DAY 1

Contrasting Cases Part 1 - Compare Kingdoms

This lesson provides an introduction to kingdoms and domains through the presentation of examples of specific organisms from within each kingdom and domain. By comparing and contrasting organisms within each kingdom, then comparing the key characteristics of each kingdom across kingdoms, students should develop a strong understanding of what makes each kingdom unique while also laying a foundation for the characteristics common across kingdoms (e.g., made of cells). The contrasting case serves as an introduction to classification and thus precedes all work in the textbook. It also **replaces the material presented in Chapter 7, Section 2**, so you will be skipping this section entirely when you encounter it in the book. Note that all Kingdom cards are included at the end of the Day01 Powerpoint, in case you wish to project a particular card for discussion.

Big Ideas

- Organisms in the same kingdom have certain things in common, such as structure, habitat, locomotion, feeding and reproduction. Organisms in the same kingdom can also be different from each other in many ways.
- There is a set of common characteristics distinguishing each kingdom, and a novel organism can be assigned to a kingdom based on given characteristics.
- Some generally true characteristics of protists include: made up of at least one cell; each cell has a nucleus; and reproduce asexually.
- Some generally true characteristics of fungi include: made up of at least one cell; each cell has a nucleus; absorb nutrients from environment; and reproduce asexually.

Materials

Teacher:

1. Slides - day01.ppt

Students:

1. Kingdoms cards (WS 1 & 3; student resource p6 & 8)
2. Compare Kingdoms Venn Diagrams (WS 2 & 4; student resource p7 & 9)

Activities and Allotted time

5 minutes - Warm-up
30 minutes - CC activity - Compare Kingdoms: Protists and Fungi
5 minutes - Visualization 1.1 - Relative scale/magnification (Slides 13-14)
5 minutes - Visualization 1.2 - Color (Slides 15-16)

Making sense of biological categories

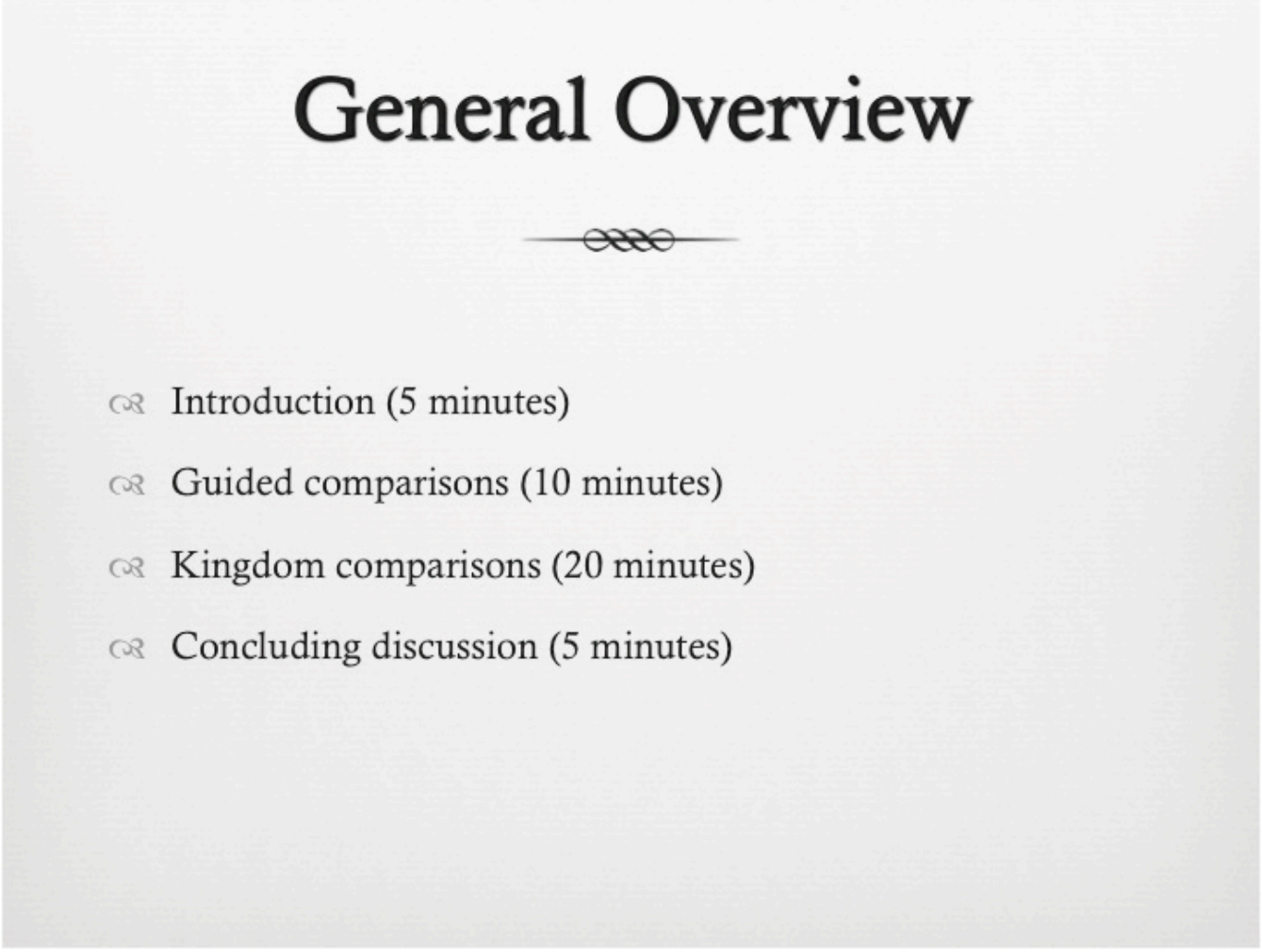
Heads up on student learning

You will find these "heads up" inserted throughout the Casebook. They are designed to inform teachers of specific misconceptions and prior knowledge that may affect the way students interpret the information presented in the materials that follow. They are not meant to be shared directly with students, but rather to inform the teacher of important issues affecting student learning.

It is usually easier for students to think about middle- to lower-level categories in biological classification systems, where differences among categories correspond more closely to things that are recognized and named in everyday life, such as cat, bear, and robin, or maple tree and rose bush. The properties that distinguish categories at middle and lower levels are often more directly observable, such as having fur or having retractable claws or a certain kind of beak. In contrast, the most general categories in biological classification are associated with the most general biological properties. At the level of Kingdoms and Domains, these generally correspond to different types of cells. While the properties of different kinds of cells are not readily observable, they are extremely important in categorizing the fundamental ways that different organisms do the work of supporting life and reproducing.

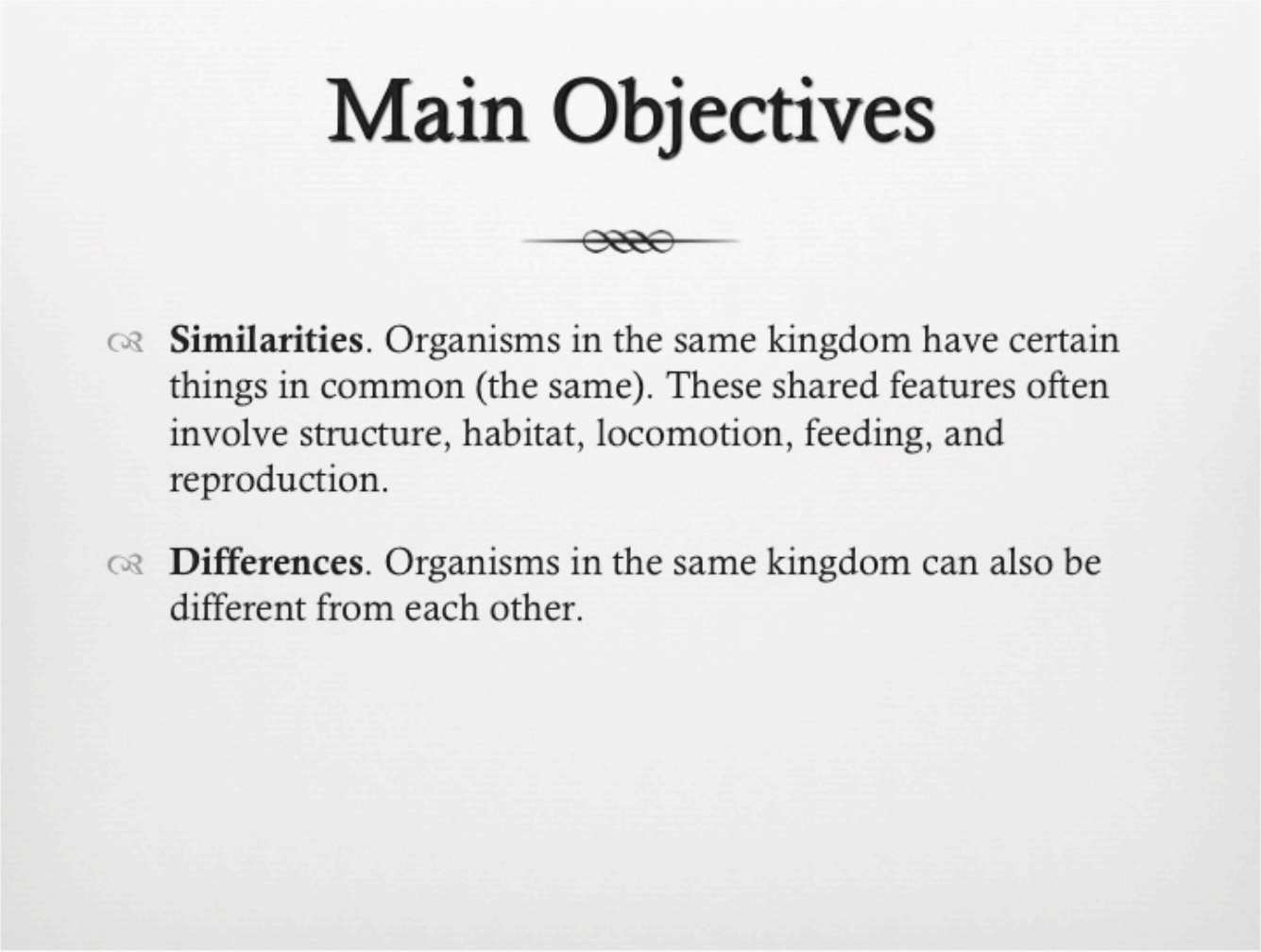
At the most general level, every member of all biological domains is a member of the top-level category *living things*. This corresponds to one of the very biggest ideas in modern biology—the Cell Theory—which states that all organisms are made of one or more cells and that the cell is the basic unit of all living things. Cell Theory is formally introduced in a later chapter in our sequence (Chapter 1), but it is worth noting that modern ideas about cells fundamentally underlie the most general categories in the biological classification system presented in Chapter 7. As students complete the contrasting cases for domains and kingdoms in this chapter, they will see that the properties that define the most fundamental categories in biological classification are generally related to types of cells.

Day 1 - Compare Kingdoms



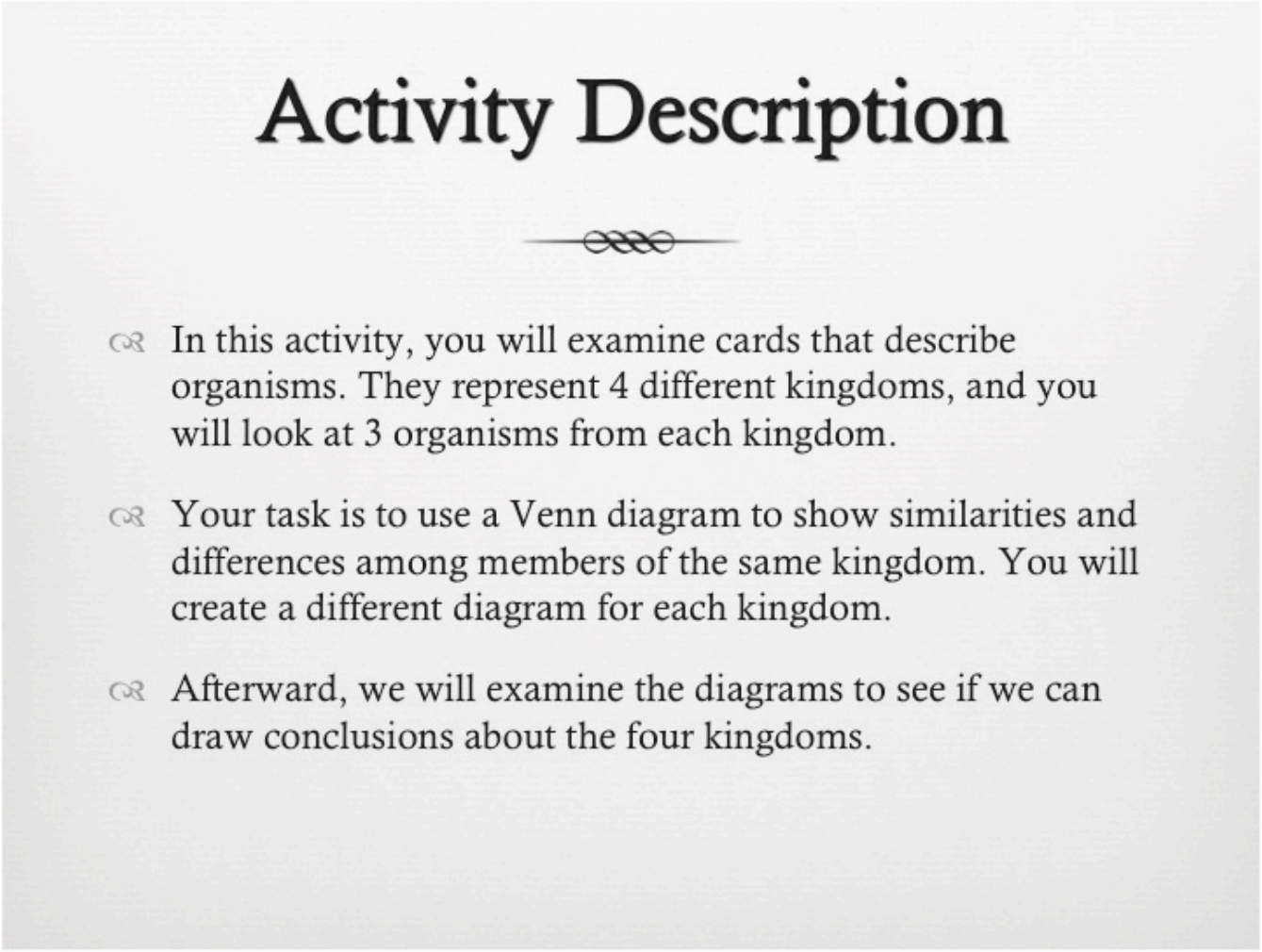
Total time = 30 minutes

Day 1 - Compare Kingdoms



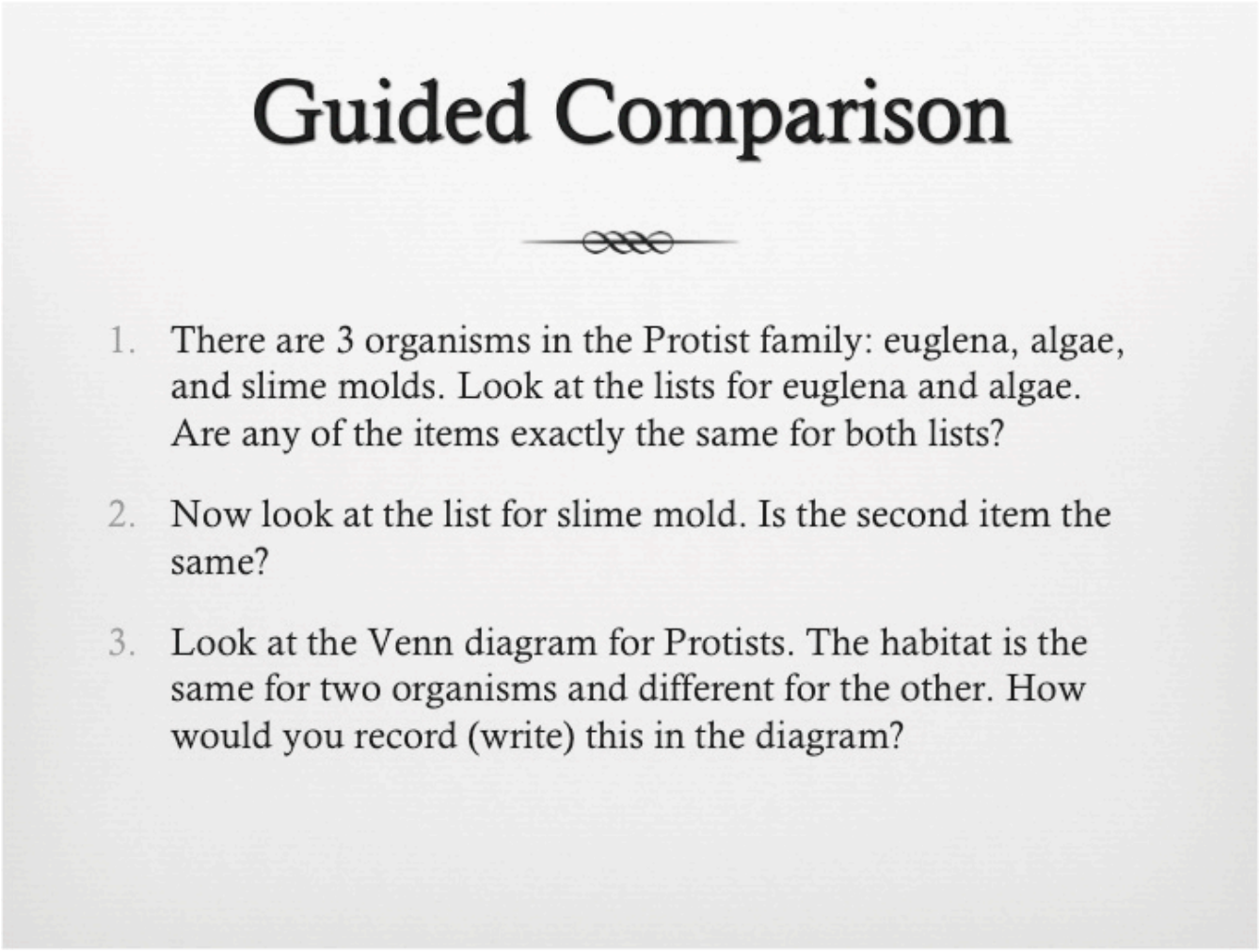
Main objectives to be displayed throughout the lesson.
You might ask students to define the following words:
structure - how many, and what kind(s) of cell(s) the organisms are made up of
habitat - where they are found; where they live
locomotion - how they move
feeding - how they obtain energy to stay alive; how and what they eat
reproduction - how they make more organisms of their kind

Day 1 - Compare Kingdoms



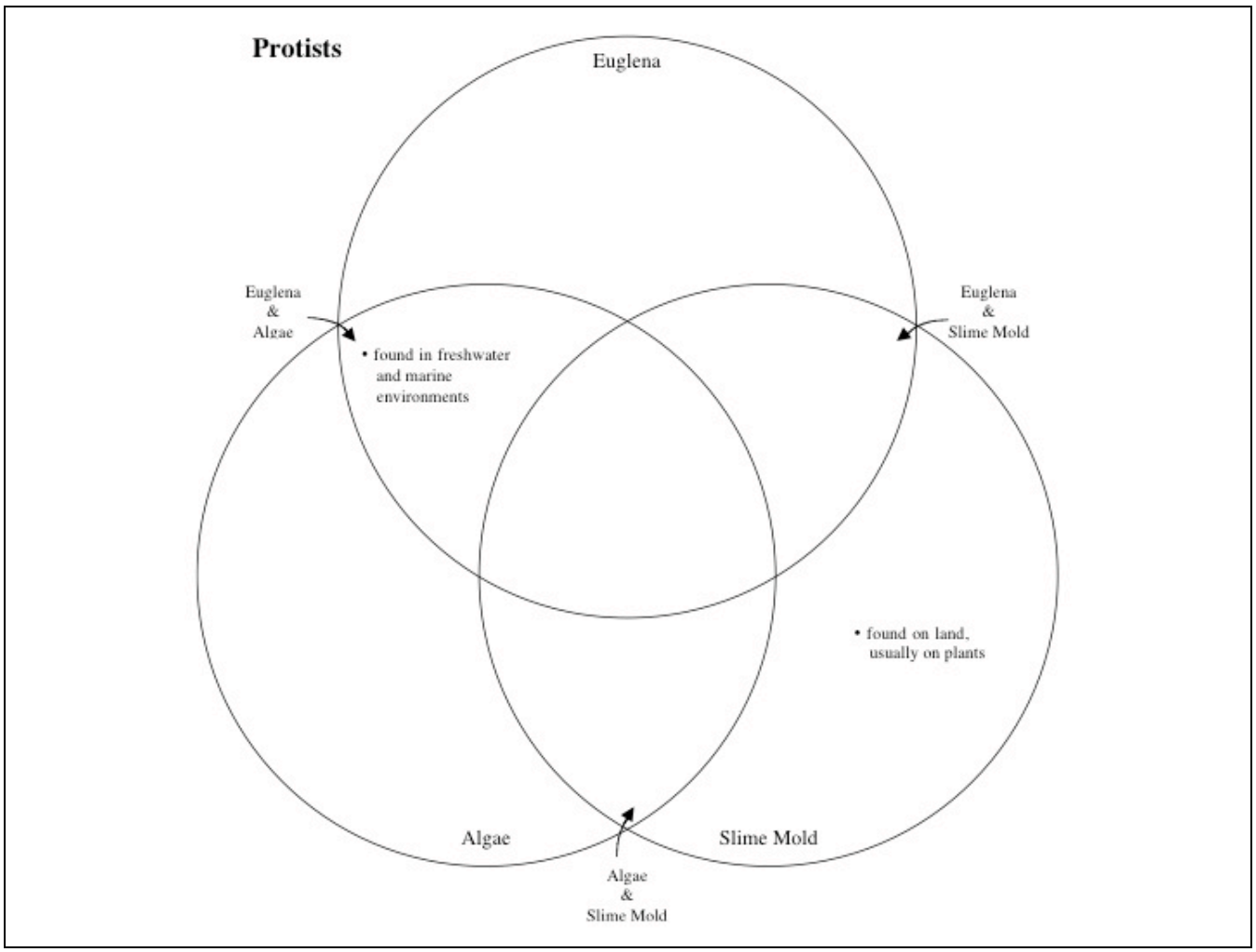
Distribute the student handouts (Kingdoms cards and Venn diagrams for Protists and Fungi) or call attention to them in the student resource book. The slides that follow will guide students through a few sample comparisons to get them started.

Day 1 - Compare Kingdoms



The second item -- both are found in freshwater and marine environments.
No -- slime mold is found on land, usually on plants.
The next slide shows how to record this information.

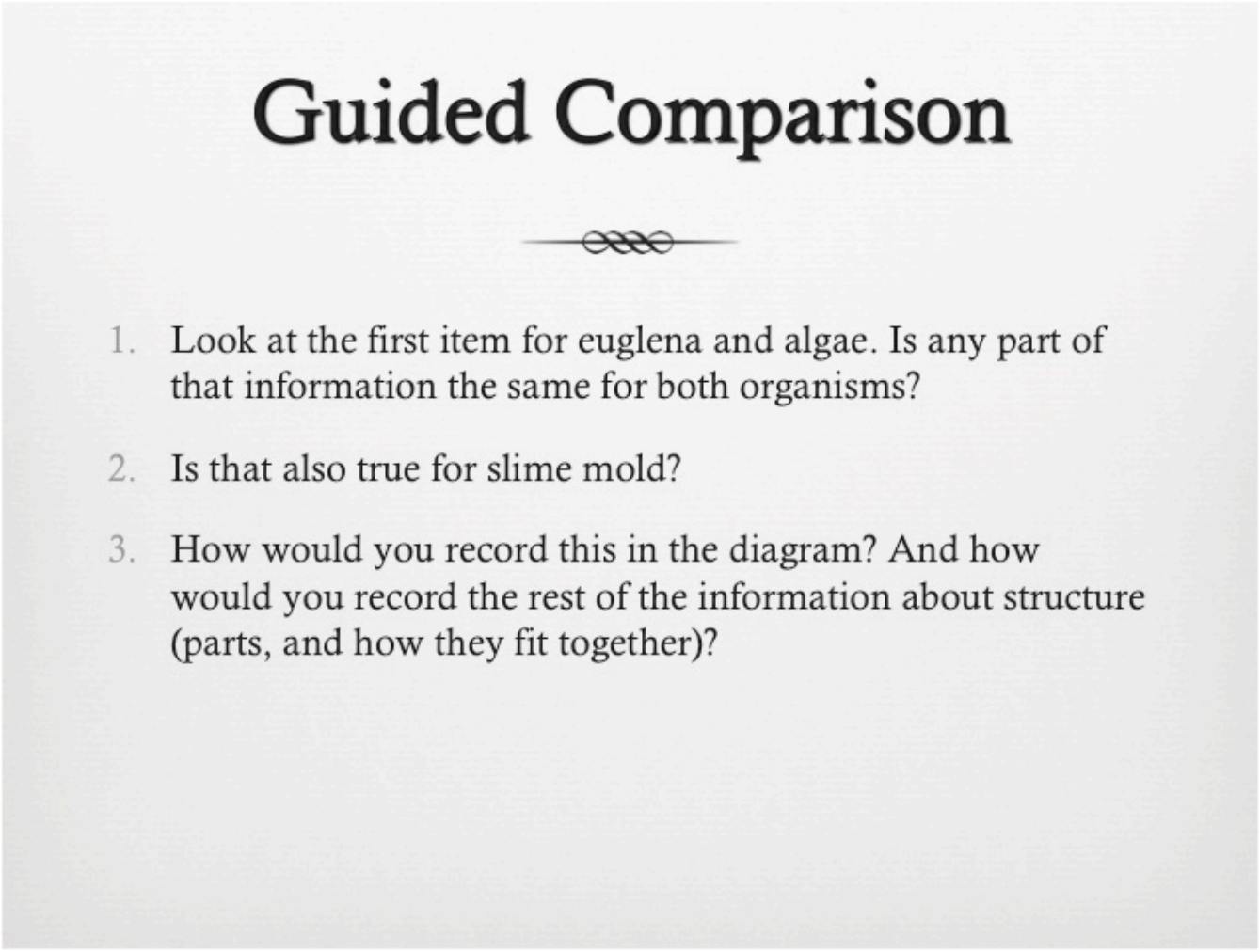
Day 1 - Compare Kingdoms



Both euglena and algae are found in freshwater and marine environments, so that information is recorded in the section that is common to both of those circles but does not overlap with the circle for slime mold.

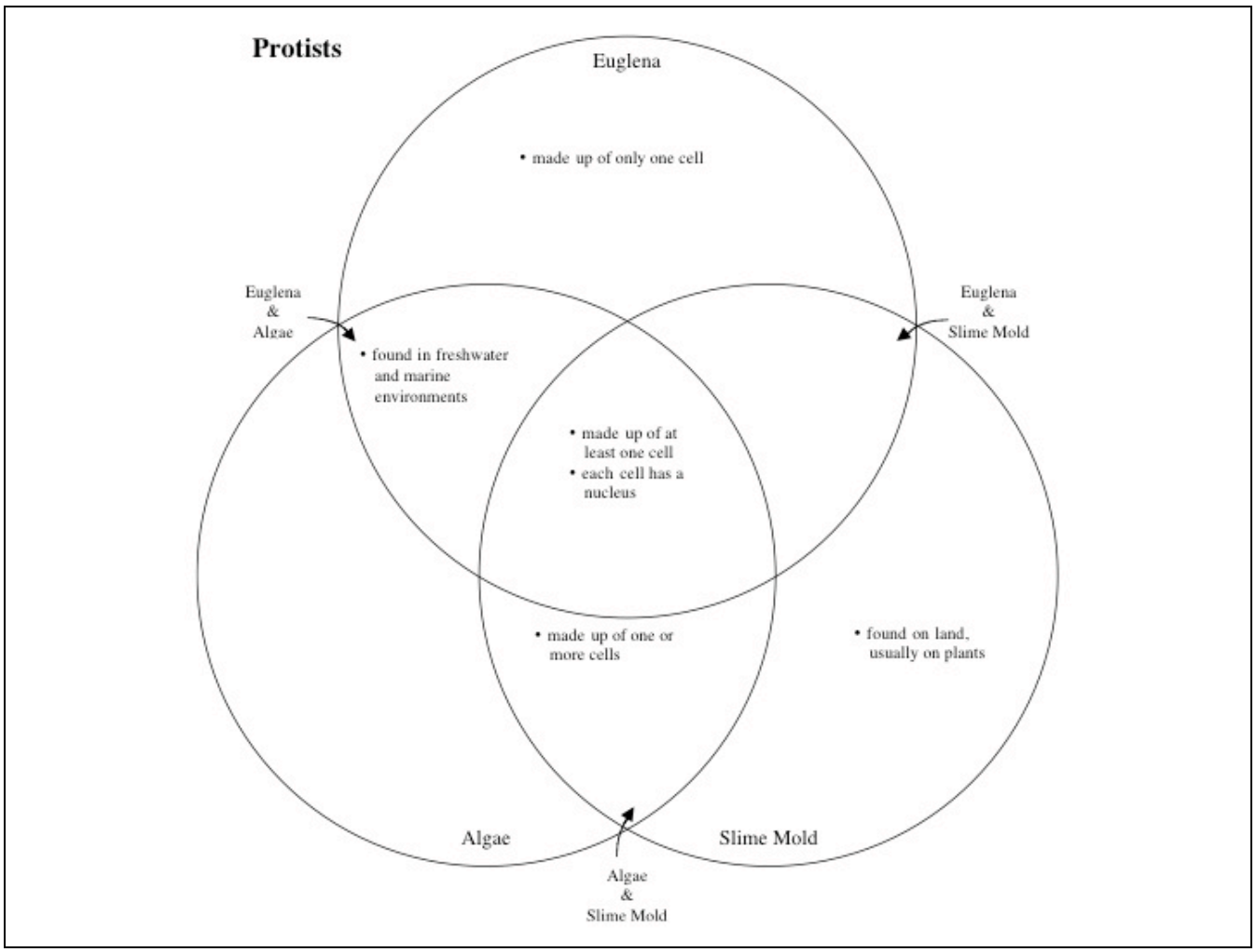
Since the habitat for slime mold is different than the other two, that information is recorded in the portion of its circle that does not overlap with any other circle.

Day 1 - Compare Kingdoms

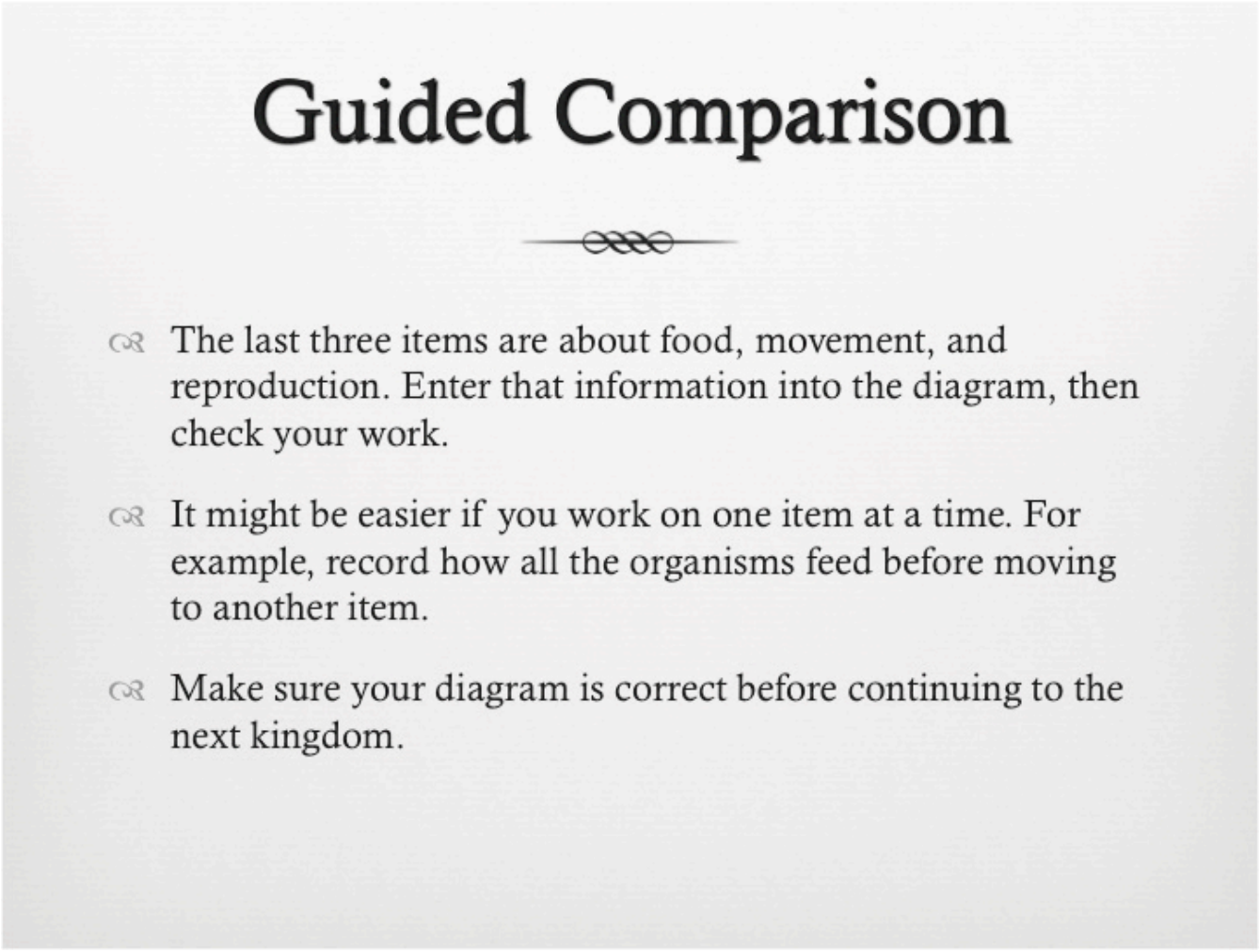


1. Both are made up of at least one cell, and it has a nucleus.
2. Yes -- it is also made up of at least one cell, and it has a nucleus.
3. The next slide shows how to record this information.

