13. NOMENCLATURE OF COMPOUNDS WITH FUNCTIONAL GROUPS

SOLUTIONS

TEACHING TASK

JEE MAINS LEVEL QUESTIONS

1. The IUPAC name of $CH_3 - CH_2 - CH(OH) - CH_3$ is:
   A)Butan-3-ol B)Butan-2-ol C)Butan-1-ol D)2-Hydroxybutane

Answer:B

Solution:$CH_3 - CH_2 - CH(OH) - CH_3 \rightarrow$ alcohol at C-2 $\rightarrow$ Butan-2-ol

2. The correct IUPAC name of $HOOC - CH_2 - CH_2 - COOH$ is:**(FA & SA- 2 Marks)**
   A)Butanoic acid B)Ethane-1,2-dicarboxylic acid
   C)Butanedioic acid D)Tetracarboxylic acid

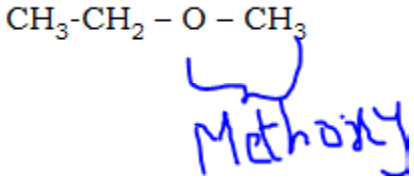
Answer:C

Solution:$HOOC - CH_2 - CH_2 - COOH \rightarrow$ four-carbon dicarboxylic acid $\rightarrow$ butanedioic acid (succinic acid)

3. CH_3-$CH_2 - O - CH_3$ represents:
   A)Methoxyethane B)Ethoxy methane C)Dimethyl etherD)All of these

Answer:A

Solution:Small group-Methyl
Large group -Ethyl
Methyl group with oxygen-->Methoxy



IUPAC name:Methoxyethane

4. The IUPAC name of $CH_3 - C(=O) - CH_2 - CH_3$ is:
   A)Propan-2-one B)Butan-2-one C)Butan-3-one D)Acetone

Answer:B

Solution:
$CH_3 - C(=O) - CH_2 - CH_3 \rightarrow$ 4-carbon ketone with C=O on C-2 $\rightarrow$ Butan-2-one

5. The correct name of $CH_3 - CH_2 - CH=CH - CH_3$ is:
   (FA & SA- 3 Marks/4 Marks)
   A)Pent-1-ene B)Pent-2-ene
   C)2-Methyl-1-butene D)But-2-ene

Answer:B

Solution:Number from right: $CH_3–CH=CH–CH_2–CH_3$ → double bond at C2 → pent-2-ene.

6. The IUPAC name of $CH_3 – CH(CH_3) – CH(CH_3) – CH_3$ is:
   A)2,3-dimethylbutane B)2-methylpentane
   C)Hexane D)3-methylpentane

Answer:A

Solution:Two methyls on C-2 and C-3 of a four-carbon chain → 2,3-dimethylbutane

7. The compound $CH_3 – CH_2 – C\equiv C – CH_3$ is named as:
   A)Pent-1-yne B)Pent-2-yne C)But-1-yne D)Hex-2-yne

Answer:B

Solution:Triple bond is at position 2 (count from nearest end) → Pent-2-yne

8. The IUPAC name of $CH_3 – CH(Br) – CH_2 – CHO$ is:
   A)4-bromobutanal B)3-bromobutanal
   C)2-bromobutanal D)1-bromobutanal

Answer:B

Solution:Aldehyde must be C-1, bromine is on C-3 → 3-bromobutanal

9. The compound $HO – CH_2 – CH_2 – OH$ is named as:
   A)Ethane-1,2-diol B)Glycol C)Ethylene glycol D)All of these

Answer:D

Solution:IUPAC: Ethane-1,2-diol; common: ethylene glycol; "glycol" commonly refers to this.So all names are correct for it.

