CHAPTER - 8

HOW ORGANISMS REPRODUCE

Class :- X

Subject :- Science

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Reproduction :-

Reproduction is the process by which living organisms produce new individuals of the same species.

Reproduction is necessary for the survival and increase in the population of a species. If organisms do not reproduce, their population decreases and species will become extinct.

Significance of Reproduction:

1. **It allows continuity of of a species generation after generation.**
2. **It plays an important role in evolution by transmitting favorable variations from one generation to another generation.**

Body design of organisms: **Organisms look similar because their body design are similar.**

- **Reproduction at its most basic level involves making copy of the blue print of body design.**
- **DNA in the cell nucleus is the information source for making protein and different proteins lead to different body design.**
- **A basic level of reproduction is the creation of a DNA copy.**
- **DNA copy is accompanied by a cell division giving rise to two cells.**
- **DNA copying always involves some variation, hence DNA copies generated are similar but not identical.**

  this tendency of variation during reproduction leads to evolution.

The importance of variation :-

DNA copying during reproduction is important for maintaining the body designs of different organisms to survive in the existing environment. But the environment is constantly changing due to changes in temperature, climate, water levels etc. If organisms cannot adjust themselves to the changes in the environment then their species will become extinct.

If there are variations in some individuals of a species they may be able to survive the changes in the environment.

So variations in species is necessary for the survival of different species and for the evolution of new species.

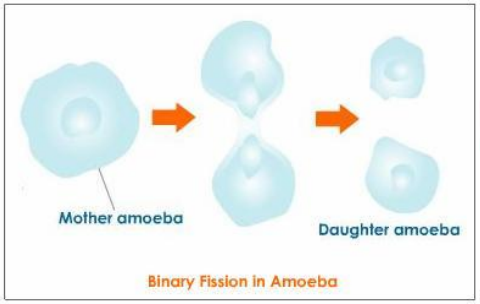
4) Types of reproduction :-

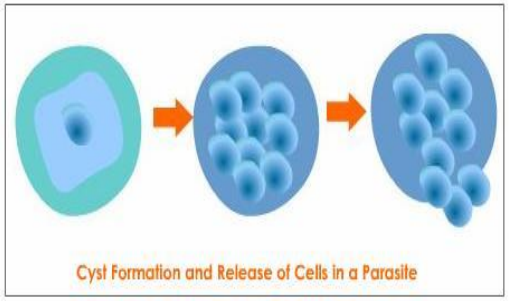
There are two main types of reproduction in living organisms. They are asexual reproduction and sexual reproduction.

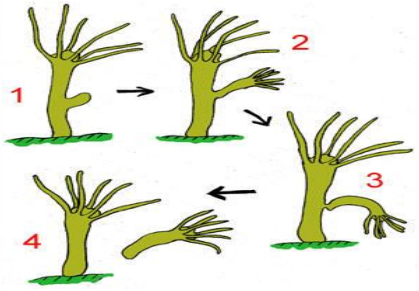
Asexual reproduction :- is reproduction in which new individuals are produced from a single parent.

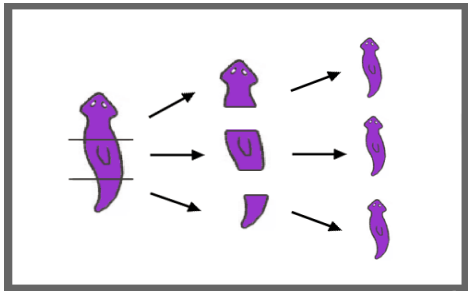
Sexual reproduction :- is reproduction in which two individuals are involved to produce a new individual.

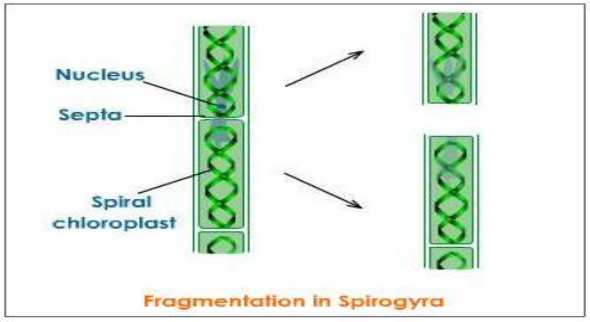
Asexual reproduction is of different types. They are:- fission, budding, regeneration, fragmentation, spore formation, vegetative propagation etc.

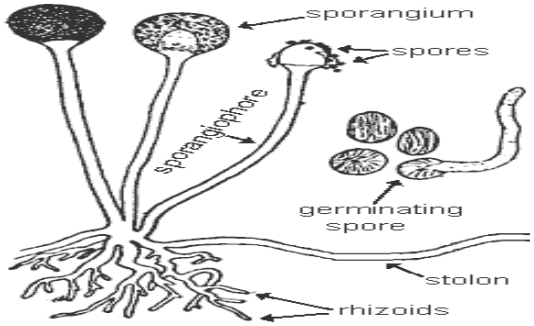










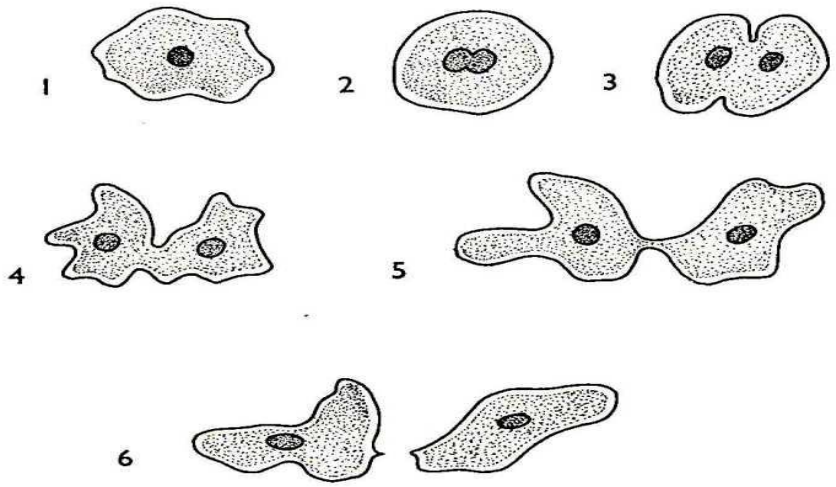


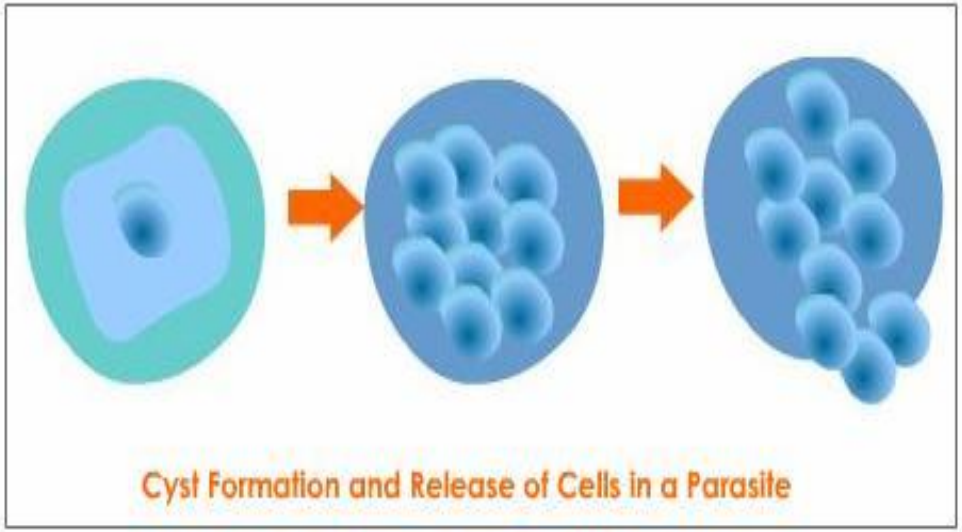
i) Fission :-

Fission is an asexual reproduction by which a unicellular organism divides and forms two or more new individuals. Fission is of two types. They are binary fission and multiple fission.

i) Binary fission :- In this method an organism divides and forms two individuals. First the nucleus divides and forms two nuclei. Then the cytoplasm divides and forms two daughter cells. Eg:- Amoeba, Paramaecium etc.

