

Organic Chemistry: Some Basic Principles and Techniques — NEET Chemistry PYQ (2005-2021)

Class 11 Chemistry · 29 real NEET & AIPMT questions, year-tagged · answers checked by RankUp

NEET 2021

1. The compound which shows metamerism is :

- (A) C_5H_{12}
- (B) C_3H_8O
- (C) C_3H_6O
- (D) $C_4H_{10}O$

NEET 2020 · Q108

2. Paper chromatography is an example of :

- (A) Adsorption chromatography
- (B) Partition chromatography
- (C) Thin layer chromatography
- (D) Column chromatography

NEET 2020 · Q112

3. A tertiary butyl carbocation is more stable than a secondary butyl carbocation because of which of the following ?

- (A) $-I$ effect of $-CH_3$ groups
- (B) $+R$ effect of $-CH_3$ groups
- (C) $-R$ effect of $-CH_3$ groups
- (D) Hyperconjugation

NEET 2019 · Q46

4. The number of sigma (σ) and pi (π) bonds in pent-2-en-4-yne is:

- (A) 10 σ bonds and 3 π bonds
- (B) 8 σ bonds and 5 π bonds
- (C) 11 σ bonds and 2 π bonds
- (D) 13 σ bonds and no π bond

NEET 2018 · Q63

5. Which of the following molecules represents the order of hybridisation sp^2 , sp^2 , sp , sp from left to right atoms?

- (A) $CH_2 = CH - CH = CH_2$
- (B) $CH_2 = CH - C \equiv CH$
- (C) $HC \equiv C - C \equiv CH$
- (D) $CH_3 - CH = CH - CH_3$

NEET 2017 · Q3

6. The correct statement regarding electrophile is:

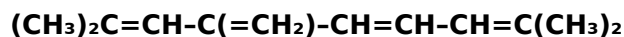
- (A) Electrophile is a negatively charged species and can form a bond by accepting a pair of electrons from a nucleophile
- (B) Electrophile is a negatively charged species and can form a bond by accepting a pair of electrons from another electrophile
- (C) Electrophiles are generally neutral species and can form a bond by accepting a pair of electrons from a nucleophile
- (D) Electrophile can be either neutral or positively charged species and can form a bond by accepting a pair of electrons from a nucleophile

7. The pair of electron in the given carbanion, $\text{CH}_3\text{C}\equiv\text{C}^-$, is present in which of the following orbitals?

- (A) 2p
- (B) sp^3
- (C) sp^2
- (D) sp

AIPMT 2015

8. The total number of π -bond electrons in the following structure is:



- (A) 16
- (B) 4
- (C) 8
- (D) 12

AIPMT 2015

9. In Dumas' method for estimation of nitrogen, 0.25 g of an organic compound gave 40 mL of nitrogen collected at 300 K temperature and 725 mm pressure. If the aqueous tension at 300 K is 25 mm, the percentage of nitrogen in the compound is:

- (A) 15.76
- (B) 17.36
- (C) 18.20
- (D) 16.76

AIPMT 2014

10. In the Kjeldahl's method for estimation of nitrogen present in a soil sample, ammonia evolved from 0.75 g of sample neutralized 10 mL of 1 M H_2SO_4 . The percentage of nitrogen in the soil is:

- (A) 45.33
- (B) 35.33
- (C) 43.33
- (D) 37.33

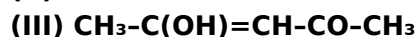
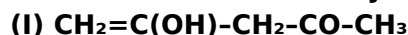
NEET 2013

11. The structure of isobutyl group in an organic compound is

- (A) $(\text{CH}_3)_2\text{CH}-\text{CH}_2-$
- (B) $\text{CH}_3-\text{CH}(-)-\text{CH}_2-\text{CH}_3$
- (C) $\text{CH}_3-\text{CH}_2-\text{CH}_2-\text{CH}_2-$
- (D) $(\text{CH}_3)_3\text{C}-$

