GUIDED READING *- Ch. 7 – MEMBRANE STRUCTURE AND FUNCTION* **NAME:** _____

- **Please print out these pages and HANDWRITE the answers directly on the printouts.** *Typed work or answers on separate sheets of paper will not be accepted.*
- **Importantly, guided readings are NOT GROUP PROJECTS!!!** *You, and you alone, are to answer the questions as you read. You are not to share them with another students or work together on filling it out. Please report any dishonest behavior to your instructor to be dealt with accordingly.*
- **Get in the habit of writing legibly, neatly, and in a NORMAL, MEDIUM-SIZED FONT.** *AP essay readers and I will skip grading anything that cannot be easily and quickly read so start perfect your handwriting.*
- **Please SCAN documents properly and upload them to Archie.** *Avoid taking photographs of or uploading dark, washed out, side ways, or upside down homework. Please use the scanner in the school's media lab if one is not at your disposal and keep completed guides organized in your binder to use as study and review tools.*
- **READ FOR UNDERSTANDING and not merely to complete an assignment.** *Though all the answers are in your textbook, you should try to put answers in your own words, maintaining accuracy and the proper use of terminology, rather than blindly copying the textbook whenever possible.*

Cellular membranes are fluid mosaics of lipids and proteins [2].

1. The large molecules of all living things fall into just four main classes. Name them. [2]

2. a. Explain the term "amphipathic".

   b. Explain what is meant by "Selectively Permeable"

3. Explain Gorter & Grendel's reasoning and contribution made to our understanding of membranes?

4. a. In the 1960's, the Davson-Danielli model of membrane structure was widely accepted. Describe this model and explain how they contributed to our understanding of membranes. [2]

b. Cite two lines of evidence that were inconsistent with this Davson-Danielli's model? [2]

5. Describe the Freeze-Fracture Technique and its use in cell biology? What does this help you visualize.

6. a. Who proposed the Fluid Mosaic Model of membrane structure and when? [2]

   b. Describe this model in detail. [2]

7. What is meant by membrane fluidity? Describe also the movements seen in the fluid membrane. [3]

8. Describe how each of the following can affect membrane fluidity. [2]

   a. Decreasing temperature and why.

b. Increasing the ratio of phospholipids with unsaturated hydrocarbon chains and why.

c. Increasing the amount of cholesterol in the membrane and why.

9. a. Name two reasons why it matters that proper membrane fluidity be maintained (i.e. List two negative effects of membrane solidification)?

b. Remember, cells respond to their environment. ***The lipid composition of cell membranes can be changed as an adjustment to changing external temperatures.***

10. Identify each of the following features of the plasma membrane.

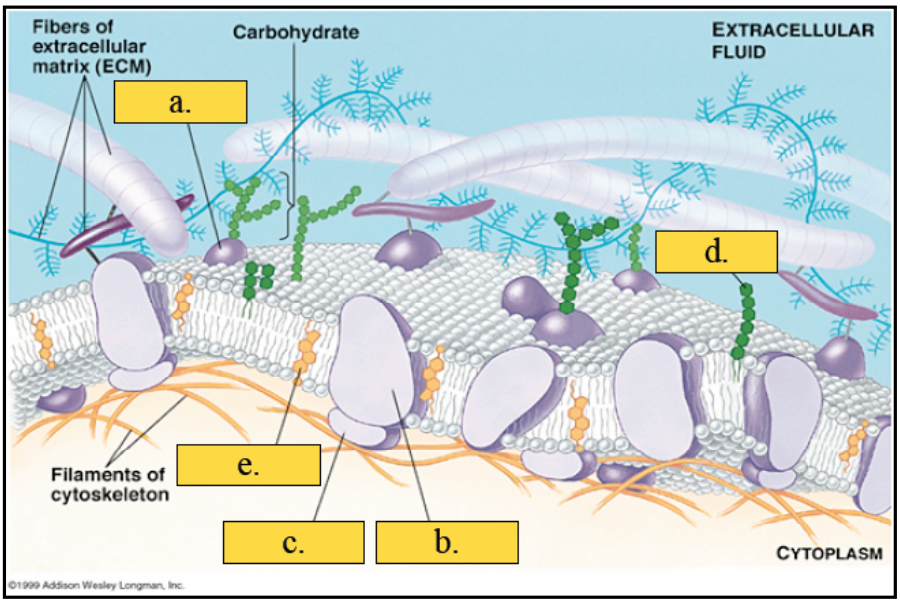
a.

