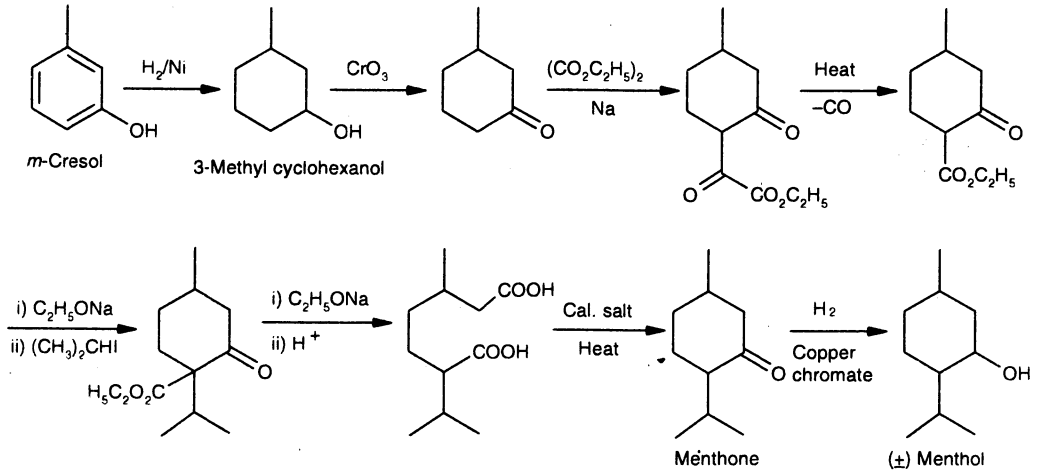
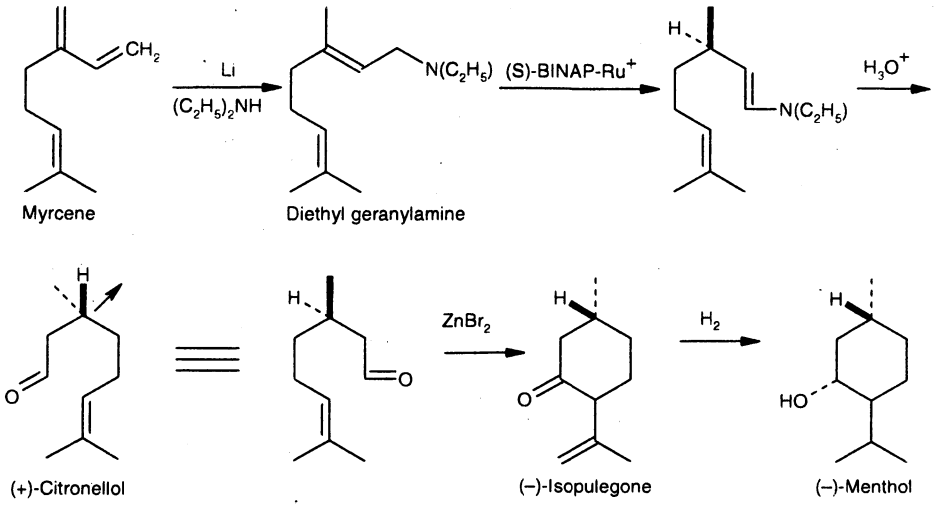


Scheme 4.5. Synthesis of Menthone/menthol from *m*-cresol.

Synthesis of Menthol from Myrcene (Scheme 4.6)



Scheme 4.6. Synthesis of Menthol from myrcene.

Spectral data

IR (cm^{-1})**:** 3333, 1048, 1028, 994, 977.

^{1}H-NMR (δ)**:** 0.82 (3H, d, C-1 methyl), 0.90 and 0.93 (6H, d, C-7 methyl), 3.42 (1H, m, H-3).

MS (m/e)**:** 71 (100), 81, 95, 41, 55, 82, 43, 123.

