13. NOMENCLATURE - HYDROCARBONS

SOLUTIONS

TEACHING TASK

JEE MAINS LEVEL QUESTIONS

1. The correct IUPAC name of $CH_3–CH_2–CH(CH_3)–CH(C_2H_5)_2$ is

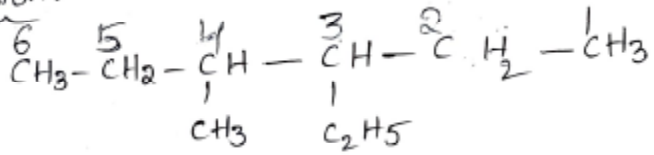
(FA & SA- 5 Marks/8 Marks)

A) 4-Ethyl -3-methyl hexane B) 3-Ethyl-4-methyl hexane
C) 4-Methyl-3-ethyl hexane D) 2, 4, -Diethyl pentane

Answer:B

Solution:- $CH_3-CH_2-CH(CH_3)-CH(C_2H_5)_2$

Expansion:-



C_2H_5 → Ethyl CH_3 → Methyl.

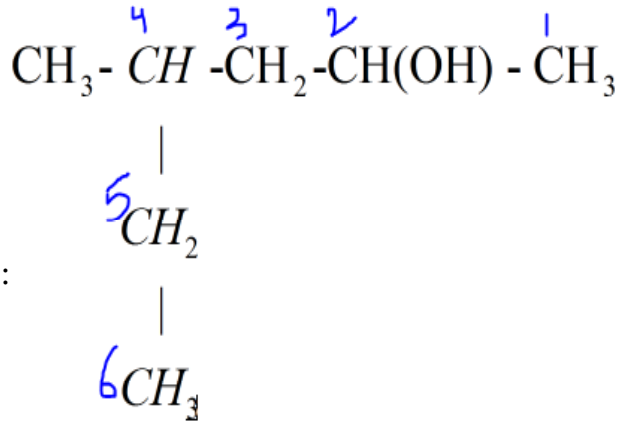
3-Ethyl-4-methyl hexane.

2. The IUPAC name of the compound is $CH_3–CH(C_2H_5)–CH_2–CH(OH)–CH_3$

A) 4-Ethyl pentanol-2 B) 4-Methyl hexanol-2
C) 2-Ethyl pentanol -2 D) 3-Methylhexanol-2

Answer:B

Solution:

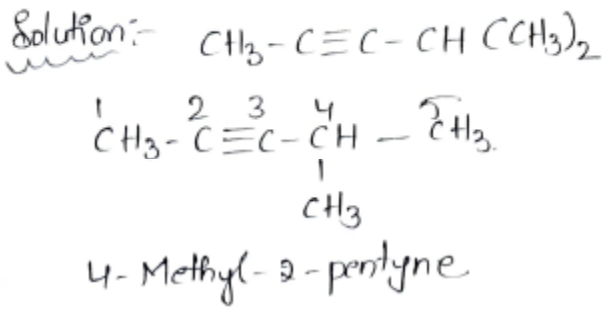


The main chain contains 6 carbons, so the parent name is hexan-2-ol (since the –OH is on carbon 2).
There is a methyl (–CH3) substituent on carbon 4.
Therefore, the correct IUPAC name is 4-methylhexan-2-ol

3. The IUPAC name of $CH_3 - C \equiv C - CH(CH_3)_2$ is

A) 4 - Methyl-2-pentyne
B) 4,4, -Dimethyl -2- butyne
C) Isopropylmethyl acetylene
D) 2-Methyl-4-pentyne

Answer:A

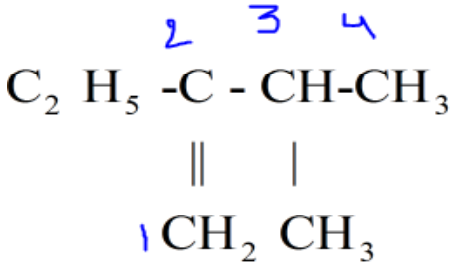


4. The IUPAC of C_2H_5 -C(=CH_2) - CH(CH_3) - CH_3 is **(FA & SA- 3 Marks / 4 Marks)**

A) 3- methyl-2- ethyl butyne -1
B) 2- ethyl -3 - methylbutene-1
C) 3- ethyl -3 -methyl- butene
D) ethyl isoprpopyl ethane

