Senior High School

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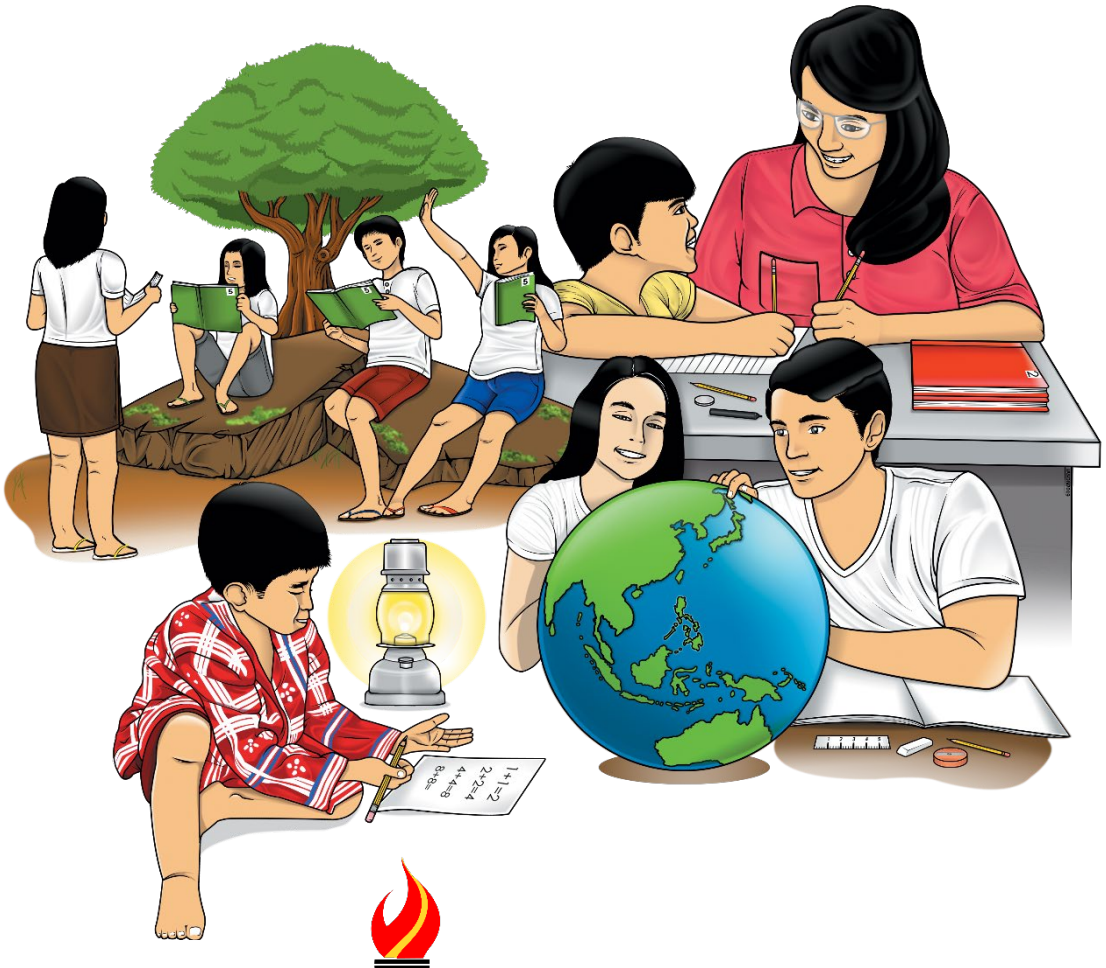
DEPARTMENT OF EDUCATION

Earth and Life Science

Quarter 2 – Module 2: Unifying Themes in the Study of Life



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Module 2

Earth and Life Science
Alternative Delivery Mode
Quarter 2 – Module 2: Unifying Themes in the Study of Life
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Quarter 2 – Module 2: Unifying Themes in the Study of Life

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Introductory Message

This Self-Learning Module (SLM) is prepared so that you, our dear learners, can continue your studies and learn while at home. Activities, questions, directions, exercises, and discussions are carefully stated for you to understand each lesson.

