**Chapter 11: Cell Communication Study Guide**

Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_

AP Biology, Mrs. Oldendorf

 ***Concept 11.1 External signals are converted into responses within the cell***

1. What is a signal transduction pathway?

 2. Complete the chart of local chemical signaling in cell communication in animals.

|  |  |
| --- | --- |
|  **Local Signaling Types**  | **Specific Example**  |
| Paracrine  |
| Synaptic  |

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

****4. A signal transduction pathway has three stages. Use Figure 11.6 to label the missing parts of the preview figure below, and then explain each step.

**Reception**

**Transduction**

**Response**

***Concept 11.2 Reception: A signal molecule binds to a receptor protein, causing it to change shape***

5. Explain the term *ligand*. (This term is not restricted to cell signaling).

6-7. The text will explain three major types of membrane receptors in Figure 11.7. This material is of fundamental importance, so we will work thorough the specific figures for each type of membrane receptor. The first example is a *G protein-linked receptor*. In the first figure, label the components and then describe the role of the three components. For pictures 2-4, describe what is happening.

1. 2.



1. 4.



8. Equally important to starting a signal is stopping a signal. Step 4 stops the signal. (Failure to do so can lead to serious problems, like cancer.) Label and then describe how the signal is halted.

9. What activates a G protein?

10. The second type of receptor described is *receptor tyrosine kinase*. Explain what a kinase enzyme does.

11. What is a key difference between receptor tyrosine kinases and G protein-coupled receptors?

12. Label and explain how the receptors are activated in the diagram below.



13. Use the following diagram to explain how the activated receptor can stimulate multiple cellular response pathways.

14. Each activated protein in the figure above triggers a signal \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ pathway leading to a \_\_\_\_\_\_\_\_\_\_\_\_\_\_ response.

15. Label the diagram and then explain what has happened with the binding of the ligand to the receptor.



16. The ligand attachment to the receptor is brief. Label and explain what happens as the ligand dissociates.



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

18. Intracellular receptors are found in the \_\_\_\_\_\_\_\_\_\_ or \_\_\_\_\_\_\_\_\_\_\_\_ of the cell, where they bond to chemical messengers that are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ or very small, like nitric oxide.

19. This diagram uses testosterone, a hydrophobic hormone, to detail how intracellular receptors work. At each arrow, add an explanation of what is happening in the cell.



20. An important idea, *transcription factors*, is introduced in Figure11.8. Explain the function of transcription factors in the cell.

***Concept 11.3 Transduction: Cascades of molecular interactions relay signals from receptors to target molecules in the cell***

21. What are two benefits of multistep pathways like the one in Figure 11.9?

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

23. Two common *second messengers* are cyclic AMP (cAMP) and calcium ions (Ca2+). Explain the role of the second messenger cAMP in Figure 11.11 from the text.

24. Figure 11.11 explains how to initiate a cellular response; how might that response be inhibited?

25. Using your new knowledge of cell signaling, explain the mechanism of disease in cholera.

26. List three types of pathways often induced by calcium ions.

27. When cell signaling causes a response in the nucleus, what normally happens?

28. When cell signaling causes a response in the cytoplasm, what normally happens?

29. How do scaffolding proteins enhance a cellular response?

***Concept 11.5 Apoptosis (programmed cell death) integrates multiple cell-signaling pathways***

30. The signal for apoptosis can come from outside or inside the cell. Give one example when the signal comes from outside the cell and two examples of cellular occurrences that would prompt an apoptosis signal from inside the cell.

*Testing Your Knowledge: Self-Quiz Answers*

Now you should be ready to test your knowledge. Place your answers here:

1.\_\_\_\_\_\_\_ 2.\_\_\_\_\_\_\_ 3.\_\_\_\_\_\_\_ 4.\_\_\_\_\_\_\_\_ 5.\_\_\_\_\_\_\_\_ 6.\_\_\_\_\_\_\_\_ 7.\_\_\_\_\_\_\_ 8.\_\_\_\_\_\_\_\_