



মণিপুরৰ শাসনৰত্ন (মণি)

DEPARTMENT OF EDUCATION (S)

Government of Manipur

CLASS X  
BIOLOGY

CHAPTER 15 - REPRODUCTION

NOTES

- **Reproduction** is the biological process by which living organisms produced new individuals similar to themselves. Reproduction is not a life process but to maintain the continuity of their own race (or species).

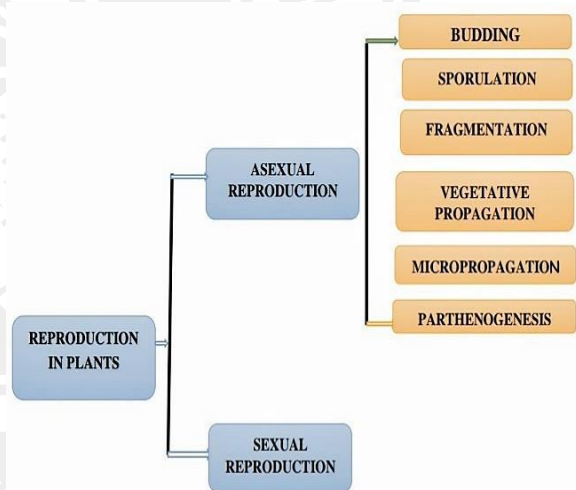
**TYPES OF REPRODUCTION:**

**Asexual and Sexual reproduction**

- **Asexual reproduction** is a rapid method of reproduction by a single parent without the formation and fusion of two cells or gametes.
- All the offspring are genetically identical and known as **clone**.
- **Sexual reproduction** is a slower method of reproduction by two parents (male and female) involving the formation and union of gametes.
- All the offspring are not genetically identical and show variations.

**REPRODUCTION IN PLANTS**

- **Types of Asexual reproduction in plants:**  
**Budding, fragmentation, sporulation (spore formation), vegetative propagation, parthenogenesis and tissue culture.**



- **Budding** is an asexual method of reproduction with **bud** which develops as an outgrowth due to repeated cell division at a specific site e.g. *Yeast*

Fig. Types of Asexual reproduction in plants

Fig: Budding in Yeast.

- **Fragmentation** is an asexual method of reproduction in which the parent breaks into daughter fragments e.g. *Spirogyra*
- **Sporulation or spore formation:** Asexual method of reproduction by means of small reproductive units called **spores**. Spores are small bodies containing a nucleus, a small amount of cytoplasm and surrounded by thick protective wall that get easily dispersed by wind e.g. Liverworts, mosses, ferns, etc.

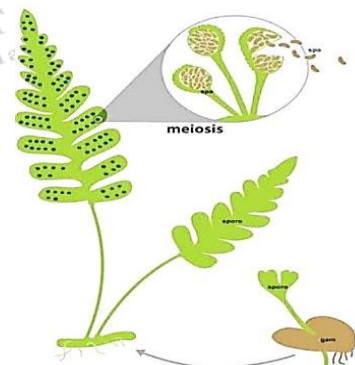
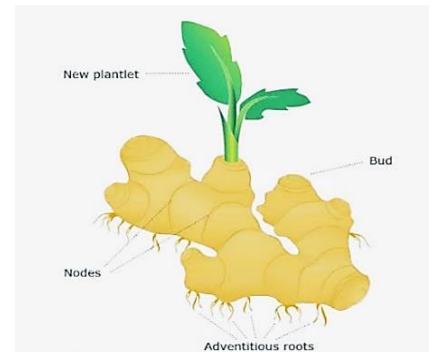


Fig. Sporulation in Fern



**Vegetative propagation:** Asexual reproduction with the help of vegetative parts of plants such as roots, stems, leaves, buds, etc. is known as **vegetative reproduction**. e.g. sweet potato, onion, grasses, banana.

- It is used in artificial methods of propagation such as layering, grafting, cutting and artificial culture in different media.



**Fig: Vegetative Propagation**

➤ **Micropropagation (or Tissue culture)**

The technique of raising plants vegetatively by culturing cells, tissues or organs on a sterilized nutrient medium under *in vitro* condition is called micropropagation.

➤ **Parthenogenesis**

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

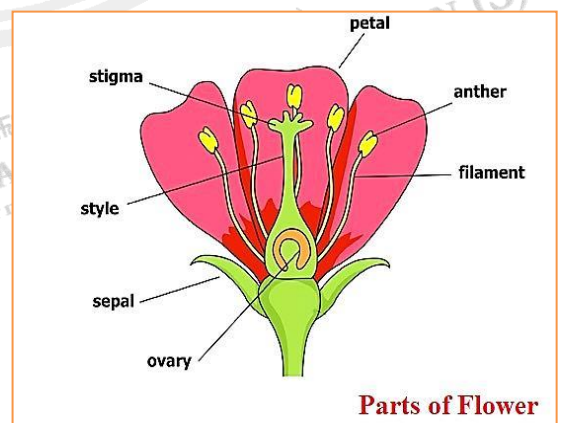
- It is the process of development of new individual from unfertilized ovum or egg.
- It is derived from the Greek words for “virgin birth”.
- It may be natural or artificial e.g. *Chara*, Tomato, etc.

