



Republic of the Philippines
Department of Education
Region IV (A) – CALABARZON
City Schools Division Office of Antipolo
District I – A



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STUDENT's ACTIVITY SHEET (SAS) FOR GENERAL BIOLOGY 1

STUDENT's ACTIVITY SHEET FOR MELC 2 (MODULAR MODALITY)

TITLE/LESSON: **Cell Structure and Function**

1. OBJECTIVES: At the end of the lesson, you are expected to:

- a. identify the different organelles within a cell;
- b. describe the structure and function of cellular organelles; and
- c. explain and give analogies related to the parts and function of the cell.

A. Content Standard:

The learners/students demonstrate understanding of cell theory.

B. Performance Standard:

The learners/students should be able construct a 3D model of a plant/animal/bacterial cell using recyclable materials.

C. Most Essential Learning Competency/ies:

Describe the structure and function of major and subcellular organelles.

(STEM_BIO11/12-1a-c-2)

II: LEARNING RESOURCES

- A. Materials/IMs Needed
- B. References
- C. Additional Materials and Learning Resources

III: TIME FRAME: 100 minute or 2 days (30 min will be allotted for the lecture part)

IV: INTRODUCTION/RATIONALE

Welcome to the General Biology 1 Alternative Delivery Mode (ADM) **STUDENT's ACTIVITY SHEET (SAS)** on **Cell Structure and Function**

The hand is one of the most symbolized part of the human body. It is often used to depict skill, action and purpose. Through our hands we may learn, create and accomplish. Hence, the hand in this learning resource signifies that you as a learner is capable and empowered to successfully achieve the relevant competencies and skills at your own pace and time. Your academic success lies in your own hands!

This **SAS** was designed to provide you with fun and meaningful opportunities for guided and independent learning at your own pace and time. You will be enabled to process the contents of the learning resource while being an active learner.

Likewise, this learning resource hopes to engage you into guided and independent learning activities at your own pace and time. Furthermore, this also aims to help you acquire the needed 21st century skills while taking into consideration your need and circumstances.

This contained the concepts about cell theory which will give you further understanding on the processes that are important to sustain life. This **SAS** will help you explore the key concepts on topics and immerse you in various activities and hands-on tasks that will help you answer the questions pertaining to the cell theory.

This SAS/Learning Materials has the following parts to guide you accomplish the task given:

What I Need to Know

This will give you an idea of the skills or competencies you are expected to learn in the SAS.

What I Know

This part includes an activity that aims to check what you already know about the lesson to take. If you get all the answers correct (100%), you may decide to skip this module.

What's In

This is a brief drill or review to help you link the current lesson with the previous one.

What's New

In this portion, the new lesson will be introduced to you in various ways such as a story, a song, a poem, a problem opener, an activity or a situation.

What is It

This section provides a brief discussion of the lesson. This aims to help you discover and understand new concepts and skills.

What's More

This comprises activities for independent practice to solidify your understanding and skills of the topic. You may check the answers to the exercises using the Answer Key at the end of the module.

What I Have Learned

This includes questions or blank sentence/paragraph to be filled in to process what you learned from the lesson.

What I Can Do

This section provides an activity which will help you transfer your new knowledge or skill into real life situations or concerns.

Assessment

This is a task which aims to evaluate your level of mastery in achieving the learning competency.

Additional Activities

In this portion, another activity will be given to you to enrich your knowledge or skill of the lesson learned. This also tends retention of learned concepts.

At the end of this SAS you will also find:

References

This is a list of all sources used in developing this module.

The following are some reminders in using this module:

1. Use the module with care. Do not put unnecessary mark/s on any part of the module. Use a separate sheet of paper in answering the exercises.
2. Don't forget to answer *What I Know* before moving on to the other activities included in the module.
3. Read the instructions carefully before doing each task.
4. Observe honesty and integrity in doing the tasks and checking your answers.
5. Finish the task at hand before proceeding to the next.
6. You are requested to have at least four (4) small thin notebooks which will be served as your **BIO-JOURNAL**. All your answers in each activity must be written/placed there to be submitted to me, Mrs. Zenaida P. Cristobal every week(Friday) with the help of your parent/guardian.
7. Return this SAS to your teacher/facilitator once you are through with it with the help of your parent or guardian.

If you encounter any difficulty in answering the tasks in the part of each SAS, **DO NOT** hesitate to consult your teacher, Mrs, **Zenaida P. Cristobal**. Always bear in mind that you are not alone.

You can reach me via our Group Chat (GC), Cell Phone number and email address posted in our GC.

I hope that through this material, you will experience meaningful learning and gain profound understanding of the relevant competencies. You can do it!

What I Need to Know

In lesson 1, you have learned about the cell theory and the discoveries made by scientists.

In this next topic, you will learn on the cell structure and functions that carry out basic life processes.

The SAS is divided into two lessons, namely:

- Lesson 1 – Cell Structure and Functions
- Lesson 2- Cell Analogy

After going through this module, you are expected to:

- a. identifies the different organelles within a cell
- b. describes the structure and function of cellular organelles
- c. explains and give analogies related to the parts and function of the cell

What I Know

Activity 2.1 “Match Me”

Directions: Read and analyze the questions carefully. This activity is divided into two (2) parts.

