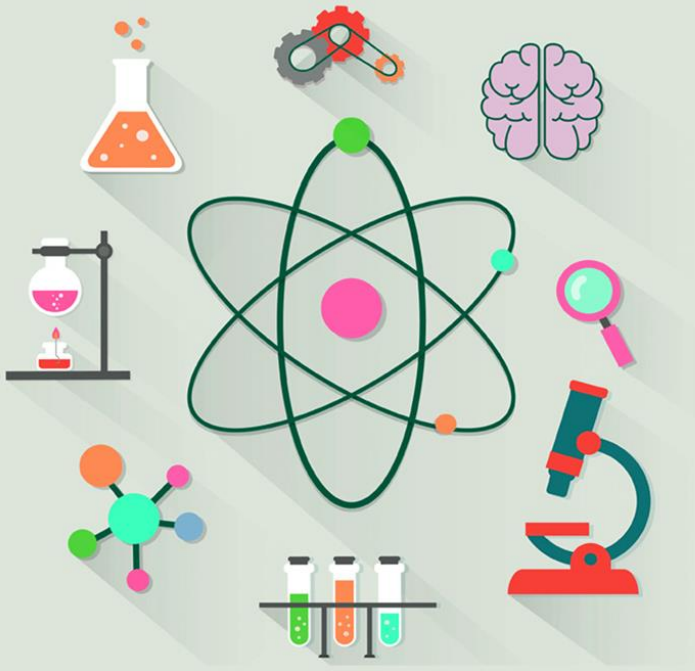


Conjugated diene

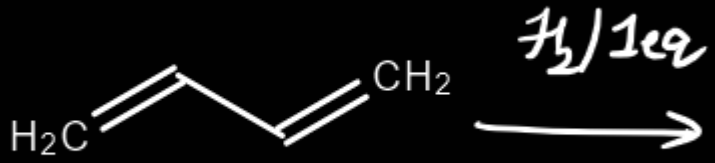


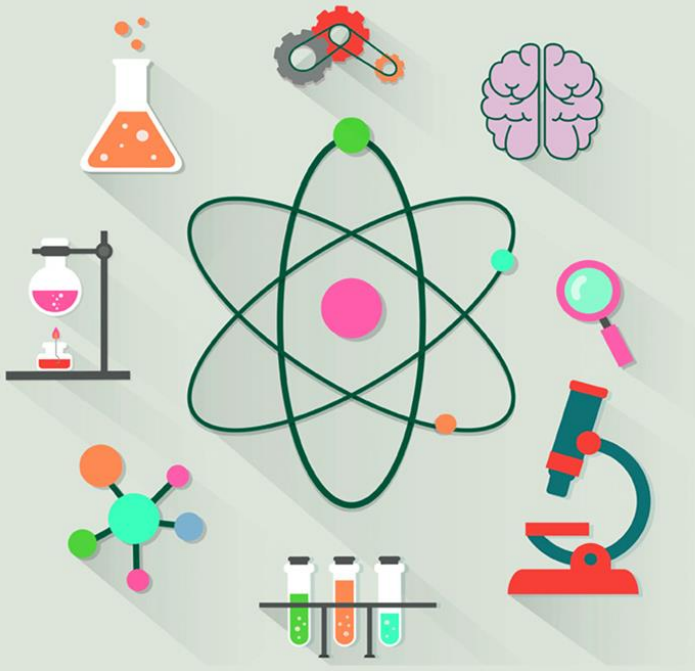


Cis alkene



PRACTICE QUESTIONS


H_2C
CH_2
H_2/1eq



IMPORTANT NOTE

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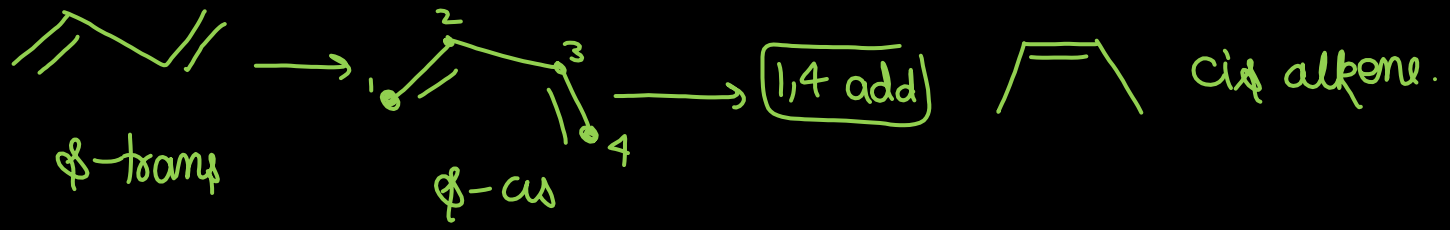
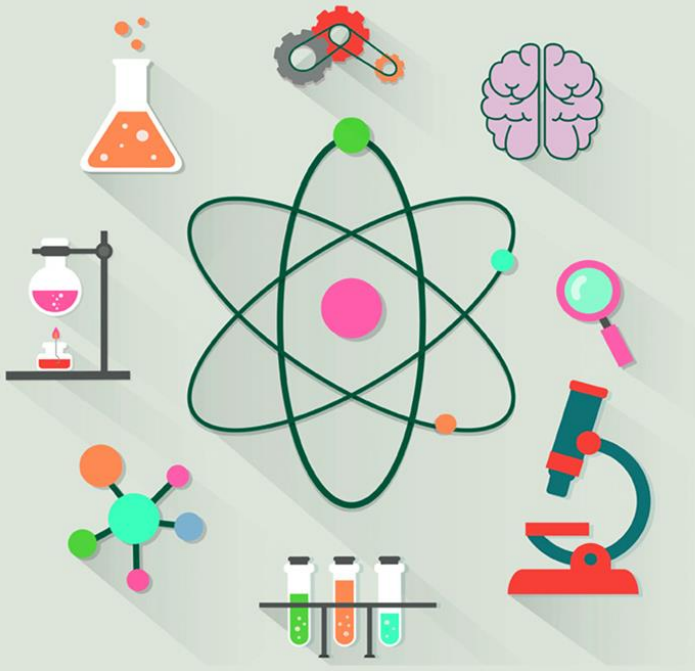
Note :

In conjugated dienes, 1,4 addition occurs if the double bonds are in s cis form or if they can be converted to s cis form

If diene is not in s cis form, then simply 1,2 addition takes place at a less crowded form

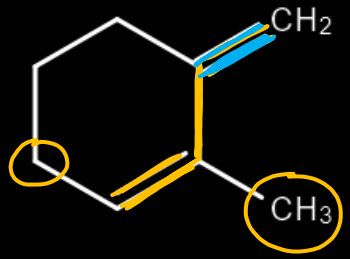




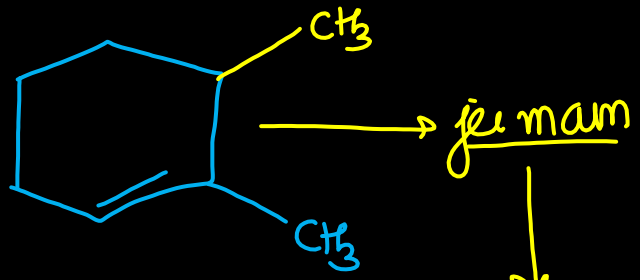
PRACTICE QUESTIONS

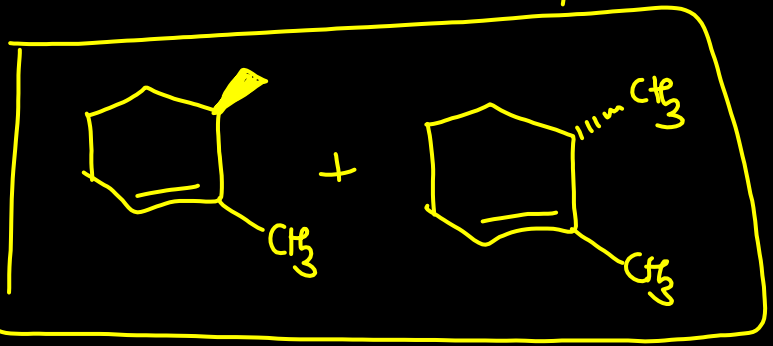
PREDICT the product of hydrogenation

(total no of Pdts) — jee adv



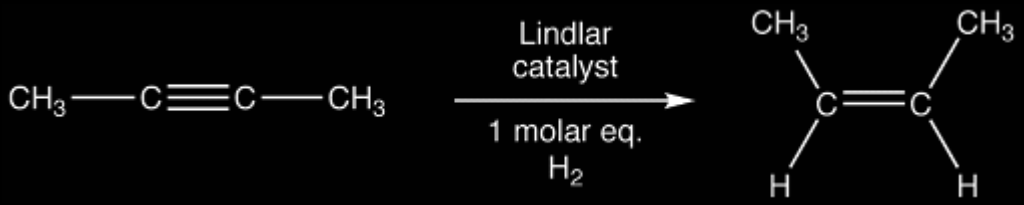
Rotation- Restricted

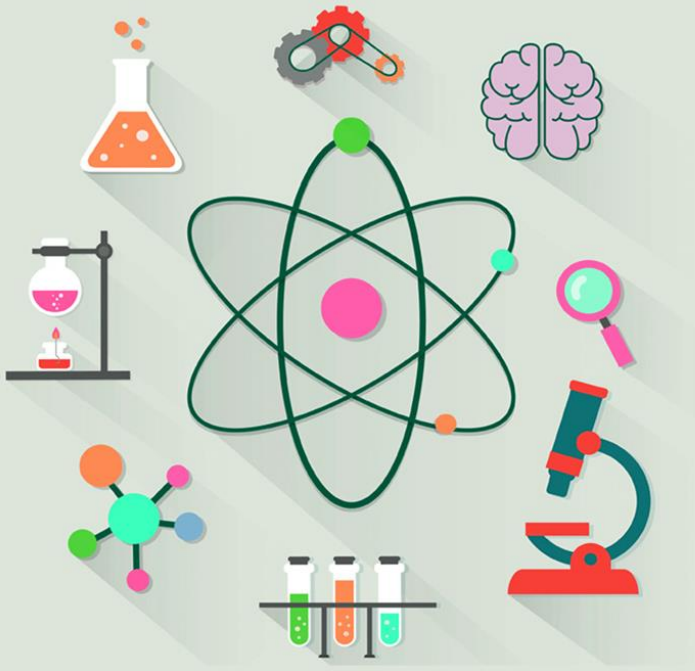




From ALKYNES

Lindlar's catalyst : Pd/ $BaSO_4$ Quinoline



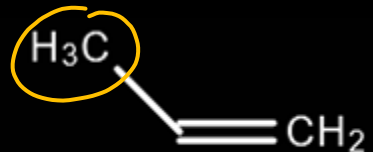


PRACTICE QUESTIONS

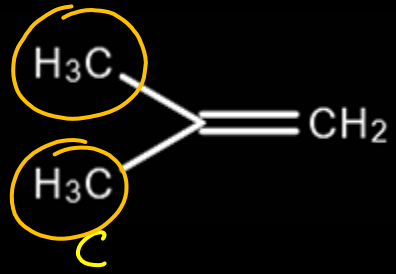
$$R - CH = CH - R \xrightarrow[BaSO_4]{H_2/Pd} ?$$

Arrange the following in the order of rate of hydrogenation

A



B



C

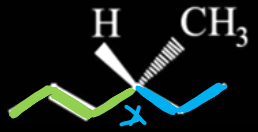
a) A = B = C

b) A > B > C

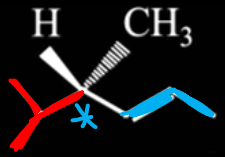
c) A < B < C

Unacademy Atoms

Which of the following compounds produces an optically inactive compound on hydrogenation ?

A. 

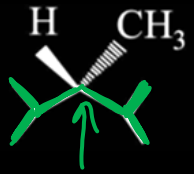
active

B. 

active.

C. 

active

D. 

achiral → inactive

green hearts

[Sep. 03, 2020 (I)]

Kolbe's Electrolysis :

Wherever sodium or potassium salt of a carboxylic acid undergoes electrolysis, hydrocarbon is obtained as a product.

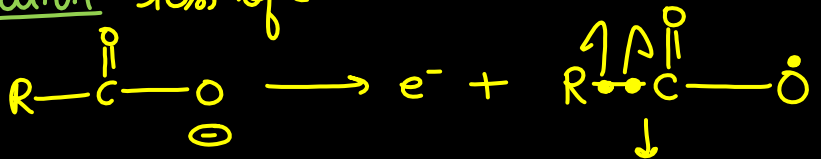
$$2\,RCOONa + 2H_2O \xrightarrow{\text{electro}} R - R + 2CO_2 + 2NaOH + H_2$$

$$2\,RCOONa + H_2O \xrightarrow{elec} R-R + 2CO_2 + NaOH + H_2$$

Mechanism

Anode:

Oxidation loss of e^-



$R\cdot + \cdot R$

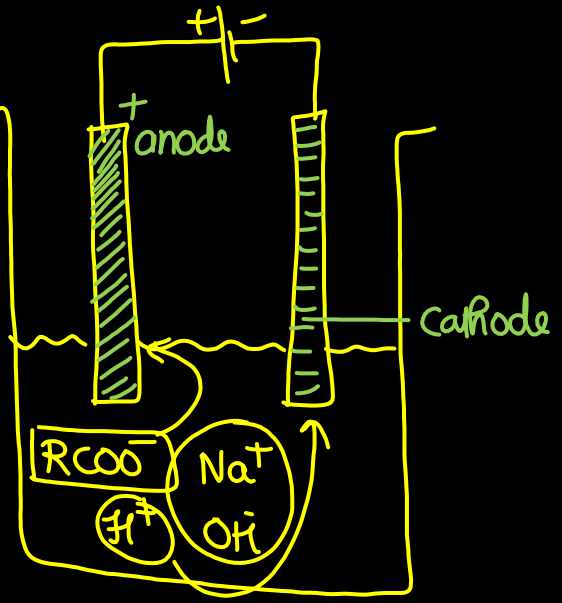
Cathode:

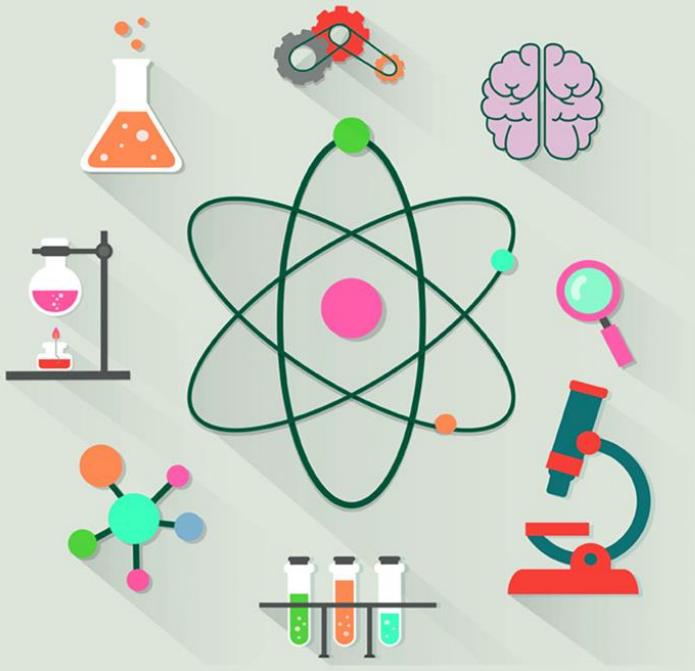
$2e^-$

$R-R$

CO_2

$2H^+ + 2e^- \longrightarrow H_2(g)$





IMPORTANT POINTS

Note

(i) CO_2 gas is evolved at anode

(ii) H_2 is evolved at cathode

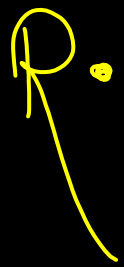
(iii) As NaOH is produced, the pH increases