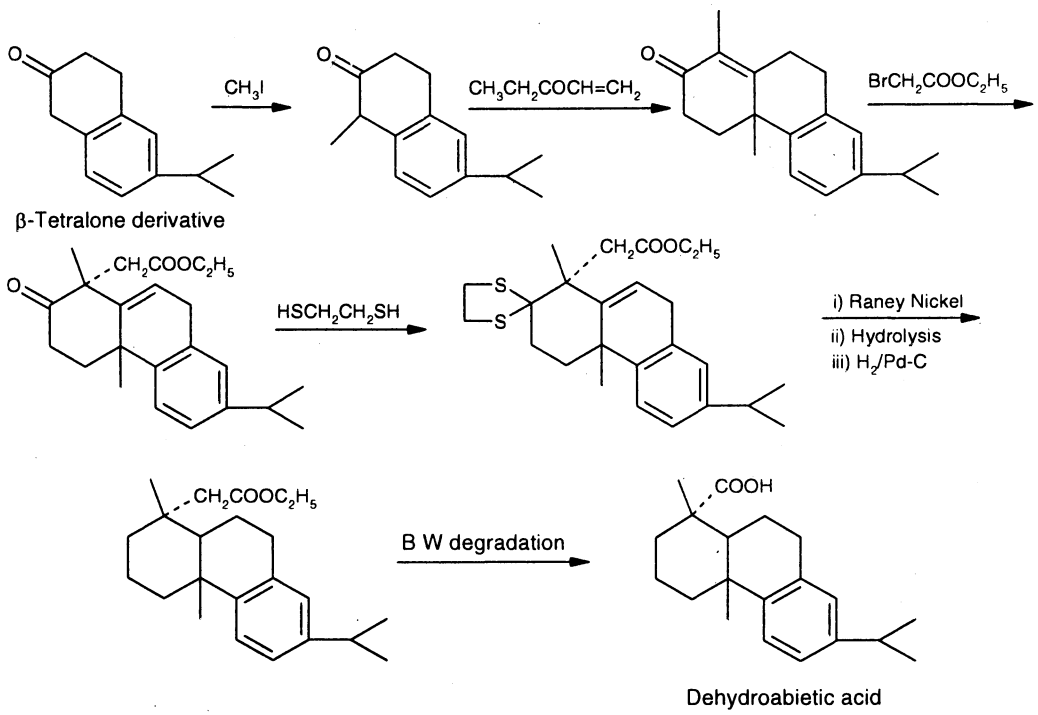
Stereochemistry in Menthol

Since menthol has 3 stereocenters and has a total of 8 stereoisomers.

Natural menthol exists as one pure stereoisomer, nearly always the (*1R, 2S, 5R*) form. The eight possible stereoisomers are:

Synthesis

The final structure of abietic acid is proposed by the synthesis of dehydroabietic acid. It can be prepared on heating from abietic acid in presence of Pd/C at 250-275°C.



Spectral data

UV: 235, 241.5, 250 nm (ε_{max} –21500, 23000, 15000 respectively).

IR (cm^{-1}): 1735, 1465, 1435, 1250, 900.

^{1}H-NMR (methyl ester, δ): 0.99 (3H, s, CH_3-7), 1.02 (3H, s, CH_3-12), 1.26 (3H, d, CH_3-1), 5.37 (1H, t, H-14), 5.77 (1H, s, H-8).

MS (methyl ester, m/e): 313 (100), 254, 121, 91, 104, 93, 79, 109.

Stereochemistry

The abietic acid contains four chiral centers: C-1, C-11, C-12 and C-13 positions. Stereochemical features is determined by preparing simple derivatives of abietic acid: these include the *p*-bromo ester derivative (**3**) of the abietanol (**2**) obtained by standard reduction of abietic acid (**1**). A single crystal X-ray study established the connectivity and the absolute configuration of (3) (Scheme 4.10), thereby confirming the absolute configuration of (–)-abietic acid as 1R, 11R, 13R, 12R. The molecule exhibits a trans anti 6/6/6 tricyclic hydrocarbon skeleton in which the cyclohexane ring A has a typical chair form. Cyclohexane rings B and C, containing conjugated double bonds, have half-chair conformations. Thus, the relative stereochemistry is transfusion for the A/B ring junction, anti between C-13 hydrogen and C-12 methyl (phenanthrene numbering), and coplanar for the B/C ring junction. The ester linkage is located at C-1 and the isopropyl group at C-7. The structure is unsolvated. Bond lengths and angles lie in the ranges normally observed for such sterically non-strained molecules.

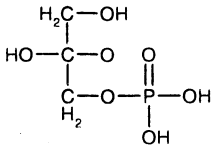
glycophospholipids. Similarly, if spingosine present as alcohol then these are known as spingophospholipids or spingolipids.

A. Glycerophospholipids

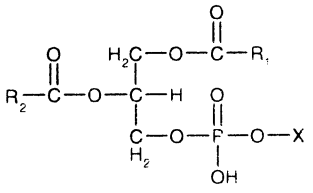
These are phospholipids or phosphatides which consist of an alcohol such as glycerol, one or two molecules of fatty acid, and a phosphoric acid compound. In other way, these are triglyceride derivatives in which one fatty acid has been replaced by a phosphate group and one of several nitrogen-containing molecules. They are found in all plants and animals and include such substances as lecithin, cephalin, etc. Lecithin is a significant constituent of brain and nervous tissue consisting of a mixture of diglycerides of stearic, palmitic, and oleic acids, linked to the choline ester of phosphoric acid.