Each SLM is composed of different parts. Each part shall guide you step-by-step as you discover and understand the lesson prepared for you.

Pre-tests are provided to measure your prior knowledge on lessons in each SLM. This will tell you if you need to proceed on completing this module or if you need to ask your facilitator or your teacher's assistance for better understanding of the lesson. At the end of each module, you need to answer the post-test to self-check your learning. Answer keys are provided for each activity and test. We trust that you will be honest in using these.

In addition to the material in the main text, Notes to the Teacher are also provided to our facilitators and parents for strategies and reminders on how they can best help you on your home-based learning.

Please use this module with care. Do not put unnecessary marks on any part of this SLM. Use a separate sheet of paper in answering the exercises and tests. And read the instructions carefully before performing each task.

If you have any questions in using this SLM or any difficulty in answering the tasks in this module, do not hesitate to consult your teacher or facilitator.

Thank you.

What I Need to Know

This module was designed and written with you in mind. It is here to help you master the Unifying Themes of Biology. The scope of this module permits it to be used in many different learning situations. The language used recognizes the diverse vocabulary level of students. The lessons are arranged to follow the standard sequence of the course. But the order in which you read them can be changed to correspond with the textbook you are now using.

The module covers:

- Lesson 1 – Unifying Themes of Study of Life (Biology)

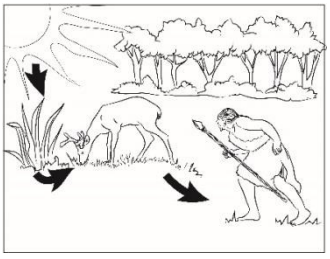
After going through this module, you are expected to:

1. name the unifying themes in the study of life;
2. describe the unifying themes illustrated;
3. explain the connection among living things and their interaction with the environment;
4. give details on how these themes serve as the foundation in the study of biology.
5. value life by taking good care of all beings, human, plants and animals.

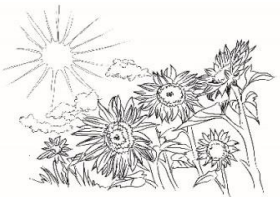
What I Know

Directions. Choose the letter of the best answer. Write the chosen letter on a separate sheet of paper.

1. Continuity of life is explained by _____.
   A. evolution
   B. regulation
   C. form and function
   D. reproduction and inheritance
2. Living things are considered organisms if they possess which of the following characteristics?
   A. grow and develop
   B. failure to produce offspring
   C. absence of orderly structure
   D. incapability of adapting to changing environment
3. Which of the following best explains why humans sweat when they get hot?
   A. use energy
   B. ability to grow
   C. ability to reproduce
   D. maintain the internal environment
4. Describe the image illustrated on the right side.



   A. They are evolving.
   B. The organisms are growing and developing.
   C. It shows how organisms respond to its environment.
   D. There is a transfer of energy among living organisms.
5. Which statement does not describe the image on the right side?



   A. Plants acquire energy for them to perform their task, the food making.
   B. There is a transfer of energy from the sun to the plants.
   C. Plants need the abiotic factors in order to grow.
   D. They are evolving.
6. Which statement is TRUE based on the illustration?

   A. Cell is present on fossils.
   B. Early organisms lack cell.
   C. Cell is the basic unit of life.
   D. Cell is present among eukaryotic only.

