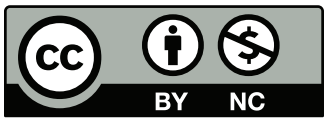
Version 01

All About Cells

Literacy Foundations Science: Biology

OPEN SCHOOL BC



Acknowledgements

Project Manager: Jennifer Riddel
Production Technician: Caitlin Flanders

Course History

New, June 2012

Table of Contents

Viewing Your PDF Learning Package

This PDF learning package is designed to be viewed in Acrobat. If you are using the optional media resources, you should be able to link directly to the resource from the pdf viewed in Acrobat Reader. The links may not work as expected with other pdf viewers.

Download Adobe Acrobat Reader:
http://get.adobe.com/reader/

Learning Package Overview

This learning package is made up of several lessons.

Lessons

Lessons have a combination of reading and hands-on activities to give you a chance to process the material while being an active learner. Each lesson contains several topics, self-marked activities, and some lessons contain links to online multimedia resources.

At the end of the learning package you will find:

Solutions

This contains all of the solutions to the Activities.

Glossary

This is a list of key terms and their definitions.

Throughout the learning package, you will see the following icons:

Check your answers using the Solutions at the end of the package.

Go online to view a multimedia resource.

Materials and Resources

There is no textbook required for this course.

You will be expected to have certain tools and materials at your disposal while working on the activities. These materials are listed in the activity and should be easy to find around the house or nearby.

In some lessons you will be directed to an online multimedia resource. Internet access is required.

The Science Orientation Skills (SOS) package is an online student resource for the basic science skills. Throughout this learning package, you will be directed to the *SOS Package* to read and review information that is central to the practice and study of science. The *SOS Package* can be found at:
www.openschool.bc.ca/courses/sos/sc08/index.html

All About Cells

Life. Every single living thing has something in common—do you know what that is? The clue is in the title! In this learning package you will learn all about cells—the parts and the functions of those parts.

By learning about the basic building block of life, scientists, and you, can have a better understanding of the workings of your body and of all living things. You'll understand what happens when all the parts are working well, and what can happen when a part malfunctions.

In this learning package you will learn about:

- the characteristics of living things
- cell theory
- the structure and function of cell organelles
- similarities and differences between cell types (plant, animal, and bacteria)
- how viruses reproduce
- osmosis and diffusion

Lesson A
Cell Theory and the Characteristics of Living Things

Introduction

Life. Our planet is teeming with it. The variety of life on Earth is staggering. Species vary from microscopic bacteria all the way up to giant sequoia trees.

Did You Know?

One of the largest living organisms is a humungous fungus in Oregon. The mushroom is estimated to cover 890 hectares and to be over 2400 years old.

Scientists argue about what the smallest living organism is. Do an Internet search for "smallest living organism" and see some of the nominees.

Scientists have developed many systems to classify things and new systems continue to be developed as more is learned. This lesson will deal with the most basic system of classification: either living or non-living.

Look around you. Everything you see is either living or non-living. Of course, some non-living things may have once been living—your wooden desk, perhaps, or your paper.

How can we tell if something is living or not?

Characteristics of Living Things

Biology is the study of life. Living things are often called **organisms**. Organisms can be found in a wide variety of environments. Despite incredible biodiversity, all living things are organized and share common characteristics:

- Living things are made of **cells.**
- Living things reproduce, grow, and develop.

- Living things obtain and use **energy.**
- Living things respond and adapt to their environment.
- Living things have movement.
- Living things get rid of waste.
- Living things exchange gases with their environment.

Depending on what you read, you may find that there are five, six, or seven common characteristics of living things listed, and they may be listed differently than you see here. The point isn't to have you memorize a list but rather to have you think about the characteristics and how you can apply them to classify living and non-living things. Further descriptions of these characteristics are provided below.

Cells

All living things are made up of one or more cells. Cells are usually too small to be seen by the unaided eye; however, they are the fundamental building block of life.

Reproduction

Living organisms have the ability to produce offspring, or reproduce. This is not necessary for the survival of an individual organism, but it is necessary for the survival of the species.

Energy

All living things need food to be used for energy and growth, and to carry on life's functions. Green plants produce their own food by using energy from the sun to combine raw materials to make sugar. This process is called photosynthesis.

Carbon dioxide + water + sun's energy ---------> sugar + oxygen

Animals and non-green plants, such as mushrooms, cannot produce their own food. They rely on plants or other animals for their food supply.

Response

All living things have the ability to detect and respond to changes in the environment. These changes are called stimuli. Examples of **stimuli** include reactions to changes in pressure, light, sound, and heat.

Movement

All living things have the ability to move. This movement is both internal and external, and is more easily seen in animals than in plants. Examples of movement in plants are the bending of leaves and stems towards light, and the growth of roots toward water. Movement of animals from one place to another is called **locomotion**.

Waste

The normal life activities carried by organisms produce waste. Organs such as the kidneys, lungs, large intestine, and the skin are responsible for collecting and eliminating wastes from the body.

Gas Exchange

All living things exchange gases with their environment. For example, animals breathe in oxygen and breathe out carbon dioxide.

Characterizing Life

So, how do you know if something is living? Some non-living things may show some of the characteristics listed above. Clouds move through the sky—are they living? Volcanoes grow over time and exchange gases with their environment—are they living?

Clouds and volcanoes are both non-living things. They may exhibit *some* characteristics of living things, but they do not exhibit *all* of the characteristics of living things. For example, neither clouds nor volcanoes are made up of cells.

It is important to note that in order to classify something as living, it must demonstrate all of the characteristics of living things.

Cell Theory

Although living things can be as diverse as blue-green algae and elephants, they are all made up of small units called cells. All life, including you, starts from a single cell.

Cells are the building blocks of life. Some plants and animals are so small and simple that they are made up of only one cell (**unicellular**). Most of the plants and animals we are familiar with are made up of many cells (**multicellular**).

Cell theory is the basis of modern biology. There are three main points to the cell theory:

- The cell is the basic unit of life.
- All living things are composed of one or more cells.
- All cells come from pre-existing cells.