Part 1: Match the descriptions in column A with the term/s in column B. Write the letter of your choice on your **Bio-Journal**. (10 minutes)

Column A	Column B
1. The best feature of this organelle is its energy producing ability	A. Chloroplast
2. Which organelle breaks down organelles that are no longer useful?	B. Mitochondria
3. Which structure makes proteins using coded instructions that come from the nucleus?	C. Ribosome
4. Its structure is basically thick and rigid layer that surrounds the plant cell and provides support and structure.	D. Cell wall
5. This organelle is unique to a plant cell	E. Lysosome
	F. Nucleus

Part 2: Multiple choice:

Write the letter of your choice on your **Bio-Journal**.

6. If the cell membrane is NOT semi-permeable membrane how would it affect the whole cell?

- A. the cell will be so much healthy for the entry of nutrients
- B. the cell will increase its size too much
- C. the cell will be damaged by the entry of harmful substances
- D. the cell will lost its receptors

7. Which phrase best describes the property of semi or selective permeability?

- A. some molecules pass
- B. all ions pass
- C. large molecules pass
- D. all molecules pass

8. What is the function of the mitochondria and its location?

- A. in the cytoplasm to produce ATP
- B. in the cytoplasm, to break down food and foreign material
- C. in the middle of the cell, to assist the nucleus
- D. in the middle of the cell, to transport the protein

9. This is the primary reason why plant cell has larger vacuole than animal cell.

- A. Plants have thicker cell walls
- B. Plants have active storing units
- C. Plants can directly make their own food
- D. Plants depend on animals for food.

10. The most important feature within the structure of the cell membrane which helps it in carrying its task is _____.

- A. viscous fluid flowing around it
- B. series of fibers within it
- C. semi-permeable phospholipid bilayer
- D. paired genetic materials within it

What's In

Lesson 2: Cell Structure and Function

Roles to Rules; Structure to function

All of the life living cell involve energy and matter. The energy is the molecules chemical activities within cell performs the following life processes:

1. Nutrition is the process by which cells obtain food molecules to support their other activities.
2. Digestion is the process by which food particles are broken down into smaller soluble units suitable for cell use with the help of enzymes.
3. Absorption is the process by which cells absorb water, minerals and other materials essential to life from their environment.
4. Biosynthesis is the process by which all cells organize complex chemicals from simple building units or substances.
5. Excretion is the process by which by-products of all cell activities which are not needed for further cell functioning are eliminated.
6. Egestion is the process by which insoluble, non-digested particles are eliminated by the cell.
7. Secretion is the process by which substances that are synthesized by the cells are expelled from the membrane. This elimination process helps in the functioning of the body.
8. Movement is a process which includes the locomotion of cell by means of special structures like cilia or flagella.
9. Irritability is the process by which cells respond or react to external factors or conditions around them. Cells can alter their functions in response to changes their environment.
10. Respiration is the process of breaking down food molecules into chemical energy needed by all cells in order to function.
11. Reproduction is a process by which a cell copies or replicates its DNA and increases its number by cell division. It gives rise to new cells as a result, organisms grow.

Note that all these life processes are made possible through the organelles working together as a team. Let's find out below what these organelles are:

Can you still remember the cellular organelles which you learned in junior high school? Try the anticipation-reaction activity below and see how much you can recall.

Activity Number 2.2 "Anticipation-Reaction Activity"

Directions: Write **P** if the organelle can be found in plants only, **A** if in animals only and **B** if found in both plants and animals. After trying this activity draw one emoticon which will reflect your overall reaction in recalling the concepts. **(5 minutes)**

1. Cytoplasm _____
2. Rough Endoplasmic Reticulum _____
3. Smooth Endoplasmic Reticulum _____
4. Ribosomes _____
5. Lysosomes _____
6. Nucleus _____
7. Nuclear Envelope _____
8. DNA _____
9. Plastids _____
10. Vacuole _____
11. Cell wall _____
12. Mitochondria _____
13. Centriole _____
14. Cell Membrane _____
15. Chloroplast _____

What's New

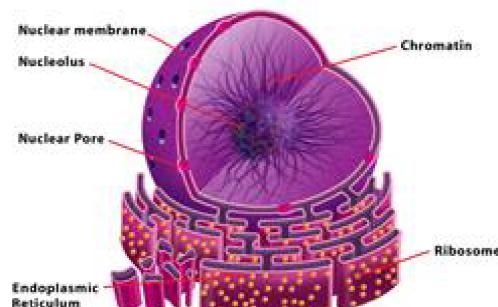
All living organisms are made up of one or many cells. The cells are the building block of life just as atoms are the basic building blocks of all matter. Each cell contains materials that carry out basic life processes.

Cell structures can only be observed under high magnification electron microscope and are separated internally into numerous membranous compartments called organelles (little organs). These organelles perform a variety of functions like production of proteins, storage of important materials, harvesting energy, repairing cell parts, digestion of substances, and maintaining the shape and structure of the cell.

