DAY 23

Contrasting Cases - Compare Plant and Animal Cells

This lesson provides an introduction to types of cells through the presentation of examples of plant cells and animal cells. By comparing and contrasting examples of each type of cell, then comparing the key characteristics of each type of cell across types, students should develop a foundation for understanding what makes each type of cell unique while also laying a foundation for the characteristics common across cells. The contrasting case serves as an introduction to cells and thus precedes all work in the Chapter 1.

Today you will introduce students to the concept of cells, complete a visualization activity regarding cut-away images, and have students compare two images of an animal cell. Tomorrow you will introduce plant cells.

Big Ideas

- A cell is made of many parts, called organelles, each of which addresses a specific need or needs of the cell.
- Not all cells have the same organelles; the requirements of the organism help determine which organelles its cells have.

Materials

Teacher:

1. Slides - day23.ppt
2. Warm-up Day 23 - Cells_warmups.ppt

Students:

1. Cells web (WS 29; student resource p43)
2. Animal Cell Worksheet (WS 30; student resource p44)

Activities and Allotted time

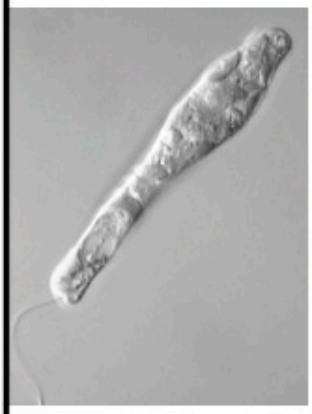
5 minutes - Warm-up
15 minutes - Introduction to Cells (follow day23.ppt, slides 1-8)
5 minutes - Visualization focus - Cut-away Convention (Slide 9)
20 minutes - CC - Animal Cells (Slide 10)

Day 23 - Warm-up

Recall the Kingdom specimen cards used in Chapter 7.

Euglena

Protist



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

Tyrannosaurus rex

Animal

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

Based on these cards, what do the euglena and the Tyrannosaurus rex have in common?

Answer: Both are made of a cell/cells with a nucleus; both move; both require food/energy; and both reproduce.

Purpose: This exercise revisits the Chapter 7 specimen cards to reinforce the idea that all living things are made of cells. It also highlights a number of the other basic qualities common to all living organisms. Even though these two organisms accomplish their necessary processes by very different means, they're both alive and thus have the same essential needs and qualities that are common to all living things. The contrast between two very dissimilar organisms emphasizes that all organisms share a certain set of basic qualities.

Day 23 - Introduction to Cells

Heads up on student learning

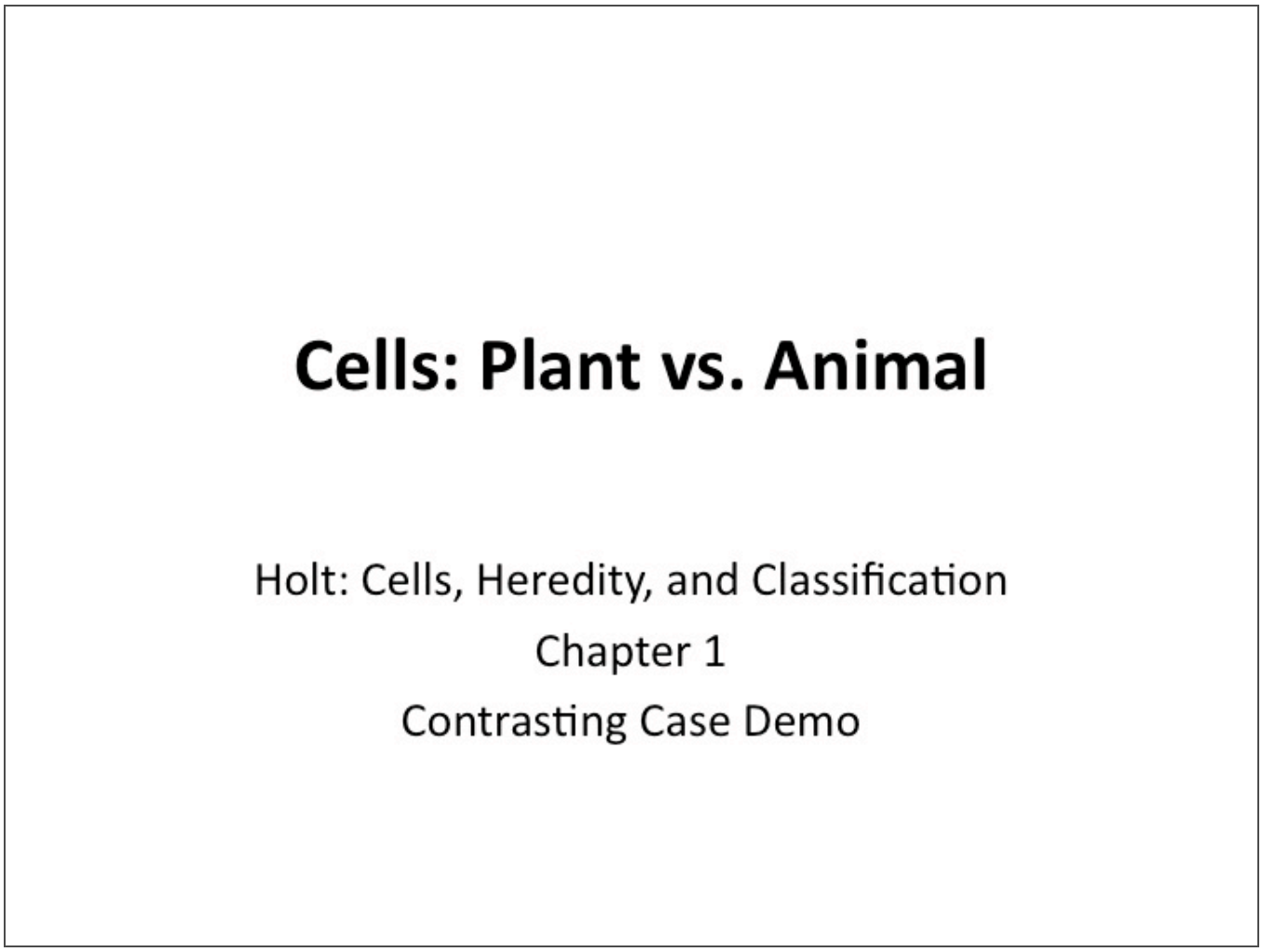
Middle school students have probably heard the names of a number of small particles that make up various kinds of matter—cells, molecules, atoms, electrons, quarks, and so forth—but there is little in their everyday experience that can help them sort these out. A particularly common confusion is between cells and molecules. Although most cells are very small and can't be seen by the naked eye, molecules are much smaller. Cells are made of molecules, which, in turn, are made of atoms. A cell is the smallest unit that can perform all of the functions that support life. Molecules are not alive. Both cells and non-living things are made of molecules.

In later science units, students will learn about even smaller particles when they are introduced to atomic theory. Molecules are made of atoms, which, in turn, are composed of even smaller particles like protons, neutrons, and electrons. The fact that both cells and atoms have a nucleus is an additional source of confusion. If you detect that students in your classroom are confusing the nucleus of a cell with the nucleus of the atom, make a point of explaining that, although the same word is used, they are not the same. Cells and their nuclei are much larger that atoms and their nuclei.

Because small structures like cells and molecules can't be seen directly, we must either use tools that magnify them many times or we must represent them using models, drawings, and diagrams. However, these representations use many conventions and techniques that are not well understood by many students. As a result, students tend to ignore the graphics they encounter in science materials. Because so much important information is conveyed through visual representations, this impedes the learning process. The inability to decode and interpret images, diagrams, and other graphic representations also impairs students' ability to perform well on tests and assessments that use these devices.

Throughout this unit, there are visualization activities designed to help students meaningfully decode these representations. These activities address skills such as interpreting relative scale and levels of magnification, understanding the use of color, and recognizing conventions such as three-dimensional cut-aways and zoom-outs.

Day 23 - Introduction to Cells



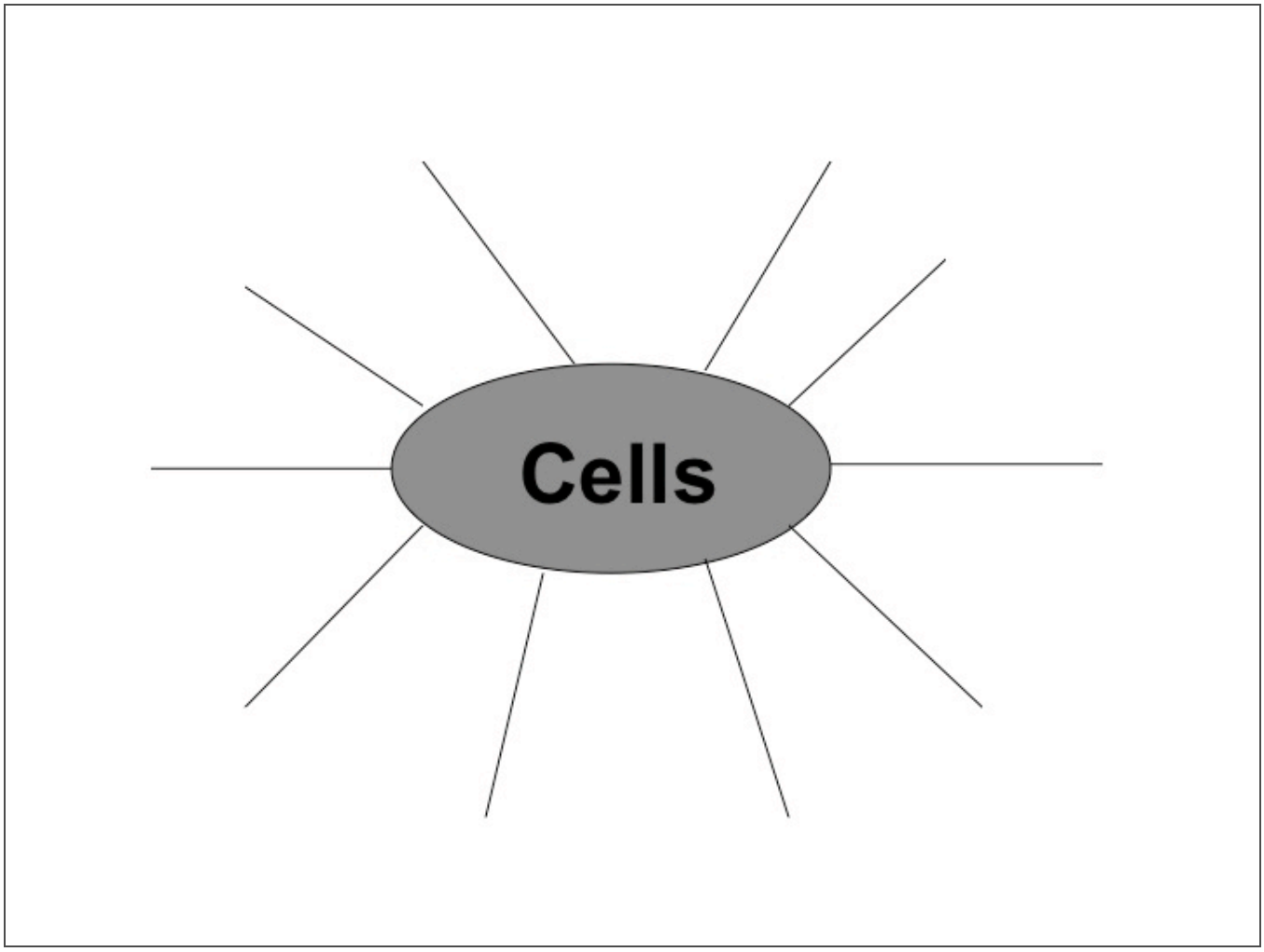
Total time = 40 minutes

Day 23 - Introduction to Cells

Introduction (5 minutes):

What do you know about cells? (can write or project this on the board)

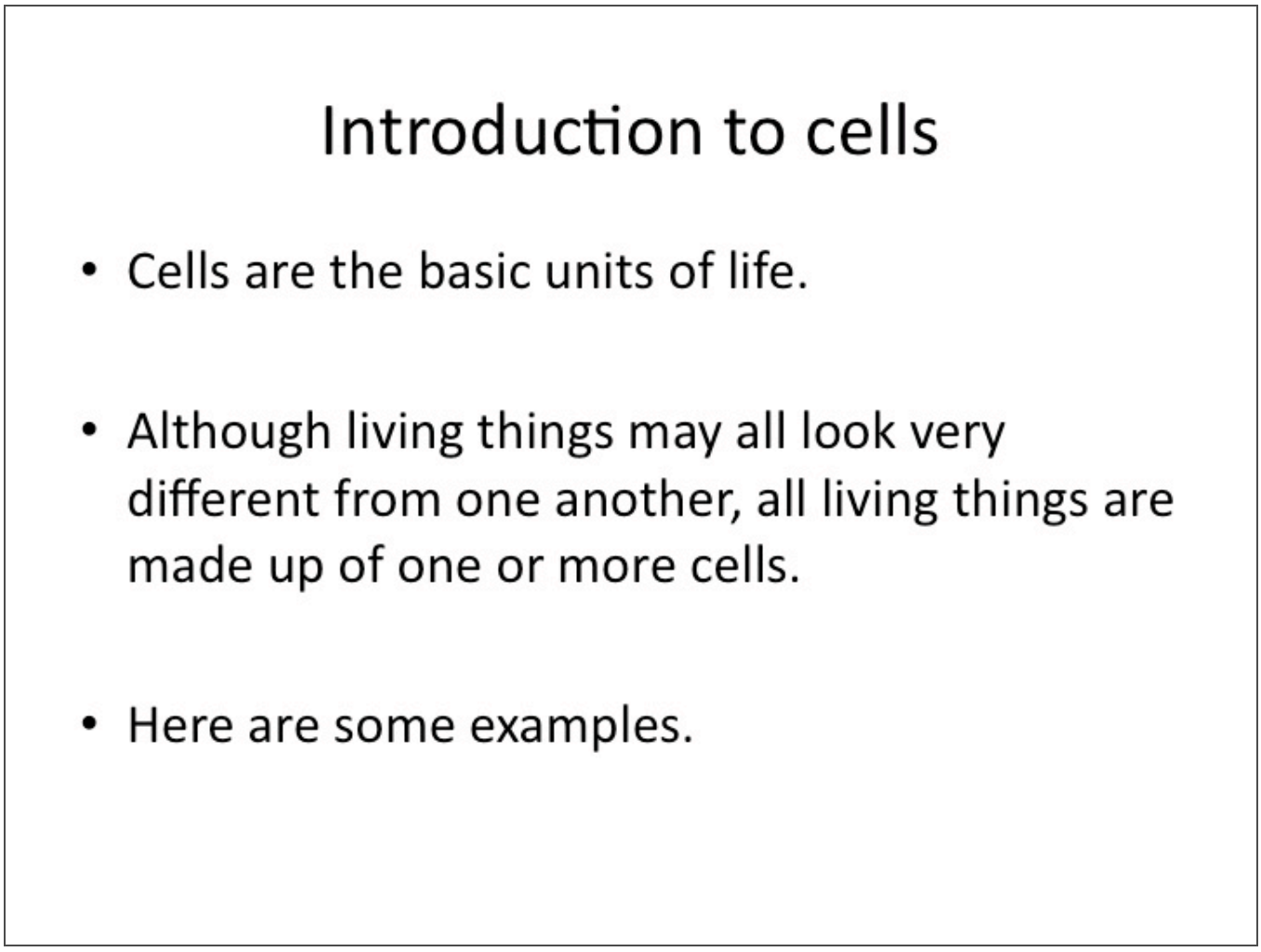
Day 23 - Introduction to Cells



At the beginning of class, have a blank "web" (a sheet with the concept of 'Cells' in the center, and with ~10 branches stemming from it) available for each student to complete.

Instruct students to take 2-3 minutes to write anything they know (or think) about cells on each branch.

Day 23 - Introduction to Cells



Review briefly:

Cells are the basic units of life.

All living things are made up of one or more cells, even though they (the living things) may look very different.

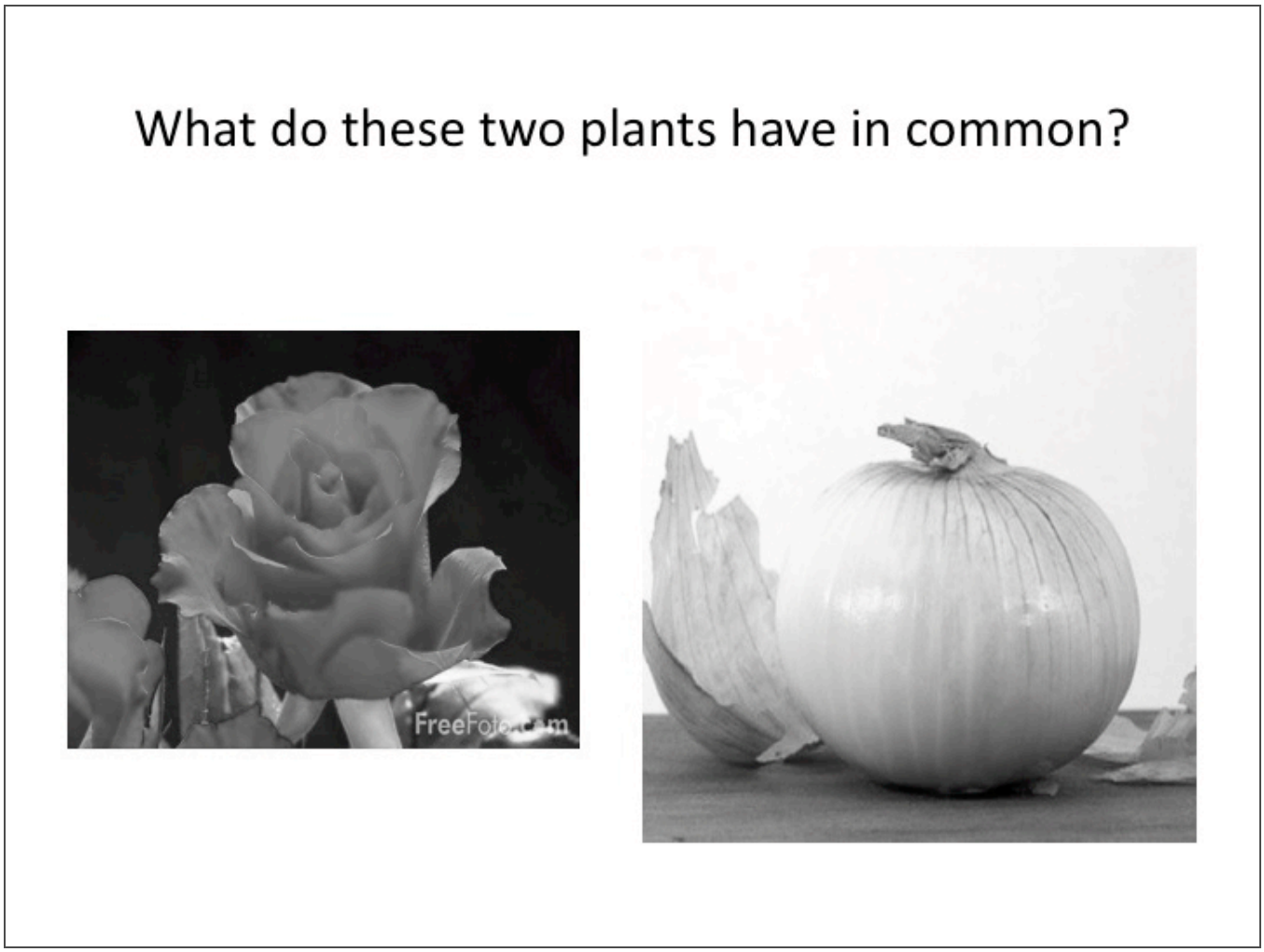
Day 23 - Introduction to Cells

What do these two animals have in common?

Examples:

Pictures of a guinea pig and Ben Savage (a human being): What do these two animals have in common? (Note: Visualization issue: relative size/scale. You may want to mention to students that the images are not drawn to scale in relation to their "real-life" sizes. Images often have different scales or levels of magnification.)

Day 23 - Introduction to Cells

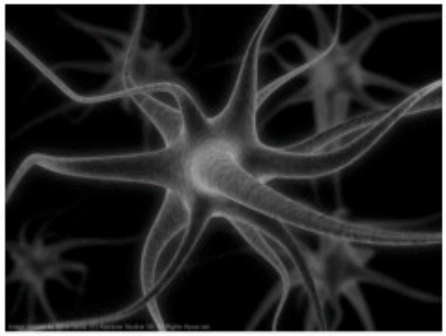


Pictures of a rose and an onion: What do these two plants have in common?

These pictures were chosen as examples because the two instances of animal and plant look very different from one another, but both are animals (or both plants), living things, and multicellular organisms. The main reason for these photos is to highlight that all of these organisms are made up of cells.

