DAY 33

Chapter 2, Section 1: Exchange with the Environment

Contrasting cases are generally placed at the beginning of a chapter to provide a strong conceptual framework for the lessons that follow. In this chapter, however, the topic of the contrasting case – photosynthesis and cellular respiration – falls after important information about cellular processes introduced in Section 1. For reasons including the conceptual difficulty students face in understanding microscopic cellular processes (see Heads Up on Student Learning on p261), we would like you to teach Chapter 2, Section 1 before beginning the contrasting case.

You may present certain concepts in Section 1 in the style of contrasting cases (i.e., present more than one example at the same time rather than sequentially, and discuss the similarities and differences between them), including passive transport vs. active transport (p36) and endocytosis vs. exocytosis (p37). Pause to present visualization activities 2.1 (p36) and 2.2 (p37). You should complete all of Section 1 today, ending with p37.

Big Ideas

- Diffusion is the movement of particles from an area of high concentration to an area of low concentration.
- Osmosis is the diffusion of water through a semi-permeable membrane.
- Cells move small particles by diffusion, which is an example of passive transport, and by active transport.
- Large particles enter the cell by endocytosis, and exit the cell by exocytosis.

Materials

Teacher:

1. Slides - day33.ppt
2. Warm-up Day 33 - Cells_warmups.ppt

Students:

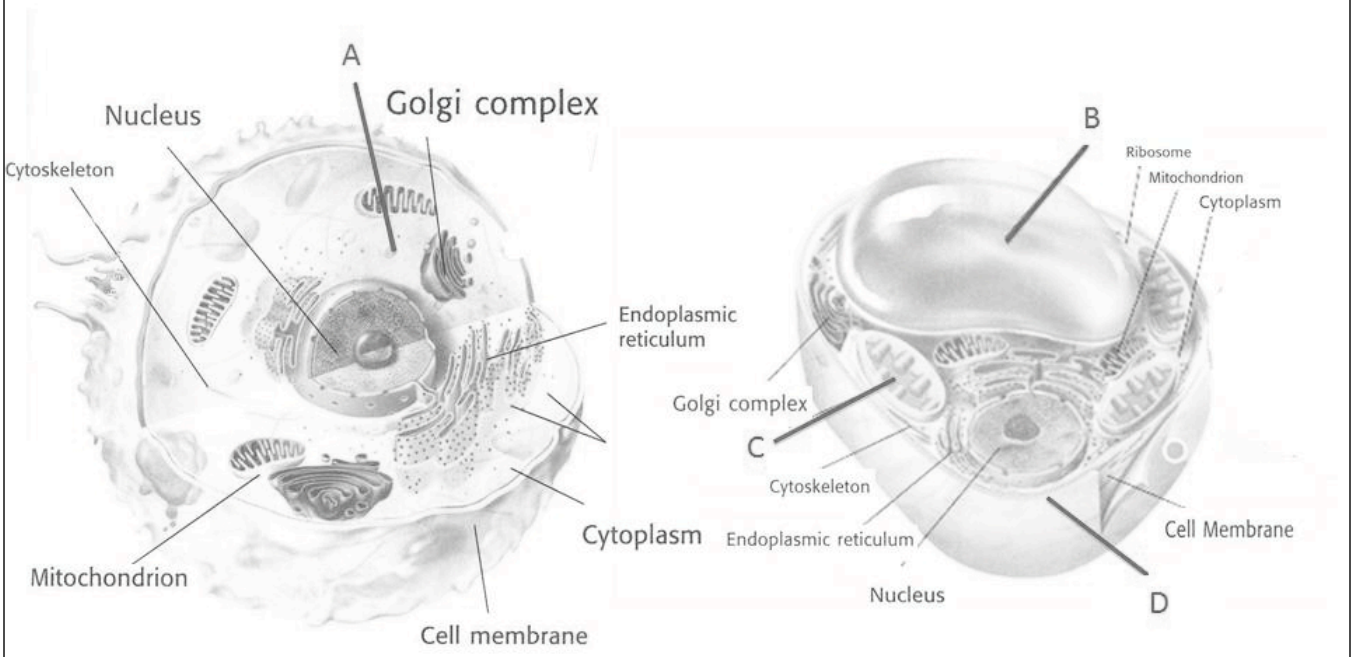
1. Holt textbook p34-337

Activities and Allotted time

5 minutes - Warm-up
30 minutes - Holt textbook Chapter 2, Section 1, p34-37
5 minutes - Visualization activity 2.1, p36
5 minutes - Visualization activity 2.2, p37

Day 33 - Warm-up

Several labels have been removed from the diagrams of an animal and a plant cell below. Name the organelles that are missing. Recall that A is unique to animal cells and B, C and D are unique to plant cells.



Answers:

A. Lysosome
B. Large central vacuole
C. Chloroplast
D. Cell wall

It may be helpful again for the teacher to emphasize that the reason animal and plant cells have some different organelles is that they must carry out different functions. This is a helpful way to lead into the photosynthesis vs. cellular respiration contrasting case.

Purpose: This exercise reviews the plant vs. animal cells contrasting case and gives students practice with the parts of a cell.

Relating observable behavior to microscopic cellular processes

Heads up on student learning

At a conceptual level, it is very challenging to understand how directly observable macroscopic properties of life, such as breathing, eating, reproducing, growing, and aging, are related to cellular processes. Observable properties and processes arise out of but do not directly resemble microscopic cellular processes. For example, when most students think of breathing, they think of humans or familiar animals breathing in and out through a mouth or nose. The exchange of gases in cellular respiration doesn't look anything like that, yet it is what underlies the observable behavior. It will take considerable time before students have sufficient background to understand how all life functions depend on what happens at the cellular level. Their explorations in this unit are the beginning of an extended learning process.

Day 33 – Exchange with the Environment

Exercise 2.1

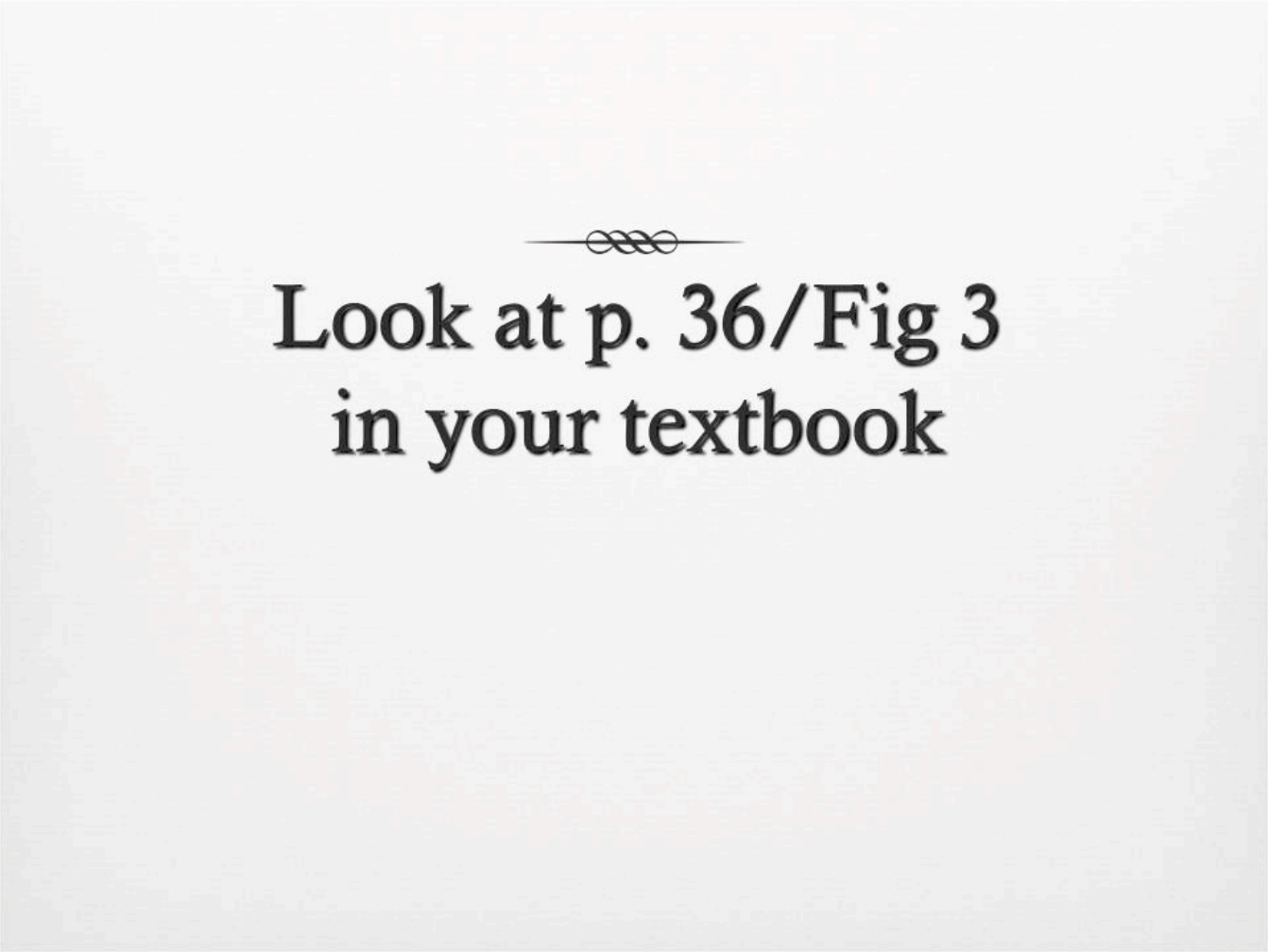
Image comprehension focus: cut-away convention

Goal: Encourage metacognition of a "cut-away" convention

Overview: This activity is intended to engage students with an understanding of the perspective involved with a cut-away convention by having them articulate the nature of that perspective.

Type of Activity: Student activity

Day 33 – Exchange with the Environment



Procedure: First the teacher should ask the students to look at p.36/fig3 (shown on the next slide if the teacher wants to project it). The teacher should ask the students to use what they know about cut-away conventions from earlier chapters to explain what is illustrated in this image of the cell membrane. This can be done as a small group activity or a guided discussion. [The student responses should include the idea that this image is not a realistic version of the membrane. In this image, a section of the membrane is missing so that the viewer can see what is happening inside the membrane (that the particle is passing through the membrane in each case).] The teacher can conclude the activity by emphasizing that the use of a "cut-out" perspective is very helpful but care must be taken to realize that it is not realistic. It is a way to illustrate what is happening inside a particular object.

Day 33 – Exchange with the Environment

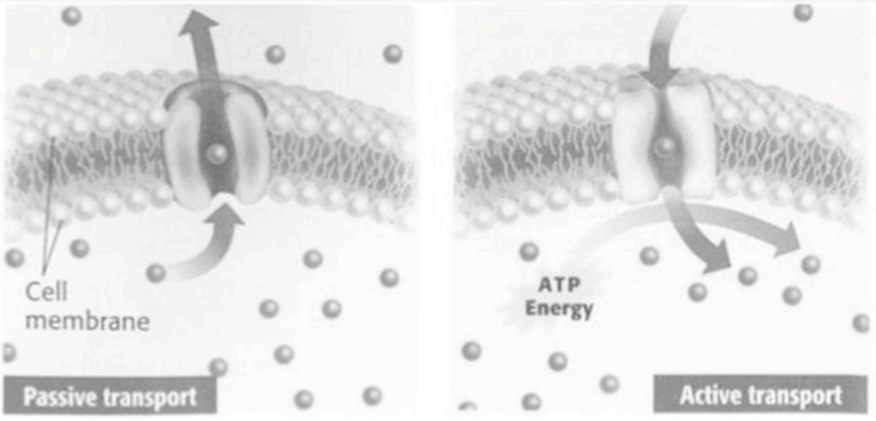
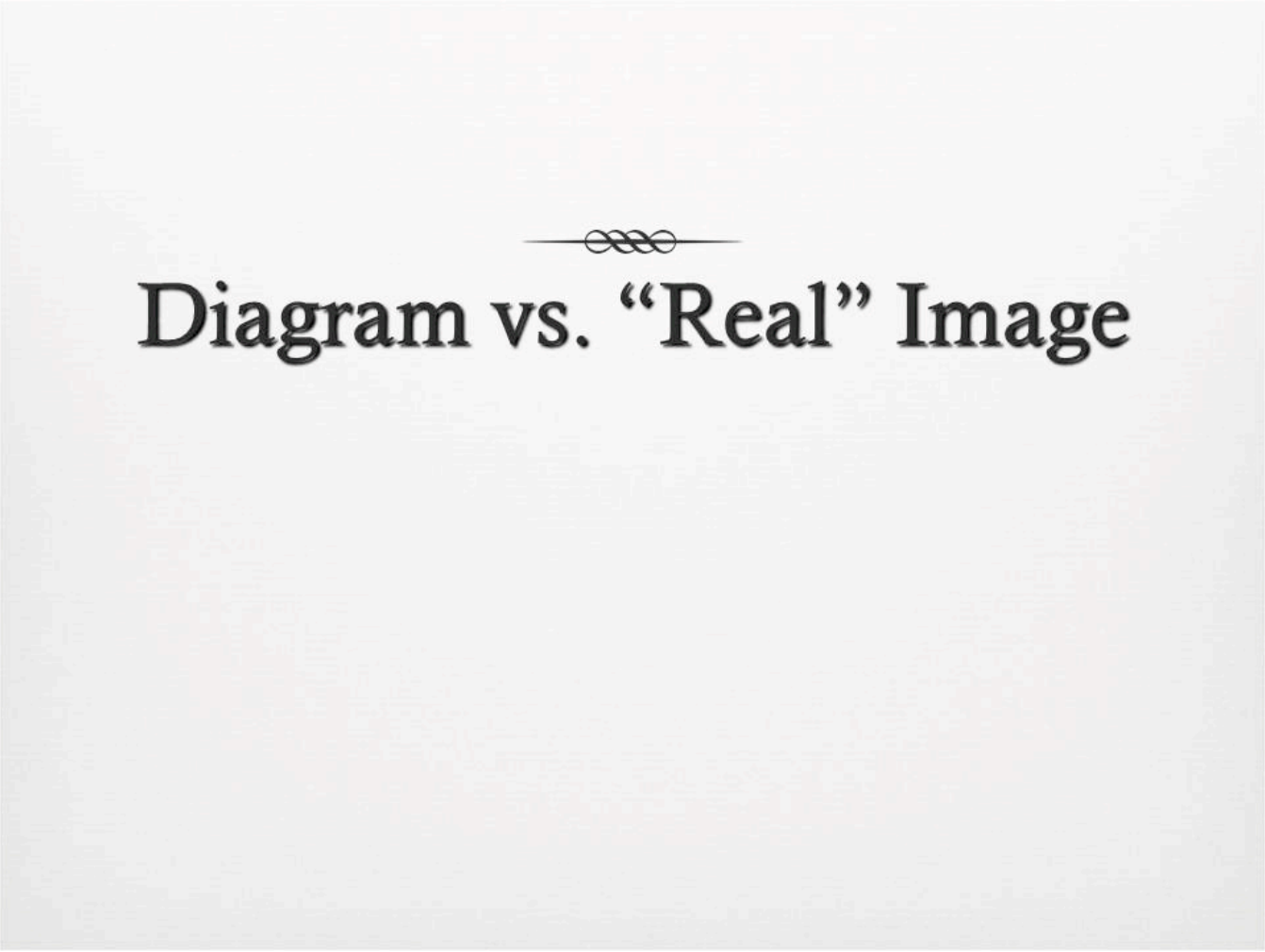


Figure 3 *In passive transport, particles travel through proteins to areas of lower concentration. In active transport, cells use energy to move particles, usually to areas of higher concentration.*

