

Chapter 8 How do organisms reproduce?

The process by which living organisms produce their own kind of individuals to maintain the continuity of species is called reproduction.

The Fundamentals of Reproduction

The process of reproduction involves the formation of DNA copy and other cellular apparatus required by the cells of an individual. DNA is the blueprint of all the basic design of organisms.

Variations

DNA copying during cell division always causes some or other type of variations in newly formed cell. This brings the differences found in the morphological and physiological features of an organism.

Types of Reproduction

Reproduction is mainly of two types, i.e., asexual reproduction and sexual reproduction.

Asexual Reproduction

It is a rapid mode of multiplication in which one parent (either male or female) is involved. The new individuals produced are identical to their parents.

Sexual Reproduction

In this process, the gametes from parents of opposite sex (male and female) fuse together to form a zygote. This zygote develops further and gives rise to new offspring. The individual produced by this method exhibits variation.

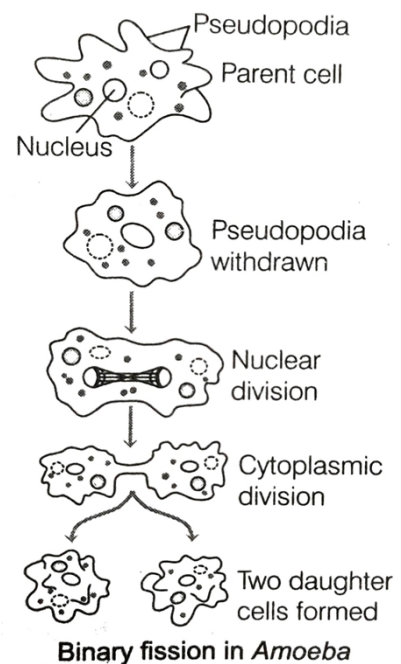
Modes of Asexual Reproduction

Asexual reproduction occurs in unicellular organisms by fission, budding, spore formation, fragmentation, regeneration (in animals) and vegetative propagation (in plants). It occurs in multicellular organisms by budding and regeneration. These are as follows

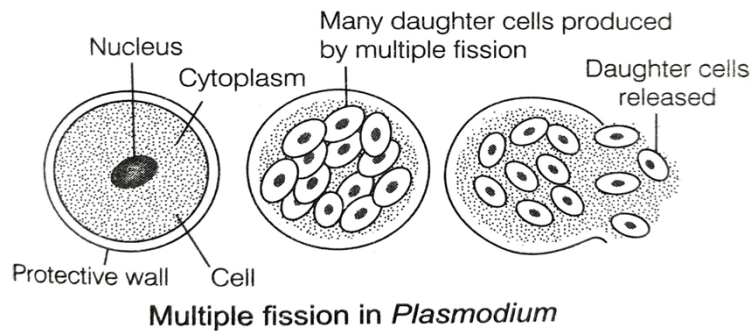
Fission

The process where a unicellular organism splits itself into two or more daughter cells. It is of two types, i.e.

- (a) **Binary Fission** In this process, parent cell divides into two identical daughter cells, e.g., Amoeba, Leishmania.



(b) **Multiple fission** in this process, parent cell divides into many identical daughter organisms simultaneously, e.g., plasmodium.

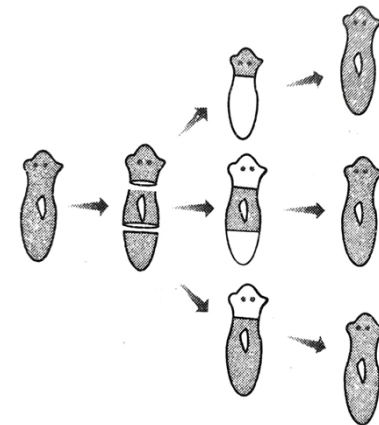


Fragmentation

The parent body on maturation breaks up into two or more small fragments, which later grow into a completely new organism, e.g., Spirogyra.

Regeneration

In this process, all fragments or parts that are separated from the body develop in new animals, e.g., sponge, Planaria, Hydra, etc.



Regeneration in *Planaria*

Budding

A daughter organism is formed from a small projection known as bud. It develops as an outgrowth due to repeated cell divisions of the parent body. When fully grown, it detaches to grow into a new independent individual, e.g., Hydra.

Vegetative Propagation

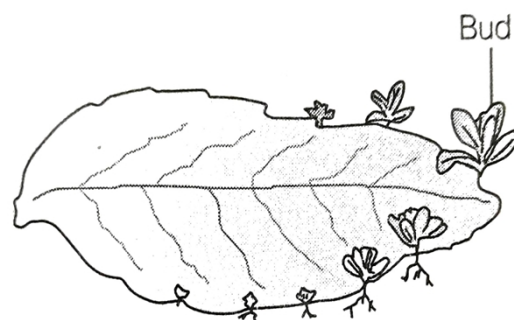
The process of obtaining complete plant from any vegetative part of plant is called vegetative propagation. This is mainly of two types

Natural Vegetative Propagation

The vegetative propagation that occurs automatically in plants is called natural vegetative propagation. It can be achieved by root, stem, leaf, etc., e.g., Bryophyllum.

