

**Q1. JEE Main 2026 (21 January Shift 2)**

Match List - I with List - II.  
List - I

Pair of Compounds

- A. 2-Methylpropene and but-1-ene
- B. Cis-but-2-ene and trans-but-2-ene
- C. 2-Butanol and diethyl ether
- D. But-1-ene and but-2-ene

List - II

Type of Isomers

- I. Stereoisomers
- II. Position isomers
- III. Chain isomers
- IV. Functional group isomers

Choose the correct answer from the options given below :

- (1) A-II, B-I, C-IV, D-III
- (2) A-III, B-I, C-II, D-IV
- (3) A-I, B-IV, C-III, D-II
- (4) A-III, B-I, C-IV, D-II

**Q2. JEE Main 2026 (21 January Shift 2)**

Given below are four compounds :

- (a) n-propyl chloride
- (b) iso-propyl chloride
- (c) sec-butyl chloride
- (d) neo-pentyl chloride

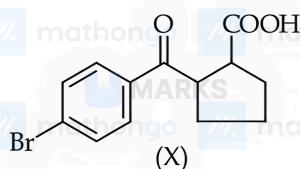
Percentage of carbon in the one which exhibits optical isomerism is :

- (1) 56
- (2) 40
- (3) 52
- (4) 46

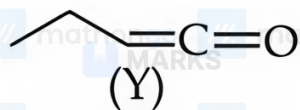
**Q3. JEE Main 2026 (21 January Shift 2)**

Given below are two statements :

**Statement I:** Compound (X), shown below, dissolves in  $\text{NaHCO}_3$  solution and has two chiral carbon atoms



**Statement II:** Compound (Y), shown below, has two carbons with  $\text{sp}^3$  hybridization, one carbon with  $\text{sp}^2$  and one carbon with  $\text{sp}$  hybridization



In the light of the above statements, choose the correct answer from the options given below :

- (1) Both Statement I and Statement II are false
- (2) Statement I is false but Statement II is true
- (3) Statement I is true but Statement II is false
- (4) Both Statement I and Statement II are true

**Q4. JEE Main 2026 (23 January Shift 1)**

Given below are two statements :

**Statement I:** Sublimation is used for the separation and purification of compounds with low melting point.

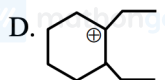
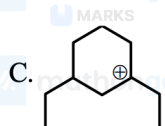
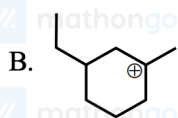
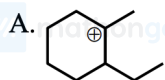
**Statement II:** The boiling point of a liquid increases as the external pressure is reduced.

In the light of the above statements, choose the correct answer from the options given below :

- (1) Both Statement I and Statement II are true
- (2) Statement I is true but Statement II is false
- (3) Both Statement I and Statement II are false
- (4) Statement I is false but Statement II is true

**Q5. JEE Main 2026 (28 January Shift 2)**

The cyclic cations having the same number of hyperconjugation are :

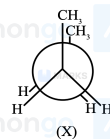


Choose the correct answer from the options given below :

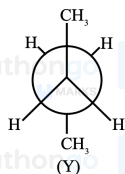
- (1) A, C and D only
- (2) A and B Only
- (3) A and C Only
- (4) B and C Only

**Q6. JEE Main 2026 (24 January Shift 2)**

Given below are two statements:



**Statement I:** There are several conformers for n -butane. Out of those conformers, (X) is the least stable and



most stable conformer is

**Statement II:** As the dihedral angle increases, torsional strain decreases from (X) to (Y).

In the light of the above statements, choose the correct answer from the options given below

- (1) Statement I is true but Statement II is false
- (2) Both Statement I and Statement II are true
- (3) Statement I is false but Statement II is true
- (4) Both Statement I and Statement II are false

**Q7. JEE Main 2026 (24 January Shift 2)**

Find out the statements which are not true.

