

General Biology 1

Activity Sheets (First Quarter)

Department of Education
June 2016

LEARNING ACTIVITIES FOR BIOLOGY 1

Content Standard: The learners demonstrate an understanding of cell theory and cell structure and functions.

Learning Competency:

The learners

- a. explain the postulates of the cell theory. (STEM_BIO11/12-1a-c-1)
- b. describe the structure and function of major and subcellular organelles
(STEM_BIO11/12-1a-c-2)

Objectives:

- a. trace the development of the cell theory
- b. explain the postulates of the cell theory

Time Frame: 4 meetings

Introduction

Our body is made up of cells. Each of which is about five thousandth of a millimeter. It is too small to be seen by the naked eye yet it contains practically all the information about you: your eye color, blood type, sex, etc.

The invention of the microscope made possible the discovery of cells. The first lenses were used in Europe in the late 1500s by merchants who needed to determine the quality of cloth through the quality of thread and the precision of the weave. From these simple lenses, combination of lenses was put together.

In the late 1600s, Dutch businessman Anton van Leeuwenhoek became one of the first people to use a microscope to study nature. Using only a single powerful lens, van Leeuwenhoek crafted instruments that could produce magnified images of very small objects. His simple microscope enabled him to see things no one had ever seen before. He was the first person to see tiny living organisms in a drop of water.

In 1665, English physicist Robert Hooke used of the first light microscopes to look at thin slices of plant tissues. One of these, a slice of cork, especially caught his eye. Under the microscope, cork seemed to be made of thousands of tiny chambers. Hooke called this chambers “cells” because they reminded him of a monastery’s tiny rooms, which were also known as cells.

Activity # 1

Directions: Look for the following hidden words in the box. They are arranged horizontally or vertically.

