



Unit: The Characteristics of Life

Lesson Plan 4: Six Kingdoms

Objective(s):

Students will be able to:



- List the 6 Kingdoms.
- Identify the determinants of kingdom classification.
- Identify the structure, mode of energy, and domain of each kingdom.

Materials:

PowerPoint: "Classifying Life's Diversity"

Anticipatory Set:

Consider the different types of creatures on the earth. What is it that makes an animal an animal; or a plant a plant? This is another question that must be answered by taxonomists when classifying organisms.

Lesson:

- I. PowerPoint presentation: Part 2 – "The Six Kingdoms"
- II. Six Kingdoms worksheet

Lab:

Kingdom Classification

Evaluation:

- Six Kingdoms worksheet
- Quiz



PowerPoint Notes:



Slide Notes:

We've learned that taxonomists classify organisms into six different kingdoms. In this lesson we will look at some similarities and differences among these kingdoms.



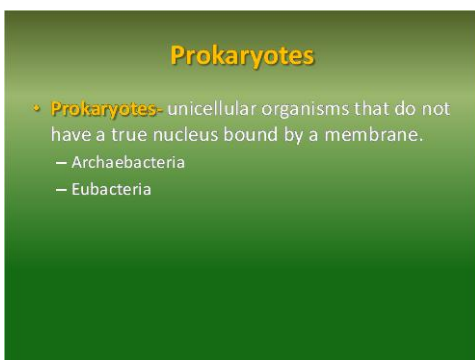
Slide Notes:

Sometimes you will hear that there are only five kingdoms. In those circumstances, it is because Archaeobacteria and Eubacteria are classified together as Prokaryotes. In this unit they have been and will continue to be classified as separate kingdoms.



Slide Notes:

The cell structure and how the organism obtains energy are the determining factors in how organisms are classified into kingdoms.



Slide Notes:

The first two kingdoms belong to the prokaryotes. All organisms found in the Archaeobacteria and Eubacteria kingdoms lack a membrane-bound nucleus.



Archaeobacteria

- Structure: unicellular; lack membrane-bound nucleus
- Energy:
 - Heterotrophy
 - Autotrophy
 - Some chemosynthetic
 - Others photosynthetic
- Live in extreme environments
- Domain Archaea

Slide Notes:

The defining characteristic of Archaeobacteria is that they are found in extreme environments. These environments were once thought to be so extreme (in heat, salt, etc.) that no living organism could survive. Archaeobacteria are the only known organisms to survive extreme conditions.

Eubacteria

- Structure: unicellular; lack membrane-bound nucleus
- Energy:
 - Heterotrophy
 - Autotrophy
 - Some chemosynthetic
 - Others photosynthetic
- Found everywhere but in extreme environments
- Domain Bacteria

Slide Notes:

Eubacteria are different from Archaeobacteria in that they cannot survive extreme environments and can be found in any other type of environment.

Protists

- Structure
 - Some unicellular; some multicellular
 - Lack complex organ system
- Energy
 - Autotrophy (obtain energy like plants)
 - Heterotrophy (obtain energy like animals)
- Domain Eukarya

Slide Notes:

Protists are eukaryotic organisms. They do have a membrane-bound nucleus. Protists stand out from other organisms in other kingdoms in that they all lack complex organ systems.

Fungi

- Structure
 - Some unicellular
 - Some multicellular
- Energy
 - Heterotrophy
 - Absorb nutrients from organic materials in environment
- Domain Eukarya

Slide Notes:

The defining characteristic of fungi is their means of obtaining energy. They are able to absorb nutrients from dead and decaying materials in the environment.



Plants

- Structure
 - Multicellular
 - Cells contain a cell wall
 - Complex organisms; contain organ systems
- Energy
 - Autotrophy
 - Photosynthetic
- Domain Eukarya

Slide Notes:

Larger plants, such as trees, have highly complex organ systems. This, along with their cell wall and ability to create their own energy using photosynthesis, separates them from the other kingdoms.

Animals

- Structure
 - Multicellular
 - Complex organisms, contain organ systems
- Energy
 - Heterotrophy
 - Herbivores, carnivores, and omnivores
- Domain Eukarya

Slide Notes:

Animals, like plants, have highly complex organ systems, but they are unable to produce their own energy.