7. Living organisms cannot live alone, they are interacting with the abiotic factors for sustainability of life. Which among the organisms is considered as abiotic?
    A. bacteria
    B. plant
    C. light
    D. man
8. One of the characteristics possessed by living organisms is growth and development. This happens upon acquiring energy. When creating a food chain, in what order do we start illustrating the smallest organism having the most energy?
    A. in the middle
    B. any order will do
    C. leading to the left
    D. leading to the right
9. A nice smell of a plant is an adaptation that _____
    A. attracts the pollinators
    B. regulates the internal environment
    C. helps the plant to keep the nutrients inside
    D. pushes away the animals that try to eat them
10. It was observed that the deciduous trees lose their leaves in cold and winter in order to avoid freezing. This is an example of _____.
    A. a response
    B. organization of life
    C. unity of living systems
    D. function and structure
11. It is a unifying theme of life science that explains the improvement of lives of all organisms through research.
    A. adaptation
    B. inheritance
    C. energy and life
    D. biology and society
12. All organisms alive today have descended from simple cellular creatures billions of years ago. Biologists were able to identify and preserved some of the characteristics of that earliest organisms. This is associated in what theme?
    A. Function and structure are interdependent.
    B. Cell theory as a description of living systems.
    C. Emergent properties arise from the organization of life.
    D. Unity of living systems is explained by evolutionary conservation.
13. The orchard sprayed with the chemical yields an average of 60 kilos of mango per tree, the other orchard yields an average of 40 kilos of mangoes per tree.
    Based on the data, in order to have a better yield, tree must _____.
        I. receive the same amount of sunlight
        II. receive the same amount of water
        III. increase the orchard spray
    A. I only
    B. II only
    C. I, II and III
    D. I and II

14. Many threatened or endangered species can be saved by a large _____.
    A. coal mine
    B. food chain
    C. wildlife hunting
    D. reforestation project
15. Living organisms can be protected if we fight deforestation. Which among the statements doesn't support this advocation?
    A. Plant more trees.
    B. Reduce the use of products made from wood fiber.
    C. Demand forest products from sustainable sources and deforestation fee supply chains.
    D. Support the products of companies who are practicing deforestation.

Lesson 1 Unifying Themes in the Study of Life

Earth is the home of organisms including animals, plants and microorganisms. They are found in the different parts of the planet. The ecosystems-the biological communities- include living organisms (biotic factors) like animals, plants, insects and bacteria (interacting to its environment), as well as the non-living components (abiotic factors) like the rock, soil, water and sunlight. Non-living things are classified as inanimate objects that may influence, alter or impact the life of biotic factors. These abiotic factors are essential to biotic factors in various ways.

The field of science that deals with the study of life is the Life Science or Biology. It involves different disciplines. These disciplines are connected to one another, through which biologist termed as unifying themes.

This module emphasizes these unifying themes that serve as the bases of the study of Life Science. The ten unifying themes include: emergent properties, the cell, the heritable information, structure or function, interaction with the environment, regulation, unity and diversity, evolution, scientific inquiry, and the science, technology and society. More so, this module explores how organisms interact with one another and its environment.

What's In

Biology is the discipline of science that deals with the study of life. This comprises number of disciplines such as biochemistry and ecology. As a wide-ranging and complex science, biologists designed the term "unifying themes", which serve as the bases for the study of life.

Activity 1: DAD (Decode, Arrange and Describe

Directions. Decode the given numbers to the corresponding twenty-eight letters of the alphabet, then arrange the letters to reveal the magic word related to Biology. Lastly, describe the term revealed. Write your answer on a separate sheet of paper.

1.

12	5	3	12

2.

27	17	17	3	5	12	7

3.

5	24	17	23	12	22	17	9	14

.

4.

1	1	1	18	22	22	9	14	17	4

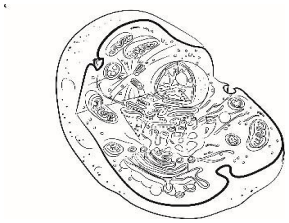
5.

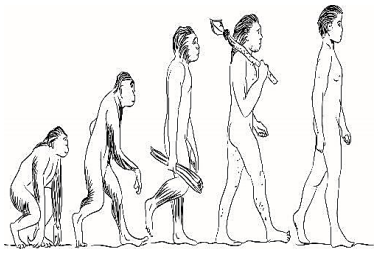
7	8	20	22	17	25

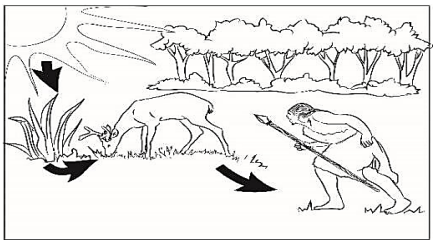
What's New

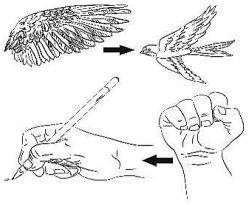
Directions. Cutting Trees that can lead to deforestation and may encourage landslide Directions: Name the unifying theme illustrated below. Choose your answer from words inside the box. Write your answer on a separate sheet of paper.

biological system cell interaction with the environment energy and life form and function	reproduction and inheritance regulation adaptation evolution biology and society

1. 

