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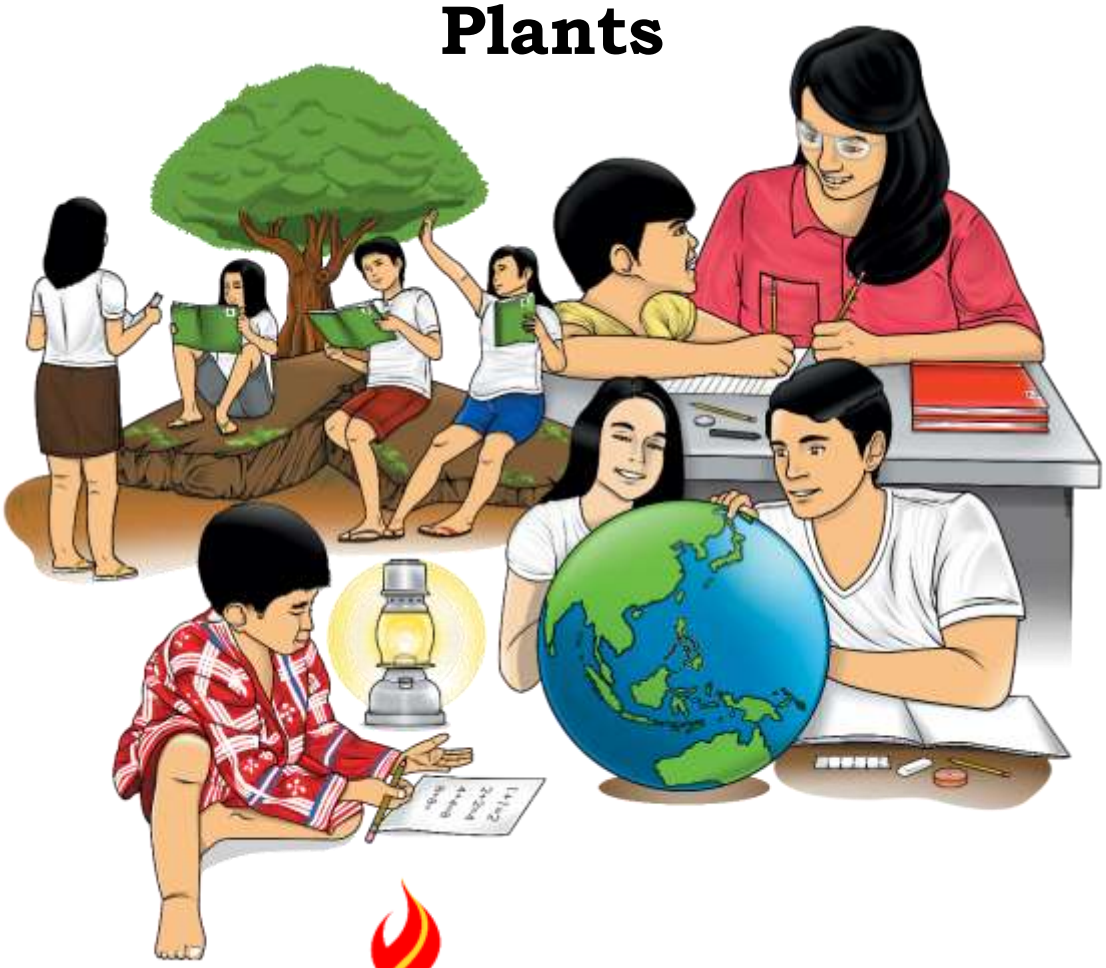
Science

Quarter 2 – Module 5: Modes of Reproduction in Flowering and Non-Flowering Plants



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Alternative Delivery Mode
Quarter 2 – Module 5: Modes of Reproduction in Flowering and Non-Flowering Plants
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Science

Quarter 2 – Module 5: Modes of Reproduction in Flowering and Non-Flowering Plants

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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 ifyou need to ask your facilitator or your teacher's assistance for betterunderstanding 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 partof 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

How do plants reproduce? The production of new individuals or offspring from their parents is known as reproduction. Plants reproduce either through sexual or asexual reproduction. In sexual reproduction, new plants are obtained from seeds while in asexual reproduction new plants are obtained without the production of seeds.

