

CHAPTER –

HOW DO ORGANISM REPRODICE

REPRODUCTION: Reproduction is the ability of living organisms to produce living beings similar to themselves.

MODES OF REPRODUCTION: The two modes of reproduction, i.e. asexual reproduction and sexual reproduction can be seen in animals.

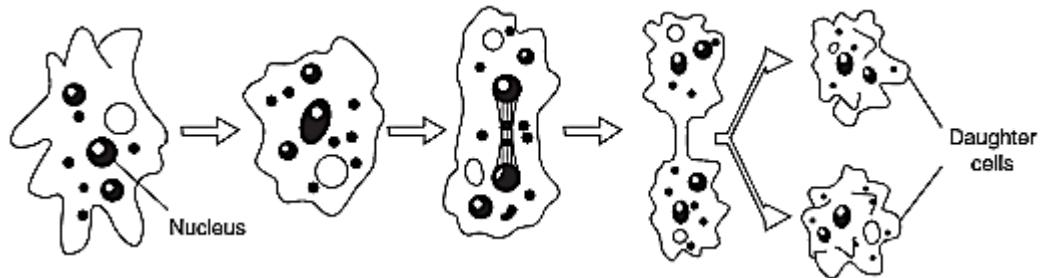
Asexual Reproduction	Sexual Reproduction
Involves only one parent	Involves two parents
No gamete fusion	Fusion of male and female gamete
Offspring are identical	Offspring are similar but not identical
Fast and simple process	Slower and complex process

Asexual Reproduction in single celled organism:

1. Fission: In unicellular organisms, reproduction occurs by cell division (fission).

Types of Fission:

- a. **Binary Fission** → Cell splits into two equal halves. Example: Amoeba (division in any plane) etc.



- b. **Multiple Fission** → Cell divides into many daughter cells simultaneously. Example: Plasmodium (malarial parasite).

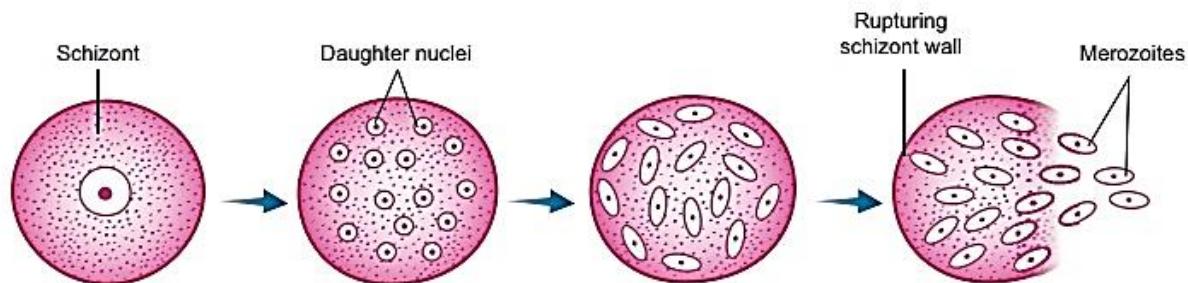
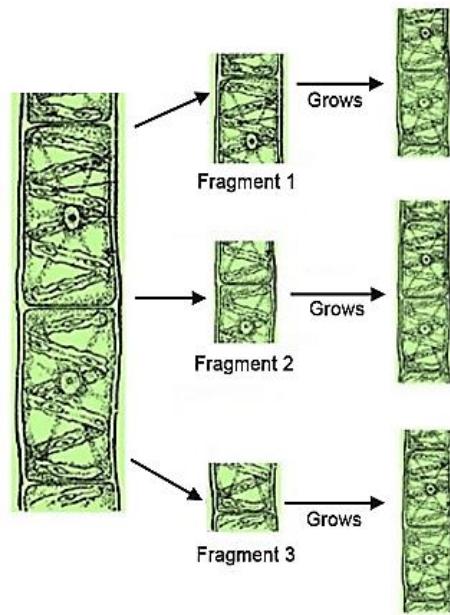
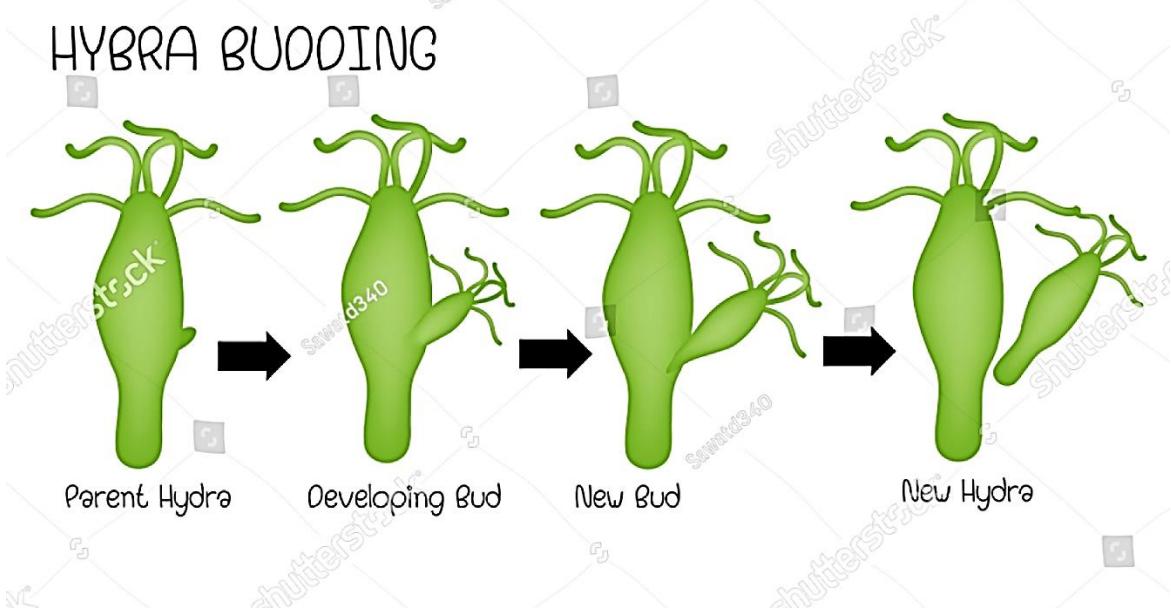