b.

c.

d.

e.



11. Membrane proteins are the Mosaic part of the model. Describe each of the two main categories. [2]

    a. Integral Proteins *(Be sure to describe how a transmembrane integral protein differs from the rest)*

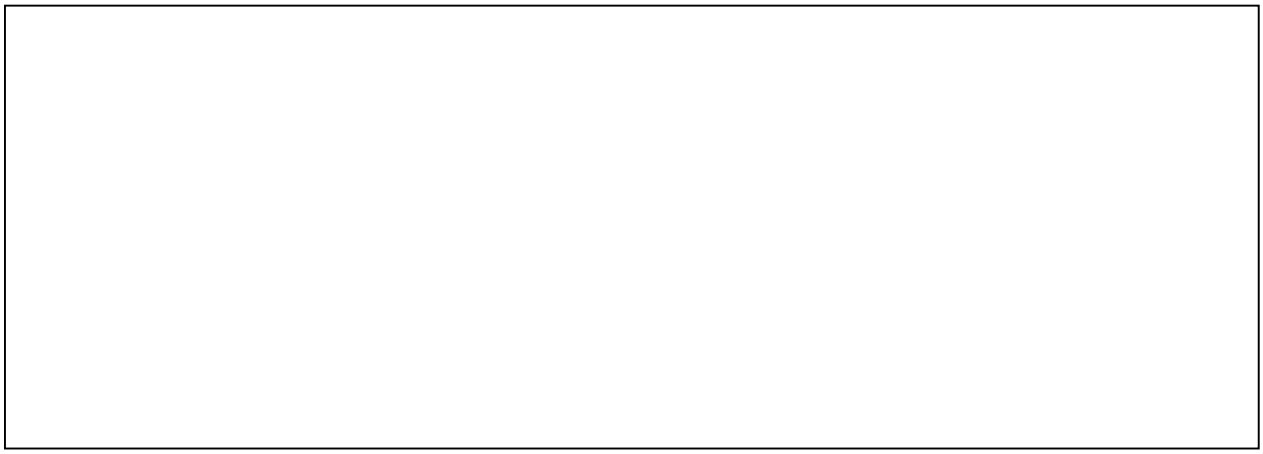
    b. Peripheral Proteins

12. List and explain the six main functions of membrane proteins.

    a.

    b.

c.



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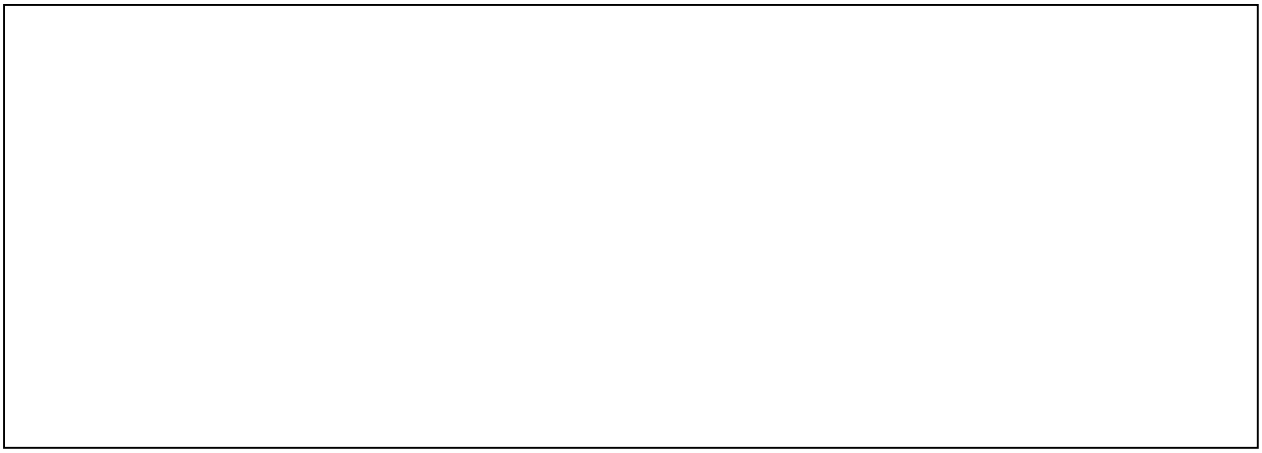