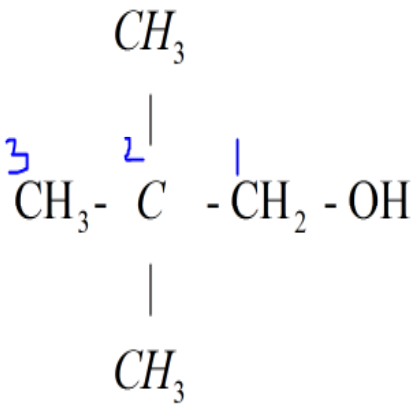
10. The correct name of $(CH_3)_3C – CH_2 – OH$ is:

(FA & SA- 5 Marks/8 Marks)

   A) 2-methyl-2-propanol B) 2-methyl-1-propanol
   C) 2,2-dimethyl-1-propanol D) tert-butyl alcohol

Answer:C

Solution:



Parent chain:3 Carbons---->Prop

2 methyl groups at 2nd carbon,OH at 1st carbon----->ol
IUPAC name:2,2-dimethyl-1-propanol

JEE ADVANCED LEVEL QUESTIONS

Multi correct answer type:

11. The correct IUPAC name of the compound $\begin{matrix}CH_2\text{-}COOH\\ |\\ CH_2\text{-}COOH\end{matrix}$ is

A) 1,4-Butane dioicacid B) Ethane-1,2-dicarboxylic acid
C) Succinic acid D) 1,2-Ethane dioic acid

Answer:A,C

Solution:A) 1,4-Butane-dioic acid — correct systematic name (carboxyls at C-1 and C-4).
C) Succinic acid — correct common name

12. Correct statements about $CH_3\text{-}CH_2\text{-}CN$ is

A) IUPAC name of the compound propane-1-nitrile
B) secondary suffix of the compound is nitrile
C) IUPAC name of the compound is ethane nitrile

Answer:A,B

Solution:3 carbons with –CN on C1 $\rightarrow$ propanenitrile (IUPAC: propanenitrile, sometimes propane-1-nitrile but not necessary).
Secondary suffix: "nitrile" (correct).
Ethanenitrile is CH_3CN

13. The correct IUPAC names for the compound $CH_3 - CH(OH) - CHO$ are:

A) 2-hydroxyethanal B)3-hydroxypropanal
C) Glycolaldehyde D)Hydroxypropanal

Answer:D

Solution:D) Hydroxypropanal — a correct parent name (the specific IUPAC name is 2-hydroxypropanal).
A) 2-hydroxyethanal and C) glycolaldehyde are 2-carbon aldehydes (wrong).
B) 3-hydroxypropanal places the OH at C-3 (wrong position)

14. For the compound $CH_3 - C(=O) - O - CH_2CH_3$ the correct statements are:

A) It is an ester. B) Common name is ethyl acetate.
C) IUPAC name is ethyl ethanoate. D) IUPAC name is methyl ethanoate.

Answer:A,B,C

Solution:A) It is an ester — true.
B) Common name ethyl acetate — true.
C) IUPAC name ethyl ethanoate — true.
D) methyl ethanoat — incorrect.

Assertion and Reason Type:

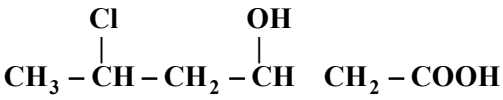
A) Both Assertion and Reason are true, and Reason is the correct explanation for Assertion.
B) Both Assertion and Reason are true, but Reason is NOT the correct

explanation for Assertion.

C) Assertion is true, but Reason is false.

D) Assertion is false, but Reason is true.

15. **Assertion** : The IUPAC name of the compound

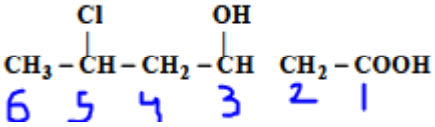


is 4–Hydroxy–2–chlorohexanoic acid

Reason : The order of preference of functional groups according to IUPAC is COOH > – OH > –Cl

Answer:D

Solution:



5-chloro-3-hydroxy hexanoic acid

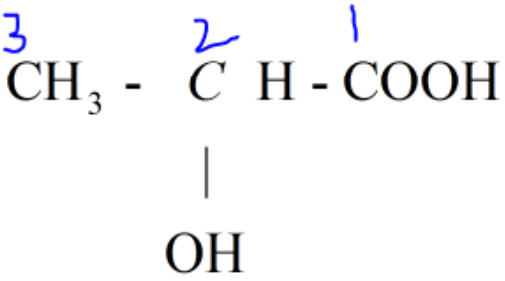
The priority order COOH > OH > Cl is correct

16. **Assertion** : The correct IUPAC name of $CH_3 - CH(OH) - COOH$ is 2–hydroxypropanoic acid

Reason : In IUPAC nomenclature, –COOH has higher priority than –OH, so the parent chain is named as carboxylic acid and –OH is treated as a substituent (hydroxy–)

Answer:A

Solution:



IUPAC name:2–hydroxypropanoic acid

Comprehension Type:

In case of a poly functional compound, one of the group is selected as the principal functional group and all others are treated as substituents. The chain is selected in a way that it contains the principal functional group and maximum number of substituents. Numbering is done in such a way that the principal functional group gets the lowest number followed by a double bond, then a triple bond, and then the substituents.

17. IUPAC name of $HO-CH_2-\underset{\displaystyle NH_2}{\underset{|}{CH}}-COOH$

A) 3 - hydroxy - 2- aminobutanoic acid B) 2-amino -3- carboxypropanol
C) 2 -amino - 3 -hydroxy - propanoic acid D) 2-amino -3-hydroxybutonoic acid

Answer:C

Solution: $HO-\overset{3}{C}H_2-\overset{2}{\underset{\displaystyle NH_2}{\underset{|}{C}}}H-\overset{1}{C}OOH$

IUPAC name:2 -amino - 3 -hydroxy - propanoic acid

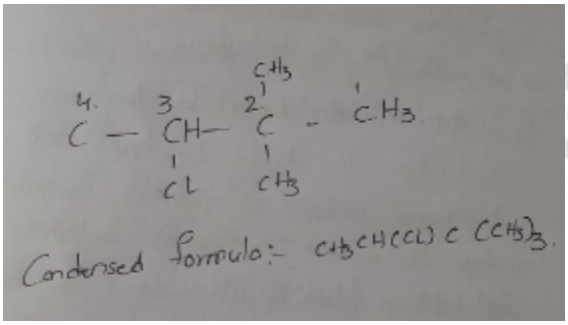
18. The formula of 3-chloro -2, 2-dimethyl butane is

A) $CH_3.CH(CH_3)C(CH_3)_2Cl$ B) $CH_3.(CH_2)_2CH_2Cl$

C) $CH_3.C(CH_3)_2.CH_2Cl$ D) $CH_3CHClC(CH_3)_3$

Answer:D

Solution:



Matrix Matching Type

19.

LIST - 1 (Structural formulA)	**LIST - 2 (Name of compounD)**
A) $H_2C=CHCN$	1) Propenamide
B) $H_2C=CH-CONH_2$	2) But–1–yn–3–one
C) $H_2C=CHCHO$	3) Propenenitrile
D) $HC\equiv C-\overset{\displaystyle O}{\overset{\|\|}{C}}-CH_3$	4) But–3–yn–2-one
	5) Propenal

Answer:A-3,B-1,C-5,D-4

Solution:A) $H_2C=CHCN$ 3) Propenenitrile

B) $H_2C=CH-CONH_2$ 1) Propenamide

C) $H_2C=CHCHO$ 5) Propenal

D) $HC \equiv C - \overset{\overset{O}{\|}}{C} - CH_3$ 4) But–3–yn–2-one

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LEARNERS TASK

CONCEPTUAL UNDERSTANDING QUESTIONS (CQU'S)

1. In IUPAC nomenclature, the order followed for naming the compounds is :
   A) Prefix(es) + root word + primary suffix + secondary suffix
   B) Root word + prefix(es) + primary suffix + secondary suffix
   C) Primary suffix + perfix(es) + root word + secondary suffix
   D) Primary suffix + root word + prefix(es) + secondary suffix.

