

Grade Level: 6-8

Time Estimate: 3-5 days

INTRODUCTION TO CELLS / INSTRUCTOR INFO

Summary

This lesson includes vocabulary, content, examples, and activities to help students learn and understand the order of life starting with shark cells all the way up to the ecosystem that sharks live in. Students will also learn about the different types of cells and will be able to successfully label a diagram of a cell.

Part 1. What are Cells?

Part 2. The Order of Life

Activity 1. Sharks at a Closer View

Goals & Objectives

The students will:

- be able to define key vocabulary terms and concepts on the topic of cells along with the order of life;
- learn about the different types of cells (eukaryotic and prokaryotic) and the differences between them;
- understand the differences between a bacteria, animal, and plant cells;
- and learn the proper order of life starting with the cell all the way to an ecosystem.

Standards

STEM

This lesson plan aims to assist teachers in implementing a STEM-based program into their classroom while inspiring the next generation of explorers, scientists, and stewards of the ocean. Based on real science and the Global Shark TrackerTM, “Introduction to Cells” is intended to promote environmental awareness and to prepare students for STEM careers.

This lesson aligns with the following TEKS:

6th Grade Science: 2C, 2D, 2E, 3A, 4A, 12A, 12B, 12C, 12D, 12F

7th Grade Science: 2A, 2C, 2D, 2E, 3A, 3B, 4A, 12C, 12D, 12F

8th Grade Science: 2A, 2C, 2D, 2E, 4A

Helpful Tips

- 1) The content in this lesson is based on the conservation work of OCEARCH™ and the Global Shark Tracker™. Spend a few minutes getting familiar with the website and the tracker if you have not done so already. The Global Shark Tracker™ is also available as an app for iPhone and Android.
- 2) This lesson plan is designed to be adaptable to suit your specific needs. Use the entire lesson plan or just parts of it. This material can be expanded to be an entire unit or condensed for just one day in the classroom.
- 3) Vocabulary words will be underlined as they first appear in the lesson plan. A complete list of vocabulary words is included as well.
- 4) Answers to questions and prompts for discussions will appear in *italics*.
- 5) Optional activities and content (side notes) will appear in a box. Use these to enhance your lesson and adapt it to suit your needs!
- 6) Have questions for OCEARCH Expedition Leader, Chris Fischer? Email info@OCEARCH.org to schedule a Skype session and let your students/child talk directly to Chris and the OCEARCH crew!
- 7) Email all questions about this lesson to info@OCEARCH.org.

Vocabulary

Cell – Basic building block of all living things. All organisms are composed of cells.

Cell Membrane – Semi-permeable layer surrounding a cell's cytoplasm and all the organelles inside.

Chlorophyll – Molecules found inside chloroplasts that absorb sunlight and converts it into food for the plant.

Chloroplasts –Organelles found inside plants that convert sunlight into sugars that can be used as a food source by the plants. Chloroplasts are only found in plants and other photosynthetic organisms.

Cytoplasm – Jelly-like fluid surrounding organelles inside a cell.

DNA – Stands for deoxyribonucleic acid. DNA is the hereditary material located inside the nucleus.

Eukaryotes – Any organism whose cells contain a nucleus and membrane-bound organelles.

Lysosomes – Organelle inside a cell that acts like a recycling center for the cell. These organelles digest foreign bacteria that invade the cell and recycle worn-out cell parts.

Mitochondria – Organelle inside a cell that acts as the cell’s energy source. These organelles have their own genetic material and convert energy from food into a unique form that the cell can utilize.

Nucleus – Serves as the cell’s command center, much like the brain is the control center for the entire body.

Photosynthesis – Process by which plants convert light energy from the sun into chemical energy that can be used by the plant.

Prokaryotes – Single-celled organism that lacks a nucleus and other membrane-bound organelles. Prokaryotes include the bacteria.

Organism – A living thing, such as a plant or animal.

Population – When several of the same kinds of organisms live within the same area.

Community – When several different species of animals and plant live together within a particular area.

