Section 5.1 Review Answers

Student Textbook page 168

1. A green plant converts light energy from the Sun into chemical energy to sustain its life processes. Herbivores such as a rabbit or deer eat the plant to obtain its stored chemical energy for their own use. When the herbivore is eaten by a mountain lion, the chemical energy that is transferred to the cat is delivered to the mitochondria of the muscle cells where it is converted to ATP and heat energy through the process of cellular respiration. The ATP produced is used in the contraction of the muscles of the mountain lion.

2. Photosynthetic organisms can use the energy from the Sun to synthesize energy-rich compounds that it can then use as "food." Thus, they do not need to rely on other organisms for those high-energy compounds.
3. Student answers should include points that are summarized in the following table. Note, a * indicates that the process listed occurs in that cellular activity.

Statement	Photosynthesis	Cellular Respiration
Converts light energy to chemical energy	*	
Converts the chemical energy in glucose to ATP		*
Occurs as a series of reactions	*	*
Involves the use of catalysts (enzymes)	*	*
ATP is produced	*	*
Oxygen is a waste product	*	
Oxygen is used		*
Occurs in the mitochondria		*
Carbon dioxide is produced		*
Carbon dioxide is consumed	*	
Water is a by-product		*
Occurs in the chloroplasts	*	
Glucose is synthesized	*	
Is a pathway that synthesizes larger molecules from smaller ones, and it requires energy		*
Is a process that breaks down large molecules to smaller ones, and it releases energy	*	

4. ATP is considered the "energy currency" of the cell because it is "spent" when the cell requires energy.
5. Student diagrams should include labels for the sugar group (ribose), nitrogenous base, and phosphate groups.
6. Student diagrams or descriptions should be similar to what is depicted in Figure 5.3 on page 163 of the student textbook. The energy that is released upon cleavage of the third phosphate group is used for numerous cellular activities. By phosphorylation of the ADP, ATP can be regenerated for further energy requirements by the cell.
7. A: Stroma
   B: Chloroplast membranes (outer and innner)
   C: Thylakoid
   D: Grana
8. The matrix is the part of a mitochondrion that performs a function related to the processes that occur in the stroma. Like the stroma, the matrix is a fluid-filled space that contains proteins and other chemicals used in reactions involving carbohydrates. (The difference between the two fluids is that the matrix supports the breakdown of carbohydrates, while the stroma supports their synthesis.)
9. Metabolism refers to all the chemical reactions that occur in a cell in order for it to survive. Metabolic pathways are discreet series of reactions that carry out specific functions. The two general categories of metabolic pathways that occur are: (1) those that synthesize large compounds from small precursor molecules and require energy, and (2) those that break down large compounds to produce smaller ones and release energy.
10. "Reducing power" refers to the amount of energy that a molecule has to reduce another compound. Molecules in their reduced state that have a large amount of available energy are considered to have "reducing power."