Introduction to Organic Chemistry (Chapters 1 and 2)
- Definition: the chemistry of carbon compounds, Importance of carbon
- Hybridisation of C, O, and N
- Formal charge (Section 2.3)
- Writing structural formulas, Abbreviated structural formulas, Use of stick notation (Section 2.12)
- Functional groups (Section 3.1)

Alkanes (Chapter 3)
- Nomenclature (Sections 3.2-3.4 and 3.7), σ-bonds and structure (Sections 1.7-1.8), conformational, constitutional and configurational isomers (Sections 3.8 and 4.1-4.3)
- Cycloalkanes: "chair" structure of 6-membered rings; configurational isomers of substituted cycloalkanes (Sections 3.6-3.8 and 4.8-4.12)

Alkenes (Chapters 6 and 7)
- Nomenclature (Section 6.3), π-bonds and structure (Sections 1.9 and 6.4)
- Configurational (geometric) stereoisomers (Sections 6.5-6.6)
- Addition reactions, mechanism of electrophilic addition (Sections 6.8-6.10, 7.2 and 7.7)
- Classification of nucleophiles and electrophiles and use of arrow notation (Sections 5.4-5.6)
- Markovnikov's Rule: carbocation stability (Sections 6.9 and 6.10)

Aromatic Hydrocarbons (Chapter 15)
- Benzene: Aromaticity, resonance and molecular orbital picture (Sections 2.4-2.5 and 15.3-15.5)
- Nomenclature (Section 15.2)
- Electrophilic substitution: halogenation, nitration, Friedel-Crafts acylation (Sections 16.1, 16.2 and 16.4)

Heterocyclic Compounds (Chapter 28)
- Pyridine, pyrrole, furan, thiophene, imidazole (Sections 15.7, 28.1-28.2 and 28.4)
- Purine, pyrimidine (Section 28.7); relevance to DNA

Organic Halogen Compounds (Chapters 10 and 11)
- Alkyl halides: structure and classification as 1°, 2°, 3° (Sections 10.2 and 3.3)
- Nomenclature (Section 10.1)
- Nucleophilic substitution reactions of 1° and 2° (Sections 11.3-11.5)
- Elimination reactions of 3° (Section 11.10)
- Lack of reactivity of aryl halides
- Formation of Grignard reagents (Section 10.8)

Alcohols, Phenols, Ethers and Thiols (Chapters 17 and 18)
- Alcohols: classification as 1°, 2°, 3° (Section 3.3)
- Nomenclature (Section 17.1)
- Hydrogen bonding (Section 17.2)
- Acid-Base reactions alcohols and phenols (Section 17.3)
- Reactions of alcohols: dehydration, oxidation, substitution (Sections 17.7 and 17.8)
- Thiols: acidity and oxidation to disulfides (Section 18.10)
- Biologically important thiols and disulfides
- NADH/NAD⁺ cycle and thiol disulfide redox cycle

Amines (Chapter 24)
- Amines: Structure and classification as 1°, 2°, 3°, 4° and aryl amines (aniline) (Sections 24.1-24.2)
• Nomenclature (Section 24.1)
• Basicity (Section 24.4) and alkylation of 3° amines
  (refer E28 : acid-base separation techniques & flowsheets)
• Examples of biologically active amines

**Aldehydes and Ketones (Chapter 19)**
Lecture 12,13
• Structure and bonding (pages 674-5)
• Nomenclature (Section 19.1)
• Nucleophilic addition reactions; formation of hemiacetals and acetals (Sections 19.4 and 19.11)
• Reactions with Grignard reagents (Section 19.8) and primary amines (imine formation – Section 19.9),
• Oxidation (Section 19.3) and reduction (Section 17.5, page 696 and NADH/NAD+ pages 710-11)

**Spectroscopy (Chapters 12 and 13; also E35 Laboratory notes)**
Lectures 14,15
• Mass spectrometry (Sections 12.1-12.3) and infra-red spectroscopy (Sections 12.6-12.9)
• UV-Visible spectroscopy (Section 14.8-14.11) and ¹H NMR spectroscopy (Sections 13.1-13.3 and 13.8-13.11)

**Carboxylic Acids and Derivatives (Chapters 20 and 21)**
Lectures 16,17
• Nomenclature (Sections 20.1 and 21.1)
• Acidity (Section 20.3)
  (refer E28 : separation of an acid, base and naphthalene)
• Preparation from oxidation of 1° alcohols/aldehydes and reactions of Grignard reagents with CO₂ (Section 20.6)
• Acid derivatives : acid chlorides, acid anhydrides, esters, thioesters, amides [Sections 21.2-21.3, Section 21.4 (up to page 785), Sections 21.5-21.6 (up to page 793), Section 21.7 (excluding reduction), Section 21.8] (refer E29 : preparation of aspirin and pentyl acetate)
• Relative reactivities, preparation and hydrolysis
• Fats, waxes and oils (Section 27.1)

**Stereochemistry (Chapter 9)**
Lectures 18,19, 20
(refer to workshop E30 where model kits supplied)
• Constitutional and stereoisomers (enantiomers and diastereomers)
• Stereogenic centres, optical activity
• R, S nomenclature and D, L nomenclature
• Racemic mixtures and resolution of enantiomers
• Compounds with 2 stereogenic centres including *meso* isomers
• Importance of chirality in nature and drug design

**Carbohydrates (Chapter 25)**
Lectures 21, 22, 23
• Monosaccharides : nomenclature and stereochemistry (Sections 25.1-25.4)
• Haworth projections, open and closed chain forms (Section 25.5)
• Reactions of monosaccharides [Section 25.7 (glycoside formation, reduction and oxidation)]
• Reducing and non-reducing sugars, mutarotation (Section 25.6)
• Disaccharides and polysaccharides: classification and hydrolysis (Sections 25.9-25.10)

**Amino Acids, Peptides and Proteins (Chapter 26)**
Lectures 24, 25
• Structure and classification of amino acids, stereochemistry (Section 26.1)
• Acid-base chemistry (Section 26.1-26.2)
• Formation and hydrolysis of peptides (Sections 26.5)
• Protein structure overview (Sections 26.6 and 26.12-26.13)

**Revision**
Lectures 26