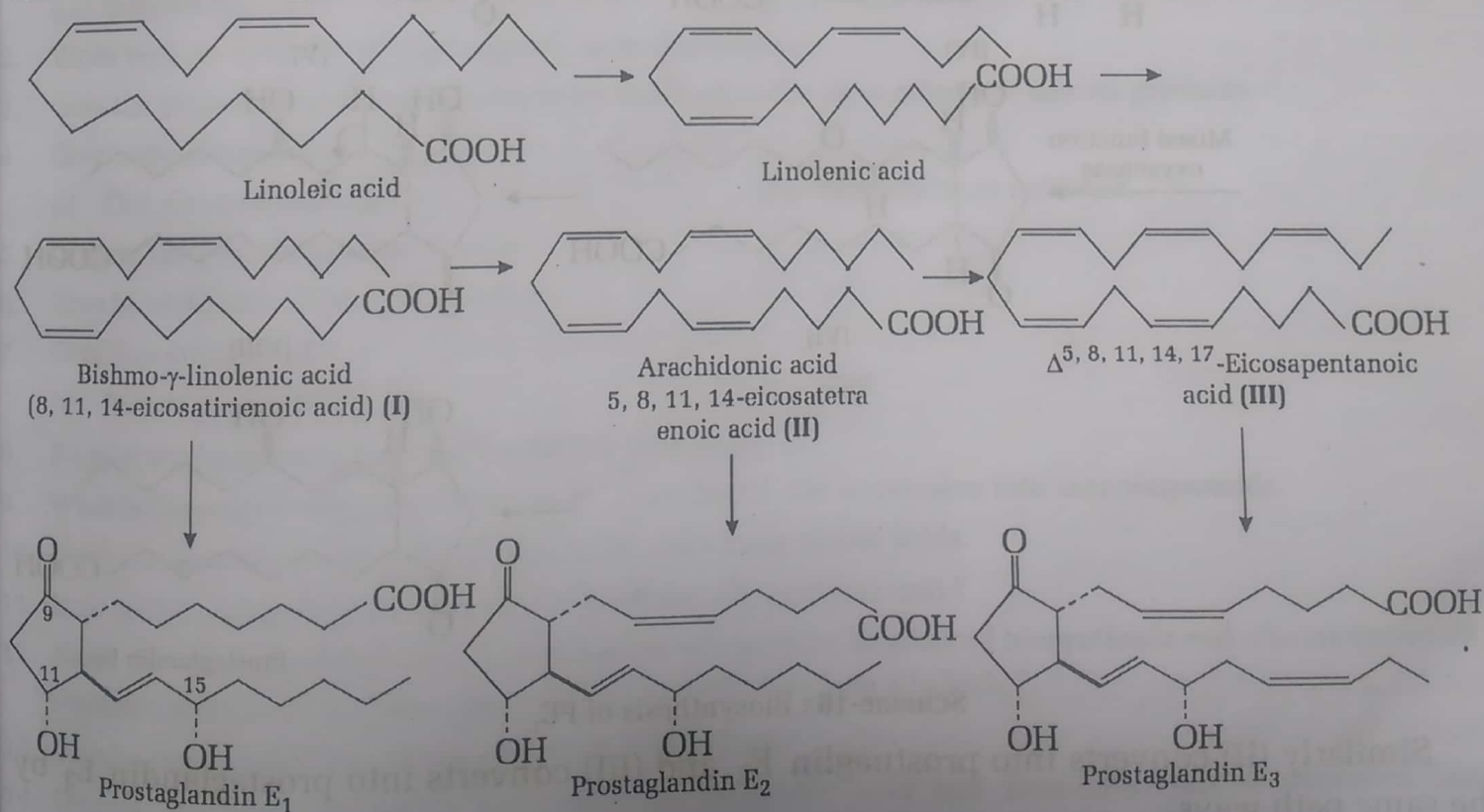
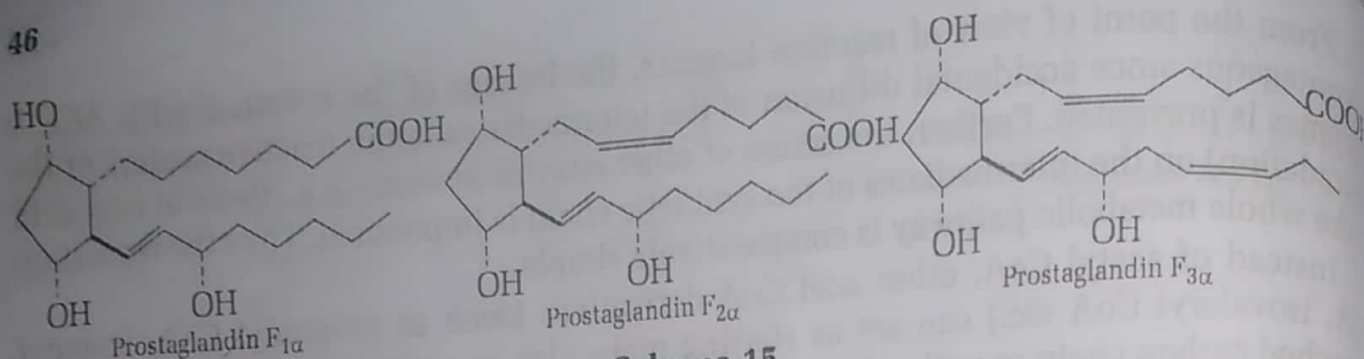


1.9.3. Biosynthesis of Prostaglandins

The prostaglandins are biosynthesized from essential fatty acids (arachidonic acid cascade) by a microsomal enzyme system called prostaglandin synthetase. This enzyme system is widely distributed in mammalian tissues. The prostaglandins are not stored in tissues but are biosynthesized and released on demand by physiological stimuli.

