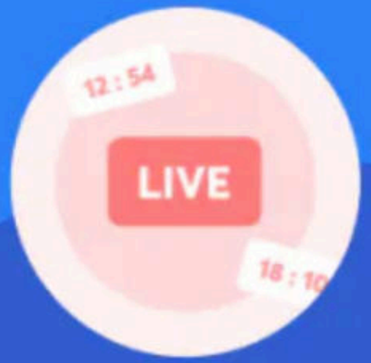
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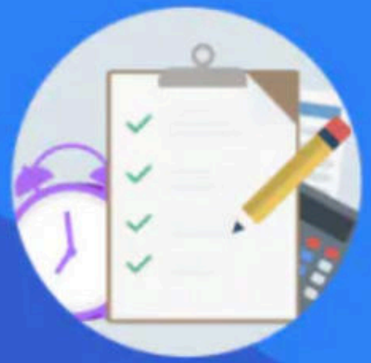
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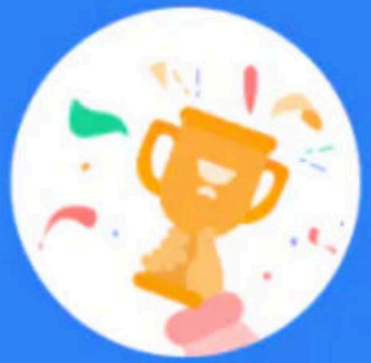
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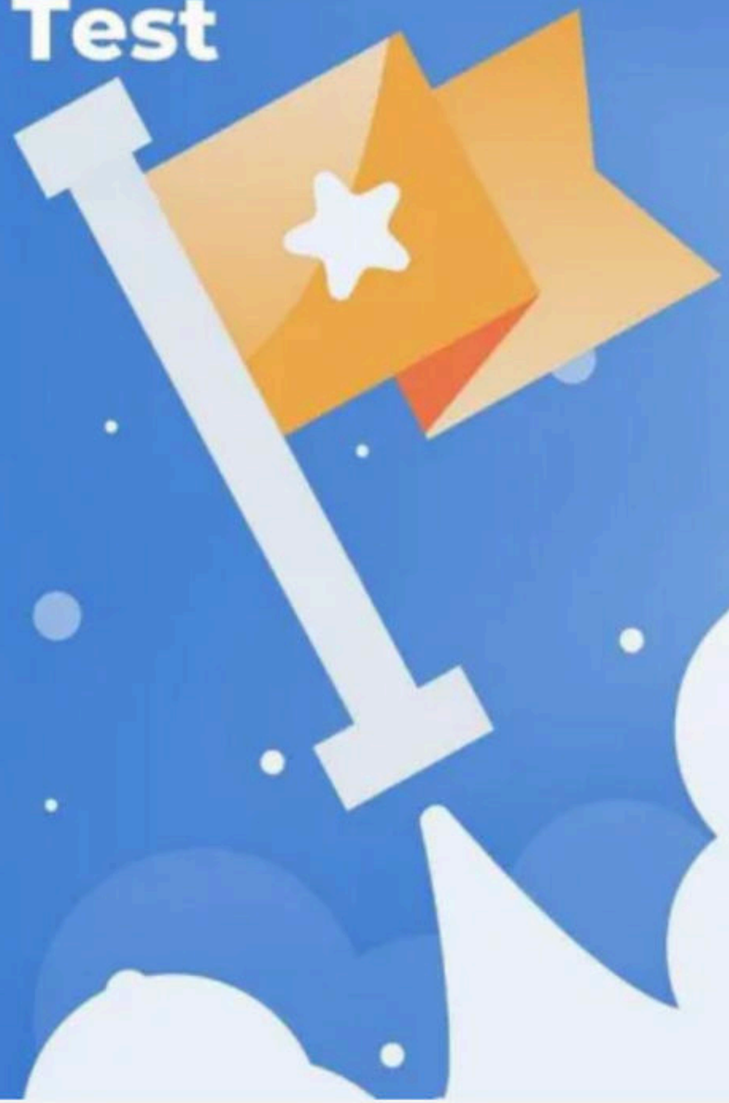
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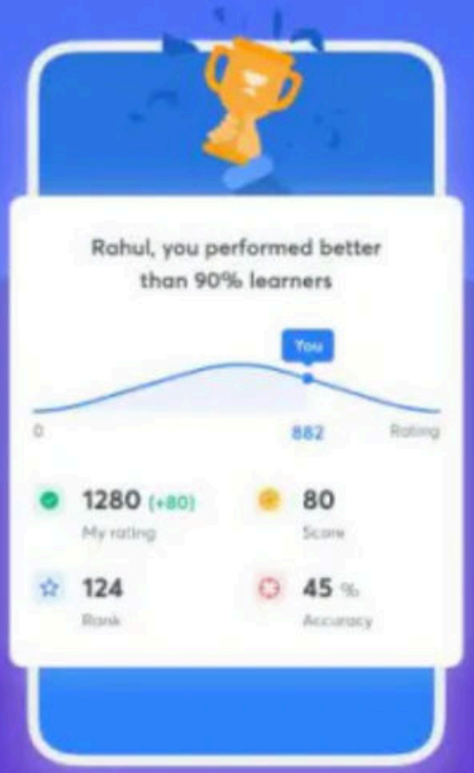
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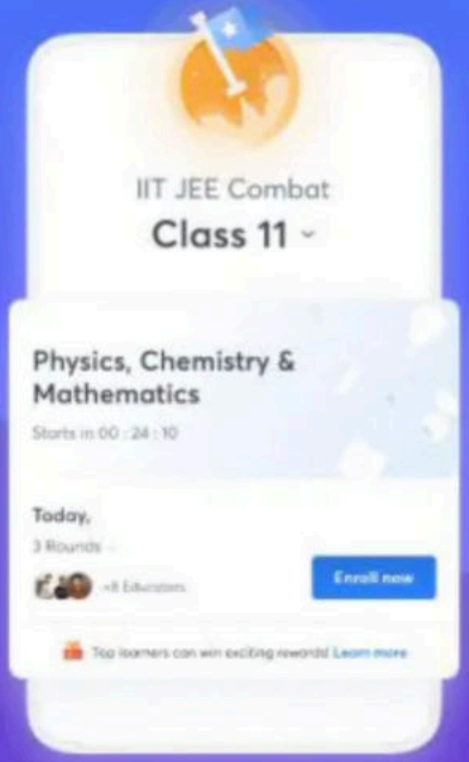
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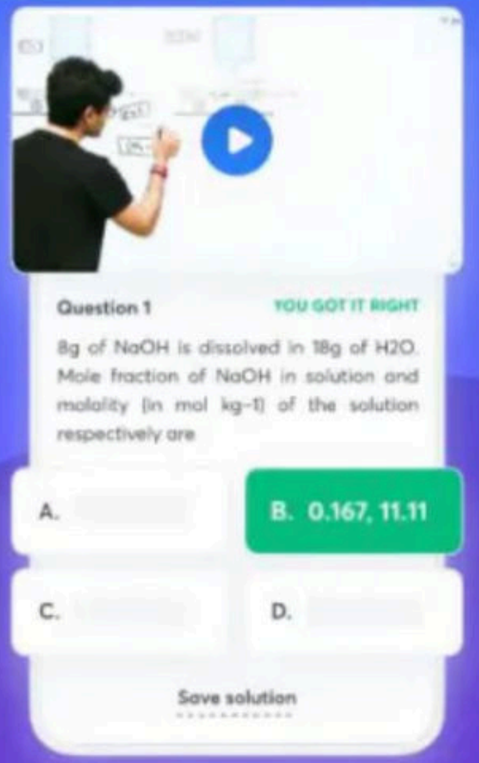
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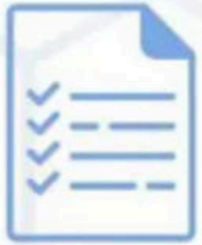
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- Carbon and Its Compounds
- Periodic Classification Of Elements
- Mole Concept
- Atomic Structure
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- Isomerism

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- Electric Potential

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- Gaseous State
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- Periodic Properties
- Chemical Bonding
- General Organic Chemistry
- Hydrocarbons
- s-block
- Basic Organic Chemistry (BOC)
- Isomerism

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- Solutions and Colligative Properties
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- Aldehydes and Ketones
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- p-block
- d and f -block
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- Basic Organic Chemistry (BOC)
- Isomerism

