Chlorophyll

S. Stanly John Xavier
Assistant Professor
Department of Chemistry
St. Xavier's College
Palayamkottai

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Chlorophyll is a magnesium-porphyrin complex. The magnesium is at the center of the flat heterocyclic porphyrin ring system.

The metal ion is bonded to four nitrogen atoms. This complex is the green pigment in plants.

These are several kinds of Chlorophyll that vary slightly in their molecular structure.

In plants, Chlorophyll a is the pigments directly responsible for the transformation of light energy to chemical energy .

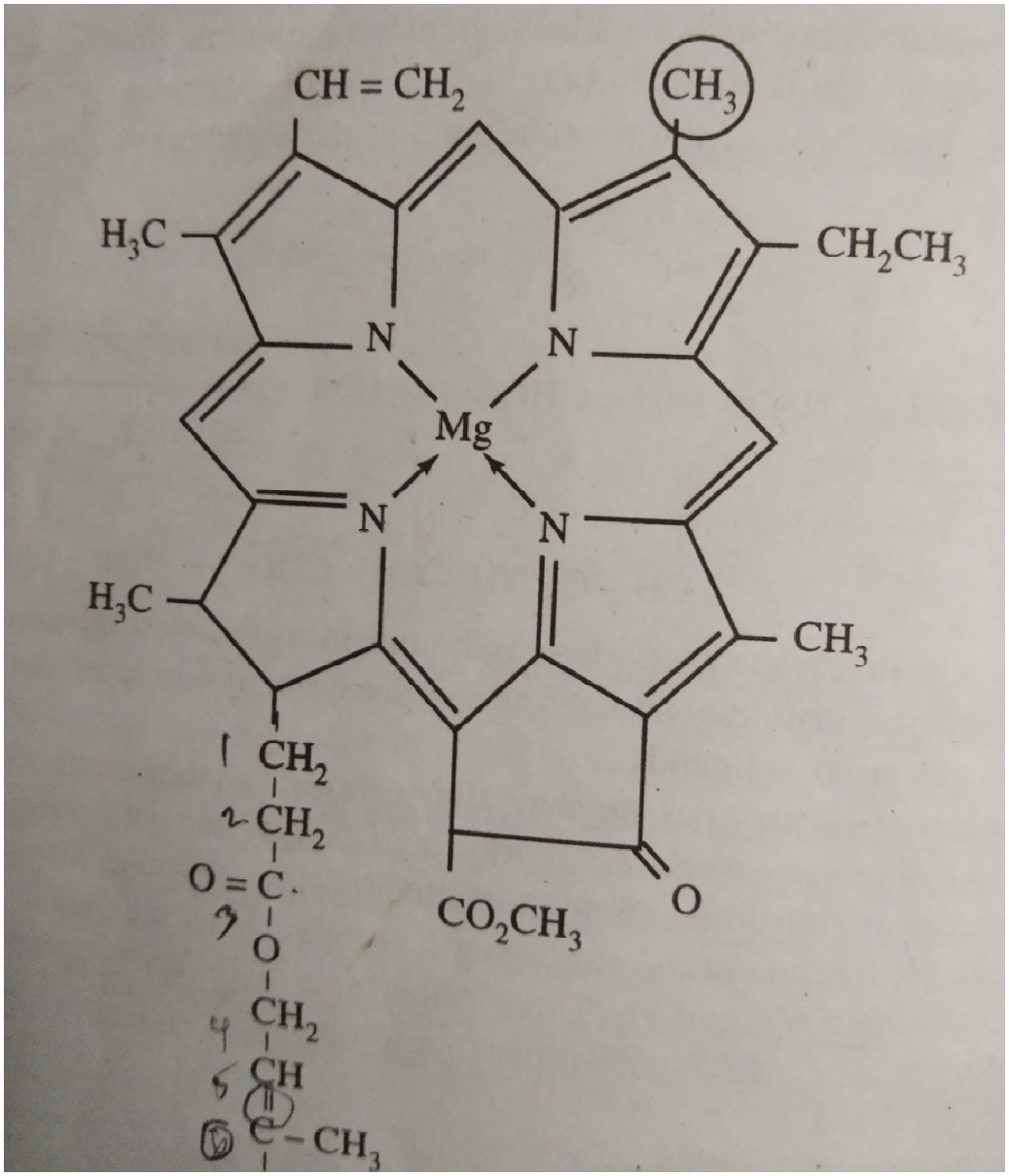
Most photosynthesis cells contain a second type of Chlorophyll also; in plants ,it is Chlorophyll b.

This is able to absorb light at wavelengths different from those absorbed by Chlorophyll a, and pass the energy on to Chlorophyll a, thus extending the range of light available for photosynthesis .

Chlorophyll a is a large molecule with central atom magnesium attached to a porphyrin ring .

An hydrophobic long carbon- hydrogen chain, attached to the ring helps anchor the molecule in the internal membrane of chloroplast.