Artificial Vegetative Propagation

The artificially made vegetative propagules in plants by humans, is



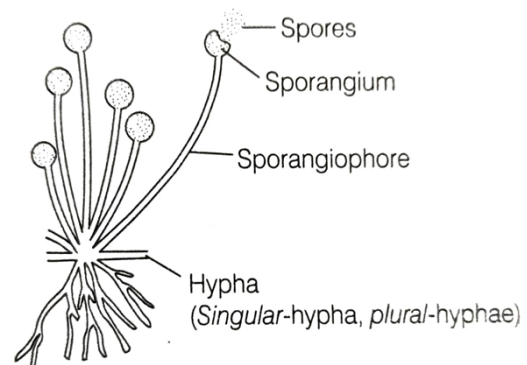
Leaf of *Bryophyllum* with buds

called artificial vegetative reproduction, e.g., cutting, layering, grafting, etc.

- **Grafting** A small part of stem from one plant without roots (scion) is attached to the part with root (stock) of another plant.
- **Layering** The development of roots on a stem, while the stem is still attached to the parent plant is called layering.
- **Tissue culture** It is a technique used for growing new plants using living tissues (like flower buds, stems, growing tips, leaves, etc.) in vitro in an artificial culture medium.
- Using this technique, large number of plants can be developed from a single parent.

Spore Formation

It is a type of asexual reproduction where blob-like structures called sporangia are involved. These cells or spores have the ability to germinate under favorable conditions forming new plants, e.g., *Rhizopus*.



Spore formation in *Rhizopus*

Modes of Sexual Reproduction

In this type of reproduction, both sexes, i.e., male and female are involved. Sex cell or gamete of one parent (male) fuses with the sex cell or gamete of another parent (female). This results in production of a new cell called zygote.

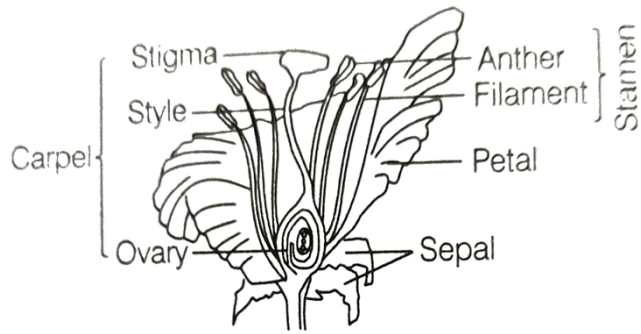
Sexual Reproduction in Flowering Plants

Flowering plant bear the reproductive parts within the flower and their seeds are enclosed in a fruit. Most plants have both male and female reproductive organs in the same flower and are known as bisexual flowers. While others have either male or female reproductive parts in a flower known as unisexual flowers.

A flower comprises of four main parts, i.e., sepals, petals, stamens and carpels. Stamens and carpels are the reproductive parts of a flower.

- Stamen** It is the male reproductive part of the flower.
- Anther** It is a bilobed structure containing two pollen sacs present at tip of stamen. These produce pollen grains that are yellowish in colour.
- Carpel (Pistil)** It is the female reproductive part, which is present in the center of the flower. It comprises of three parts

- a. **Stigma** It is the terminal part of carpel which may be sticky. It helps in receiving the pollen grains during pollination.
- b. **Style** It is the middle-elongated part of carpel. It helps in the attachment of stigma to the ovary.
- c. **Ovary** it is the swollen bottom part of carpel. It contains ovules having an egg cell (female gamete).



Longitudinal section of flower

Pollination

The transfer of pollen grains from the anther of the stamen to the stigma of a flower is termed as **pollination**. The pollen grains can be transferred by various agents like wind, water, insects and animals.

Pollination usually occurs in two ways

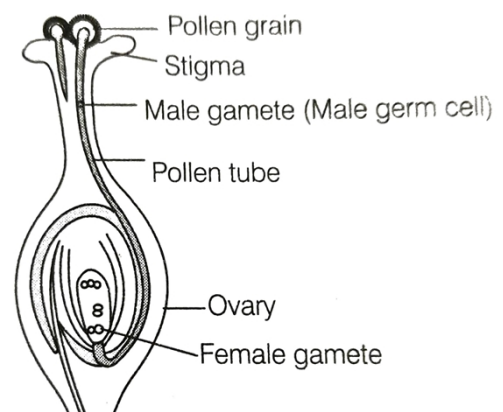
- 1. **Self-pollination** The pollen from the stamen of a flower is transferred to the stigma of the same flower or another flower of same plant.
- 2. **Cross-pollination** The pollen from the stamen of a flower is transferred to the stigma of another flower of different plant of the same species.

Fertilization

It is the process of fusion of male and female gametes. It gives rise to a zygote. As soon as the pollen lands on suitable stigma, it reaches the female germ cells in ovary. This occurs via pollen tube. The pollen tube grows out of the pollen grain, travels through the style and finally reaches the ovary.

After fertilization, ovule develops a rough coat around itself and gets converted to seeds and ovary ripens as fruit.

The seed contains future embryo that grows under suitable conditions (germination). The fertilization in the flowering plant is shown in the given figure.



Germination of pollen grain on stigma

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