This module will help you understand better the different modes of reproduction in flowering and non-flowering plants.

The module is divided into two lessons, namely:

- Lesson 1: Sexual Reproduction in Plants (Self and Cross- Pollination).
- Lesson 2: Asexual Reproduction in Plants

At the end of this module, you will be able to:

- Differentiate Self-Pollination from Cross-Pollination
- Describe the different modes of reproduction in flowering and nonflowering plants such as moss, fern, mongo and others

Note: Write all the answers of the activities in a separate sheet.

What I Know

Directions: Read each item carefully. Choose and write the letter that corresponds to the correct answer. Write your answers on a separate sheet of paper.

1. The following are agents of pollination, except_____.
   A. Dragonflies
   B. Butterflies
   C. Dogs
   D. Bees

2.It is an asexual reproduction which is through structural modification in the stem, root, or leaf of herbaceous or woody plant.
   A. Sexual Reproduction
   B. Natural Vegetative Reproduction
   C. Artificial Vegetative Reproduction
   D. Imperfect Vegetative Reproduction

3. Which plant can cross-pollinate?
   A. Rice
   B. Potatoes
   C. Tomatoes
   D. Summer squash

4. These are the methods used to improve the quality and production of plants.
   A. Natural Vegetative Reproduction
   B. Artificial Vegetative Reproduction
   C. Sexual Reproduction
   D. All of the above

5. Which of the following fruit tree did not undergo cross pollination?
   A. Apple
   B. Guava tree
   C. Mango tree
   D. Pomelo

6. It grows from big bulbs made of a stem and has special type of leaves.
   A. Ginger
   B. Onions
   C. Garlic
   D. Avocado

7. What is the most common method of pollination?
   A. Cross- pollination
   B. Pollination
   C. Reproduction
   D. Self- pollination

8. It is a kind of plant that reproduce by spreading underground and growing new shoots.
    A. Mango
    B. Bamboo
    C. Chico
    D. Santol

9. What type of pollination happens when pollen grains are transferred from the anther of a flower to the stigma of another flower that belongs to another plant but of the same kind?
    A. Cross- pollination
    B. Imperfect pollination
    C. Perfect- pollination
    D. Self- pollination

10. It is a kind of plant that develops small plants along the edge of its leaves.
    A. *Katakataka*
    B. Banana
    C. Crabgrass
    D. Fern

Lesson 1 Sexual Reproduction in Plants (Self and Cross-Pollination)

A **flower**, sometimes known as bloom or blossom, is the reproductive structure found in flowering plants. The main function of a flower is to facilitate reproduction, usually by providing a mechanism for the union of sperm with eggs. Flowers may facilitate self–pollination and cross-pollination. Pollination is important because it leads to the production of fruits and seeds that will create more plants. Flowers are important for they can be a source of food, provide natural medicines, and aid in plant reproduction.

In this lesson you will know more about self-pollination and cross-pollination, which are very important in the reproduction of flowering and non-flowering plants.

What's In

Flowers are important in making seeds. It contains the plant's reproductive structure. Flowers are made up of different parts, considered as the female parts and the male parts, which are essential during plant reproduction.

Directions: Write **TRUE** if the statement tells correct information and **FALSE** ifnot. Write your answers on a separate sheet of paper.

1. The stigma is the structure which receives the pollen grains, stimulates the pollen grain to germinate and reach the ovary.
2. The ovary enlarges and thickens its walls to become a flower.
3. The stigma, style, and ovary are the female parts of the flower.
4. Stamen is the male part of the flower.
5. The tube releases the sperm cells into the ovule to fertilize the egg cell.

What's New

Directions: Determine whether the picture below shows self-pollination or cross-pollination. Write your answer on a separate sheet of paper.

