

A microscopic view of several cells, likely yeast or similar microorganisms, against a blue background. The cells are spherical and contain internal structures like nuclei and organelles. One cell in the foreground is particularly large and detailed, showing a prominent nucleus and various organelles. Other cells are visible in the background, some in focus and some blurred.

CHAPTER 8

How do organisms reproduce?

Acknowledgment

- Images & video clips have been taken from various sources on the internet.
- Some images and video clips have been modified according to the syllabus.

Images courtesy: [google.com](https://www.google.com)

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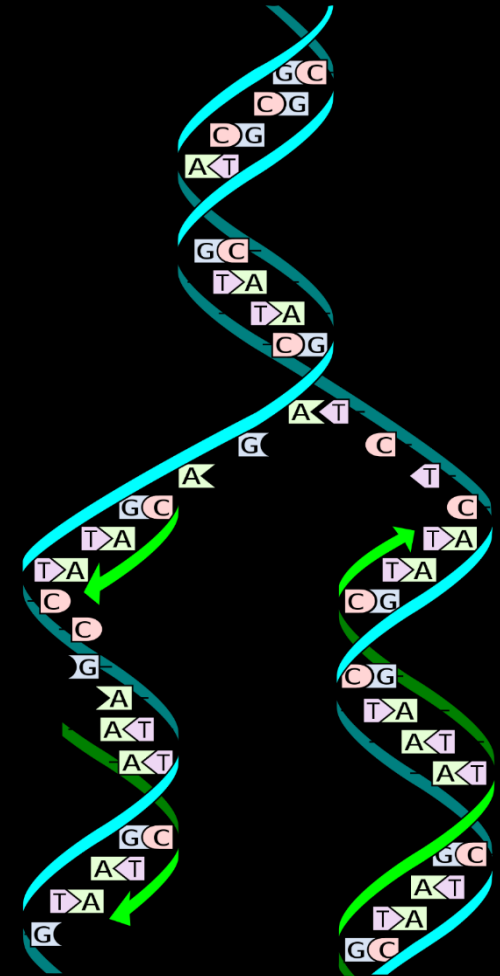
Why organisms reproduce?

Reproduction is necessary for living things because it enables them to create offspring and continue their population.



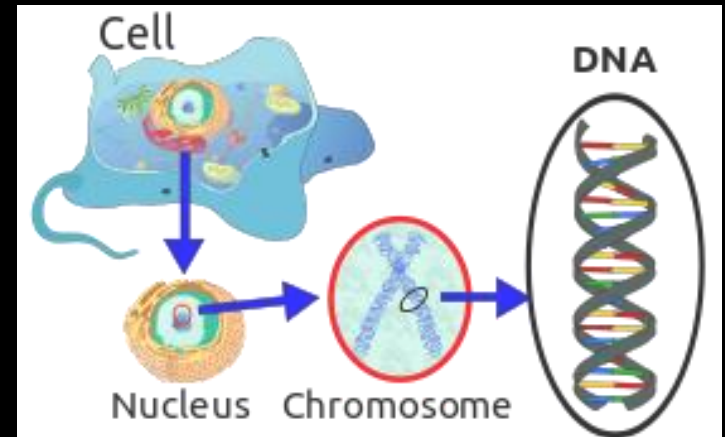
What is the most basic function of reproduction?

Reproduction at its most basic level will involve making copies of the blueprints of body design. A basic event in reproduction is the creation of a DNA copy.



Why is DNA copying an essential part of the process of reproduction?

