

**16. NOMENCLATURE OF COMPOUNDS WITH FUNCTIONAL GROUPS****SOLUTIONS****TEACHING TASK****JEE MAINS LEVEL QUESTIONS**

1. The IUPAC name of  $\text{CH}_3\text{-CH}_2\text{-CH}_2\text{-OH}$  is: **(FA & SA- 2 Marks)**  
A) Propan-2-ol                      B) Propan-1-ol  
C) Butan-1-ol                      D) Hydroxypropane

**Answer: B**

Solution: 3 carbons, -OH on C1 → Propan-1-ol.

2. The correct IUPAC name of  $\text{CH}_3\text{-CH=CH-CH}_3$  is:  
A) But-1-ene              B) But-2-ene              C) 2-Methylpropene              D) Pent-2-ene

**Answer: B**

Solution: 4 carbons, double bond between C2 and C3 → But-2-ene

3. The IUPAC name of  $\text{CH}_3\text{-CH(CH}_3\text{)-CH}_2\text{-CH}_3$  is:  
A) n-Butane                      B) 2-Methylbutane  
C) Pentane                      D) Isobutane

**Answer: B**

Solution: 4-carbon chain with a methyl on C2 → 2-Methylbutane

4. The IUPAC name of  $\text{CH}_3\text{-CH}_2\text{-CHO}$  is:  
A) Ethanal              B) Propanal              C) Propanone              D) Propanoic acid

**Answer: B**

Solution: 3 carbons, aldehyde group → Propanal

5. The IUPAC name of  $\text{CH}_3\text{-CO-CH}_2\text{-CH}_3$  is:  
A) Butan-2-one              B) Butan-1-one              C) Pentan-2-one              D) Pentan-3-one

**Answer: A**

Solution: 4 carbons, C=O on C2 → Butan-2-one.

6. The IUPAC name of  $\text{CH}_2\text{=CH-CH=CH}_2$  is: **(FA & SA- 3 Marks/4 Marks)**  
A) But-1-ene              B) Buta-1,2-diene              C) Buta-1,3-diene              D) But-2-ene

**Answer: C**

Solution: 4 carbons, double bonds at C1 and C3 → Buta-1,3-diene

7. The IUPAC name of  $\text{CH}_3\text{-CH}_2\text{-CH}_2\text{-COOH}$  is:  
A) Butanoic acid              B) Propanoic acid              C) Pentanoic acid              D) Butanal

**Answer: A**

Solution: 4 carbons, -COOH on C1 → Butanoic acid

8. The IUPAC name of  $\text{CH}_3\text{-CH}_2\text{-O-CH}_2\text{-CH}_3$  is:

A) Methoxyethane

B) Ethoxyethane

C) 1,1-Dimethoxymethane

D) 2-Oxypentane

**Answer: B**

Solution: Symmetrical ether, two ethyl groups → Ethoxyethane

9. The IUPAC name of  $\text{CH}_3\text{-CH(Cl)-CH(Br)-CH}_3$  is:

A) 2-Chloro-3-bromobutane

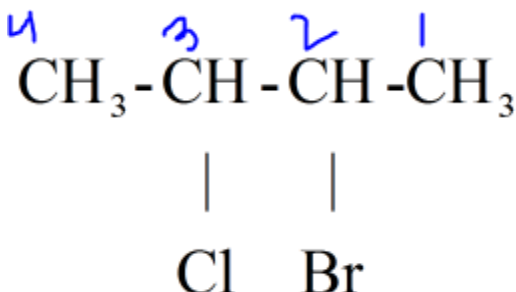
B) 3-Bromo-2-chlorobutane

C) 2-Bromo-3-chlorobutane

D) 1-Bromo-2-chlorobutane

**Answer: C**

Solution:



Alphabetical order: bromo before chloro → so 2-bromo-3-chlorobutane

10. The correct IUPAC name for the compound shown below is:

**(FA & SA- 5 Marks/8 Marks)**

A) 4-Hydroxypent-4-enoic acid

B) 3-Hydroxypent-4-enoic acid

C) 4-Hydroxypent-1-en-1-oic acid

D) 3-Hydroxypent-4-en-1-oic acid

**Answer: B, D**Solution:  $\text{CH}_2=\text{CH-CH(OH)-CH}_2\text{-COOH}$ 

carboxyl gets C-1, so the -OH is on C-3 and the C=C is between C-4 and C-5.