Answer:A

Solution:IUPAC names are written in the sequence:
Prefix(es) + Root word + Primary suffix + Secondary suffix

2. A carbon compound has many functional groups, then order of preference while naming it according to IUPAC nomenclature is
   A) –CHO > –COOH > –OH > $–NH_2$ B) –COOH > –CHO > $–NH_2$ > –OH
   C) –COOH > –OH > – NH_2 > –CHO D) –COOH > –CHO > –OH > $–NH_2$

Answer:D

Solution:Priority (descending order) in IUPAC nomenclature:
–COOH (carboxylic acid) > –CHO (aldehyde) > –OH (alcohol) > $–NH_2$ (amine)

3. The functional group present in acylchlorides is

   A) $-Cl$ B) $-\overset{\overset{O}{\|}}{C}-Cl$ C) $-\overset{\overset{O}{\|}}{C}-OCl$ D) $-CH_2-OCl$

Answer:B

Solution:Acyl (acid) chlorides contain the –C(=O)–Cl functional group

4. Functional group present in amides is
   A) - COOH B) $-NH_2$ C) $-CONH_2$ D)- COO -

Answer:C

Solution:Functional group present in amides is $–CONH_2$

5. O
   ||
   - C - group is present in
   A) ketones only B) aldehydes only
   C) Carboxylic acid only D) All the above

Answer:D

Solution:C=O is carbonyl group, present in ketones, aldehydes, carboxylic acids (and derivatives).

6. Which of the following group is always represented by prefixes in the nomenclature

A) $-NH_2$ B) $-CN$ C) $-CHO$ D) $-NO_2$

Answer:D

Solution: NO_2 is always prefix

7. IUPAC name of $CH_3CH_2CH_2COCH_3$ is

A) 2- pentanone B) Pentan-2-one C) pentanone -2 D) all the above

Answer:D

Solution: carbons, C=O at C2 $\rightarrow$ Pentan-2-one (IUPAC)

Both 2-pentanone and Pentan-2-one are considered correct IUPAC names. The format "pentanone-2" is an older or less formal variation that also indicates the same structure

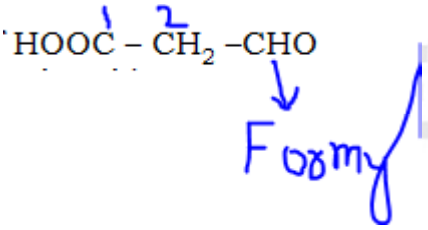
8. IUPAC name of HOOC – CH_2 –CHO is

A) Formyl ethanoic acid B) 2-Carboxyethanal

C) Prop-3-al-1-oic acid D) Prop-1-al-3-oic acid

Answer:A

Solution:



IUPAC name:Formyl ethanoic acid

9. IUPAC name of CH_3 –CHCl–CH_2–CHO is

A) 2-chloro-4-butanol B) 3-chlorobutanol

C) 2-chloro-4-butanal D) 3-chlorobutanal

Answer:D

Solution:–CHO is principal group (suffix: "-al"), chloro is prefix.

4 carbons $\rightarrow$butanal, Cl at C3 $\rightarrow$ 3-chlorobutanal

10. In IUPAC system of naming of organic compounds. Which of the following functional group has more preference than others (in a poly functional compound.

A) $-OH$ B) $-CHO$ C) $-CO-$ D) $-CONH_2$

Answer:D

Solution:In IUPAC priority among the given groups, an amide (-CONH2) has higher preferred status than aldehyde, ketone or alcohol.

