

Cell-ebrate! Life

Grade Level or Special Area: 5th Grade Science

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Length of Unit: Two Weeks

I. ABSTRACT

- A. Students will gain an understanding of the necessities of life by appreciating that a system is a collection of cycles, structures, and processes that interact. Students should understand through the use of models, experimentation, technology and authentic assessment, a whole in terms of its components and how these components relate to each other and to the whole.

II. OVERVIEW

- A. Concept Objectives for this unit include:
1. The student knows how to use a variety of tools and methods to conduct science inquiry. (TEKS 5.4)
 2. The students knows that a system is a collection of cycles, structures, and processes that interact. (TEKS 5.5)
 3. The student knows that likenesses between offspring and parents can be inherited or learned. (TEKS 5.10)
- B. Content from the *Core Knowledge Sequence*
1. Cells: Structures and Processes (p. 127)
 - a. All living things make up cells.
 - b. Structures of cells (both plant and animal)
 - a. Cell membrane: selectively allows substances in and out
 - b. Nucleus: surrounded by nuclear membrane, contains genetic material, divides for reproduction
 - c. Cytoplasm contains organelles, small structures that carry out the chemical activities of the cell, including mitochondria (which produce the cells energy) and vacuoles (which store food, water, or wastes).
 2. Plant cells, unlike animal cells, have cell walls and chloroplasts.
 - a. Photosynthesis is an important life process that occurs in plant cells, but not animal cells (photo = light; synthesis = putting together). Unlike animals, plants make their own food, through the process of photosynthesis.
 3. Cells without nuclei: monerans (bacteria)
 4. Some organisms consist of only a single cell: for example, amoeba, protozoan, some algae.
 5. Cells are shaped differently in order to perform different functions.
 6. Organization of cells into tissues, organs, and system:
 - a. In complex organisms, groups of cells form tissues (for example, in animals, skin tissue or muscle tissue; in plants, the skin of an onion or the bark of a tree).
 - b. Tissues with similar functions form organs (for example, in some animals, the heart, stomach, or brain; in some plants, the root or flower).
 - c. In complex organisms, organs work together in a system (recall, for example, from earlier studies of the human body, the digestive, circulatory, and respiratory systems).

7. Science Biographies (p. 129)
 - a. Ernest Just
- C. Skill Objectives
 1. Science
 - a. Collect and analyze information using tools including calculators, microscopes, [cameras, sound recorders, computers,] hand lenses, rulers, thermometers, compasses, balances, [hot plate,] meter sticks, timing devices, magnets, collection nets, and safety goggles (TEK 5.4A)
 - b. Describe some cycles, structures, and processes that are found in a simple system. (TEK 5.5A)
 - c. Describe some interactions that occur in a simple system. (TEK 5.5B)
 - d. Identify traits that are inherited from parent to offspring in plants and animals (TEK 5.10A)

III. BACKGROUND KNOWLEDGE

- A. For Teachers
 1. Hirsh, Jr., E. D. *What Your 5th Grader Needs to Know*. New York, NY: Doubleday, 1993, ISBN 0-385-31464-7
 2. Ireland, Patrick. "The Cell Membrane Headquarters," MSN [On-line]. Available URL: www.usd.edu/~bgoodman/Cell-ibrationframes.htm
 3. Waggoner, Ben. "Antony van Leeuwenhoek (1632-1723)," MSN [On-line]. Available URL: <http://www.ucmp.berkeley.edu/history/leeuwenhoek.html>
 4. Waggoner, Ben. "Robert Hooke (1635-1703)," MSN [On-line]. Available URL: <http://www.ucmp.berkeley.edu/history/hooke.html>
 5. Wingard, Gingi F. "Ernest Everett Just (1883-1941)," MSN [On-line]. Available URL: <http://www2.sjsu.edu/depts/Museum/ernest.html>
- B. For Students
 1. The Human Body (Second Grade p. 60)
 - a. Cells
 - a. Students should have a basic understanding that all living things are made up of cells, too small to be seen without a microscope.
 - i. Cells make up tissues.
 - ii. Tissues make up organs.
 - iii. Organs work in systems.
 2. Life Cycles (Second Grade p. 59)
 - a. The life cycle: birth, growth, reproduction, death
 - b. *It is also important to understand the processes of life for this unit.*
 3. Science Biographies (Second Grade p. 61)
 - a. Anton van Leeuwenhoek

IV. RESOURCES

- A. computer
- B. internet
- C. overhead projector
- D. Alpha Smart
- E. Classroom Performance System

V. LESSONS

Lesson One: Eureka! Anton van Leeuwenhoek Found It.

- A. *Daily Objectives*
1. Concept Objective(s)
 - a. The student knows how to use a variety of tools and methods to conduct science inquiry. (TEKS 5.4)
 2. Lesson Content (p. 127)
 - a. All living things make up cells.
 3. Skill Objective(s)
 - a. Collect and analyze information using tools including calculators, microscopes, [cameras, sound recorders, computers,] hand lenses, rulers, thermometers, compasses, balances, [hot plate,] meter sticks, timing devices, magnets, collection nets, and safety goggles. (TEK 5.4A)
- B. *Materials*
1. costume for dress as Anton van Leeuwenhoek
 2. small hand lens inside a pouch
 3. Appendix A for teacher (description of Leeuwenhoek)
 4. Appendix B for students (Exploring with Lenses)
 5. slide prepared with pond water and Intel microscope for computer and/or a Web TV set to link to ucmp.berkeley.edu/history/leeuwenhoek.html to view samples of his findings (or pictures of microscopic organisms if neither of these are available)
 6. varies objects to observe
 7. magnifying glass
 8. clear glass jar
 9. clear plastic cup
 10. clear transparency
- C. *Key Vocabulary*
1. Eureka! – (p. 81, *What Your Fifth Grader Needs to Know*) a Greek word that means, “I have found it!”
 2. micro- very small, or microscopic
- D. *Procedures/Activities*
1. Enter the classroom acting as Leeuwenhoek using Appendix A.
 2. Follow directions on Appendix B to explore the use of lenses.
- E. *Assessment/Evaluation*
1. Participation, observation of the experiment, as well as the completed experiment should be used for assessment. Questions may be typed into an Alpha Quiz if Alpha Smart is available to you, or they may be set up in a Classroom Performance System if available.