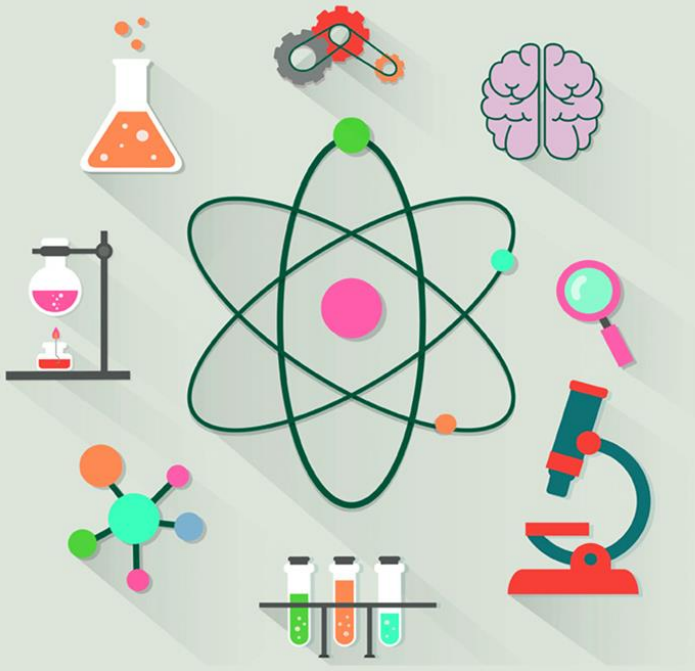
basic

(iv) CH_4 can not be obtained

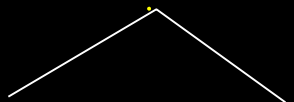
#SVshortcut

RCOONa



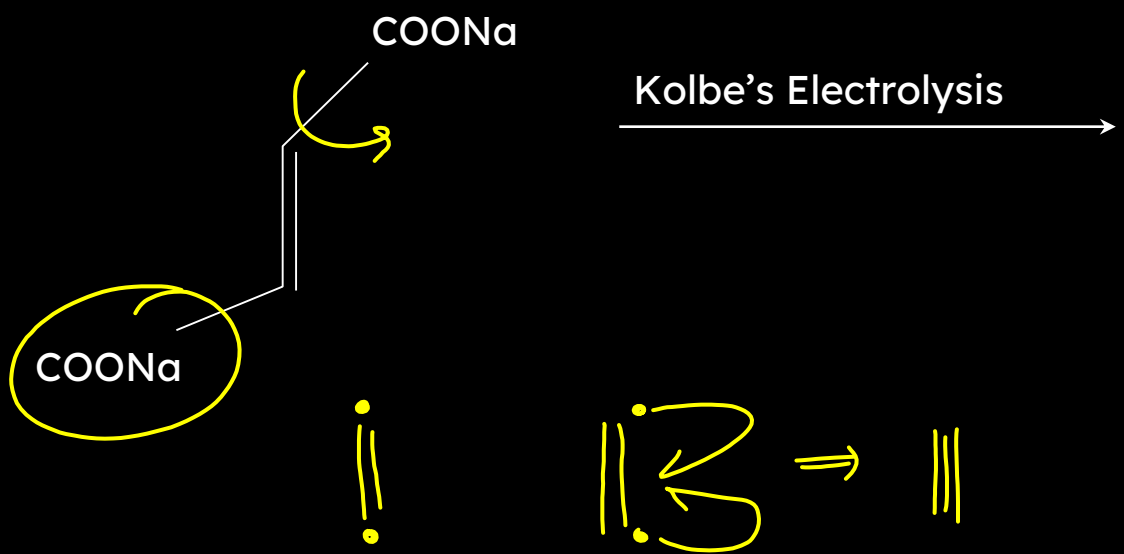


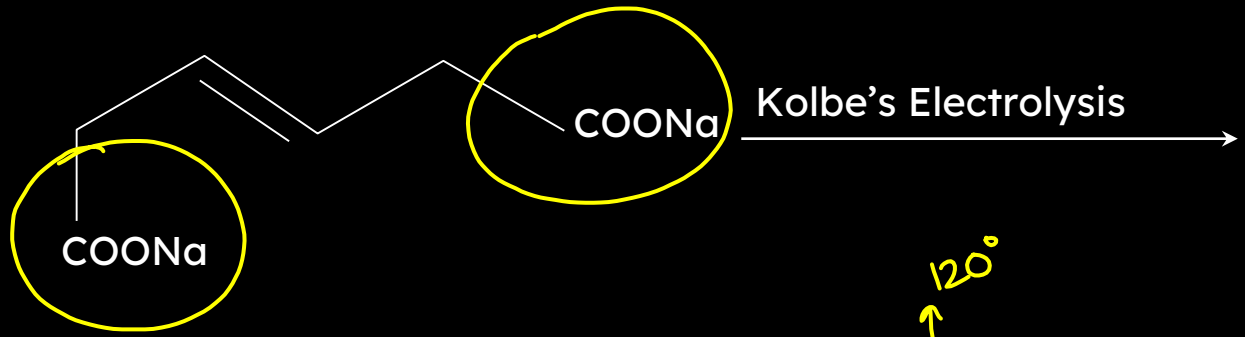
PRACTICE QUESTIONS

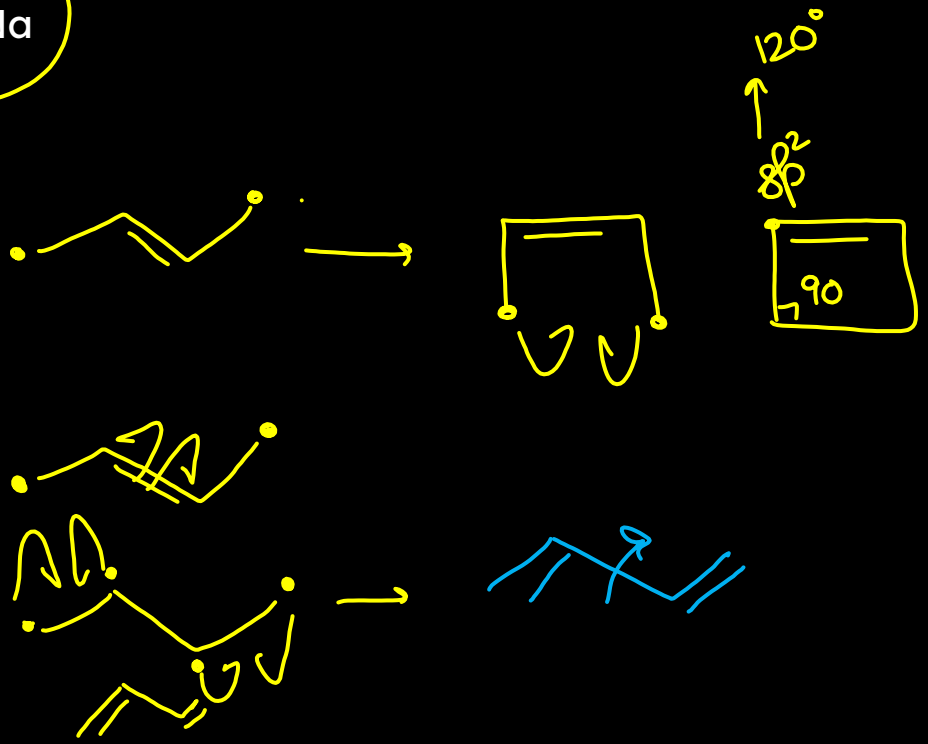


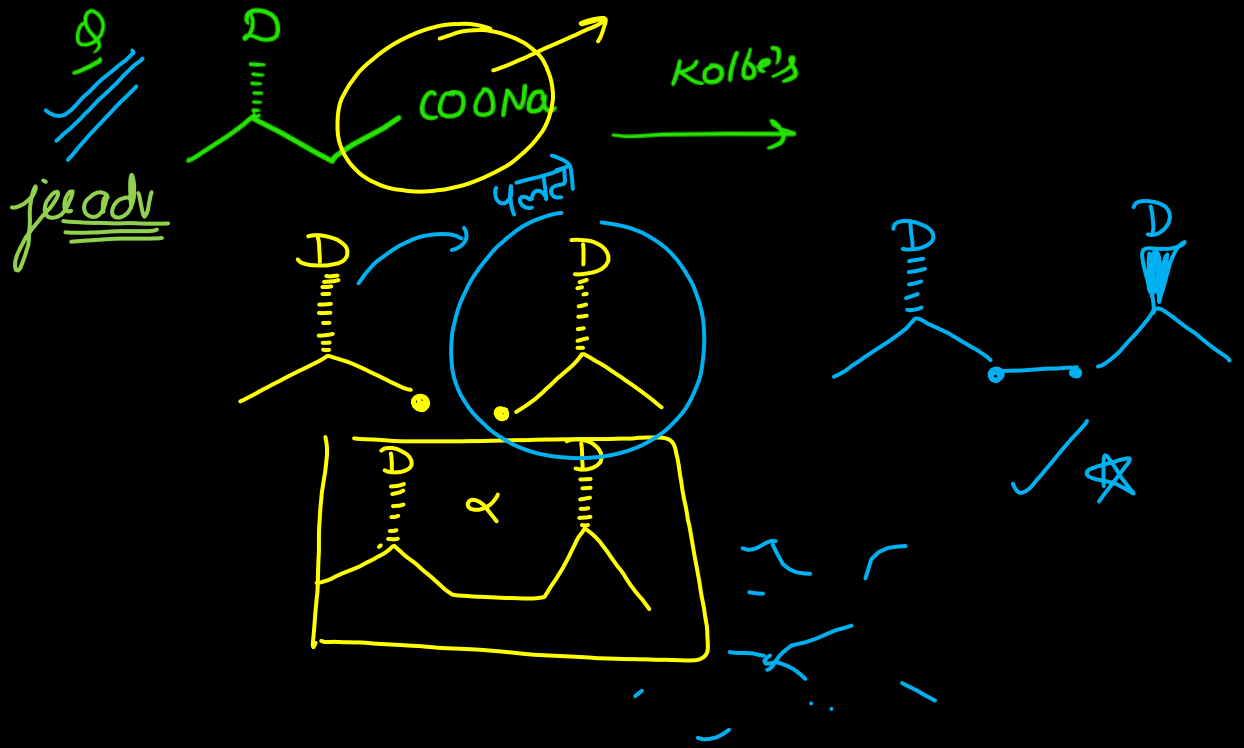
COONa

Kolbe's Electrolysis

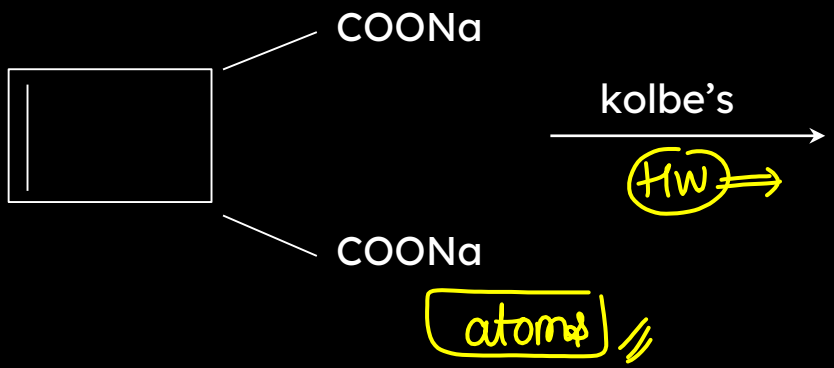

COONa
Kolbe's Electrolysis
COONa

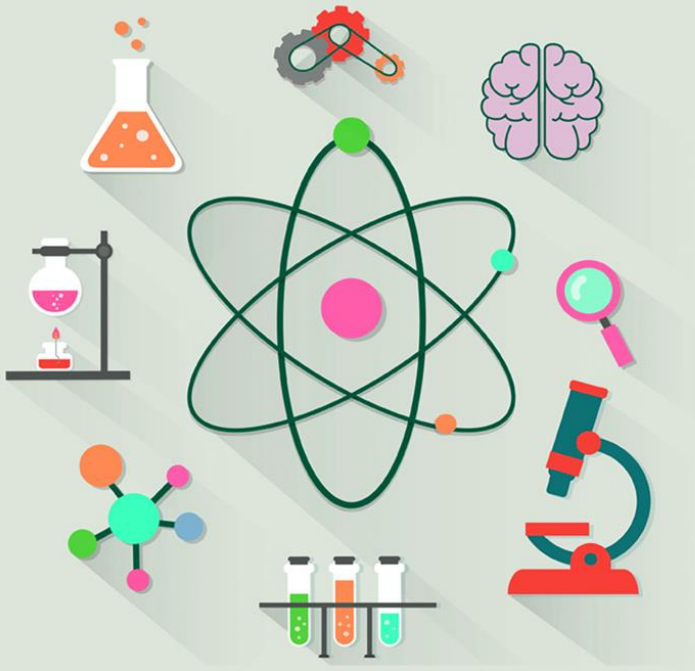

COONa
COONa
Kolbe's Electrolysis


120°
sp²
90


Q
D
COONa
Kolbe's
jee adv
पलटो
D
D
D
D
D
D
R

Q


COONa
kolbe's
HW
COONa
atoms



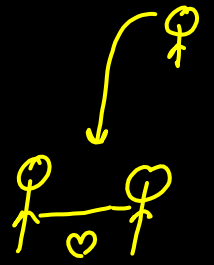
PRACTICE QUESTIONS

Wurtz reaction

When alkyl halide reacts with sodium in presence of dry ether then we get higher alkane.

$$R - X + 2Na + X - R \xrightarrow[\text{ether}]{\text{dry}} R - R$$

$$R-X + 2Na + X-R \longrightarrow R-R$$

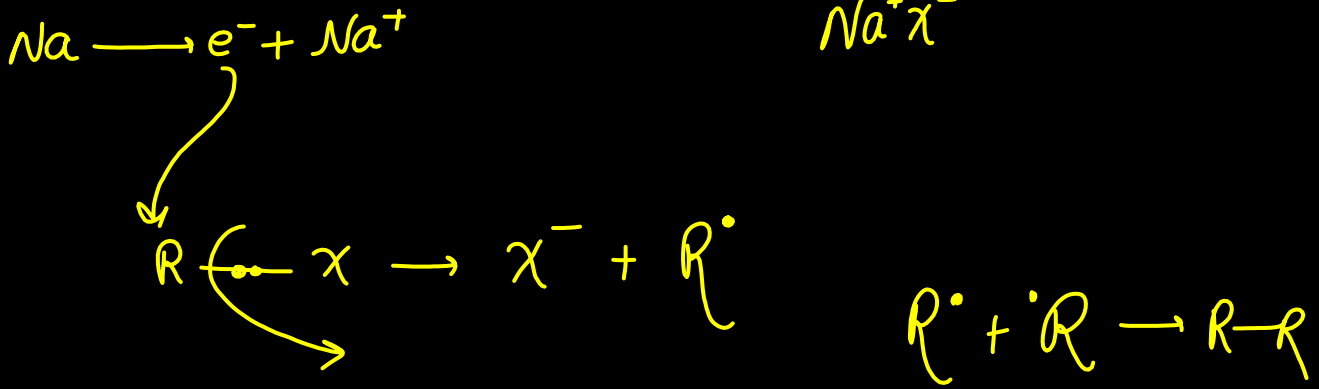


R—X

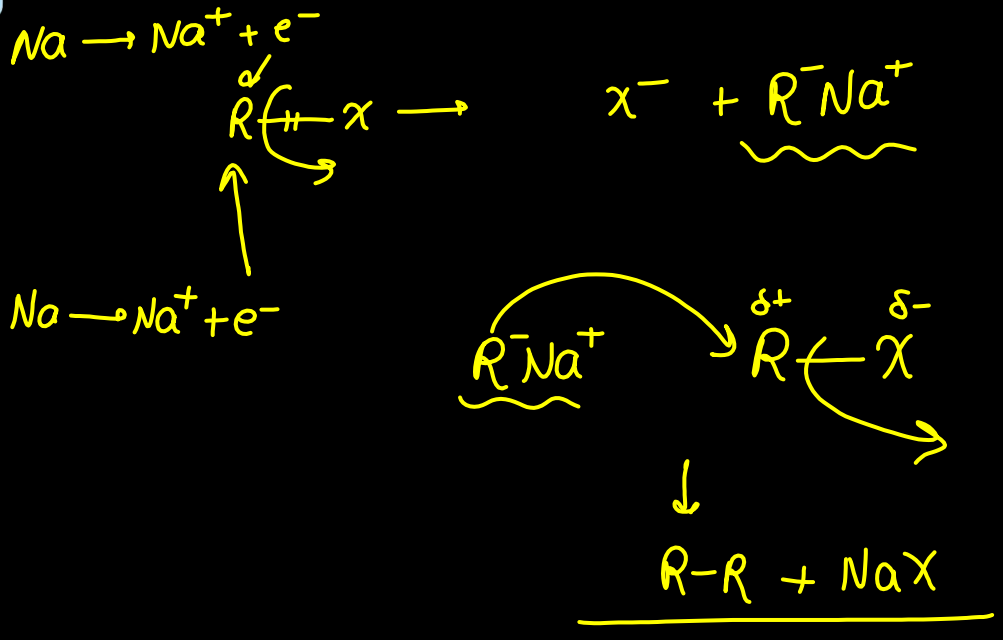
Halogen

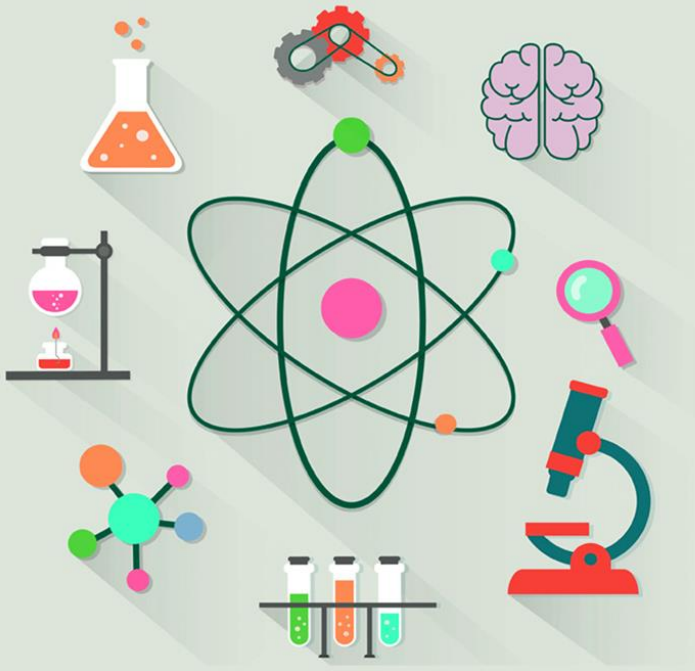
metal

Free Radical Mechanism



Ionic Mechanism



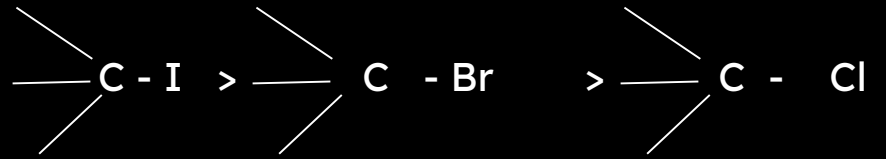


IMPORTANT POINTS

Important Points

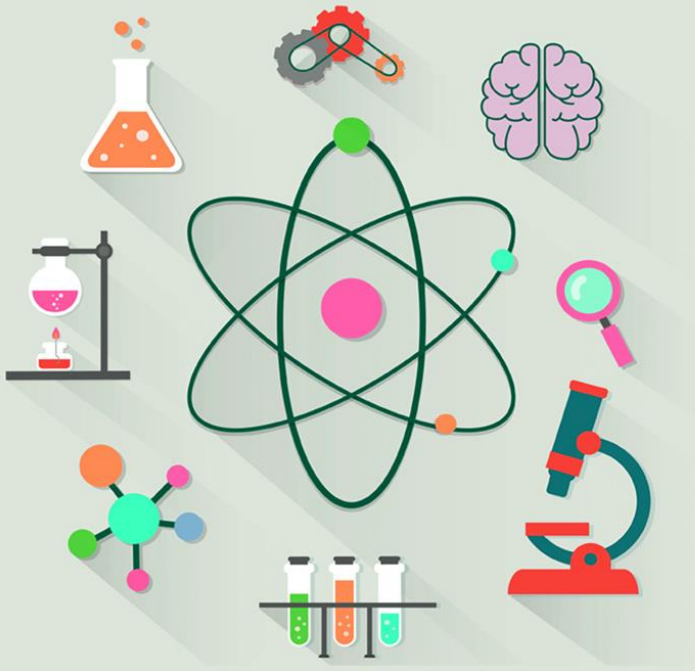
C — X

1. Breaking of C-X bond is RDS
2. Used for preparation of alkanes with even number of carbon atoms
3. Preparation of alkanes with odd number of carbon atoms/ unsymmetrical alkanes is tough.
4. Order of rate of reaction

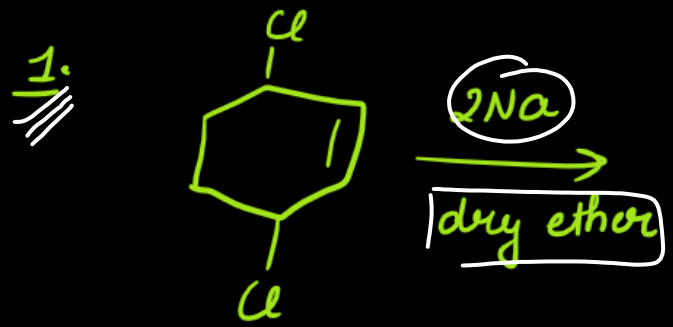


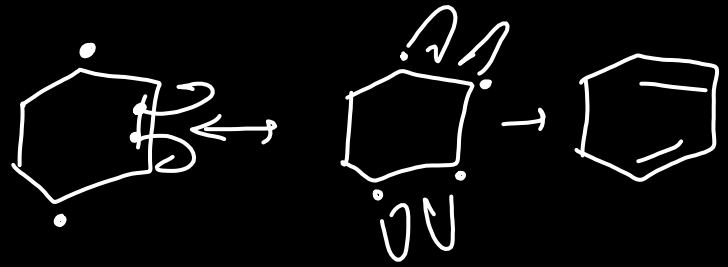
R• •R

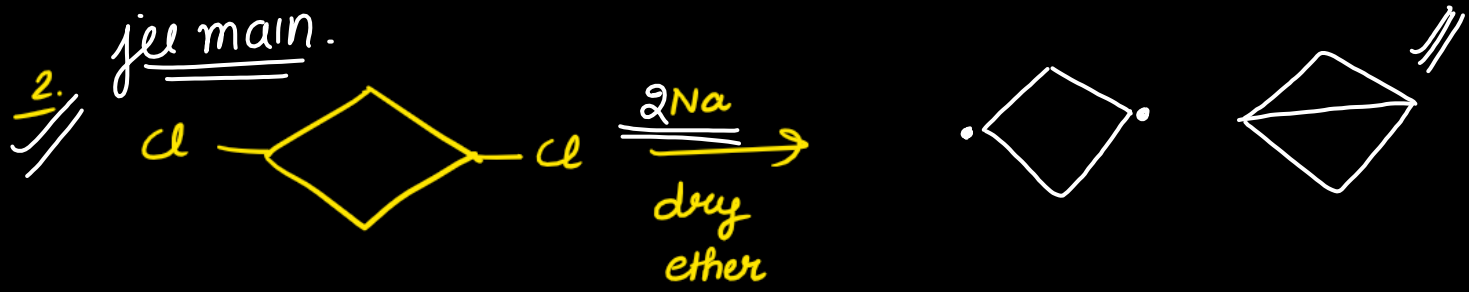
3 — 3 ⇒ 6

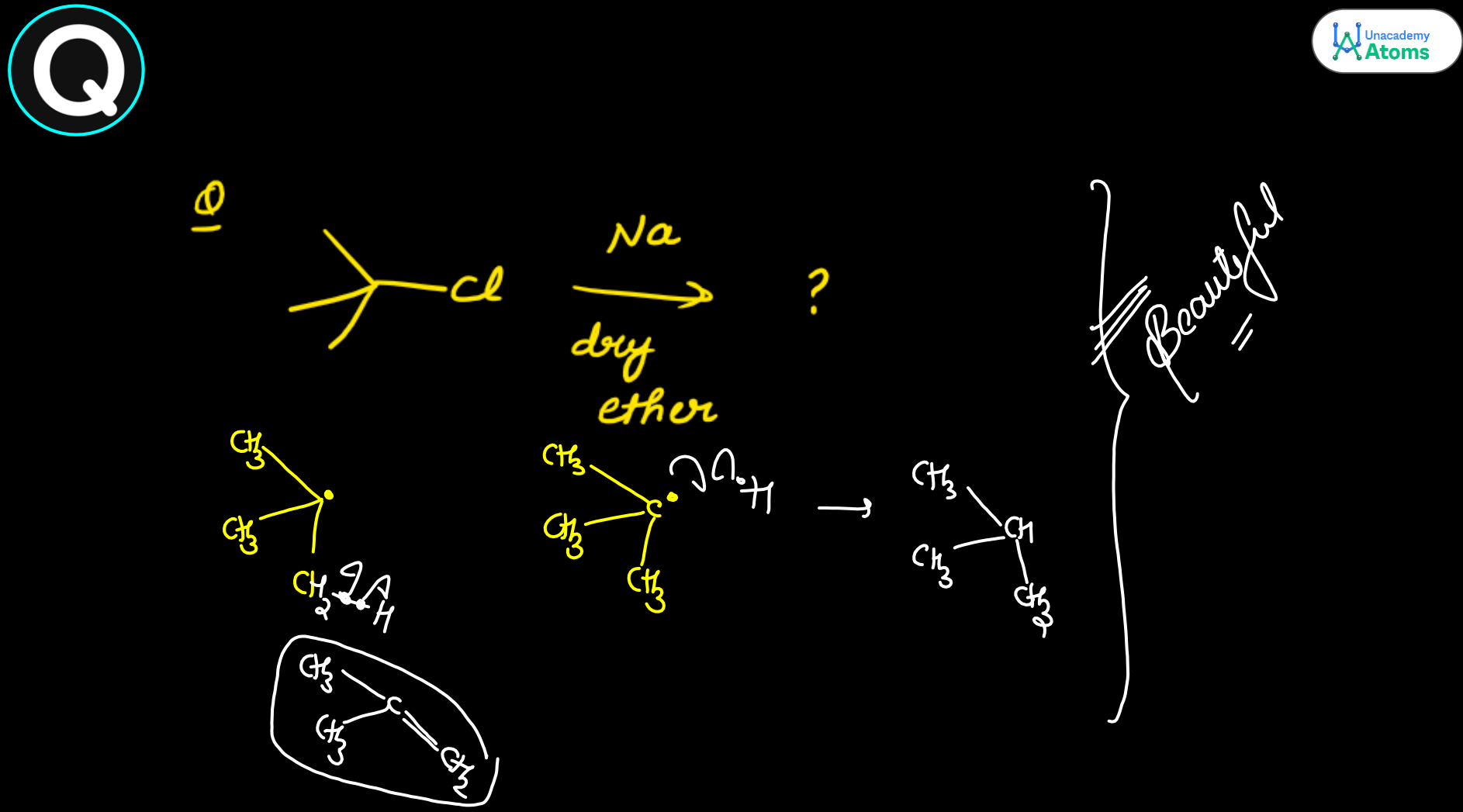


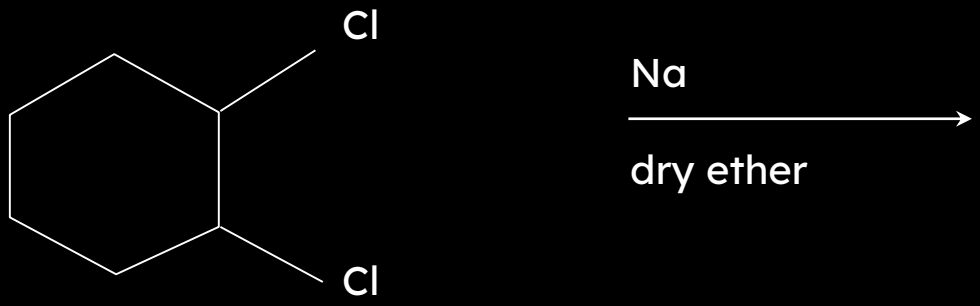
PRACTICE QUESTIONS

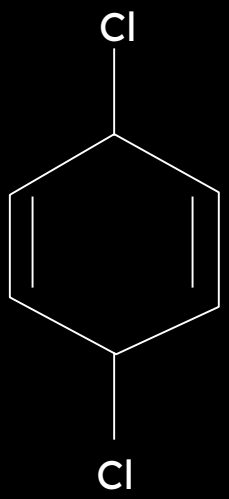

1.
Cl
Cl
2Na
dry ether




jee main.
2.
Cl
Cl
2Na
dry
ether


Q
Unacademy Atoms
Q.
Cl
Na
dry ether
?
Beautiful


Cl
Cl
Na
dry ether



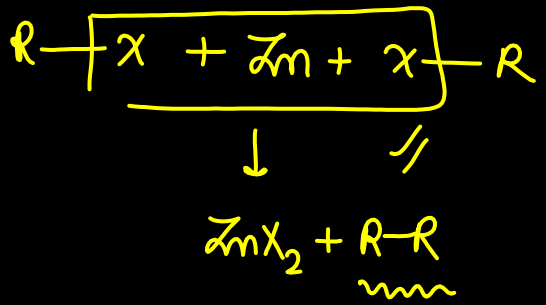
Na

dry ether

Frankland Reaction

If alkyl halide is treated with Zn dust in closed tube then higher symmetrical alkanes will be formed.