Ecosystem – An area where several different species interact with their surrounding such as water and rocks

// STANDARDS

This lesson aligns with the following TEKS:

Grade 6 Science: 1A, 1B, 2A, 2E, 3A, 3D

Grade 7 Science: 1A, 1B, 2A, 2E, 3A, 3D

Grade 8 Science: 1A, 1B, 2A, 2E, 3A, 3D

This lesson aligns with the following Next Generation Science Standards:

Framework

1. Asking questions and defining problems.
2. Planning and carrying out investigations.
3. Analyzing and interpreting data.
4. Constructing explanations.
5. Engaging in argument from evidence.
6. Obtaining, evaluating, and communicating information.

MS. Matter and Energy in Organisms and Ecosystems – MS-LS2-4

Science and Engineering Practice

Engaging in Argument from Evidence

- Engaging in argument from evidence in 6-8 builds on K-5 experiences and progresses to constructing a convincing argument that supports or refutes claims for either explanations or solutions about the natural and designed world(s). Construct an oral and written argument supported by empirical evidence and scientific reasoning to support or refute and explanation or a model for a phenomenon or solution to a problem. (MLS-LS2-4).

Connections to Nature of Science

- Science disciplines share common rules of obtaining and evaluating empirical evidence. (MS-LS1-4)

Disciplinary Core Ideas

MS-LS2-4: Ecosystem Dynamics, Functioning, and Resilience

- Ecosystems are dynamic in nature; their characteristics can vary over time. Disruptions to any physical or biological component of an ecosystem can lead to shifts in all its populations.

Crosscutting Concepts

Stability and Change

- Small changes in one part of a system might cause large changes in another part. (MS-LS2-4)

INTRODUCTION TO CELLS / PRE-LESSON ASSESSMENT

Use the following true/false, fill in the blank, and multiple choice questions as an introduction/warm-up to the lesson topics. You can do this in a verbal or written format, as a game, individually, in groups, or as a whole class! A handout is provided if you wish to hand the questions out in a quiz format.

The questions do not need to be graded. They are intended to give the students an idea of what they will be learning and to see what they already know.

1) True or False Cells are the basic building blocks of all living things.

Answer: *True*

2) True or False A prokaryotic cell contains a nucleus.

Answer: *False*

3) True or False Tissues have specific function.

Answer: *True*

4) Which of the following can be found in a plant cell but cannot be found in an animal cell?

- a. Cell wall
- b. Cytoplasm
- c. Nucleus
- d. Mitochondrion

Answer: *a. Cell Wall*

5) In the order of life what comes after organ systems?

- a. Cells
- b. Tissue
- c. Ecosystem
- d. Organism

Answer: *d. Organism*

Name: _____ Date: _____

Introduction to Cells

Select the correct answer(s) to each of the following questions.

- 1) True or False Cells are the basic building blocks of all living things.
- 2) True or False A prokaryotic cell contains a nucleus.
- 3) True or False Tissues have specific function.
- 4) Which of the following can be found in a plant cell but cannot be found in an animal cell?
 - e. Cell wall
 - f. Cytoplasm
 - g. Nucleus
 - h. Mitochondrion
- 5) In the order of life what comes after organ systems?
 - e. Cells
 - f. Tissue
 - g. Ecosystem
 - h. Organism

INTRODUCTION TO CELLS / LESSON PLAN

Part 1. What are Cells?

In this lesson we going to explore cells and explain the order of life from cells to communities. Cells are the basic living unit for all organisms. Bacteria, plants, and animals are all composed of cells. But are these cells similar across groups or do they differ? While there are similarities across cell types, there are major differences as well. Let's explore this further.

Let's start with the most simple cell type. Prokaryotes, or bacteria, possess the simplest form of cells (Figure 1). Bacteria are single-celled organisms that lack a nucleus and organized organelles. Since bacteria lack a nucleus, their DNA is just floating around in the cell. In contrast, eukaryotes (plants and animals) possess an organized nucleus with DNA located inside the nucleus! Unlike eukaryotes, prokaryotes are very small, microscopic even!