V. LESSONS

Lesson Two: Did You See That? Parts of a Microscope

- A. *Daily Objectives*
1. Concept Objective(s)
 - a. The student knows how to use a variety of tools and methods to conduct science inquiry. (TEKS 5.4)
 2. Lesson Content (p. 127)
 - a. All living things make up cells.
 3. Skill Objective(s)

- a. Collect and analyze information using tools including calculators, microscopes, [cameras, sound recorders, computers,] hand lenses, rulers, thermometers, compasses, balances, [hot plate,] meter sticks, timing devices, magnets, collection nets, and safety goggles. (TEK 5.4A)

B. *Materials*

1. Appendix C (microscope)
2. overhead projector
3. compound microscope
4. prepared slides
5. millimeter graph paper
6. pencils
7. journal or Alpha Smart

C. *Key Vocabulary*

1. arm- used to lift, and carry microscope
2. base- support, carry microscope with one hand under the base and one hand around arm
3. body tube- area that moves up and down between the eye piece and the objective
4. coarse adjustment- moves the body tube or stage up and down
5. diaphragm- regulates the light coming through the stage opening
6. eyepiece- to view and help magnify the object
7. fine adjustment- focuses for detail
8. high power objective- for powerful detailed magnification
9. low power objective- for initial viewing of an object
10. magnification- the process of enlarging the size of something
11. medium power objective- usually 10X
12. mirror- to focus light through the stage to the eye
13. stage- place for viewing the slide
14. stage clips- hold slides in position

D. *Procedures/Activities*

1. Visit www.borg.com/~lubehawk/mscope.htm with your students to study the parts of a microscope.
2. If access to the internet is not available to you, use Appendix 2A to create a labeled picture of a compound microscope.
3. Make enough copies on transparencies (for durability as well as for placement on the overhead to check for understanding later) for your students to work in pairs/groups to put together a puzzle made by your having cut apart the parts of the microscope.
4. Place each puzzle in a Zip-lock baggie.
5. Allow students time to assemble the puzzle.
6. Check for understanding of the parts of a microscope by having the students place each part of a compound microscope on the overhead.
7. A brief demonstration, using an actual compound microscope, should then be given as to the magnification of the microscope, where to place the slide, how to focus, etc.
8. Have microscopes and prepared slides ready for easy viewing so the students may obtain practice in using a microscope.
9. Give the students millimeter graph paper and ask them to illustrate what they observe.

10. After ample viewing, gather the students and ask them if they could have seen such detail without using the microscope.
 11. In a journal, or on an Alpha Smart if available, have the students respond to why a microscope would be a useful tool to a scientist. Check and discuss responses.
- E. *Assessment/Evaluation*
1. Participation and responses to why a microscope is useful should be used for assessment.

V. LESSONS

Lesson Three: Open Wide and Look Inside

- A. *Daily Objectives* (Lesson content, concept objectives, and skill objectives should all be listed in the Overview section as well.)
1. Concept Objective(s)
 - a. The student knows how to use a variety of tools and methods to conduct science inquiry. (TEKS 5.4)
 2. Lesson Content
 - a. All living things make up cells. (p. 127)
 3. Skill Objective(s)
 - a. Collect and analyze information using tools including calculators, microscopes, [cameras, sound recorders, computers,] hand lenses, rulers, thermometers, compasses, balances, [hot plate,] meter sticks, timing devices, magnets, collection nets, and safety goggles (TEK 5.4A)
- B. *Materials* (one per group)
1. slides
 2. slide covers
 3. toothpicks
 4. small containers of water
 5. pipettes
 6. compound microscope
 7. pictures of amoebas and protozoa's (These can usually be found in any Fifth Grade textbook.)
- C. *Key Vocabulary*
1. algae- single cell organism
 2. amoebae- single cell organism
 3. bacteria- microscopic unicellular prokaryotic organisms
 4. mucus- a protective lubricant coating made by cells and glands of the mucous membranes
 5. moneran- cells without nuclei (bacteria)
 6. plaque- a film of mucus and bacteria on a tooth surface
 7. protozoan- single cell organism
- D. *Procedures/Activities*
1. Have one student from each group carefully scrape their teeth with a toothpick and rub the contents collected on one side of a slide. The toothpick should be properly discarded.
 2. Have the student angle a slide cover over the slide so the edge meets one side of the slide.
 3. The student should then use the pipette to drop one drop of water onto the slide and lay the slide cover carefully over the slide.

