

CHAPTER 4

*Approximately 75% of this assignment is due in class on Monday, October 2, 2017
The completed assignment, in its entirety, is due Tuesday, October 3, 2017*

Read Hillis Chapter 4 and answer ALL concept questions (4.1–4.5) in complete sentences. Most of these questions can be answered in one or two sentences.

Hints:

- For full credit on concept 4.1, you must show all work involved in the surface-area-to-volume ratio calculation.
- In concept 4.3, you are asked to construct a table with information on all eukaryotic cell structures with regard to size, numbers per cell, and functions. However, Hillis neglects to include all this information for each organelle. Fill in as much as you can from the text. The micrograms on pp. 62–63 might be useful for estimating the size of organelles, as each contains a scale.

ESSAY 2

Due Thursday, October 5, 2017

Answers must be written out in paragraph form. Outline form is not acceptable. Labeled diagrams may be used to supplement discussion, but a diagram without a written explanation will not receive credit. You must cite the source of all information you mention. Include the page number of information from the textbook or the web address of information found online.

Trypsin is a digestive protease found in the small intestines of humans and many other vertebrates. In a quantitative experiment to investigate the influence of temperature on trypsin activity, researchers observed trypsin-mediated reactions at various temperatures.

- (a) **Predict** how the activity of human trypsin would change as the temperature of the reaction is increased from 10°C to 30°C and from 30°C to 50°C. **Justify** your predictions based on the structure and function of proteins.
- (b) Use each of the following observations to **justify** the claim that chemical bonds or interactions within a protein play a prominent role in its structure and function.
- Human trypsin is only effective in a narrow pH range (7.8–8.7).
 - Changes in the primary structure of the enzyme lead to changes in secondary and tertiary structures.
- (c) **Describe** the data that will most likely be collected in the experiment. **Propose** an appropriate control treatment for the experiment, and **explain** how the control treatment would increase the validity of the results. **Describe** what information concerning the structure of the enzyme could be inferred from the experiment.

LAB REPORT

*The draft of your individual section of the group paper is due Tuesday, October 10, 2017
The complete draft of your group's paper is due Thursday, October 12, 2017*

CHAPTER 5

*Approximately 75% of this assignment is due in class on Monday, October 16, 2017
The completed assignment, in its entirety, is due Tuesday, October 17, 2017*

Read Hillis Chapter 5 and answer concept questions 5.1–5.5 in complete sentences. Most of these questions can be answered in one or two sentences. Be sure to read 5.6 thoroughly and come prepared with questions or specific points of confusion you would like to go over in this section.

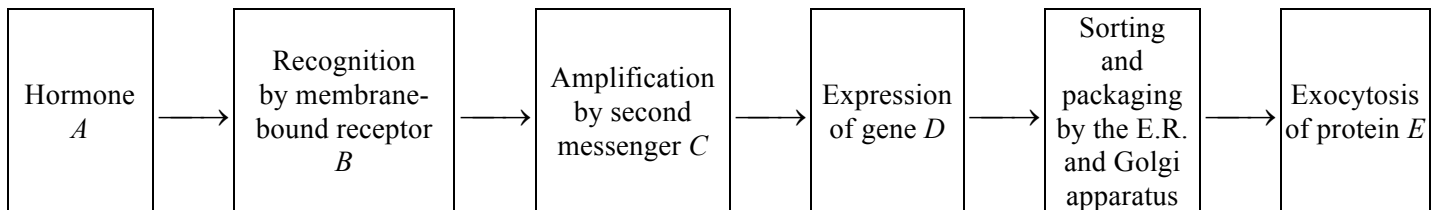
Hints:

- In concept 5.1, membrane fluidity refers to how easily components of the plasma membrane (such as membrane proteins) can move from one area of the membrane to another.
- Towards the end of the chapter, particularly in concept 5.6, Hillis gives several examples of complex signal transduction pathways; some of the diagrams can be overwhelming. Try to look at the big picture in each of these examples—What is the purpose of the diagram? What concept is Hillis trying to illustrate? Focusing on the caption for the figures may help to simplify what is being illustrated.

ESSAY 3

Due Friday, October 20, 2017

Answers must be written out in paragraph form. Outline form is not acceptable. Labeled diagrams may be used to supplement discussion, but a diagram without a written explanation will not receive credit. You must cite the source of all information you mention. Include the page number of information from the textbook or the web address of information found online.



The model above summarizes the pathway by which hormone *A* signals the secretion of protein *E* from the cells of mice. It is believed that a disruption in this signaling pathway results in Mickey's disease, in which an affected individual cannot properly digest certain fatty acids. Molecular biologists have hypothesized a number of different potential malfunctions in the pathway that could prevent the secretion of protein *E*.

- (a) **Provide reasoning** to connect each of the following potential malfunctions with the inability of a cell to secrete protein *E*.
- The gene coding for hormone *A* is not transcribed.
 - A mutation in the gene coding for receptor *B* causes an amino acid with a polar side chain to be replaced by one with a nonpolar side chain.
 - Second messenger *C* has a structural defect that makes it unable to accept a phosphate group.
 - There is a mutation in gene *D*.
 - Protein *E* is synthesized, but the correct chemical tag is not added while the protein is in the lumen of the rough endoplasmic reticulum.
- (b) **Describe** TWO pieces of experimental evidence that could be used to support the claim that Mickey's disease is caused by the absence of hormone *A* rather than by any of the other proposed malfunctions. **Provide reasoning** to explain how each piece of evidence supports the claim.
- (c) **Propose** ONE feature of a model to connect a lack of protein *E* to the symptoms of Mickey's disease.

LAB REPORT

A revised final draft of your group's paper is due Tuesday, October 24, 2017