Chapter 1

Reproduction in Organisms

Parthenogenesis & Its Types

What is Parthenogenesis?

Parthenogenesis is a type of asexual reproduction involving the development of female gametes **without** any fertilization is called parthenogenesis.

- The animals which are formed by unfertilized eggs are called **parthenotes**.
- The discovery of parthenogenesis was done by Charles Bonnet in the eggs of sea-urchins.

Whiptail Species reproduces by Parthenogenesis

- Animals such as **bees, aphids, wasps, ants** have no sex chromosomes. These organisms reproduce by parthenogenesis. A few **plants, reptiles** and **fish** are also capable of reproducing in this manner.

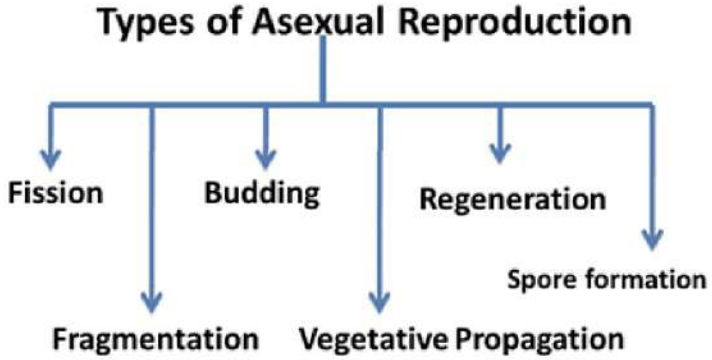
Asexual Reproduction

What is Asexual Reproduction?

- Usually followed by organisms with relatively simpler organizations.
- Offsprings produced by a single parent.
- With/without the involvement of gamete formation.

- Offsprings produced genetically and morphologically, similar to each other and to the parent, i.e. they are clones.
- In Protista and Monera, the parent cells divide into two to give rise to new individuals.
- Thus, in these organisms cell division is the mode of reproduction itself.
- Asexual reproduction is the most common method of reproduction in organisms having a Material similar body like in algae and fungi but during the unfavourable condition, they shift to sexual reproduction.

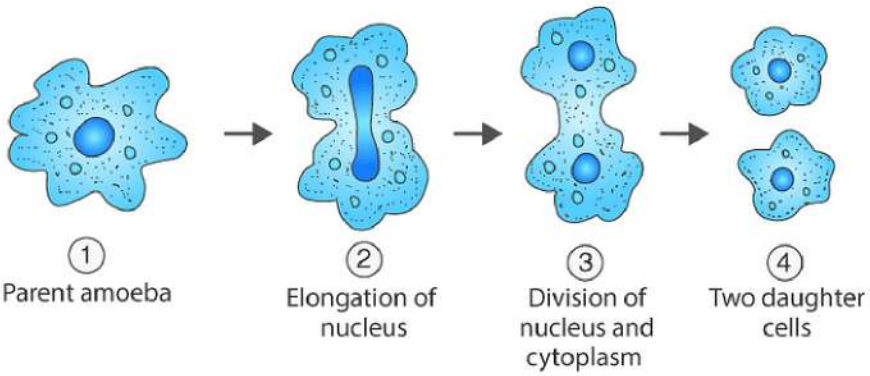
Types of Asexual Reproduction



Classification of Asexual Reproduction

(a) Binary Fission

- The term "fission" means "to divide". During binary fission, the parent cell divides into two cells.
- The cell division patterns vary in different organisms, i.e., some are directional while others are non-directional. Amoeba and euglena exhibit binary fission.



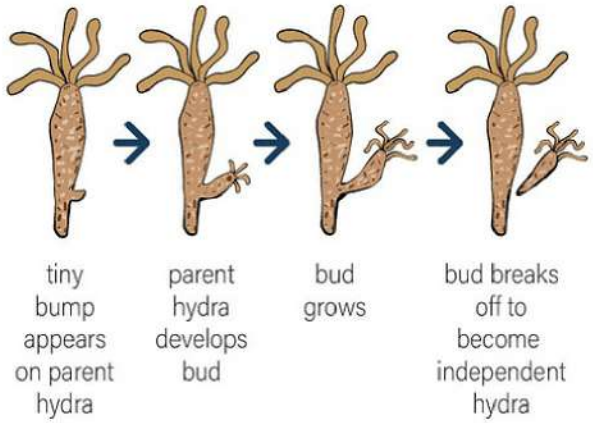
Binary Fission in Amoeba

- It is one of the simplest and uncomplicated methods of asexual reproduction.

- The parent cell divides into two, each daughter cell carrying a nucleus of its own that is genetically identical to the parent.
- The cytoplasm also divides leading to two equal-sized daughter cells.
- The process repeats itself and the daughter cells grow and further divide.