2. 

3. 

4. 

5. 

Activity 3: Match It

Directions: Match the given statements to its corresponding unifying themes. Write your answer on a separate sheet of paper.

1. Living things work as a system, at the same time they cannot be separated from non-living things since they are both operating as a system.	A. biological system
2. Cells are the basic unit of life, which denotes that all living things are composed of cells.	B. energy and life
3. Autotrophs use light to perform the process of photosynthesis, on the other hand, heterotrophs consume other organisms to obtain food.	C. biology and society
4. Living things cannot live alone, their survival depends on how they interact with the environment.	D. interaction with the environment
5. Organisms' structures fit with their functions.	E. the cellular basis of life
6. Traits of parents are being passed from one generation to the next generation.	F. form and function
7. Cells of the body are surrounded by a small amount of fluid, and normal cell functions depend on the maintenance of cell's fluid environment including temperature, volume, and chemical content.	G. reproduction and inheritance
8. Living organisms survive depending on how one will adapt to its changing environment.	H. adaptation
9. The diversity of life arises by change leading to the present biodiversity that we see.	I. regulation / homeostasis
10. The field of science is changing the lives of all organisms through research.	J. evolution
	K. scientific inquiry

What Is It

The unifying theme connects the different subdisciplines that make biology as a science. In addition to, the living organisms differ from non-living organisms in various aspects. What are these shared properties (of living organisms) that make something "alive"?

All levels of life have systems of related parts.

- A system is an organized group of interacting parts.
- A cell is a system of chemicals and processes. It is the basic unit of life.
- A body system includes organs that interact.
- An ecosystem includes living and non-living things that interact.

Structure and function are related in biology.

- Structure determines function.
- The structure is the shape of the object.
- The function is the object's specific role.

Organisms must maintain homeostasis to survive in diverse environments.

- Homeostasis is the maintenance of constant internal conditions.
- All living organisms must live in a stable environment.

Evolution explains the unity and diversity of life.

- Evolution is the change in living things over time. The genetic makeup of a population of a species changes.
- It accounts for both the diversity and the unity of life.

Traits are being inherited and transferred.

- The continuity of life depends on the inheritance of biological information in the form of DNA molecules.
- The genetic information is encoded in the nucleotide sequences of the DNA (Deoxyribonucleic acid).

Organisms reproduce.

- It is necessary part of living; process of making more of one's own kind.

Organisms are interdependent with one another.

- Organisms have evolved to live and interact with other organisms.
- Ecology deals with the interactions of living organisms with one another and their environment.

Organisms acquire and process energy.

- Living organisms use a source of energy for their metabolic activities.
- Some living organisms capture the light energy and convert it into chemical energy in food.
- Some living organisms use chemical energy stored in molecules obtained from food.

In addition to the properties mentioned, the two additional unifying themes in the study of life include the scientific inquiry and science, technology and society.

Scientific Inquiry

- The process of science includes observation-based discovery and the testing of explanations through the hypothetic-deductive.
- Scientific credibility depends on the repeatability of observation and experiments.

Science, Technology and Society

- Many technologies are goal-oriented applications of science.
- The relationships of science and technology to society are now more crucial to understand than ever before.

Activity 4: What a Beautiful Life!

Directions: Read and analyze the following questions. Write your answer on separate sheet of paper. You'll be graded based on the given rubric at the latter part of the module.

Characteristics of Life	***Questions***
Displays organization	What is the level of organization of living organisms?
Ability to reproduce	Why do organisms reproduce?
Ability to adapt on changing environment	Why do organisms adapt?
Requires energy	In what way do living organisms acquire energy? Why is energy significant?
Maintains homeostasis	In what way do homeostasis maintains?

