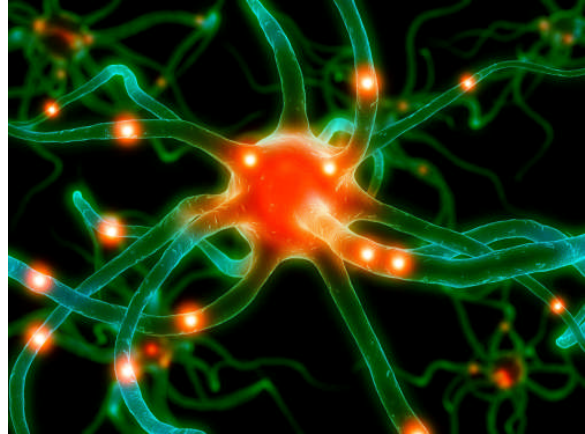


Fifth Grade Lesson Plan – The Cell

Overview

This series of lessons was designed to meet the needs of gifted children for extension beyond the standard curriculum with the greatest ease of use for the educator. The lessons may be given to the students for individual self-guided work, or they may be taught in a classroom or a homeschool setting. Assessment strategies and rubrics are included at the end of the unit. The lessons were developed by Lisa Van Gemert, M.Ed.T., the Mensa Foundation's Gifted Children Specialist.



Introduction

Not only is the cell one of the fundamental building blocks of life, it forms the basis of biological study in many grades. Study of the cell enables students to search deeper and deeper on their own, extending understanding levels far above what is taught. This lesson sequence is designed to give students a fundamental understanding of the cell that will enable them to extend their knowledge on their own. Because these lessons are designed to be self-guided, the language and wording are geared to the appropriate age.

Guiding Questions

- What is a cell?
- How are plant and animal cells different? How are they the same?
- What makes an effective cell model?
- How does osmosis affect cells?
- What is cell diffusion and how does it work?

Learning Objectives

After completing the lessons in this unit, students will be able to:

- Describe main structures and functions of the cell.
- Construct three cell models, evaluating them for completeness, effectiveness and accuracy.
- Conduct two labs on cell membrane osmosis and diffusion

Preparation

- Print out all sheets that need to be colored or completed on paper.
- Make sure you have reliable Internet access.
- Gather materials for experiments.

Lesson 1. The Structure and Function of the Cell

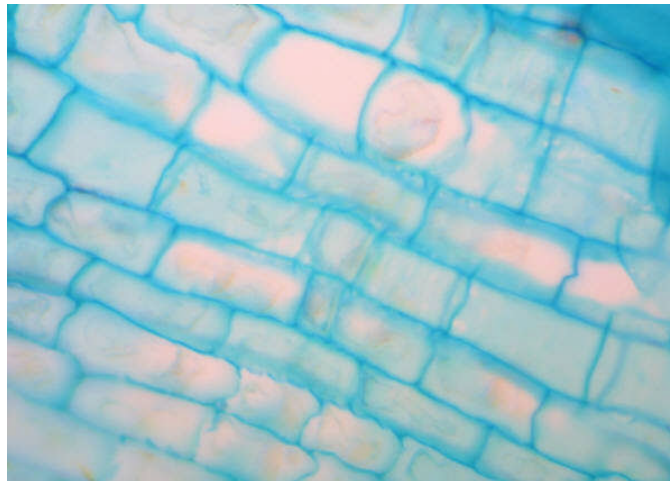
- Read through the PowerPoint presentation at:
http://www.science-class.net/PowerPoints/Cell_structure_function.ppt#1
- Read through information at the following Web site:
http://www.worldofteaching.com/powerpoints/teachone/cell_part1.ppt#1
- Grade the two sources using the rubric below. Give the PowerPoint and the Web site *each* a score for each category.