Organization

Adaptability

Levels

Growth Development

Reproduction

Homeostasis

Movement

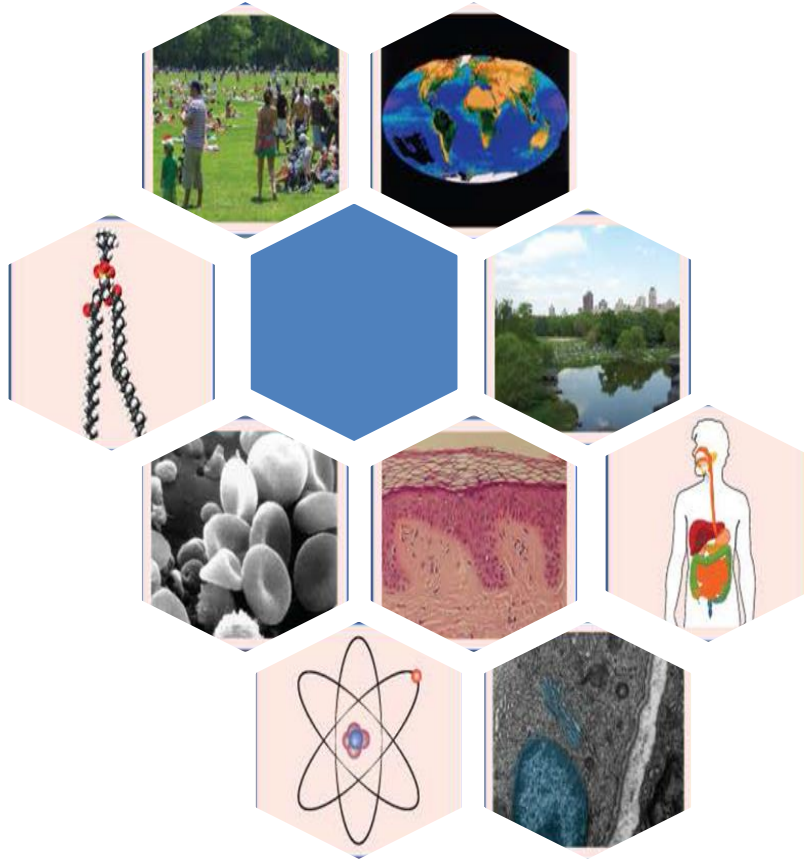
Metabolism

H	G	A	Q	M	N	B	V	C	X	Z	A	S	D	G	H
O	R	S	W	A	W	D	R	F	T	Y	H	U	E	E	H
M	O	D	E	A	S	D	F	G	H	M	H	J	Z	D	I
E	W	F	R	R	E	P	R	O	D	U	C	T	I	O	N
O	T	G	T	A	S	D	F	G	G	E	D	X	Y	H	Y
S	H	H	Y	F	Q	A	A	E	R	M	R	G	H	L	Z
T	D	J	U	V	S	A	S	F	G	E	Y	E	N	K	X
A	D	A	P	T	A	B	I	L	I	T	Y	I	I	J	C
S	E	K	I	T	G	A	A	Q	Q	A	R	O	O	H	V
I	V	L	I	Y	C	A	S	W	S	B	T	G	L	T	B
S	E	Q	O	H	U	A	D	E	D	O	Y	A	T	G	N
A	L	E	V	E	L	S	F	R	F	L	H	S	R	D	M
X	O	W	P	U	I	O	G	T	G	I	U	D	E	S	N
Q	P	E	L	I	N	F	H	Y	V	S	J	F	W	A	Y
C	M	R	K	J	O	O	J	U	H	M	K	G	D	I	L
V	E	T	J	K	L	R	J	I	N	A	N	H	C	U	R
W	N	Y	H	L	G	G	T	O	J	S	M	J	V	J	L
E	T	G	T	Y	D	A	Z	C	X	V	B	N	M	J	K
R	Y	G	G	U	T	N	Q	T	K	E	T	U	Z	M	E
T	Y	A	F	R	Y	I	W	Y	M	D	G	K	S	Y	W
Y	R	S	D	E	I	Z	E	G	T	G	B	L	D	T	S
U	E	W	S	S	C	A	R	B	G	V	A	T	F	G	D
I	W	Q	A	C	V	T	T	B	U	H	D	F	T	F	U
O	C	T	Z	X	E	I	Y	B	I	J	F	C	Y	C	I
P	Q	T	X	Y	M	O	V	E	M	E	N	T	U	X	O
K	B	G	C	U	W	N	U	A	I	N	R	B	I	Z	P

2. Pick four words from the list and define them using your own words.

Activity # 2

Directions: Observe the pictures below. Cut and identify the different levels of organization from the simplest to the complex then describe each.

