More on Photosynthesis

**Light-dependent reaction**

* + - * Pigments are responsible for absorbing the wavelengths of light necessary for the light-dependent reaction of photosynthesis to occur
      * Remember ROYGBIV when thinking about wavelengths of light in the visible spectrum
        + Chlorophylls

Absorb mostly red and blue wavelengths of light; reflect green

* + - * + Carotenoids

Absorb mostly green light and reflect yellow and orange

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| VIOLET RED | Chloro b  Chloro a  Carotenoids  absorption  Wavelength of light |

* + - H2O molecules are broken into hydrogen protons (positive ions), electrons, and oxygen atoms.
      * + The electrons replace those originally lost from chlorophyll when it was “excited” by the light.
        + The protons are used to make a small amount of ATP that will be used in the next step
        + The oxygen atoms, however, form oxygen gas (O2), which is a waste product of photosynthesis. The oxygen given off by photoautotrophs supplies most of the oxygen in our atmosphere.
    - The ATP generated, from what happens to the H protons resulting from the spitting of water, during this step of photosynthesis is used in the next step

**Light-independent reaction (AKA “Calvin Cycle”, “Dark Reaction”)**

* + - Happen in the stroma of the chloroplast of eukaryotes
    - Does NOT require light but does not ONLY happen in the dark…see plant adaptations below!
    - This is the “glucose building” step that uses the ATP generated in the first reaction
      * Carbon fixing occurs during this step
        + breaking apart carbon dioxide in order to incorporate the carbon into organics, like glucose;
        + fixing inorganic carbon into an organic compound
    - Gas exchange occurs
      * Stoma are small openings on plants, often leaves, where the exchange of gases occurs
        + Oxygen (generated in the first step) exits, carbon dioxide enters
        + Some water is also lost in this process…the evolution of a plant will dictate how it performs photosynthesis to deal with water loss from stomata

There are three variations/adaptations that we will discuss:

C3 plants: stoma open during the day

high rate of photosynthesis, high rate of growth

ex. “rainforest plants”

C4 plants: partially open stomata during the day

The C4 pathway is designed to efficiently fix CO2 at low concentrations

ex: “corn”

CAM plants: closed stomata during the day, only open at night

CAM plants live in very dry condition and, unlike other plants, open their stomata to fix CO2 only at night

ex: “desert plants”

* Temperature, carbon dioxide concentration and light intensity are three factors that can affect the **rate** of photosynthesis

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