What's More

Activity 5: Connect Me

Directions: Read and analyze what is asked. Write your answer on a separate sheet of paper.

Show the connections of the given biotic and abiotic factors written inside the box through a concept map.

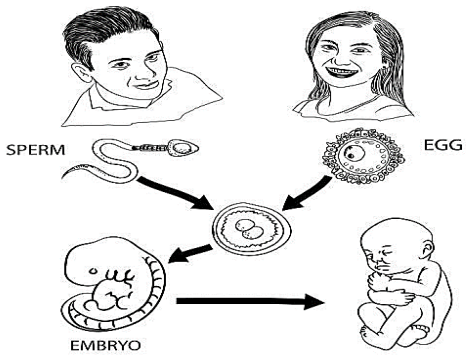
Soil	sunlight	water	Carbon dioxide
Oxygen	Corn plant	Man	Chicken

Activity 6: What's the connection?

Directions: Read and analyze the given question. Write your answer on a separate sheet of paper. You'll be graded using the rubrics written on the latter part of the module.

Biology, also referred as Biological Science or Life Science deals with the study of living organisms. It is divided into subdisciplines. As a broad discipline, biologists use the term unifying themes where the study is being anchored. The major unifying themes that were mentioned include the cell theory as a description of living systems, continuity of life as explained by the molecular basis of inheritance, the interdependence of structure and function, the diversity of life brought by evolution, unity of living systems as explained by evolutionary conservations, and emergent properties that arise from the organization of life.
Describe each unifying theme illustrated below. Give details on how these themes serve as the foundation in the study of biology.

1.



Growth and development	Continuity of life

2

Organization of life	Acquire and energy process

Directions: Using the illustration below, explain briefly the interconnections of living things and their environment. State how human being may value life. Write your answer on the answer sheet.

Activity 7: Picture It Out

Directions: Read and analyze what is asked. Write your answer on a separate sheet of paper. The rubric at the latter part of the module will serve as a basis in grading your answer.

Create a visual representation of each theme. Write a sentence that will explain how your picture is connected to the theme.

Unifying Themes	***Illustration/Explanation***
1. Biological System	
2. Cellular Basis of Life	
3. Interaction with its environment	
4. Energy and Life	
5. Form and Function	
6. Reproduction and Inheritance	
7. Regulation	
8. Adaptation	
9. Evolution	
10. Biology and Society	

Activity 8: Complete Me

Directions: Read and analyze the following questions. Write your answer on the answer sheet. You'll be graded based on the given rubrics on the latter part of the module.

The two additional unifying themes of Biology are: "*science benefits from a cooperative approach and diverse viewpoints*" and "*scientists make observations and then form and test hypotheses*". Using the template below, share your ideas about the mentioned themes as you relate it to science, technology and society.

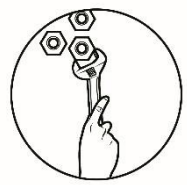
Subject Theme: _____
My chosen word is _____.
First, I know that ____.
In addition, I know that ____.
Finally, I know that ___.
Now, you know something that I know ____.

What I Have Learned

Understanding how life came about is a deep scientific undertaking. Organisms' function, structures, growth and origin are indeed one of many diverse topics that should be explored to grasp the complexities of life. Generally, the following statements provide key concepts on the unifying themes in the study of life.

1. Biology is about the study of life.
2. The unifying themes connect the different subdisciplines that make up biology as a science.
3. The unifying themes of biology comprise the cell theory as a description of living systems, continuity of life, interdependence of function and structure, evolution, unity of living systems and the properties that arise from the organization of life.
4. The living organisms are composed of cells as what was discussed in the cell theory. The cell theory is the foundation of our understanding of reproduction and growth of organisms.
5. The continuity of life is best explained by the molecular basis of inheritance. Heredity, which is the continuity of life from one generation to the next, is dependent on correct copying of cell's DNA into daughter cells.