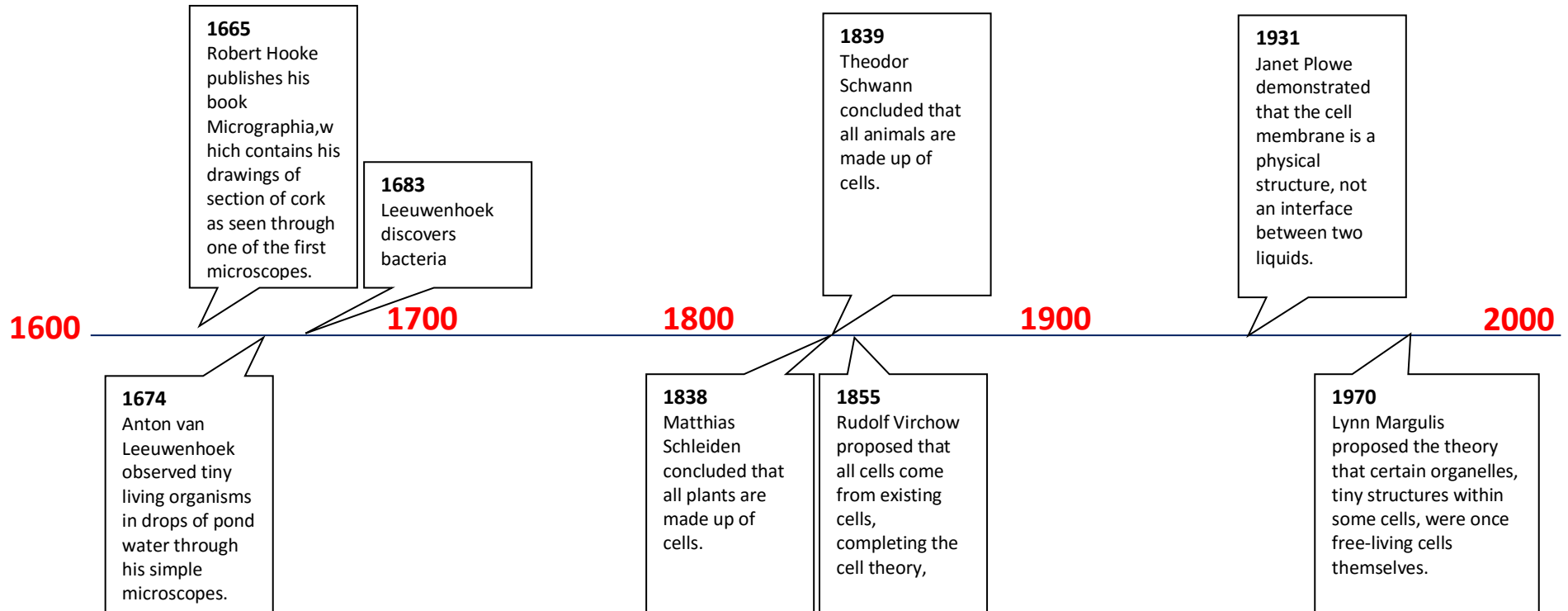


Questions:

1. Based from your diagram, what is the simplest in the level of organization? Why?
2. What is the most complex? Why?

Activity # 3

Consider the timeline below:



Questions:

1. What three statements describe the cell theory?
2. When Hooke first used the term cell, did he intend to have it apply to living material? Explain your answer.
3. What do you think were the evidences when Virchow postulated that all new cells arise from existing cells?
4. How did Virchow's idea contributed to the formation of the cell theory?

Generalizations:

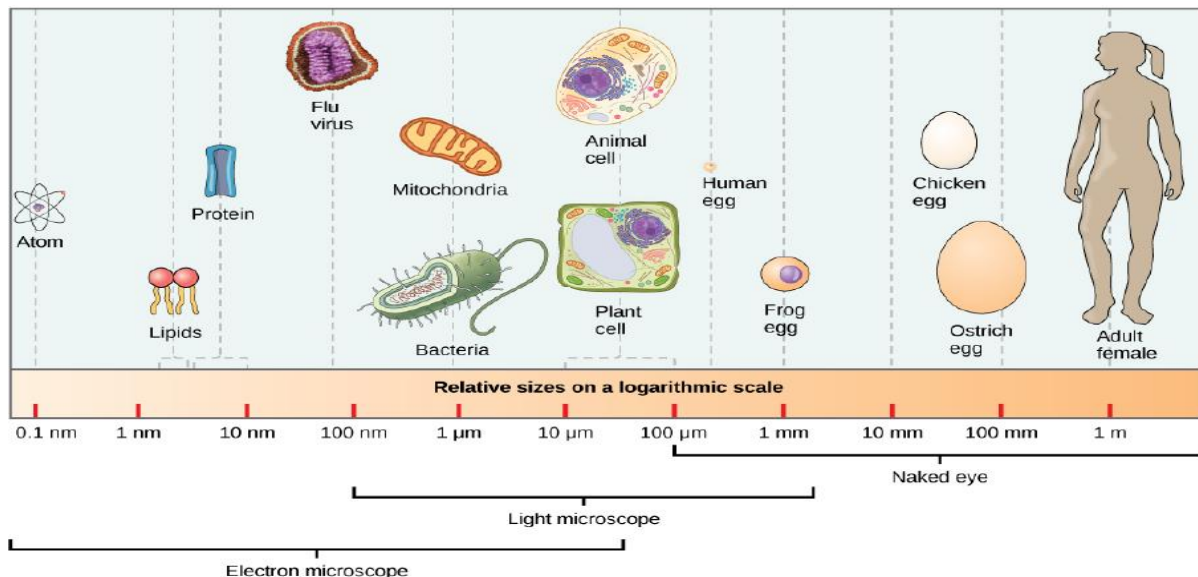
In 1838, German botanist Matthias Schleiden concluded that all plants are made of cells. The next year, another German scientist, Theodor Schwann, concluded that animals are also made up of cells. Rudolf Virchow, a German physician, studied cell reproduction. In 1855, he summarized years of research by stating, "Where a cell exists, there must have been a preexisting cell."