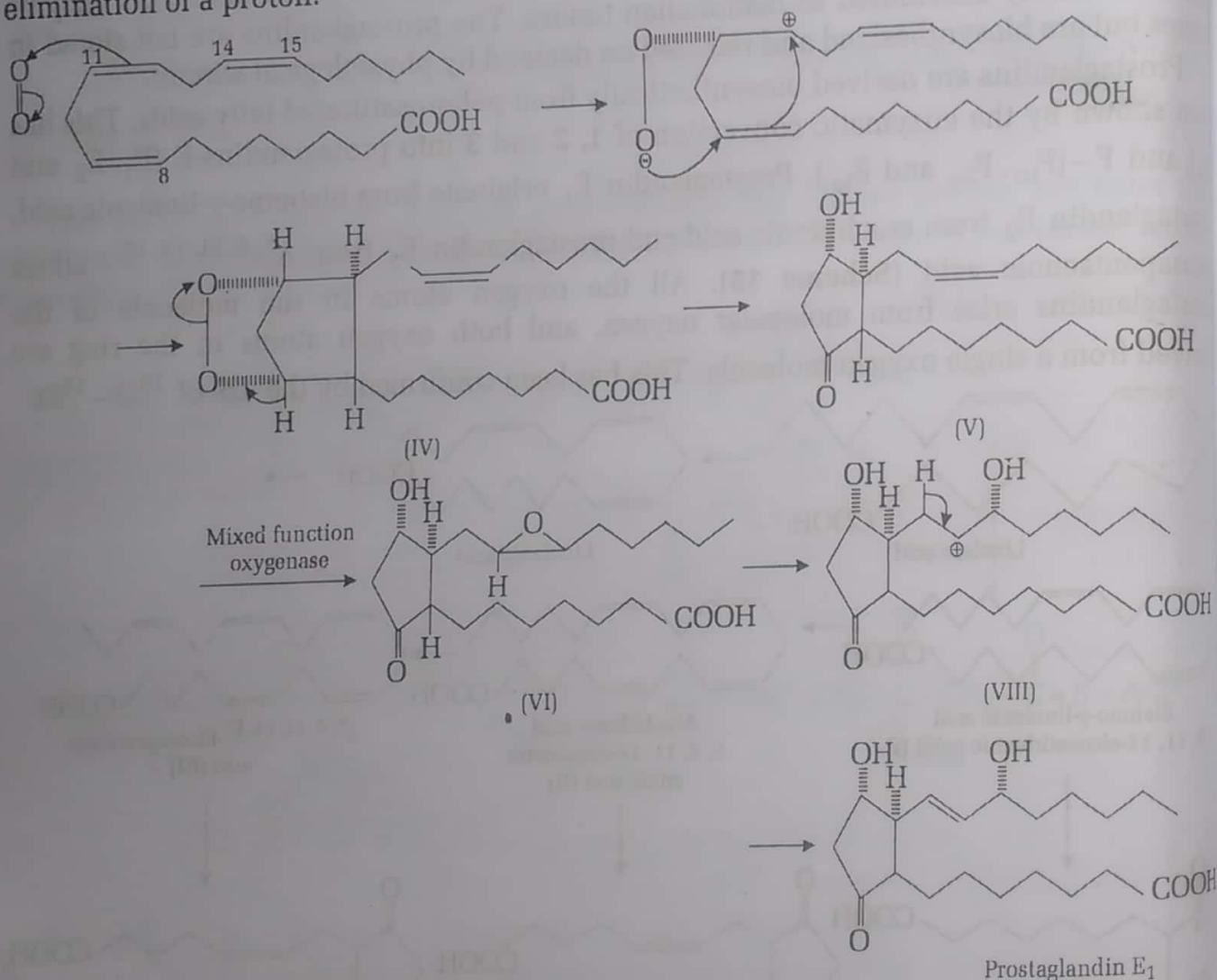
Prostaglandins are derived biosynthetically from polyunsaturated fatty acids. This has been shown by the enzymatic conversion of 1, 2 and 3 into prostaglandins-E (E_1 , E_2 and E_3) and F ($F_{1\alpha}$, $F_{2\alpha}$ and $F_{3\alpha}$). Prostaglandin E_1 originate from bishomo- γ -linolenic acid, prostaglandin E_2 from arachidonic acid and prostaglandin E_3 from $\Delta^{5, 8, 11, 14, 17}$ - all *cis* eicosapentaenoic acid (**Scheme 15**). All the oxygen atoms in the molecule of the prostaglandins arise from molecular oxygen, and both oxygen atoms in the ring are derived from a single oxygen molecule. This has been confirmed by the use of $^{18}\text{O} - ^{18}\text{O}$.





Scheme-15

The biosynthesis of E_1 may be represented as outline in Scheme-16. It probably begins with the stereospecific addition of oxygen molecule, activated by a dioxygenase, at carbon atom-9 or at carbon atom-11 of bishomo- γ -linolenic acid (compound-I). This is followed by the shift of electrons to form the cyclic peroxide (IV). Compound (V) may arise from (IV) by an intramolecular oxidation-reduction. Attack by a mixed function oxygenase on the double bond between carbon atom-14 and carbon atom-15 may lead to the epoxide (VI) to compound (VII) which is converted to prostaglandin E_1 by the elimination of a proton.



Scheme-16 : Biosynthesis of PE_1

Similarly (II) converts into prostaglandin E_2 and (III) converts into prostaglandin E_3 by the same path ways.

The precursor of prostaglandins are linoleic acid or linolenic acids. These acids must be present in our diet because we cannot synthesise these acids. Prostaglandins are synthesised from these acids.