CATEGORY	4	3	2	1
Attractiveness PowerPoint: Web site:	Makes excellent use of font, color, graphics, effects, etc., to enhance the presentation.	Makes good use of font, color, graphics, effects, etc., to enhance to the presentation.	Makes use of font, color, graphics, effects, etc., but occasionally these detract from the presentation content.	Use of font, color, graphics, effects, etc., but these often distract from the presentation content.
Content PowerPoint: Web site:	Covers topic in-depth with details and examples. Subject knowledge is excellent.	Includes essential knowledge about the topic. Subject knowledge appears to be good.	Includes essential information about the topic but there are 1-2 factual errors.	Content is minimal <i>or</i> there are several factual errors.
Organization PowerPoint: Web site:	Content is well organized, using headings or bulleted lists to group related material.	Uses headings or bulleted lists to organize, but the overall organization of topics appears flawed.	Content is logically organized for the most part.	There was no clear <i>or</i> logical organizational structure, just lots of facts.
Helpfulness PowerPoint: Web site:	Information was easy to learn and remember.	Information was somewhat easy to learn and remember.	Information was not easy to learn and remember.	Information was difficult to learn and remember.

Total PowerPoint score: _____ Total Web site score: _____

Which one would you recommend to another student learning about the cell if you could only pick one of them? Why?

- Color a plant cell, using information learned in the PowerPoint and the Web site to name structures. Print a coloring sheet from http://askabiologist.asu.edu/expstuff/pdffiles/pcell8_puzzle.pdf
- Color an animal cell, using information learned in the PowerPoint and the Web site to name structures. Print a coloring sheet from http://askabiologist.asu.edu/expstuff/pdffiles/acell9_puzzle2.pdf
- List five different structures of a cell:
 1. _____
 2. _____
 3. _____
 4. _____
 5. _____
- Put a star next to the one you think is the most important.
- List two differences between a plant cell and an animal cell:
 1. _____
 2. _____
- Is this a plant or an animal cell pictured below? How can you tell?



Lesson 2. Making a Model Cell

You will now make three different models of a cell. You can decide if you want them to be plant or animal cells.

Model Number 1: Mellow Yellow JELL-O® Cell

You will need:

- One small box of lemon gelatin
- A number of different items to represent the cell's structures. This could include mandarin oranges, raisins, grapes, gummy worms, jelly beans, cake sprinkles, dried fruit or rolled fruit, hard candies, gumballs and many more.
- Cell model chart (below)
- A container (glass or plastic)
- A zipper plastic bag (at least quart size – gallon is better)

How to do it:

- Make the gelatin as instructed on the package, using a little less water than it calls for in the recipe. This will make your cell firmer.
- Put the plastic bag inside the container, spreading the mouth of the bag over the edge of the container.
- Pour the gelatin into the bag. Once the gelatin is in the bag, seal the bag tightly and put it in the refrigerator for about an hour so that it sets a little bit.
- While the gelatin is setting, complete the cell model chart below.
- When the gelatin has set for an hour, take it out of the refrigerator and add the items you've decided to use. Put the bag back in the refrigerator and let it set overnight.

Model #1: Gelatin		
Structure	What I used	Why I used it
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		
11.		

Model Number 2: I Can See Through You, Too Cell

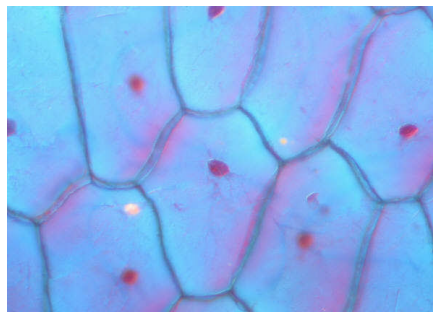
You will need:

- Corn syrup
- Two zipper plastic bags, sandwich or quart size
- Different items to represent the parts of the cell. Don't use goodies this time; use things like buttons, pipe cleaners, different shapes of pasta, string or yarn, marbles, beads, etc.
- Cell model chart (below)

How to do it:

- Pour the corn syrup into the baggie.
- Complete the model chart.
- Add the items you've chosen to represent the parts.
- Seal the bag tightly. If you've chosen a plant cell, put it in two baggies so that one represents the cell wall and one the cell membrane. Make sure to list that on your chart.