**JEE ADVANCED LEVEL QUESTIONS****Multicorrect Answer Type**11. For the compound  $\text{CH}_3\text{-CH=CH-CHO}$ , the correct statement(s) is/are:

A) The principal functional group is the aldehyde.

B) The IUPAC name is But-2-enal.

C) The carbon of the -CHO group is assigned number 1

D) The IUPAC name is 3-Butenal.

**Answer: A, B, C**

Solution: A) True — aldehyde (-CHO) is the principal functional group.

B) True — numbering from the aldehyde gives the double bond at C-2 → but-2-enal.

C) True — the carbon of the -CHO is numbered 1 (principal functional group gets C-1).

D) False — “3-Butenal” is incorrect for this structure.

12. Regarding the compound  $\text{HOOC-CH}_2\text{-CH}_2\text{-CH}_2\text{-COOH}$ , the correct statement(s) is/are:

- A) It is a dicarboxylic acid.
- B) Its IUPAC name is Pentane-1,5-dioic acid.
- C) Its common name is Glutaric acid.
- D) Its molecular formula is  $\text{C}_5\text{H}_8\text{O}_4$

**Answer: A, B, C, D**

Solution: A) True — it is a dicarboxylic acid.

B) True — IUPAC: pentane-1,5-dioic acid.

C) True — common name: glutaric acid.

D) True — molecular formula  $\text{C}_5\text{H}_8\text{O}_4$ .

13. For the compound  $\text{CH}_2=\text{C}(\text{CH}_3)\text{-CH}(\text{OH})\text{-CH}_3$ , the correct statement(s) is/are:

- A) The parent chain contains 4 carbon atoms.
- B) The IUPAC name is 3-Methylbut-3-en-2-ol.
- C) The double bond gets priority in numbering over the -OH group.
- D) The IUPAC name is Pent-3-en-2-ol.

**Answer: A, B**

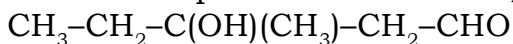
Solution: A) True — the chosen parent chain is 4 carbons long.

B) True — numbering from the end giving the -OH the lowest possible locant yields 3-methylbut-3-en-2-ol.

C) False — -OH has priority for lowest locant over the  $\text{C}=\text{C}$  (so the double bond does not get priority).

D) False — Pent-3-en-2-ol is not the correct parent/name here.

14. For the compound shown below, the correct statement(s) is/are:



- A) The principal functional group is the aldehyde.
- B) The IUPAC name is 3-Hydroxy-3-methylpentanal.
- C) The carbon chain is numbered starting from the aldehyde group.
- D) The compound contains a chiral center and can exhibit optical isomerism.

**Answer: A, B, C, D**

Solution: A) True — aldehyde (-CHO) is the principal functional group.

B) True — numbering from the aldehyde gives 3-hydroxy-3-methylpentanal.

C) True — with an aldehyde present the chain is numbered from the aldehyde (C-1 = CHO).

D) True — the carbon bearing OH (the 3-position) has four different substituents so it is a chiral center → optical isomerism possible.

**Assertion and Reason Type:**

- A) Both A & R are true and R is the correct explanation of A
- B) Both A & R are true and R is not the correct explanation of A
- C) A is true, R is false.
- D) A is false, R is true.

15. **Assertion** : The IUPAC name of the compound  $\text{CH}_3\text{-O-CH}_2\text{-CH}_2\text{-OH}$  is 2-

Methoxyethan-1-ol.

**Reason** : In IUPAC nomenclature, the alcohol (-OH) group has higher priority than the ether (-O-) group for determining the parent chain and principal suffix.

**Answer:A**

Solution:The -OH is the principal functional group, so the parent is ethanol and the ether is a substituent → 2-methoxyethan-1-ol.

