Cell structure and function essay sample

ASSIGN BUSTER

On your own and without assistance, complete this Lab 3 Answer Form electronically and submit it via the Assignments Folder by the date listed on your Course Schedule (under Syllabus). To conduct your laboratory exercises, use the Laboratory Manual that is available in the WebTycho classroom (Reserved Reading or provided by your instructor) or at the eScience Labs Student Portal. Laboratory exercises on your CD may not be updated. Save your Lab3AnswerForm in the following format: LastName_Lab3 (e. g., Smith_Lab3). You should submit your document in a Word (. doc or . docx) or Rich Text Format (. rtf) for best compatibility.

Experiment 1: Labeling (consult the Lab 3 Introduction for more details)

Bacteria: Nucleoid region, cell wall, plasma membrane, ribosomes, flagella

Protist: Macronucleus, micronucleus, plasma membrane, cytoplasm, contractile vacuole

Plant Cell: Nucleus, cell wall, plasma membrane, cytoplasm, chloroplast, mitochondria, vacuoles

Animal Cell: Nucleus, nucleolus, plasma membrane, cytoplasm, mitochondria, golgi apparatus, rough ER, ribosome

Questions

1. For each structure identified, do you think its location affects its ability to function? Why or why not? (Hint: those buried deep in the cell probably do different things than those closer to the cell membrane) *see below the cells above

2. Draw a labeled diagram of a small section of the plasma membrane and briefly describe its structure and function.

3. Describe the differences between animal and plant cells.

Although plant and animal cells both have mitochondria, cytoplasm, and ribosomes they differ in many ways. Animal cells do not have a cell wall and are round with irregular shapes. Centrioles are also present in all animal cells, as well as most eukaryotic cells. Plant cells only have centrioles if they are in the lower plant species. Both types of cells have vacuoles, but their functions are quite different. The purpose of vacuoles in a plant cell is to store water and maintain the structure of a cell, whereas in animal cells they are used to store water, waste, and ions. Animal cells have one or more small vacuoles, whereas plant cells have one, large central vacuole. Plant cells are the only type of cells that contain plastids which contain pigments that are used in the photosynthesis process. Chloroplast is another organelle that is found in plant cells and are responsible for the plant’s immune response. Both cells have an assortment of organelles, each with various functions that make life as we know it possible.

4. Which of the following structures are present in both prokaryotic and eukaryotic cells? Both eukaryotes and prokaryotes have DNA as their genetic material, each also contains RNA. Both types of cells are covered by a cell membrane and are made of the same basic chemicals: proteins, fats, minerals, and carbohydrates. Ribosomes are responsible for the synthesis proteins and are also present in prokaryotic and eukaryotic cells.

5. Where is genetic material found in plant cells?

DNA is the genetic material found in the nucleus of plant cells. Mitochondria contain their own separate DNA as well.

6. Mitochondria are the only organelles that contain their own DNA (circular) and have a double membrane. Why do you think this might be so?

Mitochondria contains circular DNA. This type of DNA is typically found in viruses and bacteria. Bacteria were present billions of years before the first eukaryotes appears. Because of their ancient origins it is argued that mitochondria originated as bacteria. The mitochondria then invaded or was consumed by another prokaryotic cell. Rather than being killed off by its host, the mitochondria then began living symbiotically in the eukaryote’s cytoplasm. Over the course of millions of years mitochondria lost the ability to function independently and became a permanent part of the eukaryotic cell. Although the mitochondria became a part of the cell, it retained some of its original DNA.

Hint 1: Where else do we see circular DNA?)

Hint 2: What do you know about the relative age of eukaryotic cells?)

7. How is the structure of the plant’s cellulose-based cell wall related to its function?

Cellulose is a carbohydrate that is used for the structure of the cell wall. It provides protection by strengthening the cell wall while the cell wall protects the cell against viruses and bacteria. In addition to being a strong supporting structure, cellulose is fully permeable to water and solutes and they flow freely in and out of the cell.

8. Defects in structures of the cell can lead to many diseases. Pick one structure of a eukaryotic cell and develop a hypothesis as to what you think the implications would be if that structure did not function properly. Cell membranes separate the interior of the cell from the outside environment. The cell membrane allows certain ions and organic molecules in and out of the cell, making the membrane selectively permeable. It controls what enters and exits the cell, and also serves as an adhesive surface for the cell wall and extra cellular structures. If this structure were to become faulty I would presume that the entirety of the cell would no longer exist. The other organelles would dissipate out of the cell and foreign objects would permeate into the cell. If there were no cell membrane the cell wall would have nothing to “ grab” onto, resulting in extraordinary weak exterior defenses. There would be no regulation as to what passes in, or flows out of the cells; opening the door to viruses that would consume the cell. I expect that without its protective shield the cell would cease to exist.

9. Using books, articles, the internet, etc. conduct research to determine if your hypothesis was correct. Upon doing further research I concluded that my hypothesis is correct. Sources from various websites and articles stated that without a cell membrane any harmful material could enter the cell, while beneficial substances could leave the cell without regulation. Foreign particles within the cell would dismantle its already delicate ecosystem and it would not be able to function properly. Without a cell membrane there is no structure ensuring that the required necessities are always present within the cell.

Experiment 2: Directions and Concentration Gradients

Table 2: Water Movement

Initial Volume

Sucrose %

Prediction: Will water move in or out?

Final Volume

Bag #1 10 mL

30%

Out

20 ml

Bag #2 10 mL

15%

In

13 ml

Bag #3 10 mL

3%

In

10 ml

Bag #4 10 mL

3%

In

5 ml

Questions

1. For each of the bags, identify whether the solution inside was hypertonic, hypotonic or isotonic in comparison to the beaker solution it was placed in.

Bag #1: Hypertonic solution

Bag #2: Hypertonic solution

Bag #3: Isotonic solution

Bag #4: Hypotonic solution

2. Which bag increased the most in volume? Why?

Bag #1 increased the most in volume. This was because the solution on the inside of the dialysis tubing was higher concentration of sucrose. In an effort to obtain equilibrium water was moved into the tubing to balance out the sucrose quantity.

3. What does this tell you about the relative tonicity between the contents of the bag and the solution in the beaker? Cells are in constant battle to equalize themselves with their surroundings. When solutions are hypotonic or hypertonic, water is moved in or out of the membrane in attempt to create equilibrium between the inside and outside of the cell. When the solution inside the bag had a higher concentration of sucrose, water moved inside the bag. When the solution inside of the bag had a lower concentration of sucrose, water moved outside of the bag.

4. What would happen if bag 1 is placed in a beaker of distilled water? If the membrane permitted, sucrose would be transferred out of the bag into the external solution. But seeing as this dialysis tubing only allowed water to permeate, water would be passed into the bag in attempt to even out its water to sucrose ratio.