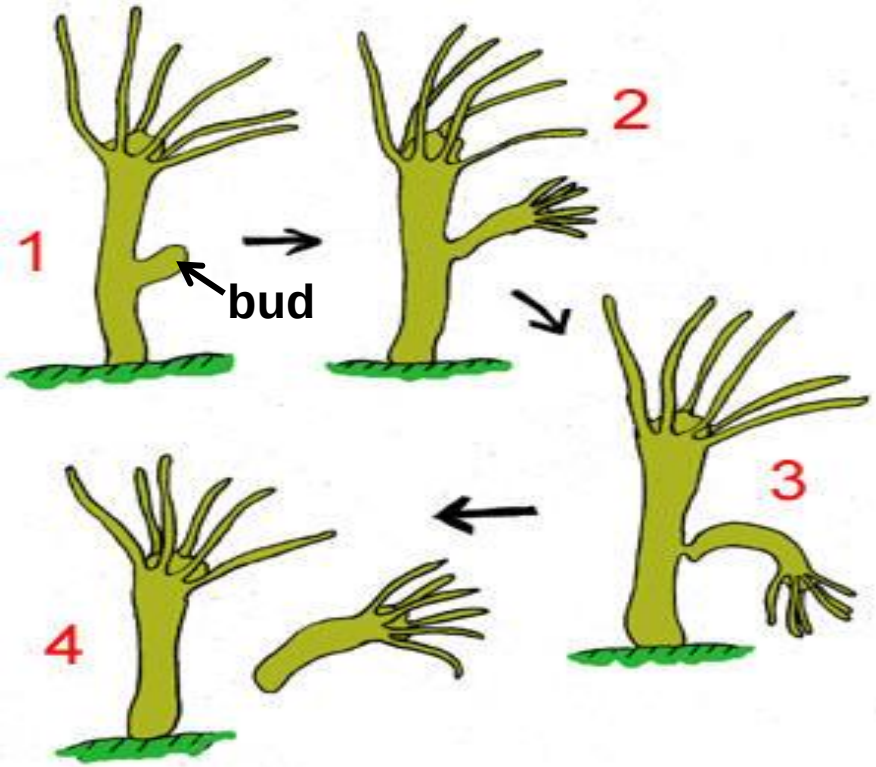
ii) Multiple fission :- In this method one organism divides into many daughter cells. Eg.Plasmodium (Malarial parasite).

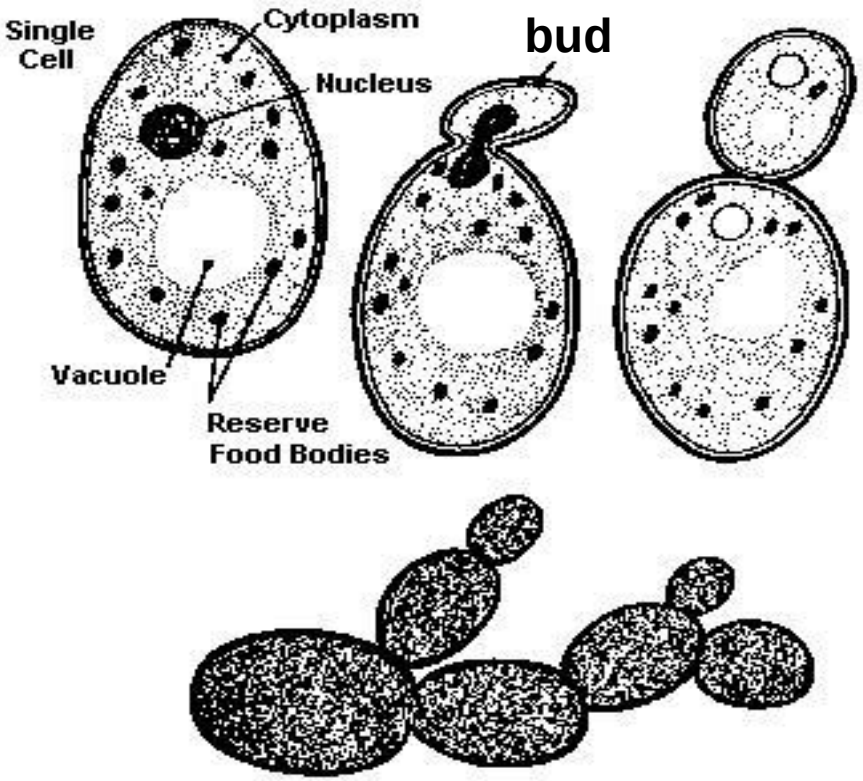




ii) Budding :-

In this method a bud like projection is formed on the body of the organism. The bud then develops into a new individual. It then separates from the parent and forms an independent individual. Eg:- Hydra, Yeast etc.

