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Grade 6-8 Living Things

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Unit: Characteristics of Life/Introduction to Cells

Monday	**Tuesday**	**Wednesday**	**Thursday**	**Friday**
Preassessment View video - Is It Alive? www.teachersdomain.org/asset/tdc02_vid_alive/	Brainstorming activity – determining the Characteristics of Life (group work)	Direct Instruction Characteristics of Life, different ways living things perform them (plant v. animals) Student Contracts	Introduce This is living! Or is it? Lab/Student Activity (group work)	This is Living! Or is it? – Lab/Student Activity (group work)
Monday	**Tuesday**	**Wednesday**	**Thursday**	**Friday**
Student Presentations on This is Living Lab/Activity	Direct instruction on history of invention of microscope and Cell Theory – Hooke, Leeuwenhoek, et al.	Comparing plant and animal cells under microscope (group work)	Model plant or animal cells (student activity)	Finish models of plant or animal cells Introduce New Unit- cell structure and function
Monday				
Due date for Characteristics of Life unit assignments - student presentations				

Terri Gomez
Unit Name: Characteristics of Life

Grade: 7
Subject: Biology
Length of Unit: 2 weeks

NYS Standards:

Standard 1, Key Idea 1 – The central purpose of scientific inquiry is to develop explanations of natural phenomena in a continuing, creative process.
1.1b Learning about the historical development of scientific concepts or about individuals who have contributed to scientific knowledge provides a better understanding of scientific inquiry and the relationship between science and society.

Standard 1, Key Idea 2 – Beyond the use of reasoning and consensus, scientific inquiry involves the testing of proposed explanations involving the use of conventional techniques and procedures and usually requiring considerable ingenuity.
2.2a Development of a research plan involves researching background information and understanding the major concepts in the area being investigated.

Standard 4, Key Idea 1 – Living things are both similar to and different from each other and nonliving things.

Essential Questions:

What are the characteristics of all living things?
Do all living things perform functions that characterize life in the same way?
Can non-living things perform functions that living things perform?
Are there categories other than living and non-living?
What is the smallest unit of life?
What is Cell Theory and which scientists helped develop it?
Who discovered cells?
How were they discovered?
What are the similarities and differences between plant and animal cells?

Summary of Unit:

This unit explores the characteristics of living things. It calls upon students to collaborate to decide upon criteria for determining life, and to then evaluate and classify various specimens to determine if they meet the agreed upon criteria. The unit emphasizes the ways in which different living things, specifically plants and animals, perform the same functions of life. It also reveals that non-living things may appear to perform some of these functions but are not alive because they don't perform all of the functions. The unit culminates in the revelation that all living things are made of cells, and introduces

students to Cell Theory and basic plant and animal cells. In the exploration of these concepts scientific method is emphasized, as well as data tabulation for the analysis of information.

Students would have been introduced to scientific method and microscope use and care previous to this unit. The unit following this one will concentrate on cell structure and function, making this unit a natural bridge between the two.

Summary of Lab/Student Activity:

The attached lesson is a laboratory investigation that is differentiated by challenge of the specimens and complexity of task, as well as by outcome. Based on the preassessment, students will be grouped by ability and readiness into 3 groups. The objective of the lesson is for students to be able to apply the Characteristics of Life, which would have been previously developed in class (see attached), to various specimens to make a determination as to whether those specimens are living or non-living. While some of the specimens may appear to be obviously non-living, when certain life functions are applied to them students will find that the answer is not as clear cut. For example, when an electric fan is applied to a rubber ball, the ball will move away – it will respond to a change in the environment. A clock uses an energy source and has motion. Other specimens may not display any obvious signs of life, though they are indeed alive. The lesson challenges students at all three levels to think critically about what characterizes life.

The hook for the lesson is that we are a class of space traveling scientists sent to Earth to investigate possible new life forms alien on our home planets. Each group comes from a different planet, and each group has captured 2 specimens that they will observe, measure and analyze, using the Characteristics of Life list. Each group will record data and compare and contrast observations in data tables. Each group will present their observations about their specimens to the gathering of inter-planetary scientists. Each individual scientist will then analyze and come to a conclusion about whether the specimens studied in the class are living or non-living.