The reason statement correctly states that -OH has higher priority than an ether for choosing the parent/suffix.

16. **Assertion** : The correct IUPAC name for the compound  $\text{CH}_2=\text{CH}-\text{CH}=\text{CH}-\text{CH}_3$  is Penta-1,3-diene.

**Reason** : When numbering a chain with multiple identical functional groups (like two double bonds), the chain must be numbered in the direction that gives the set of locants (1,3) which is lower than the alternative set (2,4).

**Answer:A**

Solution:

Numbering from the left gives double bonds at positions 1 and 3  
→ penta-1,3-diene.

The reason invokes the lowest-set-of-locants rule (choose the numbering that gives the lower set of locants for identical functional groups), which correctly explains the choice.

### Comprehension Type:

#### Numbering the Chain

Numbering starts from the end nearer to:

Main functional group (-OH, -COOH, etc.)

Double/triple bonds

Substituents

Functional groups like -COOH, -CHO, -CN are always C-1 (cannot be given higher numbers)

17. While naming an organic compound, the numbering of the parent chain is assigned such that it starts from the end nearest to which of the following, in order of priority?

A) Double bonds, then the main functional group, then substituents

B) The main functional group, then double/triple bonds, then substituents

C) Substituents, then the main functional group, then double bonds

D) Double bonds, then substituents, then the main functional group

**Answer:B**

Solution:The IUPAC numbering priority is:

Main functional group > double/triple bonds > substituents

So numbering always begins from the end closest to the principal functional group.

If no principal functional group, then look for double/triple bonds.

Substituents get the lowest numbers only after these two criteria.

18. For which of the following functional groups is the carbon atom always assigned the number 1 during the numbering of the parent chain?

- A) Alcohol ( $-\text{OH}$ ) B) Ketone ( $>\text{C}=\text{O}$ ) C) Carboxylic Acid ( $-\text{COOH}$ ) D) Ether ( $-\text{O}-$ )

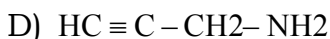
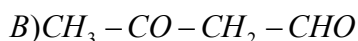
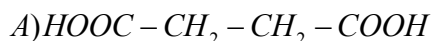
**Answer: C**

Solution: The carbonyl carbon of carboxylic acids ( $-\text{COOH}$ ) is always carbon-1 because  $-\text{COOH}$  has the highest priority among common functional groups.  $-\text{OH}$  (alcohol) and ethers are not automatically C-1. Ketones can have the carbonyl at position 2 or higher  $\rightarrow$  not always C-1.

### Matrix Matching Type

19. **LIST - 1**

**(Structural formulaA)**



**LIST - 2**

**(Name of compoundD)**

1. ~~But-2-enal~~ (Change 2-Methyl-Prop-2-enal)

2. Butane-1,4-dioic acid

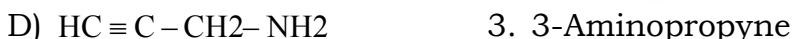
3. 3-Aminopropyne

4. 3-Oxobutan-1-al

5. Prop-2-en-1-amine

**Answer: A-2, B-4, C-1, D-3**

Solution:



## LEARNERS TASK

### CONCEPTUAL UNDERSTANDING QUESTIONS(CQU'S)

1. The correct sequence for assembling an IUPAC name is:  
 A) Prefix(es) + Word Root + Primary Suffix + Secondary Suffix  
 B) Word Root + Primary Suffix + Prefix(es) + Secondary Suffix  
 C) Prefix(es) + Word Root + Secondary Suffix + Primary Suffix  
 D) Word Root + Primary Suffix + Secondary Suffix + Prefix(es)

**Answer: A**

Solution: Standard order: Prefix(es) + Word Root + Primary Suffix + Secondary Suffix

