

## PHOTOSYNTHESIS

- the light reaction involves three stages:
- 1. Photexcitation: the e in chlorophyll absorb photons of energy
- 2. Electron transport: excited e are transferred through a series of e carrier
- 3. Chemiosmosis: Phosphorylation of ADP to ATP.

### Photoexcitation

- as the pigments absorb a photon, the electrons get boosted to a higher energy level

### Photosystems

- there are two types:
- **photosystem I** contain chlorophyll a called P700 (absorption spectrum peaks at a wavelength of 700)
- **photosystem II** contain chlorophyll a called P680
- the different peaks are due to the proteins associated with them at the reaction centre

### Electron Transport

- plants can make ATP and NADPH when the electrons move through an **electron transport system**

### Noncyclic Pathway of ATP formation:

- a photon strikes photosystem II exciting an electron of chlorophyll P680 that is captured by the primary electron acceptor, pheophytin, and transfers it to plastoquinone(Q), an electron carrier
- A Z protein initiates **photolysis** (a water molecule splits into oxygen, hydrogen ions and electrons which replace the electrons given up in P680)
- the electrons from P680 are transferred to P700 (Photosystem I) through an electron transport system (the Q cycle,  $b_6 - f$  complex, and plastocyanin)
- the electrons at this point have only lost some of their energy but then they are boosted again from the light being accepted by Photosystem I
- the electrons then enter another electron transport system(iron containing protein called ferredoxin) where  $\text{NADP}^+$  picks up two electrons and a hydrogen ion and becomes NADPH
- an electrochemical gradient is created with the accumulation of protons in the thylakoid space.
- the  $\text{H}^+$  move through ATPase complex which creates ATP from ADP (this is known as **photophosphorylation**)
- see Fig. 3 on Pg. 158

### Cyclic Pathway of ATP formation:

- electrons from Photosystem 1 (chlorophyll P700) passes from ferredoxin to the Q cycle then the  $b_6 - f$  complex then back to chlorophyll P700
- ATP is produced but NADPH is not generated, so Carbon fixation does not occur.

- see Fig. 6 on pg. 160
- the atmosphere as we know it today evolved from aquatic plants
- recall the bubbles that come off the leaves of aquatic plants; they represent the production of oxygen
- the accumulation of this oxygen changed the atmosphere and made it possible for aerobic respiration to emerge

**Seatwork**

Pg. 166 # 1 - 8