

MODULE

1

FROM CELL TO
ORGANISM**Overview**

In the First Quarter, the students learned that there are different materials in the environment. For this quarter, they will be introduced to the diverse kinds of living things and the processes and interactions they go through. This module deals with different kinds of living things and what they are made up of.

In the lower grades, the students have learned that the human body is made up of organ systems that work together. In turn, these organ systems are made up of organs whose functions are related with each other. For example, the heart and the blood vessels are organs that facilitate the circulation of blood and nutrients to the different parts of the body; similarly, the esophagus, stomach, and intestines work together to carry out digestion of food. The organs are made up of even smaller structures: the tissues and cells.

In this module, the students will be introduced to the concept of levels of organization in an organism. They will learn in the activity titled, “What makes up an organism?” that whatever happens to the smaller structures will affect the bigger structures and, eventually, the whole organism. Draw out from the students the idea that these structures work together to carry out specific functions to make the organism meet its basic needs and survive.

Towards the end of the module, the students will recognize that all organisms are made up of cells – the basic unit of structure and function in all living things. They will discover more about cells in Module 2.

Key questions for this module

What are organisms? What makes them up?

Ballpen disassembly

Below are parts of 4 different kinds of ballpens. Ask the students to identify which part belongs to which ballpen.

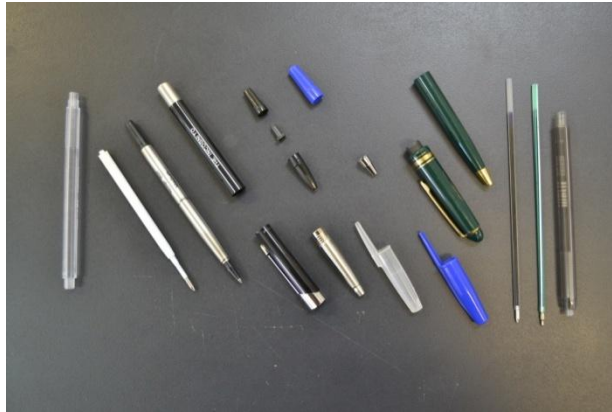


Photo: Courtesy of Michael Anthony B. Mantala

A ballpen has parts like those shown in the picture below. Ask them to identify the function of each part of the ballpen.

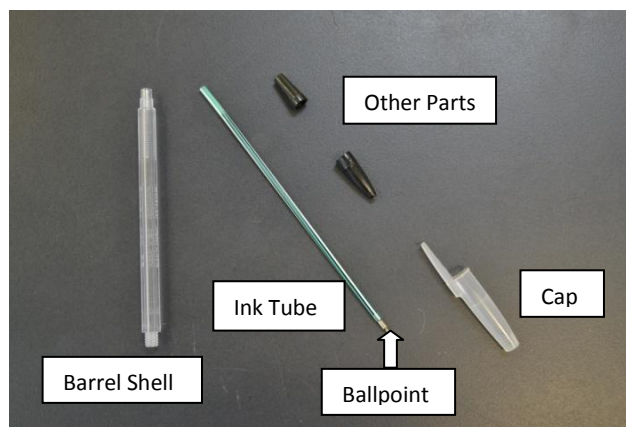


Photo: Courtesy of Michael Anthony B. Mantala

Have them take a closer look at the top picture on the next page. Ask them to identify the part of the ballpen that is missing and its function. Ask them to imagine how the ballpen will work compared to the ballpen with complete parts.

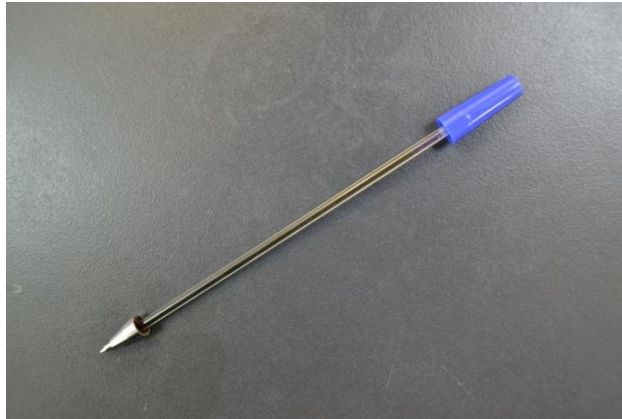


Photo: Courtesy of Michael Anthony B. Mantala

Below is a picture of a ballpen that was assembled with a part that belongs to another ballpen. Ask the students to identify the part of the ballpen that was replaced and its function. Ask them to imagine how the ballpen will work compared to the original ballpen.



