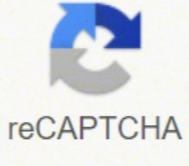




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**Next**

These graphs, together, show that most of the photosynthesis takes place in the blue and red regions of the spectrum; some photosynthesis does take place at the other wavelengths of the visible spectrum. Let us see how this happens. Though chlorophyll is the major pigment responsible for trapping light, other thylakoid pigments like chlorophyll *b*, xanthophylls and carotenoids, which are called accessory pigments, also absorb light and transfer the energy to chlorophyll *a*. Indeed, they not only enable a wider range of wavelength of incoming light to be utilised for photosynthesis but also protect chlorophyll *a* from photo-oxidation.

### 13.5 WHAT IS LIGHT REACTION?

Light reactions or the 'Photochemical' phase include light absorption, water splitting, oxygen release, and the formation of high-energy chemical intermediates, ATP and NADPH. Several protein complexes are involved in the process. The pigments are organised into two discrete photochemical **light harvesting complexes (LHC)** within the **Photosystem I (PS I)** and **Photosystem II (PS II)**. These are named in the sequence of their discovery, and not in the sequence in which they function during the light reaction. The LHC are made up of hundreds of pigment molecules bound to proteins. Each photosystem has all the pigments (except one molecule of chlorophyll *a* forming a light harvesting system also called **antennae** (Figure 13.4). These pigments help to make photosynthesis more efficient by absorbing different wavelengths of light. The single chlorophyll *a* molecule forms the **reaction centre**. The reaction centre is different in both the photosystems. In PS I the reaction centre chlorophyll *a* has an absorption peak at 700 nm, hence is called **P700**, while in PS II it has absorption maxima at 680 nm, and is called **P680**.

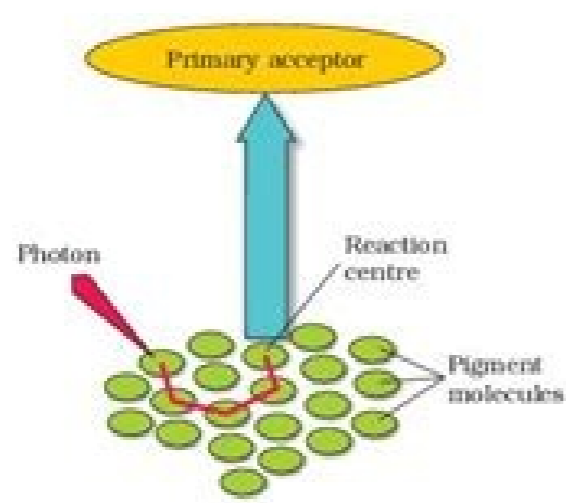


Figure 13.4 The light harvesting complex

### 13.6 THE ELECTRON TRANSPORT

In photosystem II the reaction centre chlorophyll *a* absorbs 680 nm wavelength of red light causing electrons to become excited and jump into an orbit farther from the atomic nucleus. These electrons are picked up by an electron acceptor which passes them to an **electrons transport**

2019-2020

Photosynthesis

Light energy is captured by a pigment molecule (chlorophyll) and used to drive the light reaction. The light reaction is the first stage of photosynthesis. It involves the absorption of light energy by chlorophyll and the conversion of this energy into chemical energy in the form of ATP and NADPH. The light reaction also involves the splitting of water into oxygen and hydrogen ions. The oxygen is released as a by-product, and the hydrogen ions are used in the dark reaction. The dark reaction is the second stage of photosynthesis. It involves the conversion of carbon dioxide into glucose using the ATP and NADPH produced in the light reaction. The dark reaction is also known as the Calvin cycle.

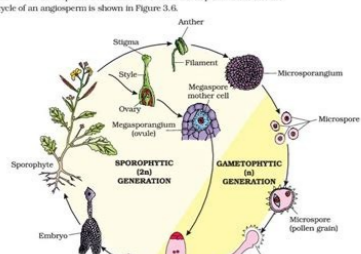
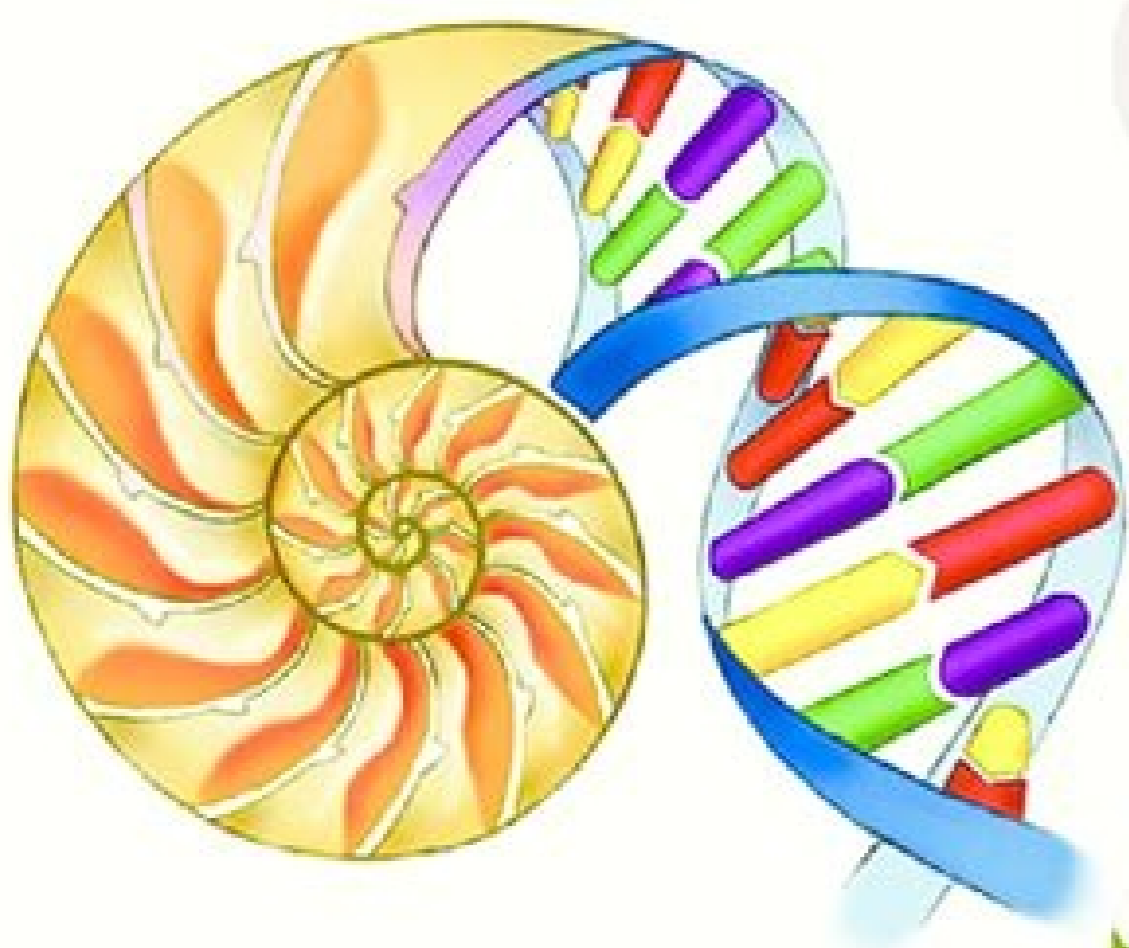