The discoveries of these are summarized in the cell theory, one of the fundamental concepts of biology. The cell theory states the following:

- All living things are composed of cells.
- Cells are the basic units of structure and function in living things.
- New cells are produced from existing cells.

Applications

Microscopy and the cell theory



Microscopes are devices that produced magnified images of structures that are too small to see with the unaided eye. Since the first microscope was invented, microscope manufacturers have had to deal with two problems: the instrument's magnification and the sharpness of the image the instrument can produce.

Light microscopes produced magnified images by focusing visible light rays. Compound light microscopes allow light to pass through the specimen and use two lenses to form an image. It can produce clear images of objects at a magnification of about 1000 times.

Electron microscopes produced magnified images by focusing beams of electrons. These microscopes can form images of objects 1000 times smaller than those visible under a light microscope. Because light from the visible spectrum is not involved, untouched electron microscope images have no color.

Activity # 4

Materials

Onion	compound microscope
Glass slide	cover slip
Iodine	

Note (Handle iodine with care. It is toxic and will stain)

Procedure

1. Get a glass slide and cover slip for yourself and make sure they are both thoroughly washed and dried.
2. Remove the single layer of epidermal cells from the inner side of the scale leaf. The thinner, the better.
3. Place the single layer of onion cell epithelium on a glass slide. Make sure that you do not fold it over or wrinkle it.
4. Place a drop of iodine stain on your onion tissue.
5. Carefully put the cover slip on the stained tissue and gently tap out any air bubbles.
6. Observe the cells under 10x, 40x and 100x with the diaphragm wide open. Slowly reduce the light intensity by closing the diaphragm and observe the image.
7. In the space provided below, draw a group of about 10 neighboring cells at 40x. In one cell, label all the parts that you can see.

8. Switch to higher power at 100x. Draw one cell and label it. Use the space provided below.

Questions:

1. As you move the diaphragm, which light intensity revealed the greatest cellular detail?
2. What is the function of the cell membrane? What about the nucleus?

3. Where is the nucleolus found and what does it produce?

4. Describe what ribosome do in the cell?

Generalizations

Cell Structure and Functions

Cells' Structures	Functions
1. Plasma Membrane	1. 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. Nucleoid	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 cells' 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

Evaluation

Direction: Read each item carefully. Choose the letter of the correct answer.

1. Which level of organization is the basic unit of life?
 - a. Cell
 - b. Tissue
 - c. Organ
 - d. System

2. Which of the following is NOT a postulate of a unified cell theory?
 - a. All living things are composed of cells.
 - b. Cells are the basic unit of life.
 - c. All cells undergo complete development.
 - d. All new cells arise from existing cells.