NEET 2013

12. The order of stability of the following tautomeric compounds is



- (A) I > II > III
- (B) III > II > I
- (C) II > I > III
- (D) II > III > I

AIPMT 2012 Prelims

13. Which nomenclature is not according to IUPAC system?

- (A) $\text{CH}_3-\text{CO}-\text{CH}_2-\text{CH}_2-\text{CH}_2-\text{COOH}$: 5-oxohexanoic acid
- (B) $\text{Br}-\text{CH}_2-\text{CH}=\text{CH}_2$: 1-Bromo-prop-2-ene
- (C) $\text{CH}_3-\text{CH}_2-\text{C}(\text{Br})(\text{CH}_3)-\text{CH}_2-\text{CH}(\text{CH}_3)_2$: 4-bromo-2,4-dimethylhexane
- (D) $(\text{CH}_3)_2\text{CH}-\text{CH}(\text{C}_6\text{H}_5)-\text{CH}_2\text{CH}_3$: 2-methylpentan-3-ylbenzene

AIPMT 2011 Mains

14. The IUPAC name of the compound $\text{ClC}(\text{CH}_3)=\text{C}(\text{I})\text{CH}_2\text{CH}_3$, in which Cl and I lie on opposite sides of the double bond, is

- (A) trans-3-iodo-4-chloro-3-pentene
- (B) cis-3-chloro-3-iodo-2-pentene
- (C) trans-2-chloro-3-iodo-2-pentene
- (D) cis-3-iodo-4-chloro-3-pentene

AIPMT 2011 Prelims

15. In Dumas' method of estimation of nitrogen 0.35 g of an organic compound gave 55 mL of nitrogen collected at 300 K temperature and 715 mm pressure. The percentage composition of nitrogen in the compound would be (Aqueous tension at 300 K = 15 mm)

- (A) 14.45
- (B) 15.45
- (C) 16.45
- (D) 17.45

AIPMT 2011 Prelims

16. The Lassaigne's extract is boiled with conc. HNO_3 while testing for halogens. By doing so it

- (A) Increases the concentration of NO_3^- ions
- (B) Decomposes Na_2S and NaCN , if formed
- (C) Helps in the precipitation of AgCl
- (D) Increases the solubility product of AgCl

AIPMT 2010 Mains · Q99

17. Which of the following species is not electrophilic in nature?

- (A) Cl^+
- (B) BH_3
- (C) H_3O^+
- (D) NO_2^+

AIPMT 2010 Mains · Q113

18. The IUPAC name of the compound $\text{CH}_3\text{CH}=\text{CHC}\equiv\text{CH}$ is

- (A) Pent-4-yn-2-ene
- (B) Pent-3-en-1-yne
- (C) Pent-2-en-4-yne
- (D) Pent-1-yn-3-ene

AIPMT 2009 Prelims · Q151

19. The state of hybridization of C2, C3, C5 and C6 of the hydrocarbon $\text{CH}_3-\text{C}(\text{CH}_3)_2-\text{CH}=\text{CH}-\text{CH}(\text{CH}_3)-\text{C}\equiv\text{CH}$

(numbered from the right: $\text{C}\equiv\text{CH}$ carbons are C1 and C2, the $\text{CH}(\text{CH}_3)$ carbon is C3, $\text{CH}=\text{CH}$ are C4 and C5, the $\text{C}(\text{CH}_3)_2$ carbon is C6, end CH_3 is C7)

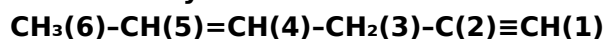
is in the following sequence:

- (A) sp^3 , sp^2 , sp^2 and sp
- (B) sp , sp^2 , sp^2 and sp^3
- (C) sp , sp^2 , sp^3 and sp^2
- (D) sp , sp^3 , sp^2 and sp^3

AIPMT 2009 Prelims · Q183

20. The IUPAC name of the compound having the formula $\text{CH}\equiv\text{C}-\text{CH}=\text{CH}_2$ is:

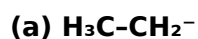
- (A) 1-butyne-3-ene
- (B) but-1-yne-3-ene
- (C) 1-butene-3-yne
- (D) 3-butene-1-yne

21. In the hydrocarbon**The state of hybridization of carbons 1, 3 and 5 are in the following sequence**

- (A) sp^3 , sp^2 , sp
- (B) sp^2 , sp , sp^3
- (C) sp , sp^3 , sp^2
- (D) sp , sp^2 , sp^3

22. How many stereoisomers does the molecule have?

- (A) 2
- (B) 4
- (C) 6
- (D) 8

23. Base strength of**is in the order of**

- (A) $a > b > c$
- (B) $b > a > c$
- (C) $c > b > a$
- (D) $a > c > b$

24. Which of the following is not chiral ?

- (A) 2-butanol
- (B) 2, 3-dibromopentane
- (C) 3-bromopentane
- (D) 2-hydroxypropanoic acid

