ORGANIC CHEMISTRY

1. General principles
A brief review of classification & sources of organic compounds, sp³, sp², sp hybridization, sigma & pi- bonds, bond lengths, bond angles & bond energies along with their significance in reactions should be carried out. An overview of bond polarization, hydrogen bonds, inductive effects, resonance, and hyper conjugation be taken. Concept of homolytic & heterolytic bond fission, acidity & basicity with different theories should be covered briefly. Ease of formation & order of stabilities of electron deficient & electron rich species along with the reasons for the same should be covered. Relationships between energy content, stability, reactivity & their importance in chemical reactions should be covered. Calculations for determining empirical & molecular formula should be covered.

2. Different classes of compounds
The following classes of compounds should be taught in detail with respect to their IUPAC / systematic nomenclature, industrial [wherever applicable] & laboratory methods of preparations, physical properties & chemical reactions with emphasis on reaction mechanisms [arrow based] & stereochemistry [wherever applicable].
   • Alkanes [including cyclic compounds]
   • Alkenes [including cyclic compounds]
   • Alkynes [only open chain compounds]
   • Aliphatic hydroxyl compounds
   • Alkyl halides
   • Aldehydes & ketones
   • Carboxylic acids
   • All functional derivatives of carboxylic acids.

3. Protection & deprotection of groups
Introduction to protection & deprotection of functional groups. Two examples each for amino, hydroxyl, & carbonyl groups. The significance of these in syntheses should be explained.

4. Aromaticity & aromatic chemistry

5. Different aromatic classes of compounds
The following classes of compounds with respect to their IUPAC / systematic nomenclature, industrial [wherever applicable] & laboratory methods of preparations,
physical properties & chemical reactions with emphasis on reaction mechanisms [arrow based] & stereochemistry [wherever applicable].

- Aromatic hydrocarbons.
- Phenolic compounds.
- Aromatic & aliphatic amines.
- Diazonium salts.
- Aromatic nitro-compounds, aryl halides, & ethers.

6. **Polycyclic aromatic hydrocarbons**
   Syntheses & reactions with mechanisms of bi & tricyclic fused carbocyclic rings like naphthalene, anthracene, & phenanthrene.

7. **Carbonyl Chemistry**
   Carbonyl chemistry involving group conversions & their reaction mechanisms along with stereochemistry wherever applicable.
   b. Reduction of arylsulfonyl hydrazine / hydrazones to alkanes.
   c. Bamford Steven reaction.
   d. DCC Oxidation of alcohol.
   e. Michael addition / 1,4-addition / conjugate addition.
   f. Mannich condensation / reaction.
   g. Robinson annulation.
   h. Stobbe condensation.
   i. Darzen's glysidic ester synthesis.
   j. Beckmann rearrangement.
   k. Baeyer Villiger rearrangement.
   l. Curtius Wolff, & Lossen rearrangements.
   m. Willgerodt rearrangement.
   n. Pinacol-pinacolone rearrangement.
   o. Methylene transfer reactions. Use of diazomethane & sulphurylides in the same.
   p. Mono- & dialkylation in 1,3-dicarbonyl compounds.
   q. Formation & use of enol ethers, enol acetates & enamines as protective groups & in regiospecific alkylations.

8. **Heterocyclic Chemistry**
   IUPAC Nomenclature of heterocyclic rings [3-10 membered] containing O, S, & N atoms. Nomenclature of above rings containing mono-,di-, & multiple [same or different] heteroatoms should also be covered. Nomenclature of 2 & 3 fused rings containing mono-, di-, & multiple heteroatoms [same or different] should also be covered. Syntheses & reactions of three to six membered rings in detail. Syntheses of five & six membered rings containing mono- or any di- heteroatoms [O, S, & N]. Syntheses of quinoline, isoquinoline, benzoxole, benzthiole, & benzazole, benzdiazole, benzoazole, & benzthiazole.
9. **Bridged rings**
Bridged ring systems & their nomenclature.

10. **Kinetic & thermodynamic control**
Kinetic & thermodynamic control of sulfonation, enolate anion formation & alkylation of enamine reactions.

11. **Stereochermistry**

12. **Carbohydrates**

13. **Amino acids & proteins**

14. **Organometallic chemistry**
Organometallic chemistry [preparation & few reactions] of Cu & Boron.

15. **Pericyclic reactions**