

# Advanced Biology

## Study Guide – Unit 3: Chapters 6 & 7

You should understand and be able to apply all concepts and vocabulary from chapters 6 and 7. Additionally, you are responsible information given during lecture and lab.

### **Ch. 6: How Cells Harvest Chemical Energy**

**Introduction:** Compare the structure and functions of slow and fast muscle fibers.  
Explain why some people seem to be natural sprinters.

#### **Introduction to Cellular Respiration**

- 6.1 Compare the processes and locations of cellular respiration and photosynthesis.  
Explain why it is accurate to say that life on Earth is solar-powered.
- 6.2 Describe and compare the processes of breathing and cellular respiration.
- 6.3 Provide the overall chemical equation for cellular respiration. Compare the efficiency of this process in cells to the efficiency of a gasoline automobile engine.
- 6.4 Explain how the human body uses its daily supply of ATP.
- 6.5 Explain how the energy in a glucose molecule is released during cellular respiration.
- 6.5 Explain how redox reactions are used in cellular respiration.
- 6.5 Describe the general roles of dehydrogenase, NAD<sub>+</sub>, and the electron transport chain in cellular respiration.

#### **Stages of Cellular Respiration and Fermentation**

- 6.6 List the cellular regions where glycolysis, the citric acid cycle, and oxidative phosphorylation occur.  
Note whether substrate-level phosphorylation or chemiosmosis occur at each of these sites.
- 6.7–6.12 Compare the reactants, products, and energy yield of the three stages of cellular respiration.
- 6.11 Explain how rotenone, cyanide, carbon monoxide, oligomycin, and uncouplers interrupt critical events in cellular respiration.
- 6.13 Compare the reactants, products, and energy yield of alcohol and lactic acid fermentation.  
Distinguish between strict anaerobes and facultative anaerobes.
- 6.14 Describe the evolutionary history of glycolysis.

#### **Interconnections Between Molecular Breakdown and Synthesis**

- 6.15 Explain how polysaccharides, fats, and proteins are used as fuel for cellular respiration. Explain why a gram of fat yields more ATP than a gram of starch or protein.
- 6.16 Explain how nutrients are used in biosynthesis.

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#### **Key Terms**

acetyl CoA (acetyl coenzyme A)	dehydrogenase	lactic acid	redox reaction
alcohol fermentation	electron transport chain	fermentation	reduction
ATP synthase	facultative anaerobe	NAD <sub>+</sub>	substrate-level phosphorylation
cellular respiration	glycolysis	obligate anaerobes	
chemiosmosis	intermediate	oxidation	
citric acid cycle	kilocalorie (kcal)	oxidative phosphorylation	

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#### **Word Roots**

- aero-** air (*aerobic*: using oxygen)
- an-** not (*anaerobic*: not using oxygen)
- chemi-** chemical (*chemiosmosis*: the production of ATP using the energy of hydrogen ion gradients across membranes to phosphorylate ADP)
- de-** without
- hydro** water (*dehydrogenase*: an enzyme that removes water when catalyzing a chemical reaction)
- glyco-** sweet
- lysis** split (*glycolysis*: the multistep chemical breakdown of a molecule of glucose into two molecules of pyruvate)

## **Ch. 7: Photosynthesis: Using Light to Make Food**

**Introduction:** Explain how plants can be used as a renewable energy source.

Explain why this is better than burning fossil fuels.

### **An Overview of Photosynthesis**

7.1 Define autotrophs, producers, and photoautotrophs.

7.2 Describe the structure of chloroplasts and their location in a leaf. Identify specifically where most light energy is converted to chemical energy.

7.3 Explain how plants produce oxygen. Describe the experiments that revealed the source of the oxygen produced during photosynthesis.

7.4 Describe the role of redox reactions in photosynthesis and cellular respiration.

7.5 Compare the reactants and products of the light reactions and the Calvin cycle. Explain how photosynthesis relates to these reactions.

### **The Light Reactions: Converting Solar Energy to Chemical Energy**

7.6 Describe the properties and functions of the different photosynthetic pigments.

7.7 Explain how photosystems capture solar energy.

7.8–7.9 Explain how the electron transport chain and chemiosmosis generate ATP, NADPH, and oxygen in the light reactions.

7.9 Compare photophosphorylation and oxidative phosphorylation.

### **The Calvin Cycle: Converting CO<sub>2</sub> to Sugars**

7.10 Describe the reactants and products of the Calvin cycle. Explain why this cycle is dependent upon the light reactions.

### **Photosynthesis Reviewed and Extended**

7.11 Review the overall process of the light reactions and the Calvin cycle, noting the products, reactants, and locations of every major step.

7.12 Compare the mechanisms that C<sub>3</sub>, C<sub>4</sub>, and CAM plants use to obtain and use carbon dioxide. Note examples of plants that use each of these systems.

### **Photosynthesis, Solar Radiation, and Earth's Atmosphere**

7.13 Describe the greenhouse effect. Explain how deforestation and the use of fossil fuels contribute to global warming.

7.14 Explain how the ozone layer forms, how human activities have damaged it, and the consequences of the destruction of the ozone layer.

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### **Key Terms**

autotroph	spectrum	photon	stoma
C <sub>3</sub> plant	global warming	photophosphorylation	( <b>plural</b> , stomata)
C <sub>4</sub> plant	granum	photorespiration	stroma
Calvin cycle	( <b>plural</b> , grana)	photosynthesis	thylakoid
CAM plant	greenhouse effect	photosystem	wavelength
carbon fixation	light reactions	producer	
chlorophyll	mesophyll	reaction center	
electromagnetic	photoautotroph	complex	

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### **Word Roots**

**auto-** self

**-troph** food (*autotroph*: an organism that makes its own food, thereby sustaining itself without eating other organisms or their molecules)

**chloro-** green

**-phyll** leaf (*chlorophyll*: a green pigment located within the chloroplasts of plants, algae, and certain prokaryotes)

**electro-** electricity

**magnet-** magnetic (*electromagnetic spectrum*: the entire spectrum of radiation)

**meso-** middle (*mesophyll*: the middle layer of tissue inside a leaf)

**photo-** light (*photoautotroph*: an organism that obtains energy from sunlight and carbon from CO<sub>2</sub> by photosynthesis; *photon*: a fixed quantity of light energy);

**-synthesis** put together or combine (*photosynthesis*: the process by which autotrophs use light energy to make sugars and other organic food molecules from carbon dioxide and water)

**thylaco-** sac or pouch (*thylakoid*: one of a number of disk-shaped membranous sacs inside a chloroplast)