

Contents

Preface	vii
1. Terpenoids	3-285
1. Introduction	3
1.1. Classification of Terpenoids 3	
1.2. Characteristics Features 4	
1.3. Different Geometric Conformations 6	
1.4. Occurrence of Terpenoids 6	
1.5. Isolation of Terpenoids 7	
1.5.1. Isolation of Essential Oils (or Volatile Oils) 8	
1.5.2. Separation of Terpenoids from Essential Oils 10	
2. Characteristics of Volatile Oils	11
2.1. Physical Characteristics: 11	
2.2. Chemical Characteristics 13	
3. Suggested Methodologies for MonoterpeneS and Sesquiterpenes	14
3.1. Gas Liquid Chromatography [GLC] 15	
3.2. Thin – Layer Chromatography (TLC): 17	
3.3. Paper Chromatography and Cellulose Plate Chromatography 18	
3.4. Iridoids 18	
3.5. Sesquiterpenoid Lactones 19	
4. Structural Features of Terpenoids	21
4.1. Isoprene Rule 21	
4.2. Cyclization Reactions 25	
4.3. Special Isoperene Rule 29	
4.4. Gem-Dialkyl Rule 31	
5. Structure Elucidation of Terpenoids	32
5.1. Analytical Procedures 32	
5.1.1. Molecular Formula 32	
5.1.2. Nature of the O-Atom 33	
5.1.3. Unsaturation 36	

5.1.4. Number of Rings	39
5.1.5. Refractive Index	40
5.1.6. Oxidative Degradation Products	40
5.1.7. Dehydrogenation	45
5.2. Synthetic Methods	46
5.2.1. Catalytic Hydrogenation	46
5.2.2. Reformatsky Reaction	47
5.2.3. Grignard Reaction	48
5.3. Physical Techniques	49
5.3.1. Ultraviolet Spectroscopy	49
5.3.2. Infrared Spectroscopy	52
5.3.3. Nuclear Magnetic Resonance (NMR) Spectroscopy	53
5.3.4. Mass Spectroscopy	54
5.3.5. Optical Rotary Dispersion (ORD)	54
5.3.6. X-Ray Diffraction Analysis	54
5.4. Intricacies of Molecular Rearrangement	54
5.5. Total Synthesis	55
6. Classification of Terpenoids	56
6.1. Hemiterpenoids	57
6.1.1. Isoprene from Fermentation of Grain	57
6.1.2. Isoprene from Amyl Alcohol	57
6.1.3. Isoprene from Acetone/Acetylene	58
6.1.4. Isoprene from p-Cresol (Coal Tar)	58
6.2. Monoterpeneoids	59
6.2.1. Acyclic Monoterpeneoids	61
6.2.1.1 Acyclic Monoterpeneoids	61
6.2.1.2 Ocimene [C ₁₀ H ₁₆]	67
6.2.1.3 Citronellal [C ₁₀ H ₁₈ O]	71
6.2.1.4 β-Citronellol [C ₁₀ H ₂₀ O]	73
6.2.1.5 Citral [C ₁₀ H ₁₆ O]	74
6.2.1.6 Geraniol [C ₁₀ H ₁₈ O]	84
6.2.1.7 Nerol [C ₁₀ H ₁₈ O]	87
6.2.1.8 Linalool [C ₁₀ H ₁₈ O]	89
2. Chemistry and Biochemical Action of Vitamins	287-471
1. Introduction	287
2. Classification of Vitamins	287