Fig. 1.4 Multiple Fission in *Plasmodium*

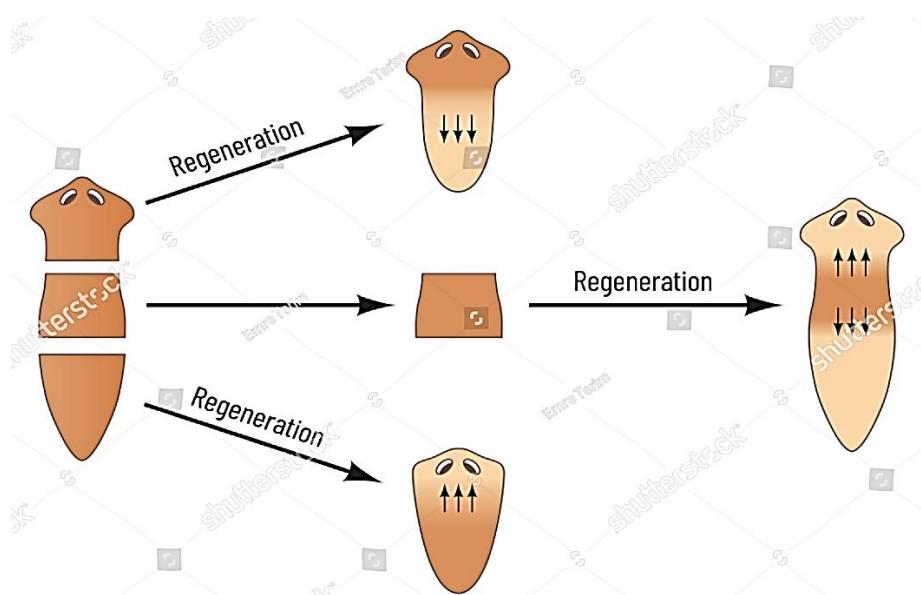
- 2. Fragmentation:** Adult organisms, on maturation, break up into smaller fragments. Each fragment develops into a new individual. Example: Spirogyra.