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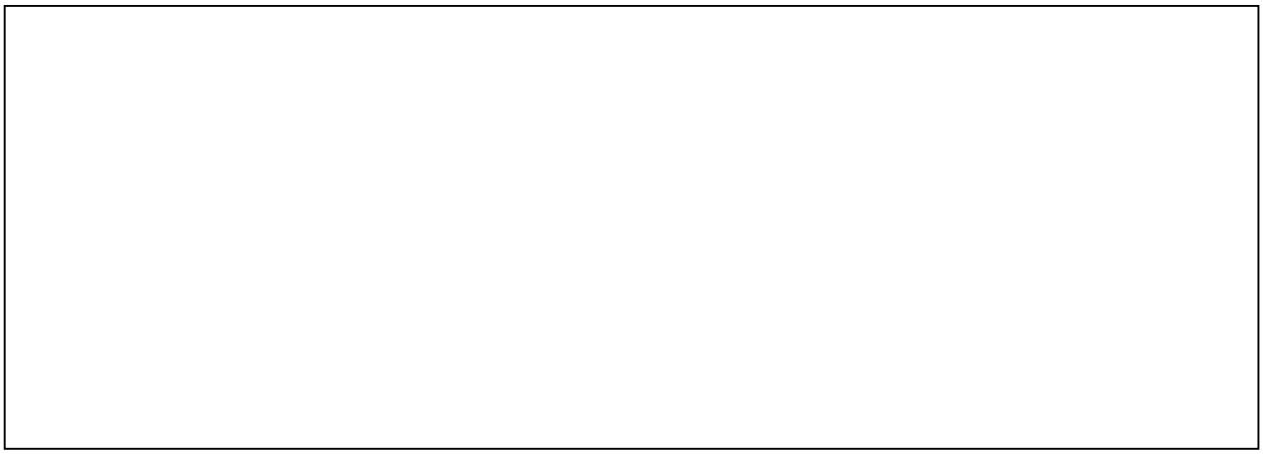