$$2RX + Zn \longrightarrow R - R + ZnX_2$$

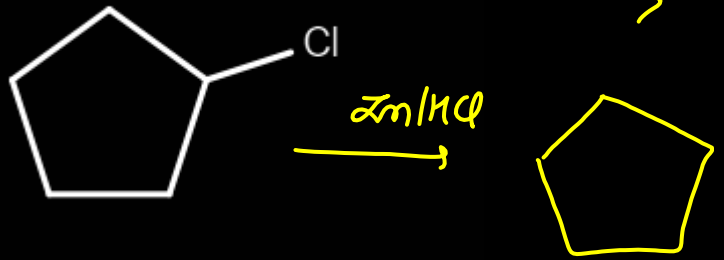


Reed's Reaction

$$RH + SO_2Cl_2 \text{ ----------> } RCl + HCl + SO_2$$

From Alkyl Halides

RX + Zn/HCl ----------> RH

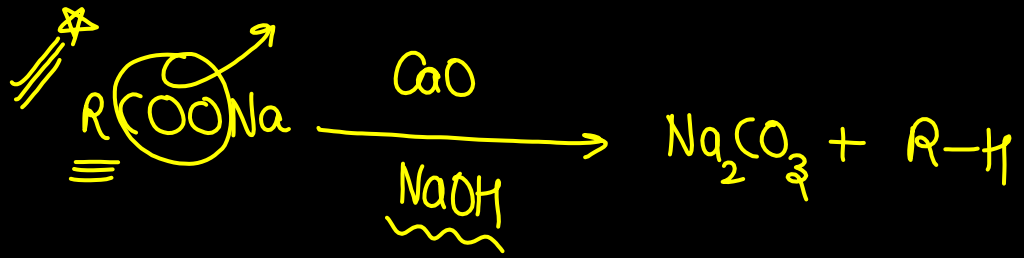


$R\overset{\sim}{\sim}X + Zn/HCl \longrightarrow R-H$

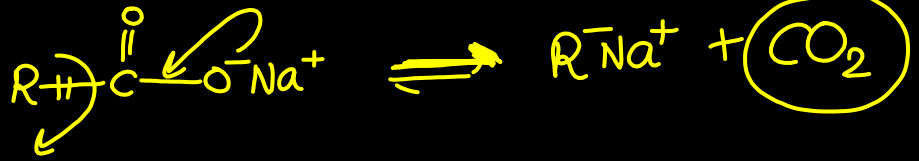
Soda Lime Decarboxylation

Whenever sodium salt of carboxylic acid is treated with soda lime, it gets decarboxylated and corresponding hydrocarbon is formed

$$RCOONa + NaOH \xrightarrow{CaO} R - H + Na_2CO_3$$

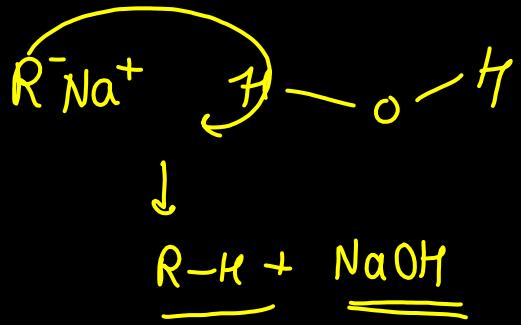


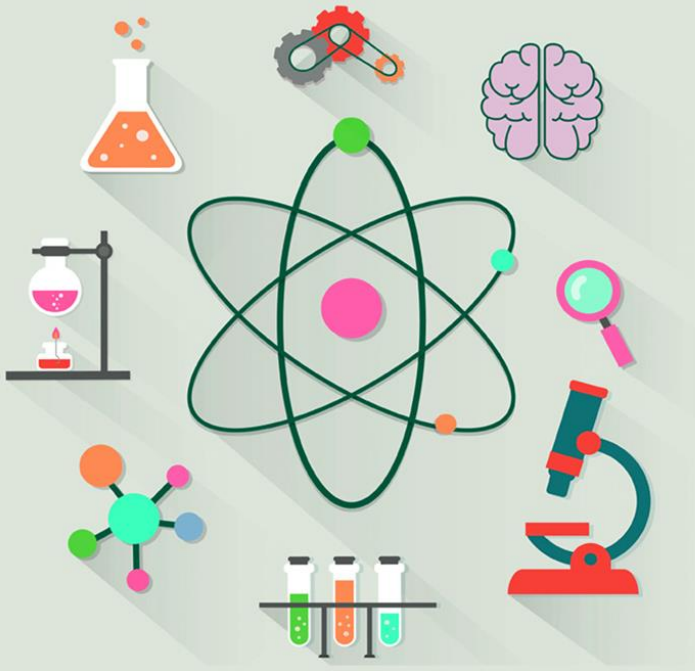
Mechanism



$$CO_2 + CaO \longrightarrow CaCO_3$$

$$CO_2 + NaOH \longrightarrow Na_2CO_3$$





IMPORTANT POINTS

Soda Lime Decarboxylation

- It is decarboxylation reaction
- Intermediate is CARBOANION
- Formation of carboanion is RDS
- Rate of reaction depends upon stability of carboanion

R^-

Kolbe's

$R^\bullet + {}^\bullet R$

↓

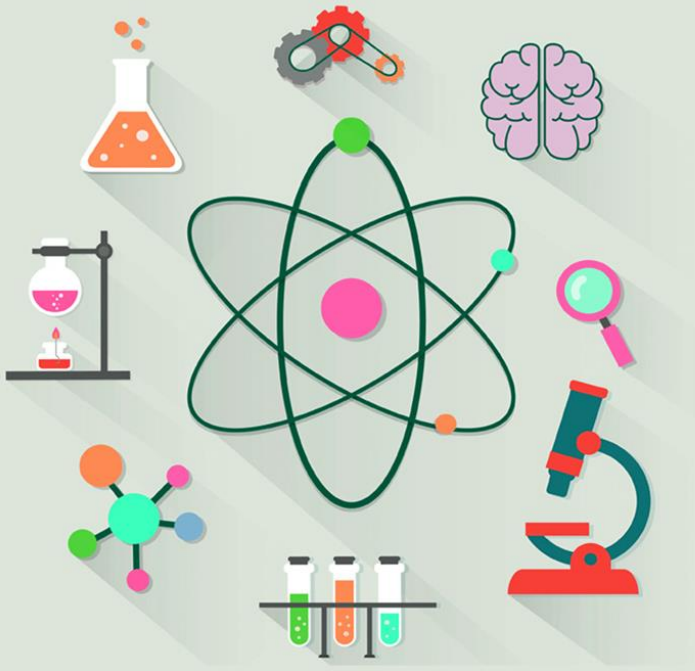
$R-R$

Soda lime

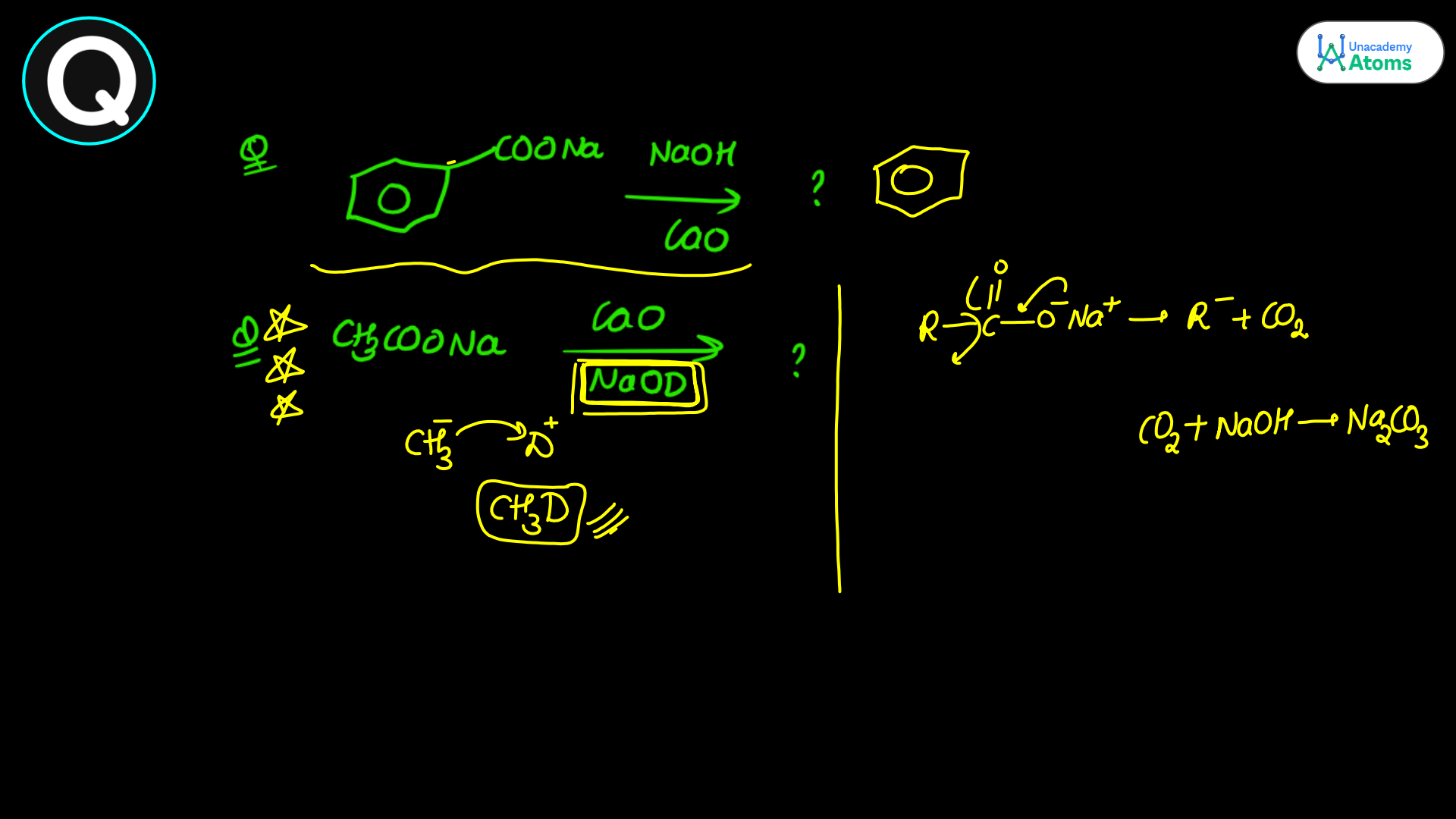
R^- $\overset{+}{H}$O

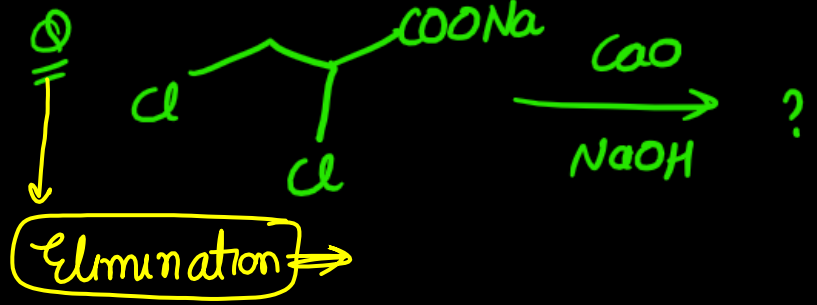
↓

$R-H$

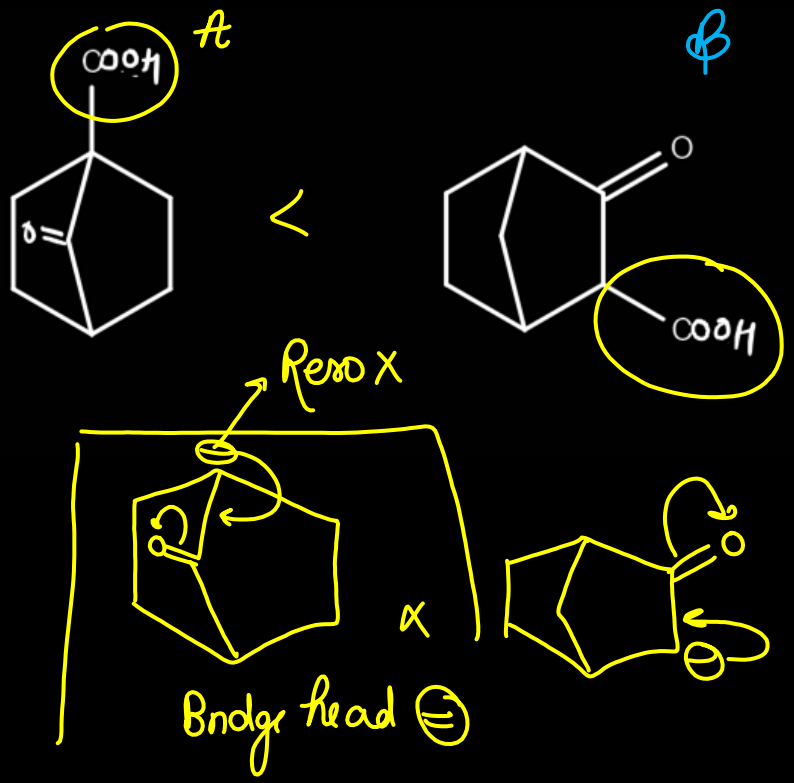


PRACTICE QUESTIONS

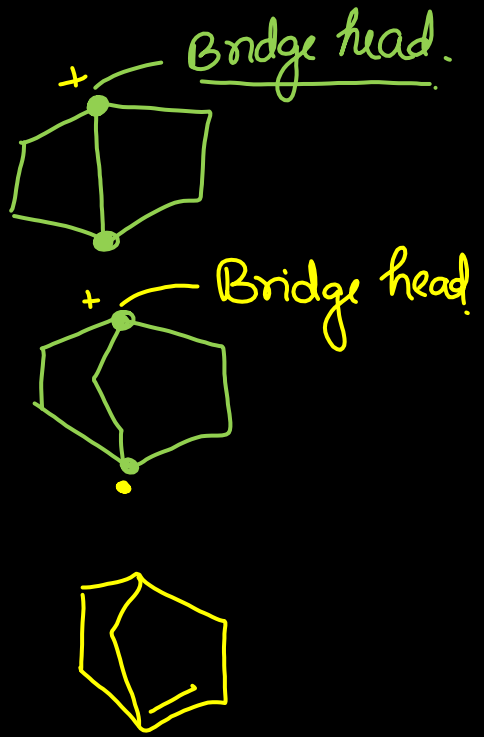

Q
COONa
NaOH
CaO
?
CH3COONa
CaO
NaOD
?
CH3−
D+
CH3D
R
C
O
Na+
R− + CO2
CO2 + NaOH → Na2CO3
Unacademy
Atoms


COONa
Cl
Cl
CaO
NaOH
?
Elimination

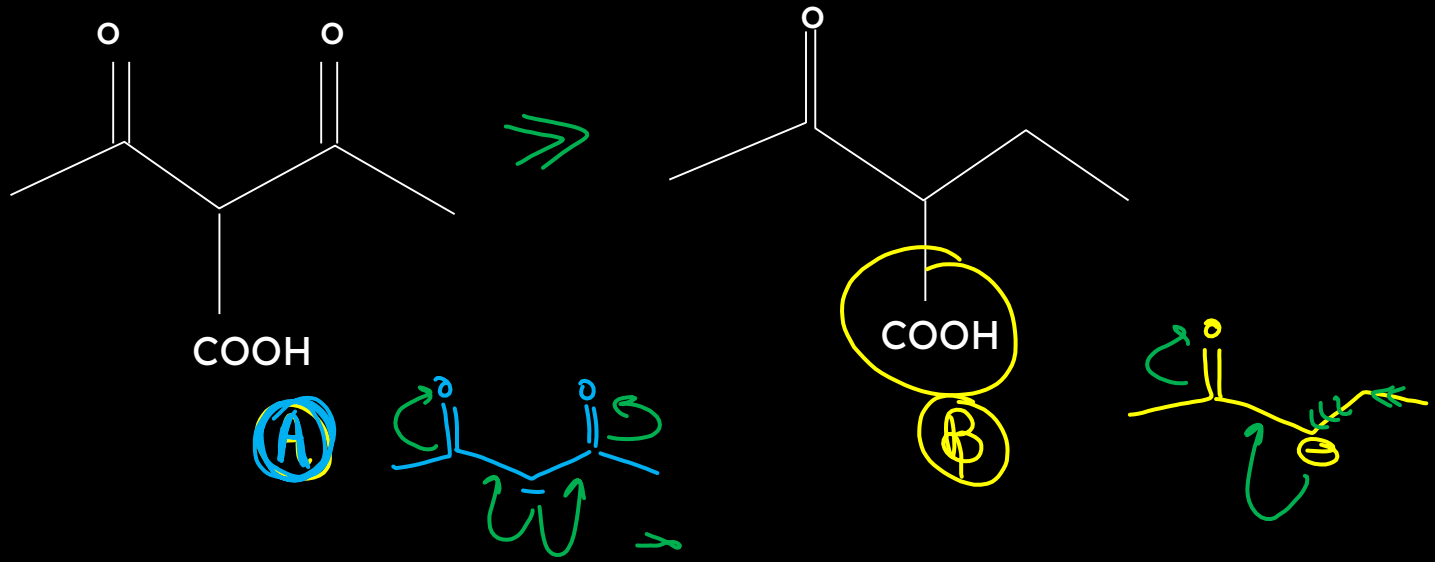
Which will show faster decarboxylation



Bredt's rule



Which will show faster decarboxylation



Which of the following reactions produce(s) propane as a major product ?

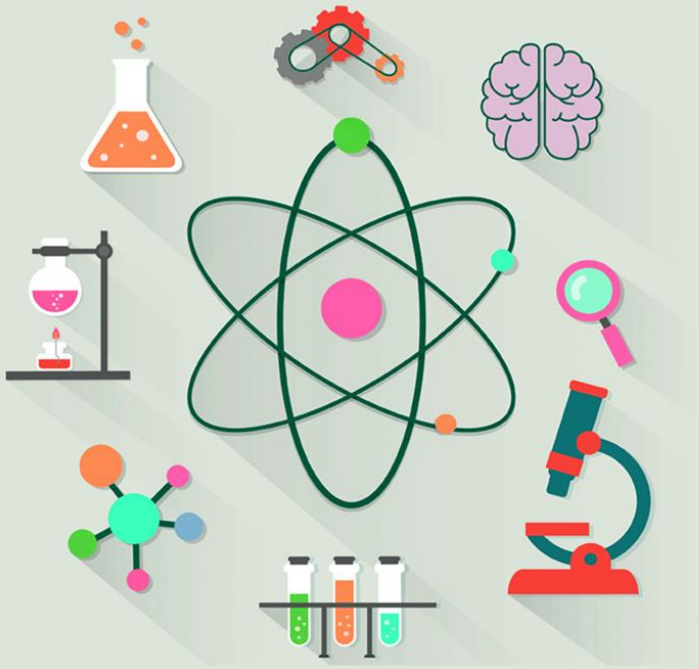
A. 

B. 

C. 

D. 

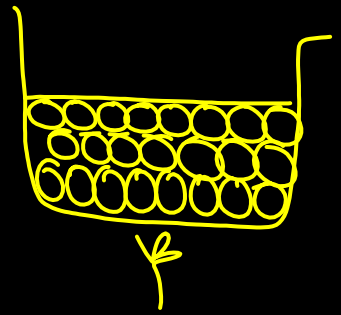
[Adv .2019]

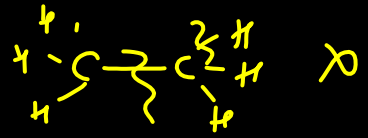


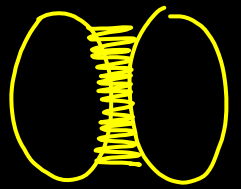
PHYSICAL PROPERTIES OF ALKANES

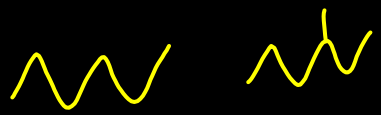
Physical Properties

1. Alkanes are non polar.
2. Boiling point depends on the extent of vanderwaal forces of attraction which depends on surface area
3. Boiling point decreases on branching









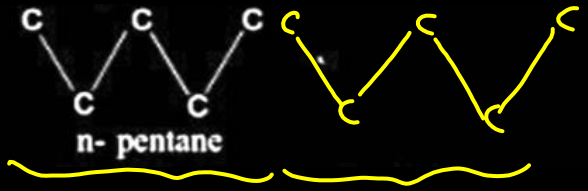
Physical Properties

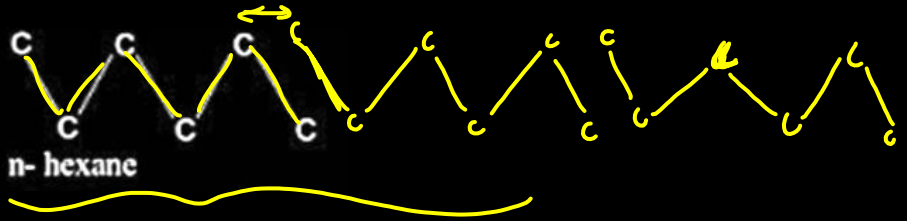
1. Alkanes are lighter than water, so it floats over water.
2. Physical state:

C_1 - C_4	→	Gaseous state
C_5 - C_{17}	→	Liquid state (except neo pentane)
C_{18} & above	→	Solid like wax

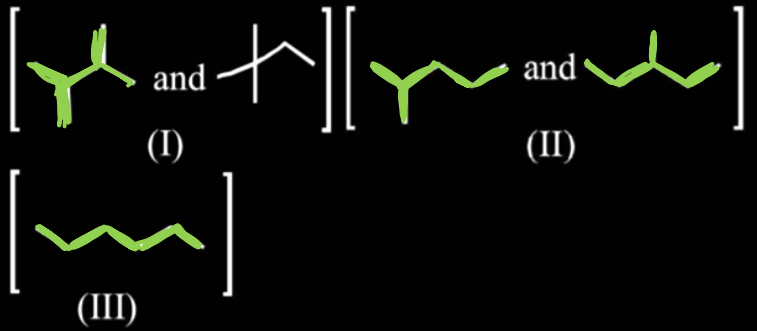
Physical Properties

Melting and boiling points increase with molecular mass and decreases with branches
the alkane having even carbons have more M.P. than odd carbons,
For e.g.



