Guided Reading Questions

Chapter 5
The Working Cell

(essay) What is counter-illumination? Define bioluminescence. What compounds and enzymes are needed to make light? What chemical provides the chemical energy to produce the light?

(5.1) Why is the plasma membrane called a fluid mosaic? What roles do unsaturated fats and cholesterol play in membrane structure? How many proteins are present in a membrane? What are the functions of integrins and glycoproteins? What are some functions of membrane proteins? Define selective permeability? What materials can and cannot move through the phospholipids?

(5.2) What property of phospholipids make them a key ingredient in membranes?

(5.3) 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 O_2 and CO_2 diffuse? Ions and polar molecules?

(5.4) Can water pass through the plasma membrane? Define osmosis. When does osmosis stop? In which direction along the solute concentration does water move?

(5.5) 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.

(5.6) 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?

(5.7) What is an aquaporin? How common are they in cells? What role do these molecules play in regulation of the amount of water in the body?

(5.8) Define active transport. How does it differ from passive transport? What is the usual source of energy for active transport?

(5.9) 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.

(5.10) Define energy and work. Differentiate kinetic and potential energy. Give two examples of both types of energy.

(5.11) 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.

(5.12) Contrast endergonic and exergonic reactions. Define cellular respiration. How are cellular respiration and burning similar and how are they different? Which type of reaction is photosynthetic? What are the energy-poor reactants and energy-rich product of photosynthesis? Define metabolism and metabolic pathway. What is energy coupling?

(5.13) 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?

(5.14) Define the energy of activation (aka activation energy). Define enzyme. How does an enzyme speed up cellular reactions?

(5.15) Define substrate and active site. What is an induced fit? Name the steps in the enzymatic reaction diagrammed in fig. 5.15. How many reactions can an enzyme catalyze in one minute? 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?

(5.16) How does an inhibitor affect an enzyme? When are inhibitors irreversible? Contrast competitive and noncompetitive inhibitors. How can competitive inhibition be overcome? How do toxins like nerve gas and pesticides work? Define negative feedback.