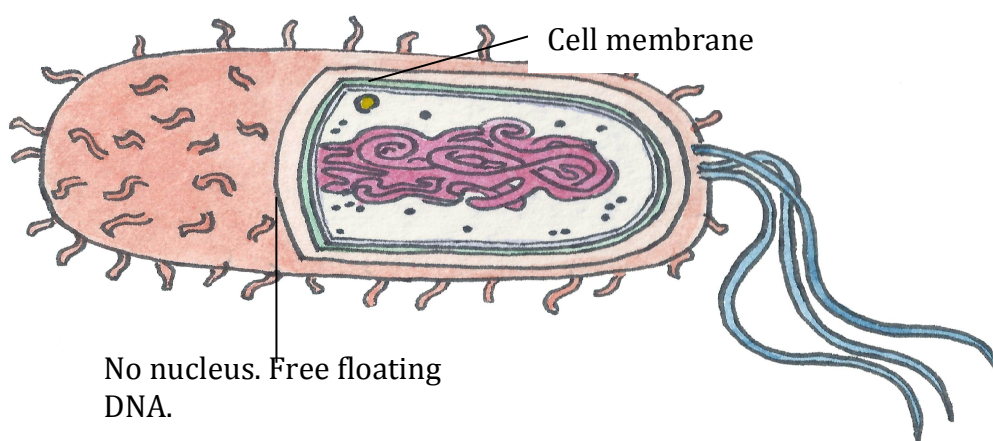


Figure 1 Prokaryotic (bacteria) cell.

Illustration Credit: Sarah Rich – Landry's Downtown Aquarium

Eukaryotic cells have different structures on the inside of the cell called organelles. Each organelle has a specific purpose and function. In simpler terms, organelle means "small organ." Organelles provide our bodies with food, gets rid of waste, protects our cells, repairs our damaged cells, and helps us to grow. Examples of organelles are the chloroplast and mitochondria.

Plant cells contain many of the same organelles as animal cells (Figure 2). For example, both plant and animal cells have a nucleus. However, there are a few major differences! The first major difference is the cell wall. Plant cells possess a cell

wall made of cellulose. This cell wall is the outside, protective layer that gives the plants a rigid structure and prevents the cells from moving. Along with this cell wall they also contain a cell membrane. Animal cells do not possess this cell wall. Plants also have additional organelles on the inside, including green chloroplasts and water-filled vacuoles. Chloroplasts hold chlorophyll, which gives the plants their green color. Chloroplasts are also used by the plants to produce their own food through a process called photosynthesis.