Six Kingdoms
Date: _____

Name: _____
Class: _____

1. Place an x in each column that describes the kingdom.

Kingdom	Prokaryote	Eukaryotes	Unicellular	Multi-cellular	Auto-trophic	Hetero-trophic	Archaea	Bacteria	Eukarya
Animalia									
Plantae									
Fungi									
Protista									
Eubacteria									
Archaeobacteria									

2. How do members of each kingdom obtain food?

3. Make a list of similar characteristics shared by Archaeobacteria and Eubacteria. Then make a list of their differences.

4. Make a list of similar characteristics shared by Plants and Animals. Then make a list of their differences.

5. Which domain holds the most kingdoms? What major characteristic is found in these kingdoms but is not found in the others?



Six Kingdoms

Date: _____

Name: **Key**

Class: _____

1. Place an x in each column that describes the kingdom.

Kingdom	Prokaryote	Eukaryotes	Unicellular	Multi-cellular	Auto-trophic	Hetero-trophic	Archaea	Bacteria	Eukarya
Animalia		X		X		X			X
Plantae		X		X	X				X
Fungi		X	X	X		X			X
Protista		X	X	X	X	X			X
Eubacteria	X		X		X	X		X	
Archaeobacteria	X		X		X	X	X		

2. How do members of each kingdom obtain food?

Animals are heterotrophic herbivores, carnivores, or omnivores. They gain energy by eating other organisms.

Plants are autotrophic and can make their own energy through photosynthesis.

Fungi are heterotrophic and absorb their nutrients from the environment.

Some Protists are animal-like heterotrophs, others are plant-like autotrophs.

Some Eubacteria and Archaeobacteria are heterotrophs, while others are chemosynthetic or photosynthetic autotrophs.

3. Make a list of similar characteristics shared by Archaeobacteria and Eubacteria. Then make a list of their differences.

Similarities

- Prokaryotes
- Unicellular
- Some autotrophic
- Some heterotrophic

Differences

- Archaeobacteria live in extreme environments.
- Eubacteria are everywhere but extreme environments.

4. Make a list of similar characteristics shared by Plants and Animals. Then make a list of their differences.

Similarities

- Eukaryotes
- Multicellular
- Domain Eukarya

Differences

- Plants are autotrophic.
- Animals are heterotrophic.

5. Which domain holds the most kingdoms? What major characteristic is found in these kingdoms but is not found in the others?

Domain Eukarya holds the most kingdoms as all organisms in the domain have a true membrane-bound nucleus.



Lab: Kingdom Classification

Date: _____

Name: _____

Class: _____

Pre-Lab Question:

When taxonomists discover a new species, what characteristics will they look at to classify the organism into the correct kingdom?

Read each paragraph below. Underline the determinant factors, or characteristics, that will allow you to classify the organism into the correct kingdom. Then identify the kingdom the organism belongs to.

1. The *Dendroaspis polylepis* is the largest of its kind, can grow to 14 feet, and is considered to be very poisonous. It is a skillful hunter, using its venom and strong muscles to kill its prey.

Kingdom:

2. The *Phyllostachys nigra* can grow to 35 feet and is found in tropical regions of the world. Despite its inability to move from place to place, it has well-designed organ systems to create its own nutrients and to transport those nutrients.

Kingdom:

3. The *Ornithorhynchus anatinus* is a very strange organism both in appearance and behavior. It has special organs that allow it to sense the electrical impulses of its prey.

Kingdom:

4. The *Paramecium caudatum* is a unicellular organism that has a membrane-bound nucleus. It has special hair-like projections called cilia that it uses for locomotion and to capture food.

Kingdom:



5. The *Streptococcus pyogenes* is a single cell organism that lacks a true nucleus. It is commonly found throughout the world and is a major cause of human sickness.

Kingdom:

6. The *Amanita muscaria* is a poisonous multicellular organism. Despite its inability to move from place to place, it is able to steal nutrients from dead and decaying organisms in its environment.

Kingdom:

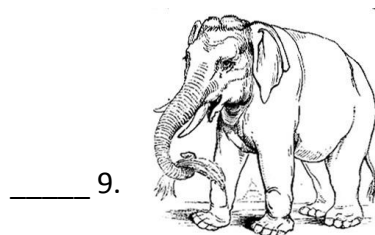
7. The *Haloarcula hispanica* is found in the hypersaline waters of southeastern Australia.

Kingdom:

8. The *Undaria pinnatifida* is an edible plantlike organism found in the sea. It is photosynthetic, but lacks the organ systems to transport the nutrients it synthesizes.

Kingdom:

Determine which statement best describes the organism pictured.