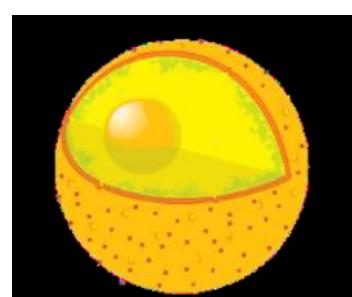
Activity 2.3: "Describe Me!"

Directions: Identify all the descriptions of cell organelles which are shown through the illustration on the right. Write your answers on your Bio-Journal. **(15 minutes)**

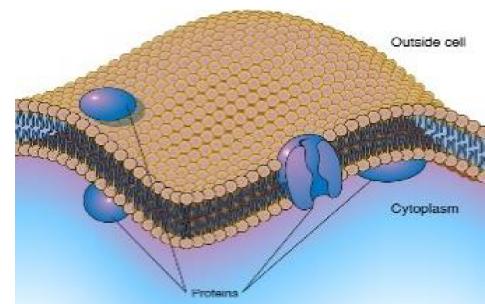
1. Control center, stores DNA



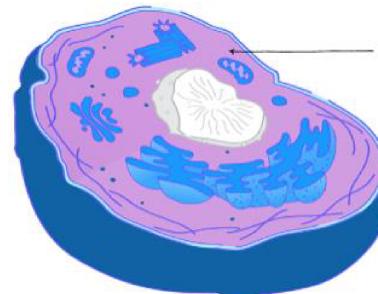
2. Center of the nucleus, produces ribosomes



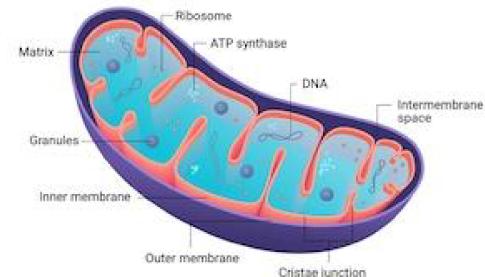
3. Controls passage of organic molecules, ions, water, oxygen and wastes into and out of the cell.



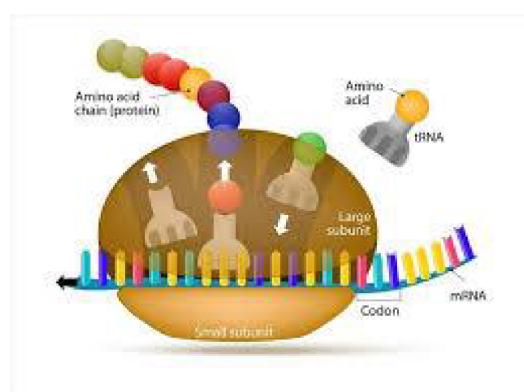
4. Provides structure to cell; gel-like fluid in which organelles are found



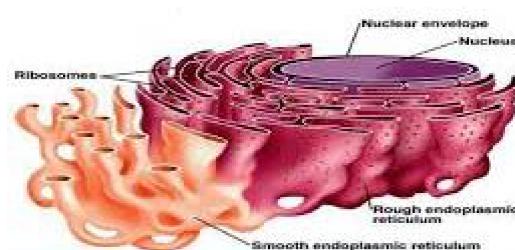
5. "Powerhouse of the cell", releases energy from food



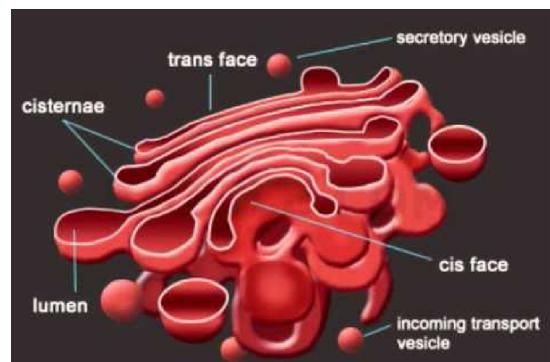
6. Small structures for protein synthesis



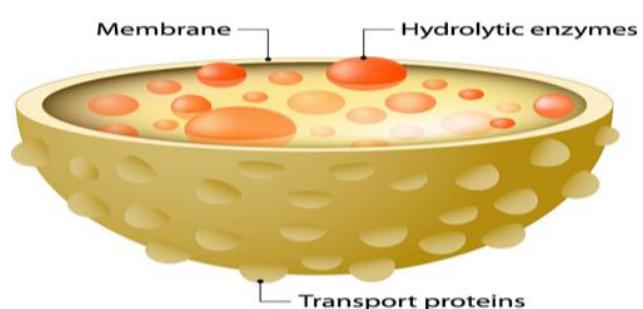
7. Modifies proteins and synthesizes lipids