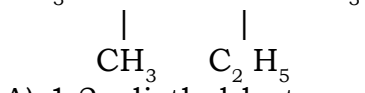
Answer:B

Solution:



Longest chain = 4 carbons (but-)
Double bond starts at carbon 1 (-1-ene)
Substituents: Ethyl at carbon 2, Methyl at carbon 3
So, IUPAC name = 2-ethyl-3-methylbut-1-ene

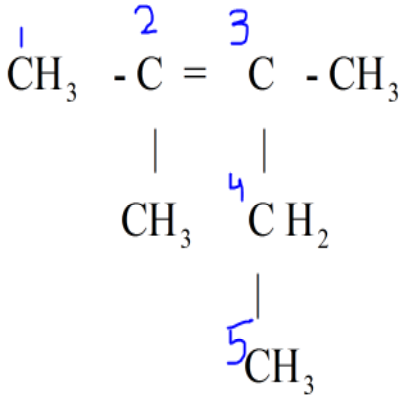
5. The correct IUPAC name of



A) 1,2 -diethyl butene
B) 2 - ethyl -3- methyl pentene
C) 3 , 4 - dimethyl hex -3- ene
D) 2 , 3 - dimethyl pent -2- ene

Answer:D

Solution:



The longest continuous chain contains 5 carbons (include one methyl on the left and the ethyl on the right): parent = pent-2-ene (double bond between C2 and C3).
There are methyl substituents on C2 and on C3 $\rightarrow$ 2,3-dimethyl.
IUPAC name: 2,3-Dimethylpent-2-ene.

6. IUPAC name of $CH_2 = CH–CH= CH_2$ is **(FA & SA- 2 Marks)**
A) 1, 2-Butadiene
B) 1,3-Butadiene
C) 1, 4-Butadiene
D) Butadiene

Answer:B

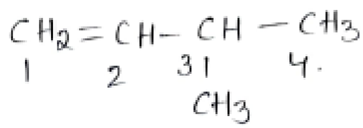
Solution:Longest chain of carbon atoms $\rightarrow$4 carbons $\rightarrow$ parent name = butane.
There are two double bonds $\rightarrow$ so the suffix becomes -diene.
The double bonds are at C-1 and C-3 (when numbering from the leftmost

double bond to give the lowest possible numbers).
IUPAC name: 1,3-Butadiene

7. IUPAC name of $CH_2 = CH - CH(CH_3)_2$ is

A) 1,1-Dimethyl -2-propane B) 3-Methyl -1- butene
C) 2-vinyl propane D) 1-Isopropyl ethylene

Answer:B

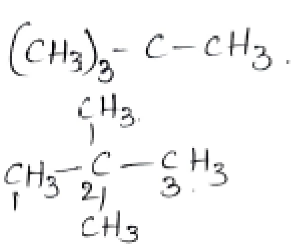
Solution:-


3- Methyl - 1- Butene

8. IUPAC name of $(CH_3)_3$ CCH_3 is

A) 1,1,1-Trimethylethane B) 2,2,2-Trimethylpropane
C) 2,2,2-Trimethylethane D) Dimethylpropane

Answer:D

Solution:-


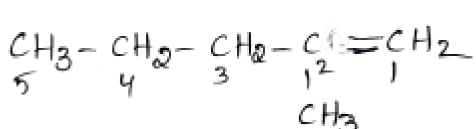
2,2 - Dimethylpropane.