Model #2: Corn Syrup		
Structure	What I used	Why I used it
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		
11.		



Model Number 3: The All You Cell

You will need:

- Anything you want to use

How to do it:

- For this model, you will choose things you already have in your house to construct a model of a cell. By now, you know how to do it. You need something that will be the cell wall or membrane. You need something that will be the cytoplasm, and you need different items to represent the structures of the cell.

Model #3: All You		
Structure	What I used	Why I used it
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		
11.		

Wrapping It Up

- Compare the three models you have. Rank each one in the following categories, 1 being the best of the three, 3 being the least best of the three (so each line will have a 1, a 2 and a 3):

	Gelatin	Corn Syrup	Homemade
Use of materials	_____	_____	_____
Cytoplasm	_____	_____	_____
Appearance of cell structures	_____	_____	_____
Overall	_____	_____	_____

- Did your scores match what you really felt about the models?

- If you were a teacher and could only use one of these in class, which one would you use and why?

Lesson 3. Experimenting with Cells

Now you'll do two experiments that will help teach you about cell transportation showing two related ideas: **diffusion** and **osmosis**.

Diffusion is the movement of molecules from crowded areas to areas where there is more space. We call this movement from areas of high concentration to areas of low concentration. Watch this animation to get an idea of how it works: http://highered.mcgraw-hill.com/sites/0072495855/student_view0/chapter2/animation__how_diffusion_works.html

Osmosis takes place when you have diffusion, but it's across a membrane that some stuff can get through but other stuff can't, so there's a higher concentration of molecules on one side of a membrane than the other. We call that a "semi-permeable" membrane. Some molecules can fit through the tiny holes in the membrane, and they go to the other side to get to the area with fewer molecules. So, osmosis is a type of diffusion.

You can read more about osmosis at: <http://encyclopedia.kids.net.au/page/os/Osmosis>.

Now it's time to try it!

Diffusion Lab

What's the Question? How do starch and iodine diffuse across a plastic baggie membrane?

The first thing you need to do is gather your materials. You will need:

- Iodine
- Starch (you can get both of these things at the grocery store)
- Glass or beaker
- Baggie

Before You Start

- Iodine is what we call an "indicator" for starch. An indicator is something that changes color in the presence of a specific thing.
- In a small glass, mix some iodine and starch together.
- What happened when the iodine came into contact with the starch?

What's In the Bag?

Make sure you have a grasp on what you are starting with. Concentration refers to which one has the most stuff, or molecules, in it. Does the baggie or the beaker/glass have a greater concentration of starch? What about iodine? Keep in mind what you just decided about concentrations. Also remember the way molecules move depending on concentration.

Moving On to the Lab

1. Fill a plastic baggie with a teaspoon of corn starch and half a cup of water. Close the bag.
2. Fill a glass or beaker halfway with water and add ten drops of iodine.
3. Place the baggie in the cup so that the baggie with the cornstarch mixture is submerged in the iodine water mixture.
4. Wait fifteen minutes and write down what you saw on the Observation Station below.

While You're Waiting... Make an Educated Guess

1. If the starch can get through the baggie, which way will the starch move? Will it go into the bag or out of the bag? _____
2. If the baggie is permeable to iodine (which means the iodine can get through), which way would the iodine move – into the bag or out of the bag? _____
3. Since iodine is an indicator for starch, if the baggie is permeable to iodine, what color do you think the solution in the baggie will turn? _____ What about the solution in the glass/beaker? _____
4. If the baggie is permeable to starch, what color would do you think the solution in the baggie will turn? _____ What about the solution in the glass/beaker? _____



Observation Station

	Starting Color	After 15 minutes
Beaker/glass		
Baggie		

Cell-3.2

After the Lab

1. What do you think moved, the starch or the iodine?

2. Why do you think that?

3. Which one was able to move across the baggie – the starch or the iodine?

4. How would the experiment's results be different if you put the iodine in the baggie and the starch in the glass/beaker?