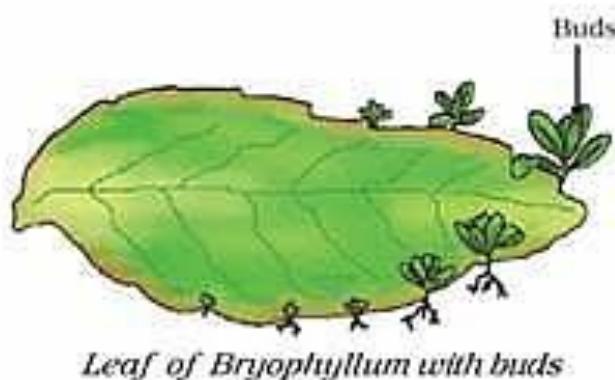
3. **Budding:** A small outgrowth called a bud arises on the parent body. The bud grows by repeated cell divisions. It then breaks off from the parent body and develops into a new individual. Example: Hydra, Planaria etc.



4. **Regeneration:** Regeneration is the ability of organisms to generate lost or damaged body parts. Regeneration is carried out by specialised cells. Example: Planaria, Hydra, Star Fish etc.



5. Vegetative Propagation: Several plants are capable of producing naturally through their roots, stems and leaves. Such type of reproduction is called vegetative propagation. Example: Sweet Potato etc.



Leaf of Bryophyllum with buds

6. Spore Formation: Spores are special structures produced in sacs called sporangia. When spores mature, sporangia burst and spores are carried by air or water to different places. When spores fall on a suitable ground, they germinate and give rise to new plants. Example: Moss, Ferns, Fungi etc.

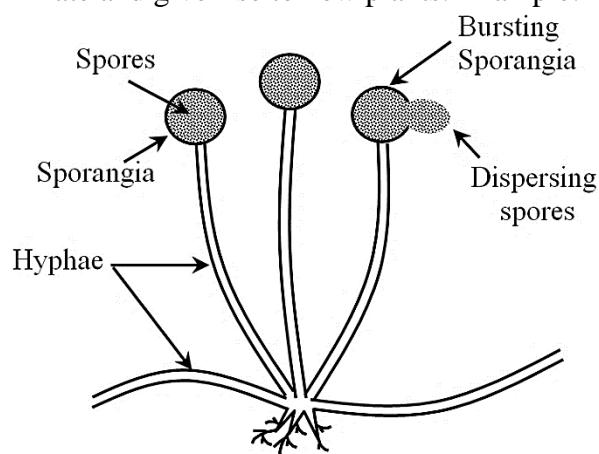


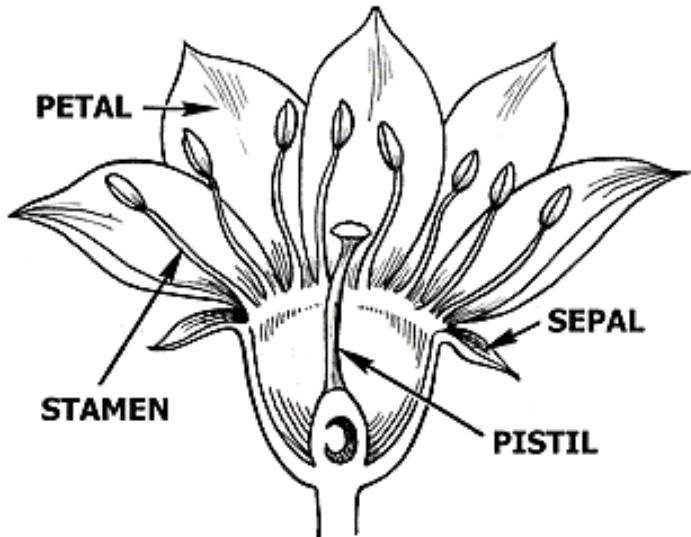
Fig. 5 Spore formation in Rhizopus

Sexual Reproduction in organism:

In sexual reproduction, two gametes or germ cells, i.e. the male gamete called sperm and the female gamete called ovum, are involved. Both the sperm and ovum fuse together to form a zygote which develops into a new individual.