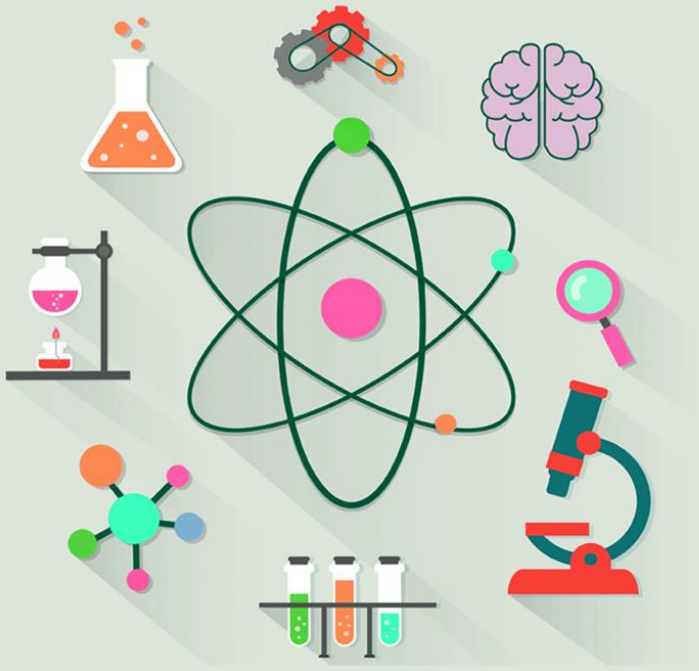


Isomers of hexane, based on their branching, can be divided into three distinct classes as shown in the figure. The correct order of their boiling points is



[Adv. 2014]

A. I > II > III
B. III > II > I
C. II > III > I
D. III > I > II



CHEMICAL PROPERTIES OF ALKANES

Combustion Reactions

$$C_xH_y + \left(x + \frac{y}{4}\right) O_2 \longrightarrow x CO_2 + \frac{y}{2} H_2O$$

$$\text{alkane / alkene / alkyne} + O_2 \longrightarrow CO_2 + H_2O$$

	C–H	
$x = n$	$x = n$	$x = n$
$y = 2n+2$	$y = 2n$	$y = 2n-2$

At 300 K and 1 atmospheric pressure, 10 mL of a hydrocarbon required 55 mL of O_2 for complete combustion, and 40 mL of CO_2 is formed. The formula of the hydrocarbon is :

A. C_4H_{10}

B. C_4H_6

C. C_4H_7Cl

D. C_4H_8

$$1\,C_xH_y + \left(x+\frac{y}{4}\right)O_2 \longrightarrow xCO_2 + \frac{y}{2}H_2O$$

10mL 55mL 40mL

1 mole C_xH_y ⟶ x moles

10mL ⟶ $10x = 40$

$x = 4$

$PV = nRT$

$V \propto n$

10mL 1 ⟶ $x+\frac{y}{4}$

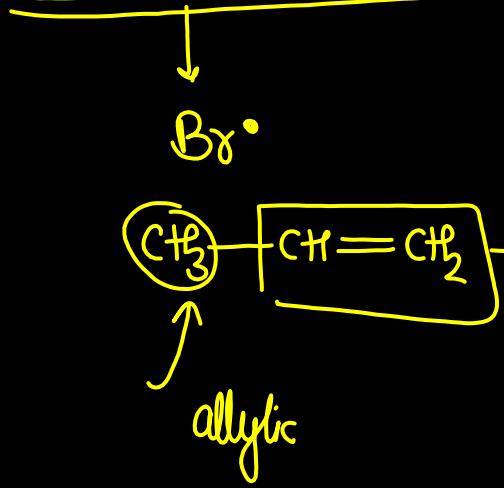
$$10\left(x+\frac{y}{4}\right) = 55$$

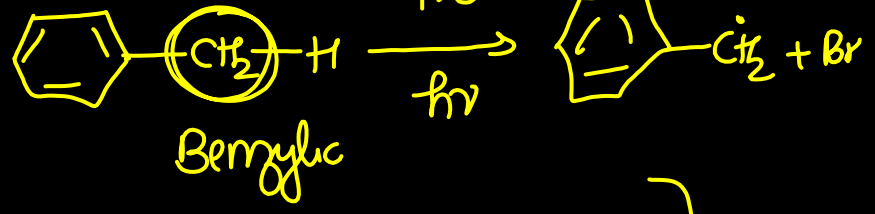
[April 10, 2019 (I)]

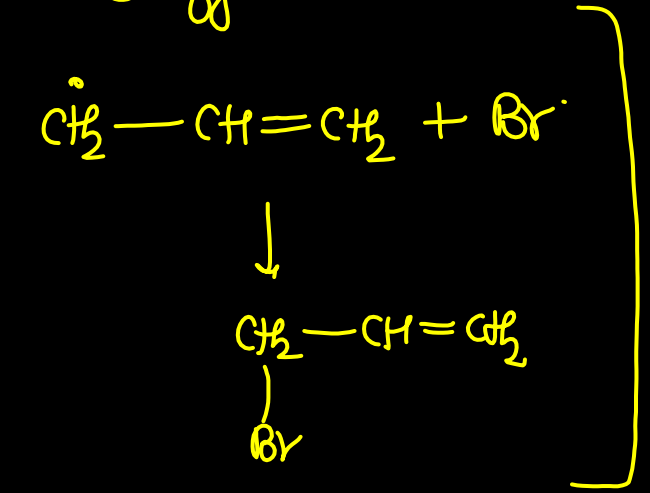
NBS — [Haloalkanes]

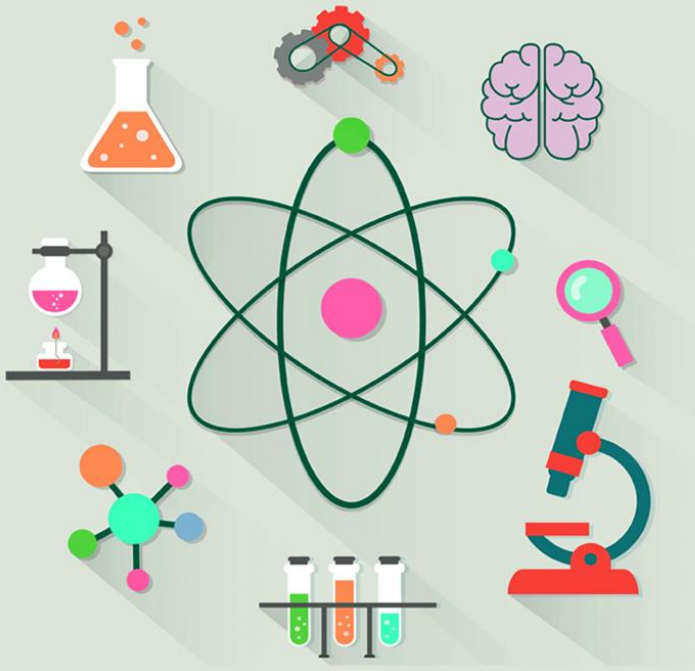
NBS oxidises allylic/benzylic position by substituting Br

N-Bromosuccinimide



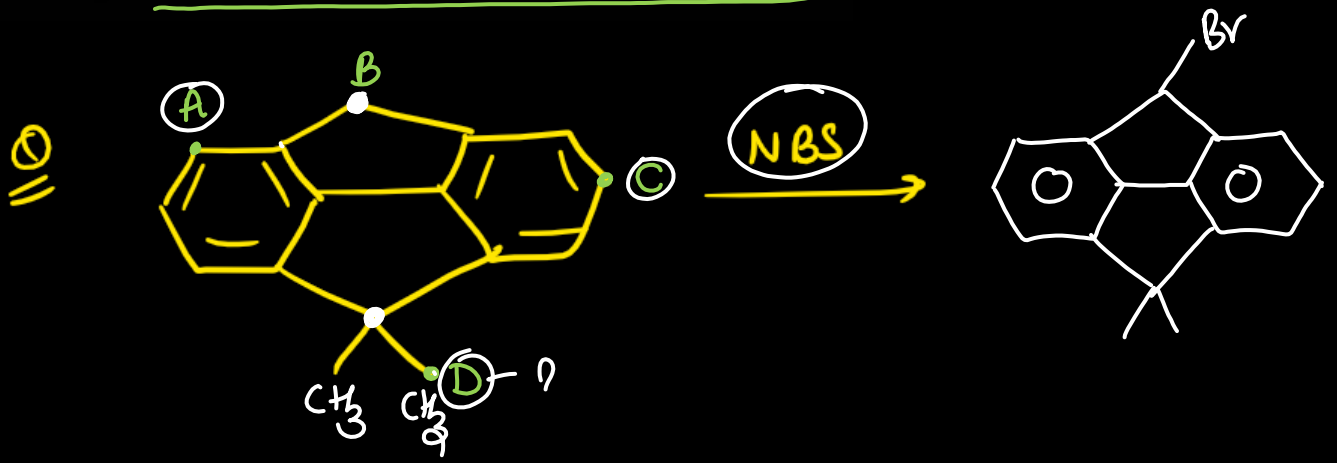






PRACTICE QUESTIONS

The product of the reaction given below is:

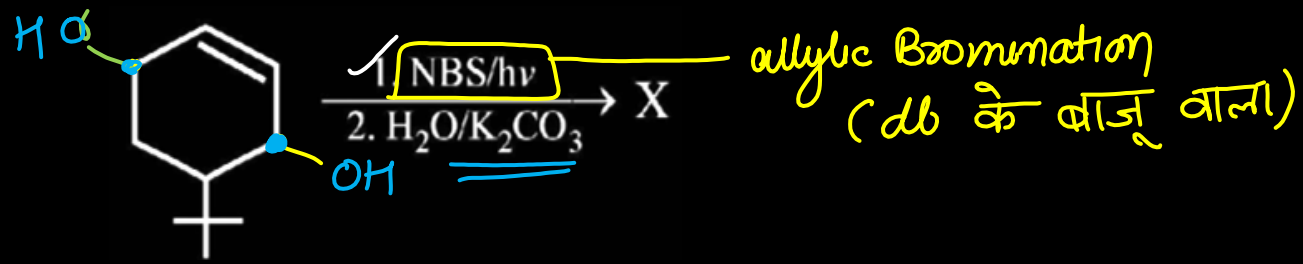


The product of the reaction given below is:

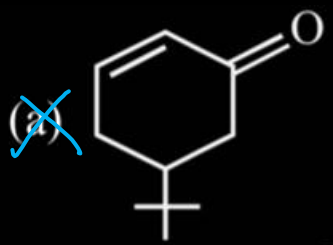
HW

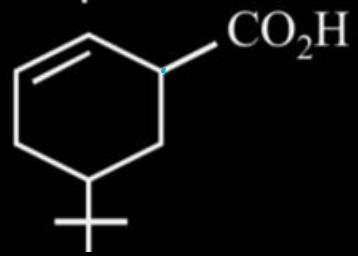
Q $CH_3-CH=CH-CH=CH-CH_3 \xrightarrow{NBS} ?$

The product of the reaction given below is:

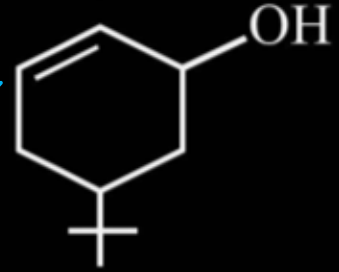


allylic Bromination (db के बाजू वाला)

(a) 

(b) 

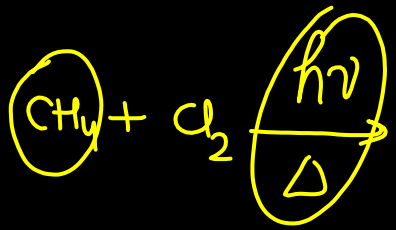
(c) 

(d) 

[2016]

Halogenation of alkanes

Alkanes react with bromine or chlorine in the presence of sunlight or UV light or in dark at high temperatures (250°C - 400°C) forming a mixture of substituted products. For example,



Mechanism of Halogenation :

free radical

① Chain initiation $X\!-\!X + h\nu \longrightarrow 2X^{\cdot}$

② Chain propagation

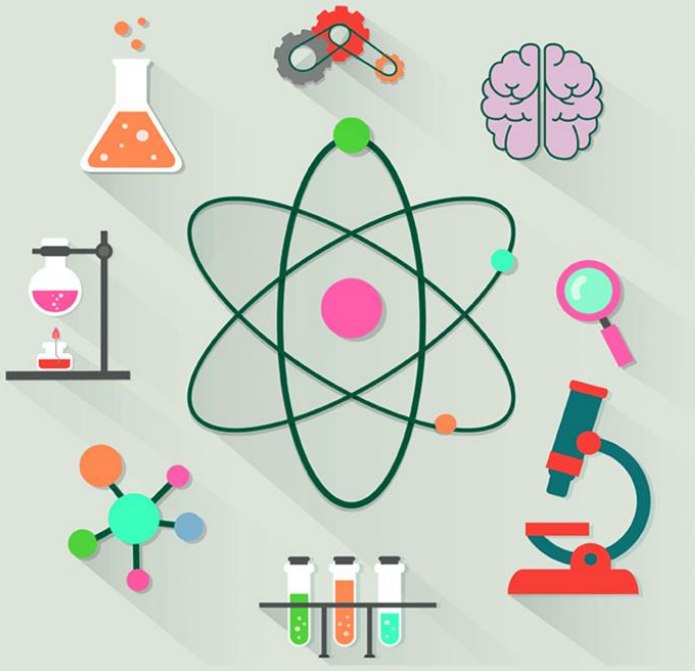
$X^{\cdot} + R\!-\!H \xrightarrow{\text{slow}} HX + R^{\cdot}$

$R^{\cdot} + X\!-\!X \longrightarrow R\!-\!X + X^{\cdot}$

③ Chain termination

$R^{\cdot} + {}^{\cdot}R \longrightarrow R\!-\!R$

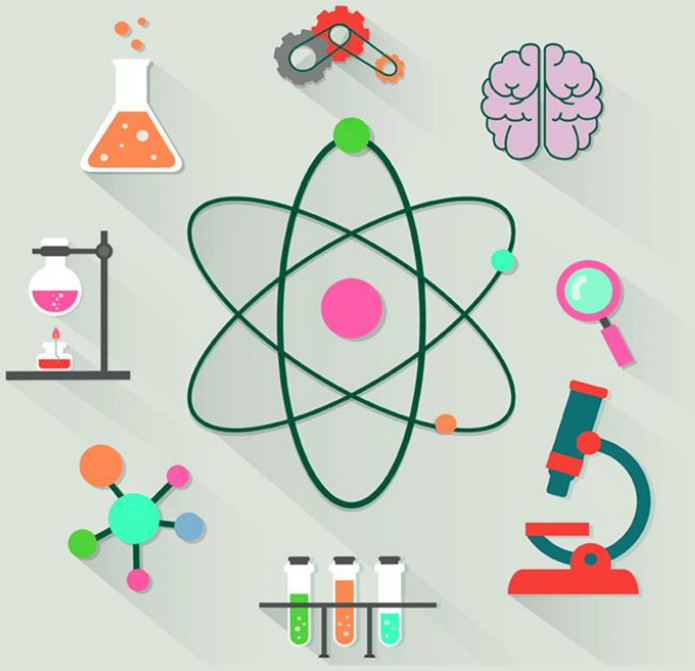
$X^{\cdot} + {}^{\cdot}X \longrightarrow X_2$



IMPORTANT POINTS

Important points

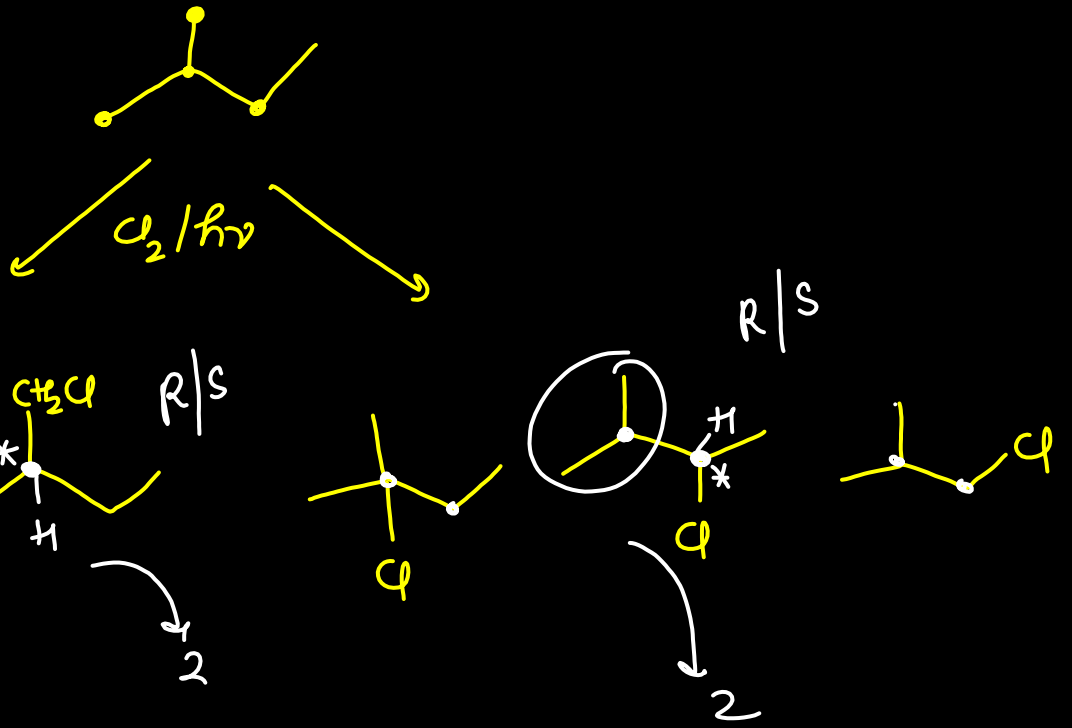
- Free radical intermediate is formed
- It is a substitution and an oxidation reaction → next chp
- RDS is the formation of free radical
- Rate of reaction for alkanes:
  Tertiary > secondary > primary
- Rate of reaction for halogens:
  $F_2 >> Cl_2 > Br_2 > I_2$



PRACTICE QUESTIONS

On monochlorination of 2 - methylbutane, the total number of chiral compounds formed is

A. 2
B. 4
C. 6
D. 8



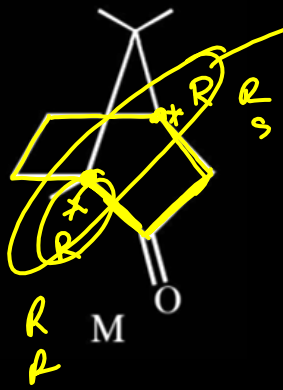
[2004 S]

The major product obtained in the photo catalysed bromination of 2 - methylbutane is:

Jee ⟶

A. 1-bromo-2-methylbutane
B. 1-bromo-3-methylbutane
C. 2-bromo-3-methylbutane
D. 2-bromo-2-methylbutane

The total number of stereoisomers that can exist for M is



connected

↓

Locked

↓

dependent

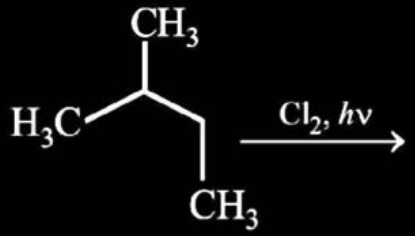
1 chiral C

↓

*

2

[Adv .2015]

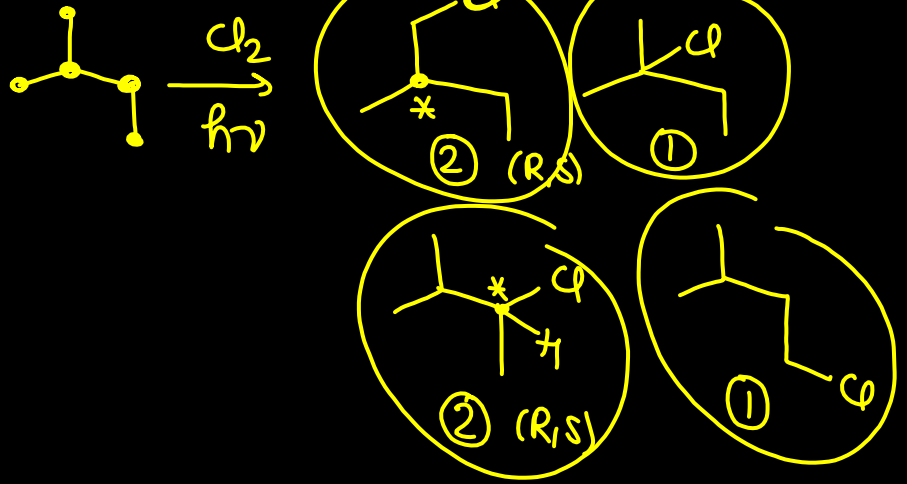


$\xrightarrow{Cl_2,\ h\nu}$ $\underset{C_5H_{11}Cl}{N \text{ (isomeric products)}}$;

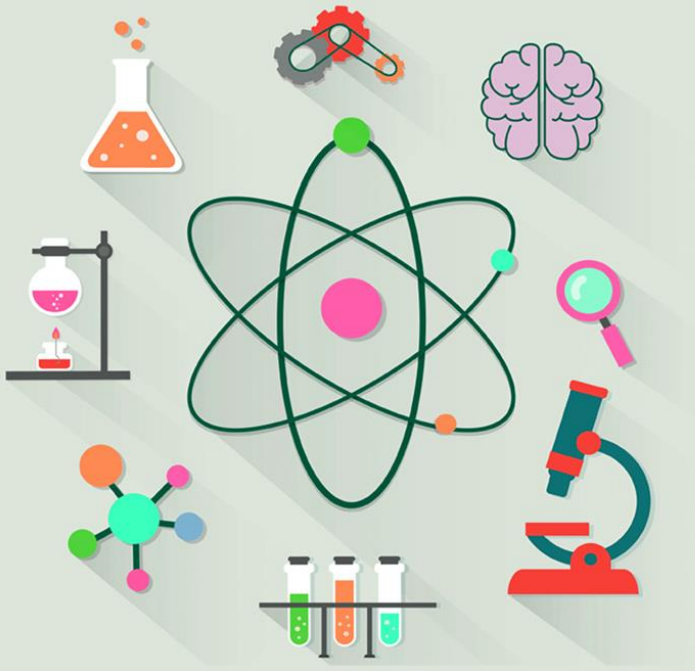
$\xrightarrow{\text{fractional distillation}}$ M (isomeric products)

Identify N and M

A. 6, 4
B. 6, 6 ✗
C. 4, 4
D. 3, 3



[2006 - 5M, -1]



IMPORTANT NOTES

Direct fluorination is explosive and can be achieved by the action of inorganic fluorides on bromo or iodo derivatives.

