

J. Asexual Reproduction

In order for a species to survive, it must be able to reproduce. In many cases, the reason a species becomes extinct is because it is unable to reproduce enough offspring. Organisms reproduce in two possible ways.

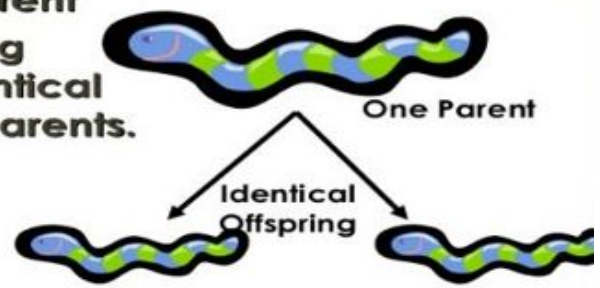
Def'n: **asexual reproduction**

The formation of a new individual from a single organism (one parent)

Since the new individual receives genetic information from only one source, the offspring will be identical genetically to the parent.

Asexual Reproduction

- One parent
- Offspring are identical to the parents.



Advantage:

No mate, happens quickly

Disadvantage:

there are genetically identical and can be drastically affected by a small change

We will discuss four types of asexual reproduction:

1. binary fission

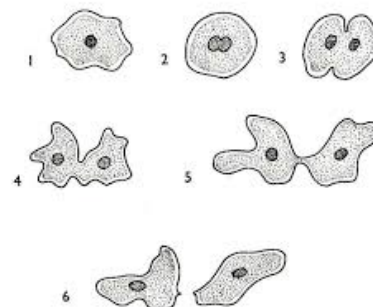
The **splitting of a single organism into 2 new organisms** approximately the same size. In this type of reproduction, the first cell duplicates its nucleus (with all the genetic material) and other organelles. Each half of the cell gets a copy of the organelles and then the cell divides.

Examples: **bacteria, amoeba**

bacteria



amoeba splitting

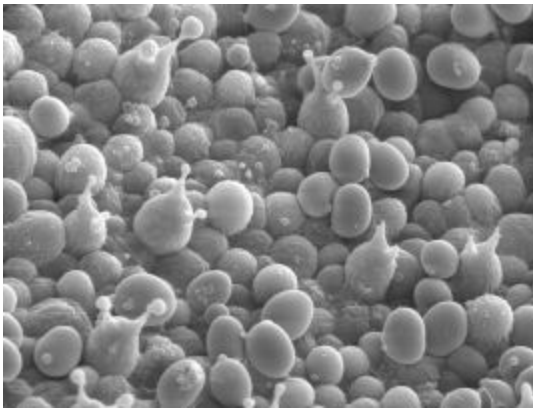


2. spores

A single celled reproductive structure from which an individual offspring develops

For this situation, the organism supplies genetic material to a spore. Spores have a tough outer coat that prevents them from being damaged or drying out. Many spores are produced and only one parent supplies the genetic information.

Examples: mushrooms, green algae, ferns



mushroom spore



fern spore

3. plant asexual reproduction

Growing of roots, tips, and stems that contain areas of rapid growth (meristem)

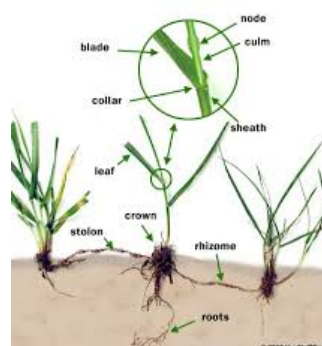
Examples: strawberry runners, potato, grasses, spider plant