- a) unicellular autotroph
- b) multicellular autotroph
- c) unicellular heterotroph
- d) multicellular heterotroph



- a) unicellular autotroph
- b) multicellular autotroph
- c) unicellular heterotroph
- d) multicellular heterotroph



Lab: Kingdom Classification

Date: _____

Name: **Key**

Class: _____

Pre-Lab Question:

When taxonomists discover a new species, what characteristics will they look at to classify the organism into the correct kingdom?

They will look at the organism's structure and means of obtaining energy.

Read each paragraph below. Underline the determinant factors, or characteristics, that will allow you to classify the organism into the correct kingdom. Then identify the kingdom the organism belongs to.

1. The *Dendroaspis polylepis* is the largest of its kind, can grow to 14 feet, and is considered to be very poisonous. It is a skillful hunter, using its venom and strong muscles to kill its prey.

(Multicellular and heterotrophic)

Kingdom: **Animalia**

Common Name: **Black Mamba**

2. The *Phyllostachys nigra* can grow to 35 feet and is found in tropical regions of the world. Despite its inability to move from place to place, it has well-designed organ systems to create its own nutrients and to transport those nutrients.

(Multicellular, autotrophic, and has organ systems)

Kingdom: **Plantae**

Common Name: **Black Bamboo**

3. The *Ornithorhynchus anatinus* is a very strange organism both in appearance and behavior. It has a special organ system that allows it to sense the electrical impulses of its prey.

(Multicellular, heterotrophic, and has organ systems)

Kingdom: **Animalia**

Common Name: **Platypus**

4. The *Paramecium caudatum* is a unicellular organism that has a membrane-bound nucleus. It has special hair-like projections called cilia that it uses for locomotion and to capture food.

(Unicellular, heterotrophic, and has true nucleus)

Kingdom: **Protista**

Common Name: **Paramecium**





5. The *Streptococcus pyogenes* is a single cell organism that lacks a true nucleus. It is commonly found throughout the world and is a major cause of human sickness.

(Unicellular, lacks true nucleus, non-extremist)

Kingdom: **Eubacteria**

Common Name: Streptococcus

6. The *Amanita muscaria* is a poisonous multicellular organism. Despite its inability to move from place to place, it is able to steal nutrients from dead and decaying organisms in its environment.

(Multicellular and heterotrophic; absorbs nutrients)

Kingdom: **Fungi**

Common Name: Fly Agaric (*Amanita*)

7. The *Haloarcula hispanica* is found in the hypersaline waters of southeastern Australia.

(Extremist)

Kingdom: **Archaeobacteria**

Common Name: None

8. The *Undaria pinnatifida* is an edible plantlike organism found in the sea. It is photosynthetic, but lacks the organ systems to transport the nutrients it synthesizes.

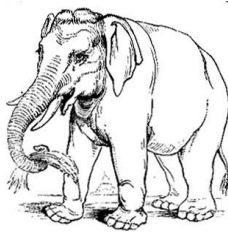
(Autotrophic and lacks organ system)

Kingdom: **Protista**

Common Name: Wakame Seaweed

Determine which statement best describes the organism pictured.

d 9.



- a) unicellular autotroph
- b) multicellular autotroph
- c) unicellular heterotroph
- d) multicellular heterotroph

b 10.



- a) unicellular autotroph
- b) multicellular autotroph
- c) unicellular heterotroph
- d) multicellular heterotroph



Quiz: Six Kingdoms

Name: _____

Date: _____

Class: _____

In the chart below, list the six kingdoms in the left column and place an x in each column that describes the kingdom.

Kingdom	Prokaryote	Eukaryotes	Unicellular	Multi-cellular	Auto-trophic	Hetero-trophic	Archaea	Bacteria	Eukarya

Write the two determining factors in how organisms are classified into kingdoms?



Quiz: Six Kingdoms

Name: **Key**

Date: _____

Class: _____

In the chart below, list the six kingdoms in the left column and place an x in each column that describes the kingdom.

Kingdom	Prokaryote	Eukaryotes	Unicellular	Multi-cellular	Auto-trophic	Hetero-trophic	Archaea	Bacteria	Eukarya
Animalia		X		X		X			X
Plantae		X		X	X				X
Fungi		X	X	X		X			X
Protista		X	X	X	X	X			X
Eubacteria	X		X		X	X		X	
Archaeobacteria	X		X		X	X	X		

Write the two determining factors in how organisms are classified into kingdoms?

Cellular structure

Means of obtaining energy