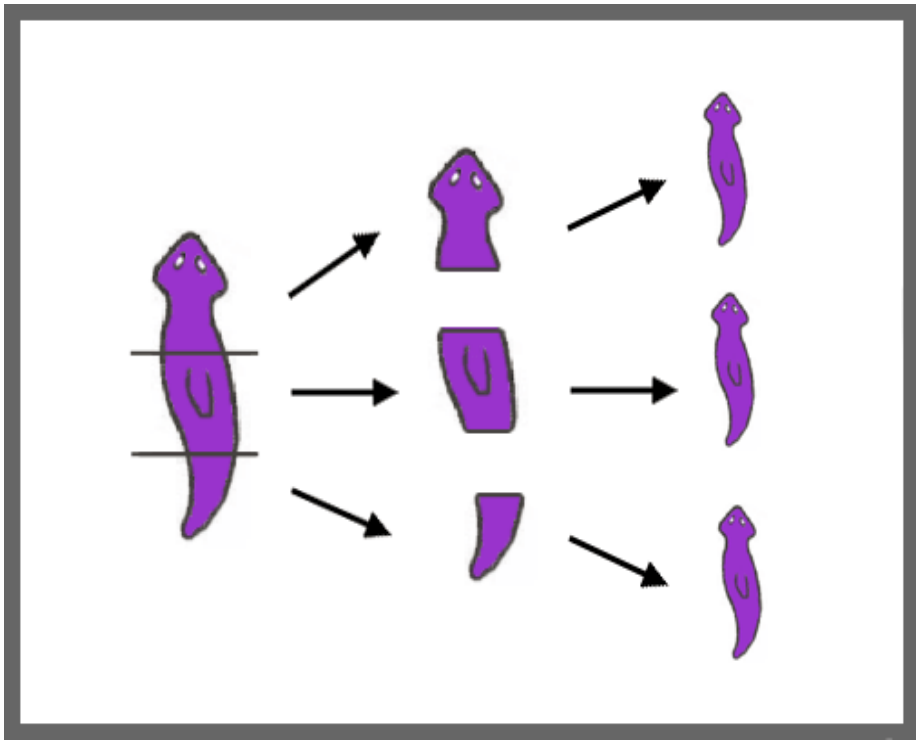


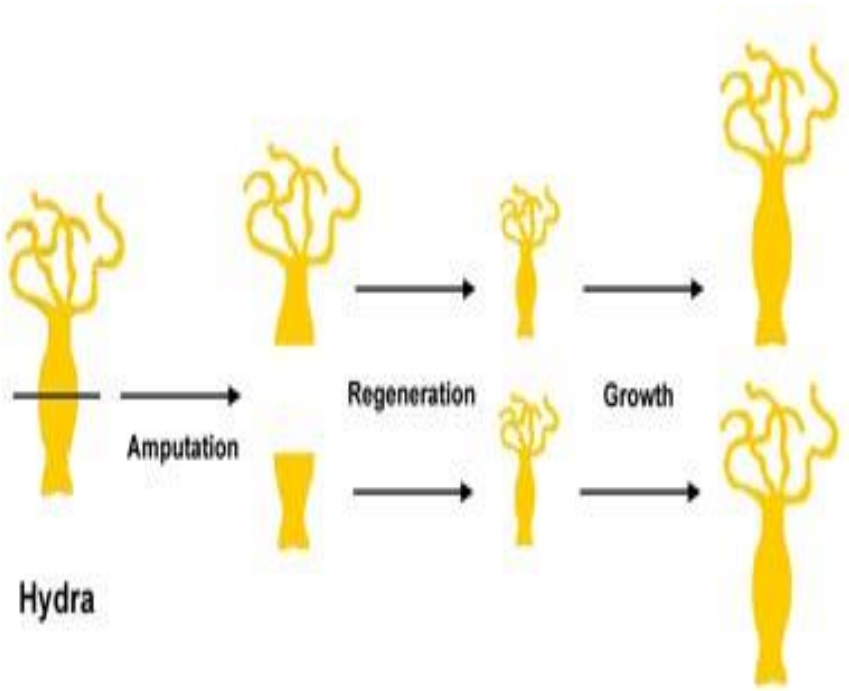


iii) Regeneration :-

It is the ability of a fully differentiated organisms to give rise to new individual organisms from its body part. The body part which contain a specialesed cell grow or regenerate into separate individuals.

Eg :- Hydra, Planaria, Star fish etc.

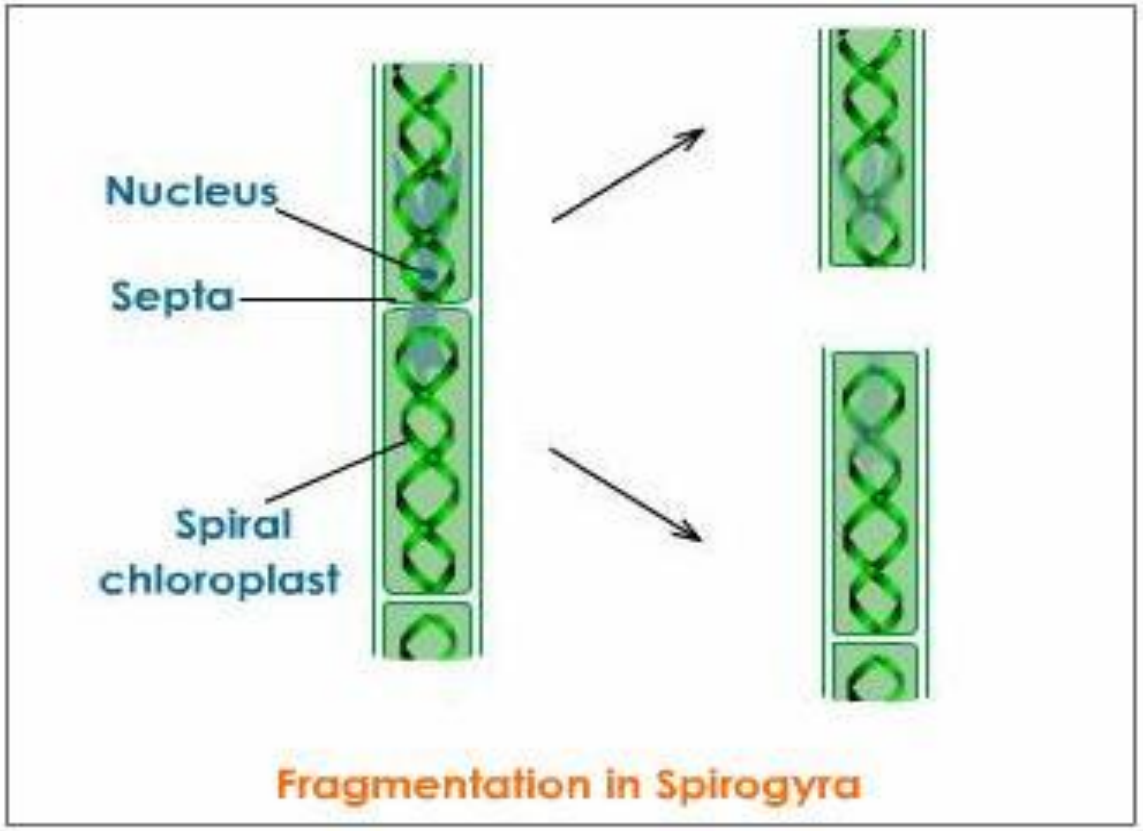




iv) Fragmentation :-

In this method the body of a simple multicellular organism breaks up into smaller pieces on maturation and each fragment develops into new individuals.

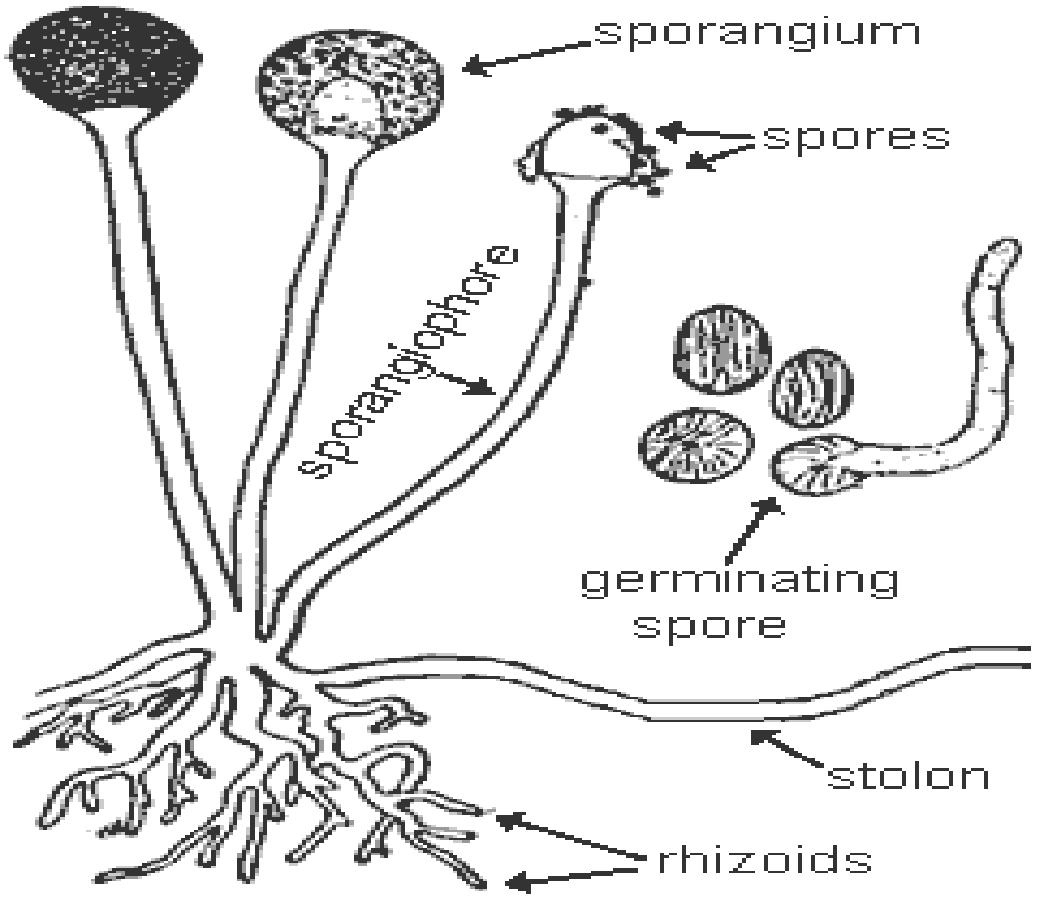
Eg :- Spirogyra, Flatwom.



