**CELL SIGNALING AND HOMEOSTASIS MODELING Name:**

**PURPOSE**: This activity will help you review the process of cell communication and how it helps maintain homeostasis in an organism.

**YOUR TASK**: Your group will create an interactive model using cutout pieces of construction paper, whiteboard markers, pipe cleaners, play-doh, or another appropriate material to describe the key features/components in a cell signaling pathway system and explain the three stages of cell signaling: reception, transduction, and cellular response. Once completed, you will share your models with your classmates.

**PROCEDURE**:

1. Your group will be assigned one of these cell signaling pathways:

G-protein receptor

Ligand-gated ion channels

Receptor tyrosine kinases

|  |  |  |
| --- | --- | --- |
| **Pathway Groups** | | |
| 1. **G-Protein** | 1. **Ligand-Gated** | 1. **Tyrosine Kinase** |
|  |  |  |

2) Spend the first day of the lab (Monday) with your Pathway Group, planning the following items:

* 1. Descriptions for reception, transduction and cellular response
  2. What materials you will use to model your signaling pathway
  3. How you will **briefly** “teach” your pathway to the other pathway types
  4. Creating your Google Document (see #4) in the ‘AP Biology Activity Log’ folder and answering the analysis questions (#8).
     1. Your final completed document (according to your assigned pathway—example: Group G-Protein) is due at the **beginning of class on day 4 (Thursday)**

3) Spend the second and third day of the lab (Tuesday & Wednesday):

* 1. Building your signal transduction pathway models and taking pictures to upload into your Google Document (#5-8).
  2. Finishing your descriptions and analysis questions in your Google Document.

**4) To document your modeling and learning, first make a Google Document titled “Pathway \_\_\_\_\_\_\_\_ (Name of Group Members)”.**

5) Using construction paper, clay, play-doh, chalk markers, or other material, create a model **(for your**

**assigned pathway)** that shows the first step in cell signaling: **reception**.

* 1. Take a picture of what you created and paste/insert it in your document under a heading titled RECEPTION. Make sure that your model contains a key or labels so that your classmates and teacher know what your model represents.

* 1. In the document, be sure to describe, **in your own words**, what your model is showing… in other words… TEACH US!

6) Now, manipulate and add components to your model that represent the second stage of cell signaling:

**transduction**.

* 1. Again, take a picture of your model and describe what is happening (in the document) under the heading titled TRANSDUCTION.

7) Finish your model by manipulating your model to show the third stage of cell signaling: **cell response**. Do like you did before… take a picture of your model and describe what is happening under the heading titled CELL RESPONSE.

* 1. Make sure you describe **specific** cell responses that may occur from the particular cell signaling pathway you were assigned. *This may require a bit of outside research!*

8) Copy, Paste, and Answer these analysis questions in your document:

1. What role does phosphorylation and dephosphorylation play in cell signaling?
2. What role do secondary messengers, such as Ca+2 and cyclic AMP (cAMP), play in cell signaling?
3. Why are they called secondary messengers?
4. What does cell signaling have to do with homeostasis of cells?
5. How else, besides cell signaling, do cells do to maintain homeostasis? Be specific!
6. Organisms respond to changes in their environment through behavior and physiological feedback mechanisms. Give two specific examples of behavior mechanisms and the physiological response(s) of the organism(s).

9) On the final day of the activity (Thursday), you will be divided into groups of threes, made up of 1 member from each respective pair to present your pathway type (G protein, Ligand-Gated, or Tyrosine Kinase) to members of the other 2 pathway groups.

* 1. You may either **quickly (5-10 mins)** reconstruct your model for this, or show them your Google Document.
  2. You will walk them through your pathway, answer their questions, and receive feedback on your model and explanation.
  3. A scoring sheet will be given to each student to score your friend’s work and presentation with a scale of 0 to 3.

10) **When you have completed your modeling and document, add the words ‘Final Version\_” to your file name. [**Exp: Final Version\_Group G-Protein (Members’ Names)]

**Rubric:** For your reference and Ms. Goh’s Use.

\_\_\_\_\_ Document completed and submitted on time (5 points)

\_\_\_\_\_ Google Document titled correctly (5 points)

\_\_\_\_\_ Picture included for Reception, Transduction, and Response (5 points per picture, total of 15)

\_\_\_\_\_Descriptions of each pathway step included (5 points per description, total of 15)

\_\_\_\_\_”Score” given by fellow members after learning about your model (avg of scores; 0-3 points)

0 points: I am completely confused. Messy model. Pathway group was unable to answer questions.

1 point: I walked away with some questions unanswered. Model needs improvement.

2 points: I mostly understand this pathway. Model looks good, but isn’t perfect.

3 points: My questions were answered well and the model is neat and well-labeled/explained.

\_\_\_\_\_Analysis Questions fully answered (12 points)

\_\_\_\_\_ Score (of 55 points)

\_\_\_\_\_ Percentage (of 100%)