11. NOMENCLATURE

SOLUTIONS

TEACHING TASK

JEE MAINS LEVEL QUESTIONS

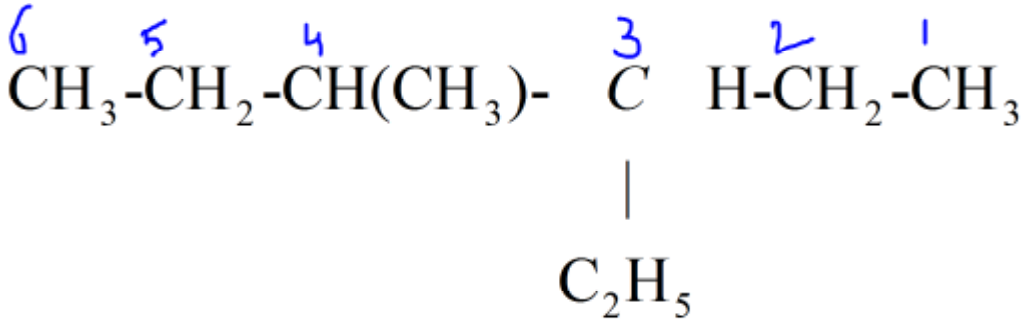
1. The correct IUPAC name of $CH_3–CH_2–CH(CH_3)–CH(C_2H_5)_2$ is

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:



Longest chain = 6 carbons → hexane

CH_3 at C_4 (if numbered from left)

C_2H_5 at C_3

Numbering from right to left gives the lowest locants:

C4 → methyl, C3 → ethyl

Substituents in alphabetical order:Ethyl before methyl

Correct name: 3-Ethyl-4-methyl hexane

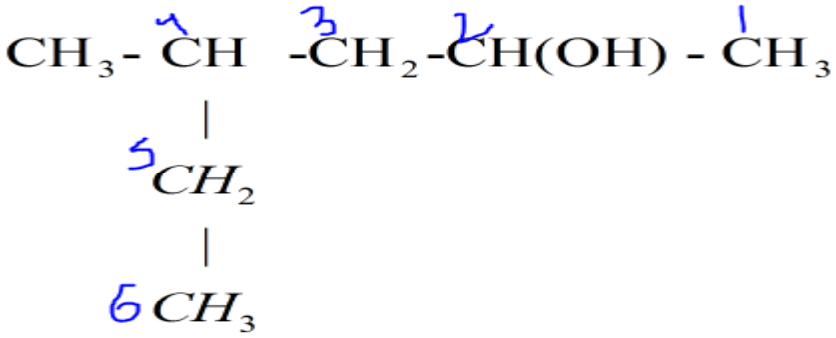
2. The IUPAC name of the compound is $CH_3–CH(C_2H_5)–CH_2–CH(OH)–CH_3$

A) 4-Ethyl pentanol-2 B) 4-Methyl hexanol-2

C) 2-Ethyl pentanol -2 D) 3-Methylhexanol-2

Answer:B

Solution:



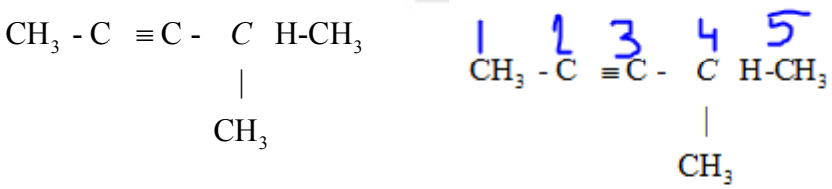
The longest carbon chain (6 carbons) by including the ethyl group as part of the main chain.
Number the chain so the OH gets the lowest possible locant: that gives the OH at C-2 and a methyl substituent at C-4.
The correct IUPAC name is 4-methylhexan-2-ol

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

Solution:



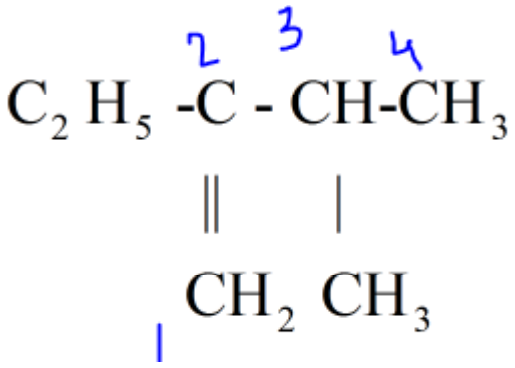
At 4th carbon Methyl group there.5 cabons in longest chain.At 2nd carbon triple bond there.
Name:4 - Methyl-2-pentyne

4. The IUPAC of $C_2H_5 - C(=CH_2) - CH(CH_3) - CH_3$ is

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

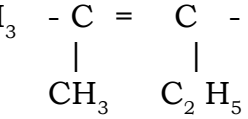
Solution:



There is a C=CH_2 group (so a double bond — it's an alkene).
The longest continuous chain containing the double bond has 4 carbon atoms (a butene backbone).
There is an ethyl (–C_2H_5) substituent and a methyl (–CH_3) substituent.
When numbering the main chain to give the double bond the lowest possible number:

The double bond starts at carbon 1.
Substituents are at C-2 (ethyl) and C-3 (methyl).
IUPAC name: 2-ethyl-3-methylbut-1-ene

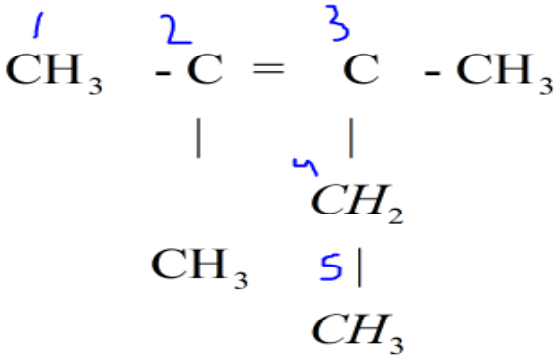
5. The correct IUPAC name of



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 that contains the C=C — that gives a 5-carbon chain (pent-2-ene).
Numbering so the double bond gets the lowest locant gives the double bond at C-2, and both double-bonded carbons carry methyl substituents → 2,3-dimethylpent-2-ene

6. 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:

$CH_2 = CH–CH= CH_2$

1 2 3 4

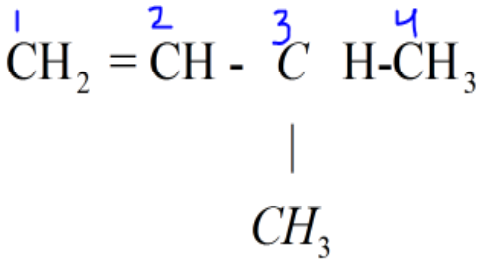
4Carbns-But
At 1st& 3rd Double bond Present
Name: 1,3-Butadiene

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:



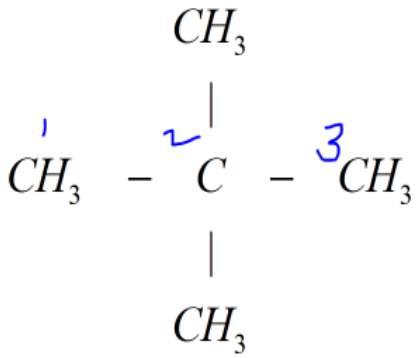
The longest chain has 4 carbons → butene backbone.
Double bond starts at carbon 1, so it's but-1-ene.
There's a methyl ($–CH_3$) substituent on carbon 3.
IUPAC name:3-Methylbut-1-ene

8. IUPAC name of $(CH_3)_3 CCH_3$ is **(FA & SA- 2 Marks)**

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

Answer:D

Solution:



Expanded form:$CH_3–C(CH_3)_3$ → actually this gives neopentane (also written as 2,2-dimethylpropane).
Let's verify:Longest chain = 3 carbons (propane).