4. Each group should then place the slide on the stage of a compound microscope and view its contents.
 5. Students should record what they observe in a journal or Alpha Smart if available.
 6. Explain that what they saw was bacteria, or monerans- single celled organisms without a nucleus.
 7. Explain that there are also single celled organisms with a nucleus like algae (green stuff that collects in swimming pools), amoebas ooze by extending parts (show a picture), and protozoa's that move by latching to things.
 8. Some one-celled organisms like bacteria, amoebas, and protozoa's are harmless while others may cause disease.
- E. *Assessment/Evaluation*
1. Recorded observations should be used for assessment.

V. LESSONS

Lesson Four: Hooke'd on Cells

- A. *Daily Objectives*
1. Concept Objective(s)
 - a. The students knows that a system is a collection of cycles, structures, and processes that interact. (TEKS 5.5)
 2. Lesson Content (p. 127)
 - a. Structures of cells (both plant and animal)
 - a. Cell membrane: selectively allows substances in and out
 - b. Nucleus: surrounded by nuclear membrane, contains genetic material, divides for reproduction
 - c. Cytoplasm contains organelles, small structures that carry out the chemical activities of the cell, including mitochondria (which produce the cells energy) and vacuoles (which store food, water, or wastes).
 3. Skill Objective(s)
 - a. Describe some cycles, structures, and processes that are found in a simple system. (TEK 5.5A)
- B. *Materials*
1. honeycomb
 2. snack size Zip-lock baggie
 3. plate of water
 4. sponge
 5. permanent marker
 6. light Karo syrup
 7. whole black olives
 8. kidney beans
 9. peanuts
 10. Appendix D
- C. *Key Vocabulary*
1. cell membrane- the outermost part of the cell that controls what enters and exists the cell
 2. cytoplasm- a jelly-like substance that fills the cell inside the membrane and surrounds the nucleus

3. diffusion- the act of spreading evenly
4. mitochondria- kidney-shaped structures that change food into energy the cell can use to do its work
5. nucleus- the control center of the cell, which helps the cell to grow, reproduce, and divide
6. osmosis- transfer of high water concentration to low water concentration
7. vacuole- oval structures, where the cell stores food, water, or wastes

D. *Procedures/Activities*

1. Ask the students why microscopes were necessary to view the bacteria in the plaque from their teeth. *They should reply that they are too small to see without a microscope.*
2. Remind the students that bacteria are living creatures because they possess the processes of life (learned prior to this unit). Also remind them that all living things are made of cells (learned from Second Grade p. 60).
3. Tell the students that an Englishman named Robert Hooke invented the compound microscope much like they have been using in class and it was he that coined the term “cell” when he was asked by the Royal Society of London to confirm Leeuwenhoek’s claim of having discovered the micro-world.
4. Explain that cells are a small, enclosed cavity or space, as in a honeycomb. Pass around a sample of honeycomb for the students to observe.
5. Remind the students that cells are the building blocks of all life forms that allow for survival and reproduction.
6. Explain that scientists use models for study when it is not possible to study an actual object. Ask students what reasons there could be for not studying a real object. Explain that there are limitations to using models for study and ask the students what they believe some limitations would be.
7. Have a student pass out a snack size Zip-lock baggie to each peer and explain that they will be building a simple model of an animal cell. Explain that the baggie represents the cell membrane- which controls what moves in, and out, of the membrane just as the zip-lock controls matter moving in and out.
8. Soak up a plate full of water into a sponge. Explain osmosis as the transfer of water from the plate to the sponge and diffusion as the water being spread evenly throughout the sponge. Squeeze the water out of the sponge and explain that osmosis and diffusion occurred again as the water flowed out of the sponge evenly just as fluids move in and out of a cell membrane.
9. Second, have the students write their name on the outside of the baggie using a permanent marker.
10. Third, have the student pour approximately half a cup of light Karo into their baggies. This represents the cytoplasm- a jelly-like substance that fills the cell inside the membrane and surrounds the nucleus
11. Fourth, give them each an olive to put into their baggie. This represents the nucleus- the control center of the cell, which helps the cell to grow, reproduce, and divide.
12. Fifth, give each student a few peanuts. These represent vacuoles- oval structures, where the cell stores food, water, or wastes.
13. Finally, give the students some kidney beans. These represent mitochondria- kidney-shaped structures that change food into energy the cell can use to do its work.

14. For homework, ask the students to be creative and follow the rubric provided on Appendix D to create their own model of an animal cell. For example, what else could be used to represent the cell membrane than a Zip-lock baggie? Karo syrup for cytoplasm, olive for nucleus, kidney beans for mitochondria, or peanuts for vacuoles?
- E. *Assessment/Evaluation*
1. Challenge the students to create their own model of an animal cell. Use Appendix D for assessment of models.

V. LESSONS

Lesson Five: Cell, You Have the Right to Remain Silent

Daily Objectives

1. Concept Objective(s)
 - a. The students knows that a system is a collection of cycles, structures, and processes that interact. (TEKS 5.5)
2. Lesson Content (p. 127)
 - a. Structures of cells (both plant and animal)
 - a. Cell membrane: selectively allows substances in and out
 - b. Nucleus: surrounded by nuclear membrane, contains genetic material, divides for reproduction
 - c. Cytoplasm contains organelles, small structures that carry out the chemical activities of the cell, including mitochondria (which produce the cells energy) and vacuoles (which store food, water, or wastes).
3. Skill Objective(s)
 - a. Describe some interactions that occur in a simple system. (TEK 5.5B)