**SEXUAL REPRODUCTION (PLANTS)**

- In lower plants, it occurs by the process of conjugation (*Spirogyra*) and gametangial contact (*Mucor*).
- In mosses and ferns, male and female gametes are formed inside antheridium and archegonium respectively. Zygote is formed by union of gametes which undergoes reduction division to form spores.
- In gymnosperms, seeds are formed within the cones and inside the fruit in angiosperms.

**Flower** is the reproductive structure of a flowering plant. It has four sets of floral parts.

- **Calyx:** collection of sepals.
- **Corolla:** collection of brightly coloured petals.
- **Androecium:** male reproductive parts consisting of stamens (composed of filaments and anthers). It produces male gametes.
- **Gynoecium:** female reproductive parts consisting of stigma style and swollen base ovary.



**Parts of Flower**



মণিপুরৰ শিক্ষা বিভাগ (সংস্কৃত)

**DEPARTMENT OF EDUCATION (S)**

Government of Manipur

- Flower may be **bisexual** (both androecium and gynoecium parts are present e.g. -Mustard, Pea, etc.) or **unisexual** (contain either androecium or gynoecium e.g.-Papaya, Watermelon, etc.)

### Pollination

- It is the transfer of pollen grains from anther to stigma of same (**self pollination**) or different flower (**cross pollination**). It is carried out by the agencies of wind, water, insects, etc.
- **Cross pollination** (artificial pollination) is widely used in production of hybrids.

**Fertilization** is the fusion of the male and female gametes and its product is **zygote**.

**Seed** is a fertilized ovule containing a protective seed coat, food and an embryo.

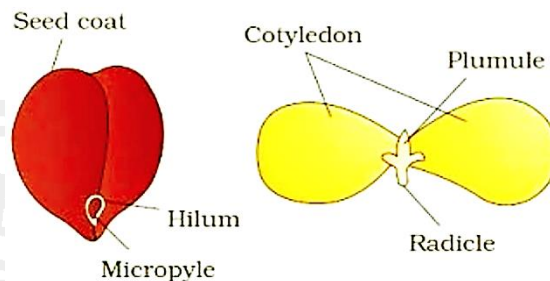


Fig: Parts of a Seed

- The parts of seed are **seed coat, embryo, endosperm and hilum**.

### Types of seed:

Endospermic seed	Non-endospermic seed
Endosperm is present in mature seeds. Food is stored in the nutritive tissue.	The endosperm is absent in mature seeds. Food is stored in cotyledons.

**Monocots** have single cotyledon e.g. Rice, wheat, Maize, etc. whereas **Dicots** have two cotyledons e.g. Pea, beans, mustard, etc.

**Germination:** It is the growth of embryo to form seedling.

- Types of germination: **Hypogeal germination** and **Epigeal germination**

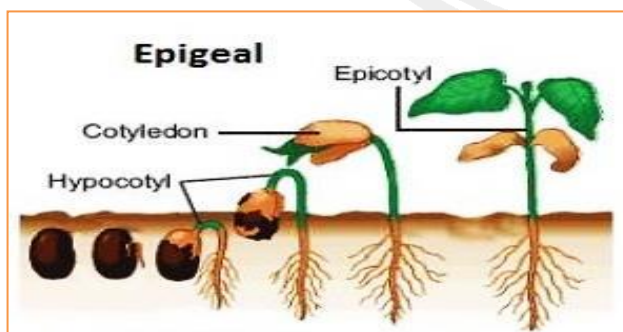


Fig: Hypogeal Germination

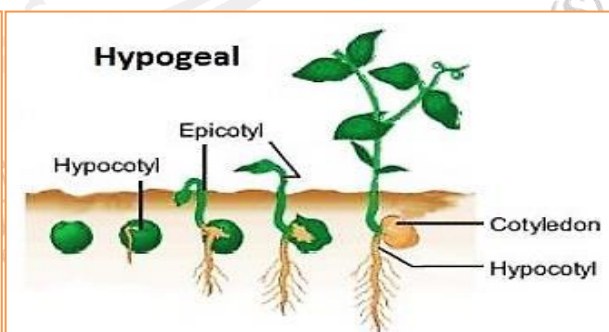


Fig: Epigeal Germination



মণিপুরৰ শিক্ষা বিভাগ (সংস্কৃত)

DEPARTMENT OF EDUCATION (S)