9. The IUPAC name of the following compound

$CH_3 - CH_2 - CH_2 - C = CH_2$ is
with CH_3 attached to C

A) 2- Methylpentene–1 B) 4- Methylpentene–1
C) 1- Hexene D) 3- Methyl pentene

Answer:A

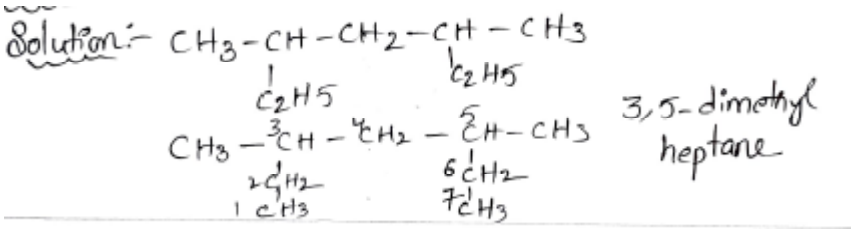
Solution:-


2- Methyl pentene-1

10. CH_3 - CH - CH_2 - CH - CH_3 (with C_2H_5 on each CH) IUPAC name is

A) 2, 4 - diethyl pentane B) 3, 5- dimethyl heptane
C) 3 - methyl 5 -ethyl hexane D) 5 - ethyl -3- methyl hexane

Answer:B

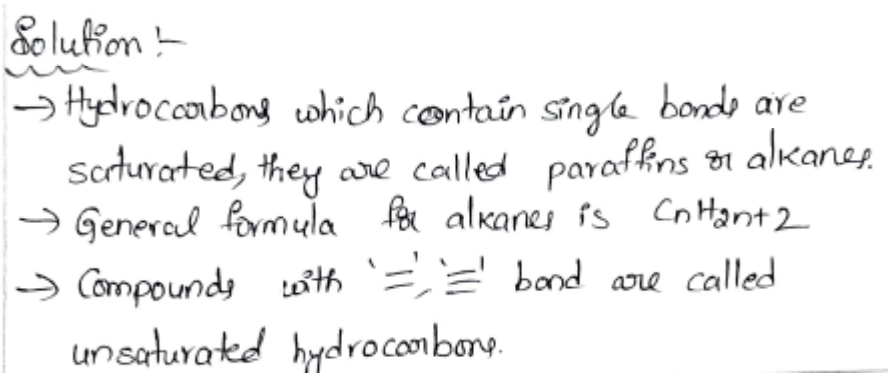


JEE ADVANCED LEVEL QUESTIONS

Multi correct answer type:

12. Which of the following statements is correct?
    A) Hydrocarbons which contain only single bonds are said to be saturated
    B) Saturated hydrocarbons are also called paraffins or alkanes
    C) are represented by the general formula C_nH_{2n+2}
    D) Compounds with double (=) or triple (º) bond are said to be unsaturated hydrocarbons

Answer:A,B,C,D



Assertion and Reason Type:

A) Both Assertion and Reason are true, and Reason is the correct explanation for Assertion.
B) Both Assertion and Reason are true, but Reason is NOT the correct explanation for Assertion.
C) Assertion is true, but Reason is false.
D) Assertion is false, but Reason is true.

13. **Assertion** :When two or more substituents are present at the end of the parent chain which gives the lowest set of the locants is preffered for numbering
    Reason : Priority order will be given according to lowest locant rule.

Answer:A

Solution:- When 2 or more substituents are present, the parent chain should be numbered to give the lowest set of locants based on lowest locant rule.

14. **Assertion** : The IUPAC name of $CH_3 - CH = CH - C \equiv C - H$ is pent–3– en–1–yne
Reason : Lowest Locant rule for multiple bond is preferred.

Answer:A

Ans:- 1

Solution:- $\overset{1}{C}H_3-\overset{2}{C}\equiv\overset{3}{C}-\overset{4}{C}H_2-\overset{5}{\underset{CH_3}{\underset{|}{C}}}H-\overset{6}{C}H_3$

5-Methyl-2-hexyne.

Comprehension Type:

In naming of Hydrocarbons, the parent carbon chain is numbered in a manner so as to give lowest number to that carbon atom linked by double (or) triple bond even if it Violates the rules of saturated hydrocarbons.