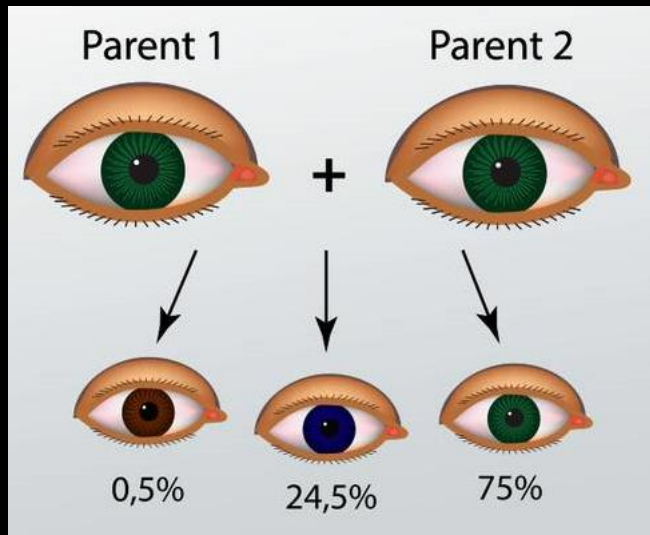
Chromosome in the nucleus of a cell contain information for inheritance of features from parent to next generation in the form of DNA. The DNA in the cell nucleus is the information source of making proteins. Therefore, a basic event in reproduction is creation of DNA copy for the next generation.



Importance of DNA copying

The importance of DNA copying during reproduction is that:

- (i) It is responsible for the transmission of parental characteristic to its offsprings.
- (ii) It also leads to certain genetic variation.



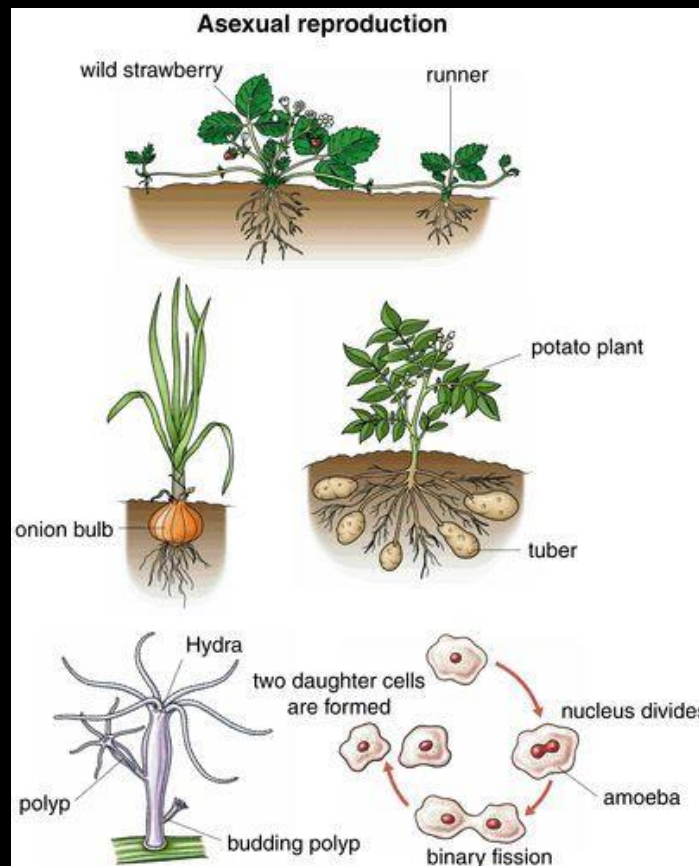
Why is variation beneficial to the species but not necessarily for the individual?

Variations allow organisms to exist in diverse habitats. In the absence of variations, a species may be restricted to particular area. If this area gets drastically altered, due to various natural or man-made causes, the species may be wiped out. If some variations were present in a few individuals, these colonize other habitats and could survive. But if variations are present in a single organism there would be very little for it to survive.

Asexual reproduction

Asexual reproduction

The type of reproduction that allows new generations to be created from a single individual is known as **asexual reproduction**.