6. The function and structure are interdependent.
7. The evolutionary change give rise to the diversity of life.
8. Living organisms (biotic factors) are dependent on its environment which consists of non-living organisms (abiotic factors). Living organisms also interact with other living organisms.
9. Biotic factors (living things) are defined by set of characteristics including the ability to reproduce, grow, move and ability to adapt to its environment. They need food, water and other abiotic factors for their growth and development.
10. Abiotic factors are inanimate objects which include rocks, water, weather and other living things present in the environment.
11. Biological systems are organized.
12. The study of Biology is important. It enables us to make appropriate decisions in life. Failure to grasp biological concepts lead into an inappropriate decision.
13. One must value life by taking good care of all beings, humans, plants and animals.



What I Can Do

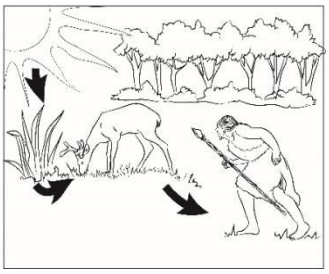
Directions: Read and analyze the given question. Write your answer on your answer sheet. The rubrics at the latter part of the module will serve as the basis in grading your answer.

"Covid-19 is one of the current problems that the world is experiencing. It is an infectious disease caused by severe acute respiratory syndrome which affects different people in different ways. How do you think Biology can be used to solve this problem? (Include also on your discussion on how life may be valued.) Make a creative presentation for your discussion.

Assessment

Directions. Choose the letter of the best answer. Write the chosen letter on a separate sheet of paper.

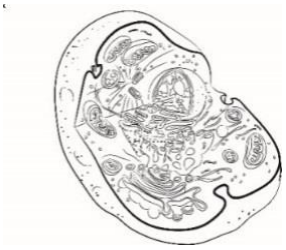
1. Genes are passed from one generation to the next generation through _____.
   A. evolution
   B. regulation
   C. form and function
   D. reproduction and inheritance
2. Which among the given examples describes the unifying form and structure?
   A. cellular basis of life
   B. light as source of energy
   C. bats have wings specialized for flying
   D. living things arise from pre-existing cells
3. *Makahiya* plant closes its leaflets when touched. This is an example of _____
   A. energy and life
   B. response to stimuli
   C. form and structure
   D. reproduction and inheritance
4. Describe the illustration.



   A. They are evolving
   B. The organisms are growing and developing.
   C. It shows how organisms respond to its environment.
   D. There is a transfer of energy among living organisms.
5. Which statement does not describe the image on the right side?

   A. Plants acquire energy for them to perform their task, the food making.
   B. There is a transfer of energy from the sun to the plants.
   C. Plants need abiotic factors in order to grow.
   D. They are evolving.

6. Which is TRUE among the given statements that tell something about the illustration?



   A. Cell is present in fossils.
   B. Early organisms lack cell.
   C. Cell is the basic unit of life.
   D. Cell is present among eukaryotic only.

7. Living organisms cannot live alone, they are interacting with the abiotic factors for sustainability of life. Which among the organisms is considered as abiotic?
   A. bacteria
   B. plant
   C. light
   D. man

8. Chameleons shift colors wherever they go. They are able to turn any colors or combine colors depending on where the environment is. What trait is being described?
   A. adaptation
   B. interaction
   C. inheritance
   D. reproduction

9. The diversity of life arises by change leading to the present biodiversity that we see. This is what we called _____.
   A. evolution
   B. adaptation
   C. inheritance
   D. reproduction

10. The field of science is changing the lives of all organisms through technology and research. This is explained by _____.
   A. biology and society
   B. adaptation
   C. energy and life
   D. inheritance

11. All organisms alive today have descended from simple cellular creatures billions of years ago. Biologists were able to identify and preserved some of the characteristics of that earliest organisms. This is associated in what theme?
   A. Function and structure are interdependent.
   B. Cell theory as a description of living systems.
   C. Emergent properties arise from the organization of life.
   D. Unity of living systems is explained by evolutionary conservation.