Day 33 – Exchange with the Environment



Exercise 2.2

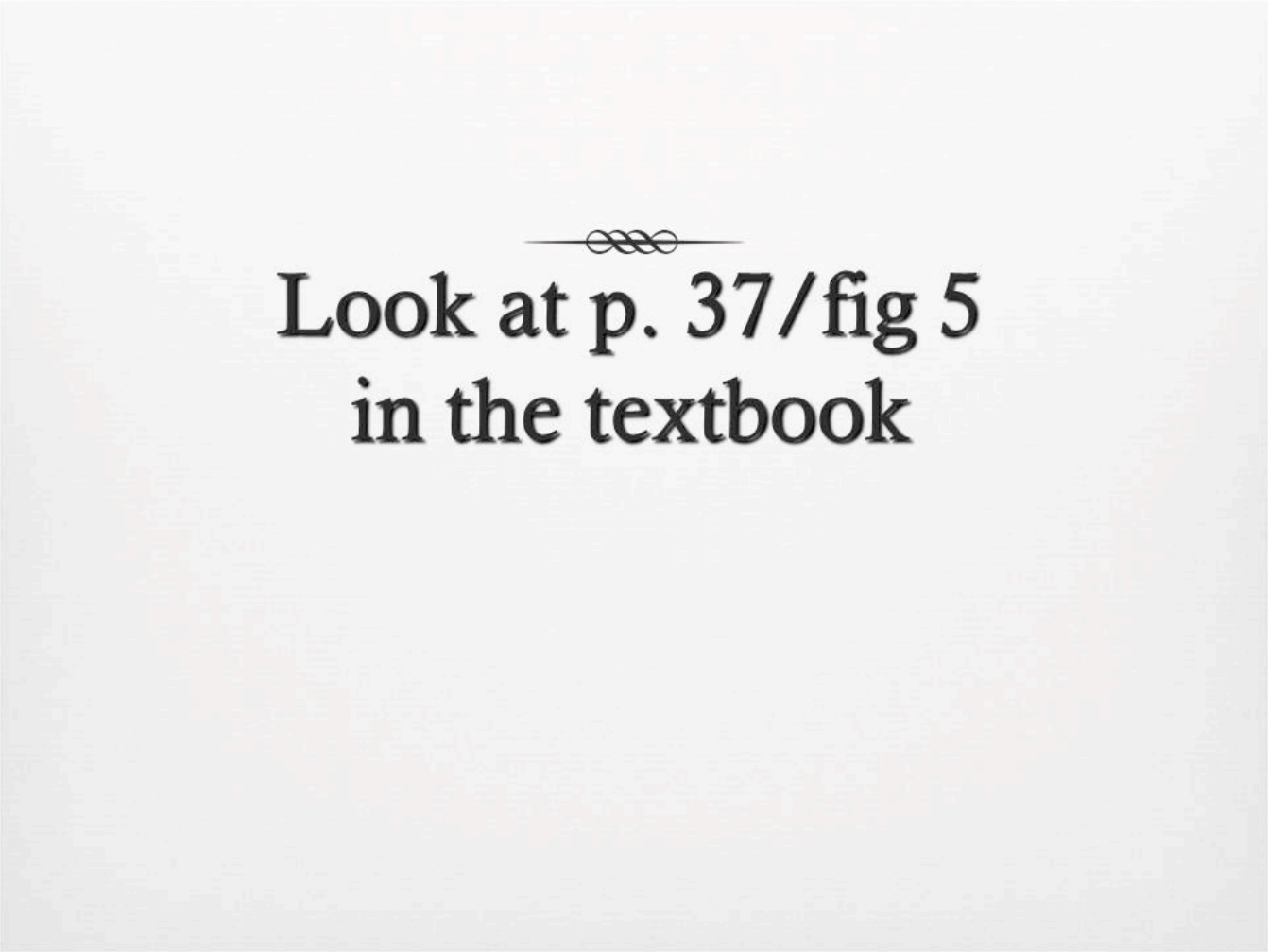
Image comprehension focus: Diagram vs. "Real" Image

Goal: To practice being able to map a real image and a diagram

Type of Activity: Student Activity

Overview: In this activity, students will practice making connections between features on real images and on diagrams to develop their diagram mapping skills. An understanding of how a diagram represents a real object is an important component of diagram comprehension.

Day 33 – Exchange with the Environment



Procedure: The teacher should ask the students to turn to p. 37/fig 5 (exocytosis, shown on the next slide if the teacher wishes to project it). The teacher should explain that the first task is to identify the real images and the diagrams. [The first three are diagrams, the real image is the one on the right.] The teacher should then ask the students to indicate which one of the diagram images represents the stage shown in the real image [the third diagram image]. Finally, the teacher should ask the students to find the particles being released in the third diagram image and their corresponding real counterpart. The teacher should end the activity by emphasizing that diagrams are useful because they capture key features of an object. Care should be taken, however, not to assume that a diagram always conveys a realistic view of the appearance of an object.

Day 33 – Exchange with the Environment

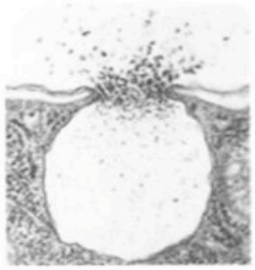
Figure 5 Exocytosis

1. Large particles that must leave the cell are packaged in vesicles.

2. The vesicle travels to the cell membrane and fuses with it.

3. The cell releases the particle to the outside of the cell.

Exocytosis means "outside the cell."



DAY 34

Chapter 2, Section 1: Review

After warming up, complete any portion of Section 1 that was not completed yesterday and conduct a review of the concepts covered. You may use the end-of-section review provided in the textbook if you wish.

Big Ideas

Review all Big Ideas presented in Chapter 2, Section 1

Materials

Teacher:

1. Warm-up Day 34 - Cells_warmups.ppt

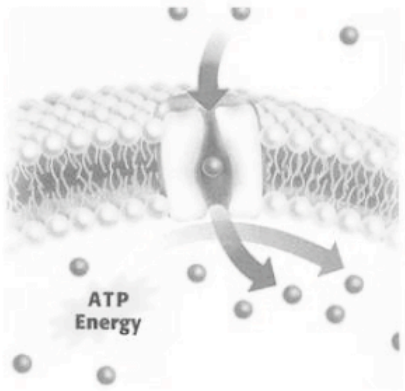
Students:

1. Holt textbook, Chapter 2, Section 1

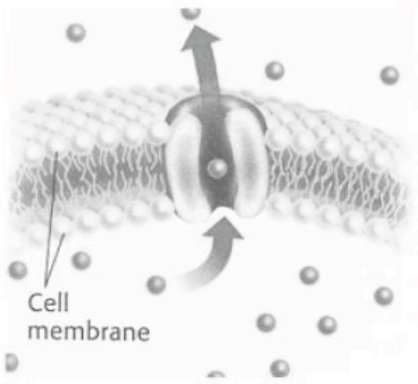
Activities and Allotted time

5 minutes - Warm-up
40 minutes - Review of Holt Chapter 2, Section 1

Day 34 - Warm-up



A.



B.

Pictured to the left are two types of transport.

1. Which picture (A or B) illustrates active transport?
2. Which picture (A or B) illustrates passive transport?
3. How is diffusion related to the type of transport occurring in B?

Answers:

1. Image A illustrates active transport because it is using ATP energy to move particles from an area of lower concentration to an area of higher concentration.
2. Image B illustrates passive transport because particles are moving from an area of higher concentration to an area of lower concentration without the use of energy.
3. Diffusion is an example of passive transport.

The teacher may want to speak briefly about the natural movement of particles from areas of higher density to lower density and emphasize that this occurs without the use of energy. To move from an area of lower density to higher density, however, energy is required. Some of this explanation may depend on the level of understanding students have concerning density.

Purpose: This exercise leads students through a comparison of active and passive transport, emphasizing the differences between the two to promote better understanding of both concepts.

DAY 35 Contrasting Cases: Photosynthesis vs. Cellular Respiration

This contrasting case will present two cases of cellular respiration for students to compare, followed by two cases of photosynthesis to compare. Through completing these comparisons, students will identify the critical features of the processes of cellular respiration and photosynthesis.

Big Ideas

- All living things (including plants) convert food into energy through a process called cellular respiration.

Materials

Teacher:

1. Warm-up Day 35 - Cells_warmups.ppt
2. Slides - day35.ppt

Students:

1. Cellular Respiration Cases (WS 33 & 34; student resource p48 & 49)
2. Comparison Across Cases (WS 35; student resource p51)

Activities and Allotted time

5 minutes - Warm-up
40 minutes - CC activities: Cellular Respiration cases

Day 35 - Warm-up

Use the word bank to the right to complete the following sentences.

Word Bank	
diffusion	higher
osmosis	lower
does not	does

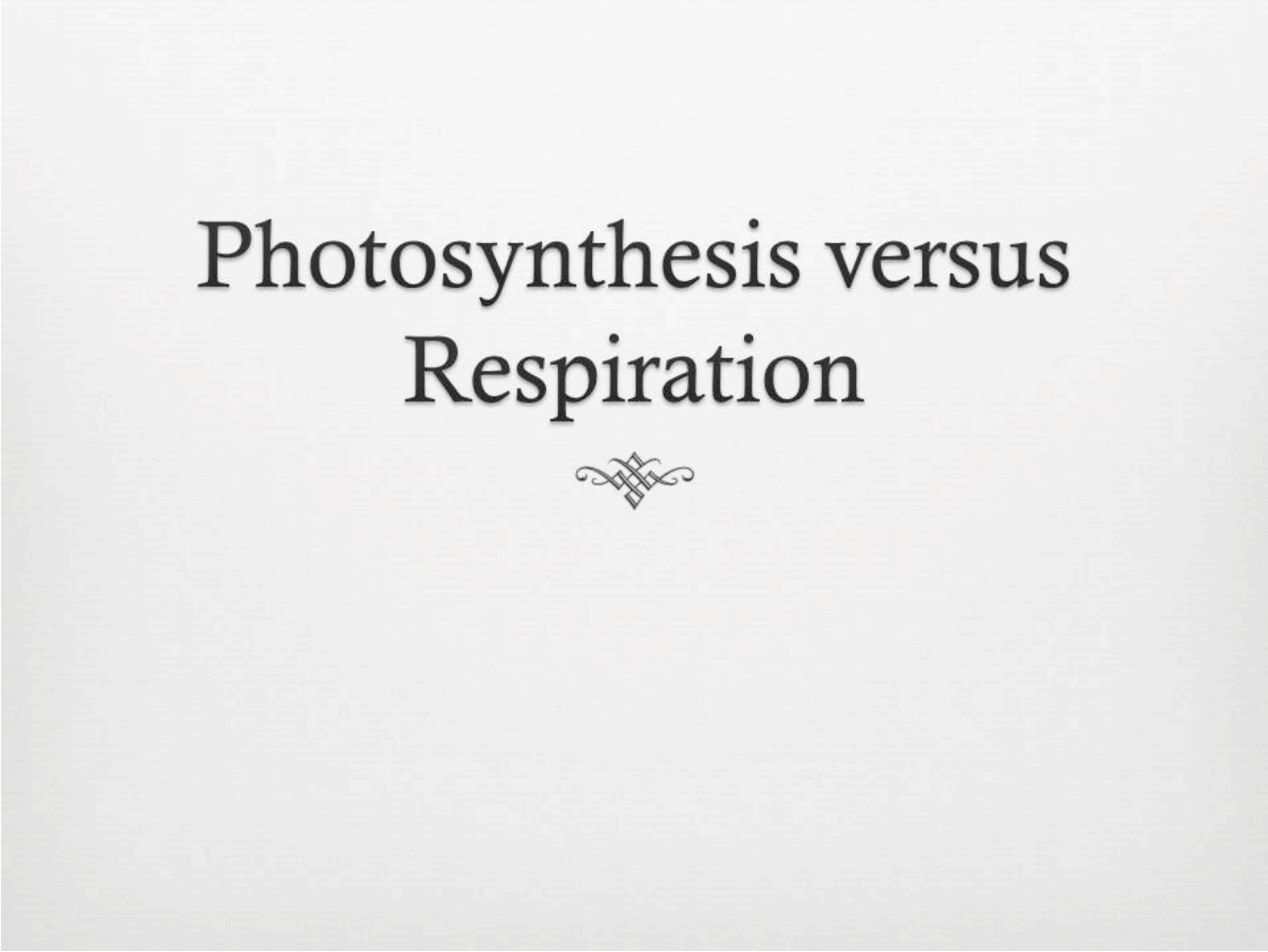
1. _____ is a special kind of _____ that occurs when water crosses a semi-permeable membrane.
2. During diffusion, molecules move from areas of _____ concentration to areas of _____ concentration.
3. Passive transport _____ require the use of energy, while active transport _____.

Answers:

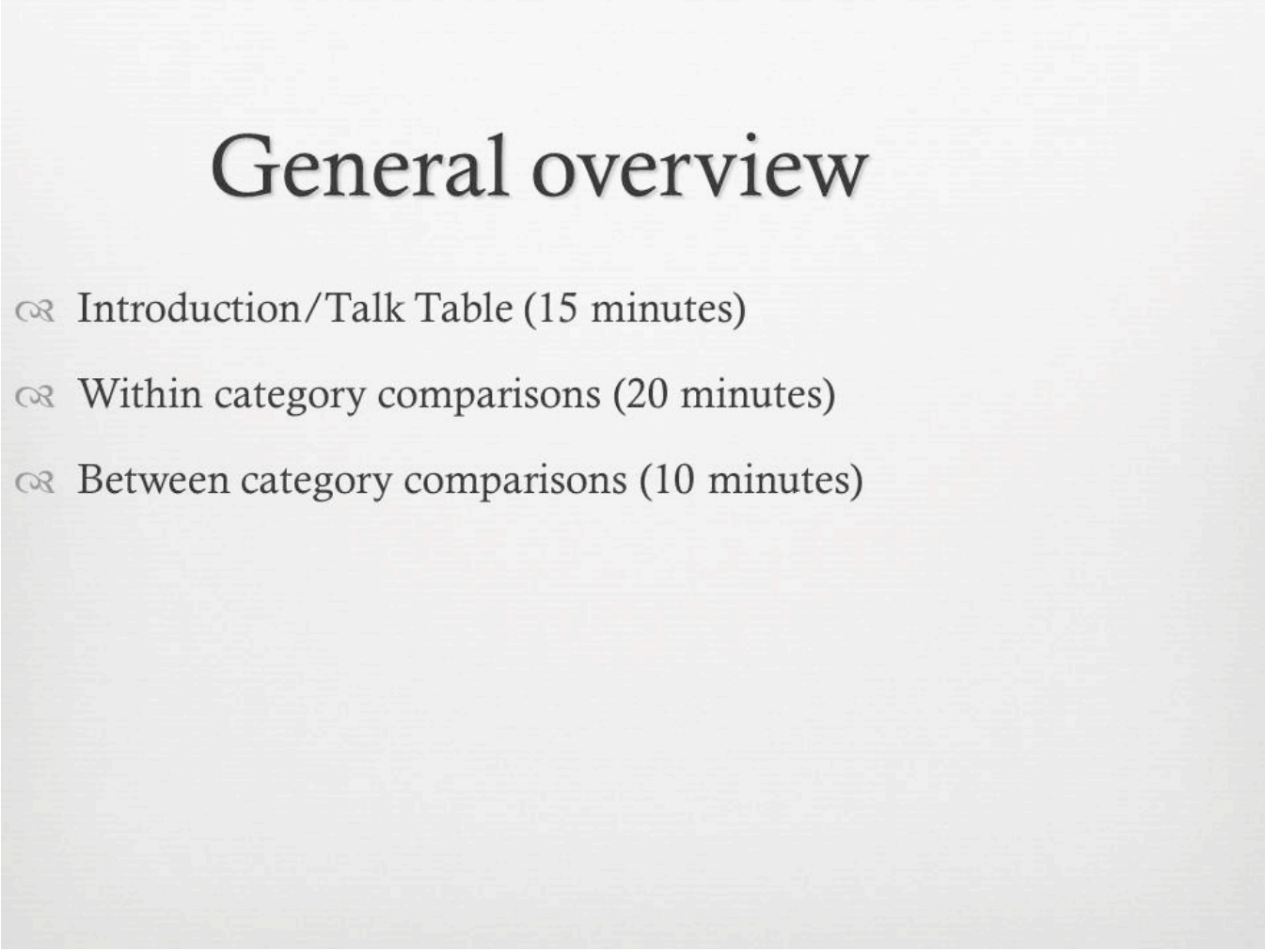
1. Osmosis, diffusion
2. Higher, lower
3. Does not, does

Purpose: This exercise helps students review relationships between similar concepts such as osmosis vs. diffusion and active vs. passive transport.

