

Unit E: Plant Propagation

Lesson 1: Understanding Sexual Reproduction

Student Learning Objectives: Instruction in this lesson should result in students achieving the following objectives:

1. Discuss the importance of plant propagation.
2. Explain the difference between sexual and asexual propagation.

Recommended Teaching Time: 1 hour

Recommended Resources: The following resources may be useful in teaching this lesson:

- A PowerPoint has also been developed with use of this lesson plan
- <http://www.hcs.ohio-state.edu/hort/technology/sseed.html>
- <http://www.hcs.ohio-state.edu/hort/technology/sseedgerm.html>
- <http://generalhorticulture.tamu.edu/lectsupl/anatomy/anatomy.html#page19>
- <http://generalhorticulture.tamu.edu/lectsupl/anatomy/anatomy.html#page20>

List of Equipment, Tools, Supplies, and Facilities

Writing surface
PowerPoint Projector
PowerPoint slides
Transparency Masters

Terms: The following terms are presented in this lesson (shown in bold italics and on PowerPoint Slide #2):

- Cross-pollination
- Diploid
- Endosperm
- Fertilization
- Gametes
- Genes
- Haploid
- Hybrids
- Pollination
- Seed
- Self-pollination
- Sexual reproduction
- Zygote

Interest Approach: Use an interest approach that will prepare the students for the lesson. Teachers often develop approaches for their unique class and student situations. A possible approach is included here.

Bring samples of various flowering plants to class. Also bring samples of several non flowering foliage plants that are propagated asexually. Display them to students and ask them what they think the value of the flower is to the plant? How are plants more successful at reproduction than animals? After a few minutes of discussion, move on to the lesson content.

**** Use this activity to lead into why plant propagation is important.**

Summary of Content and Teaching Strategies

Objective 1: Discuss the importance of plant propagation.

**** Before beginning this objective have the students give you some reasons why plants are important.**

(PowerPoint Slide #3)

I. Plants are essential for life as we know it on earth.

- A. Plants are the ecological producers of our planet. They provide food and shelter for other organisms, produce oxygen to support animal respiration, and enrich our environment.
- B. Throughout history people have relied on seeds and plant parts to grow new plants for food and fiber.

(PowerPoint Slide #4)

- C. In more recent times, knowledge of plant reproduction has resulted in the development of plant hybrids that have enabled large scale agricultural production of food and fiber plants.

****Talk to your student about the different foods they eat. How many of these are plants? Ask them how many servings of fruits and vegetables they should have a day.**

PowerPoint Slide #5 shows proper servings of food for most people. Use this information to help show how important plant propagation can be.

Objective 2: Explain the difference between sexual and asexual propagation.

(PowerPoint Slide #6)

II. **Sexual reproduction** occurs when the male sperm carried in the pollen unites with the female egg within a flower.

- A. Most plants reproduce their own kind in nature by seeds that are the result of sexual reproduction. The male sex cell (sperm) and the female sex cell (egg) are known as **gametes**. The union of the gametes produces the **seed** that contains the embryo plant and stored food.

(PowerPoint Slide #7)

- B. Both the male sperm and female egg contribute genetic information to the new embryo plant. The union of sperm and egg results in new combinations of genetic information.

These combinations produce new traits that add to the vigor of the offspring.

- C. The offspring that result from this new combination of genes are known as **hybrids**.

People have greatly improved agricultural crops through hundreds of years of hybridization.

(PowerPoint Slide #8)

- D. The **genes** (deoxyribonucleic acid) are located in chromosomes. Normal plant cells contain a pair of chromosomes and are said to be **diploid**. Reproductive cells, the egg and the sperm, contain a single chromosome and are said to be **haploid**.

(PowerPoint Slide #9)

- E. **Fertilization** unites the single chromosome in the sperm nucleus with the single chromosome in the egg nucleus. This enables the fertilized egg or zygote to have a complete pair of chromosomes (diploid).

(PowerPoint Slide #10 shows the process of fertilization.)

(PowerPoint Slide #11)

- F. **Pollination** is the transfer of the male sperm carried in the pollen to the female part of the flower, the stigma. Plants rely on wind and water to transfer the pollen to the stigma. In addition, plants depend on animals to help with pollination. Birds, insects, bats and other animals are attracted to brightly colored, scented flowers. These animals transfer pollen from the anthers of the flowers they visit to the stigmas of other flowers.

(PowerPoint Slide #12 shows an example of pollination)

(PowerPoint Slide #13)

- G. When the pollen of a plant pollinates a flower on the same plant, it is called **self-pollination**. Many plants have this ability to self pollinate, others do not. When the pollen of a plant pollinates the flower on another plant of the same species, it is said to be **cross-pollination**.