Day 1 - Compare Kingdoms

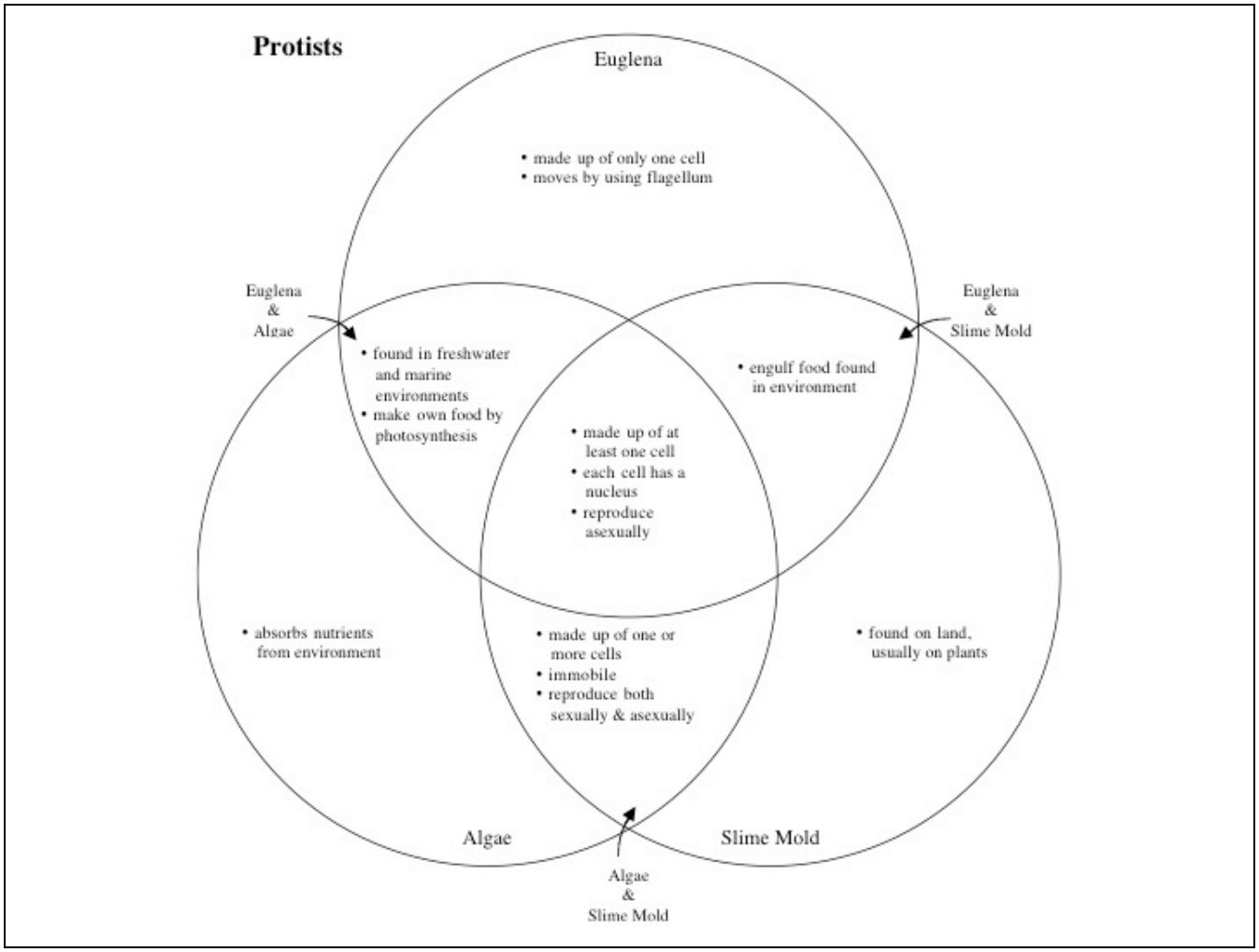


Information that is common to all three organisms is recorded in the center section, where all three circles overlap.
A feature that is common to two organisms but not the third is recorded where those two circles overlap.
Anything that is true of one but not true of either of the other two is recorded in the section that does not overlap another circle.



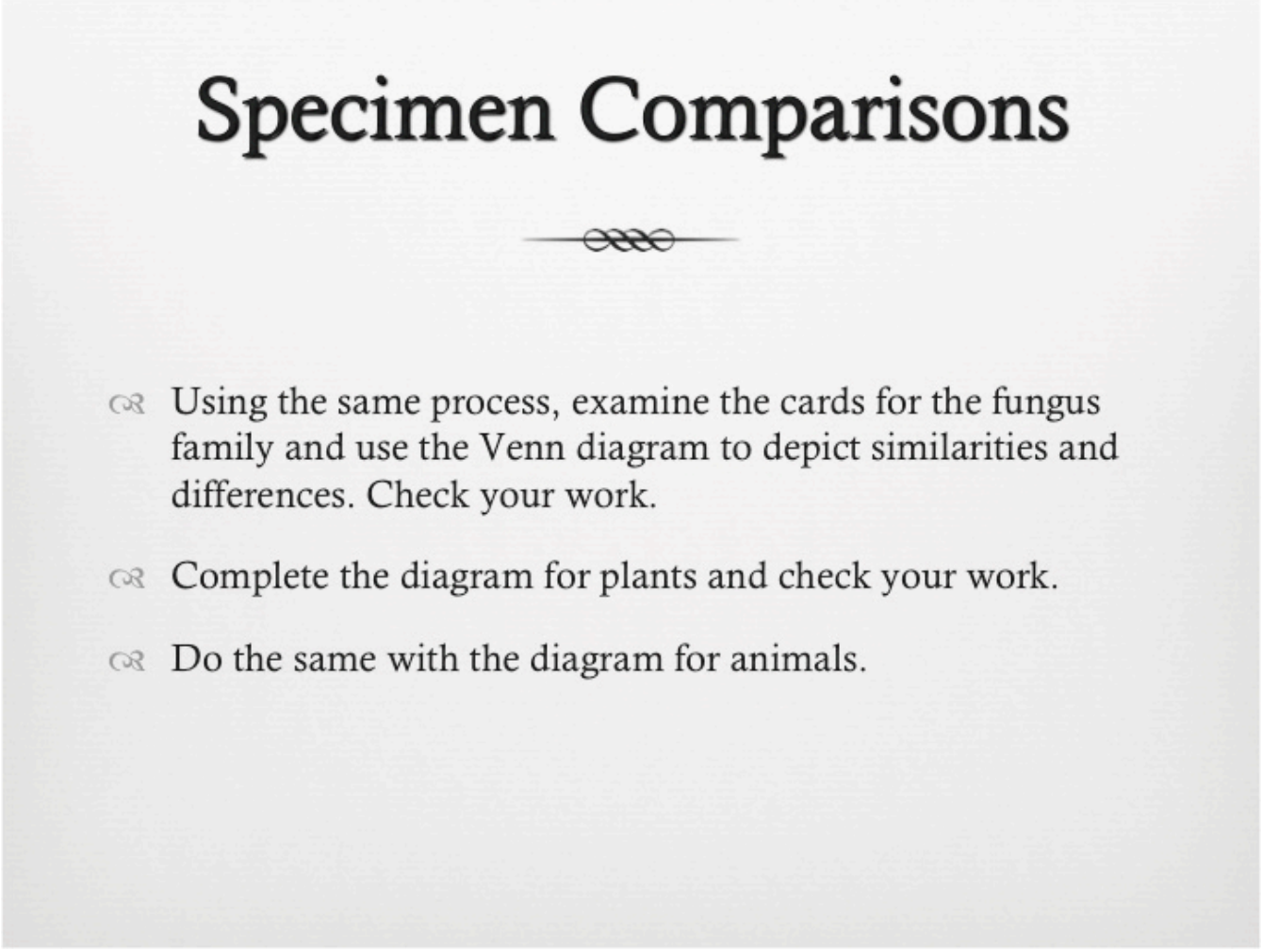
The next slide shows complete information for all three Protists.

Day 1 - Compare Kingdoms



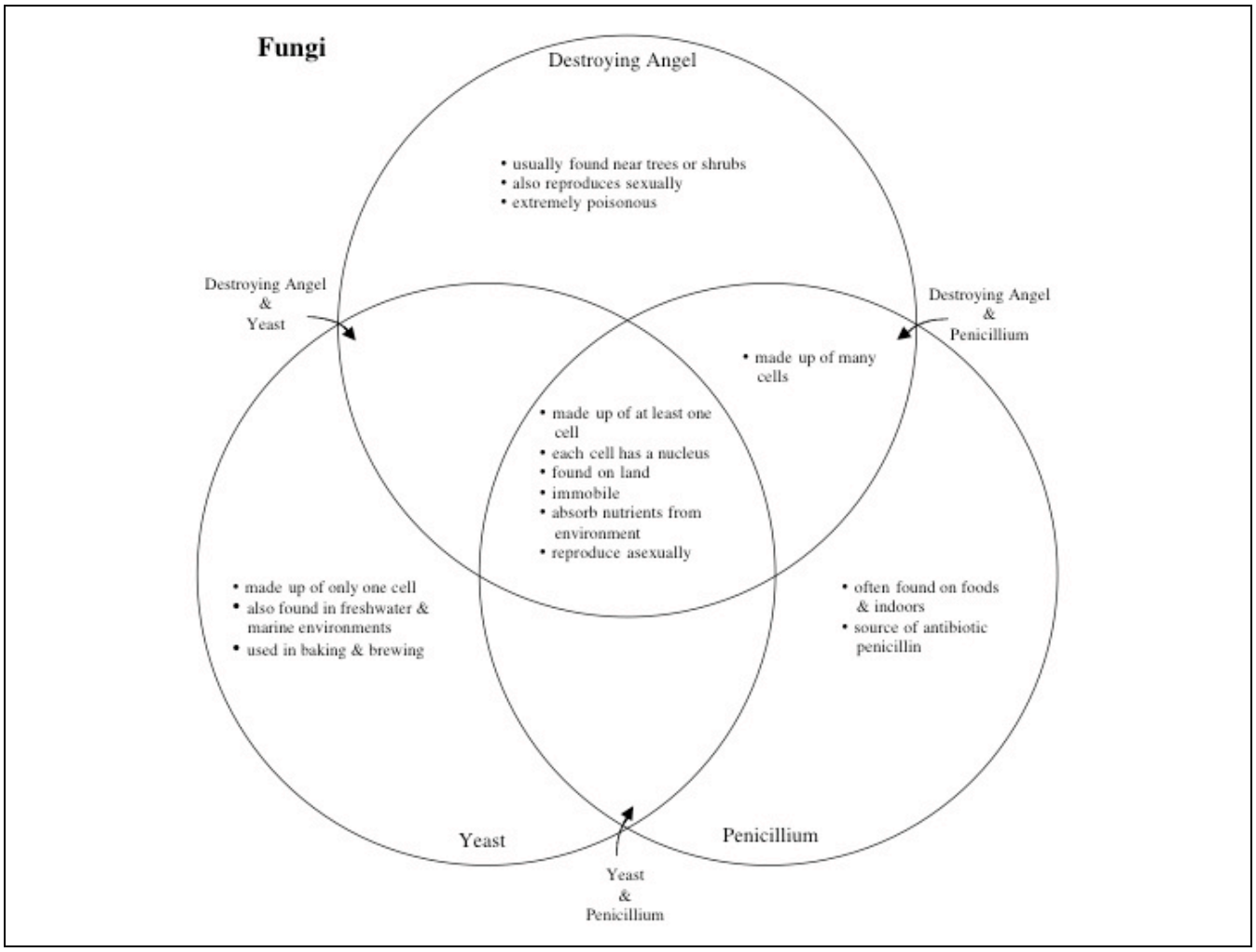
Students can use this slide to check their work. You might double-check to make sure they understand how to analyze the information and enter it into the diagram before completing the activity. (Students will need their completed diagrams for part 2 of this lesson.)

Day 1 - Compare Kingdoms



The next 3 slides depict complete information for the three remaining kingdoms.

Day 1 - Compare Kingdoms



Completed diagram for the fungus family. (Students will need their completed diagrams for part 2 of this lesson.)

Student Worksheet 1 - Protist Cards

Protist

Euglena

- Made up of one cell that has a nucleus
- Found in freshwater and marine environments
- Moves by using a flagellum, a whiplike tail that propels it forward
- Makes its own food by photosynthesis and engulfs food particles found in its environment
- Reproduces asexually

Protist

Algae

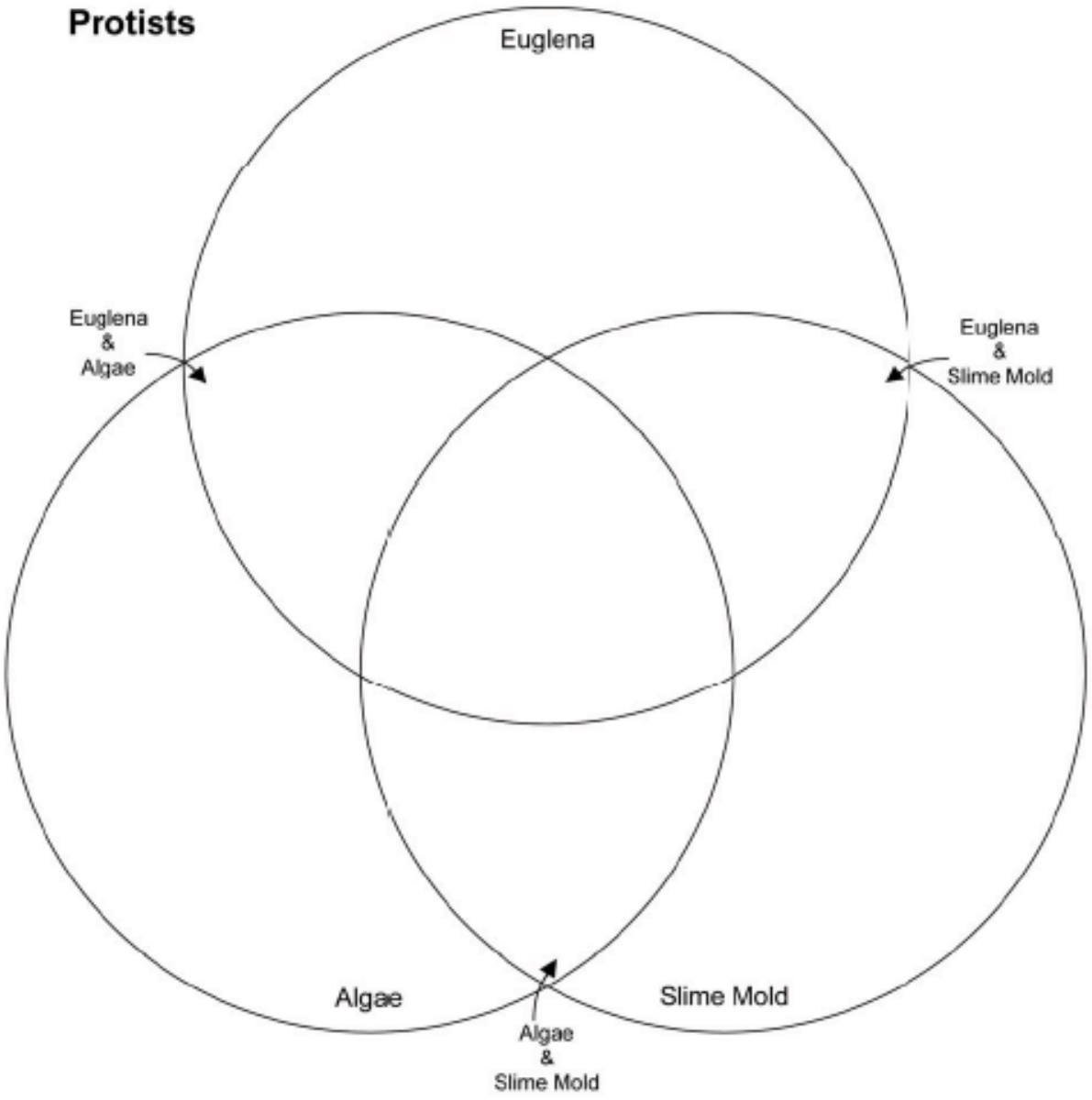
- Made up of one or more cells; each cell has a nucleus
- Found in freshwater and marine environments
- Some are mobile and have flagella
- Makes its own food by photosynthesis and absorbs nutrients from its environment
- Reproduces asexually and sexually

Protist

Slime Molds

- Made up of one or more cells; each cell has a nucleus
- Found on land, usually on plants
- Immobile
- Engulfs food particles found in its environment
- Reproduces asexually and sexually

Student Worksheet 2 - Protist Venn Diagram



Student Worksheet 3 - Fungus Cards

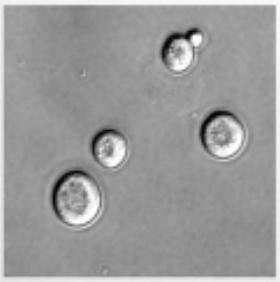
Destroying angel

Fungus

- Made up of many cells; each cell has at least one nucleus
- Found on land, usually near trees or shrubs
- Immobile
- Absorbs nutrients from its environment
- Reproduces asexually and sexually
- Extremely poisonous

Fungus

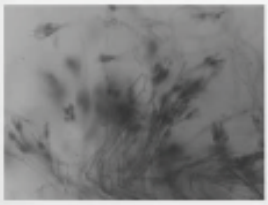
Yeast



- Made up of one cell that has a nucleus
- Found on land and in freshwater and marine environments
- Immobile
- Absorbs nutrients from its environment
- Reproduces asexually or sexually
- Used in baking bread and brewing beer

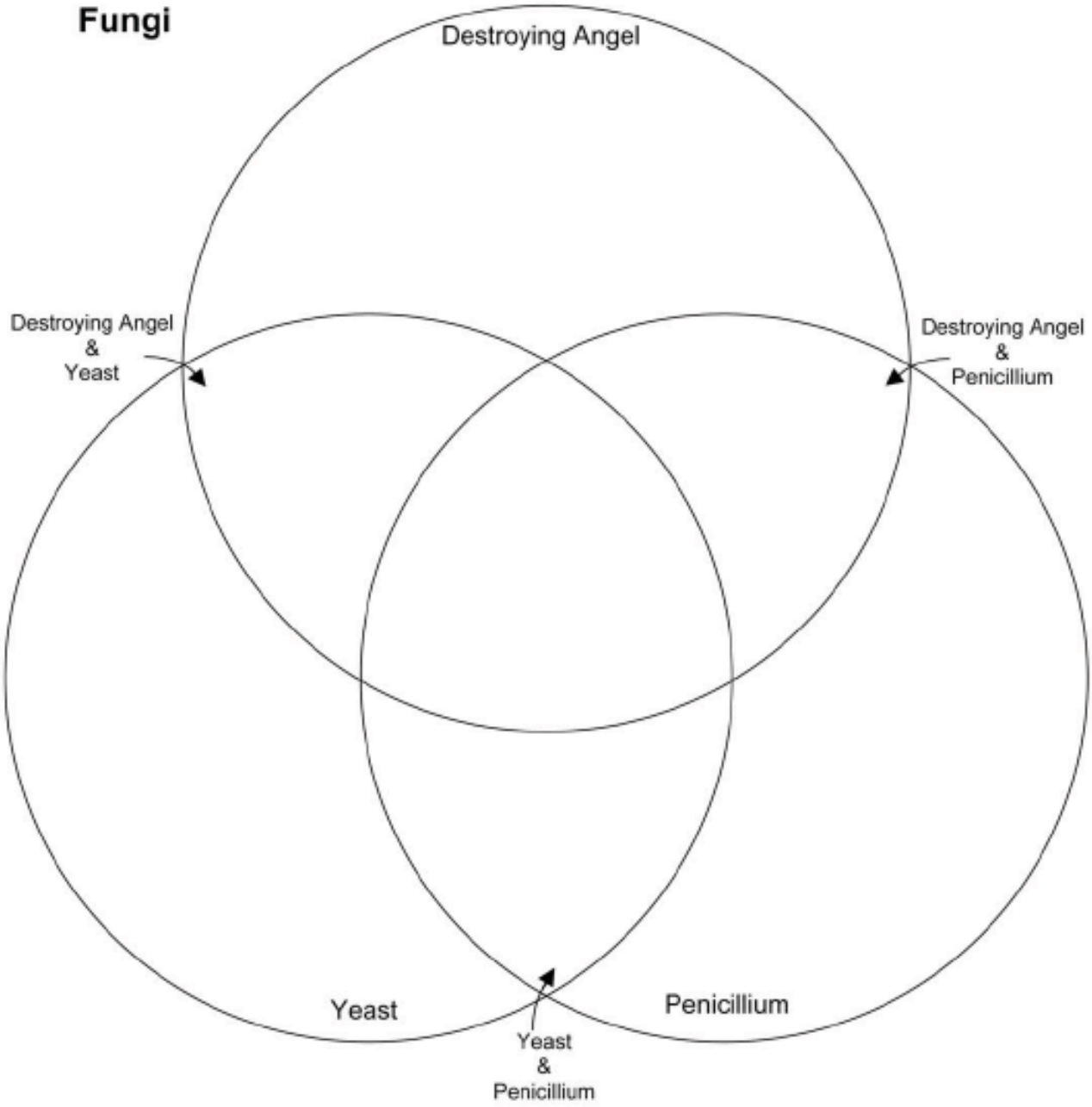
Fungus

Penicillium

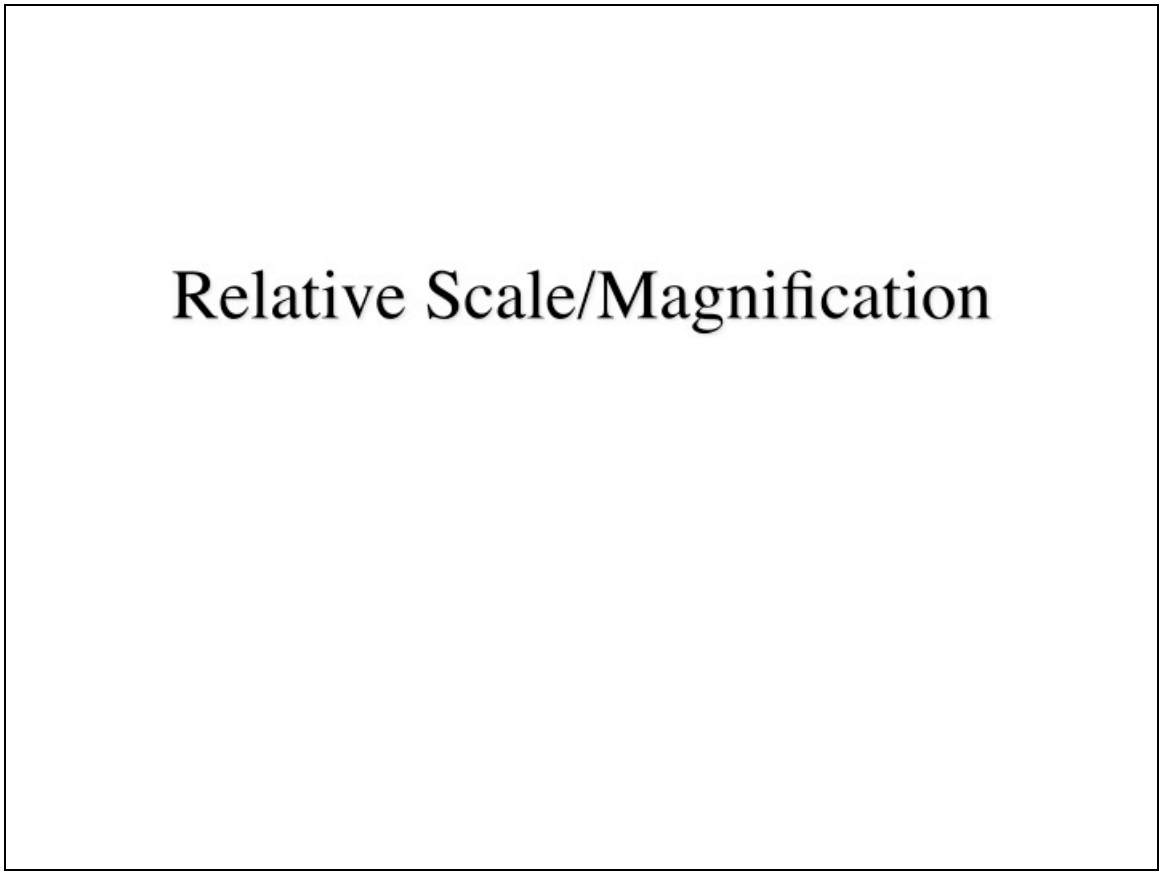


- Made up of many cells; each cell has a nucleus
- Found on land; often on foods and in indoor environments
- Immobile
- Absorbs nutrients from its environment
- Reproduces asexually
- Source of antibiotic penicillin

Student Worksheet 4 - Fungus Venn Diagram



Day 1 - Compare Kingdoms



Exercise 7.1 (This activity is an extension of the general ideas developed above to a specific case – in this case the CC images of destroying angel, yeast and Penicillium. As such it can be implemented when using those images.)

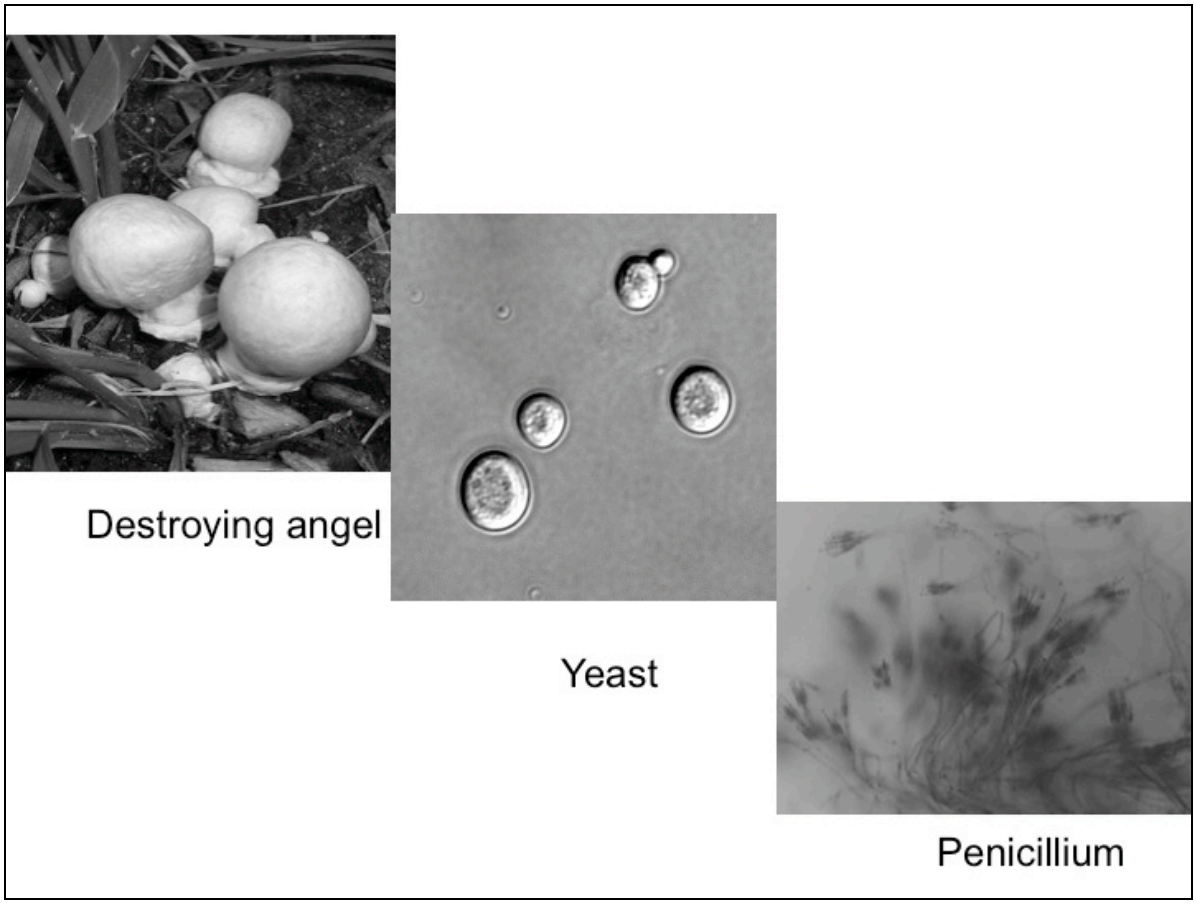
Image Comprehension Focus: Relative scale/magnification

Goal: Develop a sense that scale is relative and depends on your perspective and in some cases your proximity to an object

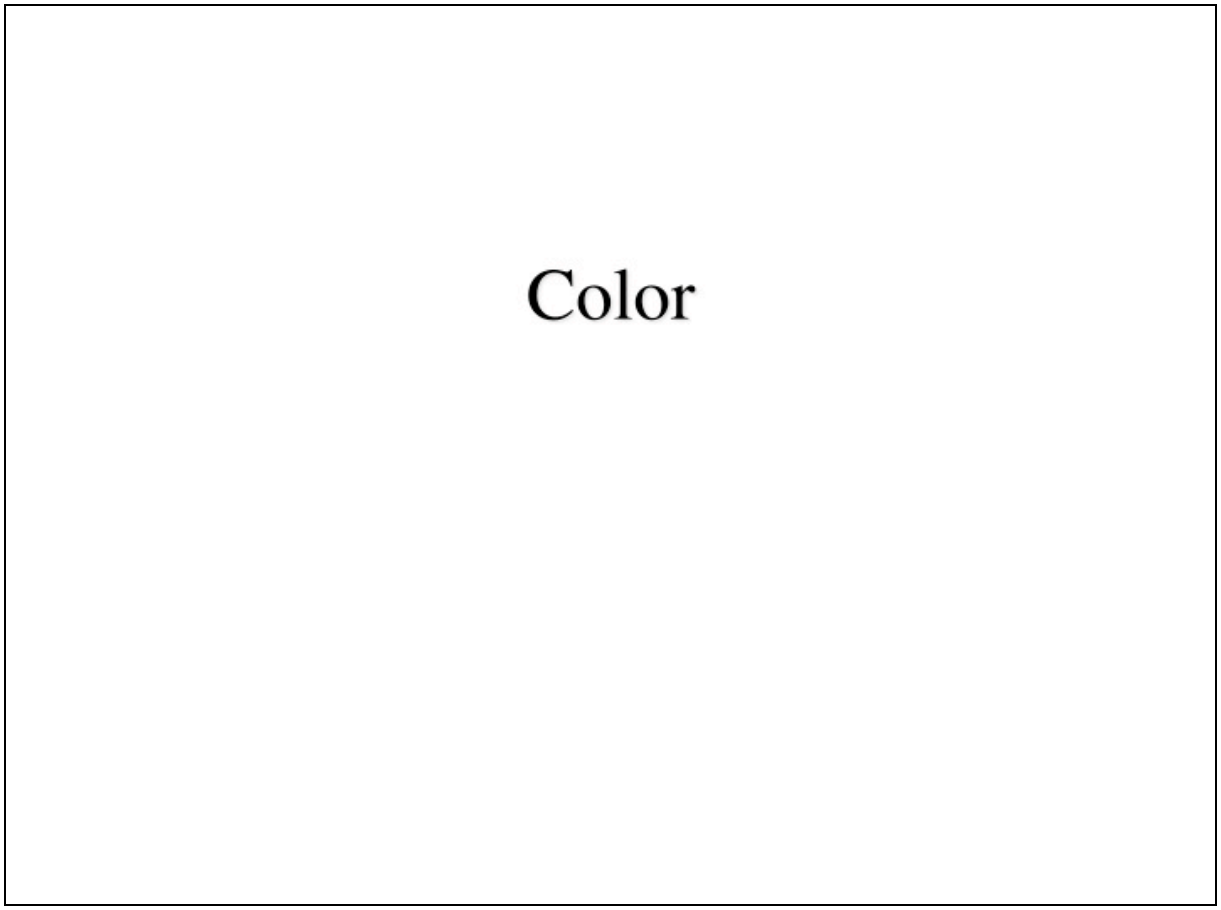
Type of Activity: teacher comment

Overview: The key idea here is for the student to see an example where it is important to understand the perspective and scale of an image. The teacher will illustrate that, although the three images appear roughly the same size, they illustrate very different perspectives with respect to magnification. An appreciation of the need to consider scale is an important component of strong image comprehension skills.

Day 1 - Compare Kingdoms



Procedure: The teacher should emphasize that sometimes one needs to be careful to note the magnification/scale of images in order to avoid developing misconceptions since these levels can vary from image to image. To illustrate this, the teacher should show the images of the destroying angel, yeast and Penicillium (from the CC materials) and note that, although they are approximately the same size on the page (or screen), the sizes are not realistic. They appear to be the same relative size due to differences in the level of magnification. For example, the destroying angel can be seen with one's eyes but the yeast and Penicillium cannot. The teacher should emphasize that, often, in order to better understand the appearance of an object that is very small, we will illustrate a magnified version of the image. Often the level of magnification is clearly indicated, but sometimes it is not. The teacher should warn students that they should keep this idea in mind (that the sizes of photos and diagrams in the text may not be realistic with respect to their relative size) as they look at the images in the textbook.