Figure 1. Self-pollination or Cross-pollination
(Dignos.n.d)

A to B _____

B to C _____

What is It

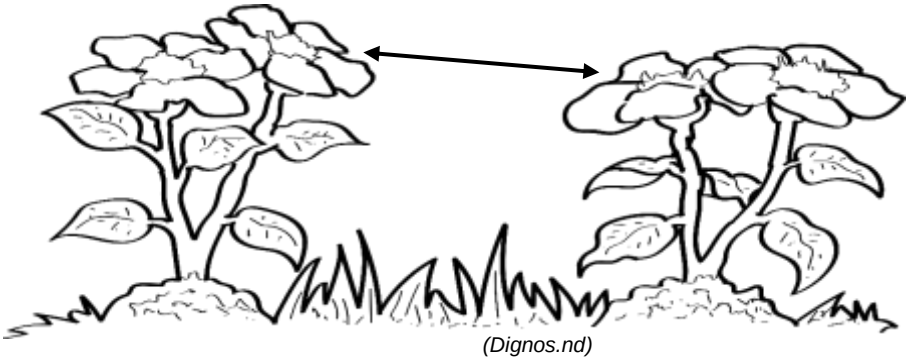
What are the two types of pollination? **Pollination** happens when pollen grains from the male anther of a flower is transferred to the female stigma. Usually this is brought about by wind, insects, birds, water, animals, and other agents that aid in the sexual reproduction of plants called agents of pollination**.** There are two kinds of pollination: self-pollination and cross-pollination.

Self-pollination occurs when the pollen from the anther is deposited on the stigma of the same flower or another flower of the same plant. Self-pollination parental characters are preserved, fewer pollen grains are needed, flowers are not large/scented, and flowers do not develop devices for attracting insect pollinator.

(*Dignos.nd)*

(Dignos.nd)

Cross-pollination is the transfer of pollen from one flower to the stigma of another flower on a different individual of the same species. It increases the adaptability of offspring, makes the organisms better, new, and useful characters can be produced, seeds produced are usually larger, and plants produced are more resistant from diseases.



(Dignos.nd)

Once a pollen grain enters the stigma, it swells and grows a long tube that travels through the style until it reaches the ovary. The tube releases the sperm cells into the ovule to fertilize the egg cell. The fertilized egg cell and the ovule itself develops into a seed. The ovary then enlarges and thickens its walls to become a fruit. This will be the receptacle for the seeds. These seeds can eventually grow into new plants. Grasses, maple trees, and sunflowers are among other plants and trees that can self-pollinate, while apple trees, pumpkins/squash, daffodils, and most flowering plants are some that can cross- pollinate.

What's More

Activity 1

Directions: Match the functions in Column A with the flower parts in Column B. Write the letter of the correct answer on another sheet of paper.

Column A	**Column B**
1. It holds the anther in a high position for release of pollen.	a. style
2. It connects the stigma to the ovary, also traps the pollen grains.	b. stigma
3. This structure receives the pollen grains, stimulates the pollen grain to germinate and reach ovary.	c. filament
4. It is the transfer of the pollen grains from the anther to the stigma of the same flower.	d. self-pollination
5. It is the transfer of pollen grains from the anther of a flower to the stigma of another flower	e. cross pollination

Activity 2

Directions: Supply the blanks with the correct terms. Choose from the list of options inside the box. Write your answers on a separate sheet of paper.

stigma	ovary	pollination	self-pollination	cross-pollination

The transfer of the pollen grains from the anther to the stigma is called (1)_____. Once a pollen grain enters the (2)_____, it swells and grows a long tube that travels through the style until it reaches the (3)_____.

(4) _____is the transfer of pollen grains from the anther to the stigma of the same flower or of a different flower that belongs to the same plant. In (5) _____, the pollen grains are transferred from the anther to the stigma of a flower in another plant of the same kind.

Activity 3

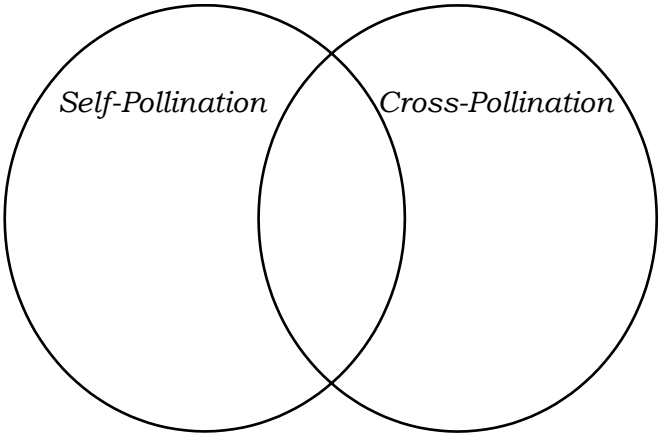
Directions: Study the pictures below. Using a Venn diagram, differentiate self-pollination from cross-pollination. You may use the Rubrics below to score yourself. Write your answers on a separate sheet of paper.