25. The correct order regarding the electronegativity of hybrid orbitals of carbon is :

- (A) $\text{sp} > \text{sp}^2 < \text{sp}^3$
- (B) $\text{sp} > \text{sp}^2 > \text{sp}^3$
- (C) $\text{sp} < \text{sp}^2 > \text{sp}^3$
- (D) $\text{sp} < \text{sp}^2 < \text{sp}^3$

26. The IUPAC name of $\text{CH}_3\text{CH}_2-\text{CH}(\text{CH}_3)-\text{CH}(\text{CH}_3)-\text{COCl}$ is :

- (A) 3, 4-dimethylpentanoyl chloride
- (B) 1-chloro-1-oxo-2, 3-dimethylpentane
- (C) 2-ethyl-3-methylbutanoyl chloride
- (D) 2, 3-dimethylpentanoyl chloride

27. Which amongst the following is the most stable carbocation ?

- (A) $(\text{CH}_3)_2\text{C}^+\text{H}$
- (B) $(\text{CH}_3)_3\text{C}^+$
- (C) C^+H_3
- (D) $\text{CH}_3\text{C}^+\text{H}_2$

28. Which one of the following pairs represents stereoisomerism ?

- (A) Chain isomerism and rotational isomerism
- (B) Structural isomerism and geometric isomerism
- (C) Linkage isomerism and geometric isomerism
- (D) Optical isomerism and geometric isomerism

29. Names of some compounds are given. Which one is not correct in IUPAC system ?

- (A) $\text{CH}_3\text{-CH(OH)-CH(CH}_3\text{)-CH}_3$: 3-methyl-2-butanol
- (B) $\text{CH}_3\text{-C}\equiv\text{C-CH(CH}_3\text{)}_2$: 4-methyl-2-pentyne
- (C) $\text{CH}_3\text{-CH}_2\text{-C(=CH}_2\text{)-CH(CH}_3\text{)-CH}_3$: 2-ethyl-3-methyl-but-1-ene
- (D) $\text{CH}_3\text{-CH}_2\text{-CH}_2\text{-CH(CH}_2\text{CH}_3\text{)-CH(CH}_3\text{)-CH}_2\text{CH}_3$: 3-methyl-4-ethyl heptane

Answer key and explanations**1. Answer: (D) $\text{C}_4\text{H}_{10}\text{O}$**

Metamerism arises when different alkyl groups are attached to the same polyvalent functional group, e.g. ethers. $\text{C}_4\text{H}_{10}\text{O}$ gives $\text{CH}_3\text{-O-C}_3\text{H}_7$ and $\text{C}_2\text{H}_5\text{-O-C}_2\text{H}_5$, which are metamers. $\text{C}_3\text{H}_8\text{O}$ has only one ether ($\text{CH}_3\text{OC}_2\text{H}_5$), so it cannot show metamerism.

2. Answer: (B) Partition chromatography

In paper chromatography water held in the cellulose fibres is the stationary phase, and components separate by partition between it and the moving solvent, so it is partition chromatography. Thin layer and column chromatography are adsorption methods using a solid adsorbent.

3. Answer: (D) Hyperconjugation

The tert-butyl cation has nine α C-H bonds that can donate electron density into the empty p orbital, against fewer in the sec-butyl cation, so it gets more hyperconjugative stabilisation. Methyl groups are +I (electron-releasing), not -I, and they have no resonance effect here.

4. Answer: (A) 10 σ bonds and 3 π bonds

Pent-2-en-4-yne is $\text{CH}_3\text{-CH=CH-C}\equiv\text{CH}$: 4 C-C σ bonds + 6 C-H σ bonds = 10 σ ; the double bond adds 1 π and the triple bond 2 π , total 3 π . Counting every bond line of the multiple bonds as π would overcount.

5. Answer: (B) $\text{CH}_2 = \text{CH} - \text{C} \equiv \text{CH}$

In $\text{CH}_2=\text{CH-C}\equiv\text{CH}$ the two doubly bonded carbons are sp^2 and the two triply bonded carbons are sp . Buta-1,3-diene is all sp^2 , and but-2-ene has sp^3 end carbons.