Exercise 7.2

NOTE: This activity is designed to highlight that colors are often "false" and not the true color of the object. If the contrasting case Penicillium example is shown in color as part of a PowerPoint, this is a good opportunity to highlight this idea. If it is shown in grayscale, one can use the alternate textbook image to illustrate the concept and then link it back to the Penicillium by explaining that, if this was in color, the color would be "false" color.

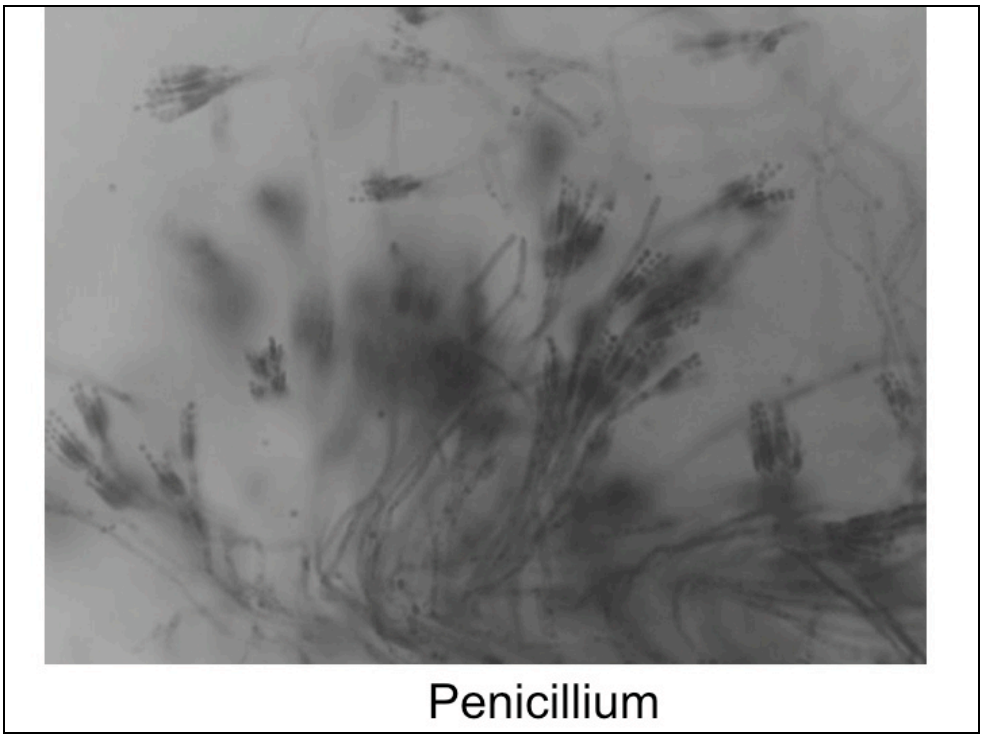
Image comprehension focus: Color

Goal: To understand that colors are often "false" and not the true color of the object

Type of Activity: Teacher comment

Overview: The purpose of this activity is to make explicit the idea that the color shown in images, especially biological slides, may not reflect the true color of the object but may instead be examples of "false-color" created by processes such as staining the object in order to see it better or the use of particular types of microscopes.

Day 1 - Compare Kingdoms



Penicillium

Procedure: The teacher should explain that, often with biological samples, the sample is "stained" or exposed to a material that will give it a color. This is done in order to better see the object using a microscope. Therefore the color shown does not reflect the true color of the object but rather is an example of "false color." The teacher should direct the students to the images of Penicillium (from the contrasting cases power point) as an example of this practice (or the alternate image described below if the Penicillium image is not in color). The teacher should explain that the pink color is not realistic but is false-color due to how the material was exposed to a stain prior to being placed under the microscope so it could be seen well. The teacher should also explain that, because color may not be realistic, viewers should always consider the origin of the color when understanding the image and not assume that it is true color. This is especially important when viewing biological images that have been magnified.

Modified procedure: If the materials are supplied in grayscale, direct the students to look at fig 3/p. 171 in their textbooks. The color is still "false-color," but the origin of the color is a bit different since it results from the use of an electron microscope to visualize the E. coli. Although the details are a bit different, the teacher can still emphasize that, often with biological images, the color is not the true color (in this case, E coli is not yellow) and that the viewer needs to be aware of this and not assume the color of an image represents the actual color. The teacher can then note that, if the Penicillium slide was in color, the color would not represent the true color of the object but rather the color of a stain which was applied to the material to help see it better under the microscope.

Day 1 - Compare Kingdoms

Day 1:

Slides 17-19

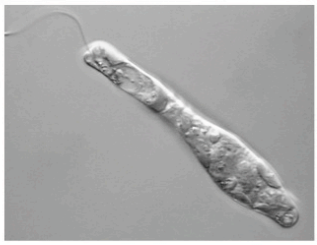
Classification
Chapter 7

Holt: Cells, Heredity, and Classification

Eukarya Index Cards

Protist

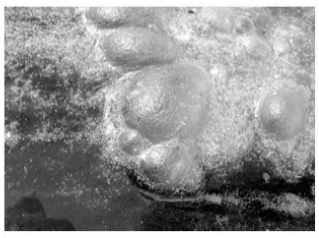
Euglena



- Made up of one cell that has a nucleus
- Found in freshwater and marine environments
- Moves by using a flagellum, a whiplike tail that propels it forward
- Makes its own food by photosynthesis and engulfs food particles found in its environment
- Reproduces asexually

Protist

Algae



- Made up of one or more cells; each cell has a nucleus
- Found in freshwater and marine environments
- Some are mobile and have flagella
- Makes its own food by photosynthesis and absorbs nutrients from its environment
- Reproduces asexually and sexually

Day 1 - Compare Kingdoms

Day 1:

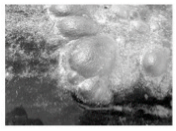
Slides 20-22

Protist

Slime Molds

- Made up of one or more cells; each cell has a nucleus
- Found on land, usually on plants
- Immobile
- Engulfs food particles found in its environment
- Reproduces asexually and sexually

Protists



What is the same?

What is different?

Fungus

Destroying angel

- Made up of many cells; each cell has at least one nucleus
- Found on land, usually near trees or shrubs
- Immobile
- Absorbs nutrients from its environment
- Reproduces asexually and sexually
- Extremely poisonous

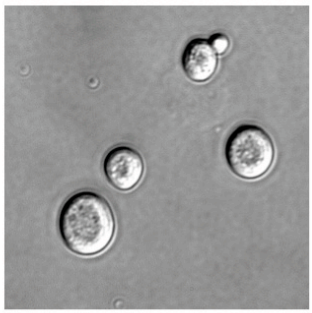
Day 1 - Compare Kingdoms

Day 1:

Slides 23-25

Fungus

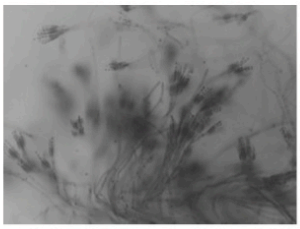
Yeast



- Made up of one cell that has a nucleus
- Found on land and in freshwater and marine environments
- Immobile
- Absorbs nutrients from its environment
- Reproduces asexually or sexually
- Used in baking bread and brewing beer

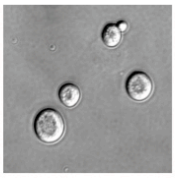
Fungus

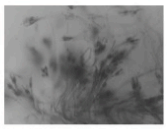
Penicillium



- Made up of many cells; each cell has a nucleus
- Found on land; often on foods and in indoor environments
- Immobile
- Absorbs nutrients from its environment
- Reproduces asexually
- Source of antibiotic penicillin

Fungi





What is the same?
What is different?

DAY 2 Contrasting Cases Part 1 - Compare Kingdoms (continued)

Today will pick up with comparisons of organisms in the Animal and Plant kingdoms, building on yesterday's comparison of Protists and Fungi. Following this activity, students should have a clear understanding of the characteristics that distinguish organisms in each of the four kingdoms. The presentation will pick up right where yesterday's left off. You will need to distribute the worksheets and cards for Plants and Animals, or direct students' attention to their location in the Student Resource Book. As with Part 1, slides of the individual cards are included at the end of today's presentation and may be used as a reference when discussing particular organisms.

Big Ideas

- Organisms in the same kingdom have certain things in common, such as structure, habitat, locomotion, feeding and reproduction. Organisms in the same kingdom can also be different from each other in many ways.
- There is a set of common characteristics distinguishing each kingdom, and a novel organism can be assigned to a kingdom based on given characteristics.
- Some generally true characteristics of animals include: made up of many cells; each cell has a nucleus; ingest food found in the environment; and reproduce sexually.
- Some generally true characteristics of plants include: made up of many cells; each cell has a nucleus and cell wall; make their own food by photosynthesis; and reproduce sexually.

Materials

Teacher:

1. Warm-up Day 2 - Cells_warmups.ppt
2. Slides - day02.ppt

Students:

1. Kingdoms cards (WS 5 & 7; student resource p10 & 12)
2. Compare Kingdoms Venn Diagrams (WS 6 & 8; student resource p11 & 13)

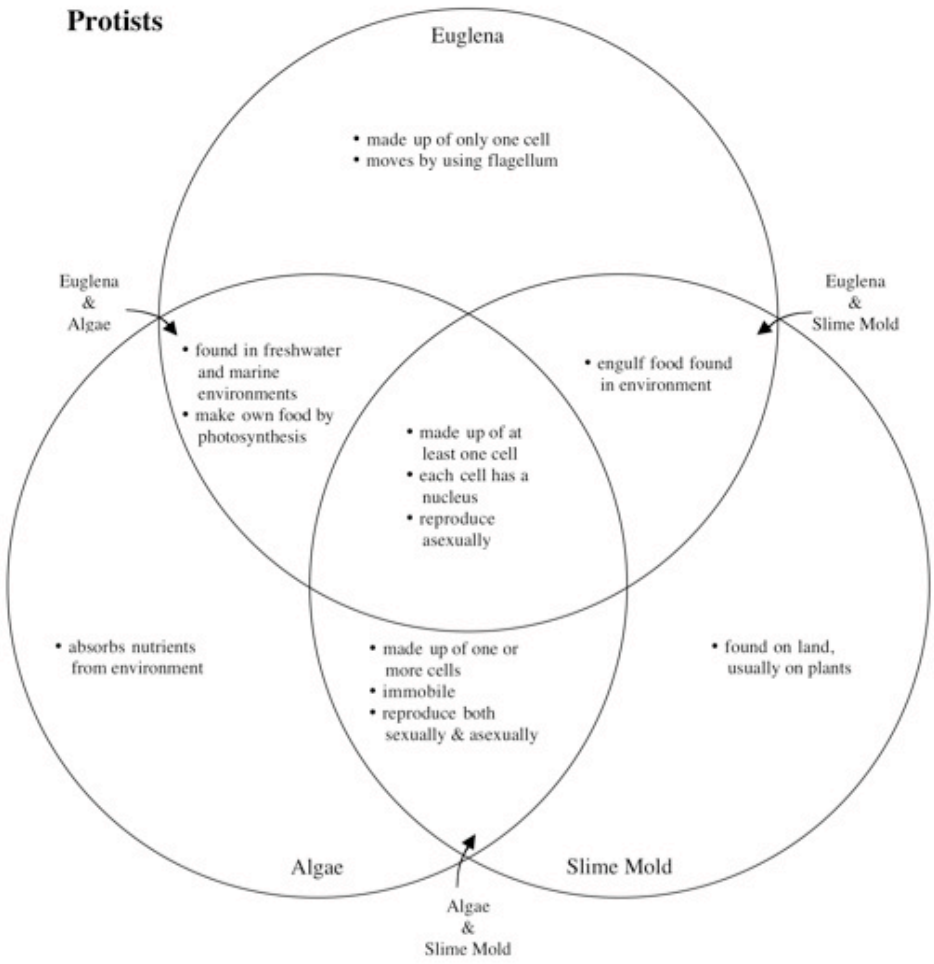
Activities and Allotted time

5 minutes - Warm-up
40 minutes - CC activity - Compare Kingdoms: Animals and Plants

Day 2 - Warm-up

Use your completed Venn diagram from yesterday to answer the following question:

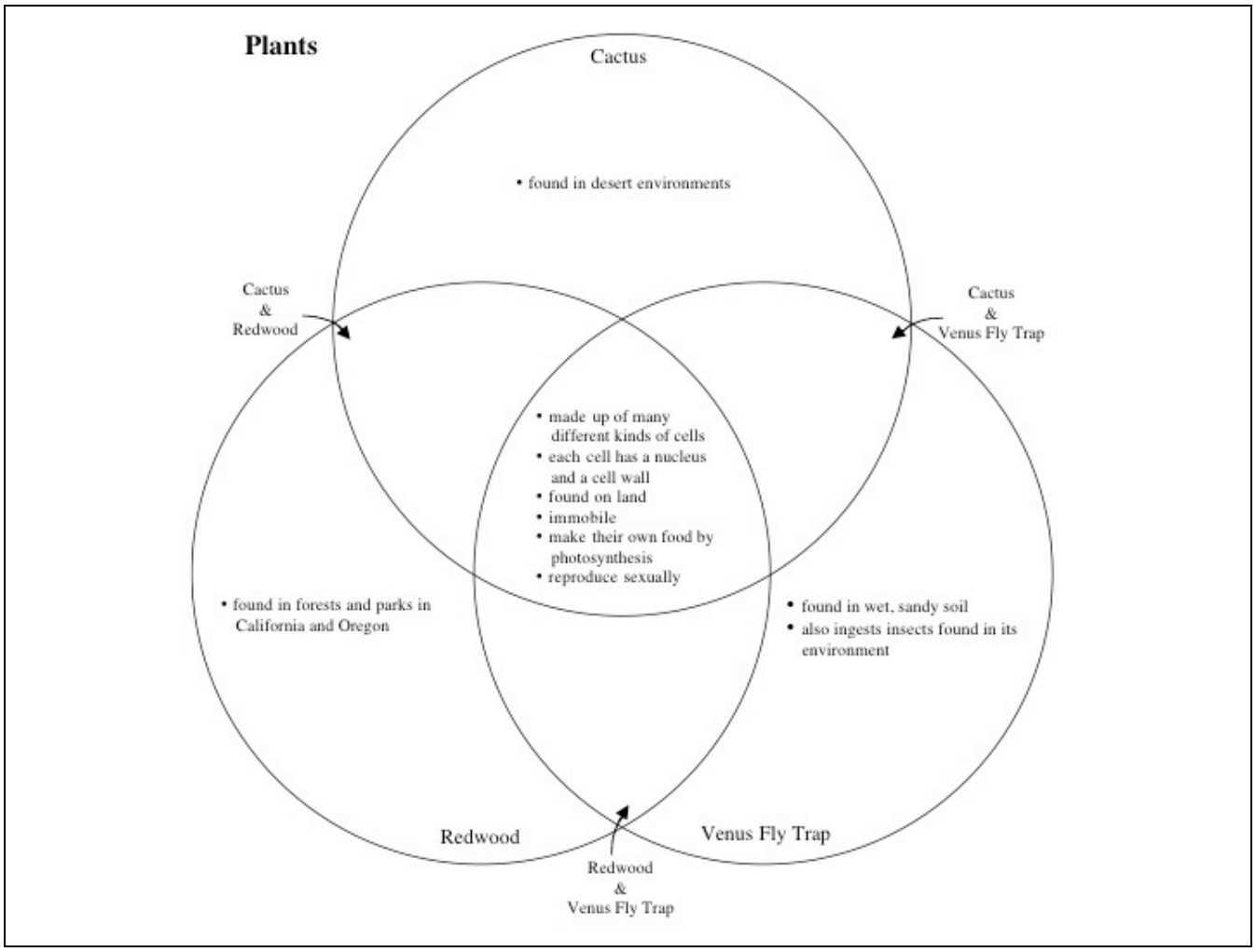
Water mold is another organism in the Protist kingdom. What are three characteristics that water mold will likely have in common with other organisms in the Protist family?



Answer: Water mold will likely be made up of at least one cell; each cell will have a nucleus; and it will likely reproduce asexually. Responses should be taken from the center section, as this contains the characteristics that apply to all three organisms and can most likely be generalized to other protists.

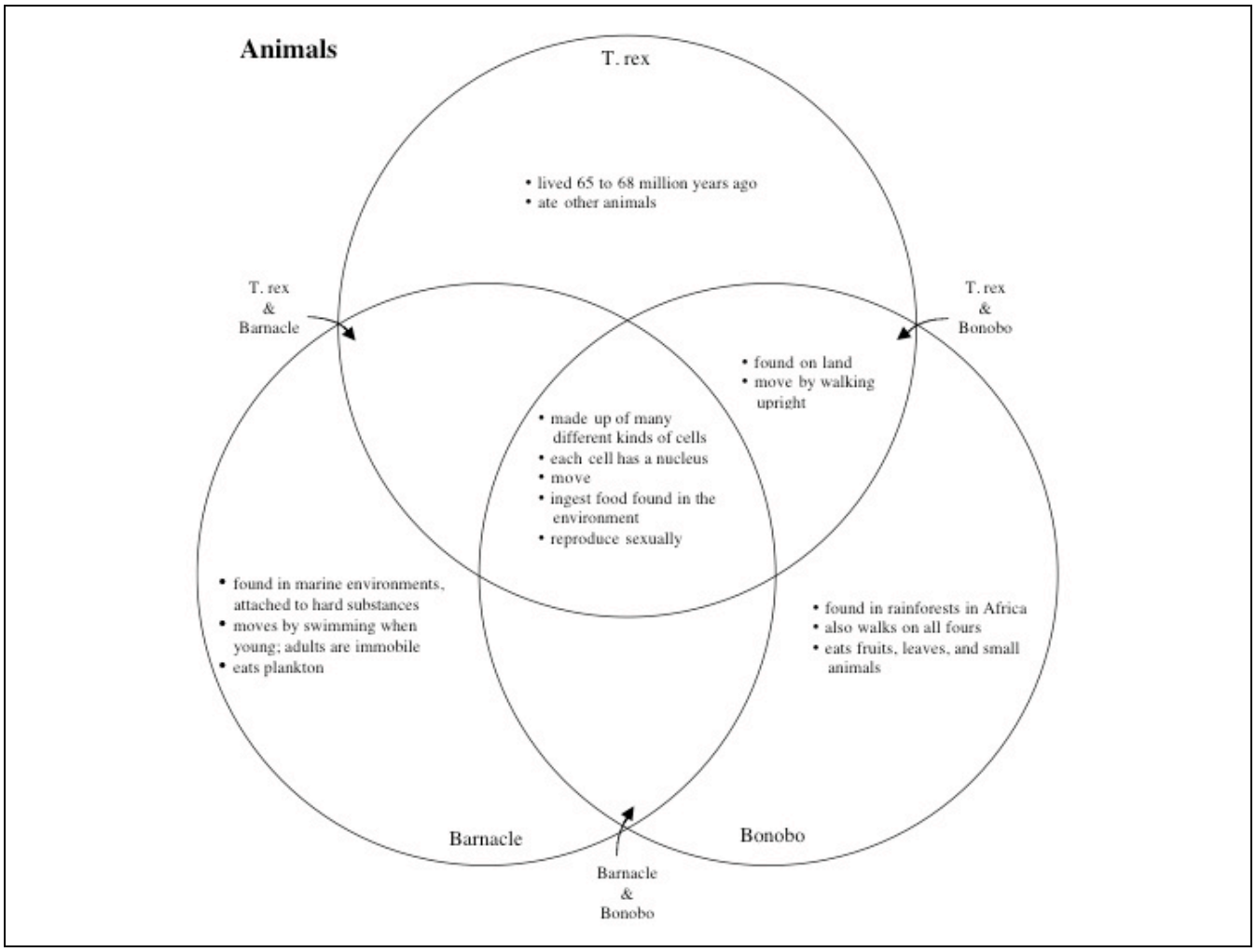
Purpose: This exercise should help students practice using Venn diagrams while reviewing the characteristics of the Protist kingdom. It helps students generate inferences about other organisms within a kingdom and reinforces the idea presented in the contrasting cases that organisms within a kingdom have some characteristics in common and other characteristics that are different.

Day 2 - Compare Kingdoms



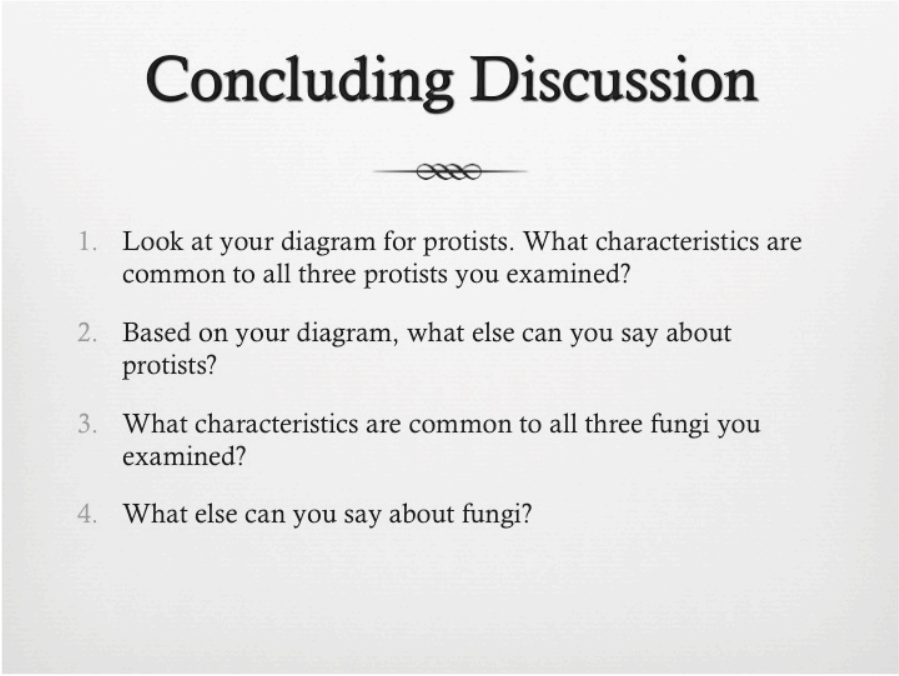
Completed diagram for the plant family. (Students will need their completed diagrams for part 2 of this lesson.)

Day 2 - Compare Kingdoms



Completed diagram for the animal family. (Students will need their completed diagrams for part 2 of this lesson.)

Day 2 - Compare Kingdoms



In this discussion, students will use their diagrams to draw conclusions about each of the four kingdoms. You might begin the discussion by pointing out that all of these conclusions are tentative, because they are based on just three specimens from each group.

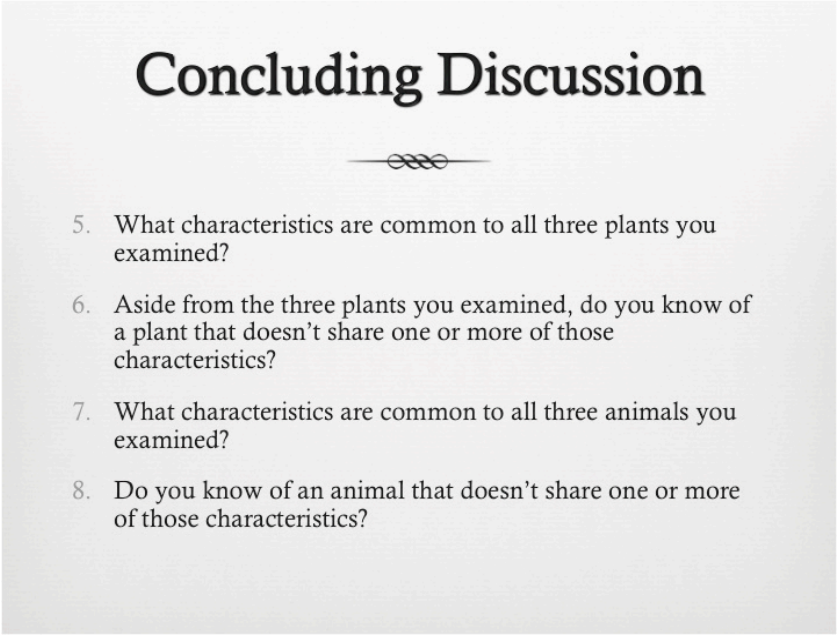
1. They are all made up of at least one cell, each cell has a nucleus, and they all reproduce asexually.

2. They are found in many different environments; some are immobile and others can move; some can make their own food by photosynthesis and others obtain food from their environment; some reproduce sexually as well as asexually.

3. They are all made up of at least one cell, each cell has a nucleus, they are all found on land, they are all immobile, they all absorb nutrients from their environment, and they all reproduce asexually.

4. Some can be found in water as well as on land; some reproduce sexually as well as asexually; some are useful to humans and others are harmful.

Day 2 - Compare Kingdoms



5. They are all made up of many different kinds of cells, and each cell has a nucleus and a cell wall. They are all found on land, they are all immobile, they all make their own food by photosynthesis, and they all reproduce sexually.

6. Many plants are not found on land. For example, water lilies are found in ponds, lakes, rivers, and canals. Many plants reproduce asexually as well as sexually. For example, strawberry plants send out horizontal stems that take root and develop into new plants. Daffodils produce bulbs that develop into new plants. Aspen trees send up new stems from their roots.

7. They are all made up of many different kinds of cells, and each cell has a nucleus. They all move, they all ingest food found in the environment, and they all reproduce sexually.

8. Some animals, including barnacles, sponges, corals, and anemones, are immobile for most of their lives. Some animals reproduce asexually. For example, jellyfish, sea stars, and tapeworms grow buds that break off and develop into new animals.

Student Worksheet 5: Animal Cards

Animal

Tyrannosaurus rex

- Made up of many different kinds of cells; each cell had a nucleus.
- Found on land, 65 to 68 million years ago
- Moved by walking upright
- Fed on animals found in its environment
- Reproduced sexually

Animal

Barnacle

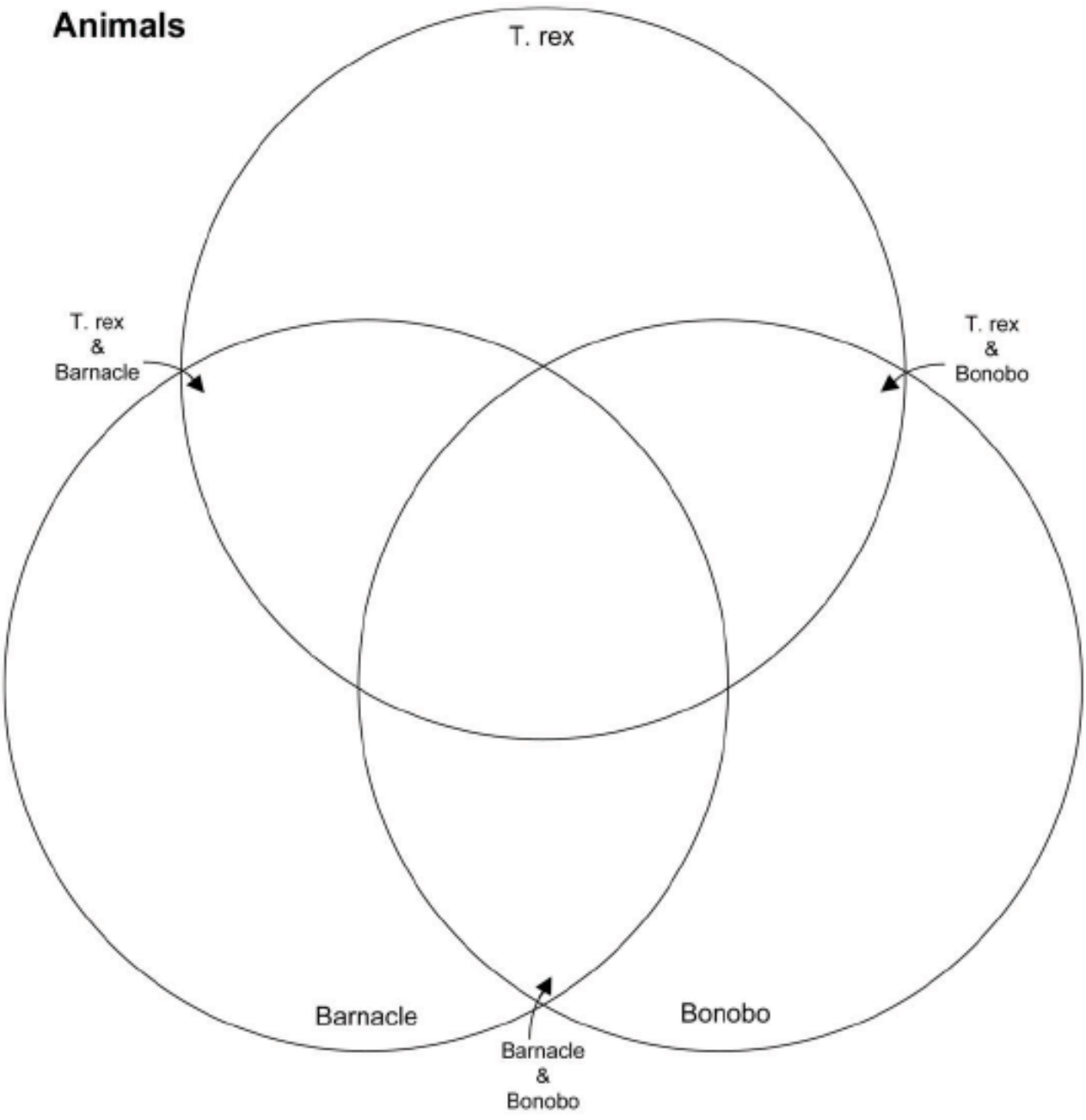
- Made up of many different kinds of cells; each cell has a nucleus
- Found in marine environments; attached to hard substances
- Moves by swimming when young; adults are immobile
- Feeds on plankton found in its environment
- Reproduces sexually

Animal

Bonobo

- Made up of many different kinds of cells; each cell has a nucleus.
- Found on land, in rainforests in Africa
- Moves by walking upright and on all fours
- Eats fruits, leaves, and small animals found in its environment
- Reproduces sexually

Student Worksheet 6: Animal Venn



Student Worksheet 7: Plant Cards

Plant

Cactus

- Made up of many different kinds of cells; each cell has a nucleus and a cell wall
- Found on land, in desert environments
- Immobile
- Makes its own food by photosynthesis
- Reproduces sexually

Plant

Redwood

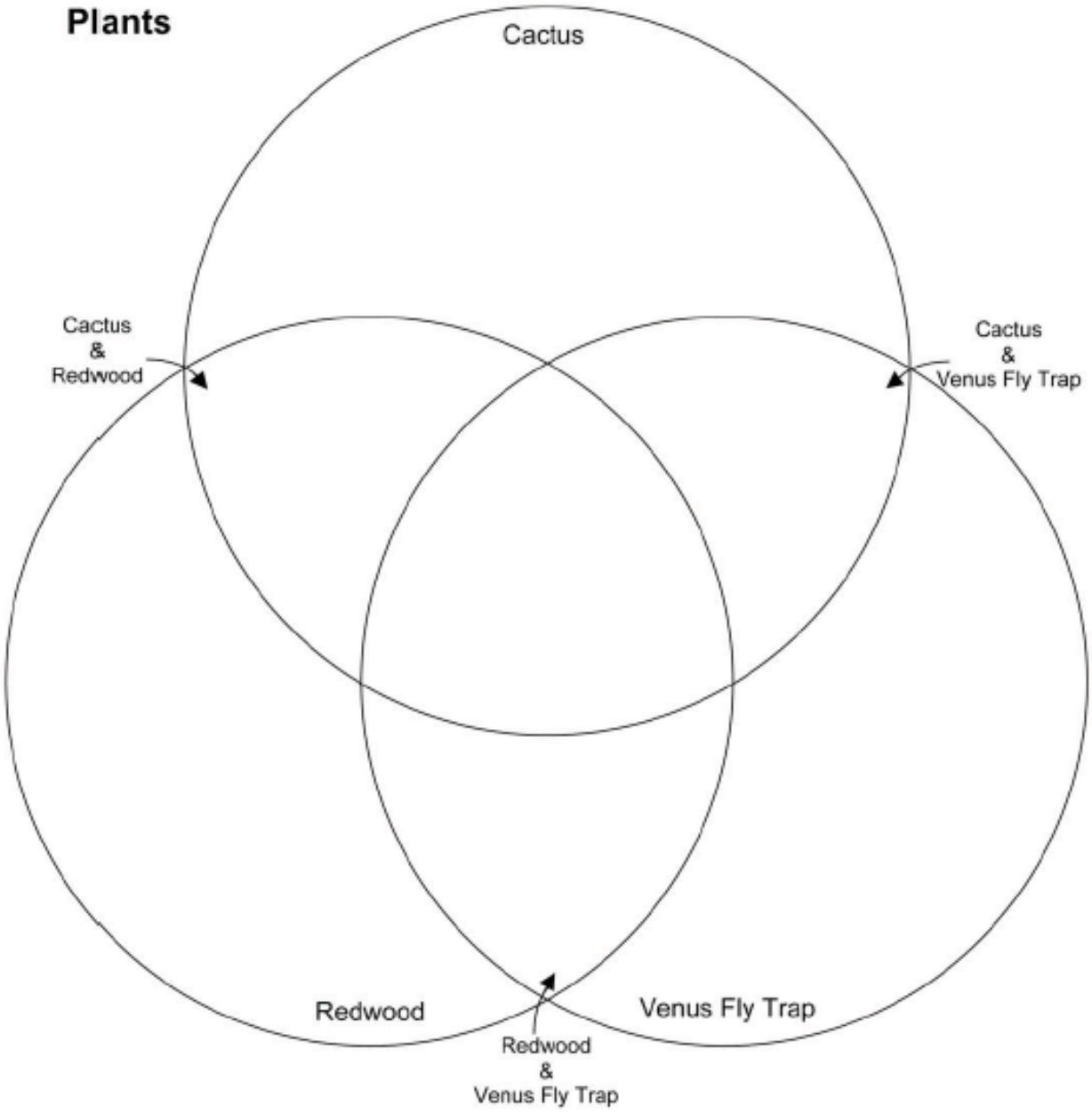
- Made up of many different kinds of cells; each cell has a nucelus and a cell wall.
- Found on land, in forests and parks in California and Oregon
- Immobile
- Makes its own food by photosynthesis
- Reproduces sexually