Illustration

Self-pollination *Cross-pollination*

Figure 4. Self-pollination and Cross-pollination (Dignos,n.d)

Venn Diagram



Self-Assessment Rubric. **Self-Pollination versus Cross-Pollination**

Criteria	Very Good (3)	Good (2)	Developing (1)
Following the directions	I can do this on my own	I can do this with help from my parents	I am still confused but am starting to work on it
Research and collecting information	I collected a lot of information from other books and the internet	I collected some information from another book	I only collected information from this material
Completing the tasks	I was able to complete the tasks on my own	I was able to complete to tasks with some help	I was not able to complete the tasks.
Improving Ideas	I was able to use my own idea and the new information I learned to answer the activity	I only write the information that I have gathered from the book I read	I only use the information I get from this material
Understanding	I completely understand this and fell like I could share it to others	I understand this but I feel like I need more practice	I am close to understanding this, but I still need help

Lesson 2 Asexual Reproduction in Plants

Plants do not only grow from seeds. There is another way of growing plants, it is through asexual reproduction. Asexual reproduction produces individuals that are genetically identical to the parent plant. It has two methods: one is natural vegetative reproduction and the other is artificial vegetative reproduction. Non – flowering plants have special structures that help them reproduce asexually. In this lesson, you will learn about asexual reproduction in plants and how to produce them in real life.

What's In

In the previous lessons you have learned about sexual reproduction in plants. To help you link the current lesson with the previous one, let us answer the following.

Directions: Identify whether the following plants reproduce sexually, asexually, or both sexually and asexually. Copy the list of plants and write your answer on a separate sheet of paper.

1. Mongo Beans
2. Potatoes
3. Moss
4. Avocado
5. Ferns
6. Calamansi
7. Sampaguita
8. Chico
9. Strawberry
10. Santol

What's New

Did you know that aside from reproducing plants sexually there is another way in reproducing them? This is called asexual reproduction. Asexual reproduction in plants may either be natural vegetative reproduction or artificial vegetative reproduction. Some plants like moss, fern, *katakataka*, potatoes, garlic, and many others undergo asexual reproduction.

Now, let us try if you know some of the plants that reproduce by natural or artificial vegetative reproduction.

Directions: Identify whether the following plants commonly reproduce asexually through natural vegetative reproduction or artificial vegetative reproduction. Write the name of the plant in the corresponding column. Copy and answer it in a separate sheet of paper.

Ferns Onion Lanzones Cassava Banana Moss Santol Sampaguita Sweet Potato Ginger	
Natural Vegetative Reproduction	**Artificial Vegetative Reproduction**
1. 2. 3. 4. 5.	1. 2. 3. 4. 5.

What is It

Asexual Methods of Growing Plants

1. **Natural Vegetative Reproduction** is any form of asexual reproduction occurring in plants in which a new plant grows and develop naturally without human action. It occurs when an axillary bud grows into a lateral shootand develops its own roots. New plants may sprout from stems, roots or leavesof a parent plant. Modified stems are most often the source of vegetative plant propagation. Vegetative plant structures that arise from plant stems include rhizomes, runners, bulbs, tubers, and corms. Tubers can also stretch from roots. Plantlets emerge from plant leaves.

a. **Runners**

Some plants like the strawberry and ferns have stems that grow along the ground from the parent plant. These stems are called runners. It can be cut and the new plant can be transferred to another place for it to continue growing.

Figure 1. Runners (Dignos.nd)

b. **Bulbs**

It is a large rounded bud with a small basal stem at the lower end. It has fleshy, scale-like overlapping leaves as onions. Its function is to store food and propagate. Simply taking a bulb to form the parent plant and transferring to a new location will enable you togrow new plants.