- A. Resonating structures with more number of covalent bonds and lesser charge separation are more stable.
- B. In electromeric effect, an unsaturated system shows +E effect with nucleophile and -E effect with electrophile.
- C. Inductive effect is responsible for high melting point, boiling point and dipole moment of polar compounds.
- D. The greater the number of alkyl groups attached to the doubly bonded carbon atoms, higher is the heat of hydrogenation.
- E. Stability of carbanion increases with the increase in s— character of the carbon carrying the negative charge.

Choose the correct answer from the options given below:

- (1) B & D only
- (2) A, C & D only
- (3) B, D & E only
- (4) A, D & E only

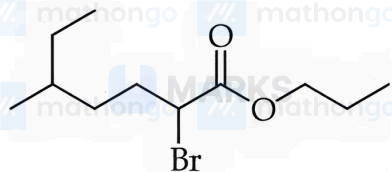
**Q8. JEE Main 2026 (24 January Shift 2)**

0.25 g of an organic compound "A" containing carbon, hydrogen and oxygen was analysed using the combustion method. There was an increase in mass of  $\text{CaCl}_2$  tube and potash tube at the end of the experiment. The amount was found to be 0.15 g and 0.1837 g, respectively. The percentage of oxygen in compound A is %. (Nearest integer)

(Given: molar mass in  $\text{gmol}^{-1}$  H : 1, C : 12, O : 16)

**Q9. JEE Main 2026 (22 January Shift 2)**

The IUPAC name of the following compound is :



- (1) n-propyl-2-bromo-5-methylheptanoate
- (2) n-propyl-1-bromo-4-methylhexanoate
- (3) 2-bromo-5-methylpropanoate
- (4) 2-bromo-5-methylhexylpropanoate

**Q10. JEE Main 2026 (22 January Shift 2)**

When 1 g of compound (X) is subjected to Kjeldahl's method for estimation of nitrogen, 15 mL 1 M  $\text{H}_2\text{SO}_4$  was neutralized by ammonia evolved. The percentage of nitrogen in compound (X) is :

- (1) 0.21
- (2) 21
- (3) 42
- (4) 0.42

**Q11. JEE Main 2026 (22 January Shift 1)**

Sodium fusion extract of an organic compound (Y) with  $\text{CHCl}_3$  and chlorine water gives violet color to the  $\text{CHCl}_3$  layer. 0.15 g of (Y) gave 0.12 g of the silver halide precipitate in Carius method. Percentage of halogen in the compound (Y) is \_\_\_\_\_. (Nearest integer)

(Given : molar mass  $\text{gmol}^{-1}$  C : 12, H : 1, Cl : 35.5, Br : 80, I : 127)

**Q12. JEE Main 2026 (23 January Shift 2)**

In Carius method 0.2425 g of an organic compound gave 0.5253 g silver chloride. The percentage of chlorine in the organic compound is

- (1) 34.79%
- (2) 37.57%
- (3) 87.65%
- (4) 53.58%

**Q13. JEE Main 2026 (23 January Shift 2)**

Given below are two statements:

**Statement I:**  $(\text{CH}_3)_3\text{C}^\oplus$  is more stable than  $\text{C}^\oplus\text{H}_3$  as nine hyperconjugation interactions are possible in  $(\text{CH}_3)_3\text{C}^\oplus$ .

**Statement II:**  $\text{C}^\oplus\text{H}_3$  is less stable than  $(\text{CH}_3)_3\text{C}^\oplus$  as only three hyperconjugation interactions are possible in  $\text{C}^\oplus\text{H}_3$ .

In the light of the above statements, choose the correct answer from the options given below

- (1) Statement I is false but Statement II is true
- (2) Statement I is true but Statement II is false
- (3) Both Statement I and Statement II are true
- (4) Both Statement I and Statement II are false

**Q14. JEE Main 2026 (21 January Shift 1)**

In Carius method, 0.75 g of an organic compound gave 1.2 g of barium sulphate, find percentage of sulphur (molar mass  $32 \text{ g mol}^{-1}$ ). Molar mass of barium sulphate is  $233 \text{ g mol}^{-1}$ .

