24- Benzene and its compounds.

(Q-1) Delocalisation in benzene. (C_6H_6)

> Overlap of the p orbitals in the 3 π bonds in benzene ~~causes~~ produces a ring of delocalised electrons above and below the plane of benzene.
These delocalised electrons are very attractive for the electrophiles to attack ∴ they undergo electrophilic substitution rather than addition.
The substitution reactions involve a temporary breaking of the delocalisation ∴ the activation energy is high, and the reactions tend to be relatively slow.

(Q-2) Reactivity ~~de~~ difference between benzene and chlorobenzene.

> Chlorobenzene reacts more slowly than benzene.

- Chlorine is said to be the deactivating group.
- Chlorine is more electronegative than carbon, so it draws electrons in the ring towards itself.
- This decreases the electron density around the ring so its less attractive for ~~nucleophiles~~ electrophites ∴ the reaction is slower than benzene.

Q-3) Acidic character of phenol, alcohol and water.

PHENOL > WATER > ALCOHOL

most acidic — least acidic

Phenol is weakly acidic

$$C_6H_5OH \rightleftharpoons C_6H_5O^- + H^+$$

> The phenoxide ion has its negative charge spread over the whole ion as one of the lone pairs on oxygen atom, overlaps with the delocalised π bonds.
This reduces its charge density ∴ H^+ ions are not strongly attracted.
Also, phenol ionises to form a stable negative ion ∴ the equilibrium lies to the right.

> In ~~the~~ alcohols, the electron donating alkyl groups (attached to oxygen atom) ~~done~~ concentrate the negative charge on the oxygen atom, which more readily accepts H^+. ∴ the equilibrium lies to the left.

Q-4) Benzene structure:

- All C-C bonds are of same length.
- Bond angles are 120°
- σ bonds between C-C and C-H
- Carbon's are sp^2 hybridised
- delocalised e^- form rings of charge above and below plane of carbon.