

Lesson Outline for Teaching

Lesson 1: Sexual Reproduction and Meiosis

A. What is sexual reproduction?

1. Sexual reproduction produces an offspring when genetic materials from two different sex cells combine.
 - a. The female sex cell, a(n) egg, forms in an ovary.
 - b. The male sex cell, a(n) sperm, forms in a testis.
2. During a process called fertilization, an egg cell and a sperm cell join together. The new cell that forms is called a(n) zygote.

B. Diploid Cells

1. Organisms that reproduce sexually make two kinds of cells—body cells and sex cells.
2. Body cells are diploid; they have pairs of chromosomes.
3. If a zygote has too many or too few chromosomes, it will not develop properly.
4. Different organisms have different numbers of chromosomes.
5. Homologous chromosomes are pairs of chromosomes that have genes for the same traits arranged in the same order.

C. Haploid Cells

1. Sex cells are haploid; they have only one chromosome from each pair of chromosomes.
2. In meiosis, one diploid cell divides and makes four haploid cells.

D. The Phases of Meiosis

1. Meiosis involves two divisions of the nucleus and the cytoplasm. These divisions, known as meiosis I and meiosis II, result in four haploid cells.
2. During interphase, the reproductive cell grows and duplicates its chromosomes.
3. During meiosis I, each pair of duplicated homologous chromosomes separates.
4. After meiosis I, the two cells formed during this stage go through a second division of the nucleus and cytoplasm called meiosis II. During meiosis II, sister chromatids separate to produce four haploid cells.

E. Why is meiosis important?

1. Meiosis forms sex cells with the correct haploid number of chromosomes. This maintains the correct diploid number of chromosomes in organisms when sex cells join.
2. Meiosis creates genetic variation by producing haploid cells.

Lesson Outline continued

F. How do mitosis and meiosis differ?

1. During mitosis and cell division, a body cell and its nucleus divide once and produce two identical cells.
2. During meiosis, a reproductive cell and its nucleus divide twice and produce four cells—two pairs of identical haploid cells.

G. Advantages of Sexual Reproduction

1. Sexual reproduction produces offspring that have a new combination of DNA. This results in genetic variation among individuals.
2. Genetic variation gives individuals within a population slight differences that might be an advantage if the environment changes.
3. Selective breeding has been used to develop desirable traits in plants and animals.

H. Disadvantages of Sexual Reproduction

1. One disadvantage of sexual reproduction is that organisms have to grow and develop until they are mature enough to produce sex cells.
2. Another disadvantage is that searching for a mate takes time and energy and might expose individuals to predators, diseases, or harsh environmental conditions.

Discussion Question

What are some disadvantages of sexual reproduction?

Organisms have to grow and develop until they are mature enough to produce sex cells. Searching for a mate takes time and energy and might expose individuals to predators, diseases, or harsh environmental conditions.

Lesson Outline for Teaching

Lesson 2: Asexual Reproduction

A. What is asexual reproduction?

1. In asexual reproduction, one parent organism produces offspring without meiosis and fertilization.
2. Because the offspring of asexual reproduction inherit all their DNA from one parent, they are genetically identical to each other and their parent.

B. Types of Asexual Reproduction

1. Cell division in prokaryotes is known as fission.
2. During fission, DNA is copied and the cell splits to form two identical offspring. The original cell no longer exists.
3. Many unicellular eukaryotes reproduce by mitotic cell division. In this type of asexual reproduction, an organism forms two offspring through mitosis and cell division.
4. In budding, a new organism grows on the body of its parent by mitosis and cell division. When the bud becomes large enough, it can break from the parent and live on its own.
5. Regeneration occurs when an offspring grows from a piece of its parent.
 - a. Sea stars, sea urchins, sea cucumbers, and planarians can reproduce through regeneration.
 - b. Many animals can regenerate damaged or lost body parts. This is not reproduction; new individuals are not produced.
6. Vegetative reproduction is a form of asexual reproduction in which offspring grow from a part of a parent plant.
7. Cloning is a type of asexual reproduction developed by scientists and performed in laboratories. It produces identical individuals from a cell or from a cluster of cells taken from a multicellular organism.
8. Using a cloning method called tissue culture, plant growers and scientists use a meristem to make a copy of a plant with desirable traits.
9. Because all of a clone's chromosomes come from one parent, the clone is a genetic copy of its parent.
10. Asexual reproduction enables organisms to reproduce without a(n) mate.
11. Asexual reproduction also enables some organisms to rapidly produce a large number of offspring.
12. Asexual reproduction produces offspring that are genetically identical to each other and to their parent. This results in little genetic variation within a population.

Lesson Outline continued

13. Genetic variation is important because it can increase an organism's chance of surviving if the environment changes.
14. Genetic changes, called mutations, can occur and then be passed to offspring; this can affect the offspring's ability to survive.

Discussion Question

How can a plant be cloned without laboratory equipment?

Take a piece of the plant and plant it in soil so the piece grows as a new plant.