15. The IUPAC name of $CH_3 - C \equiv C - CH_2 - \underset{CH_3}{\underset{|}{C}}H - CH_3$ is

A) 5 – Methyl – 2 – Hexyne
B) 2 – Methyl – 4 – Hexyne
C) 2 – yne – 5 – Methyl Hexane
D) 1,1 – Dimethyl – 3 – Pentyne

Answer:A

Ans:- 1

Solution:- $\overset{1}{C}H_3-\overset{2}{C}\equiv\overset{3}{C}-\overset{4}{C}H_2-\overset{5}{\underset{CH_3}{\underset{|}{C}}}H-\overset{6}{C}H_3$

5-Methyl-2-hexyne.

16. The IUPAC name of $CH_2 = \underset{CH_3}{\underset{|}{C}} - CH = CH_2$ is

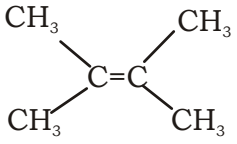
A) 3 – Methyl buta – 1,3 – diene
B) 2 – Methyl buta – 1,3 – diene
C) Penta diene
D) 2 – Methyl pentene

Answer:B

Solution:- $CH_2 = C - CH = CH_2$ (1, 2, 3, 4)

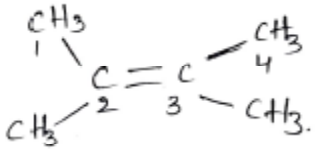
CH_3

2-methyl buta-1,3-diene.

17. The IUPAC name of  is

A) 2,3 – dimethyl but – 3 – ene
B) 2,3 – dimethyl but – 2 – ene
C) 2,3 – dimethyl but – 1 – ene
D) 2,3 – dimethyl but – 4 – ene

Answer:D

Solution:- 

2,3-dimethyl but-2-ene.

Integer Type:

18. Difference of Hydrogens between Alkane and Alkyl group is _____

Answer:1

Solution:- Alkane → C_nH_{2n+2}.

Alkyl group → C_nH_{2n+1}.

Difference is 1 hydrogen atom.

19. Number of 1^0 carbons in n – Butane is _____

Answer:2

Solution:- Structure of n-butane

$CH_3 - CH_2 - CH_2 - CH_3$.

Primary Carbon (1°) → These are carbons bonded to only one other carbon atom.

$CH_3 - CH_2 - CH_2 - CH_3$ (1°, 2°, 2°, 1°)

2 - primary Carbons

Matrix Matching Type:

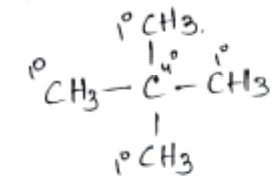
20.

	LIST - 1 (compound)	LIST - 2 (type of carbons)
A)	Neopentane	A)1º, 2º, 3º carbons
B)	2,2,3-Trimethyl pentane	B)All are 2°–Carbons
C)	Cyclohexane	C)1º, 2º, 3º,4°– Carbons
D)	Isopentane	D)1°and 4ºCarbons
		5) 1°and 2°–Carbons

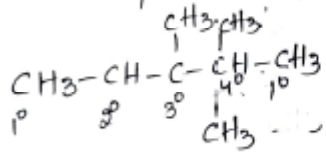
Answer:A-D,B-C,C-B,D-A

Solution:

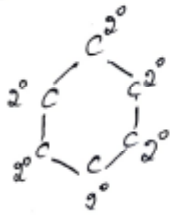
A) Neopentane. → D) 1° and 4° Carbons.