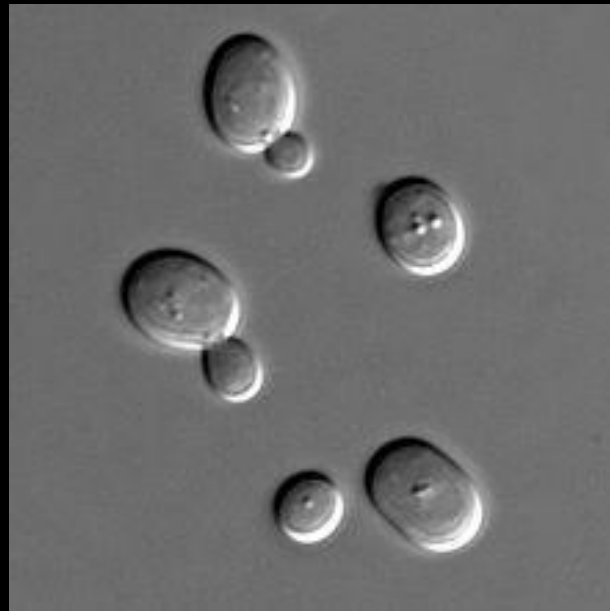
Methods of asexual reproduction

The different methods of asexual reproduction are

- (i) Fission
- (ii) Budding.
- (iii) Spore formation.
- (iv) Regeneration.
- (v) Fragmentation.
- (vi) Vegetative propagation.

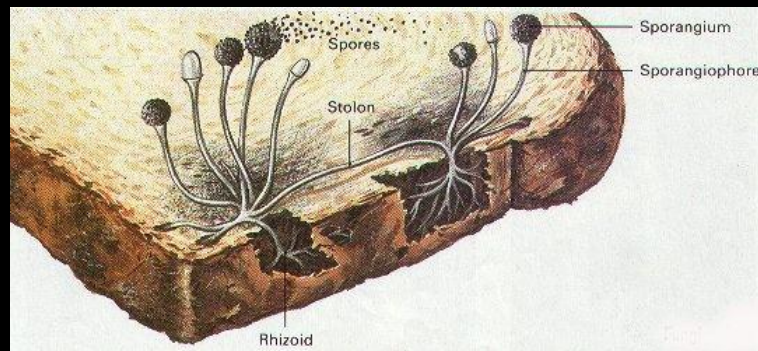
(Activity 8.1) Dissolve about 10 gm of sugar in 100 mL of water. Take 20 mL of this solution in a test tube and add a pinch of yeast granules to it. Put a cotton plug on the mouth of the test tube and keep it in a warm place. After 1 or 2 hours, put a small drop of yeast culture from the test tube on a slide and cover it with a coverslip. Observe the slide under a microscope.

Formation of yeast cells can be seen. Some of them, may show chain budding



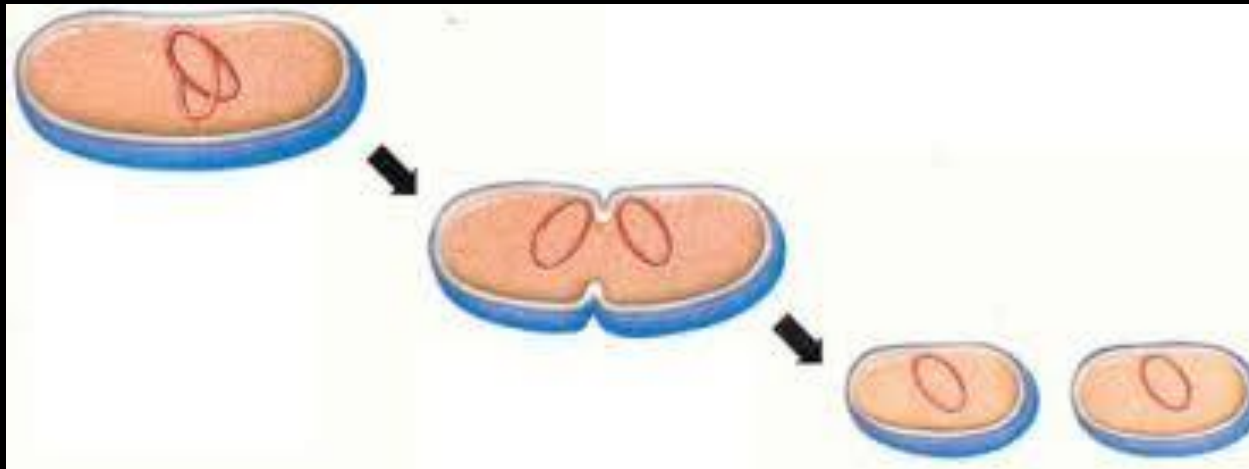
(Activity 8.2) Wet a slice of bread, and keep it in a cool, moist and dark place. Observe the surface of the slice with a magnifying glass. Record your observations for a week.