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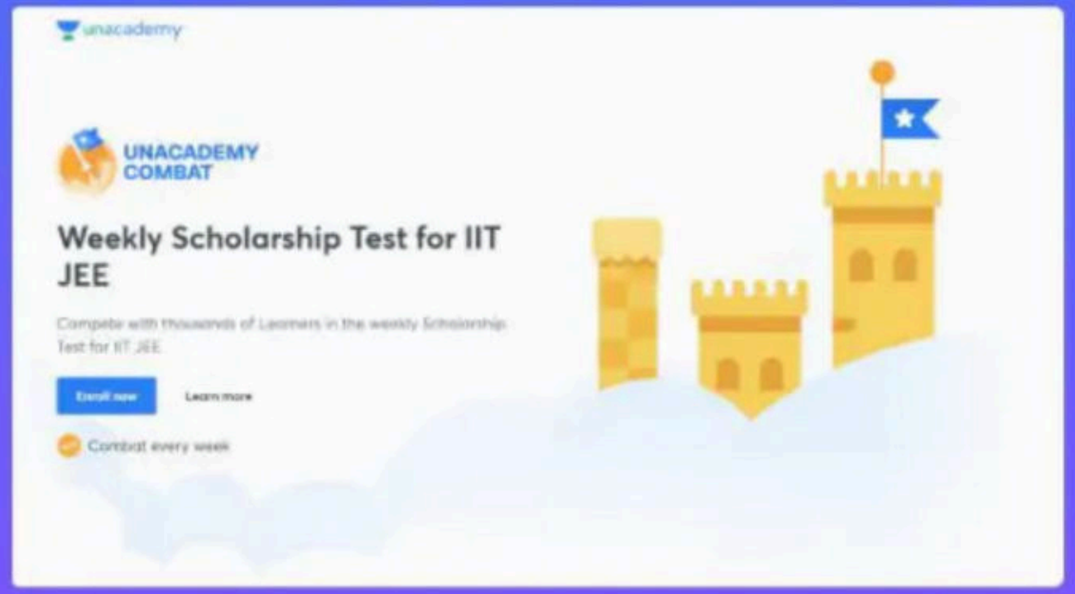
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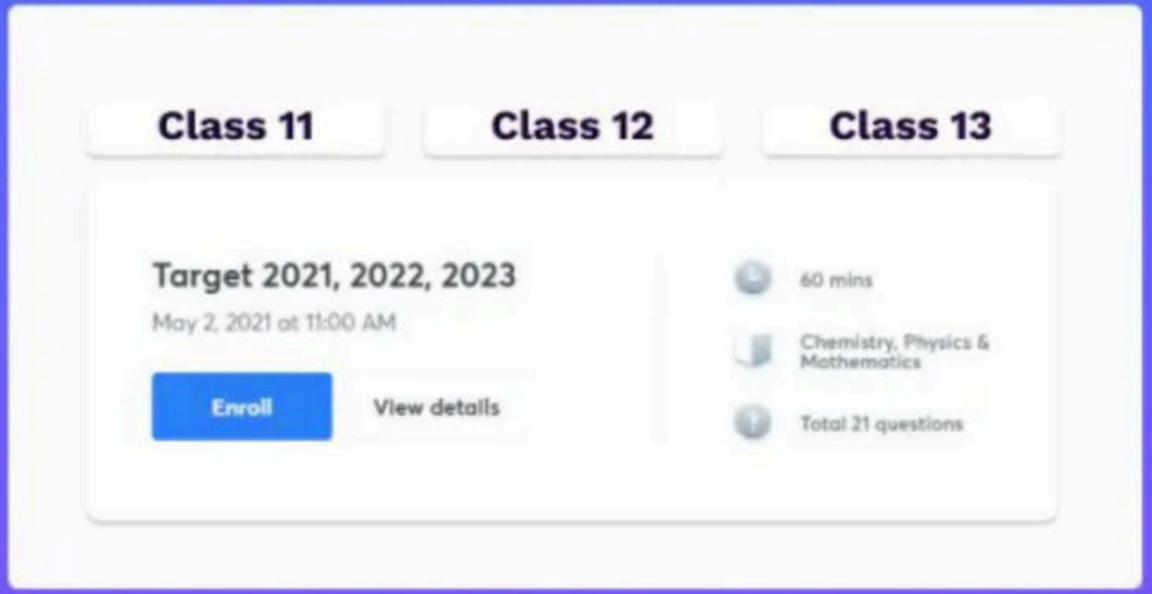
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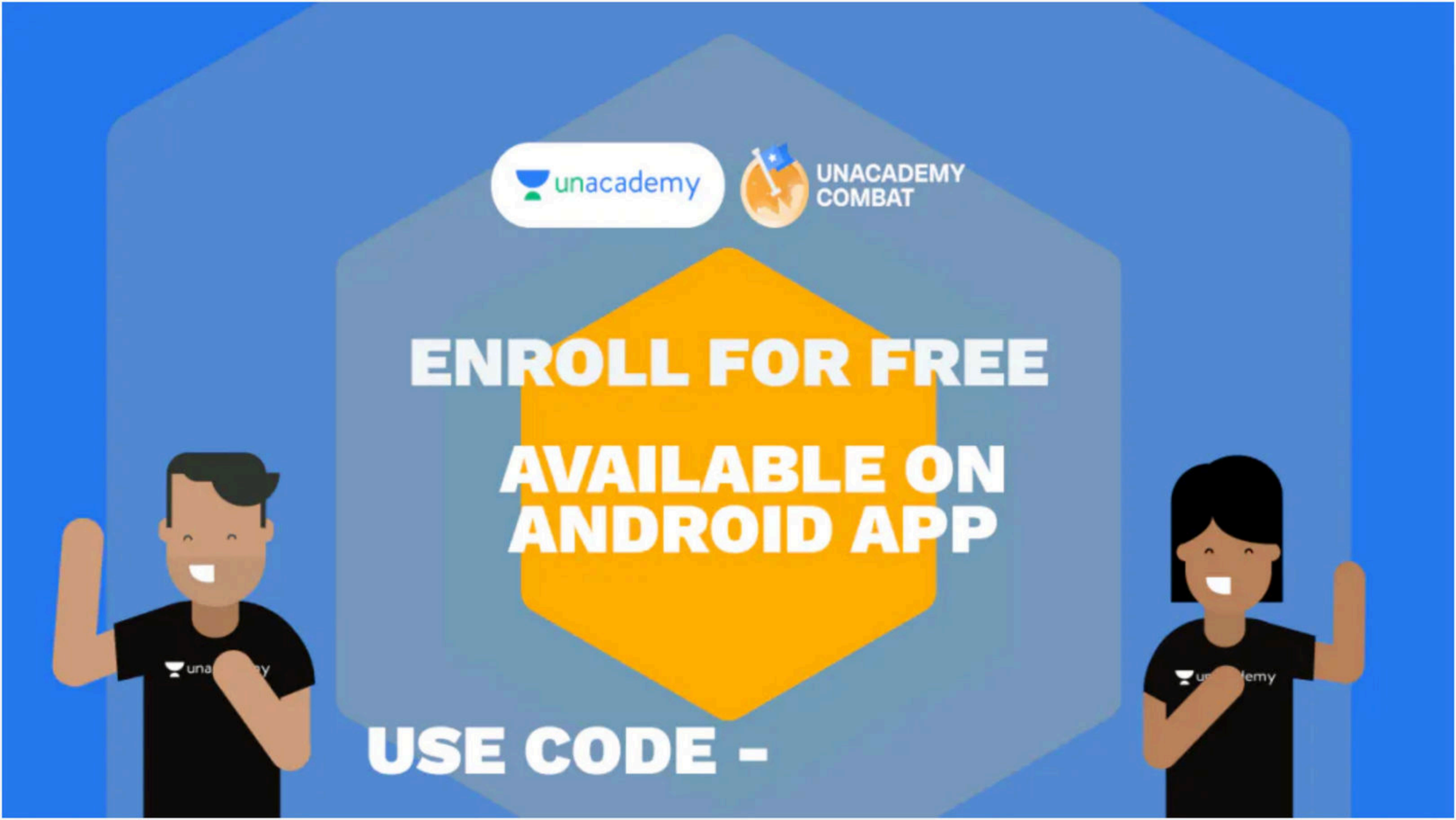
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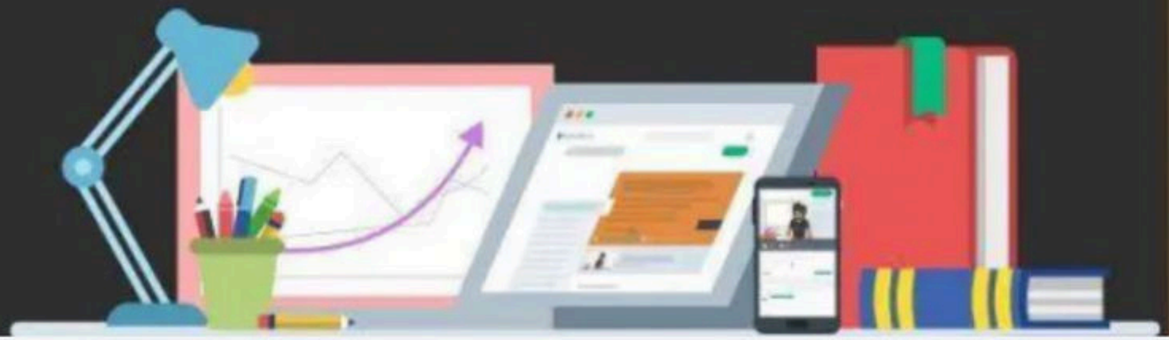

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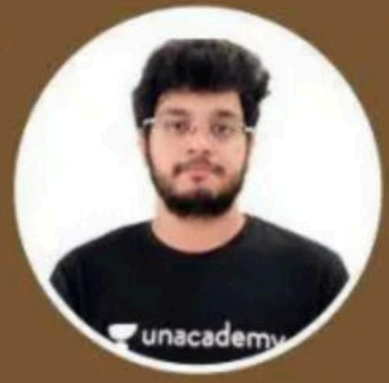




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1. On halogenation, an alkane gives only one monohalogenated product. The alkane may be :

(a) 2-methyl butane
(b) 2, 2-dimethyl propane
(c) cyclopentane
(d) both (b) and (c)

2. Which of the following compounds can be best prepared by Wurtz-reaction ?

(a) Iso-butane

(b) *n*-butane

(c) *n*-pentane

(d) Iso-pentane

3. A hydrocarbon *A* (V.D. = 36) forms only one monochloro substitution product. *A* will be :

(a) iso-pentane
(b) neo-pentane
(c) cyclohexane
(d) methyl-cyclohexane

4. Ethyl iodide and *n*-propyl iodide are allowed to undergo Wurtz reaction. The alkane which will not be obtained in this reaction is :

(a) butane
(b) propane
(c) pentane
(d) hexane

5. $CH_3-\underset{\displaystyle CH_3}{\overset{\displaystyle |}{CH}}-CH_2-CH_3 \xrightarrow[h\nu]{Cl_2}$

Number of chiral centers generated during monochlorination in the above reaction :

(a) 1 (b) 2 (c) 3 (d) 4

6. $CH_3Cl \longrightarrow CH_4$

Above conversion can be achieved by :

(a) Zn / H^+

(b) $LiAlH_4$

(c) Mg / (ether) then H_2O

(d) all of these

7. *n*-Butane $\xrightarrow{Cl_2/h\nu}$

Give the total number of monochloro products(including stereoisomers), which are possible in the above reaction.

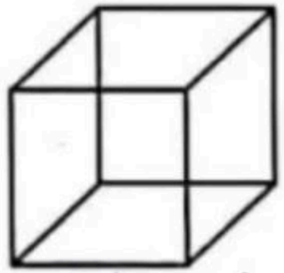
(a) 2 (b) 3 (c) 4 (d) 5

8. $CH_4 + Cl_2 \xrightarrow{h\nu} CH_3Cl + HCl$

To obtain high yields of CH_3Cl, the ratio of CH_4 to Cl_2 must be :

(a) high
(b) low
(c) equal
(d) can't be predicted

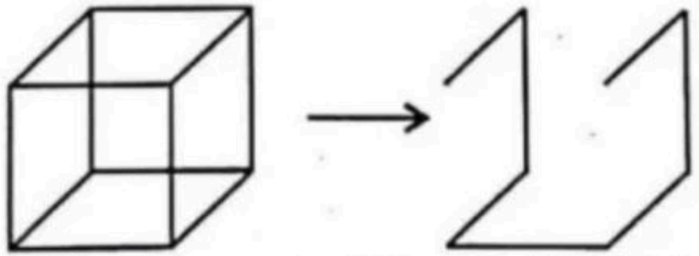
9. Double bond equivalent of cubane is :



Cubane

(a) 4 (b) 5 (c) 6 (d) 7

10. How many bond cleavages are required to convert cubane into non-cyclic skeleton ?



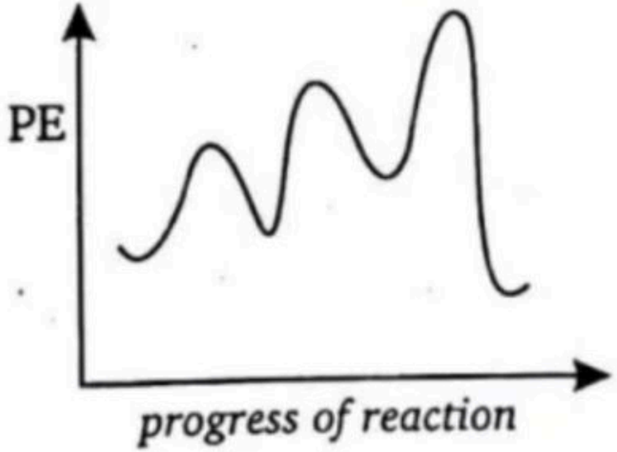
Cubane

Non-cyclic skeleton

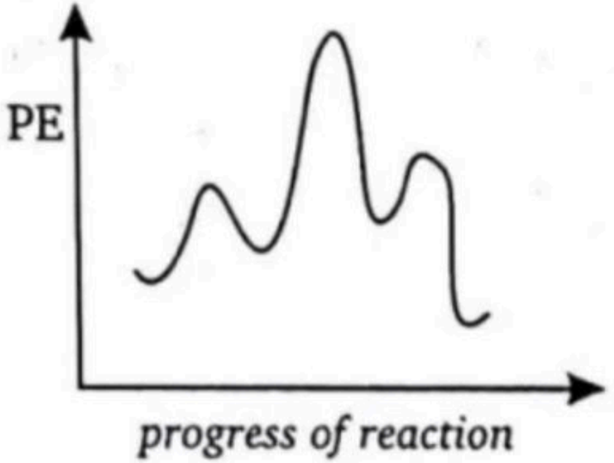
(a) 2 (b) 3 (c) 4 (d) 5

11. Draw an energy profile diagram for a three step reaction in which first step is slowest and last step is fastest. (Assume that reaction is exothermic)

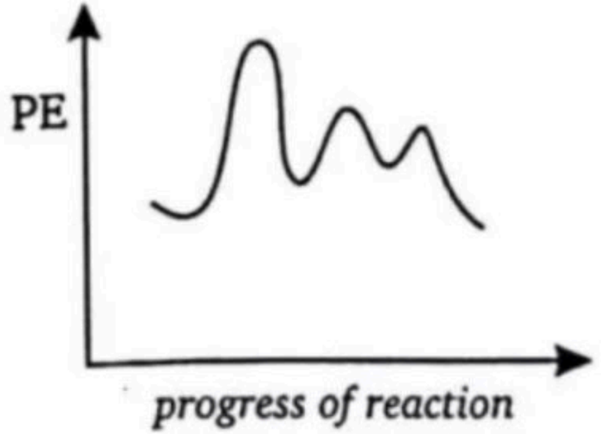
(a)



(b)



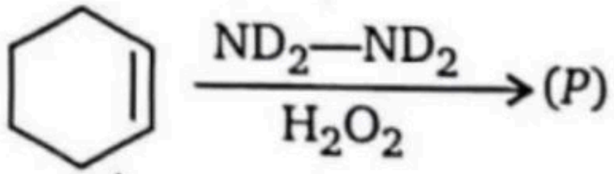
(c)



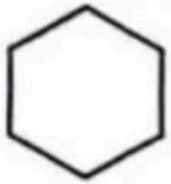
(d) None of these

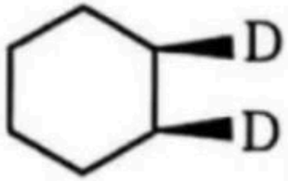
12. $CH_3-\underset{\underset{CH_3}{|}}{CH}-CH_2-CH_3 \xrightarrow[h\nu]{Cl_2} (x)$ = Number of monochloro product including stereoisomers.