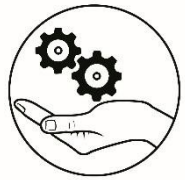
12. Research plays significant role for the improvement of lives in a given society. With these, more scientists agree that all scientific knowledge comes from _____.
    A. observation
    B. experimentation
    C. both experimentation and observation
    D. textbooks
13. The orchard sprayed with the chemical yields an average of 60 kilos of mango per tree, the other orchard yields an average of 40 kilos of mangoes per tree. Based on the data, in order to have a better yield, trees must _____.

    I. receive the same amount of sunlight
    II. receive the same amount of water
    III. increase the orchard spray

    A. I only
    B. II only
    C. I, II and III
    D. I and II
14. Many threatened or endangered species can be saved by a large _____.

    A. coal mine
    B. food chain
    C. wildlife hunting
    D. reforestation project
15. Living organisms can be protected if we fight against deforestation. Which among the statements doesn't support this advocation?

    A. Plant more trees.
    B. Reduce the use of products made from wood fiber.
    C. Demand forest products from sustainable sources and deforestation fee supply chains.
    D. Support the products of companies practicing deforestation.



Additional Activities

Directions: Read and analyze the following. Write your answer on the separate sheet of paper. You'll be graded based on the rubrics given on this module.

1. Explain the quotation "*Your body isn't just a body, it's an ecosystem"* by Steve Mills. You may present your work through an essay or illustration.

2. Explain how Biology can be studied from a microscopic approach to global approach. (Indicate the unifying themes where the study of Biology is being anchored).

RUBRICS FOR GRADING

SHORT ANSWERS

CRITERIA	3	2	1
Analysis	Shows a deeper understanding of the topic	Shows a little understanding of the topic	Shows no understanding of the topic
Structure	Presentation of ideas were exceptionally well – organized and easy to understand	Presentation of concepts gave an idea about the topic, but there are some parts which are unclear and somewhat confusing to follow	Presentation of ideas is not clear and concise; the flow of the presentation was unclear and confusing to follow
Writing style	Direct statement supports student's ideas	Words convey intended message	Able to get vague idea of message

CREATIVE OUTPUT

CRITERIA	3	2	1
Content	Complete understanding of the topic is utilized	Incomplete understanding of the topic is utilized	Lack of understanding on the topic
Relevance	The message/interpretation of the output is relevant to the topic discussed	The message/interpretation of the output is slightly relevant to the topic discussed	The output is irrelevant to the activity and the topic discussed
Creativity	Output is unique and not similar to others; nice and interesting to view	Output is nice and interesting to view but not unique	Output doesn't show creativity and not unique

Answer Key

*Acquire and process of energy- Living organisms use a source of energy for their metabolic activities.

This factor enable the biologists to study how energy flow through living systems.

Activity 7: Picture It Out

Students' answer may vary

Activity 8: Complete Me

Students' answer may vary

What I Can Do

Students' answer may vary

Assessment

1. D
2. C
3. B
4. D
5. D
6. C
7. C
8. A
9. A
10. A
11. D
12. C
13. D
14. D
15. D

What is It

Activity 4: What a Beautiful Life?

1. A
2. E
3. B
4. D
5. F
6. G
7. I
8. H
9. J
10. C

What's More

Activity 5: Connect Me

Activity 6: What's the connection

1. *Growth and development- Describe as the change in size and mass, and corresponds to maturation of an organism.

Knowing the growth and development, biologists are able to know the origin of organisms and how they are related to one another.

* Continuity of Life- This is possible through reproduction, growth and development.

Enable biologists to know how offspring are produced and how genetic information are transferred.

2. *Organization of Life- Living organisms have levels

What's I Know

1. D
2. A
3. D
4. D
5. D
6. C
7. C
8. C
9. A
10. A
11. D
12. D
13. D
14. D
15. D

What's In

Activity 1: DAD

1. cell
2. ecology
3. evolution
4. adaptation
5. growth

What's New

Activity 2: Name It

1. cell
2. evolution
3. interaction with the environment
4. form and function
5. energy and life

Activity 3: Match It

1. A
2. E
3. B
4. D
5. F
6. G
7. I
8. H
9. J
10. C

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