strawberry runner



potato eye



grass rhizome

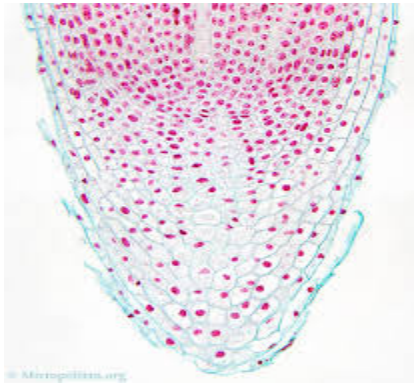


spider plant

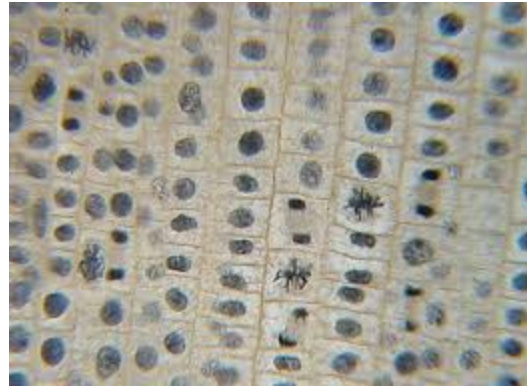
Def'n: **meristem**

An area of rapid cell division of unspecialized cells that produce new growth

Meristematic cells eventually become the other specialized cells within the plant (leaves, stems, flowers, etc.) If the plant is damaged, the meristematic cells are able to make repairs. These cells can also be used to make a completely new plant.



onion root tip

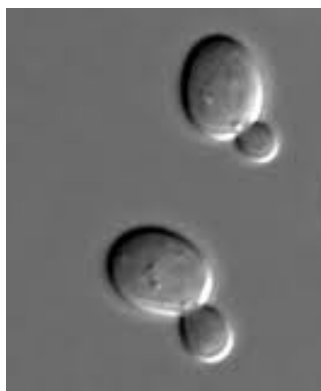


meristem cells

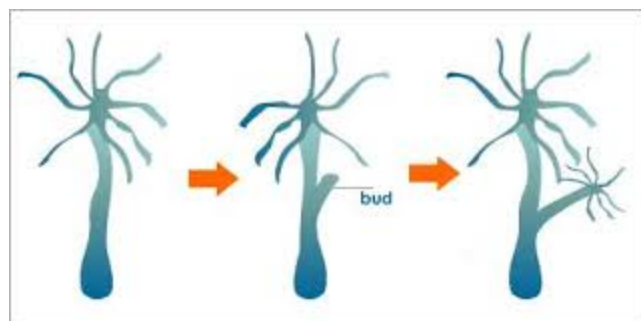
4. Budding

Process in which a **bud forms on an organism and eventually breaks off** to form a new organism

Examples: **yeast** cells, sea sponges, **hydras**



yeast cells



hydra

Def'n: **clone**

Identical copy or duplicate molecular, gene, or cell

Asexual Reproduction Assignment

1. What are the four ways organisms reproduce asexually?

- i) _____
- ii) _____
- iii) _____
- iv) _____

2. What is the main advantage for an organism to reproduce asexually?

3. A single mushroom on a lawn may produce millions of spores. Why are there not millions of mushrooms produced on the lawn?

4. Could humans reproduce by binary fission? Explain why or why not.

5. One way of reproducing plants is by “cuttings”. A leaf is cut and placed into soil where it forms a new plant. Why would a gardener use this method instead of planting seeds?

6. The following questions will be answered by performing some computer research.

A. Mexican Whiptail Lizard

Do a search to find information on this organism and answer the questions that follow.

a) Where does it live?

b) What does “parthenogenic” mean?

b) What sex (gender) are all the adults?

B. Phasmatodea (stick insects)

Do a search to find information on this organism and answer the questions that follow.

a) What do these insects imitate? _____

b) Find information on their Life Cycle. Does the female require a male to fertilize? ____

c) Are some species bisexual? _____

d) What determines if the species is bisexual or not? _____

e) Do all phasmids reproduce in this way? _____

K. Sexual Reproduction

Sexual reproduction is different from asexual reproduction.

Def'n: sexual reproduction

Reproduction process involving 2 sexes or mating types and resulting in offspring with a combination of genes from both parents