Sexual Reproduction in Flowering Plants:

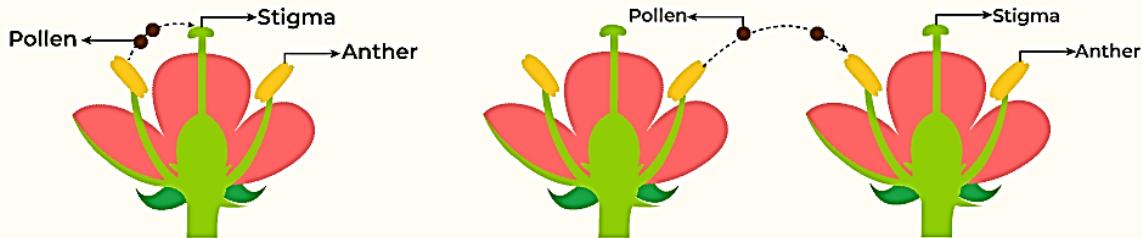
- A flower is the reproductive organ in angiosperms.
- Stalk/ Pedicel: Point of attachment.
- Thalamus: Petals and other parts arise from the thalamus.
- Sepals (Calyx) & Petals (Corolla) → Protect the flower, attract pollinators.
- Stamen (Male part/Androecium): Contains anther → produces pollen grains (male gametes).
- Pistil/Carpel (Female part/ Gynoecium):
 - ✓ Stigma → sticky tip, receives pollen.
 - ✓ Style → tube-like structure.
 - ✓ Ovary → contains ovules with egg cell (female gamete).



Pollination:

- Pollination is the process of transferring pollen from the male anther of a flower to the female stigma.
- Pollen can be moved by wind, water, or animals called pollinators, such as bees, birds, and bats.
- Self-pollination → Pollen transferred to stigma of the same flower.
- Cross-pollination → Pollen transferred to another flower (via wind, water, insects, animals).

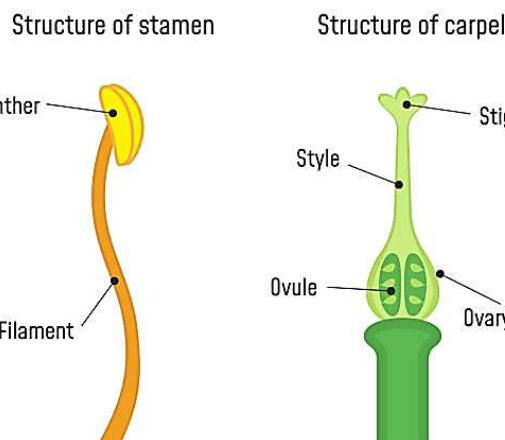
Self-Pollination Vs Cross-Pollination

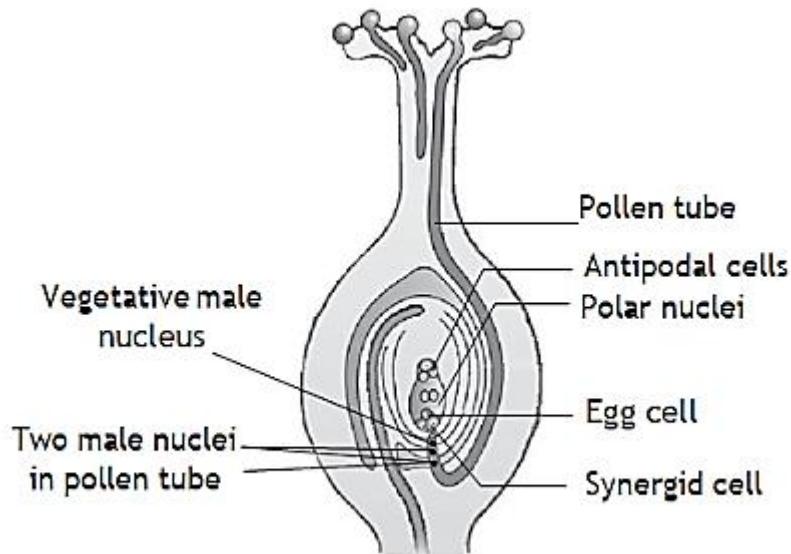


Fertilization:

Fusion of male and female gamete is known as fertilization.