Photo: Courtesy of Michael Anthony B. Mantala

In this motivation part of the lesson, you used ballpens to represent structure and function in organisms. The ballpen is made up of different parts that have specific functions; they work together to make the ballpen perform its function. Similarly, organisms are made up of parts that work together: organ systems, organs, tissues, and cells.

Of course, you can use other representations. Bear in mind though, that the use of representations has its limitations. It can help, to some extent, concretize abstract concepts like structural organization in organisms as it can also give, to some extent, misconceptions like using the ballpen as a representation for concepts the apply to living things.

That said, have them discover through a discussion that like the ballpen that is made up of different parts that work together, organ systems are made up of organs that also work together to carry out the organ system's task. Anything that happens to the small parts will certainly affect the bigger parts and, eventually, the organism.

What makes up an organism?

In this activity, you will ask the students to read the selection and answer the questions that follow. The activity seeks to answer the questions: ‘What are organisms?’ and, ‘What are they made up of?’

If you have a model or a poster of a human torso, you can show it to the class and ask the students to check the parts closely. If not, you can direct the class to check Figure 2 of Module 1.

Q1. What parts of the human body do you see?

They will see that the human body is made up of different parts.

Q2. To which organ systems do these parts belong?

To answer this question, have them recall the different organ systems of the body that they have learned in the lower grades. Then, have them look at Figure 3.

Figure 3 shows some organ systems of the human body. Have them identify the parts that make up each of the organ systems. Ask them to describe how the different parts work together in an organ system. Have them imagine what happens to the organism if any of the organ systems is injured or diseased.

Q3. Can you identify these organ systems?

The organ systems shown in Figure 3 include the skeletal, muscular, circulatory, and nervous systems

Q4. How do these organ systems work together?

To answer this question, they will have to identify the functions of each of the organ systems and describe how the function of one organ system relates to the functions of the others. For example, the skeletal system, along with the muscular system, functions for movement. The bones move according to the alternating contraction and relaxation of the muscles. These movements of the skeletal and muscular systems are coordinated by the nervous system. All these happen because of energy that comes from the nutrients transported by the circulatory system to the different parts of the body.

Organ systems are made up of functionally related organs. Figure 4 shows a model of a human heart.

Q4. Refer to Figure 4. What parts of the human heart do you see?

The human heart is made up of muscles and blood vessels: the veins and arteries. If they had advanced readings, they would probably mention auricles, ventricles, and valves in addition to what is shown in the figure. They will have more on these and other parts of the heart in higher Biology.

Q6. What do you think will happen to the heart if any of these parts were injured or diseased?

An injury to any of the parts of the heart is an injury of the heart. This means, the heart will suffer in the same way that its parts suffer.

Q7. If these parts of the heart were injured or diseased, what do you think will happen to the organism?

As you ask this question, you can also ask them if they know of relatives or acquaintances who have been diagnosed with heart ailment. They would probably mention that the person is weak and experiences chest pains or difficulty in breathing. An injury to any of the parts of the heart affects the organism – the person.

Another organ – the kidney – belongs to another organ system, the excretory system. Like the processing you did for the heart, ask the students to check out the picture of a model of a human kidney.

Q8. Refer to Figure 5. What parts of the human kidney do you see?

Like the heart, the kidneys are made up of muscles and blood vessels. Those who had advanced readings may probably mention renal cortex, medulla, and pelvis in addition to what is shown in the figure. They will have more on these and other parts of the heart in higher Biology.

Q9. What do you think will happen to the kidneys if any of these parts were injured or diseased?

An injury to any of the parts of the kidneys is an injury of the entire organ. This means, the kidneys will suffer in the same way that its parts suffer.

Q10. If these parts of the kidneys were injured or diseased what do you think will happen to the organism?