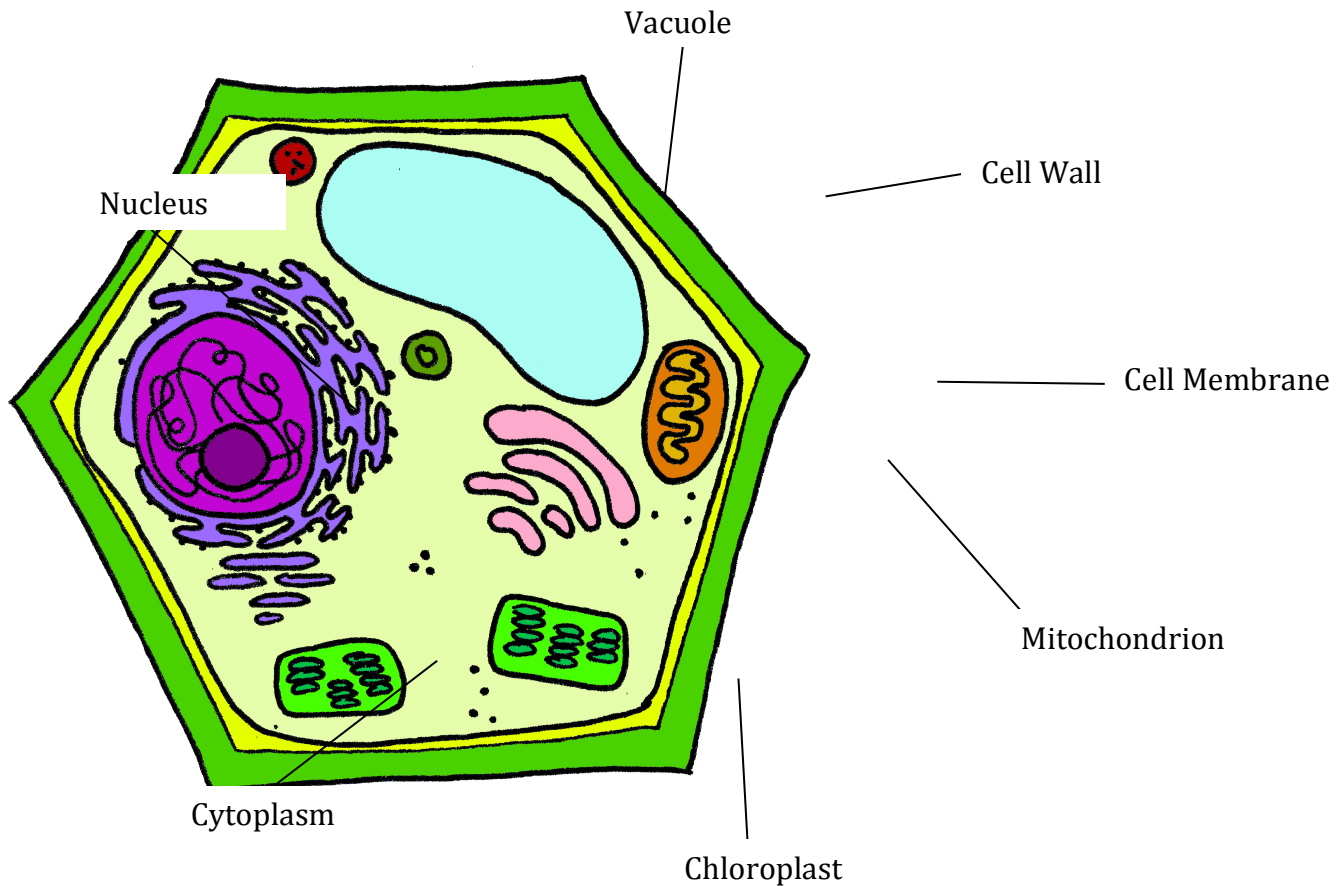


Figure 2. Anatomy of a plant cell.

Illustration Credit: Sarah Rich – Landry’s Downtown Aquarium

For this lesson, we are going to focus on animal cells (Figure 3). Unlike plant cells that possess a cell wall, animal cells have only a cell membrane. The cell membrane allows for cell movement and contains cholesterol. This cholesterol, allows the cell to be stable. Remember, that food needs to come into a cell and waste must exit the cell. So how does this happen? Well, there are “doors” or small openings in the cell membrane that allow food and waste to go in and out of the cell.

On the inside of the cell, there is a jelly-like substance that fills most of the cell. This substance is called cytoplasm. Organelles can be found in the cytoplasm. The mitochondria is the powerhouse of the cell, providing up to 90% of the cells energy. Animal cells (like plant cells) have a nucleus, which houses the DNA and controls everything that the cell does.