3. Nomenclature of Vitamins	289
4. Precursors of Vitamins	289
5. Fat-soluble Vitamins	290
5.1. Vitamin A ₁ [Syn: Vitamin A; Vitamin A Alcohol, Axerophthol; Oleovitamin A; Anti-infective Vitamin]: 291	
5.2. Vitamin A ₂ [Syn: Retinol2; 3,4-Dehydroretinol] 304	
5.3. Vitamin D 310	
5.4. Vitamin E [or Tocopherols] 319	
5.5 Vitamin K 338	
5.6. Vitamin P Complex [or Bioflavonoids] 355	
6. Water Soluble Vitamins	355
6.1. Vitamin B Complex Compounds 356	
6.1.1. Vitamin B ₁ [Syn : Thiamine; Aneurine] 356	
6.1.2. Vitamin B ₂ [Syn : Riboflavin; Lactoflavine;] 367	
8.1.3 Vitamin B ₅ (Syn : Pantothenic Acid) 381	
8.1.4 Folic Acid [Syn : Vitamin Bc; PGA] 393	
8.1.5 Nicotinic Acid (Niacin) [Syn : Nicotinamide (Niacinamide); Anti-pellagra Vitamin] 404	
8.1.6 Pyridoxine Hydrochloride [or Vitamin B ₆ Hydrochloride] 412	
8.1.7 Biotin [or Vitamin H] 426	
8.1.8 Inositol [Syn: myo-Inositol; meso-Inositol] 437	
8.1.9 Vitamin B ₁₂ [or Cyanocobalamin] 439	
7. Vitamin C [or L-Ascorbic Acid]	452
<i>Recommended Further Readings</i> 470	
<i>Review Questions</i> 470	
3. Natural Dyes	473-501
1. Introduction	473
2. Dyeing Process	475
2.1 Vat Dyeing	475
2.2. Aluminum and Iron Lakes 478	
2.3. Ingrain [or Developed Dyeing] 479	
2.4. Direct Dyeing [or Substantive Dyeing] 479	
3. Study of Natural Dyes	479
3.1. Alizarin 479	
3.2 Indigotin [Syn: Indigo Blue, Indigo] 490	
<i>Recommended Further Readings</i> 500	
<i>Review Questions</i> 501	

4. Purines, Pyrimidines and Nucleic Acids	503-597
1. Introduction	503
2. Purines [or Aminopurines]	503
2.1. Purine Variants <i>504</i>	
2.2. Occurrence of Purine <i>504</i>	
2.3 Characteristics Features <i>505</i>	
2.4 Synthesis of Purine [or 1H-Purine] <i>505</i>	
2.5. General Methods for Synthesis of Purine Derivatives <i>506</i>	
2.5.1. Fischer's Method <i>507</i>	
2.5.2. Traube's Method <i>507</i>	
2.5.3 Saransin Method <i>510</i>	
2.6. Some Selected Purines <i>510</i>	
2.6.1. Uric Acid <i>510</i>	
2.6.2. Xanthines <i>523</i>	
2.6.3. Xanthine Derivatives <i>525</i>	
2.6.3.1. Caffeine (or 1, 3, 7-Trimethylxanthine) <i>526</i>	
2.6.3.2. Theobromine [or 3, 7-Dimethylxanthine] <i>534</i>	
2.6.3.3. Theophylline [or 1, 3-Dimethylxanthine] <i>538</i>	
2.6.4. Aminopurines <i>541</i>	
2.6.4.1. Adenine [6-Aminopurine] <i>543</i>	
2.6.4.2. Guanine [or 2-Amino-6-hydroxypurine] <i>546</i>	
3. Pyrimidines [or, 1,3-diazines]	547
3.1. Examples of Pyrimidines <i>549</i>	
3.1.1. Cytosine [or 4-Amino-2-oxo-1,2-dihydropyrimidine] <i>549</i>	
3.1.2. Thymine [or 5-Methyluracil] <i>551</i>	
3.1.3. Uracil [or 2, 4-Dihydroxypyrimidine; 2, 4-Pyrimidinediol] <i>553</i>	
4. Nucleic Acids.....	555
4.1. Introduction <i>555</i>	
4.2. Classification of Nucleic Acids <i>556</i>	
4.3. Inter-relationship Prevalent in Nucleic Acids Nucleotides and Nucleosides <i>556</i>	
4.4. Isolation of Nucleic Acids <i>561</i>	
5. Degradation Constituents of Nucleic Acids	561
6. Constitution of Nucleic Acids	563
6.1. Structure of Nucleosides <i>563</i>	
6.1.1. Linkage of 'Base' to 'Sugar' in Nucleosides <i>565</i>	
6.1.2. Size of the Pentose Ring in Nucleosides <i>569</i>	
6.1.3. Configuration of the Ring System <i>571</i>	

6.2. Structure of Nucleotides 576	
6.3. Nucleotides : Sequential Arrangements of Bases in Nucleic Acids and Structure of Nucleic Acids 581	
7. Structure of Nucleic Acids	585
8. DNA Provides a Template for Replication and Transcription	587
<i>Recommended further readings 596</i>	
<i>Review Questions 597</i>	
5. Natural Products: Colour Reaction Tests	599-606
1. Introduction	599
2. Applications of Colour Reaction Tests	599
2.1. α-Amino Acids 600	
2.2. Carbohydrates 601	
2.3. Alkaloids 602	
2.4. Glycosides 602	
2.5. Flavonoids 603	
2.6. Steroids 604	
2.7. Vitamins 606	
<i>Recommended Further Readings 606</i>	
<i>Review Questions 606</i>	
Index	607-620