

KAMARAJAR HIGHER SECONDARY SCHOOL, BOMMAIKUTTAIMEDU, NAMAKKAL-19



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# 1. REPRODUCTION IN ORGANISM

## Introduction:

### Stages involved in life cycle of living organism:

- |                |                 |                  |
|----------------|-----------------|------------------|
| i) Birth       | ii) Growth      | iii) Development |
| iv) Maturation | v) Reproduction | vi) Death        |

### Reproduction:

- It is a biological process by which organisms produce their young ones.
- It is the fundamental features of all living organisms.

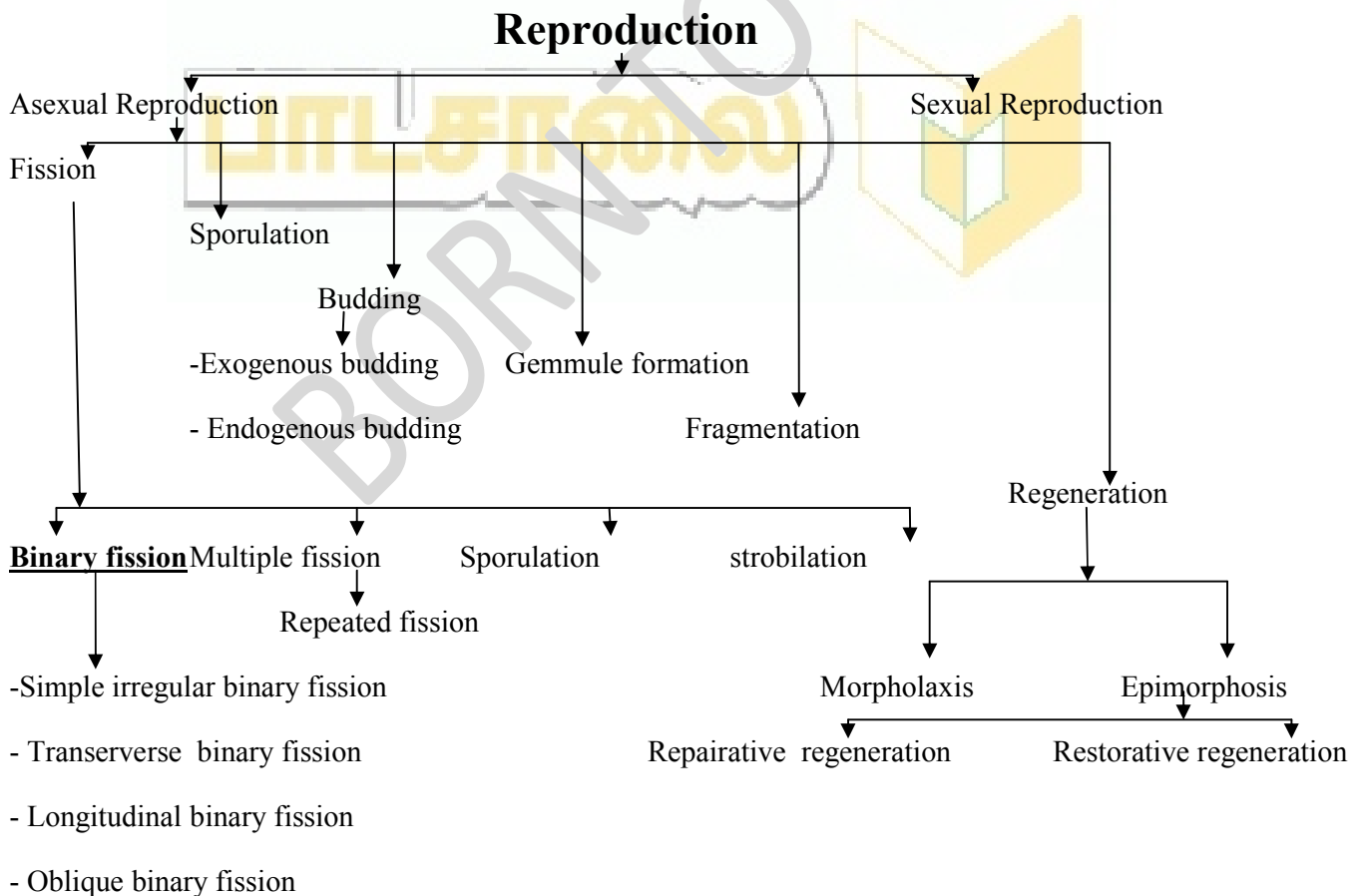
### Modes of Reproduction:

#### Basic features of reproduction:

- |                                  |                                    |                    |
|----------------------------------|------------------------------------|--------------------|
| i) Synthesis of RNA and Proteins | ii) Replication of DNA             | iii) Cell division |
| iv) Growth                       | v) Formation of reproductive units | vi) Fertilization. |

#### Types of Reproduction:

- |                         |                         |
|-------------------------|-------------------------|
| i) Asexual reproduction | ii) Sexual reproduction |
|-------------------------|-------------------------|



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**Difference between Asexual and Sexual Reproduction**

S.No		Asexual Reproduction	Sexual Reproduction
i)	Parents	Single Parent	Two Parents
ii)	Gamete formation	Does not takes place	Takes place
iii)	Cell division	Amitotic (or) mitotic	Mitotic cell division
iv)	Nature of offspring	Genetical identical	Genetical variation
v)	Types of cell	Somatic cell	Gamete cell
vi)	Example	Protista, Bacteria, Archaea etc.	Reptiles, Aves, Mammals etc

**Asexual Reproduction:**

- Reproduction by a single parent without the involvement of gamete formation is called asexual reproduction.
- The offspring produced are genetically identical
- It is usually by amitotic(or) mitotic division of somatic cells (Somatogenic (or) Blastogenic reproduction)

**Sexual Reproduction:**

- When two parents participate in the reproductive process involving two types of gametes (ovum and sperm) is called sexual reproduction.

**Asexual Reproduction:****Fission:**

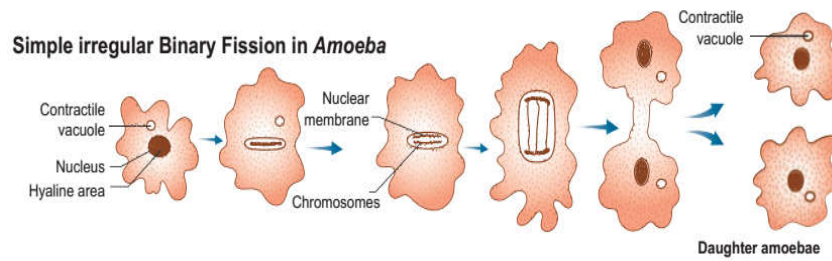
- It is the division of the parent body into two (or) more identical individuals
- Types: i) Binary fission, ii) Multiple fission iii) sporulation and iv) strobilation

**Binary fission:**

- The parent organism divides into two halves
- Each half forms a daughter individuals.
- The nucleus divides amitotically (or) mitotically (Karyokinesis)
- It is followed by the division of the cytoplasm (cytokinesis)
- The resultant offsprings are genetically identical to the parent
- **Types:** i) Simple irregular binary fission ii) Transverse binary fission  
iii) Longitudunal binary fission iv) Oblique binary fission