8. Modifies, sorts, tags, packages and distributes lipids and protein
-
-
-



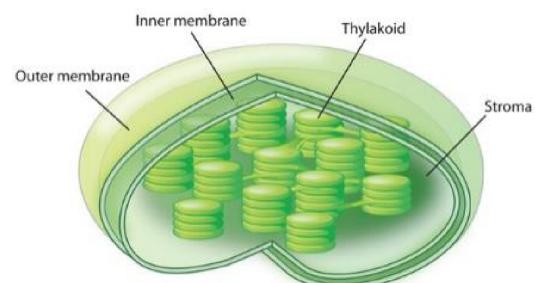
9. Garbage disposal, digestion of macromolecules; recycling or worn out organelles
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-
-



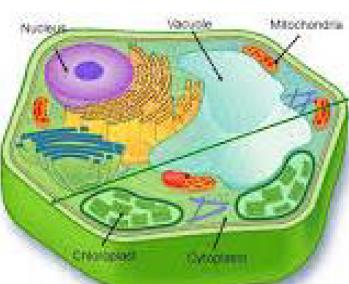
10. Storage and transport; digestive function in plant cells.
-
-
-



11. Site of photosynthesis, trap sunlight to make food
-
-
-



12. Protection, structural support and maintenance of cell shape
-
-
-



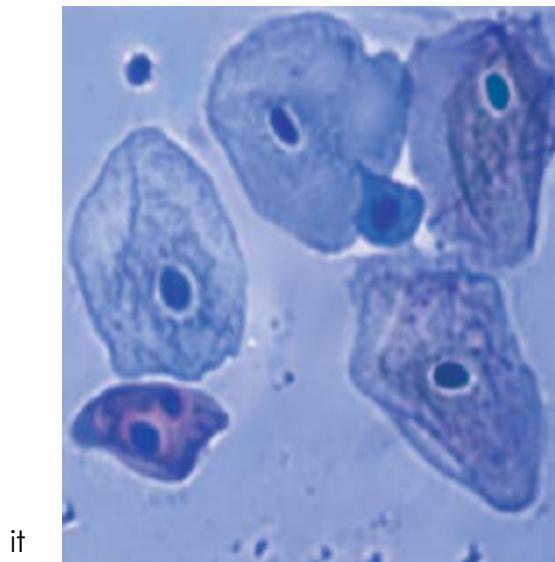
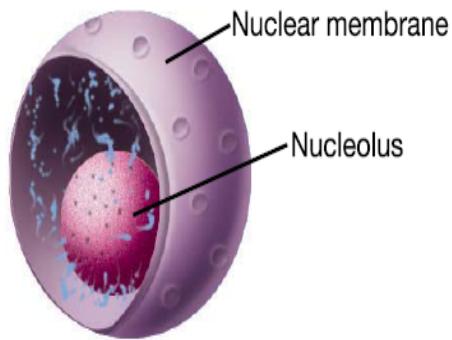
What Is It

and Function

The principal parts of a cell are:

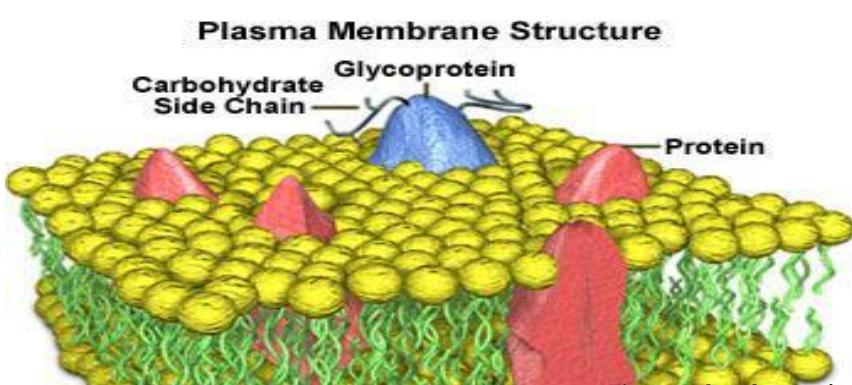
1. Cell membrane
2. Cytoplasm
3. Nucleus

The **nucleus** is covered with a membrane that allows materials to pass in and out. It's often called the **"control center"** of the cell because it contains DNA. The nucleolus is where the ribosomes are formed and this structure can be found both in plants and animals.

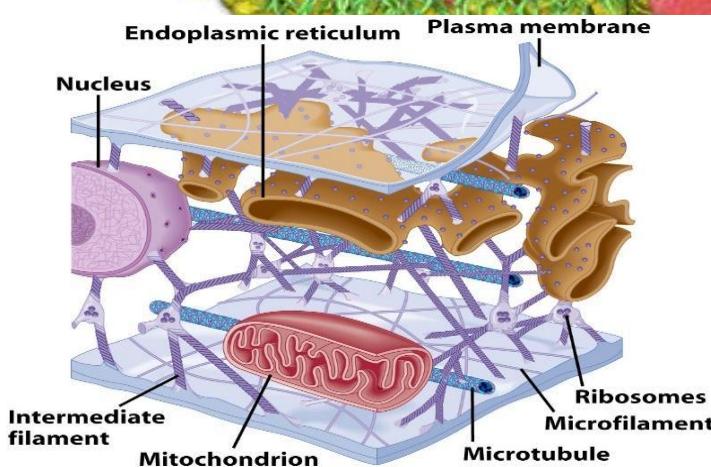


The **cell membrane** is a **semi-permeable membrane** that facilitate the movement of molecules inside and outside the plant or animal cell. It allows only chosen substances to enter or leave cell which can protect the cell from harmful substances.