JEE MAINS LEVEL QUESTIONS

11. What is the IUPAC name of CH_3-CH_2-CHO?
A) Propanal B) Propanone C) Ethanal D) Butanal

Answer:A

Solution:It contains an aldehyde group (–CHO).
The longest chain has 3 carbons → propane.
Since it's an aldehyde → propanal

12. The IUPAC name of CH_3-CO-CH_3 is:
A) Propanal B) Propanone C) Ethanal D) Acetone

Answer:B

Solution:It contains a carbonyl group (C=O) between two methyl groups → a ketone.
Three carbons → propanone (common name: acetone)

13. What is the correct name for CH_3-CH_2-OH? **(FA & SA- 2 Marks)**
A) Methanol B) Ethanol C) Propanol D) Butanol

Answer:B

Solution:The compound CH_3–CH_2–OH has 2 carbon atoms and an –OH (hydroxyl) group.Hence, its IUPAC name is ethanol

14. The IUPAC name of HCOOH is:
A) Methanoic acid B) Ethanoic acid C) Formic acid D) Acetic acid

Answer:A

Solution:The compound HCOOH contains one carbon atom and a –COOH (carboxylic acid) group.
Root name for 1 carbon → methan-
Functional group suffix for –COOH → –oic acid
IUPAC name: Methanoic acid(Common name: Formic acid)

15. What is the name of CH_3-CH_2-NH_2? **(FA & SA- 5 Marks/8 Marks)**
A) Methylamine B) Ethylamine C) Propylamine D) Butylamine

Answer:B

Solution:2 carbons, amine → Ethylamine

16. What is the name of CH_3-CHCl-CH_3?
A) 1-Chloropropane B) 2-Chloropropane
C) Chloroethane D) 1-Chloroethane

Answer:B

Solution:The compound CH_3–CHCl–CH_3 has three carbon atoms (propane) and a chlorine atom on the second carbon.
IUPAC name: 2-Chloropropane

17. The IUPAC name of CH_2=CH-COOH is: **(FA & SA- 3 Marks/4 Marks)**
A) Prop-2-enoic acid B) But-2-enoic acid
C) Acrylic acid D) Vinylformic acid

Answer:A

Solution:3 carbons, double bond C2–C3, COOH at C1 → Prop-2-enoic acid

18. What is the name of CH_3-C=N?
A) Ethanenitrile B) Methanenitrile C) Acetonitrile D) Propanenitrile

Answer:A

Solution:2 carbons, nitrile → Ethanenitrile (common: Acetonitrile)

19. The IUPAC name of CH_3-CH_2-CH_2-CHO is:
A) Butanal B) Propanal C) Pentanal D) Butanone

Answer:A

Solution:4 carbons, aldehyde → Butanal

20. The IUPAC name of CH_3-CH_2-CO-CH_3 is:
A) Butan-2-one B) Pentan-2-one C) Butanone D) Propanone

Answer:A

Solution:4 carbons, ketone at C2 → Butan-2-one

JEE ADVANCED LEVEL QUESTIONS

Multicorrect Answer Type:

21. Which is not the correct suffixes for alcohols, aldehydes and ketones, according to IUPAC system are respectively
A) -ane , - al - keto B) -ol -al - keto
C) -ol , - al, - one D) -ol, -ane , -one

Answer:A,B,D

Solution:the correct IUPAC suffixes are: alcohol = -ol, aldehyde = -al, ketone = -one
So option C shows the correct suffixes. Options A, B and D are not correct

22. Which of the following compounds are correctly named according to IUPAC rules?

1. $CH_3 - CH_2 - CH_2 - CHO$ — Butanal
2. $CH_3 - CO - CH_3$ — Propanone
3. $CH_3 - CH_2 - OH - Ehanol$
4. $HCOOH - MethanoicAcid$

A) 1 and 2 only B) 1, 2, and 3 only
C) 1, 2, 3, and 4 D) 3 and 4 only

Answer:C

Solution:All are correct.

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.

23. **Assertion** : IUPAC name of HOOC–COOH is ethanedioic acid.
Reason : It contains two ketonic and two hydroxy groups.