v) Spore formation :-

In this method structures called sporangia produce tiny cells called spores. When the spores come in contact with a moist surface, it develops into new individuals.

Eg :- Rhizopus(Bread mould) , Mucor, Penicillium etc.



vi) Vegetative propagation :-

In this method new plants are produced from the vegetative parts of the plant like root, stem or leaves without the help of any reproductive organs.

It may be natural:

By Roots: Dahalia, Sweet potato.

By stems: Ginger(Rhizome), Potato(Tuber),Onion(Bulb)

By leaves: Bryophyllum

Vegetative propagation can also be done artificially by cutting, layering, grafting etc.

Cutting - Rose, Chrysanthum, Grapes etc.

Layering - lemon, Guava, Hibiscus, Bougainvillea, Jasmine, Rasberry, Strawberry etc.

Grafting – this method is applied to improve variety of fruits like mango, apples, peas, etc

Advantages of vegetative propagation:-

1. Plants takes less time to grow.
2. It also helps in the propagation of plants which do not produce seeds like rose, jasmine banana or produce seed with prolonged period of dormancy.

Disadvantages of vegetative propagation:

1. There is no genetic variation, so there is less adaptibility to the environment.
2. The disease of the parent plants get transferred to the offspring.
3. New characters can neither be introduced nor undesirable characters be eliminated.

vii) Tissue Culture: In this method new plants are grown by removing tissues or cells from the growing tip of a plant.

in this technique cells are induced to devide artificially by chemicals(Cytokinin) to form a group of cells called ‘callus’. Now the callus is transferred to another medium containing hormones for growth and differentiation.

the plantlets are now placed in soil, so that grow into mature plants.

❖This technique is commonly used for ornamental plants.

Characteristics of asexual reproduction:

1. Only one individual of an organism is involved.
2. The new individual produced are genetically identical to their parents.
3. It presents a rapid mode of multiplication.

Advantages of Asexual reproduction:

1. Plants takes less time to grow.
2. It also helps in the propagation of plants which do not produce seeds like rose, jasmine banana or produce seed with prolonged period of dormancy.
3. It helps to preserve parental characters.

Disadvantages of Asexual reproduction:

1. There is no genetic variation, so there is less adaptability to the environment.
2. The disease of the parent plants get transferred to the offspring.
3. New characters can neither be introduced nor undesirable characters be eliminated.

SEXUAL REPRODUCTION: It is the process of producing new organisms from two parents by making use of their sex cells or gametes.

e.g- human, fish, dogs, cats and most of the flowering plants.

- Thus the two major process i.e. formation of gametes and fusion of gametes constitutes sexual reproduction.
- Two sexes namely Male(producing male gamete / Sperm) and Female (producing female gamete / Ova) are involved.

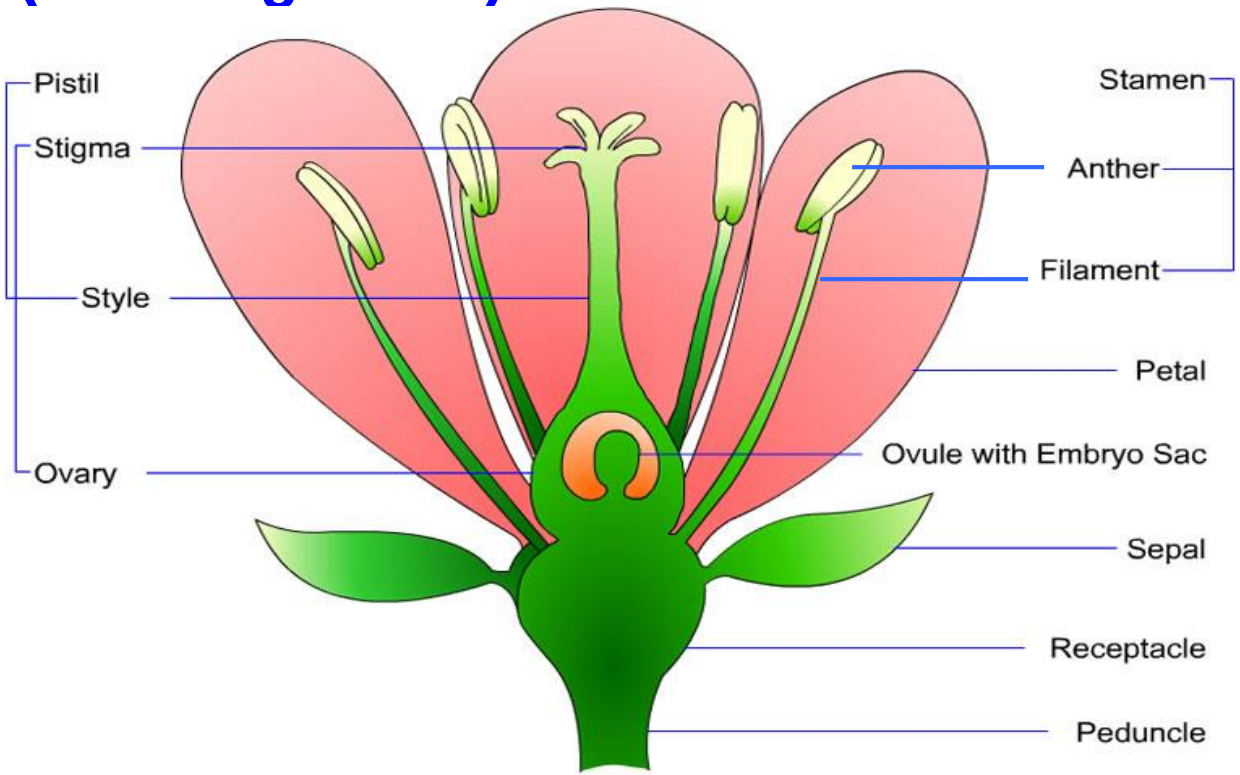
Significance of sexual reproduction:

1. It promotes variation and thus promotes diversity of characters in the offspring's.
2. It plays a prominent role in the origin of new species.