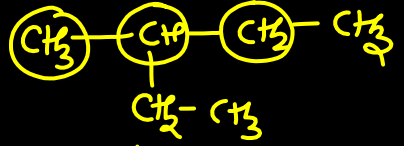
$2C_2H_5Br + HgF_2 \rightarrow 2C_2H_5F + H_gBr_2$ ⟶ Haloalkanes

$CH_4 + F_2 \xrightarrow{h\nu}$

Chlorination is highly reactive and less selective
Bromination is less reactive but more selective

Relative Reactivity of Chlorination towards tertiary, secondary and primary:

1 : 3.8 : 4.5



$3^\circ \gg 2^\circ \gg 1^\circ$ — general

Relative Reactivity of Bromination towards tertiary, secondary and primary:

1 : 80 : 1600

$Br_2/h\nu$

Iodination is reversible and can be carried out sufficiently in the presence of strong oxidising agents like iodic acid (HIO_3) or nitric acid that destroys hydroiodic acid (HI) and shifts the equilibrium towards the right.

$$\Rightarrow CH_4 + I_2 \xrightarrow{h\nu} CH_3I + HI$$

$$5\,HI + HIO_3 \longrightarrow 3I_2 + 3H_2O$$

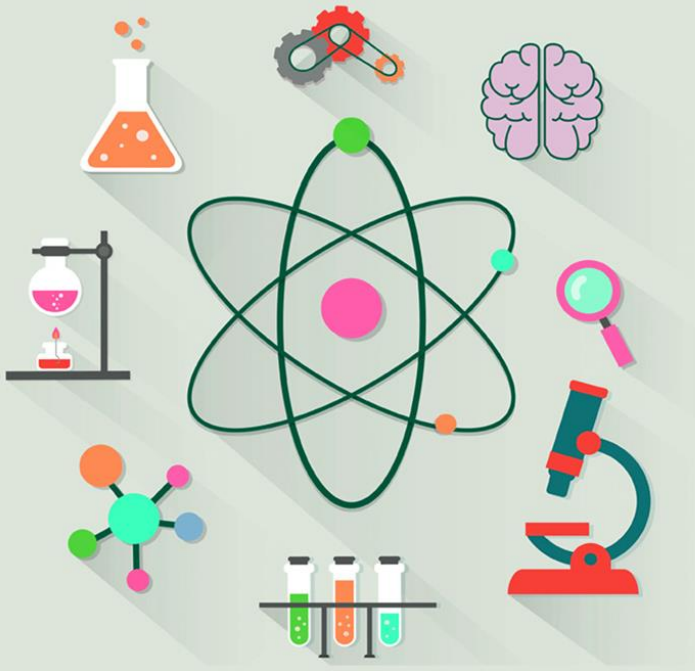
HNO_3

H—I

$CH_4 + I_2 \xrightarrow{h\nu} CH_3I + H-\overset{-1}{I}$

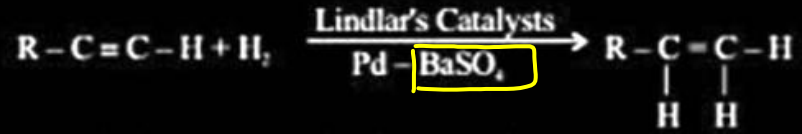
HNO_3
HIO_3

I_2

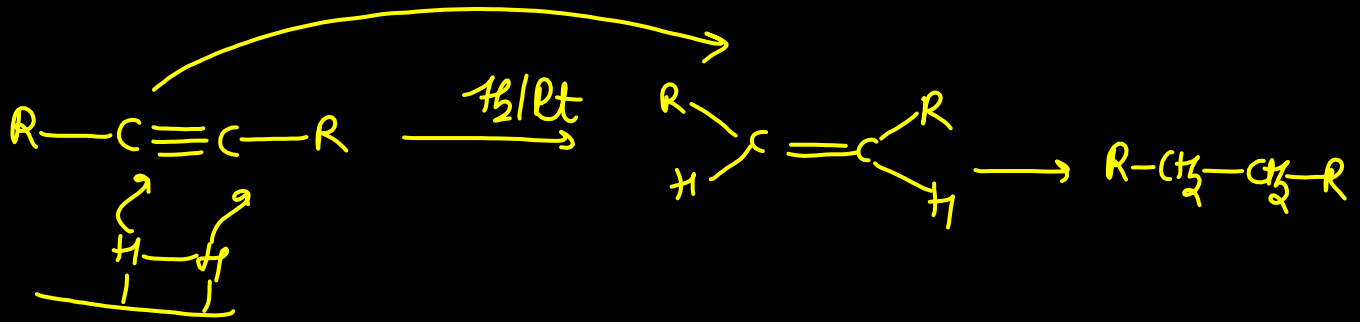


PREPARATION OF ALKENES

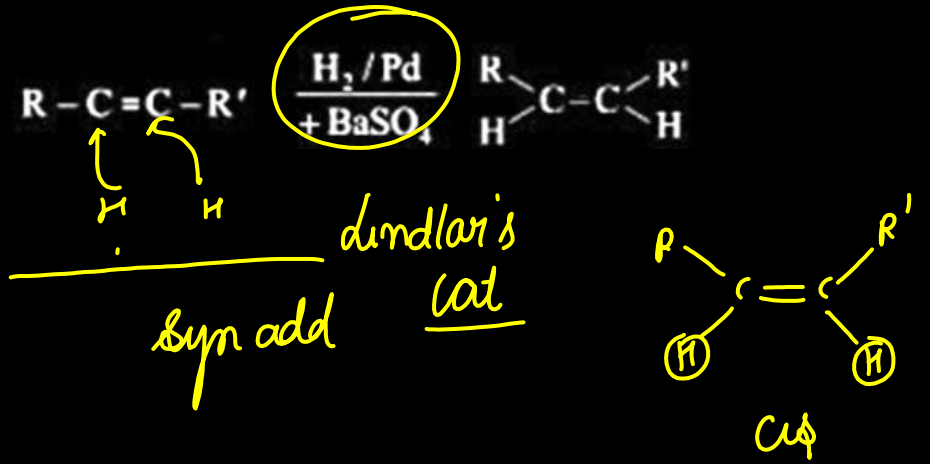
From Alkynes :



Poison of catalyst such as $BaSO_4$, $CaCO_3$ are used to stop the reaction after the formation of alkene, otherwise alkanes are formed.



(i) The reaction takes place at the surface of Pd, that is why it is cis addition and the product is cis from eg.



From ALKYNES

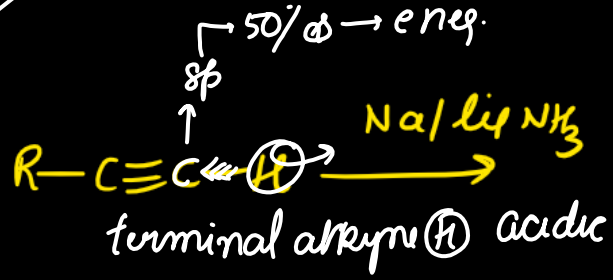
BIRCH REDUCTION: Na/Liq ammonia → Na/liq NH_3

1. Birch reduction can not reduce ALKENES
2. Na/liq ammonia shows acid base reaction with terminal alkynes.
3. Birch reduction gives trans alkenes exclusively.

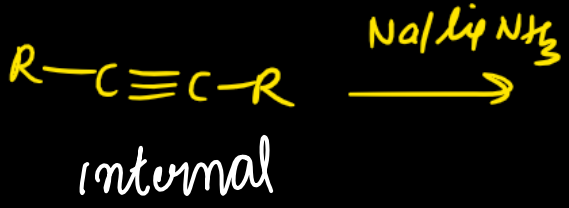
Lindlar's cat → cis alkene 100%

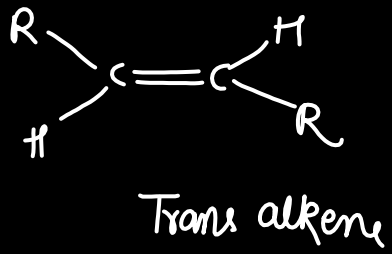
Birch Red → trans 100%

From ALKYNES



JEE Adv 2020 → 2 times





Mechanism of Birch Reduction

Leaving

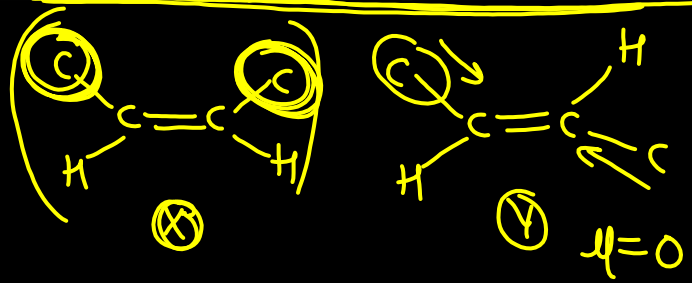
↓

Haloalkanes

are

When 2-butyne is treated with H_2/Lindlar's catalyst, compound X is produced as the major product and when treated with Na/liq. NH_3 it produces Y as the major product. Which of the following statements is correct?

(a) Y will have higher dipole moment and higher boiling point than X
(b) Y will have higher dipole moment and lower boiling point than X
(c) X will have lower dipole moment and lower boiling point than Y
(d) X will have higher dipole moment and higher boiling point than Y



[April 15, 2018 (II)]

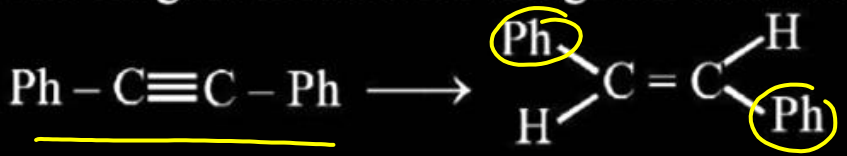
The *trans*-alkenes are formed by the reduction of alkynes with:

(a) H_2-Pd/C, $BaSO_4$
(b) $NaBH_4$
(c) Na/liq. NH_3
(d) Sn - HCl

[Main 2018]

Unacademy Atoms

The reagent needed for the given conversion is



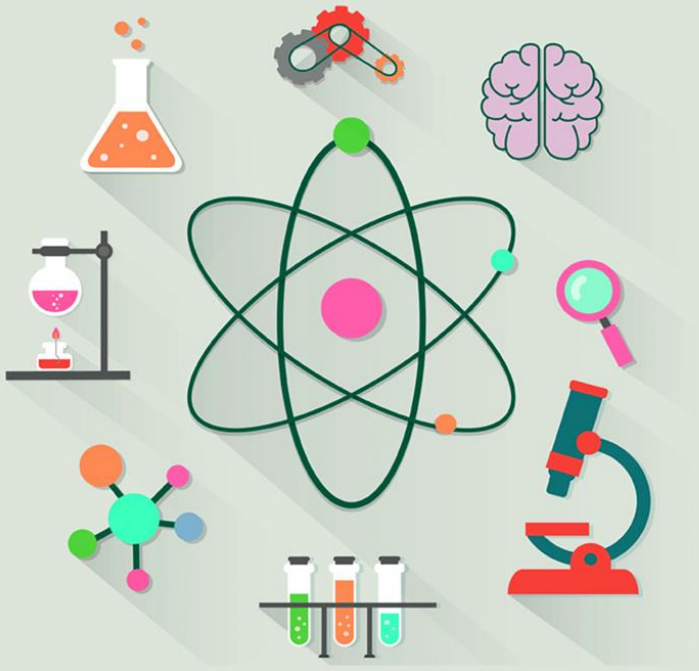
(a) Cat. hydrogenation

(b) H_2/ Lindlar Cat.

(c) Li/NH_3

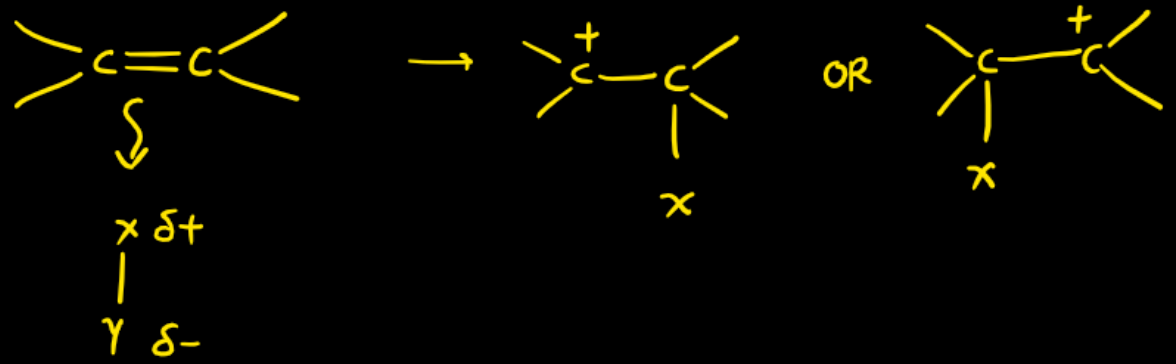
(d) $LiAlH_4$

[April 11, 2014]

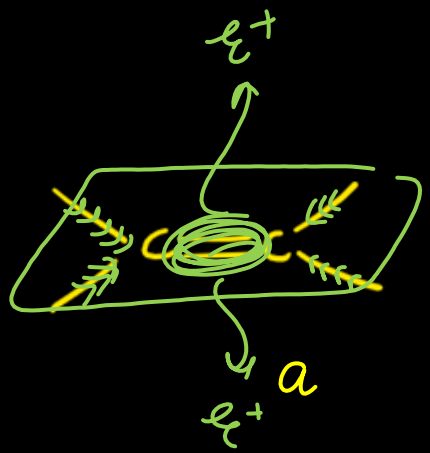


ELECTROPHILIC ADDITION ON ALKENES

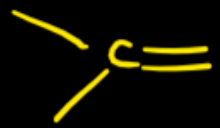
Electrophilic Addition



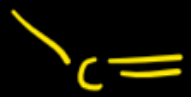
Arrange the following in the order of electrophilic attack



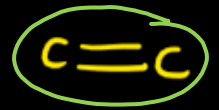
a



b



c

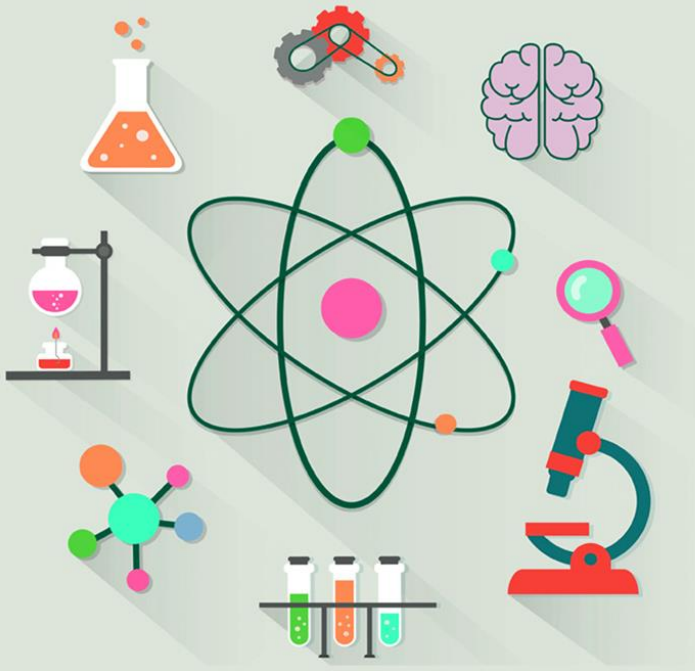


d

Steric hindrance
πe^- density (e - excess)

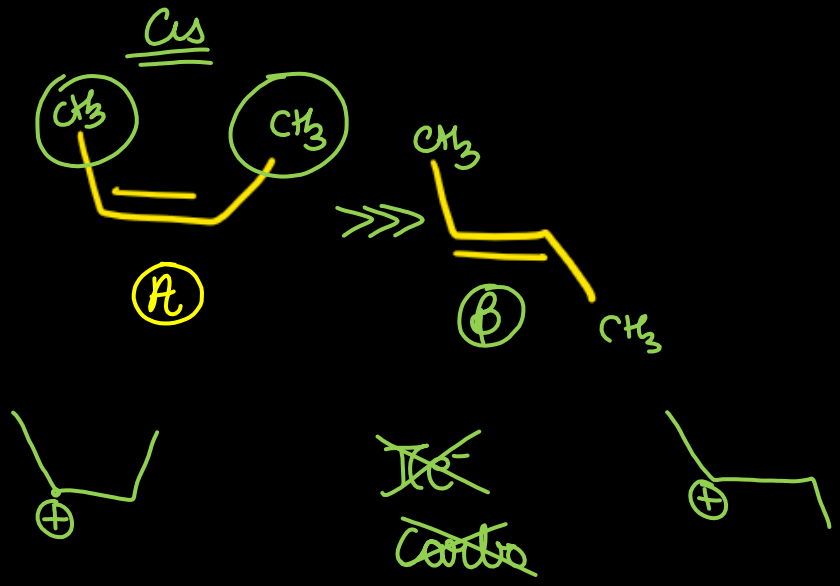
Electrophilic Addition

1. Check the nucleophilicity of alkene
2. If nucleophilicity is same, check the stability of carbocation
3. If the stability of carbocation is same, check the stability of alkene
4. More stable the alkene, less reactive it will be.

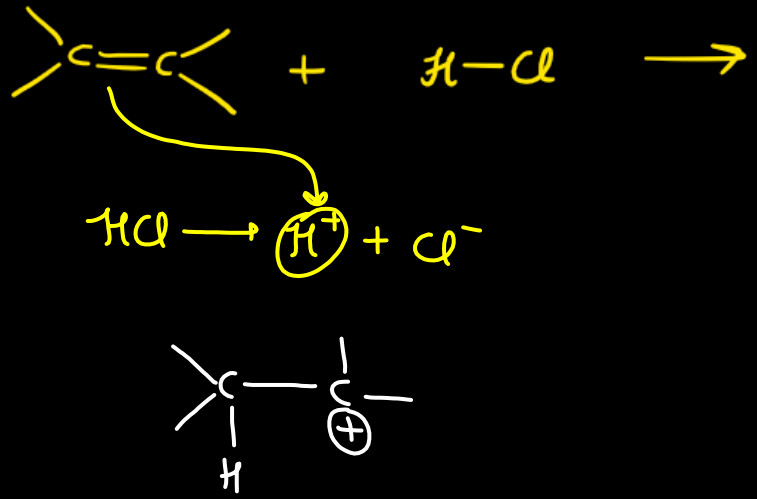


PRACTICE QUESTIONS

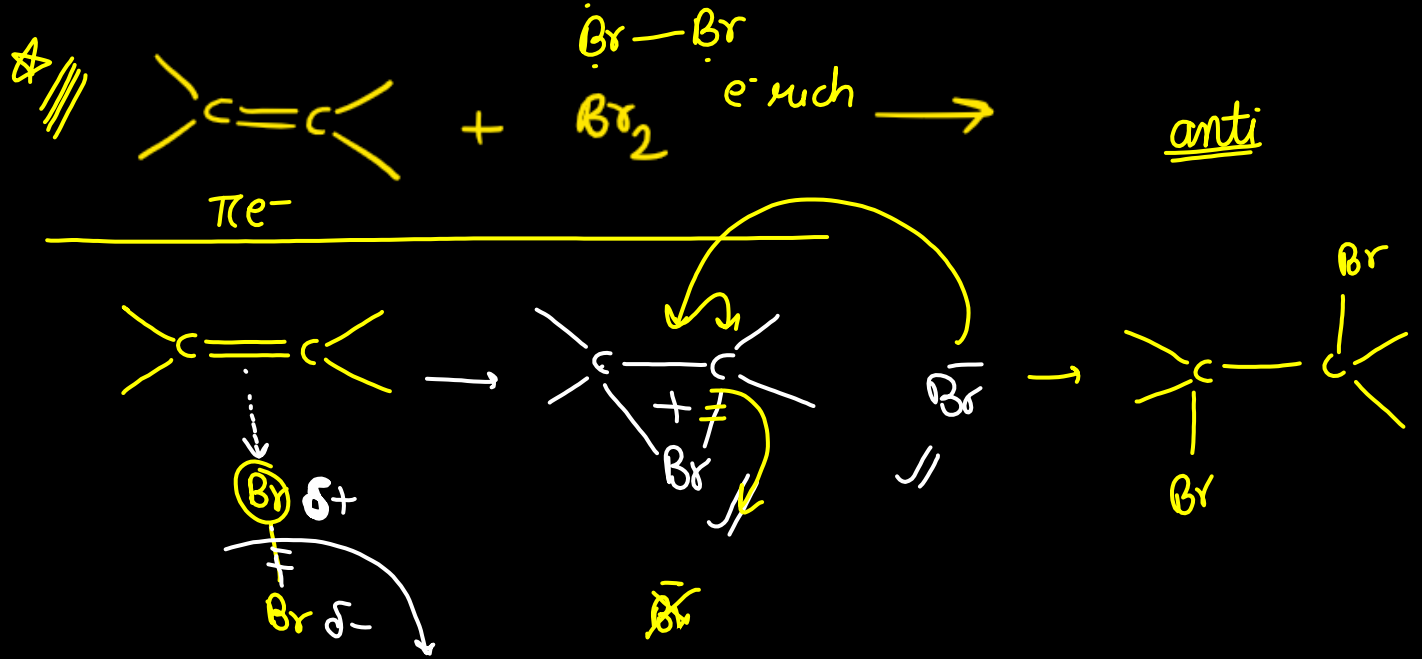
Arrange the following in the order of electrophilic attack



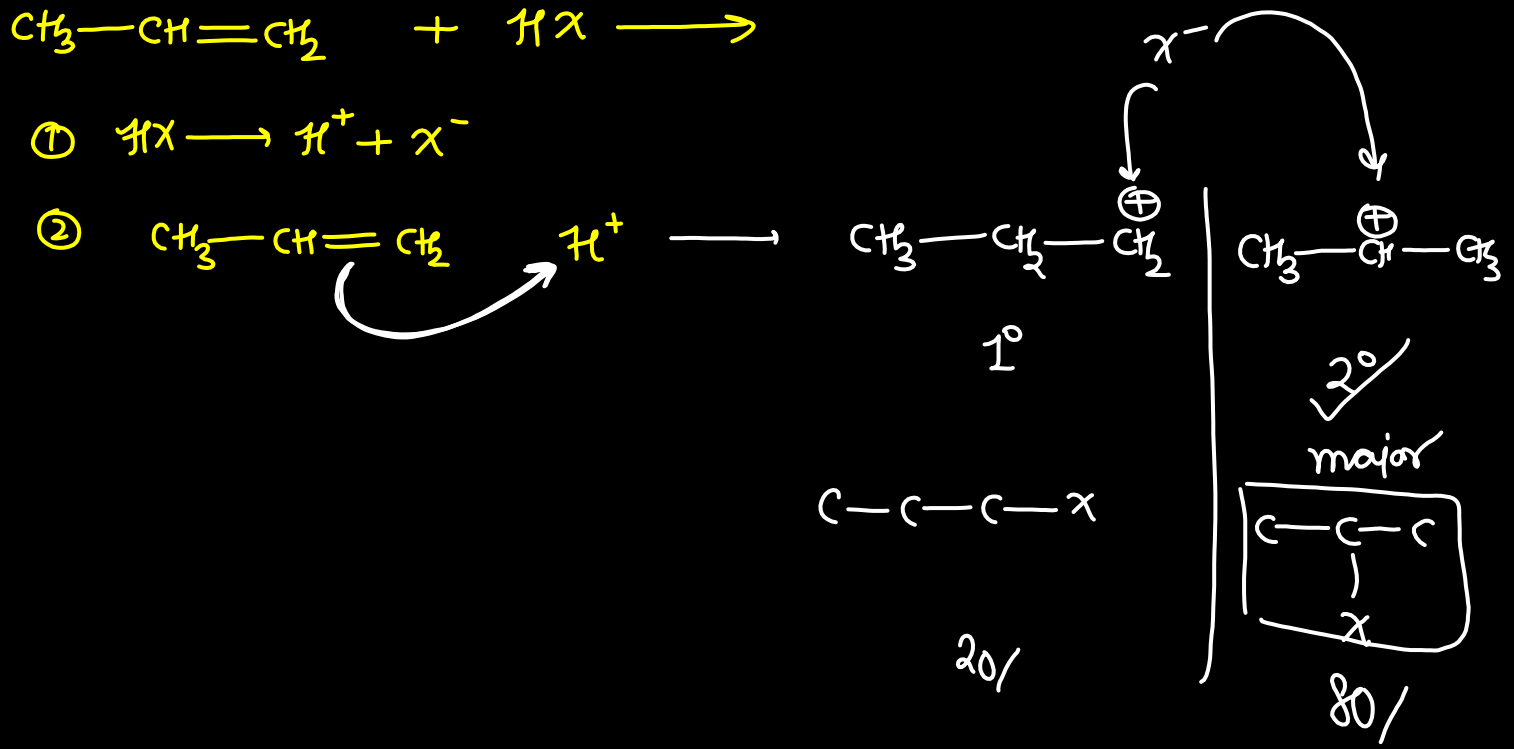
Types of Electrophilic Addition



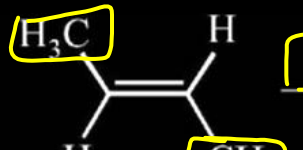
Types of Electrophilic Addition



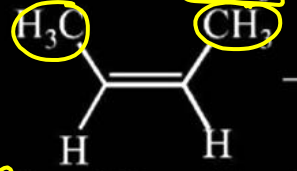
Hydrohalogenation Reaction



The correct statement(s) for the following addition reactions is

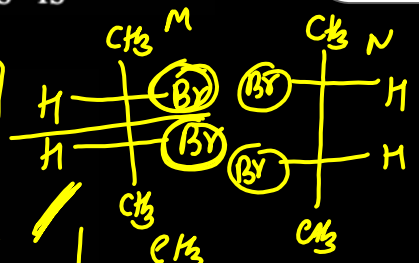
(i) 