3. Who coined the term cell for the box like structure he observed when viewing cork tissue?
 - a. Matthias Schleiden
 - b. Theodor Schwann
 - c. Rodolf Virchow
 - d. Robert Hooke

4. How do cells arise from existing cells?
- through growth and development
 - through metabolizing
 - through reproduction
 - through adaptability
5. How do a mushroom, amoeba, carabao, and sampaguita similar from each other?
- All living things are composed of cells.
 - Cells are the basic unit of life.
 - All cells undergo complete development.
 - All new cells arise from existing cells.
- I and II
 - II and IV
 - I, II and III
 - II, III and IV
6. Distinct thread like structures containing genetic information are called _____.
- ribosome
 - nuclei
 - chromosomes
 - mitochondria
7. Which of the following is NOT a component of the endomembrane system?
- mitochondrion
 - golgi apparatus
 - endoplasmic reticulum
 - phospholipid
8. Cell membranes are constructed mainly of _____.
- lipid bilayers
 - protein pumps
 - carbohydrate gates
 - free-moving proteins
9. The organelle that makes energy available for the cell is the _____.
- nucleolus
 - chromosome
 - mitochondrion
 - chloroplast
10. In many cells, the structure that controls the cells activities is the _____.
- cell membrane
 - organelle
 - nucleolus
 - nucleus

Performance Assessment

Classroom Cell Model

Materials

Variety of craft supplies

Index card

Procedure:

1. Your class is going to make a model of a plant cell using the whole classroom. In a small group of about 3 to 4 persons, decide what cell part or organelle you would like to model.
2. Using materials of your choice, make a three dimensional model of the cell part or organelle you chose. Make the model as complete and as accurate as you can.
3. Label an index card with the name of your cell part or organelle and list its main features and functions. Attach the card to your model.
4. Attach your model to an appropriate place in the room. If possible, attach your model to another related cell part or organelle.

Assume that a cell is 50 micrometers wide. Calculate the scale of your classroom cell model. (Hint: Divide the width of the classroom by the width of the cell, making sure to use the same units).

References:

Miller, Kenneth R. and Joseph Levine. Prentice Hall Biology. Pearson Education South Asia Pte Ltd. Jurong Singapore. 2003

Lesson Plan in Science II (Biology). Bureau of Secondary Education Department of Education. 2003.
Cell Structure and Function

Online Source retrieved on May 30, 2016:

<http://www.youngstown.k12.oh.us/Downloads/BIOLOGY%20UNIT%207%20CELL%20STRUCTURE%20AND%20FUNCTION%20ycsd.pdf>

Content Standard:

The learners demonstrate an understanding of prokaryotic versus eukaryotic cells.

Learning Competency:

The learners distinguish prokaryotic and eukaryotic cells according to their distinguishing features. (STEM_BIO11/12-Ia-c-3)

Objectives:

- a. compare and contrast prokaryotic from eukaryotic cells
- b. observe the specimen of prokaryotic and eukaryotic cells under compound microscopes
- c. identify the organelles present in prokaryotic and eukaryotic cells

Time Frame: 2 meetings

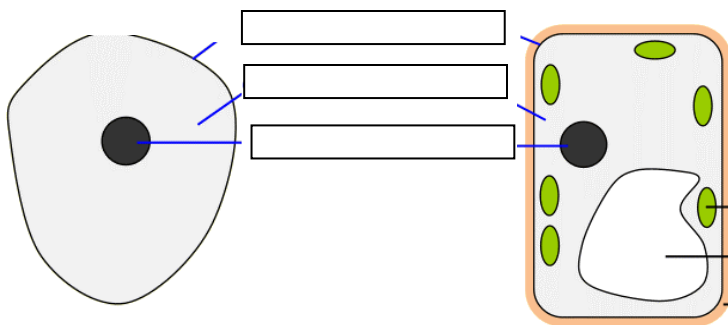
Introduction

All living organisms are made up of cells; however, cells come in varied shapes with size typically from 5 to 50 micrometers in diameter. There are bacteria that are about 0.2 micrometers.

Even though cells vary in size and shape, certain structures are common to most cells. All cells have a cell membrane and cytoplasm. The cell membrane is a thin, flexible barrier around the cell. Some cells even have cell wall, a strong layer around the cell membrane. There is a basic cells structure that is present in many but not all cells, the nucleus. It is a structure in the cytoplasm that is surrounded by a membrane and contains and protects the cell's DNA. There are two basic types of cells based on whether they have a nucleus or not: prokaryotic and eukaryotic cells.