- H. Fertilization occurs when the nucleus of the sperm unites with the nucleus of the egg. Plant fertilization is unique because the sperm contains two nuclei. Flowering plants have a double fertilization. One sperm nucleus unites with the egg nuclei to produce a **zygote**. The second sperm nucleus unites with the nuclei of the embryo sac that develops into the **endosperm**.

Use TM: E1-1 to discuss the reproductive structures of the parts of the flower. Use TM: E1-2 to illustrate pollination. Discuss agents of pollination. Ask what problems arise from the use of substances in our environment that destroy the honey bee populations? Use TM: E1-3 to discuss the double fertilization that results from pollination. This would also be a good opportunity to review the major parts of the seed that they learned in Unit B. PowerPoint Slides #14, #15, and #16 shows a quick review of this information.

Review/Summary: Focus the review and summary of the lesson around the student learning objectives. Review the diagram of seed structure. Discuss and review the vocabulary of reproduction and the function of each seed structure. PowerPoint Slide #17 has questions that can be used as review.

Application: Application involves having the students apply the learning objectives.

Evaluation: Evaluation should focus on student achievement of the lesson objectives. A sample written test is attached.

Answers to Sample Test:

Part One: Matching

1. d
2. e
3. c
4. a
5. b
6. f
7. g

Part Two: Completion

1. diploid, haploid
2. pollination

Part Three: Short Answer

1. Sexual reproduction gives the plant species the means to change with a changing environment. Every time sexual reproduction occurs there is a recombining of genetic material. Most genetic changes are beneficial because they enable plants to adapt to a changed environment and therefore survive.
2. Pollen may be transferred by wind, water or animals to the ovary of the flower where the nuclei of the sperm and egg unite to form a seed that contains the embryo plant. Self-pollination is the pollination of a flower on the same plant. Cross-pollination is the pollination of the flower on another plant.
- 3.. Sexual propagation involves the reproduction of plants with the use of seeds. Asexual propagation is the reproduction of new plants from the stems, leaves or roots of a parent plant.

Sample Test

Name _____

Test

Unit E Lesson 1: Understanding Sexual Reproduction

Part One: Matching

Instructions. Match the term with the correct response. Write the letter of the term by the definition.

- | | |
|------------------------|------------------|
| a. sexual reproduction | e. fertilization |
| b. gamete | f. zygote |
| c. self-pollination | g. genes |
| d. hybrid | |

- _____ 1. Offspring of genetically different parents.
- _____ 2. Process within flowering plants that results in a zygote and endosperm.
- _____ 3. When pollen of a plant pollinates a flower on the same plant.
- _____ 4. Propagation involving male and female reproductive cells.
- _____ 5. A male or female reproductive cell.
- _____ 6. A fertilized egg resulting from the union of nuclei of sperm and egg cells.
- _____ 7. The traits inherited from the parent plants are found in these structures.

Part Two: Completion

Instructions. Provide the word or words to complete the following statements.

1. Normal cells with a double set of chromosomes are said to be _____, while those cells with a single set of chromosomes are said to be _____.
2. _____ is the transfer of the male sperm carried in the pollen to the female part of the flower, the stigma.

Part Three: Short Answer

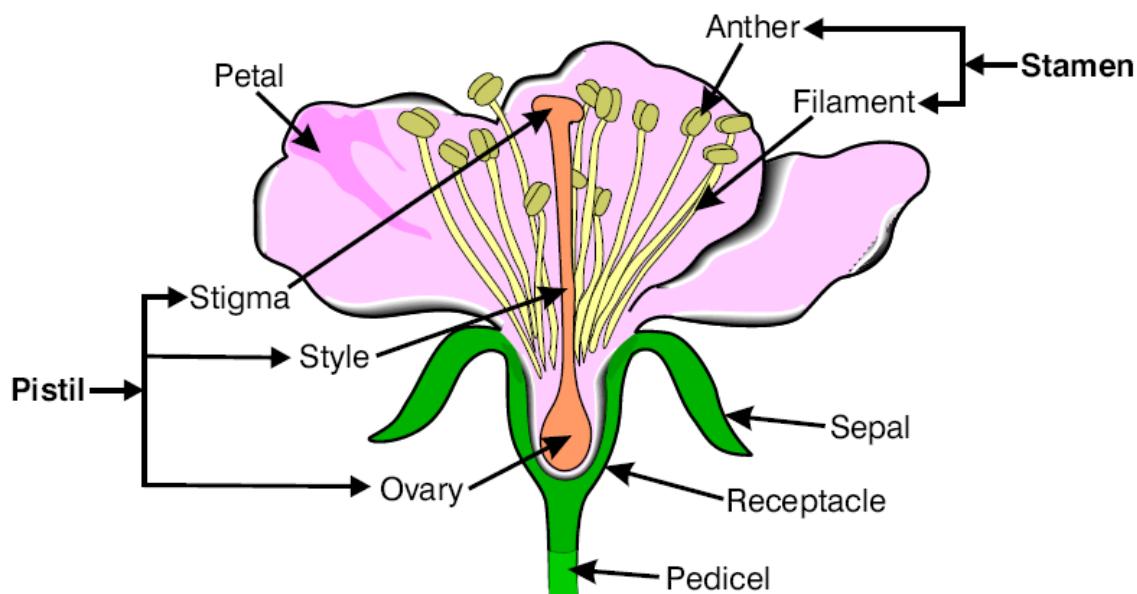
Instructions. Provide information to answer the following questions.