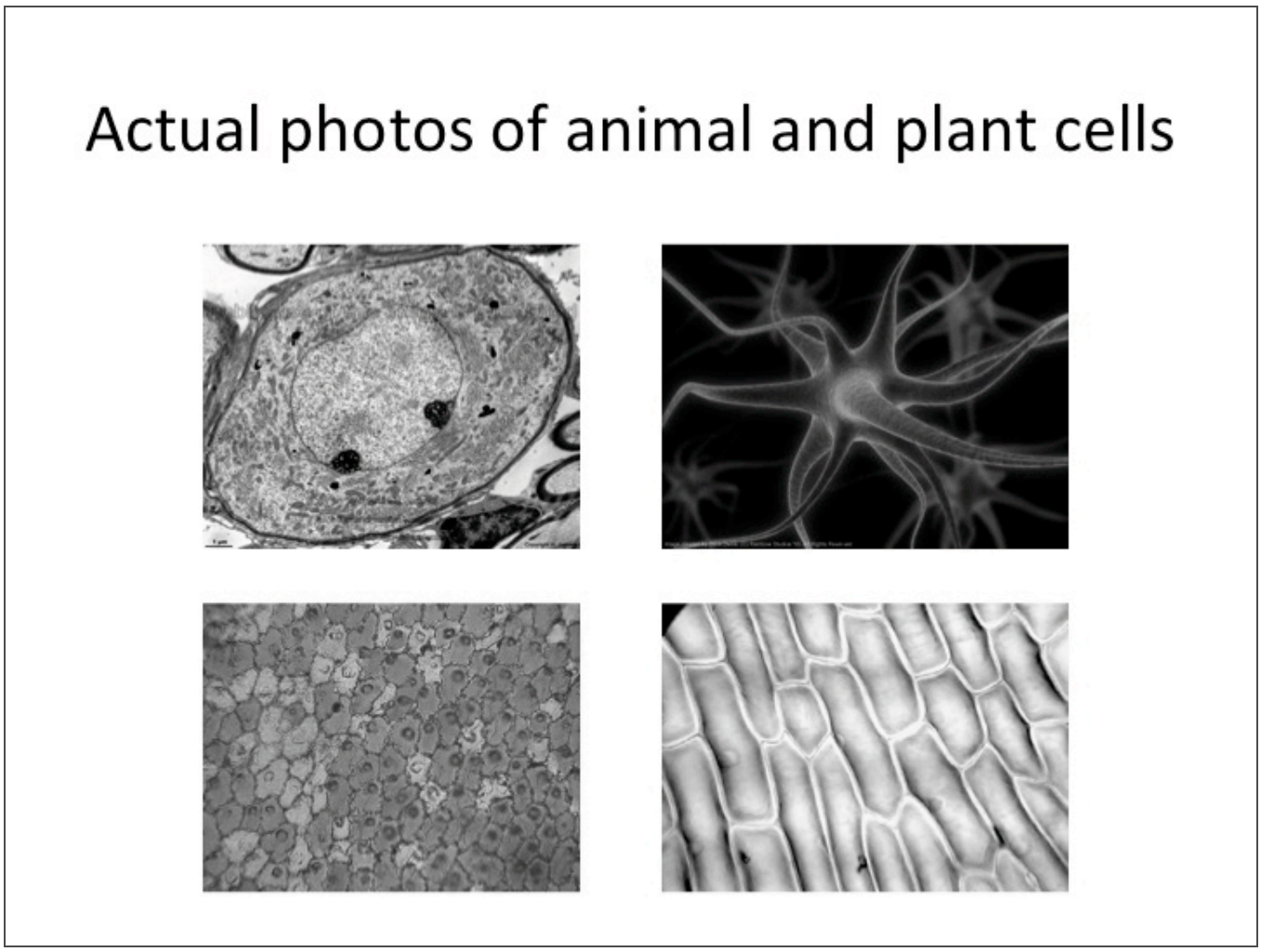
These were also chosen because we could find pictures of actual cells from these organisms.

All of the previous four living things are made of many tiny cells.



- On the next slide, you will see photographs of actual cells, including the brain cell to the left.
- A single cell is too small to see with just your eyes. These photographs have been taken through a microscope, which make the cells look thousands of times larger than they really are.
- The colors you will see may not be the real colors of the cell, as colors are added to make different parts easier to see under the microscope.

Day 23 - Introduction to Cells



Examples of pictures of "real life" cells:

Top row (L to R): guinea pig cell from the retina (eye), human neuron (brain cell)

Bottom row (L to R): rose petal cells, onion cells

Keep in mind that each of these images are shown at different magnifications, and their sizes relative to one another may not be accurate in these photos.

Day 23 - Introduction to Cells

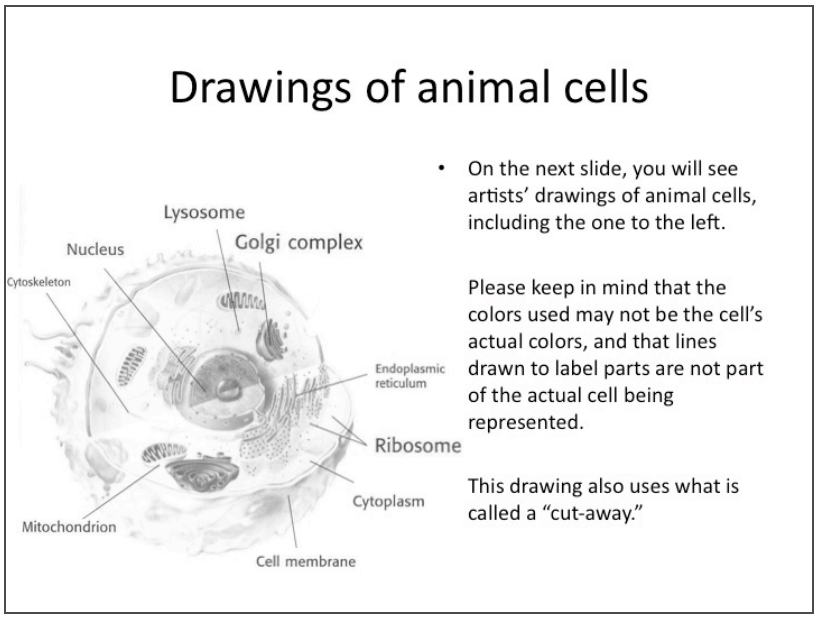


Image Comprehension Focus: Cut-away convention

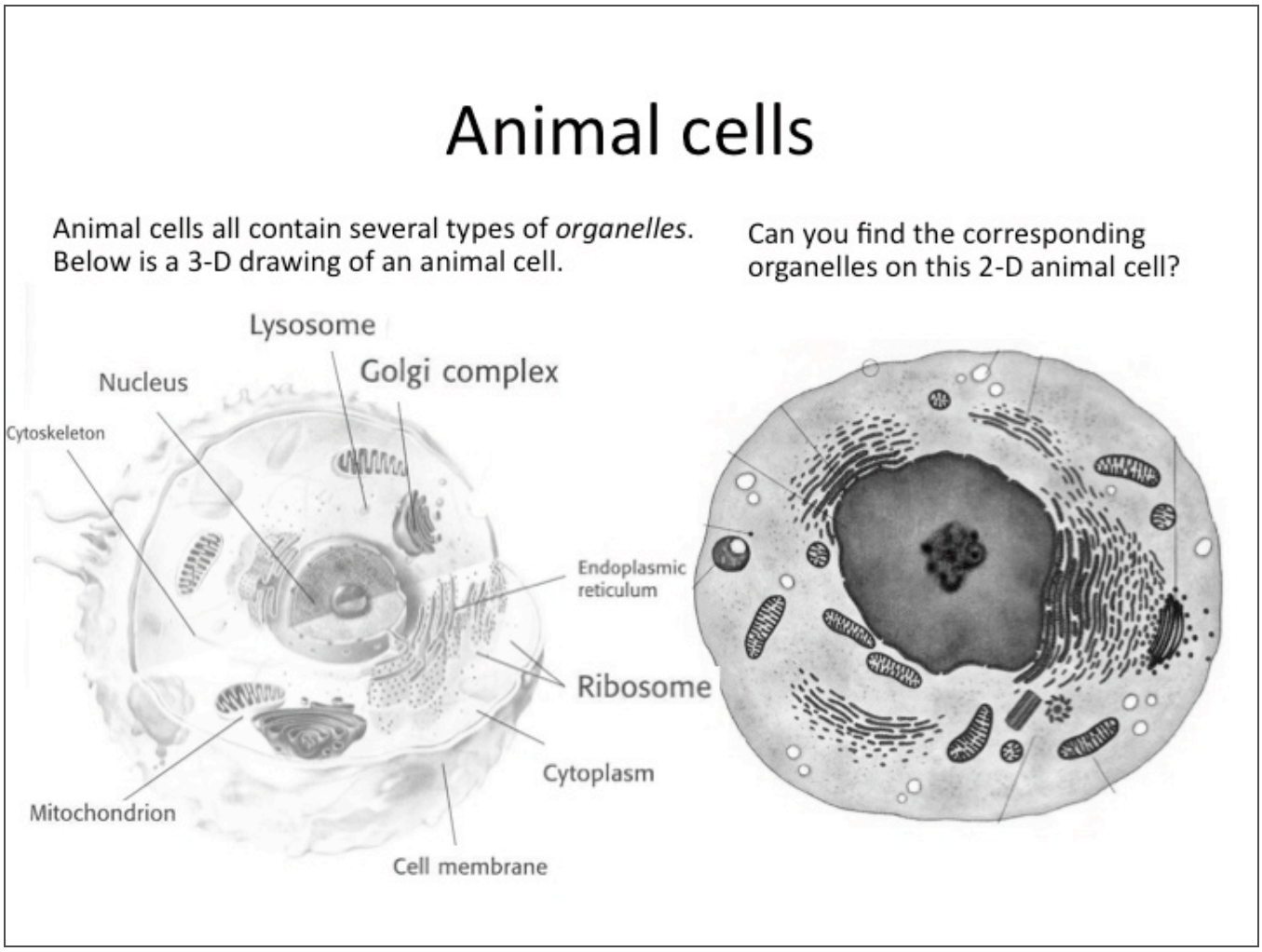
Goal: Identify what a "cut-out" convention is and the signals that this type of perspective is being used in a diagram.

Sometimes images use conventions that show you are looking at an object in a particular way. It is important to be able to recognize these conventions when you are looking at images/diagrams because it will help you understand them. In this drawing, the cell is shown as if we made a cut into it and removed a section so we can see the inside. A clue to the use of this type of convention is that we can simultaneously see the surface (in this case, the outside of the cell) and the inner portions (in this case, the nucleus, membrane, and organelles). Analogy: cutting a section out of an apple so you can see both the skin on the outside and the flesh and seeds on the inside at the same time.

The teacher should conclude this activity by emphasizing the importance of understanding when this type of convention is used because it will help the viewer to understand what the image is illustrating.

NOTE: Another option is for the teacher to demonstrate this perspective by actually cutting a section out of an apple with a plastic knife to give the students a concrete example.

Day 23 - Introduction to Cells

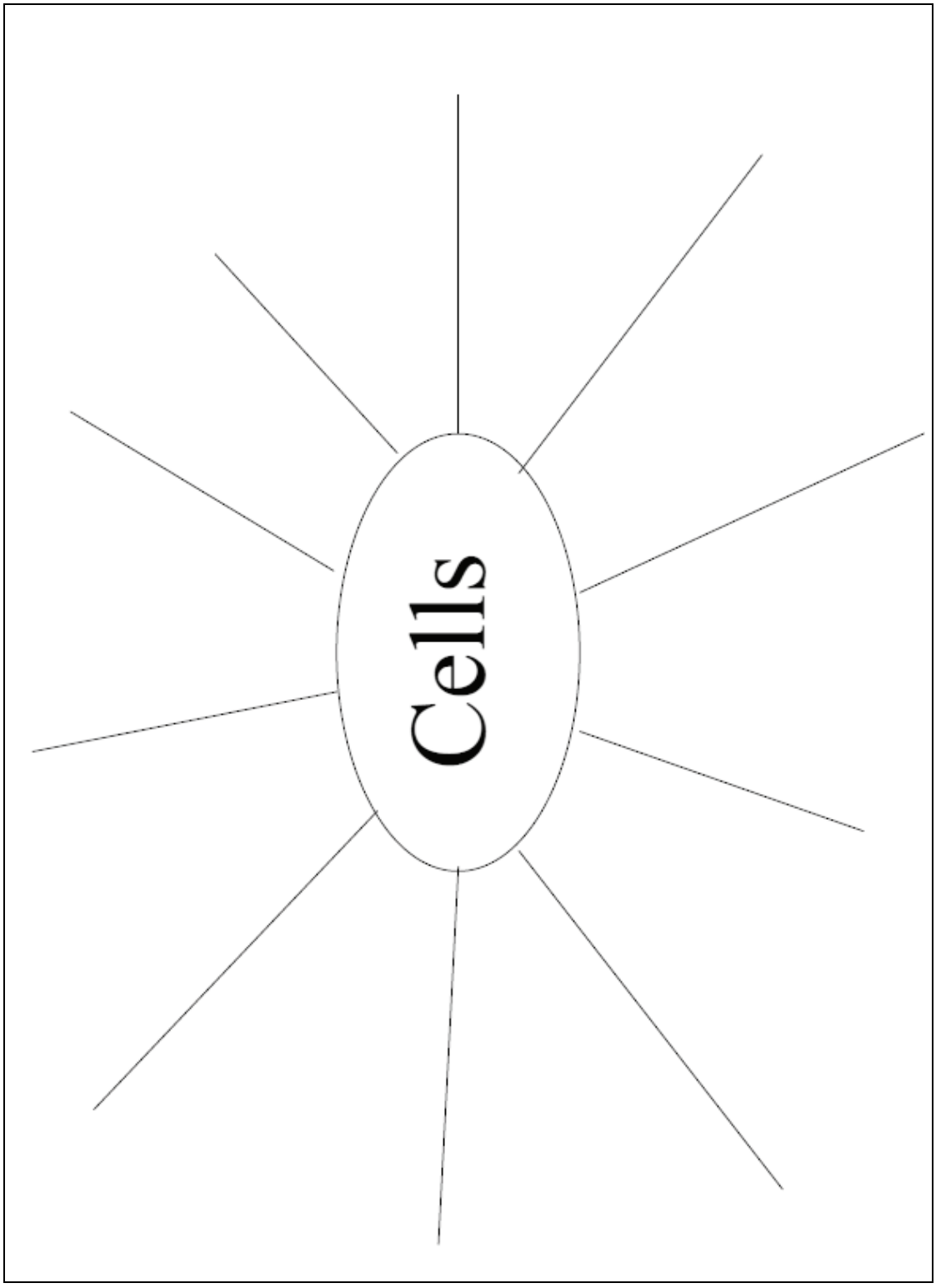


Hand out worksheet 30 or direct students' attention to p44 in the student resource book, which is also depicted on this slide.

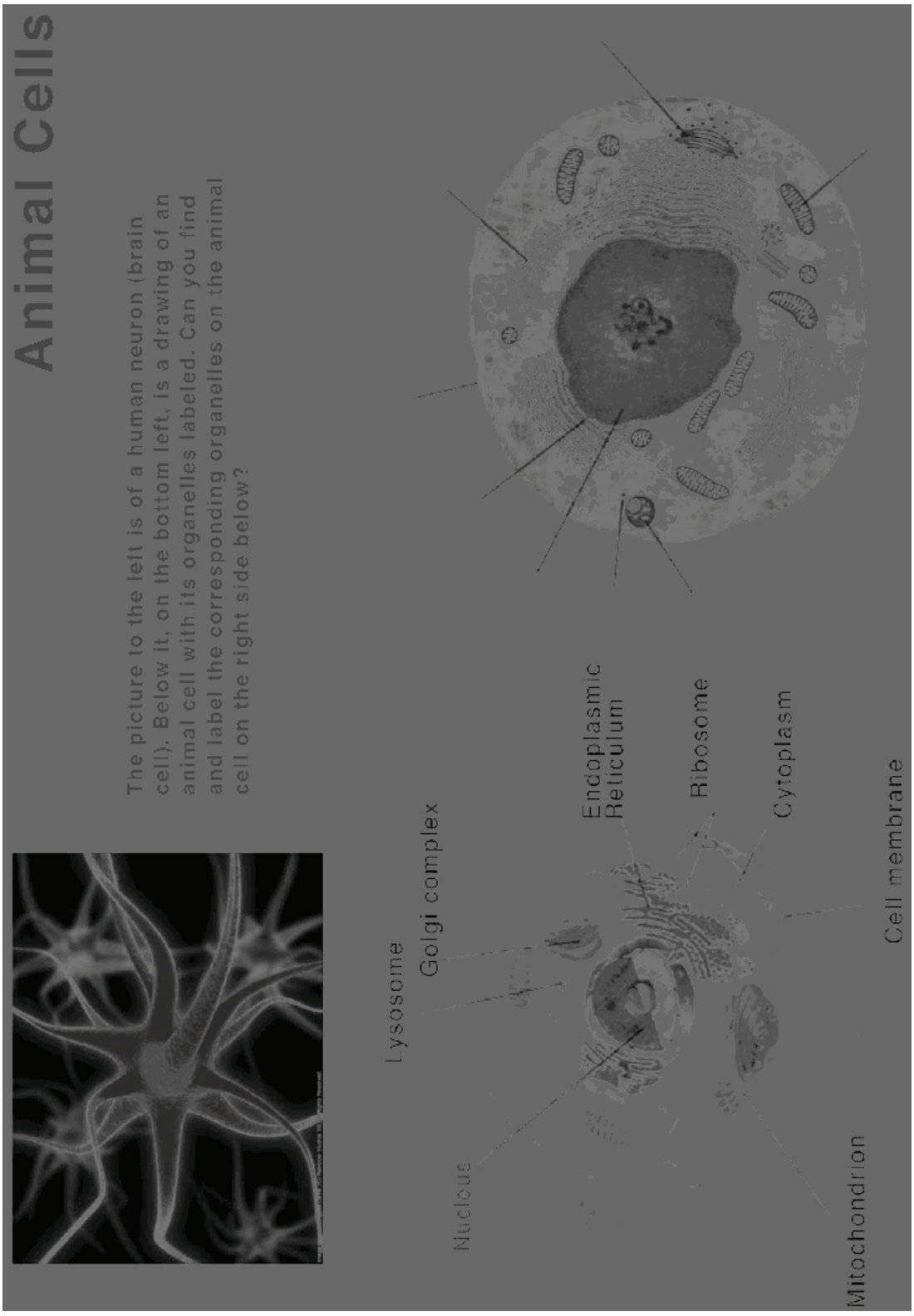
One labeled example of an animal cell with visible organelles would be a drawing of one of the "real life" animal cells in the previous slide. In this example, we have a 3-D drawing of an animal cell with organelles labeled and an unlabeled example of a "generic animal cell." Have students attempt to label the unlabeled cell, based on the organelles identified in the labeled cell.

After students have completed their work independently, project this slide and discuss as a group the appropriate labels for each organelle in the 2-D image.

Student Worksheet 29: Cells Web



Student Worksheet 30: Animal Cell Worksheet



DAY 24 Contrasting Cases - Compare Plant and Animal Cells (continued)

Begin with the warm-up. Today students will repeat yesterday's exercise of comparing a 2-D and a 3-D image of a cell, this time working with plant cells. You will then lead students through a comparison of plant and animal cells, highlighting the structures that are common to both as well as those that are unique to one.

Big Ideas

- A cell is made of many parts, called organelles, each of which addresses a specific need or needs of the cell.
- Not all cells have the same organelles; the requirements of the organism help determine which organelles its cells have.

Materials

Teacher:

1. Slides - day24.ppt
2. Warm-up Day 24 - Cells_warmups.ppt

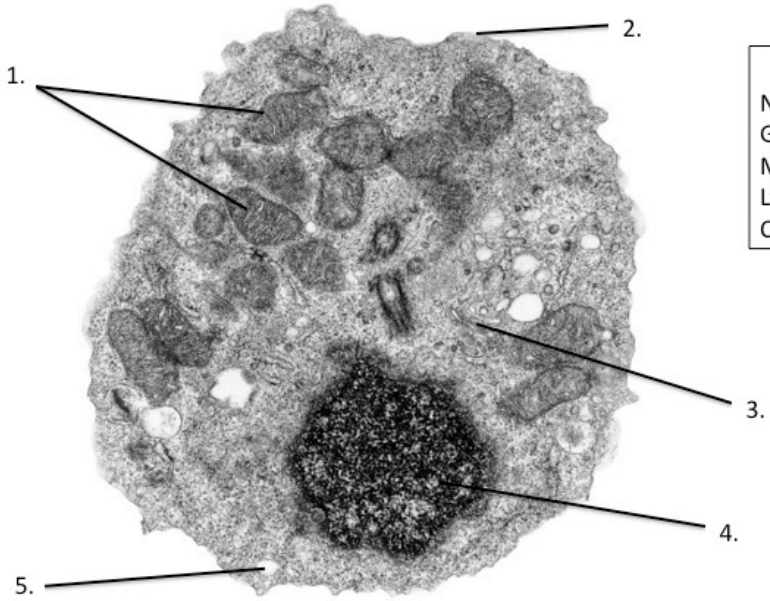
Students:

1. Plant Cell Worksheet (WS 31; student resource p45)
2. Plant and Animal Cell Comparison Chart (WS 32; student resource 46)

Activities and Allotted time

5 minutes - Warm-up
40 minutes - CC activity - Compare Plant and Animal Cells

Day 24 - Warm-up



Word Bank
Nucleus
Golgi complex
Mitochondria
Lysosome
Cell membrane

This is a real photo of an animal cell, taken with a microscope. Pictures and diagrams don't look the same, but a diagram is meant to represent a real thing. Look at the diagram of an animal cell on page 13 in your textbook, and use the word bank above to try to identify the numbered parts of this cell.

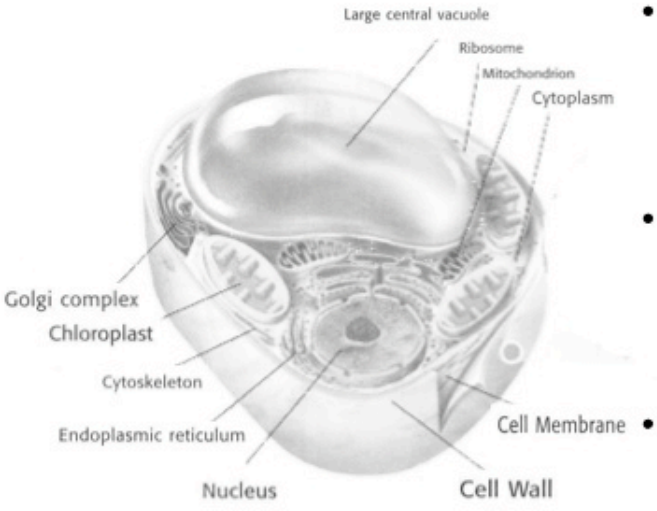
Answers:
1. Mitochondria
2. Cell membrane
3. Golgi complex
4. Nucleus
5. Lysosome

Once students have reviewed the answers, direct them to page 13 and elaborate on why the features illustrated in the diagram are similar to the actual image features. For example, draw students' attention to how the mitochondria in both the book and the real slide are small organelles with clear, roundish outlines and lines running across the width of the inside. Encourage students to contrast how each organelle appears in the book and how it appears in the photo, and to make note of the qualities common across both images.

Purpose: This exercise reviews parts of an animal cell while providing practice with real vs. diagram visualization skills. By comparing cell parts in a real image of an animal cell to cell parts in a diagram, students should come away with a stronger understanding of the cell parts. The instructor may want to point out the utility of the process of elimination as a reasoning skill: if students were able to identify three or four of the organelles, they could eliminate those from the word bank and thus figure out what the remaining organelles were.