6. Answer: (D) Electrophile can be either neutral or positively charged species and can form a bond by accepting a pair of electrons from a nucleophile

An electrophile is an electron-deficient species: it may be positively charged (H^+ , NO_2^+) or neutral (BF_3 , AlCl_3 , carbonyl carbon), and it bonds by accepting an electron pair from a nucleophile. Saying electrophiles are 'generally neutral' ignores the many cationic electrophiles, and negatively charged species are nucleophiles.

7. Answer: (D) sp

The negatively charged carbon is triple-bonded, so it is sp hybridised; its lone pair occupies the remaining sp orbital, pointing away from the triple bond. The two unhybridised 2p orbitals are used for the π bonds, so the lone pair is not in a p orbital.

8. Answer: (C) 8

The structure contains four C=C double bonds (including the exocyclic $=\text{CH}_2$), i.e. four π bonds. Each π bond has 2 electrons, so there are 8 π electrons; 4 is the number of π bonds, not electrons.

9. Answer: (D) 16.76

Dry gas pressure = $725 - 25 = 700$ mm. $V(\text{STP}) = 40 \times 700 \times 273 / (300 \times 760) = 33.5$ mL; mass of $\text{N}_2 = 28 \times 33.5 / 22400 = 0.0419$ g. $\% \text{N} = 0.0419 / 0.25 \times 100 = 16.76$. Not subtracting aqueous tension gives a higher value.

10. Answer: (D) 37.33

10 mL of 1 M $\text{H}_2\text{SO}_4 = 10$ mmol, which neutralises 20 mmol NH_3 , containing 20 mmol N = 0.28 g. $\% \text{N} = 0.28 / 0.75 \times 100 = 37.33$.

11. Answer: (A) $(\text{CH}_3)_2\text{CH-CH}_2\text{-}$

Isobutyl is $(\text{CH}_3)_2\text{CH-CH}_2\text{-}$, attached through a CH_2 next to the branched carbon. $\text{CH}_3\text{-CH(-)-CH}_2\text{-CH}_3$ is sec-butyl, $(\text{CH}_3)_3\text{C-}$ is tert-butyl and the straight chain is n-butyl.

12. Answer: (B) III > II > I

III is the enol of acetylacetone; its C=C is conjugated with the C=O and it forms a six-membered intramolecular hydrogen bond, so it is the most stable. The keto form II comes next, and I, whose C=C is not conjugated with the carbonyl, is least stable: III > II > I.

13. Answer: (B) Br-CH₂-CH=CH₂ : 1-Bromo-prop-2-ene

Br-CH₂-CH=CH₂ must be numbered to give the double bond the lowest locant, so its IUPAC name is 3-bromoprop-1-ene, not 1-bromoprop-2-ene. The other names are correct: 5-oxohexanoic acid, 4-bromo-2,4-dimethylhexane (locants 2,4,4 beat 3,3,5) and (2-methylpentan-3-yl)benzene.

14. Answer: (C) trans-2-chloro-3-iodo-2-pentene

The longest chain containing the double bond has five carbons, numbered from the end nearer the double bond: C2 carries Cl and C3 carries I, giving 2-chloro-3-iodopent-2-ene. Cl and I, the heavier substituents on each alkene carbon, are on opposite sides, so it is trans. Names like 3-iodo-4-chloro-3-pentene number from the wrong end.

15. Answer: (C) 16.45

Pressure of dry N₂ = 715 – 15 = 700 mm. Volume at STP = 55 × (700/760) × (273/300) = 46.1 mL. Mass of N₂ = 28 × 46.1/22400 = 0.0576 g, so %N = 0.0576/0.35 × 100 ≈ 16.5 (16.45). Forgetting the aqueous tension correction gives a higher value.

16. Answer: (B) Decomposes Na₂S and NaCN, if formed

If N or S is present, Na₂S and NaCN are in the Lassaigne extract and would give black Ag₂S or white AgCN with AgNO₃, interfering with the halide test. Boiling with HNO₃ decomposes them (releasing H₂S and HCN). It does not change the solubility product of AgCl.

17. Answer: (C) H₃O⁺

Electrophiles are electron-deficient: Cl⁺ and NO₂⁺ are positive and electron-poor, and BH₃ has an empty orbital on boron. In H₃O⁺ the oxygen has a complete octet and still a lone pair, so it acts as an acid (proton donor) but not as an electrophile.