2. The primary suffix for a carbon chain with a double bond is:  
 A) -ane B) -ene C) -yne D) -ol

**Answer: B**

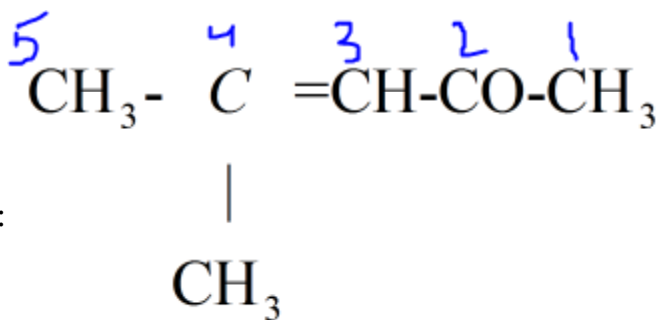
Solution: -ane (single), -ene (double), -yne (triple), -ol (alcohol = secondary suffix).

3. In a molecule containing both a double bond and a triple bond, which gets



C) 4-Methyl-3-penten-2-one

D) 2-Methyl-3-penten-4-one

**Answer:A**

Solutiion:

The ketone takes priority, so the parent chain must include the carbonyl and the C=C. Numbering from the carbonyl end gives the ketone at 2 and the double bond at 3. Choosing the longest chain through one of the terminal methyls gives a five-carbon chain, with the other methyl as a substituent at C4. Hence: 4-methylpent-3-en-2-one. Option C is an older-style equivalent, but A is the correct IUPAC form.

9. For the compound  $\text{HOOC}-\text{CH}(\text{OH})-\text{CH}_2-\text{COOH}$ , the principal functional group is:

A) The carboxylic acid group

B) The alcohol group

C) Both have equal priority

D) The longer carbon chain determines it

**Answer:A**

Solutiion: Carboxylic acid has highest priority.

10. In the IUPAC name "4-oxopentanoic acid", the number "4" refers to the position of:

A) The carboxylic acid group

B) The ketone group

C) The parent carbon chain

D) A methyl substituent

**Answer:B**

Solutiion: The "4" locates the oxo (=O) (the ketone) at C-4.

### JEE MAINS LEVEL QUESTIONS

11. What is the IUPAC name of  $\text{CH}_3-\text{CH}_2-\text{CH}_2-\text{OH}$ ?

A) Propan-2-ol

B) Propan-1-ol

C) Butan-1-ol

D) Hydroxypropane

**Answer:B**

Solution: 3 carbons, OH at end → Propan-1-ol

12. The IUPAC name of  $\text{CH}_3-\text{CH}=\text{CH}-\text{CH}_3$  is:

**(FA & SA- 2 Marks)**

A) But-1-ene

B) But-2-ene

C) 2-Methylpropene

D) Pent-2-ene

**Answer:B**

Solution: 4 carbons, double bond at C2 → But-2-ene

13. What is the correct IUPAC name for  $\text{CH}_3\text{-CH}_2\text{-CH}_2\text{-COOH}$ ?  
 A) Butanoic acid B) Propanoic acid C) Pentanoic acid D) Butanal

**Answer:A**

Solution: 4 carbons, COOH at end → Butanoic acid

14. The IUPAC name of  $\text{CH}_3\text{-CH}_2\text{-O-CH}_2\text{-CH}_3$  is:  
 A) Methoxyethane B) Ethoxyethane  
 C) 1,1-Dimethoxymethane D) 2-Oxypentane

**Answer:B**

Solution: Symmetrical ether → ethoxyethane (common: diethyl ether)

15. What is the name of  $\text{CH}_3\text{-CH}_2\text{-CH}_2\text{-NH}_2$ ? **(FA & SA- 3 Marks/4 Marks)**  
 A) Methylamine B) Ethylamine  
 C) Propylamine D) Butylamine

**Answer:C**

Solution: 3 carbons,  $\text{NH}_2$  at end → Propan-1-amine (common: propylamine)

16. What is the name of  $\text{CH}_3\text{-CH(Br)-CH}_3$ ?  
 A) 1-Bromopropane B) 2-Bromopropane  
 C) Bromoethane D) 1-Bromoethane