Day 24 - Compare Cells

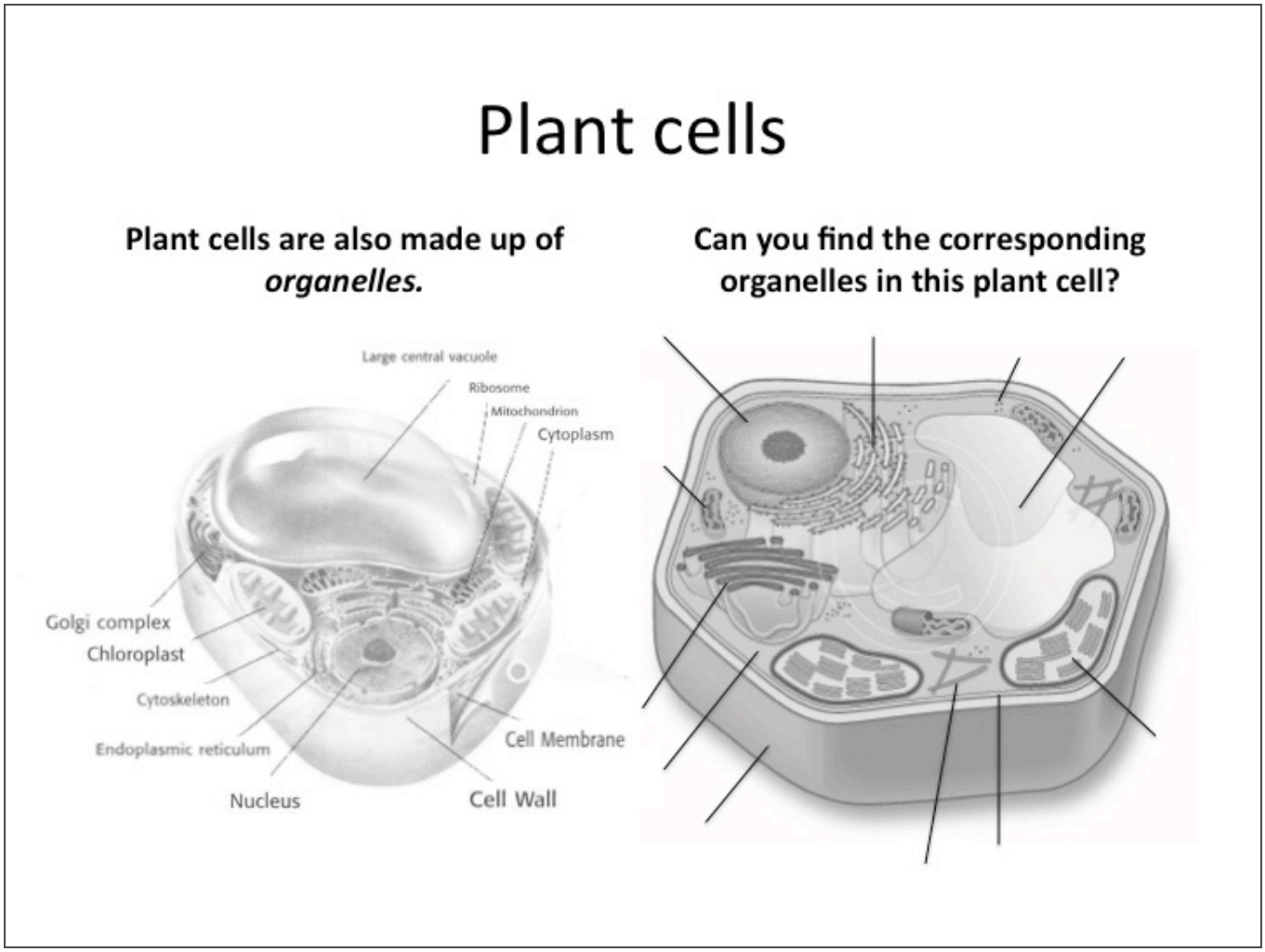
Drawings of plant cells



- On the next slide, you will see 3-dimensional drawings of plant cells, like the one to the left.
- These drawings represent cells that have had a portion cut away so the internal organelles can be visible.
- Similar to previous examples, colors may not be true to life, pictures have been magnified, and lines have been added to indicate organelle names.

Cut-away convention also used here (refer back to Slide 9 discussion/analogy/examples). Students may need to be reminded of what they learned yesterday about cut-away images.

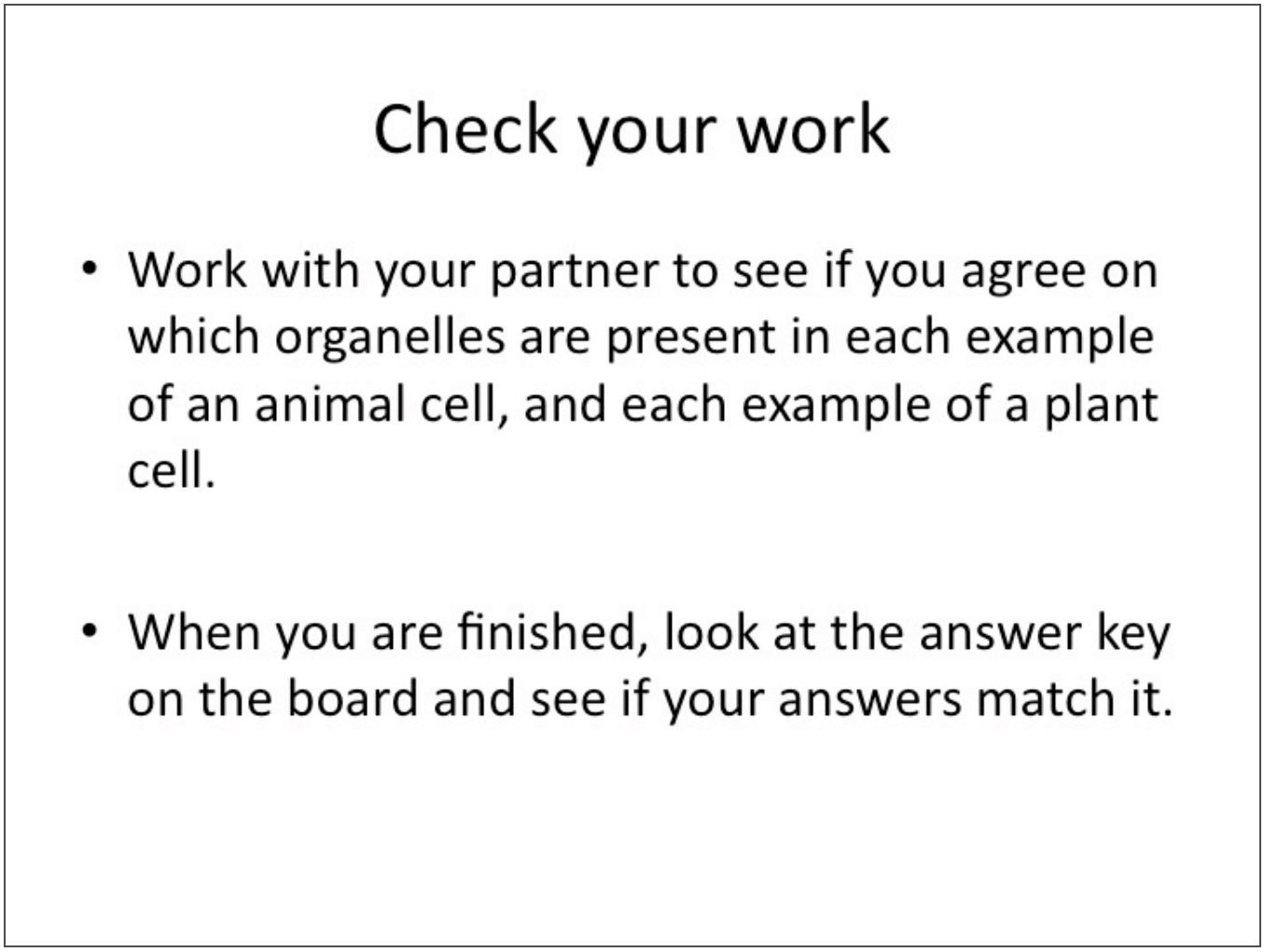
Day 24 - Compare Cells



Similar to animal cell comparison – one example of a plant cell (preferably matching "real life" example) with labeled organelles

Students should work independently to label corresponding organelles on the unlabeled plant cell.

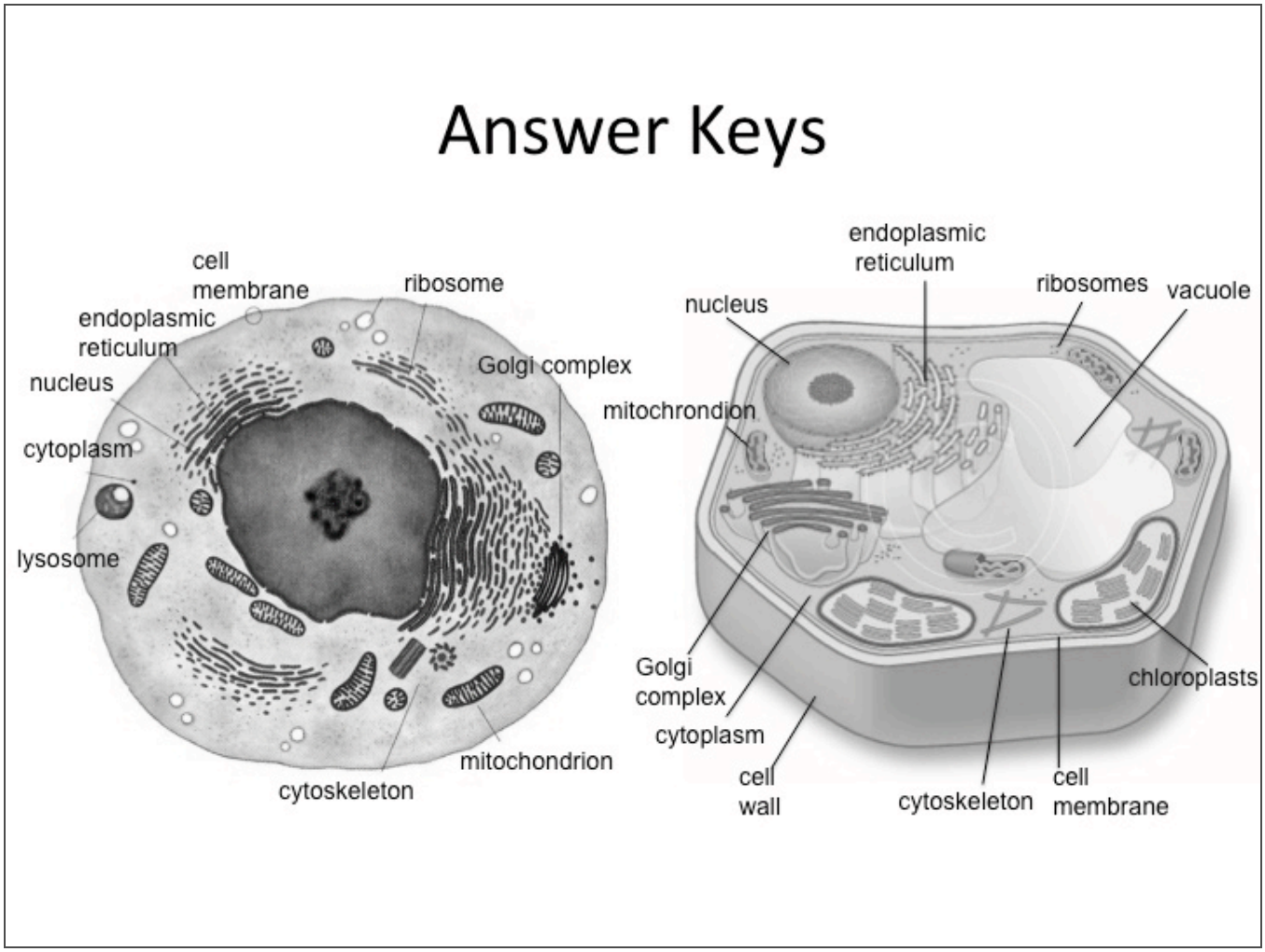
Day 24 - Compare Cells



Peer comparison/Answer check

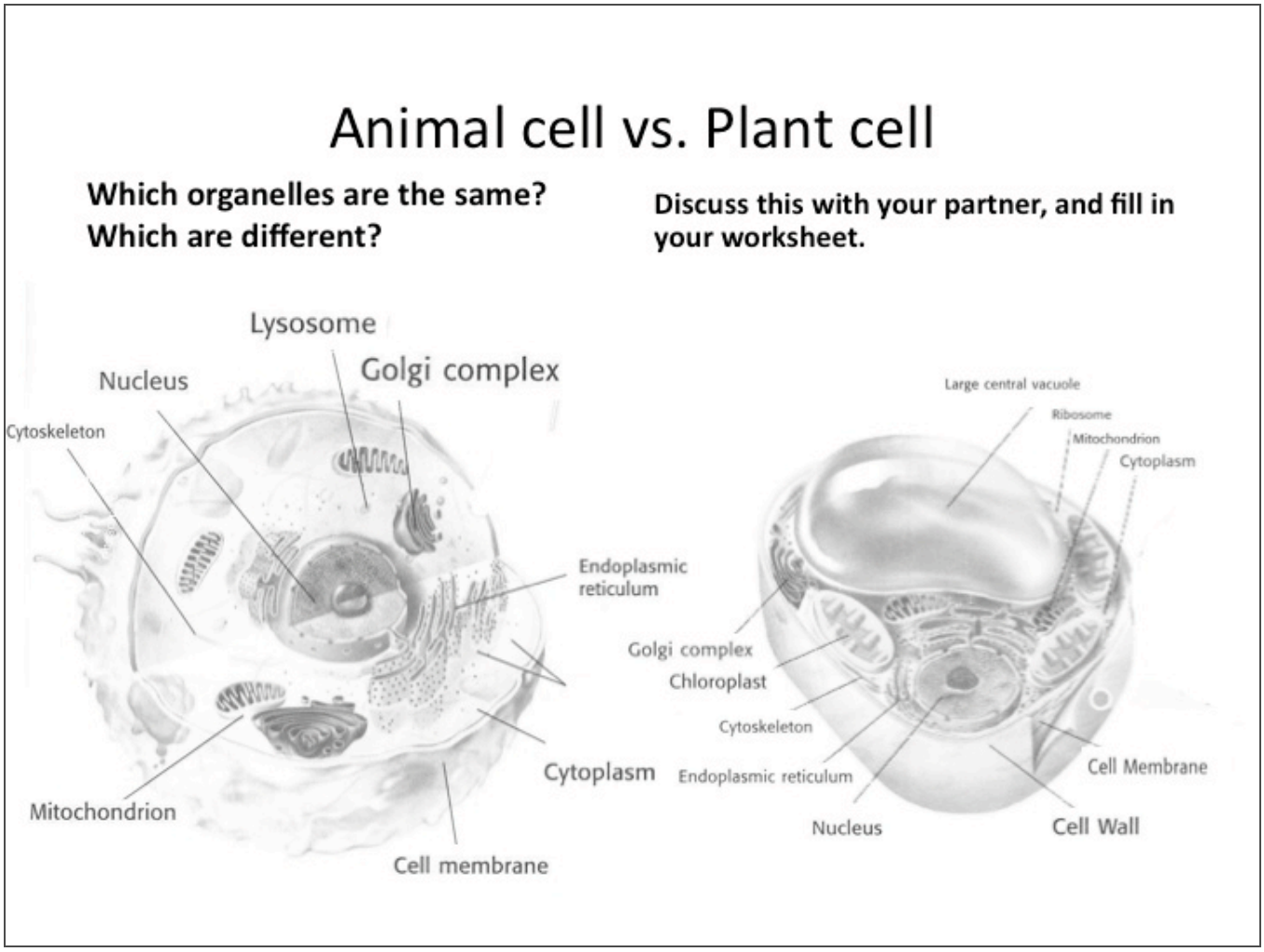
Students should compare papers with a partner to see if they agree on all of the corresponding parts for the plant cell.

After 2-3 minutes, teacher can put labeled answer keys on board and students can double check to see that all organelles are correctly labeled.



Should be labeled and projected on board/screen/overhead

Day 24 - Compare Cells



Between-category comparison

Materials: plant v. animal cell photos (labeled animal and labeled plant cell) to directly compare; plant/animal cell chart in notebook or handout (WS 32, student resource book p46)

With partner, students should compare labeled plant and animal cells. Each organelle should be placed in the appropriate column, and students can star (*) or circle organelles that are present in both plant and animal cells.

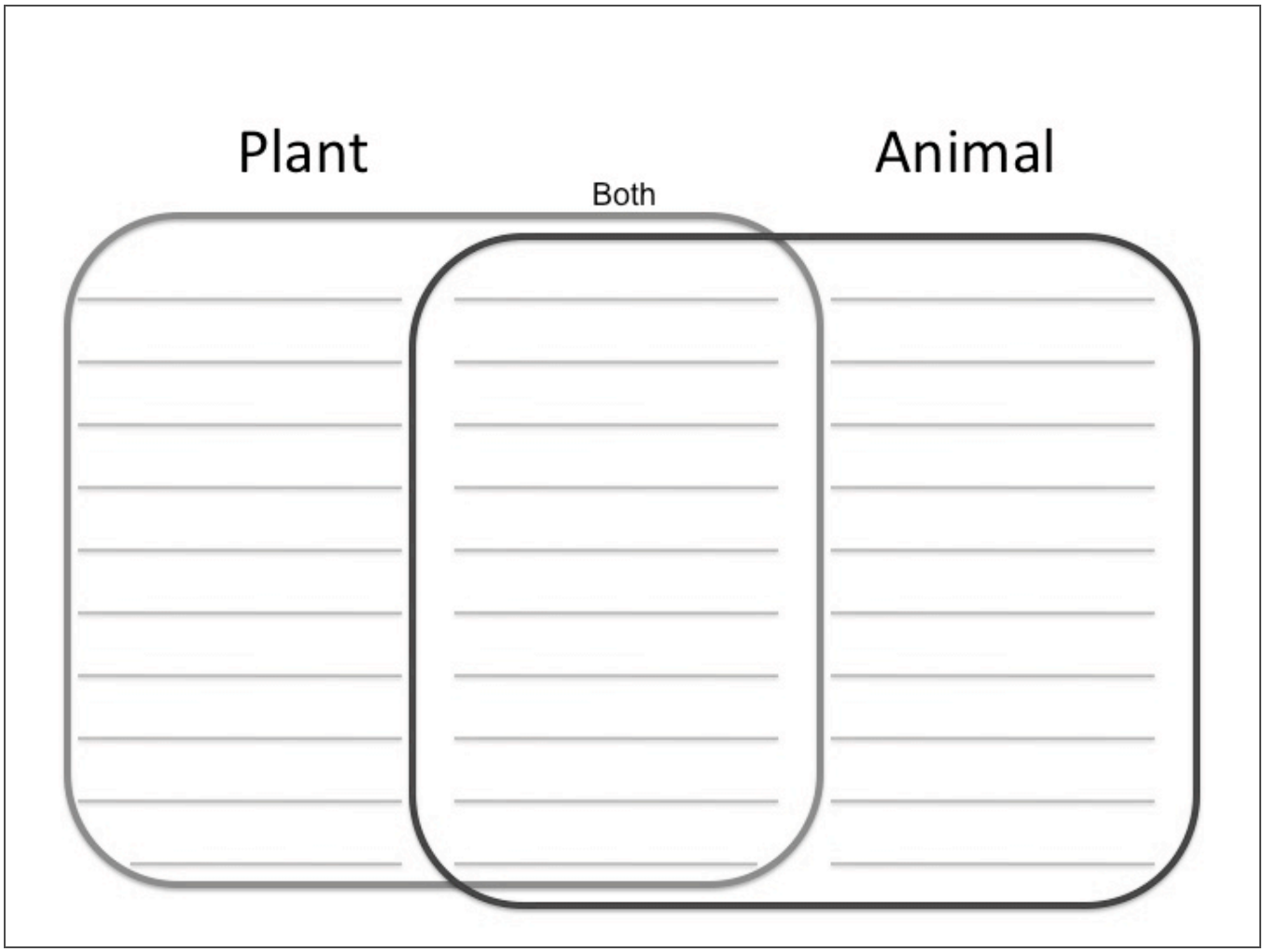
Day 24 - Compare Cells

Check your work!

Plant Cell	Animal Cell
Cell Membrane	Cell Membrane
Cytoplasm	Cytoplasm
Cytoskeleton	Cytoskeleton
Endoplasmic Reticulum	Endoplasmic Reticulum
Golgi complex	Golgi complex
Mitochondria	Mitochondria
Nucleus	Nucleus
Ribosomes	Ribosomes
Cell Wall	Lysosome
Chloroplasts	
Vacuole	

Answer key for Plant/Animal chart worksheet. Organelles listed in black are unique to plant or animal, bolded/white are common to both. List may not be exhaustive.

Day 24 - Compare Cells



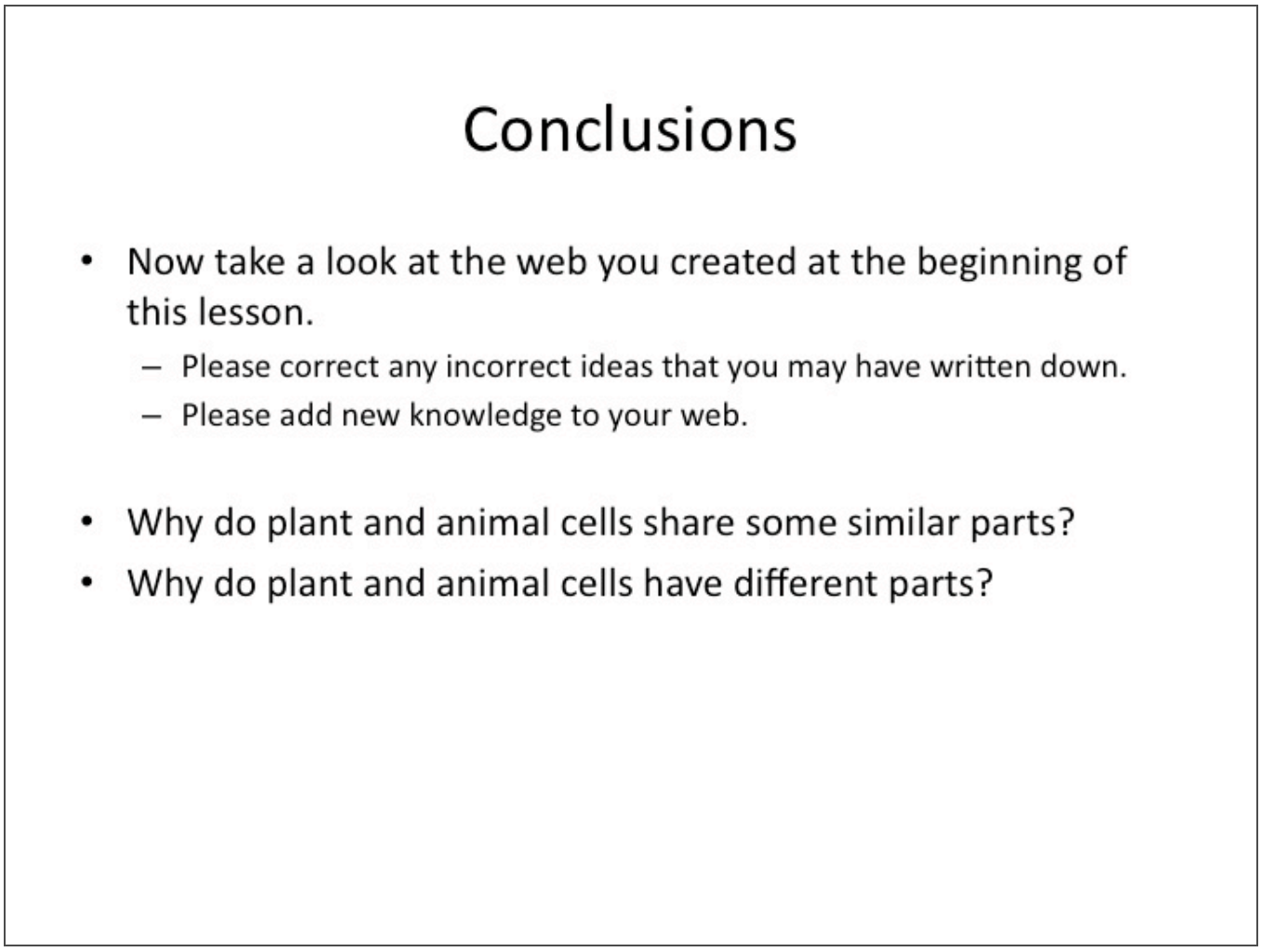
Discussion

Venn diagram: students can help teacher fill out which organelles are plant-only, animal-only, and both.