During the week, on observing the surface of the slice with a magnifying glass, a layer of white cotton like mass is seen covering the surface of slice. Area of white mass coverage found to be increasing on subsequent days. After a week, layer of white cotton like mass turns black showing formation of sporangia or spores.



How do organisms reproduce by fission?

Fission is a form of asexual reproduction in which an organism divides into two or more parts.



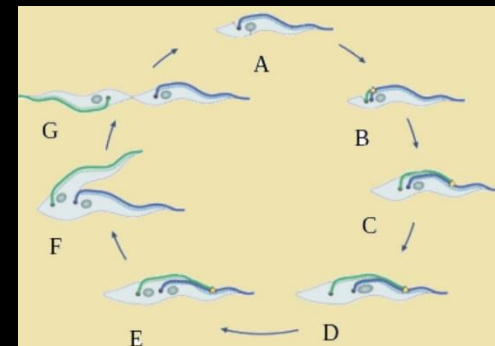
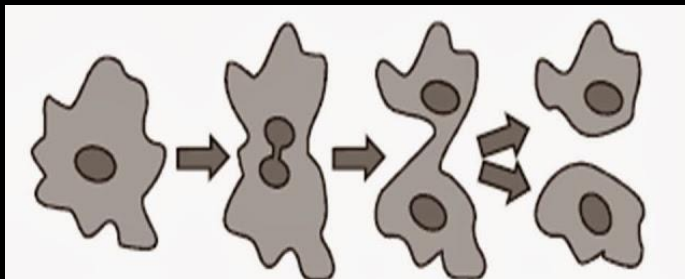
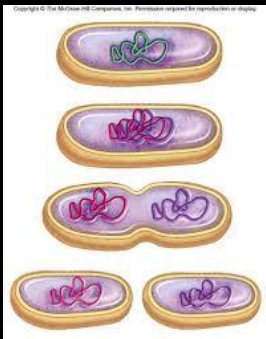
How is the fission method of reproduction different in different organisms?

In unicellular organisms fission, leads to the creation of new individuals.

Many bacteria and protozoa simply split into two equal halves during cell division.

In organisms such as Amoeba, the splitting of the two cells during division can take place in any plane.

In Leishmania fission occurs in a definite orientation.



(Activity 8.3) Observe a permanent slide of Amoeba under a microscope. Similarly observe another permanent slide of Amoeba showing binary fission. Compare the observations of both the slides.

In the permanent slide of amoeba, an amoeba cell is seen containing normal cytoplasm and nucleus. In permanent slide showing binary fission, nucleus seen to be dividing and the constriction is also seen in cytoplasm, suggesting formation of two daughter nuclei.

