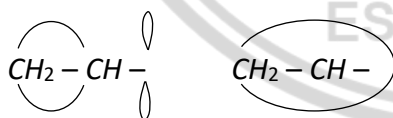
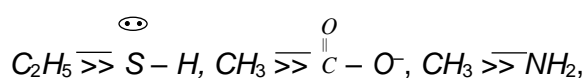


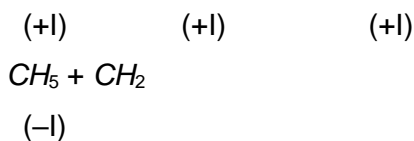
Organic reactions and their mechanism

21. (d) $\text{CH}_3 - \text{O}^-$ is the strongest nucleophile which is capable of acting as donor of electron pair.
22. (a) The phenyl ring having $\text{H} - \text{N} <$ group is activated while another one is deactivated due to $\text{C} = \text{O}$, so electrophilic aromatic bromination will occur at para position with respect to $\text{H} - \text{N} <$ group inactivated ring.
23. (d) The non reactivity of the chlorine atom in vinyl chloride may be explained from the molecular orbital point of view as follows. If the chlorine atom has sp^2 hybridization the $\text{C} - \text{Cl}$ bond will be a σ -bond and the two lone pairs of electron would occupy the other two sp^2 orbitals. This would leave a p -orbital containing a lone pair and this orbital could not conjugate with the π bond of the ethylenic link. Thus two M.O.S. will be required to accommodate these four π electrons. Further more since chlorine is more electronegative than carbon, the electron will tend to be found in the chlorine atom has now lost full control of the one pair and so, is less negative than it would have been had there been no conjugation. Since two carbon atoms have acquired a share in the lone pair, each atom acquires a small negative charge. Hence, owing to delocalisation of bonds (through conjugation), the vinyl chloride molecule has an increased stability. Before the chlorine atom can be displaced by some other group the lone pair must be localised again on the chlorine atom. This requires energy and so the chlorine is more firmly bound than has no conjugation occurred.



24. (a) Nucleophiles are those substances which can donate a pair of electrons. These can be neutral or negative. The nucleophilic power depends on the tendency of species to donate electrons. This is more, when an electron pushing group ($+I$ group) is present. Among the alkyl groups, those having higher number of C -atoms will push more, hence ethyl $>$ methyl.





25. (a) Conjugated acid of Cl^- is a stronger acid i.e., HCl .

26. (b) Saytzeffs product.

27. (d) 2, 3

28. (b) Reactivity order rule:

Electron-donating groups (EDG) → activate benzene

Electron-withdrawing groups (EWG) → deactivate benzene

Now check each compound:

IV. Toluene (CH_3 -benzene)

• $-CH_3$ is an **activating group** (+I, hyperconjugation)

→ **MOST reactive**

II. Benzene

• No substituent

→ Reactivity = **moderate**

I. Chlorobenzene

• $-Cl$ is **deactivating** (-I effect)

But due to +M resonance, it directs ortho/para but still **less reactive than benzene**.

III. Anilinium chloride ($C_6H_5-NH_3^+$)

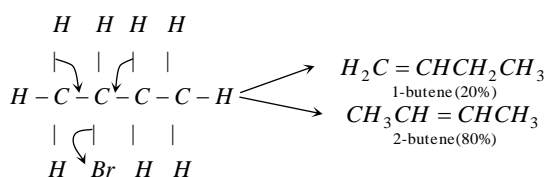
• $-NH_3^+$ is a **strongly deactivating group**

• Strong -I and no +M

→ **LEAST reactive**

29. (b) If the dehydrohalogenation of an alkyl halide can yield more than one alkene, then according to the saytzeff rule, the main product is the most highly substituted alkene.





30. (d) Halogenation of alkanes takes place in presence of light (sunlight or UV) or at elevated temperature via free radical.
31. (d) All the given species undergo nucleophilic substitution reaction. This reactivity can be explained in terms of the nature of $\text{C}-\text{X}$ bond which is highly polarised covalent bond due to large difference in the electronegativities of carbon and halogen atoms.



32. (c) Increasing + I effect