Teacher should demonstrate one plant and one overlapping plant/animal so students are reminded of how a Venn diagram works.

Each partner can go to the board and fill in an organelle, or teacher can ask each group to give one organelle and whether it is "plant," "animal," or "both." Once the Venn diagram is completed, students can copy it into their notebooks.

Day 24 - Compare Cells



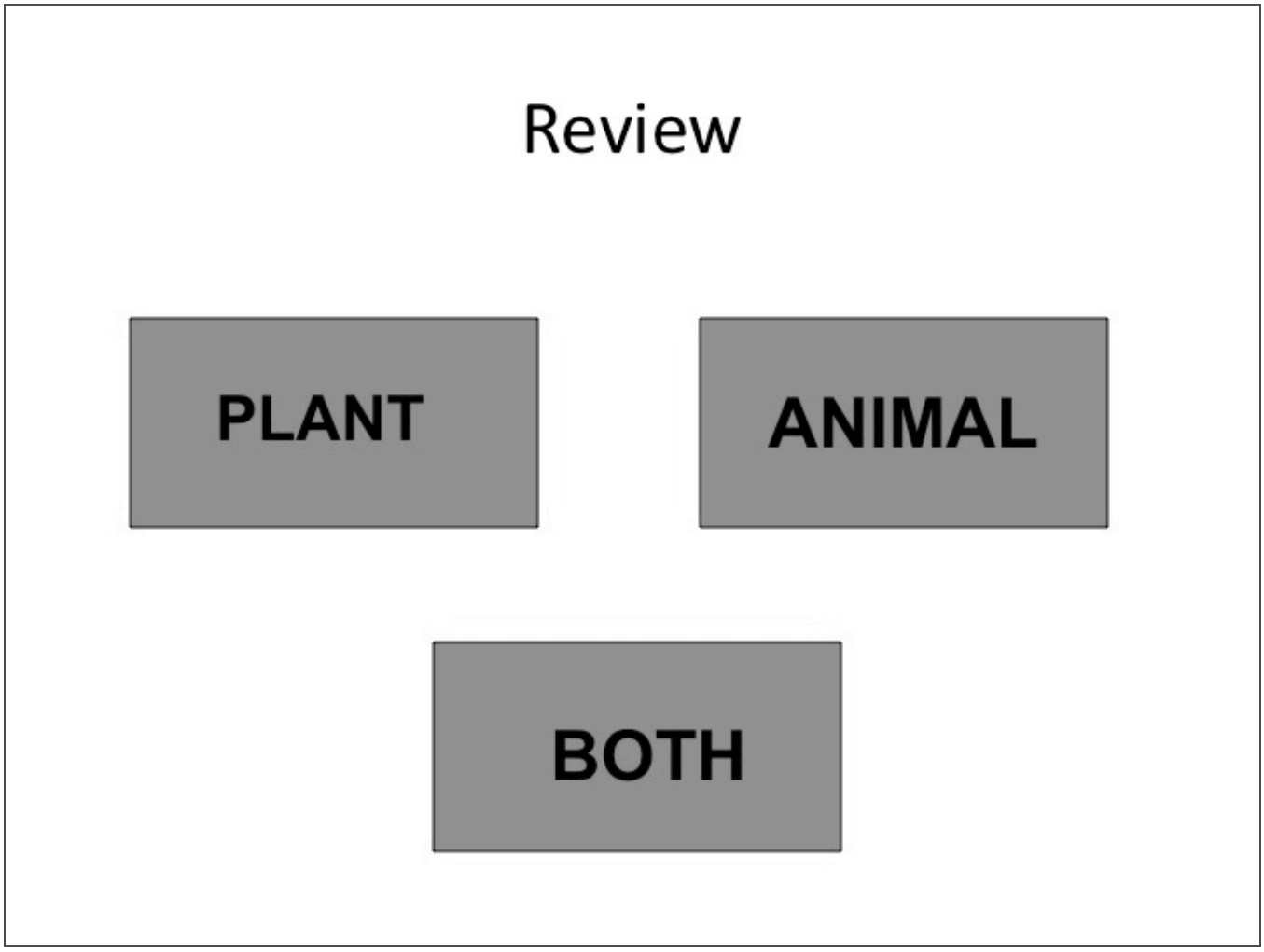
Now ask students to return to the web that they created at the beginning of the lesson. They can correct any incorrect ideas they had about cells as well as add knew knowledge to the web

Teacher can engage the class in a discussion about similarities and differences in parts of cells. Main focus: Why are some parts similar, and why are some parts different?

Try to guide students toward the idea that plants and animals are both living things and are thus made up of cells.

Some functions of all living things: need nutrients/food to create energy, growth, "breathing"/respiration, etc.

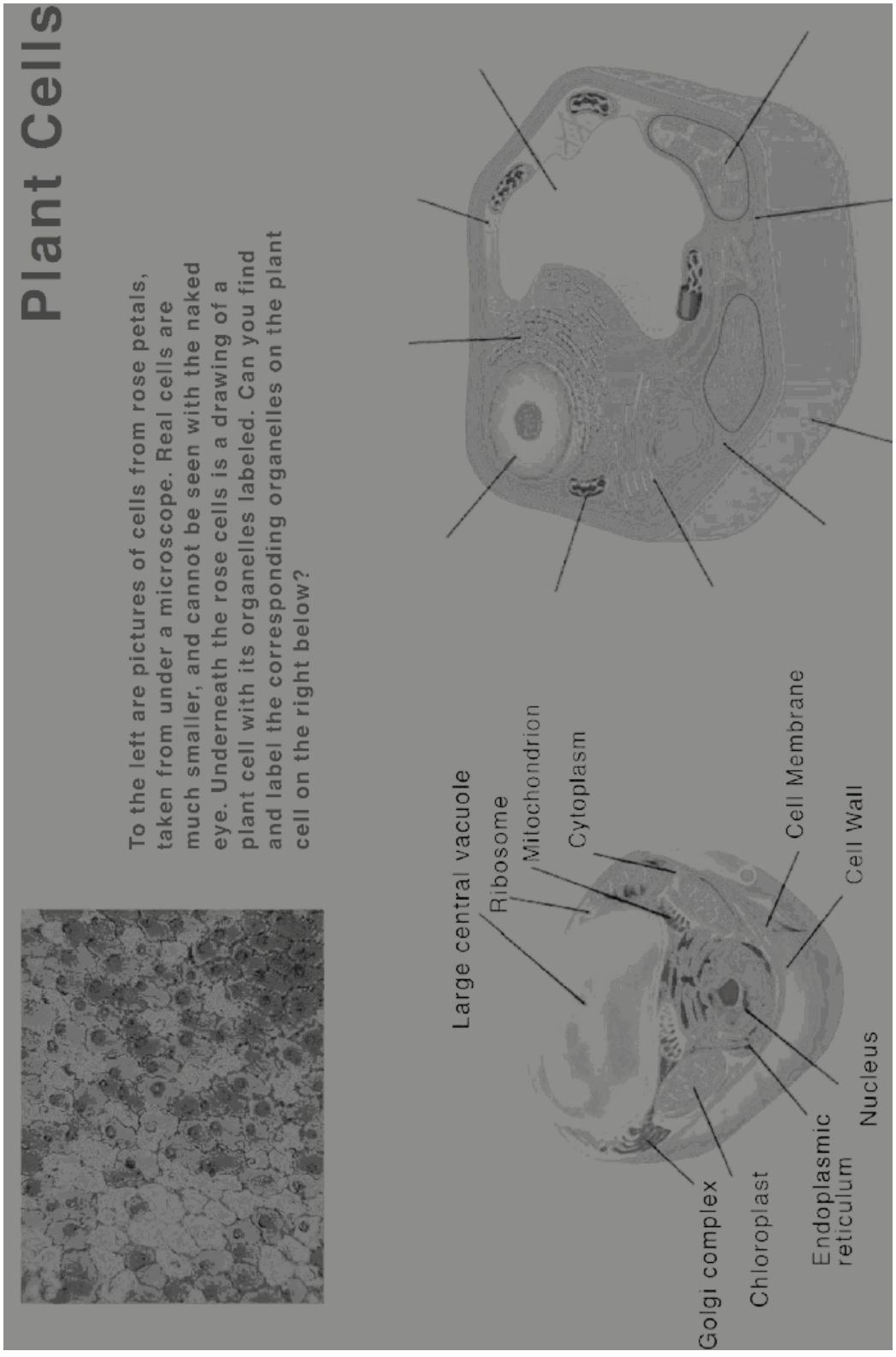
Day 24 - Compare Cells



Review organelles using display cards: PLANT; ANIMAL; BOTH

Display cards: Create sets of three cards with identical labels on the front and the back: Plant; Animal; Both. Name an organelle and ask students to hold up the card identifying the type of cell in which the organelle is found. You will be able to see their answers on one side of the card, and students behind them will see it on the other side.

Student Worksheet 31: Plant Cell Worksheet



Student Worksheet 32: Plant and Animal Cell Comparison Chart

With your partner, please fill in the appropriate organelles in each column, and draw an asterisk (*) next to the ones that are same across both plant and animal cells.

Plant cell	Animal Cell

DAY 25

Chapter 1, Section 1: The Diversity of Cells

Building on what students have learned about plants and animal cells, you will now begin teaching Chapter 1, Section 1 as you normally would, with the addition of a few visualization activities. After warming up, complete visualization activity 1.1 on p4 in the textbook. Proceed with teaching p4-6, then complete visualization activity 1.2 on p5.

Big Ideas

- Cell theory states that all organisms are made of cells, the cell is the basic unit of all living things, and all cells come from other cells.
- Most cells are too small to be seen with the naked eye. A cell's surface-area-to-volume ratio limits the size of a cell.

Materials

Teacher:

1. Warm-up Day 25 - Cells_warmups.ppt
2. Slides - day25.ppt

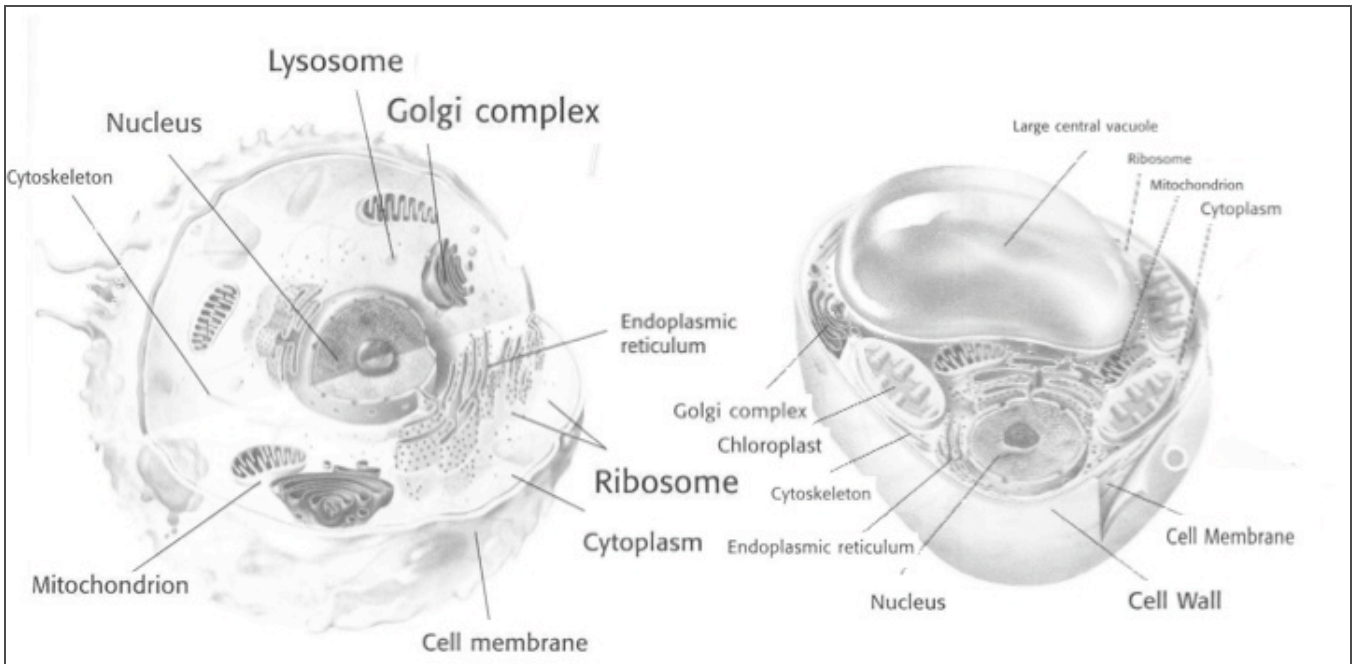
Students:

1. Holt textbook pages 4-6

Activities and Allotted time

5 minutes - Warm-up
5 minutes - Visualization activity 1.1 regarding p4
30 minutes - Holt Ch 1, Section 1, p4-6
5 minutes - Visualization activity 1.2 regarding p5

Day 25 - Warm-up



Compare the animal cell on the left and the plant cell on the right.

1. Name one organelle that animal cells have and plant cells do not.
2. Name three organelles that plant cells have and animal cells do not.

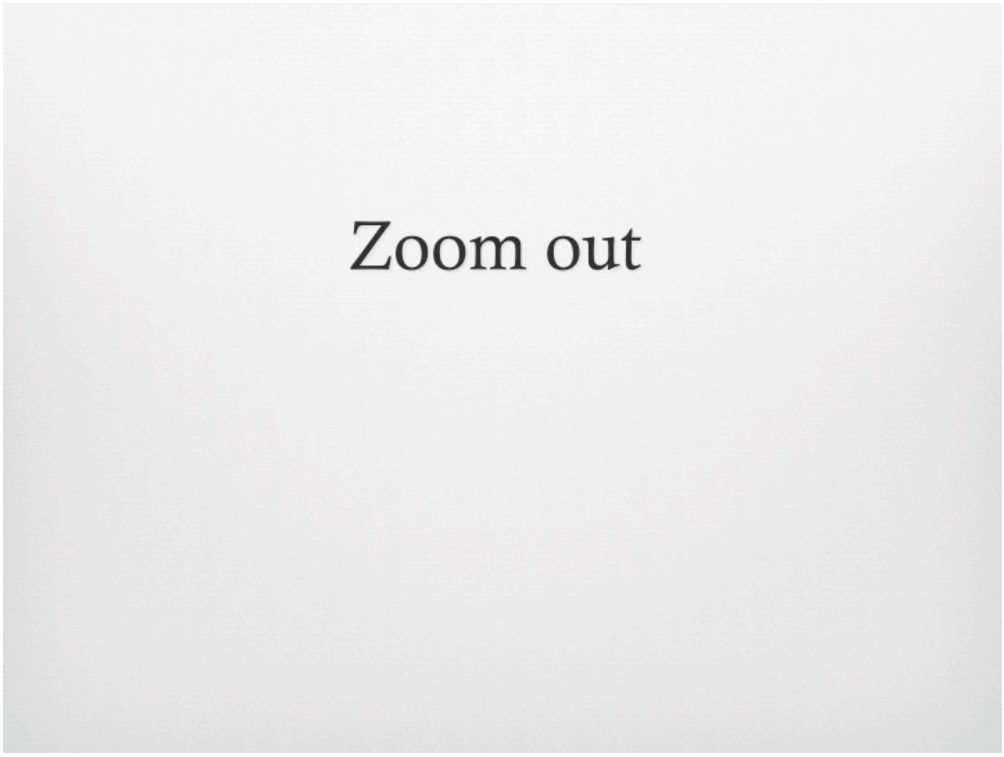
Answers:

1. Lysosome

2. Cell wall, chloroplast, and large central vacuole

Purpose: This exercise reinforces the comparison between plant and animal cells, helping students to better understand the properties of each. Teacher should point out to students that the plant and animal cells have different organelles because the organisms need to carry out some different functions. Teacher may wish to note that they will be looking more closely at the specific functions of each organelle a little later in the unit, and that it will help students to better understand why animal cells do not have chloroplasts and plant cells do not have lysosomes, etc.

Day 25 - The Diversity of Cells



Exercise 1.1

Image Comprehension Focus: Zoom out

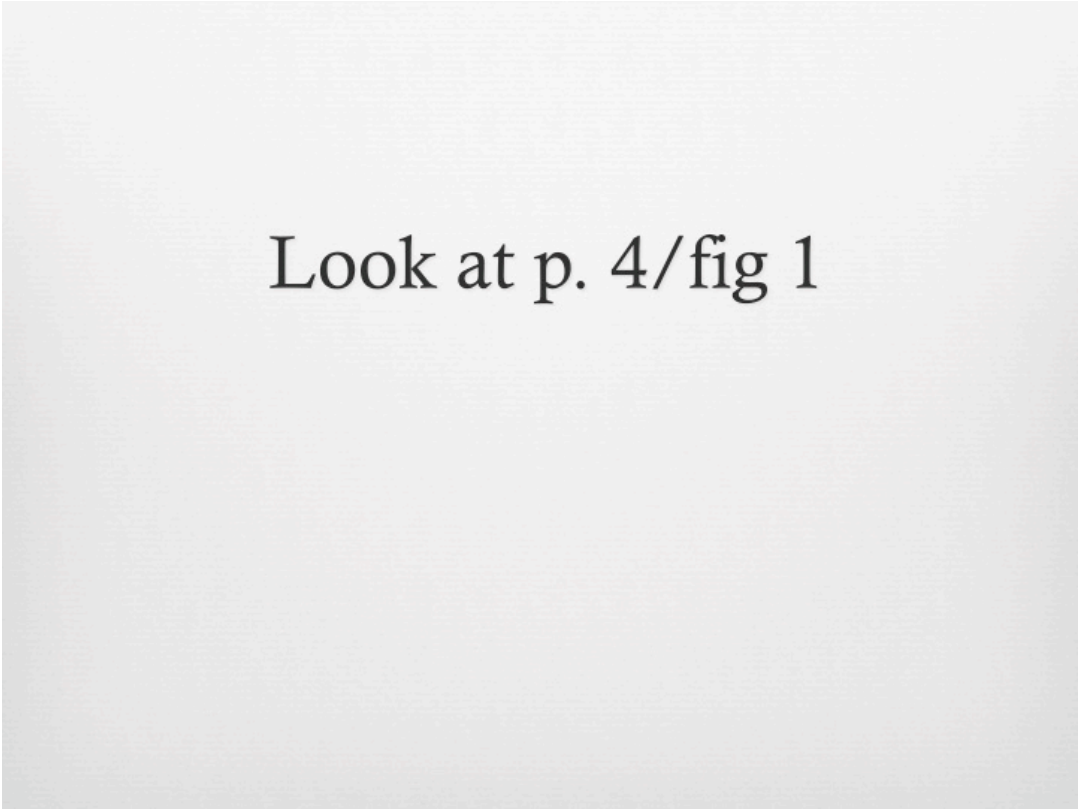
Goal: Expand the students' understanding of a "zoom-out" convention by illustrating additional visual clues that a zoom-out is being used in a diagram.

Type of Activity: Teacher Comment

Overview: This activity is designed to help the students develop their understanding of the "zoom-out" convention by explicitly discussing how the perspective changes in a zoom-out and by explicitly discussing an additional visual clue that this type of convention is being used.

Procedure: The teacher should ask the students to review the visual clue that they learned in chapter one that indicated a "zoom-out" convention was in the diagram. [The clue was a small circle connected to a big circle by the use of a shadow, where the big circle had a magnified version of the small circle.] To review these, the teacher can direct the students to look at p.113/fig7 from chapter 5.