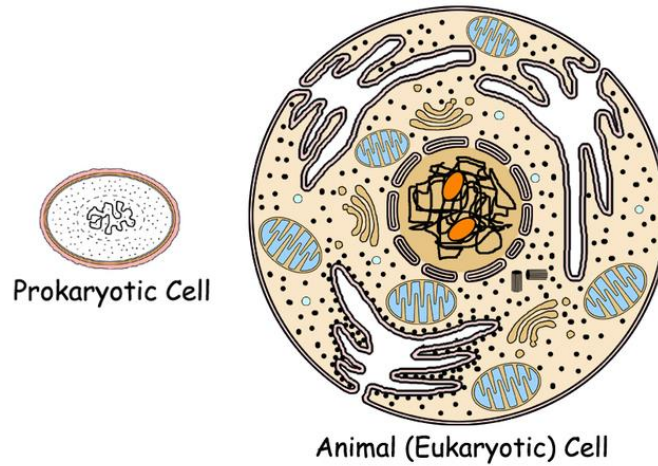
Recall:

Below are drawing of plant and animal cells. Label the parts of the cell. Write your answers on the box provided.



Activity # 1

1. Below is a picture of a prokaryotic and eukaryotic cell. Describe and differentiate one with the other.



Activity # 2

Materials:

Compound microscope	bread mold
Prepared slides of bacteria, <i>Oscillatoria</i> , blood cell, <i>Amoeba</i>	
Onion	toothpick
Microscope slides	medicine dropper
Cover slip	tissue paper
Methylene blue solution	

Procedure

1. Scrape the inner cheek cells with the broad end of a toothpick. Make sure the toothpick is new and clean.
2. Prepare a wet mount of the specimen by spreading the scrapings evenly on the glass slide. Stain the cheek cells with a few drops of methylene blue solution.
3. Observe the wet mount under the low power objective (LPO) and high power objective (HPO) of a compound microscope.
4. Sketch and label the parts of a human cheek cell that you saw under the HPO of the microscope.
5. View prepared slides of protist, bacterial cell, *Oscillatoria*, blood cell and internal leaf structure under LPO and HPO.
6. Complete the table below. Compare the parts of prokaryotic and eukaryotic cells by putting a check if the part of the cell is present and a cross mark if the part is not found at all.

Cell Component	Prokaryote		Eukaryote			
	Bacteria	<i>Oscillatoria</i>	Blood cell	<i>Amoeba</i>	Breadmold	Onion
Cell wall						
Plasma membrane						
Nucleus						
Nucleolus						
Ribosome						
Endoplasmic reticulum						
Golgi body						
Mitochondrion						
Chloroplast						
Vacuole						

Questions:

1. What are the parts of the cell visibly seen under a compound microscope?
2. Based on your observations of the cells, what structures are common to all cells?
3. Can you not recognize the nucleus in the prokaryotic cell?
4. When is a cell prokaryotic? Eukaryotic?
5. Bacteria and blue-green algae are both primitive prokaryotic that lived on earth. Explain why these prokaryotic organisms are more adaptive than eukaryotes.

Generalizations

Biologists divide cells into two categories: eukaryotes and prokaryotes. The cells of eukaryotes have a nucleus, but the cells of prokaryotes do not.

The cells of prokaryotes are generally smaller and simpler than the cells of eukaryotes. Prokaryotes have cell membranes and cytoplasm but do not contain nuclei. All bacteria are prokaryotes. Examples of prokaryotes include *Escherichia coli* which live in your intestines, and *Staphylococcus aureus*, which can cause skin infection. Even though they are relatively simple, prokaryotes carry out every activity associated with life. They grow, reproduce, and respond to changes in the environment.