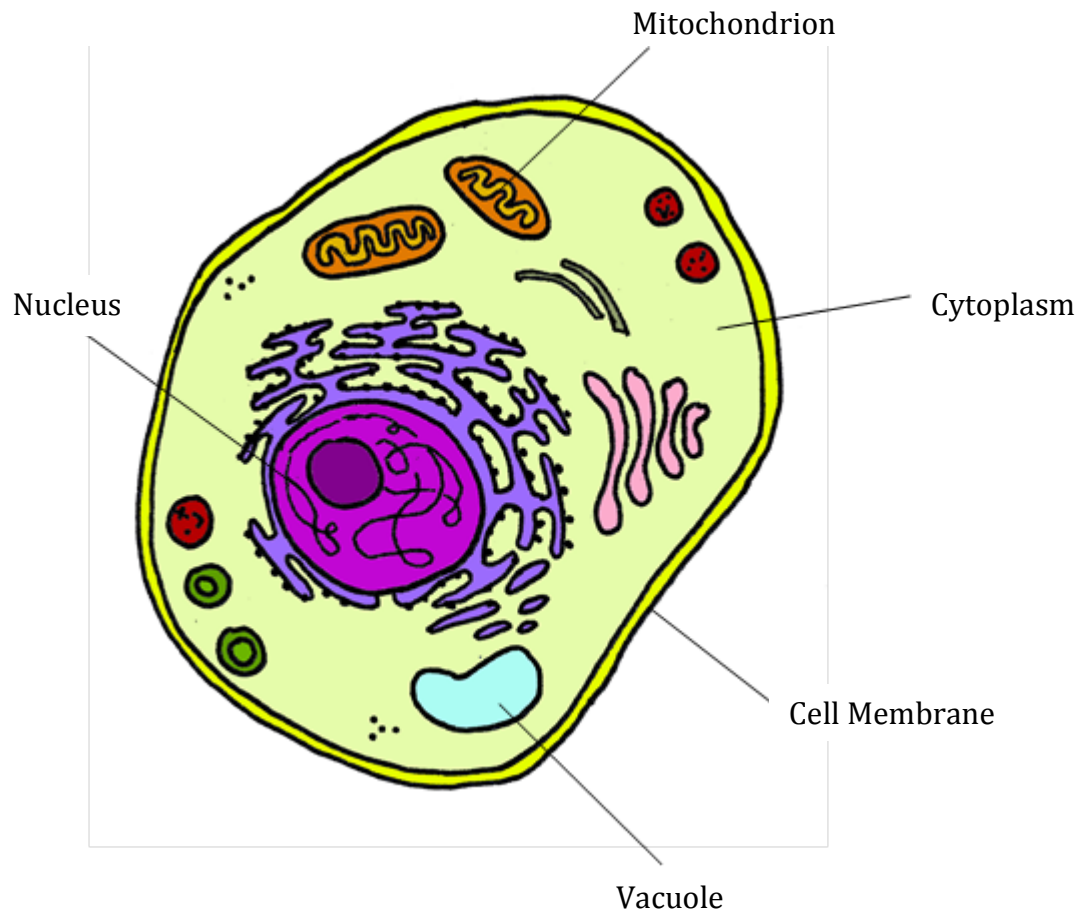


Figure 3. Anatomy of an animal cell.

Illustration Credit: Sarah Rich – Landry’s Downtown Aquarium

Part 2. The Order of Life

A tissue is a group of cells combined. Cells may group together to form tissues (e.g., stomach tissue, liver tissue, heart tissue). As these tissues are created, they form into organs such as the heart, stomach, intestines, liver, and brain. From here the organs that perform similar functions are grouped together into systems, for example the digestive system or nervous system. Once you have all of the organ systems you then have an entire organism! An organism is a particular species of animal such as a shark. There are several different species of shark including the Mako shark and the hammerhead shark. When several sharks live in a specific area together they are called a population. As sharks live within an area they encounter other species of animals, such as fish and crabs. Combined, they make up a community. Communities of animals are always interacting with their physical surrounding, such as water and rocks, which together make an ecosystem.

