SUPRAMOLECULAR CHEMISTRY

1. Nature of Supramolecular Interaction

- Deals with non-covalent interactions between molecules.
- Forces involved: Hydrogen bonding, Van der Waals, π–π stacking, electrostatic, hydrophobic interactions.
- Molecules organize and recognize each other via weak forces.

---

2. Host–Guest Interaction

- Host: Large molecule (e.g., crown ether, cyclodextrin).
- Guest: Smaller molecule or ion fitting into host cavity.
- Interactions: Hydrogen bonding, ion–dipole, hydrophobic effects.
- Example: Crown ether + Na^+ complex.

---

3. Molecular Recognition

- Definition: Selective binding of a guest by a host molecule.
- Types:
  - Complementary (lock and key)
  - Dynamic (induced fit)
  - Cooperative (multiple sites enhancing binding)

---

4. Self-Assembly

- Spontaneous organization of molecules into ordered structures (e.g., micelles, liposomes, DNA double helix).
- Driven by non-covalent forces such as hydrogen bonding and hydrophobic effect.

---

5. Cation Binding Hosts

- Bind cations using electron-rich atoms (O, N).
- Examples: Crown ethers, cryptands, calixarenes.

---

6. Receptors

- Cation receptors: Bind metal ions.
- Anion receptors: Bind anions via hydrogen bonding or electrostatics.

- Neutral receptors: Bind neutral molecules via H-bonding or hydrophobic forces.

---

7. Crown Ethers

- Cyclic polyethers that selectively bind cations.
- Example: 18-crown-6 binds K^+.
- Applications: Phase-transfer catalysts, ion transport, metal ion separation.

---

8. Clathrates

- Inclusion compounds that trap guest molecules without direct bonding.
- Example: Methane clathrate
- Applications: Gas storage, drug delivery, separation processes.

MEDICINAL CHEMISTRY

1. Drug and Drug Metabolism

- Drug: Chemical substance producing a biological effect.
- Metabolism: Biotransformation mainly in the liver.
  - Phase I: Oxidation, reduction, hydrolysis.
  - Phase II: Conjugation (glucuronidation, acetylation, etc.).

---

2. Mechanism of Drug Action

- Drugs act by interacting with biological targets such as:
  - Enzymes: Inhibition (e.g., aspirin inhibits COX).
  - Receptors: Activation or blocking (e.g., antihistamines).
  - Ion channels: Blocking or modulation.
  - DNA: Binding or damaging (anticancer agents).

---

3. Common Diseases and Treatments

Disease	Cause	Treatment
Diabetes	Low insulin	Insulin, metformin
Hypertension	High BP	ACE inhibitors, β-blockers
Infection	Microbial attack	Antibiotics, antivirals

Anemia	Low Hb	Iron, folic acid
Ulcers	H. pylori infection	Antacids, proton-pump inhibitors

4. Blood and Clinical Tests

- Urea: Kidney function (20–40 mg/dL).
- Cholesterol: Lipid metabolism (< 200 mg/dL).
- Blood sugar: Diabetes indicator (< 100 mg/dL fasting).
- Iron (Fe): Detects anemia.
- Protein/Albumin: Liver function.
- Vitamins & minerals: Check nutritional status.

5. Medicinally Important Compounds

- Analgesics: Paracetamol, aspirin.
- Antibiotics: Penicillin, streptomycin.
- Antiseptics: Dettol, phenol.
- Antimalarials: Chloroquine, quinine.

6. Vitamin Deficiency Diseases

Vitamin	Deficiency Disease	Major Source
A	Night blindness	Carrots, milk
B_1 (Thiamine)	Beriberi	Whole grains
B_3 (Niacin)	Pellagra	Meat, fish
B_{12}	Pernicious anemia	Meat, eggs
C	Scurvy	Citrus fruits
D	Rickets/Osteomalacia	Sunlight, fish oil
K	Poor blood clotting	Green vegetables
E	Reproductive disorders	Nuts, oils