Government of Manipur

### Difference between Epigeal and Hypogeal germination:

Hypogeal germination	Epigeal germination
<ul style="list-style-type: none"> <li>➤ The cotyledons remain below the ground and plumule emerges.</li> <li>➤ This is due to the elongation of epicotyl.</li> <li>➤ The cotyledons do not act as leaf.</li> <li>➤ e.g. Maize, Gram, Bean, etc.</li> </ul>	<ul style="list-style-type: none"> <li>➤ The cotyledons emerge above the ground.</li> <li>➤ This is due to elongation of hypocotyl.</li> <li>➤ The cotyledons act as embryonic leaf.</li> <li>➤ e.g. Castor, sunflower, etc.</li> </ul>

**Reproduction in animals:** Asexual methods-Binary fission, multiple fission, regeneration and budding

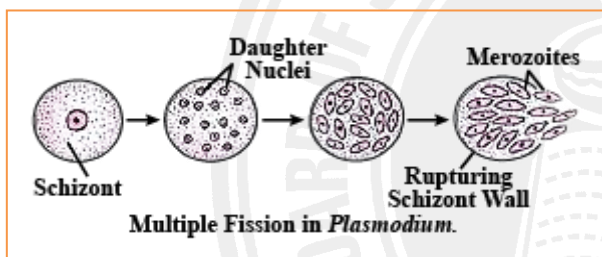
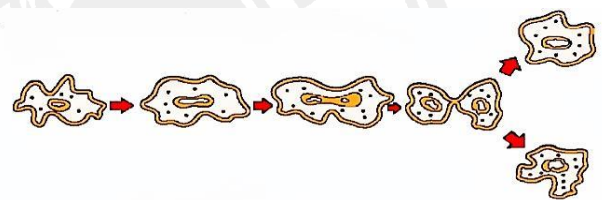


Fig. Multiple Fission in *Plasmodium*



Binary fission in *Amoeba*

Fig. Binary Fission in *Amoeba*

**Fission:** A single cell body is divided into two more daughter individuals found only in unicellular organism.

**Regeneration:** The process of development of new individuals from broken pieces which is carried out by special cells in which they divide to form a large number of cells ; different cells then give rise to various cell types and tissues and finally give rise to a complete individual .

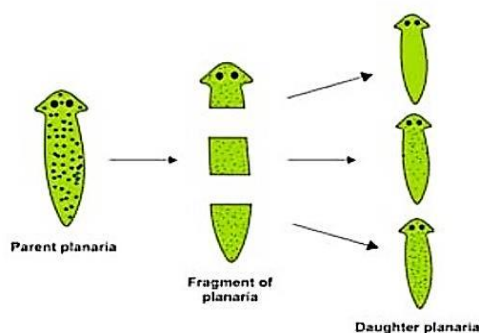


Fig. Regeneration in *Planaria*

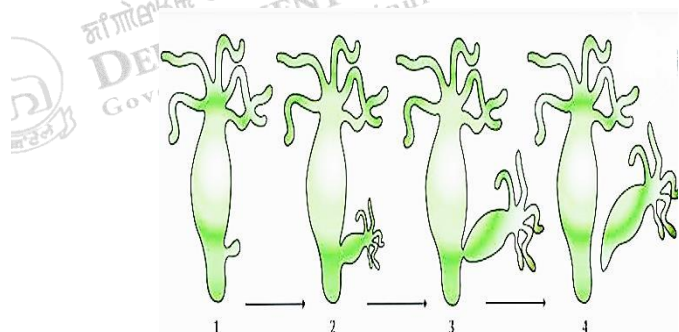


Fig. Budding in *Hydra*





**Budding** is also found in animals like *Hydra* where special reparative cells develop an outgrowth called **bud** due to repeated cell division at a specific site. The bud grows in size and detached at maturity .

### **SEXUAL REPRODUCTION (INVERTEBRATES)**

- **Through oral grooves:** In *Paramecium*, they meet by their oral grooves for exchange of cytoplasmic and nuclear materials. After separation each individual divides into two by binary fission.
- **Copulation:** In insects, both the partners are actively involved in the transfer of gametes by their physical union e.g. earthworms, insects.
- **Hermaphrodite animals:** In hermaphrodite animals like hydra and tapeworm, male and female gonads mature at different time to perform sexual reproduction.
- In earthworm, sperms are exchanged between two individuals by copulation to prevent them from self-fertilization.
- **Metamorphosis** is the transformation from larva to adult during the development of an organism e.g. seen in insects, amphibians, etc.

### **Sexual reproduction (Vertebrate animals)**

The fusion of gametes occur by external release as in Fishes and Amphibians (**External fertilization**) or by internal transfer as in birds and mammals (**Internal fertilization**)

**Viviparous:** Animals that gave birth to young ones and the development takes place inside uterus by placenta e.g. rat, rabbit, monkey and human beings.

**Oviparous:** Animals that lay egg and development of embryo takes place inside it e.g. birds