**Answer:B**

Solution: 3 carbons, Br on middle C → 2-Bromopropane

17. The IUPAC name of  $\text{CH}_2=\text{CH-CHO}$  is:  
 A) Prop-2-enal B) But-2-enal C) Acrolein D) Vinylformaldehyde

**Answer:A**

Solution: 3 carbons, aldehyde at end, double bond C1-C2 → Prop-2-enal

18. What is the name of  $\text{CH}_3\text{-C}\equiv\text{N}$ ?  
 A) Ethanenitrile B) Methanenitrile C) Acetonitrile D) Propanenitrile

**Answer:A**

Solution: 2 carbons, nitrile at end → Ethanenitrile (common: acetonitrile)

19. The IUPAC name of  $\text{CH}_3\text{-CH}_2\text{-CH}_2\text{-CO-CH}_3$  is: **(FA & SA- 5 Marks/8 Marks)**  
 A) Butan-2-one B) Pentan-2-one C) Butanone D) Propanone

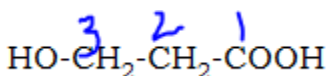
**Answer:B**

Solution: 5 carbons, ketone at C2 → Pentan-2-one

20. The IUPAC name of  $\text{HO-CH}_2\text{-CH}_2\text{-COOH}$  is:  
 A) 2-Hydroxyethanoic acid B) 3-Hydroxypropanoic acid  
 C) 2-Hydroxypropanoic acid D) 1-Hydroxypropanoic acid

**Answer:B**

Solution: Number the parent chain from the  $\text{-COOH}$  end (highest priority).



So the  $\text{-OH}$  group is on carbon-3 of a 3-carbon (propanoic acid) chain.



Thus the name is 3-Hydroxypropanoic acid.

## JEE ADVANCED LEVEL QUESTIONS

### Multicorrect Answer Type

21. For the compound  $\text{CH}_3\text{-CH}_2\text{-CH(OH)-CH}_3$ , which of the following statements is/are correct?
- A) The parent chain is a four-carbon chain.
  - B) The correct IUPAC name is Butan-2-ol.
  - C) The hydroxyl (-OH) group is attached to a secondary carbon atom.
  - D) It can also be correctly named as 2-Butanol.

**Answer: A, B, C, D**

Solution: A) The parent chain is a four-carbon chain.

Yes, 4 carbons  $\rightarrow$  butane derivative  $\rightarrow$  true.

B) The correct IUPAC name is Butan-2-ol.

Yes, alcohol at C2  $\rightarrow$  Butan-2-ol  $\rightarrow$  true.

C) The hydroxyl (-OH) group is attached to a secondary carbon atom.

Carbon attached to OH is connected to 2 alkyl groups ( $\text{CH}_3$  and  $\text{CH}_2\text{-CH}_3$ ) ? secondary carbon  $\rightarrow$  true.

D) It can also be correctly named as 2-Butanol.

2-Butanol is acceptable common/IUPAC alternative (though strict IUPAC uses butan-2-ol, 2-butanol is widely accepted)  $\rightarrow$  true.

22. Which of the following pairs show a correct match between the structure and its IUPAC name?
- A)  $\text{CH}_3\text{-CH}_2\text{-CH}_2\text{-CHO}$  : Butanal
  - B)  $\text{CH}_3\text{-CO-CH}_2\text{-CH}_3$  : Butan-2-one
  - C)  $\text{CH}_2\text{=CH-CH}_2\text{-CH}_3$  : But-1-ene
  - D)  $\text{CH}_3\text{-CH}_2\text{-CH}_2\text{-CH}_2\text{-OH}$  : Butan-1-ol

**Answer: A, B, C, D**

Solution: A)  $\text{CH}_3\text{-CH}_2\text{-CH}_2\text{-CHO}$  : Butanal

4 carbons, aldehyde at C1  $\rightarrow$  Butanal  $\rightarrow$  correct.

B)  $\text{CH}_3\text{-CO-CH}_2\text{-CH}_3$  : Butan-2-one

4 carbons, ketone at C2  $\rightarrow$  Butan-2-one  $\rightarrow$  correct.

C)  $\text{CH}_2\text{=CH-CH}_2\text{-CH}_3$  : But-1-ene

4 carbons, double bond at C1  $\rightarrow$  But-1-ene  $\rightarrow$  correct.