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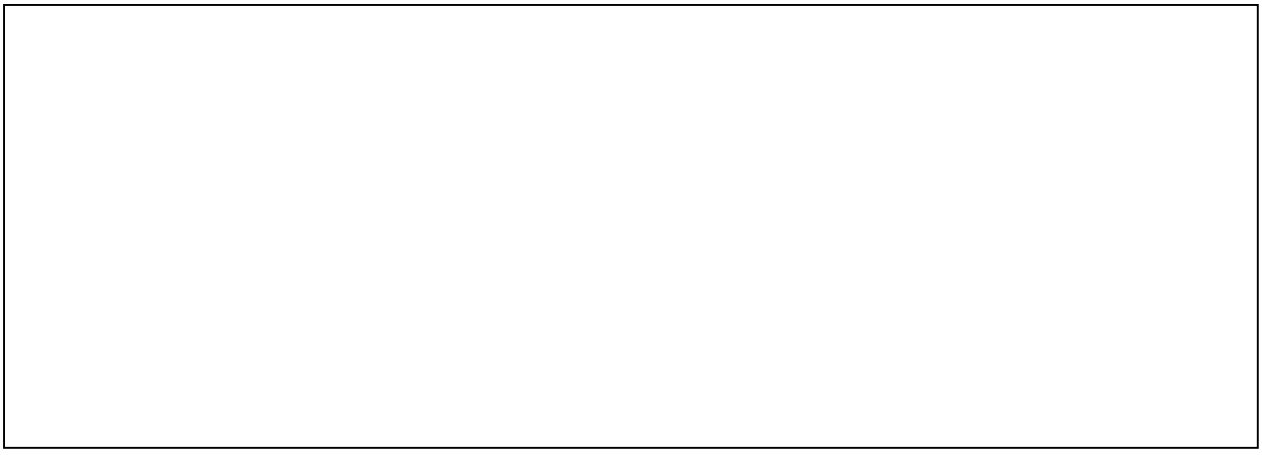


13. a. Define cell-cell recognition.

c. Membrane carbohydrates are important in cell-cell recognition. What are two examples of this?

d. What is the difference between these two molecules?

e. How do cells recognize each other with the help of these membrane carbohydrates?

f. What are some of the ways organisms use cell-to-cell recognition?

14. Many carbohydrate moieties (parts) are attached to proteins and lipids in the ER and Golgi apparatus. These molecules are then transported via transport vesicles to the plasma membrane. On which side of the transport vesicle's membrane, the inside or the outside, are the carbohydrates found and why? [1]

15. Let's review and see if you can answer this without looking back at your notes or book. What would be the difference in the saturation levels of membrane phospholipids fatty acids in organisms adapted to living in colder environments versus those adapted to living in warmer environments and why? [1]

Membrane structure results in selective permeability *[2].*

16. a. Which type of substances can cross through the lipid bilayer unaided and which cannot? WHY?

    b. How has the cell solved the latter problem?

17. Distinguish between Channel Proteins and Carrier Proteins. [2]

18. Are transport proteins specific? Cite an example that supports your response. [2]

19. Peter Agre received the Nobel Prize in 2003 for the discovery of Aquaporins. What are they? [2]

20. Aquaporins exclude passage of hydronium ions (H_3O^+). Recent research reveals a role for some aquaporins in fat metabolism, in which they allow passage of glycerol, a three carbon alcohol, as well as H_2O. Since H_3O^+ is much closer in size to water than is glycerol, what do YOU supposed is the basis of this selectivity? [1]

21. Consider the following materials that must cross the membrane. For each, tell how it occurs. [2]

    a. CO_2

    b. Glucose

c. H^+

d. O_2

e. H_2O

Passive transport is diffusion of a substance across a membrane with no energy investment *[2].*

22. What is Diffusion and what do concentration gradients have to do with it?

23. Define the term Passive Transport.

24. a. What is Osmosis?

b. What is free water and why is free water concentration the driving force in osmosis? [3]

25. Define the following terms.

a. Isotonic

b. Hypertonic

c. Hypotonic

d. Osmoregulation and give an example of it.