Before you ask this question, you can ask them if they know of people who have been diagnosed with kidney problems. You can also ask how these people are coping with the disease. They will probably mention that these people are weak and have difficulty urinating or may have poor appetite. An injury to any of the parts of the kidneys affects the organism – the person.

Organs themselves are made up of even smaller parts: the tissues and cells. Guide the students through Figure 6 that shows a picture of a muscle

tissue. You should be able to draw the idea that these tissues play specific tasks to keep the organs, organ systems, and the whole organism healthy.

Q11. What procedure can a medical doctor do to correct an injury the these organs?

They will answer this question using what they have learned from the interviews they made of the articles they have read.

Q12. What do you think will happen to the organs if these tissues were injured or diseased?

The organ will suffer from an injury to the tissues.

Q13. If these tissues were injured or diseased, what do you think will happen to the organ systems?

The organ systems will suffer, too.

Q14. If these tissues were injured or diseased, what do you think will happen to the organism?

The organism will suffer, too. For example, a cut on the tissues of the skin is felt by the whole organism. Anything that happens to the tissues will affect the bigger structures they make up.

Plants are also made up of organ systems: the root and shoot systems. The roots absorb water and nutrients; the shoot system moves them to the different parts of the plant.

Q15. In what ways are the functions of the organ systems of plants similar to those of animals?

Like the organ systems of animals, those of plants have parts that work together. For example, the shoot system of plants is composed of the stem, leaves, and flowers. The stem has tissues that allow for the transport of water and nutrients from the roots to the leaves. The leaves on the other hand serve as structures for photosynthesis through which, they manufacture their food. The flowers are the reproductive organs of plants.

Q16. In what ways are they different?

Plants have only two organ systems: the root and shoot systems; whereas, animals have complex organ systems that work directly with the other organ systems. For example, plants do not have a nervous system that coordinates the functions of the other organ systems of animals. Plants also do not have circulatory and respiratory systems that move oxygen and nutrients to the different parts of the body.

Figure 8 shows a picture of a flower. Flowers are the reproductive organs of plants. Together with the leaves and the stems, they make up the shoot system.

Q17. How are flowers similar to the reproductive organs of animals?

Like the reproductive organs of animals, complete flowers have male and female parts. These parts work together to bear seeds from which new plants germinate.

Q18. How are they different?

Plants can dispense with their flowers – their reproductive organs – to generate their kind for they can also reproduce asexually. Animals that reproduce sexually make use of only their reproductive organs to do so.

Q19. How do the flowers, leaves, and stems help plants meet their basic needs?

They have learned in the lower grades that plants are able to manufacture their food through photosynthesis. They use their leaves to carry out this process. The stem provides support to the leaves, flowers, and fruits. They also serve as channels for the transport of water and nutrients from the roots to the different parts of the plant. The flowers serve as their reproductive organs.

Q20. What do you think will happen to the plant if any of the parts that make up the shoot system were injured or diseased?

Anything that happens to any of the parts that make up the shoot system of plants will certainly affect the plant as well. You can ask them to cite examples to highlight this connection.

The root system is another organ system of plants. In some plants, it is made up of the primary root, the secondary roots, and the root hairs. Figure 9 shows a picture of a root tip of an orchid.

Q21. Aside from absorbing water and nutrients, what other functions do the roots serve?

Roots also provide anchorage to the plant.

Plants have tissues, too. You can peel off the skin of onion bulbs to show your students what tissues look like. Tissues of onion bulbs would look like a transparent plastic. Roots are also made up of tissues. Figure 10 shows a model of a section of a root tip.

Tissues are made up of cells – the basic units of structure and function in organisms. All organisms are made up of cells; they are the smallest level of organization at which the properties of life can be carried out.

Q22. What do you think will happen to the roots if the tissues that make them up were injured or diseased?

Q23. If the roots were injured or diseased, what do you think will happen to the plant?

Serious damage to the root will kill the plant.

Q24. What do you think will happen to the tissues, organs, and organ systems if these cells were injured or diseased?

When cells or tissues are injured or diseased, the higher levels of organization that they make up are affected as well.

Q25. What do you think will happen to the organism?

The different parts that make up an organism each perform a specific function. Anything that happens to the smallest of parts that make up an organism will most likely affect the whole organism.