Figure 2. Bulbs (Dignos.nd)

c. **Tubers**

A tuber is a thick and enlarged portion of a stem that grows underground. It bears small scale-like leaves and tiny buds called eyes. When the "eyes" are separated from the parent plant, they may sprout new shoots and form new leaves and roots. An example of this is a sweet potato (*kamote).*

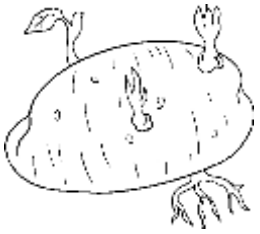


Figure 2. Tubers (Dignos.nd)

d. **Rhizome**

A rhizome or rootstocks is a plant stem found either at the soil surface or underground. It contains enlarged portions called nodes from which roots and shoots originate. When separated, each piece of a rhizome is capable of producing a new plant as it grows up out of the ground. Examples of rhizomes are ginger and crabgrass.

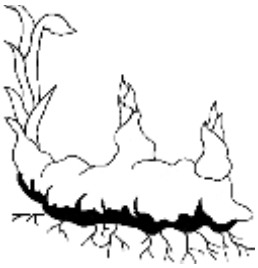


Figure 3. Rhizomes (Dignos.nd)

e. **Suckers**

An upright shoot that grows from buds found at the base of the stems of present plants. Banana, bamboo, pineapple, and bird of paradise are some examples of plants that reproduce suckers.

Figure 4. Suckers (Dignos.nd)

f. **Plantlets**

Leaves of some plants will grow into a new plant if they detached from the parent plant. It grows a small plant on the edge of their leaves. Some examples are *Katakataka* and begonia.

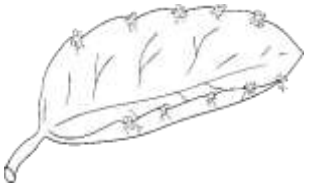


Figure 5. Plantlets (Dignos.nd)

2. **Artificial Vegetative Reproduction** is also called cloning. This type of vegetative reproduction produces the next generation that is generally identical to the parent. The various way in artificial reproduction are cuttings, grafting, marcotting, layering, and budding.

a. **Cuttings**

This is taken from any part of a plant, such as a stem, leaf, or root which has been removed from a plant in order to induce the growth of roots to produce new plants. There are three kinds of cutting namely: leaf-cutting, stem cutting, and root cutting. It is the most commonly used method in producing new plants. Examples of these plants are sugar cane, cassava, *santan, gumamela*, *bougainvilla*, roses, and *sampaguita*.

Figure 6. Cuttings (Dignos.nd)

b. **Grafting**

It is the most widely used artificial method of reproducing new plants. *Santol*, mango, *lanzones*, and *calamansi* are propagated through this method. It is done by cutting a stem from one plant and attaching it to the stump of another plant. The portion of the stem cut from a tree has many buds or known as the scion. The stump to which the scion is inserted is called the stock.

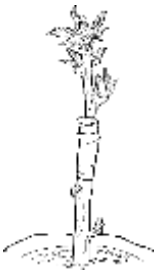


Figure 7. Grafting (Dignos.nd)

c. **Marcotting**

This method can be used to propagate any species of woody plants. This method can also be used to make new plants just in case the plant is already old. A classic example of this is *citrus*.

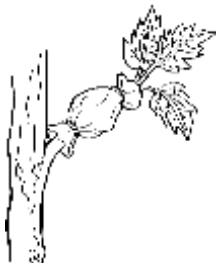


Figure 8. Marcotting (Dignos.nd)

d. **Layering**

It is a method of propagation that encourages new roots to form on branches that are still attached to the parent plant. The stem is covered with soil until it grows roots. When the plant is established, it is cut from the parent plant and planted in a new location.

Figure 9. Layering
(Dignos.nd)

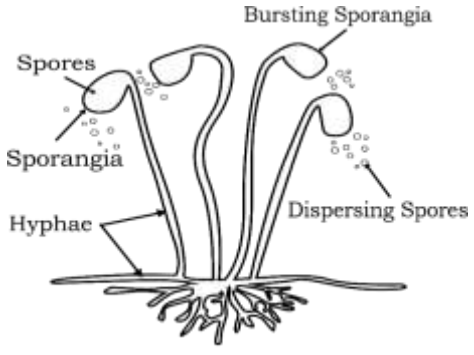
e. **Budding**

This method is done by making a T-shaped cut as an opening in the stem of the parent plant.Then a scion, which is normally the mature bud cut from another plant, is inserted underneath the bark of the parent plant which serves as the stock. The scion must be bound securely to the stock. When the bud grows, it is cut from the mother plant and planted to a new location. Mango and *santol* can be propagated through this method.