Two methyl groups attached to carbon 2.
IUPAC name: 2,2-Dimethylpropane

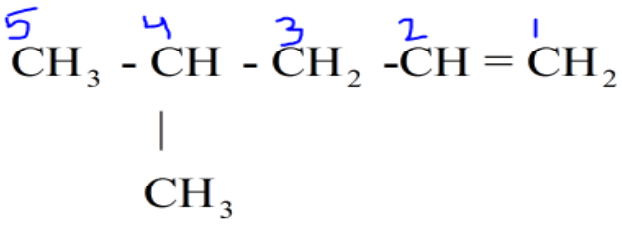
9. The IUPAC name of the following compound

$CH_3 - \underset{\displaystyle CH_3}{\underset{|}{CH}} - CH_2 - CH = CH_2$ is

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

Answer:B

Solution:The longest chain has 5 carbon atoms →pentene
Double bond starts at carbon



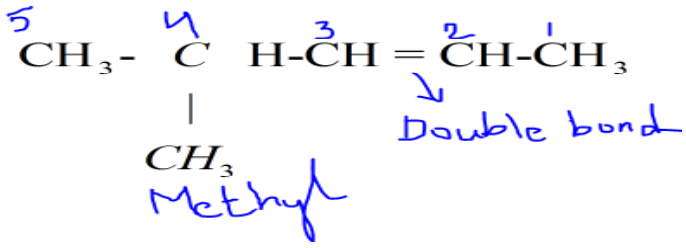
So, the methyl (–CH_3) substituent is on carbon 4
The IUPAC name:4- Methylpentene–1

10. The structure of 4-methylpentene-2 is **(FA & SA- 5 Marks / 8 Marks)**

A) $(CH_3)_2CH–CH_2CH=CH_2$ B) $(CH_3)_2CH–CH = CH–CH_3$
C) $(CH_3)_2CH–CH_2–CH=CH–CH_3$ D) $(CH_3)_2C =CH–CH_2–CH_3$

Answer:B

Solution:For 4-methylpentene-2
Methyl at 4th carbon
double bond at 2nd carbon
Parent chain =5 Carbons



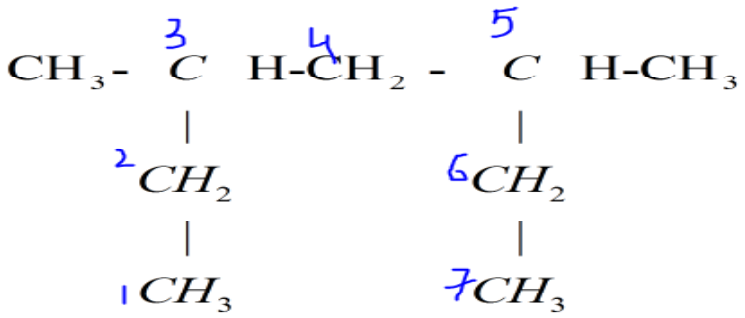
11. $CH_3 - \underset{\displaystyle C_2H_5}{\underset{|}{CH}} - CH_2 - \underset{\displaystyle C_2H_5}{\underset{|}{CH}} - CH_3$ IUPAC name is **(FA & SA- 3 Marks / 4 Marks)**

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

Answer:B

Solution:The longest continuous chain — here you can trace a 7-carbon chain through one ethyl substituent on each side, so the parent is heptane.
Numbering from the end that gives the lowest set of locants places the two

substituents at C-3 and C-5, and each substituent is a methyl group ? 3,5-dimethylheptane



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)Alkanes are represented by the general formula C_nH_{2n+2}
    D) Compounds with double (=) or triple (≡) bond are said to be unsaturated hydrocarbons

Answer:A,B,C,D

Solution:

A) True — only single covalent (s) bonds → saturated hydrocarbons.
B) True — alkanes = paraffins → saturated hydrocarbons.
C) True — general molecular formula of alkanes is C_nH_{2n+2} .
D) True — alkenes (C_nH_{2n}) and alkynes (C_nH_{2n-2}) are unsaturated

Assertion and Reason Type:

A) Both A) and (R) are true and (R) is the correct explanation of A)
B) Both A) and (R) are true and (R) is not the correct explanation of A)
C) A) is true but (R) is false
D) A) is false but (R) is true

13. **Assertion A):** 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 (R): Priority order will be given according to lowest locant rule.