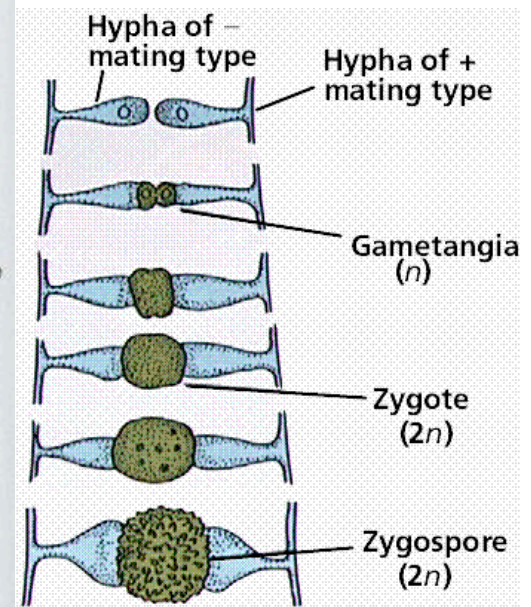
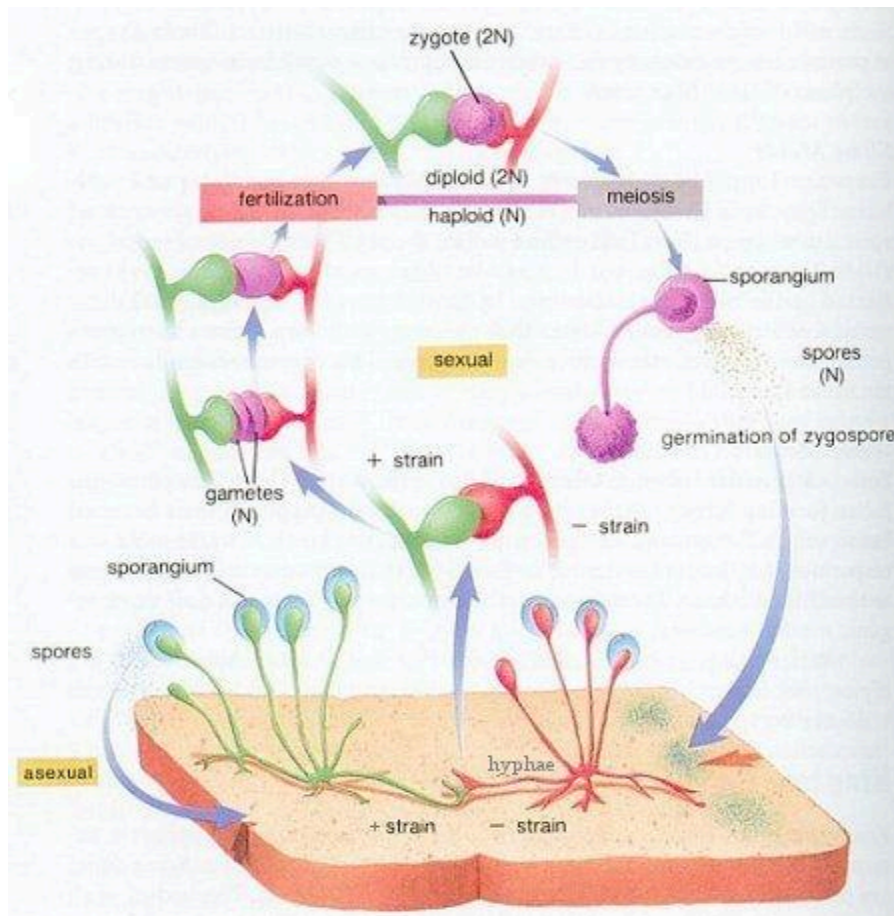
Sexual Reproduction

There are four types of sexual reproduction we will cover.