e. Turgid

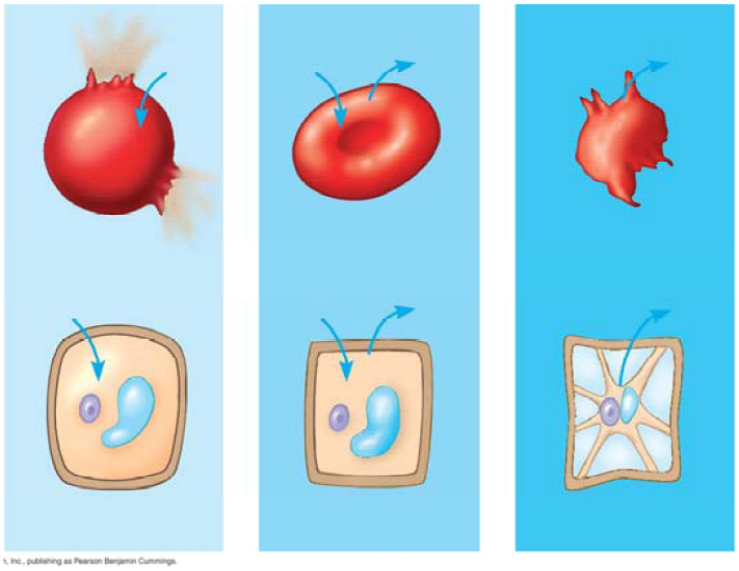
f. Flaccid

g. Plasmolysis

26. Describe using the words you have learnt such as Passive Transport, Osmosis, Concentration Gradient, Free Water etc… why a carrot left on the counter overnight would become limp. Underline each of these vocabulary words you use. [2]

27. What are the difference between animal and plan cells in reference to how they react to changes in solute concentration of their environments?

28. a. Label the Hypotonic Solution, Isotonic Solution, and Hypertonic Solution. [2]



b. What is indicated by the blue arrows? Label them. [2]

c. Which cell is Lysed? Turgid? Flaccid? Plasmolyzed? Apply all these labels. [2]

29. Why doesn't the plant cell burst? [2]

30. a. What is Facilitated Diffusion? [2]

c. Is it active or passive? Why? [2]

31. Two types of passive transport proteins are Carrier Proteins and Channel Proteins.

a. What is a Channel Protein?

b. Explain how their structure fits their function.

c. Provide an example.

d. One type of Channel Protein is an Ion Channel, which lets certain ions through. Some of these ion channels also are Gated Channels. What is special about these and how do they work?

e. Provide an example.

f. What is a Carrier Protein and how do they work?

g. Provide an example.

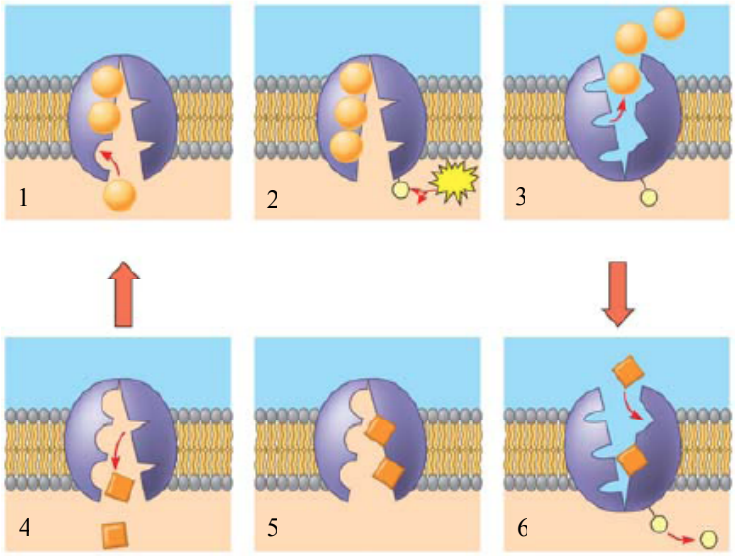
Active transport uses energy to move solutes against their gradients *[2].*

32. a. Describe Active Transport and its usefulness to the cell or organelle.

b. What type of transport proteins are involved. [2]

c. What is the role of ATP in the process? [2] How does it do this?

33. a. The Sodium-Potassium Pump is an important system for you to know! Use this diagram to understand how it works. Use the following terms *(Extracellular Fluid, Cytoplasm, Na^+, K^+, ATP, ADP, P, Transport Protein)* to label these figures. [2]



b. Briefly summarize what is occurring in each figure.

1.

2.