The anchor activity (The World in a Drop of Water) for students who have completed the lab, or who are waiting for their turn with specimens, is to observe and draw various one-celled organisms that I will have set up at microscope stations (examples: volvox, algae, paramecium, amoeba, euglena, yeast, spirogyra, etc.). Students will record their observations of these organisms, making note of signs of any of the Characteristics of Life that were developed in class. This anchor activity helps students segue into the second half of the unit in which we discuss cells as the basic unit of life, and that a unicellular organism performs all of the functions of life listed on the Characteristics of Life.

CHARACTERISTICS OF LIFE

All living things perform the following life functions in one way or another:

1. Grow and Develop – animals grow from birth, plants grow from seeds; requires nutrients
2. Use Energy – food, oxygen as fuel sources for animals; sunlight, carbon dioxide for plants
3. Reproduce – animals and plants "make copies" of themselves
4. Get rid of waste – excretion of food not absorbed, exhaling, sweating; plants give off oxygen
5. React to changes in the environment – responding to something external, by moving, growing in the direction of, shivering, loosing leaves, changing shape, etc.

Tiered by challenge/complexity of task

The tiered groups and their specific specimens and tasks are as follows:

Moon Walkers:

Specimen A – a guinea pig in a see-through travel cage
Specimen B – a rubber ball

- Challenge of specimens is basic
- Scaffolding is provided for how to determine the weight of Specimen A
- Weight is determined to the nearest gram
- Measurement is determined to the nearest centimeter

Martians:

Specimen A – earthworm
Specimen B – battery operated travel clock w/second hand

- Challenge of specimens is standard
- Some scaffolding is provided for how to determine weight of Specimen A
- Weight is determined to the nearest milligram
- Measurement is determined to the nearest millimeter

Venusians:

Specimen A – house plant
Specimen B – sea sponge

- Challenge of specimens is complex
- No scaffolding is provided for how to determine weight of Specimen A
- Weight is determined to the nearest milligram
- Measurement is determined to the nearest millimeter
- Will apply a Change in Environment to both specimens and record observation

Tiered by Assessment/Outcome

Along with observations of the students during the lab, the following tiered assessments will be given to students by their ability:

Moon Walkers:

- Predict what will happen in a predesigned experiment on the specimens
- Identify the Characteristic of Life being testing
- Formulate a hypothesis and prediction for the experiment, using a scaffolded outline provided
- Create a story book for 2nd graders to teach them about the Characteristics of Life and examples of them found on Earth

Martians:

- Design an experiment to test one of two Characteristics of Life: Growth & Development or React to Changes in the Environment
- Formulate a hypothesis and conclusion for experiment
- Identify independent variable
- Predict outcome
- Specify the procedure
- Create an informational brochure for Martians back home about the 3 different creatures found to be alive on Earth, comparing and contrasting how they perform life functions

Venusians:

- Choose a Characteristic of Life (except React to Changes in the Environment); design an experiment to test it on specimens
- Formulate a hypothesis and conclusion for experiment
- Identify the dependent and independent variables
- Identify the control
- Predict the outcome
- Specify the procedure
- Research sea sponges and how other scientists define life; write a position paper on whether Specimen B is correctly classified, should be reclassified or needs a new classification that you develop

This is Living! Or is it?

Characteristics of Life Unit Contract

You are space traveling scientists sent to Earth to investigate possible new life forms alien to your planet. As a scientist back home you learned that living things come in a variety of sizes, forms, shapes and colors. Yet all living things share certain characteristics.

In this unit you will identify the Characteristics of Life and apply those characteristics to various objects to determine if they are living or non-living. You will also explore the world of cells and be introduced to the scientists whose investigations led to the development of Cell Theory.

Choose your projects, below, and return this contract to me by Friday, when we'll conference about it. The assignment(s) you choose are due IN FULL on Monday, _____(Date to be 3 weeks from date of preassessment).