Activity 1
Living or Non-living?

If you have Internet access, you may choose to do this activity online. Go to *http://media.openschool.bc.ca/osbcmedia/sc08/html/sc0811a1f_living.htm*

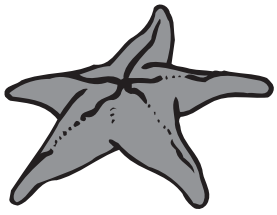
If you do not have Internet access, complete the activity below.

For each item, circle the correct classification: living or non-living.

1. living or non-living

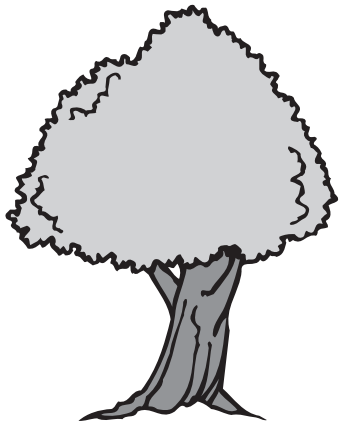
2. living or non-living

3. living or non-living



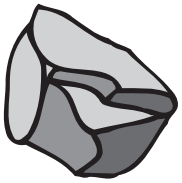
4. living or non-living

5. living or non-living



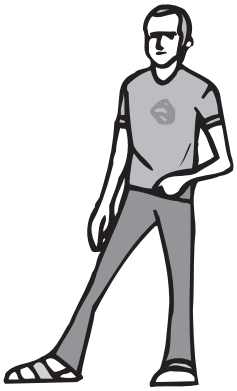
6. living or non-living

7. living or non-living



8. living or non-living

9. living or non-living



10. living or non-living

Check your answers using the Solutions at the end of this learning package.

Summary

Completing this lesson has helped you to:

- identify the characteristics of living things
- learn about cell theory

Once you have completed these parts, move on to Lesson B.

Lesson B
Plant and Animal Cells

Introduction

With a single lens, the scientist Robert Hooke, (1635-1703), began the exploration of the parts of a cell. From the small single-celled amoebas right up to elephants and oaks, there are some features that all cells share.

By understanding the functions and parts of a single cell, scientists are able to better understand the workings of the human body, plants, and other animals.

Activity 1
Pre-quiz

Before you learn about the functions and parts of cells, try this pre-quiz just for fun to see what you already know—you may be surprised!

Circle the letter of the best answer.

1. All living things are made of these. They are the smallest units of life on Earth:
   a. cells
   b. molecules
   c. embryos
   d. chromosomes

2. The nucleus and all the organelles in a cell float in this:
   a. vacuole
   b. blood
   c. cytoplasm
   d. plasma

3. This is a property of cell membranes:
   a. soluble
   b. permeable
   c. non-permeable
   d. semi-permeable

4. This is the part of a cell that contains all the important information for the cell's organization and development:
   a. nucleus
   b. chloroplast
   c. vacuole
   d. cytoplasm

5. Plant cells have these, but animal cells do not:
   a. cell membranes
   b. cell walls
   c. cytoplasm
   d. a nucleus

6. The layer that surrounds a cell and lets some things pass in and out of it is:
   a. blubber
   b. cell wall
   c. epidermis
   d. cell membrane

7. Thread-like structures inside the nucleus of a living cell, containing strands of DNA, are:
   a. chromosomes
   b. genes
   c. mitochondria
   d. enzymes

8. Small organs found in the cytoplasm of a cell, each with a special function, are:
   a. vacuoles
   b. organelles
   c. chloroplasts
   d. molecules

9. The process by which cells divide and multiply is called:
   a. cell division
   b. reproduction
   c. duplication
   d. respiration

10. The part of the cell in which photosynthesis takes place:
   a. organelles
   b. vacuoles
   c. chloroplasts
   d. mitochondria

11. The molecule that contains the genetic instructions for the cell is called:
   a. DNA
   b. nucleus
   c. enzyme
   d. gene

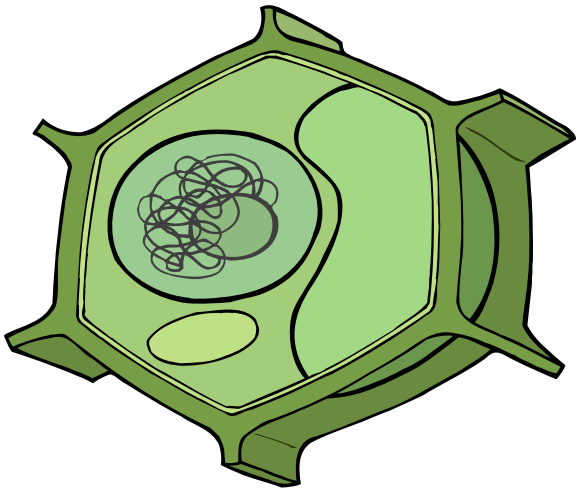
12. An amoeba is:
   a. a multi-celled animal
   b. a single-celled animal
   c. an unborn offspring
   d. a microscopic organism that causes sickness and disease

Check your answers using the Solutions at the end of this learning package.

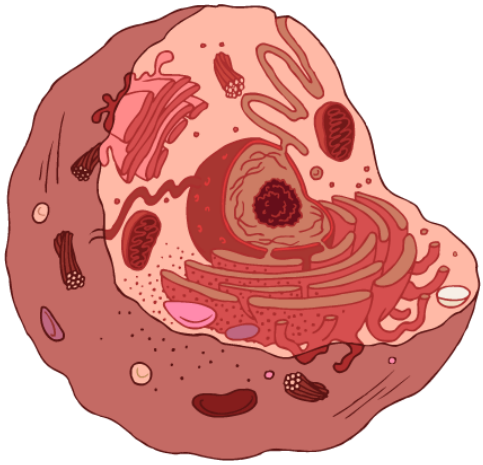
The Cell

The cell is the smallest unit of life. The adult human body is made up of 100 trillion cells. For example, in the body, there are skin cells, brain cells, heart cells, etc., just to name a few. Each cell contains **organelles**, which are **microscopic** structures that let cells carry out all the activities necessary for life. Just as the human body has organs like the heart, stomach, and lungs, the cell has organelles.