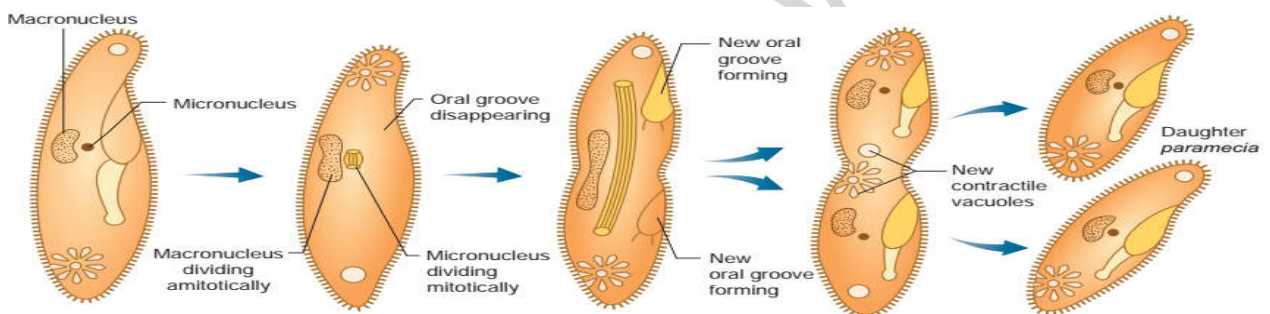
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### i) Simple irregular binary fission:



- In this, plane of division is hard to observe.
- The contractile vacuoles cease to function and disappear.
- The nucleoli disintegrate
- The nucleus divides mitotically.
- The cell then constricts in the middle and the cytoplasm divides and forms two daughter cells.
- Example: Amoeba:

### ii) Transverse binary fission:

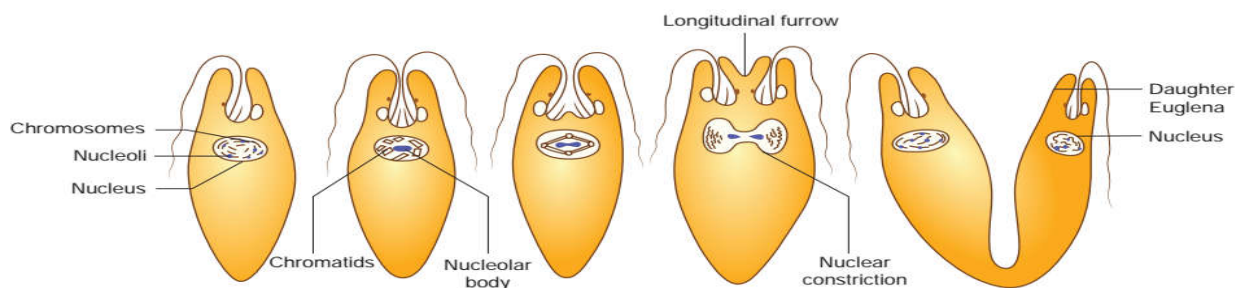


- In this, the plane of the division occurs at transverse axis of the individual.
- Example: Paramecium and Planaria.

Paramecium - the macronucleus divides by amitosis

- the micronucleus divides by mitosis

### iii) Longitudinal binary fission:



- In this, the nucleus and cytoplasm divides in the longitudinal axis of the organism.
- In flagellates - The flagellum is retained by one daughter cell
- The basal granule is divided into two

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- The new basal granule forms a flagellum in the other daughter individual.
- Example: Vorticella and Euglena.

**iv) Oblique binary fission:**

- In this, the plane of division is oblique.
- It is seen in dinoflagellates
- Example: ceratium.

**Multiple fission:**

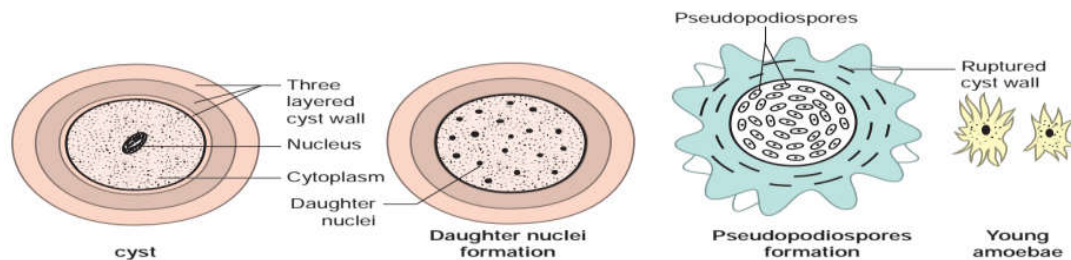
- The parent body divides into many similar daughter cells simultaneously.
- The nucleus divides repeatedly without the division of cytoplasm.
- Later, the cytoplasm divides into as many parts as that of nuclei.
- Each cytoplasmic part encircles one daughter nuclei.
- It results in the formation of many smaller individuals from a single parent organism.

