Cell Project:

Modeling the Structure-Function Relationship amongst Cells

**Introduction**

According to the cell theory, all organisms are made up of cells, and these cells are responsible for carrying out all of life’s activities. This is true for all living organisms, ranging from unicellular bacteria to multicellular fungi, plants, and animals. Furthermore, there is variability in cells between different organisms and within the same organisms, resulting in many different types of cells. Each type of cell has developed a specific structure that effectively allows it to carry out its specific job or function. In this modeling activity, you and a partner will demonstrate this structure-function relationship by developing a model of a specific type of plant and animal cell.

**Objectives**

* To develop a model that illustrates the relationship between a specific cell type’s structure and it’s function.
* To compare the structure and function between different types of cells.
* To use models to understand biological processes (e.g., photosynthesis, respiration, diffusion, DNA replication).

**Project Components**

* *Part 1, Modeling the Basic Cell Structure & Function* (due \_\_\_\_\_\_\_\_\_)
* Select two specific types of cells to research.
* Select one plant cell: upper epidermal cell, lower epidermal cell, spongy mesophyll, palisade mesophyll, tracheid, companion cell, parenchyma cell
* Select one animal cell: cheek cell, nerve cell, muscle cell, white blood cell, bone cell, connective tissue cell, intestinal epithelial cell
* Create a model that accurately depicts the structure of the selected cells.
* State the function(s) of the selected cells.
* Identify all of the organelles that comprise the selected cells. Include all of the following, being sure to put organelles in the appropriate cells: *cell membrane, cell wall, nucleus, nuclear membrane, nucleolus, chromatin, cytoplasm, ribosomes, rough ER, smooth ER, Golgi apparatus, lysosomes, vacuole(s), mitochondria, chloroplasts, plastids, centrioles, flagella, cilia.*
* Create a model that graphically represents the distribution and abundance of each cell component in the cell.
* Within the model, describe the function of each organelle.
* Explain how the structure of the cell allows the cell to carry out its function in an organism.
* *Part 2, Modeling Specific Biological Processes* (due \_\_\_\_\_\_\_\_\_)
* Develop more detailed, “zoomed-in” sub-models of the cell structures responsible for carrying out 4 major biological processes. These processes include photosynthesis, cellular respiration, diffusion/osmosis, and DNA replication.
* Within the model, describe the processes of each of the 4 major biological activities.
* Explain (separate paper) how the structures of these cell organelles support the 4 major biological processes to be carried out.
* Describe a common medical concern that is associated with each cell type. (separate paper)
* *Part 3, Comparing Cell Types* (due \_\_\_\_\_\_\_\_\_) – record the following information in a clear and easily understandable way on paper that can be placed on or near your models. Be sure to consider structures and functions.
* Differentiate between your selected plant and animal cell.
* Distinguish between your selected plant cell and another type of plant cell.
* Distinguish between your selected animal cell and another type of animal cell.

**Rubric**

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| --- | --- | --- | --- |
| **Project Element** | **Student Eval.** | **Teacher Eval.** | **Comments** |
| **Planning, draft, and pre-writing** – evidence of planning and dividing work is demonstrated. |  | **/10** |  |
| **Equal participation in project** |  | **/30** |  |
| **Editing –** includes evidence of peer/adult editing, with comments & signature |  | **/10** |  |
| **Display** |  | **/10** |  |
| **Effort Total** |  | **/60** |  |
| **Cell structure –** model shows correct structure of specific cell types |  | **/10** |  |
| **Cell function –** role the cell plays in an organism is stated |  | **/10** |  |
| **Organelle modeling and structure** |  | **/20** |  |
| **Organelle function** |  | **/20** |  |
| **Cell structure-function relationship** |  | **/10** |  |
| **Modeling of biological processes’ structure** |  | **/20** |  |
| **Explanation of process of biological activities** |  | **/20** |  |
| **Organelle and biological processes structure-function relationship** |  | **/10** |  |
| **Medical concern** |  | **/10** |  |
| **Plant/Animal cell comparison** |  | **/10** |  |
| **Specific plant cell type comparison** |  | **/10** |  |
| **Specific animal cell type comparison** |  | **/10** |  |
| **Product Total** |  | **/170** |  |