Not all cells are the same. A plant cell and an animal cell are shown below. What differences do you see? Are there any similarities?



Plant Cell



Animal Cell

In fact, there are more similarities than differences between these types of cells! Read on to learn about the parts of a cell.

Organelles

To learn about the organelles present in most cells, you'll work through an interactive tutorial. As you work through the *Interactive Cell* tutorial, be sure to take notes about the name and function of each organelle. You will be responsible for knowing each organelle's appearance and function. Please note: the cell you will explore is an animal cell.

To use the Interactive Cell go to: *http://media.openschool.bc.ca/osbcmedia/sc10vs/course/html/sc1011c1f_interactivecell.html*

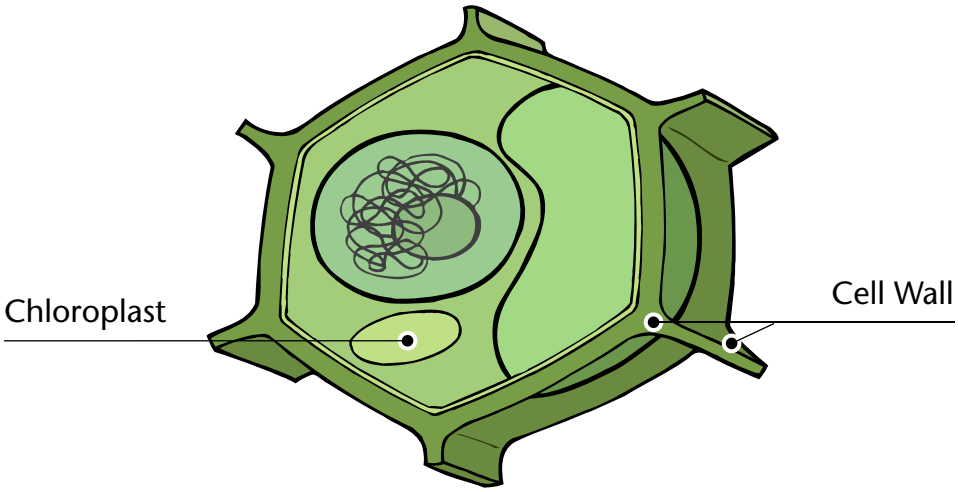
It can be hard to imagine how much activity goes on in a cell, but using an analogy can help. Think of the cell as a factory. This will help you understand how the various organelles work together within the cell, and about their individual

functions and responsibilities. Just like all the bits of machinery in a factory work together, so do all of the parts of a cell.

Each organelle provides some form of support for the life processes of the cell. Their functions are intertwined to allow cell processes to function as a cohesive whole. The **cell membrane** protects the cell, holds in the **cytoplasm** and all the organelles, and regulates the materials that flow in and out of the cell. The **nucleus** controls all of the cell's functions and contains the genetic material (**chromosomes**) needed for the cell to reproduce. **Mitochondria** burn fuel, sending energy to **ribosomes** on the **endoplasmic reticulum**, which, in turn, create new proteins that the cell can use to grow and/or reproduce. Proteins are stored by **Golgi bodies** and are transported in small packages called vesicles. **Vacuoles** function as temporary storage containers within the cell, storing starch, water, and sometimes wastes. **Lysosomes** contain enzymes that break down food particles, cell wastes, and worn-out organelles.

Plant Cells

As mentioned, the cell you explored in the *Interactive Cell* was an animal cell. Plant cells contain two additional structures that are not present in animal cells: a **cell wall** and **chloroplasts**.



The cell wall is a rigid structure that surrounds the cell membrane of plant cells. It is made of **cellulose** and is what gives plant cells their box-like shape. Chloroplasts contain the green pigment chlorophyll and are the site of **photosynthesis** in plant cells. They absorb energy from the sun and use that energy to convert carbon dioxide and water into simple sugars and oxygen. In this way, plant cells produce their own food.

Activity 2
Parts of a Cell

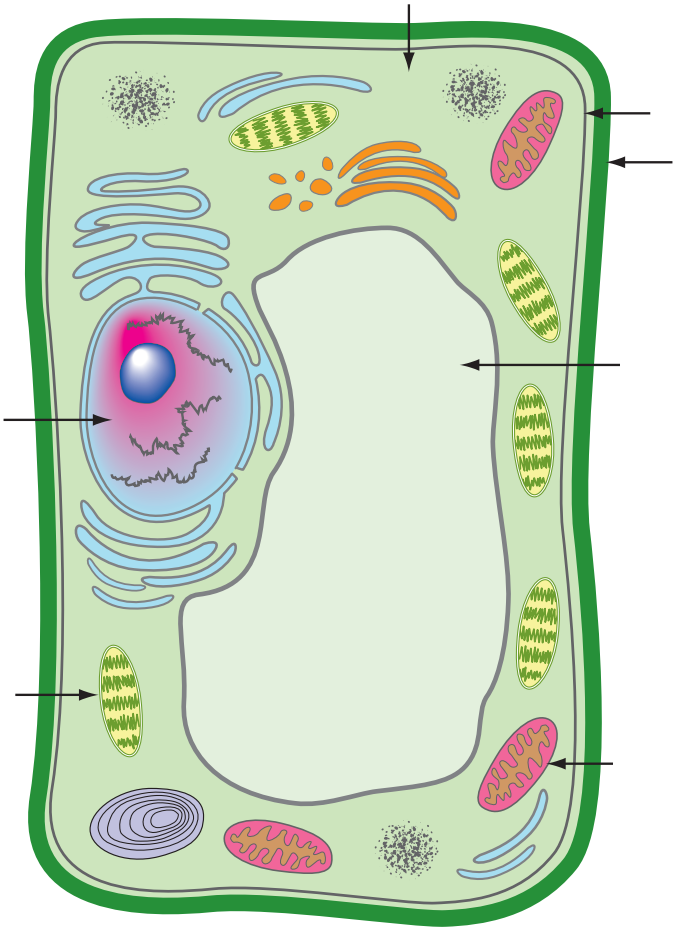
1. Match each of the definitions on the left with the appropriate term on the right.