Day 35 – Cellular Respiration vs Photosynthesis

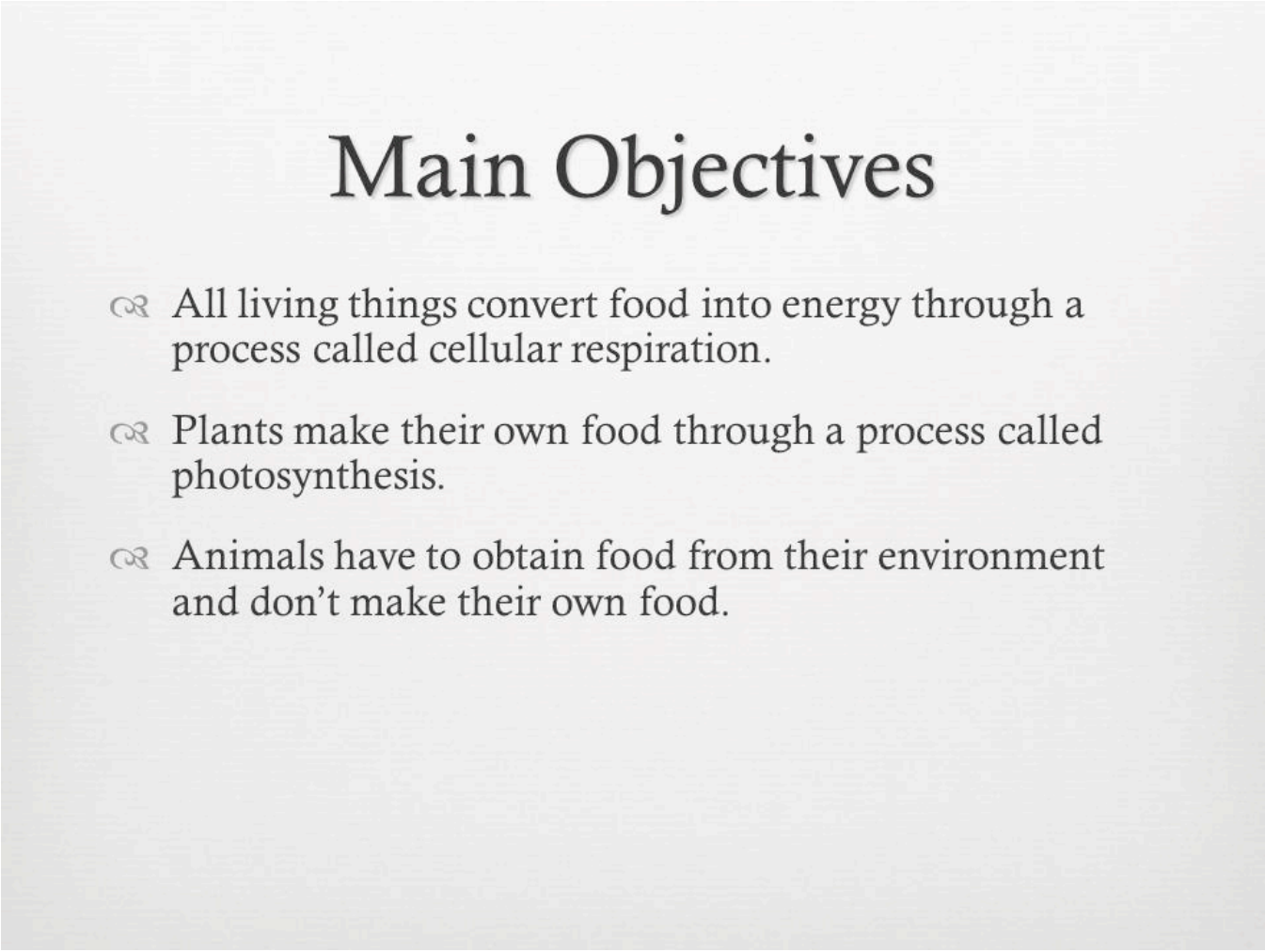


Day 35 – Cellular Respiration vs Photosynthesis



Total time = 40 minutes

Day 35 – Cellular Respiration vs Photosynthesis

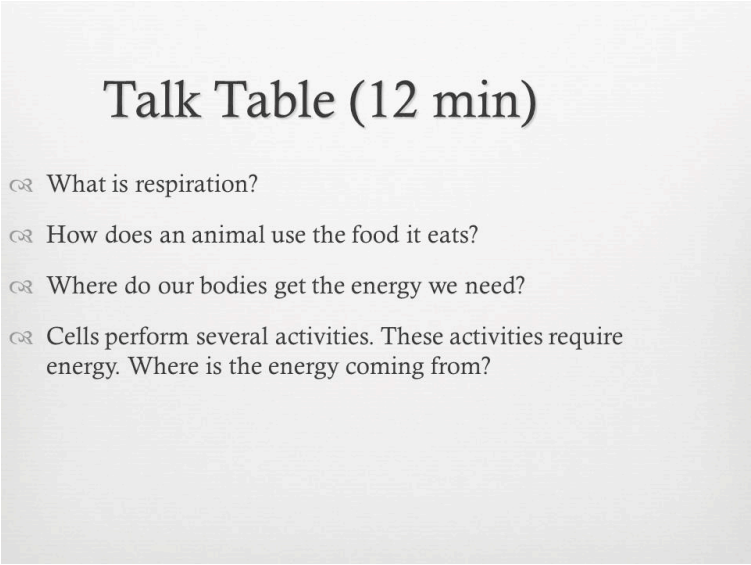


Main objectives to be put on the board and left up throughout the class.

Explain that photosynthesis and cellular respiration are complementary processes:

One process makes food. The other uses the food to chemically transform it to usable energy.

Day 35 – Cellular Respiration vs Photosynthesis



Introduction - potentially a "to-do" daily (activity that students engage in when they first enter the class while waiting to get started)

If not done as a "to-do" daily, this is the first activity for teachers to engage in. Have students copy these questions into their notebooks and jot down their initial answers to these questions. (Answers do not have to be correct.)

What is respiration?

Potential answers: how we breath, oxygen coming in, carbon dioxide going out

How does an animal use the food it eats?

Potential answers: energy, nutrients, glucose, activity

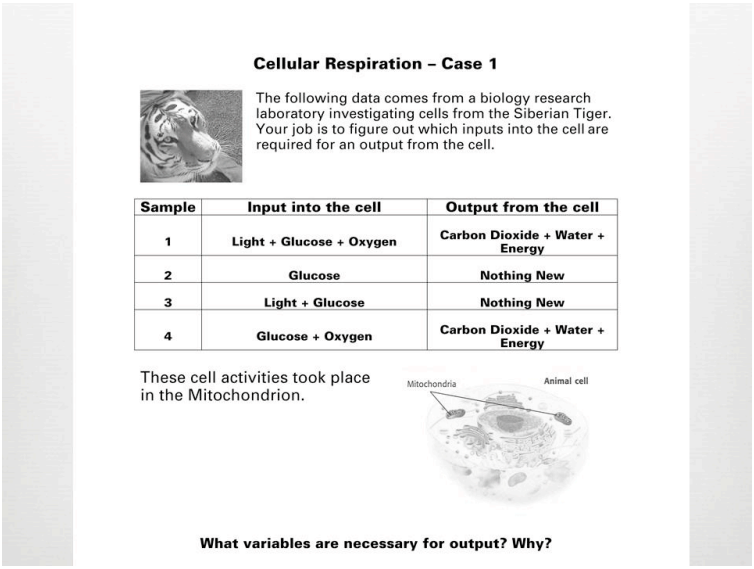
Where do our bodies get the energy we need?

Potential answers: food (glucose)

Cells perform several activities. These activities require energy.

Where is the energy coming from? food (glucose)

Day 35 – Cellular Respiration vs Photosynthesis



Cellular Respiration – Case 1

The following data comes from a biology research laboratory investigating cells from the Siberian Tiger. Your job is to figure out which inputs into the cell are required for an output from the cell.

Sample	Input into the cell	Output from the cell
1	Light + Glucose + Oxygen	Carbon Dioxide + Water + Energy
2	Glucose	Nothing New
3	Light + Glucose	Nothing New
4	Glucose + Oxygen	Carbon Dioxide + Water + Energy

These cell activities took place in the Mitochondrion.

What variables are necessary for output? Why?

This slide and the next should take 10 minutes total. This slide should take 5 minutes. **Give students Cellular Respiration Case 1 (WS 33), or direct them to it in the student resource book (p48).** This first example should be worked through with the teacher guiding students through the exercise. Read the description of the case to the students, and guide them through/discuss with them how to correctly fill out the worksheet.

In this activity, the students interpret and reason about the the PATTERNS of data from several mini-experiments. In this case a biology research laboratory investigating the cells of the Siberian Tiger found the following four results (LABELED SAMPLES 1-4 on their worksheets). Remind students that the cell pictured is a drawing of a cell that is microscopic in size, and that the relative size of the actual tiger and cell are not realistically represented on this slide or their worksheet. Also, the cell drawing is a cutaway, which means that it is illustrated as if a section was sliced away so we can see both the organelles inside and the membrane on the outside.

Scientists are trying to figure out what inputs produce a new output. Can the students figure out what variables are necessary for output? The inputs show the incoming elements (chemicals) and the outputs shows what is produced.

Answer: Glucose + Oxygen + Cell. WHY? This is what is common to the two samples that produced the same new output. Therefore, you can infer that light was not required in the fourth sample, so it must not be necessary for the output.

Glucose and oxygen are required to produce carbon dioxide, water, and energy. This process is a chemical activity that breaks down food (glucose) into carbon dioxide, water, and ATP (energy). In animals, the energy is primarily used to regulate body temperature and other cell processes.

Day 35 – Cellular Respiration vs Photosynthesis

Cellular Respiration – Case 2

The following data comes from a biology research laboratory investigating cells from rye grass. Your job is to figure out which inputs into the cell are required for an output from the cell.

Sample	Input into the cell	Output from the cell
1	Glucose + Oxygen	Carbon Dioxide + Water + Energy
2	Glucose + Water	Nothing New
3	Glucose	Nothing New
4	Light + Glucose + Oxygen	Carbon Dioxide + Water + Energy

These cell activities took place in the Mitochondrion.

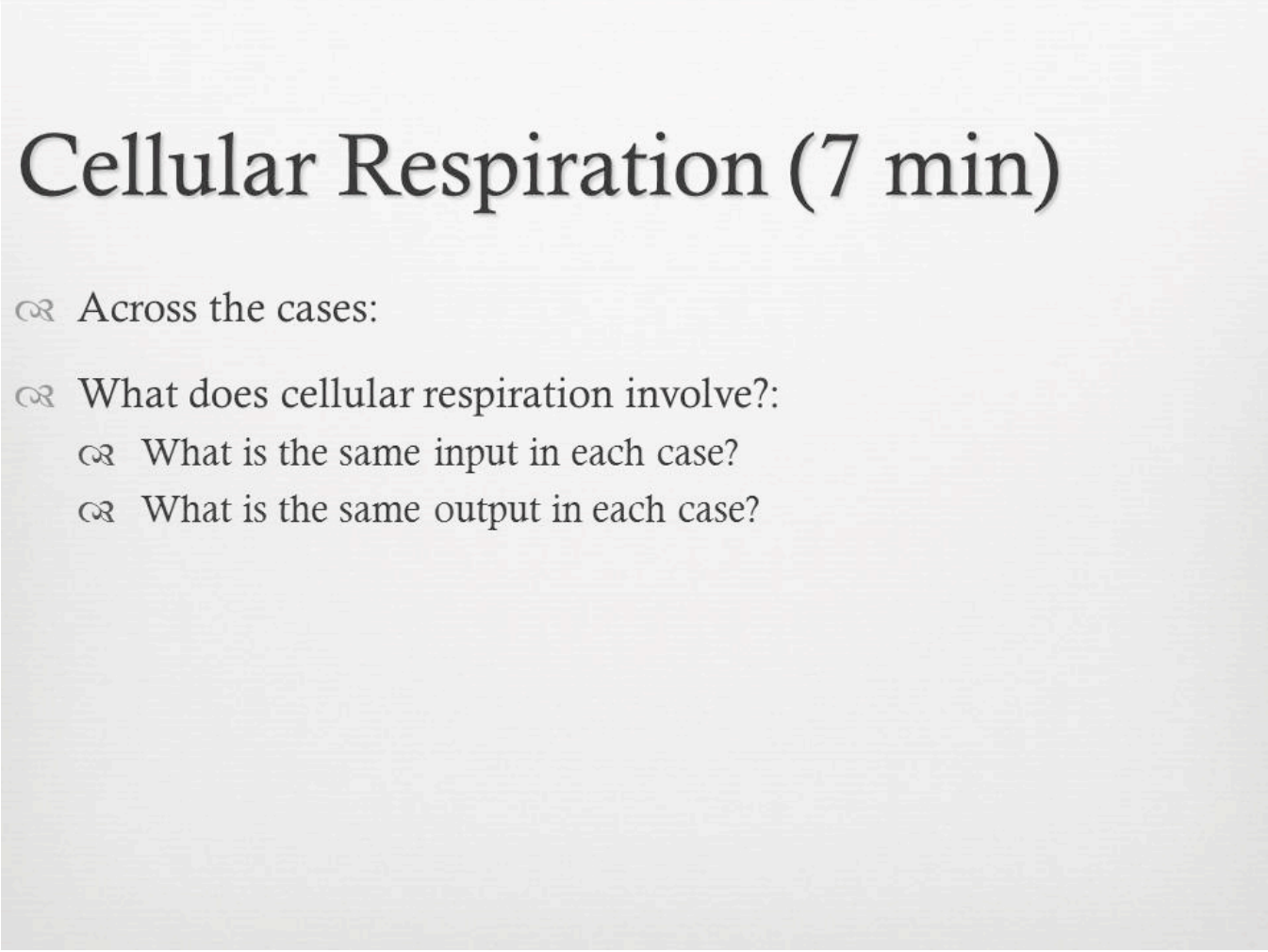
What variables are necessary for output? Why?

Give students Cellular Respiration Case 2 (WS 34), or direct their attention to it in the student resource book (p49). Have students first work through the worksheet then have a quick class discussion checking their answers.

Answer: Glucose + Oxygen + Cell. WHY? This is what is common to the two samples that produced the same new output. Therefore, you can infer that light was not required in the fourth sample, so must not be necessary for the output.

Glucose and oxygen are required to produce oarbon dioxide, water, and energy. This process is a chemical activity in the CELL that breaks down food (glucose) into carbon dioxide, water, and ATP (energy). In animals, the energy is primarily used to regulate body temperature and other cell processes.

Day 35 – Cellular Respiration vs Photosynthesis



Hand out the Across the Cases worksheet for cellular respiration (WS 35) or direct students to it in the student resource book (p51).

What is the input?

Glucose + Oxygen + Cell

What is the output?

Carbon Dioxide + Water + Energy

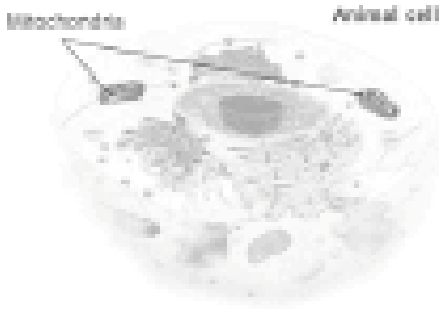
Student Worksheet 33: Cellular Respiration Case 1

Cellular Respiration – Case 1

The following data comes from a biology research laboratory investigating cells from the Siberian Tiger. Your job is to figure out which inputs into the cell are required for an output from the cell.

Sample	Input into the cell	Output from the cell
1	Light + Glucose + Oxygen	Carbon Dioxide + Water + Energy
2	Glucose	Nothing New
3	Light + Glucose	Nothing New
4	Glucose + Oxygen	Carbon Dioxide + Water + Energy

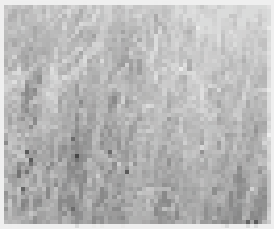
These cell activities took place in the Mitochondrion.



What variables are necessary for output? Why?

Student Worksheet 34: Cellular Respiration Case 2

Cellular Respiration – Case 2



The following data comes from a biology research laboratory investigating cells from rye grass. Your job is to figure out which inputs into the cell are required for an output from the cell.

Sample	Input into the cell	Output from the cell
1	Glucose + Oxygen	Carbon Dioxide + Water + Energy
2	Glucose + Water	Nothing New
3	Glucose	Nothing New
4	Light + Glucose + Oxygen	Carbon Dioxide + Water + Energy

These cell activities took place in the Mitochondrion.

What variables are necessary for output? Why?

Day 35 – Cellular Respiration vs Photosynthesis

Student Worksheet 35: Cellular Respiration Case Comparison

Across the cases

What does cellular respiration look like?

What is the input?

What is the output?

