

## Chapter 4 Power Notes Answer Key

### Section 4.1

1. ATP
2. energy released for cell processes
3. ADP
4. energy from breakdown of molecules
5. 4 cal/mg; 36 ATP from glucose; most common molecule broken down to make ATP
6. 9cal/mg; 146ATP from a triglyceride; stores most of the energy in people
7. 4 cal/mg; infrequently broken down by cells to make ATP

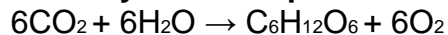
*Chemosynthesis*—process through which some organisms use chemicals from the environment (rather than light energy) as a source of energy to build carbon-based molecules

### Section 4.2

**Photosynthesis**—process through which light energy is captured and used to build sugars that store chemical energy

1. chloroplast
2. sunlight
3. water
4. thylakoid; chlorophyll and other light-absorbing molecules
5. oxygen
6. energy-carrying molecules transferred to light-independent reactions
7. carbon dioxide from the atmosphere
8. light-independent reactions (Calvin cycle)
9. one six-carbon sugar (glucose)

#### **Photosynthesis equation**



### Section 4.3

1. energy absorbed from sunlight and transferred to electrons that enter an electron transport chain
  2. water molecules are broken down; electrons enter chlorophyll
  3. energy from electrons in transport chain is used to pump H<sup>+</sup> ions across the thylakoid membrane
  4. energy absorbed from sunlight is transferred to electrons
  5. high-energy electrons used to produce an energy-carrying molecule called NADPH
  6. H<sup>+</sup> ions flow (by diffusion) through a channel in the thylakoid membrane
  7. The channel is part of ATP synthase, which produces ATP
1. carbon dioxide molecules enter the Calvin cycle
  2. energy added to molecules in the cycle; molecules rearranged into higher-energy molecules
  3. high-energy three-carbon molecule leaves the cycle; two are bonded together to make a six-carbon sugar
  4. energy added to molecules remaining in the cycle to change them into five-carbon molecules

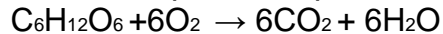
## Section 4.4

*Cellular respiration*—process through which sugars and other carbon-based molecules are broken down to produce ATP when oxygen is available

*Glycolysis*—anaerobic process in cytoplasm that splits glucose into 2 three-carbon molecules

1. mitochondrion
2. three-carbon molecules
3. Krebs cycle; mitochondrial matrix; produces 2 ATP
4. carbon dioxide
5. energy transferred to 2nd aerobic stage
6. energy from glycolysis and oxygen enter the process
7. water produced; large number of ATP molecules produced

*Cellular respiration equation:*



## Section 4.5

**Glycolysis** (as a sketch or in words)—2 ATP molecules used to split glucose; 4 ATP(2ATP net) and 2 NADH formed as the three-carbon molecules are rearranged into 2 molecules of pyruvate.

1. pyruvate broken down; CO<sub>2</sub> released
2. coenzyme A binds; intermediate enters Krebs cycle
3. citric acid (6-carbon molecule) formed
4. citric acid broken down; NADH made; CO<sub>2</sub> released
5. five-carbon molecule broken down; NADH and ATP made; CO<sub>2</sub> released
6. four-carbon molecule rearranged, NADH and FADH<sub>2</sub> made
7. Krebs cycle (or citric acid cycle)
  1. energized electrons removed from NADH and FADH<sub>2</sub>
  2. energy from electrons in the electron transport chain is used to pump H<sup>+</sup> ions across the inner mitochondrial membrane
  3. H<sup>+</sup> ions flow through ATP synthase, and ATP molecules are produced
  4. oxygen picks up electrons that went through the electron transport chain and H<sup>+</sup> ions

## Section 4.6

*Fermentation*—process that allows glycolysis to continue to produce ATP when oxygen is not available, but does not produce ATP

**Lactic acid fermentation** (as sketch or in words)—pyruvate and NADH enter fermentation;

NADH used to convert pyruvate into lactic acid; NAD<sup>+</sup> recycled to glycolysis

**Alcoholic fermentation** (as sketch or in words)—pyruvate and NADH enter fermentation; NADH used to convert pyruvate into an alcohol and carbon dioxide; NAD<sup>+</sup> recycled to glycolysis

1. cheese
2. yogurt
3. bread