	Definition	Term
_____	where instructions for the cell functions originate	A. nuclear membrane
_____	where lipids such as steroids are assembled	B. Golgi body
_____	stores starches and water	C. nucleus
_____	assembles proteins	D. mitochondria
_____	the region between the cell membrane and the nucleus	E. smooth endoplasmic reticulum
_____	transforms sugars into usable cell energy	F. ribosomes
_____	organelle that stores proteins	G. vacuole

2.

a. Label the following on this cell:

- cell wall
- chloroplast
- vacuole
- nucleus
- cell membrane
- cytoplasm
- mitochondrion



b. Is the cell you just labeled a plant cell or an animal cell? How do you know?

3. You may wish to go back to Activity 1 and try the pre-quiz again. Compare your results to your previous score to see how much you've learned in this lesson!

Check your answers using the Solutions at the end of this learning package.

Summary

Completing this lesson has helped you to:

- describe the structure and function of cell organelles
- accurately list similarities and differences between cell types (plant and animal)

Once you have completed this part, move on to Lesson C.

Lesson C
Bacteria and Viruses

Introduction

Do you have a cough or a cold? Not feeling quite right? It's probably the fault of bacteria or a virus. But which one is it, and what's the difference between them?

In this lesson, you'll learn about bacteria and viruses. You'll compare their characteristics with those of plant and animal cells.

How Many Cells?

In previous lessons, you learned about animal and plant cells. Animals and plants are both examples of **multicellular** organisms. Multicellular organisms are made up of many specialized cells that work together to ensure that the body or plant has everything it needs to live.

How many cells do you think there are in a **unicellular** organism? If you said just one, you're correct! There may be only one cell, but all of the functions of life must happen within that one cell. These cells are so tiny that they are only visible under the microscope. One of the most common and plentiful unicellular organisms are **bacteria** (singular: *bacterium*).

Bacteria

Bacteria live on every surface of our bodies—on our skin, in our mouths, even on our eyelashes. The bacteria in your body make up 10% of your mass! Bacteria, which are examples of **prokaryotic** cells, are among the earliest life forms and live in just about every material and environment on Earth.

Did You Know?

- There are between 200-500 species of bacteria in your mouth.
- Between 500-1000 bacteria can fit on the tip of a pin.
- There are more bacterial cells than human cells in your body.

Although some bacteria can cause serious health problems, most perform important functions and are necessary to maintain the health of plants, animals, and the environment.

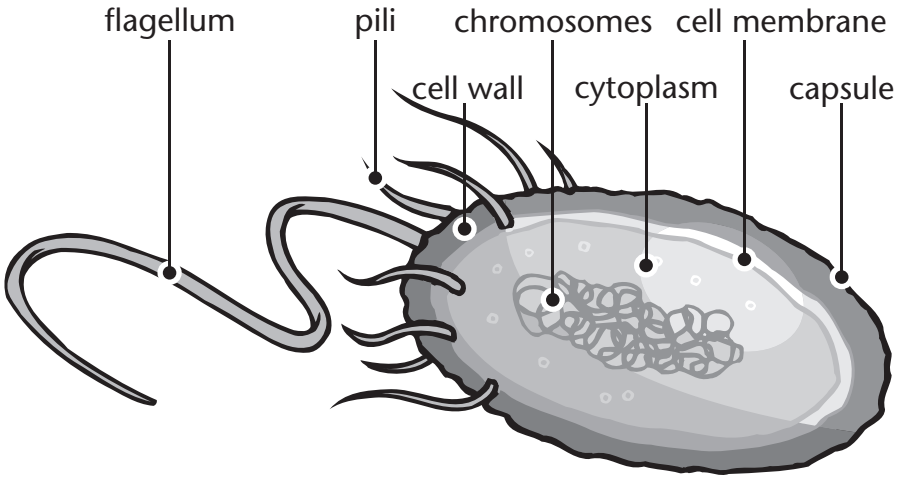
Helpful bacteria turn milk into yogurt and cheese, make bread rise, are used for a variety of medicines, and produce about half the world's oxygen. Harmful bacteria can cause diseases such as strep throat and pneumonia and can also contaminate water and food.

Bacteria have the following characteristics:

- They lack a nucleus, nuclear membrane, and many of the other organelles.
- They have a single large DNA molecule.
- They are usually less than 0.002mm long.

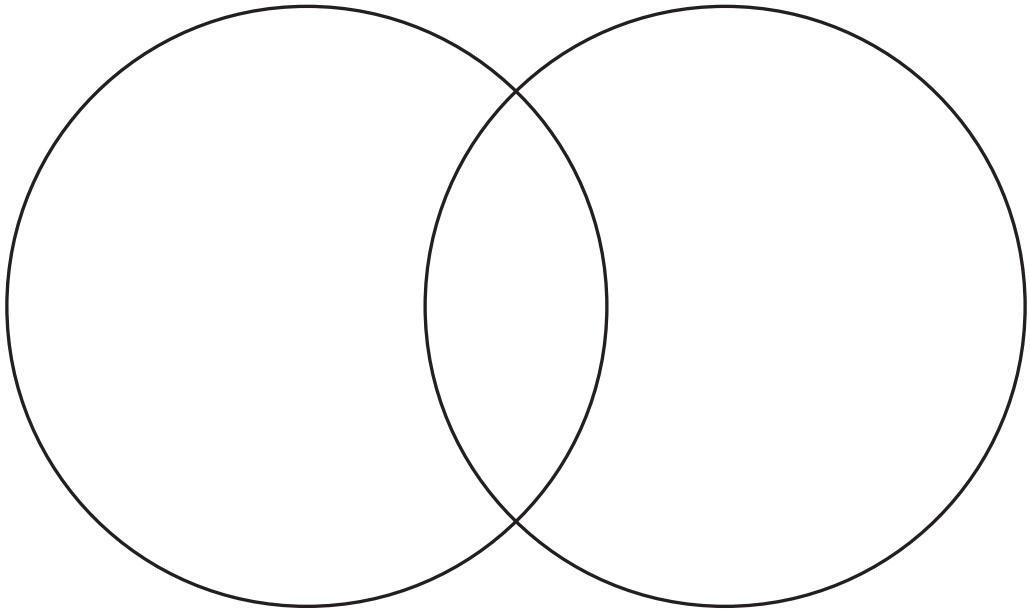
They are different from plant and animal cells because they have no nucleus, mitochondria, or ribosomes.

