

Q1. JEE Main 2026 (21 January Shift 2)

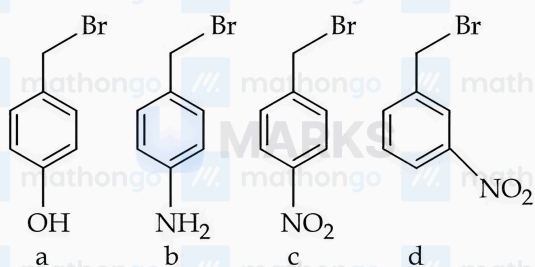
The correct order of the rate of the reaction for the following reaction with respect to nucleophiles is :



- (1) $\text{PhO}^- > ^-\text{OH} > \text{CH}_3\text{COO}^- > \text{ClO}_4^-$
- (2) $\text{CH}_3\text{COO}^- > \text{PhO}^- > ^-\text{OH} > \text{ClO}_4^-$
- (3) $^-\text{OH} > \text{PhO}^- > \text{CH}_3\text{COO}^- > \text{ClO}_4^-$
- (4) $\text{ClO}_4^- > \text{CH}_3\text{COO}^- > ^-\text{OH} > \text{PhO}^-$

Q2. JEE Main 2026 (21 January Shift 2)

The correct order of reactivity of the following benzyl halides towards reaction with KCN is :



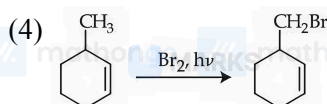
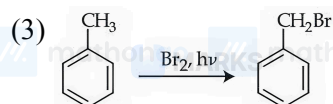
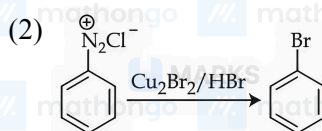
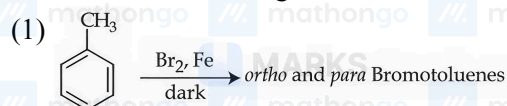
- (1) $b > a > c > d$
- (2) $b > a > d > c$
- (3) $a > b > d > c$
- (4) $a > b > c > d$

Q3. JEE Main 2026 (23 January Shift 1)

Consider all the structural isomers with molecular formula $\text{C}_5\text{H}_{11}\text{Br}$ are separately treated with KOH(aq) to give respective substitution products, without any rearrangement. The number of products which can exhibit optical isomerism from these is ____.

Q4. JEE Main 2026 (28 January Shift 2)

Which of the following reaction is NOT correctly represented?

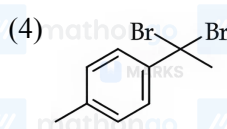
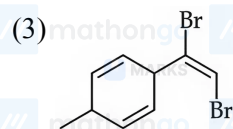
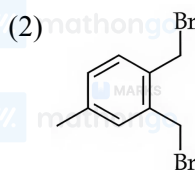
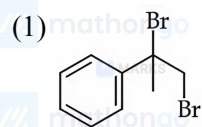


Q5. JEE Main 2026 (24 January Shift 2)

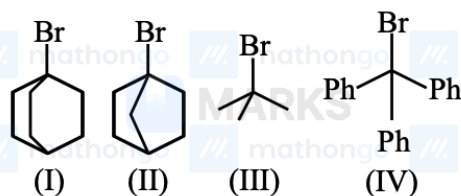
Grignard reagent RMgBr(P) reacts with water and forms a gas (Q). One gram of Q occupies 1.4dm^3 at STP. (P) on reaction with dry ice in dry ether followed by H_3O^+ forms a compound (Z). 0.1 mole of (Z) will weigh ____ g. (Nearest integer)

Q6. JEE Main 2026 (22 January Shift 2)

The dibromo compound [P] (molecular formula : $\text{C}_9\text{H}_{10}\text{Br}_2$) when heated with excess sodamide followed by treatment with dilute HCl gives [Q]. On warming [Q] with mercuric sulphate and dilute sulphuric acid yield [R] which gives positive Iodoform test but negative Tollen's test. The compound [P] is :

**Q7. JEE Main 2026 (22 January Shift 1)**

The correct order of the rate of reaction of the following reactants with nucleophile by SN_1 mechanism is: (Given : Structure I and II are rigid)



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

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

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

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

Q8. JEE Main 2026 (22 January Shift 1)

As compared with chlorocyclohexane, which of the following statements correctly apply to chlorobenzene?

- A. The magnitude of negative charge is more on chlorine atom.
- B. The C – Cl bond has partial double bond character.
- C. C – Cl bond is less polar.
- D. C – Cl bond is longer due to repulsion between delocalised electrons of the aromatic ring and lone pairs of electrons of chlorine.
- E. The C – Cl bond is formed using sp^2 hybridised orbital of carbon.