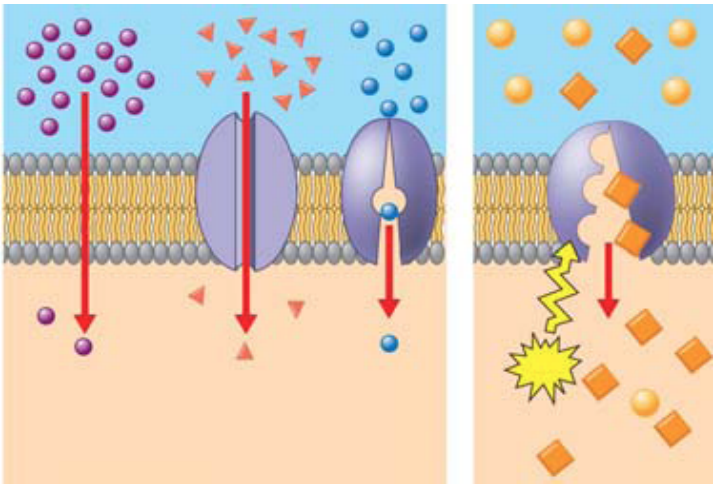
3.

4.

5.

6.

34. Label the following diagram with the following terms: Facilitated Diffusion with a Carrier Protein, Facilitated Diffusion with a Channel Protein, Active Transport with a Carrier Protein, Simple Diffusion.



35. Define and explain the following terminology.

a. Membrane Potential *(Include a mention of which side of the membrane is positive?)*

b. Electrochemical Gradient *(Be sure to explain the 2 forces that drive the diffusion of ions across membranes)*

c. Electrogenic Pump

d. Proton Pump

36. a. What is Cotransport, how does it function, and why is it so advantageous? Include a drawing.

b. Explain how understanding it is used in our treatment of diarrhea.

Bulk transport across the plasma membrane occurs by exocytosis and endocytosis *[2].*

37. What is a ligand? [3]

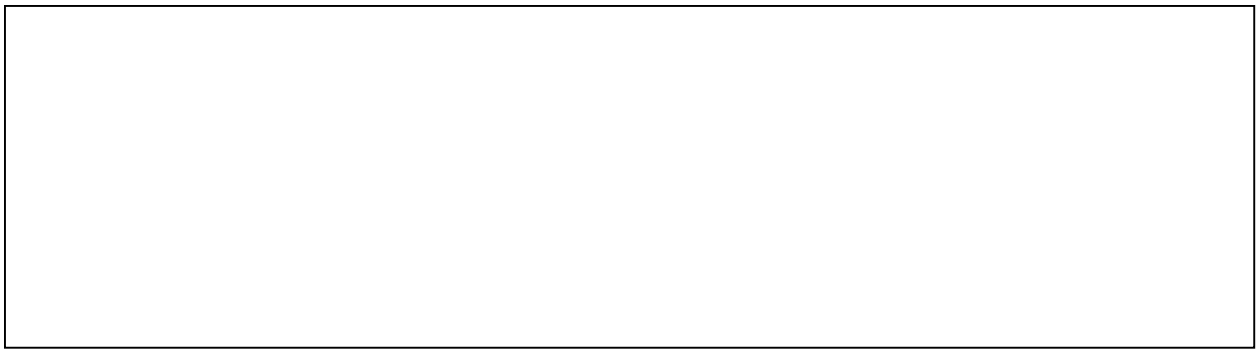
38. What is the difference between exocytosis and endocytosis?

39. Describe the three types of endocytosis witnessed in animal cells.

1.

2.

3.