Bacteria reproduce by splitting off bits of themselves, called **spores**, that grow into more bacteria. These spores then move away and spread the bacteria to neighboring sites. Some bacteria have small **flagella**, whip-like tails that allow bacteria to move themselves. Others just float on the wind or water, and go wherever they happen to be carried.



Activity 1
Plant vs. Bacterium

Complete this Venn diagram to show the similarities and differences between a plant cell and a bacterium cell.



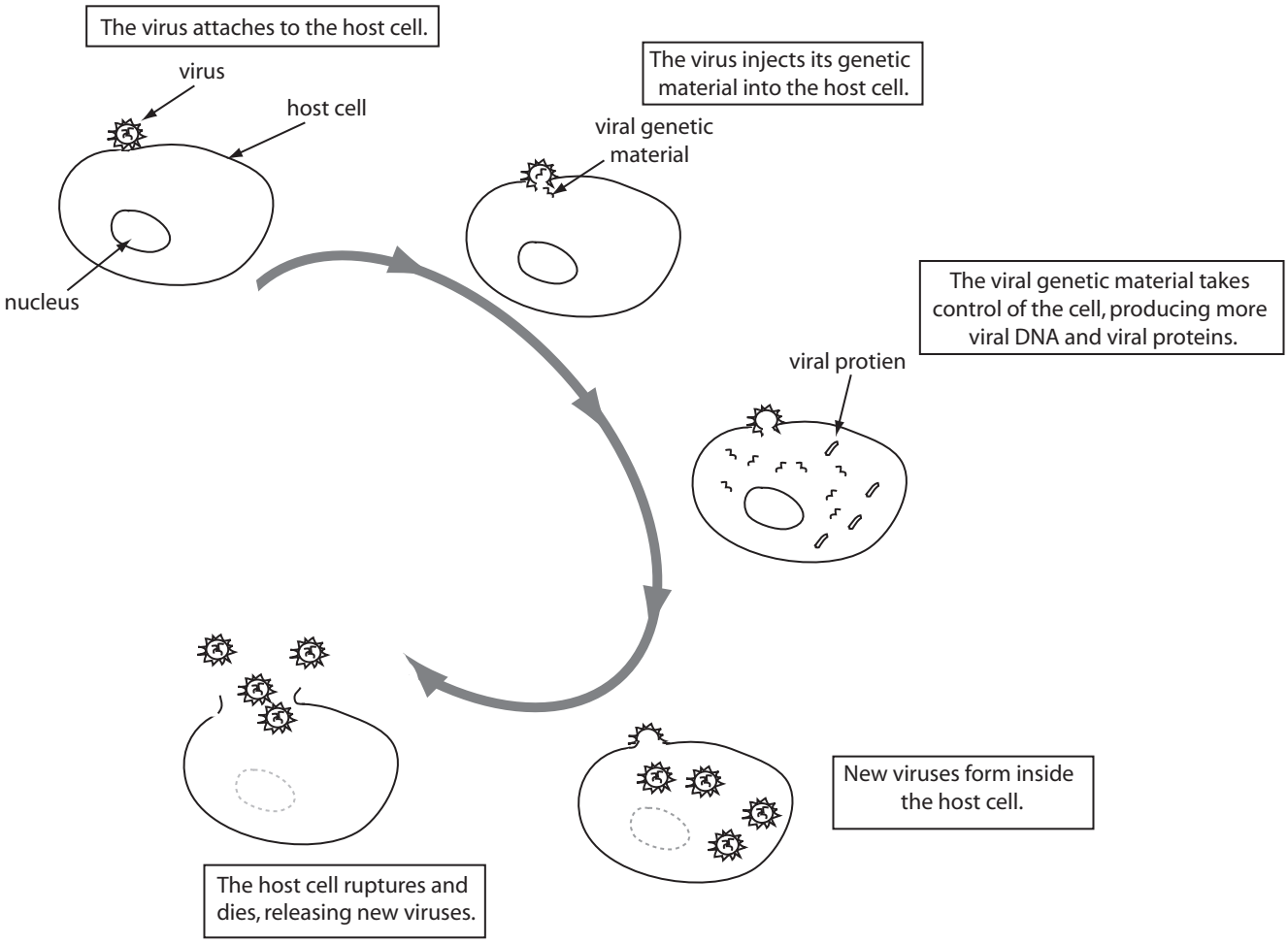
Check your answers using the Solutions at the end of this learning package.

Viruses

Viruses are not alive and are not true cells. They range in size from 0.03-0.3 µm (0.00003-0.0003 mm). Viruses have two parts:

- genetic material (DNA)
- protein cover

They are only able to reproduce by invading a living cell, as shown in the diagram below. Once inside the living cell the virus forces the cell to make copies of the viral DNA resulting in more viruses. Viruses cause diseases such as colds, flu, chicken pox, and HIV/AIDS.



Effects on Humans

Like all living organisms, bacteria produce proteins that can affect nearby cells. Bacteria that are harmful to humans release **toxins** (poisons) into the body that destroy or inhibit the normal function of the cells.

Treatment for bacterial infections often involves **antibiotics**, which are used to kill the bacteria directly. One problem with antibiotics is that they do not differentiate between the 'good' bacteria in our bodies and 'invading' bacteria; sometimes as a result, the cure for one problem will cause other problems in turn.

Earlier in this lesson you saw how viruses invade host cells and cause the cells to die. Influenza, smallpox, measles, HIV, and SARS are all viral infections. Some drugs and vaccines have proven effective in the fight against certain viruses, but antibiotics are completely ineffective.

