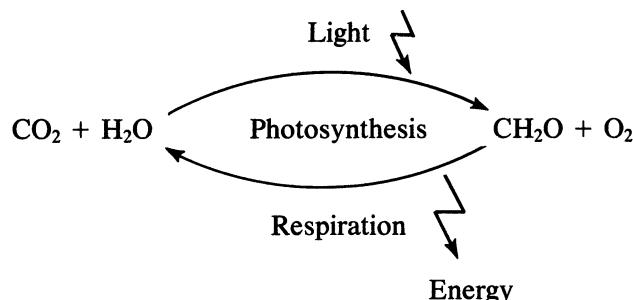


contribute to these binding sites. The variable sections have *hypervariable* regions in which the frequency of amino acid replacement is high. The study of how cells develop and produce antibodies is being actively pursued worldwide. Recent developments have also led to insights on how to impart catalytic activities to antibodies. These molecules have been called *abzymes*. Coupling new developments in protein engineering to antibodies promises the development of extremely specific catalytic agents.

### 2.2.3. Carbohydrates: Mono- and Polysaccharides

Carbohydrates play key roles as structural and storage compounds in cells. They also appear to play critical roles in modulating some aspects of chemical signaling in animals and plants. Carbohydrates are represented by the general formula  $(CH_2O)_n$ , where  $n \geq 3$ , and are synthesized through photosynthesis.



The gases  $CO_2$  and  $H_2O$  are converted through photosynthesis into sugars in the presence of sunlight and are then polymerized to yield polysaccharides, such as cellulose or starch.

*Monosaccharides* are the smallest carbohydrates and contain three to nine carbon atoms. Common monosaccharides are presented in Table 2.5. Common monosaccharides are either aldehydes or ketones. For example, glucose is an aldohexose. Glucose may be present in the form of a linear or ring structure. In solution, D-glucose is in the form of a ring (pyranose) structure. The L-form plays a minor role in biological systems.