18. Answer: (B) Pent-3-en-1-yne

Number the chain so the multiple bonds get the lowest locants: from the C≡CH end the triple bond is at C-1 and the double bond at C-3, giving pent-3-en-1-yne. Numbering from the CH₃ end gives the higher set {2,4}, so pent-2-en-4-yne is wrong.

19. Answer: (D) sp, sp³, sp² and sp³

C2 is a triple-bonded carbon (sp). C3 is the CH(CH₃) carbon with only single bonds (sp³). C5 is a double-bonded carbon (sp²). C6 is the quaternary C(CH₃)₂ carbon (sp³). So the sequence is sp, sp³, sp², sp³.

20. Answer: (C) 1-butene-3-yne

CH₂=CH-C≡CH: numbering from the double-bond end gives the double bond at C1 and the triple bond at C3, and when locants tie the double bond gets the lower number. The name is but-1-en-3-yne, written here as 1-butene-3-yne. Names with 'yne' cited first are wrong since 'ene' precedes 'yne'.

21. Answer: (C) sp, sp³, sp²

C-1 is part of the C≡C triple bond (sp), C-3 is a CH₂ with only single bonds (sp³), and C-5 is part of the C=C double bond (sp²). The sp, sp², sp³ sequence wrongly gives C-3 a double bond.

22. Answer: (B) 4

The C=C bond has two different groups on each carbon, so it shows cis-trans isomerism (2 forms). The CHBr carbon carries H, Br, CH₃ and CH₂CH=CHCH₃, so it is a stereocentre (2 forms). These are independent, giving 2 × 2 = 4 stereoisomers. Counting only one source of isomerism would give 2.

23. Answer: (A) a > b > c

The conjugate acids get more acidic from ethane (sp³) to ethene (sp²) to ethyne (sp), because more s-character holds the lone pair more tightly. The stronger the conjugate acid, the weaker the base, so the basicity order is ethyl > vinyl > acetylide anion. The reverse order (acetylide strongest) is the stability order, not the base strength.

24. Answer: (C) 3-bromopentane

In 3-bromopentane, C-3 carries H, Br and two identical ethyl groups, so there is no stereocentre and the molecule is achiral. 2-Butanol and lactic acid each have a carbon with four different groups, and 2,3-dibromopentane has two such carbons with no internal symmetry.

25. Answer: (B) sp > sp² > sp³

The more s-character in a hybrid orbital, the closer its electrons are held to the nucleus and the more electronegative it is. s-character is 50% in sp, 33% in sp² and 25% in sp³, so electronegativity is sp > sp² > sp³. This is why ethyne's C-H is the most acidic.

26. Answer: (D) 2, 3-dimethylpentanoyl chloride

The principal chain includes the -COCl carbon and has five carbons; numbering starts from that carbon (C-1). Methyl groups sit on C-2 and C-3, so the name is 2,3-dimethylpentanoyl chloride. Numbering from the other end, or choosing a four-carbon chain with an ethyl branch, breaks the IUPAC rules.

27. Answer: (B) $(\text{CH}_3)_3\text{C}^+$

Carbocation stability is $3^\circ > 2^\circ > 1^\circ > \text{methyl}$ because of hyperconjugation and the +I effect of alkyl groups. $(\text{CH}_3)_3\text{C}^+$ is tertiary and most stable; the methyl cation is least stable.

28. Answer: (D) Optical isomerism and geometric isomerism

Stereoisomers have the same connectivity but different spatial arrangement; geometrical and optical isomerism are the two types. Chain, structural and linkage isomerism change connectivity.

29. Answer: (D) $\text{CH}_3\text{-CH}_2\text{-CH}_2\text{-CH}(\text{CH}_2\text{CH}_3)\text{-CH}(\text{CH}_3)\text{-CH}_2\text{CH}_3$: 3-methyl-4-ethyl heptane

For $\text{CH}_3\text{CH}_2\text{CH}_2\text{-CH}(\text{C}_2\text{H}_5)\text{-CH}(\text{CH}_3)\text{-CH}_2\text{CH}_3$ the substituents must be cited alphabetically: 4-ethyl-3-methylheptane, so '3-methyl-4-ethyl heptane' is incorrect. The other three names correctly identify the parent chain and lowest locants.

Questions as set in the AIPMT/NEET papers conducted by CBSE and NTA. Answers checked and explanations written by the RankUp team. RankUp is not affiliated with CBSE or NTA.