

## MODULE

## 4

REPRODUCTION: THE  
CONTINUITY OF LIFE

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**Overview**

This module discusses the different modes of reproduction in representative plants, animals, and microorganisms. Investigations in this module will help students understand the different ways that organisms reproduce. At the end of this module, students should be able to describe asexual and sexual reproduction and differentiate the offspring resulting from each mode of reproduction.

**Key questions for this module**

What are the different modes of reproduction?  
How can we use this knowledge to grow plants?

## Activity

1

*Can you grow new plants from "eyes"?*

In this activity, the potato is used as an example of a plant that can reproduce asexually through vegetative reproduction. The potato tuber, a specialized underground stem, is cut into pieces 2-3 days before planting to allow for the growth of the hard and waxy layer on the cut surface to prevent rapid decomposition.

If potatoes are not readily available, you may use ginger or sweet potato for this activity.

Possible answers to the developmental questions in Activity 1:

- Q1. The cut pieces are planted with the eye pieces pointing upward to enable the shoots to grow faster.
- Q2. Answers may vary.
- Q3. One potato "eye" will yield one new shoot.

Q4. Vegetative propagation is a faster way of propagating plants. A larger number of offspring may also result in vegetative propagation. In Activity 1, several new plants were grown from one potato plant.

Ask the students if they know of other plants that can be propagated vegetatively. Students may give some of these possible answers: Some plants that can be propagated vegetatively are *kamote* (sweet potato), cassava, ginger, pineapple, and some ornamental plants.

Activity

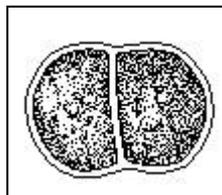
2

*Can one become two?*

Before discussing fission, show the class how to prepare a wet mount of *Protococcus*. The scrapings of *Protococcus* must be soaked in water three days before the cells are studied. In this way, it will be easier to separate the cells from the other algae and debris in the scrapings. To separate *Protococcus*, tease the scrapings using two dissecting needles. The *Protococcus* is a green alga that may form clusters or colonies.

Answer to the developmental questions in Activity 2:

Q5. Dividing *Protococcus* cells may look like these:



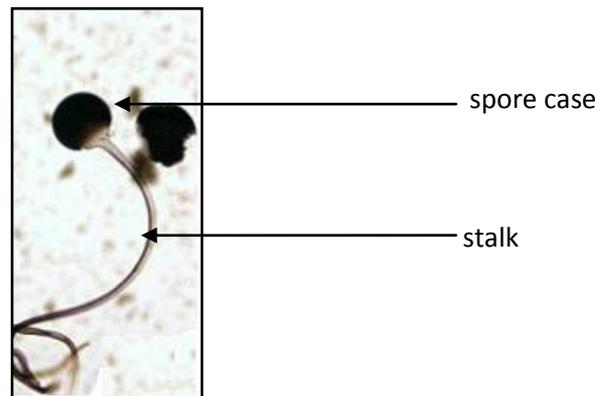
Q6. Paramecium and amoeba are two examples of unicellular organisms that reproduce through fission.

You may show students prepared slides of Paramecium undergoing fission.

Introduce budding as another type of asexual reproduction. You may show the class a slide of yeast cells. Have them describe what they see. In some cases, they may see actual budding of the yeast cells. The smaller cell is called a bud which detaches itself from the mother cell and grows into a mature cell. Ask the students if they know of other organisms that reproduce by budding. *Possible responses: hydra and sponges.*

Prepare ahead of time a bread mold culture before the discussion on spore formation as a means of asexual reproduction. Expose a piece of bread for a few days until you can observe mold growing on the bread. Spore formation is common among the molds. Using the bread mold culture, show the class where the spores are located.

If you have a microscope, you may prepare the bread mold for examination under the microscope. With a dissecting needle, get a few filaments from the culture and place them on a clean slide with a drop of water. Put a cover slip. Under the microscope, the bread mold looks like this:



*Mold with spore case*

Call the attention of the students to the round structures at the tip of the stalk. These are the spore cases containing the spores. You may crush one and show the spores under the microscope to give the students an idea of the size and number of spores. Ask students how important spores are. The acceptable response is: the spores, when carried by the wind to bread or fruit, can grow into a new mold.

Emphasize that proper temperature, amount of moisture, and food source are necessary for the spores to germinate. Ask the class if they know of other organisms that can reproduce by spore formation. *Possible responses: kabute* (mushrooms), shelf or bracket fungi, *pako* (fern).

Proceed to the discussion on asexual reproduction among animals. Reproduction through regeneration or replacement of missing parts is also possible among lower forms of animals. The bodies of sponges, hydra, and planaria can be cut into several pieces and each part can become new individuals. Point out the difference between regeneration and reproduction. Through regeneration lizards, crabs, and lobsters can replace missing parts like tails or legs but their tails or legs cannot regenerate the missing heads.

In general, increased specialization in animals corresponds to a decrease in capacity for regeneration.