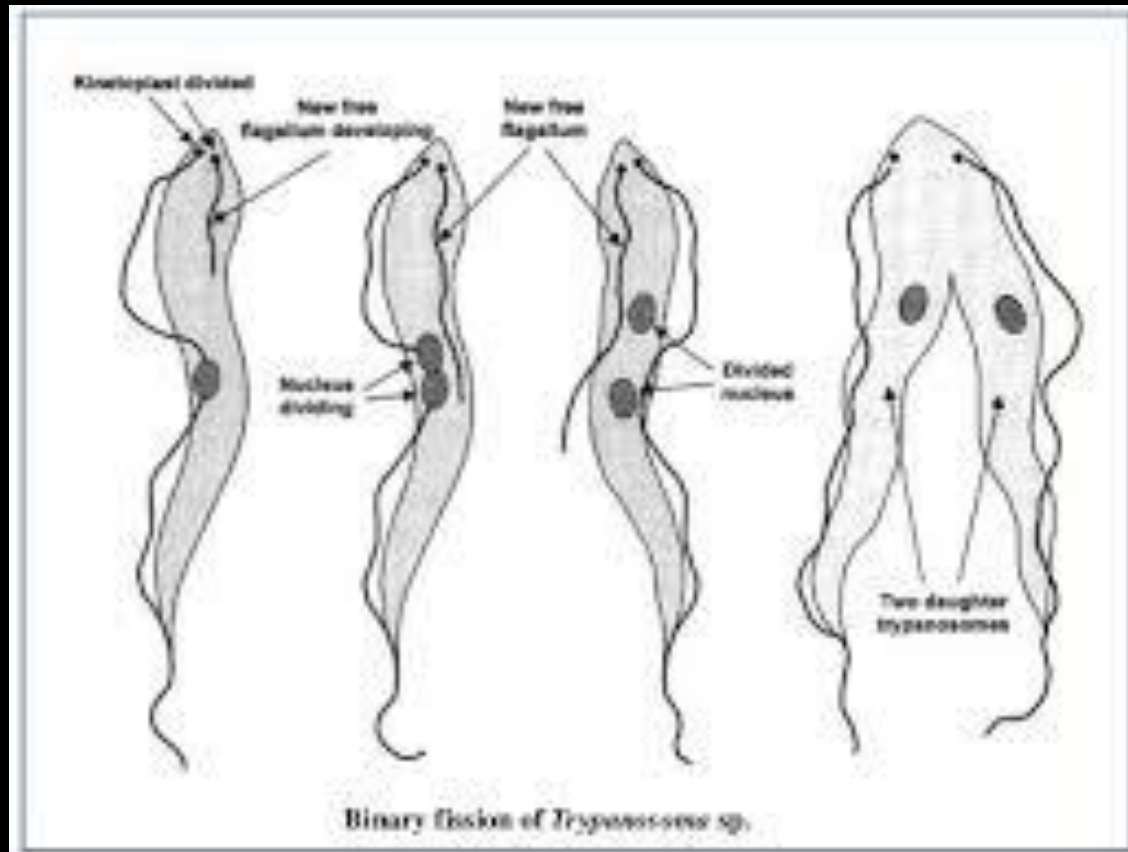


Binary fission

The process by which an organism reproduces asexually by dividing into two cells from a single cell is called **binary fission**.

Binary fission in Leishmania

In Leishmania, binary fission occurs in a definite orientation.



Multiple fission

The process by which an organism reproduces asexually by dividing into many daughter cells simultaneously is called **multiple fission**.