B. *Materials*

1. 3D model of a Police Station
2. paper
3. pencil

C. *Key Vocabulary*

1. None

D. *Procedures/Activities*

1. Ask the student what is the heart of a city. Steer the conversation until the students decide on the local police station. Show the students a 3D model of a Police Station.
2. Ask the students what part of the police station controls its activity like that of a cells nucleus. *Police Chief*
3. Ask how the doors of a Police Station might compare with an animal cell. *The cell membrane allows for movement in and out of the cell just as the doors of the Police Station.*
4. Ask how the hallways of a Police Station might compare with an animal cell. *The cytoplasm allows for ease of movement inside the cell just as hallways allow for ease of movement inside the Police Station.*
5. Ask how the kitchen, or vending machines of a Police Station, might compare with an animal cell. *They allow for storage of food just as the vacuole of a cell.*
6. Ask what would represent the mitochondria, which does the work of the cell, inside a Police Station. *Police Officers*

7. Have students get into groups and brainstorm (draw a picture, make a list, draw a map, etc.) how else they could represent a simple animal cell. Examples might include: a city, hospital, fire house, amusement park, etc.
 8. Help the students decide what materials they would need to make a 3D model of their representation of the interaction of an animal cell.
 9. Ask the students to bring materials to build their models tomorrow.
- E. *Assessment/Evaluation*
1. Participation, and evidence of brainstorming, should be used for assessment.

V. LESSONS

Lesson Six: Cell, You Have the Right to Remain Silent *con't*

A. *Daily Objectives*

1. Concept Objective(s)
 - a. The students knows that a system is a collection of cycles, structures, and processes that interact. (TEKS 5.5)
2. Lesson Content (p.127)
 - a. Structures of cells (both plant and animal)
 - a. Cell membrane: selectively allows substances in and out
 - b. Nucleus: surrounded by nuclear membrane, contains genetic material, divides for reproduction
 - c. Cytoplasm contains organelles, small structures that carry out the chemical activities of the cell, including mitochondria (which produce the cells energy) and vacuoles (which store food, water, or wastes).
3. Skill Objective(s)
 - a. Describe some interactions that occur in a simple system. (TEK 5.5B)

B. *Materials* (will vary)

1. Appendix E (Rubric)
2. cardboard
3. glue/tape
4. construction paper
5. markers/crayons/map pencils
6. toothpicks
7. pipe cleaners
8. yarn/string/ribbon/coated wire
9. scissors
10. ruler

C. *Key Vocabulary*

1. None

D. *Procedures/Activities*

1. Share Appendix E with the students and allow them time to build a 3D model representing the interaction of a cell and its parts as brainstormed following the discussion of how a Police Station represents the interaction of a cell and its part.
2. Ask each group to demonstrate how their model represents the interaction of a cell and its part.

E. *Assessment/Evaluation*

1. The rubric provided in Appendix E, should be used to assess the models created.

V. LESSONS

Lesson Seven: Jelly Genes Lab

A. Daily Objectives

1. Concept Objective(s)
 - a. The student knows that likenesses between offspring and parents can be inherited or learned. (TEKS 5.10)
2. Lesson Content (p. 127)
 - a. Nucleus: surrounded by nuclear membrane, contains genetic material, divides for reproduction
3. Skill Objective(s)
 - a. Identify traits that are inherited from parent to offspring in plants and animals (TEK 5.10A)

B. Materials

1. Appendix F (Jelly Genes Lab answer document for teacher)
2. Appendix G (Jelly Genes Lab copies for students)
3. paper cups
4. jellybeans
5. colored pencils
6. procedure sheet
7. lab sheet

C. Key Vocabulary

1. genes- a group or unit of chromosomes consisting of DNA strands that determine characteristics
2. traits- distinguishing feature
3. chromosomes- structures in the nucleus of a cell that control the cell's activity
4. reproduction- make more of own kind
5. DNA- nucleic acid that carries genetic information in a cell determining individual hereditary characteristics
6. micro- very small, or microscopic

D. Procedures/Activities

1. Use Appendix F and G to give a brief explanation that living organisms reproduce (make more of own kind) and are determined by the mother (female) and father (male) as to its individual characteristics. *Reproduction is taught further into the Fifth Grade Core Knowledge Sequence. Students will study cell division in detail in Seventh Grade.*
2. Follow directions on pp. 79-82 "Jelly Genes Lab" from [A Taste of Science: 18 Edible Science Experiments](#) for the remainder of this lesson. ISBN 0-7424-0124-3

E. Assessment/Evaluation

1. Participation and completion of the experiment should be used for assessment. Questions may be typed into an Alpha Quiz if Alpha Smart is available to you, or they may be set up in a Classroom Performance System if available.