Plant

Venus fly trap

- Made up of many different kinds of cells; each cell has a nucelus and a cell wall
- Found on land, in wet sandy soils
- Immobile
- Makes its own food by photosynthesis and feeds on insects found in its environment
- Reproduces sexually

Student Worksheet 8: Plant Venn



Day 2 - Compare Kingdoms

Day 2:

Slides 5-7

Animal

Tyrannosaurus rex

- Made up of many different kinds of cells; each cell had a nucleus.
- Found on land, 65 to 68 million years ago
- Moved by walking upright
- Fed on animals found in its environment
- Reproduced sexually

Animal

Barnacle

- Made up of many different kinds of cells; each cell has a nucleus
- Found in marine environments; attached to hard substances
- Moves by swimming when young; adults are immobile
- Feeds on plankton found in its environment
- Reproduces sexually

Animal

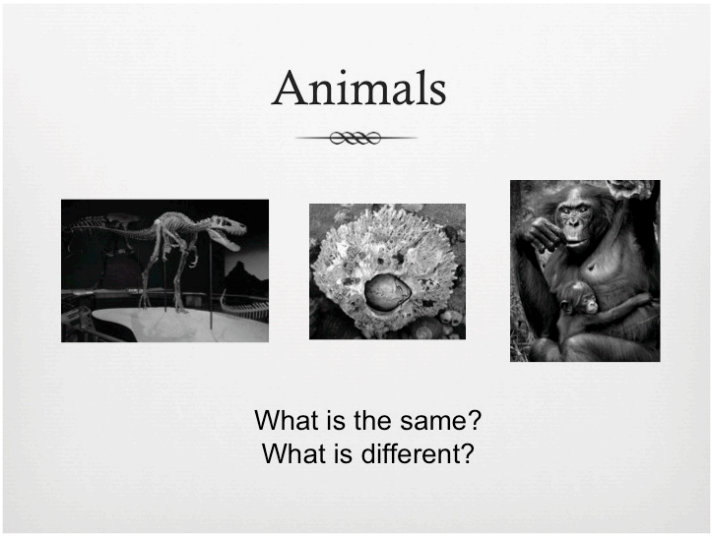
Bonobo

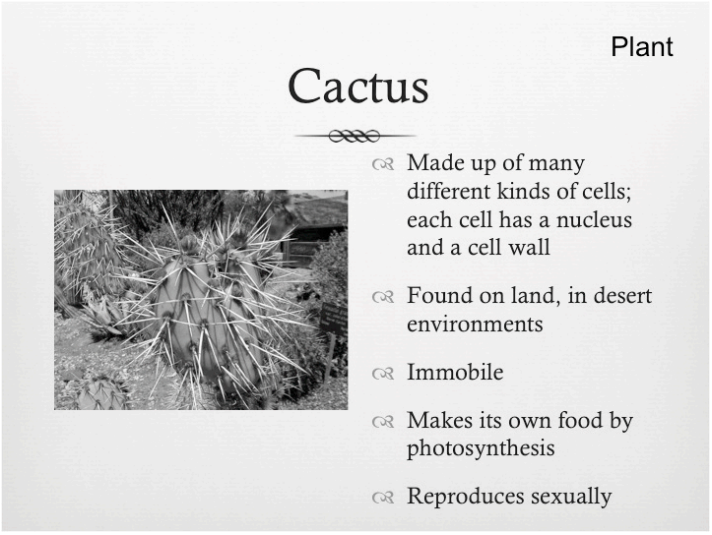
- Made up of many different kinds of cells; each cell has a nucleus.
- Found on land, in rainforests in Africa
- Moves by walking upright and on all fours
- Eats fruits, leaves, and small animals found in its environment
- Reproduces sexually

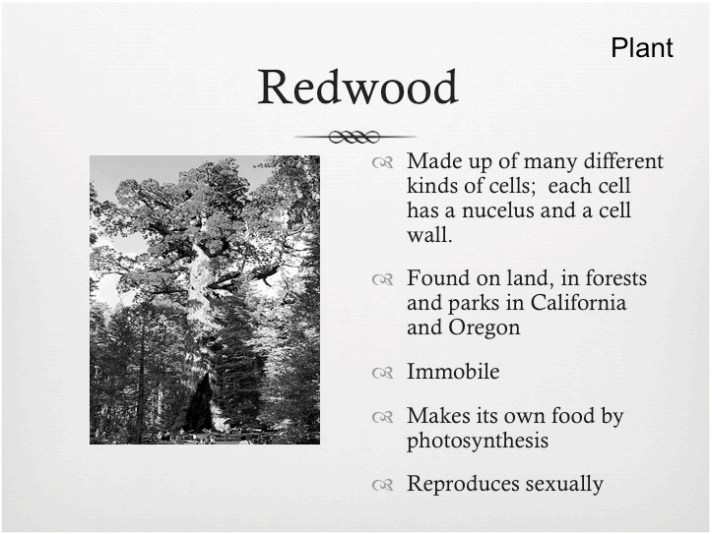
Day 2 - Compare Kingdoms

Day 2:

Slides 8-10



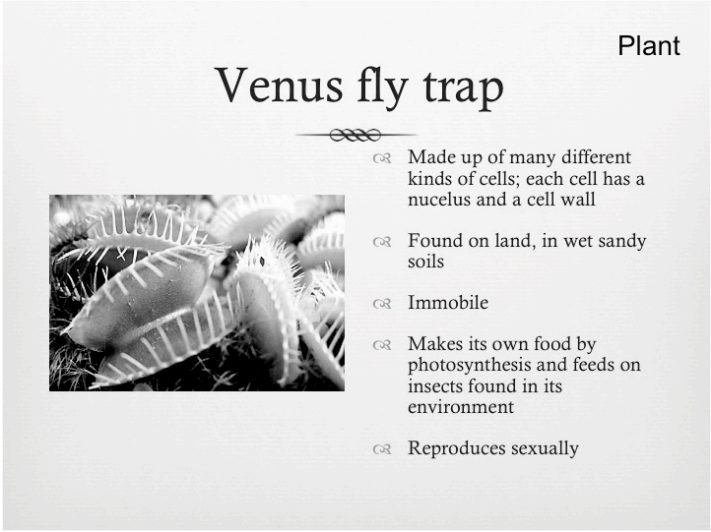


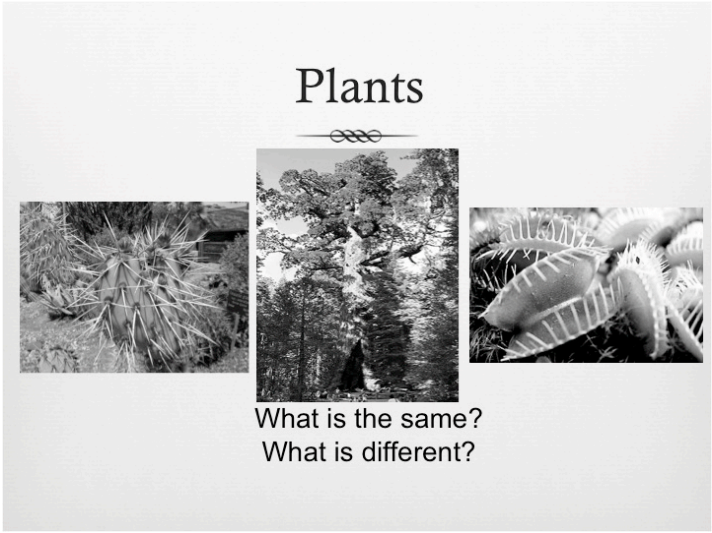


Day 2 - Compare Kingdoms

Day 2:

Slides 11-12





DAY 3

Contrasting Cases Part 2 - Compare Domains

Building on what students have learned about the characteristics of each kingdom, this lesson will introduce the three domains and the characteristics that distinguish organisms in each domain. The domain of Eukarya consists of the four Kingdoms that have already been introduced: Plants, Animals, Fungi and Protists. The domains of Archaea and Bacteria will be entirely new. These two domains may prove especially challenging, as the organisms in this domain are microscopic and largely unfamiliar to students. Today's activities will focus on within-case comparisons of organisms in the domains of Archaea and Bacteria. You may point out that all the organisms already studied belong in the third domain, Eukarya, but we will save a more thorough look at Eukarya for the between-domain comparison on Day 4.

Big Ideas

- Organisms in the same domain have certain things in common, such as structure, habitat, locomotion, feeding and reproduction. Organisms in the same domain can also be different from each other in many ways.
- There is a set of common characteristics distinguishing each domain, and a novel organism can be assigned to a domain based on given characteristics.
- Some generally true characteristics of organisms in domain Archaea include: made up of one cell that has a cell wall but not a nucleus; metabolize chemicals found in their environment; and reproduce asexually.
- Some generally true characteristics of organisms in the domain Bacteria include: made up of one cell that has a cell wall but not a nucleus; commonly found in humans and animals; metabolize sugars found in their environment; and reproduce asexually.

Materials

Teacher:

1. Warm-up Day 3 - Cells_warmups.ppt
2. Slides - day03.ppt

Students:

1. Domain cards (WS 9 & 11; student resource p14 & 16)
2. Compare Domains Venn Diagrams (WS 10 & 12; student resource p15&17)

Activities and Allotted time

5 minutes - Warm-up
40 minutes - CC activity - Compare Domains: Archaea and Bacteria

Day 3 - Warm-up

Cactus

Redwood

Venus Fly Trap

Look at the plant kingdom cards in your kingdom specimen pages to answer the following questions.

1. What is the same about the way a cactus, a redwood, and a Venus fly trap all obtain energy?
2. What is the same about the structure of these plants?

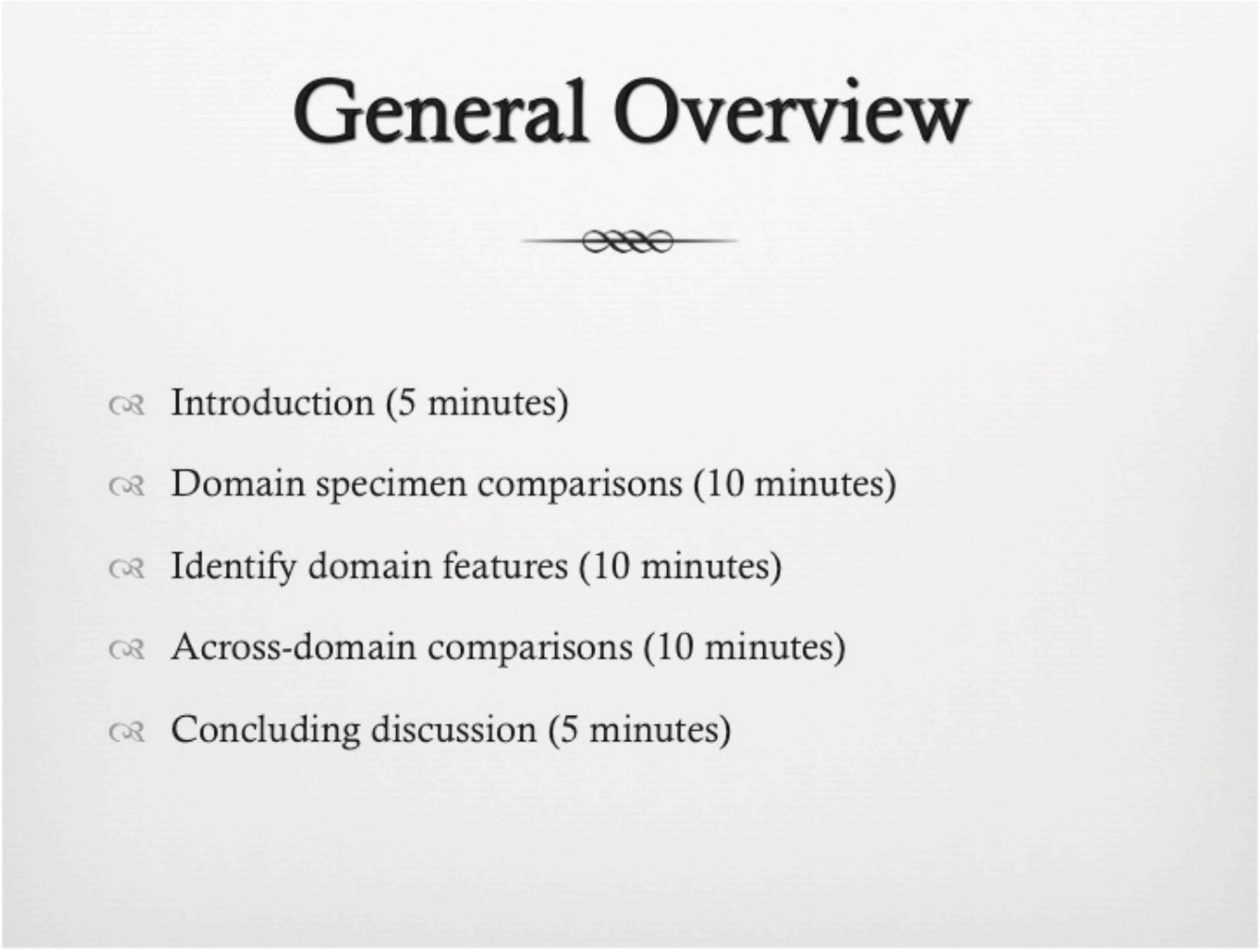
Answers:

1. They all obtain energy (or make their own food) through photosynthesis.

2. They are all made up of many different kinds of cells; each cell has a nucleus and a cell wall.

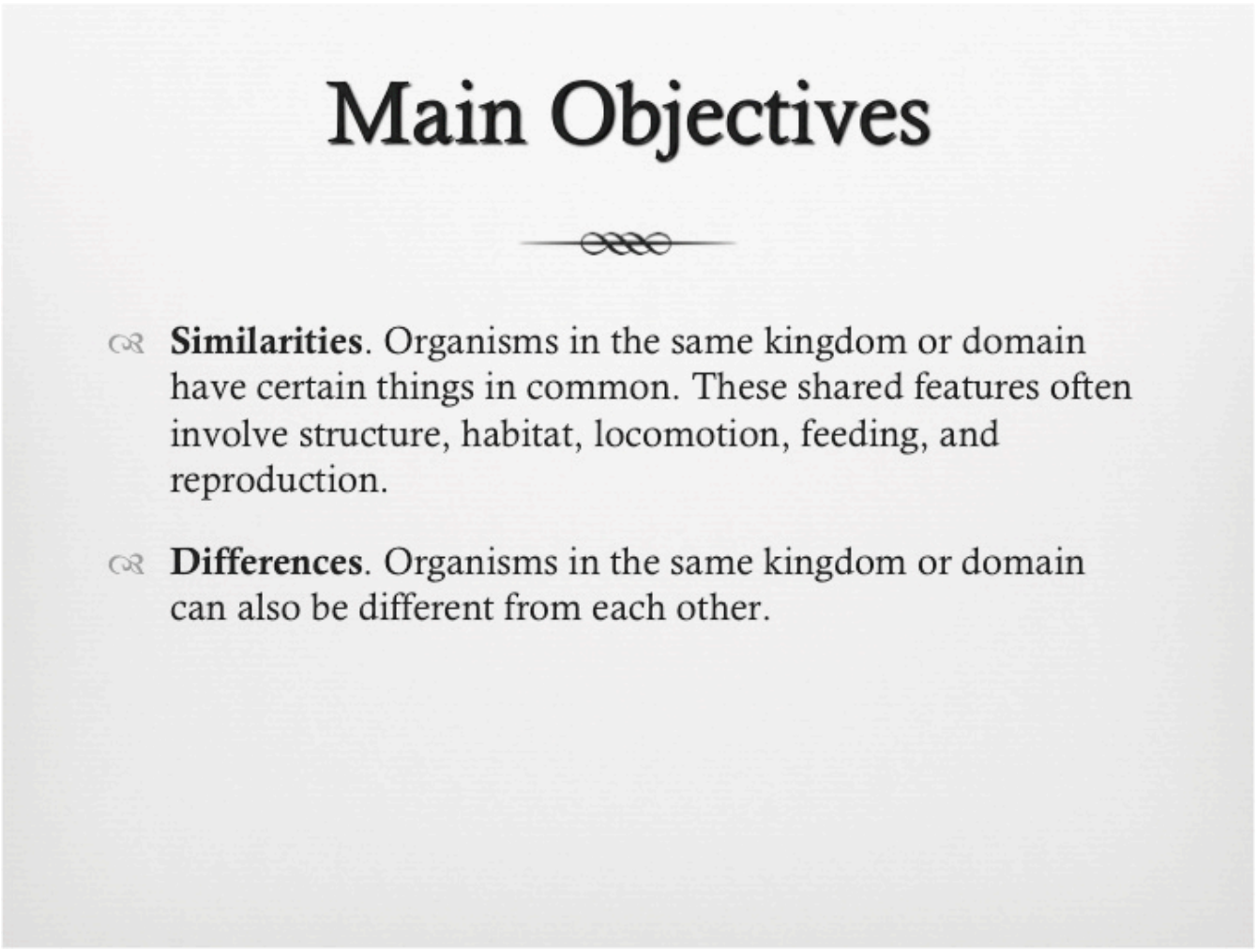
Purpose: This exercise gives students practice with the idea that organisms are grouped into kingdoms based on similarities in qualities such as their cellular structure and how they get food. The teacher could point out that they are also similar in terms of their locomotion (immobile) and reproduction (sexual).

Day 3 - Compare Domains

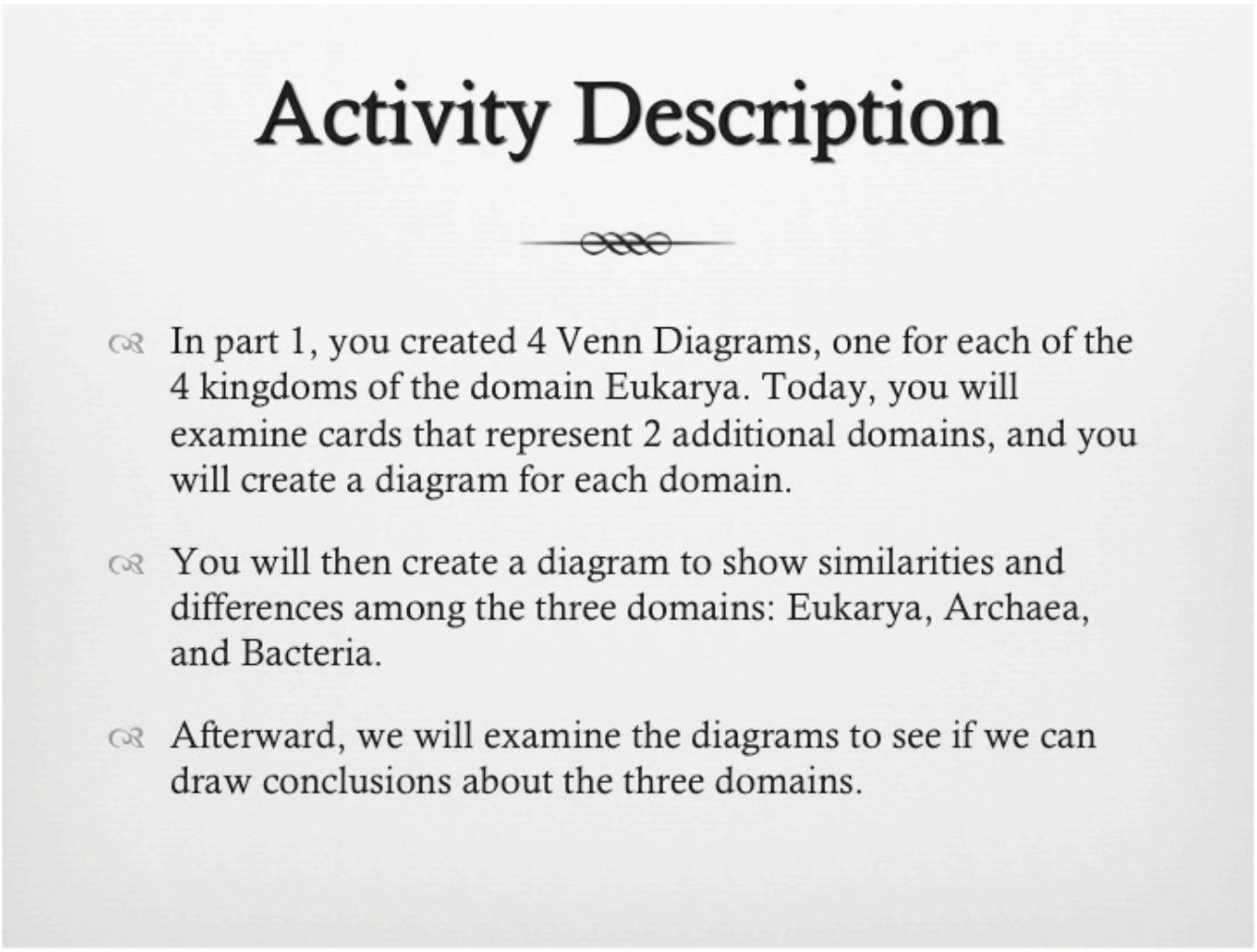


Total time = 40 minutes. (Students will need their completed diagrams from part 1 -- protists, fungi, plants, animals -- for the across-domain comparisons.)

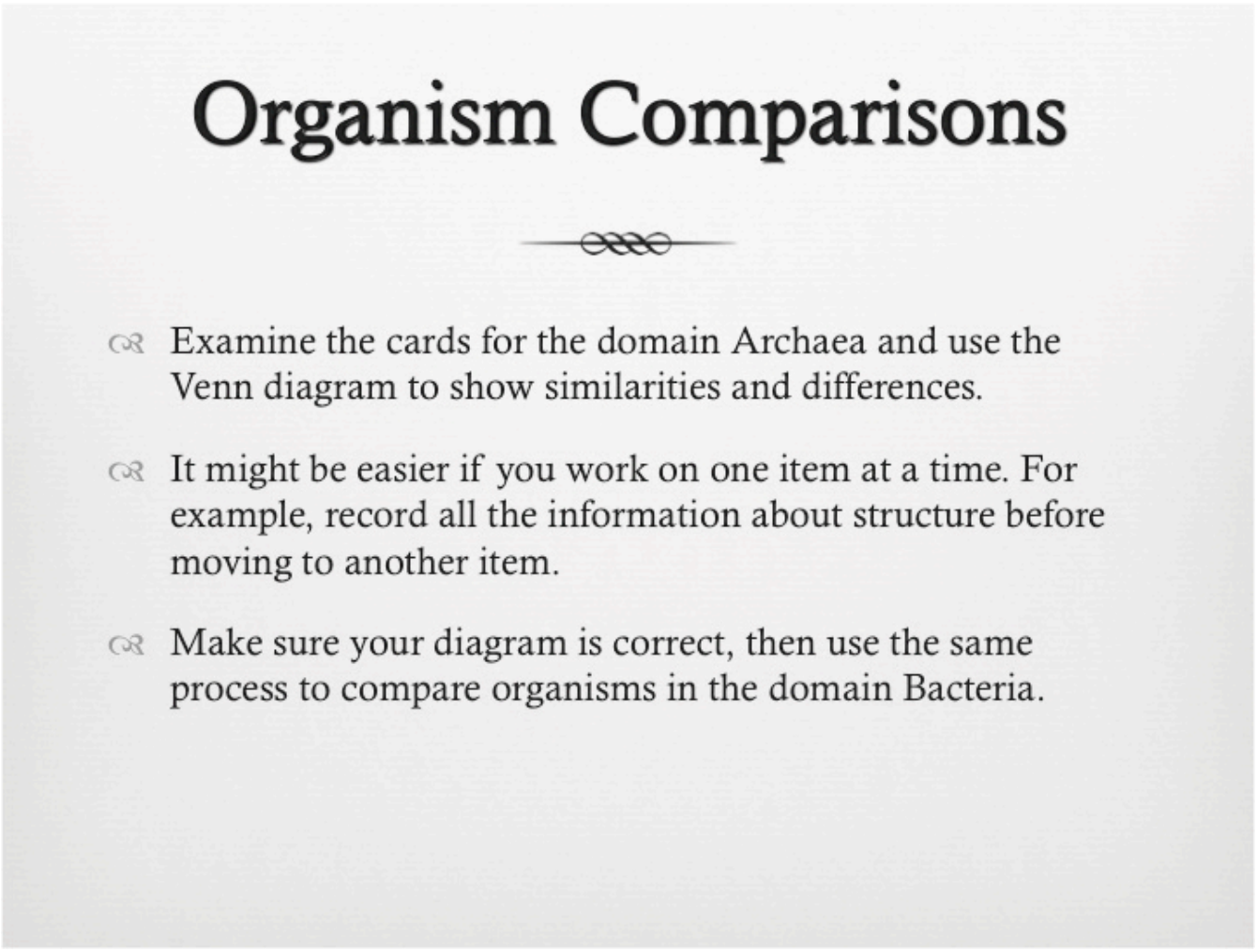
Day 3 - Compare Domains



Main objectives to be displayed throughout the lesson. (These are identical to part 1, except for the addition of "or domain" to each.)

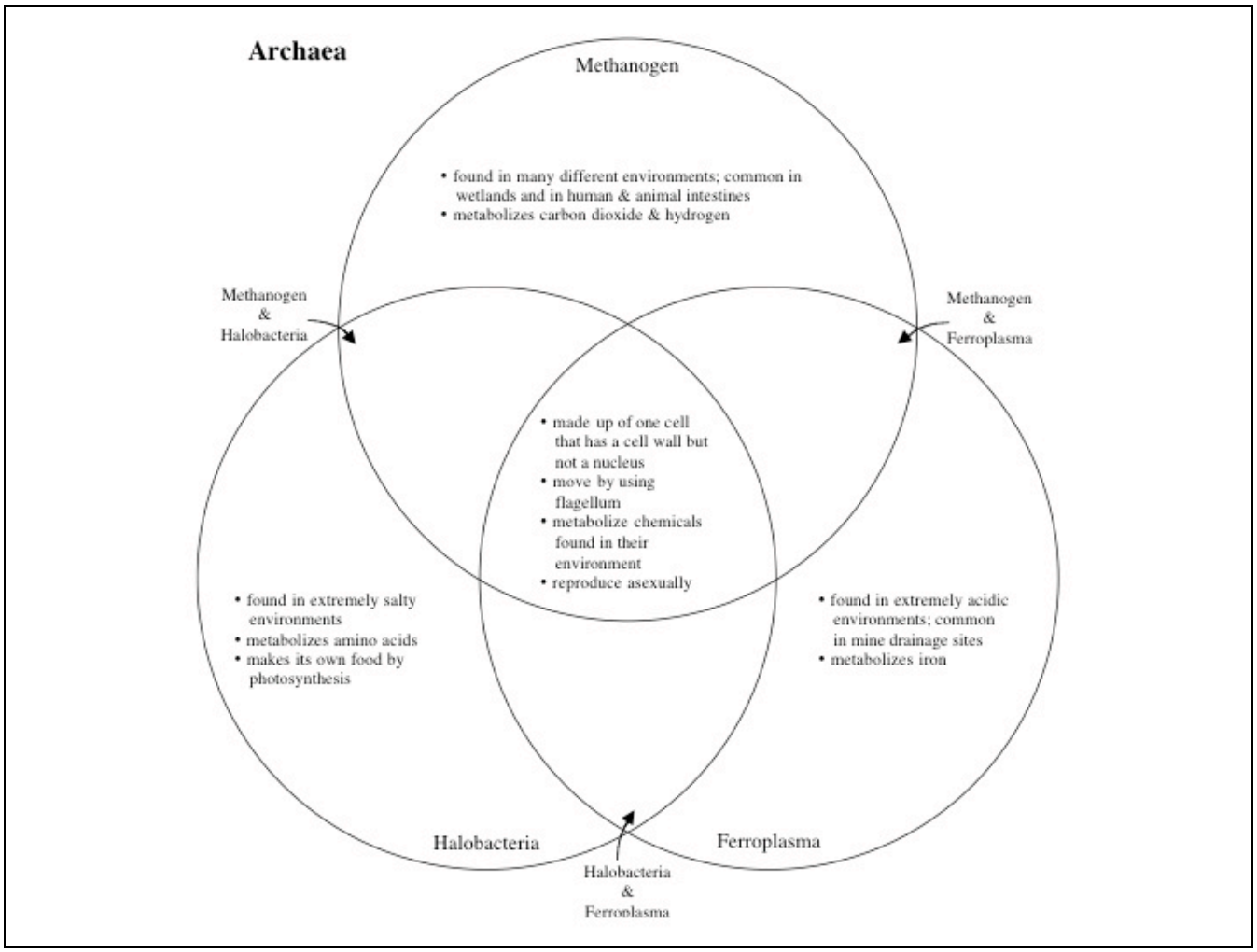


Distribute the student handouts (worksheets 9-12) before moving on.



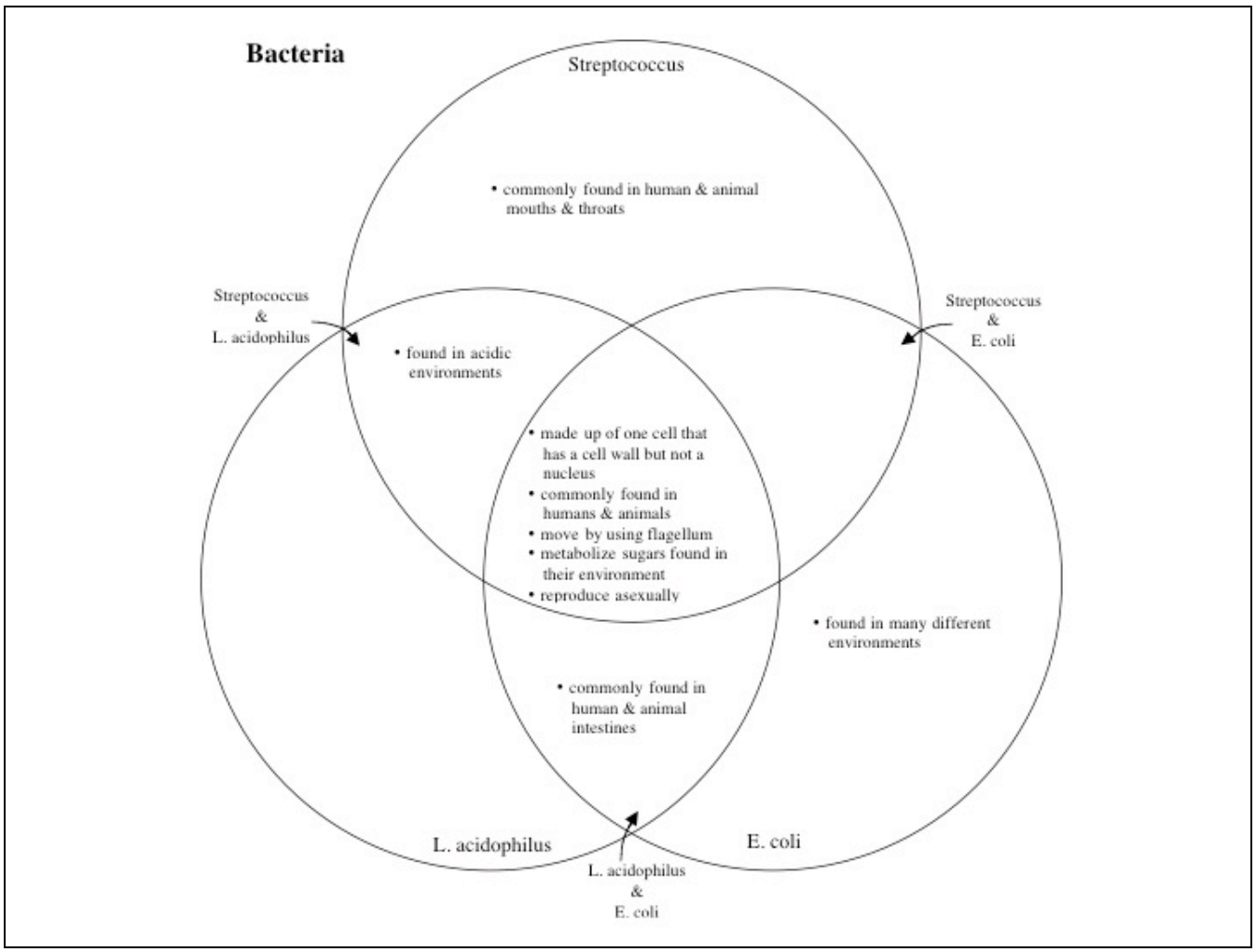
The next two slides show completed diagrams for the two domains.

Day 3 - Compare Domains



Completed diagram for the domain Archaea.