DAY 36 Contrasting Cases: Cellular Respiration vs. Photosynthesis

After warming up, continue the cellular respiration vs. photosynthesis contrasting case by introducing two cases of photosynthesis. After students have compared these two cases, lead them through a comparison of photosynthesis and cellular respiration based on the critical features they have identified through the case comparisons.

Big Ideas

- Plants make their own food through a process called photosynthesis.
- Animals have to obtain food from their environment and don't make their own food.
- The inputs and outputs of photosynthesis and cellular respiration are reversed; oxygen and glucose are the inputs of cellular respiration and outputs of photosynthesis, while carbon dioxide, water and energy are the outputs of cellular respiration and the inputs of photosynthesis.

Materials

Teacher:

1. Warm-up Day 36 - Cells_warmups.ppt
2. Slides - day36.ppt

Students:

1. Photosynthesis Cases (WS 36 & 37; student resource p52 & 53)
2. Photosynthesis Comparison Across Cases (WS 38; student resource p55)
3. Respiration vs. Photosynthesis (WS 39' student resource p56)

Activities and Allotted time

5 minutes - Warm-up
20 minutes - CC activity: Photosynthesis cases
20 minutes - CC activity: Photosynthesis vs. Cellular Respiration

Day 36 – Warm-up

Input	Output
Glucose + Oxygen	Carbon Dioxide + Water + Energy

1. What is the process outlined in the chart above?
2. Does this process occur in plant cells, animal cells, or both?
3. Where does this process occur?
4. Why does this process occur?

Answers:

1. Cellular respiration
2. Cellular respiration occurs in both plants and animals.
3. Cellular respiration converts food (glucose) into energy.

Purpose: This exercise gives students practice identifying cellular respiration from its inputs and outputs. It also addresses a common misconception that cellular respiration occurs only in plants.

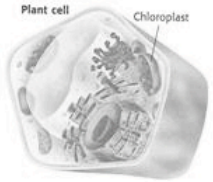
Day 36 – Cellular Respiration vs. Photosynthesis

Photosynthesis – Case 1

The following data comes from a biology research laboratory investigating cells from the Ginkgo Tree. Your job is to figure out which inputs into the cell are required for an output from the cell.

Sample	Input into the cell	Output from the cell
1	Water	Nothing New
2	Glucose	Nothing New
3	Carbon Dioxide + Water	Nothing New
4	Water + Energy (Sunlight) + Carbon Dioxide	Oxygen + Glucose

These cell activities took place in the Chloroplast.



What variables are necessary for output? Why?

This slide and the next, students should take 10 minutes total. This slide should take 5 minutes. **Visualization focus**: Same as Slides 5 & 6 (tree, leaf, and cell are not depicted with realistic representation of relative size; cutaway cell drawing)

Give students Photosynthesis Case 1 (WS 36) or direct them to it in the student resource book (p52). Have students first work through the worksheet then have a quick class discussion checking their answers.

Answer: Water + Energy+ Carbon Dioxide + Cell. WHY? This is the only one that produced an output. Notice that all components are necessary since the Cell + Carbon Dioxide + Water did not produce an output.

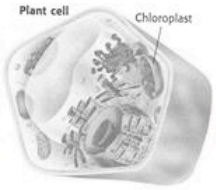
Water + Energy + Carbon Dioxide is required to produce Oxygen and Glucose. This process is a chemical activity that uses energy from the sun to convert Water and Carbon Dioxide into food (glucose) for the cell. Oxygen is also produced. The food is used by the plant cells for energy.

Photosynthesis – Case 2

The following data comes from a biology research laboratory investigating cells from the Sage Flower. Your job is to figure out which inputs into the cell are required for an output from the cell.

Sample	Input into the cell	Output from the cell
1	Carbon Dioxide	Nothing New
2	Water + Energy (Sunlight)	Nothing New
3	Dirt + Water + Energy (Sunlight) + Carbon Dioxide	Oxygen + Glucose
4	Water + Energy (Sunlight) + Carbon Dioxide	Oxygen + Glucose

These cell activities took place in the Chloroplast.



What variables are necessary for output? Why?

This slide should take 5 minutes. Give students Photosynthesis Case 2.

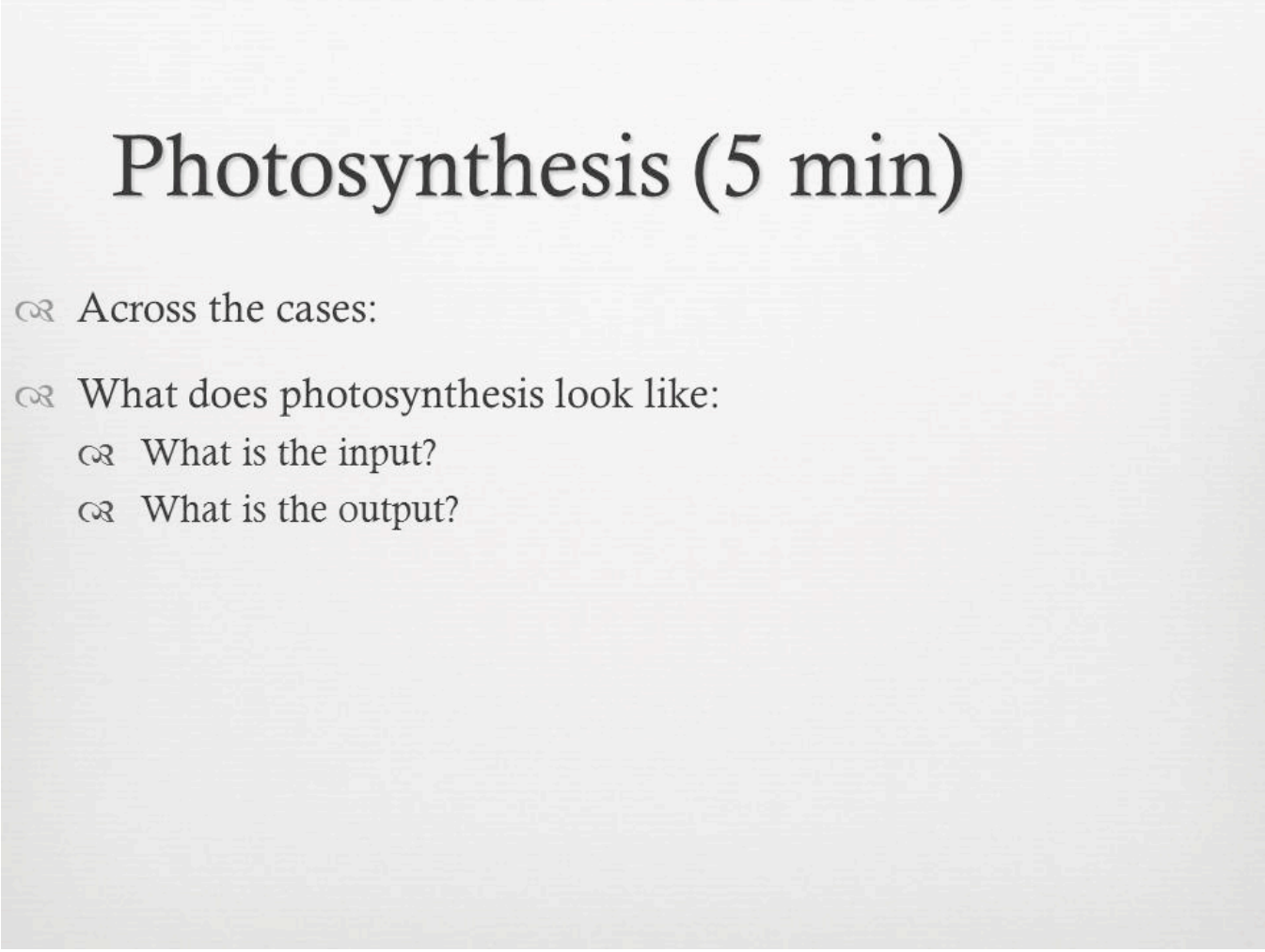
Have students first work through the worksheet then have a quick class discussion checking their answers.

Visualization focus: Same as Slides 5 & 6 (flower and cell are not depicted with realistic representation of relative size; cutaway cell drawing)

Answer: Water + Energy+ Carbon Dioxide + Cell. WHY? This is what is common to the two samples that produced the same new output. Therefore, one can infer that DIRT was NOT necessary because it was not present in the second third sample and the same output was obtained.

Water + Energy + Carbon Dioxide is required to produce Oxygen and Glucose. This process is a chemical activity that uses energy from the sun to convert Water and Carbon Dioxide into food (glucose) for the cell. Oxygen is also produced. The food is used by the plant cells for energy.

Day 36 – Cellular Respiration vs. Photosynthesis



Hand out the Photosynthesis comparison worksheet (WS 38) or direct students to it in the student resource book (p55).

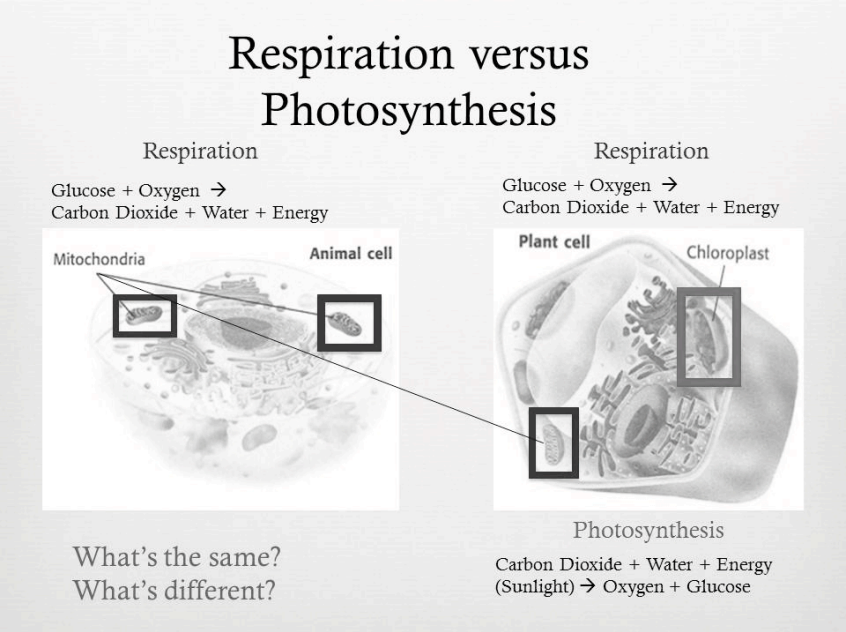
What is the input?

Carbon dioxide + water + energy + cell

What is the output?

Glucose + Oxygen

Day 36 – Cellular Respiration vs. Photosynthesis



Have students work through the Respiration vs. Photosynthesis worksheet and have a discussion filling in the answers.

Cellular Respiration

Glucose and Oxygen are required to produce Carbon dioxide, water, and energy. This process is a chemical activity in the CELL that breaks down food (glucose) into Carbon dioxide, water and ATP (energy).

Photosynthesis

Water + Energy (sunlight) + Carbon Dioxide is required to produce Oxygen and Glucose. This process is a chemical activity that uses energy from the sun to convert Water and Carbon Dioxide into food (glucose) for the cell. Oxygen is also produced. The food is used by the plant cells for energy.

The same: both are chemical activities that take place in the cell. Both processes use some of the same chemicals *but in different ways*. [The chemicals are the same but play different roles.]

Different: Inputs and outputs are different. Walk through the differences for each chemical what role does Glucose play in Respiration? What about photosynthesis?

The chemical processes take place in different parts of the cells. Respiration takes place in the mitochondria; Photosynthesis takes place in the chloroplast.

The processes are complementary: One process makes food (photosynthesis). The other uses the food to chemically transform it to usable energy (respiration).

Student Worksheet 36: Photosynthesis Case 1

Photosynthesis – Case 1

The following data comes from a biology research laboratory investigating cells from the Ginkgo Tree. Your job is to figure out which inputs into the cell are required for an output from the cell.

Sample	Input into the cell	Output from the cell
1	Water	Nothing New
2	Glucose	Nothing New
3	Carbon Dioxide + Water	Nothing New
4	Water + Energy (Sunlight) + Carbon Dioxide	Oxygen + Glucose

These cell activities took place in the Chloroplast.

What variables are necessary for output? Why?

Student Worksheet 37: Photosynthesis Case 2

Photosynthesis – Case 2

The following data comes from a biology research laboratory investigating cells from the Sage Flower. Your job is to figure out which inputs into the cell are required for an output from the cell.

Sample	Input into the cell	Output from the cell
1	Carbon Dioxide	Nothing New
2	Water + Energy (Sunlight)	Nothing New
3	Dirt + Water + Energy (Sunlight) + Carbon Dioxide	Oxygen + Glucose
4	Water + Energy (Sunlight) + Carbon Dioxide	Oxygen + Glucose

These cell activities took place in the Chloroplast.

What variables are necessary for output? Why?

Student Worksheet 38: Photosynthesis Across Case Comparison

Across the cases

What does photosynthesis look like?

What is the input?

What is the output?

Student Worksheet 39: Respiration vs. Photosynthesis

Respiration vs. Photosynthesis

Process	Input	Output
Cellular Respiration		
Photosynthesis		

Where does cellular respiration occur?

Where does photosynthesis occur?

What is the same between cellular respiration and photosynthesis?

What is different between cellular respiration and photosynthesis?

DAY 37

Chapter 2, Section 2: Cell Energy

After warming up, provide a quick review of the concepts taught in the preceding contrasting case by using the review worksheet and slide at the beginning of today's lesson. Proceed with Chapter 2, Section 2 as you would normally teach it, pausing for the visualization activities included in today's presentation.

If you wish, you can present the concept of cell respiration in plants vs. animals in a contrasting case style.

Big Ideas

- Most of the energy that fuels life processes comes from the sun.
- The sun's energy is converted into food by the process of photosynthesis.
- Cellular respiration breaks down glucose into water, carbon dioxide, and energy.
- Fermentation is a way that cells get energy from their food without using oxygen.

Materials

Teacher:

1. Warm-up Day 37 - Cells_warmups.ppt
2. Slides - day37.ppt

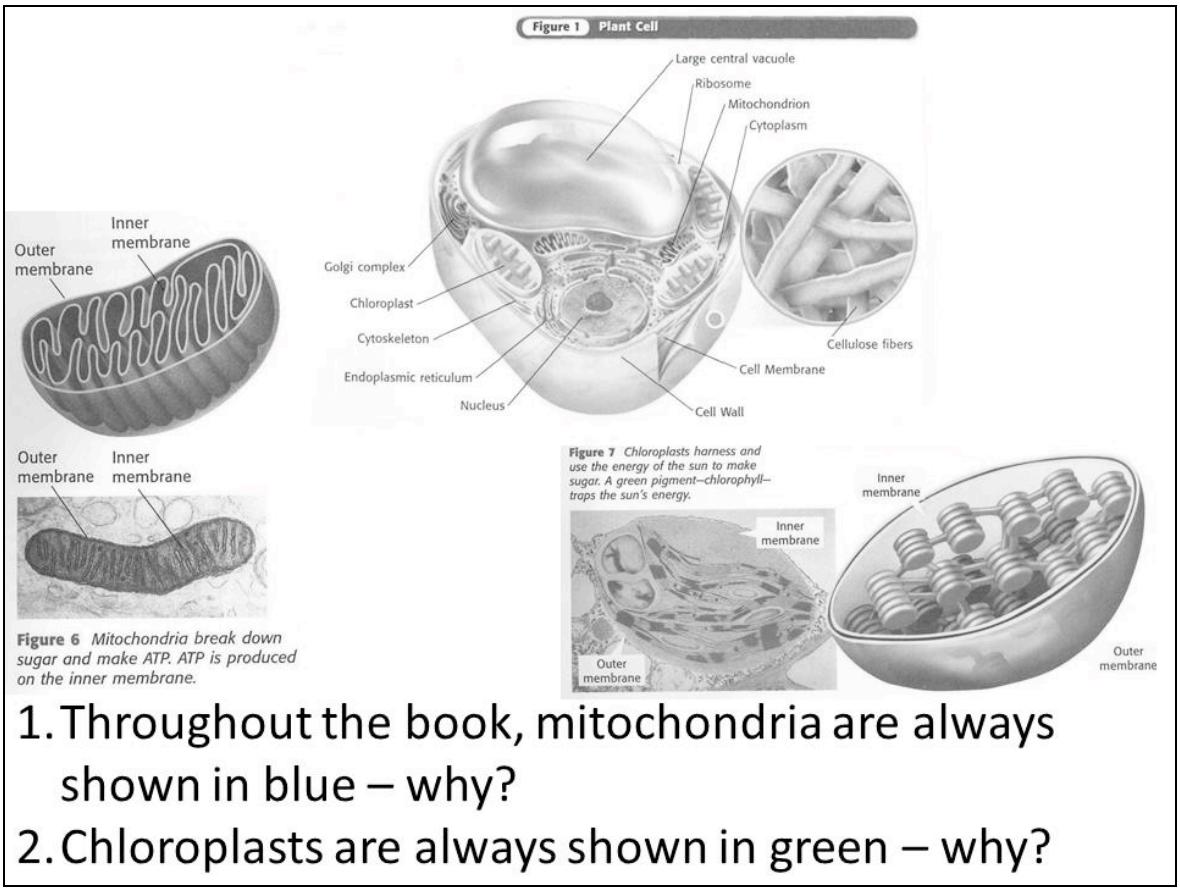
Students:

1. CC Review Questions (WS 40; student resource p57)
2. Holt textbook p38-41.

Activities and Allotted time

5 minutes - Warm-up
20 minutes - Holt Ch 2, Section 2, p38-41
5 minutes - Visualization activity 2.3 regarding p38
5 minutes - Visualization activity 2.4 regarding p40
5 minutes - Visualization activity 2.5 regarding p38-39
5 minutes - Visualization activity 2.6 regarding p40

Day 37 – Warm-up



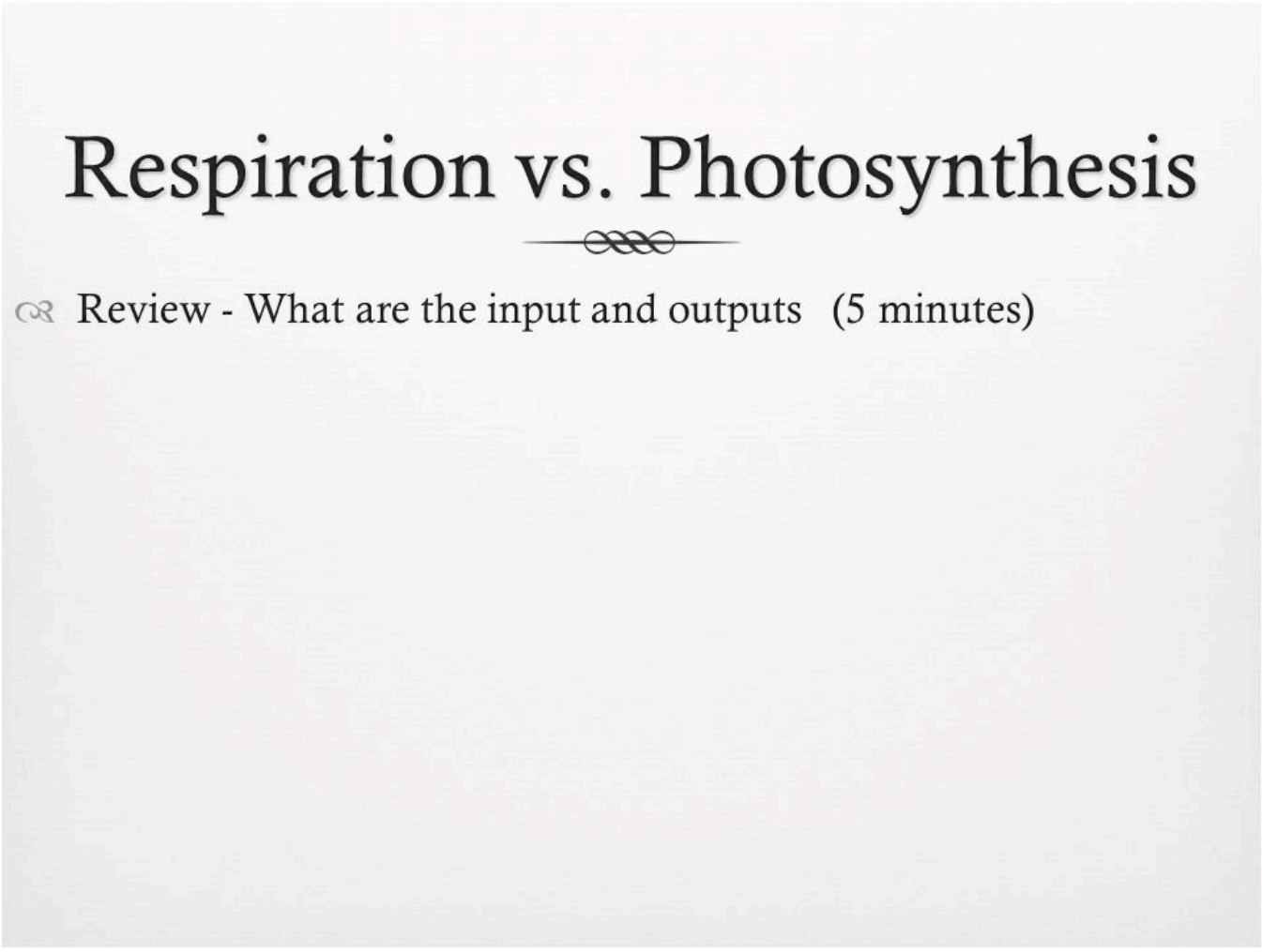
1. Throughout the book, mitochondria are always shown in blue – why?
2. Chloroplasts are always shown in green – why?

Answers:

1. The decision to make mitochondria blue is completely arbitrary. Mitochondria are not *actually* blue. However, the fact that they are *always* shown in blue is done on purpose because it helps the reader understand the diagrams of cells. Once a color was chosen for the first picture, that color was then used consistently through the rest of the book.

2. Unlike the mitochondria, using green for chloroplasts actually has a basis in reality. Chloroplasts contain chlorophyll, which really is green. In other words, in the special case of chloroplasts, the color reflects something truly important about the function of the organelle. Since this organelle does have a distinctive color, it makes sense to use it. In fact, it would only be confusing to choose a different, arbitrary color.

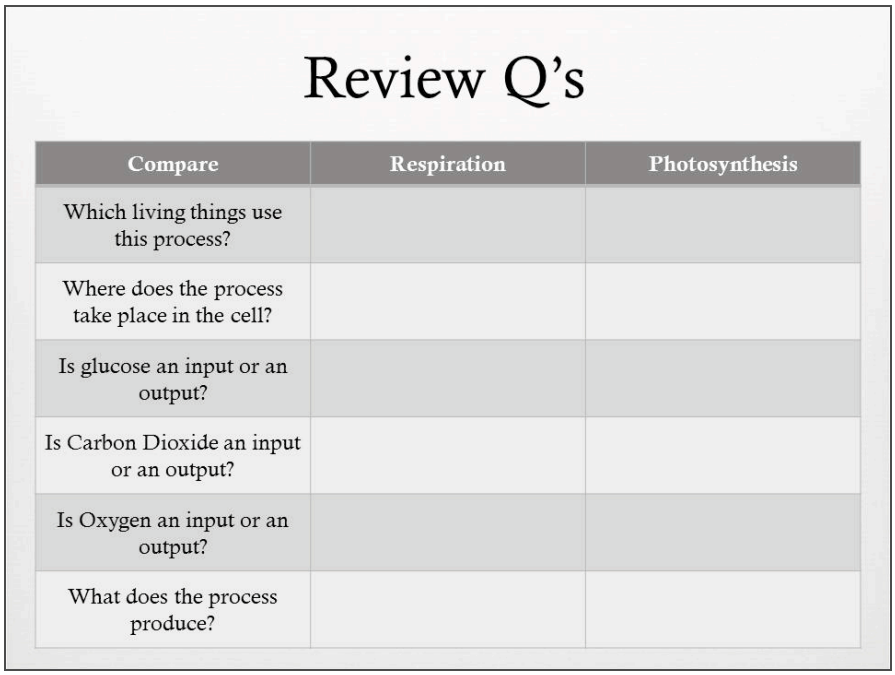
Purpose: This exercise reaches back to "mitochondria" (p16) and "chloroplasts" (p16), and examines the use of colors in diagrams.



For the review, ask students to use the input and outputs table from the review sheet between-group comparison.

The next slide raises some questions regarding the inputs and outputs of the two processes. Hand out the Review Questions worksheet (WS40) or direct students to it in the student resource book (p57).

Day 37 – Cell Energy



Which living things use this process?

Cells for both

Where does the process take place?

Respiration: Mitochondria

Photosynthesis: Chloroplast

Is glucose (food) made (output) or broken down (input)?

Respiration: broken down

Photosynthesis: made

Is Carbon Dioxide a product (output) or raw material (input)?

Respiration: output / product

Photosynthesis: raw material / input

Is Oxygen a product (output) or raw material (input)?

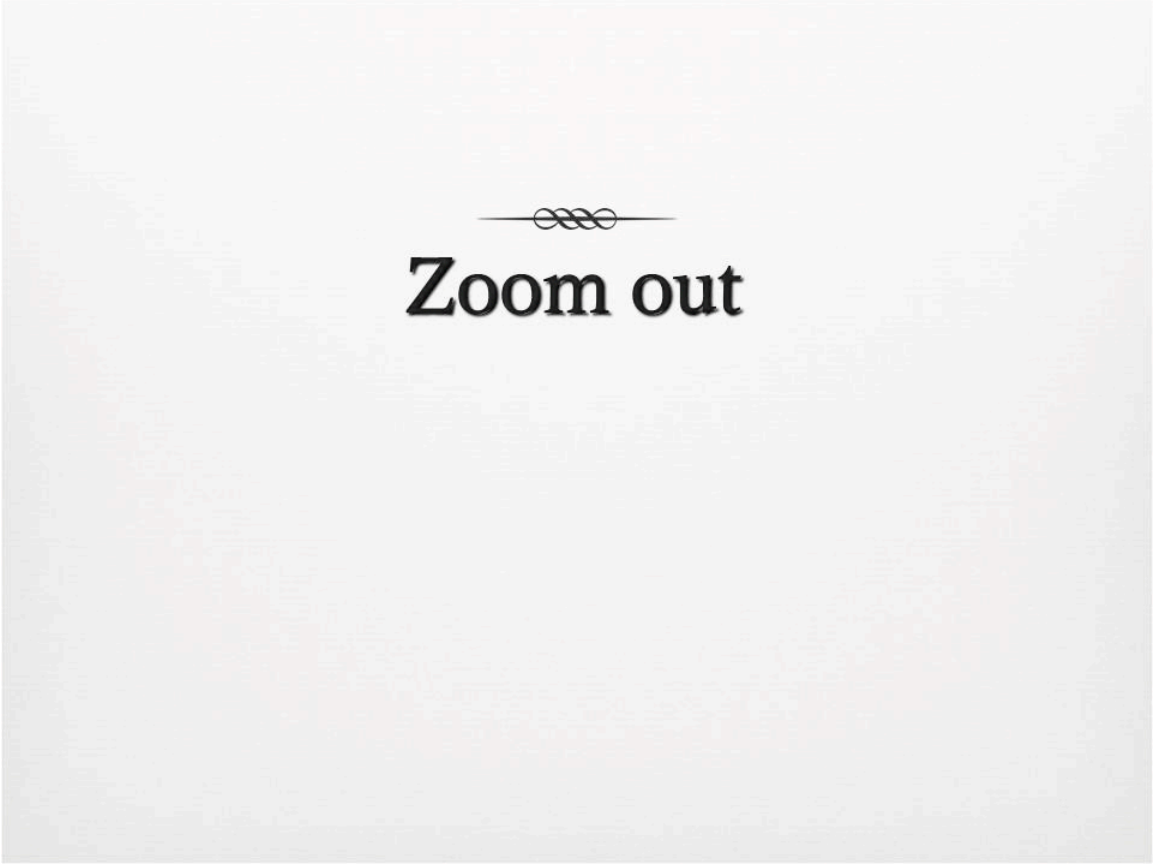
Respiration: raw material / input

Photosynthesis: output / product

What does the process produce?

Respiration: energy (ATP)

Photosynthesis: food



Exercise 2.3

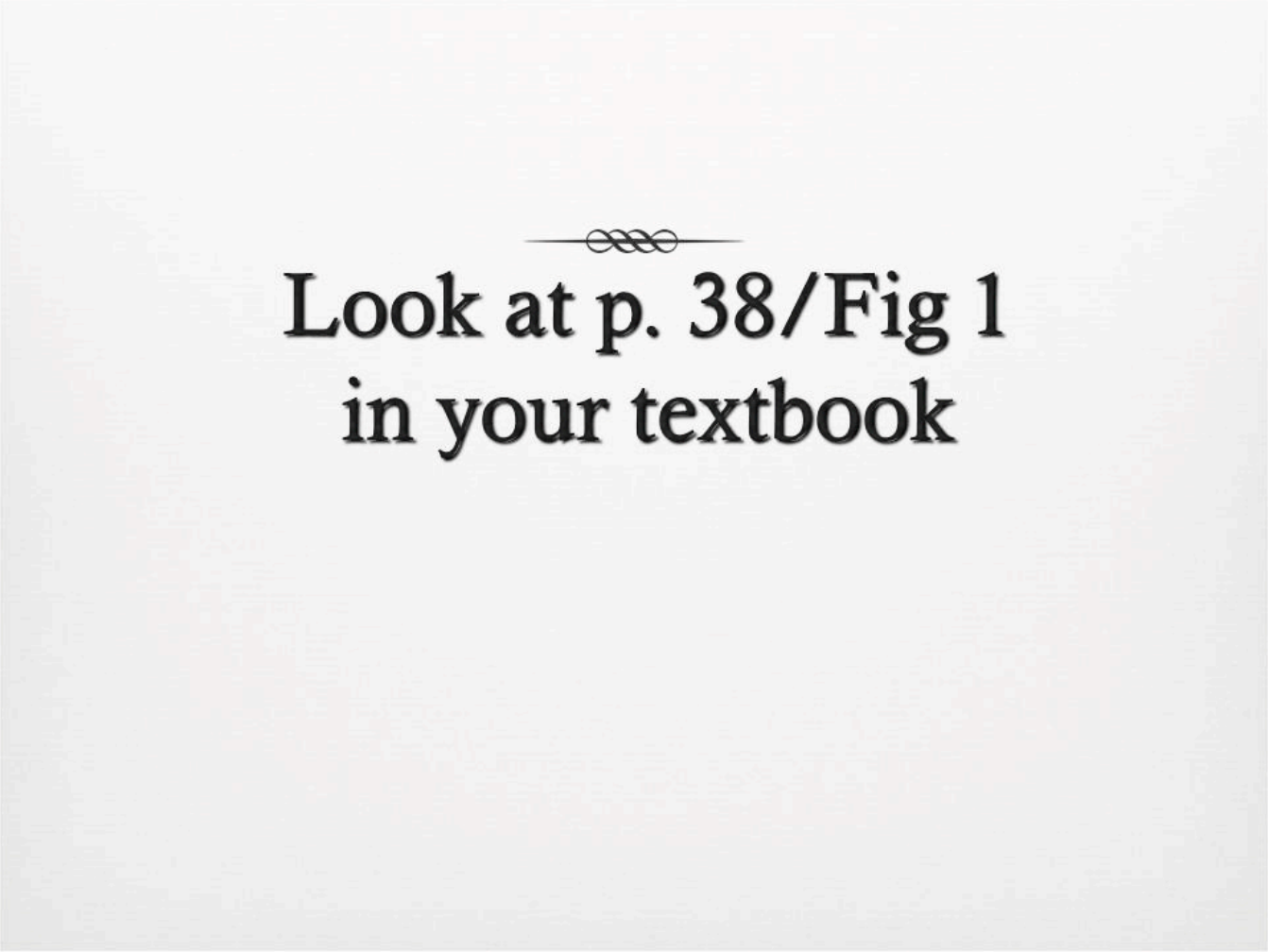
Image comprehension focus: Zoom-out

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.

Module Activity: Teacher comment

Overview: This activity is designed to help the students develop a better understanding of the "zoom-out" convention by explicitly discussing two visual clues 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 five and chapter one that indicated a "zoom-out" convention was in the diagram. [One was a small circle connected to a big circle by a shadow; the big circle had a magnified version of the small circle.] To review these, the teacher can direct the students to look at both p.15/fig5 and p.12/fig1 from chapter one (chap 1 day two slide #10 and #12). (proceed to the next slide)



Procedure: Next the teacher can explain that this chapter has a slightly different clue that a "zoom-out" is being used. First the teacher can direct the students to look at p. 38/fig1 (photosynthesis, shown on the next slide if the teacher wants to project it). The teacher should note that, in this case, an arrow is used to indicate zoom-out, but the structure is not visible in the original image. Here, the level of magnification or extent of "zoom-out" is so large (from an observable plant leaf to a cell) that you cannot see the expanded image in the original image. The teacher should emphasize that the idea is the same, it's just a greater difference in magnification.