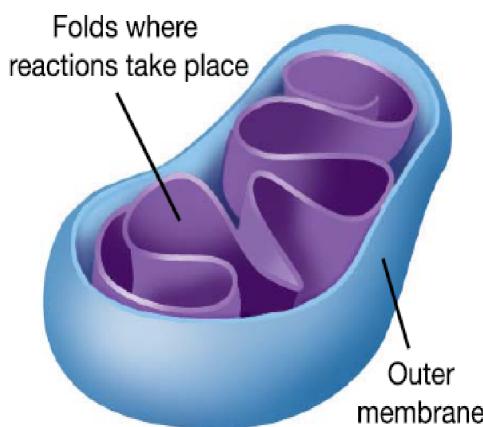
The cell membrane is often pictured as **fluid mosaic model**. Fluidity becomes its characteristic because its molecules are constantly moving. The phospholipid molecules move sideways within the membrane. Since the plasma membrane is fluid, it can seal itself if is damaged or broken.



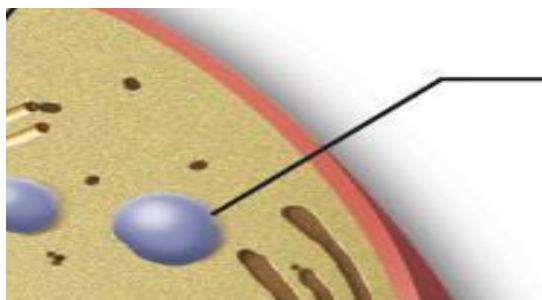
or



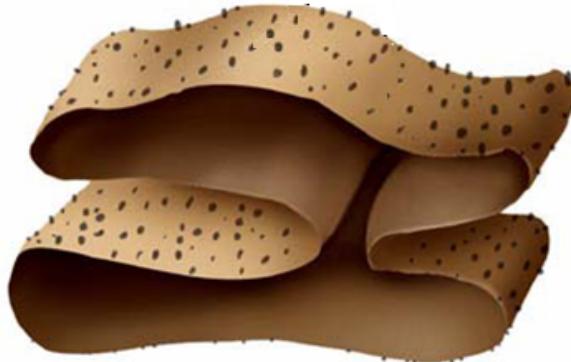
The **cytoplasm** is a viscous fluid **jelly like** **Hydrophilic** material where organelles are embedded. Its jelly like feature secures the organelles in plants and animals so that they remain in place.



The **Mitochondria** are called the “**powerhouses**” of **cells**. They produce much of the **energy** a plant or animal cell needs to carry out its functions. They are the centers of cellular respiration, a process in which energy-rich ATP (Adenosine Triphosphate) that functions in energy storage and transfer is produced.



A **vacuole** is the **storage area of the cell**. Vacuoles store water, food, and waste. Animals have a very small vacuole while plants as the producers through the process of photosynthesis have a big central vacuole.



The **endoplasmic reticulum** (ER) is a series of tunnels throughout the cytoplasm.

They **transport proteins** from one part of the cell to another that is why they are called as the transport center of the cell.

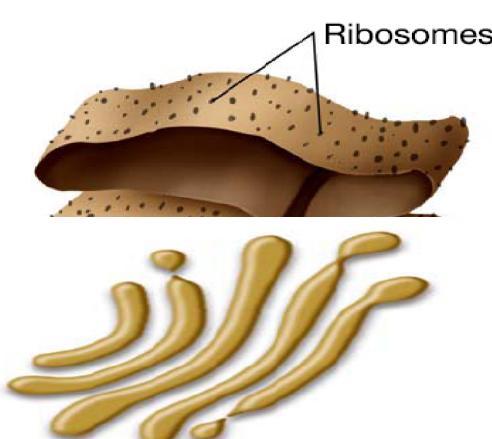
ER in plants and animals form a network of tiny canals through the cell.

These canals are formed by two parallel membranes. They connect the nuclear membrane and the plasma membrane thus serving as passageway for food substances.

Two types of Endoplasmic Reticulum:

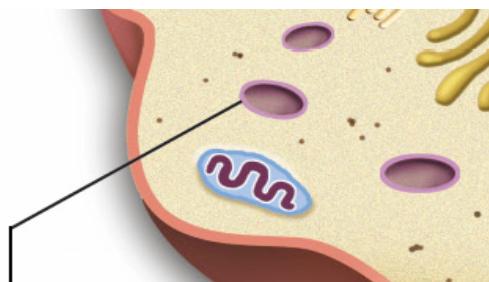
Smooth - ribosome free and functions in detoxification of lipids.

Rough - contains ribosomes and releases newly made protein from the cell.