Activity 2
Fighting off Viruses

For each question, select the best answer.

1. Bacteria reproduce by invading a host cell.
   a. True
   b. False

2. All bacteria contain chromosomes.
   a. True
   b. False

3. All bacteria are harmful.
   a. True
   b. False

4. Bacteria are very small.
   a. True
   b. False

5. Bacteria have a nucleus but no nuclear membrane.
   a. True
   b. False

6. Viruses tend to be larger than bacteria.
   a. True
   b. False

7. Viruses contain DNA.
   a. True
   b. False

8. Which of the following characteristics of life does a virus have?
   a. movement caused by a force from within itself
   b. reproduction
   c. response to a change in environment
   d. growth from within itself

9. Viruses differ from bacteria because:
   a. Viruses have nuclei and bacteria don't.
   b. Viruses are living cells and bacteria are not.
   c. Bacteria can't live freely outside of organisms but viruses do.
   d. Viruses have no nuclei, cytoplasm, or cell membrane.


Check your answers using the Solutions at the end of this learning package.

Summary

Completing this lesson has helped you to:

- accurately list similarities and differences between cell types (plant, animal, and bacteria)
- understand how viruses reproduce

Once you have completed this part, move on to Lesson D.

Lesson D
Diffusion and Osmosis

Introduction

Just as you need food to survive, so does every cell in your body. But while you have a mouth, the cells in your body do not.

Just as you do, the cell produces waste that must be eliminated. So how do nutrients get into cells, and how do waste materials get out? The key to this process is the cell membrane.

Cellular Membrane

All cells are surrounded by barriers, designed to let some material in and keep other material out. Plant cells have a thick, non-living layer called a **cell wall**, and both plant and animal cells have a thinner, more flexible layer called a **cell membrane**. The membrane does most of the work of controlling the flow and transport of materials in and out of the cell.

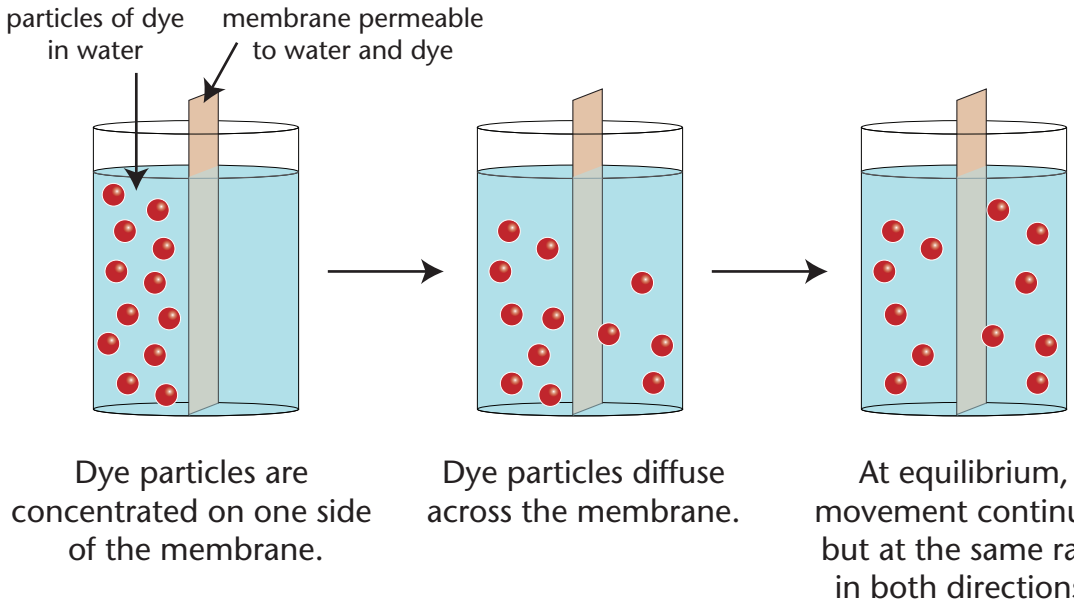
The cell membrane has small pores all across its surface, like little holes in a chain link fence. In general, the smaller the molecule, the more easily it can pass through a membrane. Molecules that are larger than the membrane's pores have difficulty passing through. Because some materials can pass through the membrane and some cannot, it's called a **selectively permeable membrane**. The cells in our bodies each have a selectively permeable membrane. The process that allows for the passage of molecules through the membrane is called **diffusion**.

Diffusion

Diffusion is what happens if you cook a spicy meal and the smell of it fills the room, then the house. In gases and liquids, molecules tend to move from areas of high concentration to areas of low **concentration**; they spread and occupy available space, moving towards an even distribution. In the case of the spicy meal, the concentration of scent molecules is high in the meal itself, and decreases the further from the meal you go. Therefore, the scent molecules will spread out from the meal into areas of low concentration, trying to create an equal distribution.

Since cells are surrounded by and filled with liquid, the process of diffusion is what allows molecules to enter and leave the cell. These molecules move from an area of high concentration to an area of low concentration. Diffusion continues until the

concentration of molecules is equal on both sides of the membrane. This is called **equilibrium**. Once equilibrium has been reached, molecules will still move across the membrane, but the number of molecules will stay constant on both sides. The process of diffusion is shown below.



Osmosis

Have you ever watered a plant, even though it looked wilted or dead, and then watched as it appeared to come back to life? This happens because of the process of **osmosis**. When you watered the plant, the water diffused into the plant cells, filling the vacuoles and cytoplasm and causing them to swell and return to the normal shape and structure.

The diffusion of water in the cell is so important to the life of the cell that it has its own name, osmosis. Osmosis is the transport of water across a semi-permeable membrane from areas where there is a high concentration of water to areas of low concentration. The effectiveness of osmosis in a cell can determine its life or death.

The cytoplasm of a cell is mainly made up of water, though the water is not entirely pure, since other substances are also found in it. If you place a cell in pure water, it will begin to transport water across the cell membrane by osmosis and try to balance out the purity of water on both sides.