Activity

2

Levels of organization in an organism

For Activity 2, *Levels of organization in an organism*, ask the students to complete the table on page 8 of Module 1 using the information they gathered from their interviews with relatives or neighbors who have diseases affecting certain organs or who know of people who have the disease. They may also use the information from the articles that they have read in Activity 1. Have the students read the procedure for completing the table.

The activity will help the students synthesize what they have learned about what makes up an organism; it also serves as an enrichment activity. In each of the boxes that correspond to the levels of organization, have them describe how the disease affects the parts that make up each level. Opposite each level of organization, have them cut and paste pictures (they may use the pictures that come with the articles) that show how the disease affects the parts that make up the different levels. Another option is to have them show it through drawing. After completing the table, have them present their work to class.

In the last part of Activity 2, ask the students to reflect on the question, *Are there levels of organization that are bigger than the organism?*

At the end of Module 1, the students should have learned the following big ideas:

- *Organisms are made up of parts: organ systems, organs, tissues, and cells.*
- *Whatever happens to any of these parts will affect the other parts and the whole organism.*
- *We need to keep our cells and tissues healthy to make our organs, organ systems, and the whole body healthy.*
- *To stay healthy, we need to eat nutritious foods; they include the plants in our backyard and the animals in our farm.*
- *Like us, these plants and animals are also organisms. They have basic needs that include proper care for them.*

PRE/POST TEST

1. The heart pumps blood that carries oxygen and nutrients to the different parts of the body. To which organ system does the heart belong?
 - A. Circulatory
 - B. Digestive
 - C. Excretory
 - D. Reproductive

2. Cancer starts from cells that start to grow uncontrollably fast. They destroy tissues and organs. What does this say about the effects of diseased cells on the higher levels of organization in an organism?
 - A. Cancer involves only certain kinds of cells and does not affect any other kind of cell.
 - B. Diseased cells affect only the next higher levels of organization that they make up – the tissues.
 - C. Diseased cells damage the higher levels of organization they make up: tissues, organs, organ systems, and eventually, the whole organism.
 - D. Diseased cells **do not** affect the other parts of an organism.

3. Each part of an organ system plays a specific function. Which of the following structures **does not** match its function?
- A. Eyes : Sight
 - B. Kidneys : Respiration
 - C. Heart : Circulation
 - D. Stomach : Digestion
4. Flowers are the reproductive organs of plants. How are flowers different from the reproductive organs of animals?
- A. Flowers have male and female parts; animals have either male or female parts.
 - B. Flowers need pollinators like bees to reproduce; animals **do not**.
 - C. Flowers are shed from time to time; nothing is shed from animals.
 - D. There is **no** difference between flowers and the reproductive organs of animals.
5. The organ systems of plants consist of the root and shoot systems. Why is it important for these organ systems to work together?
- A. To grow and survive
 - B. To avoid pests and other animals
 - C. To survive floods and strong winds
 - D. To survive droughts and earthquakes
6. Which of the following differentiates organs from tissues?
- A. Organs make up tissues; tissues make up organs
 - B. Tissues make up organs; cells make up tissues
 - C. Organs and tissues are made up of cells.
 - D. Organs and tissues make up an organ system.
7. At which smallest level of organization in an organism can the characteristics of life be carried out?
- A. Organ system
 - B. Organ
 - C. Tissue
 - D. Cell
8. Which is the correct sequence – from biggest to smallest – of the levels of organization in an organism?
- A. Cell → Organ → Organ System → Tissue
 - B. Organ → Organ System → Tissue → Cell
 - C. Tissue → Cell → Organ → Organ System
 - D. Organ System → Organ → Tissue → Cell

Answer Key

1. A
2. C

Note: When cancer cells metastasize, they spread to the cells of other tissues and organs. But even in the early stages, they start affecting nearby cells and tissues and making them cancerous.

3. B
4. B

Note: Some animals are hermaphroditic like the earthworms. They have both male and female parts; hence A is not the answer. Egg and sperm cells are shed from the reproductive organs of animals from time to time; hence, C is not the answer. Option B shows a difference between flowers and the reproductive organs of animals; D is not the answer.

5. A
6. B
7. D
8. D

References

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