V. LESSONS

Lesson Eight: Mean Green on the Scene: Model of a Plant Cell

A. Daily Objectives

1. Concept Objective(s)

- a. The students knows that a system is a collection of cycles, structures, and processes that interact. (TEKS 5.5)
 2. Lesson Content (p. 127)
 - a. Plant cells, unlike animal cells, have cell walls and chloroplasts.
 - b. Photosynthesis is an important life process that occurs in plant cells, but not animal cells (photo = light; synthesis = putting together). Unlike animals, plants make their own food, through the process of photosynthesis.
 3. Skill Objective(s)
 - a. Describe some cycles, structures, and processes that are found in a simple system. (TEK 5.5A)
 - b. Describe some interactions that occur in a simple system. (TEK 5.5B)
- B. Materials**
1. Student created cell models depicting the interactions of an animal cell and its parts.
 2. green confetti
 3. 'bricks' (toy bricks, sponges, boxes, etc.)
 4. cup with a little water
 5. straw
 6. party whistle that makes a high pitch when you suck in
 7. party whistle that folds out and makes a flat sound when you blow on it
 8. flashlight
 9. two pie tins
 10. model or picture showing the parts of a plant
 11. sugar
 12. plain white paper
 13. colors/map pencils/markers
- C. Key Vocabulary**
1. cell wall- a sturdy layer around the plant cell that gives it a rigid shape
 2. chloroplast – contains the chlorophyll which allows the plant to make its own food by capturing sunlight and changing it into energy
 3. photosynthesis- the process by which a plant makes its own food
- D. Procedures/Activities**
1. Tell the students that plant cells are much like an animal cell with a couple of differences.
 2. Have them place 'bricks' around their models representing the interaction of a cell and its parts. Explain to them that a cell wall is much like a brick wall around a city. It is a stiff outer layer that surrounds and protects it.
 3. Then, have them sprinkle green confetti on their model like rain pouring down. Explain the green confetti represents the green chloroplasts in a plant that contains chlorophyll, which allows the plant to make its own food by capturing sunlight and changing it into energy.
 4. Explain that the process by which green plants make their own food is called photosynthesis.
 5. Using a model, or picture of the parts of a plant, demonstrate how water travels up the roots of a plant and make a slurping noise with the cup of water and a straw.

6. Demonstrate how the water continues up the stem and suck air in through the party whistle.
 7. Demonstrate how water travels into the leaves and make a *whooshing* noise.
 8. Flash a flashlight and demonstrate how the chlorophyll in the cells of the leaves captures sunlight and demonstrate how carbon dioxide we breathe out is captured in the plant. Blow the party whistle.
 9. Clap your hands (sprinkle the students with sugar for effect) and explain that the plant just produced glucose, a form of sugar.
 10. Go through the motions again and have the students explain the process as you go.
 11. Invite volunteers to act out photosynthesis for their peers.
- E. *Assessment/Evaluation*
1. Students should draw a diagram illustrating the process of photosynthesis.

V. LESSONS

Lesson Nine: Just, E.'xactly What's Your Function?

- A. *Daily Objectives* (Lesson content, concept objectives, and skill objectives should all be listed in the Overview section as well.)
1. Concept Objective(s)
 - a. The students knows that a system is a collection of cycles, structures, and processes that interact. (TEKS 5.5)
 2. Lesson Content (p. 127-8)
 - a. Cells are shaped differently in order to perform different functions.
 3. Skill Objective(s)
 - a. Describe some interactions that occur in a simple system. (TEK 5.5B)
- B. *Materials*
1. Appendix H (Who Am I? answer document for teacher)
 2. Appendix I (Who Am I? copies for students)
 3. Appendix J (various scientists names and cartoon characters)
 4. pictures of red blood cells and nerve cells (These can usually be found in any Fifth Grade textbook.)
- C. *Key Vocabulary*
1. function- assigned duty or activity
- D. *Procedures/Activities*
1. Use Appendices H & I to play *Who Am I?* Cut scientists names (as well as cartoon characters for fun) apart from Appendix J and tape on a lecture board so the students may use them to choose from as they play *Who Am I?*
 2. Begin reading from Appendix H allowing time for students to fill in the blanks on their copy of Appendix I. After each new fact, ask the students if they know who it is. Remove each incorrect answer from the lecture board.
 3. Continue reading until the correct choice is made and/or Appendix I is complete.
 4. Hold up a toy wheel and ask the students how they know that a wheel will roll. *It's round.*
 5. Hold up a spoon and ask the students how they know it will scoop. *It has a handle for leverage and it is concave to collect objects.*
 6. Explain that just as these tools perform a job according to their shape, Ernest Just concluded that cells perform different jobs according to their shape.

7. Ask two volunteers to come to the front of the room and quietly explain for one of them to begin holding their breath after you give a brief explanation to the class that they will demonstrate the job of red blood cells in your body. He/she should be very animated and breathe in loudly and deeply, and puff out his/her cheeks for effect. He/she should hold their breath until the other student taps his/her shoulder. Instruct the second volunteer to wait about five seconds only, before tapping the first volunteer on the arm. *One thousand one, one thousand two, one thousand three, one thousand four, one thousand five.*
8. Explain that the second volunteer was the red blood cells that carries oxygen through the body (first volunteer) and the first volunteer could not breathe without red blood cells performing their job.
9. Show the class a picture of red blood cells and have them describe its shape, color, etc.
10. Have two more volunteers come to the front of the room and explain to the class that they will demonstrate the job of nerve cells.
11. Quietly explain to one volunteer to tell the other volunteer to start turning in circles. However, he/she should not begin turning in circles until the first volunteer taps him/her on the shoulder because he/she did not receive the message until the nerve cell performed its job.
12. After the demonstration for the class, explain that it is the nerve cells job to carry messages throughout the body and the second volunteer could not begin turning until the first volunteer delivered (tapped shoulder) the message.
13. Explain to the class that cells make the tissues that form red blood cells and nerves and they work together in a system to allow for survival. Ask what would happen if the cells didn't form the tissues and carry out their job within a system? *Blood could not flow through out the body and carry oxygen vital for life. Organisms could not function without cells forming nerve tissue and carrying messages throughout the body. The same is true of all cells in all organisms.*
14. Further explain that cell tissues form organs, such as the heart. Ask: What is the function of the heart? *to pump blood through the body*
15. Ask what would happen if cells didn't form the tissues, that form the heart organ? *The heart wouldn't pump blood carrying the oxygen through the circulatory system.*

E. *Assessment/Evaluation*

1. Appendix I can be used for assessment. Also, the questions asked in steps 13-15 of the Procedures could be recorded in a journal, or Alpha Smart if available, for assessment.