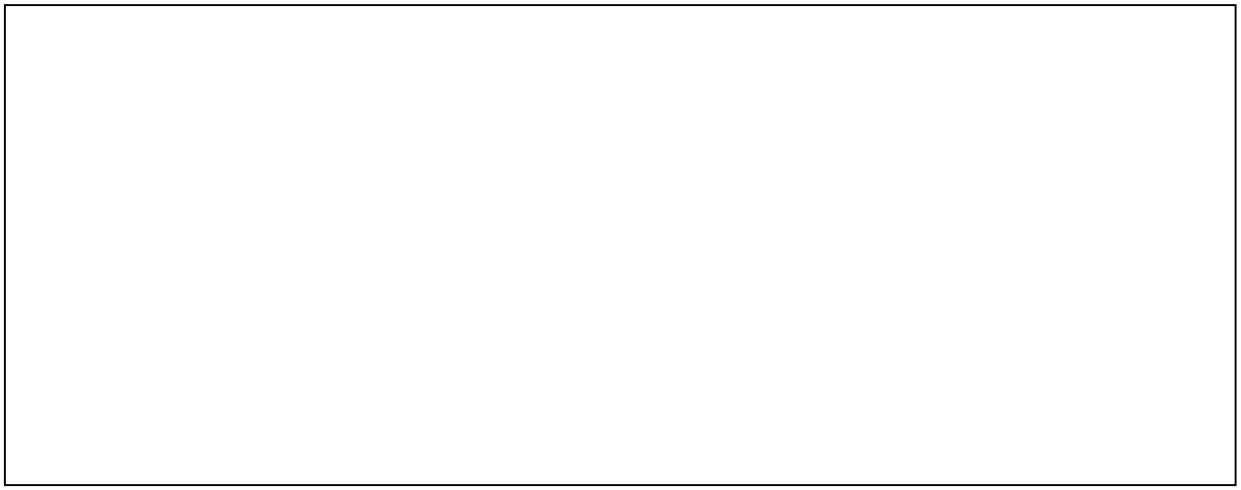


40. Please answer the Self-Quiz at the end of your chapter. *Do your best to try it from memory first in order to test how well you grasped the material.*

1. _____ 2. _____ 3. _____ 4. _____ 5. _____

6. Redraw the figure in this question then answer the 5 parts below.

a.



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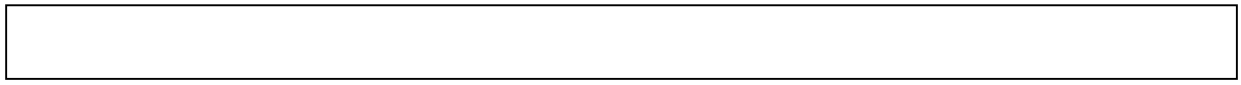

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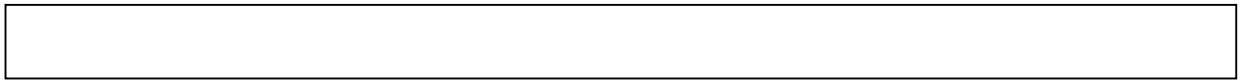

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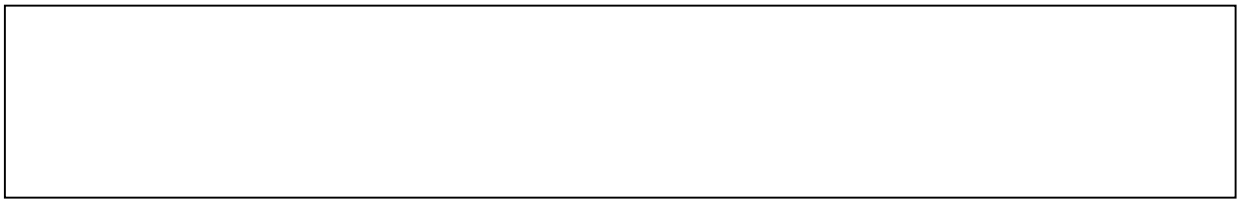

References

1. Campbell *et al*. (2008). AP* Edition Biology. 8th Ed. San Francisco: Pearson Benjamin Cummings.

2. Adapted from Fred and Theresa Holtzclaw

3. Adapted from L. Miriello