**Multiple fission of plasmodium:****Repeated fission:**

- If multiple fission, it produces four (or) many daughter individuals by equal cell division.
- The young ones do not separate until the process is complete
- This division is called repeated fission.
- Example: vorticella.

**Multiple fission in Plasmodium****Multiple fission occurs in two stages:**

Stages	Schizont stage	Oocyte stage
Process	Schizogony	Sporogony
Daughter individuals	Merozoites	Sporozoites.

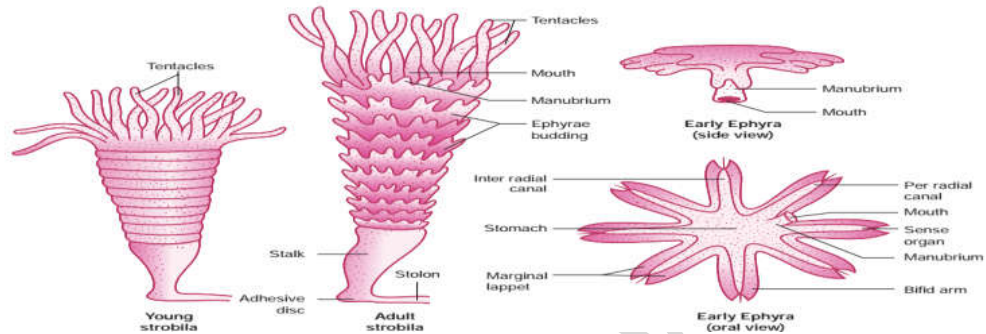
**Multiple fission in Amoeba****Encystment:**

- It occur, during unfavourable condition
- Amoeba, withdraws its pseudopodia
- It secretes a three layered, protective chitinous cyst wall around it and becomes inactive.

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**Pseudopodiospore (or) Amoebulac:**

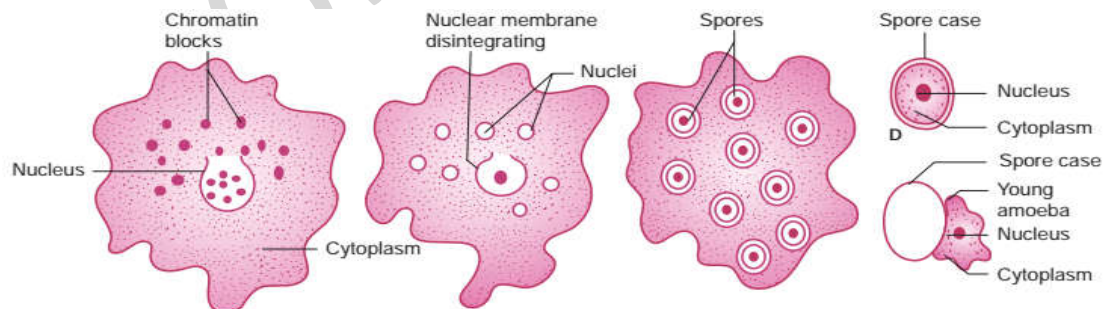
- It occurs, during favourable condition.
- The encysted amoeba divides by multiple fission and produces many minute amoebae called pseudopodiospore (or) amoebulae.
- The cyst wall absorbs water and breaks off liberating the young pseudopodiospores, each with a fine pseudopodia.
- They feed and grow rapidly to lead an independent life.