5) Sexual reproduction in flowering plants :-

a) Reproductive parts of a flower :-

The stamen and pistil are the reproductive parts of the flower. Stamen is the male reproductive part. It produces pollen grains in the anther which contains the male germ cell (male gamete). Pistil is the female reproductive part. It produces ovules in the ovary which contain the female germ cell (female gamete).



b) Pollination :-

The transfer of pollen grains from the anther to the stigma of a flower is called pollination.

It takes place by wind(Anemophily), water (Hydrophily) insects (Entomophily, Animals (Zoophily), Birds (Ornithophily) or Bat (Chiropterophily).

It is of two types:-

(A) Self pollination: If the pollen grains are transferred from the anther to the stigma of the same flower it is called self pollination. E.g.- Pea, Wheat, Rice, Chinarose etc.

It can further be of two types:

a) Autogamy:- if the transfer of pollen grains from anther of a flower to the stigma of the same flower is called Autogamy.

b) Geitonogamy:- when pollen from one flower transferd over the stigma of another flower borne on the same plant is called Geitanogamy.

Advantages of self pollination:-

1. **Ensure continuity of a race.**
2. **It helps to preserve parental characters as the gametes from the same flower is involved.**
3. **It is not necessary for flower to produce nectar or sent or be colourful.**

Disadvantages of self pollination:-

1. **New verities cannot be obtained.**
2. **The genetic defects of the breed cannot b removed.**
3. **Repeated self pollination leads to loss of vigour & vitality of the species.**

(B) CROSS POLLINATION:- it is the transfer of pollen grains from the anther of one flower to the stigma of another flower born on other plant of the same species.

Advantages of cross pollination:

1. **It result in healthier offspring.**
2. **Seeds produced have much better germinating capacity.**
3. **More abundent and viable seeds are produced.**
4. **Variations are introduced by cross pollination.**

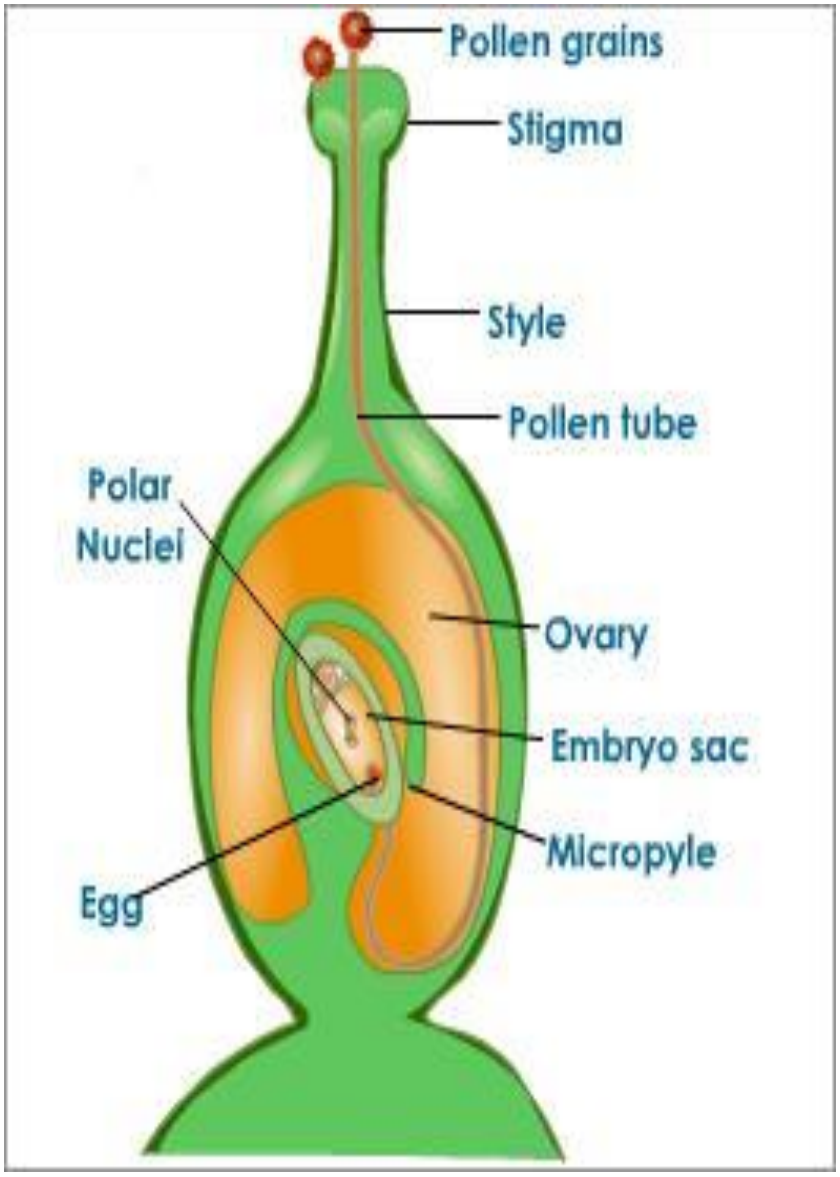
Disadvantages of cross pollination:-

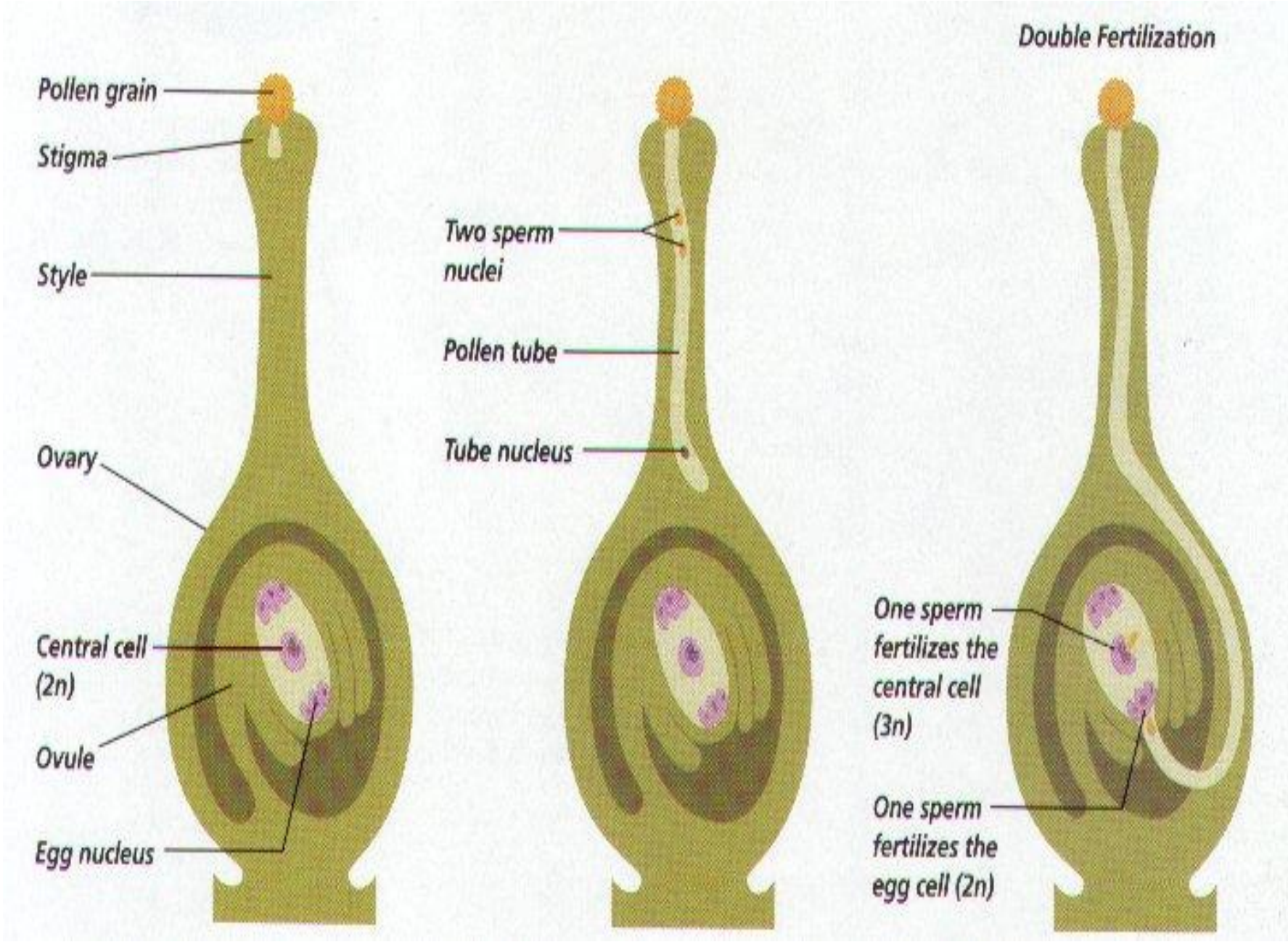
1. **Plants have to depend on external agencies for pollination.**
2. **The pollen grain have to be produced in large quantity to ensure pollination.**