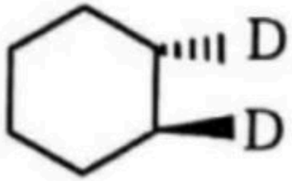
(a) 4 (b) 5 (c) 6 (d) 7

13. 

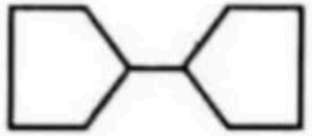
Product (*P*) is :

(a) 

(b) 

(c) 

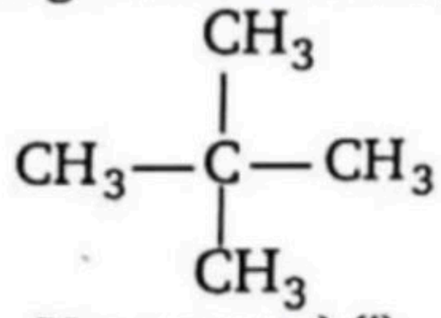
(d) both (b) & (c)

14. $(A) \xrightarrow{H_2(1\text{mole})/Pt}$ 

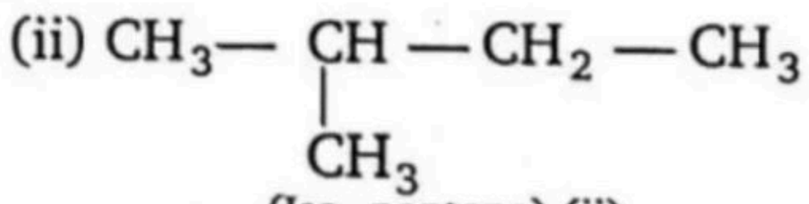
Double bond equivalent (degree of Unsaturation) of (*A*) is :

(a) 1 (b) 2 (c) 3 (d) 4

15. Arrange the following alkanes in decreasing order of their heats of combustion.

(i) 

(Neo-pentane) (i)

(ii) 

(Iso-pentane) (ii)

(iii) $CH_3 - CH_2 - CH_2 - CH_2 - CH_3$

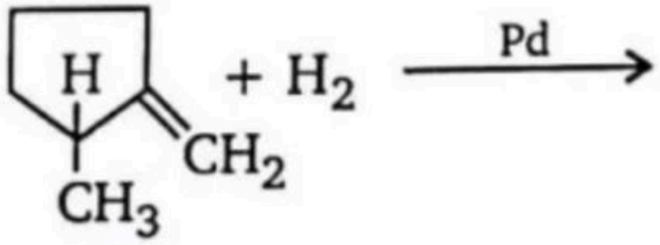
(*n*-pentane)

(a) (i) > (ii) > (iii)

(b) (iii) > (i) > (ii)

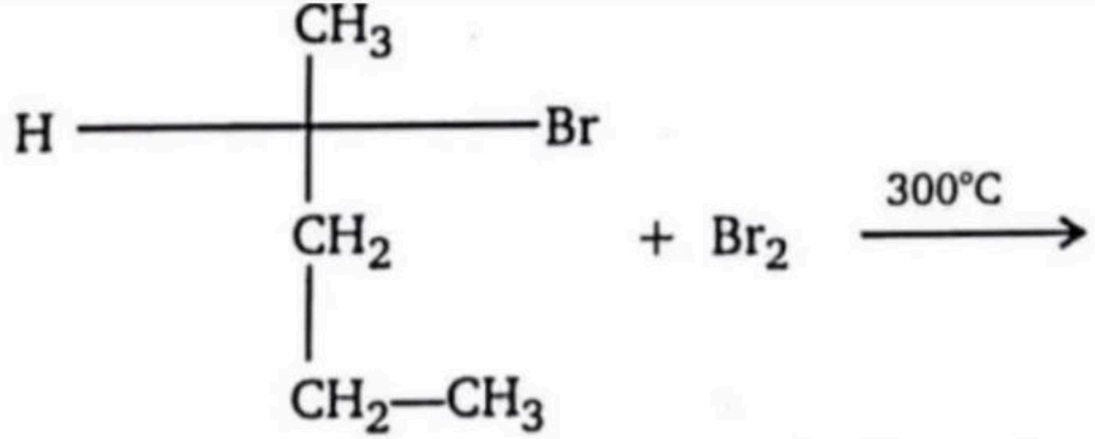
(c) (iii) > (ii) > (i)

(d) (i) > (iii) > (ii)

16. 

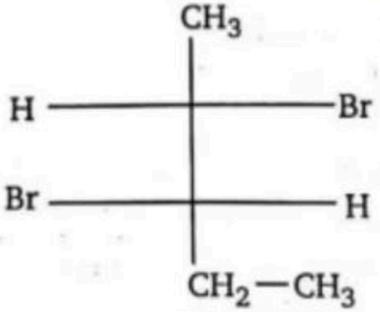
Product of the above reaction will be :

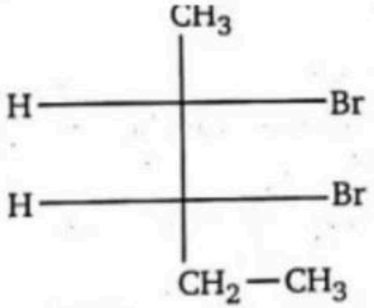
(a) Racemic mixture
(b) Diastereomers
(c) Meso
(d) Constitutional isomers

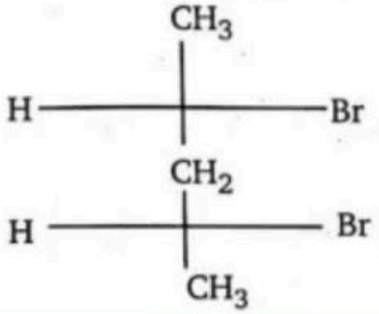
17. 

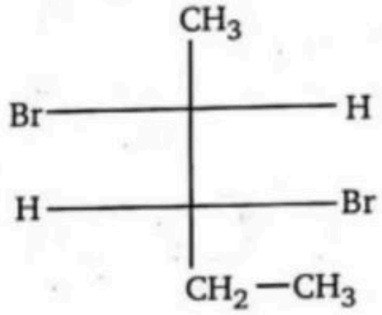
$+ Br_2 \xrightarrow{300°C}$

Which of the following compound will not be obtained as a product in the above reaction ?

(a) 

(b) 

(c) 

(d) 

18. Following are the structures of four isomer of hexane. Among the names given below, which correctly identifies the fifth isomer ?

$CH_3CH_2CH_2CH_2CH_2CH_3$

$(CH_3)_2CHCH_2CH_2CH_3$

$(CH_3)_3CCH_2CH_3$

$(CH_3)_2CHCH(CH_3)_2$

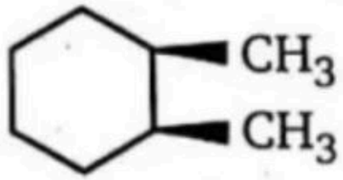
(a) 2-Methyl pentane

(b) 2-Ethyl butane

(c) 2,3-Dimethyl butane

(d) 3-Methyl pentane

19. Which of the following describes the best relationship between the methyl groups in the chair conformation of the substance shown below ?



(a) Trans
(b) Anti
(c) Gauche
(d) Eclipsed

20. Compare the stabilities of the following two compounds (*A*) and (*B*):

A : *cis*-1-ethyl-3-methyl cyclohexane

B : *trans*-1-ethyl-3-methyl cyclohexane

(a) *A* is more stable

(b) *B* is more stable

(c) *A* and *B* are of equal stability

(d) No comparison can be made

21. Which conformation of ethane has the lowest potential energy ?

(a) Eclipsed
(b) Skew
(c) Staggered
(d) All will have equal potential energy

22. Ethane is subjected to combustion process. During the combustion the hybrid state of carbon changes from :

(a) sp^2 to sp^3

(b) sp^3 to sp

(c) sp to sp^3

(d) sp^2 to sp^2

23. $CH_3-CH_2-CH_2-CH_3 \xrightarrow[\Delta]{AlCl_3} CH_3-\underset{\displaystyle CH_3}{\overset{\displaystyle |}{CH}}-CH_3$

Above reaction is an example of :

(a) isomerization
(b) polymerization
(c) cracking
(d) de-hydrogenation

24. Which of the following has highest chlorine content ?

(a) Pyrene (b) DDT (c) Chloral (d) Gammaxene

25. Pure methane can be prepared by :

(a) Wurtz reaction

(b) Kolbe electrolysis method

(c) soda-lime de-carboxylation

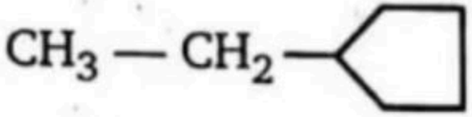
(d) reduction with H_2

26. Calcium carbide + heavy water $\longrightarrow$?

The product of the above reaction is :

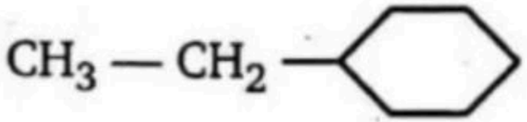
(a) C_2H_2 (b) CaD_2 (c) $Ca(OD)_2$ (d) CD_4

27.