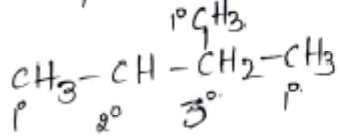
B) 2,2,3-Trimethyl pentane → C) 1°, 2°, 3°, 4°- Carbons



C) Cyclohexane → B) All are 2° Carbons



D) Isopentane → A) 1°, 2°, 3° Carbons



LEARNERS TASK

CONCEPTUAL UNDERSTANDING QUESTIONS (CUQ's)

1. The hydrocarbon residue derived by removing a hydrogen atom from an alkene is called :

   A) Alkenyl group B) Alkyle group C) Alkynyl group D) Aryl group

Answer:A

Solution:The hydrocarbon residue derived by removing a hydrogen atom from an alkene is called an alkenyl group

2. The unsaturated hydrocarbons with C = C are called _____.

   A) Alkanes B) Alkenes C) Alkynes D) None

Answer:B

Solution:Unsaturated hydrocarbons containing a C=C (double bond) are called alkenes.

3. The IUPAC name of acetylene is :

   A) Ethane B) Ethene C) Ethylene D) Ethyne

Answer:D

Solution:The IUPAC name of acetylene (C_2H_2) is ethyne

4. A compound with the molecular formula C_2H_2 must contain :

   A) All single bonds B) One double bond
   C) One triple bond D) None of the above

Answer:C

Solution:A compound with the molecular formula C_2H_2 contains one triple bond.

5. The general formula of alkyne is :

   A) C_nH_n B) C_nH_{2n-2} C) C_nH_{2n} D) C_nH_{2n+2}

Answer:B

Solution:The general formula of alkynes is C_nH_{2n-2}

6. Alkynes have in their molecule :

   A) Four hydrogen atoms more than in a molecule of corresponding alkane
   B) Two hydrogen atoms more than in a molecule of corresponding alkane
   C) Two hydrogen atoms less than in a molecule of corresponding alkane
   D) Two hydrogen atoms less than in a molecule of corresponding alkene

Answer:D

Solution:Alkynes have 2 hydrogen atoms less than alkenes

7. The general formula of alkane series is :

   A) C_nH_{2n-2} B) C_nH_{2n} C) C_nH_{2n+2} D) C_nH_{2n+4}

Answer:C

Solution:The general formula of alkane series is C_nH_{2n+2}

8. Primary suffix for unsaturated hydrocarbons is/are:

A) -ane B) -ene C) -yne D) Both 2&3

Answer:D

Solution:Primary suffix for unsaturated hydrocarbons (those having double or triple bonds) are:

Double bond $\rightarrow$–ene

Triple bond $\rightarrow$–yne

9. Which of the following statement is correct?

A) The IUPAC name of alkenes ends with suffix -ene

B) The IUPAC name of alkynes ends with suffix -yne

C) The IUPAC name of alkanes ends with suffix -ane

D) All of these

Answer:D

Solution:All three statements are correct:

Alkenes $\rightarrow$ end with –ene

Alkynes $\rightarrow$ end with –yne

Alkanes $\rightarrow$ end with –ane

10. Primary suffix for unsaturated hydrocarbons

A) ane B) ene C) yne D) none

Answer:B,C

Solution:

For unsaturated hydrocarbons, the primary suffix indicates the presence of double or triple bonds.

ene $\rightarrow$ for double bond (C=C)

yne $\rightarrow$ for triple bond (C$\equiv$C)

Both are primary suffixes for unsaturated hydrocarbons

JEE MAINS LEVEL QUESTIONS

11. Alkenes are characterize by : **(FA & SA- 2 Marks)**

A) C – C bonds B) C = C bonds C) C ° C bonds D) Cyclic structure

Answer:B

Solution:Alkenes are unsaturated hydrocarbons that contain at least one carbon–carbon double bond (C=C)

12. The IUPAC name of $CH_3CH_2CH_2CH_3$ is :

A) Methylpropane B) Ethylethane C) Butane D) 1, 2-dimethylethane

Answer:C

Solution:The structure CH_3–CH_2–CH_2–CH_3 has 4 carbon atoms in a straight chain.“?

The IUPAC name is butane

13. The IUPAC name of $CH_3\underset{\displaystyle CH_2CH_3}{\underset{|}{C}}HCH_2CH_3$ is :

A) 1, 1-methylethylpropane B) 2-ethylbutane

C) 1-methyl-1-ethylpropane D) 3-methylpentane

Answer:D

Solution: $CH_3-\underset{3}{CH}(\underset{4}{CH_2}-\underset{5}{CH_3})-\underset{2}{CH_2}-\underset{1}{CH_3}$

3-methyl pentane.