c) Fertilisation :-

After the pollen grain is transferred to the stigma it produces a pollen tube which passes through the style and enters the ovary and ovule. In the ovule the male germ cell (male gamete) fuses with the female germ cell (female gamete) to form a zygote. This process is called **fertilisation.**

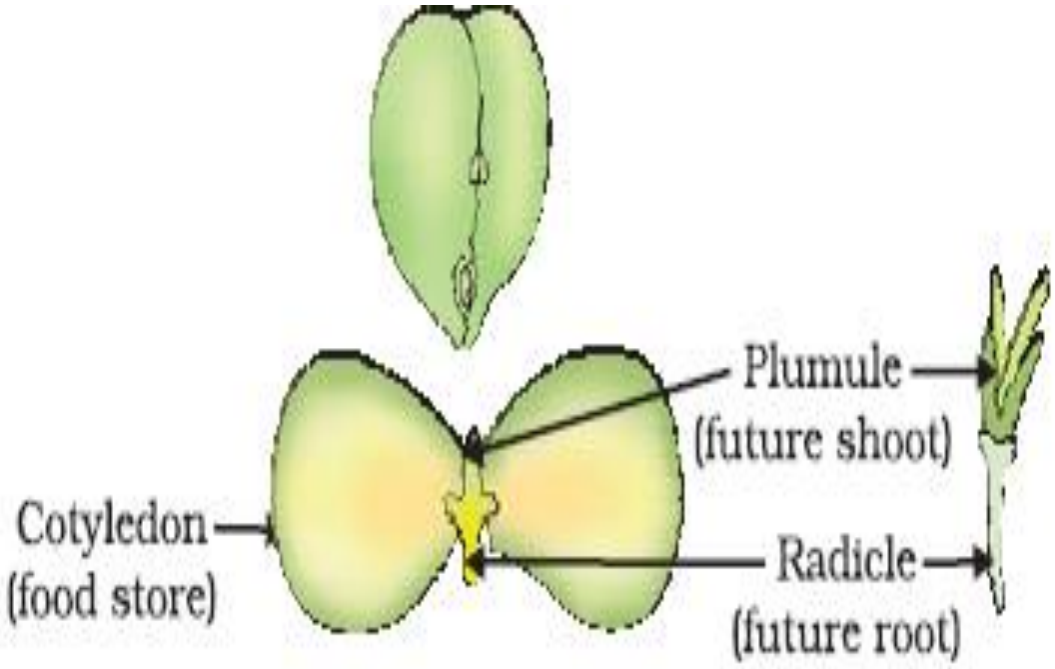
After fertilisation the zygote divides several times and forms the **embryo** which then develops into the **seed** and the **ovary** develops into the **fruit.**




Double Fertilization
Pollen grain
Stigma
Style
Ovary
Central cell (2n)
Ovule
Egg nucleus
Two sperm nuclei
Pollen tube
Tube nucleus
One sperm fertilizes the central cell (3n)
One sperm fertilizes the egg cell (2n)

Germination:

It is the initial stage in the growth of a seed to develop into a seedling under appropriate conditions.



REPRODUCTION IN HUMAN BEING:

- **Is sexual reproduction involving male reproductive organ and female reproductive organ.**
- **The reproductive organs of human being i.e. Testis in male and ovary in female become functional only after attaining sexual maturity.**

in male sexual maturity is attainded at the age of 13-14 years while in female at the age of 10-12 years. This is known as the age of pubirty.

SEXUAL MATURITY IN HUMAN BEING: various changes takes place in human body at the time of sexual maturity:-

Changes common in both boys and girls:-

1) **Thick hair growth in armpits & genital area between the thigh (also called Pubic region).**
2) **Thinner hair on legs, arms and faces.**
3) **Oily skin and appearence of pimples.**

Changes different in boys and girls:

In Girls:

1) **Breast size begin to increase.**
2) **Darkening of the nipple skin.**
3) **Start of menstruation.**