- (1) 10.30% (2) 16.48% (3) 21.97% (4) 4.55%

**Q15. JEE Main 2026 (21 January Shift 1)**

Identify correct statements from the following :

- A. Propanal and propanone are functional isomers.  
B. Ethoxyethane and methoxypropane are metamers.  
C. But-2-ene shows optical isomerism.  
D. But-1-ene and but-2-ene are functional isomers.  
E. Pentane and 2, 2-dimethyl propane are chain isomers.

Choose the correct answer from the options given below :

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

**Q16. JEE Main 2026 (21 January Shift 1)**

From the following, the least stable structure is:



**Q17. JEE Main 2026 (28 January Shift 1)**

CORRECT order of stability for the following is  $\text{CH}_2 = \text{CH}^-$ ,  $\text{CH}_3 - \text{CH}_2^-$ ,  $\text{CH} \equiv \text{C}^-$

- (1)  $\text{CH}_2 = \text{CH}^- > \text{CH} \equiv \text{C}^- > \text{CH}_3 - \text{CH}_2^-$   
(2)  $\text{CH} \equiv \text{C}^- > \text{CH}_2 = \text{CH}^- > \text{CH}_3 - \text{CH}_2^-$   
(3)  $\text{CH} \equiv \text{C}^- > \text{CH}_3 - \text{CH}_2^- > \text{CH}_2 = \text{CH}^-$   
(4)  $\text{CH}_3 - \text{CH}_2^- > \text{CH}_2 = \text{CH}^- > \text{CH} \equiv \text{C}^-$

**Q18. JEE Main 2026 (28 January Shift 1)**

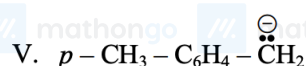
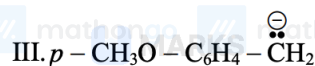
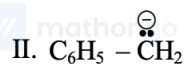
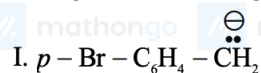
0.53 g of an organic compound (x) when heated with excess of nitric acid (concentrated) and then with silver nitrate gave 0.75 g of silver bromide precipitate. 1.0 g of (x) gave 1.32 g of  $\text{CO}_2$  gas on combustion. The percentage of hydrogen in the compound (x) is \_\_\_\_%.

[Nearest Integer]

[Given: Molar mass in  $\text{gmol}^{-1}$  H : 1, C : 12, Br : 80, Ag : 108, O : 16; Compound (x) :  $\text{C}_x\text{H}_y\text{Br}_z$ ]

**Q19. JEE Main 2026 (24 January Shift 1)**

Arrange the following carbanions in the decreasing order of stability.



Choose the correct answer from the options given below:

(1)  $\text{I} > \text{IV} > \text{II} > \text{V} > \text{III}$

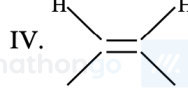
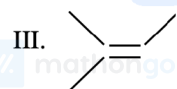
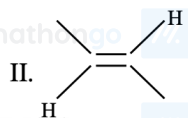
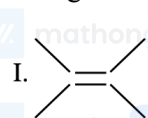
(2)  $\text{I} > \text{II} > \text{IV} > \text{V} > \text{III}$

(3)  $\text{IV} > \text{I} > \text{II} > \text{V} > \text{III}$

(4)  $\text{IV} > \text{II} > \text{I} > \text{III} > \text{V}$

**Q20. JEE Main 2026 (24 January Shift 1)**

Arrange the following alkenes in decreasing order of stability.



Choose the correct answer from the options given below:

(1)  $\text{III} > \text{II} > \text{I} > \text{IV}$

(2)  $\text{I} > \text{III} > \text{IV} > \text{II}$

(3)  $\text{III} > \text{I} > \text{II} > \text{IV}$

(4)  $\text{I} > \text{III} > \text{II} > \text{IV}$

**Q21. JEE Main 2026 (24 January Shift 1)**

In Dumas method for estimation of nitrogen, 0.50 g of an organic compound gave 70 mL of nitrogen collected at 300 K and 715 mm pressure. The percentage of nitrogen in the organic compound is \_\_\_\_ %.  
(Aqueous tension at 300 K is 15 mm).