14. The IUPAC name of $CH_3CH_2CH = CH_2$ is :

A) Butene B) Isobutene C) Butene-2 D) 3-methylpropene

Answer:A

Solution: $\underset{4}{CH_3}-\underset{3}{CH_2}-\underset{2}{CH}=\underset{1}{CH_2}$

IUPAC Name → Butene.

15. The IUPAC name of $CH(CH_3) = CH\ CH_3$ is :

A) Butene B) Isobutene C) But-2-ene D) 3-methylprop-2-ene

Answer:C

Solution: $\overset{2}{CH}(\overset{1}{CH_3})=\overset{3}{CH}-\overset{4}{CH_3}$

But-2-ene → 4 Carbons & double at 2nd carbon.

16. The correct order of arrangement of rootword, suffixes and prefixes is ____

A) Primary prefix+Rootword+Primarysuffix+Secondarysuffix+Secondary prefix .

B) Secondary prefix+Primaryprefix+Rootword Primarysuffix+Secondarysuffix.

C) Secondary prefix+Rootword+Primaryprefix+Primarysuffix+Secondary suffix.

D) None

Answer:B

Solution:Secondary prefix+Primaryprefix+Rootword Primarysuffix+Secondarysuffix.

17. IUPAC name of $CH_2 = CH–CH= CH_2$ is

A) 1, 2-Butadiene B) 1,3-Butadiene C) 1, 4-Butadiene D) Butadiene

Answer:B

Solution:The longest chain has 4 carbon atoms → buta-.

There are two double bonds → -diene.

Number the chain from the end giving the lowest locants to the double bonds →positions 1 and 3.

IUPAC name: Buta-1,3-diene (written as 1,3-butadiene)

18. IUPAC name of $CH_2 = C = CH_2$ is **(FA & SA- 3 Marks / 4 Marks)**

A)1,2- Propadiene B) 1, 1-propadieneC) 2, 2-propadieneD) 1, 3-propadiene

Answer:A

Solution:For $CH_2 = C = CH_2$

3 carbon atoms $\rightarrow$ propadiene

Double bonds at carbon 1 and 2

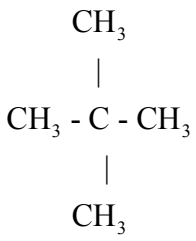
19. I.U.P.A.C name of neo-pentane is **(FA & SA- 5 Marks / 8 Marks)**

A) 2- ethyl pentane B) 2, 2- di methyl pentane

C) 2, 2- di methyl propane D) 2- methyl propane

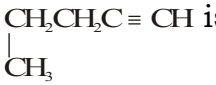
Answer:C

Solution:



Longest chain = propane

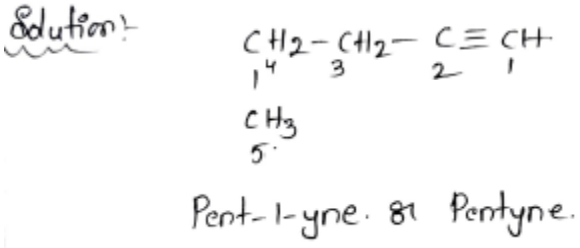
Two methyl groups on carbon 2 $\rightarrow$ 2,2-dimethylpropane

20. The IUPAC name of  is :

A) Pentyne B) 4-methylbutyne

C) 1-methylbute-3-yne D) Propylethyne

Answer:A



JEE ADVANCED LEVEL QUESTIONS

Multi correct answer type:

21. Which of the styatements is correct

A) Alicyclic Compound is Saturated cyclic hydrocarbons)

B) Aromatic Compounds (Unsaturated cyclic hydrocarbons)

C) ethyne trivial name is acetylene

D) propyne trivial name is methyl acetylene

Answer:A,B,C,D

Solution:-

→ Alicylic compound is saturated cyclic hydrocarbons.