(proceed to the next image)

Day 37 – Cell Energy

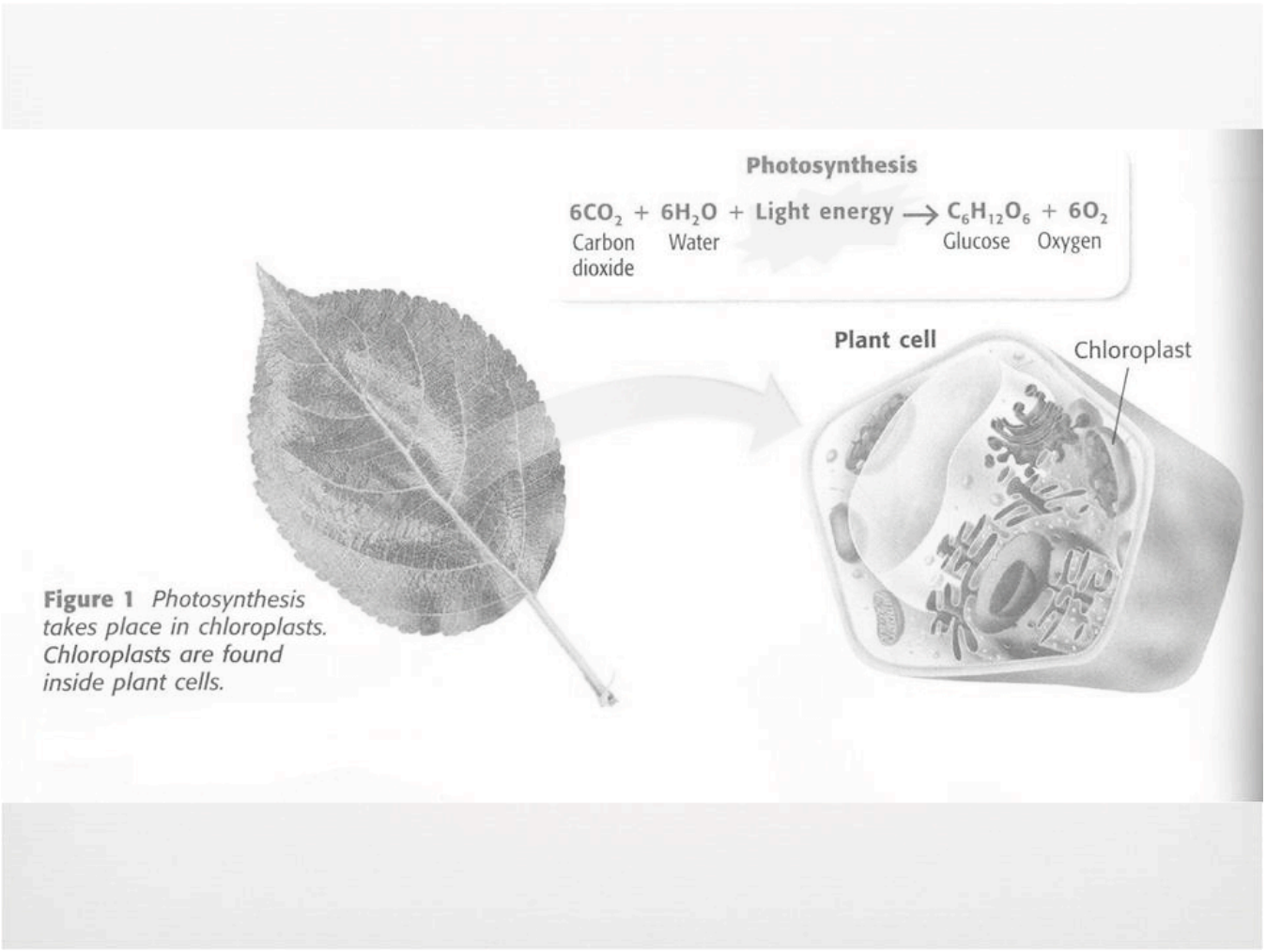
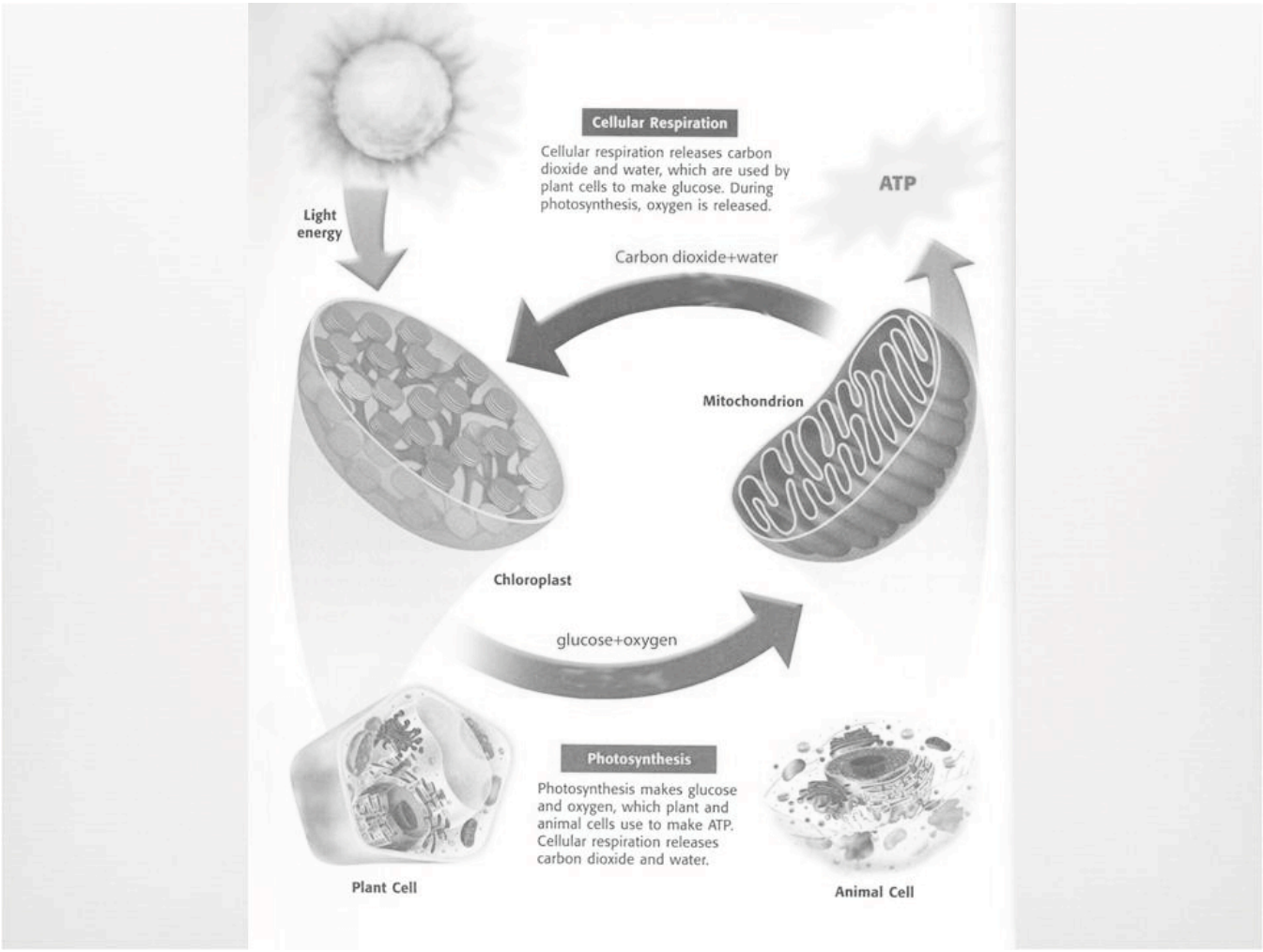
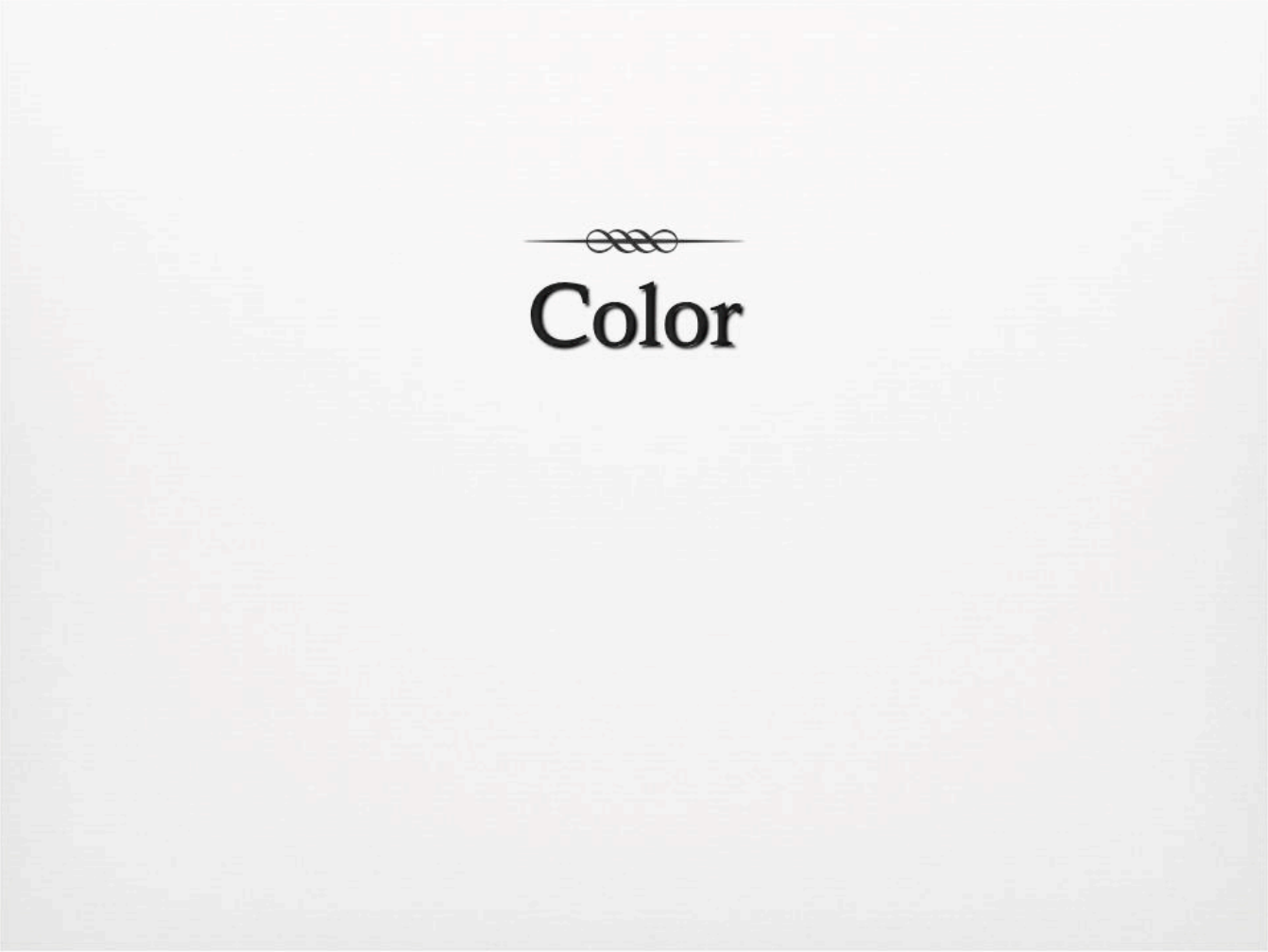


Figure 1 *Photosynthesis takes place in chloroplasts. Chloroplasts are found inside plant cells.*



Procedure continued…The teacher should then tell the students that they are going to look again at a modified version of p. 40/fig 3 (photosynthesis and respiration, shown above). The teacher should explain that, in the earlier case involving the use of a shadow to indicate a zoom-out, one could not see the magnified structures in the original image. In fig 3, however, the shadow convention is used, but one can find the structure in the original image. In this case, we are looking at a larger version of the chloroplast and the mitochondria. Again, the idea is the same. The only difference is that we are enlarging a part of the image that we could see in the original.



Exercise 2.4

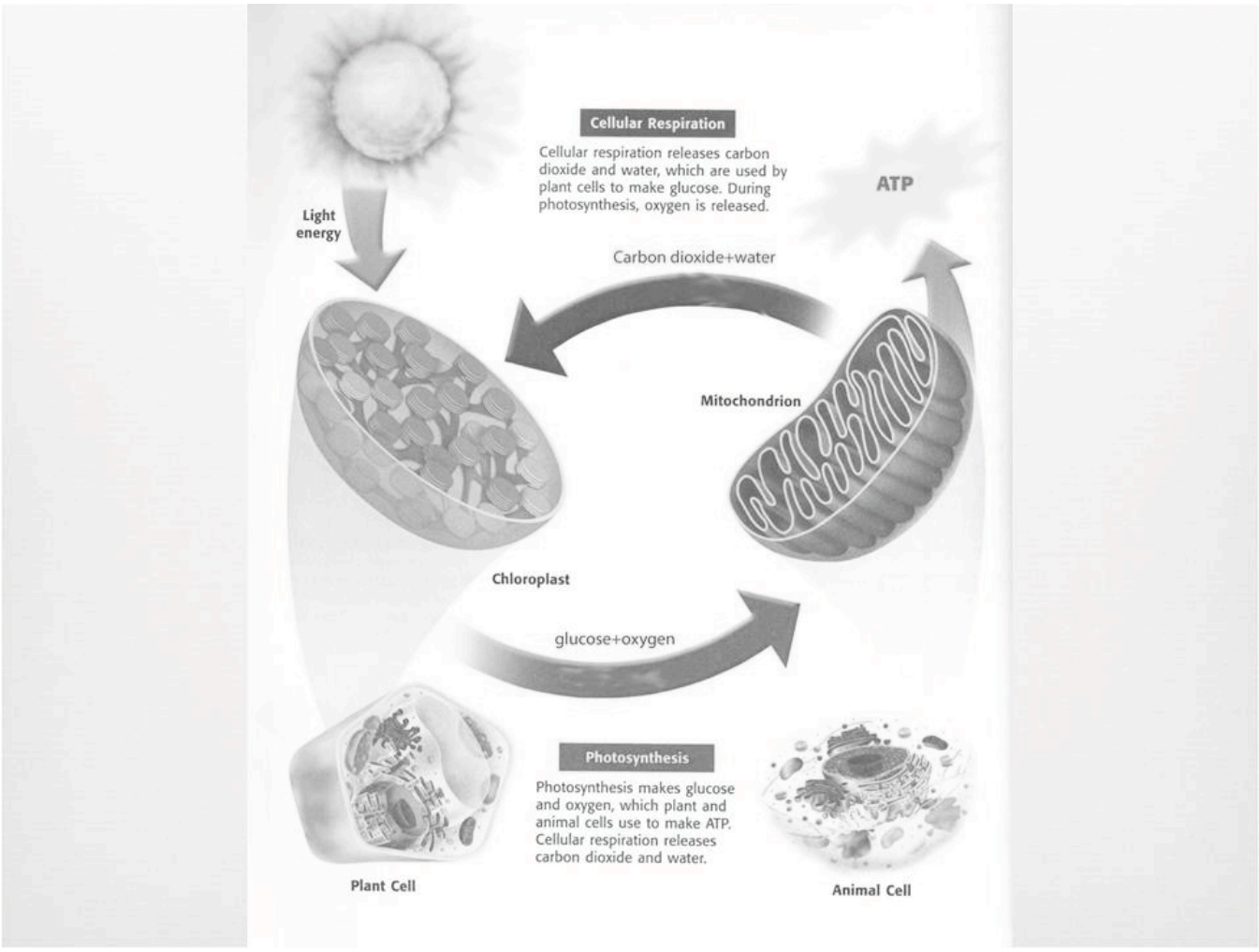
Image comprehension focus: Color

Goal: Maintain the concept that color is often used to identify similar parts of a diagram.

Type of Activity: Student Activity

Overview: The purpose of this activity is to provide the students with an opportunity to practice interpreting the use of color as a mechanism to identify similar structures in a diagram.

