

## SHORT QUESTIONS

**Q.1 Aromatic compounds burn with sooty flame, why?**

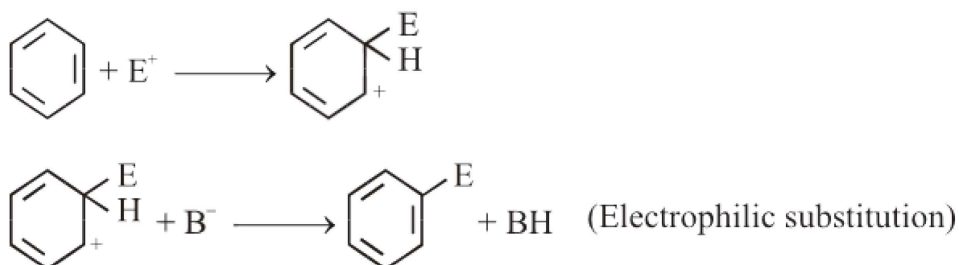
**Ans.** Aromatic compounds have high percentage of carbon as compared to hydrogen. Aromatic compounds containing six carbon atoms have six hydrogen in it but the aliphatic compounds with six carbon atoms have fourteen hydrogen atoms aromatic compounds due to greater percentage of carbon, do not burn properly and give soot or smoke of carbon.

**Q.2 What is meant by aromatic compounds?**

**Ans.** The term aromatic was derived from the Greek word "aroma" meaning "fragrant" usually the compounds containing six membered benzene ring are called aromatic compound e.g., phenol, toluene, benzene, naphthalene, etc.

**Q.3 Benzene usually undergoes electrophilic substitution reaction and not addition reactions, why?**

**Ans.** In benzene ring, delocalized Pi-electrons are present in the form of sheath. This sheath of electrons above and below the carbon plane can be donated to the substance, which is electron deficient. During electrophilic substitution reactions, the aromaticity of ring remains as such. In addition reaction of benzene it changes to a non-aromatic compounds.



**Q.4 Benzene is less reactive than alkanes, why?**

**Ans.** In benzene ring, delocalized Pi-electrons are present in the form of sheath above and below the carbon plane. In case of ethene, localized Pi-electron cloud is present. Delocalized cloud of electrons is more stable as compared to localized cloud. Some energy is required to break the delocalization of electronic cloud called resonance energy. Due to this resonance stability benzene is less reactive than alkene.

**Q.5 Give two reactions of benzene in which it behaves as saturated hydrocarbon.**

**Ans.** (i) Benzene reacts with chlorine in the presence of Fe to form chlorobenzene.

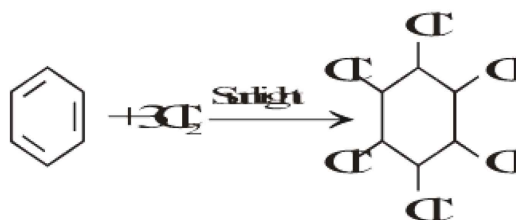


- (ii) Benzene reacts with nitric acid in the presence of sulphuric acid to form nitrobenzene.



**Q.6** What product will be formed when benzene reacts with chlorine (i) in the presence of sunlight (ii) in the presence of Fe catalyst?

**Ans.** Benzene in the presence of sunlight undergoes addition reaction and form hexachloride.



In the presence of Fe benzene undergoes electrophilic substitution.



**Q.7** Why benzene is given a cyclic structure?

**Ans.** Benzene given a cyclic structure due to following reasons:

- It has one mono substitution product.
- It has three di-substitution products.
- It can add three molecules of chlorine and three molecules of hydrogen. It means it has three double bonds.

Above observation indicates that it has cyclic structure.

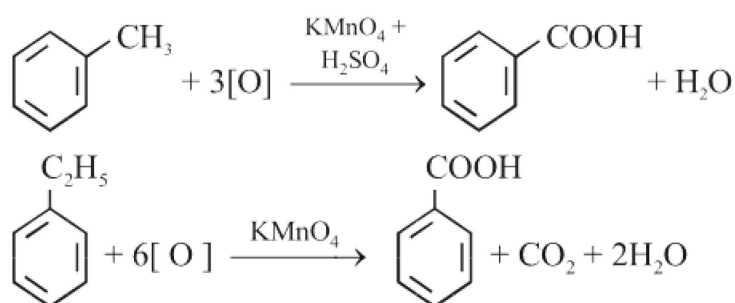
**Q.8** Bond length of C-C in benzene is intermediate between single and double bonds, explain it.

**Ans.** X-rays analysis has shown that C-C bond length in benzene lies in between double and single bond. C-C double bond of benzene have intermediate properties of single and double bond.

- In alkane C-C bond length is 1.54 Å.
- In alkene C=C bond length is 1.34 Å.
- In benzene C-C bond length is 1.397 Å.

**Q.9** What products are formed by the oxidation of toluene and ethylbenzene in the presence of strong oxidizing agent?

**Ans.** In the presence of acidified  $\text{KMnO}_4$  side chain of benzene oxidized to  $-\text{COOH}$  group irrespective to the number of carbon atoms in side chain.



**Q.10** Halogens are more electronegative than carbon but halobenzenes have electron-donating effect, why?

**Ans.** According to electronegativity of halogens they should have electron withdrawing effect and meta directors. In actual practice, they have electron donating effect and ortho-para-directors due to resonance factor. Lone pairs present at halogen atom increases the electron density of benzene ring and activate the ring.