The Order of Life

Cells

Tissues

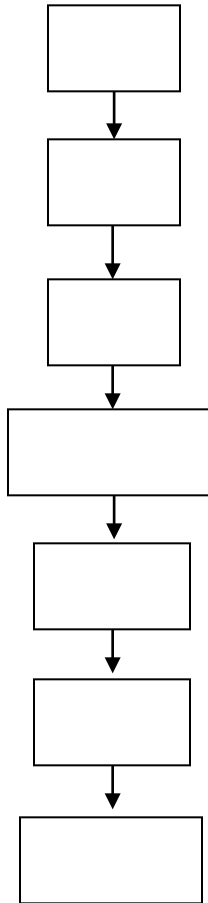
Organs

Organ System

Organism

Population

Community



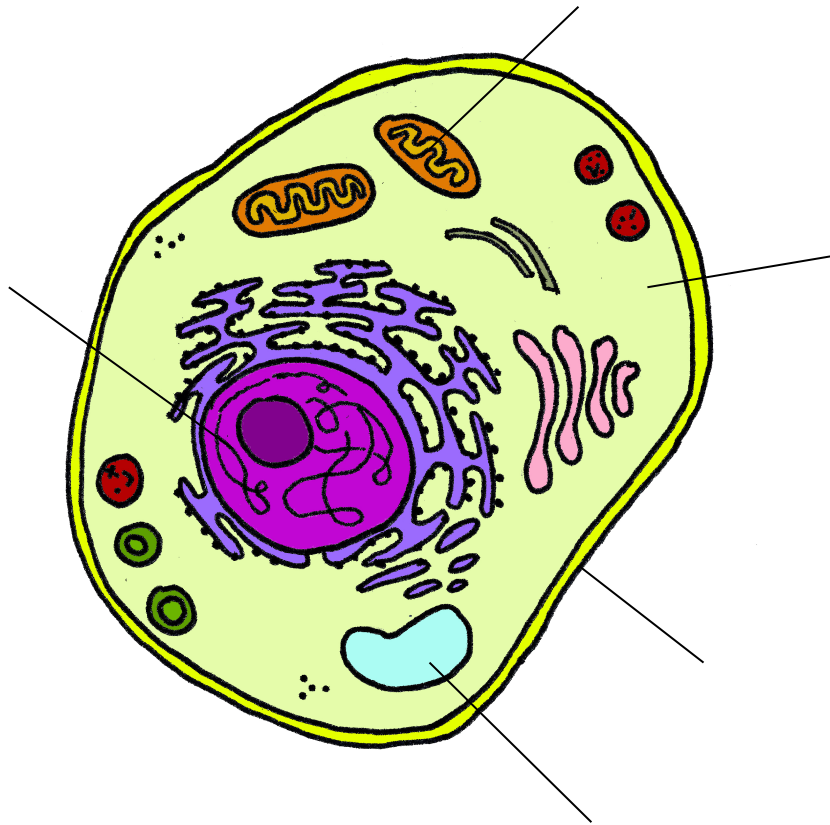
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Date: _____

Introduction to Cells: Animal Cells

Label the following organelles in the animal cell. Use the word bank below.

Word Bank: cell membrane, mitochondria, nucleus, vacuole, cytoplasm



1. Is this a eukaryotic cell or a prokaryotic cell? How can you tell?
2. Name some of the different features between an animal cell and a plant cell.

Part 3. Activity 1. Sharks at a Closer View (45 – 60 minutes)

Introduction

In this activity, students will create a poster abo

life starting from a cell all the way up to an ecosystem.

Students will research the components of a shark cell making sure to describe the key features and functions of the cell. From there students can research the function of organs, how they are grouped into systems, which make a shark. Using the OCEARCH global shark tracker students will pick an area of the world where a community of sharks live and record information about them for their poster, which is to be completed at home.

Materials

- Computer
- Writing utensil
- Worksheet provided
- Butcher paper/poster board
- Markers/crayons

Instructions

1. As a class, students should discuss the characteristics of a sharks. Are they made up of cells? What is a tissue made of? Are there different types of tissues and can they have different functions? What does an organ consist of? What type of organs do they have? Where do sharks live? Do they interact with other sharks? What do sharks eat?
2. Research background knowledge about sharks and show students how to use the OCEARCH website.
3. Have students pick a specific area where multiple sharks live together and have them write three of the sharks names, along with their corresponding information.
4. Discuss their findings, along with the definition of a population, community, and ecosystem. Do the same species of sharks live in a particular area together? Do different species of sharks interact with each other? Do they encounter other types of animals within the area they are living in?
5. Students should create a poster about the order of life starting with a cell all the way to an ecosystem. It must include the following:
 1. A labeled diagram of an animal cell.
 2. A list of characteristics for an animal cell, the different types of organs that a shark has along with their functions.
 3. The definitions for population, community, and ecosystem.
 4. Pictures of what a population, community, and ecosystem would look like.

Name: _____

Date: _____

Activity 1. Cells Practice Questions

1. What is the basic unit of life that sharks are made of?
2. Do tissues build into organs and if so do they have different functions?
3. List two types or organs within a shark.
4. Using the OCEARCH Global Shark Tracker, pick three sharks in a similar area on the map and complete the table below.

Name of shark	Species	Tag location	How far has the shark traveled?	Length

Based on the data you recorded answer the questions below.

5. Were different species of sharks living within the same area? If so what is that called?
6. In general, do sharks travel around or stay in the same place?
7. Which one of your three sharks has traveled the farthest? Which one has traveled the least?
8. What other types of animals do you think that your sharks have encountered along their journey?