Day 25 - The Diversity of Cells



Procedure (cont'd): The teacher should then direct the students to look at p. 4/Fig 1. (This image is on the next slide if you want to project it.) He/she should point out that the circle located above and to the left of the microscope illustrates what it would look like if one was looking into the microscope. The teacher should also indicate that a microscope allows a viewer to look at a sample using a high level of magnification so one can see aspects of the object that are not visible using one's eyes alone. The idea is the same as when you look through a magnifying glass, but at a much stronger level of magnification so you can see things on even a smaller scale. In this example, looking at cork under a microscope allows the viewer to see that the cork is composed of cells. In addition, the teacher should note that this image also uses a "zoom-out" convention in that part of the image is at a much higher level of magnification than the rest. In this case, the cork cells are shown at a higher level of magnification. The teacher should conclude this explanation with the comment that images often have clues that they are using a "zoom-out" convention and that the next activity is to look at some examples that are used in the textbook in this chapter. (proceed to next activity)

Day 25 - The Diversity of Cells

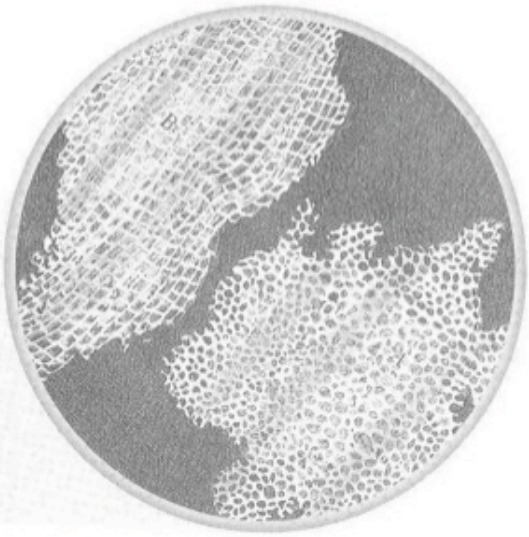
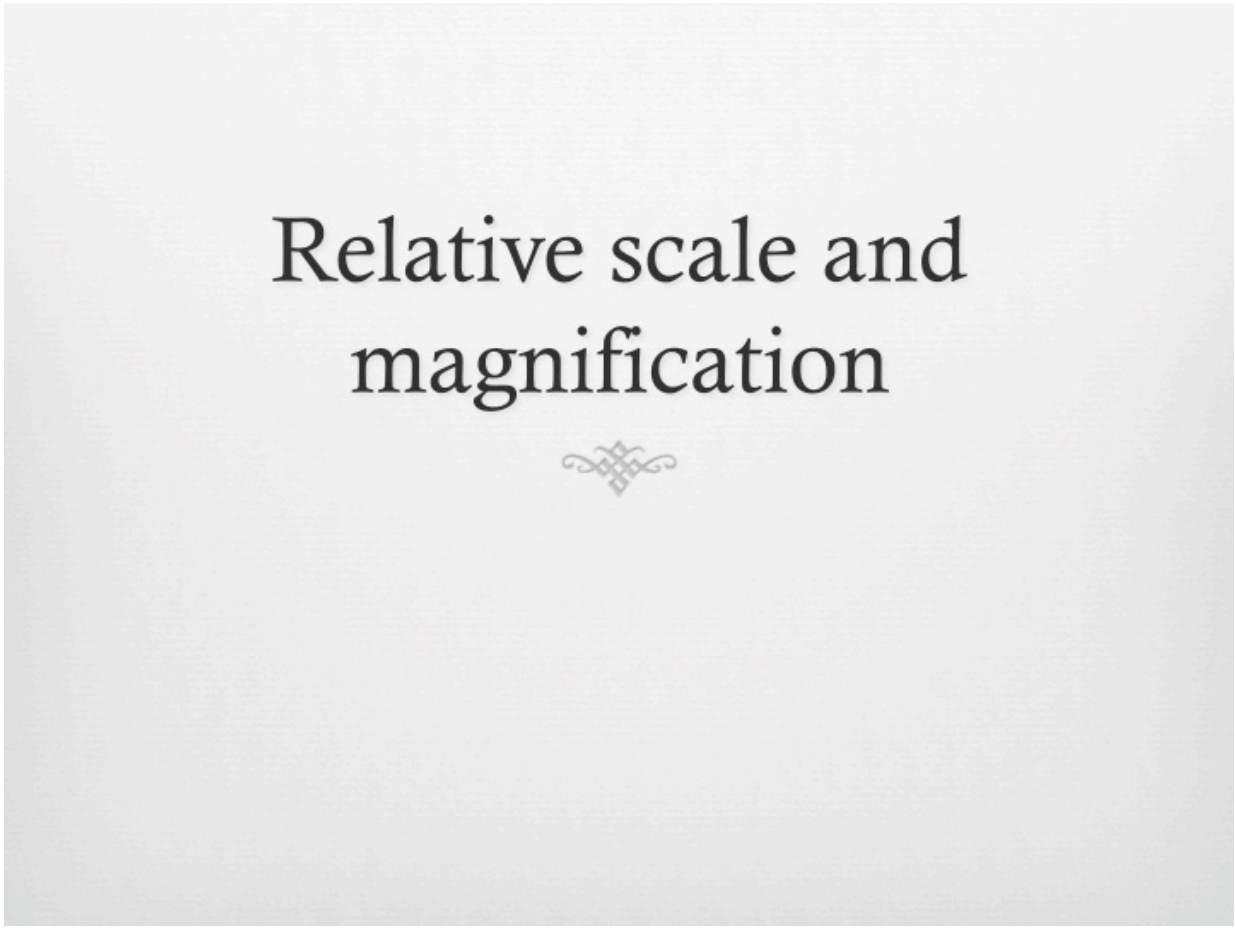


Figure 1 *Hooke discovered cells using this microscope. Hooke's drawing of cork cells is shown to the right of his microscope.*



Exercise 1.2

Image Comprehension Focus: Relative scale and magnification

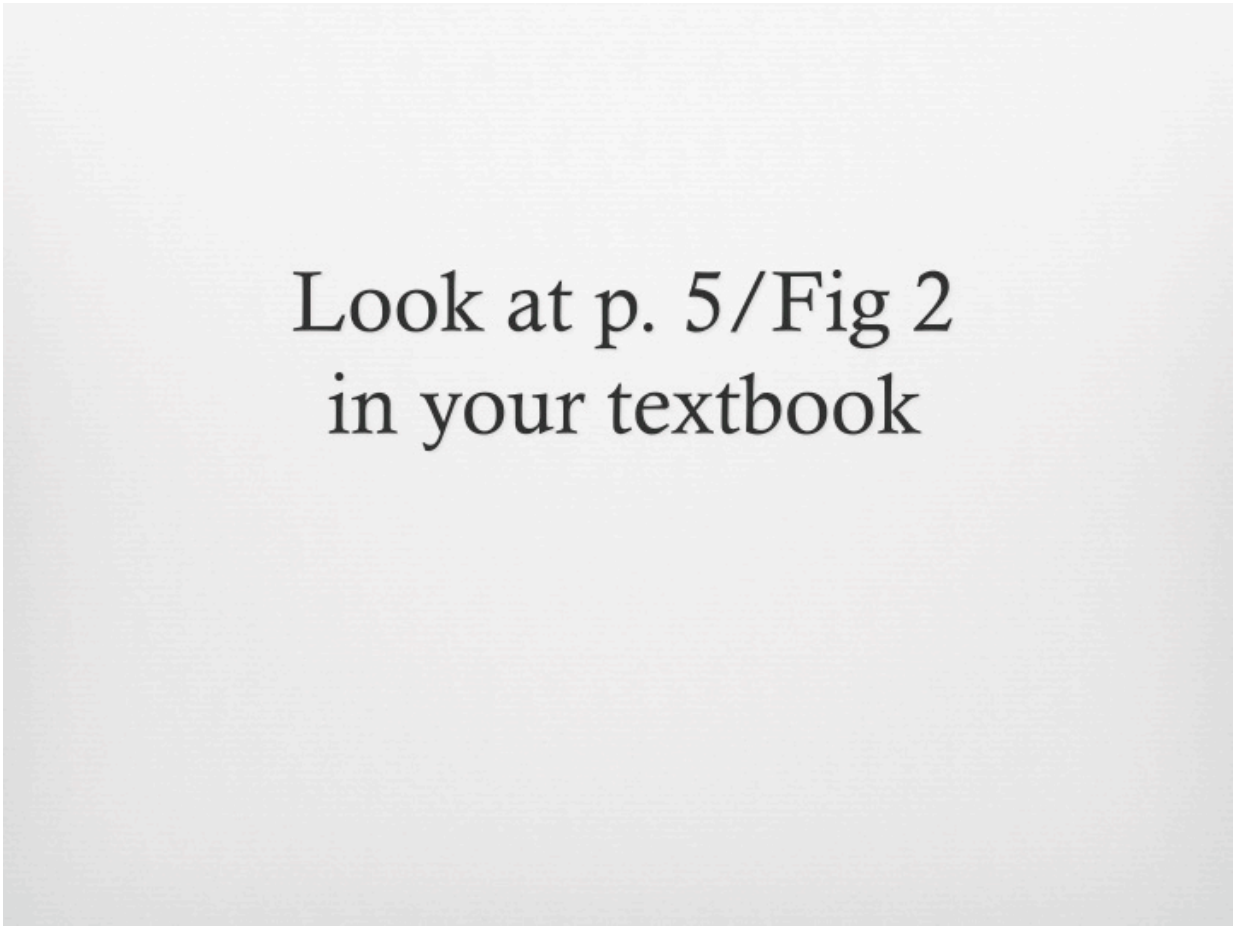
Goal: Explicitly illustrate that the scale of the textbook images need to be considered (apply ideas from chap 7 scale focus and chap 5 p.114/f.8)

Type of Activity: Teacher comment

Overview: The purpose of this activity is to remind students about the importance of considering the scale or magnification of an image, especially when looking at unfamiliar images or studying objects that are not visible to the naked eye.

Procedure: The teacher should remind the students of the previous discussions from chapter 7 and chapter 5 that one needs to carefully consider the scale of an image when viewing it. The teacher should indicate that the class is going to look at an image in the textbook to illustrate this problem. (proceed to the next slide)

Day 25 - The Diversity of Cells



Procedure cont'd: After directing the students to look at p. 5/fig 2 (included on the next slide if you want to project it), the teacher should emphasize that the bacteria is magnified much more than the other slides. To help put this in context for the students, the teacher can mention that a red blood cell can be up to ten times larger than some bacteria even though the image makes it seem that the bacteria is larger. If the students have difficulty understanding the concept of ten times larger, the teacher can use a concrete reference to illustrate a 1:10 ratio. (One example is to use unit cubes and explain that the height of the stack of ten cubes is ten times larger than the height of one cube. Another example is to compare 1 cm and 10 cm on a ruler.) The teacher can also note that there is a clue that the relative sizes of the images are not accurate and ask the class to find that clue. (There is a mention of stronger magnification in the caption.) The teacher should note that there is not always a clue to the scale of the image, as the students will see as they progress through the textbook.

Day 25 - The Diversity of Cells

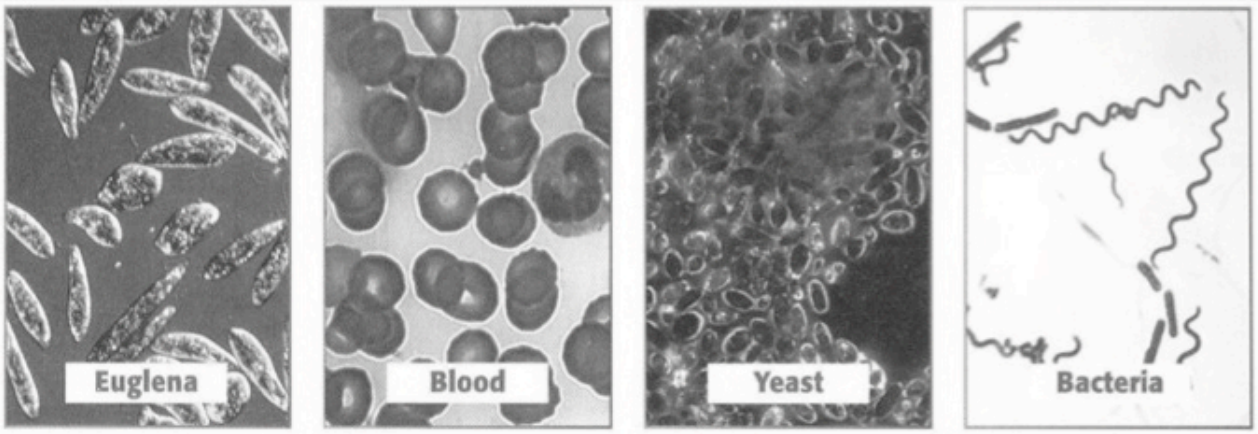


Figure 2 *Leeuwenhoek examined many types of cells, including protists such as* Euglena *and the other types of cells shown above. The bacteria cells in the photo have been enlarged more than the other cells. Bacterial cells are usually much smaller than most other types of cells.*

DAY 26

Chapter 1, Section 1: The Diversity of Cells

Following the warm-up, you will continue teaching Chapter 1, Section 1 as you would normally teach it. If you wish, there are several opportunities in this section to present concepts in a contrasting case style (i.e., present more than one example at the same time rather than sequentially, and discuss the similarities and differences between them). You may try this with Prokaryotes: Bacteria vs. Archaea (pages 8-9) or prokaryotic cells vs. eukaryotic cells (pages 8-10).

Please **omit all content on p7,** which covers the parts of a cell, as this has already been covered in the contrasting case. Begin on p8 and stop on p10 to complete Section 1.

Big Ideas

- The two basic kinds of cells are prokaryotic cells and eukaryotic cells. Eukaryotic cells have a nucleus and membrane-bound organelles. Prokaryotic cells do not.
- Prokaryotes are classified as archea and bacteria.
- Archaeal cell walls and ribosomes are different from the cell walls and ribosomes of other organisms.
- Eularyotes can be single-celled or multicellular.

Materials

Teacher:

1. Warm-up Day 26 - Cells_warmups.ppt

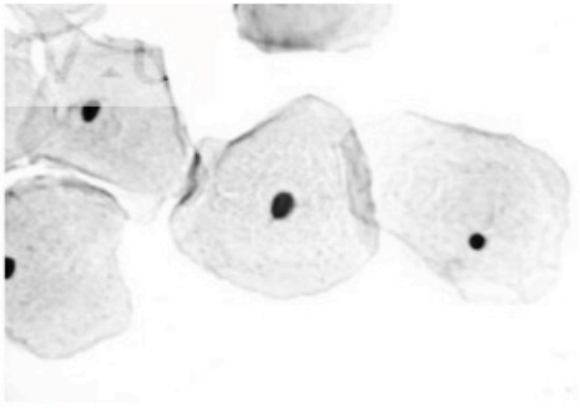
Students:

1. Holt textbook pages 8-10

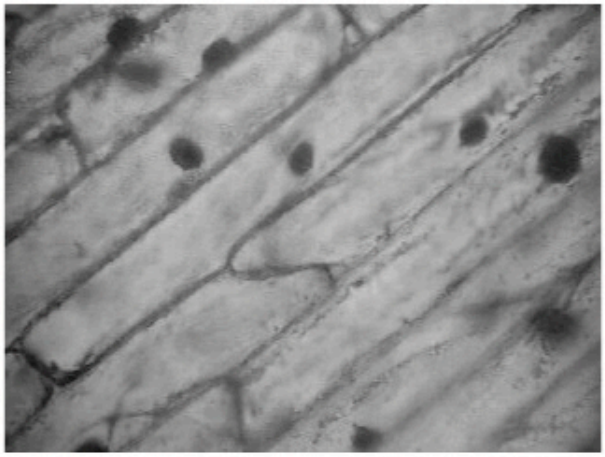
Activities and Allotted time

5 minutes - Warm-up
40 minutes - Holt textbook Chapter 1, Section 1, p8-10

Day 26 – Warm-up



Scientists often stain cells with color so they can see the parts of a cell better under a microscope. The cells to the left have been stained with iodine, and the purple dots are cell nuclei.



One of the pictures is a magnified photo of **human cheek cells**, and the other is a magnified photo of **onion cells**. Based on your knowledge of cell walls and cell membranes, decide which image is from a human and which is from a plant.

Answer: The picture on the top is an animal cell (human cheek cell) and the picture on the bottom is a plant cell (onion cell).

In these images, students can clearly see the walls of the onion cell and understand that cell walls are more rigid than cell membranes, which are relatively malleable. Teachers may want to point out to students that not all plant cells look as rectangular and rigid as the onion cells.

Purpose: This exercise provides more practice with the real vs. diagram visualization skill and reinforces the plant cell vs. animal cell contrasting case.

DAY 27

Chapter 1, Section 2: Eukaryotic Cells

After warming up, complete visualization activities 1.3 and 1.4 on p12-13. Proceed with teaching Chapter 1, Section 2 as you would normally teach it, concluding today on p15. After you have finished the lesson, complete visualization activities 1.5 and 1.8, which concern figures on p13-14.

Big Ideas

- Eukaryotic cells have organelles that perform functions that help cells remain alive.
- All cells have a cell membrane. Some cells have a cell wall. Some cells have a cytoskeleton.
- The nucleus of a eukaryotic cell contains the cell's genetic material, DNA.
- Ribosomes are the organelles that make proteins. Ribosomes are not covered by a membrane.
- The endoplasmic reticulum (ER) and the Golgi complex make and process proteins before the proteins are transported to other parts of the cell or out of the cell.

Materials

Teacher:

1. Warm-up Day 27 - Cells_warmups.ppt
2. Slides - day27.ppt

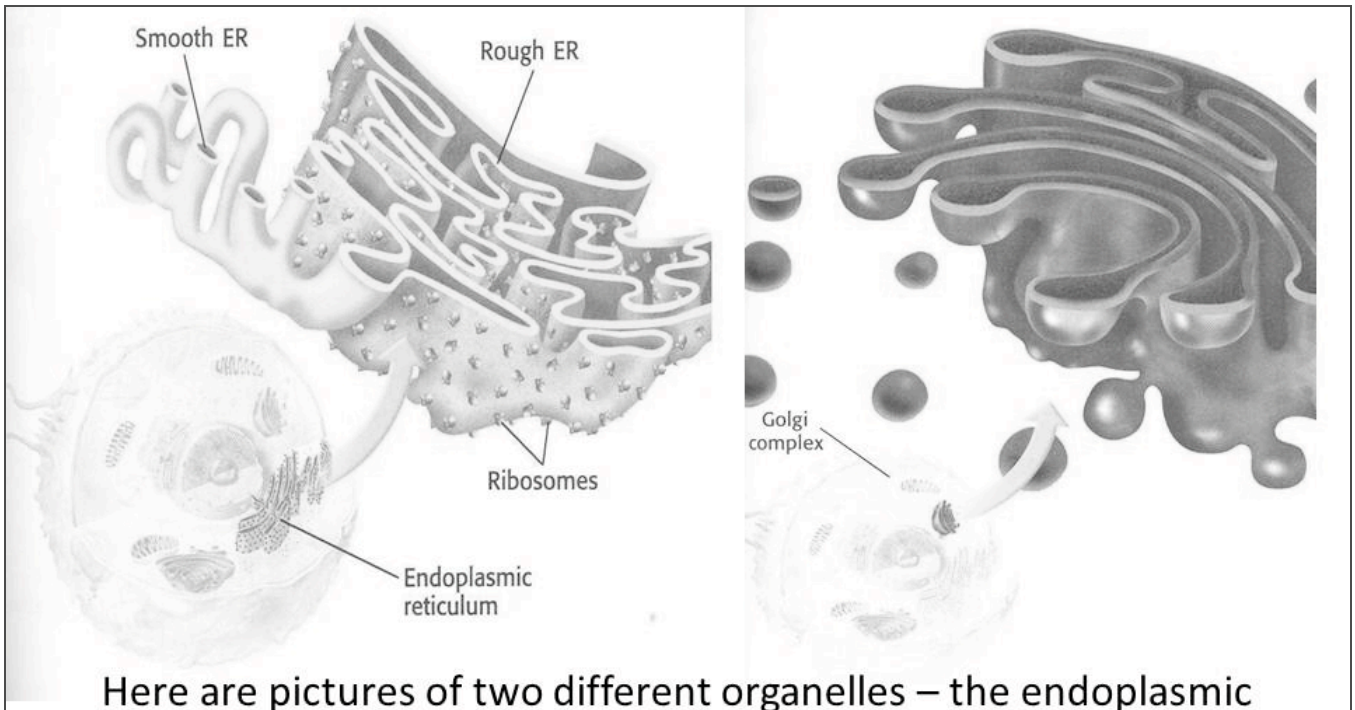
Students:

1. Holt textbook pages 12-15

Activities and Allotted time

5 minutes - Warm-up
5 minutes - Visualization activity 1.3 regarding p12-13
5 minutes - Visualization activity 1.4 regarding p12
20 minutes - Holt Ch 1, Section 1, p12-15
5 minutes - Visualization activity 1.5 regarding p13
5 minutes - Visualization activity 1.8 regarding p14

Day 27 – Warm-up



Here are pictures of two different organelles – the endoplasmic reticulum, and the Golgi complex

1. Which is larger, a cell or an organelle?
2. What is the function of an organelle? What does it do?

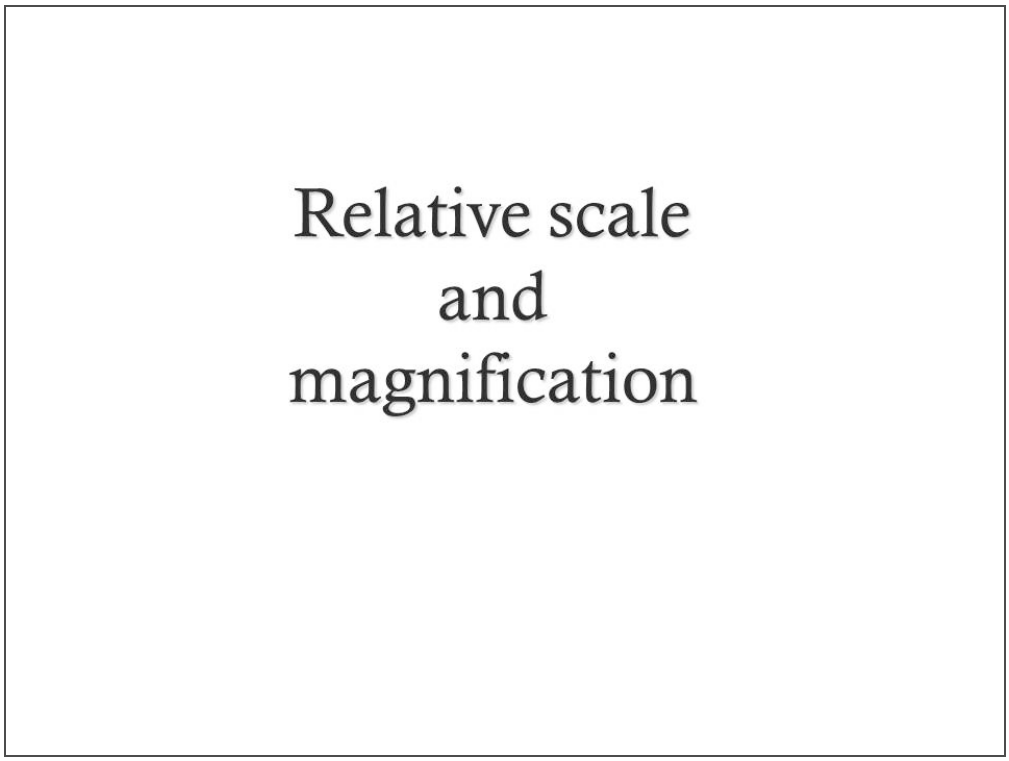
Answers:

1. A cell is much larger than an organelle. Organelles are contained within cells, which is shown in the picture using the zoom-out convention.

2. The definition of an organelle given on page 7 is, "Cells have organelles that carry out various life processes. Organelles are structures that perform specific functions within the cell."

Purpose: This exercise reaches back to "organelles" (p 7), and uses the zoom-out perspective. The images displayed are from Page 15, Fig 5 (endoplasmic reticulum), and Page 17, Fig 8 (Golgi complex).