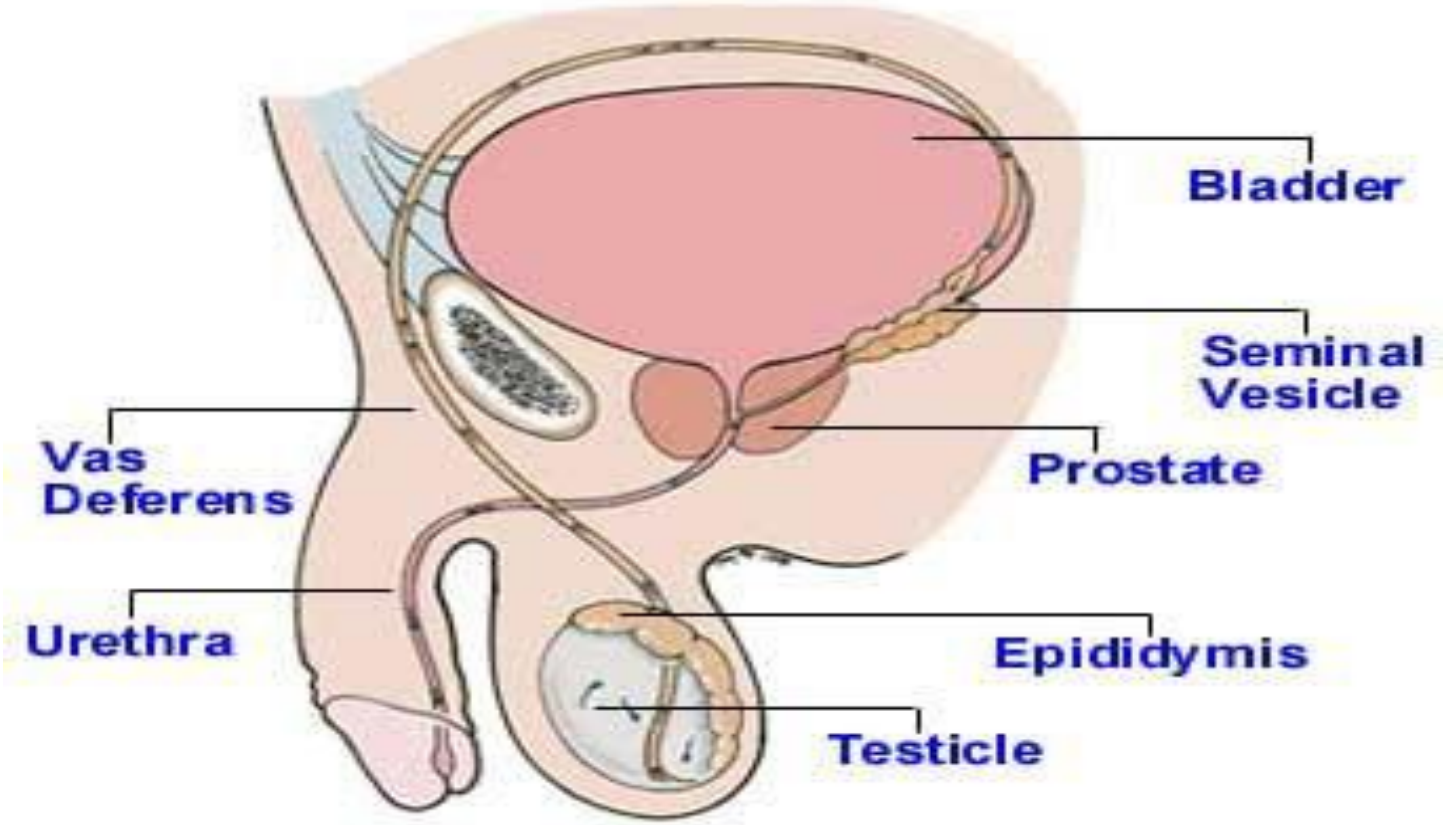
In Boys:

1) **Thick facial hair growth.**
2) **Voice begin to crack.**
3) **Penis occasionally begin to erect and enlarged followed by night flow.**

PUBERTY: It is the age at which the sex hormone or gametes begin to be produced and the boy and girls becomes sexually mature.

6) Reproduction in human beings :-

a) Male reproductive system :- It consists of two portions- one that produces germ cell and the other that deliver the germ cell to the site of fertilisation. The human male reproductive systems consists of the following organs:-



1) Testes(Sing- Testis) : are one pair lies in a small sac-like structure outside the abdominal cavity called scrotum.

Function: to produce Sperm and male sex hormone called Testosterone.

The scrotum decreases the temperature inside by 2 degree centigrade thus provides the optimal temperature for formation of sperms.

2) Epididymis: is coiled tube-like structure firmly attached to the testis.

Function: it serves as storehouse of the sperms. Inside the epididymis the sperm become mature and develop motility.

3) Vas-deferens: The sperms are carried by a long tube called vas-deferens or sperm duct into organs called seminal vesicles, where the sperm got nourished and stored.

4) Urethra: is a common duct for the passage of both urine and spermatic fluid. Urethra carries the sperm to an organ called penis which opens outside through a male genital pore.

5) Penis: forms the external male genital organ. It is copulatory organ with thick muscular wall.

ACCESSORY GLAND:

1) **Seminal vesicles: are a pair of thin walled muscular elongated sac which secrete fluid for nourishment of sperms.**
2) **Prostate gland: also produce fluid which is released in the urethra along with secretion of seminal vesicles.**
3) **Bulbo-urethral gland/Couper's gland: are one pair secrete watery alkaline fluid which neutralise acidic urethra and lubricate the urethra for passage of semen.**

SEMEN: the fluid ejaculated through penis during sexual intercourse (3-4ml / ejaculation).

Semen = Seminal fluid + Sperm

Seminal fluid: is secretion of seminal vesicles, prostate and couper's gland.

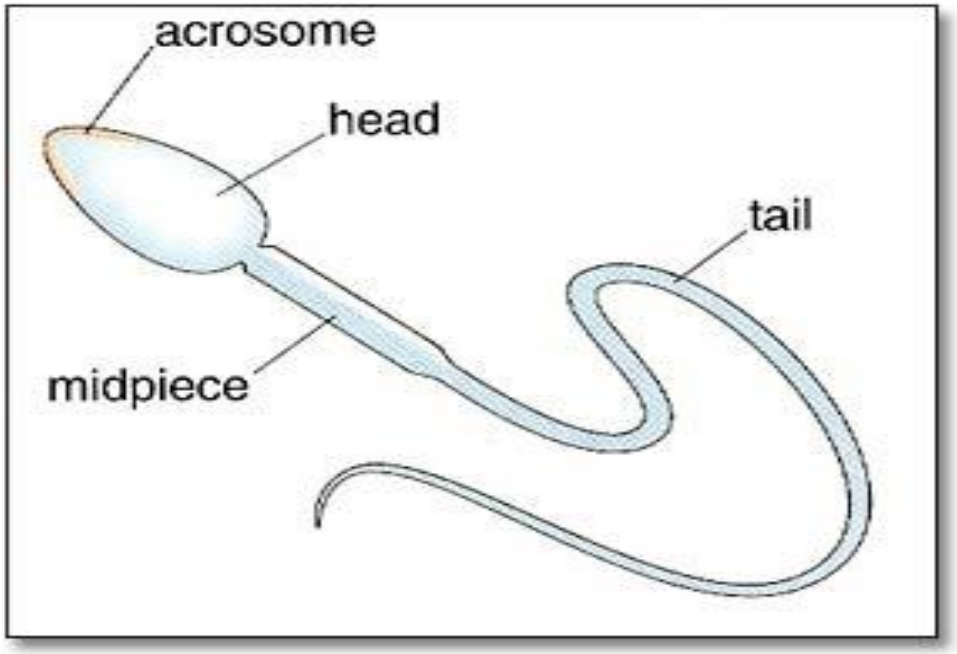
Function:

1) **Provide nutrition and activation of sperm.**
2) **Neutralise the acidic urethra .**
3) **Lubrication of urethra and female genitilia to facilitate sexual intercourse.**