**Strobilation:**

- In this, several transverse fission occur simultaneously giving rise to a number of individuals, which do not separate immediately from each other.
- Example: Aurelia.

**Plasmotomy:**

- It is the division of multinucleated parent into many multinucleate daughter individuals with the division of nuclei.
- Opalina and Pelomyxa (Giant Amoeba)

**Sporulation in Amoeba:****i) During unfavourable condition:**

- Nucleus breaks into several small fragments (or) Chromatin blocks.
- Each fragment develops a nuclear membrane, becomes surrounded by cytoplasm and develops a spore-case around it.

**ii) During favourable condition:**

- The parent body disintegrates and the spores are liberated,
- Each one hatching into a young amoeba.

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**Budding:**

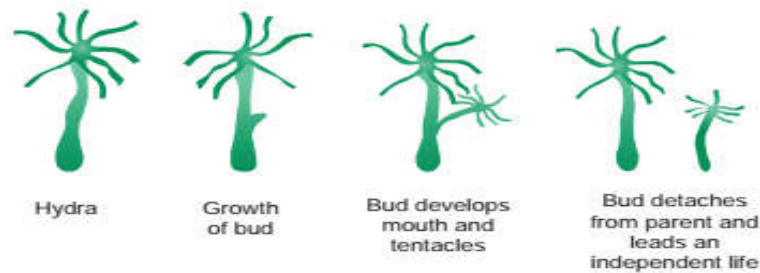
- In this, the parent body produces one (or) more buds.
- Each bud grows into a young one.
- The buds separate from the parent to lead a normal life.

**Types:**

**i) Exogenous budding:**

- The buds formed on the outer surface of the parent body is known as Exogenous budding
- Example: Hydra.

**Exogenous budding in Hydra:**



When food is plenty,

- The ectoderm cells increase and forms a small elevation on the body surface.
- Ectoderm and endoderm are pushed out to form bud
- The bud contains an interior lumen in continuation with parent's gastro vascular cavity.
- The bud enlarges, develops a mouth and a circle of tentacles at its free end
- When fully grown, the bud constricts at the base.
- Finally it separates from the parent body and leads an independent life.

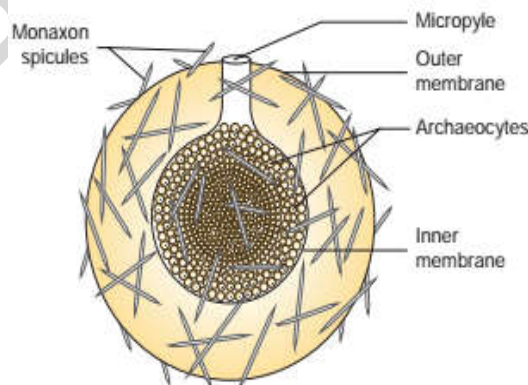
**Endogenous budding in Noctiluca:**

- In this, hundreds of buds are formed inside the cytoplasm
- Many remains within the body of the parent.

**Gemmule formation:**

- In sponges, asexual reproduction are occur by formation of gemmule.

**Gemmule**



- Gemmules are internal bud.
- A completely grown gemmule are hard, ball.
- It consists of internal mass of food laden archacocytes.

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**During unfavourable condition**

- Sponges disintegrate
- Gemmule withstand adverse condition

**During favourable condition**

- Gemmules begin to hatch .