Day 3 - Compare Domains

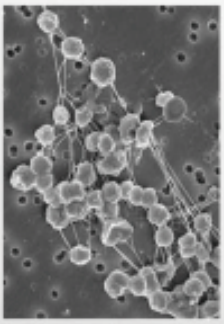


Completed diagram for the domain Bacteria.

Student Worksheet 9: Archaea Cards

Archaea

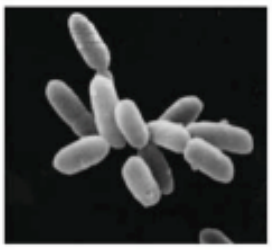
Methanogen



- Made up of one cell that has a cell wall but not a nucleus
- Found in many different environments; common in wetlands and in human and animal intestines
- Moves by using a flagellum
- Metabolizes carbon dioxide and hydrogen found in its environment
- Reproduces asexually

Archaea

Halobacteria



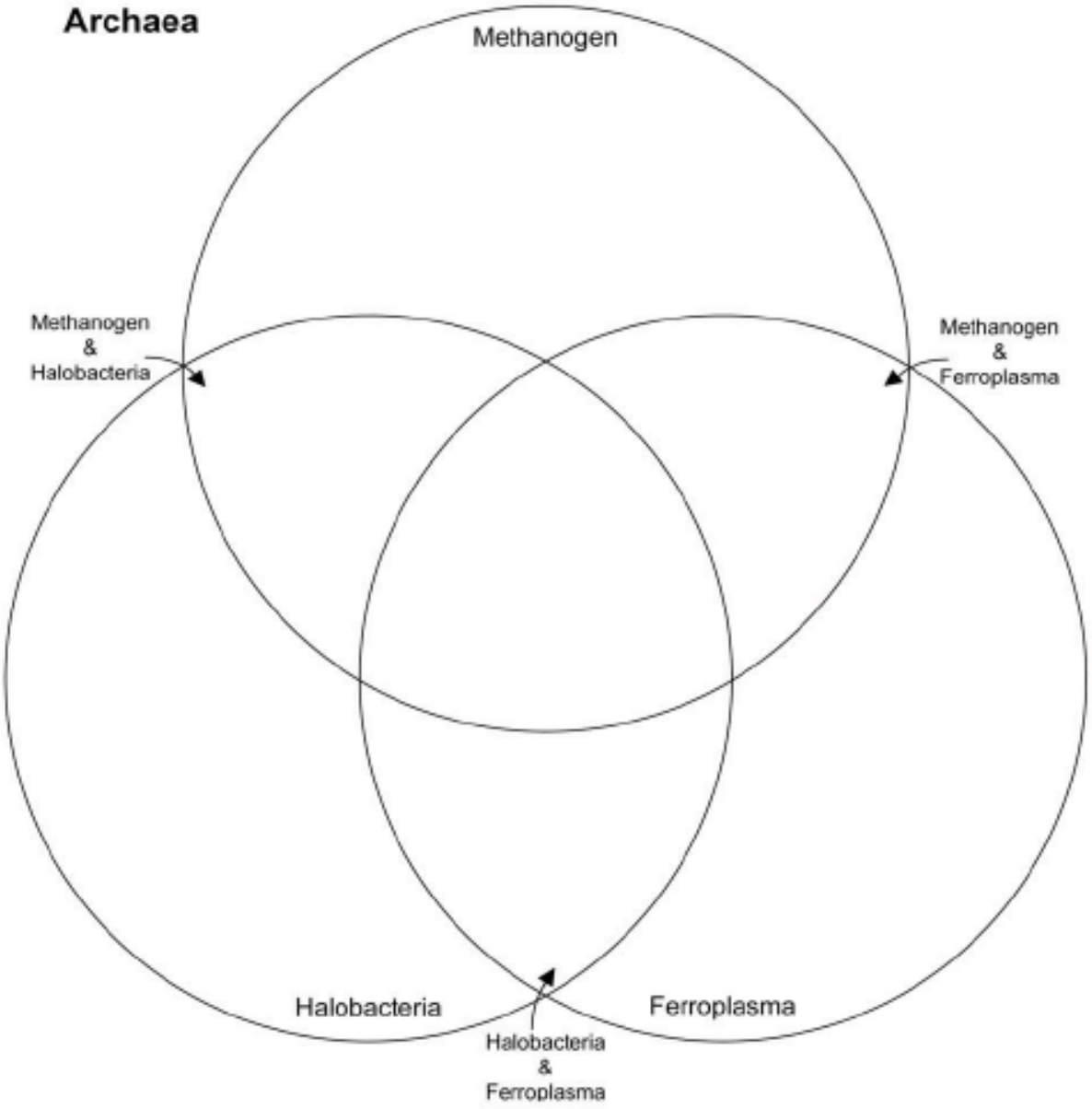
- Made up of one cell that has a cell wall but not a nucleus
- Found in extremely salty environments
- Moves by using a flagellum
- Metabolizes amino acids found in its environment and makes its own food by photosynthesis
- Reproduces asexually

Archaea

Ferroplasma

- Made up of one cell that has a cell wall but not a nucleus
- Found in extremely acidic environments; common in mine drainage sites
- Moves by using a flagellum
- Metabolizes iron found in its environment
- Reproduces asexually

Student Worksheet 10: Archaea Venn



Student Worksheet 11: Bacteria Cards

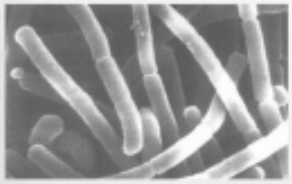
Bacteria

Streptococcus

- Made up of one cell that has a cell wall but not a nucleus
- Found in acidic environments; common in human and animal mouths and throats
- Moves by using a flagellum
- Metabolizes sugars found in its environment
- Reproduces asexually

Bacteria

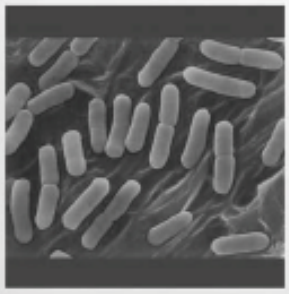
L. acidophilus



- Made up of one cell that has a cell wall but not a nucleus
- Found in warm, acidic environments, common in human and animal intestines
- Moves by using a flagellum
- Metabolizes sugars found in its environment
- Reproduces asexually

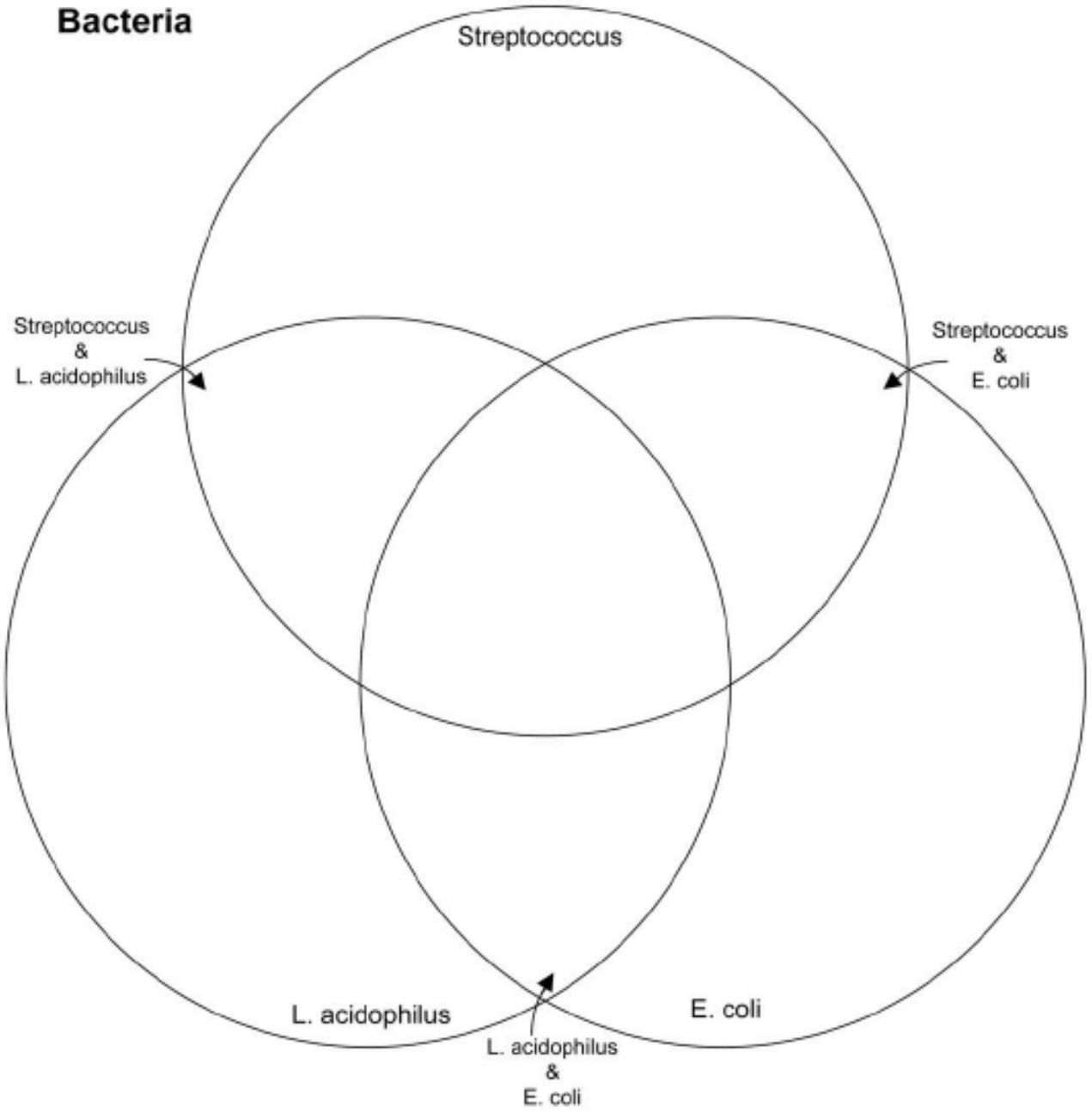
Bacteria

E. coli



- Made up of one cell that has a cell wall but not a nucleus
- Found in many different environments; common in human and animal intestines
- Moves by using a flagellum
- Metabolizes sugars found in its environment
- Reproduces asexually

Student Worksheet 12: Bacteria Venn



Day 3 - Compare Domains

Day 3:

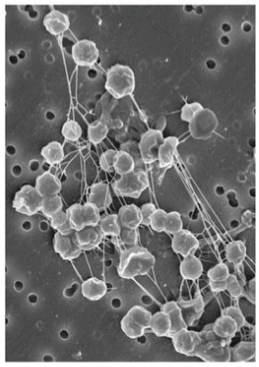
Slides 8-10

Holt: Cells, Heredity, and Classification
Domain Comparison Cards (Prokarya v. Eukarya)

Classification
Chapter 7

Methanogen

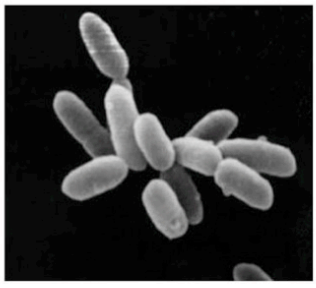
Archaea



- Made up of one cell that has a cell wall but not a nucleus
- Found in many different environments; common in wetlands and in human and animal intestines
- Moves by using a flagellum
- Metabolizes carbon dioxide and hydrogen found in its environment
- Reproduces asexually

Halobacteria

Archaea



- Made up of one cell that has a cell wall but not a nucleus
- Found in extremely salty environments
- Moves by using a flagellum
- Metabolizes amino acids found in its environment and makes its own food by photosynthesis
- Reproduces asexually

Day 3 - Compare Domains

Day 3:

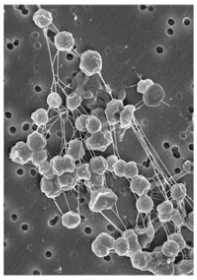
Slides 11-13

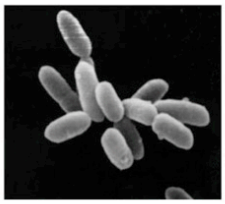
Ferroplasma

Archaea

- Made up of one cell that has a cell wall but not a nucleus
- Found in extremely acidic environments; common in mine drainage sites
- Moves by using a flagellum
- Metabolizes iron found in its environment
- Reproduces asexually

Archaea

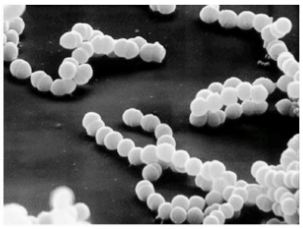




What is the same?
What is different?

Streptococcus

Bacteria



- Made up of one cell that has a cell wall but not a nucleus
- Found in acidic environments; common in human and animal mouths and throats
- Moves by using a flagellum
- Metabolizes sugars found in its environment
- Reproduces asexually

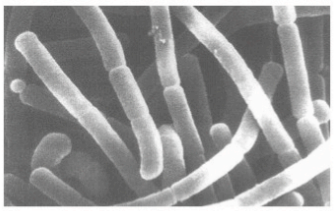
Day 3 - Compare Domains

Day 3:

Slides 14-16

L. acidophilus

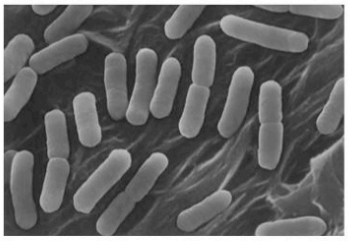
Bacteria



- Made up of one cell that has a cell wall but not a nucleus
- Found in warm, acidic environments, common in human and animal intestines
- Moves by using a flagellum
- Metabolizes sugars found in its environment
- Reproduces asexually

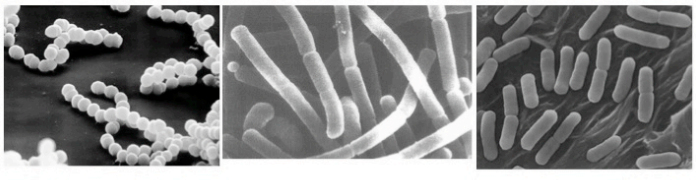
E. coli

Bacteria



- Made up of one cell that has a cell wall but not a nucleus
- Found in many different environments, common in human and animal intestines
- Moves by using a flagellum
- Metabolizes sugars found in its environment
- Reproduces asexually

Bacteria



What is the same?
What is different?

DAY 4 Contrasting Cases Part 2 - Compare Domains (continued)

Today's lesson will introduce the domain Eukarya using some familiar examples from the Kingdoms activity and some new examples. Following the warm-up, put up the first slide of the presentation and discuss the questions about similarities and differences across Kingdoms. Before moving on, distribute the Eukarya cards and Venn diagram (WS13 and 14) or draw students' attention to the correct location in the student resource book. Have students complete the Eukarya Venn using these cards, just as you did for the other domains in yesterday's lesson. Students will then compare across domains (WS 15) to highlight the distinguishing features of each domain. This lesson will conclude the contrasting case for this chapter.

Big Ideas

- Organisms in the same domain have certain things in common, such as structure, habitat, locomotion, feeding and reproduction. Organisms in the same domain can also be different from each other in many ways.
- There is a set of common characteristics distinguishing each domain, and a novel organism can be assigned to a domain based on given characteristics.
- All organisms in the domain Eukarya are made up of one or more cells that have a nucleus. The domain includes simple, one-celled organisms and complex multicellular organisms, and it is composed of the four kingdoms studied earlier.

Materials

Teacher:

1. Warm-up Day 4 - Cells_warmups.ppt
2. Slides - day04.ppt

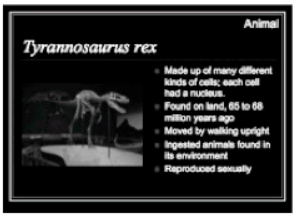
Students:

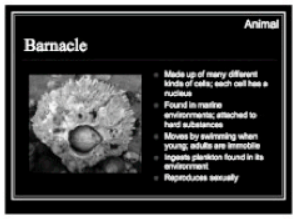
1. Domain cards - Eukarya (WS 13; student resource p18)
2. Compare Eukarya, Domains Venns (WS 14-15; student resource p19 & 21)

Activities and Allotted time

5 minutes - Warm-up
40 minutes - CC activity - Compare Domains: Eukarya and all domains

Day 4 - Warm-up





Look at your kingdom cards from your student book and find the cards for the destroying angel, the tyrannosaurus rex, and the barnacle.

1. Which two have the most in common?

2. Why?

Answer:

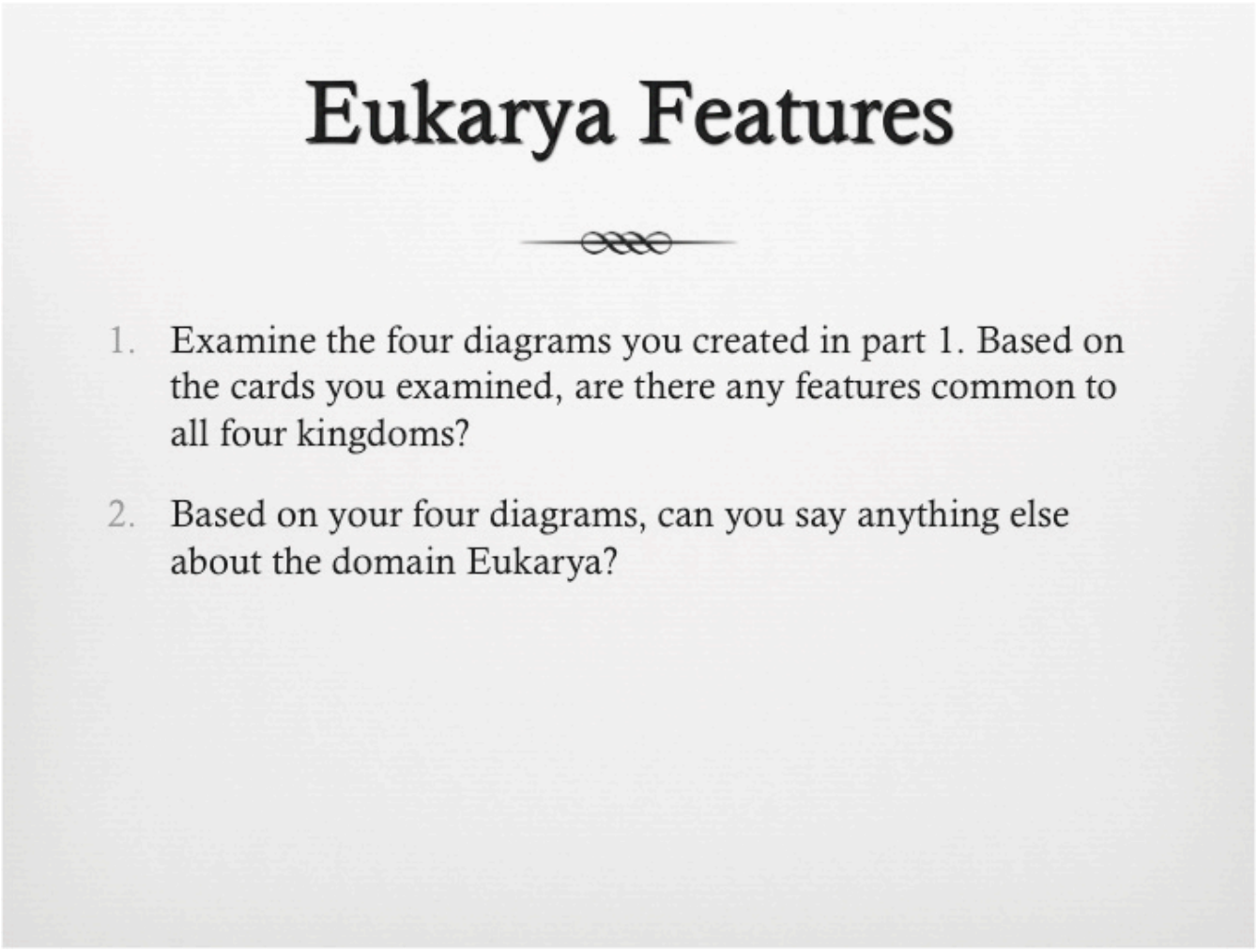
1. Tyrannosaurus rex and barnacle.

2. Although the barnacle and destroying angel share more apparent characteristics – they are about the same size, don't appear to move, etc. – the barnacle is an animal while the destroying angel is a fungus. Students should recall that organisms are grouped into kingdoms not by how they look, but by functional characteristics like structure, habitat, locomotion, feeding, and reproduction.

Students may ask *why* the barnacle and Tyrannosaurus are both classified as animals when they appear so different. The teacher can highlight some of the structural/functional similarities, such as both ingesting their food and reproducing sexually. Expanding on why they're similar enough to be classified within the same kingdom may help students better understand the criteria that go into determining kingdom classification.

Purpose: This exercise contrasts appearance with the more functional characteristics by which organisms are grouped into kingdoms. It illustrates that students can't base classification simply on appearance while also reinforcing the idea that organisms in the same kingdom can be very different.

Day 4 - Compare Domains

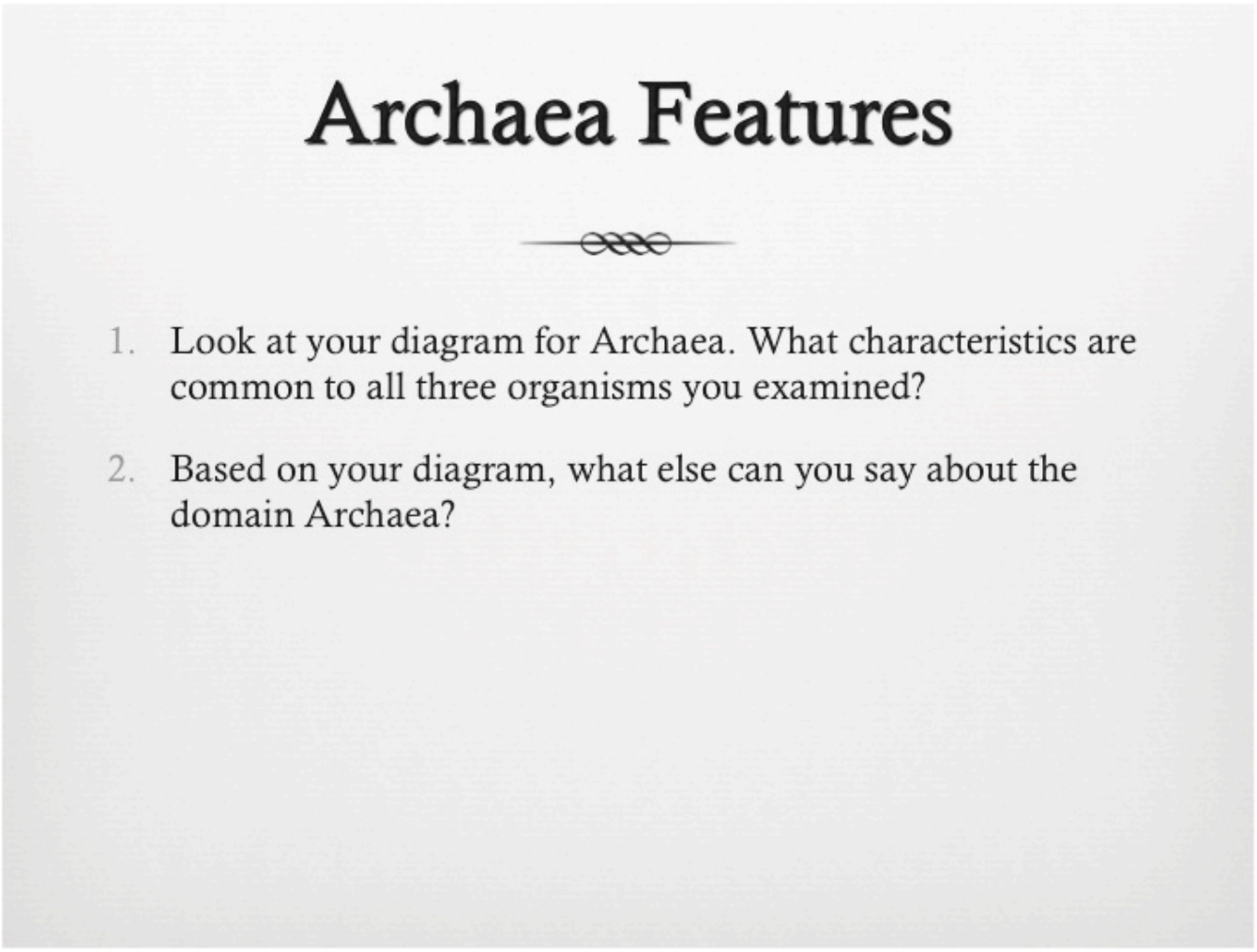


1. They are all made up of cells, and each cell has a nucleus.

2. Members of this domain range from simple, one-celled organisms to complex, multicellular plants and animals. They are found in many different environments. Some are immobile, some move by using a flagellum, and some walk upright. Some make their own food, some obtain food from their environment, and some do both. Some reproduce asexually, some reproduce sexually, and some do both.

**Pause to distribute Eukarya cards and have students complete the Eukarya Venn before proceeding with between-domains comparison.

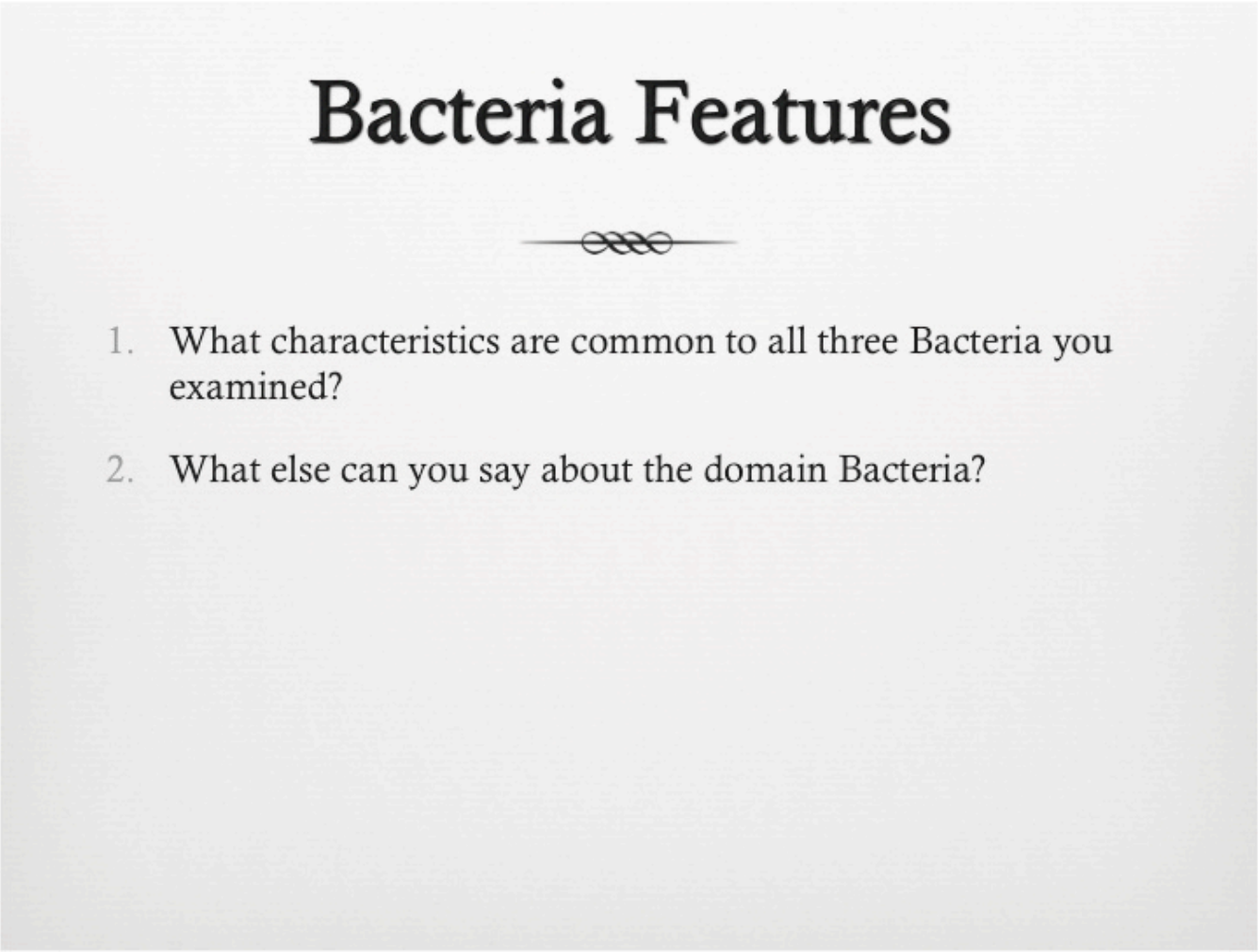
Day 4 - Compare Domains



1. They are all made up of one cell that has a cell wall but not a nucleus. They all move by using a flagellum. They all metabolize chemicals found in their environment, and they all reproduce asexually.

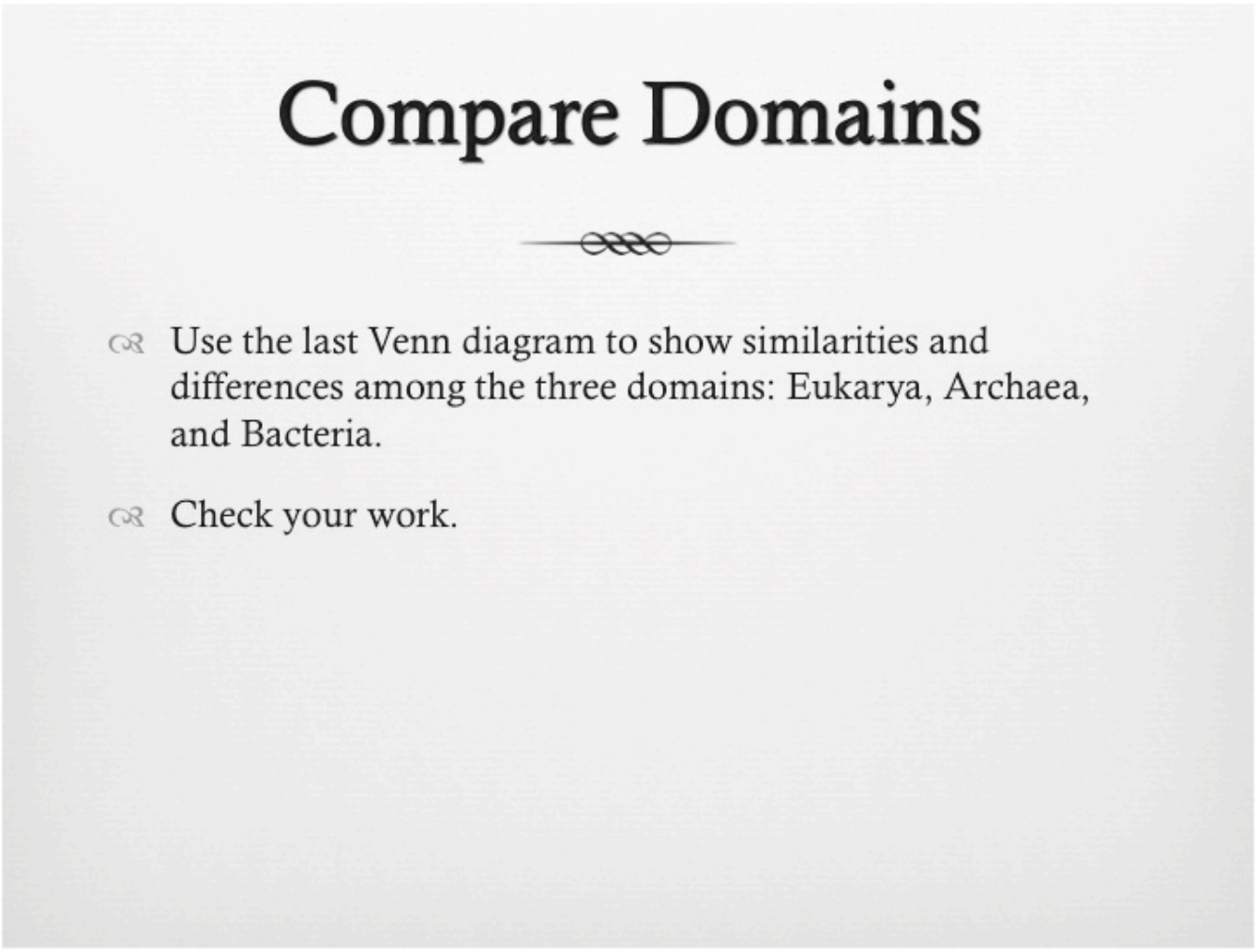
2. They are found in many different environments, including places that are extremely salty or acidic. Some make their own food by photosynthesis in addition to metabolizing chemicals from the environment.