Glycerophospholipid structures

Phospholipids are synthesized by esterification of an alcohol to the phosphate of phosphatidic acid (1, 2-diacylglycerol 3-phosphate). Most phospholipids have a saturated fatty acid on C-1 and an unsaturated fatty acid on C-2 of the glycerol backbone. The most commonly added alcohols are serine, ethanolamine and choline. These also contain nitrogen that may be positively charged, whereas, glycerol and inositol do not. Based on the type of alcohol (X), the major classifications of phospholipids are shown in Table 5.4



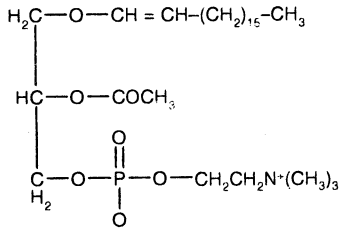
Glycerol-3-phosphate



Phospholipids (R_1 and R_2 are the alkyl groups of fatty acids. For 'X' see Table 5.4)

Plasmalogens

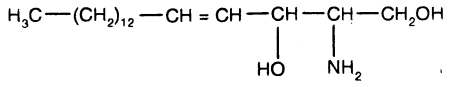
Plasmalogens are glycerol ether phospholipids. These are of two types, alkyl ether and alkenyl ether. Three major classes of plasmalogens have been identified: choline, ethanolamine and serine plasmalogens. Ethanolamine plasmalogen is prevalent in myelin. Choline plasmalogen is abundant in cardiac tissue. One particular choline plasmalogen (1-alkyl, 2-acetyl phosphatidylcholine) has been identified as an extremely powerful biological mediator, capable of inducing cellular responses at concentrations as low as 10^{-11} M. This molecule is called platelet activating factor (PAF).



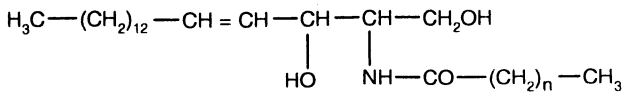
Platelet activating factor (PAF)

B. Spingophospholipids

The sphingophospholipids, like the phospholipids, are composed of a polar head group and two nonpolar tails. The core of sphingolipids is the long-chain amino alcohol, sphingosine. Amino acylation, with a long chain fatty acid, at carbon-2 of sphingosine yields a ceramide. It is a simple compound of spingophospholipids.



Sphingosine



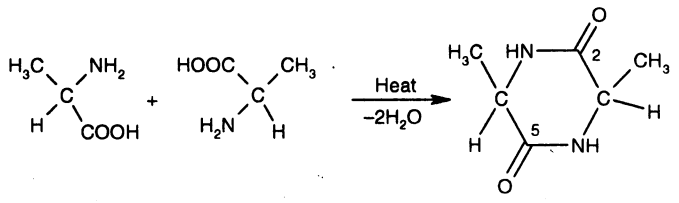
Ceramide

The sphingolipids include the sphingomyelins and glycosphingolipids (the cerebrosides, sulphatides, globosides and gangliosides).

(3) Reactions due to both Amino and Carboxyl groups

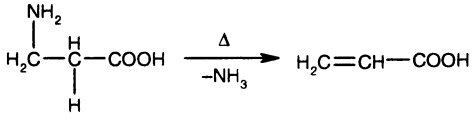
(i) **Action of heat:** On heating amino acids behaves as hydroxyl acids.

(a) α-Amino acids lose two molecules of water between two molecules of amino acids and give cyclic amides known as Diketopiperazine.

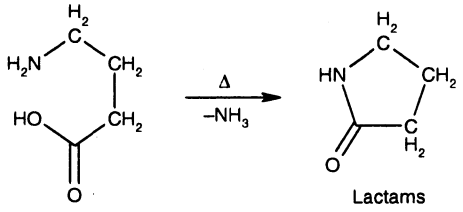


2,5-Diketopiperazine

(b) β-Amino acids eliminate a molecule of ammonia and yield α, β-unsaturated acids.

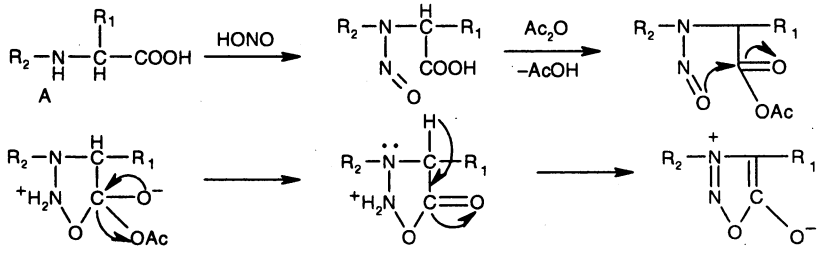


(c) γ and δ-amino acids by losing one molecule of water within a molecule form cyclic amides called lactams.

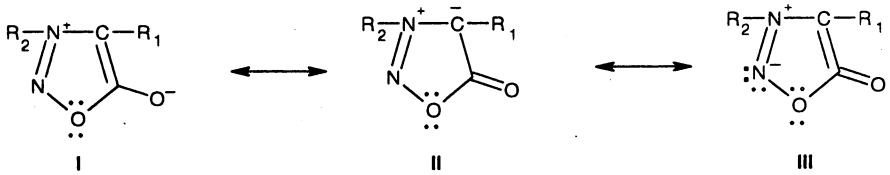


Lactams

(ii) **Action of nitrous acid:** N-alkyl or N-aryl amino acids form N-nitroso derivatives with nitrous acid and these derivatives dehydrate in the presence of acetic anhydride to give 'sydnones'.



Although, sydnones look like β-lactones, they are very stable because of having aromatic sextet. Sydnones are best represented as resonance hybrid of following three structures.



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