Day 37 – Cell Energy



Procedure: The teacher should ask the students to look at modified fig 3/p. 40, shown above. He/she should then tell the students that they should use what they know about the role of color in diagrams to identify which organelles are present in both plant and animal cells [nucleus, ER, Golgi complex and mitochondria]. Once the students have had a chance to make their identifications, the teachers should ask them to share the process they used in order to determine which organelles exist in both. [They should have noticed that the color scheme is consistent for both cells. For example, the Golgi complex is purple in both, mitochondria are blue, etc.] The teacher should conclude the activity by reminding the students to always consider color when trying to understand a diagram because often color choices provide valuable information.

Exercise 2.5

Image comprehension focus: Captions

Goal: To practice with the concept 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 to further emphasize that captions are critical to read when viewing a diagram or image. The goal is to give the students another experience that reinforces the importance of captions to encourage them not the skip them when viewing images.

Day 37 – Cell Energy

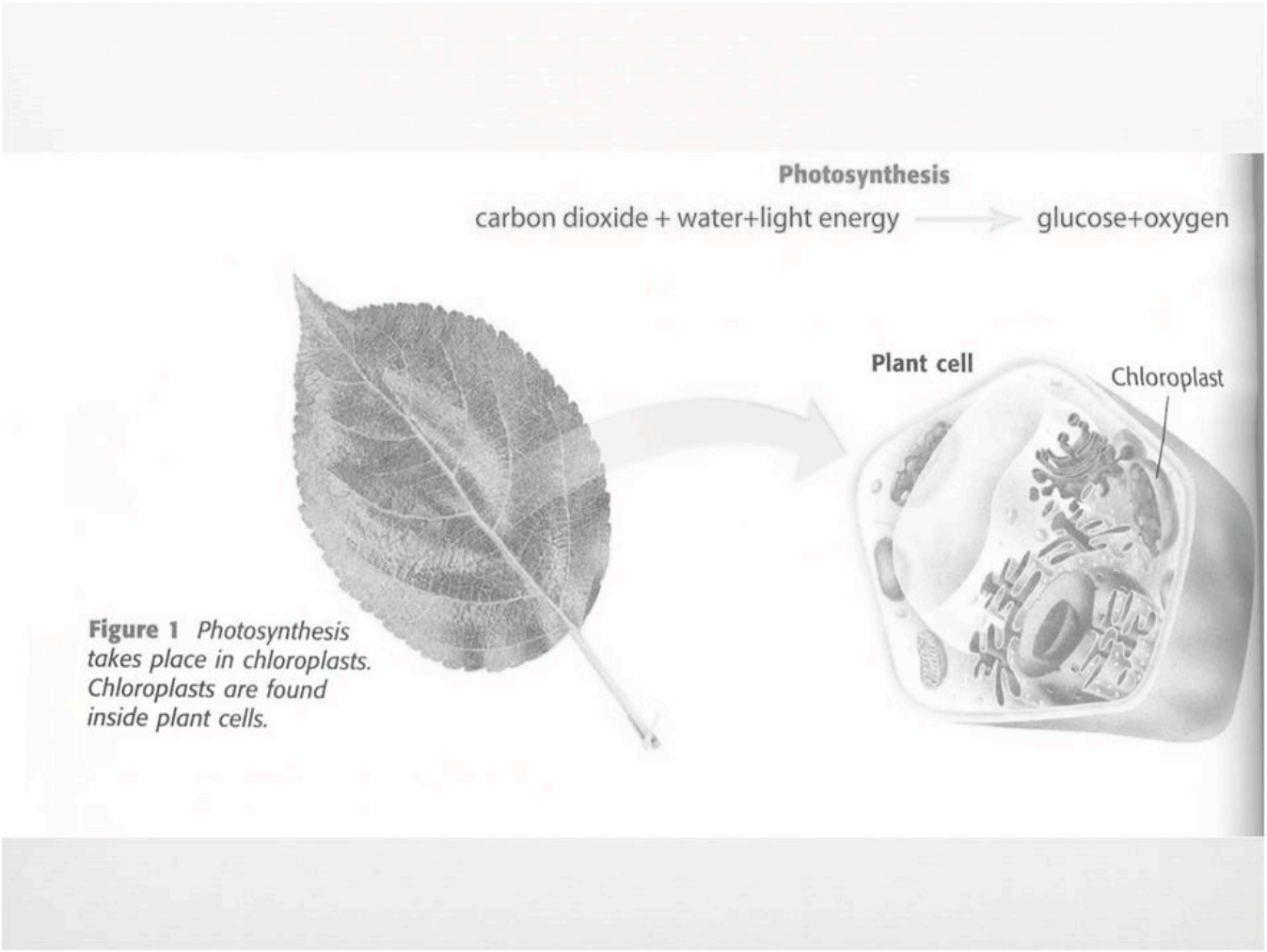
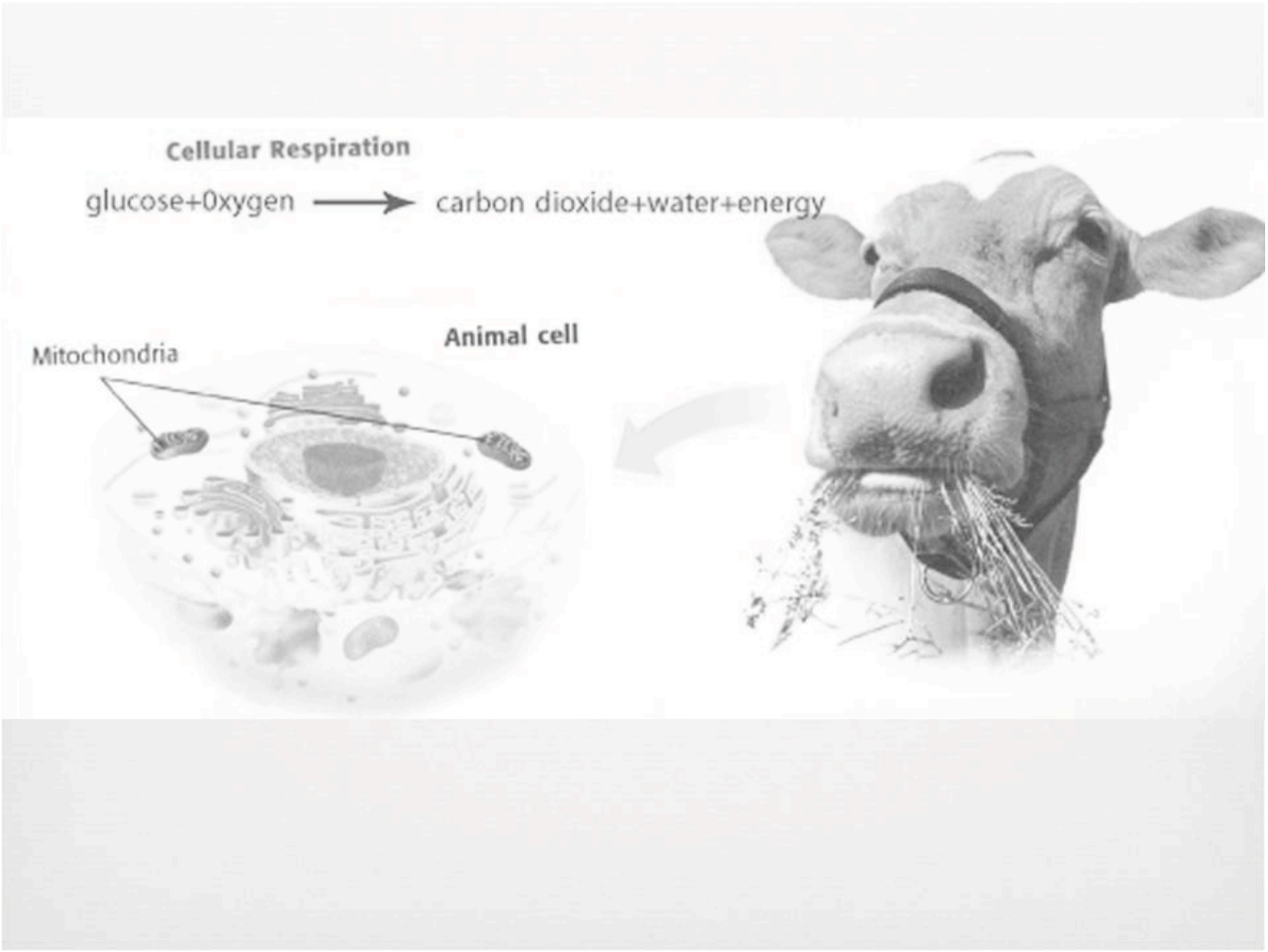


Figure 1 *Photosynthesis takes place in chloroplasts. Chloroplasts are found inside plant cells.*

Procedure**:** The teacher should ask the students to look at modified p. 38/fig 1 (plant cell-photosynthesis, shown above) and read the caption. The students should then describe what role the caption serves in this image. [To help clarify that the image involves magnification since chloroplasts are found in plant cells as well as to indicate what process (photosynthesis) occurs in the chloroplasts.] After they have reviewed the role of caption in this example, proceed to the next slide.

Day 37 – Cell Energy



Procedure continued: The teacher should indicate that the class is going to re-examine the textbook image related to cellular respiration (the modified image from p. 39/Fig 2, shown above). The teacher should note that the caption has been removed and ask the students to write their own. After each student has written a caption, the class can share the captions and discuss whether or not the student captions function as they should to clarify the image and indicate what is important. [Key features that should be included in the caption: Respiration occurs in the mitochondria to produce energy (and carbon dioxide and water) and, in this example, the mitochondria is in an animal cell.]

Exercise 2.6

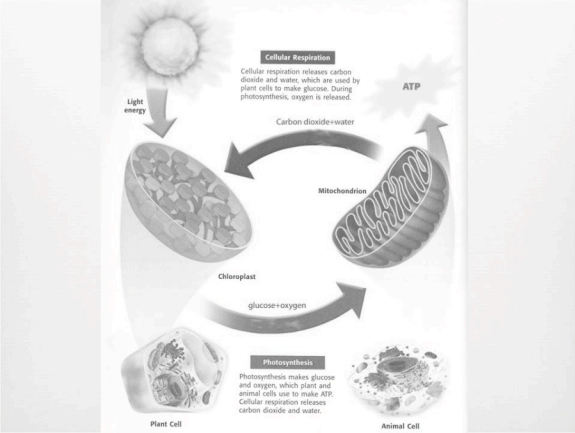
Image comprehension focus: Labeling and arrows

Goal: Mainain understanding of the role of different types of labels and their importance in image comprehension and illustrating another role for arrows in diagrams.

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 addition, this activity is designed to highlight how arrows can indicate a process (in this case, the addition or release of particular materials during photosynthesis and respiration). Providing the opportunity for the students to concretely consider how explanatory labels are functioning in a specific diagram will help them appreciate that labels convey important information and should always be read when looking at a diagram or other image. In addition, explicitly focusing on the use of arrows in a diagram can improve the students' ability to understand the role of arrows in future diagrams and therefore aid them in strengthening their image comprehension skills.

Day 37 – Cell Energy



Procedure:

1) The teacher should show the modified fig 3/p. 40 shown above and indicate that the class is going to look at this diagram again, but with a focus on the arrows and labels. Next he/she should ask them to identify a label in the diagram and indicate what type of label it is [naming: light energy, chloroplast, mitochondrion, animal cell, plant cell; explanatory: text under photosynthesis and respiration].

2) The teacher should ask the students to choose one of the explanatory labels and describe specifically how it helps to explain the diagram. [Each explanatory label provides information about the materials in the arrow of the same color. For example, in the case of photosynthesis (which is in a red box), the explanatory label explains that glucose and oxygen are released in this process from the chloroplast and taken up by the mitochondrion. In the case of respiration (which is in a purple box), the explanatory label explains that carbon dioxide and water are released in this process from the mitochondrion and taken up by the chloroplast.]

3) The teacher should also explicitly note that this image illustrates another role arrows perform in diagrams beyond being a clue for a "zoom-out." In this image, the arrows are used to indicate that substances are released or required for various processes. The teacher can point to the red arrow, which shows that the glucose and oxygen released by the chloroplasts are used by the mitochondria, and the purple arrow, which shows that the carbon dioxide and water released by the mitochondrion are used by the chloroplasts to generate more glucose and oxygen. In addition, the orange arrows also show materials being incorporated or released. The teacher can point to the orange arrow on the upper left which shows energy being required by the chloroplasts and the orange arrow on the upper right which shows ATP being released by the mitochondrion. The teacher should conclude the activity by emphasizing that the labels provide a guide to understanding the other parts of the diagram and should always be read when looking at a diagram or other image.

Student Worksheet 40: Respiration vs. Photosynthesis Review

Review Questions

Compare	Respiration	Photosynthesis
Which living things use this process?		
Where does the process take place in the cell?		
Is glucose (food) made or broken down?		
Is Carbon Dioxide a product or raw material?		
Is Oxygen a product or a raw material?		
Is light needed for the process to occur?		
What does the process produce?		

DAY 38

Chapter 2, Section 2: Review

After the warm-up, conduct a review of Chapter 2, Section 2 and complete any portion of the section or the visualization activities that you were unable to complete yesterday. You may use the end-of-section review in the text if you wish. Try to tie in concepts taught in Section 1 and in the contrasting case as you conduct the review.

Big Ideas

Review all Big Ideas introduced in Chapter 2, Section 2.

Materials

Teacher:

1. Warm-up Day 38 - Cells_warmups.ppt

Students:

1. Holt textbook Chapter 2, Section 2

Activities and Allotted time

5 minutes - Warm-up
40 minutes - Holt Ch 2, Section 2 Review

Day 38 – Warm-up

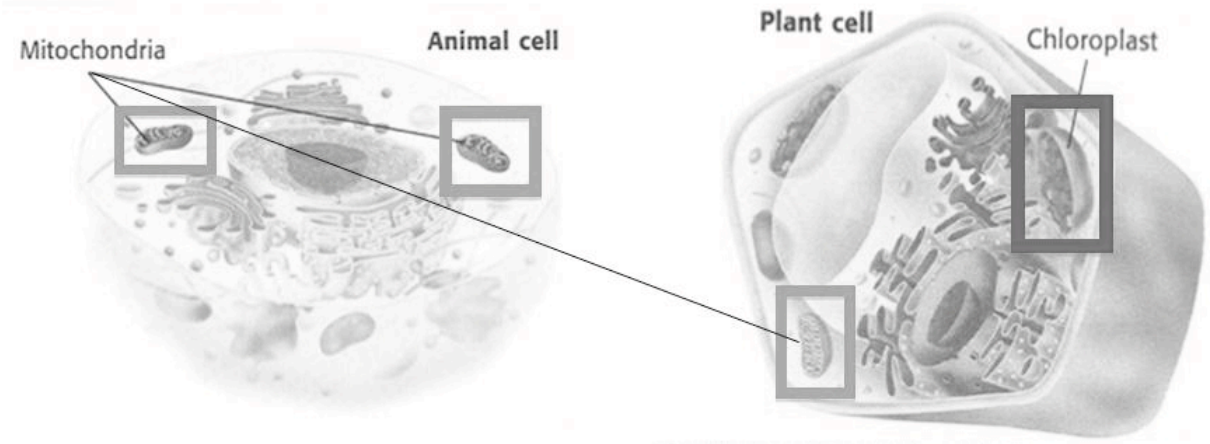
Use the diagram to answer the questions on the board.

Cellular Respiration

Glucose + Oxygen → Carbon Dioxide + Water + Energy

Photosynthesis

Carbon Dioxide + Water + Energy (Sunlight) → Oxygen + Glucose



Questions to write on the board:

1. Where do animals get food? How do they turn it into energy?
2. Where do plants get food? How do they turn it into energy?

Cellular Respiration

Glucose + Oxygen → Carbon Dioxide + Water + Energy

Answers:

1. Animals get food by consuming things, and they convert food into energy using cellular respiration.
2. Plants convert solar energy into food using photosynthesis, and they convert food into energy they can use through cellular respiration.

Purpose: This exercise reviews the contrasting case of photosynthesis vs. cellular respiration and addresses the common misconception that cellular respiration occurs only in animals.

DAY 39

Chapter 2, Section 3: The Cell Cycle

After beginning the class with a warm-up, begin teaching Chapter 2, Section 3 as you normally would teach it. This section discusses cell cycle and how new cells are formed. Continue through p43 today; we will complete the section tomorrow.

Big Ideas

- A cell produces more cells by first copying its DNA.
- Eukaryotic cells produce more cells through the four phases of mitosis.