Day 27 - Eukaryotic Cells



Exercise 1.3

Image Comprehension Focus: Relative scale and magnification

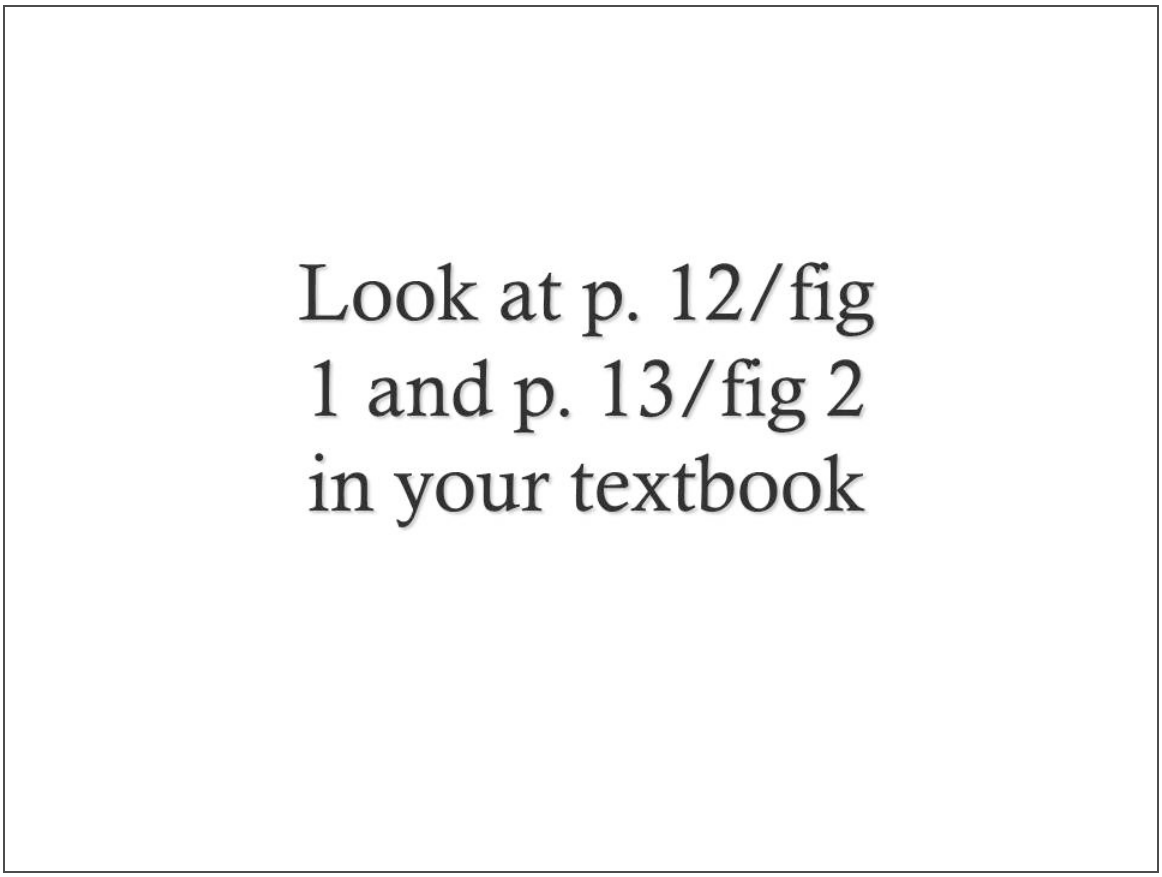
Goal: Reinforce the idea that the scale of the textbook images need to be considered

Type of Activity: Teacher comment

Overview: The purpose of this activity is to remind students about the importance of considering the scale or magnification of an image and the relative sizes of objects within one image by giving students additional concrete textbook examples where this is an issue.

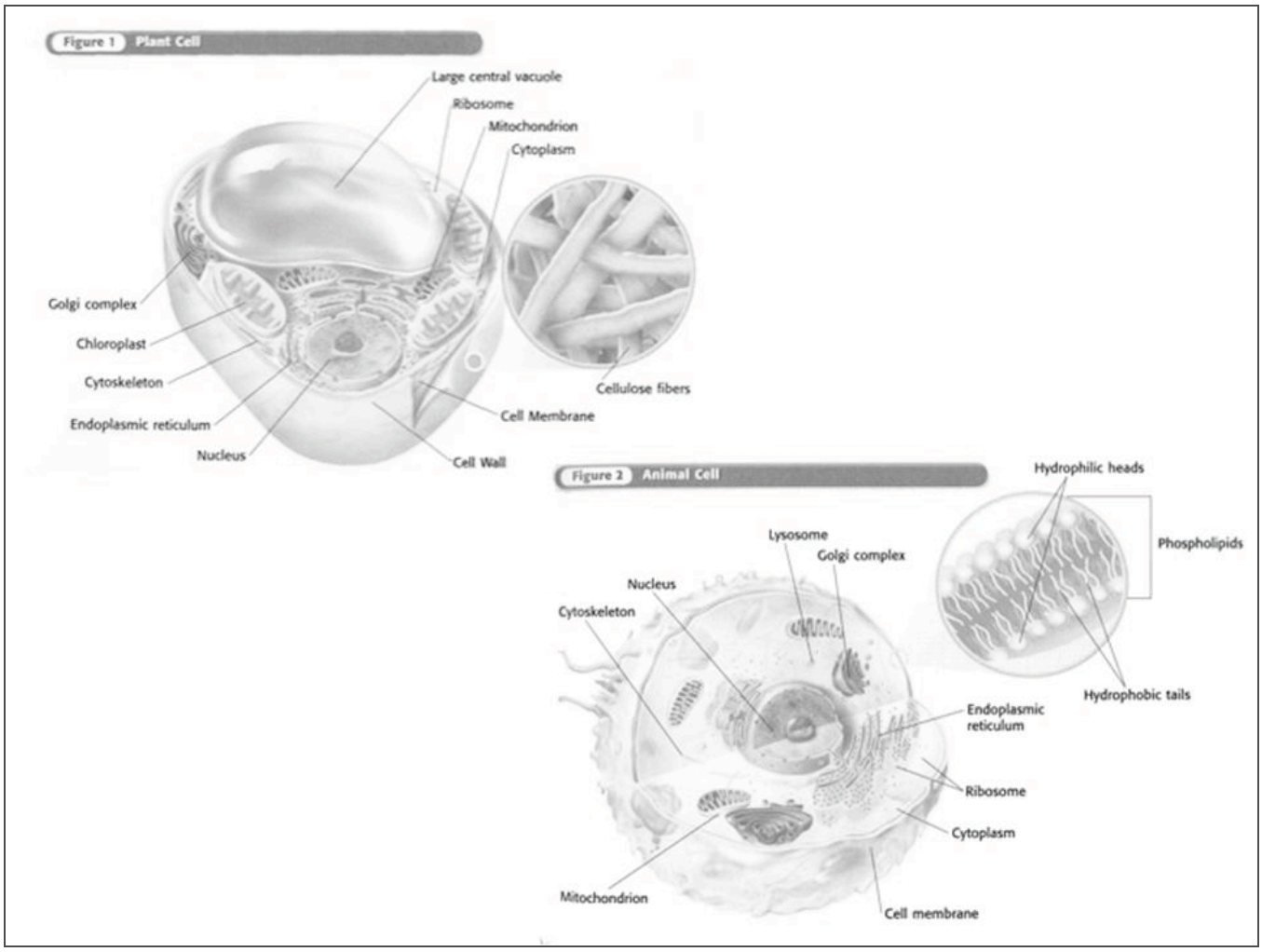
Procedure: The teacher should remind the students that scale and magnification are especially important in this chapter since it focuses on cells, which are too small to be seen with human eyes alone. The teacher can give the context that most plant and animal cells are so small that they are less than $1/10^{th}$ the width of a human hair. [Background info: cells are about 10 microns and human-hair width is approximately 100 microns. The human eye can see to about 40 microns.] If the students have difficulty understanding the concept of $1/10^{th}$ the size, the teacher can use a concrete reference to illustrate a 1:10 ratio. [The height of a single unit cube is $1/10^{th}$ the height of ten unit cubes or 1 cm is $1/10^{th}$ as long as 10 cm on a ruler.]

Day 27 - Eukaryotic Cells

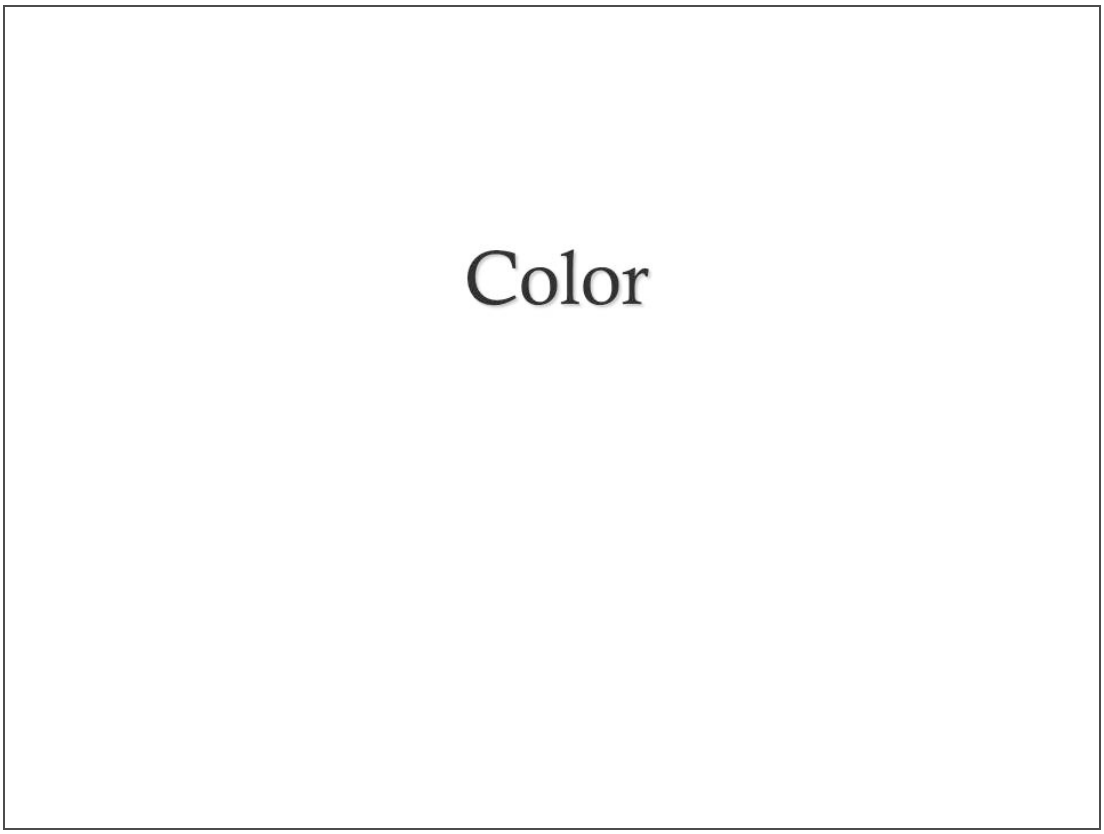


Procedure: The teacher can then direct the students to reexamine p12/fig1 (plant cell) and p. 13/fig2 (animal cell) (shown on the next slide if the teacher wants to project them) and emphasize that, in order for the diagrams to show what these cells look like, they have been greatly magnified since they take up such a large portion of the textbook page. The teacher should conclude the activity with the emphasis that the relative sizes of objects in images may not be accurate, so care should always be taken to understand the magnification or relative size of objects in images and diagrams. One should not assume that the size of the object shown reflects what size it would be if the viewer was looking it with his/her eyes alone (assuming it was close to the viewer as opposed to a great distance away).

Day 27 - Eukaryotic Cells



Day 27 - Eukaryotic Cells



Exercise 1.4

Image comprehension focus: color

Goal: Maintain the concept that colors used in diagrams are often false, and they are for differentiating objects in a diagram

Type of Activity: Teacher comment

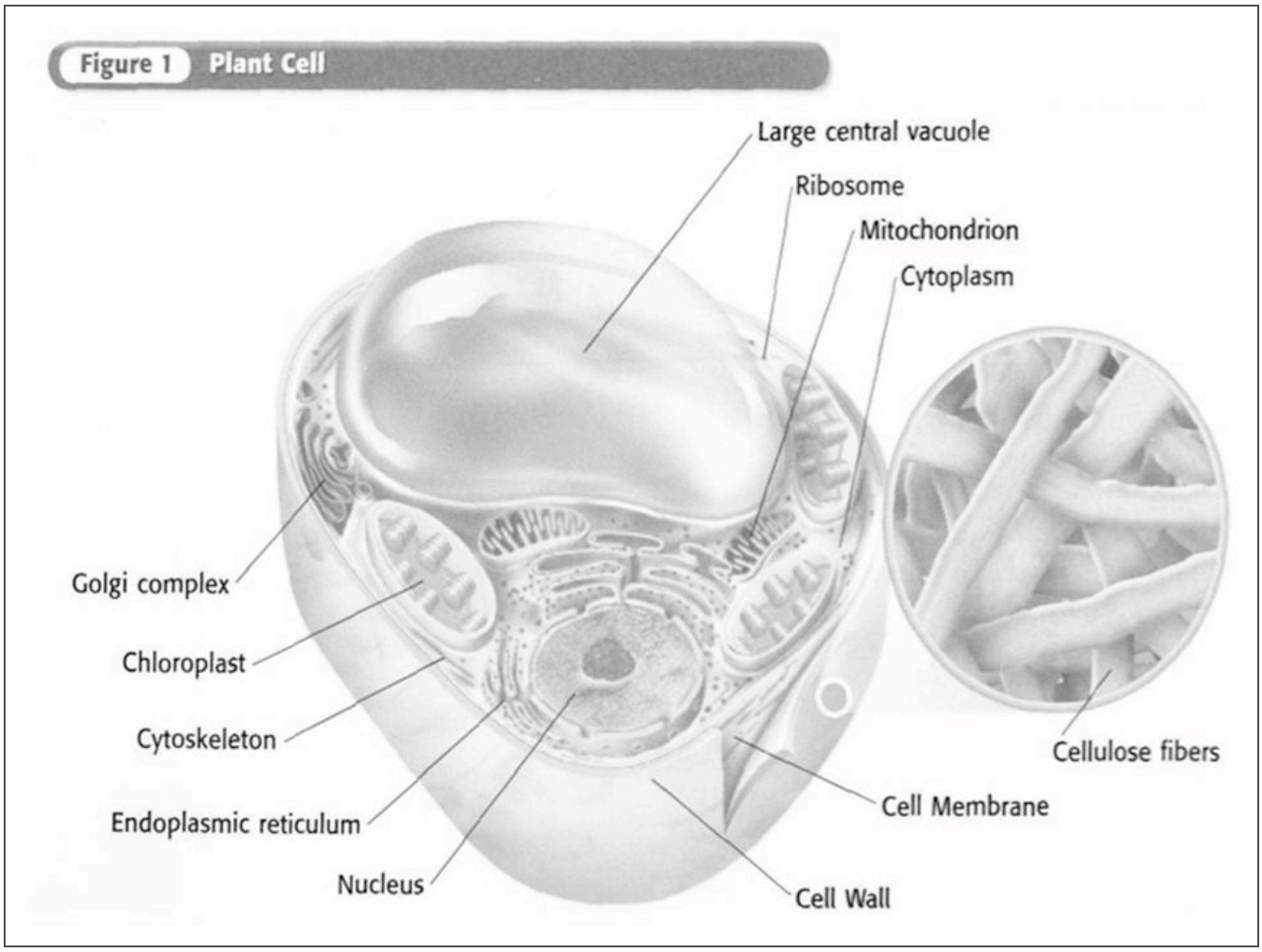
Overview: This activity is designed to help the students develop their understanding of how color is often used in diagrams. Specifically, the students will explore how color can be used to visually represent similarities and differences between parts of the image (reflecting back to the concept of color use in chap 5, p. 114/fig 8 and p. 123/Fig 2). More importantly, this activity will serve to combat the misconception that the colors of objects in diagrams always accurately reflect their actual appearance. These ideas will help students develop their image comprehension skills.

Day 27 - Eukaryotic Cells

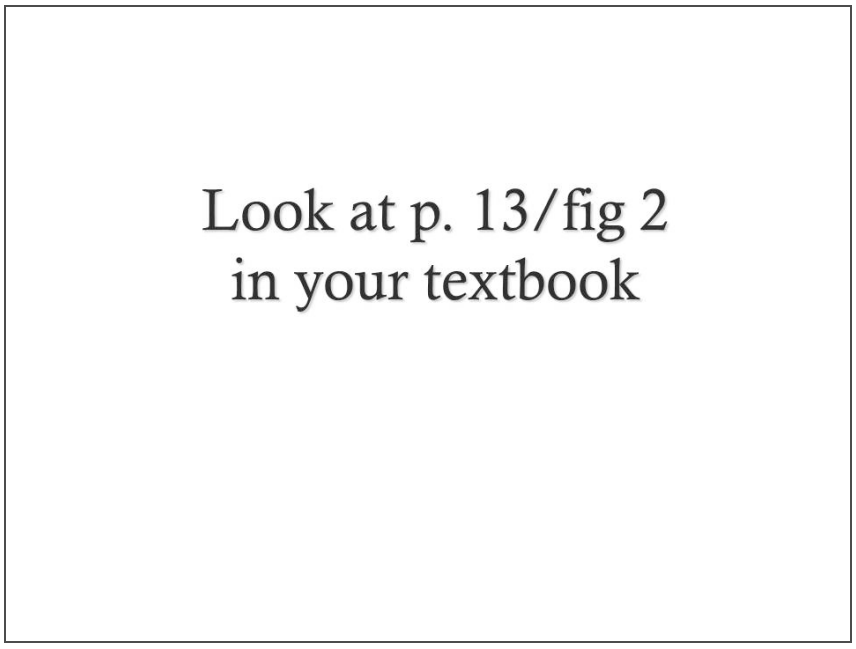
Look at p. 12/Fig 1
in your textbook

Procedure: The teacher should direct the students to look at p. 12/Fig 1 (plant cell, shown on the next slide if the teacher wants to project it). He/she should point out that color is being used here to show the different organelles (for example, the chloroplasts are green, the mitochondria are blue). The reason that these organelles have different colors is to make it easier to differentiate so it will be easier to understand the structure of the cell. The teacher should also note that these color choices are only to help identify the different parts of the diagram. They do not accurately represent their "true" colors. [For example, the Golgi complex is not naturally purple.] The teacher should follow this explanation with the student activity.

Day 27 - Eukaryotic Cells



Day 27 - Eukaryotic Cells



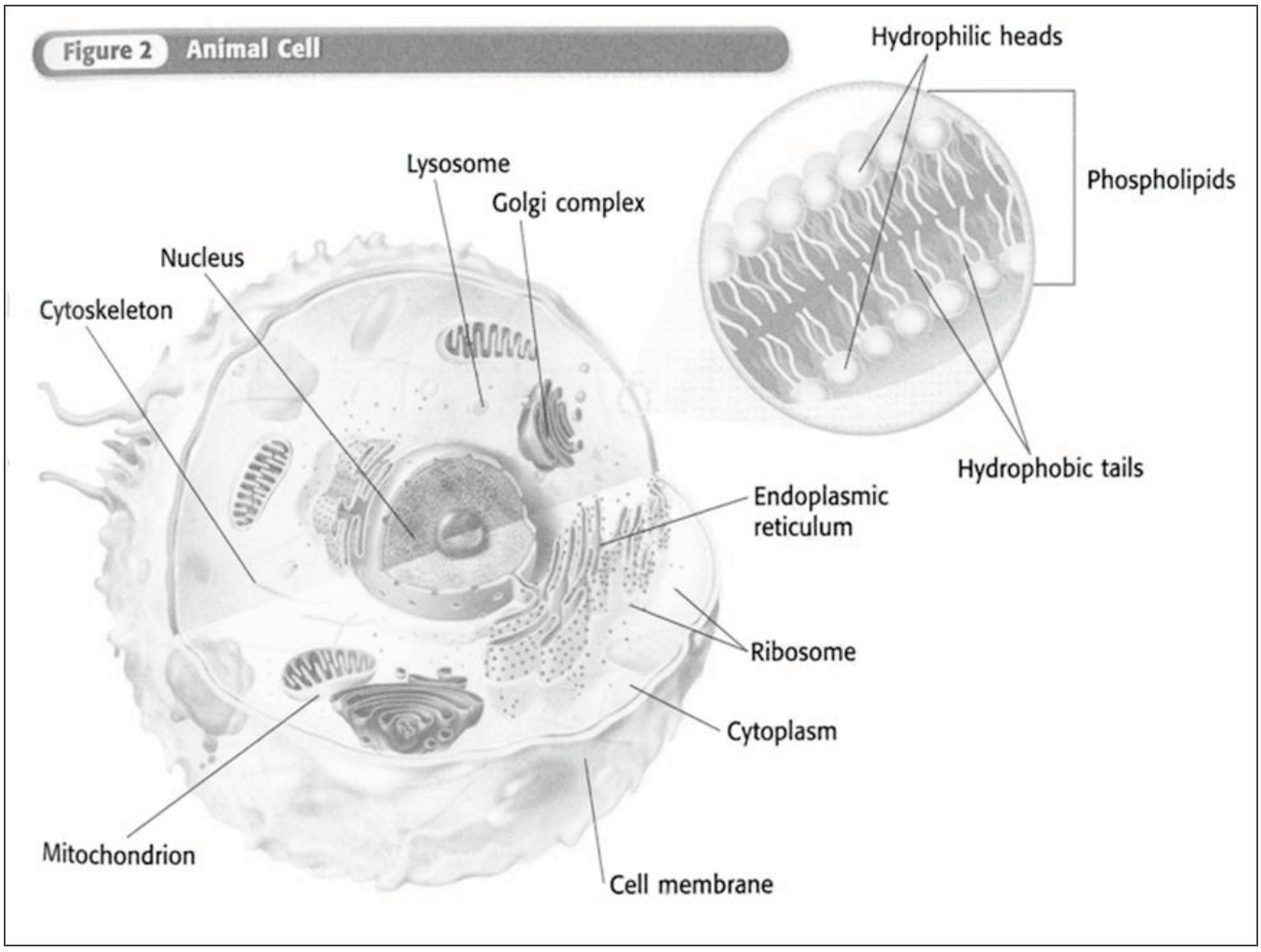
Exercise 1.5

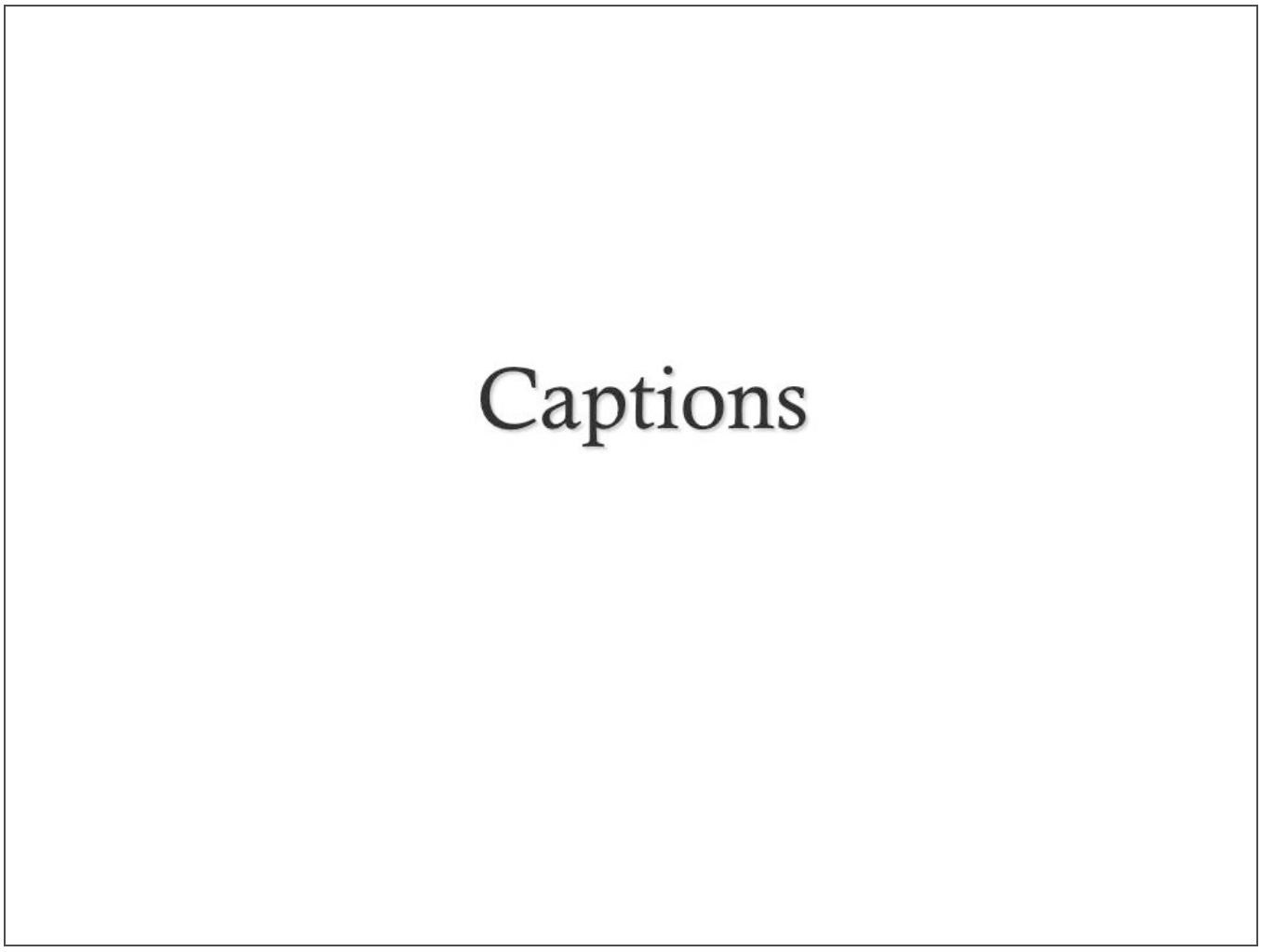
Type of Activity: Student Activity

Overview: This activity is designed for students to practice and apply the concepts outlined in the teacher comment above so they can develop their image comprehension skills.