D)  $\text{CH}_3\text{-CH}_2\text{-CH}_2\text{-CH}_2\text{-OH}$  : Butan-1-ol

4 carbons, OH at C1  $\rightarrow$  Butan-1-ol  $\rightarrow$  correct.

### Assertion and Reason Type:

- A) Both A & R are true and R is the correct explanation of A
- B) Both A & R are true and R is not the correct explanation of A
- C) A is true, R is false.
- D) A is false, R is true.

23. **Assertion** : The IUPAC name of  $\text{CH}_3\text{-O-CH}_3$  is methoxymethane.

**Reason** : In ethers, the larger alkyl group forms the root name, and the smaller alkyl group with the oxygen is named as an alkoxy substituent.

**Answer:B**

Solution:Assertion: True —  $\text{CH}_3\text{-O-CH}_3$  is named methoxymethane in IUPAC (systematic name for symmetrical ethers).

Reason: True as a general rule for unsymmetrical ethers — the larger alkyl group is the parent, the smaller becomes the alkoxy substituent.

Why not correct explanation: In this molecule both groups are methyl (same size), so “larger vs smaller” doesn’t apply. The name results from treating either methyl as parent and the other as methoxy; symmetry, not size, governs the choice.

**24. Assertion** : The correct IUPAC name for the compound  $\text{CH}_3\text{-CH}_2\text{-CH(CH}_3\text{)-CHO}$  is 2-methylbutanal.

**Reason** : For aldehydes, the carbonyl carbon is always assigned number 1, and the chain is numbered accordingly to give substituents the lowest possible numbers.

**Answer:A**

Solution:Assertion: True — the correct IUPAC name is 2-methylbutanal.

Reason: True — aldehyde carbonyl is always “1”; the longest chain including the CHO group has four carbons (butanal), and the methyl substituent is at C2, which follows lowest-locant rules.

**Comprehension Type****Multiple Bonds (Alkenes/Alkynes)**

Both double ( $\text{C}=\text{C}$ ) and triple ( $\text{C}\equiv\text{C}$ ) bonds must be part of the parent chain.

If both are at equal positions, double bond gets priority in numbering

25. According to IUPAC nomenclature rules for unsaturated hydrocarbons, what is a fundamental requirement regarding multiple bonds in the parent chain?

A) Only the double bond must be included in the parent chain; the triple bond can be a substituent.

B) The parent chain must be chosen to include the maximum number of substituents, even if it excludes a multiple bond.

C) Both double and triple bonds must be part of the parent chain when present.

D) The multiple bond with the highest molecular weight must be included in the parent chain.

**Answer:C**

Solution:IUPAC rule for unsaturated hydrocarbons: the parent chain must contain as many multiple bonds as possible (both double and triple bonds must be included if present), provided it is the longest chain containing those bonds.

26. When numbering a carbon chain containing both a double and a triple bond at equivalent positions from the two ends, which bond is assigned the lower locant?

A) The triple bond

B) The bond belonging to the longer carbon chain

C) The double bond

D) The bond of the functional group with the highest priority

**Answer: C**

**Solution:** When numbering a chain with both double and triple bonds at equivalent positions from the two ends: IUPAC rule states that if identical locants from either end for multiple bonds, the double bond receives lower number than triple bond.

### Matrix Matching Type

#### 27. List - I (Functional Group)

- A)  $-COOH$   
 B)  $-C \equiv N$   
 C)  $-COCl$   
 D)  $-CONH_2$

#### List - II (IUPAC Prefix / Suffix)

1. -oyl chloride  
 2. -amide  
 3. -nitrile  
 4. -oic acid  
 5. cyano-

**Answer: A-4, B-3,5, C-1, D-2**

**Solution:**

- A)  $-COOH$   
 B)  $-C \equiv N$   
 C)  $-COCl$   
 D)  $-CONH_2$

4. -oic acid  
 3. -nitrile (suffix) or 5. cyano (prefix)  
 1. -oyl chloride  
 2. -amide

## KEY

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