Figure 10. Budding
(Dignos.nd)

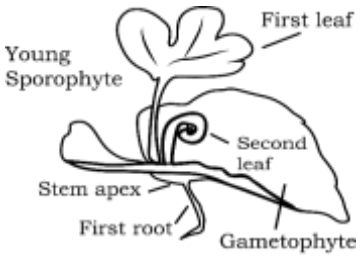
There are some plants that reproduce both sexually and asexually. Moss and ferns reproduce asexually by releasing millions of spores through the air. Spores are different to seeds. They do not contain plant embryos or food stores. When the sporangia break open, the spores are released and dispersed by the wind. If the spore lands in a suitable environment, it can grow into a tiny plant called a gametophyte. The spores are reproductive body and are spread through the environment by wind. Asexual reproduction does not need seeds.

The two methods of asexual reproduction in plants are natural vegetative reproduction by structure modification such as runners, bulbs, tubers, rhizomes, suckers and plantlets. The other one is artificial vegetative reproduction. This type of vegetative reproduction produces the next generation that is generally identical to the parent. The various ways are cutting, grafting, marcotting, layering, and budding.



Moss

(Gaspay.nd)



Fern

(Gaspay.nd)

What's More

Activity 1: Am I Natural or Artificial?

Directions: Determine the mode of asexual reproduction of the listed plants below. Write **N** for natural vegetative reproduction and **A** for artificial vegetative reproduction.

1. Moss
2. Potato
3. Ferns
4. Calamansi
5. Fortune Plant
6. Sugar Cane
7. Santan
8. Onion
9. Ginger
10. Banana

Were you able to determine the mode of asexual reproduction of the plants listed in activity 1? Thumbs Up! Now, let's do another activity.

Activity 2: Match Me If You Can!

Directions: Match the plants in Column A with the asexual methods in Column B. Write the letter of the correct answer on a sheet of paper.

Column A	**Column B**
1. Moss	a. Rhizomes
2. Katakataka	b. Bulbs
3. Onions	c. Plantlets
4. Ferns	d. Spores
5. Ginger	

Activity 3: Am I Artificially Reproduced?

Directions: The following plants reproduce through artificial methods. Identify the specific artificial vegetative reproduction that the plants exemplify. Choose the letter of the correct answer from the choices given in the box.

A. Cuttings	**B. Grafting**	**C. Marcotting**	**D. Budding**

1. Rose
2. *Calamansi*
3. Santan
4. Mango
5. Santol

What I Have Learned

(1)_____ is the transfer of pollen grains from the anther to the stigma of the same flower or of a different flower that belongs to the same plant. (2)_____ is the transfer of pollen grains from the anther of a flower to the stigma of another flower that belongs to another plant but of the same kind. There are several ways by which plants produce their (3)_____. These are categorized into two types: (4)_____ and (5)_____reproduction.

In sexual reproduction, new plants are obtained from (6)_____while in asexual reproduction new plants are obtained without the production of seeds.

In asexual reproduction, there are two methods, these are the (7)_____ and the other one is (8)_____. There are some plants that reproduce both asexually and sexually, such as (9)_____and they reproduce asexually by means of (10) _____ and sexually by sperm and egg.

What I Can Do

Living in a barrio, traditional herbal medicine is still commonly used. Many herbal plants have been used by our forefathers because of their health benefits. These plants are commonly found in backyards and gardens. Interview your parents about herbal plants. Identify by checking the method of reproduction of the listed commonly found herbal plants. Write your answers following the table format below.

Herbal Plants	**Method of Reproduction**	
	Sexual Reproduction	Asexual Reproduction
ex: *Katakataka*		/
1. Ginger		
2. Aloe Vera		
3. Lagundi		
4. Garlic		

Assessment

A. Directions: Read each item carefully. Choose and write the letter that corresponds to the correct answer. Write your answers on a separate sheet of paper.