1. zygosporous

Single-celled reproductive structure that is formed by some fungi

Example: bread mold



2. bacterial conjugation

The direct transfer of DNA from one bacteria to another that then divides

Examples: bacteria

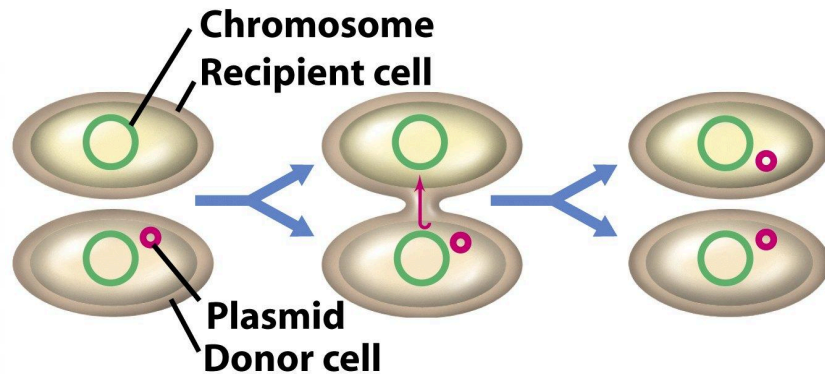
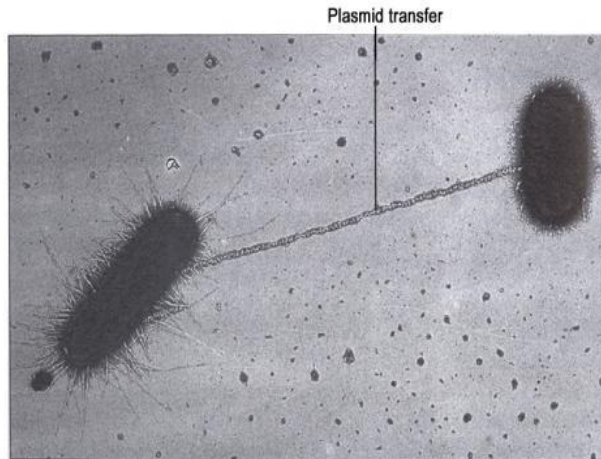


Figure 10-19 Brock Biology of Microorganisms 11/e
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In this type of sexual reproduction, the bacteria do not “mate” as such. Bacterial conjugation results in genetic recombination but not reproduction because there is no increase in the number of cells. Following conjugation, the cells divide by binary fission (asexual reproduction). Bacteria are known to pass on their resistance to antibiotics in this way.

3. plant sexual reproduction

Fertilization due to a sperm (pollen) and egg (ovule) coming together

Plants are classified as either angiosperms (have enclosed seeds in fruits or grains and produce flowers) or gymnosperms (do not have enclosed seeds and do not produce flowers).