Choose the correct answer from the options given below:

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

Q9. JEE Main 2026 (22 January Shift 1)

The correct order of reactivity of CH_3Br in methanol with the following nucleophiles is F^- , I^- , $C_2H_5O^-$ and $C_6H_5O^-$

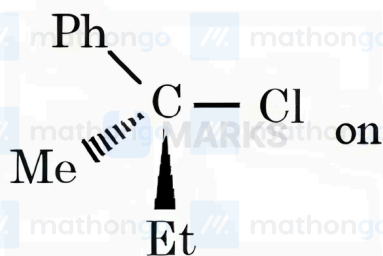
- (1) $I^- > C_2H_5O^- > F^- > C_6H_5O^-$
- (2) $I^- > C_2H_5O^- > C_6H_5O^- > F^-$
- (3) $I^- > F^- > C_6H_5O^- > C_2H_5O^-$
- (4) $I^- > C_6H_5O^- > F^- > C_2H_5O^-$

Q10. JEE Main 2026 (24 January Shift 1)

Given below are two statements:

Statement I: 'C – Cl' bond is stronger in $CH_2 = CH - Cl$ than $CH_3 - CH_2 - Cl$

Statement II: The given optically active molecule,



on hydrolysis gives a solution that can rotate the plane polarized light.

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

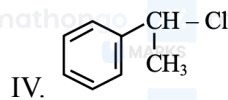
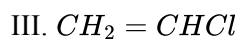
Q11. JEE Main 2026 (24 January Shift 1)

Match the LIST-I with LIST-II

List-I (Chloro derivative)

- A. Vinyl Chloride
- B. Benzyl chloride
- C. Alkyl chloride
- D. Allyl chloride

List-II (Example)



Choose the correct answer from the options given below:

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

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

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

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

ANSWERS AND SOLUTIONS

1. (3) 2. (2) 3. 3 4. (4) 5. 6 6. (4) 7. (4) 8. (1)
9. (2) 10. (4) 11. (4)

1. (3) For the S_N2 reaction $CH_3Br + Nu^-$, nucleophilicity in aprotic solvents is determined by basicity and polarizability.
 ^-OH (hydroxide) is the strongest nucleophile and base, making it highly reactive.
 PhO^- (phenoxide) is a good nucleophile with reasonable basicity.
 CH_3COO^- (acetate) is weakened by resonance stabilization of its negative charge across the C-O bonds, reducing its nucleophilicity.
 ClO_4^- (perchlorate) is a very weak nucleophile, being the conjugate base of a strong acid ($HClO_4$).
The correct order of nucleophilicity is: $^-OH > PhO^- > CH_3COO^- > ClO_4^-$, which matches option (3).
2. (2) Reactivity in S_N2 reactions with KCN depends on the stability and nucleophilicity of the transition state.
For benzyl halides, substituents on the benzene ring affect the reactivity of the benzylic carbon through resonance and inductive effects.
Para-nitro group ($-NO_2$) is strongly electron-withdrawing, activating the benzylic carbon toward nucleophilic substitution.
Para-amino ($-NH_2$) is electron-donating, deactivating.
Para-hydroxyl ($-OH$) is weakly donating.
Meta-nitro group has reduced electron-withdrawal compared to para-position.
Order of reactivity based on electronic effects: para- NO_2 (c) > meta- NO_2 (d) > para- OH (a) > para- NH_2 (b).
This gives $b > a > d > c$.
3. (3) For $C_5H_{11}Br$ structural isomers to show optical isomerism after KOH substitution ($Br \rightarrow OH$), the resulting product must have a chiral center (asymmetric carbon with four different groups).
Possible carbon skeletons: n-pentane, 2-methylbutane, 2,2-dimethylpropane.
Analysis of isomers:
2-bromopentane $\rightarrow CH_3CHOHCH_2CH_2CH_3$: C2 bonded to H, OH, CH_3 , and $CH_2CH_2CH_3$ (chiral).
3-bromopentane $\rightarrow CH_3CH_2CHOHCH_2CH_3$: C3 bonded to H, OH, CH_2CH_3 , CH_2CH_3 (NOT chiral).
3-bromo-2-methylbutane $\rightarrow CH_3CH(CH_3)CHOHCH_3$: Chiral center present.
1-bromo-3-methylbutane $\rightarrow HOCH_2CH(CH_3)CH_2CH_3$: C2 bonded to H, OH, CH_3 , and CH_2CH_3 (chiral).
2,2-dimethylpropane derivatives: No chiral centers possible.
Compounds giving chiral products: 2-bromopentane, 3-bromo-2-methylbutane, and 1-bromo-3-methylbutane.
Total = 3.
4. (4) Reaction (1): Toluene + Br_2/Fe in dark conditions undergoes electrophilic aromatic substitution on the benzene ring, producing ortho and para bromotoluenes. This is correctly represented.

Reaction (2): The diazonium salt reacts with Cu_2Br_2/HBr via the Sandmeyer reaction to produce bromobenzene.

This is correctly represented.

Reaction (3): Toluene + Br_2 with light ($h\nu$) undergoes free radical substitution at the benzylic position, producing benzyl bromide (CH_2Br). This is correctly represented.

Reaction (4): Cyclohexene is shown producing an allylic bromination product, but cyclohexene with Br_2 and light undergoes electrophilic addition across the $C=C$ double bond to form dibromocyclohexene or undergoes addition rather than simple allylic substitution. This representation is incorrect.