Similarly, if you place the cell in salty water then the inside of the cell will start to push water out across the membrane, trying to make its surroundings equal to the purity of the water on the inside of the cell. This is the reason that it is said that sailors who are stranded at sea should never drink sea water if thirsty. The saltiness of the sea water would literally *remove* water from the body, rather than replenish it.

If a cell is in a fluid that has the same concentration as the cytoplasm, then there will be no net movement of water across the boundary, and osmosis will not take place.

Activity 1
Diffusion and Osmosis

For each question, select the best answer.

1. Diffusion moves large molecules across the cell membrane.
   a. True
   b. False

2. Molecules move from areas of high concentration to areas of lower concentration.
   a. True
   b. False

3. No energy is required for osmosis and diffusion.
   a. True
   b. False

4. If the salt concentration inside a cell is 2%, and the salt concentration outside the cell is 6%, water will flow into the cell by osmosis.
   a. True
   b. False


Check your answers using the Solutions at the end of this learning package.

Summary

Completing this lesson has helped you to:

- relate the concepts of osmosis and diffusion to the transport of materials across cell membranes

All About Cells—Appendix

Activity Solutions

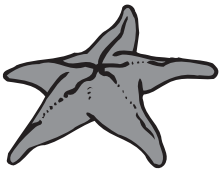
Lesson A: Cell Theory and the Characteristics of Living Things

Lesson A: Activity 1: Living or Non-living?

1. non-living

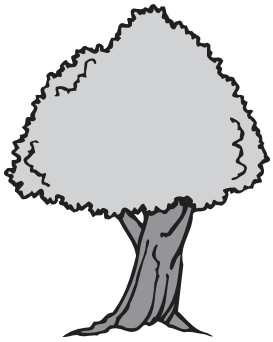
2. non-living

3. non-living



4. living

5. non-living

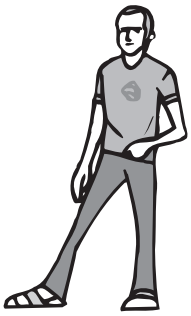


6. living

7. living

8. non-living

9. living



10. living

Lesson B: Plant and Animal Cells

Lesson B: Activity 1: Pre-quiz

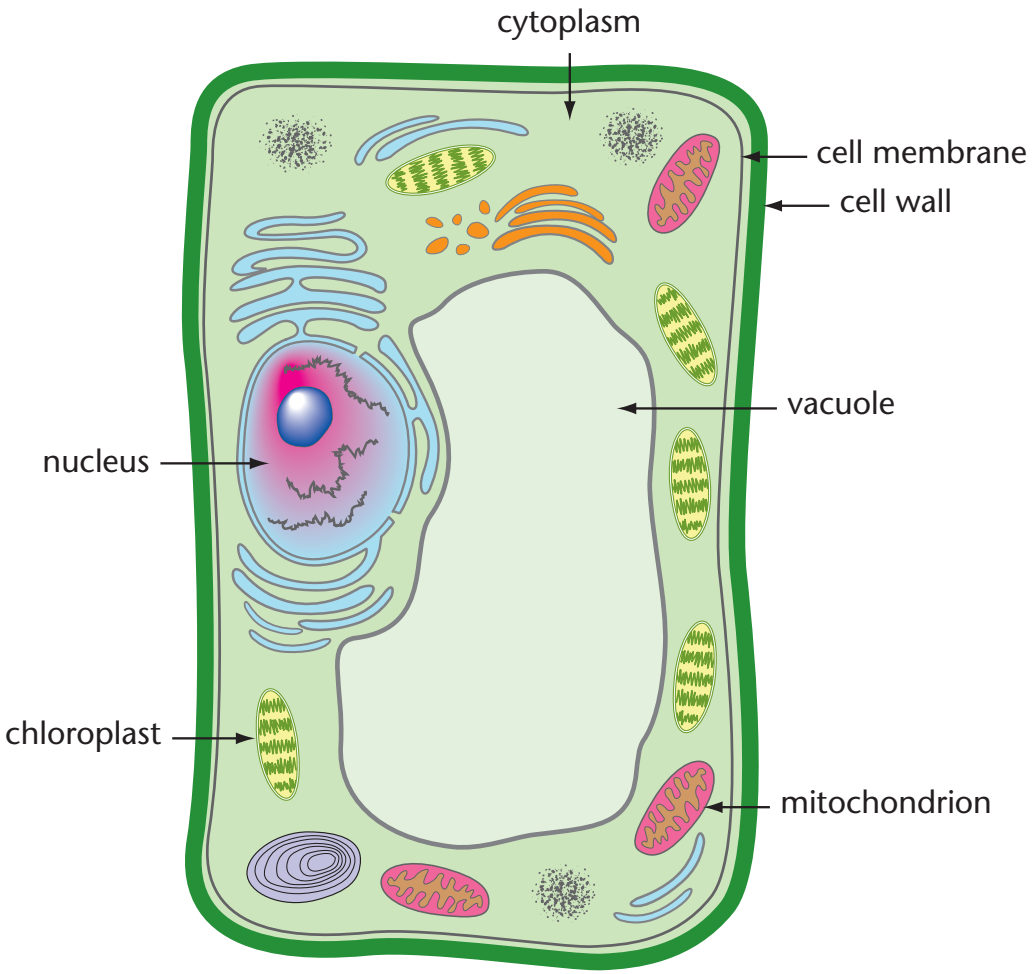
1. a. cells
2. c. cytoplasm
3. d. semi-permeable
4. a. nucleus
5. b. cell walls
6. d. cell membrane
7. a. chromosomes
8. b. organelles
9. a. cell division
10. c. chloroplasts
11. a. DNA
12. b. a single-celled animal

Lesson B: Activity 2: Parts of a Cell

1.