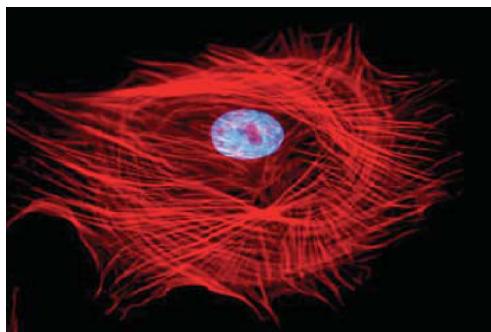


Ribosomes are the **protein factories** of the cell. These are very essential since all the functions and processes in plant and animal cell requires protein. Even all the organelles inside the cell are made up of proteins making ribosomes very important.

Golgi bodies receive proteins and other compounds from the ER. They **package** these materials and **distribute** them to the plant and animal parts of the cell.



Lysosomes contain hydrolytic enzymes that can break things down. Lysosomes pick up bacteria, food, and old organelles in plant and animal cell and break them into small pieces that can be reused.



The **cytoskeleton** is a series of fibers made from proteins. It provides structure to the cell and gives it its shape.

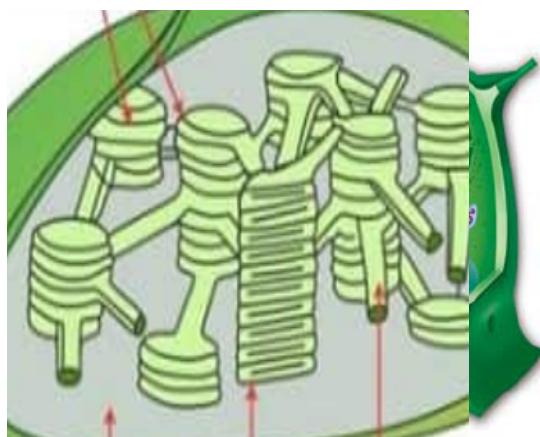
Components of cytoskeleton

- Microtubules- absent in plant cell, it provides pathways for certain cellular molecules to move about just as tracks are provided for railroad cars or trains. It is also found in structures like the cilia and flagella which both aid in movement.

For examples, the cells that line your windpipe use cilia to sweep foreign materials from the lungs. Sperm cells use flagella to move. It is also involved in cell division as a mitotic spindle.

Intermediate filaments- these are absent in plants. Since they are the most stable component of the cytoskeleton, they are found in durable structures such as hair, scales and fingernails. They also help provide structure to the nuclear envelope.

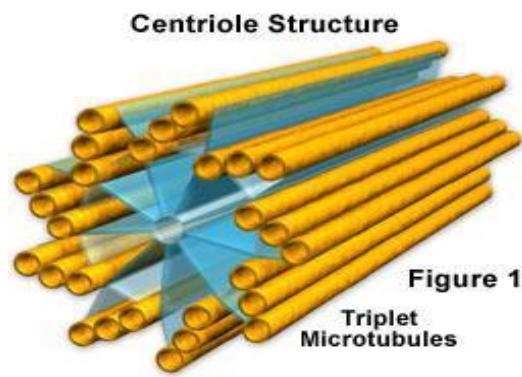
Microfilaments- pipe-like structures and help provide shape and movement for the cells. Examples of microfilaments are found in muscle cells.



Cell wall is a rigid organelle composed of cellulose that gives plant cell its box-like shape. The cell wall consists of several distinct layers. The primary cell wall is the outer layer; it expands as the cell grows. As the plant reaches its full size, a secondary cell wall develops inside the primary cell wall. This new layer adds strength to the wall. Two primary cell walls of adjacent cells are separated by another layer, the middle lamella which is composed of a jelly like polysaccharide called pectin. Both the primary and

secondary walls are composed mainly of polysaccharide cellulose which is commercially important as the main component of paper and cotton. Aside from cellulose, the secondary walls usually contain lignin, a complex organic compound that adds hardness and rigidity to cell walls.

Plastids are double membrane bound organelles found in plants. It is basically the storage of their pigments. Types of Plastids include the Leucoplasts which are colorless organelles that store starch and Chromoplasts which contain colored pigments like chloroplast.



Centrioles are paired organelles found only in animal cell. They are located together near the nucleus, at right angles to each other. They are essential in building cilia and flagella and also as spindle fiber during cell division.

The concepts about Cell Structure and Functions is summarized in the tabulated form below and on the next page.

Cell Structure and Functions

Cells' Structures	Functions
1. Cell Membrane	Separates cell from external environment; controls passage of organic molecules, ions, water, oxygen and wastes into and out of the cell
2. Cytoplasm	2. Provides structure to cell; site of many metabolic reactions; medium in which organelles are found
3. Nucleolus	3. Location of DNA
4. Nucleus	4. Cell organelle that houses DNA and directs synthesis of ribosomes and proteins
5. Ribosomes	5. Protein synthesis
6. Mitochondria	6. ATP production or cellular respiration
7. Peroxisomes	7. Oxidizes and breaks down fatty acids and amino acids and detoxifies poisons
8. Vesicles and Vacuoles	8. Storage and transport; digestive function in plant cells
9. Centrosome	9. Unspecified role in cell division in animal cells; organizing center of microtubules in animal cells
10. Lysosomes	10. Digestion of macromolecules; recycling or worn out organelles
11. Cell wall	11. Protection, structural support and maintenance of cell shape
12. Chloroplast	12. Photosynthesis
13. Endoplasmic reticulum	13. Modifies proteins and synthesizes lipids
14. Golgi apparatus	14. Modifies, sorts, tags, packages and distributes lipids and proteins
15. Cytoskeleton	15. Maintains cell's shape, secure organelles on specific positions, allows cytoplasm and vesicles to move within the cell, and enables unicellular organisms to move independently
16. Flagella	16. Cellular locomotion
17. Cilia	17. Cellular locomotion, movement of particles along extracellular surface of plasma membrane, and filtration