$\xrightarrow{Br_2/CHCl_3}$ *M* and *N*

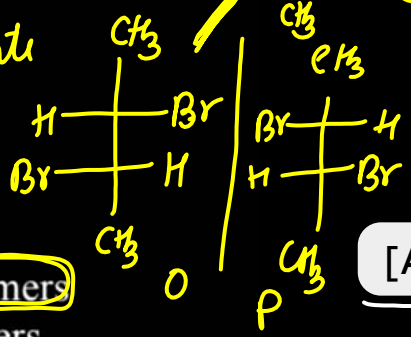
(ii) 

$\xrightarrow{Br_2/CHCl_3}$ *O* and *P*

Trans → anti



cis → anti



(a) *O* and *P* are identical molecules

(b) (*M* and *O*) and (*N* and *P*) are two pairs of diastereomers

(c) (*M* and *O*) and (*N* and *P*) are two pairs of enantiomers

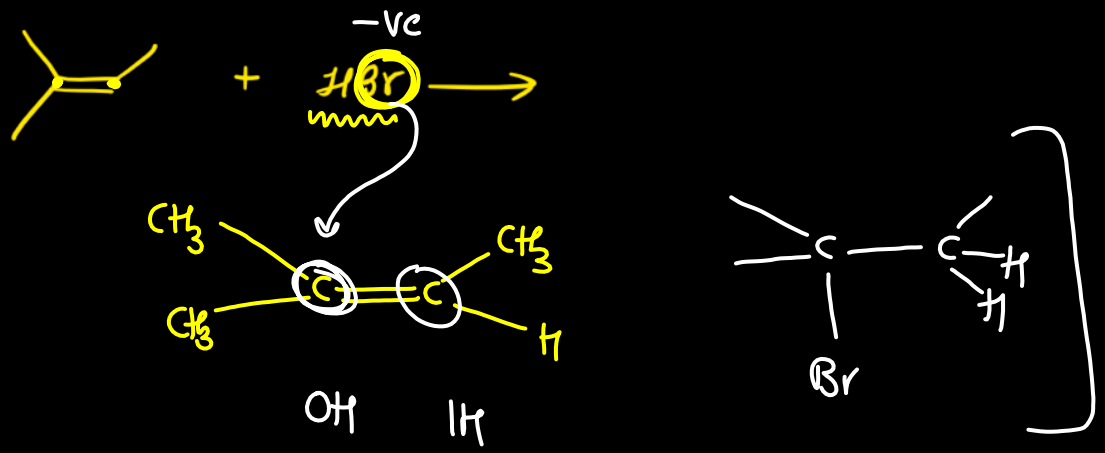
(d) Bromination proceeds through *trans*-addition in both the reactions

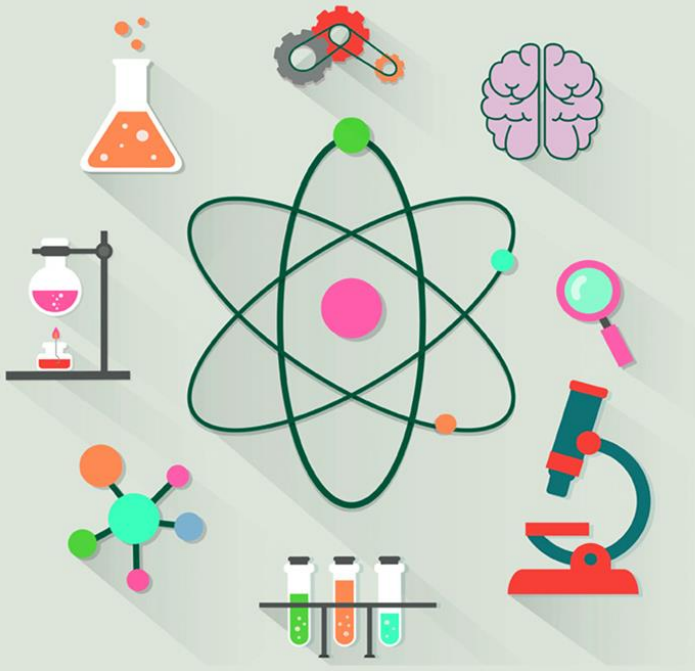
[Adv. 2017]

TAM CAR

Markovnikov Addition

The negative part of attacking species goes to that carbon which has less number of hydrogens attached to it.

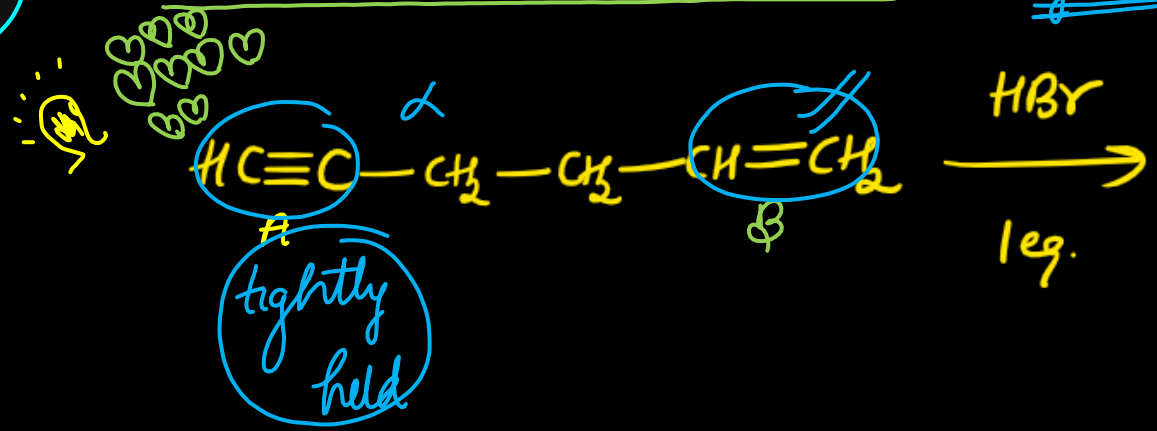


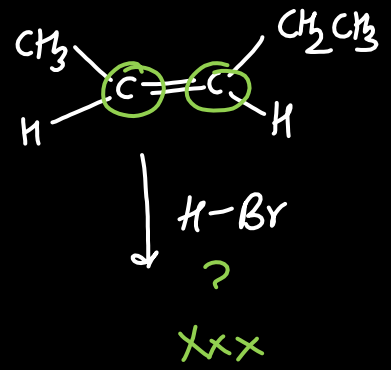


PRACTICE QUESTIONS

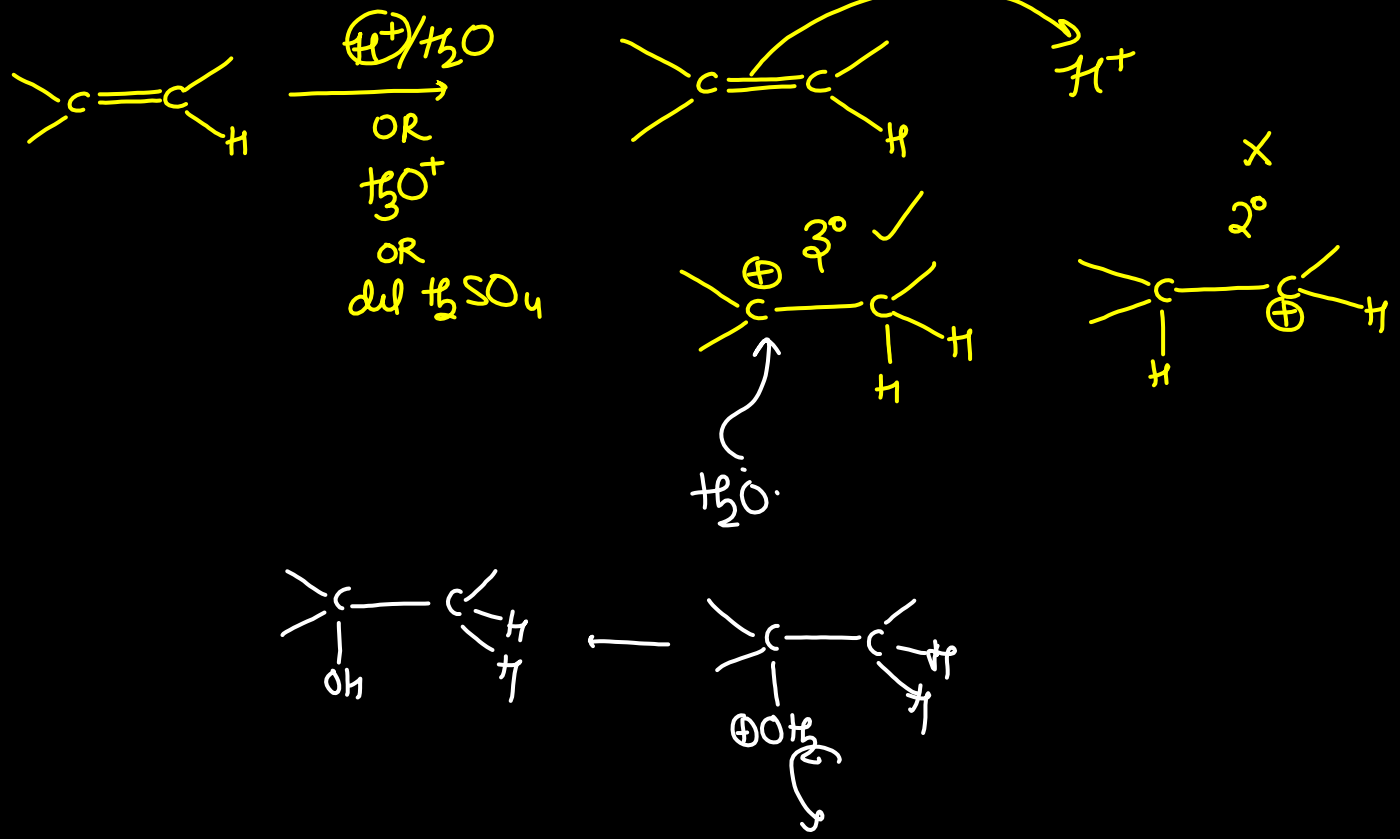
Find the major product of the following reaction

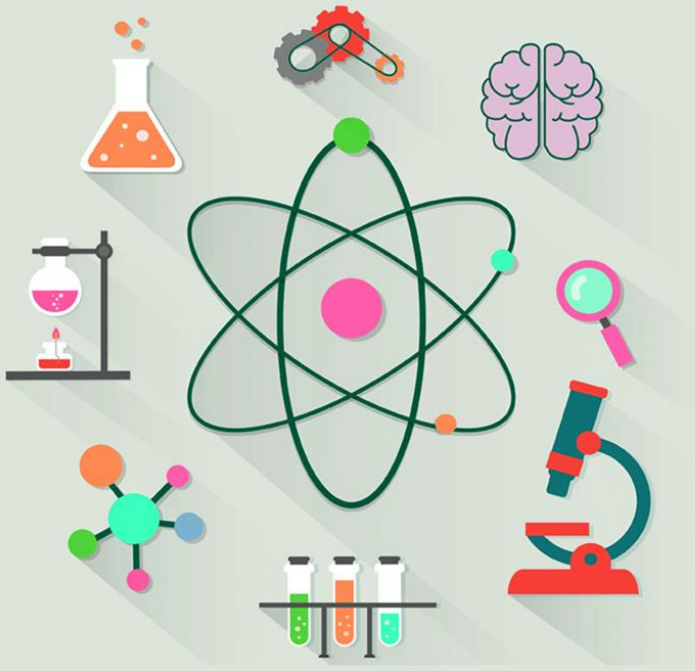
Jee main.





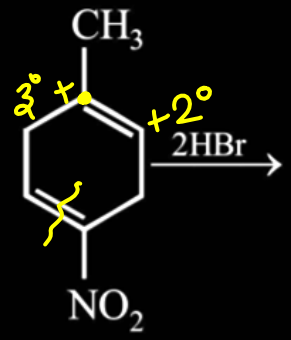
Hydration of alkenes

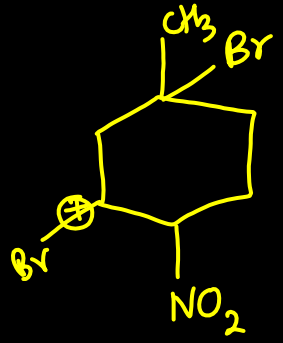


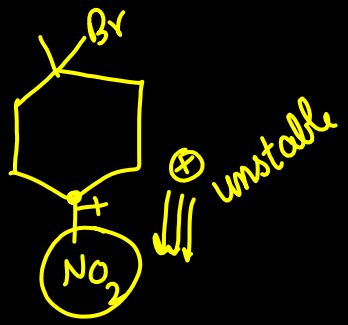


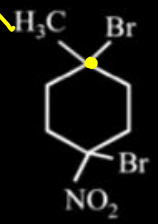
PRACTICE QUESTIONS

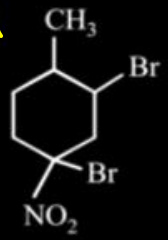
The major product of the following reaction is :

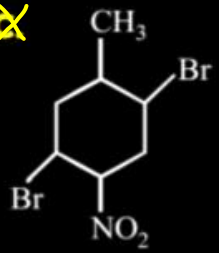






A. 

B. 

C. 

D. 

[Sep. 06, 2020 (I)]

Unacademy Atoms

Which of the following has the shortest C - Cl bond ?

A. $Cl - CH = CH_2$

B. $Cl - CH = CH - NO_2$

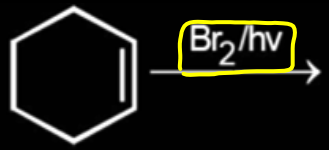
C. $Cl - CH = CH - CH_3$

D. $Cl - CH = CH - OCH_3$

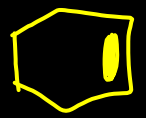
GOC notes

[Jan. 09, 2020 (II)]

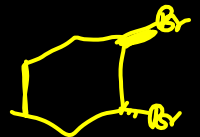
Bromination of cyclohexene under conditions given below yields :



$Br_2 \longrightarrow 2Br^{\bullet}$

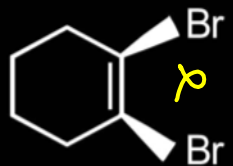


$+ Br_2/CCl_4 \rightarrow$ (CCl_3H)

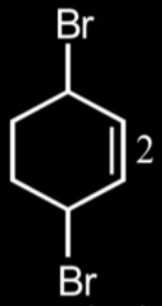


[April 10, 2016]

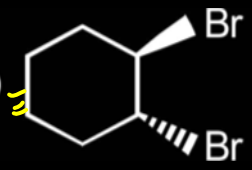
(a)



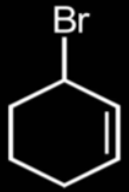
(c)

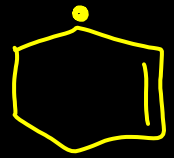


(b)

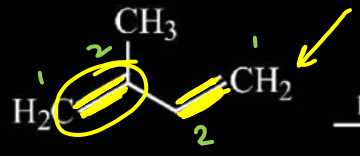


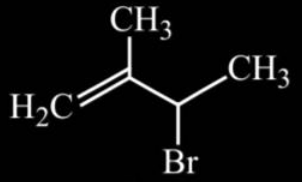
(d)



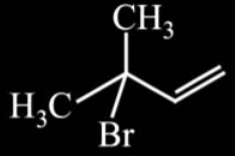


In the following reaction, the major product is

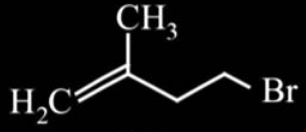


(a) 

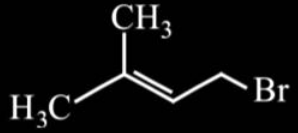
✗ 1,2-add

(b) 

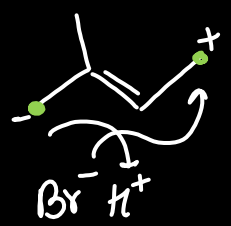
✓✓✓ 1,2 add

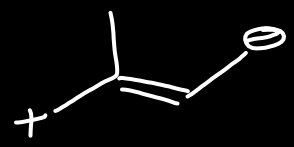
(c) 

✗ 1,2 add

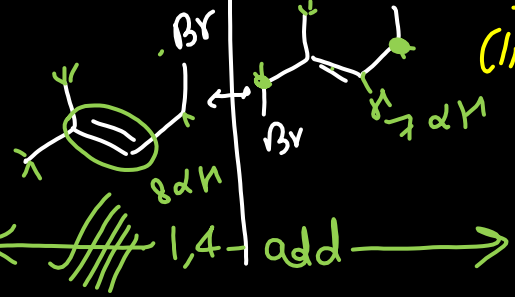
(d) 

? 1,4 add





[Adv. 2015]



(1,2 or 1,4)

The major product formed in the following reaction is :

$$CH_3CH = CHCH(CH_3)_2 \xrightarrow{HBr}$$

A. $CH_3CH(Br)CH_2CH(CH_3)_2$

B. $CH_3CH_2CH(Br)CH(CH_3)_2$

C. $Br(CH_2)_3CH(CH_3)_2$

D. $CH_3CH_2CH_2C(Br)(CH_3)_2$

[Sep. 05, 2020 (II)]

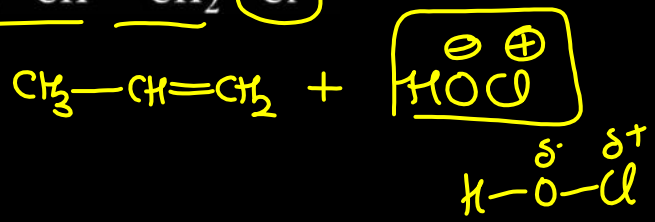
The reaction of propene with HOCl ($Cl_2 + H_2O$) proceeds through the intermediate:

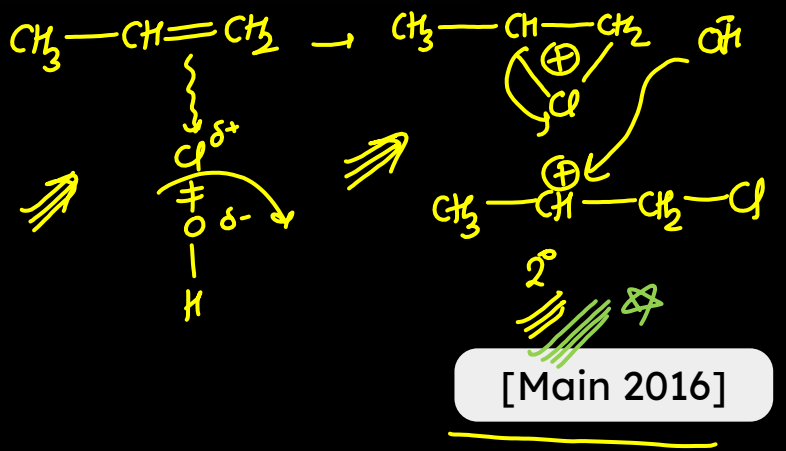
(a) $CH_3-CH(OH)-CH_2^+$

(b) $CH_3-CHCl-CH_2^+$

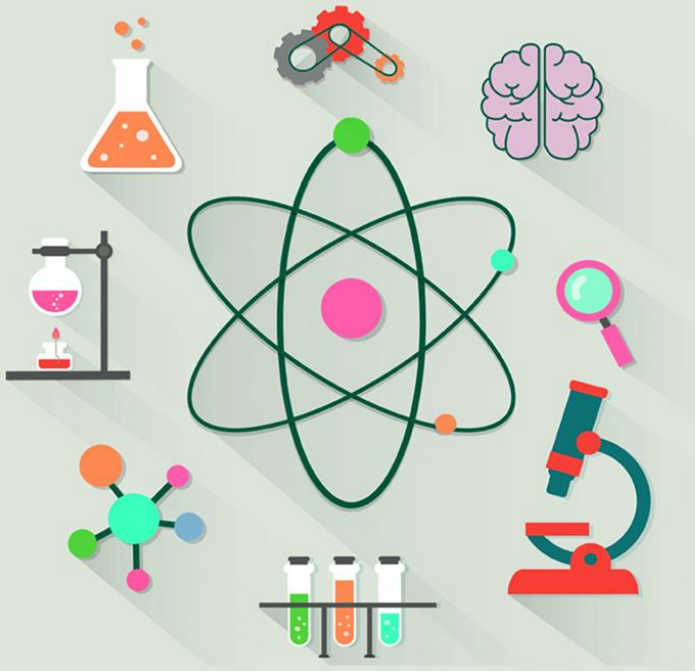
(c) $CH_3-CH^+-CH_2-OH$

(d) $CH_3-CH^+-CH_2-Cl$





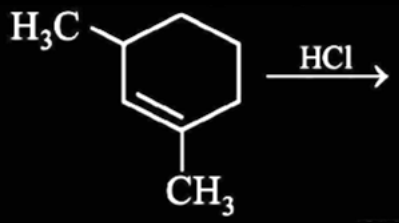
[Main 2016]



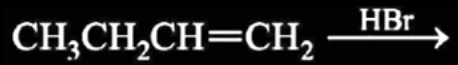
PRACTICE QUESTIONS

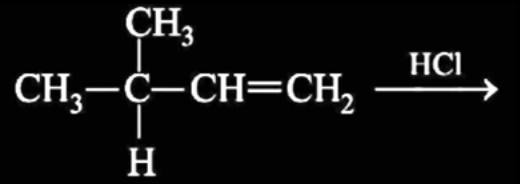
Which of the following reactions will not produce a racemic product ?

A. 

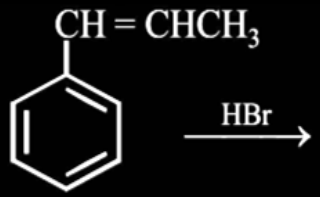
B. 

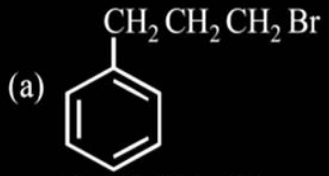
[Jan. 09, 2020 (II)]

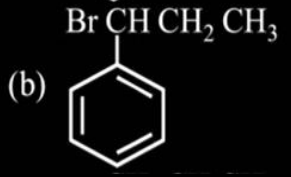
C. 

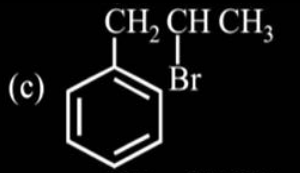
D. 

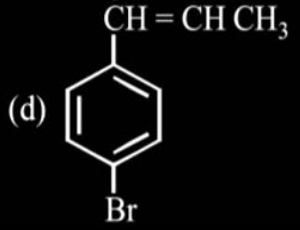
The major product of the following reaction is :



(a) 

(b) 

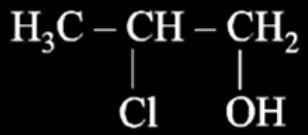
(c) 

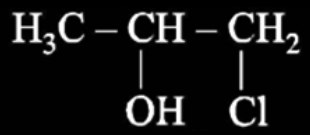
(d) 

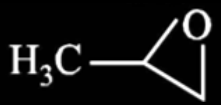
[Main 2018]

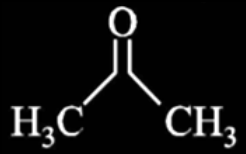
The major products of the following addition reaction is

$$H_3C - CH = CH_2 \xrightarrow{Cl_2/H_2O}$$

A. 

