

## BSCS Biology An Ecological Approach

### Chapter 19 The Flowering Plant: Maintenance and Coordination

*A root, a stem, a leaf, some means of capturing sunlight and air and making food—in sum, a plant. The green substance of this earth, the chlorophyll, is all summed up in the plants. Without them we perish, all of us who are flesh and blood.*

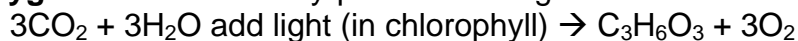
*-Hal Borland (1900-1978), Our Natural World,*

#### Introduction

Plants, like other multicellular organisms, are complex and rather complicated living systems. They are comprised of a vast array of specialized tissues of differentiated cells. These systems make it possible for plants to carry out various life processes to ensure continued survival. Without plants, life on earth as we know it would not be possible.

#### Photosynthesis

**Photosynthesis** is a composite series of chemical reactions in which the **energy** of the sun (or other light source) is converted into **simple sugars**. This process occurs in the green **chloroplasts** of plants. Plants appear green because the chloroplasts absorb the most visible light **wavelengths** other than those of the green **spectrum**. During photosynthesis, **carbon dioxide** and **water** are the raw products. **Light energy** is applied to the **chloroplasts** and **sugar** is produced with **oxygen** released as a by-product. The general formula is represented by



Photosynthesis is, therefore, the source of oxygen on earth. The four environmental factors affecting photosynthesis are **(1) light intensity (2) temperature (3) amounts of oxygen and (4) carbon dioxide** in the environment. Generally speaking, the following principles apply:

As temperature rises, chemical reactions speed up.

An increase in the level of carbon dioxide slows the rate of photosynthesis.

An increase in the level of oxygen also slows the rate of photosynthesis.

#### Plant Hormones

Plants produce various “chemical messengers” or hormones, which have an effect on their target areas. Outlined here are the hormones and generalized summary of their effect:

- **Auxins** influence the differentiation process of growth.
- **Gibberellins** affect stem elongation.
- **Abscisic acid** causes stomates to close and therefore limit plant water loss.
- **Cytokinins** promote growth.
- **Ethylene** induces ripening of fruits.

## **Plant Responses to External Stimuli**

Plants can slowly move in response to such external factors (stimuli) as light and gravity. These movements are called **tropisms**. They are

- **gravitropism** - the response to gravity (roots grow down and stems grow up)
- **phototropism** - the plant's response to light

The ability of plants to produce flowers is dependent on the amount of light they receive during the course of the day. **Long day plants** flower in response to extended periods of light. **Short day plants** respond by flowering in response to fewer periods of light. **Day neutral** plants are not sensitive to such periods of light. Knowing these cycles has allowed flower growers to “force” plants to bloom by manipulating lighting schedules under artificial conditions in controlled environments such as greenhouses.