ANSWERS AND SOLUTIONS

- |         |         |         |         |         |         |         |         |
|---------|---------|---------|---------|---------|---------|---------|---------|
| 1. (4)  | 2. (3)  | 3. (4)  | 4. (3)  | 5. (3)  | 6. (2)  | 7. (1)  | 8. 73   |
| 9. (1)  | 10. (3) | 11. 43  | 12. (4) | 13. (2) | 14. (3) | 15. (4) | 16. (4) |
| 17. (2) | 18. 4   | 19. (3) | 20. (4) | 21. 15  |         |         |         |

1. (4) Analyzing the pairs of compounds in List-I:

A. 2-Methylpropene ( $\text{CH}_3 - \text{C}(\text{CH}_3) = \text{CH}_2$ ) and but-1-ene ( $\text{CH}_3 - \text{CH}_2 - \text{CH} = \text{CH}_2$ ) have the same molecular formula  $\text{C}_4\text{H}_8$  but different carbon skeletons (branched vs straight chain). Thus, they are chain isomers.

(A-III)

B. Cis-but-2-ene and trans-but-2-ene are geometrical isomers, which fall under the category of stereoisomers. (B-I)

C. 2-Butanol ( $\text{C}_4\text{H}_9\text{OH}$ ) and diethyl ether ( $\text{C}_2\text{H}_5 - \text{O} - \text{C}_2\text{H}_5$ ) have the same molecular formula  $\text{C}_4\text{H}_{10}\text{O}$  but different functional groups (alcohol vs ether). Thus, they are functional group isomers. (C-IV)

D. But-1-ene and but-2-ene have the same carbon chain and functional group but differ in the position of the double bond (at  $\text{C}_1$  vs  $\text{C}_2$ ). Thus, they are position isomers. (D-II)

Matching the pairs: A-III, B-I, C-IV, D-II.

2. (3) Optical isomerism occurs when a compound has a chiral center (asymmetric carbon).

Examining each compound:

n-propyl chloride ( $\text{CH}_3\text{CH}_2\text{CH}_2\text{Cl}$ ) has no chiral center,

iso-propyl chloride ( $\text{CH}_3\text{CHClCH}_3$ ) has no chiral center,

sec-butyl chloride ( $\text{CH}_3\text{CH}_2\text{CHClCH}_3$ ) has one chiral center attached to four different groups, and

neo-pentyl chloride has no chiral center.

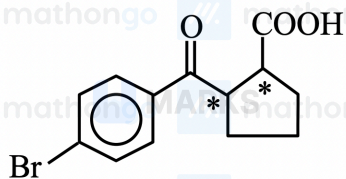
Therefore, sec-butyl chloride exhibits optical isomerism.

For  $\text{C}_4\text{H}_9\text{Cl}$ :

molar mass =  $4(12) + 9(1) + 35.5 = 92.5$  g/mol.

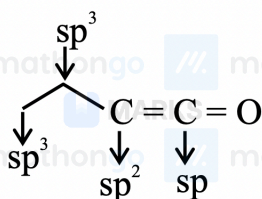
Carbon percentage =  $(48/92.5) \times 100 = 51.89\% \approx 52\%$

3. (4) Statement I:



Two chiral centre and due to presence of  $-COOH$  compound dissolves in  $NaHCO_3$ .

Statement II:



Two  $sp^3$  carbons, one  $sp^2$  carbon, and one  $sp$  carbon.

Both statements are true.

4. (3) Statement I: Sublimation is a process where a solid directly converts into vapor without passing through the liquid state. It is used to separate sublimable compounds from non-sublimable impurities. It is not specifically used for compounds based on having a low melting point, but rather based on their ability to sublime. Thus, Statement I is false.

Statement II: The boiling point of a liquid is the temperature at which its vapor pressure equals the external pressure. If the external pressure is reduced, the vapor pressure required to reach boiling is lower, which occurs at a lower temperature. Therefore, the boiling point decreases as the external pressure is reduced. Thus, Statement II is false.

Since both statements are false, the correct option is (3).

5. (3) A: Cation at  $C_1$ .  $\alpha$ -carbons are Methyl (3H),  $C_2$  (1H),  $C_6$  (2H). Total = 6.