	Definition	Term
C	where instructions for the cell functions originate	A. nuclear membrane
E	where lipids such as steroids are assembled	B. Golgi body
G	stores starches and water	C. nucleus
F	assembles proteins	D. mitochondria
A	the region between the cell membrane and the nucleus	E. smooth endoplasmic reticulum
D	transforms sugars into usable cell energy	F. ribosomes
B	organelle that stores proteins	G. vacuole

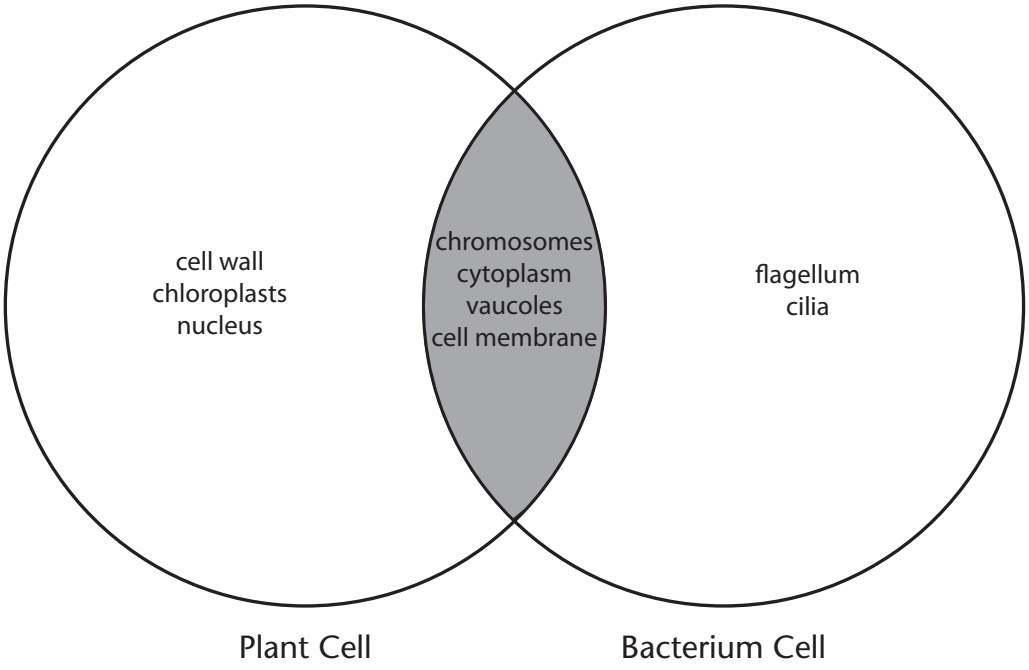
2. a.



b. The cell is a plant cell because it has a cell wall and contains chloroplasts.

Lesson C: Bacteria and Viruses

Lesson C: Activity 1: Plant vs. Bacterium



Lesson C: Activity 2: Fighting off Viruses

1. False. Bacteria reproduce by producing spores. Viruses invade a host cell.
2. False. Bacteria have a single large DNA molecule.
3. False. Some bacteria are harmful, but many are not.
4. True.
5. False. Bacteria have neither a nucleus nor a nuclear membrane. They have a single large DNA molecule.
6. False. Viruses are much smaller than bacteria.
7. True.
8. b. Reproduction is the only characteristic of life displayed by viruses.
9. d. Viruses do not have any of the cellular machinery that bacteria, animal, or plant cells do. They do have DNA or RNA which can be used to take over a host cell and make more viruses.

Lesson D: Diffusion and Osmosis

Lesson D: Activity 1: Diffusion and Osmosis

1. False. Diffusion moves small molecules across the cell membrane.

2. True.

3. True. Osmosis and diffusion rely on a concentration gradient and so they require no energy.

4. False. Think of the "water concentration" which is higher inside the cell than outside. In osmosis and diffusion, the movement is always from high to low. Water will leave the cell by osmosis.

Glossary

analogy
resemblance or similarities in some details between different things

antibiotic
a substance used to treat bacterial infection

bacteria
prokaryotic cells, single-celled micro-organisms

biodiversity
total number of different species and the ecosystem in which they live

cell
the basic unit of life

cell membrane
a protective layer that surrounds the cell and controls what enters and leaves the cell; like a security system/gate

cell theory
the cell is the basic unit of life; organisms are composed of one or more cells; all cells come from pre-existing cells

cell wall
a strong, protective layer that supports and protects plant cells

cellulose
a tough, insoluble carbohydrate that makes up a large part of the cell wall

chloroplast
site of photosynthesis in plant cells, where light energy turns nutrients into glucose

chromosome
a structure that contains an organism's genetic information (DNA), which is the blueprint for reproduction

cilia
tiny hairs that help provide movement for a cell

concentration
the amount of a given substance in a given space

cytoplasm
a watery fluid inside a cell; contains the cell's organelles

diffusion
the movement of molecules from an area of high concentration to an area of lower concentration

endoplasmic reticulum
folded membranes that act as canals for transporting materials through the cytoplasm

energy
the ability to do work

equilibrium
an equal number of particles on both sides of a membrane

eukaryotic cells
has a nucleus and has membrane-bound organelles

flagellum
whip like tail that provides movement for a cell

Golgi body
a cell structure that stores proteins and packages them in units called vesicles

impermeable
does not allow the passage of materials

locomotion
movement of animals from one place to another

lysosomes
a cell structure that uses enzymes to break down cell particles

microscopic
only visible with a microscope

mitochondria
site of cellular respiration (energy production for the cell)

model
a simplified representation of a complex idea, process, or system

multicellular
made up of more than cell

nucleus
controls the functions of the cells

organelle
all the microscopic structures found in the cytoplasm of a cell, each with a special function

organism
a living thing

osmosis
the movement of water particles through a selectively permeable membrane, from an area of high concentration to an area of low concentration

photosynthesis
the process by which water and carbon dioxide, in the presence of sunlight, are converted into simple sugars and oxygen

prokaryotic cells
no nucleus and no membrane-bound organelles

response
a reaction to a stimulus

ribosomes
manufactures proteins

selectively permeable membrane
a membrane that allows some materials to pass through it but keeps other materials out

spores
specialized reproductive cells formed and then distributed via wind or water

stimulus
anything that causes an organism to respond

theory
a set of statements or principles that explain a group of facts or observations that can be used to predict future outcomes

toxins
poisons produced by a living organism

unicellular
made up of only one cell

vacuole
stores starch, water, etc.