Unlike the cells of prokaryotes, the cells of eukaryotes do contain nuclei. In addition to a nucleus, a cell membrane, and cytoplasm, most cells of eukaryotes contain dozens of other specialized structures called organelles that perform important cellular functions. Although some eukaryotes live solitary lives

as single-celled organisms, many are large, multicellular organisms. All plants, animals and fungi, and many microorganisms, are eukaryotes.

Evaluation

Direction: Read each item carefully. Circle the letter of the best answer.

- Despite differences in size and shape, all cells must have cytoplasm and a _____ .
 - cell wall
 - cell membrane
 - mitochondrion
 - nucleus
- If a cell of an organism contains a nucleus, the organism is a or an _____ .
 - plant
 - eukaryote
 - animal
 - prokaryote
- What is the main difference between prokaryotes and eukaryotes?
 - Prokaryotes cannot undergo cell division.
 - Prokaryotes have no internal membranes.
 - Prokaryotes have no DNA.
 - Prokaryotes have no cytosol.
- Which of the following statements about eukaryotic cells is INCORRECT?
 - Eukaryotic cells have a membrane bound nucleus.
 - Eukaryotic cells are more complex than prokaryotic cells.
 - Eukaryotic cells are usually smaller than prokaryotic cells.
 - Eukaryotic cells are believed to have evolved more recently than did prokaryotic cells.
- If a cell has a cell membrane, it is _____ .
 - prokaryotic
 - can be either prokaryotic or eukaryotic
 - eukaryotic
 - none of these have a cell membrane

Alternative Assessment

Make a two-column chart comparing prokaryotes and eukaryotes. In the first column, list the features of prokaryotes. In the second column, list the features of the eukaryotes.

References:

Miller, Kenneth R. and Joseph Levine. Prentice Hall Biology. Pearson Education South Asia Pte Ltd. Jurong Singapore. 2003

Lesson Plan in Science II (Biology). Bureau of Secondary Education Department of Education. 2003.

Oxford University Press Online Resource Center Sample test questions for Molecular Biology

Online Source retrieved on May 30, 2016:

http://global.oup.com/uk/orc/biosciences/molbiol/snape_biochemistry5e/student/mcqs/ch02/

Content Standard:

The learners demonstrates an understanding of cell types

Learning Competency:

The learners classify different cell types(plant/animal tissues) and specify the function(s) of each (STEM_BIO11/12-la-c-4)

Objective:

The learner should be able to:

1. Prepare cell slides for viewing under a microscope
2. Understand the basics of using a microscope
3. Identify differences between a plant and animal cell

Time Frame: 2 meetings

Materials needed:

2 Glass Slides	2 Cover Slips
1 Bottle of methylene blue	1 Plastic tray
1 Bottle of iodine	1 Plastic dropper
1 Small plastic cup	1 Toothpick
1 Piece of onion	1 Pair of tweezers
1 Confocal microscope	

Laboratory Precautions:

1. Care must be taken when doing this part of the lab to handle and dispose of the cells with appropriate concern. Using a prepared epithelial cell slide would also work.
2. Remind students to observe and to practice important laboratory rules

Procedure:

PART A

Plant Cells: Onion Skin Wet Mount

1. Peel the delicate transparent tissue from the inner surface of a piece of onion using forceps or tweezers.
2. Make a wet mount by placing the tissue, unwrinkled, in a small drop of water on a glass slide.
3. Add one small drop of Lugol's iodine stain to the tissue and cover with a cover slip as directed.
Important: Be careful for the Lugol's can stain and burn the skin!
4. Examine the onion cells at low power and focus as necessary.

5. Next examine the cells at medium and high power.

6. Prepare a diagram of onion skin tissue showing three to four cells. Label the structures that you can identify from the microscope. (examples - cell membrane, nucleus, etc.) Remember to follow guidelines for drawing and labeling a proper biological diagram.