B: Cation at  $C_1$ .  $\alpha$ -carbons are Methyl (3H),  $C_2$  (2H),  $C_6$  (2H). Total = 7.

C: Cation at  $C_1$ .  $\alpha$ -carbons are Methyl (3H),  $C_2$  (1H),  $C_6$  (2H). Total = 6.

D: Cation at  $C_1$ .  $\alpha$ -carbons are Ethyl group's  $CH_2$  (2H),  $C_2$  (1H),  $C_6$  (2H). Total = 5.

A and C both have 6  $\alpha$ -hydrogens, thus they have the same number of hyperconjugation structures.

6. (2) Both statements are true.

7. (1) Evaluating each statement:

(A) TRUE - More covalent bonds with lesser charge separation increases resonance stabilization.

(B) FALSE - In electromeric effect, unsaturated systems show +E effect toward nucleophiles and -E effect toward electrophiles, opposite to stated.

(C) TRUE - Inductive effect of polar groups affects melting points, boiling points, and dipole moments.

(D) FALSE - Greater alkyl substitution on doubly bonded carbons decreases heat of hydrogenation (more

substituted alkenes are more stable).

(E) TRUE - Higher s-character of orbital holding negative charge increases carbanion stability.

Statements NOT true: B and D. Therefore answer is B & D only.

8. (73) In combustion analysis:  $\text{CaCl}_2$  tube absorbs  $\text{H}_2\text{O}$  and potash tube absorbs  $\text{CO}_2$ .

Mass increase of  $\text{CaCl}_2 = 0.15$  g gives moles of  $\text{H}_2\text{O} = 0.15/18 = 0.00833$  mol, so moles of H = 0.01667 mol and mass of H = 0.01667 g.

Mass increase of potash = 0.1837 g gives moles of  $\text{CO}_2 = 0.1837/44 = 0.00417$  mol, so moles of C = 0.00417 mol and mass of C = 0.05 g.

Mass of O = 0.25 - 0.05 - 0.01667 = 0.18333 g.

Percentage of O =  $(0.18333/0.25) \times 100 = 73.33\% \approx 73\%$  (nearest integer).

9. (1) The main functional group is an ester ( $\text{COO}-$ ).

The alcohol part is n-propanol, giving an n-propyl ester.

For the acid part, identify the longest carbon chain: Starting from the carbonyl carbon (C1):

$\text{C}(=\text{O})\text{-CHBr}$  (C2)- $\text{CH}_2$  (C3)- $\text{CH}$ (with two methyls).

The isopropyl group represents two methyl branches on C4.

The longest continuous chain through the main skeleton and maximizing chain length is 7 carbons, making it a heptanoate.

Numbering from the carbonyl: C1-C2(Br)-C3-C4-C5(methyl substituent)-C6-C7.

Therefore, the IUPAC name is n-propyl 2-bromo-5-methylheptanoate.

10. (3) In Kjeldahl's method, nitrogen in the compound is converted to  $\text{NH}_3$ .

The ammonia is absorbed and reacts with  $\text{H}_2\text{SO}_4$  according to:  $2\text{NH}_3 + \text{H}_2\text{SO}_4 \rightarrow (\text{NH}_4)_2\text{SO}_4$ .

Given that 15 mL of 1 M  $\text{H}_2\text{SO}_4$  was neutralized:

Moles of  $\text{H}_2\text{SO}_4 = 15 \times 10^{-3}$  mol.

From stoichiometry, 1 mol  $\text{H}_2\text{SO}_4$  reacts with 2 mol  $\text{NH}_3$ .

Therefore, moles of  $\text{NH}_3 = 2 \times 15 \times 10^{-3} = 0.030$  mol.

Since each  $\text{NH}_3$  contains 1 nitrogen atom:

Moles of N = 0.030 mol.

Mass of N =  $0.030 \times 14 = 0.42$  g.

Percentage of N in compound =  $(0.42/1) \times 100 = 42\%$ .

11. (43) The sodium fusion extract gives violet color with  $\text{CHCl}_3$  and chlorine water, indicating the presence of iodine.