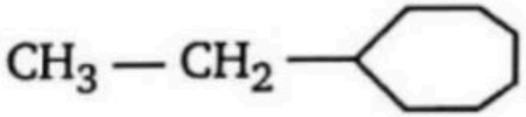
Ethyl cyclopentane

(I)



Ethyl cyclohexane

(II)



Ethyl cycloheptane

(III)

Arrange the compounds I, II and III in decreasing order of their heats of combustion:

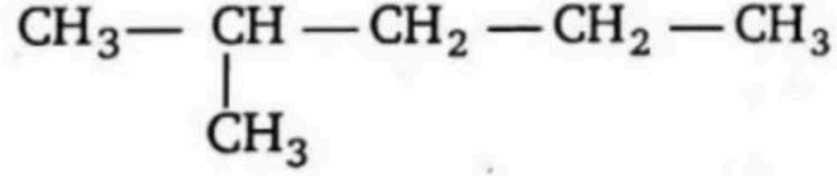
(a) II > I > III

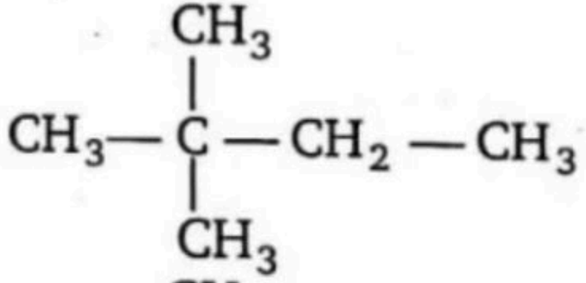
(b) I > II > III

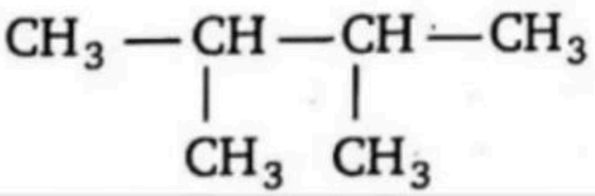
(c) III > II > I

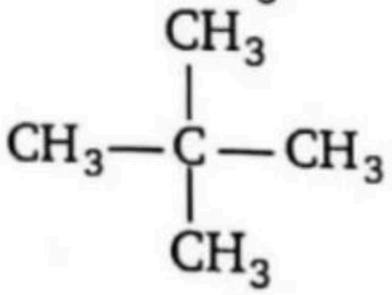
(d) III > I > II

28. An alkane (mol. wt. = 86) on bromination gives only two monobromo derivatives (excluding stereoisomers). The alkane is :

(a) 

(b) 

(c) 

(d) 

29. Order of the bond strength of C — H bonds involving sp, sp^2 and sp^3 hybridized carbon atoms is :

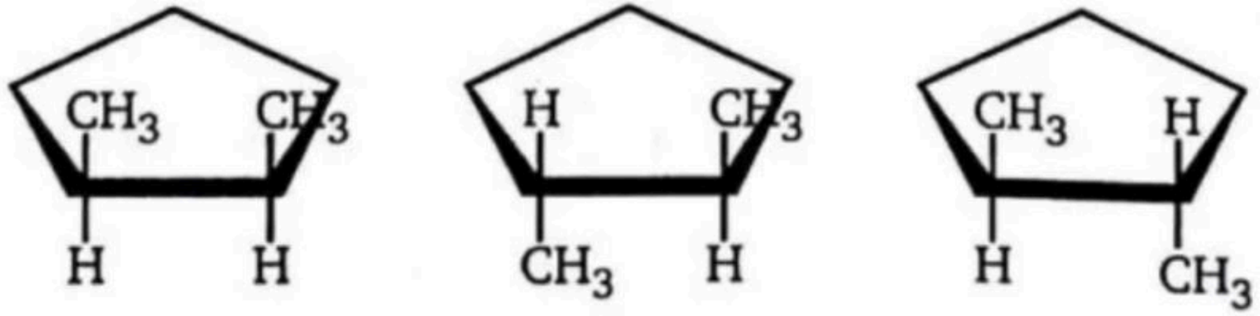
(a) $sp > sp^2 > sp^3$

(b) $sp^3 > sp^2 > sp$

(c) $sp^2 > sp^3 > sp$

(d) $sp^2 > sp > sp^3$

30.

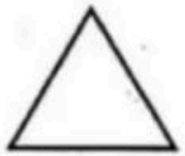


(I) (II) (III)

Among the structures given , select the enantiomers :

(a) I and II
(b) I and III
(c) II and III
(d) I, II and III

31.



(I)



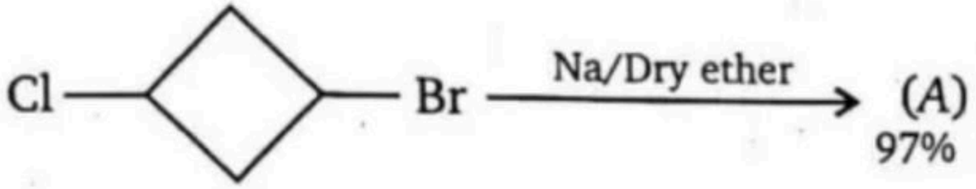
(II)



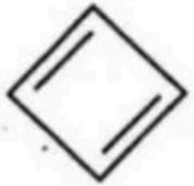
(III)

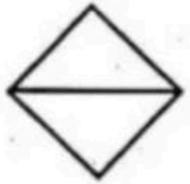
The correct order of reactivity of I, II & III towards addition reactions is :

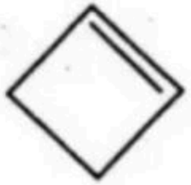
(a) I > III > II (b) I > II > III (c) III > II > I (d) III > I > II

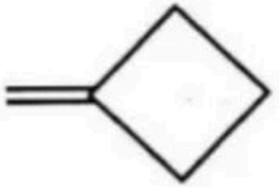
32. 

Product (*A*) of above reaction is :

(a) 

(b) 

(c) 

(d) 

33. Which of the following reactants is suitable for preparation of methane and ethane by using one step only ?

(a) $H_2C = CH_2$

(b) CH_3OH

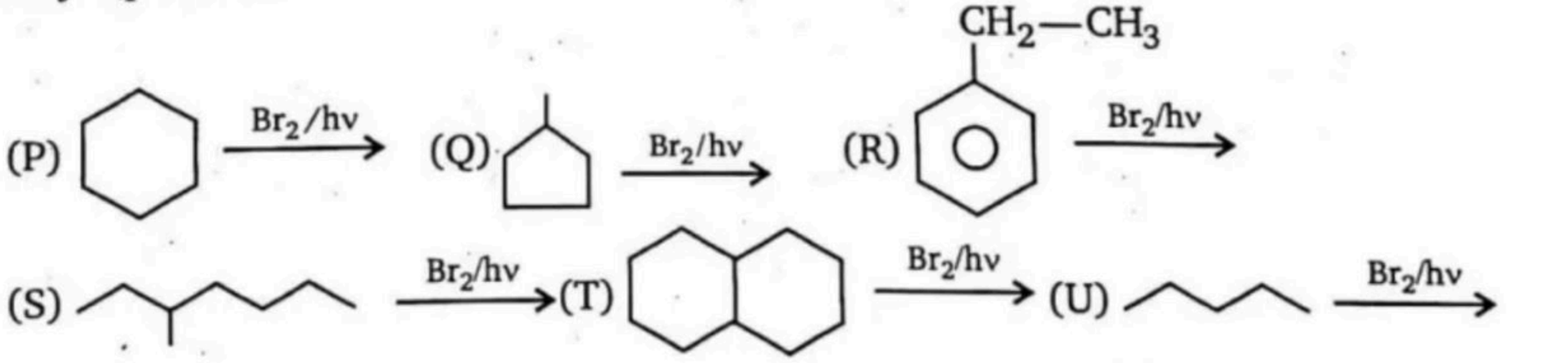
(c) $CH_3 - Br$

(d) $CH_3 - CH_2 - OH$

34. How many carbon atoms does an alkane (not a cycloalkane) need before it is capable to exist in enantiomeric form ?

(a) 4 (b) 5 (c) 6 (d) 7

35. Among the following free radical bromination reactions, select those in which 2° halide is the major product —



(a) P, Q, R, S

(b) P, R, U

(c) P, R, S, T

(d) P, Q, R, S, T

36. $(A) + Cl_2 \xrightarrow{hv}$ monochloro product

To maximise the yield of monochloro product in the above reaction ?

(a) Cl_2 must be added in excess

(b) Reactant (A) must be added in excess

(c) Reaction must be carried out in dark

(d) Reaction must be carried out with equimolar mixture of Cl_2 and A

37. $CH_3 - CH_2 - CH_2 - CH_3 \xrightarrow{Br_2/h\nu}$

Major product in the above reaction is :

(a) Racemic mixture
(b) Meso
(c) Diastereomers
(d) Constitutional isomers

38. Select the chain propagation steps in the free-radical chlorination of methane.

(1) $Cl_2 \longrightarrow 2Cl^{\bullet}$

(2) $Cl^{\bullet} + CH_4 \longrightarrow CH_3Cl + H^{\bullet}$

(3) $Cl^{\bullet} + CH_4 \longrightarrow CH_3^{\bullet} + HCl$

(4) $H^{\bullet} + Cl_2 \longrightarrow HCl + Cl^{\bullet}$

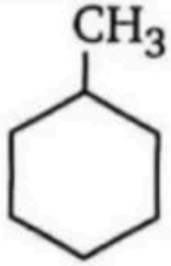
(5) $CH_3^{\bullet} + Cl_2 \longrightarrow CH_3Cl + Cl^{\bullet}$

(a) 2, 3, 5

(b) 1, 3, 6

(c) 3, 5

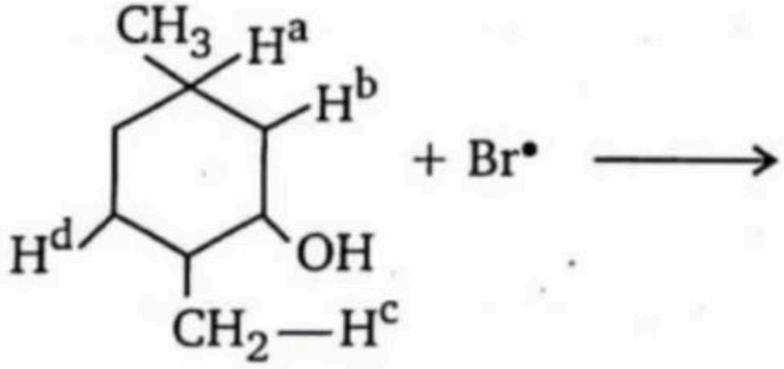
(d) 2, 3, 4

39.  $\xrightarrow{Br_2/h\nu}$ Monobromo derivatives

The number of possible monobromo products is (excluding stereoisomers):

(a) 4 (b) 5 (c) 8 (d) 10

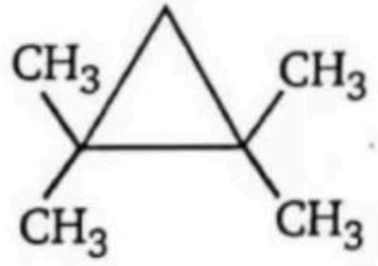
40.



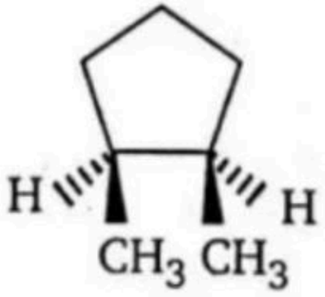
$Br^{\bullet}$ will abstract which of the hydrogen most readily ?

(a) a (b) b (c) c (d) d

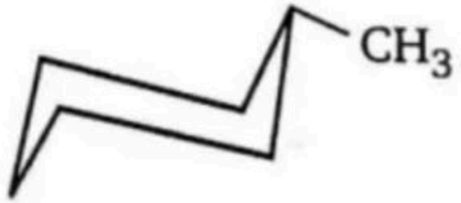
41. Arrange the following compounds in decreasing order of their heats of combustion :



(i)



(ii)



(iii)

(a) (iii) > (ii) > (i)
(b) (ii) > (i) > (iii)
(c) (iii) > (i) > (ii)
(d) (i) > (ii) > (iii)

42. $\underset{a}{CH_3}-\underset{b}{CH_2}-\underset{c}{CH_2}-\underset{d}{CH_2}-F$

Arrange the hydrogens a, b, c, d, in decreasing order of their reactivities towards chlorination:

(a) $a > b > c > d$

(b) $b > c > d > a$

(c) $b > c > a > d$

(d) $c > b > a > d$

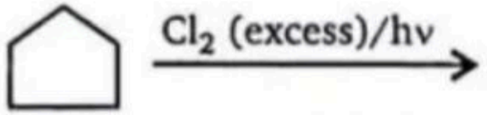
43. On catalytic reduction (H_2/Pt) how many alkenes will give *n*-butane ?