Answer:C

Solution:

Assertion: True — HOOC–COOH is oxalic acid, and its IUPAC name is ethanedioic acid (2 carboxyl groups on ethane backbone).
Reason: False — It has two carboxylic acid groups (–COOH), not ketone (C=O in the middle) or hydroxyl (–OH separately). The –OH is part of the COOH group, not separate hydroxy groups

Comprehension Type

If one functional group and multiple bonds are present, the longest possible chain having the functional group and multiple bonds is taken as the parent chain even if it may not be the longest possible chain. Numbering is done in a way that the functional group gets the lowest possible number followed by the double / triple bond. [Do not care for the lowest sum rule]. The chain terminating groups like –CHO,–CN, –COOH should always get the number 1 for their carbon atoms irrespective of the above rules.

24. Structure of Prop - 2- ynal

A) $CH_3 - C \equiv C - OH$ B) $CH \equiv C - CH_2 - OH$

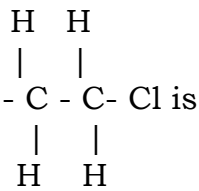
C) $CH \equiv C - CHO$ D) $CH_2 = CH - CHO$

Answer:C

Solution:Prop-2-ynal

Prop $\rightarrow$ 3 carbon atoms.
-yn- $\rightarrow$ triple bond.
2-yn- $\rightarrow$ triple bond starts at carbon-2.
-al $\rightarrow$ aldehyde group (–CHO) at carbon-1.
So the structure must be: $CH \equiv C - CHO$

25. The I.U.P.A.C.name of

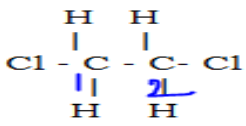


is

A) 1,2 - dichoroethane B) 2,2 - dichloroethane
C) 1,1 - dichloroethane D) Dichloroethane

Answer:A

Solution:



This is a two-carbon chain (ethane) with one chlorine atom on carbon 1 and another chlorine atom on carbon 2.So, the correct IUPAC name is: 1,2-

dichloroethane.

26. The IUPAC name of $CH_3\ CH_2\ CH_2\ \underset{\underset{O}{||}}{C}\ -\ CH_3$ is

A) 2- pentanone B) Pentanone -2 C) Pentan - 2- one D) all are correct

Answer:D

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

This is a five-carbon chain (pentane) with a ketone group (C=O) on the second carbon.

Correct IUPAC name is:Pentan-2-one

But the other names given are also acceptable and commonly used:

2-pentanone → Correct

Pentanone-2 → Acceptable (older naming)

Pentan-2-one → Correct IUPAC format

Matrix Matching Type:

27.

(Functional Group)	**(Prefix UseD)**
A) –CHO	1) Keto
B) $-\overset{\overset{|}{}}{C}=O$	2) Amino
C) $-NH_2$	3) Aldo
D) –O–	4) One
	5) Alkoxy

Answer:A-3, B-1, C-2, D-5

Solution:

A) –CHO	3) Aldo
B) $-\overset{\overset{|}{}}{C}=O$	1) Keto
C) $-NH_2$	2) Amino
D) –O–	5) Alkoxy

KEY

				TEACHING TASK					
			JEE MAINS LEVEL QUESTIONS						
1	2	3	4	5	6	7	8	9	10
B	C	A	B	B	A	B	B	D	C
			JEE ADVANCED LEVEL QUESTIONS						
11	12	13	14	15	16	17	18	19	
A,C	A,B	D	A,B,C	D	A	C	D	A-3,B-1,C-5,D-4	
				LEARNERS TASK					
			CONCEPTUAL UNDERSTANDING QUESTIONS (CQU'S)						
1	2	3	4	5	6	7	8	9	10
A	D	B	C	D	D	D	A	D	D
			JEE MAINS LEVEL QUESTIONS						
11	12	13	14	15	16	17	18	19	20
A	B	B	A	B	B	A	A	A	A
			JEE ADVANCED LEVEL QUESTIONS						
21	22	23	24	25	26	27			
A,B,D	C	C	C	A	D	A-3, B-1, C-2, D-5			