Answer:A

Solution:Both A and R are true, and R correctly explains A — because the lowest set of locants rule is exactly the reason why that numbering is chosen

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

Answer:A

Solution:- $\overset{5}{CH_3}-\overset{4}{CH}=\overset{3}{CH}-\overset{2}{C}\equiv\overset{1}{CH}$

pent-3-en-1-yne

lowest locant rule for the multiple bond

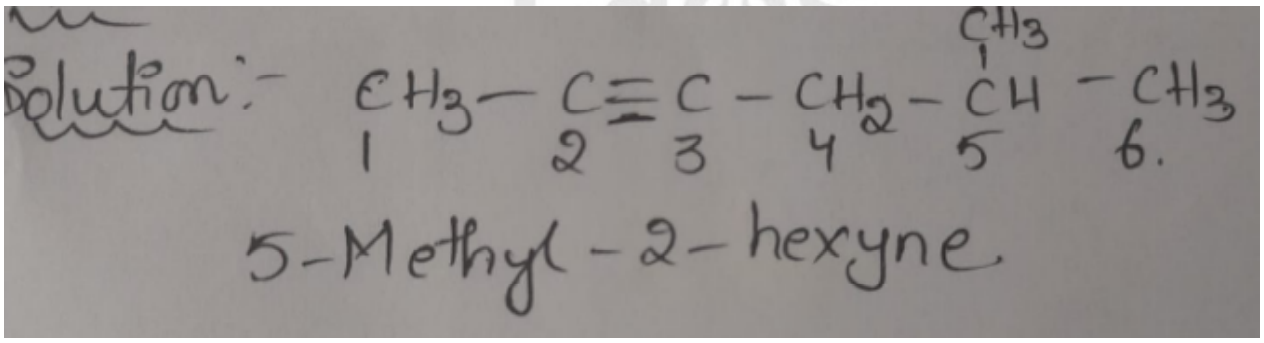
Comprehension Type:

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 $CH_3-C\equiv C-CH_2-\underset{\displaystyle CH_3}{\underset{|}{CH}}-CH_3$ 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



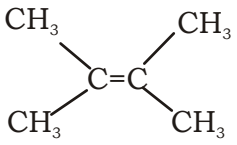
16. The IUPAC name of $CH_2=\underset{\displaystyle CH_3}{\underset{|}{C}}-CH=CH_2$ is

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

Answer:B

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

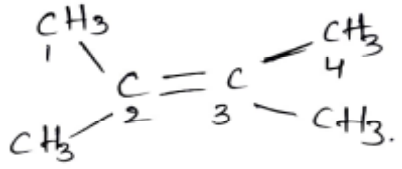
2-methyl buta-1,3-diene.

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:B

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.

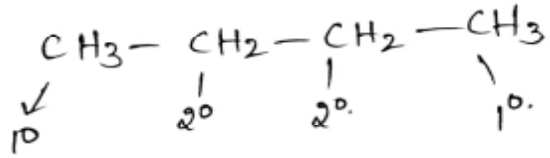
19. Number of 1^0 carbons in n – Butane is _____

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.



2 - primary Carbons

Matrix Matching Type:

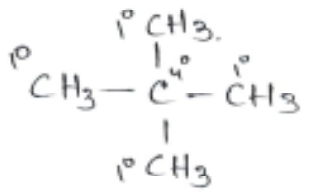
20.

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

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

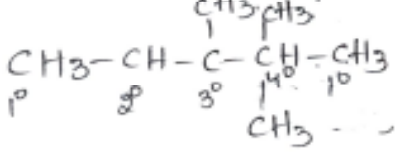
Solution:

A) Neopentane.



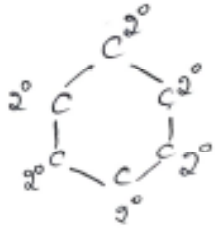
→ D) 1° and 4° Carbons.

B) 2,2,3-Trimethyl pentane.



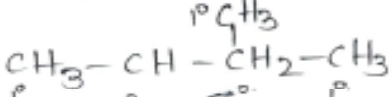
→ C) 1°, 2°, 3°, 4°- Carbons

C) Cyclohexane



→ B) All are 2° Carbons

D) Isopentane.



→ A) 1°, 2°, 3° Carbons

LEARNER'S 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: Removing a H atom from an alkene gives 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 with C=C are alkenes.