Figure 13.5 The light reaction



**11**  
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**EXERCISES WITH DETAILED SOLUTIONS**

**Question 9:**  
Differentiate between the following:

- (i) red algae and brown algae
- (ii) liverworts and moss
- (iii) homosporous and heterosporous pteridophyte
- (iv) syngamy and triple fusion

**Answer 9:**

(i) Red algae and brown algae

Red algae	Brown algae
1. Red algae are grouped under the class Rhodophyceae.	1. Brown algae are grouped under the class Phaeophyceae.
2. They contain floridean starch as stored food.	2. They contain mannitol or laminarin as stored food.
3. They contain the photosynthetic pigments chlorophylls a and d, and phycoerythrin.	3. They contain the photosynthetic pigments chlorophylls a and c, and fucoxanthin.
4. Their cell walls are composed of cellulose, pectin, and phycocolloids.	4. Their cell walls are composed of cellulose and algin.
5. Flagella are absent	5. Two flagella are present

(ii) Liverworts and moss

Liverworts	Moss
1. They have unicellular rhizoids.	1. They have multicellular rhizoids.
2. Scales are present very often	2. Scales are absent
3. They are generally thalloid, with dichotomous branching.	3. They are foliage, with lateral branching.
4. Gemma cups are present	4. Gemma cups are absent
5. Sporophyte has very photosynthetic tissue little	5. Sporophyte has abundant photosynthetic tissue

(iii) Homosporous and heterosporous pteridophyte

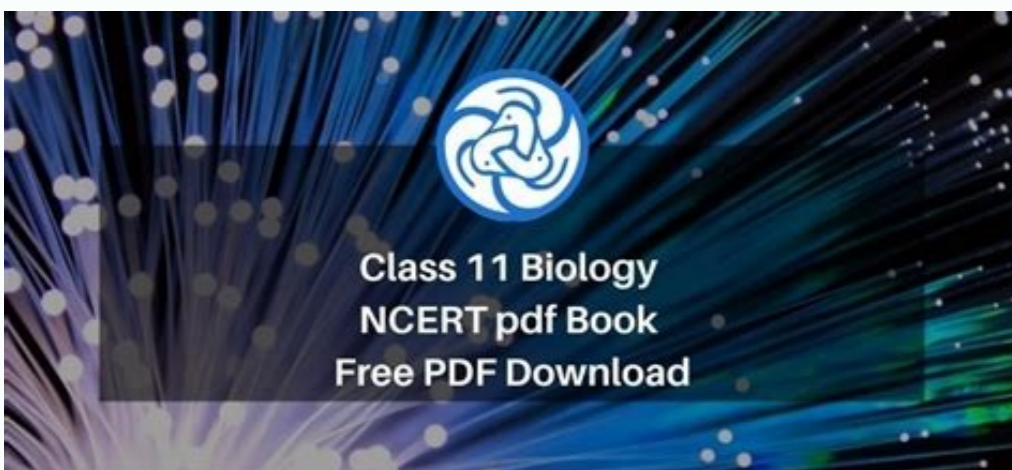
Homosporous pteridophytes	Heterosporous pteridophytes
1. They bear spores that are of the same type.	1. They bear two kinds of spores – microspores and megaspores.
2. They produce bisexual gametophytes.	2. They produce unisexual gametophytes.

(iv) Syngamy and triple fusion

Syngamy	Triple fusion
1. It is the process of fusion of the male gamete with the egg in an angiosperm.	1. It is the process of fusion of the male gamete with the diploid secondary nucleus in an angiosperm.
2. A diploid zygote is formed as a result of syngamy.	2. A triploid primary endosperm is formed as a result of triple fusion.

**Question 10:**

How would you distinguish monocots from dicots?



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