

# Haloalkanes and Haloarenes

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## Assertion & Reason Type Questions

consists of two statements, one is Assertion (A) and the other is Reason (R). Give answer:

- a. Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
- b. Both Assertion (A) and Reason (R) are true but Reason (R) is not a correct explanation of Assertion (A).
- c. Assertion (A) is true but Reason (R) is false.
- d. Assertion (A) is false but Reason (R) is true.

**Q 1. Assertion (A):** Chlorobenzene is less reactive towards nucleophilic substitution reaction.

**Reason (R):** Nitro group in chlorobenzene increases its reactivity towards nucleophilic substitution reaction.

**Answer :** (b) Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A).

**Q 2. Assertion (A):** Chlorobenzene is resistant to nucleophilic substitution reaction at room temperature.

**Reason (R):** C-Cl bond gets weaker due to

**Answer :** (b) The electron pair on chlorine atom is in conjugation with the electrons of the benzene ring. This results in delocalisation of the electrons of C-Cl bond and a partial double bond character develop in the bond which makes it difficult for the nucleophile to cleave the C-Cl bond. Hence, assertion is true but reason is false.

**Q 3. Assertion (A):** Alkyl halides are insoluble in water. resonance.

**Reason (R):** Alkyl halides have halogen attached to  $sp^3$  hybrid carbon.

**Answer :** (b) Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A).

**Q 4. Assertion (A):** It is difficult to replace chlorine by - OH in chlorobenzene in comparison to that in chloroethane.

**Reason (R):** Chlorine-carbon (C-Cl) bond in chlorobenzene has a partial double bond character due to resonance.

**Answer :** (a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of the Assertion (A).

**Q 5. Assertion (A):** The boiling points of alkyl halides decrease in the order:  $RI > RBr > RCl > RF$ .

**Reason (R):** The boiling points of alkyl chlorides, bromides and iodides are considerably higher than that of the hydrocarbon of comparable molecular

**Answer :** (b) Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A).

**Q 6. Assertion (A):** KCN reacts with methyl chloride to mass. give methyl isocyanide.  
**Reason (R):** CN is an ambident nucleophile.

**Answer :** (d) Assertion (A) is false because KCN reacts with methyl chloride to give methyl cyanide as the main product along with a small amount of methyl isocyanide.

**Q 7. Assertion (A):** Nucleophilic substitution of iodoethane is easier than chloroethane.  
**Reason (R):** Bond enthalpy of C-I bond is less than that of C-Cl bond.

**Answer :** (a) In iodoethane, there is bonding between the s orbital and 3p orbitals whereas in chloroethane, the bonding is in between 2p and 3p orbital. The bonding between 2p and 3p orbital is more effective than s and 3p orbital. Since, there is less bond energy in the C-I bond than in the C-Cl bond, therefore it is easier to break the C-I bond in iodoethane and hence easier is the nucleophilic substitution. So, both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).

**Q 8. Assertion (A):** tert-Butyl bromide undergoes Wurtz reaction to give 2, 2, 3, 3-tetramethylbutane.

**Reason (R):** In Wurtz reaction, alkyl halides react with sodium in dry ether to give hydrocarbon containing double the number of carbon atoms present in the halide.

**Answer :** (a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of the Assertion (A).

**Q 9. Assertion (A):** Presence of a nitro group at ortho or para position increases the reactivity of haloarenes towards nucleophilic substitution.

**Reason (R):** Nitro group, being an electron withdrawing group decreases the electron density over the benzene ring.

**Answer :** (a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of the Assertion (A).

**Q 10. Assertion (A):** In monohaloarenes, further electrophilic substitution occurs at ortho and para positions.

**Reason (R):** Halogen atom is a ring deactivator.

**Answer :** (b) Halogen being more electronegative acts as ring deactivator as it dominates -I effect over +m. However, lone pairs on halogen delocalises in the ring which enable further electrophilic substitution at ortho and para positions. Thus, assertion and reason both are true and reason is the correct explanation of assertion.

**Q 11. Assertion (A):** Aryl iodides can be prepared by reaction of arenes with iodine in the presence of an oxidising agent.

**Reason (R):** Oxidising agent oxidises I, into HI.

**Answer :** (c) Aryl iodide can be prepared by the reaction of arenes with iodine in the presence of an oxidising agent. So, assertion is true. Also, HI convert into I<sub>2</sub> by the oxidising agent such as HIO, although HI can convert aryl halides into arenes.

**Q12. Assertion :** S<sub>N</sub><sup>2</sup> reaction of an optically active aryl halide with an aqueous solution of KOH always gives an alcohol with opposite sign of rotation.

**Reason :** S<sub>N</sub><sup>2</sup> reactions always proceed with inversion of configuration.

**Q13. Assertion :** Alkylbenzene is not prepared by Friedel-Crafts alkylation of benzene.

**Reason :** Alkyl halides are less reactive than acyl halides.

**Q14. Assertion :** Exposure of ultraviolet rays to human causes the skin cancer, disorder and disrupt the immune system.

**Reason :** Carbon tetrachloride is released into air it rises to atmosphere and depletes the ozone layer.

**Q15. Assertion :** CHCl<sub>3</sub> is stored in dark bottles.

**Reason :** CHCl<sub>3</sub> is oxidised in dark.

**Q16. Assertion :**  $\text{CCl}_4$  is not a fire extinguisher.

**Reason :**  $\text{CCl}_4$  is insoluble in water.

### **ANSWER KEY 12 to 16**

**Q12 :** (d) Assertion is false, because aryl halides do not undergo nucleophilic substitution under ordinary conditions. This is due to resonance, because of which the carbon–chlorine bond acquires partial double bond character, hence it becomes shorter and stronger and thus cannot be replaced by nucleophiles. However Reason is true.

**Q13 :** (c) Alkyl halides give polyalkylation products.

**Q14 :** (b) Carbon tetrachloride rises to atmosphere and deplete the ozone layer. This depletion of ozone layer increases exposure of UV rays to human being which lead to increase of skin cancer, eye diseases and disorder with disruption of the immune system.

**Q15 :** (c)  $\text{CHCl}_3$  is stored in dark bottles to prevent oxidation of  $\text{CHCl}_3$  in presence of sunlight.

**Q16 :** (d)  $\text{CCl}_4$  is used as a fire extinguisher. The dense, non combustible vapours cover the burning substance and prevents the availability of oxygen around burning material.