In the Carius method, 0.15 g of compound Y produces 0.12 g of silver halide precipitate ( $\text{AgI}$ ).

Molar mass of  $\text{AgI} = 108 + 127 = 235$  g/mol.

Moles of  $\text{AgI} = 0.12 / 235 = 0.000510$  mol.

Since each  $\text{AgI}$  contains one I atom, moles of I = 0.000510 mol.

Mass of I =  $0.000510 \times 127 = 0.0647$  g.

Percentage of halogen (iodine) in compound Y  
 $= (0.0647 / 0.15) \times 100 = 43.1\%$ , which rounds to 43% (nearest integer).

12. (4) In Carius method, chlorine is converted to AgCl.

Molar mass of AgCl = 143.5 g/mol.

Moles of AgCl formed =  $0.5253 / 143.5 = 0.003661$  mol.

Since each AgCl contains one Cl atom, moles of Cl = 0.003661 mol.

Mass of Cl =  $0.003661 \times 35.5 = 0.1300$  g.

Percentage of Cl =  $(0.1300 / 0.2425) \times 100 = 53.58\%$ .

13. (2) Statement I: In the tert-butyl carbocation  $(CH_3)_3C^+$ , there are three methyl groups attached to the carbocationic carbon. Each methyl group has 3  $\alpha$ -hydrogens, making a total of 9  $\alpha$ -hydrogens. Thus, 9 hyperconjugation interactions are possible, which significantly stabilize the carbocation. Statement I is true.

Statement II: In the methyl carbocation  $CH_3^+$ , there are no  $\alpha$ -carbons and consequently no  $\alpha$ -hydrogens. Hyperconjugation requires the presence of at least one  $\alpha$ -hydrogen on a carbon adjacent to the  $sp^2$  hybridized carbocation center. Therefore, zero hyperconjugation interactions are possible in  $CH_3^+$ . Statement II is false because it claims three hyperconjugation interactions are possible.

Conclusion: Statement I is true but Statement II is false.

14. (3) In Carius method, sulfur is converted to  $BaSO_4$ . Each mole of  $BaSO_4$  contains 1 mole of S.

Mass of S =  $\frac{32}{233} \times 1.2 = 0.1648$  g

Percentage of S =  $\frac{0.1648}{0.75} \times 100 = 21.97\%$

15. (4) A. Propanal ( $CH_3CH_2CHO$ ) and propanone ( $CH_3COCH_3$ ): Same formula  $C_3H_6O$ , different functional groups (aldehyde vs ketone)  $\rightarrow$  Functional isomers. True

B. Ethoxyethane ( $C_2H_5OC_2H_5$ ) and methoxypropane ( $CH_3OC_3H_7$ ): Same ether group, different alkyl groups  $\rightarrow$  Metamers. True

C. But-2-ene ( $CH_3CH=CHCH_3$ ): No chiral carbon, shows geometrical isomerism (cis-trans), not optical. False

D. But-1-ene and but-2-ene: Both are alkenes, differ in position of double bond  $\rightarrow$  Position isomers, not functional isomers. False

E. Pentane and 2,2-dimethylpropane: Both  $C_5H_{12}$ , different carbon skeleton  $\rightarrow$  Chain isomers. True  
Correct: A, B and E only.

16. (4) To determine the stability of resonating structures, we follow these rules:

1. Structures with more covalent bonds are generally more stable.
2. Structures where all atoms have complete octets are more stable.
3. Separation of opposite charges decreases stability, while like charges on adjacent atoms highly destabilize the structure.
4. Negative charge on a more electronegative atom and positive charge on a more electropositive atom is

preferred.

In structure (4), there are two positive charges (+) located on adjacent atoms (the carbon atom and the nitrogen atom of the nitro group).

Electrostatic repulsion between like charges on adjacent atoms makes the structure highly unstable.

In structures (1), (2), and (3), like charges are not on adjacent atoms.

Therefore, structure (4) is the least stable.