Procedure: The teacher should instruct the students to look at p 13/fig2 (animal cell, shown on the next slide if the teacher wants to project it). He/she should ask them to use what they talked about above to identify all the Golgi complexes and all the mitochondria in the image. After giving the students time to make their identifications, the teacher should ask the students to share their ideas and explain how they made their identifications. [One of each is labeled; use the idea that the same type of organelle is the same color.] The teacher should also remind the students that color can be used to help illustrate a concept visually but may not be an accurate representation of the true color of the object. In this example, the color helps to show the different organelles, but the colors are not realistic. [For example, as noted above, the mitochondria are not really blue.] The teacher should conclude the activity with the reminder that one should pay attention to the colors in diagrams because they may provide information that is very useful to understanding that image.

Day 27 - Eukaryotic Cells





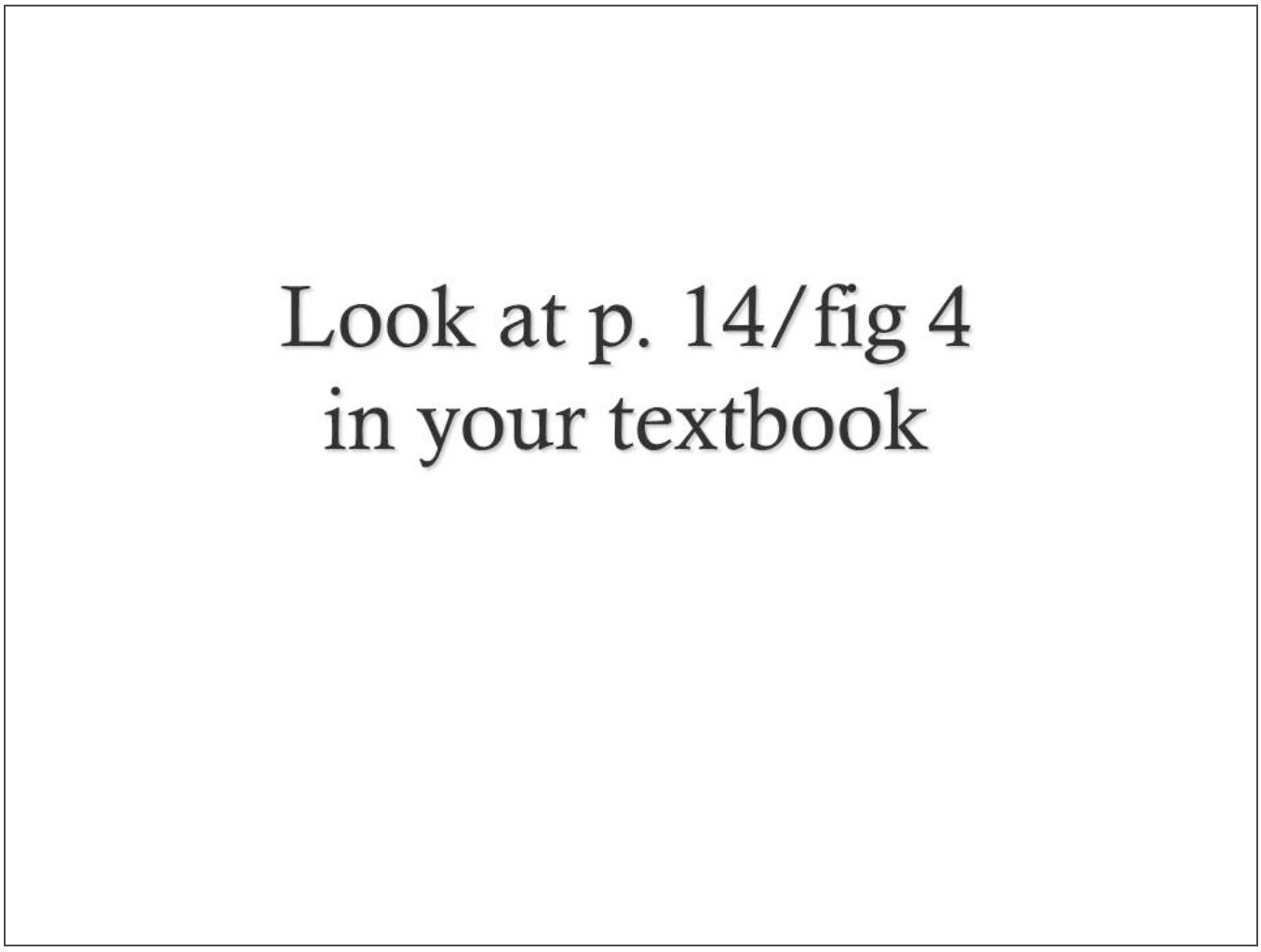
Exercise 1.8

Image comprehension focus: Captions

Goal: To reinforce the idea that captions are extremely important to consider when looking at an image since they often provide information that is crucial to understanding the diagram.

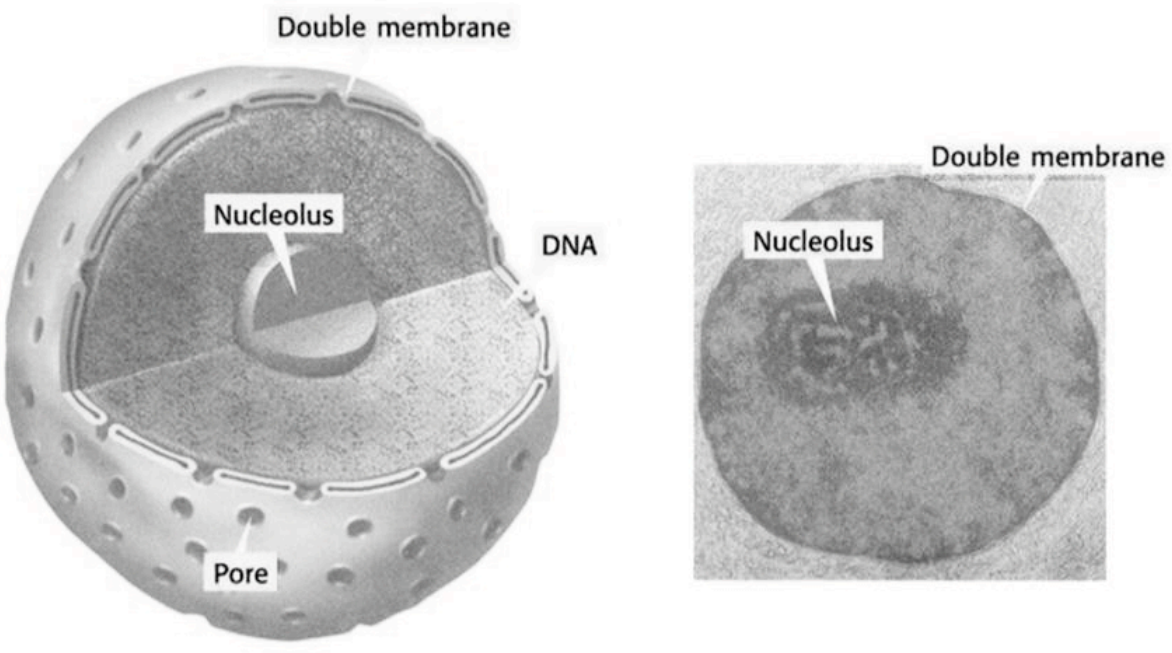
Overview: This activity is designed for students to practice the concept that captions are critical to read when viewing a diagram or image. The goal is to give them an experience that reinforces the importance of captions to encourage them not to skip them when viewing images.

Day 27 - Eukaryotic Cells



Procedure: The teacher should ask the students to look at p.14/fig4 silently (shown on the next slide if the teacher wants to project it). After thirty seconds, the teacher should ask the students to close their books and write down the answers to the following questions: What is the overall object shown in the image? What do pores do? After allowing the students a few minutes to jot down their responses individually, the teacher should ask for a show of hands of who could answer the questions. Next the teacher should ask for a show of hands as to who read the caption. The teacher should then have the students look back at the figure and explain that the answers to both questions were only in the caption. If one just looked at the image and the labels, he/she would not know the answers. The teacher should conclude the activity by reemphasizing the importance of captions and the vital role they play in understanding images.

Figure 4 *The nucleus contains the cell's DNA. Pores allow materials to move between the nucleus and the cytoplasm.*



DAY 28

Chapter 1, Section 2: Eukaryotic Cells (continued)

After the warm-up, continue working through Chapter 1, Section 2. After completing Section 2, complete visualization activities 1.6, 1.7, and 1.8.

Big Ideas

- Mitochondria and chloroplasts are organelles that provide chemical energy for the cell.
- Lysosomes are organelles responsible for digestion within a cell. In plant cells, organelles called vacuoles store cell materials and sometimes act like large lysosomes.

Materials

Teacher:

1. Warm-up Day 28 - Cells_warmups.ppt
2. Slides – day28.ppt

Students:

1. Holt textbook pages 16-18

Activities and Allotted time

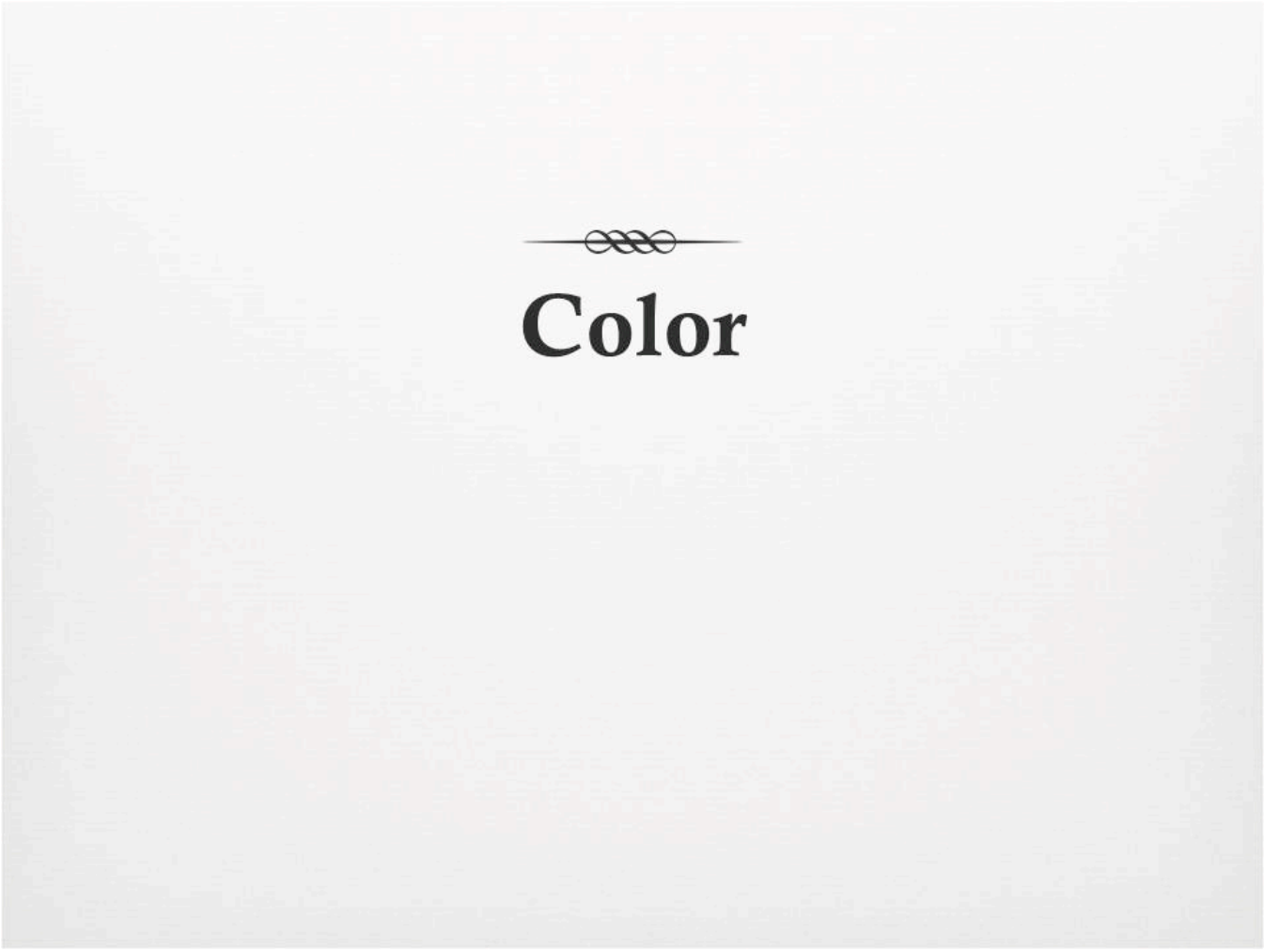
5 minutes - Warm-up
25 minutes - Holt Ch 1, Section 2, p16-18
5 minutes - Visualization activity 1.6 regarding p16
5 minutes - Visualization activity 1.7 regarding p16
5 minutes - Visualization activity 1.8 regarding p17

Day 28 – Warm-up

These flowers are wilting! Based on your knowledge of plant cells, describe what might have happened on a cellular level to make the stems droop.

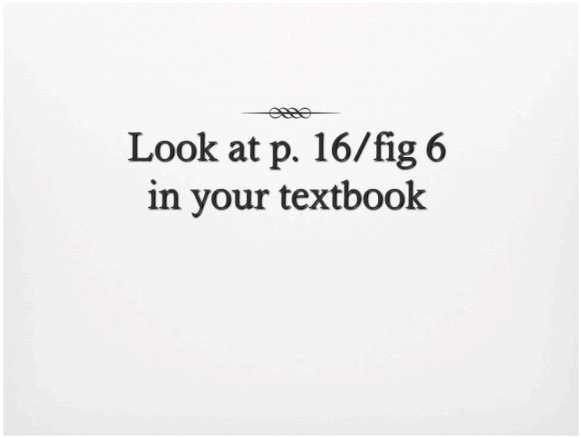
Answer: Some plant cells store water in their vacuoles. When the vacuoles lose water, it can cause some plants to wilt.

Purpose: This exercise helps students apply a concept that is familiar on the cellular level (plant cells store water in vacuoles) to a real-image, macro level.



Project this slide during the visualization activity if you wish.

Day 28 - Eukaryotic Cells



Exercise 1.6

Type of Activity: Teacher comment

Goal: Maintain the idea that colors are often "false" and do not reflect the true color of the object

Overview: The purpose of this activity is to reinforce the idea that the colors of the biological samples are examples of "false-color" in that they are not natural but rather the result of exposure to a stain or other material in order to aid with visualization of the object.

Procedure: The teacher should remind the students of the previous consideration of "false-color" where it was discussed that, often with biological samples, the sample is "stained" or exposed to a material that will give it a color so it will be easier to look at with a microscope. As an example, the teacher should direct the students to look at fig 6/p.16 (shown on the next slide if the teacher wants to project it) and indicate that the blue of the mitochondria sample in the lower image is a "false color" resulting from exposure to a stain. In addition, the teacher should direct the students to note that only the mitochondria itself is blue, the surrounding area is not because the surrounding area did not have the same reaction to the stain. The teacher should emphasize that, when viewing images, it is important to consider if the color shown is realistic or a "false color."

Optional Demo: In order to illustrate the fact that substances can react differently and that this difference can make it easier to differentiate between components, the teacher can take some lemon juice and use a popsicle stick to use the juice as "ink" to draw either a shape or a letter on a piece of white paper. Once the juice dries, it cannot be distinguished from the paper. If the paper with juice writing is then exposed to a heat source like a light bulb or a hairdryer, however, the juice will turn brown and will become visible. The teacher can then make the link to the stains, in that the juice and paper react differently to the light so that exposing them to it (like exposing a biological sample to a stain) causes it to be easier to differentiate between the two.

Day 28 - Eukaryotic Cells

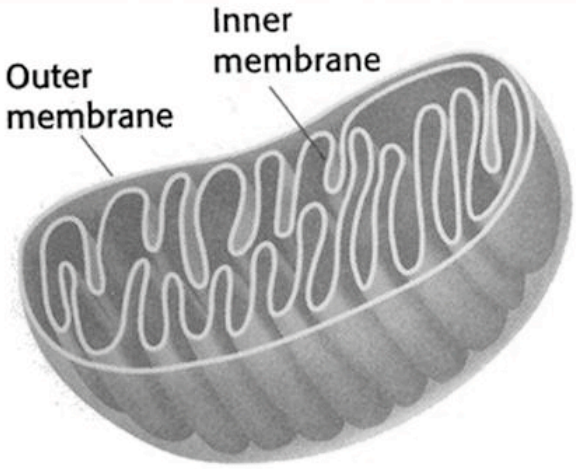


Figure 6 *Mitochondria break down sugar and make ATP. ATP is produced on the inner membrane.*

Exercise 1.7

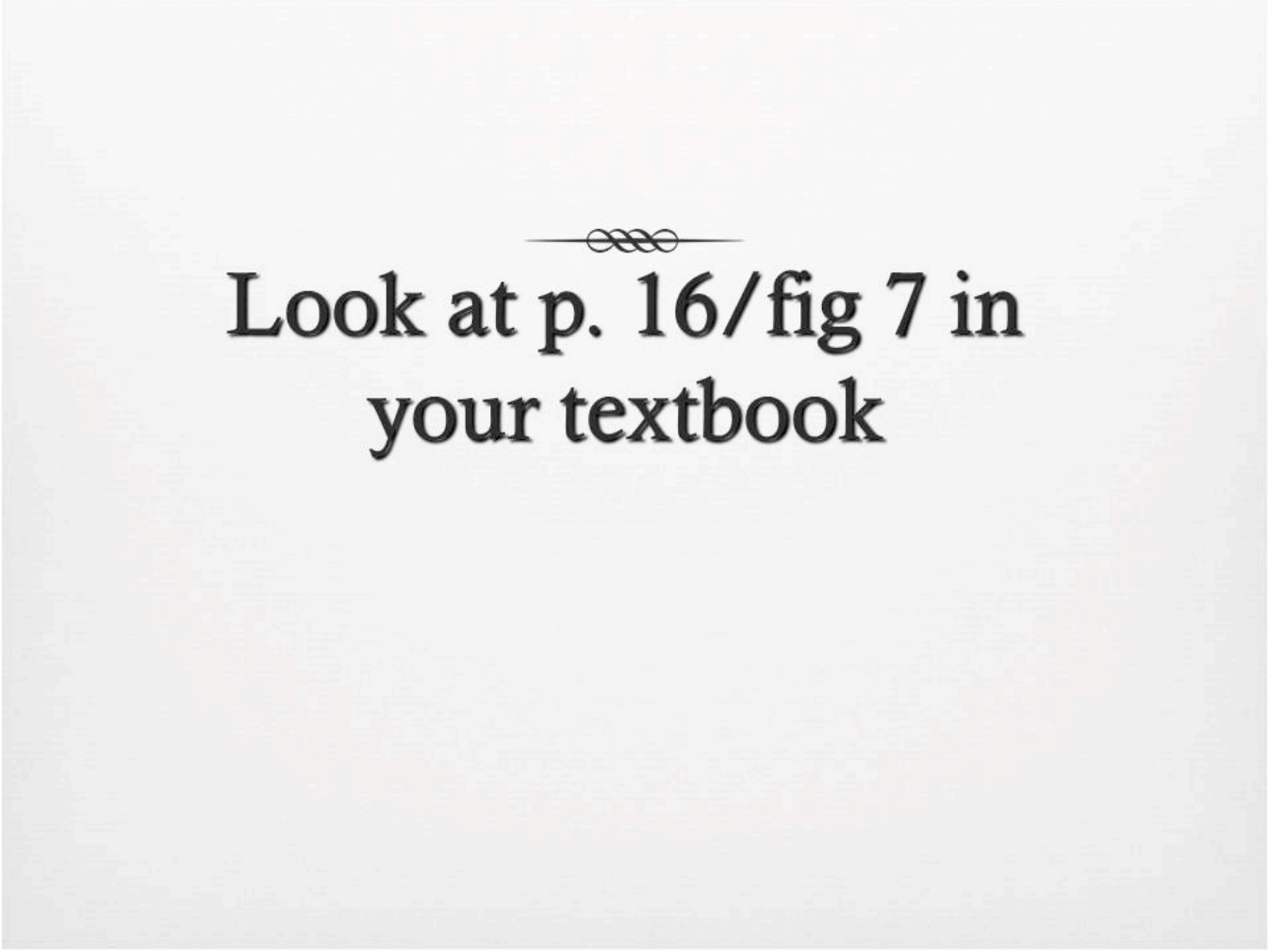
Image Comprehension Focus: Labeling

Goal: Develop 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 help the students practice with 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.