What's More

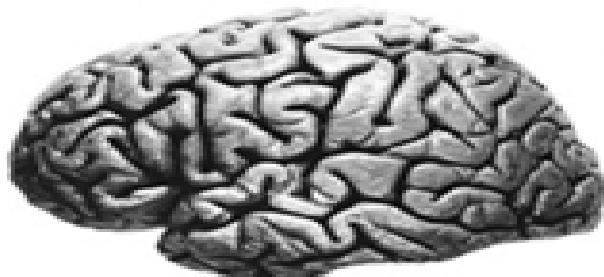
Activity Number 2.4 "Making Connections"

Directions: Look and study the figures below and on the next page. You can ask any members of your family, friends, or relatives via text or messenger to share their



ideas in the given illustrations. **(10 minutes)**

beehive and apartment building



computers' hard drive and human brain

Questions:

1. How is beehive and apartment building similar?
2. How are computers' hard drive and human brain similar?

Let's go back to the anticipation-reaction activity that you completed a while ago, you have the chance to change your answer based on what you have learned today but do not erase your previous answer, just write your new answer beside the previous so you can compare your two scores.

Activity Number 2.5 “ANTICIPATION-REACTION ACTIVITY”

Directions: Copy the 15 parts of cell in your BIO-JOURNAL. **Write P** if the organelle can be found in plants only, **A** if in animals only and **B** if found in both plants and animals. After trying this activity draw one emoticon which will reflect your overall reaction after learning the concepts. **(5 minutes)**

1. Cytoplasm _____
 2. Rough Endoplasmic Reticulum _____
 3. Smooth Endoplasmic Reticulum _____
 4. Ribosomes _____
 5. Lysosomes _____
 6. Nucleus _____
 7. Nuclear Envelope _____
 8. DNA _____
 9. Plastids _____
 10. Vacuole _____
 11. Cell wall _____
 12. Mitochondria _____
 13. _____ Centriole
-
14. Cell Membrane _____
 15. Chloroplast _____

QUESTION: How do you feel now after answering the activity?

What I Have Learned

These are the important concepts that you should remember!

1. Cell has three basic parts namely: nucleus, cytoplasm and cell membrane.
2. The nucleus serves as the control center of the cell.
3. The cell membrane is a selectively permeable membrane composed of phospholipid bilayer.
4. The cytoplasm is a jelly like fluid where all the organelles are suspended.
5. The organelles found in the cytoplasm are mitochondria, endoplasmic reticulum, Golgi body, vacuoles, lysosome, cytoskeleton and its components, cell wall, plastids and centrioles.

6. The structure and function of organelles make life possible for organisms like plants and animals.

Activity Number 2.6 “I Can Do It: Cell Analogy Time”

Directions: Think of another analogy to which you can relate the parts and function of the cell. Make sure to use an analogy that you commonly observe at home, in school or in your community. Illustrate and put the appropriate label your **BIO-JOURNAL**. Answer the guide questions below: **(10 minutes)**

Cell Analogy Guide Questions:

1. Why is nucleus very important? How is it related to the chosen analogy?
2. Describe the role of vacuole. How is it related to the chosen analogy?
3. Describe the role of ribosomes in the cell? How is it related to the chosen analogy?
4. Why is Golgi body important for the cell? How is it related to the chosen analogy?
5. What does the mitochondrion do for the cell? How is it related to the chosen analogy?
6. What do ribosomes do? Are they found freely floating in the cytoplasm? How is it related to the chosen analogy?
7. What does the endoplasmic reticulum do? How is it related to the analogy?
8. What does the cell membrane do? How is it related to the analogy?
9. What are Lysosomes? How is it related to the chosen analogy?
10. How does the cytoskeleton do for the cell? How is it related to the chosen analogy?