V. **LESSONS**

Lesson Nine: What's Your Function?

A. *Daily Objectives*

1. Concept Objective(s)
 - a. The students knows that a system is a collection of cycles, structures, and processes that interact. (TEKS 5.5)
2. Lesson Content (p. 127)
 - a. Organization of cells into tissues, organs, and system:
 - a. In complex organisms, groups of cells form tissues (for example, in animals, skin tissue or muscle tissue; in plants, the skin of an onion or the bark of a tree).

- b. Tissues with similar functions form organs (for example, in some animals, the heart, stomach, or brain; in some plants, the root or flower).
 - c. In complex organisms, organs work together in a system (recall, for example, from earlier studies of the human body, the digestive, circulatory, and respiratory systems).
 - 3. Skill Objective(s)
 - a. Describe some interactions that occur in a simple system. (TEK 5.5B)
- B. *Materials*
 - 1. copies of Appendix K (Nerve Cells)
 - 2. copies of Appendix L (Muscles)
 - 3. clock with second hand
 - 4. clothes pins
 - 5. textbook
 - 6. blindfold
 - 7. toothpicks
 - 8. rulers
 - 9. pencils
- C. *Key Vocabulary*
 - 1. None
- D. *Procedures/Activities*
 - 1. Follow the directions given on Appendix K.
 - 2. Follow the directions given on Appendix L.
- E. *Assessment/Evaluation*
 - 1. Participation and Appendices K and L can be used for assessment. Questions from each experiment can be typed in an Alpha Quiz if Alpha Smarts are available or a Classroom Performance System can be used if available.

VI. CULMINATING ACTIVITY

- A. Invite parents to view journals, models, drawings, slides of specimens, experiments etc. completed by the students the last two weeks. “. . . my work, which I’ve done for a long time, was not pursued in order to gain the praise I now enjoy, but chiefly from a craving after knowledge, which I notice resides in me more than most other men. And therewithal, whenever I found out anything remarkable, I have thought it my duty to put down my discovery on paper, so that all ingenious people might be informed thereof. Anton van Leeuwenhoek” (Waggoner, www.ucmp.berkeley.edu/history/leeuwenhoek.html).

1. HANDOUTS/WORKSHEETS

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Appendix A

Anton van Leeuwenhoek

(Students should have prior knowledge of Leeuwenhoek from the 2nd Grade Sequence.)

I am a simple tradesman born in Delft, Holland in 1632. *(Allow the students to fill in the blank using their skill of observation of your dress and inferencing.)* I received no higher education from a college but my curiosity, talent, and perseverance helped me make great discoveries. *Ask the students:* Does your curiosity cause you to want to know what I am hiding in my pouch? Well, then. I will show you it is a hand lens. I was highly skilled at grinding lenses and I made many simple microscopes. But, it was my keen eyesight and patience that warranted my discoveries. Eureka! *(Fifth Grade Core Knowledge Saying)* You might imagine my astonishment when one day I discovered the micro-world. This world is full of living creatures too small to be seen without a microscope. *(Access ucmp.berkeley.edu/history/hooke.html to view sample of his findings, or have a prepared slide for use under an Intel microscope for computers, or have pictures available to show. Students should learn the parts of a microscope and how to use a microscope before trying to view the pond water. The unit addresses this next.)* Though it was I that discovered the micro-world, it was my colleague Robert Hooke that coined the term *cells*. You probably learned in Second grade that cells are the building blocks of life. Every living thing is made up of cells. Let's begin to explore.

adapted from www.ucmp.berkeley.edu/history/leeuwenhoek.html

Appendix B

Exploring with Lenses

Directions: Look at the objects on your table with the magnifying glass, jar, plastic cup, and transparency at different distances. Notice the difference in the way the objects look with each lens, and at varying distances. Answer the questions below.

Use the chart below to write the name of the object you are looking at and draw a picture under each type of lens. Also, answer the questions for each object and lens.

Object:			
Magnifying Glass	Jar	Plastic Cup	Transparency
Draw a picture	Draw a picture	Draw a picture	Draw a picture
How is the image changed?			
Is the image bigger or smaller?			