Binary fission Vs Multiple fission

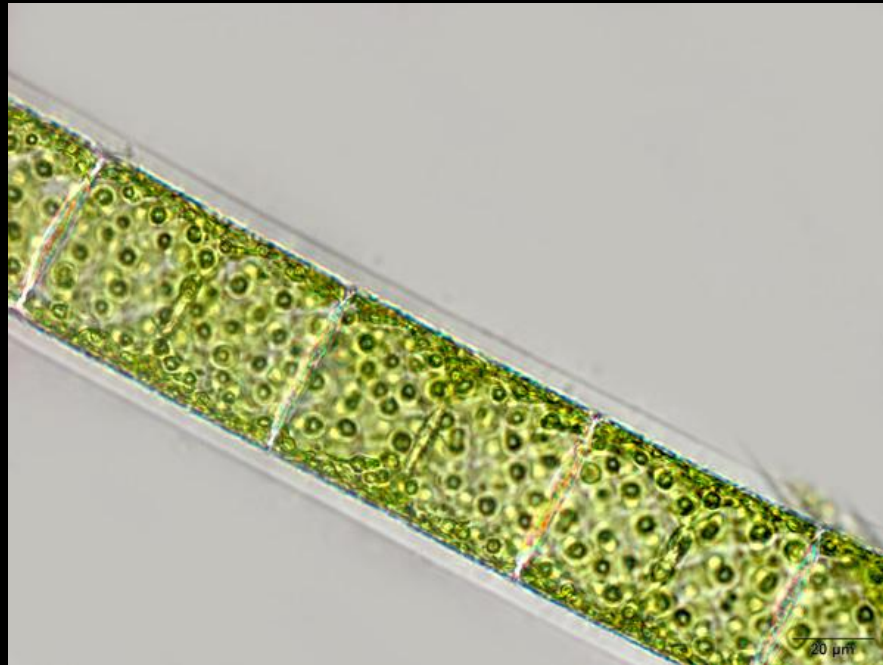
| Binary fission | Multiple fission |
|--|---|
| In binary fission, the parent organism splits to form two new organisms. | In multiple fission, the parent organism splits to form many new organisms at the same time |
| It takes place during favourable environmental conditions. | It takes place during unfavourable environmental conditions |
| It takes place in organisms like Amoeba, Paramecium, etc. | It takes place in organisms like Plasmodium. |

How do yeast reproduce?

Yeast puts out small buds that separate and grow further into a new individual.

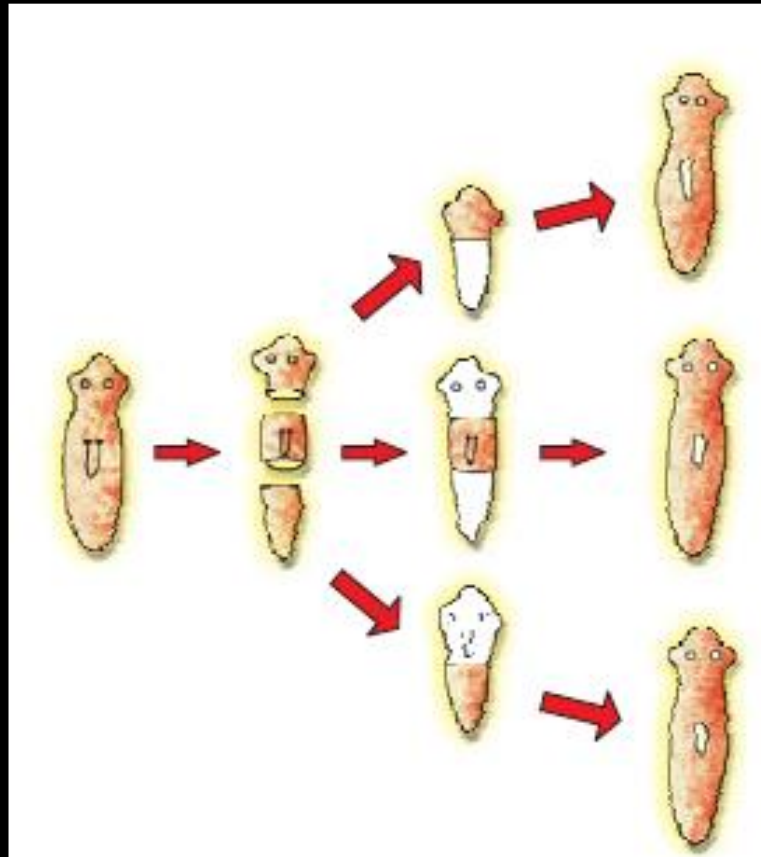
(Activity 8.4) Collect water from a lake or pond that appears dark green and contains filamentous structures. Put one or two filaments on a slide. Put a drop of glycerine on these filaments and cover it with a coverslip. Observe the slide under a microscope. Can you identify different tissues in the Spirogyra filaments?

Spirogyra filament consists of many cells. These cells are attached in linear fashion to form a filament.