B. 

C. 

D. 

[Jan. 08, 2020 (I)]

Anti Markovnikov Addition/ Peroxide effect/ Kharasch effect

$CH_3-CH=CH_2 + HX \xrightarrow[h\nu]{R-O-O-R} CH_3-CH_2-CH_2-X$

Initiation

① $R-\ddot{O}-\ddot{O}-R \xrightarrow{h\nu} 2\,R-\dot{O}$

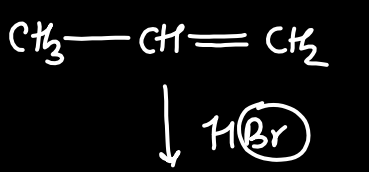
② $R-O^{\cdot} + H\ddot{X} \longrightarrow R-OH + X^{\cdot}$

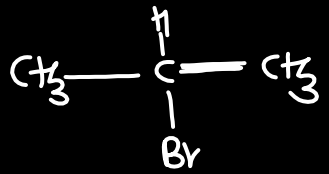
Propagate

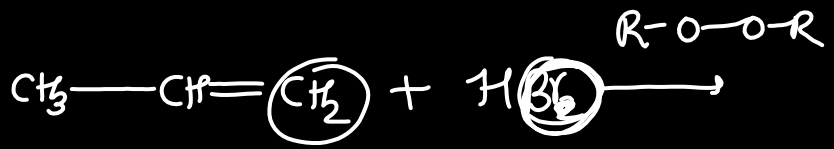
$X^{\cdot} + CH_3-CH=CH_2 \longrightarrow CH_3-\underset{\underset{X}{|}}{CH}-\dot{C}H_2$ (1°)

$CH_3-\dot{C}H-CH_2X$ (2°)

Mechanism of Anti Markovnikov Addition





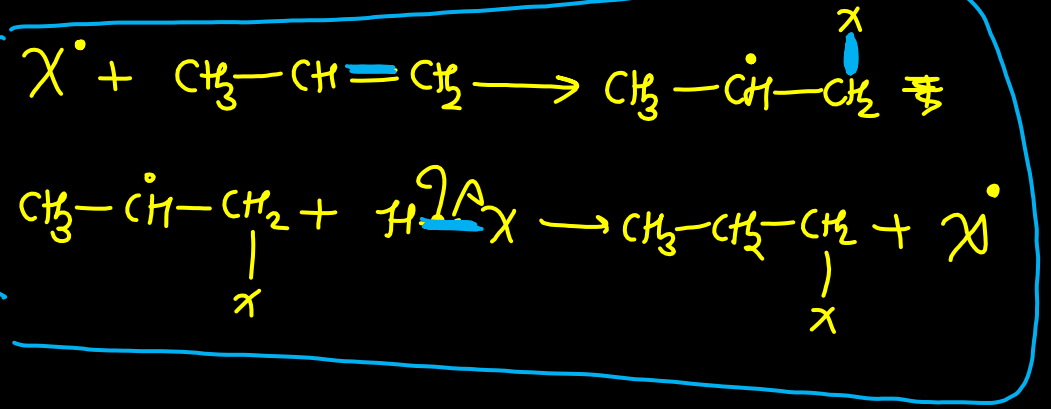


Important points

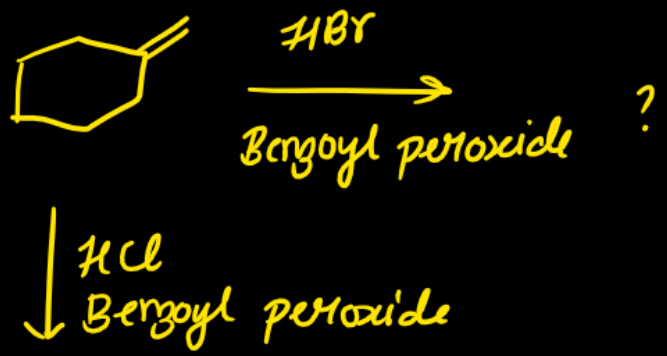
1. Intermediate: Free Radical
2. No rearrangement is possible
3. Out of all HX only HBr can show anti markovnikov effect since its both propagation steps are exothermic
4. HCl and HI do not show anti markovnikov since in HI, the first propagation step is endothermic and for HCl the second step is endothermic

Propagation

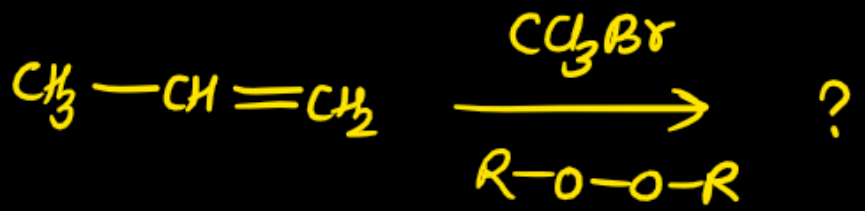
exo

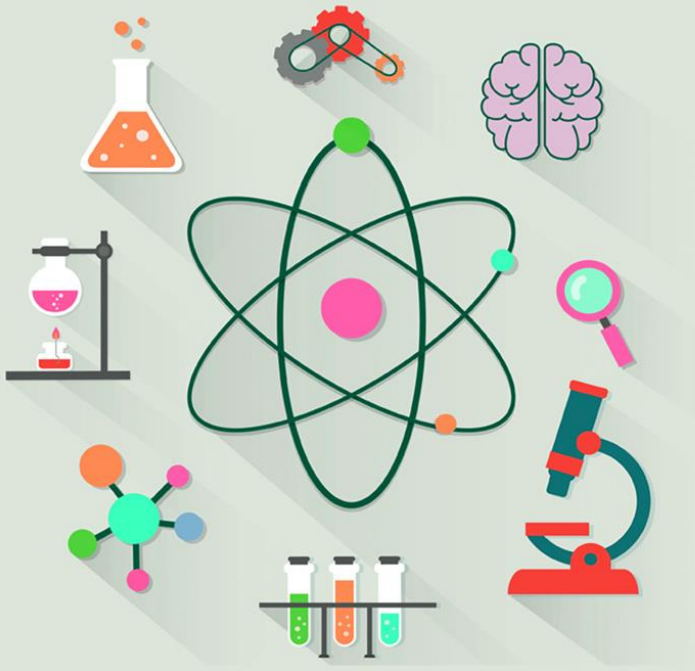


Find the major product of the following reaction



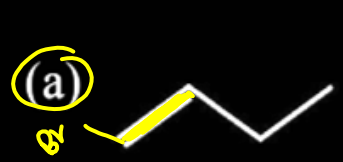
Find the major product of the following reaction

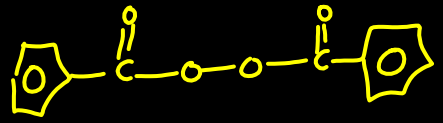


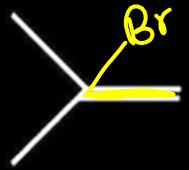


PRACTICE QUESTIONS

The increasing order of the boiling point of the major products A, B and C of the following reactions will be :

(a)  + HBr $\xrightarrow{(C_6H_5CO)_2O_2}$ A



(b)  + HBr ⟶ B

(c)  + HBr ⟶ C

A. B < C < A

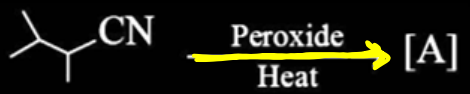
B. C < A < B

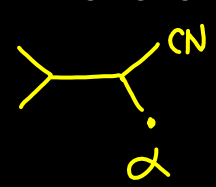
C. A < B < C

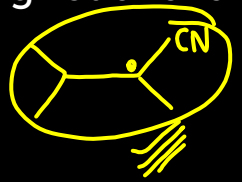
D. A < C < B

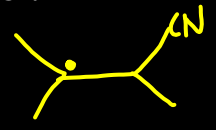
[Sep. 06, 2020 (II)]

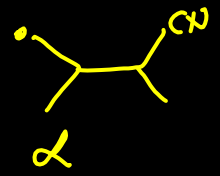
The major products A and B in the following reactions are :

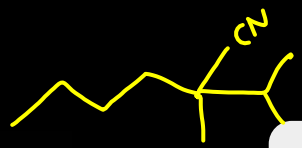




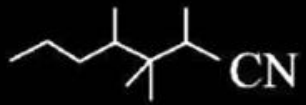


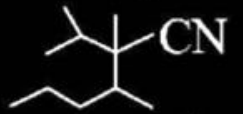


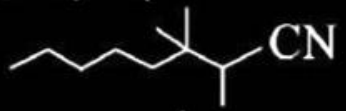




[Jan. 08, 2020 (I)]

A. A =  and B = 

B. A =  and B = 

C. A =  and B = 

D. A =  and B = 

Which one of the following alkenes when treated with HCl yields majorly an anti Markovnikov product ?

(a) $CH_3O-CH=CH_2$

(b) $Cl-CH=CH_2$

(c) $H_2N-CH=CH_2$

(d) $F_3C-CH=CH_2$

[April. 08, 2019 (II)]

3-Methyl-pent-2-ene on reaction with HBr in presence of peroxide forms an addition product. The number of possible stereoisomers for the product is :

A. Six

B. Zero

C. Two

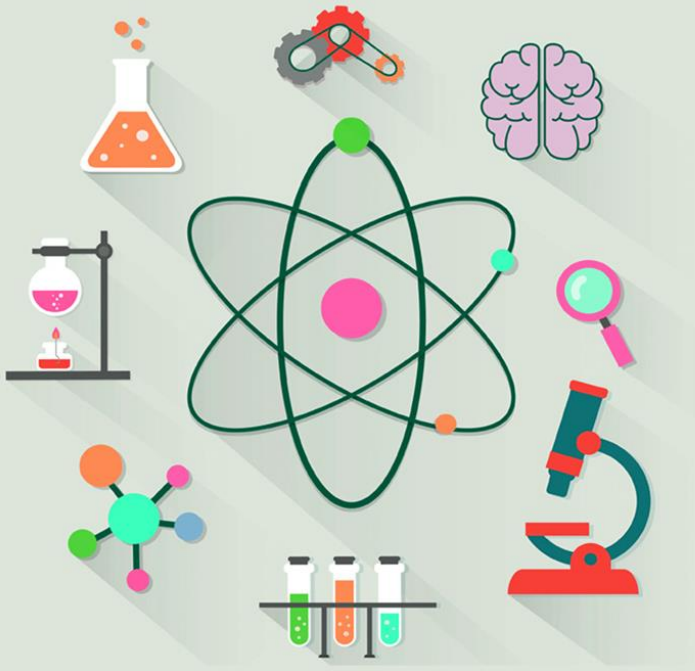
D. Four

[Main 2017]

The addition of HI in the presence of peroxide catalyst does not follow anti-Markovnikov's rule because :

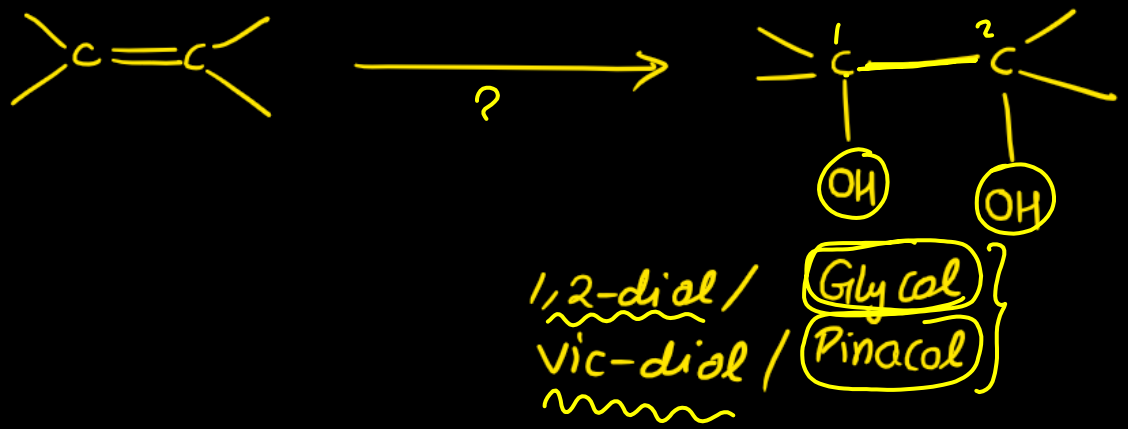
(a) HI is a strong reducing agent.
(b) H-I bond is too strong to be broken homolytically.
(c) I atom combines with H atom to give back HI.
(d) Iodine atom is not reactive enough to add across a double bond.

[April 9, 2013]

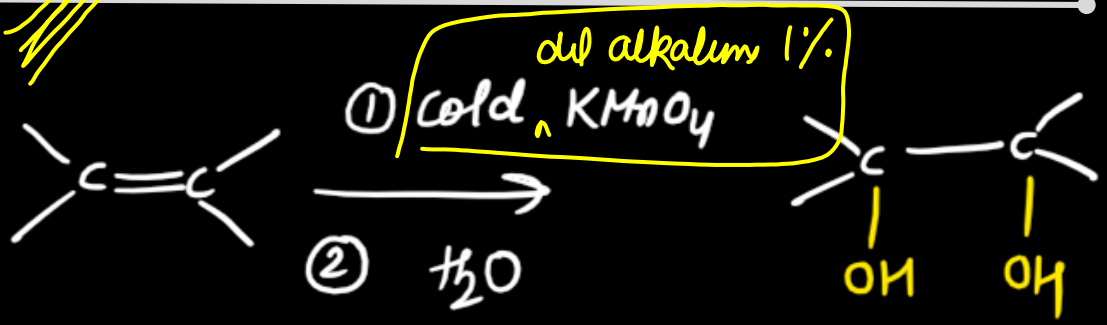


OXIDATION OF ALKENES

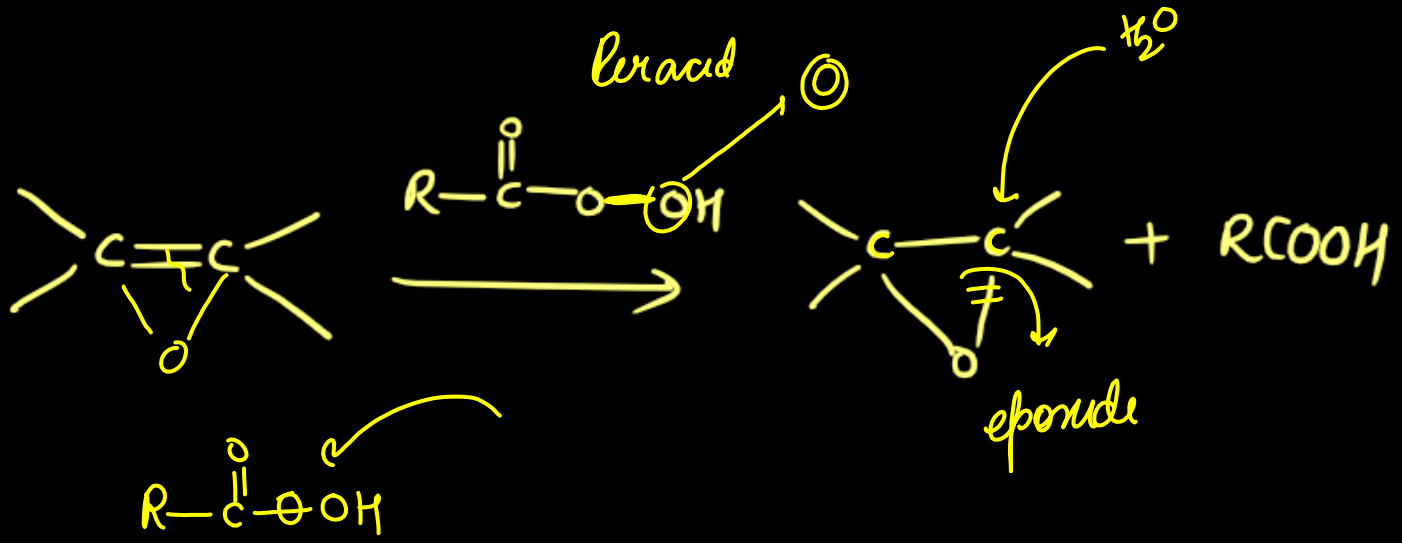
Oxidation of alkenes



Bayer's reagent for oxidation of alkenes

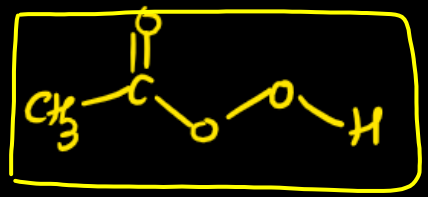


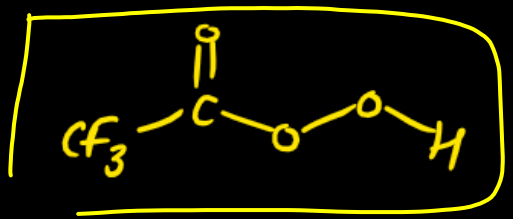
Oxidation of alkenes by peracid



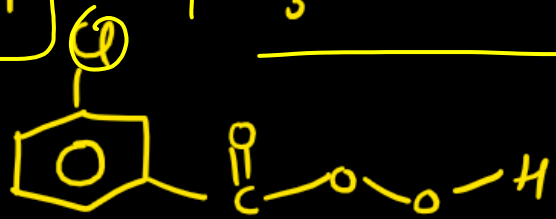
Oxidation of alkenes by peracid

R—COOOH may be

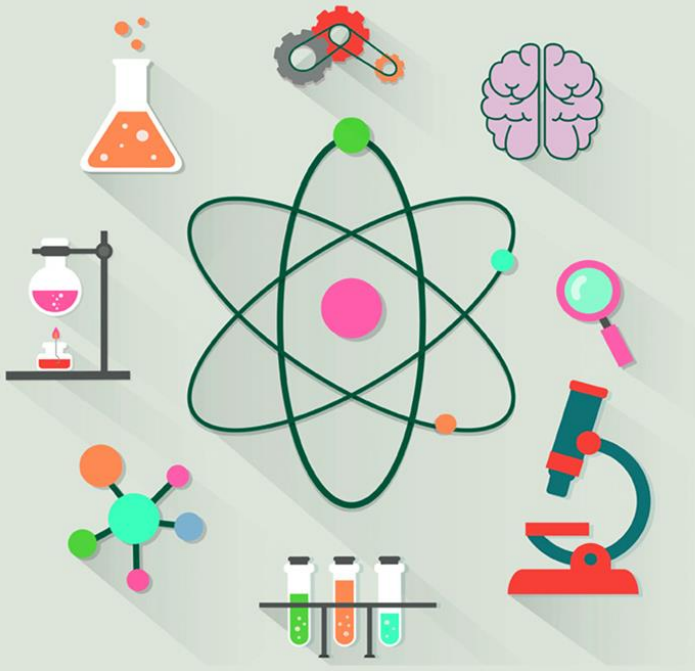




MCPBA



meta chloro peroxy benzoic acid



PRACTICE QUESTIONS

But-ene on treatment with alkaline Potassium permanganate at elevated temperature followed by acidification gives

A. 

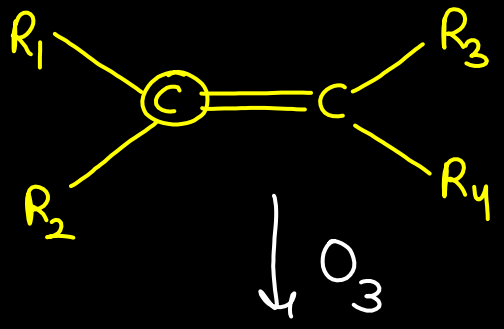
B. one molecule of CH_3CHO and one molecule of CH_3COOH

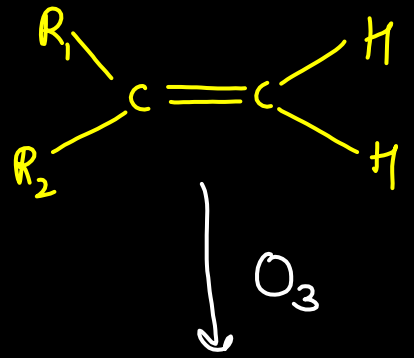
C. 2 molecules of CH_3COOH

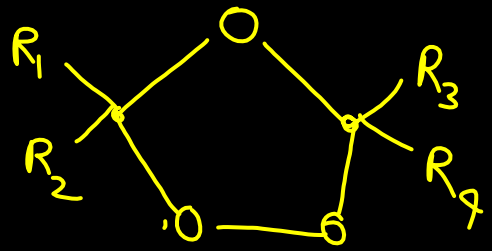
D. 2 molecules of CH_3CHO

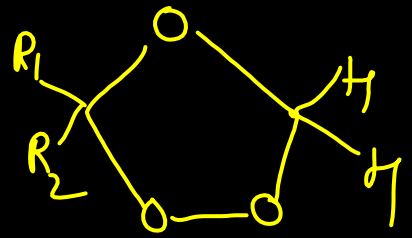
[April. 12, 2019 (I)]