What I Can Do

Activity 2.7 “REFLECTIVE WRITING”

Directions: Write a short paragraph discussing why is it necessary for a student like you to understand and appreciate the significance of having healthy cells in our body. Make your answer brief and concise, express your answer using 5-10 sentences only. Rubric will be the basis of your teacher in giving scores. **(10 minutes)**

Rubric for Student Reflections

	Above Expectations	Meets Expectations	Approaching Expectations	Below Expectations
	4	3	2	1
Reflective Thinking	The reflection explains the student's own thinking and learning processes, as well as implications for future learning.	The reflection explains the student's thinking about his/her own learning processes.	The reflection attempts to demonstrate thinking about learning but is vague and/or unclear about the personal learning process..	The reflection does not address the student's thinking and/or learning.
Analysis	The reflection is an in-depth analysis of the learning experience, the value of the derived learning to self or others, and the enhancement of the student's appreciation for the discipline.	The reflection is an analysis of the learning experience and the value of the derived learning to self or others.	The reflection attempts to analyze the learning experience but the value of the learning to the student or others is vague and/or unclear.	The reflection does not move beyond a description of the learning experience.
Making Connections	The reflection articulates multiple connections between this learning experience and content from other courses, past learning, life experiences and/or future goals.	The reflection articulates connections between this learning experience and content from other courses, past learning experiences, and/or future goals.	The reflection attempts to articulate connections between this learning experience and content from other courses, past learning experiences, or personal goals, but the connection is vague and/or unclear.	The reflection does not articulate any connection to other learning or experiences.

Assessment

My Performance Number 1 “3-D Plant Cell Model”

Directions: Construct a 3D model of a plant/animal cell using indigenous or recyclable materials and label the parts. You will initially start with 100 points for your grade/score. You will lose points if lacking of the following items:

Remember: Your performance grade/score is worth 100 points. It is intended to help you better understand the cell and improve your grade. Please take this seriously

and turn it in on time by taking a picture/photo and send it to my messenger.

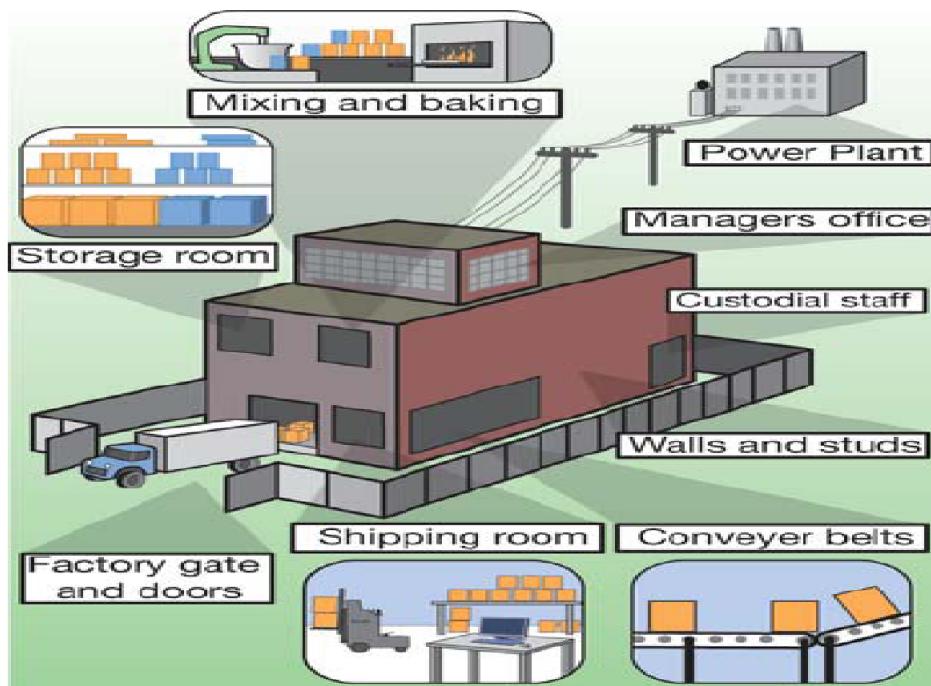
3-D Plant Cell Model Rubric for Grading

Indicators	Highest Possible Score	Your Score
1. Complete organelle	15	
2. Type of materials used	15	
3. Shape of cell model	10	
4. Timeliness	10	
5. Visibility of three-dimensional figure	10	
6. Uniqueness/originality	15	
7. Creativity	15	
8. Name on project	10	
TOTAL	100	

Additional Activities

Activity 2.8 “Analogy Time”

Directions: Relate the identified parts and function of the cell to the given parts of the factory as seen in the figure on the next page. Write a short justification of how their functions are related. Copy the table on subsequent on the factory figure and place it on your **BIO-JOURNAL** to organize your answers. **(20 minutes)**



Factory part	Organelle	Justification
1. Mixing and baking		
2. Storage room		
3. Factory gate and doors		
4. Power plants		
5. Managers office		
6. Custodial staff		
7. Walls and Studs		
8. Conveyor belts		
9. Shipping room		
10. Factory security guard		

V: REFLECTION: (5 minutes)

Directions: Accomplish the 3, 2, 1 exit card by writing your:

3 important facts

1. _____
2. _____
3. _____

2 interesting ideas

1. _____
2. _____

1 question in mind that you would like to ask

1. _____

References

- <https://www.spectrumnews.org/news/in-cell-sequencing-reveals-genomes-natural-geometry/amp/>
- <https://www.slideshare.net/mobile/rajpalchoudharyjat/cell-wall-structure-and-function>
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- Carmelita M. Capco.(2003). Phoenix Science Series Biology pages 156-170

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