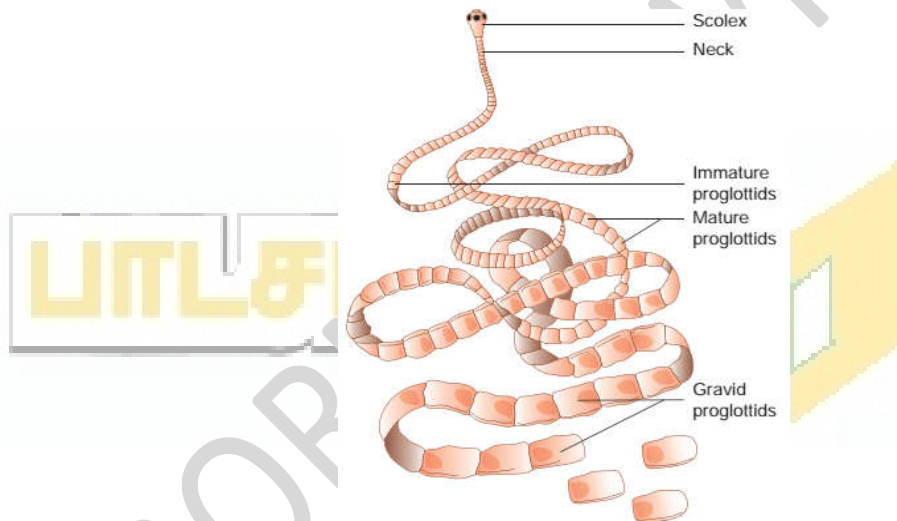
**Fragmentation:**

- In this, the parent body breaks into fragments.
- Each fragments, has the potential to develop into a new organism.

**Fragmentation in sea anemone:**

- Lobes are constricted off from pedal disc.
- Each lobe grows mesenteries and tentacles to form a new sea anemone.

**Fragmentation in Tapeworm:**



- In *Tanea solium*, fragmentation occurs in gravid proglottids.

**Gravid proglottids**

- They are the oldest and posterior end of the strobila.
- They are regularly cut off either singly (or) group by a process called apolysis.
- This process is very significant

**Reason:**

- It help in transferring the developed embryos from the primary host (man) to find a secondary host (pig).

**Regeneration:**

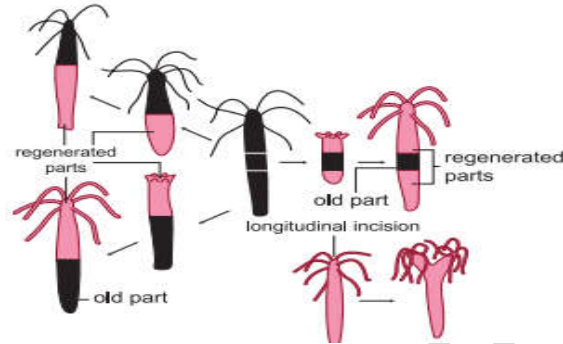
- It is a regrowth in the injured region
- It was first studied in Hydra by **Abraham Trembly**

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**Types:****i) Morphallaxis:**

- The whole body grows from a small segment.
- *Example:* Hydra and Planeria.

**Regeneration in Hydra:**

- When Hydra, accidentally cut into several pieces, each piece can regenerate the lost parts and develop into new organism.
- The part usually retain their original polarity with oral ends by developing tentacles and aboral ends by producing basal discs.

**ii) Epimorphosis:**

- It is the replacement of lost body parts
- It is of two types.

**a) Reparative regeneration:**

- In this, only certain damaged tissue can be regenerated.

**b) Restorative regeneration:**

- In this several body parts can develop.
- *Example:* Star fish, tailed wall lizard.

**Sexual Reproduction:**

- When two parents participate in the reproductive process involving two types of gametes (ovum and sperm) is called sexual reproduction.
- The organism produced genetically variation.

**Types of sexual reproduction:**

- i) Syngamy (fertilization)      ii) Conjugation      iii) Parthenogenesis

**Syngamy:**

- The fusion of two haploid gametes takes place to produce a diploid zygote.
- It is of two type:      i) External fertilization      ii) Internal fertilization

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- The fusion of male and female gametes takes place outside the body of female organism in the water medium.
- **Example:** Sponges, Fishes, Amphibians etc.

**Internal fertilization:**

- The fusion of male and female gametes takes place within the body of female organisms.
- **Example:** Reptiles, Aves, Mammals.