- Pollen grain lands on stigma.
- Pollen tube grows down through style → reaches ovary.
- Male gamete from pollen fuses with egg cell in ovule.
- This fusion forms a zygote.





Longitudinal section of a flower showing path of pollen tube growth

Fruit Formation: After fertilisation, the ovary enlarges and forms a fruit. Scientifically, the fruit is the ripened ovary. Ovules become the seeds of the fruit.

Seed Germination: Seed germination is the process where a dormant plant embryo inside a seed begins to grow into a new seedling.

Reproduction in Human Being:

Humans reproduce by sexual reproduction. Begins after puberty (teenage years). Requires male gamete (sperm) + female gamete (egg).

Growth and Development: Growth and development are gradual and irreversible processes. Size and complexity of the body increase gradually. Growth in humans is divided into the following stages:

Infants	Children between 1 month and 1 year of age are called infants.
Toddler	Children between 1 to 4 years of age. Growth is fast. Children learn to balance the body.
Adolescent	Children between the ages of 11 to 19. The period of transition from childhood to adulthood.
Adulthood	It is from the age of 18/20 onwards. An individual attains full growth and emotional stability.

Puberty:

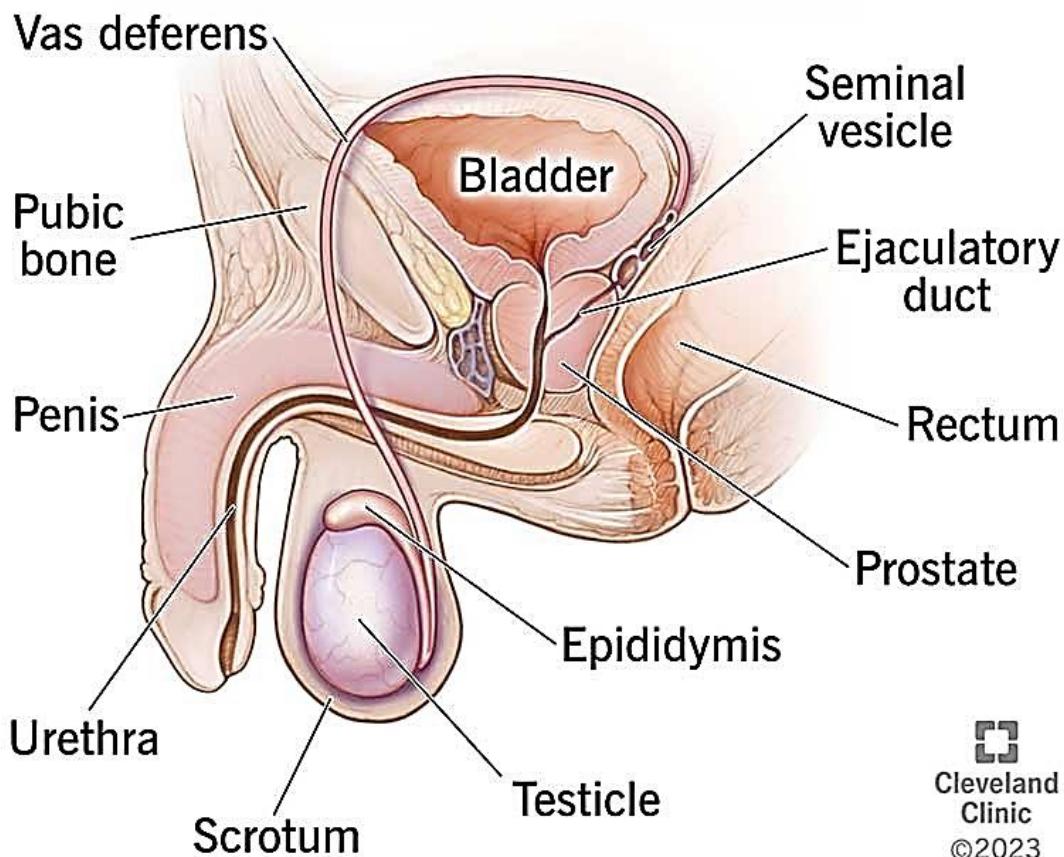
- Puberty is the period during which the reproductive system matures in boys and girls.
- In girls, puberty begins at the age of 11 years.
- In boys, it begins at the age of 12–14 years.
- Puberty continues till the age of 18 years.