Questions:

Answer the following questions:

1. Describe the shape of the cells. _____
2. What cell structures and organelles can you see? _____
3. How come there are no chloroplasts evident? _____

PART B

Animal Cells: Human Cheek Cell Wet Mount

1. Place a drop of water on a clean slide. Gently scrape the inside of your cheek with the blunt end of a clean toothpick and stir the material on the toothpick in the drop of water on the slide.
Reminder: Do not forget to properly dispose the toothpick.

2. Add one small drop of methylene blue stain to the slide and then add a coverslip as directed.

3. Focus and examine the slide under low power before moving to the higher magnifications.

4. Prepare a diagram showing 3 - 4 cells of the cheek and label structures you can identify.
Reminder: Do not forget to identify magnification of the drawing.

Questions:

Answer the following questions.

4. What are the shapes of the cells? _____
5. What cell structures can you identify? _____
6. Would the cells normally be attached to one another? Explain. _____
7. Some of the cells may be folded or wrinkled. What does this indicate to you about the thickness of the cells? _____
8. Explain how these cells differ from the plant cells viewed previously. _____

Illustration:

Draw and label the plant and animal cell as seen under the microscope. Indicate the magnification used.

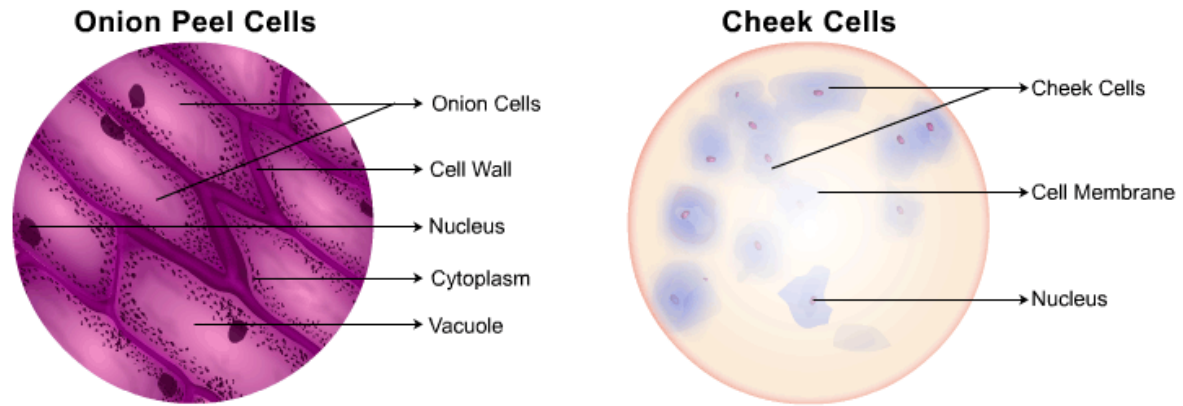


Fig. 1 Onion Peel Cells vs. Human Cheek Cells

Enrichment:

Using a **Venn Diagram** or **Tabular form** show the difference between an animal cell and a plant cell

Features	Animal Cell	Plant Cell
Cell Shape	Round (irregular shape)	Rectangular (fixed shape)
Cell Wall	Absent	Present and is formed of cellulose
Cell Membrane	Present	Present and is covered by the cell wall
Nucleus	Present	Present
Vacuole	One or more small vacuoles	A large central vacuole taking up 90% of the cell volume
Plastids	Present	Present
Chloroplast	Absent	Present and make their own food
Endoplasmic Reticulum	Present	Present
Ribosomes	Present	Present
Mitochondria	Present	Present

Conclusion:

1. What if we did not use iodine or methylene blue?
2. How do the stains help when looking at cells?
3. How do onion cells look under the microscope?
4. How do cheek cells look under the microscope?
5. What differences can you note between plant and animal cells?

References:

Miller, Kenneth R. and Joseph Levine. Prentice Hall Biology. Pearson Education South Asia Pte Ltd. Jurong Singapore. 2003

Lesson Plan in Science II (Biology). Bureau of Secondary Education Department of Education. 2003.

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<http://www.cswnetwork.org/projects/pdf/216.pdf>