**17. (2)** Carbanion stability is determined by the s-character of the hybrid orbital bearing the negative charge.

The acetylide anion  $CH \equiv C^-$  has the carbanion on an  $sp$  hybridized carbon (50% s-character), providing optimal stabilization through efficient overlap with the charged orbital.

The vinyl anion  $CH_2 = CH^-$  has the carbanion on an  $sp^2$  hybridized carbon (33% s-character), offering moderate stabilization.

The primary alkyl anion  $CH_3 - CH_2^-$  has the carbanion on an  $sp^3$  hybridized carbon (25% s-character), providing the least stabilization.

Greater s-character enables better penetration of the nucleus and enhanced stabilization of the negative charge.

Therefore, the order is  $CH \equiv C^- > CH_2 = CH^- > CH_3 - CH_2^-$ .

**18. (4)** From AgBr precipitate:

0.75 g AgBr ( $M = 188$ ) equals 0.00399 mol Br, so the compound has one Br atom.

From combustion of 1.0 g:

1.32 g  $CO_2$  ( $M = 44$ ) equals 0.03 mol C.

The molar mass is found from 0.53 g sample:

$M = (0.53 \times 188)/(0.75 \times 1) = 133$  g/mol.

From 1.0 g sample producing 0.03 mol  $CO_2$

We have  $(1.0/133) \times x = 0.03$ , giving  $x = 4$ .

Thus the molecular formula is  $C_4H_5Br$  with  $M = 48 + 5 + 80 = 133$ .

Percentage of hydrogen =  $(5/133) \times 100 = 3.76\%$ , which rounds to 4%.

**19. (3)** Carbanion stability increases with electron-withdrawing groups (stabilize negative charge) and decreases with electron-donating groups (destabilize negative charge).

IV has CHO (strongly electron-withdrawing by inductive effect), most stable.

I has Br (weakly electron-withdrawing).

II is pure benzyl with resonance from ring.

V has  $CH_3$  (weakly electron-donating).

III has  $OCH_3$  (strongly electron-donating, destabilizes the carbanion).

The critical factor is inductive electron-withdrawing ability:

$CHO > Br > H > CH_3 > OCH_3$ .

Therefore:  $IV > I > II > V > III$ .

20. (4) Alkene stability increases with the degree of alkyl substitution on the double bond due to hyperconjugation and inductive stabilization effects.

Analyzing each structure:

I is tetrasubstituted (4 alkyl groups attached to the two  $sp^2$  carbons), the most stable.

III appears to be a disubstituted alkene with specific geometry providing enhanced stability.

II is trisubstituted (3 alkyl groups and 1 hydrogen).

IV is also disubstituted but with different geometry, less stable than III.

The decreasing order of stability: tetrasubstituted > trisubstituted > disubstituted variations.

Therefore: I > III > II > IV.

21. (15) Given data:

Mass of organic compound ( $w$ ) = 0.50 g

Volume of nitrogen gas ( $V_1$ ) = 70 mL

Temperature ( $T_1$ ) = 300 K

Total pressure = 715 mm Hg

Aqueous tension = 15 mm Hg

Pressure of dry nitrogen ( $P_1$ ) =  $715 - 15 = 700$  mm Hg

Convert the volume of nitrogen to STP conditions ( $P_0 = 760$  mm Hg,  $T_0 = 273$  K):

Using the combined gas law:  $\frac{P_1 V_1}{T_1} = \frac{P_0 V_0}{T_0}$

$$V_0 = \frac{P_1 V_1 T_0}{P_0 T_1} = \frac{700 \times 70 \times 273}{760 \times 300} \approx 58.68 \text{ mL}$$

At STP, 22400 mL of  $N_2$  weighs 28 g.

$$\text{Mass of } N_2 \text{ collected} = \frac{28 \times 58.68}{22400} \text{ g}$$

$$\text{Percentage of nitrogen} = \frac{\text{Mass of } N_2}{\text{Mass of compound}} \times 100$$

$$\%N = \frac{28 \times 58.68}{22400 \times 0.50} \times 100$$

$$\%N = \frac{28 \times 58.68}{112} = \frac{58.68}{4} = 14.67\%$$

Rounding to the nearest integer, we get 15.