3. The IUPAC name of acetylene is :
   A) Ethane B) Ethene C) Ethylene D) Ethyne

Answer:D

Solution:Acetylene is the common name for C_2H_2 , IUPAC name 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:C_2H_2 is acetylene (ethyne), which has a carbon–carbon 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 for alkynes is C_nH_{2n-2} , where n is the number of carbon atoms.

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:

$Alkane : C_nH_{2n+2}$

$Alkene : C_nH_{2n}$

$Alkyne : C_nH_{2n-2}$

Comparing the formulas, we see that alkynes have two fewer hydrogen atoms than the corresponding alkene

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:C_nH_{2n+2} is the general formula for alkanes (saturated hydrocarbons).

8. Primary suffix for unsaturated hydrocarbons is/are:
A) -ane B) -ene C) -yne D) Both 2&3

Answer:D

Solution:Primary suffixes for unsaturated hydrocarbons are -ene (for alkenes) and -yne (for alkynes).

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:Alkenes end with -ene

Alkynes end with -yne

Alkanes end with -ane

10. Primary suffix for unsaturated hydrocarbons
A) ane B) ene C) yne D) none

Answer:B,C

Solution: Primary suffixes for unsaturated hydrocarbons are -ene (for alkenes) and -yne (for alkynes).

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 characterized by the presence of at least one carbon–carbon double bond.

12. The IUPAC name of $CH_3CH_2CH_2CH_3$ is :
A) Methylpropane B) Ethylethane C) Butane D) 1, 2-dimethylethane

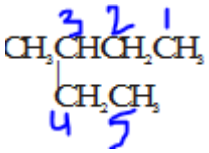
Answer:C

Solution:The structure $CH_3CH_2CH_2CH_3$ is a straight-chain alkane with 4 carbon atoms, so its 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:



Methyl group at 3rd carbon
parent chain -5 carbons
IUPAC name:3-methylpentane

14. The IUPAC name of $CH_3CH_2CH = CH_2$ is :
A) Butene B) Isobutene C) Butene-2 D) 3-methylpropene

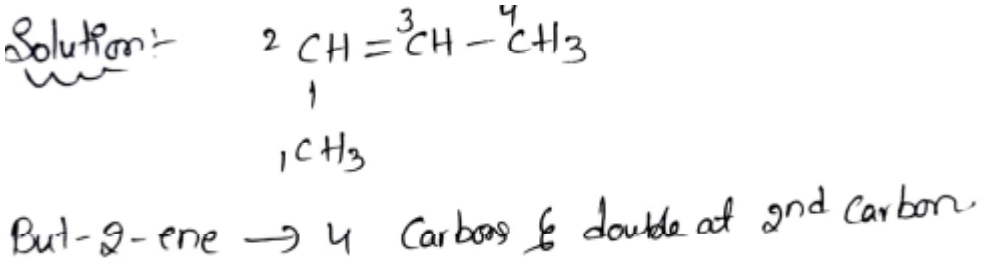
Answer:A

Solution:The correct IUPAC name of the compound $CH_3CH_2CH = CH_2$ is But-1-ene (or 1-Butene)

15. The IUPAC name of $\begin{matrix}CH\\|\\CH_3\end{matrix} = CH\ CH_3$ is : **(FA & SA- 5 Marks / 8Marks)**

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

Answer:C



16. The correct order of arrangement of rootword, suffixes and prefixes is ____
(FA & SA- 3 Marks / 4 Marks)

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:The correct order in IUPAC naming is:

Secondary prefix + Primary prefix + Root word + Primary suffix + Secondary suffix

Where:

Secondary prefix = substituents (e.g., methyl, ethyl) with locants

Primary prefix = cyclic, bicyclic, or special prefixes (e.g., "cyclo")

Root word = number of carbon atoms in main chain

Primary suffix = saturation indication (-ane, -ene, -yne)

Secondary suffix = functional group suffix (e.g., -ol, -al, -oic acid)

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: $\overset{1}{CH_2} = \overset{2}{CH} - \overset{3}{CH} = \overset{4}{CH_2}$ → 1,3-Butadiene.