→ Aromatic compounds are unsaturated cyclic hydrocarbons.

→ Ethyne's (C_2H_2) trivial name is acetylene.

→ Propyne's (C_3H_4) trivial name is methyl acetylene

Assertion and Reason Type:

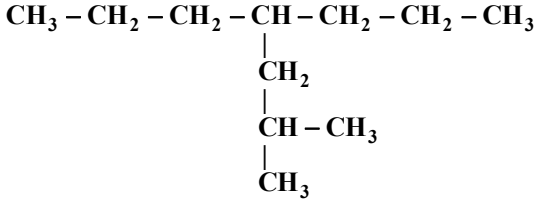
A) Both Assertion and Reason are true, and Reason is the correct explanation for Assertion.

B) Both Assertion and Reason are true, but Reason is NOT the correct explanation for Assertion.

C) Assertion is true, but Reason is false.

D) Assertion is false, but Reason is true.

22. **Assertion :** IUPAC name of

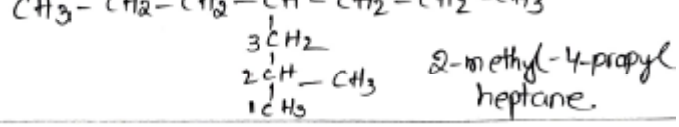


is 2-methyl-4-propyl heptane but not 4–(2–methyl propyl)heptane

Reason : When there are two equally longest straight chains in a molecule, the longest straight chain having more branches is considered as parent alkane

Ans:- A

Solution:-



Comprehension Type:

IUPAC system is used to give a systematic name of an organic compound is generally derived by identifying the parent hydrocarbon and the functional group(s) attached to it.

The IUPAC name of any organic compound essentially consists of three parts.

A) Root word 2. Suffix 3. Prefix

23. Structural formula of 2–methyl–2–butene is

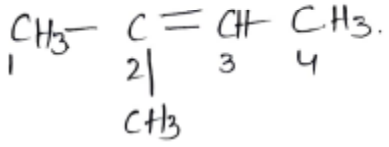
A) CH_3–CH = C(CH_3)–CH_3 B) CH_3–CH = CH – CH_3

C) CH_3 – CH_2 – C(CH_3) = CH_2 D) CH_3 – CH (CH_C) – CH = CH_2

Answer:A

Solution:- 2-methyl-2-butene.

But → 4 Carbon methyl → CH_3.



Integer type:

24. Number of carbons in root word Hex is _____

Answer:6

Solution:Number of carbons in root word Hex is 6

Matrix Matching Type:

25.

Formula of alkane		IUPAC name of alkyl radical formed
i)	CH_4	p)Butyl
ii)	C_2H_6	q)Methyl
iii)	C_3H_8	r)Ethyl
iv)	C_4H_{10}	s)Propyl

Answer:i-q,ii-r,iii-s,iv-p

Solution:

i)	CH_4	q)Methyl
ii)	C_2H_6	r)Ethyl
iii)	C_3H_8	s)Propyl
iv)	C_4H_{10}	p)Butyl

KEY

				TEACHING TASK					
			JEE MAINS LEVEL QUESTIONS						
1	2	3	4	5	6	7	8	9	10
B	B	A	B	D	B	B	D	A	B
			JEE ADVANCED LEVEL QUESTIONS						
12	13	14	15	16	17	18	19	20	
A,B,C,D	A	A	A	B	D	1	2	A-D,B-C,C-B,D-A	
				LEARNERS TASK					
			CONCEPTUAL UNDERSTANDING QUESTIONS (CUQ's)						
1	2	3	4	5	6	7	8	9	10
A	B	D	C	B	D	C	D	D	B,C
			JEE MAINS LEVEL QUESTIONS						
11	12	13	14	15	16	17	18	19	20
B	C	D	A	C	B	B	A	C	A
			JEE ADVANCED LEVEL QUESTIONS						
21	22	23	24	25					
A,B,C,D	A	A	6	i-q,ii-r,iii-s,iv-p					