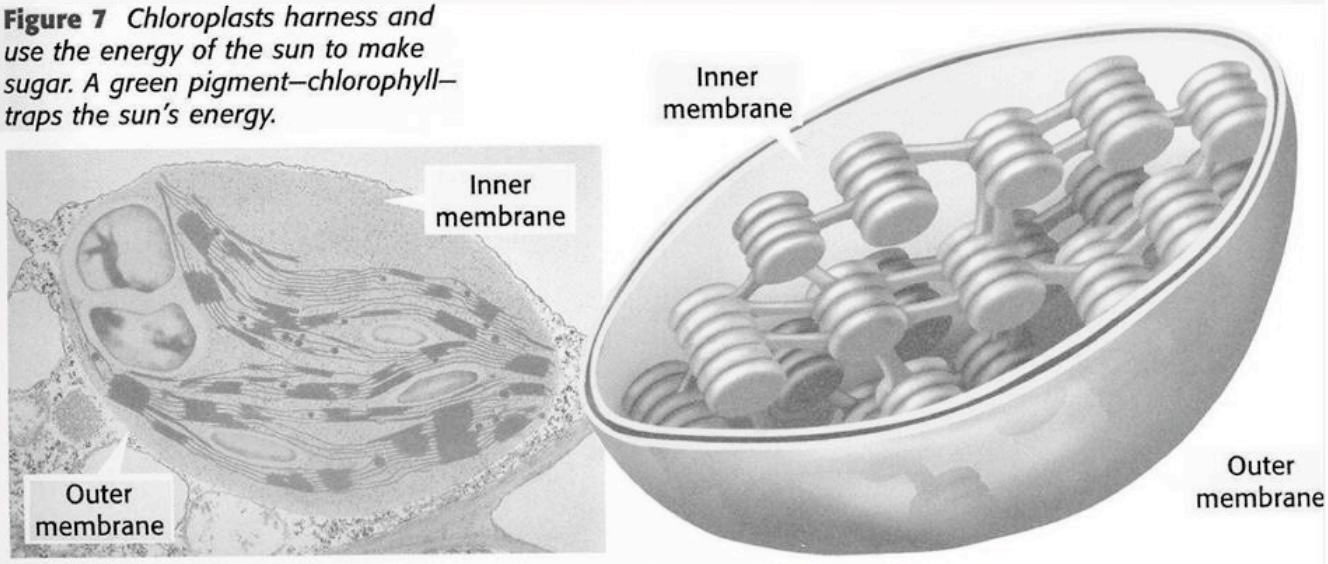
Procedure: First the teacher should ask the students to indicate the two types of labels and their function. [Naming labels identify different parts of a diagram; explanatory labels provide more information about a particular part of a diagram.]



Procedure continued: The teacher should direct the students to look at p.16/fig7 (chloroplasts, shown on the next slide if the teacher wants to project it) and ask them what types of labels are in this diagram. [They are naming labels; they indicate/identify the parts of the chloroplast.] After the class has identified the types of labels, the teacher should indicate that, in this case, the labels are within white boxes right next to the parts they are identifying, which is the normal location for naming labels. The teacher should note that this difference is one of appearance only and it makes no difference with respect to understanding – in each image, the labels identify parts of the target objects no matter how that is visually presented. The teacher should review another type of label – explanatory labels (in chap 5 p.124/fig3) and emphasize the importance of reading the labels since they provide detailed information on the parts of the diagram or image.

Day 28 - Eukaryotic Cells

Figure 7 *Chloroplasts harness and use the energy of the sun to make sugar. A green pigment—chlorophyll—traps the sun's energy.*



Day 28 - Eukaryotic Cells

Exercise 1.8

Image Comprehension Focus: Perspective

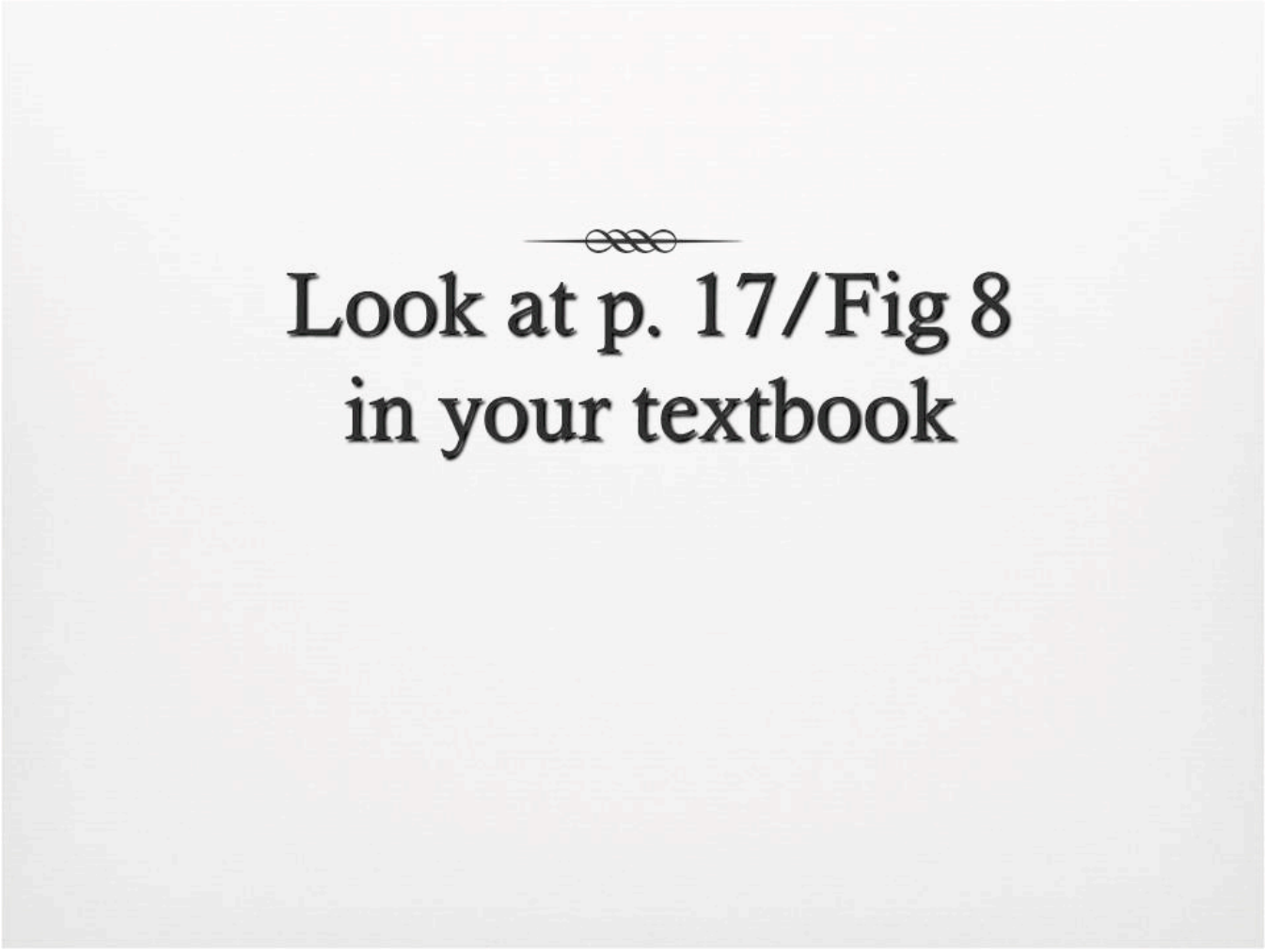
Goal: To understand the relationship between 2D and 3D perspectives.

Type of Activity: Teacher Demo

Overview: The purpose of this activity is to demonstrate the relationship between a 3D and a 2D perspective. By considering how the same objects appear in 3D and in 2D, the students can begin to develop an understanding of each perspective and how the two perspectives relate to one another. This type of understanding can help them with comprehending images which use a 2D perspective.

Procedure: The teacher should remind the students (or explain if they are unfamiliar with the concept) that there are different types of perspectives in drawings, 2D and 3D. A 3D perspective shows an object in three dimensions (similar to how images appear to our eyes, where we can see height, length, and width) while a 2D perspective shows an image in only two dimensions (flat, like a photograph of a familiar object). To illustrate this, the teacher can hold a ball or other spherical object then draw a circle to show the relationship between the images in 3D and in 2D. In addition, teacher can show the students a side view of an entire stack of paper (which is a 3D perspective since it has height, length and width) and then have students observe the top of the stack of paper (which simulates 2-D since now it primarily has width and length) to illustrate the relationship. Next the teacher can indicate that sometimes an object can be examined by cutting a thin central layer out of it. This would be like removing one page from the middle of the stack of paper and looking at it from the top. This approach creates a 2D perspective of the object that allows the viewer to see inside the object.

(Proceed to next slide)



Procedure continued: To illustrate this with the textbook images, the teacher can ask the students to look at p17/fig 8 (Golgi complex, shown on next slide if the teacher wants to project it). The teacher should point out that this figure shows both a 3D diagram of the complex (on the left) as well as a cross section of an actual Golgi complex on the right. The actual cross section creates a 2D perspective of this organelle. The teacher should guide the class to consider what is the same about the shape of the two and what is different. [The cross section provides a perspective as if one were looking down from the top of the 3D object and could not see that it has height to it.]

Day 28 - Eukaryotic Cells

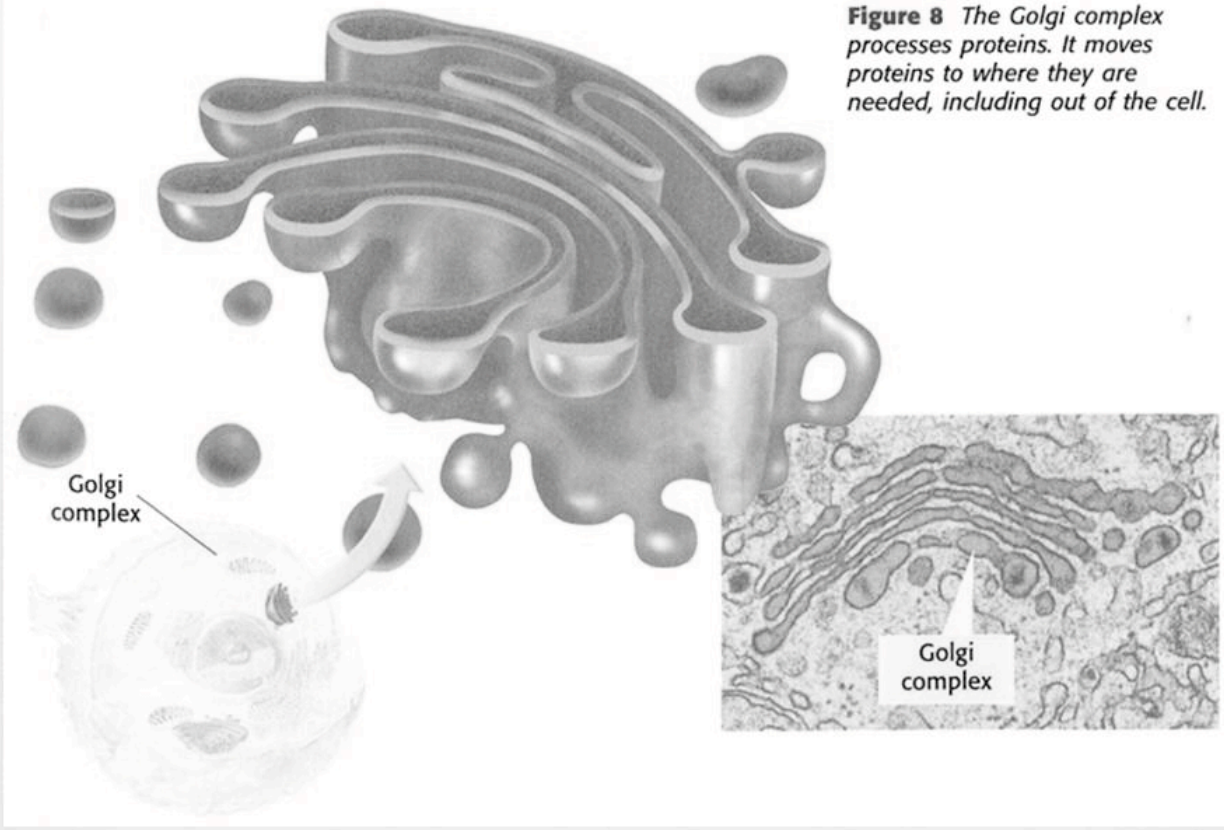


Figure 8 *The Golgi complex processes proteins. It moves proteins to where they are needed, including out of the cell.*

DAY 29

Chapter 1, Section 3: The Organization of Living Things

After beginning the class with a warm-up, begin teaching Chapter 1, Section 3 as you normally would teach it. This section discusses the special processes that multicellular organisms experience and how cells work together to form tissues and organs. As you proceed through the section, try to connect ideas back to the concepts presented earlier in the chapter.

Big Ideas

- Advantages of being multicellular are larger size, longer life, and cell specialization.
- Four levels of organization are cell, tissue, organ, and organ system.
- A tissue is a group of cells working together. An organ is two or more tissues working together. An organ system is two or more organs working together.

Materials

Teacher:

1. Warm-up Day 29 - Cells_warmups.ppt

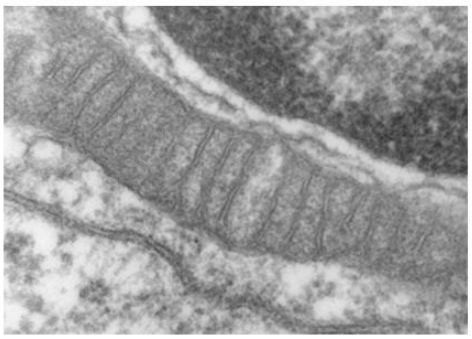
Students:

1. Holt textbook pages 20-21

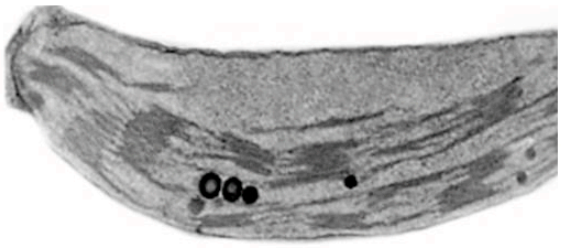
Activities and Allotted time

5 minutes - Warm-up
40 minutes - Holt Ch 1, Section 3, p20-21

Day 29 - Warm-up



A



B

Images A and B are real photos of cell organelles taken through a microscope.

1. Which organelle is shown in image A?
2. What is its purpose?
3. Which organelle is shown in image B?
4. What is its purpose?

Answers:

1. Mitochondria
2. The mitochondria breaks down food to produce energy, which it stores in the form of ATP. This is where cellular respiration occurs.
3. Chloroplast
4. The chloroplast converts energy from the sun into food. This is where photosynthesis occurs.

After providing the answers, it may be helpful to have students turn to page 16 to note the characteristics shared by the images on the slide and the drawings in the book.

Purpose: This exercise reviews two very important organelles – chloroplasts and mitochondria – while providing practice with real vs. diagram visualization skills. By comparing organelles in a real image to diagrams, students should come away with a stronger recognition of these parts. Gaining stronger familiarity with chloroplasts and mitochondria will be particularly useful when the class reaches the photosynthesis vs. cellular respiration contrasting case.

DAY 30

Chapter 1, Section 3: The Organization of Living Things (cont)

After warming up, continue teaching Chapter 1, Section 3, starting on p22 and proceed through the end of the section on p23. Please pause on pages 22 and 23 to remind students that naming labels are used to identify parts of the diagram, as in Figure 4. Explanatory labels are used to provide more information about part of a diagram. Figure 3 has both types. The blue labels name the images, and the black labels explain how the images relate to each other.

Big Ideas

- In organisms, a part's structure and function are related.

Materials

Teacher:

1. Warm-up Day 30 - Cells_warmups.ppt

Students:

1. Holt textbook, p22-23

Activities and Allotted time

5 minutes - Warm-up
40 minutes – Holt textbook Chapter 1, Section 3, p22-23

Day 30 - Warm-up

Humans are *multicellular organisms*. Scientists do not agree on exactly how many cells are in the human body, but they know it is somewhere in the **tens of trillions**. To give you an idea of how big that is, if you tried to count to one trillion at a rate of one number per second, it would take you more than 30,000 years!

We've also learned that some organisms consist of just a single cell.

Think about why some organisms have so many cells when others have just one. Without looking in your textbook, try to write down three reasons why it is beneficial to be multicellular.

Answer: Multicellular organisms can have a larger size (a single cell is generally very small), a longer life (they are not limited to the life span of a single cell), and they can be specialized (different cells can have different jobs, rather than every cell having to do everything). Emphasize that all of these things make multicellular organisms more complex and allow them to do a wider variety of things.

Purpose: This exercise reviews the lesson about multicellular organisms and helps students begin to think about how cells work together.

DAY 31

Chapter 1 Review and Embedded Assessment

After today's warm-up, you may review material from Chapter 1 or catch 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 Chapter 1.

Materials

Teacher:

1. Warm-up Day 31 - Cells_warmups.ppt

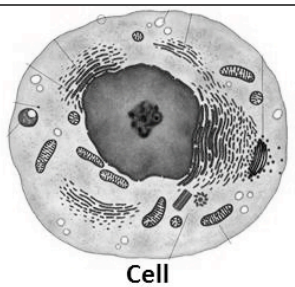
Students:

1. Holt textbook, Chapter 1
2. Embedded Assessment #3

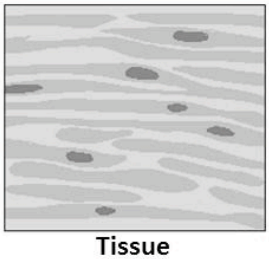
Activities and Allotted time

5 minutes - Warm-up
20 minutes - Holt Ch 1 review
20 minutes - Embedded Assessment #3

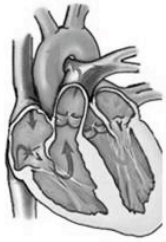
Day 31 – Warm-up



Cell
(drawing of animal cell pictured above)



Tissue
(drawing of smooth muscle tissue pictured above)



Organ
(drawing of heart pictured above)

Use the words **cell(s)**, **tissue(s)**, and **organ(s)** to fill in the blanks in the following questions. Words can be used more than once.

1.A group of cells that work together to perform a specific job is called a(n) _____.
2._____ are the basic building block of life.
3.When two or more tissues work together to perform a specific function, it is called a(n) _____.
4.An organ is made up of _____, which in turn are made up of groups of _____.

Answers:

1. Tissue
2. Cells
3. Organ
4. Tissues, cells

Purpose: This exercise helps students compare the roles of cells, tissues and organs, placing emphasis on how the three are related.

Embedded Assessment #3 - Answer Key

Embedded Assessment 3: Cells

Please select the best answer to each question.

1. What is the smallest unit that can carry out all the processes necessary for life?

    a. Cell*

    b. Nucleus

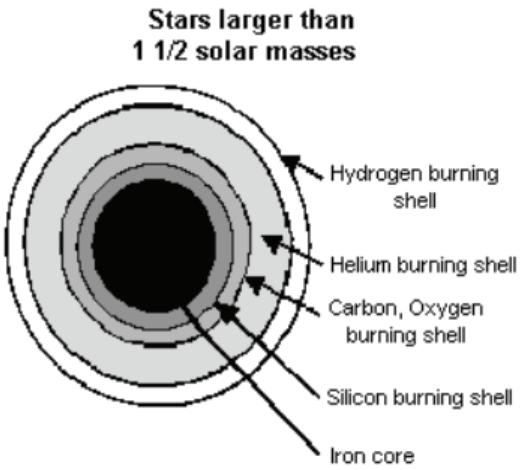
    c. Organelle

2. A single-celled organism with a nucleus is most likely a member of which Kingdom?

    a. Archaea

    b. Bacteria

    c. Protista*

3. 

From the information above, in stars larger than 1 ½ solar masses, one can find _____ between the iron core and a carbon and oxygen burning shell.

    a. A helium burning shell

    b. A silicon burning shell*

    c. A helium and silicon burning shell

    d. A hydrogen burning shell

4. Which statement is NOT part of the cell theory?
    a. All organisms are made of one or more cells.
    b. Animal and plant cells contain the same organelles.*
    c. The cell is the basic unit of living things.
5. A structure made of two or more tissues working together is called a(n):
    a. cell.
    b. organ.*
    c. system.
6. Larger size, longer life, and more-specialized cells are characteristics of organisms that are
    a. multicellular.*
    b. prokaryotic.
    c. single-celled.
7. When certain genes make organisms more likely to survive and reproduce, which process can occur?
    a. Trait dominance
    b. Natural selection*
    c. Selected breeding

Please answer the following question using complete sentences.

8. What are three parts that plant cells have and animal cells do not?

Sample Answer: Three parts that plant cells have and animal cells do not are the cell wall, chloroplasts, and vacuoles.

DAY 32

Chapter 1 - Flex Day

About Flex Days: These days are built into the schedule at the end of each chapter. If you are unable to complete all of the material from the chapter, you can teach the "overflow" material during the flex day. If the flex day does not need to be used to 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 32 - Cells_warmups.ppt

Students:

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

Activities and Allotted time

5 minutes - Warm-up
40 minutes - Review or catch up
Optional activity – Cells Alive! (textbook p184)

Day 32 - Warm-up

Use the word bank to the right to fill in the blanks.

Word Bank

eukaryotes	humans
prokaryotes	eubacteria
nucleus	plants
archaebacteria	

1. Cells are divided into two groups depending on whether they have a _____ or not.
2. Cells with a nucleus are called _____. Examples include _____ and _____.
3. Cells without a nucleus are called _____. Examples are _____ and _____.

Answers:

1. Nucleus
2. Eukaryotes, plants, humans
3. Prokaryotes, archaebacteria, eubacteria

Purpose: This exercise reviews the comparison between prokaryotes and eukaryotes. It also addresses any misconceptions students might have about associating eubacteria with eukaryotes (when in fact eubacteria are prokaryotes).