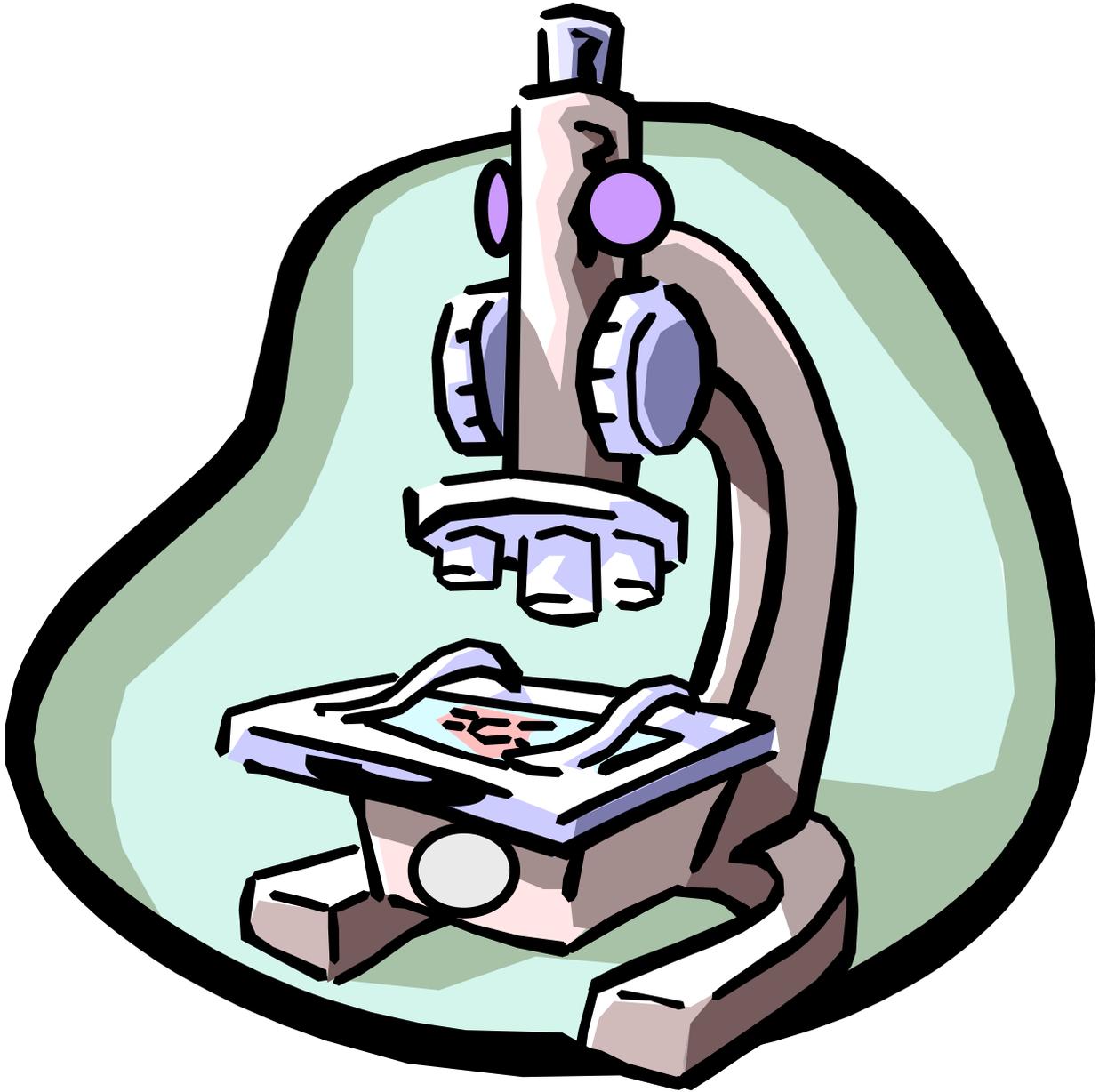
3. Does it make a difference where you hold the lens?

2. What happens when you change the distance between the lens and the object, and your eye?

3. Does the angle you hold the lens to the object make a difference?

Appendix C

Parts of a Microscope



Appendix D

Rubric for Building a Model of an Animal Cell

Directions: Circle the appropriate number to show progress of assignment. 4 shows Proficient, 3 shows Satisfactory, 3 shows Minimal, and 1 shows Unsatisfactory.

Name:

All components of an animal cell appropriately represented	4	3	2	1
Carefully created with much thought and effort	4	3	2	1
Accurate description of animal cell presented	4	3	2	1
Work completed and turned in on time	4	3	2	1

Appendix E

Rubric to Assess Interaction Represented in Animal Cell

Directions: Circle the appropriate number to show progress of assignment. 4 shows Proficient, 3 shows Satisfactory, 3 shows Minimal, and 1 shows Unsatisfactory.

Name:

Appropriate theme to represent the interaction within an animal cell	4	3	2	1
Carefully created with much thought and effort	4	3	2	1
Proper demonstration of Model's structures and interactions	4	3	2	1
Participant worked well with others and contributed to the model	4	3	2	1

Appendix F

Jelly Genes Lab *Answer Document*

Directions: Make a transparency of Appendix G and allow the students the opportunity to fill in the blanks as you present the material.

Cells are the building blocks of life. The building occurs when *genes* found in the nucleus of each cell group to form strands of DNA. Genes and the *traits* they communicate are inherited from the male and female parents of the organism. Humans have approximately *100,000* genes. Genes group together as *chromosomes*. Each gene carries a set of instructions that determines characteristics. Chromosomes are microscopic, threadlike structures. Gregor Mendel first hypothesized that traits were passed from parents to offspring during reproduction. Scientists later confirmed that humans receive *23* chromosomes from “mom” and *23* chromosomes from “dad”. Each gene has *46* chromosomes. Chromosomes are linked together to form DNA.

Appendix G

Jelly Genes Lab

_____ are the building blocks of life. The building occurs when _____ found in the nucleus of each cell groups to form strands of DNA. Genes and the _____ they communicate are inherited from the male and female parents of the organism. Humans have approximately _____ genes. Genes group together as _____. Each gene carries a set of instructions that determines characteristics. Chromosomes are microscopic, threadlike structures. Gregor Mendel first hypothesized that traits were passed from parents to offspring during reproduction. Scientists later confirmed that humans receive _____ chromosomes from “mom” and _____ chromosomes from “dad”. Each gene has _____ chromosomes. Chromosomes are linked together to form _____.

Appendix H

Who Am I? Answer Document

I was born August 14, 1883 in Charleston, South Carolina. Who Am I?

I hungered to learn so I utilized the Scientific Method as I inquired about the things around me. Who Am I?