Changes in Boys	Changes in Girls
Testis mature and start producing sperm.	Ovaries mature and start producing ovum. Menstrual Cycle begins.
Pectoral girdle (Shoulder) grows.	Pelvic girdle (Hip) became broad.
Hair growth in pubic region.	Hair growth in pubic region.
Development of moustache and beard.	Enlargement of breasts.

Male Reproductive System:

- Male reproductive system is located in the pelvis region.
- A pair of testes is located below the abdomen within the pouch known as scrotal sac or scrotum.
- The testes produce male gametes or sperms (germ cells).
- Sperm formation takes place in testis. From testis sperms travel through vasa efferentia, Epididymis, Vasa deferens, Urinary bladder, Urethra (Common passage for urine and sperm).

Male Reproductive System



Sperm Cell (Male Gamete)

- Sperm is a unicellular, microscopic, motile male reproductive cell.
- It is haploid (n) → contains half the number of chromosomes.

Main Parts of Sperm:

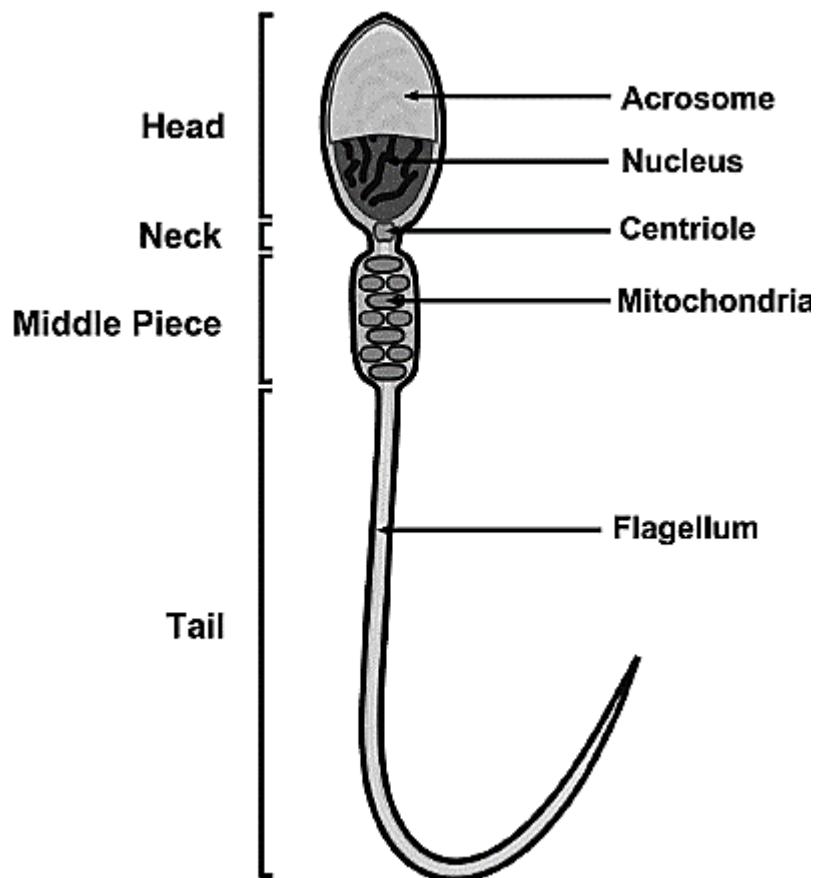
Head:

- Nucleus → carries 23 chromosomes (paternal genetic material).
- Acrosome: helps sperm to penetrate the egg membrane during fertilization.

Neck: Small region connecting head and middle piece.

Middle Piece: Provides ATP/energy for movement of the tail.

Tail: Long, whip-like structure. Function: Provides motility to sperm and Propels sperm forward → helps it swim towards the egg.