18. IUPAC name of $CH_2 = C = CH_2$ is
A) Propadiene B) 1, 1-propadiene
C) 2, 2-propadiene D) 1, 3-propadiene

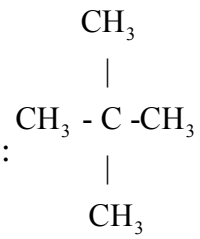
Answer:A

Solution:The compound $CH_2 = C = CH_2$ is an allene with three carbon atoms and two double bonds between C1–C2 and C2–C3.
The longest chain is 3 carbons → root = "prop"
Two double bonds → suffix = "diene"

Numbering must give the lowest locants to the double bonds: numbering from either end gives the double bonds at C1 and C2.
According to IUPAC rules, for cumulative double bonds, the name is propa-1,2-diene, commonly called propadiene.

19. I.U.P.A.C name of neo-pentane is
A) 2- ethyl pentane B) 2, 2- di methyl pentane
C) 2, 2- di methyl propane D) 2- methyl propane

Answer:C

Solution:

neo-pentane

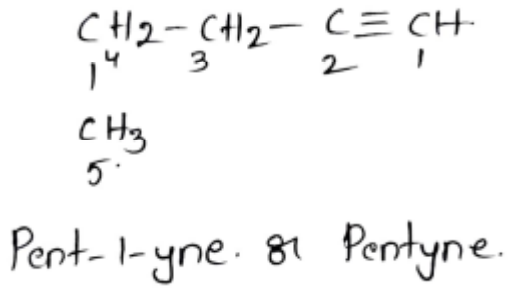
The longest continuous chain has 3 carbons → propane
The remaining two methyl groups are substituents on the central carbon (C2)
Base chain → propane
Substituents → two methyl groups on C2
Name: 2,2-dimethylpropane

20. The IUPAC name of $CH_2CH_2C \equiv CH$ (with CH_3 branch) is :

A) Pentyne
B) 4-methylbutyne
C) 1-methylbute-3-yne
D) Propylethyne

Answer:A

Solution:



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

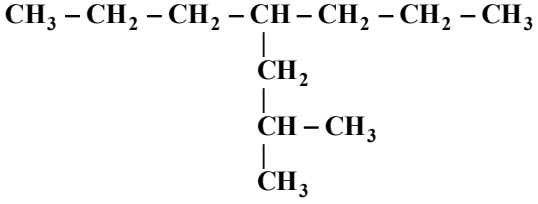
Answer:B,C,D

Solution:A) Not always true — alicyclic compounds can be cycloalkanes (saturated) or cycloalkenes (unsaturated).
So this statement is false as it says "is" implying all alicyclic are saturated.
B) True — aromatic compounds are unsaturated rings with conjugated pi-systems (e.g., benzene).
C) True — common name for C_2H_2 is acetylene.
D) True — $CH_3 - C \equiv CH$ is commonly called methyl acetylene.

Assertion and Reason Type:

A) Both A) and (R) are true and (R) is the correct explanation of A)
B) Both A) and (R) are true and (R) is not the correct explanation of A)
C) A) is true but (R) is false
D) A) is false but (R) is true

22. **Assertion (A):** IUPAC name of



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

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

Answer:A

Solution:There are two possible 7-carbon straight chains in the molecule. According to IUPAC rules, when two (or more) chains of the same maximum length exist you choose the one that gives the greater number of substituents (i.e. the chain that is more branched) as the parent. Choosing that chain leads to a methyl and a propyl substituent on the heptane backbone (so the name be comes 2-methyl-4-propylheptane). Choosing the other equally long chain would instead produce a single substituent that must be named as 2-methylpropyl — but that choice is not preferred because it gives fewer substituents on the parent. The Reason states this tie-breaking rule, so it correctly explains the Assertion

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

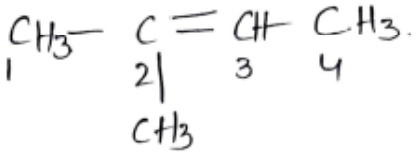
A) $CH_3–CH = C(CH_3)–CH_3$ B) $CH_3–CH = CH – CH_3$

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:The number of carbons in the 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	B	B
11									
B									
			JEE ADVANCED LEVEL QUESTIONS						
12	13	14	15	16	17	18	19	20	
A,B,C,D	A	A	A	B	B	1	2	A-D,B-C,C-B.D-A	
				LEARNER'S 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					
B,C,D	A	A	6	i-q,ii-r,iii-s,iv-p					