5. (6) Grignard reagent $RMgBr$ reacts with water to produce gas Q.

One gram of Q occupies 1.4 L at STP.

Moles of Q = $1.4/22.4 = 0.0625$ mol, so molar mass = $1/0.0625 = 16$ g/mol, identifying Q as CH_4 .

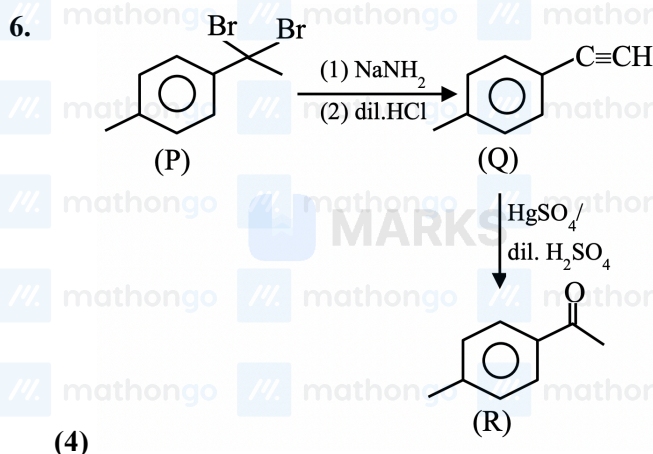
Thus P = CH_3MgBr .

When P reacts with dry ice: $CH_3MgBr + CO_2 \rightarrow CH_3COOMgBr$.

Upon treatment with H_3O^+ , this gives Z = CH_3COOH (acetic acid).

Molar mass of Z = 60 g/mol.

Mass of 0.1 mol = $0.1 \times 60 = 6$ g.



(4)

7. (4) Rate of $S_N1 \propto$ Stability of $C^\oplus$ formed

(I) and (II) are unstable due to Bredt's rule, (I) has more +I effect.

(II) < (I) < (III) < (IV)

8. (1) Chlorobenzene has Cl attached to an sp^2 carbon of the benzene ring, while chlorocyclohexane has Cl attached to an sp^3 carbon.

Statement B is correct: the C-Cl bond has partial double bond character due to resonance with the aromatic π system, where chlorine's lone pairs interact with the aromatic ring.

Statement C is correct: the C-Cl bond is less polar in chlorobenzene because the resonance contribution reduces the electronegativity difference between C and Cl.

Statement E is correct: the C-Cl bond is formed using sp^2 hybridized orbital of carbon.

Statement A is incorrect because chlorine carries less negative charge due to resonance donation to the aromatic system.

Statement D is incorrect because the C-Cl bond is actually shorter in chlorobenzene due to partial double bond character, not longer.

The correct statements are B, C, and E only.

9. (2) In methanol (protic solvent), nucleophilicity is determined by basicity and solvation effects. Smaller ions are heavily solvated by the protic solvent, reducing their effective nucleophilicity.

$C_2H_5O^-$ (ethoxide) is the strongest nucleophile as it is less solvated and highly basic.

$C_6H_5O^-$ (phenoxide) is weaker due to resonance stabilization by the benzene ring.

F^- is highly solvated despite high basicity, reducing its nucleophilicity significantly.

I^- is the best nucleophile because it is the largest ion and least solvated in methanol.

The correct order is $I^- > C_2H_5O^- > C_6H_5O^- > F^-$.

10. (4) Statement I: In vinyl chloride ($CH_2=CH-Cl$), the C-Cl bond involves an sp^2 hybridized carbon, while in ethyl chloride (CH_3-CH_2-Cl), it involves an sp^3 carbon. The sp^2 carbon has greater s-character, forming a shorter and stronger C-Cl bond. Additionally, resonance stabilization from the Cl atom's p-orbital overlapping with the π system further strengthens the vinyl C-Cl bond. Statement I is TRUE.

Statement II: The optically active molecule shown has a stereogenic center bearing Me, Ph, Et, and Cl groups. Upon hydrolysis via nucleophilic substitution (typically SN_1 for tertiary or secondary centers), the C-Cl bond breaks to form an alcohol. SN_1 mechanism generates a carbocation intermediate, allowing nucleophilic attack from both faces, producing a racemic mixture of the alcohol product. A racemic solution cannot rotate polarized light as the d- and l-enantiomers cancel each other's rotations. Statement II is FALSE.

11. (4) Vinyl Chloride has Cl directly attached to a C=C double bond, matching III: $\text{CH}_2=\text{CHCl}$.

Benzyl Chloride has CH_2Cl attached to a benzene ring, matching IV (benzene with CH_2Cl substituent).

Alkyl Chloride is a general chlorine-substituted alkane, matching II: $\text{CH}_2-\text{CH}(\text{Cl})\text{CH}_3$ (a standard secondary alkyl chloride).

Allyl Chloride has CH_2Cl attached to the allylic position (adjacent to C=C), matching I: $\text{CH}_2=\text{CH}-\text{CH}_2\text{Cl}$.

The correct matching is A-III, B-IV, C-II, D-I.