Ozonolysis of alkenes

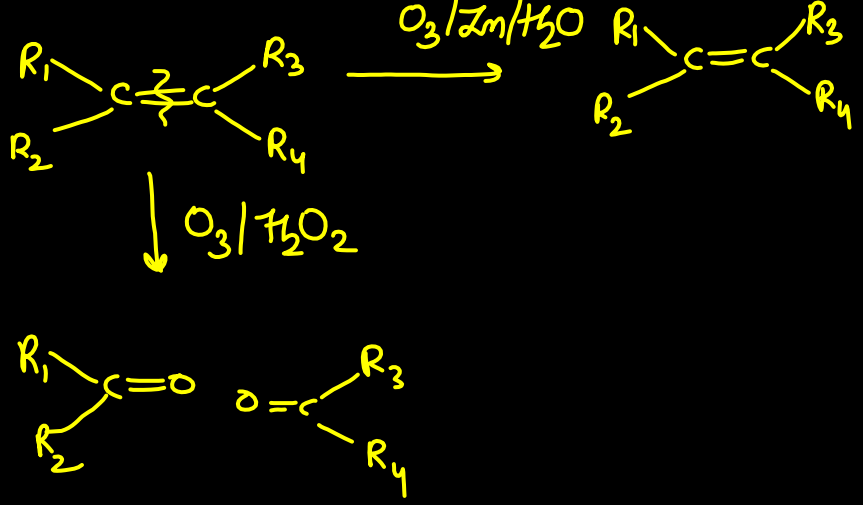


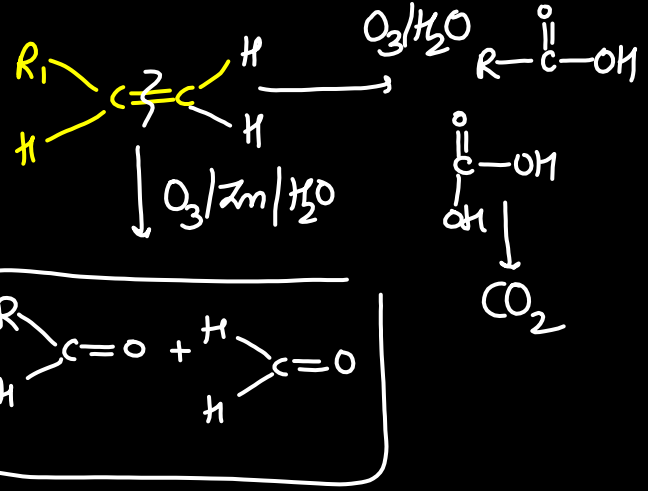




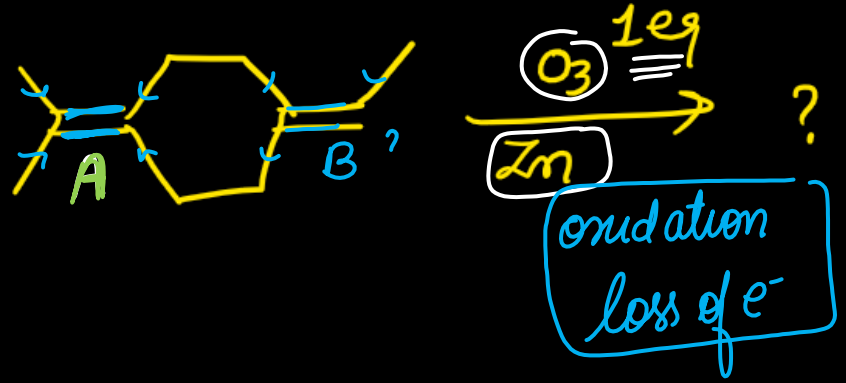


Ozonolysis of alkenes

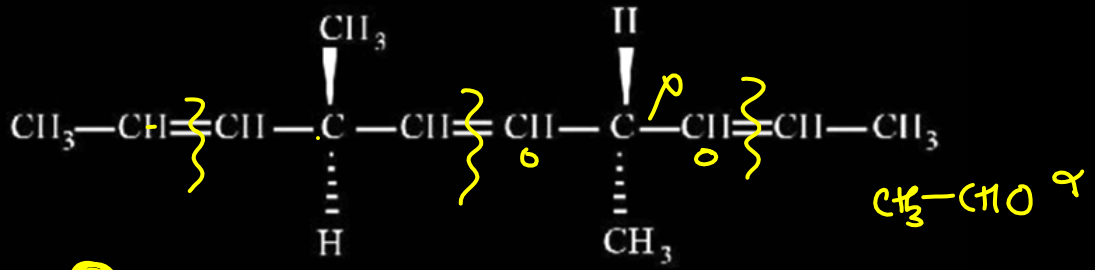




Find the major product of the following reaction

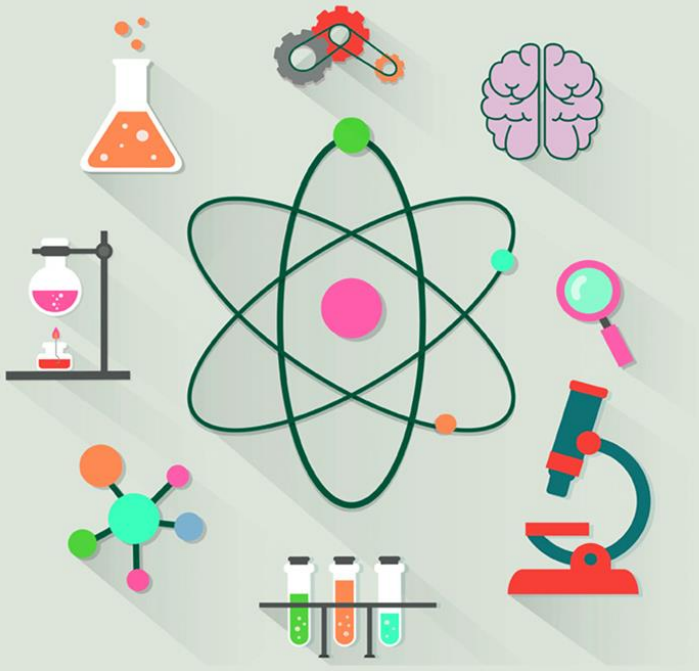


The number of optically active products obtained from the **complete** ozonolysis of the given compound is :



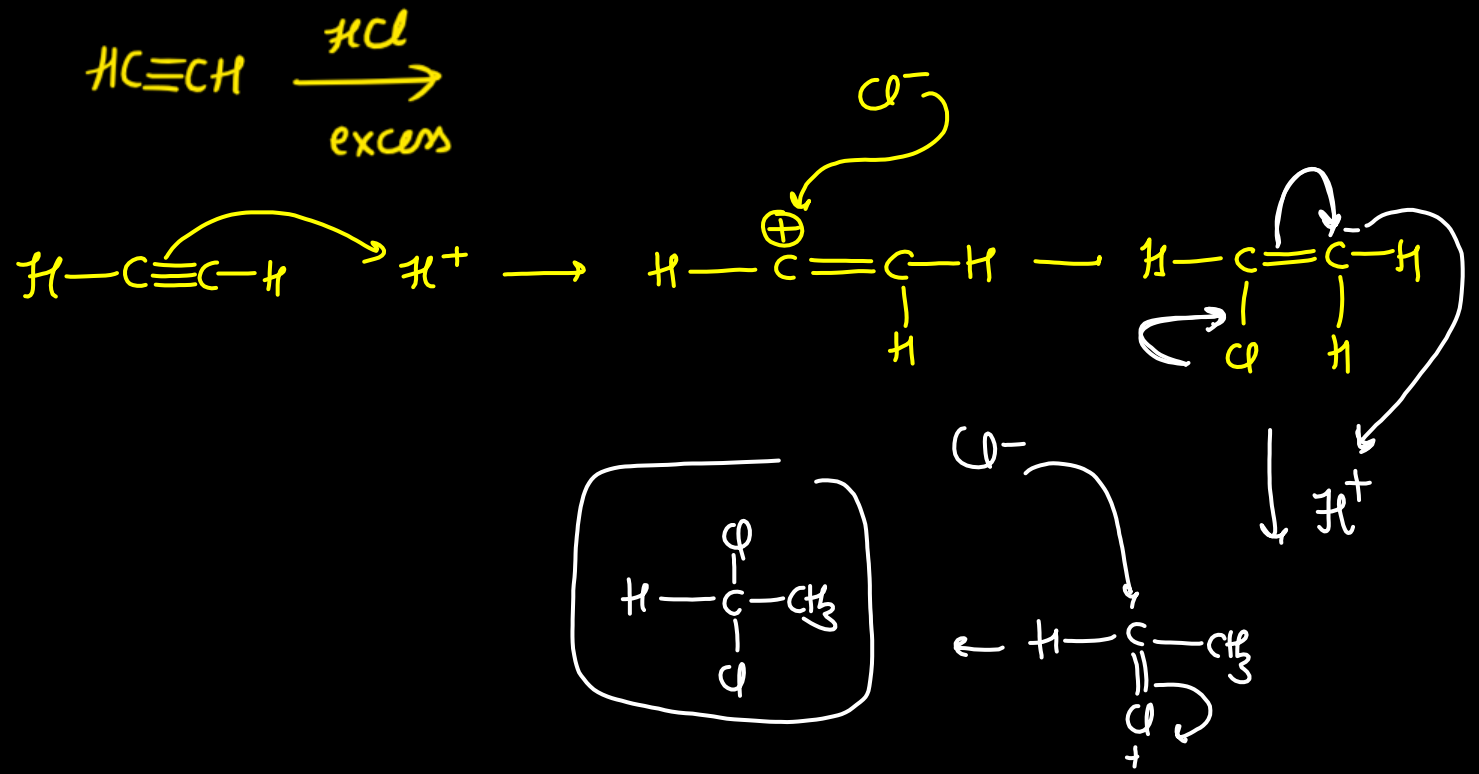
(a) 0
(b) 1
(c) 2
(d) 4

[2012]

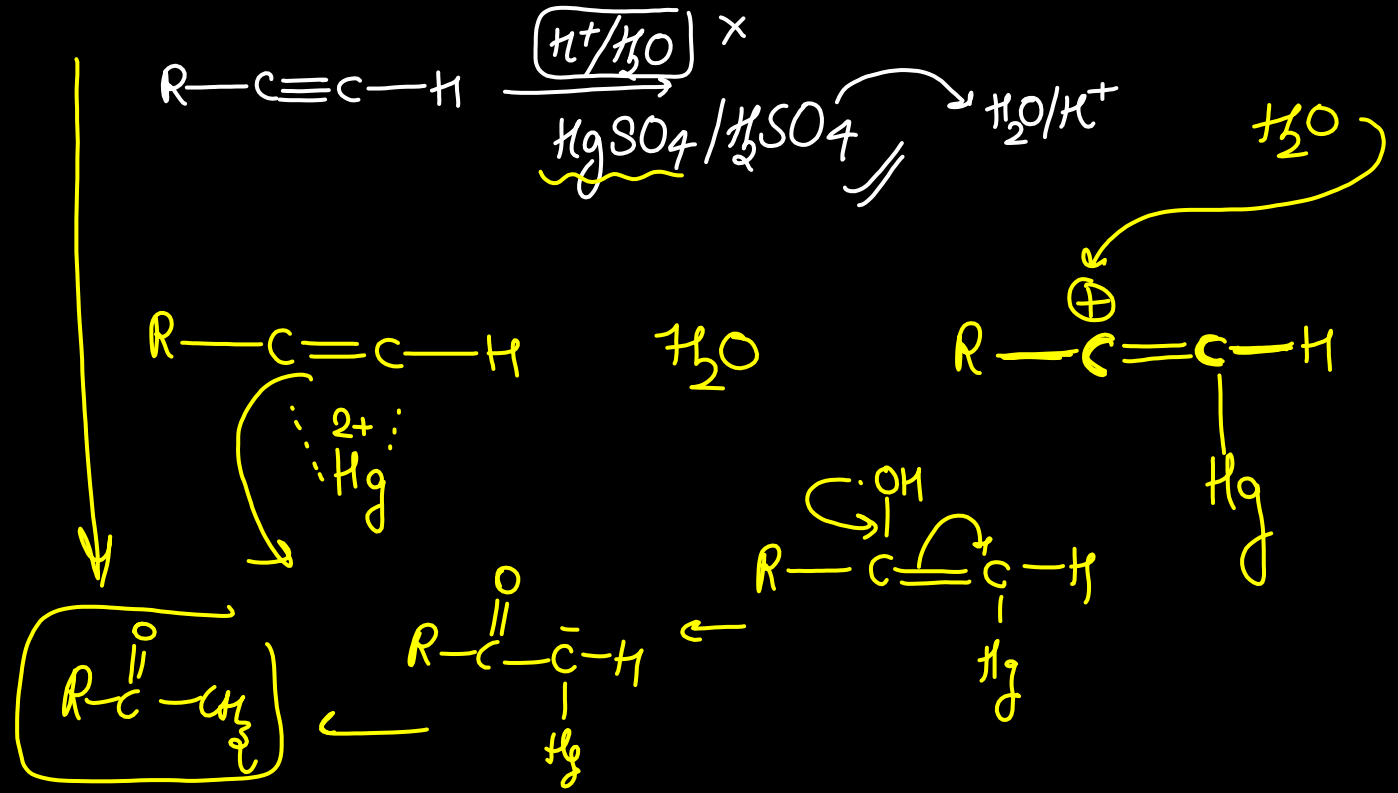


ELECTROPHILIC ADDITION ON ALKYNES

Find the major product of the following reaction

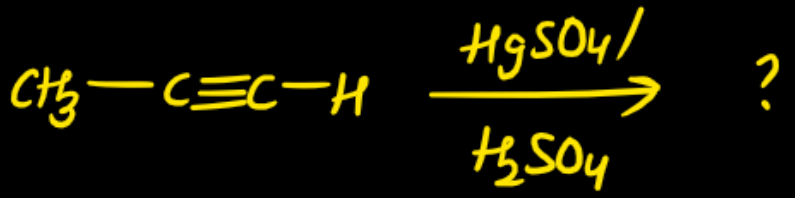


Hydration of alkynes/ Kuchrov's Reaction

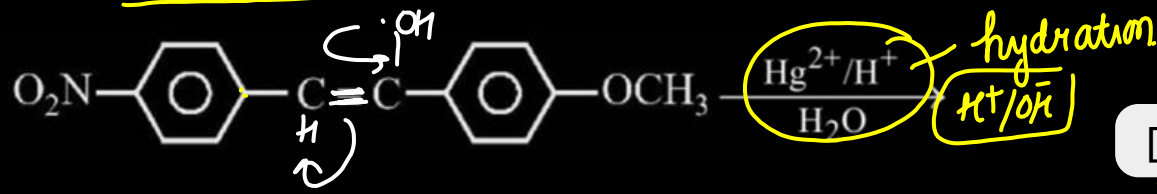


Mechanism of hydration of alkynes

Find the major product of the following reaction

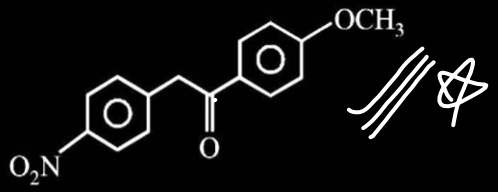


The major product obtained from the following reaction is:

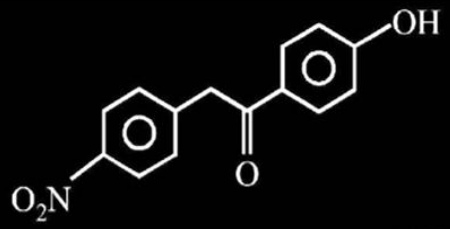


[Sep. 06, 2020 (I)]

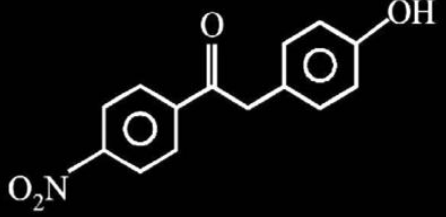
(a)



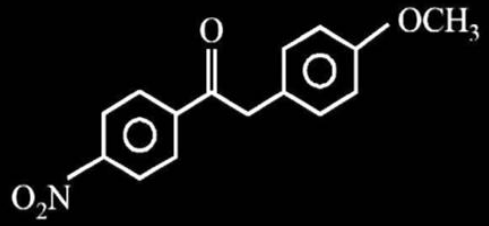
(c)



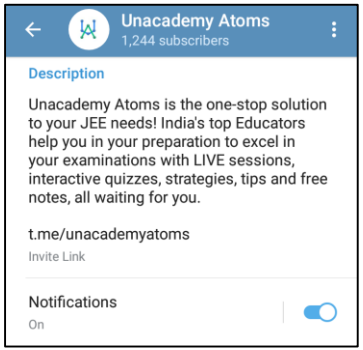
(b)



(d)



Telegram Channel



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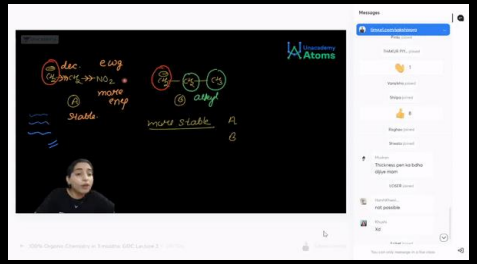

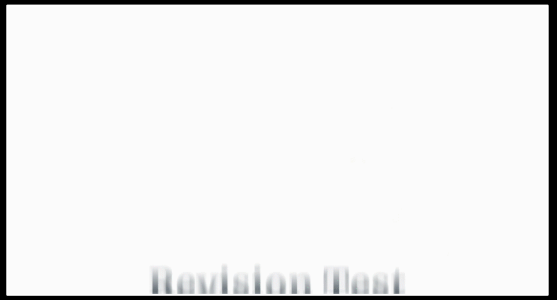

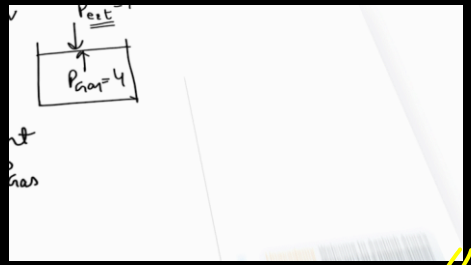

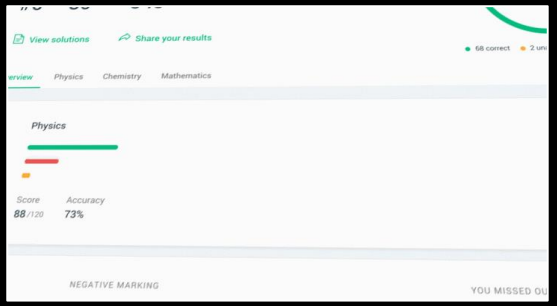

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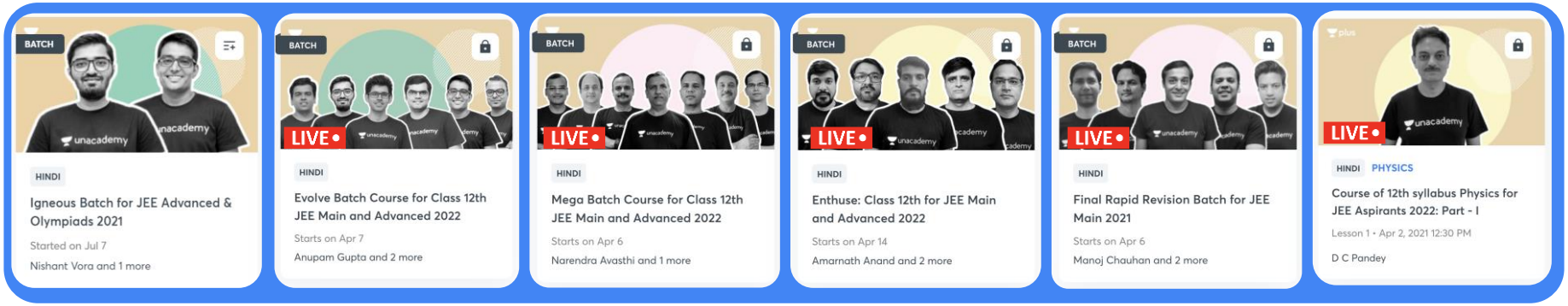

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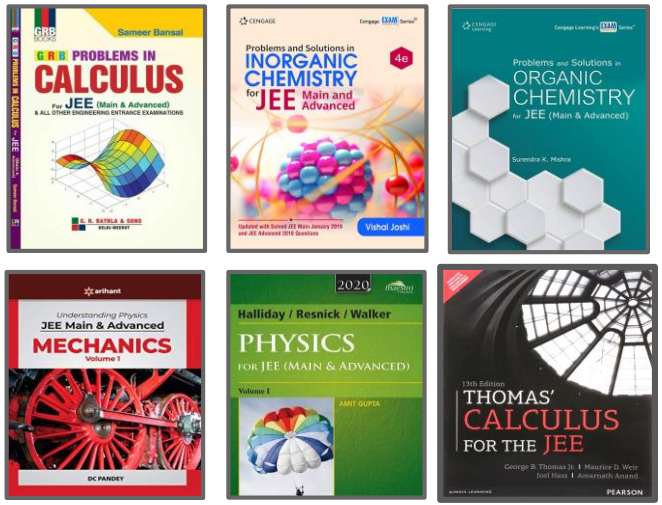

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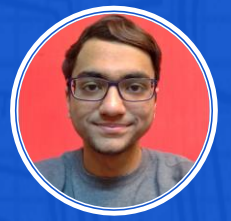

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Vaishnovi Arun
99.58

Devashish Tripathi
99.52

Maroof
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Siddharth Kaushik
99.48

Mihir Kothari
99.39

Sahil
99.38

Vaibhav Dhanuka
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Pratham Kadam
99.29

Shivam Gupta
99.46

Shrish
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99.10

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99.02

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Naman Goyal
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MIHIR PRAJAPATI
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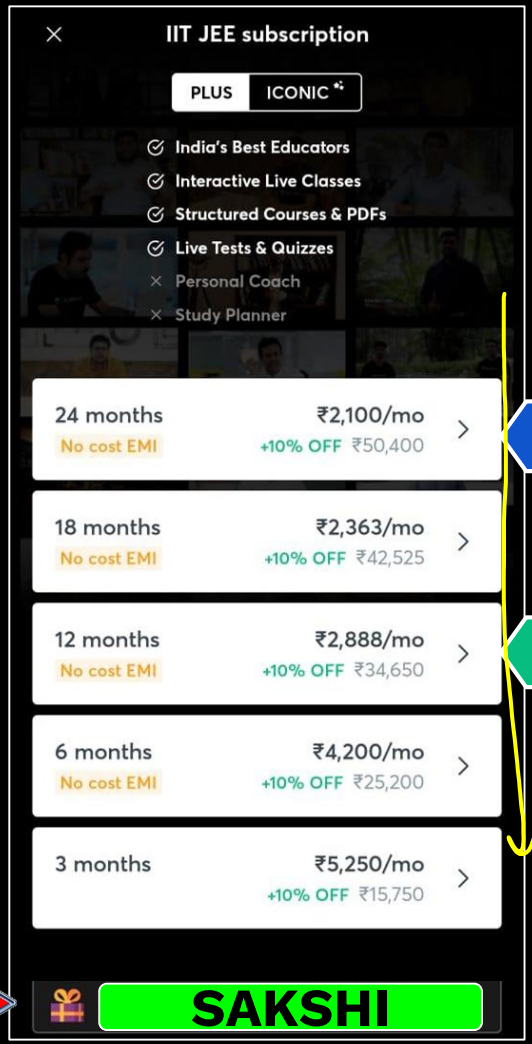

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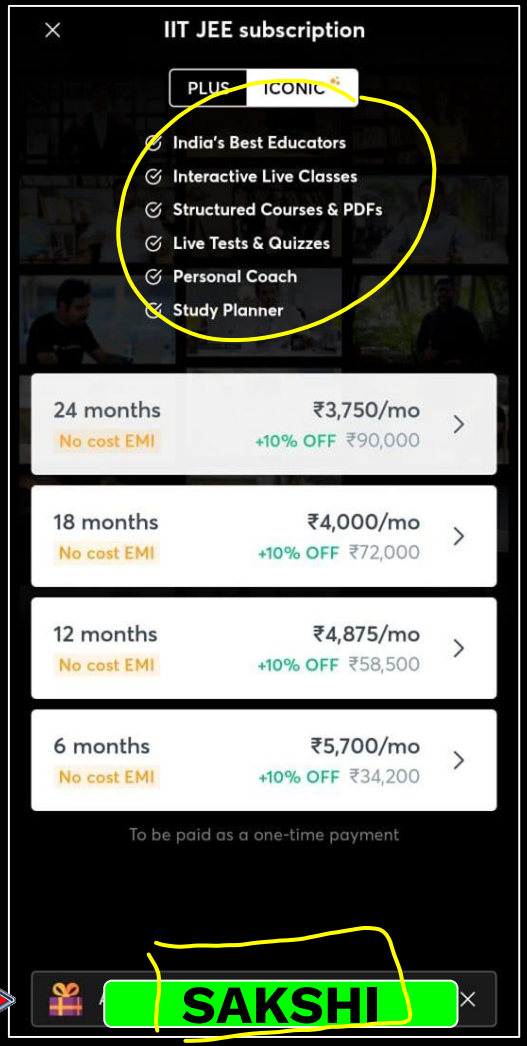
12th / Drop

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