After providing students with a wide range of common examples of organisms that reproduce asexually, ask them to describe the offspring resulting from asexual reproduction. *Answer: Asexual reproduction gives rise to offspring that are identical to the parents.*

After the kinds of asexual reproduction have been taken up, introduce the second mode of reproduction, sexual reproduction. Emphasize that sexual reproduction involves sex cells or gametes. The female gamete is called egg cell or ovum; and the male gamete is called sperm cell. A form of sexual reproduction is called conjugation. This is exhibited by *Spirogyra*, *Paramecium*, and bread mold. If you have a prepared slide of conjugating *Paramecium* and *Spirogyra*, you may focus them under the microscope for students to study. Use drawings if there are no prepared slides.

### Sexual Reproduction in Flowering Plants

The flower is the reproductive structure in plants. Some plants have the male and the female reproductive structures in one flower. Others have separate flowers containing the male and female reproductive structures. In Activity 3, the gumamela flower will be studied.

Activity

3

Structure of a Gumamela flower

At the end of this activity, the students should be able to: (1) distinguish the male and the female reproductive structures; and (2) describe the function of each structure in reproduction.

Ask each student to bring the following: gumamela flowers (1 fresh, 1 withered, and 1 gumamela bud), scalpel or razor blade. Remind the students not to play with the scalpel or razor blade.

To motivate the students, ask them what they think about flowers. What is the importance of flowers? Encourage discussion of responses. Then bring around the discussion to the biological importance of flowers. You may bring up the topic of pollination and the role of attractive flowers.

Proceed with the activity.

Answers to the developmental questions in Activity 3:

- Q6. The flower is attached to the stem by a short stalk-like structure.
- Q7. The sepals provide protection to the unopened flower.
- Q8. The stigma of the fresh flower feels sticky.
- Q9. The stigma is sticky so the pollen grains that fall on it can better adhere on it.
- Q10. The answers may vary.
- Q11. Pollen grains may reach the pistil through agents of pollination like insects, wind, water, and humans.

Use illustrations or drawings in describing the formation of a pollen tube so that the students will understand the process better. Talk about fertilization which occurs after pollination. Fertilization is the fusion of the nuclear contents of the egg and the sperm. From this union, a zygote results. In plants, the zygote or embryo is within the seed.

### **Sexual Reproduction in Humans and Animals**

Sexual reproduction needs two parents, a male and a female and this involves specialized cells or gametes. The more complex species have gonads for the production of the male and female gametes. Gametes differ in form and structure. Use diagrams of the egg and sperm cells to facilitate the discussion on gametes. Emphasize that gametes are microscopic cells. The method by which the sperm comes in contact with the egg cell may be external or internal. External fertilization usually occurs in aquatic animals. In internal fertilization, specialized structures transport the sperm into the egg within the body of the female. Fertilization or the union of these gametes starts the development of the new individual.

Sexual reproduction gives rise to offspring that are a combination of the traits from its parents. Thus, the offspring differ genetically from their parents and their siblings. These genetic differences help to ensure the survival of the species in changing environmental conditions.

## PRE/POST TEST

1. Which of the following structures are NOT involved in asexual reproduction?  
A. Gametes  
B. Tuber  
C. Stem  
D. Root
2. A farmer grew only one type of onion. All of the onion plants died from the same disease. What can be said of this onion plant population?  
A. Only a few plants were resistant to the disease.  
B. All of the onion plants were resistant to the disease.  
C. The onion plants were genetically identical.  
D. The onion plants were genetically different from each other.
3. A farmer wants to propagate a good variety of a crop in a way which maintained all its desirable traits. Which of the following methods should be used?  
A. Self-pollination  
B. Vegetative propagation  
C. Growing seeds produced from this variety  
D. Cross-pollinating this crop with another good variety and growing the seeds resulting from the cross
4. A sperm cell unites with an egg cell to form a zygote. Which process is taking place?  
A. Pollination  
B. Fertilization  
C. Asexual reproduction  
D. Vegetative propagation
5. In sexual reproduction, what is the source of the genetic material in a zygote?  
A. An egg cell only  
B. A sperm cell only  
C. A pollen and a sperm cell  
D. An egg cell and a sperm cell
6. Which species can produce offspring that are genetically different from their parents?  
A. A species that has few variations  
B. A species that reproduces asexually  
C. A species that reproduces sexually  
D. A species that competes with a similar species

7. What is NOT a characteristic of sexual reproduction?
- A. Gametes from two parents unite to form a zygote.
  - B. Offspring are genetically identical with the parent.
  - C. Offspring are different from their parents and sibling.
  - D. Genetic variability of offspring help to ensure survival in changing environmental conditions.

| Answer Key |
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| 1. A       |
| 2. C       |
| 3. B       |
| 4. B       |
| 5. D       |
| 6. C       |
| 7. B       |

## References

- Hwa, K. S., Sao-Ee, G., & Luan, K. S. (2010). *My pals are here! 6A science*. (International Ed.). Singapore: Marshall Cavendish.
- Philippines. Department of Education. (2009). *Science and Technology II textbook*. (Rev. ed.). Pasig City: Instructional Materials Development Corporation.