Day 4 - Compare Domains



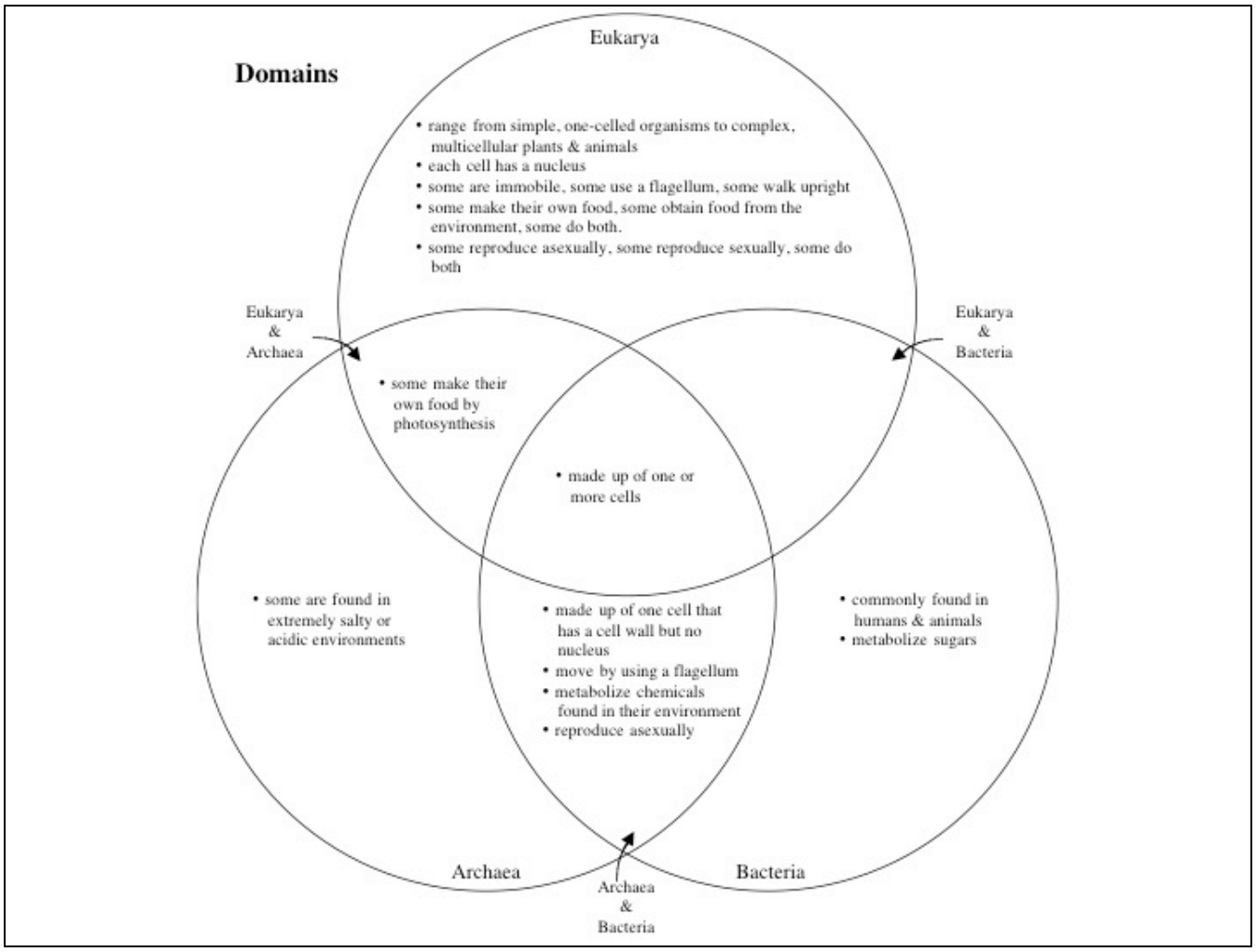
1. They are all made up of one cell that has a cell wall but not a nucleus. They are all commonly found in humans and animals. They all move by using a flagellum. They all metabolize sugars found in their environment, and they all reproduce asexually.

2. They are found in many different environments, including acidic environments and human and animal intestines, mouths & throats.



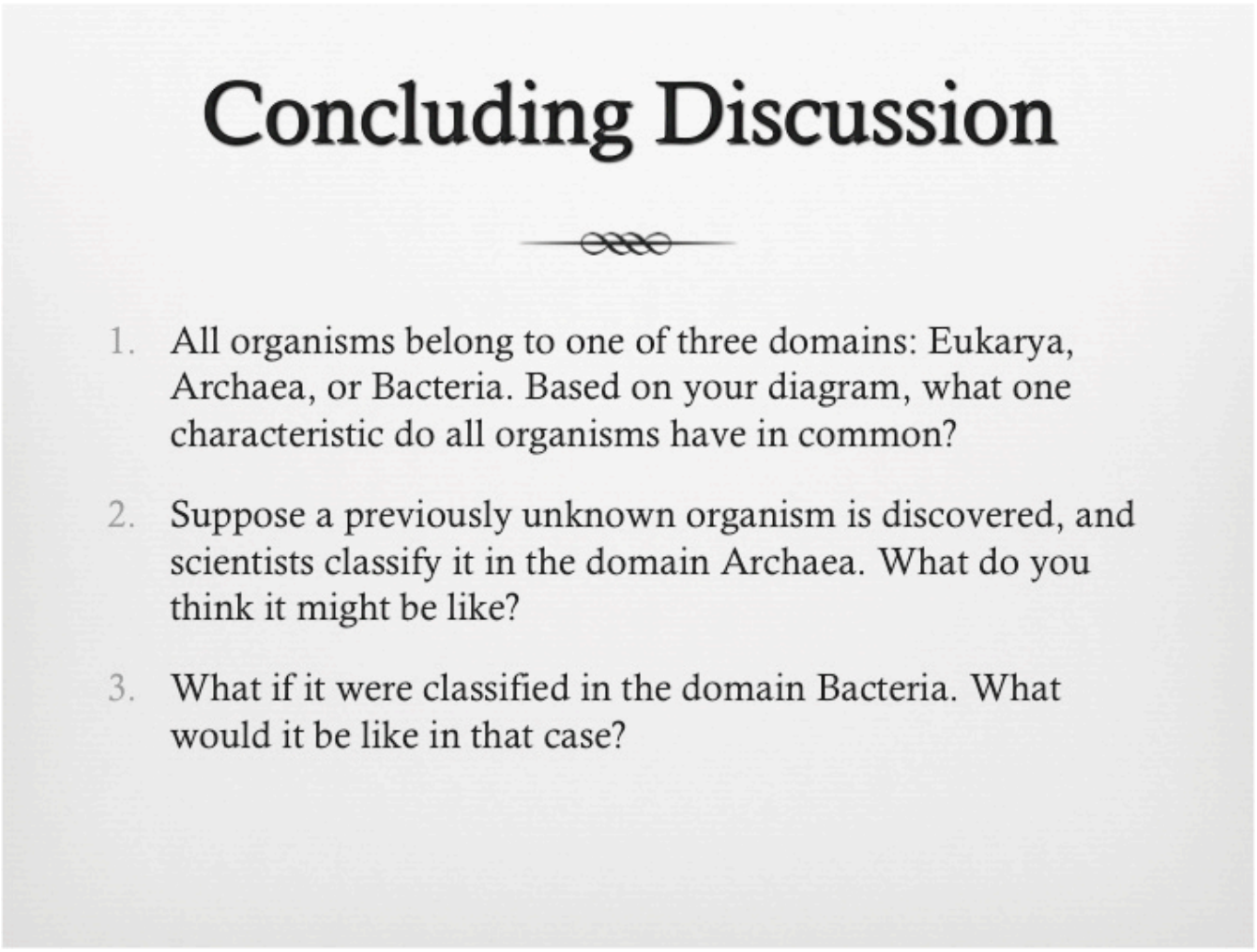
Final Venn is WS 15, or student resource book p21. The next slide shows a completed diagram for the three domains.

Day 4 - Compare Domains



Completed diagram for the three domains.

Day 4 - Compare Domains

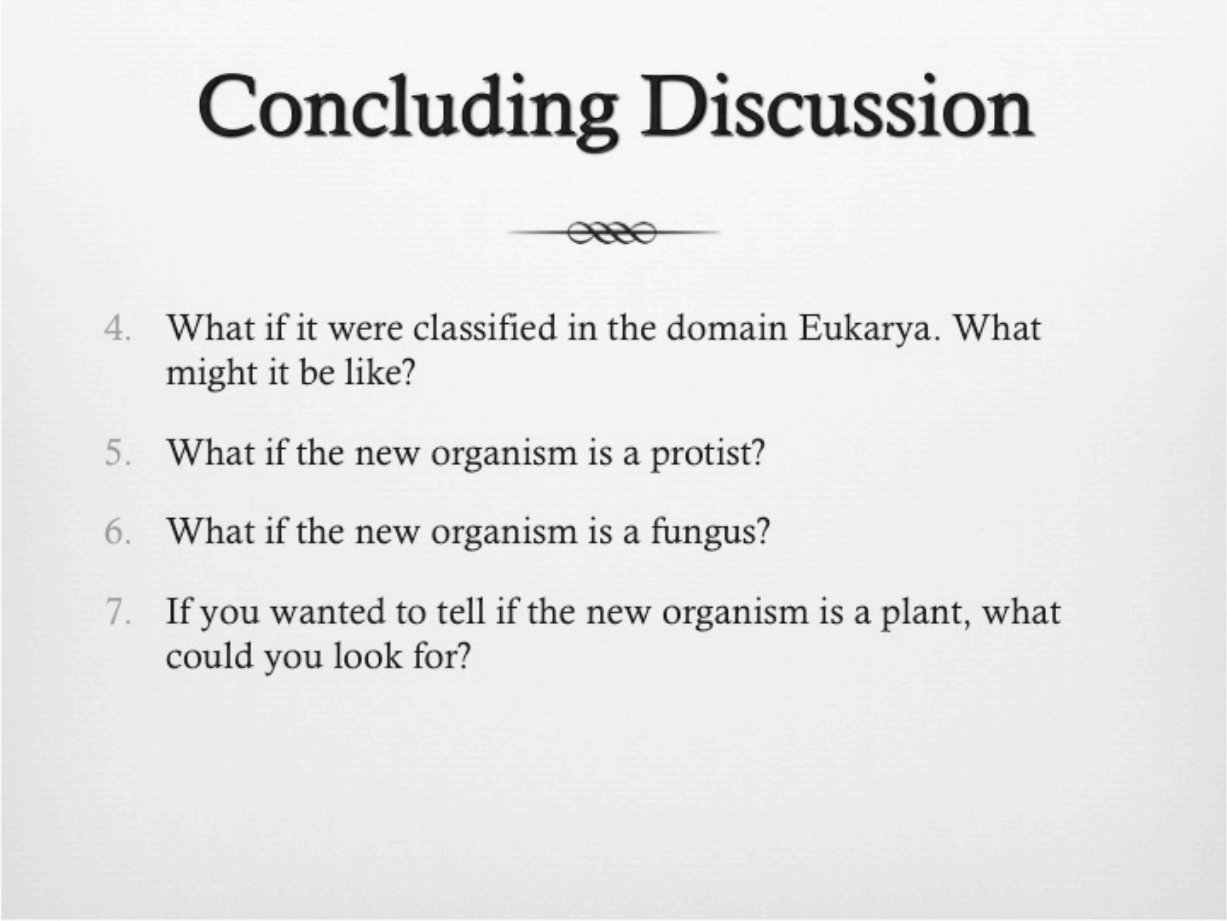


1. They are all made up of cells.

2. A single-cell organism that has a cell wall but no nucleus. It moves by using a flagellum, metabolizes chemicals found in its environment, and reproduces asexually. It may be found in an extremely salty or acidic environment.

3. Very similar, except that it probably metabolizes sugars and it's less likely to be found in an extreme environment. It may have been discovered inside the body of a human or animal.

Day 4 - Compare Domains



4. Other than the fact that each cell has a nucleus, it's difficult to say. The domain Eukarya includes such a wide range of organisms that more information is needed before a prediction can be made.

5. It would still be difficult to predict. It could be single-celled or multicellular. It could be found on land or in freshwater or marine environments. It could be immobile, or it could move using a flagellum. It might make its own food by photosynthesis, or it might absorb or engulf food from its environment. It probably reproduces asexually, but it might also reproduce sexually.

6. Again, it could be single-celled or multicellular. It is probably found on land, although it may also be found in freshwater and marine environments. It is probably immobile, and probably absorbs nutrients from its environment.

7. Examine its cells and see if they have a cell wall. Find out if it makes its own food by photosynthesis.

Student Worksheet 13: Eukarya Cards

Eukarya

Slime molds

- Made up of one or more cells; each cell has a nucleus
- Found on land, usually on plants
- Immobile
- Engulfs food particles found in its environment
- Reproduces asexually and sexually

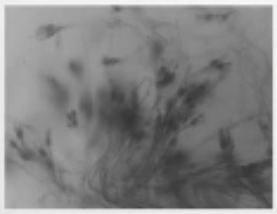
Eukarya

Bonobo

- Made up of many different kinds of cells; each cell has a nucleus.
- Found on land, in rainforests in Africa
- Moves by walking upright and on all fours
- Eats fruits, leaves, and small animals found in its environment
- Reproduces sexually

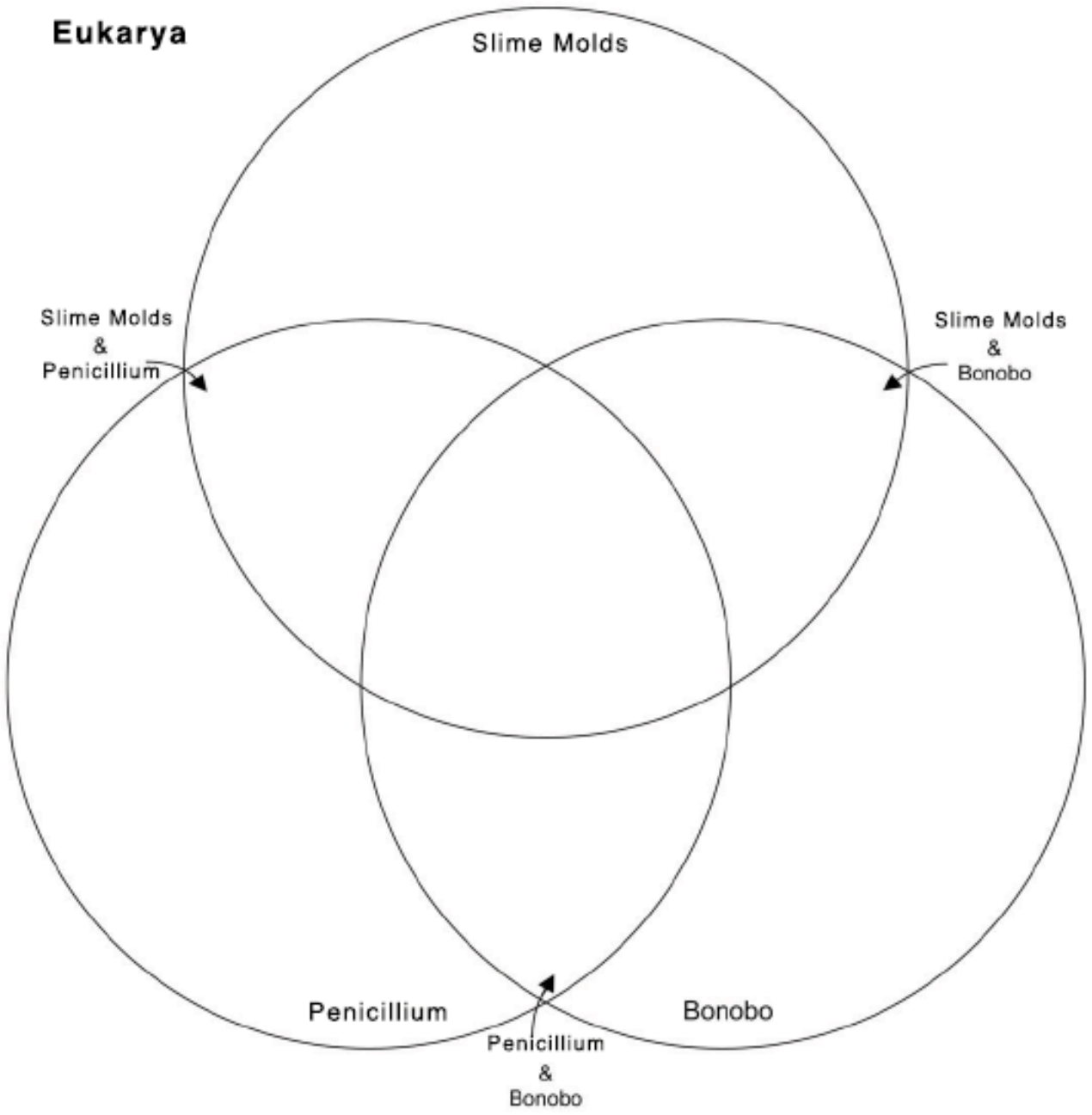
Eukarya

Penicillium



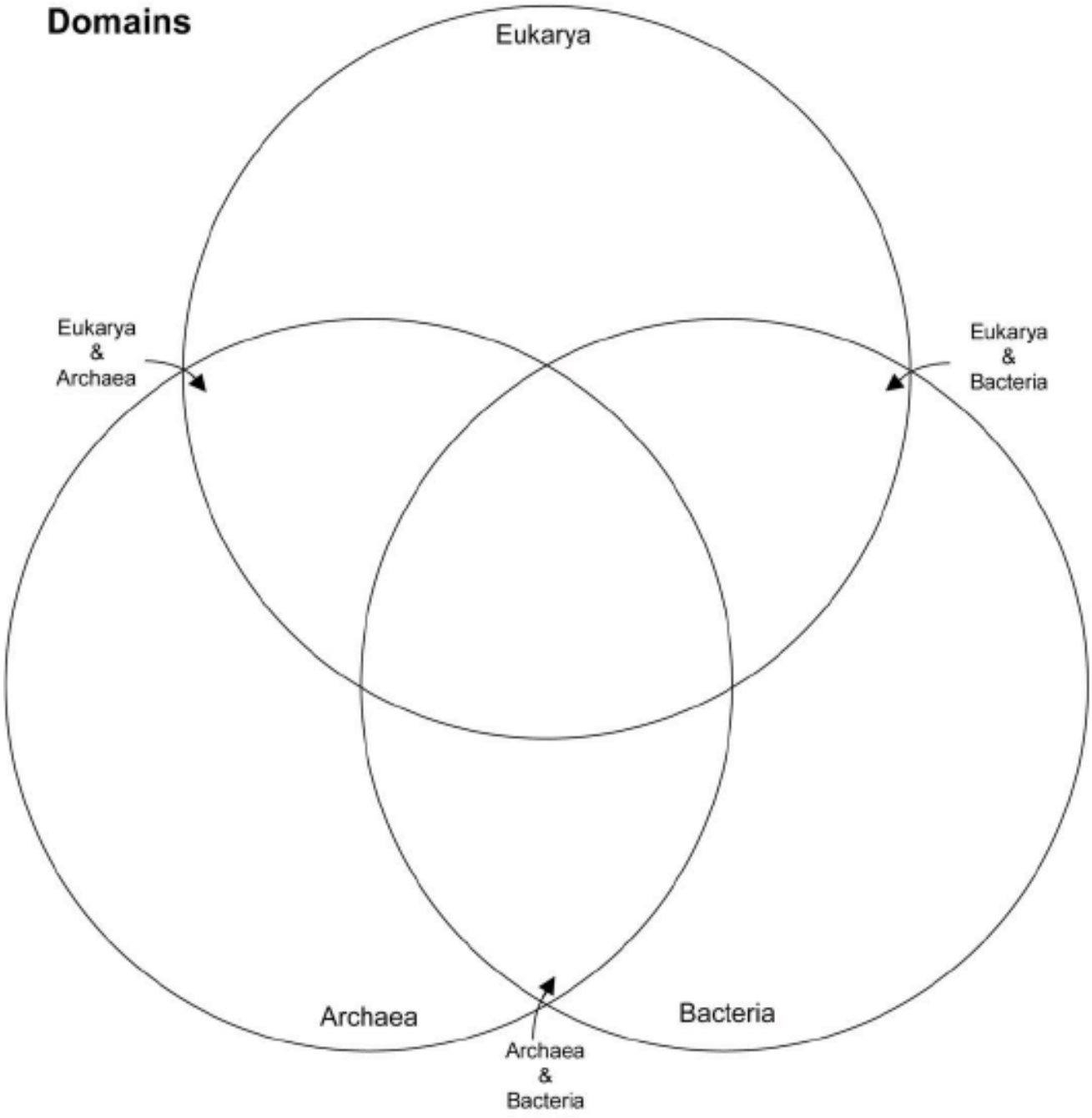
- Made up of many cells; each cell has a nucleus
- Found on land, often on foods and in indoor environments
- Immobile
- Absorbs nutrients from its environment
- Reproduces asexually
- Source of antibiotic penicillin

Student Worksheet 14: Eukarya Venn



Day 4 - Compare Domains

Student Worksheet 15: Domains Venn



Day 4 - Compare Domains

Day 4:

Slides 8-10

Slime molds

Eukarya

- Made up of one or more cells; each cell has a nucleus
- Found on land, usually on plants
- Immobile
- Engulfs food particles found in its environment
- Reproduces asexually and sexually

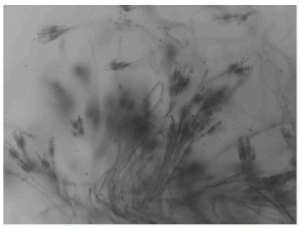
Bonobo

Eukarya

- Made up of many different kinds of cells; each cell has a nucleus.
- Found on land, in rainforests in Africa
- Moves by walking upright and on all fours
- Eats fruits, leaves, and small animals found in its environment
- Reproduces sexually

Penicillium

Eukarya

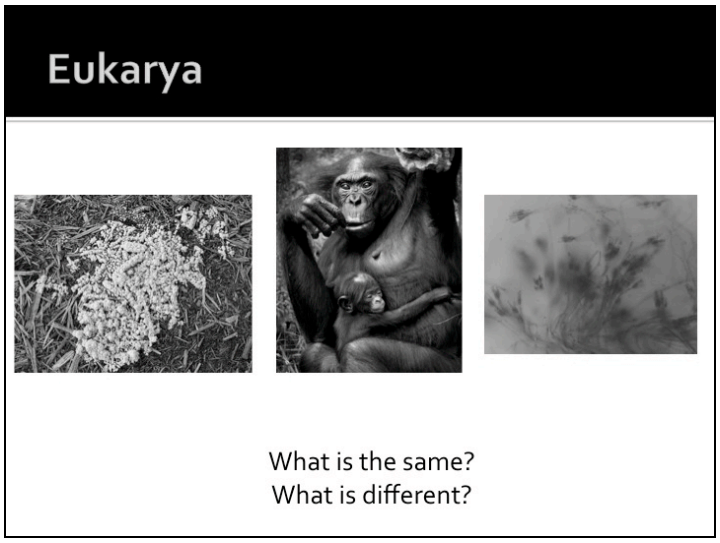


- Made up of many cells; each cell has a nucleus
- Found on land, often on foods and in indoor environments
- Immobile
- Absorbs nutrients from its environment
- Reproduces asexually
- Source of antibiotic penicillin

Day 4 - Compare Domains

Day 4:

Slide 11



DAY 5

Class Inclusion Activity

Today's lesson will introduce class-inclusion hierarchies, an important and challenging concept that students will need to know as they proceed with Chapter 7. Students will better understand class-inclusion hierarchies based on this activity and prior days' lessons on taxonomy (kingdoms, domains). Following today's lesson, students will be well equipped to pick up with Chapter 7, Section 1.

Big Ideas

- Biologists use a class-inclusion hierarchy to classify current living species. This hierarchy can be used to make certain inferences about categories and category members.

Materials

Teacher:

1. Warm-up Day 5 - Cells_warmups.ppt
2. Slides - day05.ppt

Students:

1. Class inclusion systems, Part 1 (WS 16; student resource p22 & 23)
2. Class inclusion systems, Part 2 (WS 17; student resource p24 & 25)

Activities and Allotted time

5 minutes - Warm-up
40 minutes - Class inclusion activity

Day 5 - Warm-up

Use your kingdom and domain specimen cards in your student book to determine which organism is being described.

- I belong in the domain Eukarya.
- I belong in the kingdom Fungus.
- I am made up of one cell that has a nucleus.
- I am used in baking and brewing.

What am I?

Answer: Yeast

Purpose: This exercise lets students practice using characteristics on a hierarchical level to identify organisms. Rather than looking at all their cards to find the most specific characteristic (used in baking and brewing), they should understand that it is easiest to start by sorting by the largest group (domain Eukarya), then move down through each increasingly specific characteristic.

Biological classification systems

Heads up on student learning

Biological classification systems often involve a lot of unfamiliar words, such as eukaryote, phylum, protist, and so forth. Students often believe that their task in learning about biological classification is to memorize these terms and their associated properties as if they were learning a long list of isolated vocabulary items. This approach completely misses the underlying organization of the system and its purpose. Exercises in which students create and use dichotomous keys may help somewhat in getting students to think about how scientists classify living things, but most biology textbooks never actually reveal or explain the underlying organizational properties of the classification system and how those properties can be used to make inferences.

The kind of classification system that biologists use to classify current living species has a particular kind of structure: it is a class-inclusion hierarchy. Because of the way it is organized, it can be used to make inferences about categories and category members. There are two important principles underlying a class-inclusion hierarchy:

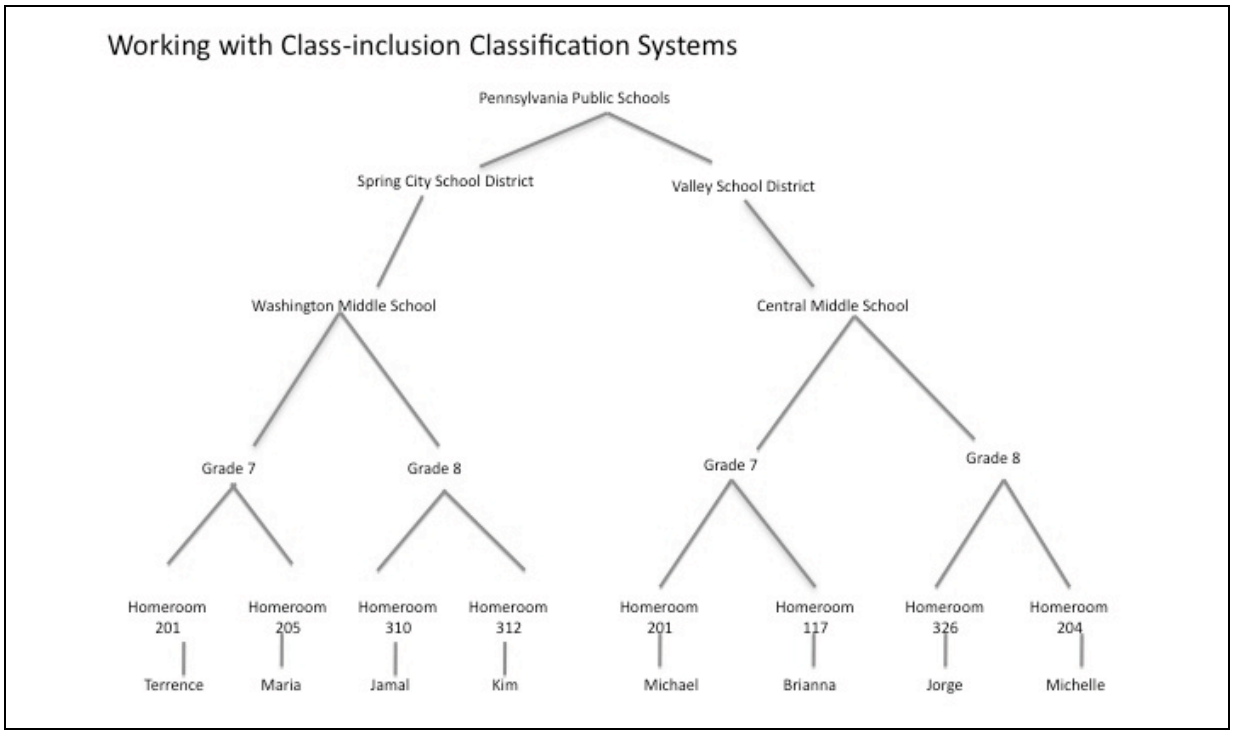
(1) For categories at the same horizontal level in the hierarchy, all individuals must belong to one and only one category at that level. A snake, for instance, cannot be both a reptile and an amphibian, because those are contrasting categories at the same level.

(2) More specific categories have all of the properties of every larger category that they are a subset of. An individual who is a member of the most specific category (e.g., a lion, which is a member of the species Panthera leo) is also a member of a more general category at every level of the system. The lion is also member of the genus Panthera, the family Felidae, the order Carnivora, the class Mammalia, the phylum Chordata, the kingdom Animalia, and the domain Eukarya. Every defining property of every one of those categories applies to the lion.

It may be difficult for students to appreciate that the properties of the categories at the highest, most general levels of the system apply to individuals in the more specific categories that fall under them. For instance, when they learn about the domain Eukarya, they may think it represents some exotic kind of organism with the strange property of "membrane-bound organelles," and they may fail to recognize that the house cat (and they themselves!) are members of the Eukaryote category, and that they must also have membrane-bound organelles.

To help students become oriented to the inferential system that underlies biological classification, students complete an activity which is about a class-inclusion hierarchy that is familiar to them: the organization of students into classrooms, grades, schools, and districts. Although most students won't be able to articulate the principles for inference that underlie this system, they know them implicitly. The activity leads students through questions designed to draw out their knowledge of how the system works and what kinds of inferences you can use it to make. The second part of this lesson extends this to classification for domains and kingdoms. It builds on the contrasting cases for domains and kingdoms, asking students to use these categories to make inferences about members.

Day 5 - Class Inclusion Activity



Background for teachers: This short activity is designed to get students ready to understand the classification system used in biology by first getting them to think about a class-inclusion hierarchy that they are already familiar with: the organization of students into classrooms, grades, schools, and districts.

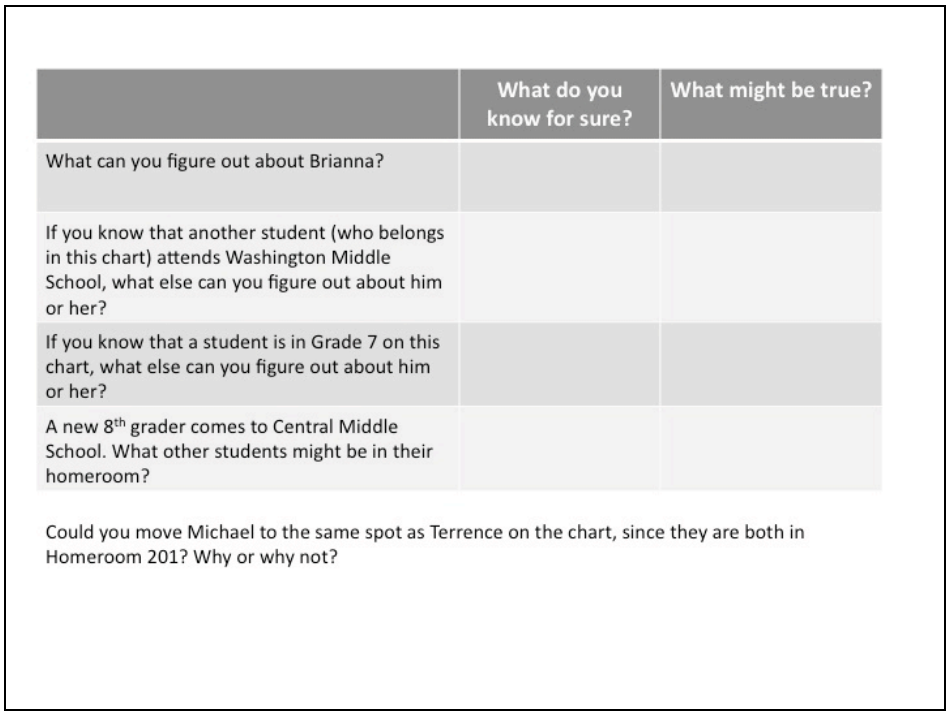
There are two important principles underlying a class-inclusion hierarchy:

(1) For categories at the same horizontal level in the hierarchy, all individuals must belong to one and only one category at that level. In the school example, the same student can't be a student in both 7th grade and 8th grade at the same time. In the biological system, the same organism cannot be both a protist and a fungus.

(2) Second, more specific categories have all of the properties of every larger category that they are a subset of. For example, in the chart above, look at the student named Kim. Kim simultaneously belongs to ALL of the categories on the branches running from Homeroom 312, to Grade 8, to Washington Middle School, to Spring City School District, to Pennsylvania Public Schools. Similarly, if an organism is a plant, it must also be a eukaryote and a living thing, and it will share all the properties of those categories.

In this two-part lesson, students will first look at the properties of a familiar class-inclusion system. Then they will construct their own class-inclusion tree for the biological domain and kingdom categories they have been working with. They will then practice using the system to make inferences. There is a student worksheet to accompany each part of this lesson.

Day 5 - Class Inclusion Activity



	What do you know for sure?	What might be true?
What can you figure out about Brianna?		
If you know that another student (who belongs in this chart) attends Washington Middle School, what else can you figure out about him or her?		
If you know that a student is in Grade 7 on this chart, what else can you figure out about him or her?		
A new 8th grader comes to Central Middle School. What other students might be in their homeroom?		

Could you move Michael to the same spot as Terrence on the chart, since they are both in Homeroom 201? Why or why not?