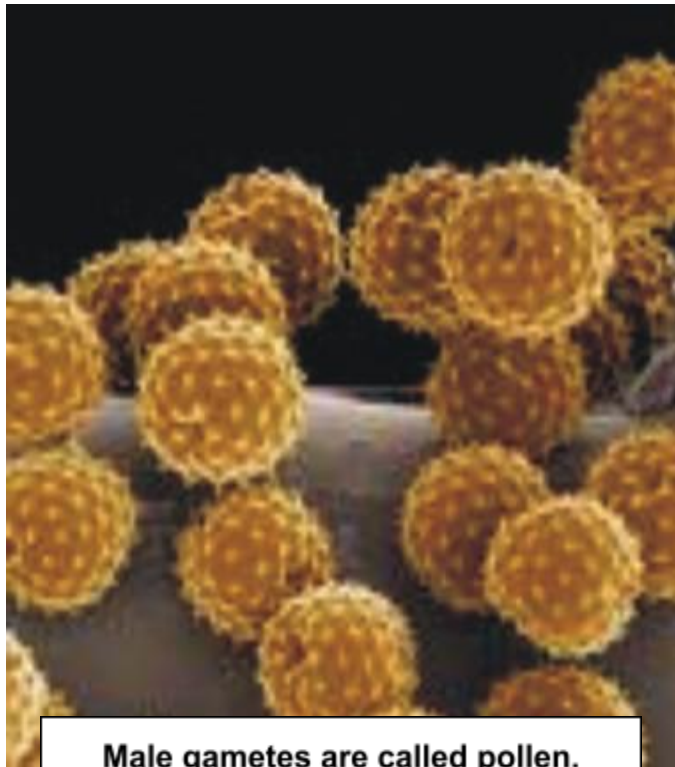
Example: plants being pollinated

Common Flower Parts



Def'n: **gamete (sex cell - sperm or ovule)**

Male or female reproductive cell containing half the number of chromosomes

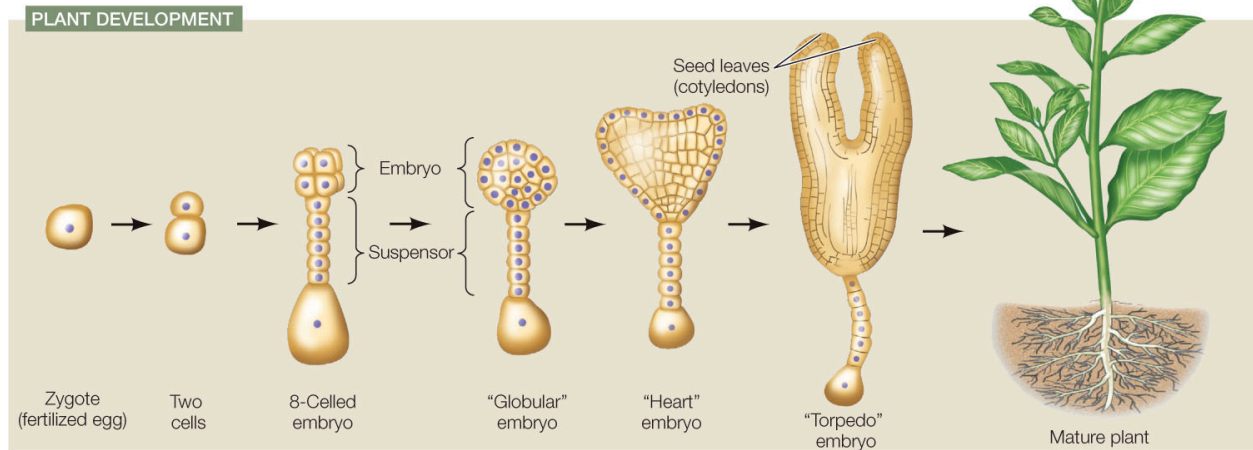


Male gametes are called pollen.



Female gametes are called eggs.

During sexual reproduction in flowering plants, pollen grains, each of which contains a sperm nucleus, are produced in the stamen. The pollen travels in the stigma (pollen tube) until it reaches the ovule. The sperm nucleus then fertilizes the egg to become a zygote.



Def'n: zygote

Newly fertilized cell

The zygote then undergoes many cell divisions and forms a multicellular embryo.

Def'n: embryo

A multicellular organism in early development

In plants: The embryo is supplied with food by a cotyledon.

Def'n: cotyledon

A structure in the seed that provides food

Note:

Some plants may reproduce both asexually and sexually.

Examples:

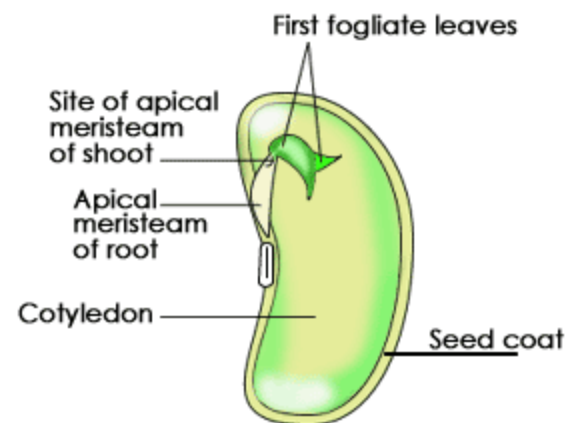
strawberries – flowers (seeds) and runners