5. Draw a picture of the experiment below. Use arrows to show the way the diffusion was occurring.

Do You Know?

1. Can you define diffusion?

2. Can you define osmosis?

3. What is one word you can use to explain the difference between diffusion and osmosis?

4. Can you explain why iodine is called an indicator of starch?

5. Can you describe the way that molecules tend to move?

Next Lab: Observing Osmosis

It is hard to see osmosis in cells because they're so small, but there are some big cells that you can see with the naked eye. In this experiment, you will demonstrate osmosis in a big cell – an egg!

What's Your Question? How does osmosis happen in an egg cell?

What You Need

- Raw egg
- 500 ml beaker/glass
- 250 ml vinegar
- 250 ml corn syrup
- 250ml water
- 250 ml or larger graduated cylinder (use a liquid measuring cup if you don't have a graduated cylinder)
- Plastic wrap
- Water

To Begin

- Put the egg in the beaker or glass. Pour the vinegar over the egg. Cover the beaker with plastic wrap.
- Wait 30 minutes. Write down what you can see on the Observation Station on the next page.
- Wait two days!

Two Days Later

- Write down what you see on the Observation Station.
- Pour the vinegar into the measuring cup and write down how much vinegar was in the glass/beaker.
- Rinse the egg off with water and put it back in the glass/beaker.
- Pour the corn syrup over the egg. Cover the beaker with plastic wrap.
- Wait two days!

Two Days Later

- What do you see? Write it down on the Observation Station.
- Pour the corn syrup into the measuring cup and write down how much corn syrup was in the glass/beaker.
- Rinse the egg off with water and put it back in the glass/beaker. Pour the 250ml water over the egg. Cover the beaker with plastic wrap.
- Wait two days!

Two Days Later

- What do you see? Write it down on the Observation Station.
- Pour the water into the measuring cup and write down how much water was left in the glass/beaker.
- Throw that egg away! It has served its use in the cause of science.

Observation Station

	How much liquid is left in the glass/beaker?	What do you notice about the egg?
Day 1		
After the vinegar		
After the corn syrup		
After the water		

Extension

Watch the video at http://www.xvivo.net/press/harvard_university.htm.

Go back to the PowerPoint presentation you looked at in Lesson 1. Using what you've learned, improve it. You can change the words or pictures. Can you make it better? In what way is your version better?

Read books on cells (you can find them at the library under call numbers in the 570s and 611). Can you write a short book on cells for kids in kindergarten? See if you can make a ten-page book with pictures and one activity (a dot-to-dot or a picture to color). Make a copy of it to give to a kindergarten teacher.

Check out these Web sites on cells and cell biology:

- <http://www.cellsalive.com>
- http://www.biology4kids.com/files/cell_main.html
(go to the activity page and see how you do on some of the quizzes!)
- <http://science.howstuffworks.com/cellular-microscopic-biology/cell.htm>
- take the virtual cell tour at <http://www.ibiblio.org/virtualcell/tour/cell/cell.htm>
- <http://micro.magnet.fsu.edu/cells/>
This one's a little more advanced. If you scroll down on the first page, you can click on the different types of cells and see good drawings.

Assessment

Section 1: Structure and Function of the Cell (10 points)

Reasonable scoring of rubric	___ /3
Effective coloring of cell diagrams	___ /4
Thorough completion of questions	___ /3
TOTAL	___ /10

Section 2: Construction of Cell Models (35 points)

Cell Model 1	___ /10
Cell Model 2	___ /10
Cell Model 3	___ /10
Reflection/rubric/questions	___ /5
TOTAL	___ /35

Section 3: Experimenting with Cells (20 points)

Lab 1	___ /10
Lab 2	___ /10
TOTAL	___ /20

Cumulative Total: ___ /65

Bonus for extension activities at teacher's discretion.