(b) Budding

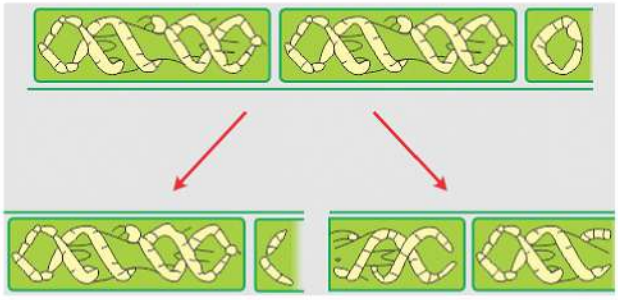
- Budding is the process of producing an individual through the buds that develop on the parent body.
- Hydra is an organism that reproduces by budding.
  - The bud derives nutrition and shelter from the parent organism and detaches once it is fully grown.



Budding in Hydra

(c) Fragmentation

- Fragmentation is another mode of asexual reproduction exhibited by organisms such as spirogyra, planaria etc



Fragmentation in Spirogyra

- The parent body divides into several fragments and each fragment develops into a new organism.

(d) Vegetative Propagation

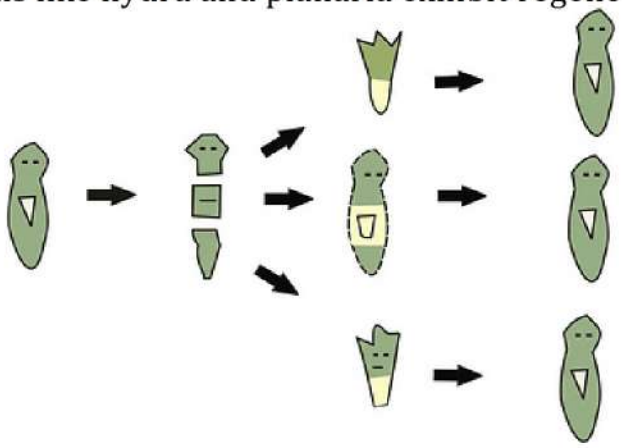
- Asexual reproduction in plants occurs through their vegetative parts such as leaves, roots, stems, and buds. This is called vegetative propagation.
- **Example**: Potato tubers, Runners/stolon, Onion bulbs, etc., all reproduce through vegetative propagation.

Vegetative Parts	Examples
Roots	Dahlia, Asparagus, Dalbergia, Guava and Tapioca
Stems ❖ **Tubers** ❖ **Bulbs** ❖ **Rhizome** ❖ **Corms** ❖ **Suckers** ❖ **Runners** ❖ **Stolons** ❖ **Offsets**	 Potato and Artichoke Garlic and Onion Ginger, Turmeric and Banana Colocasia, Crocus and Gladiolus Mint and Chrysanthemum Oxalis and Centella Jasmine Pistia and Eichhornia
Leaves	Bryophyllum, Begonia, Kalanchoe and walking fern
Bulbils	Agave, lily and Dioscorea
Turions (fleshy buds in aquatic plants)	Potamogeton and Utricularia

(e) Regeneration

- Regeneration is the power of growing a new organism from the lost body part. For eg., when a lizard loses its tail, a new tail grows.
- This is because the specialized cells present in the organism can differentiate and grow into a new individua

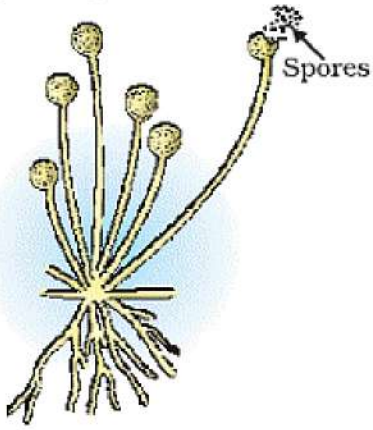
- Organisms like hydra and planaria exhibit regeneration.



Regeneration in Planaria

(f) Spore Formation

- Spore formation is another means of asexual reproduction.
- During unfavourable conditions, the organism develops sac-like structures called sporangium that contain spores.



Spore Formation

- When the conditions are favourable, the sporangium burst opens and spores are released that germinate to give rise to new organisms.

Advantages of Asexual Reproduction

Following are the advantages of asexual reproduction:

- Mates are not required.
- The process of reproduction is rapid.
- An enormous number of organisms can be produced in very little time.

- Positive genetic influences pass on to successive generations.
- It occurs in various environments.

Disadvantages of Asexual Reproduction

The major disadvantages of asexual reproduction are:

- Lack of diversity. Since the offsprings are genetically identical to the parent they are more susceptible to the same diseases and nutrient deficiencies as the parent.
- All the negative mutations persist for generations.
- Since only one organism is involved, the diversity among the organisms is limited.
- They are unable to adapt to the changing environment.
- A single change in the environment would eliminate the entire species.