Everybody has to Launch (Complete all items):

- Develop Characteristics of Life
- Read required textbook assignments and do homework
- Do This Is Living! Or is it? Lab/Student Activity
- Present Findings/Conclusions from Lab/Activity
- Observe plant and animal cells and identify structures; compare/contrast in a Venn Diagram
- Create a model of a plant or animal cell and label parts

You may then choose 2 Expeditions or 1 Exploration

Choose 2 Expeditions:

- Write a cell theory rap, including all the scientists who proposed the major pieces of it
- Create journals or logs as Hooke and Leeuwenhoek recording the processes that led them to discover cells
- Construct a timeline from the development of microscopes to the discoveries that led to cell theory, identifying all scientists who played a part
- Make a PowerPoint presentation of how plants and animals perform the same life functions in different ways
- Make a mural comparing and contrasting living and non-living things
- Create an ad or a jingle for the manager of the Life Functions Department of the Cell Corporation
- Make a PowerPoint of the events that led to the development of cell theory.

OR

Choose one Exploration:

- Invent a new organism; describe how it will perform life functions
- Research and debate whether viruses meet the criteria for living things (partners – but see me about it)
- Research and write an editorial about whether viruses meet the criteria for living things
- Write a position paper hypothesizing how cell theory could have been developed without the invention of the microscope; or formulate a competing theory to replace cell theory in the absence of microscopes

I will complete my mission to explore life on Earth by (Due Date) _____

Signed: _____

This is Living! Or is it?

NAME_____ DATE_____

MOON WALKERS ACTIVITY PACKET

OBJECTIVE: To determine whether a specimen is living or non-living by observing it and applying the Characteristics of Life.

Looking Closely for Signs of Life

You are space traveling scientists sent to Earth to investigate possible new life forms alien to your moon. As a scientist back home you learned that living things come in a variety of sizes, forms, shapes and colors. Yet all living things share certain characteristics.

You have captured two specimens to carefully observe. You will apply the Characteristics of Life that you developed on your home moon to your specimens, record what you see on scientific data tables, and determine if they are living or non-living.

Materials:

Specimen A
Specimen B
hand lens/magnifying glass
metric ruler
laboratory balance
flashlight
white and dark paper

Procedure: The Moon Walkers group will split and the subgroups will take turns observing the specimens. When each subgroup has finished recording data, you will switch specimens. If you find yourself waiting, go on to the Analysis and Conclusions section or visit The World in a Drop of Water set up at the side table!

1. The Head Scientist (me) will distribute your specimens. Collect the other materials listed above at the front table.

DON'T TAKE THE LID OFF OF THE CAGE!

2. Observe your specimens for 5 minutes, using your senses of sight, smell, and hearing. Record your observations in the data tables on Pages 3-4.

3. Measure your specimens. Record all measurements in the data tables. For specimens in cages, wait until they are at rest at the bottom of the cage. Hold the metric ruler up against the plastic and estimate the specimen's length, width, and height to the nearest centimeter.

4. Weigh each of your specimens to the nearest gram and record the weights in the data tables. For specimens in cages, LEAVE THE SPECIMEN IN THE CAGE AND WEIGH THE CAGE WITH THE SPECIMEN INSIDE ON THE LAB BALANCE. Record the weight of the specimen and cage to the nearest gram in the space below. Then, subtract the weight of the cage from that number to find the weight of the specimen. Record this in the data table.

Weight of cage and specimen: _____

Minus weight of cage: -- _____85 grams_____

Equals weight of specimen: = _____

5. Use the flashlight to shine a beam of light on the specimens, and observe their response. Record your observations in the data tables.

6. Use a sheet of dark paper to shade the specimens from the light of the flashlight. Be patient! Observe their response. Record your observations in the data tables.

7. On a separate sheet of paper, sketch your specimens to the best of your ability so the folks back home can get a general idea of what these things looks like. Indicate color, shape, size, as well as any other characteristics that you observe. Label any parts that you can identify.