1. Why is pollination important?
   A. To germinate seeds
   B. To plant seeds
   C. To produce seeds
   D. To scatter seeds

2. What is the most common method of transferring the pollen grains from the male anther of a flower to the female stigma?
   A. Self- pollination
   B. Cross- pollination
   C. Perfect pollination
   D. Imperfect- pollination

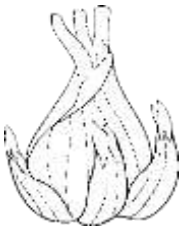
3. What type of pollination happens when pollen grains are transferred from the anther of a flower to the stigma of another flower in the same plant?
   A. Self- pollination
   B. Cross- pollination
   C. Perfect pollination
   D. Imperfect- pollination

4. Which statement describes cross-pollination?
   A. The production of seeds in a flower.
   B. The union of the sperm and the egg cell.
   C. The transfer of pollen from the anther to the stigma of another flower of the same plant.
   D. The transfer of pollen from the anther to the stigma of another flower of another plant but of the same kind.

B. Directions: Identify the reproduction mode of the following plants whether sexually, asexually, or both sexually and asexually. Write your answer on a separate sheet of paper.

_____5. 

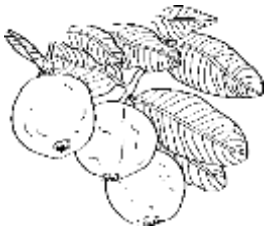
Mongo
(*Dignos.nd)*

_____8. 

Onion
(*Dignos.nd*)

_____6. 

Banana
(*Dignos.nd*)

_____9. 

Guava
(*Dignos.nd*)

_____7. 

Fern
(*Dignos.nd*)

_____10. 

Strawberry
(*Dignos.nd*)

Additional Activities

What plants are commonly found in your community that can undergo sexual and asexual reproduction? Discuss to your parents or guardians how it will reproduce. Cut out at least three pictures of these plants, paste it in your answer sheet. You may also draw these plants if no pictures are available. Then, in one or two sentences describe how each plant reproduce.

Rubrics for Rating

Criteria/Points	**3**	**2**	**1**
Pictures / Drawing Presented	All three pictures/drawings were presented correctly.	Only two pictures/drawings were presented correctly.	Only one picture/drawing was presented correctly.
Description	All three pictureswere described how they reproduce	Only two pictures were described how they reproduce	Only one picture was described how they reproduce

Answer Key

Lesson 1
WHAT'S MORE
Activitiy 3

WHAT I KNOW

1.	C	6.	B
2.	B	7.	A
3.	D	8.	B
4.	B	9.	A
5.	D	10.	A

Lesson 1
WHAT'S IN

1. TRUE
2. FALSE
3. TRUE
4. TRUE
5. TRUE

WHAT'S NEW

A. Self-pollination
B. Cross-pollination

Lesson 1
WHAT'S MORE

Activitiy 1		***Activitiy 2***	
1.	C	1.	Pollination
2.	A	2.	Stigma
3.	B	3.	Ovary
4.	D	4.	Self-pollination
5.	E	5.	Cross pollination

ASSESSMENT:

1. C
2. B
3. A
4. D
5. Sexually
6. Asexually
7. Both
8. Asexually
9. Sexually
10. Both

ADDITIONAL ACTIVITY:

(Varied answer depending on the availability in the community)

WHAT CAN I DO?

Herbal Plants	Method of Reproduction	
	Sexual	Asexual
Katakataka		/
Ginger		/
Aloe Vera	/	
Lagundi		/
Garlic	/	/

What I have Learned

1. Self-pollination
2. Cross-pollination
3. Offspring

(4 & 5 could be interchanged)

4. sexually
5. asexually
6. seeds

(7 & 8 could be interchanged)

7. Natural vegetative reproduction
8. Artificial vegetative reproduction
9. Moss or fern
10. spores

Lesson 2
WHAT'S MORE?

Activity 1:

1. N
2. N
3. N
4. A
5. A
6. A
7. A
8. N
9. N
10. N

Activity 2:

1. D
2. C
3. B
4. D
5. A

Activity 3:

1. A, C
2. B,C
3. A, C
4. B, D
5. B, D

Lesson 2
WHAT'S NEW?

Natural Vegetative Reproduction	Artificial Vegetative Reproduction
Ferns	Banana
Moss	Lanzones
Onion	Cassava
Sweet Potato	Sampaguita
Ginger	Santol

Lesson 2
WHAT'S IN?

1. Sexually
2. Asexually
3. Both
4. Sexually
5. Both
6. Both
7. Both
8. Both
9. Both
10. Both

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