(a) 1
(b) 2
(c) 3
(d) 4

44. On catalytic reduction (H_2/Pt) how many alkenes will give 2-methylbutane ?

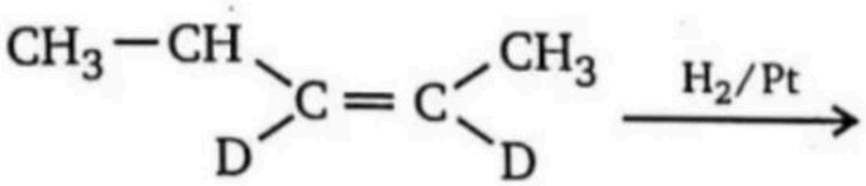
(a) 1 (b) 2

(c) 3 (d) 4

45. 

How many dichloro products are formed in the above reaction (including stereoisomers)?

(a) 5
(b) 6
(c) 7
(d) 9

46. 

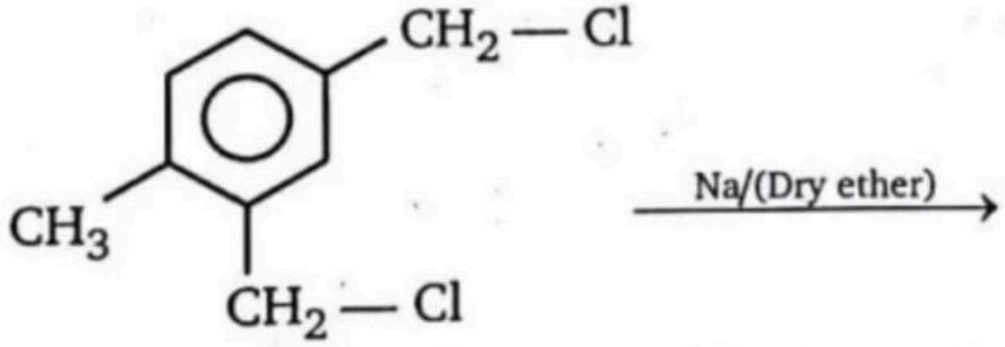
Product of the above reaction will be :

(a) Racemic mixture
(b) Diastereomers
(c) Meso
(d) Constitutional isomers

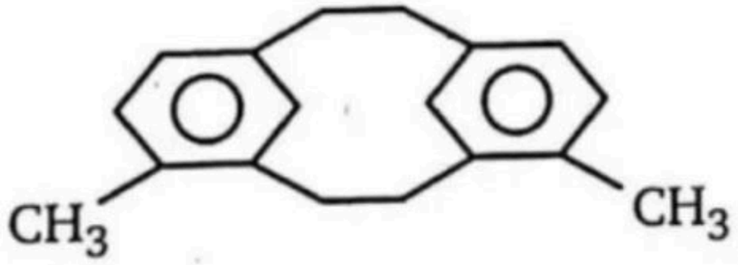
47. $Ph-CH_2-\underset{\underset{D}{|}}{CH}-CH_3 \xrightarrow{Br_2/h\nu}$

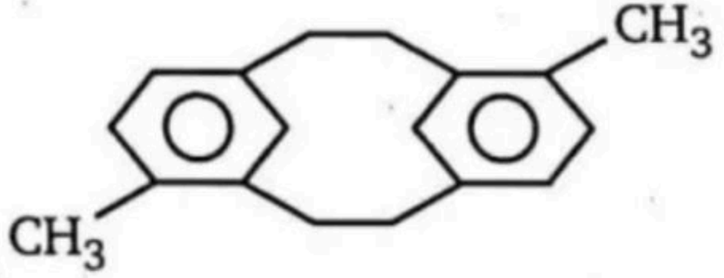
Product of the above reaction will be :

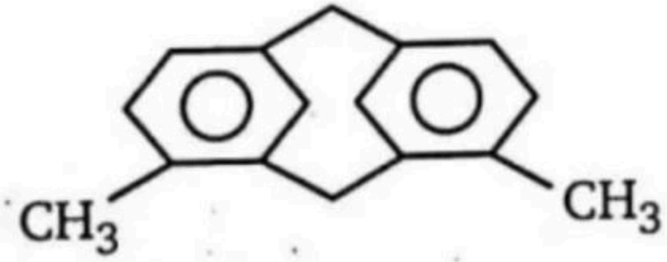
(a) Diastereomers
(b) Racemic mixture
(c) Meso
(d) Constitutional isomers

48. 

Products obtained in above Wurtz reaction is :

(a) 

(b) 

(c) 

(d) Both (a) and (b)

49. Rank the transition states that occur during the following reaction steps in order of increasing stability (least → most stable) :

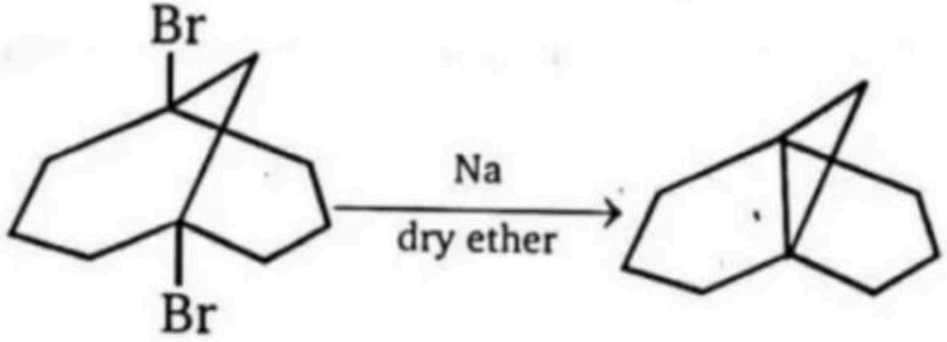
1. $H_3C-\overset{+}{O}H_2 \longrightarrow CH_3^+ + H_2O$

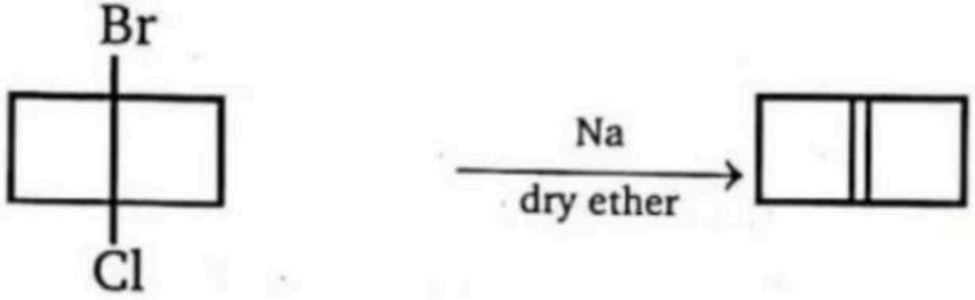
2. $(CH_3)_3C-\overset{+}{O}H_2 \longrightarrow (CH_3)_3C^+ + H_2O$

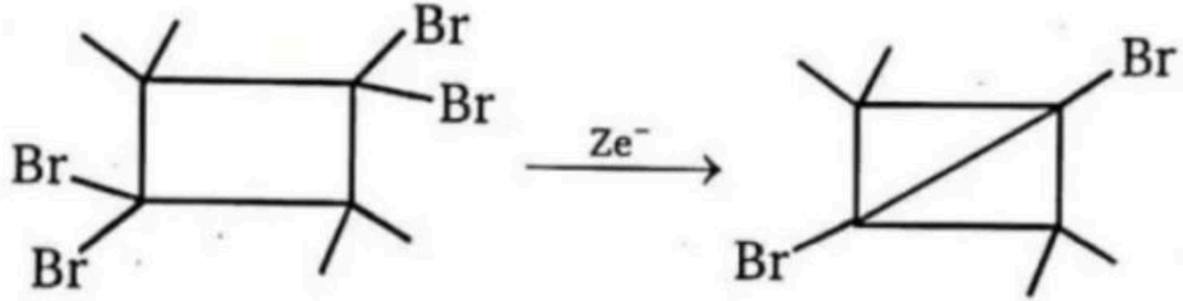
3. $(CH_3)_2CH-\overset{+}{O}H_2 \longrightarrow (CH_3)_2CH^+ + H_2O$

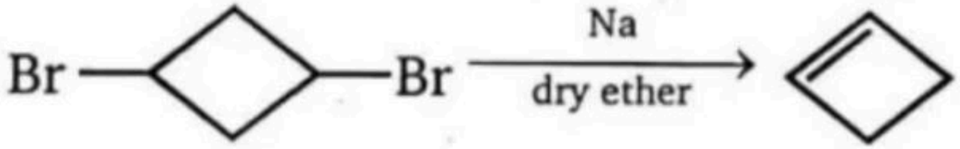
(a) $1 < 2 < 3$
(b) $2 < 3 < 1$
(c) $1 < 3 < 2$
(d) $2 < 1 < 3$

50. Which of the following does not represent major product of that reaction ?

(a) 

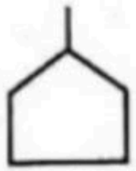
(b) 

(c) 

(d) 

1. Comprehension

For the given question (1, 2, 3), consider the following reaction.



$+ X_2 \xrightarrow{\text{light}}$ monohalogenation product

A. Light is involved in which step of the reaction :

(a) Initiation only
(b) Termination only
(c) Propagation only
(d) Propagation and Termination

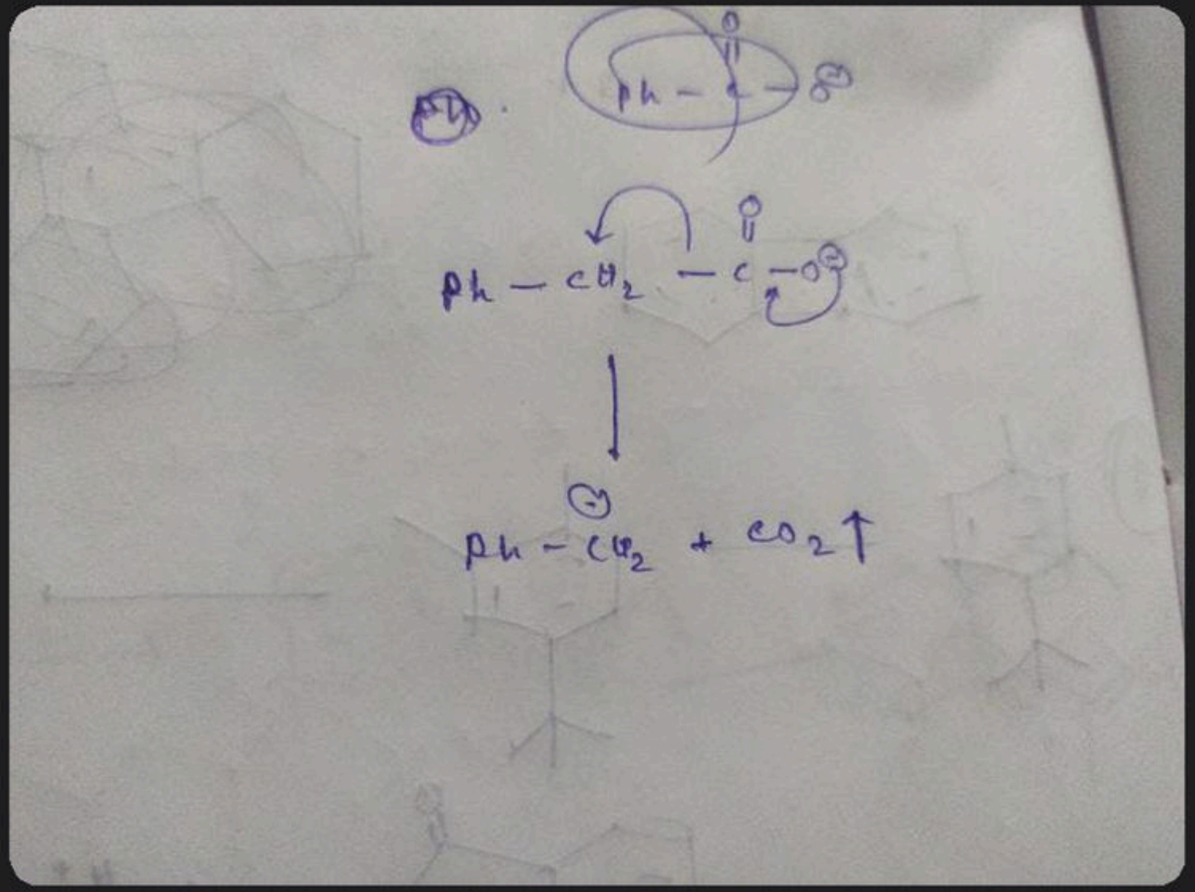
B. Which halogen will give the best yield of a single monohalogenation product ?