Female Reproductive System:

- The female reproductive system is consisting of a pair of ovaries along with pair of oviducts, uterus, cervix, vagina and external genitalia located in pelvic region.
- Ovaries are primary organs that produce the female gamete (ovum) and several hormones.
- They are located on each side of lower abdomen.
- Functions: Produce eggs (ova) and Provide site for fertilization & embryo development.
- One egg is produced every month by one of the ovaries. The egg is carried from the ovary to the womb through a thin oviduct or fallopian tube. The two oviducts unite into an elastic bag-like structure known as the uterus. The uterus opens into the vagina through the cervix.

Female Reproductive System

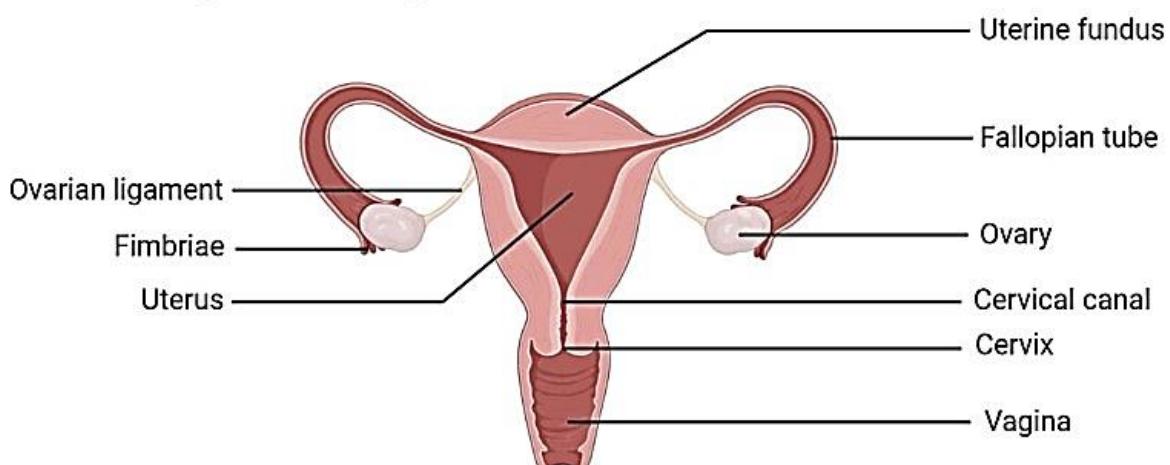


Figure: Structure of Female Reproductive System

Designed By: Sagar Aryal. Created with [biorender.com](https://www.biorender.com)

Fertilisation: The process of fusion of the male gamete with the female gamete is called fertilisation.

If fertilization take place:	If fertilization doesn't take place:
<ol style="list-style-type: none">1. At the time of intercourse, semen is deposited into the female's vagina.2. Sperm swims through the uterus and reach the fallopian tube.3. A single sperm will fuse with the egg and from the zygote. This complete the process of fertilization.4. As soon as the zygote is formed, it starts developing.5. By the time it reaches the uterus, it is a mass of cells known as an embryo.6. The period of development of the embryo inside the uterus is called the gestation period.7. In humans, the gestation period is of 9 months, i.e. about 280 days.8. The embryo after completing three months of development is called the foetus.	<ol style="list-style-type: none">1. If the ovum is not fertilised, then it lives for one day. The layer of uterus breaks down and disintegrate.2. The ovum, layer of the uterus and some blood discharge out of the body. This is called menstruation.3. The menstrual discharge last for four days.4. After menstruation, the ovum is released, and the uterus again prepare itself for the receival of the fertilised egg cell. \5. If there is no fertilization, then menstruation is repeated.

Reproductive Health:

1. Gonorrhoea 2. Syphilis	<ul style="list-style-type: none">• Caused by Bacteria.• Bacteria spread through sexual contact.• Burning sensation during urination.• Sores in genitals.
3. AIDS (Acquired Immuno Deficiency Syndrome	<ul style="list-style-type: none">• Caused by the infection of HIV (Human Immunodeficiency Virus)• The virus attacks the immune system itself.• HIV is transmitted by o Sexual intercourse o Sharing contaminated needles o Blood transfusion of contaminated blood o from the infected mother to the unborn foetus