

Guided Reading Questions

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Chapter 5 The Working Cell

- (intro) What compounds and enzymes are needed for fireflies to make light? What chemical provides the chemical energy to produce the light? Where is luciferase located?
- (5.1) Define energy and work. Differentiate kinetic and potential energy. Give two examples of both types of energy.
- (5.2) Define thermodynamics. What are the system and the surroundings? What is an open system? What do the first and second laws of thermodynamics state? Define entropy.
- (5.3) Contrast endergonic and exergonic reactions. Which type of reaction is photosynthetic? What are the energy-poor reactants and energy-rich product of photosynthesis? Define cellular respiration. How are cellular respiration and burning similar and how are they different? Define cellular metabolism. What is energy coupling?
- (5.4) What is ATP and what are its components? Which bonds in ATP are unstable (and, though not stated, release large amounts of energy)? Define ADP and phosphorylation. What reactions generate and what reactions degrade ATP?
- (5.5) Define the energy of activation (aka activation energy). Which part of Figure 5.5A represents activation energy? Define enzyme. How does an enzyme speed up cellular reactions? How is the enzyme represented in Figure 5.5A?
- (5.6) Define substrate and active site. What is an induced fit? Name the steps in the enzymatic reaction diagrammed in fig. 5.6. How many reactions can an enzyme catalyze in one minute?
- (5.7) How does temperature affect enzymes? What is the optimal temperature for most human enzymes? Name four factors that effect enzyme activity? Define cofactor and coenzyme?
- (5.8) How does an inhibitor affect an enzyme? When are inhibitors irreversible? Contrast competitive and noncompetitive inhibitors. How can competitive inhibition be overcome? Define negative feedback.
- (5.9) When do inhibitors act like poisons? How does penicillin work? Why does it not affect humans?
- (5.10) How do membranes help maintain metabolic order? Define selective permeability. How does a cell membrane appear under a microscope?
- (5.11) What is the main structural component of a membrane? Which end of a phospholipid is hydrophobic and which end is hydrophilic? Draw a phospholipid bilayer. What materials can easily pass through the phospholipid bilayer and what materials cannot?
- (5.12) Why is the plasma membrane called a fluid mosaic? In what directions can proteins move in a plasma membrane? What are the roles of unsaturated fatty acids and cholesterol within the membrane? What is the physical state of the membrane? Define glycoprotein and glycolipid.
- (5.13) Which molecules perform most of the functions in a membrane? What are some functions of membrane proteins? Define receptor and signal transduction? Contrast passive and active transport.
- (5.14) Define diffusion and concentration gradient. In which way along a concentration gradient is the net movement of molecules? Does diffusion continue after equilibrium has been

- reached? Does the cell perform any work during passive transport? Through which portion of a plasma membrane do O₂ and CO₂ diffuse? Ions and polar molecules?
- (5.15) What properties prevent substances from freely diffusing across the membrane? Define facilitated diffusion. Why is facilitated diffusion a passive transport process? What is the driving force in passive transport? What types of substances use facilitated diffusion? What type of protein does water pass through?
- (5.16) Can water pass through the plasma membrane? Define osmosis. When does osmosis stop? In which direction along the solute concentration does water move?
- (5.17) Define tonicity, isotonic, hypotonic, and hypertonic. What happens to an animal cell when it is placed in isotonic, hypotonic and hypertonic solutions? Define osmoregulation. Do plant cells prefer an isotonic or hypotonic environment? Why does a plant cell not burst in a hypotonic environment? Define plasmolysis.
- (5.18) Define active transport. How does it differ from passive transport? What is the usual source of energy for active transport?
- (5.19) Define exocytosis. Draw and describe how large molecules are secreted/excreted from a cell? Define endocytosis, phagocytosis, pinocytosis and receptor-mediated endocytosis. Note that molecules do NOT cross the membrane in either exocytosis or endocytosis.
- (5.20) How is excess cholesterol removed from the blood? What occurs in hypercholesterolemia?
- (5.21) What is the function of the membranes in chloroplasts and mitochondria? What process converts light energy to chemical energy? What is the ultimate source of energy for organisms?