Chapter 14 – NMR spectroscopy
1. Numbers of peak clusters, chemical shift, integration, splitting
2. Identifying molecules
3. $^1$H and $^{13}$C NMR spectra

Chapter 15 – Aromaticity
4. Aromatic, anti-aromatic, and non-aromatic molecules
5. Heterocyclic aromatic molecules
6. Hückel’s rule
7. Electrophilic aromatic substitution
   - Halogenation
   - Nitration
   - Sulfonation
   - Friedel-Crafts alkylation
   - Friedel-Crafts acylation

Chapter 16 – Substituted benzenes
8. Activating/deactivating groups for EAS
9. ortho/para- and meta-directing groups in EAS
10. Synthesis of di- and tri-substituted benzenes
11. Modification of substituents
    - Reduction of $-\text{NO}_2$ to $-\text{NH}_2$
    - Reduction of C=O to $-\text{CH}_2$-
    - Oxidation of alkyl to $-\text{CO}_2\text{H}$
12. Retrosynthesis; multi-step synthesis of substituted benzenes
13. Diazonium ions; synthesis of diazo compounds
14. Nucleophilic aromatic substitution; benzyne

Chapter 17 – Carbonyl compounds I
15. Acid, acyl chloride, anhydride, ester, amide
16. Nucleophilic acyl substitution; mechanism
17. Saponification
18. Fischer esterification; transesterification
19. Relative reactivity of acid derivatives
20. Gabriel synthesis
21. Conversion of acid to acyl chloride

Chapter 18 – Carbonyl compounds II
22. Aldehydes, ketones
23. Nucleophilic addition; mechanism
- Hydride (reductions)
- Grignard and organolithium reagents
- Nitrogen nucleophiles (formation of imine, oxime, hydrazone, etc.)
- Oxygen and sulfur nucleophiles (hemi-acetal, acetal, thioacetal, etc.)

24. Conjugate (1,4-) addition
25. Gilman reagent
26. Wittig reaction

Chapter 19 – Enolate reactions
27. Halogenation; haloform reaction
28. Deuteration; identification using NMR spectra
29. Alkylation of enolates
30. Alkylation of enamines; Stork reaction
31. Michael addition
32. Aldol condensation
33. Claisen condensation; Dieckmann condensation
34. Robinson annulation

Chapter 20 – Oxidation reactions
35. Oxidation of alcohols, aldehydes
   - PCC
   - CrO$_4^{2-}$
36. Baeyer-Villiger oxidation
37. Oxidation of alkenes
   - Peroxyacid + H$^+$/H$_2$O
   - Dihydroxylation (KMnO$_4$/OH$^-$/cold)
   - Cleavage by KMnO$_4$/H$^+$/Δ

Chapter 21 – Amines
38. Amines

Chapter 22 – Carbohydrates
39. Intramolecular hemiacetal formation
40. Glycosides
41. Disaccharides; polysaccharides

Chapter 23 – Amino acids and peptides
42. Configuration
43. Amide/peptide bond
44. Peptide synthesis
45. Structural changes as pH changes

Other Topics
46. Sequences of reactions (synthetic strategy)
47. Functional groups