8. Observe your specimens through the hand lens or magnifying glass. Sketch any interesting features that you see.

Data Table – Moon Walkers

Organism's name Presenter:	
Color Presenter:	
Shape Presenter:	
Any other observation Presenter:	
Measurements Presenter:	
Weight (Mass) Presenter:	
Response to light Presenter:	
Response to shade Presenter:	

Data Table – Moon Walkers

Organism's name Presenter:	
Color Presenter:	
Shape Presenter:	
Any other observation Presenter:	
Measurements Presenter:	
Weight (Mass) Presenter:	
Response to light Presenter:	
Response to shade Presenter:	

Observations:

Each group will share its observations with the other space travelers gathered in our class for a convention. Each scientist in the group will share at least one observation for Specimen A and one observation for Specimen B from the data tables. Decide who will share which observations, record the names of the presenters on the data tables, and be prepared to talk about how you obtained your information.

Make a note of how your specimen and the other groups' specimens are different and how they are similar. Record your notes in the data table below.

Specimen	**How is this different from your specimen? How is it different from the other group's specimen**	**How is this the same as your specimen? How is it the same as the other group's specimen?**

Moon Walkers Analysis and Conclusions:

1. Which characteristics of life did you observe in the specimen you studied?

2. Which characteristics of life did you NOT observe in the specimen you studied?

3. Do you believe your specimen has the characteristics of life you did NOT observe? Why or why not?

4. Apply the Characteristics of Life that we devised in class to determine if the specimen is living or non-living. Then do the same with the other groups' specimens. Explain your conclusion. Record your answers in the table below.

SAMPLE	LIVING, NON-LIVING	EXPLANATION

5. You have designed an experiment in which you aim an electric fan on high speed at each of your specimens.

Predict what will happen:

Specimen A: _____

Specimen B: _____

Which of the Characteristics of Life does this experiment test?_____

In this experiment, what is the independent variable (the thing that you control)?_____

Based on your prediction above, and on what you know about the Characteristics of Life, formulate a hypothesis for each specimen, stating whether your experiment would prove that the specimen is alive, and explain your answer:

My hypothesis is that <u>because/even though</u> (circle one) Specimen A

_____ (rewrite your prediction from above), which indicates that it

_____ (rewrite the Characteristics of Life being tested, from above)

<u>it is/is not</u> (circle one) alive because _____.

My hypothesis is that <u>because/even though</u> (circle one) Specimen B

_____ (rewrite your prediction from above), which indicates that it

_____ (rewrite the Characteristics of Life being tested, from above)

<u>it is/is not</u> (circle one) alive because _____.

6. Create a story book for the 2nd grade Moon Walkers class at your former elementary school to teach them about the Characteristics of Life. Include examples found on Earth of living things that perform these life functions and non-living things that don't.

This is Living! Or is it?

NAME_____ DATE_____

MARTIANS ACTIVITY PACKET

OBJECTIVE: To determine whether a specimen is living or non-living by observing it and applying the Characteristics of Life.

Looking Closely for Signs of Life

You are space traveling scientists sent to Earth to investigate possible new life forms alien to your planet. As a scientist back home you learned that living things come in a variety of sizes, forms, shapes and colors. Yet all living things share certain characteristics.

You have captured two specimens to carefully observe. You will apply the Characteristics of Life that you developed on your home planet to your specimens, record what you see on scientific data tables, and determine if they are living or non-living.

Materials:

Specimen A
Specimen B
hand lens/magnifying glass
metric ruler

laboratory balance
flashlight
white and dark paper

Procedure: The Martians group will split and the subgroups will take turns observing the specimens. When each subgroup has finished recording data, you will switch specimens. If you find yourself waiting, go on to the Analysis and Conclusions section or visit The World in a Drop of Water set up at the side table!

1. The Head Scientist (me) will distribute your specimens. Collect the other materials listed above at the front table.

2. Observe your specimens for 5 minutes, using your senses of sight, smell, and hearing. Record your observations in the data tables on Pages 3-4.

3. Measure your specimens. Record all measurements to the nearest millimeter in the data tables.

4. Weigh each of your specimens to the nearest milligram and record the weights in the data tables. When weighing Specimen A, weigh the specimen in its container. The container and the bedding material weigh 99.2 grams. How will you determine the weight of just Specimen A? (Hint: there is subtraction involved!)

5. Use the flashlight to shine a beam of light on the specimens, and observe their response. Record your observations in the data tables.