Materials

Teacher:

1. Warm-up Day 39 - Cells_warmups.ppt

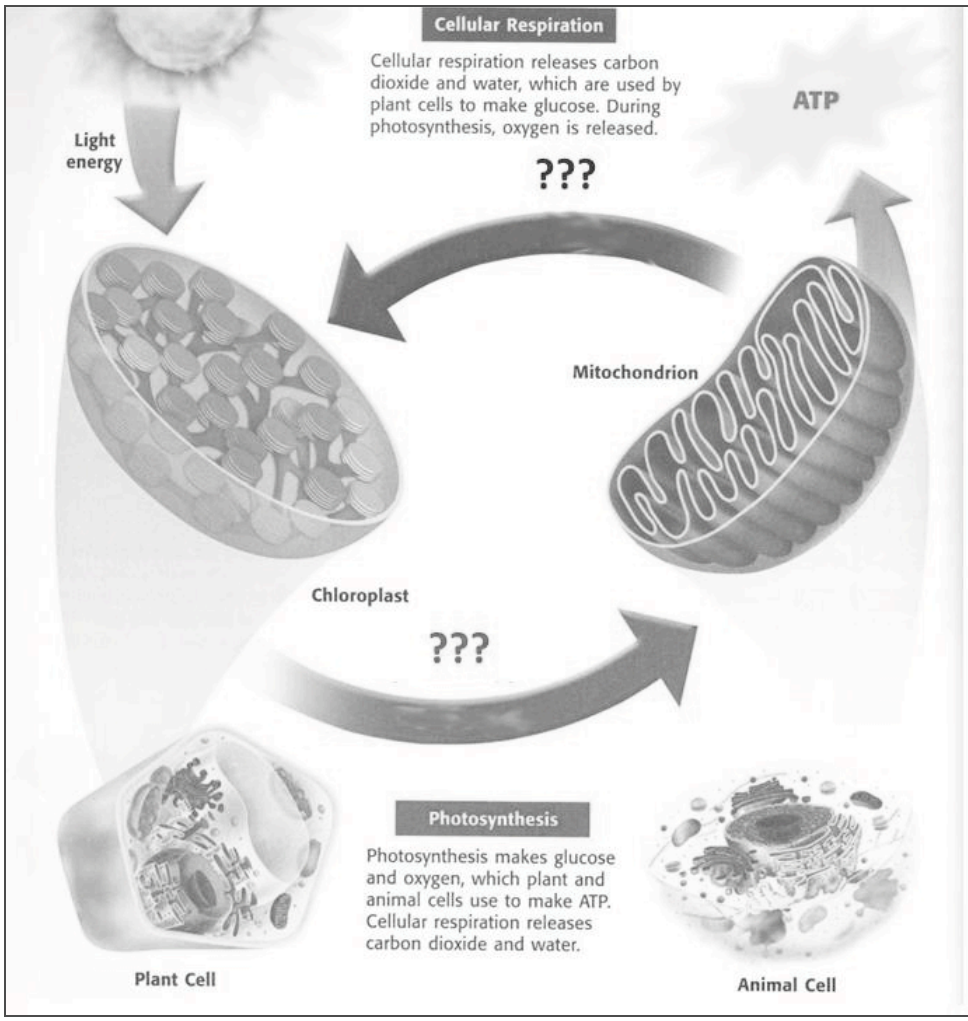
Students:

1. Holt textbook pages 42-43

Activities and Allotted time

5 minutes - Warm-up
40 minutes - Holt Ch 2, Section 3, p42-43

Day 39 - Warm-up



The labels for the purple and red arrows are missing from this diagram. Decide which of the following labels should go with the purple arrow and which should go with the red arrow:

Glucose + oxygen

Carbon dioxide + water

Answers: The purple arrow should be accompanied by the label "carbon dioxide and water," as these are the products of cellular respiration. The red arrow should be accompanied by the label "glucose + oxygen," as these are the products of photosynthesis.

Purpose: This exercise reviews the cycle of photosynthesis and cellular respiration. It allows students to contrast the two processes, this time with emphasis on their outputs.

DAY 40

Chapter 2, Section 3: The Cell Cycle

After warming up, continue teaching Chapter 2, Section 3, starting on p44 and proceed through the end of the section on p45. 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

- Mitosis produces two cells that have the same number of chromosomes as the parent cell.
- At the end of mitosis, a cell divides the cytoplasm by cytokinesis.
- In plant cells, a cell plate forms between the two new cells during cytokinesis.

Materials

Teacher:

1. Warm-up Day 40 - Cells_warmups.ppt

Students:

1. Holt textbook, p44-45

Activities and Allotted time

5 minutes - Warm-up
40 minutes - Holt textbook Chapter 2, Section 3, p44-45

Day 40 - Warm-up

The DNA of a cell is organized into structures called chromosomes.

1. What is the main difference between prokaryotic and eukaryotic cells?
2. How are chromosomes different in prokaryotic and eukaryotic cells?
3. Which contain more DNA: prokaryotic or eukaryotic cells?

Answers:

1. A prokaryotic cell does not have a nucleus and a eukaryotic cell does.
2. In a prokaryotic cell, a chromosome is the main ring of DNA. In a eukaryotic cell, a chromosome is one of the structures in the nucleus and is made up of DNA and protein.
3. Eukaryotic cells are more complex and contain more DNA than prokaryotic cells.

Purpose: This exercise reviews the prokaryotic vs. eukaryotic comparison, this time emphasizing the role of chromosomes in the nucleus.

DAY 41

Embedded Assessment 4

After today's warm-up, please begin embedded assessment 4 immediately. This is a longer embedded assessment, designed to thoroughly review content in previous chapters as well as this one, and it will require an entire class period to complete.

Materials

Teacher:

1. Warm-up Day 41 - Cells_warmups.ppt

Students:

1. Embedded Assessment #4

Activities and Allotted time

5 minutes - Warm-up
40 minutes - Embedded Assessment #4

Day 41 – Warm-up

Look at p.44-45/fig. 4 in your textbook and use the diagram of the cell cycle to answer the following questions.

1. What happens to chromosomes before mitosis?
2. Why does mitosis occur?

Answers:

1. Chromosomes are copied during mitosis.
2. Mitosis is a process of cell division during which a cell splits into two identical cells with the same number of chromosomes.

Purpose: This exercise gives students practice recalling both the process and purpose of mitosis.

Embedded Assessment #4 - Answer Key

Embedded Assessment 4: The Cell in Action

Please select the best answer to each question.

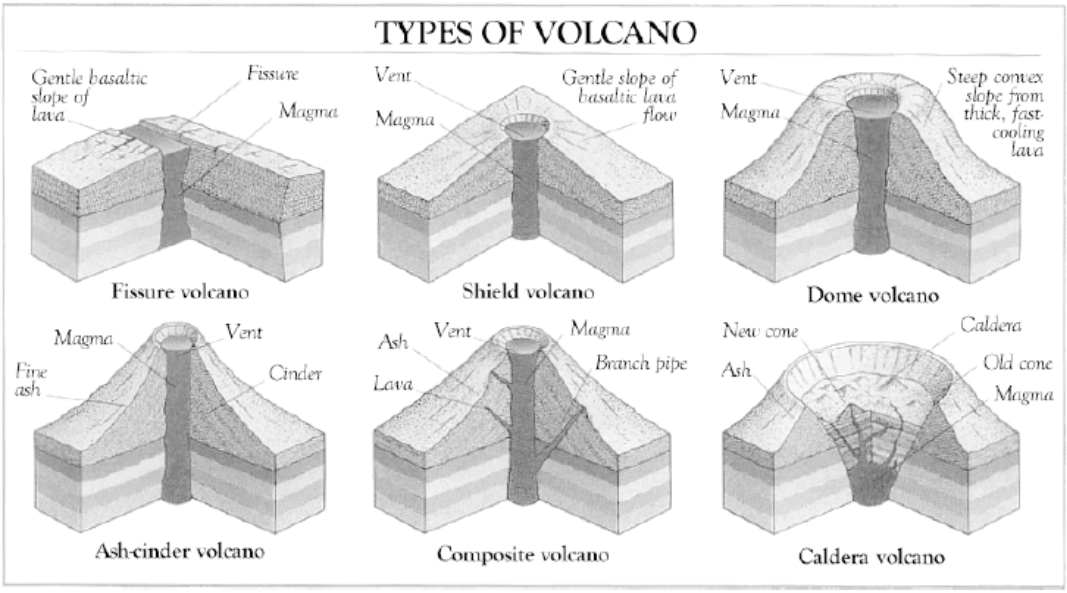
1. How do particles move from areas of lower concentration to areas of higher concentration?

   a. by cellular respiration

   b. by active transport*

   c. by diffusion

2.



Using information from the above figure, one can see that a dome volcano has a convex slope that is steep, while _____ and _____ volcano types have gentle slopes.

   a. Ash-cinder and Composite

   b. Caldera and Composite

   c. Shield and Ash-cinder

   d. Fissure and Shield*

3. Cells without a nucleus are called:
    a. chloroplasts.
    b. eukaryotes.
    c. prokaryotes.*
4. Domain Eukarya does NOT include:
    a. plants.
    b. bacteria.*
    c. fungi.
5. During the process of diffusion,
    a. a cell surrounds and absorbs large particles.
    b. particles move from areas of lower concentration to higher concentration.
    c. particles move from areas of higher concentration to lower concentration.*
6. A complex, multicellular organism that eats food, usually moves around and responds quickly to the environment is likely a(n):
    d. animal*
    e. fungus
    f. plant.
7. Osmosis is important to cells because
    a. cells are filled with fluids that are made mostly of water.*
    b. cells need to move from place to place.
    c. cells are usually dry.

8. The process of photosynthesis uses carbon dioxide, water and energy to produce

a. fermentation.

b. glucose.*

c. ATP.

9. Cells divide into two new cells by the processes of

a. fermentation and cellular respiration.

b. mitosis and cytokinesis.*

c. multiplication and division.

10. Which of the following is NOT an example of natural selection?

a. Male birds developing extremely colorful displays of feathers

b. Insects developing pesticide resistance

c. Dog owners breeding their pets to produce friendlier offspring*

11. What important process in cells uses oxygen and glucose to produce energy?

a. photosynthesis

b. fermentation

c. cellular respiration*

12. Which part of the cell forms a barrier between the cell and its environment?

a. Cell membrane*

b. Nucleus

c. Ribosome

13. Where does photosynthesis take place in a cell?

    a. In the nucleus

    b. In the mitochondria

    c. In the chloroplasts*

14. Cells are divided into two groups depending on whether or not they have a(n):

    a. eukaryote.

    b. membrane.

    c. nucleus.*

15. A characteristic that can be passed from parent to offspring through genes is called a

    a. zygote.

    b. eukaryote.

    c. trait.*

Please answer the following question using complete sentences.

16. All energy that fuels life comes from the sun. Explain, through discussion of photosynthesis and cellular respiration, how this is true.

Plants convert energy from the sun into glucose, or food, through the process of photosynthesis. Plants can use this glucose for energy through the process of cellular respiration. Other organisms, like animals, consume plants (or other animals, which in turn consume plants) to acquire the glucose that plants produced through photosynthesis. Those organisms then convert glucose into energy through cellular respiration, too.

Day 41 – Embedded Assessment

Read the passage below and use the information, along with what you have learned in class, to answer the question that follows.

Cancer starts in the body's cells. All of our organs and tissues are made up of cells. Each cell contains genes that determine how the cell grows, functions, and eventually dies. Through the process of mitosis, when the cell reproduces, it makes a carbon copy of itself.

When someone has cancer, their cells don't grow in a normal way, and the person develops growths or tumors. Cancer starts with one cell changing due to a mutation in the cell's DNA that affects its growth. Once a cell in the body has changed in this way, it tends to multiply at a much more rapid rate than normal. The normal 'checkpoints' regulating mitosis are ignored or overriden by the cancer cell, and cell reproduction continues out of control.

If one cell is affected by cancer, then through the process of mitosis, a tumor made up of a cluster of malignant cells is created. These malignant cells can send out signals to the body so that they develop blood vessels at the site to provide them with a steady supply of food (glucose) and oxygen. The blood vessels attached to the cancerous cells also mean that the cancer has the means to travel to other parts of the body.

Cancer cells that have broken away from the tumor travel through the bloodstream and are taken to different parts of the body. From there, they can start new tumors, a process known as mastitis. When someone is described as having a form of cancer, the term refers to the part of the body where the disease started.

17. According to the article, what is the difference between the way a normal, healthy cell reproduces and the way a cancer cell reproduces?

a. The cancerous cell disrupts mitosis so it can no longer occur, leaving cells with no way of producing new cells.

b. The cancerous cell makes mitosis occur very slowly, so that the body's cells can no longer keep up with the rate at which new cells are needed.

c. The cancerous cell goes through mitosis very rapidly, without the normal balances that control the rate of mitosis, and it overproduces new cells.*

DAY 42

Chapter 2: Skills Practice Lab

This activity is designed to help students develop lab skills. Complete today's warm-up, then conduct the Skills Practice Lab on p185-186. If you are behind schedule, today's activity may be skipped and you can continue directly to Day 43.

Materials

Teacher:

1. Warm-up Day 42 - Cells_warmups.ppt

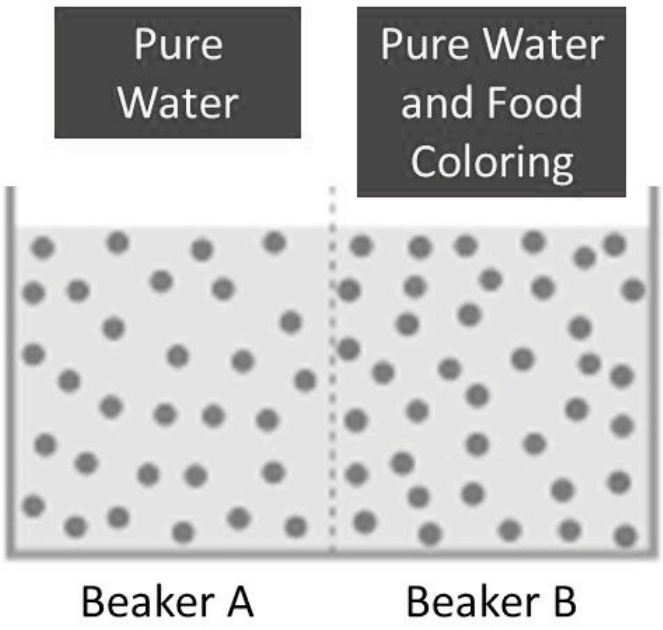
Students:

1. Holt textbook p185-186

Activities and Allotted time

5 minutes - Warm-up
40 minutes - Skills Practice Lab, p186

Day 42 - Warm-up



Use the diagram to the left to answer the questions.

1.In which beaker is the density of pure water higher?
2.Beaker A and Beaker B are separated by a semi-permeable membrane that will allow water (but not food coloring) to pass through. In which direction will water flow?
3.If the water passes through the membrane, what is this process called?

Answer:

1. The density of water is higher in the side that is pure water. It doesn't matter that the two beakers are level; they contain the same amount of liquid, but only a portion of the liquid in Beaker B is water while the rest is food coloring.
2. Water will flow from Beaker A, where the water density is higher, to Beaker B, where the water density is lower.
3. The process of water passing through a membrane from an area of higher concentration to an area of lower concentration is called osmosis.

Purpose: This exercise reviews the process of osmosis while addressing density, about which many students have misconceptions.

DAY 43

Chapter 2: Review

After completing today's warm-up, conduct a chapter review, using whatever resources you would prefer. You may use section review questions or chapter review questions from the book; you may also return graded embedded assessments or target concepts that seemed to be challenging for students.

Materials

Teacher:

1. Warm-up Day 43 - Cells_warmups.ppt

Students:

1. Holt textbook Chapter 2
2. Graded Embedded Assessment 4 (optional)

Activities and Allotted time

5 minutes - Warm-up
40 minutes - Chapter 2 review

Day 43 - Warm-up

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

Word Bank

Carbon dioxide Mitochondria
Photosynthesis Chloroplasts
Cellular respiration

1. The conversion of light energy into food is called _____ and it occurs in the _____.
2. The conversion of food into energy is called _____ and it occurs in the _____.
3. _____ is a necessary ingredient of photosynthesis and a by-product of cellular respiration.

Answers:

1. Photosynthesis, chloroplasts
2. Cellular respiration, mitochondria
3. Carbon dioxide

Purpose: This exercise reviews the photosynthesis vs. cellular respiration contrasting case and emphasizes the role carbon dioxide plays in both.