(a) F_2
(b) Cl_2
(c) Br_2
(d) I_2

C. How many monohalo derivatives are possible (excluding stereoisomers) ?

(a) 3
(b) 4
(c) 5
(d) 6

Question
from Debkumar

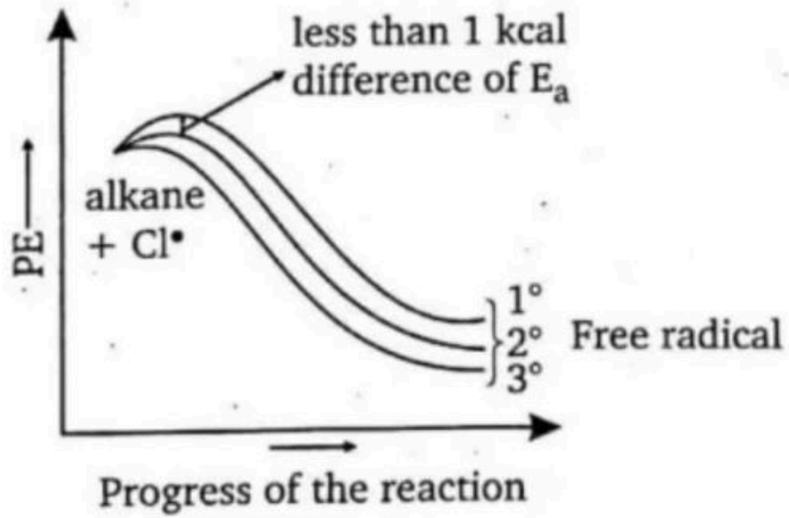


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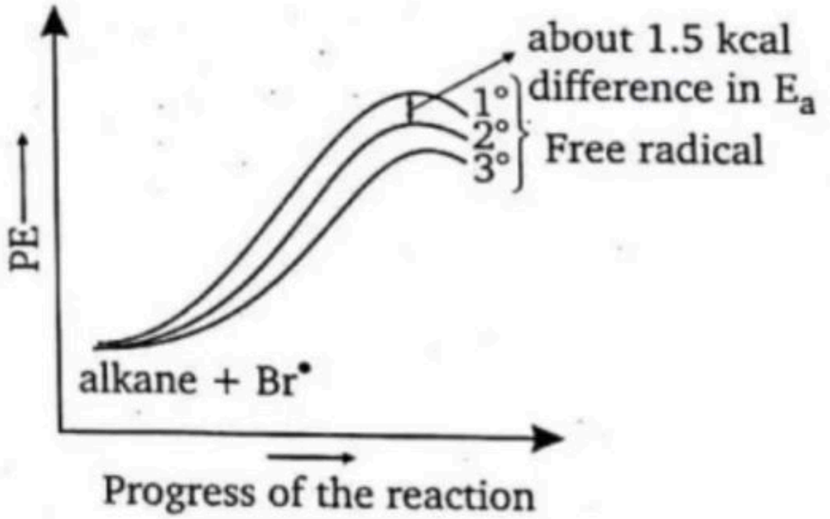
2. Comprehension

Halogenation is a substitution reaction, where halogen replaces one or more hydrogens of hydrocarbon.

$$R-H + X_2 \xrightarrow{h\nu} R-X + HX$$



Chlorination is exothermic and transition state resembles with products



Bromination is endothermic and transition state resembles with products

Chlorine free radical make 1°, 2°, 3° radicals with almost equal ease, whereas bromine free radicals have a clear preference for the formation of tertiary free radicals. So, bromine is less reactive, and more selective whereas chlorine is less selective and more reactive.

The relative rate of abstraction of hydrogen by Br• is

$$3^\circ > 2^\circ > 1^\circ$$
$$(1600)\ \ (82)\ \ \ (1)$$

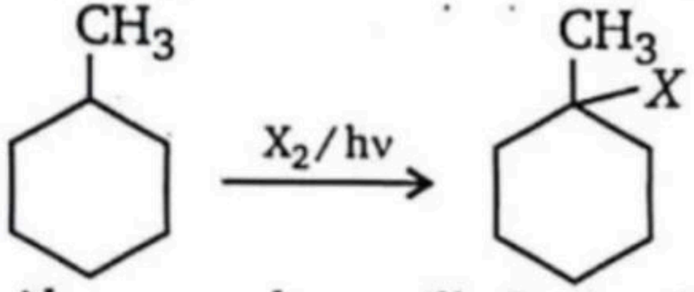
The relative rate of abstraction of hydrogen by Cl• is :

$$3^\circ > 2^\circ > 1^\circ$$
$$(5)\ \ (3.8)\ \ (1)$$

A. 1-halo-2,3-dimethyl butane will be obtained in better yields, if halogen is :

(a) Br_2 (b) Cl_2 (c) I_2 (d) Can't be predicted

B.



Above product will obtained in better yield if X is

(a) Cl_2 (b) I_2 (c) Br_2 (d) Can't be predicted

C. $CH_3-\underset{\displaystyle CH_3}{\overset{|}{CH}}-CH_3 \xrightarrow{Cl_2/h\nu}$ Product

Major product in the above reaction is :

(a) $CH_3-\underset{\displaystyle CH_3}{\overset{|}{CH}}-CH_2-Cl$

(b) $CH_3-\underset{\displaystyle Cl}{\overset{|}{\underset{\displaystyle CH_3}{\overset{|}{CH}}}}-CH_3$

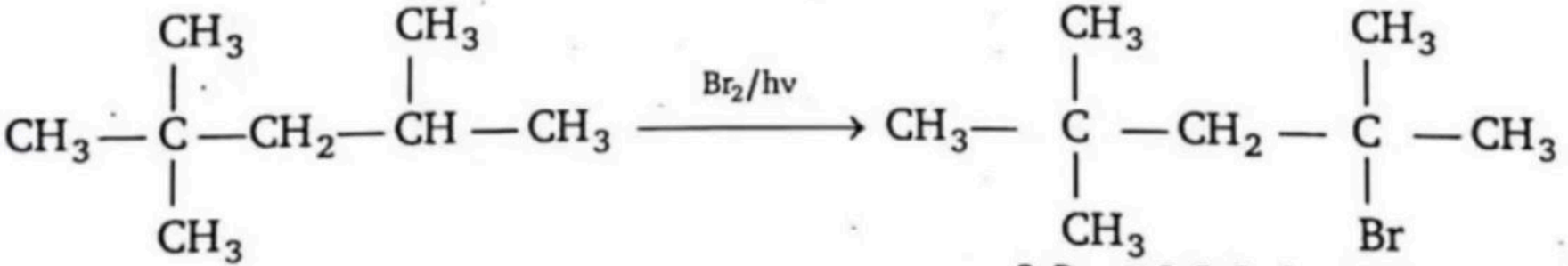
(c) $CH_3-CH_2-CH_2-Cl$

(d) $CH_3-\underset{\displaystyle Cl}{\overset{|}{CH}}-CH_2-CH_3$

D. Which of the following will give five monochloro products, when allowed to react with Cl_2 in presence of sun light (excluding stereoisomers) ?

(a) *n*-pentane (b) Iso-pentane (c) 2-methyl-pentane (d) 3-methyl pentane

E.

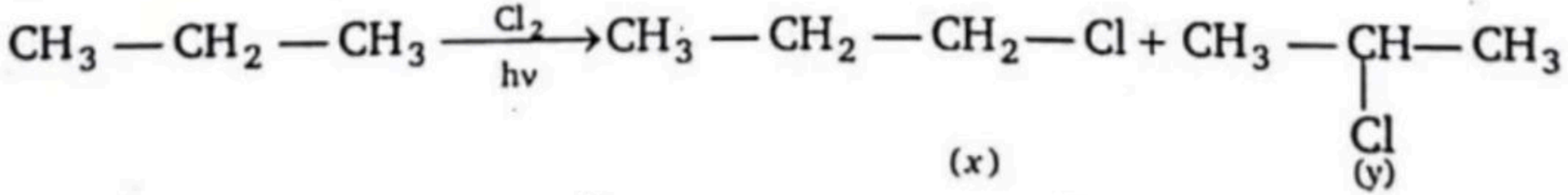


2, Bromo-2, 5, 5 trimethyl pentane (x%)

What is the value of x (% yield of product)?

(a) 18 % (b) 82 % (c) 90 % (d) 60 %

F. What would be the product ratio x/y in the chlorination of propane if all the hydrogen were abstracted at equal rate ?

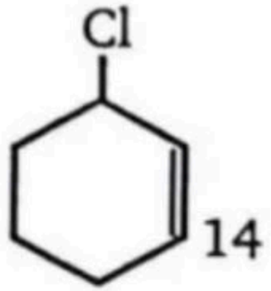


(a) $\frac{1}{3}$ (b) $\frac{3}{1}$ (c) $\frac{9}{1}$ (d) $\frac{1}{9}$

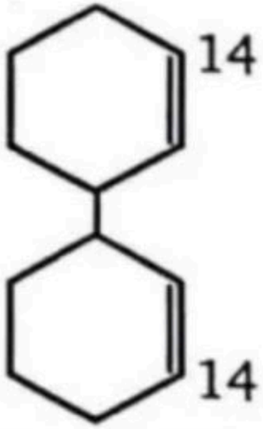
G. How many dichloro products (including stereoisomers) will be formed when R-2-chloropentane reacts with Cl_2 in presence of UV radiation ?

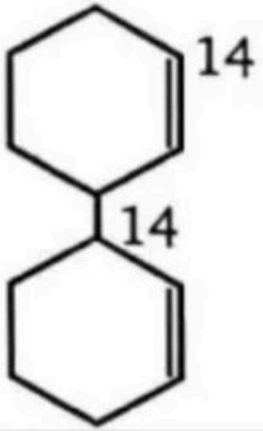
(a) 5 (b) 6 (c) 7 (d) 8

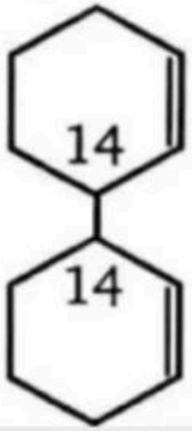
Microsoft Edge

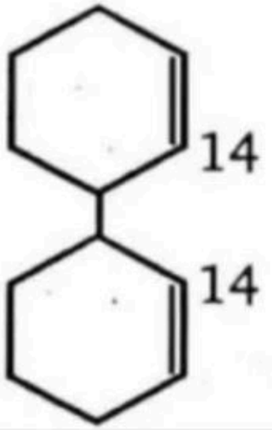
3. 

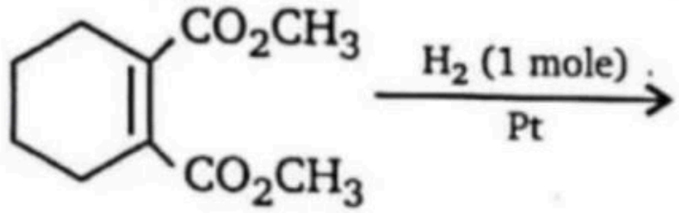
$\xrightarrow[\text{dry ether}]{\text{Na}}$ (A); Product (A) is :

(a) 

(b) 

(c) 

(d) 

4. 