1. Explain the advantage of sexual reproduction.

2. Describe how self-pollination and cross-pollination differ.

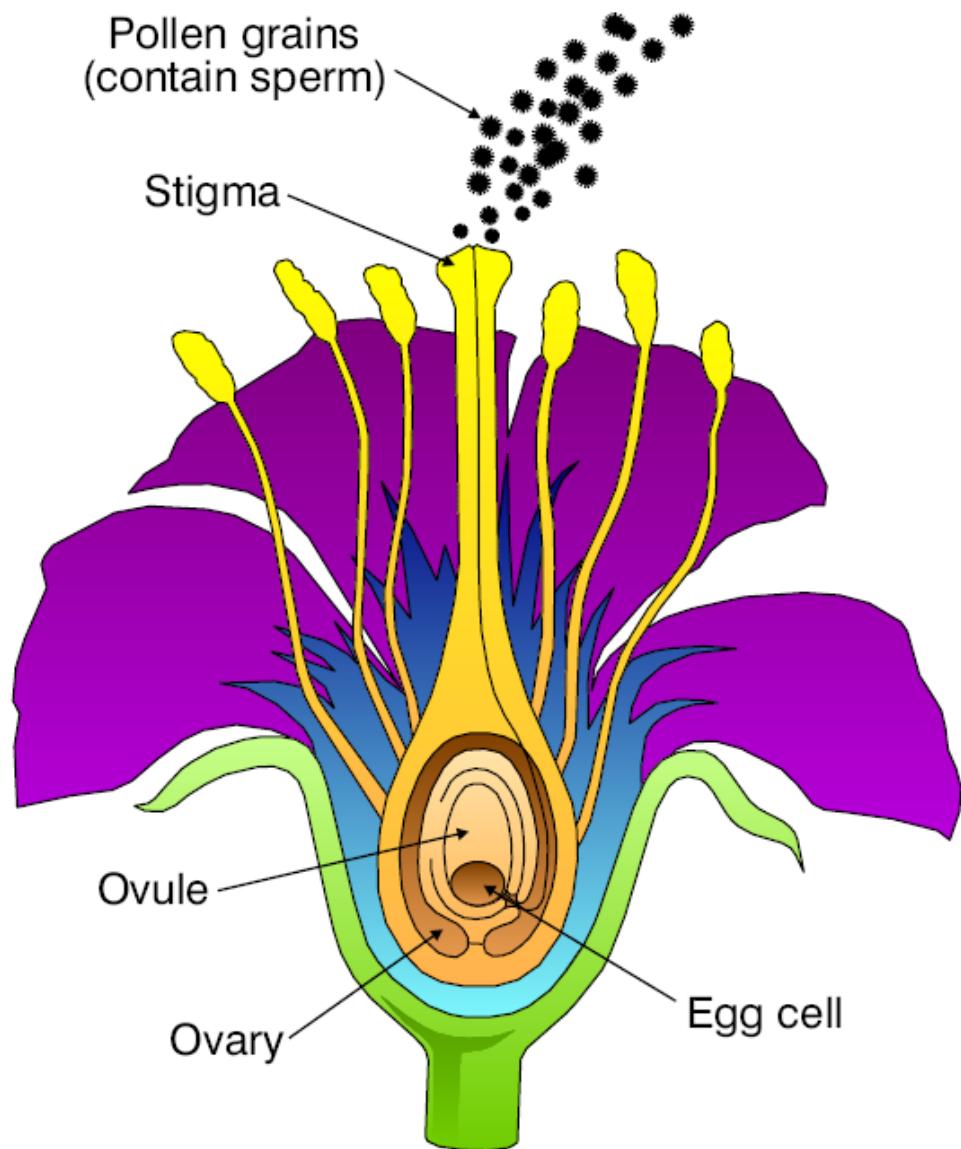
3. Describe the difference between sexual and asexual propagation.

PARTS OF A PERFECT FLOWER



(Courtesy, Interstate Publishers, Inc.)

POLLINATION



DOUBLE FERTILIZATION

