**AP Bio Reading Guide – Chapter 5**

***Section 1***

1. Phospholipids are amphipathic. Explain what this means.

2. In the 1960s, the Davson-Danielli model of membrane structure was widely accepted. Describe this model and then cite two lines of evidence that were inconsistent with it.

3. The currently accepted model of the membrane is the fluid mosaic model. Describe this model.

4. What is meant by membrane fluidity? Describe the movements seen in the fluid membrane.

5. Describe how each of the following can affect membrane fluidity:

a. decreasing temperature: b. phospholipids with unsaturated hydrocarbon chains: c. cholesterol:

6. Membrane proteins are the mosaic part of the model. Describe each of the two main categories: integral proteins, peripheral proteins.

7. Study Figure 5.7 in your text. Use it to briefly describe the following major functions of membrane proteins:

*Transport, Enzymatic Activity, Attachment to the Cytoskeleton and ECM, Cell-Cell Recognition, Intercellular Joining,*

*Signal Transduction*

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

9. Distinguish between glycolipids and glycoproteins.

***Section 2***

10. Distinguish between *channel proteins* and *carrier proteins*.

11. Are transport proteins specific? Cite an example that supports your response.

12. Peter Agre received the Nobel Prize in 2003 for the discovery of *aquaporins*. What are they?

13. Consider the following materials that must cross the membrane. For each, tell how it is moved across.

*CO2, Glucose, H+, O2, H2O*

***Section 3***

15. Define the following terms: *Diffusion*, *Concentration Gradient*, *Passive Transport*, *Osmosis*, *Isotonic*, *Hypertonic*, *Hypotonic*, *Turgid*, *Flaccid*, *Plasmolysis*

16. What is *facilitated diffusion*? Is it active or passive? Cite two examples.

17. Why does the red blood cell burst when placed in a hypotonic solution, but not the plant cell?

***Section 4***

18. Describe *active transport*. What type of transport proteins are involved, and what is the role of ATP in the process?

19. The *sodium-potassium pump* is an important system for you to know. Use Figure 5.14 to understand how it works, and briefly summarize what is occurring in each step.

20. For each type of transport, give an example of a material that is moved in this manner.

Facilitated diffusion with a carrier protein Facilitated diffusion with a channel protein

Active transport with a carrier protein Simple diffusion

22. What are the two forces that drive the diffusion of ions across the membrane? What is the combination of these forces called?

23. What is *cotransport*? Explain how understanding it is used in our treatment of diarrhea.

***Section 5***

24. Define each of the following, and give a specific cellular example.

*Exocytosis, Endocytosis, Receptor-mediated endocytosis, Phagocytosis, Pinocytosis*

25. What is a *ligand*? What do ligands have to do with receptor-mediated endocytosis?

26. Are the processes you described in question 21 active or passive transport? Explain your response.

***Section 6***

This one of the most difficult sections in the book because most of the material will be completely new to you. Cell communication is not covered in standard high school biology books, yet perhaps no other aspect of biology has grown as much as cell signaling in the last decade. Take your time with this section, and you will be rewarded with a knowledge base that will be most helpful in this course and courses to come.

27. What is a *signal transduction pathway*?

28. Describe and give a specific example of each of the following: *Paracrine* *signaling*, *Synaptic* *signaling*

29. How does a hormone qualify as a *long-distance signaling* example?

30. A signal transduction pathway has three stages. Use Figure 5.20 to explain each step.

a. reception b. transduction c. response

31. Explain the term *ligand*. (This term is not restricted to cell signaling. You will see it in other situations during the year.)

32. Describe the role of the three components of a *G protein-coupled receptor*.

a. G protein-coupled receptor b. G protein c. GDP

33. Equally important to starting a signal is stopping a signal. (Failure to do so can lead to serious problems, like cancer.) Describe how the signal is halted.

34. What activates a G protein?

35. A G protein is also a GTPase enzyme. Why is this important?

36. Look next at *ion channel receptors*. This figure shows the flow of ions into the cell. Ion channel receptors can also stop the flow of ions. These comparatively simple membrane receptors are explained in three steps. Explain the role of the following molecules: a. ligand b. ligand-gated ion channel receptor c. ions:

37. Figure 5.22 shows what has happened with the binding of the ligand to the receptor. Explain what occurs.

38. The ligand attachment to the receptor is brief. Explain what happens as the ligand dissociates.

39. In what body system are *ligand-gated ion channels* and *voltage-gated ion channels* of particular importance?

40. Intracellular receptors are found either in the cytoplasm or nucleus of target cells. In order to be able to pass through the plasma membrane, the chemical messengers are either hydrophobic or very small, like nitric oxide. Referring to Figure 5.23, explain how testosterone, a hydrophobic steroid hormone, works as an intracellular receptor.

41. What are two benefits of multistep pathways like the one in Figure 5.23 in your book?

42. Explain the role in transduction of these two categories of enzymes: protein kinase, protein phosphatases

43. What is the difference between a first messenger and a second messenger?

44. Two common *second messengers* are *cyclic AMP* (*cAMP*) and *calcium ions* (Ca2+). Explain the role of the second messenger cAMP in Figure 5.25 in the text.

45. What is the important relationship between the second messenger and *protein kinase A*?

46. Figure 5.25 explains a cellular response is initiated; how might that response be inhibited?

47. Use your new knowledge of cell signaling to explain the mechanism of disease in cholera.

48. When cell signaling causes a nuclear response, what normally happens?

49. When cell signaling causes a cytoplasmic response, what normally happens?