(A); Product (A) is :

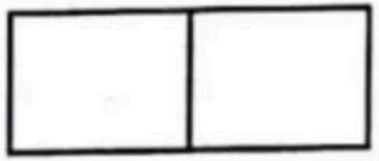
(a) Meso compound (b) Racemic mixture (c) Diastereomers (d) Optically active

5. $Ph—CH_2—\overset{\overset{O}{\|}}{C}—OH \xrightarrow[(2)\ H^{\oplus}]{(1)\ NaOH,\ CaO,\ \Delta} (A)$

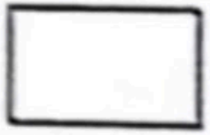
Product (*A*) is :

(a) $Ph—CO_2H$ (b) $Ph—CH_2—OH$ (c) $Ph—CH_3$ (d) 

6. Match the column I with column II and with column III.

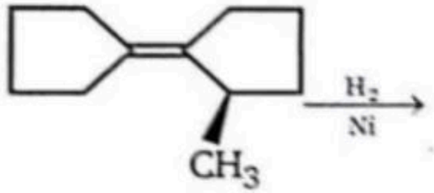
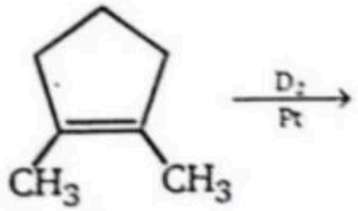
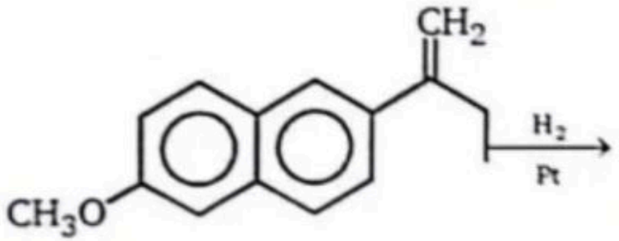
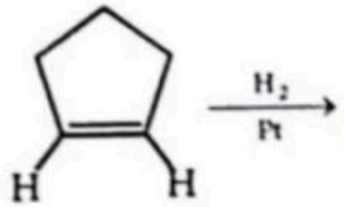
Column (I)		Column (II)		Column (III)	
Compound		Mono-chloro products (excluding stereoisomerism)		Monochloro products (including stereoisomerism)	
(a)		(p)	1	(w)	1
(b)	$CH_3-\underset{\displaystyle CH_3}{\overset{\displaystyle |}{CH}}-CH_2-CH_3$	(q)	2	(x)	3
(c)	$CH_3-\underset{\displaystyle CH_3}{\overset{\displaystyle CH_3}{\overset{|}{\underset{|}{C}}}}-\underset{\displaystyle CH_3}{\overset{\displaystyle CH_3}{\overset{|}{\underset{|}{C}}}}-CH_3$	(r)	3	(y)	5
(d)	$CH_3-CH_2-CH_2-CH_3$	(s)	4	(z)	6

7.

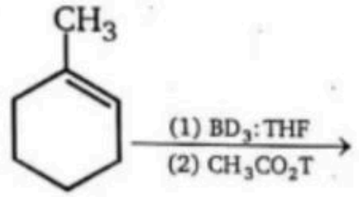
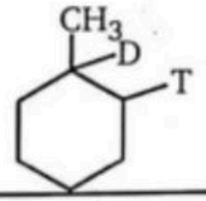
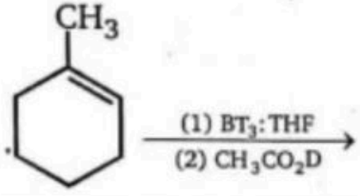
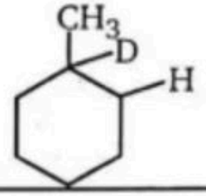
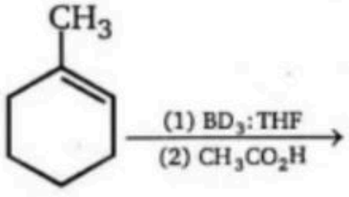
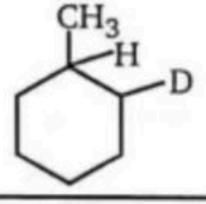
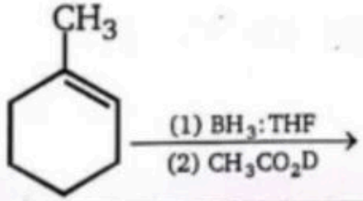
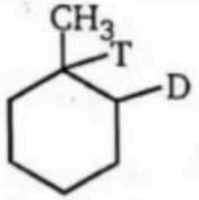
A.	*R*-2-chloropentane $\xrightarrow[h\nu]{Cl_2}$ Optically active di-chloro products (*P*)
B.	 $\xrightarrow[h\nu]{Cl_2}$ Optically active dichloro products (*Q*)
C.	*R*-2-chlorobutane $\xrightarrow[h\nu]{Cl_2}$ Optically active di-chloroproducts (*R*)

Sum $P + Q + R$ is :

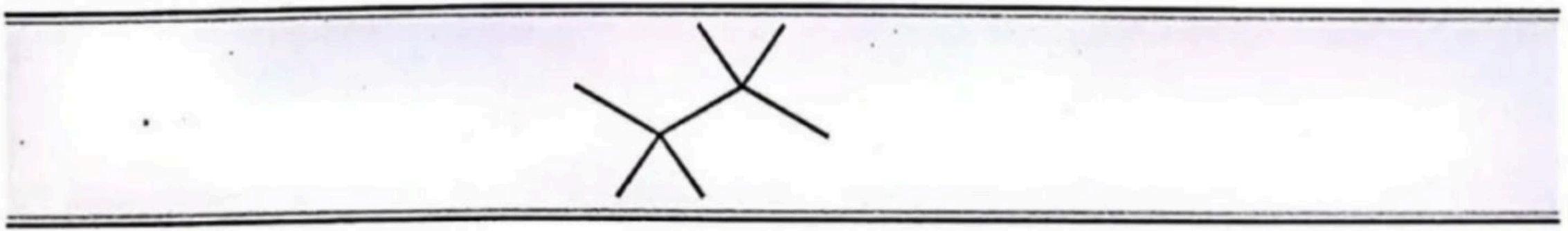
8. Match the column I and II.

Column (I)		Column (II)	
Reaction		Type of Reaction	
(a)		(p)	Meso compound
(b)		(q)	Diastereomers
(c)		(r)	Racemic
(d)		(s)	Optically inactive due to absence of chiral center

9. Match the column :

Column (I)		Column (II)	
Reaction		**Product**	
(a)		**(p)**	
(b)		**(q)**	
(c)		**(r)**	
(d)		**(s)**	

10. How many distinct monochlorinated products, (including stereoisomers) may be obtained when the alkane shown below is heated in the presence of Cl_2 ?



(a) 1 (b) 2 (c) 3 (d) 4 (e) 6

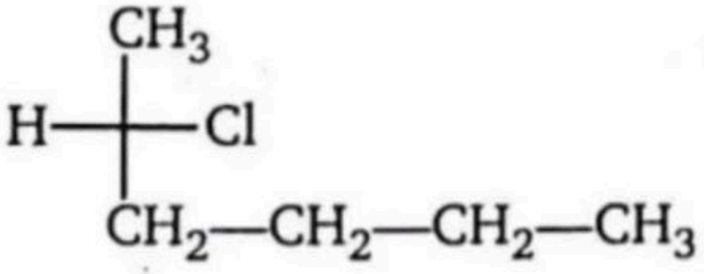
11. How many distinct monochlorinated products, (including stereoisomers) may be obtained when the alkane shown below is heated in the presence of Cl_2 ?



(a) 2 (b) 4 (c) 5 (d) 6 (e) 8

12. Match the column :

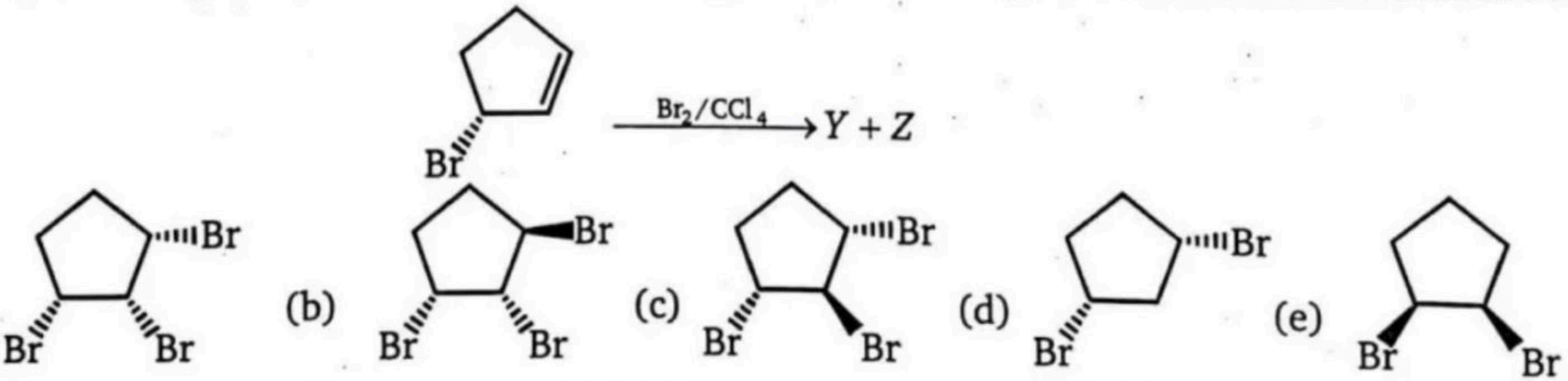
Column (I)		Column (II)	
	Wurtz reaction		**Number of dimerization product**
(a)	$CH_3-Cl \xrightarrow[\text{dry ether}]{Na}$	**(p)**	5
(b)	$CH_3-Cl + CH_3-CH_2-Cl \xrightarrow[\text{dry ether}]{Na}$	**(q)**	6
(c)	$CH_3-Cl + CH_3-CH_2-Cl + CH_3-CH_2-CH_2-Cl \xrightarrow[\text{dry ether}]{Na}$	**(r)**	3
(d)	$H_2C=CH-CH=CH-CH_2-Cl + CH_3-CH_2-Cl \xrightarrow[\text{dry ether}]{Na}$	**(s)**	1

13. 

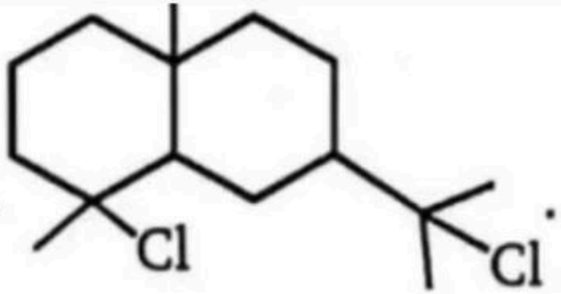
$\xrightarrow[h\nu]{Cl_2}$ (x). (x) = total number of di-chloro product

S-2-chloro hexane

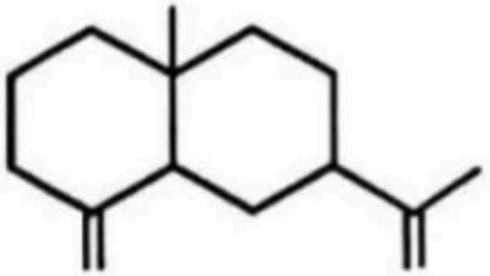
1. (R)-3-bromocyclopentene (shown below) reacts with Br_2/CCl_4 to form two products, Y and Z, Y is not optically active (does not rotate plane-polarized light). What is the structure of Y ?