**Different kinds of syngamy in living organisms:****i) Autogamy:**

- In this, the male and female gametes are produced by the same cell (or) organisms
- Both the gametes fuse together to form a zygote.
- **Example:** Actinosphaerium and Paramecium.

**ii) Exogamy:**

- In this, the male and female gametes are produced by different parents.
- Both the gametes fuse to form a zygote
- So it is a biparental.
- **Example:** Human.

**iii) Hologamy:**

- In this, the entire mature organisms do not form gametes.
- They themselves behave as gametes.
- The fusion of such mature individuals is known as **Hologamy**.
- **Example:** Trichonympha

**iv) Paedogamy:**

- It is the sexual union of young individuals, produced immediately after the division of the adult parent cell by mitosis.

**v) Merogamy:**

- In this, the fusion of small sized and morphologically different gametes takes place.

**vi) Isogamy:**

- The fusion of morphological and physiological identical gametes are called **isogamy**
- **Example:** Monocystis.

**vii) Anisogamy:**

- The fusion of morphological and physiological different gametes are called **anisogamy**.
- It is customary to use the term fertilization instead of anisogamy (or) syngamy.
- **Example:** Higher invertebrate and all vertebrates.

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**KAMARAJAR HIGHER SECONDARY SCHOOL, BOMMAIKUTTAIMEDU, NAMAKKAL-19****Conjugation:**

- It is the temporary union of two individuals of the same species.
- During their union, both individuals called conjugants.
- They exchange certain amount of nuclear material and then separated.
- It is commonly found in ciliates
- **Example:** Paramecium, Vorticella and Bacteria.

**Phases of life cycle:****i) Juvenile phase: (Vegetative phase)**

- It is the period of growth between the birth of the individual up to reproductive maturity.

**ii) Reproductive phase: (Maturity phase)**

- In this the organisms reproduce and their offsprings reach maturity period.
- On the basis of time, the breeding animals are two types.

**a) Seasonal breeders:**

- It reproduces at particular period of the year.
- **Example:** Frogs, Lizards, most birds, Deers, etc

**b) Continuous breeders:**

- It continues to breed throughout their sexual maturity.
- **Example:** Honey bees, Poultry, Rabbit etc.

**iii) Senescent phase:**

- It begins at the end of reproductive phase.
- When degeneration sets in the structure and functioning of the body.

**Parthenogenesis:**

- Development of an egg into a complete individual without fertilization is known as parthenogenesis.
- It was first discovered by Charles Bonnet.
- It is of two types- Natural parthenogenesis
  - Artificial parthenogenesis

**Natural parthenogenesis:**

- Parthenogenesis occurs regularly, constantly and naturally in their life cycle is known as **natural parthenogenesis**.
- It is of two type - Complete parthenogenesis
  - Incomplete parthenogenesis.

**a) Complete parthenogenesis:**

- It is found in certain animals.
- There is no biparental sexual reproduction
- There are no male organisms and such individuals are represented by female only.

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**b) Incomplete parthenogenesis:**

- It is found in some animals.
- Both sexual reproduction and parthenogenesis occurs.
- Example: Honey bees.

**Complete parthenogenesis in Honey bees:**

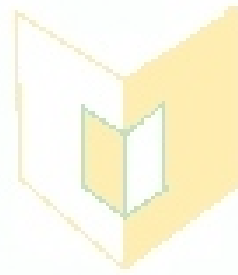
- The zygote develop into queen bees and worker bees.
- The unfertilized eggs develop into drones.

**Paedogenetic parthenogenesis: (Paedogenesis)**

- In this the larvae produce a new generation of larvae by parthenogenesis.
- It occurs in the sporocysts and Redia larvae of liver fluke.
- It is also found in larva of some insects.
- *Example:* Gall fly.

**Artificial parthenogenesis:**

- The unfertilized egg (ovum) is induced to develop into a complete individual by physical and chemical stimuli.
- *Example:* Annelids and Sea urchin eggs.



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