spider plants – flowers (seeds) and runners

grasses – flowers (seeds) and rhizomes

potatoes – flowers (seeds) and planting mature potatoes with eyes

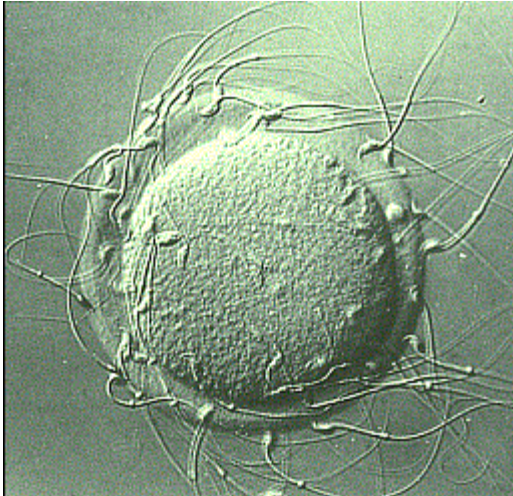
Dicot Seed



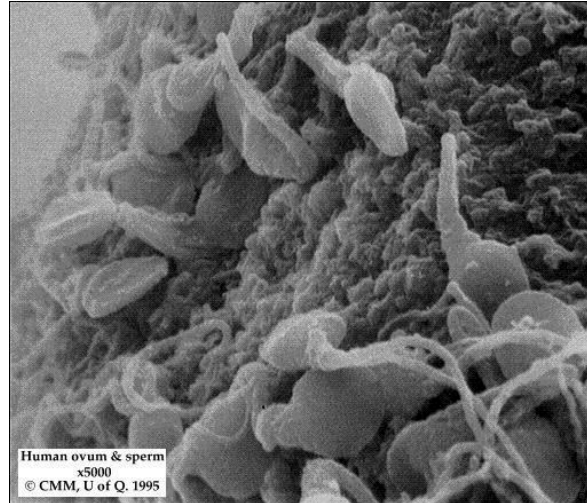
4. animal sexual reproduction

Fertilization due to the combination of a sperm and an egg

Animals have a variety of methods of reproducing sexually, but they all must involve the presence of a sperm cell and egg cell in the same place at the same time.



Female gametes are called eggs.



Male gametes are called sperm.

Advantage: genetic variation

Disadvantage: slow, you need a mate

Sexual Reproduction Assignment

1. What is the difference between sexual and asexual reproduction?
2. State and give an example of each type of sexual reproduction we discussed:
3. What are an organism's "adaptations"?
4. What is polymorphism? Which types of organisms are generally polymorphic?
5. What is a hermaphrodite?
6. What is the main advantage for organisms undergoing sexual reproduction as opposed to asexual reproduction?
7. What is a gamete and what are the male and female forms of this?
8. Explain how a zygote is formed.
9. What is the difference between budding and bacterial conjugation?
10. State one advantage and one disadvantage of a flowering plant self-pollinating?
11. Explain how a zygospore is produced in bread mould.
12. What is binary fission?
13. State four examples of organisms that reproduce both sexually and asexually.
14. Explain the two ways that a potato can reproduce. Be specific in your answer.

L. Artificial Selection and Natural Selection

In many situations people want to have organisms with a set of desired traits. Many times certain traits are emphasized over others to develop particular characteristics.

Def'n: **artificial selection (selective breeding)**

Technique in which only those organisms with the desired characteristics are bred together

Examples: **race horses**, purebred animals, **belgian blue cows**

Other times, nature takes care of selecting which organisms of a species survive. This is often called survival of the fittest (best adapted).

Def'n: **natural selection**

Only those organisms with the best adaptations survive and reproduce, resulting in changes to the genetic traits

Examples:

1. Case of the **Peppered Moth** (handout)
2. San Jose Scale (handout)
3. **Antibiotic resistance in bacteria**
4. Problems with purebred animals

Selection assignment:

1. What is the difference between artificial selection and natural selection?
2. Why does artificial selection produce changes in organisms faster than natural selection?

3. As a tomato grower, state three desirable traits you may wish to develop in the fruit.
4. Wild boars are raised in captivity for their meat. State two problems that could exist should they escape into the wild.
5. Give an advantage and disadvantage to owning a purebred animal compared with a mixed breed.
6. Some doctors express concern that over prescribing antibiotics can lead to bacterial resistance. Explain how bacteria can become resistant to some antibiotics.
7. Some people suggest that the use of antibacterial soap is not good for us. Explain why.
8. Before the 1970's a chemical pesticide called DDT was used as an insect control. It was highly resistant to breaking down and would remain in the food chain for many years. Birds at the top of the food chain were particularly affected (hawks, eagles, falcons). The chemical in their system would prevent calcium from building up on the eggs during development and the eggs would have weak shells.
 - a) What happened to the population of these birds?
 - b) Explain why the population of these birds was affected.
 - c) DDT was banned from use during the 1970's. What happened to the bird population after the ban?

d) Why would these birds be more affected than smaller birds (sparrows, wrens, robins, etc.)?

e) Is this situation an example of natural selection or artificial selection?

f) Although banned from Canada, DDT is still used in many developing countries because it is inexpensive and effective at controlling mosquitoes that carry malaria. What effects could this have on birds in Canada? Explain your answer.

9. Does natural selection contribute to biological diversity? Explain.

10. Explain how selective breeding (artificial selection) limits biodiversity.