SPERM: 20-200 million /ml or 300-600 million/ejaculation

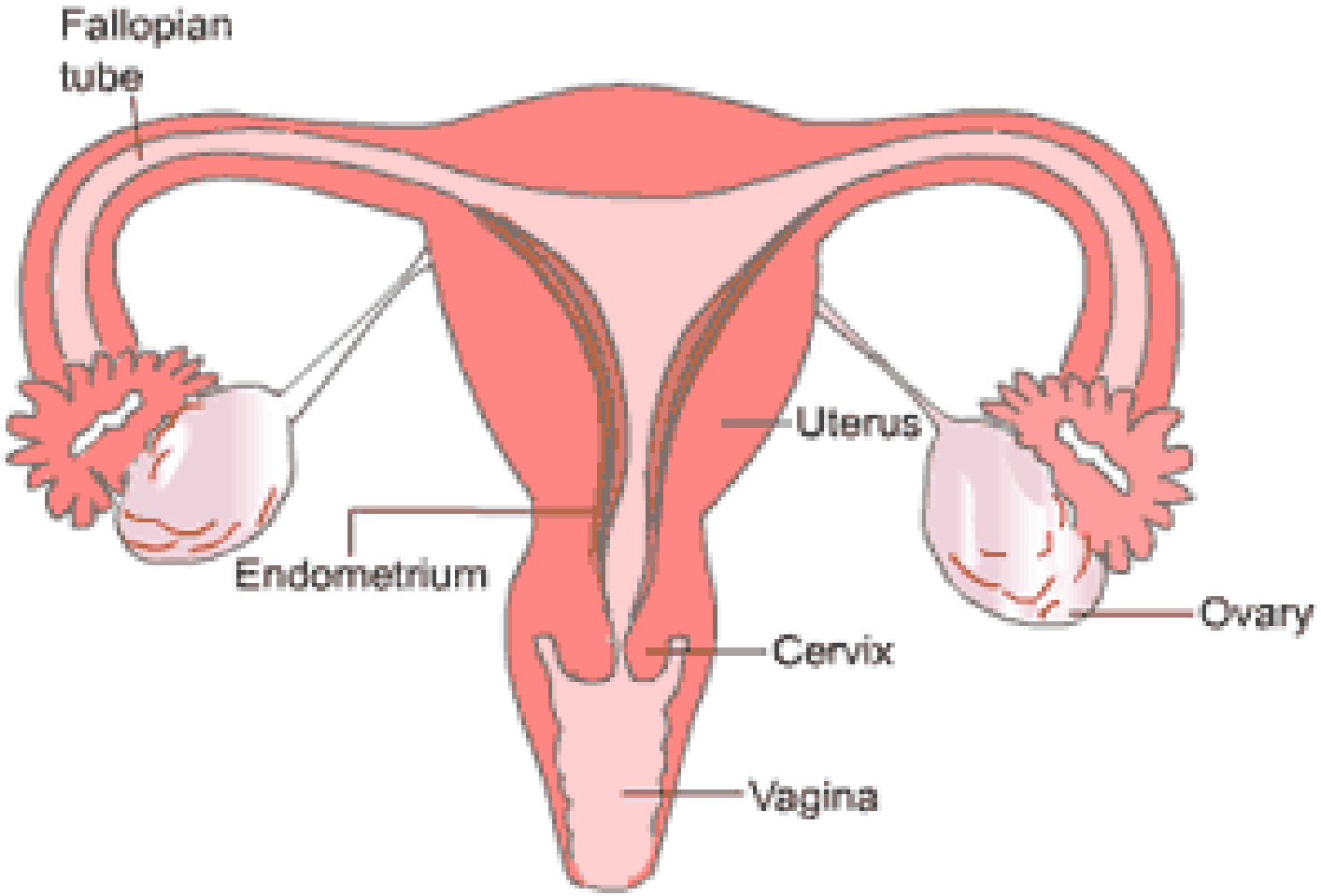
- **Increased number of sperm cells in the semen increases sperm competitiveness and should not be considered as biological wastage.**
- **Life span: 24-48 hours in female genitilia.**

Structure:



b) Female reproductive system :-

The human female reproductive system consists of the following organs:



um (egg)

1) **ovaries: are one pair located in the abdominal cavity near the kidney.**

ovaries are the female primary reproductive organ which perform dual function of production of female gamete or ovum and the secretion of female sex hormone – Oestrogen & Progesterone.

2) **Fallopian tube: are one pair long convoluted tubes that carry ova/egg from the ovary to the uterus. These tubes open into an elastic bag-like structure, the uterus.**

3) **Uterus/Womb: it is a hollow organ within which embryo develops. Its upper portion is broader, while its lower portion is narrower, called cervix.**

4) **Vegina: is long (about 8cm) & tubular muscular structure receiving the cervix of the uterus. It is also called "birth canal". It receives sperms from the male and also serve as the passage through which fully developed foetus is born.**

SEXUAL REPRODUCTION IN HUMAN BEING:

- The sperm is introduced inside the female vagina through the penis by the process of copulation or mating. Fertilisation occurs in the fallopian tube.
- Sperms are highly active & mobile which move up through cervix into the uterus and then pass into the fallopian tubes.
- In the fallopian tube only one sperm fertilises the ovum to form zygote. This is called fertilisation.(Fertilisation occurs only if copulation takes place during the ovulatory period)

The embryo development of the zygote starts immediately in the fallopian tube and pregnancy starts while menstruation stops.

The embryo moves down to reach the uterus. The embryo get embedded in the thick inner lining of the uterus(process is called Implantation)

Then a special tissues develops between the uterine Wall and the embryo (foetus) called Placenta, through which the exchange of nutrients, oxygen and waste products take place between the foetus and the mother.

- **The time period from the development of foetus inside the uterus till birth is called Gestation period. It is approximately 9 months in human.**
- **At the end of gestation period the female give birth of the fully developed foetus (The act of giving birth is termed as Parturition)**

Reproductive cycle/ Sexual Cycle/ Menstrual Cycle: Represent cyclic changes in the reproductive system of female. It begins with menstruation.

Menstruation: The breakdown and removal of the inner thick and soft lining of the uterus along with blood vessels in the form of vaginal bleeding is called **menstruation / menstrual flow**.

First menstruation which occurs at the age of 11-12 years is called **MONARCHE**.

The last menstruation which occurs at the age of 45 years marks the end of the reproductive period is called **MENOPAUSE.**

REPRODUCTIVE HEALTH: is all those aspects of general health which help a person to lead a normal, safe and satisfying life.

STDs(Sexually Transmitted Disease):- are the disease which are spread by sexual contact from an infected person to a healthy person. They are caused by various microorganisms that live in worm and moist environments of the vagina, urethra, anus and mouth. Some of the common STDs are:

1. Gonorrhoea: is caused by bacterium – Neisseria gonorrhoea. It is charecterised by inflamation of urinogenital tract and the patient feels burning sensation during urination. This bacteria infects the Ureters in men and Cervix in Women.

2. Syphilis: Bacterium Treponema Pallidium. It is charecterised by lesions in the mucous membrane of urinogenital tract.

3. Trichomoniasis: Protozoan Trichomonas vaginalis. It is charecterised by some vaginal discharge at the urino-genital tract of the female.

4. AIDS(Acquired Immune Deficiency Syndrome) :- It is caused by virus called HIV (Human Immune Virus) which suppresses the body's immune system and thereby making it susceptible to any disease.

Modes of transmission of aids:

- By having Sexual contact with an infected person.
- By the transfusion of blood from an infected person.
- Through infected needles used for injection.
- Through the placenta from the mother to child during pregnancy.

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METHODS TO AVOID PREGENENCY:

Mechanical Barrier method: In this method physical devices such as Condoms, diaphragm & cervical caps are used.

These devices prevent the entry of sperm in the female genital tract during copulation, thus acting as barrier between them.

Chemical methods: In these methods, specific drugs are used by females which are of two types- oral pills and Vaginal pills.

Oral pills(oral contraceptive-Ocs)- contains Progesteron hormone mainly which stops the ovary from releasing ovum into the fallopian tube by changing the hormonal balance of the body.

IUCD.(Intrauterine Contraceptive Devices):-

e.g- Copper-T (Placed safely inside the uterus by a doctor) It prevents implantation in the uterus.

SURGICAL METHOD: in this method a small portion of vas deferens in male and the fallopian tube in female is surgically removed or tied. It is called VASECTOMY in males and TUBECTOMY in females.

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