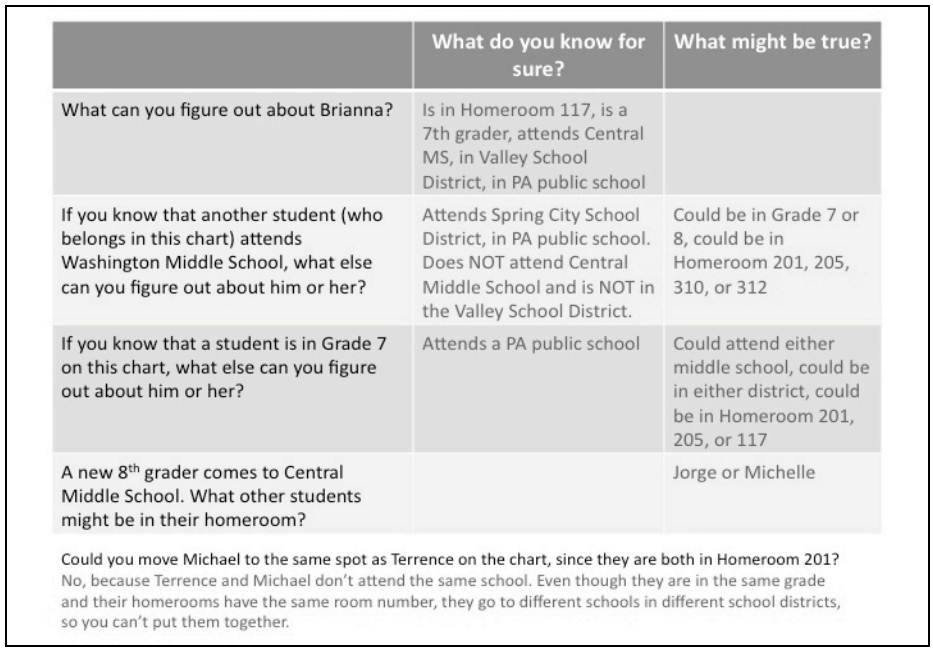
See the accompanying student worksheet. Before you introduce the text material on biological classifcation, use this activity to get students thinking about the familiar case of a school-based class inclusion hierarchy. Although most students probably won't articulate the organizational principles of the system, they know them implicitly. The student worksheet for this activity leads them through a series of questions designed to draw out how the system works and what kinds of inferences you can use it to make.

Use the chart on the preceding slide (which is also reproduced on the student worksheet) to fill in the middle and right-hand columns of the table and to answer the question at the bottom of the table.

Point out the headings on the columns. The middle column asks students to figure out what they can say FOR SURE about an individual based on the information they are given in the first column. The last column asks them to figure out what MIGHT BE TRUE about the individual based on the information they are given. Students can do this as a whole class activity, in small groups, or working individually.

The next slide gives examples of correct responses. Before moving to the next slide, have your students generate and share their own responses.

Day 5 - Class Inclusion Activity



	What do you know for sure?	What might be true?
What can you figure out about Brianna?	Is in Homeroom 117, is a 7th grader, attends Central MS, in Valley School District, in PA public school	
If you know that another student (who belongs in this chart) attends Washington Middle School, what else can you figure out about him or her?	Attends Spring City School District, in PA public school. Does NOT attend Central Middle School and is NOT in the Valley School District.	Could be in Grade 7 or 8, could be in Homeroom 201, 205, 310, or 312
If you know that a student is in Grade 7 on this chart, what else can you figure out about him or her?	Attends a PA public school	Could attend either middle school, could be in either district, could be in Homeroom 201, 205, or 117
A new 8th grader comes to Central Middle School. What other students might be in their homeroom?		Jorge or Michelle

Could you move Michael to the same spot as Terrence on the chart, since they are both in Homeroom 201?
No, because Terrence and Michael don't attend the same school. Even though they are in the same grade and their homerooms have the same room number, they go to different schools in different school districts, so you can't put them together.

This slide gives examples of correct responses.

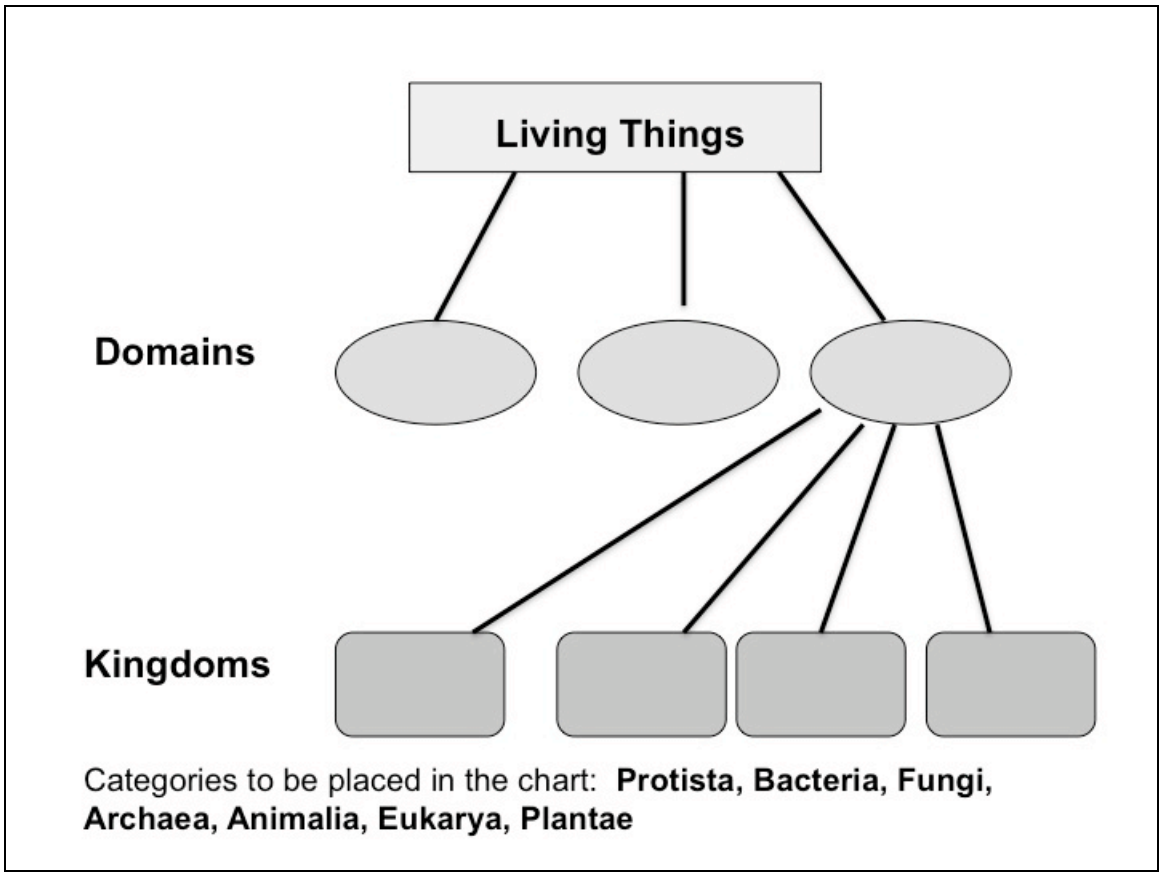
Some students may observe that in the "know for sure" column, you can also say things that you know must NOT be true of the individual. For example, Brianna CANNOT be a student in the Spring City School District. These are correct inferences and they can be very useful in science.

Students may notice that the more specific a category you can place an individual in (that is, the closer to the bottom of the chart), the more definite inferences you can make. If you can only place an individual in a more general category (that is, toward the top of the chart), then you can say fewer things for sure. There are more things that might or might not be true of the individual.

The question at the bottom, about Terrence and Michael, illustrates an important point about class-inclusion hierarchies. You may occasionally find the same property associated with more than one category in the system, but you cannot combine members of categories who belong to different classes at higher levels. In biology, for example, students sometimes learn that a characteristic of the vertebrate class of Mammals is that they have hair or fur. Then they notice that some kinds of bees are also furry and think that a bee could be a mammal. But mammals must also be vertebrates and bees are not vertebrates. Similarly, Michael and Terrence may have the same homeroom number, but they cannot be in the same classroom because they attend different schools in different districts.

In Part 2 of this activity, you will help connect students' observations from this activity to the biological classification system for domains and kingdoms.

Day 5 - Class Inclusion Activity



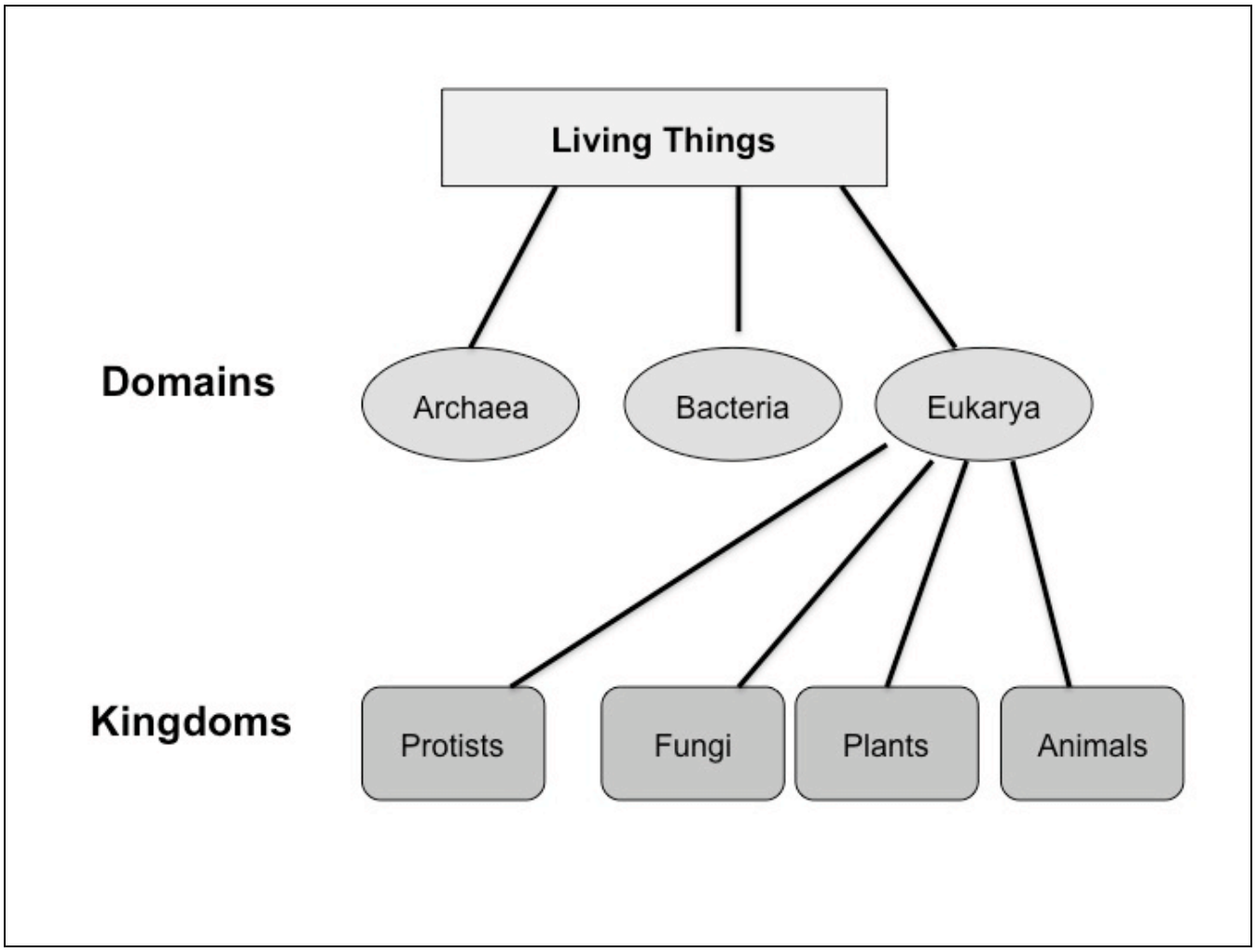
Part 2: Use the student worksheet to accompany Part 2 of this lesson.

Work with your students to create a 3-level hierarchy that includes living things, domains, and kingdoms and the properties associated with each category. Encourage them to refer to the domain and kingdom cards and Venn diagrams from the preceding contrasting cases to decide on the properties that go with each category. The slide above can serve as a framework.

Help students identify one category that belongs at the domain level and one category that belongs at the kingdom level. What properties go with each of the categories they selected?

Students should then try to place all of the domain and kingdom categories in the tree.

Day 5 - Class Inclusion Activity



This slide shows the correct placement of the categories.

Have students complete the accompanying worksheet (WS 19). After giving students time to consider and respond to these questions on their own, begin a discussion of their answers. Once students have shared their thoughts, proceed to the next slide to review possible answers.

Day 5 - Class Inclusion Activity

Examples of responses to student questions:

1. If you know something is a protist, what else can you say about it?
   It is a member of the domain Eukarya and it is a living thing. It is not a fungus, plant, or animal.

2. If something is a member of the domain Eukarya, could it be a plant?
   Yes, but it doesn't have to be. Animals, fungi, and protists are also members of Eukarya.

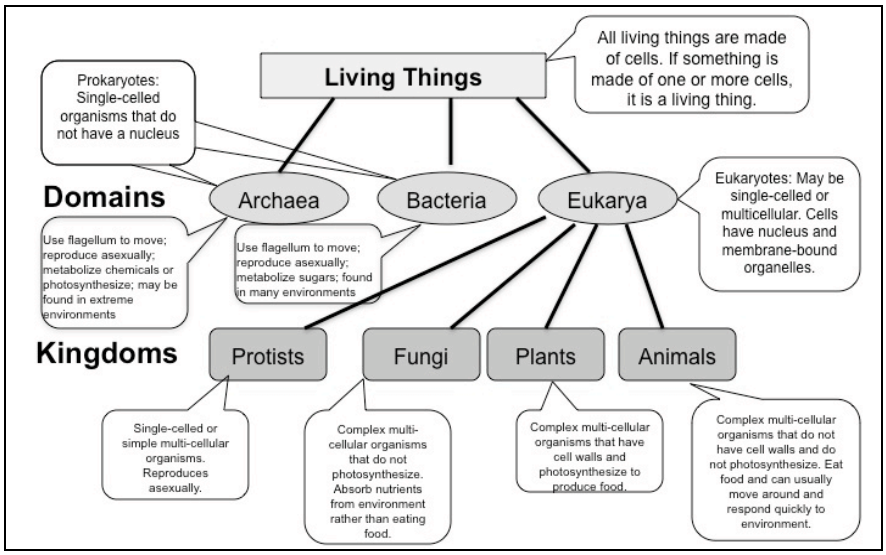
3. If something is an animal, could it be a member of the domain Archaea?
   No. Animals are members of the domain Eukarya, so they can't members of any other domain.

4. If something is a member of the domain Bacteria, could it be a protist?
   No. Protists belong to the domain Eukarya, so they can't be Bacteria.

5. If something is a living thing, does it have to be an animal?
   No. It might be animal, but there are many kinds of living things that are not animals.

Project this slide briefly as a review of possible answers, giving students time to correct misconceptions or errors in their responses.

Day 5 - Class Inclusion Activity



This version of the tree shows the major properties associated with each category. The next slide shows how each of the organisms represented on the Kingdom cards would be placed in this tree. Display this slide and review the properties that go with each category. This shows how the category features that the students analyzed when they did the contrasting cases comparing domains and kingdoms map onto the categories as they are placed in the tree. With this slide visible, ask students to use it to make inferences. Do this is as a whole-class activity. On the next page are examples of questions you might ask.

1. If you know that something is an animal, what can you infer about it?

(It is a complex, multi-cellular organism, it does not have cell walls and does not photosynthesize. It eats foods and can usually move around and respond quickly to the environment. Its cells have nuclei and membrane-bound organelles, and it is a living thing.)

2. If you know that something is bacteria, what can you infer about it?

(It is a single-celled organism with no nucleus; it moves around using flagellum; it reproduces asexually; it metabolizes sugars; it is found in many environments; and it is a living thing. It CANNOT be a protist, fungus, plant or animal.)

3. If you know that something is multi-cellular, could it belong in the domain Archaea?

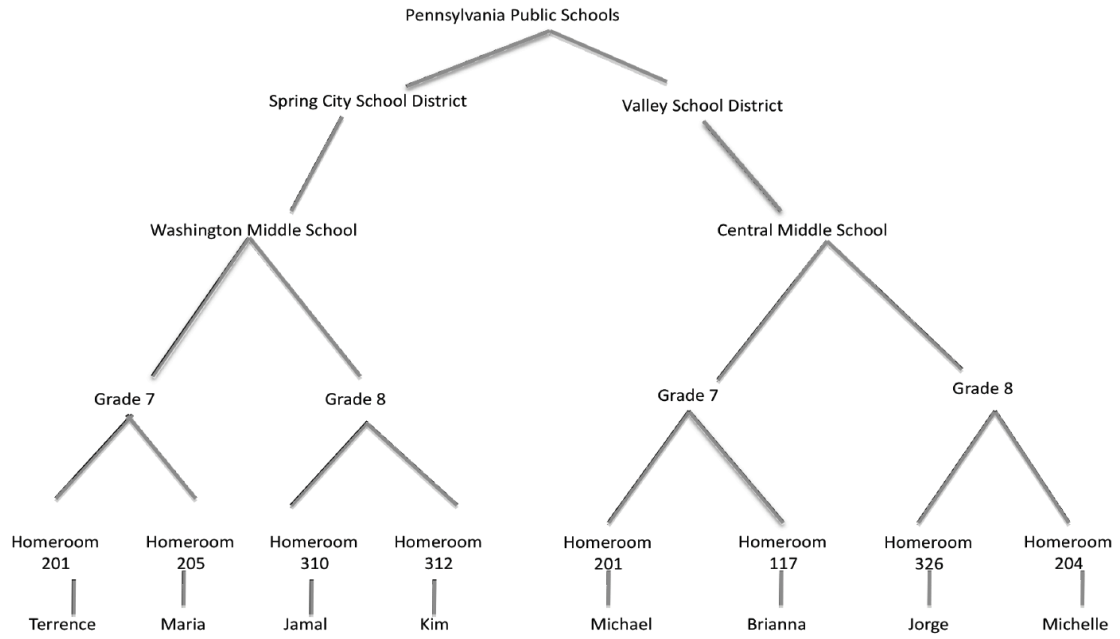
(No. All members of Archaea are prokaryotes, which are single cells.)

4. If you know that something is multi-cellular, can you infer that it photosynthesizes?

(No. It could belong to any of the Kingdoms under Eukarya, so it could be a protist, a fungus, a plant, or an animal. It might photosynthesize if it is a protist or a plant, but not if it's a fungus or an animal.)

Student Worksheet 16: Class-inclusion Systems, Part 1

Ch. 7, Class-inclusion Systems, Part 1



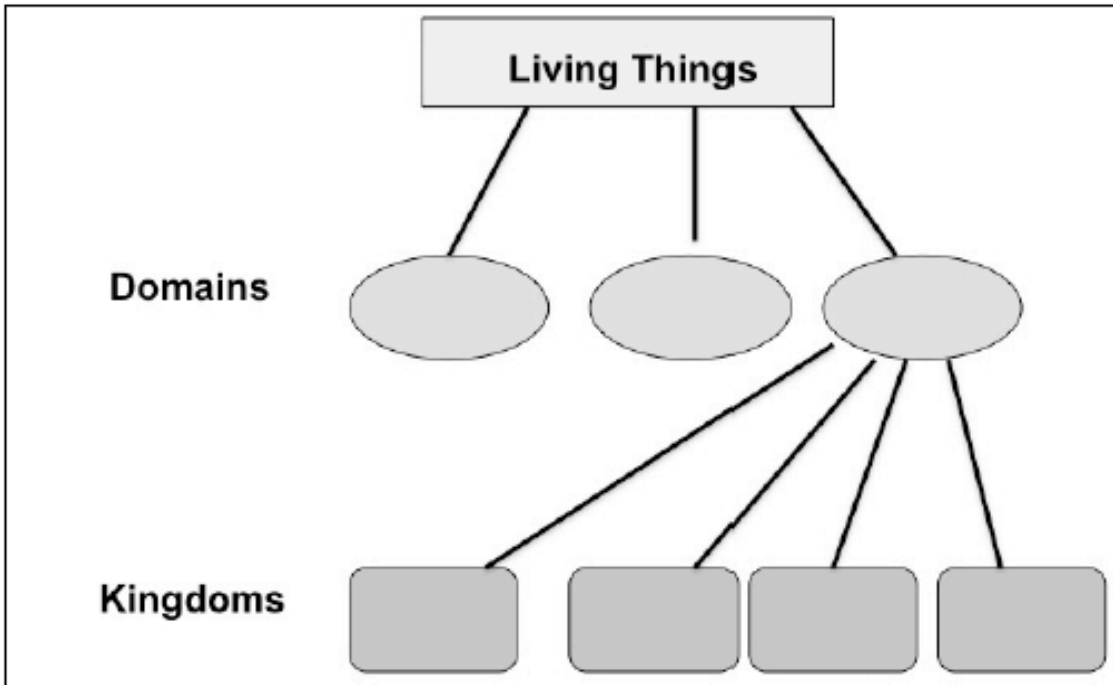
	What do you know for sure?	What might be true?
What can you figure out about Brianna?		
If you know that another student (who belongs in this chart) attends Washington Middle School, what else can you figure out about him or her?		
If you know that a student is in Grade 7 on this chart, what else can you figure out about him or her?		
A new 8th grader comes to Central Middle School. What other students might be in their homeroom?		

Could you move Michael to the same spot Terrence on the chart, since they are both in Homeroom 201? Why or why not?

Day 5 - Class Inclusion Activity

Student Worksheet 17: Class-inclusion Systems, Part 2

Ch. 7, Class-inclusion Systems, Part 2



Categories to be placed in the chart: **Protista, Bacteria, Fungi, Archaea, Animalia, Eukarya, Plantae**

After you have finished the chart, use it to answer the following questions:

1. If you know something is a protist, what else can you say about it?

2. If something is a member of the domain Eukarya, could it be a plant?

3. If something is an animal, could it be a member of the domain Archaea?

4. If something is a living thing, does it have to be an animal?

DAY 6

Chapter 7, Section 1: Sorting It All Out

We have chosen to begin the unit with Chapter 7 because instruction on classification provides a conceptual foundation for the lessons taught in the earlier portions of this text. After beginning the class with a warm-up, proceed with Chapter 7, Section 1 as you normally would teach it. Please pause on p. 165 for two visualization activities highlighting diagrams that appear on that page. Stop at the end of p.165 today.

Big Ideas

- Scientists classify organisms to help make sense and order of the many kinds of living things in the word.
- Taxonomy, the science of describing, classifying and naming living things, is based on shared characteristics across organisms.
- Scientists also use shared characteristics to hypothesize how closely related organisms may be.

Materials

Teacher:

1. Warm-up Day 6 - Cells_warmups.ppt
2. Slides - day06.ppt

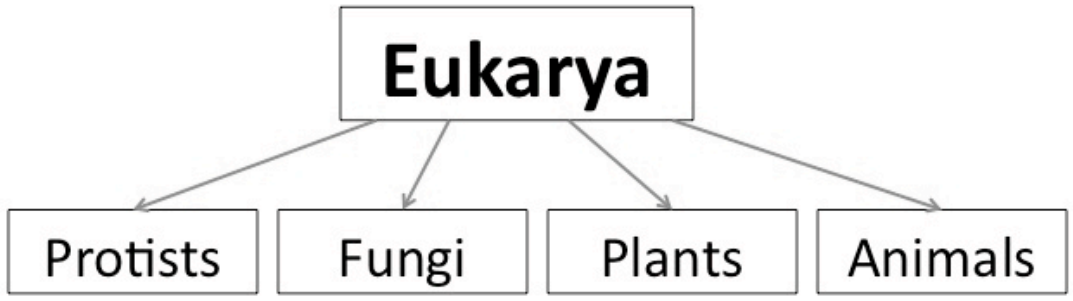
Students:

1. Holt textbook pages 164-165

Activities and Allotted time

5 minutes - Warm-up
30 minutes - Holt Ch 7, Section 1, p164-165
5 minutes - Visualization activity 7.3 regarding p165
5 minutes - Visualization activity 7.4 regarding p165

Day 6 - Warm-up



Several days ago, we examined the four families that fit into the domain Eukarya.

1. Which contains more organisms: the Eukarya domain or the Animal family?

2. Can an organism be an animal without also belonging in the domain Eukarya?

Answers:

1. The Eukarya domain is larger than the Animal kingdom. The Eukarya domain includes everything in the Animal kingdom as well as all Protists, Fungi and Plants.

2. No, if something is in the Animal kingdom it must also be part of the Eukarya domain. Teacher can provide hierarchy example that students can relate to, e.g. you can't live in the city of Philadelphia without also living in the state of Pennsylvania.

Purpose: This exercise helps students understand categorical hierarchy and reinforces the domains vs. kingdoms contrasting case. It also permits the teacher to catch any misconceptions students might have about the relationship between domains and kingdoms before they move forward in the chapter.

Exercise 7.3 (should be done after the introduction of the concept of branching diagrams)

Image Comprehension Focus: Labeling

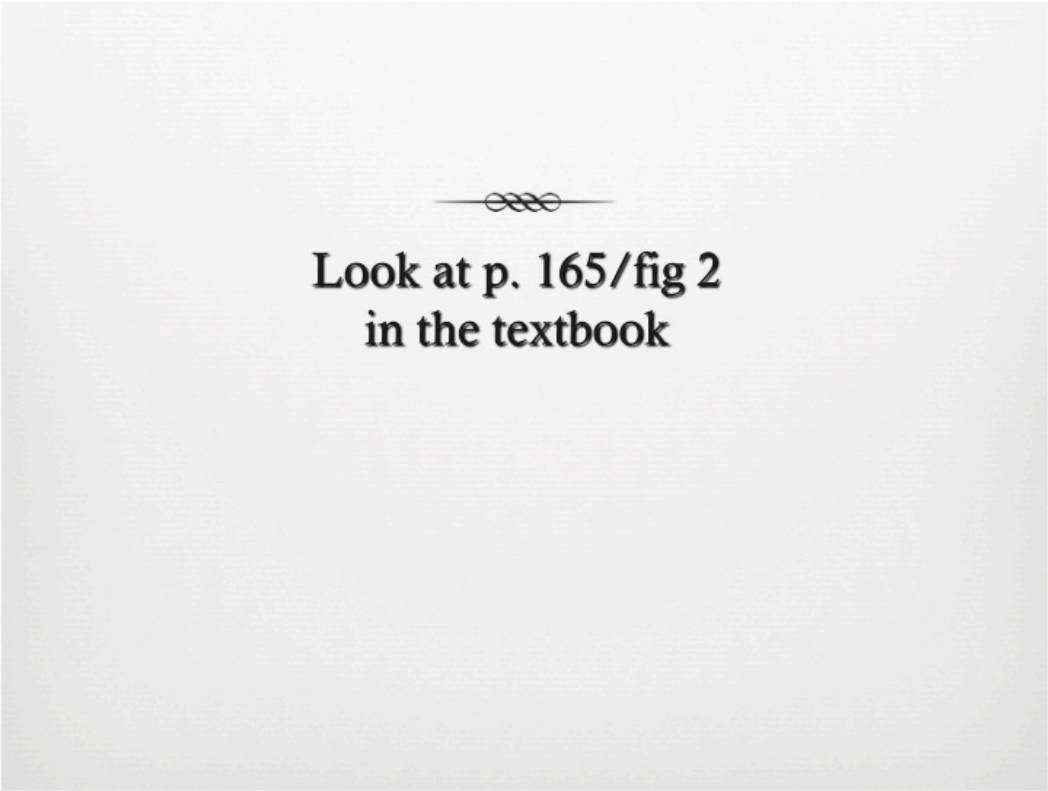
Goal: To develop an understanding of the role of different types of labels and their importance in image comprehension.

Type of Activity: Student Activity

Overview: This activity is designed to focus the students on the fact that there are different types of labels and that they perform different roles in an image. In addition, this activity is designed to highlight the important role labels play in understanding an image and to encourage students to always read the labels when looking at a diagram.

Procedure: First the teacher should describe that labels are short pieces of text or writing that occur inside a diagram and that they are very important to understanding a diagram. In addition, there are different types of labels, naming labels and explanatory labels. Naming labels identify or "name" parts of a diagram and explanatory labels provide more information about a particular part of a diagram.

Day 6 - Sorting It All Out



1) The teacher should direct the students to look at the image on p. 165/Fig 2 (branching diagram) [also shown on the next slide if the teacher wants to project it] and ask them to use the diagram to group the animals in the following categories: ability to purr, retractable claws, giving birth to live young, and hair and mammary glands. [Correct answers: ability to purr: cats, retractable claws: cats and lions, giving birth to live young: cats, lions, and bears, hair and mammary glands: all of them.]

2) The teacher should ask the students to find the naming labels in the image [platypus, brown bear, lion, and house cat] and the explanatory labels in the diagram [ability to purr, retractable claws, giving birth to live young, and hair and mammary glands].

3) The teacher should then guide the students to reflect that they needed to use the explanatory labels to understand the characteristics that are shared between the animals shown. The teacher should end the activity emphasizing the importance of reading labels in understanding diagrams.

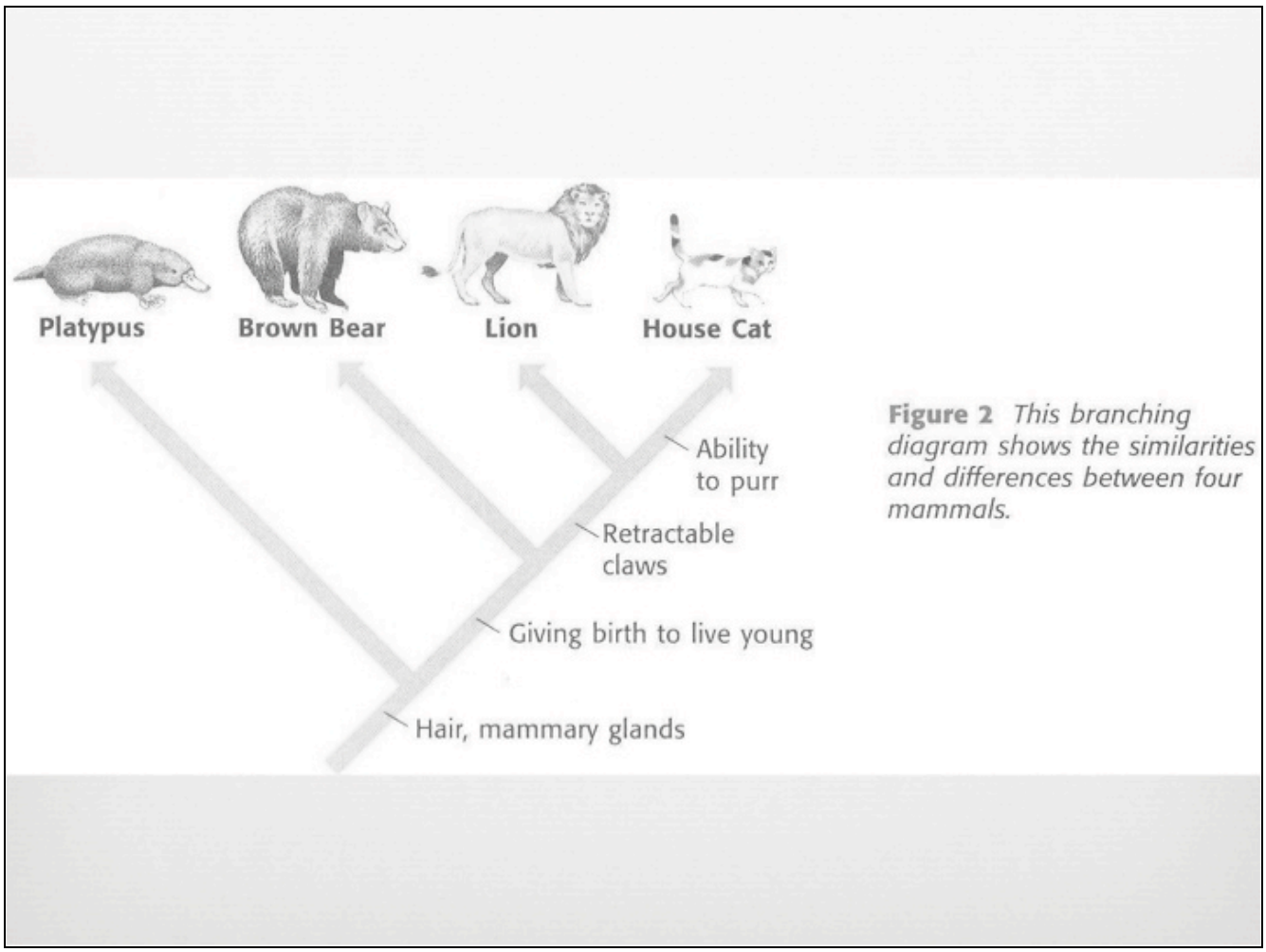
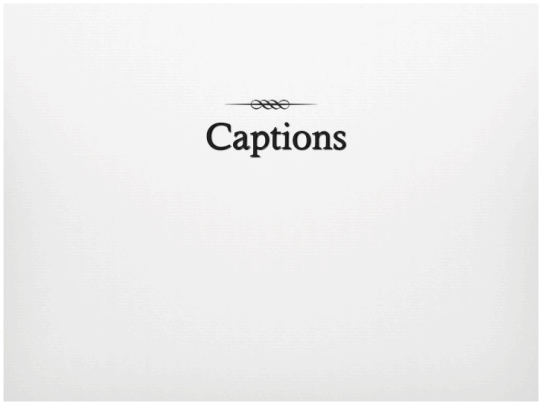


Figure 2 *This branching diagram shows the similarities and differences between four mammals.*

Project this slide during the visualization activity if you wish.