6. Use a sheet of dark paper to shade the specimens from the light of the flashlight. Be patient! Observe their response. Record your observations in the data tables.

7. On a separate sheet of paper, sketch your specimens to the best of your ability so the folks back home can get a general idea of what these things looks like. Indicate color, shape, size, as well as any other characteristics that you observe. Label any parts that you can identify.

8. Observe your specimens through the hand lens or magnifying glass. Sketch any interesting features that you see.

Data Table – Martians

Organism's name Presenter:	
Color Presenter:	
Shape Presenter:	
Any other observation Presenter:	
Measurements Presenter:	
Weight (Mass) Presenter:	
Response to light Presenter:	
Response to shade Presenter:	

Data Table – Martians

Organism's name Presenter:	
Color Presenter:	
Shape Presenter:	
Any other observation Presenter:	
Measurements Presenter:	
Weight (Mass) Presenter:	
Response to light Presenter:	
Response to shade Presenter:	

Observations:

Each group will share its observations with the other space travelers who studied different specimens. Each scientist in the group will share at least one observation for Specimen A and one observation for Specimen B from the data tables. Decide who will share which observations, record the names of the presenters on the data tables, and be prepared to talk about how you obtained your information.

Make a note of how your specimen and the other groups' specimens are different and how they are similar. Record your notes in the data table below.

Specimen	**How is this different from your specimen? How is it different from the other group's specimens**	**How is this the same as your specimen? How is it the same as the other group's specimens?**

Martians Analysis and Conclusions:

1. Which characteristics of life did you observe in the specimen you studied?

2. Which characteristics of life did you NOT observe in the specimen you studied?

3. Do you believe your specimen has the characteristics of life you did NOT observe? Why or why not?

4. Apply the Characteristics of Life that we devised in class to determine if all the specimens studied by our class of space travelers are living or non-living. Explain your conclusions. Record your answers in the table below.

SPECIMEN	LIVING, NON-LIVING	EXPLANATION

5. Design an experiment to test if your specimens perform either of the following Characteristics of Life:

- Grow & Develop
- React to Changes in the Environment.

Be sure to indicate:

- Hypothesis about each specimen – is it alive or not, and how will your experiment show this?
- Independent variable – what are you changing and controlling?
- Your procedure
- Your prediction about the outcome

6. Create an informational brochure for the folks back home about 3 Earth creatures your fellow space traveling scientists studied and that you determined to be alive. Your brochure must compare and contrast the ways that the creatures perform the life functions listed on the Characteristics of Life.

This is Living! Or is it?

NAME_____ DATE_____

VENUSIANS ACTIVITY PACKET

OBJECTIVE: To determine whether a specimen is living or non-living by observing it and applying the Characteristics of Life.

Looking Closely for Signs of Life

You are space traveling scientists sent to Earth to investigate possible new life forms alien to your planet. As a scientist back home you learned that living things come in a variety of sizes, forms, shapes and colors. Yet all living things share certain characteristics.

You have captured two specimens to carefully observe. You will apply the Characteristics of Life that you developed on your home planet to your specimens, record what you see on scientific data tables, and determine if they are living or non-living.

Materials:

Specimen A
Specimen B
hand lens/magnifying glass
metric ruler
empty flower pot
bag of potting soil
flat glass tray/container
400 ml beaker
laboratory balance
flashlight
white and dark paper

Procedure: The Venusians group will split and the subgroups will take turns observing the specimens. When each subgroup has finished recording data, you will switch specimens. If you find yourself waiting, go on to the Analysis and Conclusions section or visit The World in a Drop of Water set up at the side table!

1. The Head Scientist (me) will distribute your specimens. Collect the other materials listed above at the front table.

2. Observe your specimens for 5 minutes, using your senses of sight, smell, and hearing. Record your observations in the data tables on Pages 3-4.

3. Measure your specimens. Record all measurements to the nearest millimeter in the data tables.

4. Weigh each of your specimens to the nearest milligram and record the weights in the data tables. How will you estimate the weight of Specimen A without accounting for its container and home? Describe your procedure here:

_____

_____

5. Use the flashlight to shine a beam of light on the specimens, and observe their response. Record your observations in the data tables.