I often challenged the theories of leading biologists of the 19th and 20th centuries. Who Am I?

Although I am a tenacious learner, I have been described as humble and modest. Who Am I?

As a tenacious learner, I was motivated to attend Dartmouth College where I graduated magna cum laude with a degree in zoology, special honors in botany and history, and honors in sociology. Who Am I?

After graduation, I taught at Howard University. Who Am I?

Within five years, I was appointed head of the Department of Zoology. Who Am I?

I was still not satisfied that I learned all I could, so I also served as a professor in the medical school and head of the Department of Physiology. Who Am I?

I was the first African American to be awarded the Spingarn Medal by the NAACP in 1915. Who Am I?

I again attended college and received my doctorate in experimental embryology from the University of Chicago. Who Am I?

I was considered a leader and authority on cell development and I published two books: Basic Methods for Experiments on Eggs of Marine Mammals and The Biology of the Cell Surface. Who Am I?

I am Ernest Just and I lived to be 58 years old.

adapted from www2.sjsu.edu/depts/Museum/ernest.html

Appendix I

Who Am I?

I was born August 14, 1883 in Charleston, _____ . Who Am I?

I hungered to learn so I utilized the _____ as I inquired about the things around me. Who Am I?

I often challenged the _____ of leading biologists of the 19th and 20th centuries. Who Am I?

Although I am a tenacious learner, I have been described as _____ and _____ . Who Am I?

As a tenacious learner, I was motivated to attend _____ where I graduated magna cum laude with a degree in zoology, special honors in botany and history, and honors in sociology. Who Am I?

After graduation, I taught at _____ . Who Am I?

Within five years, I was appointed head of the Department of _____ . Who Am I?

I was still not satisfied that I learned all I could, so I also served as a professor in the _____ school and _____ of the Department of Physiology. Who Am I?

I was the first _____ to be awarded the Spingarn Medal by the NAACP in 1915. Who Am I?

I again attended college and received my doctorate in experimental embryology from the University of _____ . Who Am I?

I was considered a _____ and authority on _____ development and I published two books: Basic Methods for Experiments on Eggs of Marine Mammals and The Biology of the Cell Surface. Who Am I?

I am _____ and I lived to be 58 years old.

adapted from www2.sjsu.edu/depts/Museum/ernest.html

Appendix J

Names of Scientists and Cartoon Characters

Ernest Just
Albert Einstein
Amelia Earhart
Anton van Leeuwenhoek
Coyote
George Washington Carver
Isaac Newton
Marie Curie
Pluto
Robert Hooke
Sponge Bob
Thomas Edison

Name _____

WHY ARE YOUR NERVE CELLS SO IMPORTANT?

Try the following experiment to find out. You will need: a blindfold, 2 toothpicks, a ruler, a pencil, the chart below, and a partner.

1. Blindfold your friend. Hold the two toothpicks together and gently press the toothpicks onto your friend's fingertip until he or she can feel the pressure. Ask your friend if he/she feels one or two toothpicks.
2. Move the toothpicks apart slightly and again gently press the toothpicks onto your friend's fingertip until he or she can feel the pressure. Ask your friend if he/she feels one or two toothpicks. Keep moving the toothpicks apart until your friend feels the touch of two toothpicks.
3. Measure the distance between the two toothpicks and record the number on your chart.
4. Repeat steps 1-3 on the back of your friend's hand, cheek and the back of their neck.
5. Trade places with your friend. Have your friend try all the above steps on you, and record the number each time on the chart.

LOCATION	Your name:	Your name:
<i>FINGERTIP</i>		
<i>BACK OF HAND</i>		
<i>CHEEK</i>		
<i>BACK OF NECK</i>		

Can you answer the following questions from your observations?

1. Where are the nerve cells farthest apart?
2. Why do you think they are so far apart?
3. Where are the nerve cells closest together?
4. Why do you think they are so close?
5. Do you think that testing water in the bathtub with your hands for temperature is a true test?
6. Why do you think mothers test their baby's formula on their wrists?

7. We know our skin is sensitive to touch, but can you name what else our skin does?

Appendix L

Name _____

DO YOU KNOW WHY YOUR MUSCLES GET TIRED?

Try the following experiment to find out. You will need: a book, clothespin, a clock with second hand, and the chart below.

NAME	FINGER	HAND	ARM

1. In the group, decide who will go first and who will record the data. Then, pick up the clothespin and hold the ends between your thumb and index finger. See how many times you can open and close the clothespin in 30 seconds. Be sure to open the clothespin completely each time you squeeze the ends together. Do this experiment 3 times and record you data on the chart. Each person in the group should do this one at a time.
2. Start again with the same person. Put your arm on the table with the palm of your hand facing up. Find out how many times you can make a fist in 30 seconds. Be sure to open your hand completely, and then form a tight fist each time. Record you data on the chart. Each person in the group should do this one at a time.
3. Start again with the same person. Pick up a book and stand with your hand holding the book hanging straight down. Find out how many times, in 30 seconds, you can lift the book to shoulder height. Keep you arm straight as you lift the book. Record you data on the chart. Each person in the group should do this one at a time.
4. Do your muscles know when they are tired? How do they tell you?

Can you answer the following questions from your observations?

1. Did you get better or worse each time you repeated the experiments?
2. What could you do to improve the strength of the muscles you tested?
3. Do you think your muscles are different shapes and sizes?
4. Do you think your muscles work by themselves?
5. What other things do you think your muscles help you do?

6. Take a guess as to how many muscles you think are in your body.