Exercise 7.4a (Should be done after labeling exercise related to branching diagrams but prior to a discussion of the levels of classification)

Image comprehension focus: Captions

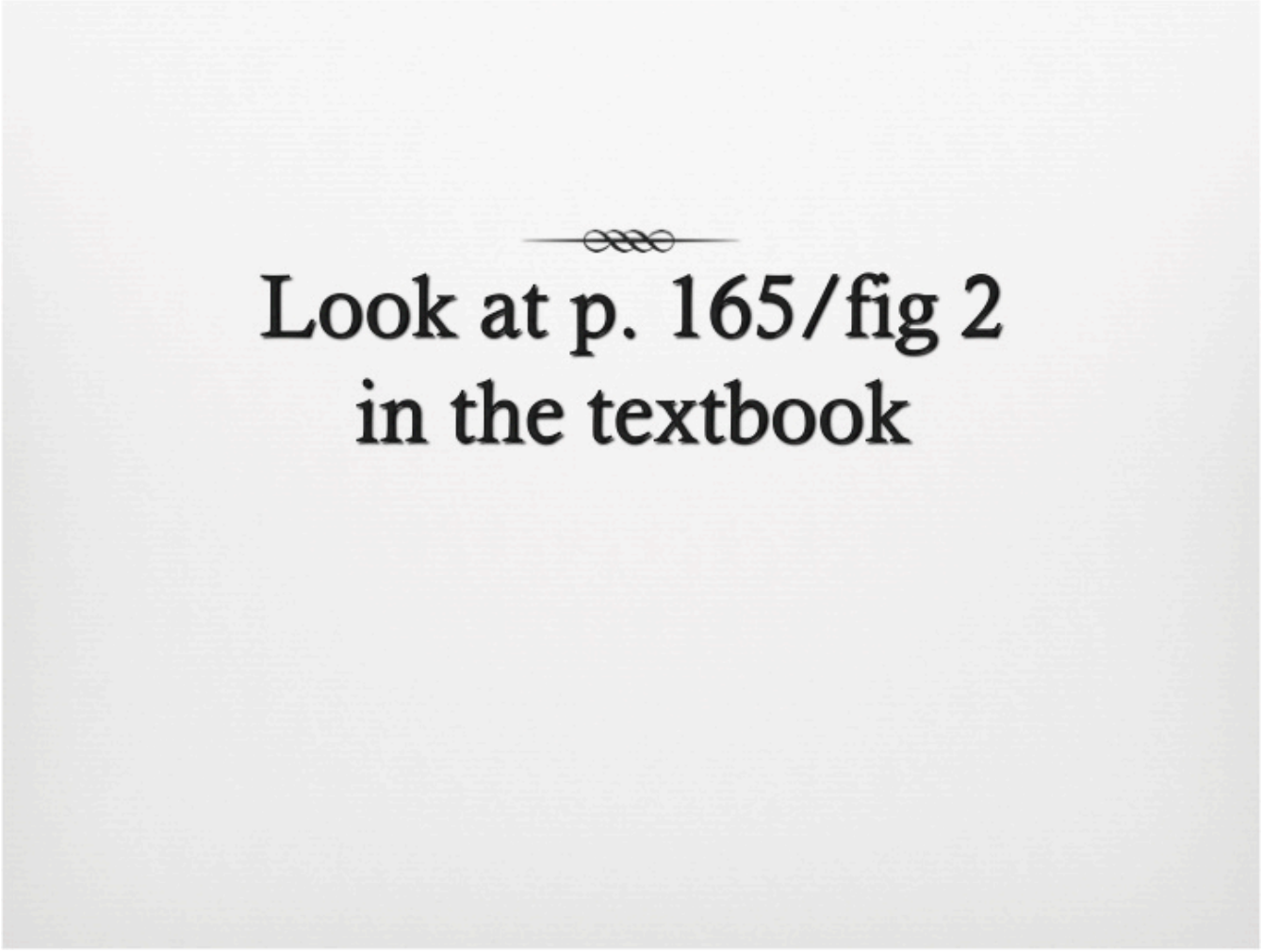
Goal: To identify what a caption is and to explain the role of captions in a diagram. In addition, to convey that captions are extremely important to consider when looking at an image since they often provide information that is crucial to understanding the diagram.

Type of Activity: Teacher comment

Overview: This activity is designed to help the students build an understanding of the role and importance of captions. An understanding of the important role captions play in images and the fact that they should always be read, even if the viewer thinks he/she knows what the image is depicting, will aid students in developing their image comprehension skills.

Procedure: First the teacher should indicate that a caption is the text that is outside an image. It is often below the image but can also be above or to the side. If the image has a figure name or other title, the caption will be the text next to that title. The teacher should also explain that captions have several uses including indicating what is important in an image and what part of the image to pay attention to. The teacher should also emphasize that captions should always be read even if the viewer thinks he/she knows what the image is illustrating. The teacher should also teach students to differentiate captions (often detailed; explain the general content of the whole diagram) from labels (usually short and concise; explain or name part of a diagram).

Day 6 - Sorting It All Out



Procedure: The teacher should again ask the students to look at p 165/Fig 2 (branching diagram-also shown on the next slide if you want to project it) and explain that the class is now going to examine the caption of the figure that was just examined. The teacher should indicate where the caption is (on the right hand side next to the figure number) and that it describes the function of the diagram (In this case, to determine the similarities and differences between four mammals).

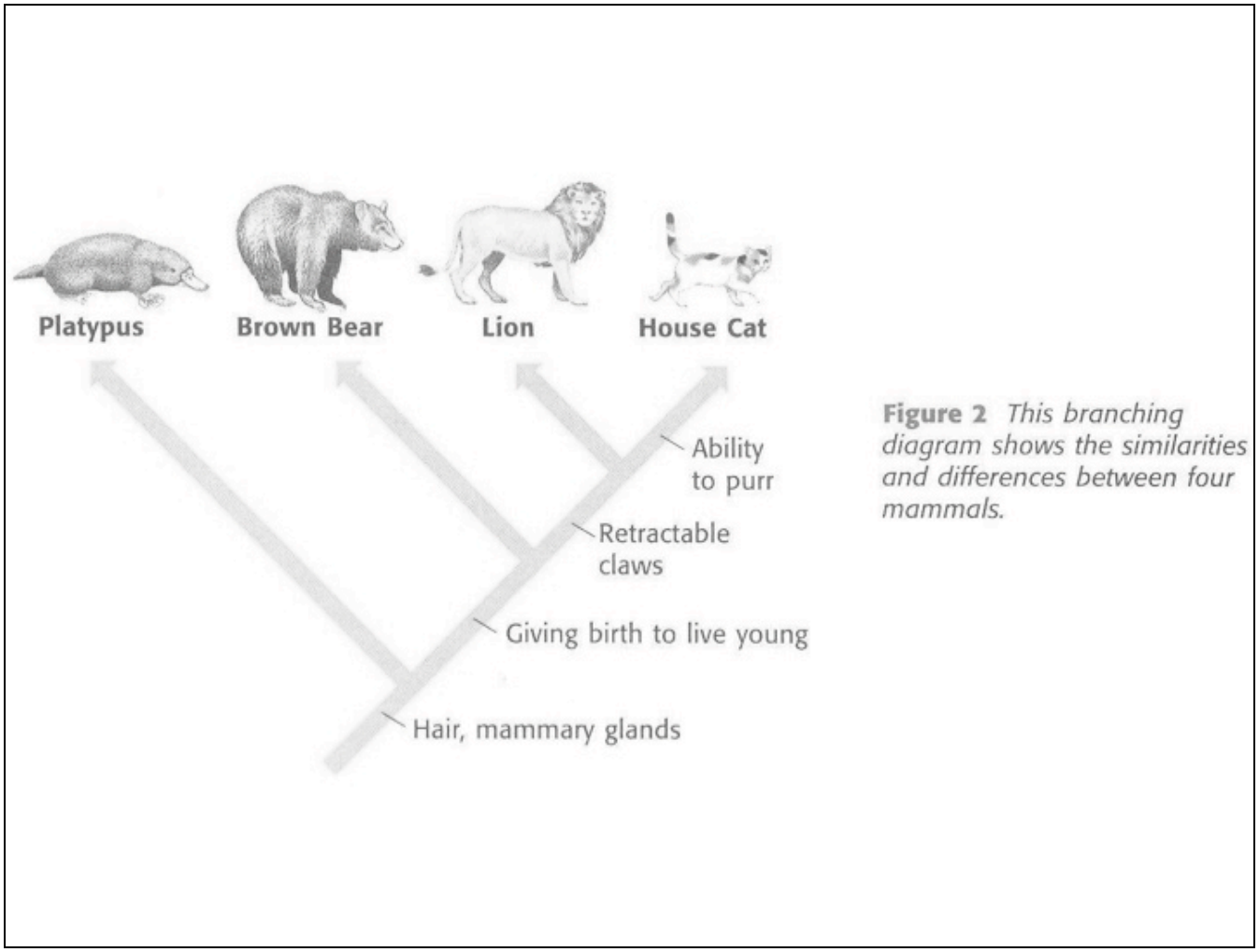


Figure 2 *This branching diagram shows the similarities and differences between four mammals.*

Project this slide during the visualization activity if you wish.

DAY 7

Chapter 7, Section 1: Sorting it All Out

After beginning the class with a warm-up, continue with Chapter 7, Section 1 as you normally would teach it. Please pause on p. 166 for two visualization activities highlighting diagrams that appear on that page. Begin on p.166 and stop at the end of p.167 today.

Big Ideas

- Scientists classify organisms to help make sense and order of the many kinds of living things in the world.
- Taxonomy, the science of describing, classifying and naming living things, is based on shared characteristics across organisms.
- Scientists also use shared characteristics to hypothesize how closely related organisms may be.

Materials

Teacher:

1. Warm-up Day 7 - Cells_warmups.ppt
2. Slides - day07.ppt

Students:

1. Holt textbook pages 166-167

Activities and Allotted time

5 minutes - Warm-up
30 minutes - Holt Ch 7, Section 1, p166-167
5 minutes - Visualization activity 7.5 regarding p166
5 minutes - Visualization activity 7.6 regarding p166

Day 7 - Warm-up

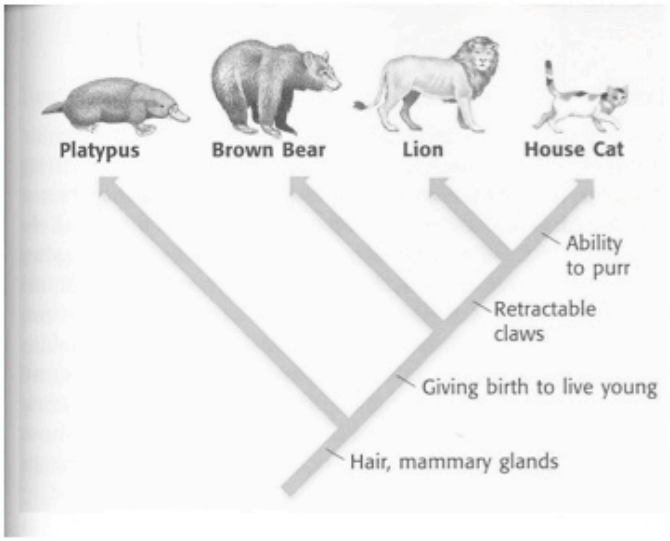


Figure 2 *This branching diagram shows the similarities and differences between four mammals.*

Refer to the diagram above to answer the following questions.

1.Is a lion more closely related to a brown bear or a house cat?
2.A brown bear and a lion are more similar in size, but a house cat and a lion are more similar in structure and shape. Which characteristics are more important when classifying organisms?

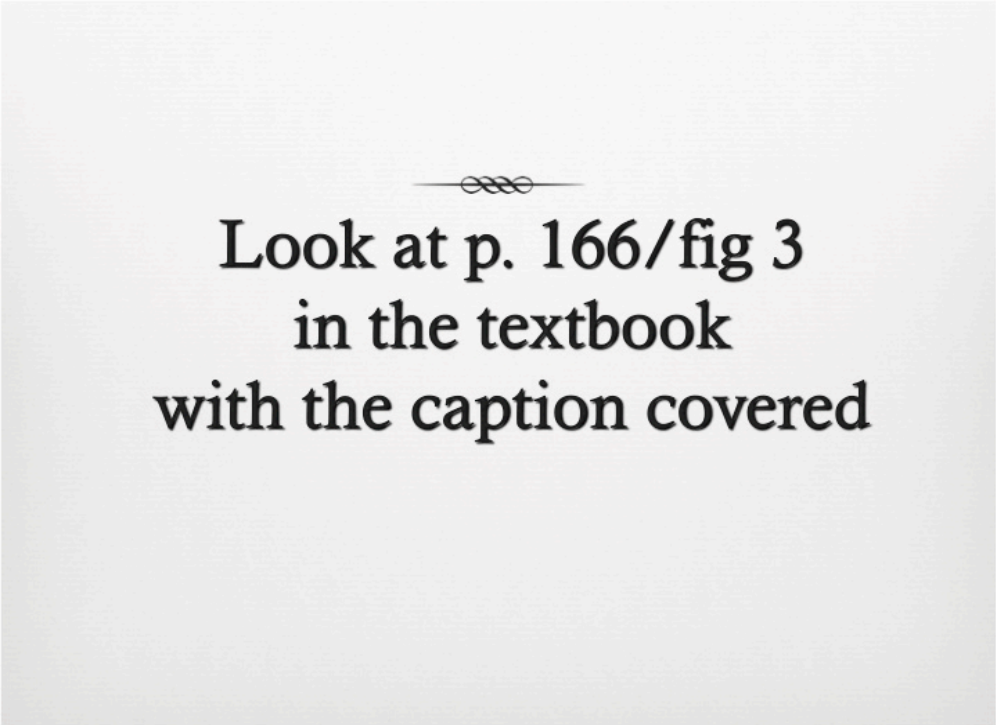
Answers:

1. A lion is more closely related to a house cat because they share more characteristics, which is illustrated by their placement farther along the branching diagram.

2. Structure and function are more relevant when classifying organisms than appearance. Two animals that don't look very similar might be closely related if they share characteristics like how their bodies are built, where they live, how they get around, how they obtain energy to stay alive, and how they reproduce.

Purpose: This exercise should reinforce students' practice with reading branching diagram and understanding of what it means to classify by function and structure.

Day 7 - Sorting It All Out



Exercise 7.4b

Image comprehension focus: Captions

Goal: To identify what a caption is and to explain the role of captions in a diagram. In addition, to convey that captions are extremely important to consider when looking at an image since they often provide information that is crucial to understanding the diagram.

Module Activity: Student Activity

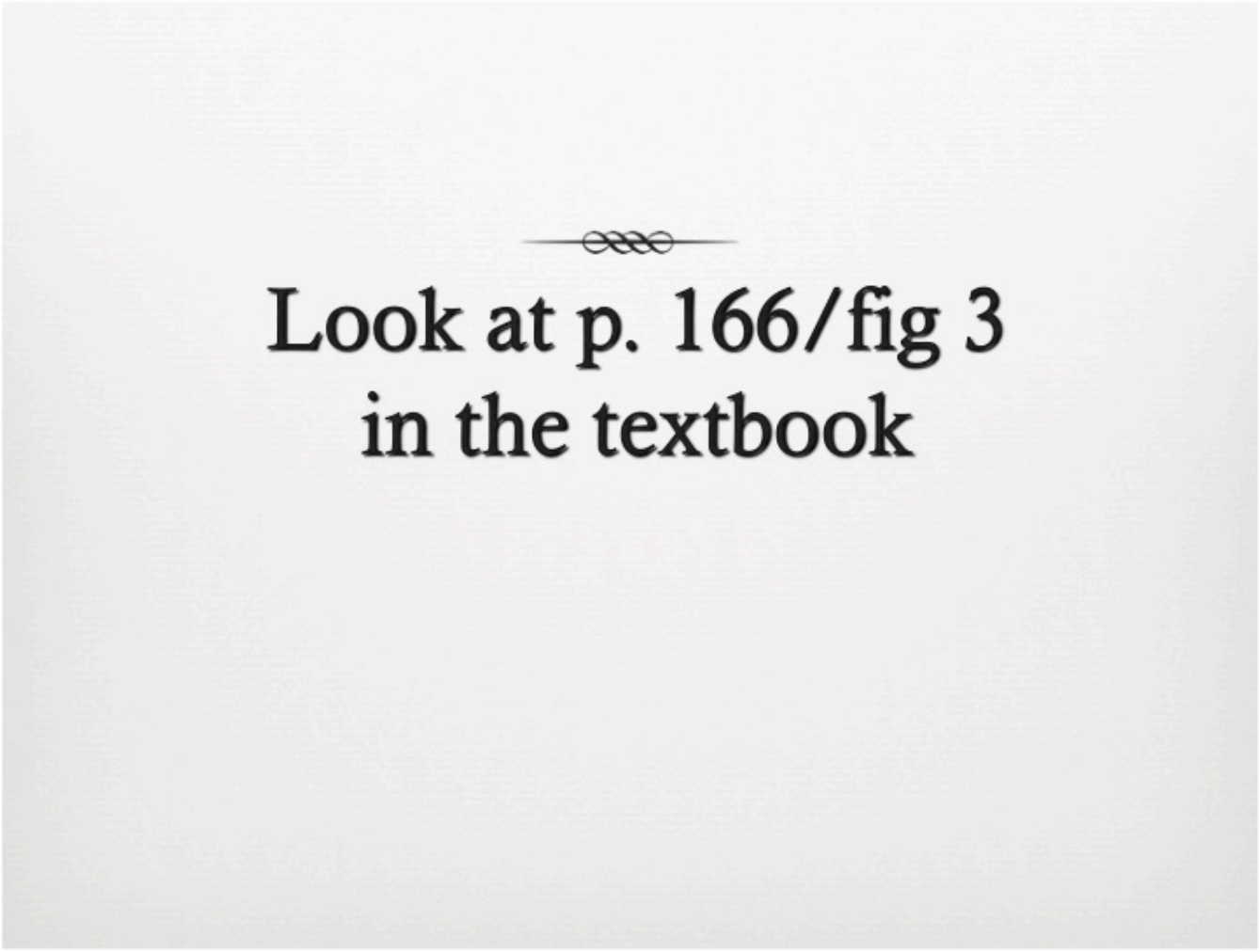
Overview: This activity is designed for students to practice the concepts raised in the teacher comment. The goal is to give them an experience that reinforces the importance of captions to encourage them not the skip them when viewing images.

Procedure: The teacher should ask the students to look at p. 166 (Fig 3) with the caption covered. [This image without the caption is displayed on the next page if you want to project it instead.] Next he/she should ask them to describe what the image illustrates. After recording the students' ideas, the teacher should proceed to the next image (the figure with the caption)

Day 7 - Sorting It All Out

Kingdom Animalia	Phylum Chordata	Class Mammalia	Order Carnivora	Family Felidae	Genus *Felis*	Species *Felis domesticus*
All animals are in the **kingdom Animalia.**	All animals in the **phylum Chordata** have a hollow nerve cord. Most have a backbone.	Animals in the **class Mammalia** have a backbone. They also nurse their young.	Animals in the **order Carnivora** have a backbone and nurse their young. They also have special teeth for tearing meat.	Animals in the **family Felidae** are cats. They have a backbone, nurse their young, have special teeth for tearing meat, and have retractable claws.	Animals in the **genus *Felis*** have traits of other animals in the same family. However, these cats cannot roar; they can only purr.	The **species *Felis domesticus*** is the common house cat. The house cat shares traits with all of the organisms in the levels above the species level, but it also has unique traits.
						

Project this slide during the visualization activity if you wish.



Procedure continued:

The teacher should ask the students to consider the same question while viewing the image with the caption visible. [The image is shown on the next slide if the teacher wants to project it.] After recording the students' ideas, the teacher can then ask the students to reflect on how the caption changed their understanding of the image. [The focus should include comparing the students' responses before and after the inclusion of the caption and examining if the students ideas changed at all with respect to either the content of their ideas or the level of detail.] The teacher should also note that the caption provided a context within which to understand the image (that it involves a hierarchy of classification levels). The teacher should conclude the activity by re-emphasizing the importance of captions and the vital role they play in understanding images.

Day 7 - Sorting It All Out

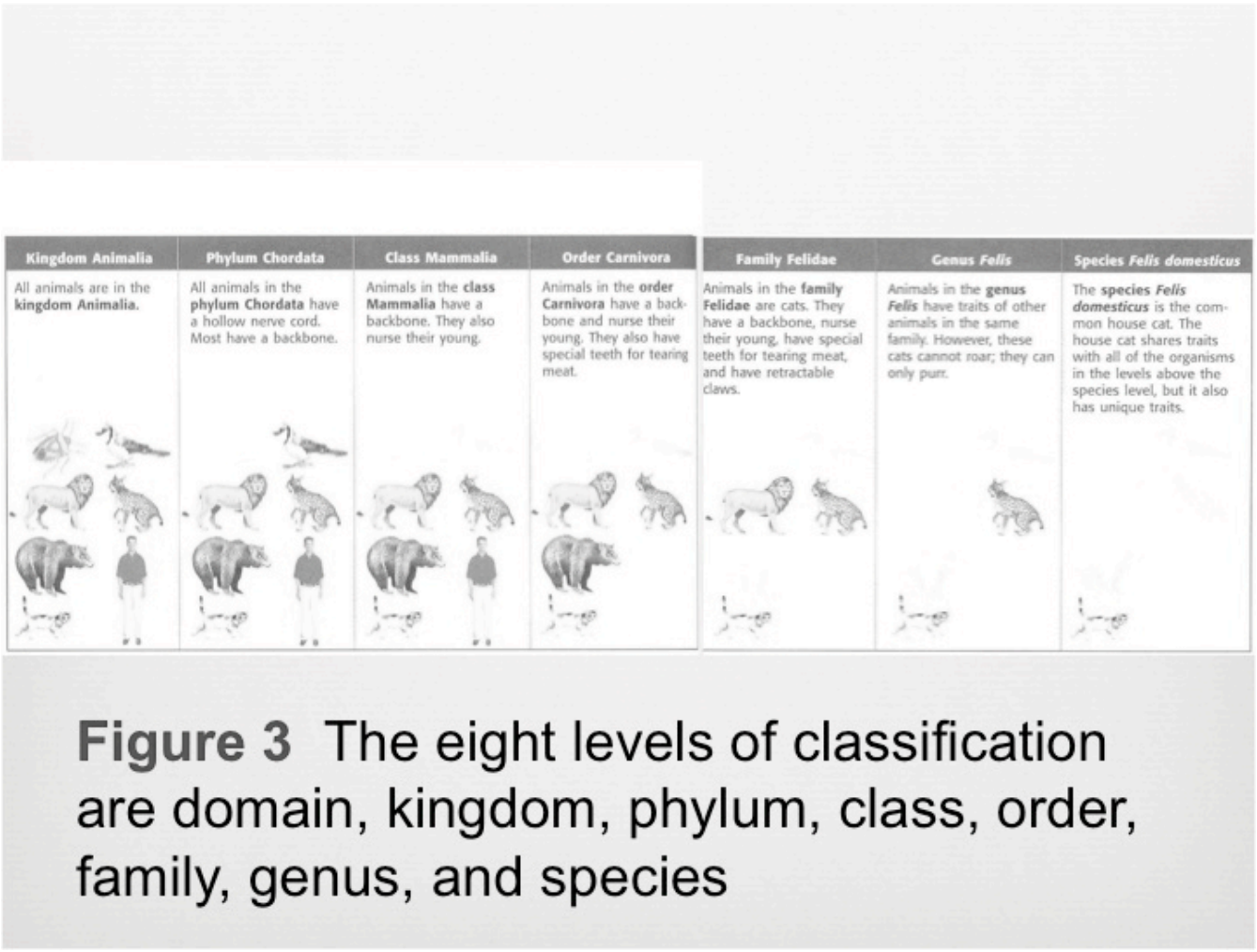


Figure 3 The eight levels of classification are domain, kingdom, phylum, class, order, family, genus, and species

Project this slide during the visualization activity if you wish.

DAY 8

Chapter 7, Section 1: Sorting it All Out

Information on Kingdoms and Domains was covered in detail in the contrasting cases at the start of this chapter. Additionally, if you have an older version of the Holt text, Chapter 7, Section 2 may reflect an out-of-date classification system. For these reasons, we are asking you to skip teaching Section 2 in this class. After beginning the class with a warm-up, continue with a review of Chapter 7, Section 1. You may use the section review if you wish, and/or the chapter review at the end of Chapter 7. During the review, try to relate back to the contrasting cases when appropriate. You may also use this day to catch up if any lessons have taken longer than expected.

Big Ideas

Review of all Big Ideas in Chapter 7.

Materials

Teacher:

1. Warm-up Day 8 - Cells_warmups.ppt

Students:

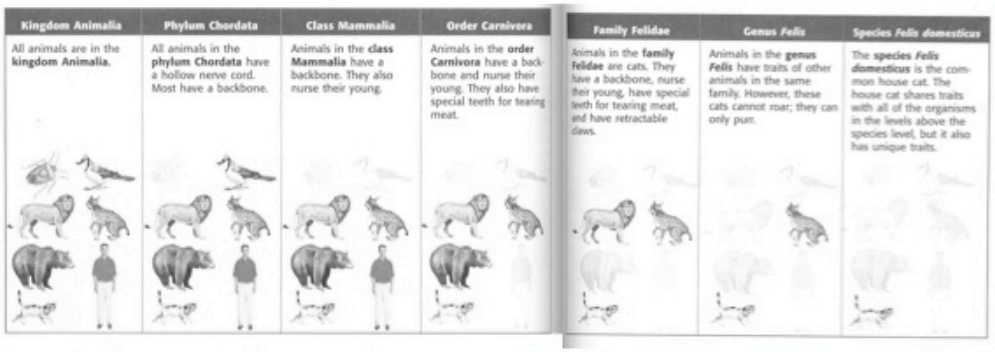
1. Holt textbook, Chapter 7, Section 1

Activities and Allotted time

5 minutes - Warm-up
40 minutes - Review of Chapter 7

Day 8 - Warm-up

Look at p166/fig 3 in the textbook to answer the following questions:



Kingdom Animalia	Phylum Chordata	Class Mammalia	Order Carnivora	Family Felidae	Genus *Felis*	Species *Felis domesticus*
All animals are in the **kingdom Animalia.**	All animals in the **phylum Chordata** have a hollow nerve cord. Most have a backbone.	Animals in the **class Mammalia** have a backbone. They also nurse their young.	Animals in the **order Carnivora** have a backbone and nurse their young. They also have special teeth for tearing meat.	Animals in the **family Felidae** are cats. They have a backbone, nurse their young, have special teeth for tearing meat, and have retractable claws.	Animals in the **genus *Felis*** have traits of other animals in the same family. However, these cats cannot roar; they can only purr.	The **species *Felis domesticus*** is the common house cat. The house cat shares traits with all of the organisms in the levels above the species level, but it also has unique traits.

1. What do a house cat and a lion have in common? List as many traits as you can.
2. What do a house cat and human have in common?

Answers:

1. They are cats, they have a backbone, they nurse their young, they have special teeth for tearing meat, and they have retractable claws.

2. They have a backbone and they nurse their young. (If the students guessed from the class name that they are both mammals, encourage them for using deductive skills!)

Purpose: This exercise reinforces the idea that organisms within any taxonomic group share certain characteristics, and the further down the taxonomic system you go the more they have in common. Point out to students that some of the traits shared by humans and cats are the same traits shared by lions and cats, but lions and cats have some additional traits in common that humans do not have. It also gives students practice reading diagrams.

DAY 9

Chapter 7 Review and Embedded Assessment 1

After today's warm-up, you may continue reviewing material from Chapter 7 or catching up on anything missed. Please allow 15-20 minutes for the embedded assessment, depending on the needs of your class.

Big Ideas

Review of all Big Ideas covered in Chaper 7.

Materials

Teacher:

1. Warm-up Day 9 - Cells_warmups.ppt

Students:

1. Holt textbook, Chapter 7
2. Embedded Assessment #1

Activities and Allotted time

5 minutes - Warm-up
20 minutes - Holt Ch 7 review
20 minutes - Embedded Assessment #1

Day 9 - Warm-up

The scientific name for a **lion** is *Panthera leo*.

The scientific name for a **leopard** is *Panthera pardus*.

The scientific name for a **wildcat**, the ancestor of house cats, is *Felis silvestris*.

Use the information to the left to answer the following questions.

1.What is the genus name of a lion?

2.Is a lion more closely related to a leopard or a wildcat?

3.How can you tell?

Answers:

1.A lion belongs in the genus *Panthera*. You can tell from its scientific name.

2.A lion is more closely related to a leopard than a wildcat.

3.An organism's scientific name is composed of the genus and species names of that organism. Lions and leopards belong in the genus *Panthera*, while the wildcat belongs in the genus *Felis*. Organisms in the same genus are more closely related to each other than to organisms outside of their genus.

Purpose: This exercise gives students practice working with scientific names and deriving information from them. It also reinforces the idea that organisms within a classification group share more traits and are more closely related than organisms outside of that classification group.

Day 9 - Embedded Assessment

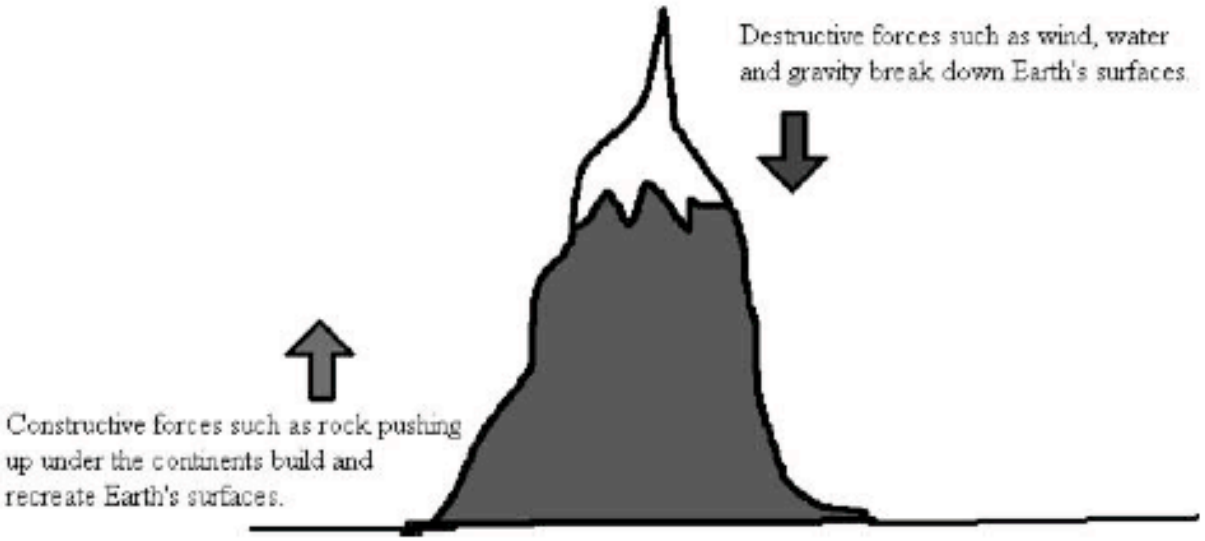
Embedded Assessment #1 - Answer Key

Embedded Assessment 1: Classification

Please select the best answer to each question.

1. Members of kingdom Animalia depend on bacteria and fungi because bacteria and fungi:
    a. do not perform photosynthesis.
    b. recycle nutrients in dead organisms.*
    c. use sunlight to produce sugar.
2. The scientific name for the polar bear is *Ursus maritimus*. What is its specific name?
    a. *Ursus*
    b. *maritimus**
    c. Polar bear
3. The two parts of a scientific name are the names of the genus and the:
    a. specific name.*
    b. phylum name.
    c. Family name.
4. Scientists classify organisms by:
    a. Arranging the organisms in orderly groups.*
    b. Giving the organisms many common names.
    c. Deciding whether the organisms are useful.
5. The organisms in what kingdom usually move by themselves and have specialized sense organs that allow them to respond to their environment?
    a. Fungi
    b. Plantae
    c. Animalia*

6.



Based on the diagram above, what force does **NOT** contribute to the breaking down of Earth's surfaces?

a. Force of wind
b. Force of rock pushing up*
c. Force of water
d. Force of gravity

Please answer the following question using complete sentences.

7. Scientists used to classify organisms as either plants or animals. Why doesn't that classification system work?

Sample answer: Some organisms, such as slime molds and mushrooms, have characteristics that neither plants nor animals have. As a result, additional kingdoms and domains were added to the classification system.

DAY 10

Chapter 7 - Flex Day

About Flex Days: These days are built into the schedule at the end of each chapter. If you cannot teach all of the material from the previous days during this chapter, you can teach the "overflow" material during the flex day. In times where the flex day does not need to be used to cover previous material from the chapter, we provide a suggested optional activity. You can also use this day to review the embedded assessment and reteach any material that seemed especially challenging for students.

Materials

Teacher:

1. Warm-up Day 10 - Cells_warmups.ppt

Students:

1. Graded embedded assessments (optional for review)
2. Holt Chapter 7

Activities and Allotted time

5 minutes - Warm-up
40 minutes - Review or catch up
Optional activity - Shape Island (textbook p176-177)

Day 10 - Warm-up

Dichotomous keys are not just useful in science class. They can help you identify animals you might see in the wild. Using the dichotomous key on p.168 in your textbook, determine the name of this animal.

Answer: This animal is an opossum. Students should have followed the following path: 1.b. This mammal does not fly. Its "hand" does not form a wing. 2.a. This mammal has no hair on its tail. 3.b. This mammal has a long, naked tail. 5.b. This mammal has a tail that is not flat or paddle shaped.

Purpose: This exercise lets students practice using a dichotomous key, this time with a photograph of a real animal instead of a cartoon. It also helps prepare students for our diagram vs. real visualization lesson, which explains that diagrams may not be realistic (like the animal drawings originally used in the dichotomous key activity) but are designed to capture key aspects of an object or process.