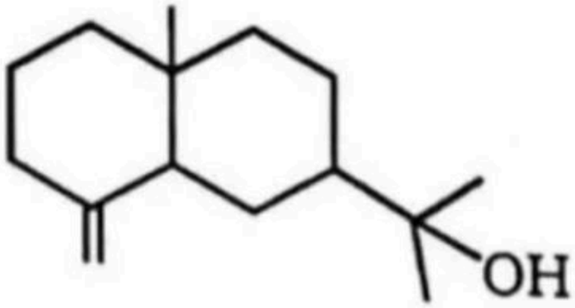


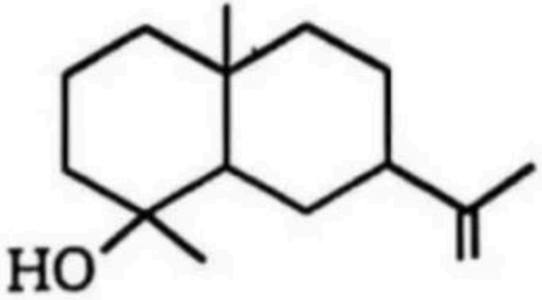
(a) (b) (c) (d) (e)

2. $A \xrightarrow{2HCl}$ 

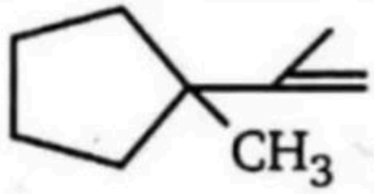
. Reactant (*A*) can be:

(a) 

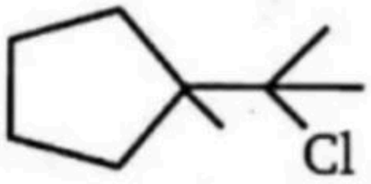
(b) 

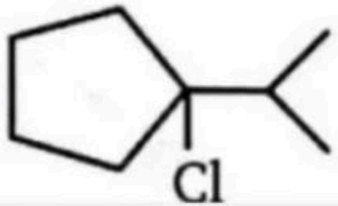
(c) 

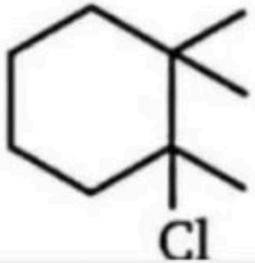
(d) All of these

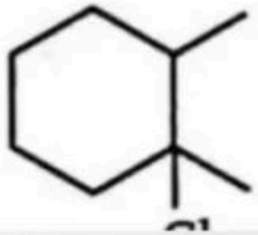
3. 

$\xrightarrow{HCl}$; Major product of the reaction is :

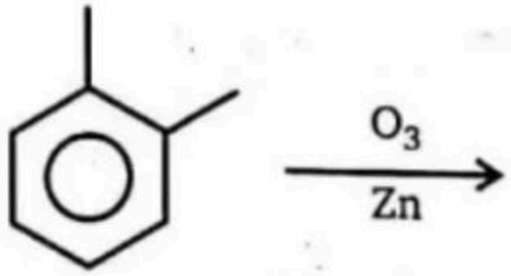
(a) 

(b) 

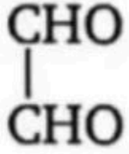
(c) 

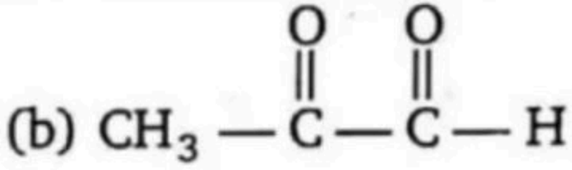
(d) 

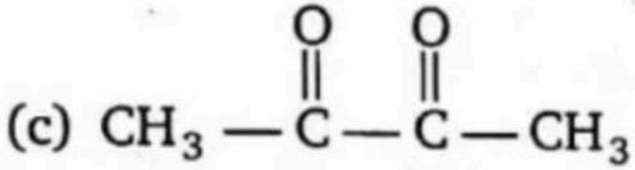
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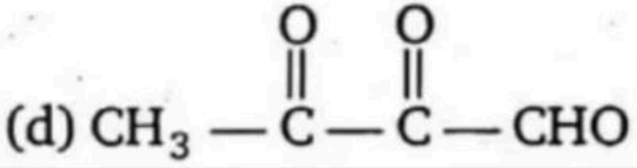
4. 

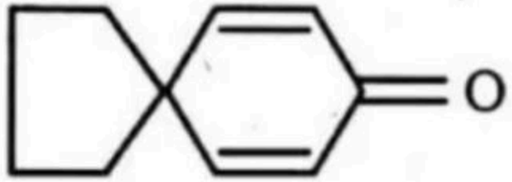
Which of the following products cannot be obtained in ozonolysis of *o*-xylene?

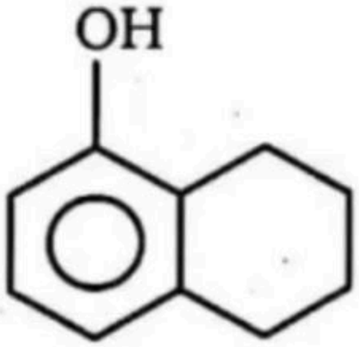
(a) 

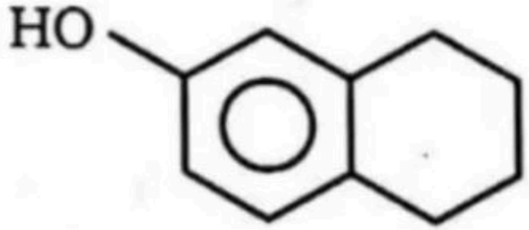
(b) 

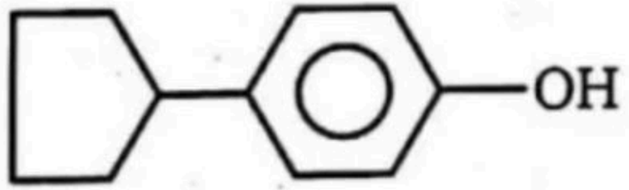
(c) 

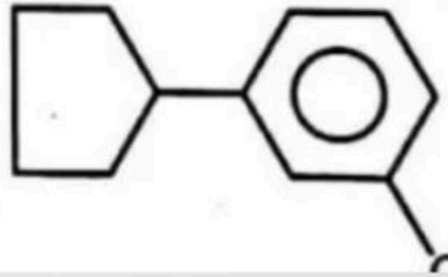
(d) 

5.  Major product of the reaction is :

(a) 

(b) 

(c) 

(d) 

6. $\begin{matrix} CH_2-CO_2K \\ | \\ CH_2-CO_2K \end{matrix} \xrightarrow{\text{electrolysis}} \underset{\text{(major)}}{(A)}$ (Kolbe electrolysis method)

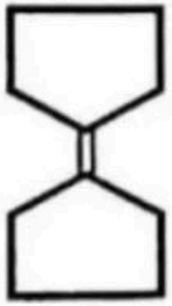
Product (A) of the reaction is :

(a) CH_3-CH_3

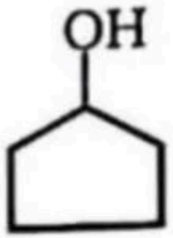
(b) $CH_2=CH_2$

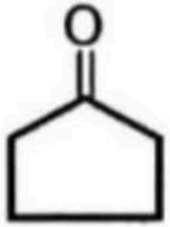
(c) $CH_3-CH=CH_2$

(d) none of these

7. 

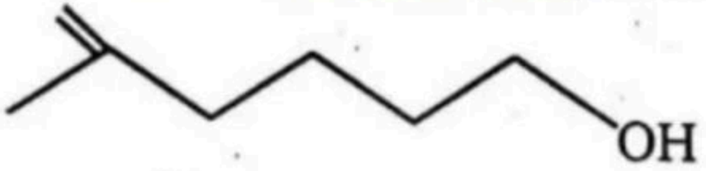
$\xrightarrow[Zn]{O_3} A \xrightarrow[Or\ LiAlH_4]{H_2/Ni} B \xrightarrow[\Delta]{H^+}$ (C); Product (C) of the reaction is :

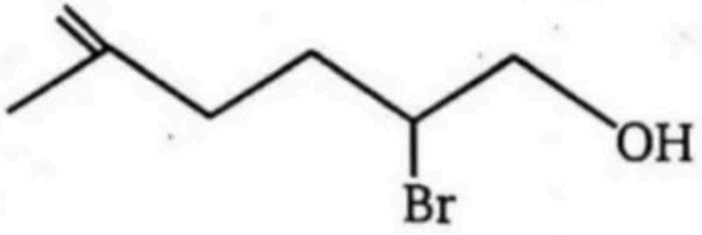
(a) 

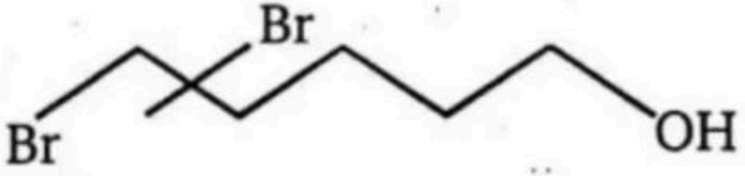
(b) 

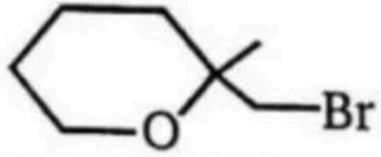
(c) 

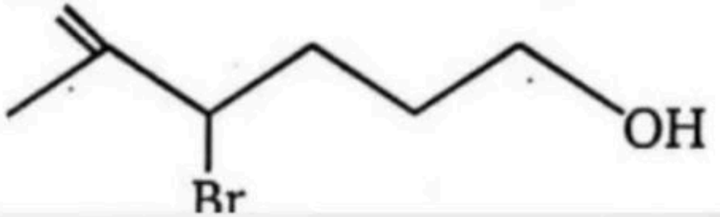
(d) 

8.  $\xrightarrow[CH_2Cl_2]{Br_2}$ *W*. Product *W* is :

(a) 

(b) 

(c) 

(d) 

9. The reaction of propene with H_3O^+ will proceed with which of the following intermediates ?

(a) $CH_3-\overset{\oplus OH_2}{\underset{|}{CH}}-CH_2$

(b) $CH_3-\overset{\oplus}{C}H-\overset{OH}{\underset{|}{CH}}-CH_2$

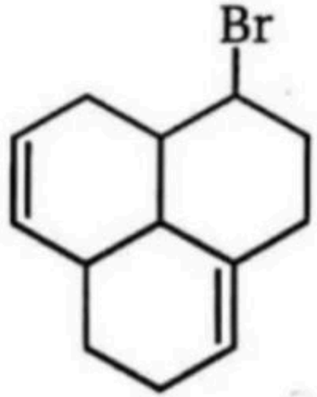
(c) $CH_3-\overset{\oplus OH_2}{\underset{|}{CH}}-CH_3$

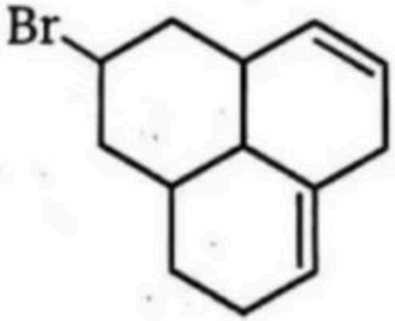
(d) $CH_3-\overset{OH}{\underset{|}{CH}}-CH_3$

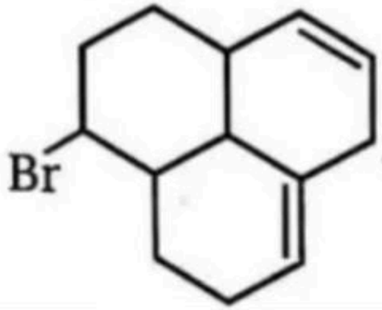
10. Which of the following bromides is the major product of the reaction shown below, assuming that there are no carbocation rearrangement ?



$$+ \underset{(1 \text{ equivalent})}{HBr} \longrightarrow C_{13}H_{17}Br$$

(a) 

(b) 

(c) 

(d) 