6. Use a sheet of dark paper to shade the specimens from the light of the flashlight. Observe their response. Record your observations in the data tables.

7. On a separate sheet of paper, sketch your specimens to the best of your ability so the folks back home can get a general idea of what these things looks like. Indicate color, shape, size, as well as any other characteristics that you observe. Label any parts that you can identify.

8. Observe your specimens through the hand lens or magnifying glass. Sketch any interesting features that you see.

9. Place Specimen B in the glass container. Fill the beaker with water and pour a little more than half of the water into the glass container holding Specimen B. Pour the rest into the container holding Specimen A. Observe their response. Record your observations in the data tables.

Data Table – Venusians

Organism's name Presenter:	
Color Presenter:	
Shape Presenter:	
Any other observation Presenter:	
Measurements Presenter:	
Weight (Mass) Presenter:	
Response to light Presenter:	
Response to shade Presenter:	
Response to water Presenter:	

Data Table – Venusians

Organism's name Presenter:	
Color Presenter:	
Shape Presenter:	
Any other observation Presenter:	
Measurements Presenter:	
Weight (Mass) Presenter:	
Response to light Presenter:	
Response to shade Presenter:	
Response to water Presenter:	

Observations:

Each group will share its observations with the rest of the space travelers in the class. Each scientist in the group will share at least one observation for Specimen A and one observation for Specimen B from the data tables. Decide who will share which observations, record the names of the presenters on the data tables, and be prepared to talk about how you obtained your information.

Make a note of how your specimen and the other groups' specimens are different and how they are similar. Record your notes in the data table below.

Specimen	**How is this different from your specimen? How is it different from the other group's specimen**	**How is this the same as your specimen? How is it the same as the other group's specimen?**

Venusians Analysis and Conclusions:

1. Which characteristics of life did you observe in the specimen you studied?

2. Which characteristics of life did you NOT observe in the specimen you studied?

3. Do you believe your specimen has the characteristics of life you did NOT observe? Why or why not?

4. Apply the Characteristics of Life that we devised in class to determine if all the specimens studied by our class of space travelers are living or non-living. Explain your conclusions. Record your answers in the table below.

SPECIMEN	LIVING, NON-LIVING	EXPLANATION

5. Choose one of the Characteristics of Life (other than React to Changes in the Environment) and design an experiment to test if your specimens perform it. Be sure to indicate a hypothesis, the independent variable, the dependent variable, a control, your procedure and your prediction.

6. After snorkeling in an Earth ocean, one of your Venusian colleagues claims to have seen things on the ocean floor that look like your Specimen B. She'd been to the same spot 2 years ago and saw smaller ones, but says they're now twice the size. Not only that, she saw parts of them opening and closing, letting in streams of water and gushing streams out – and one of the outgoing streams of water had little moving particles in it that swam away! She thinks they are ocean creatures that are alive, but you can see that your Specimen B doesn't do any of the things she says, even when it's wet. Nevertheless, she has challenged you to reexamine your Specimen B and either reconfirm your classification of it, reclassify it or come up with a whole new classification for it!

Research Sea Sponges on the class computer. Decide if Specimen B behaves the same way as the Sea Sponges in your research.

Research the characteristics of living things in a high school text book and on the internet (a good start is at http://simple.wikipedia.org/wiki/Life) to find out how other scientists define living and non-living things, and how they list characteristics of life. Compare our list with your findings.

Present your findings to the Interplanetary Science Academy in a very brief position paper (2 pages, max!). Based on your research:

- Discuss any differences you find in how the characteristics of life are defined by other scientists
- Decide if Specimen B has been correctly classified, if you should reclassify it, or if you believe a new classification is called for. Explain why.

THE WORLD IN A DROP OF WATER

At each microscope station, observe the specimen in the field of vision. DO NOT ADJUST THE FOCUS! The specimen should be in focus – if you don't see anything, be patient! The specimen may have wandered out of the field of vision but will be back!

Make a sketch of what you see at each station, noting anything you observe about the specimen. Look careful for signs that the specimen performs any of the Characteristics of Life, and make a note of it.