Chlorophyll b differs from Chlorophyll a in having an aldehyde (CHO) group in place of the CH_3 group.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CH3
H3C
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N
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H3C
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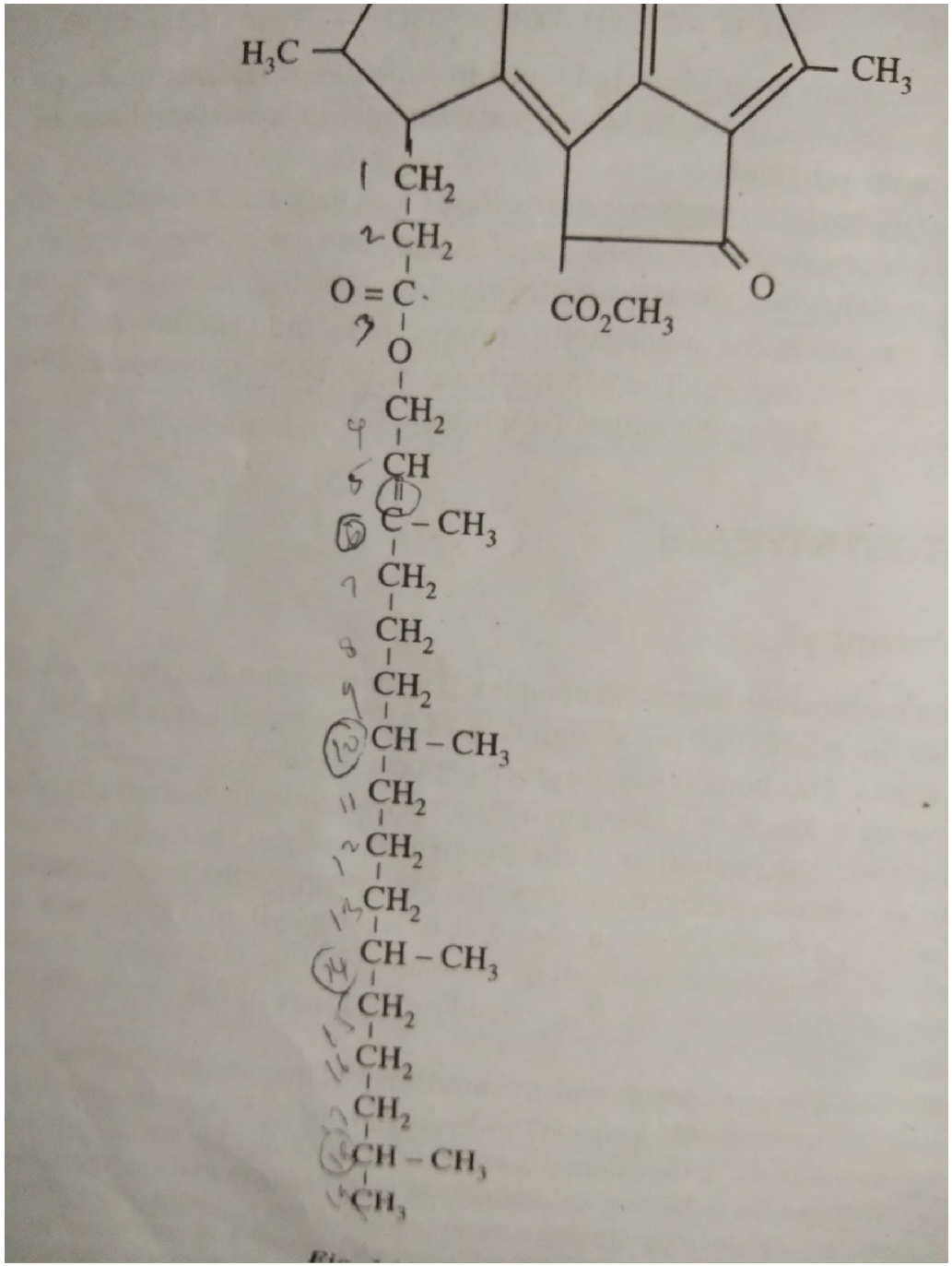
CH2
CH2
O = C
O
CH2
CH
C
CH3
CO2CH3
O


H3C
CH3
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O=C
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CO2CH3
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C – CH3
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CH – CH3
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Chlorophyll can convert light energy into chemical energy only when it is associated with certain proteins and embedded in a specialized membrane.

Photo synthesis requires, in addition to Chlorophyll, the help of four other metal complexes ,a manganese complexes, two iron complexes(cytochromes and ferredoxin) and copper complex (plastocyanin)

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1) Chlorophyll absorbs light in the red region (near 700 nm) from the sunlight and supplies the absorbed energy for photosynthesis ; in this synthesis ,CO_2 is converted into sugars

2) CO_2 is fixed and oxygen is a by- products in this process .photosynthesis occurs not only in higher plants but also in algae and certain bacteria . It involves the conversion of light energy into chemical energy.

2) Many individual enzyme-catalyzed reactions occurs in photosynthesis . The process begins with the absorption of light by Chlorophyll .

3) The green colour of Chlorophyll and therefore it capacity to absorb sunlight in the visible region is primarily due to its extended conjugated system.

Chlorophyll traps photos of sunlight and supplies these to the plants cells to reduce carbon dioxide to carbohydrate and to oxidize water oxygen.

3) Magnesium in it makes the molecule rigid so that the energy absorbed is not lost thermally through molecular vibrations .

In addition, it enhances the rate at which the short – lived excited state initially formed by photon absorption is transformed into the corresponding triplet state ;

The triplet state has a longer lifetime and therefore can transfer its excitation energy into the redox chain.

4) photo synthesis involves a series of redox reactions. At the initial stage of the electron – transfer sequence, a manganese complex undergoes reversible redox reaction.

At other stages, iron containing plastocyanin participate in redox reactions. The chain of these redox processes ultimately releases molecular oxygen.