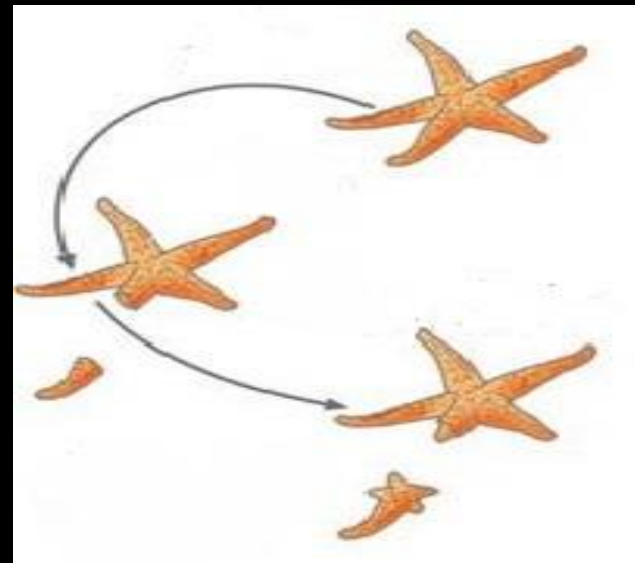
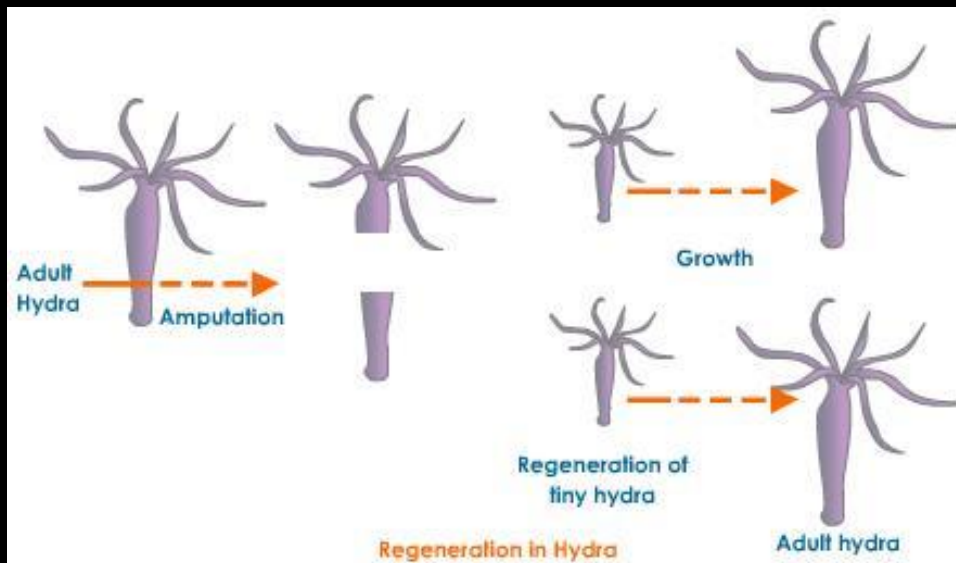
Fragmentation

Fragmentation is a form of asexual reproduction in which an organism is split into fragments. Each of these fragments develop into mature, fully grown individuals.



Regeneration

Regeneration is a process in which an individual which has got cut or broken up into many pieces grow into separate individuals. For example: Simple animals like Hydra and Planaria.



Give reason: Regeneration is not a form of reproduction.

Regeneration is not the same as reproduction, since most organisms would not normally depend on being cut up to be able to reproduce.

Can you think of reasons why more complex organisms cannot give rise to new individuals through regeneration?

Multicellular organisms cannot reproduce by cell because they are not simple random collection of cells.

Simple multicellular organisms possess special type of tissues which have the potential to grow into a new organism but complex multicellular organisms have no such specialised cells.

Reproduction Vs Regeneration

| Reproduction | Regeneration |
|--|---|
| It is the process in which individual organism gives rise to new one either by sexual or asexual method. | It is the process by which new organism develop from the body parts of parent organism. |

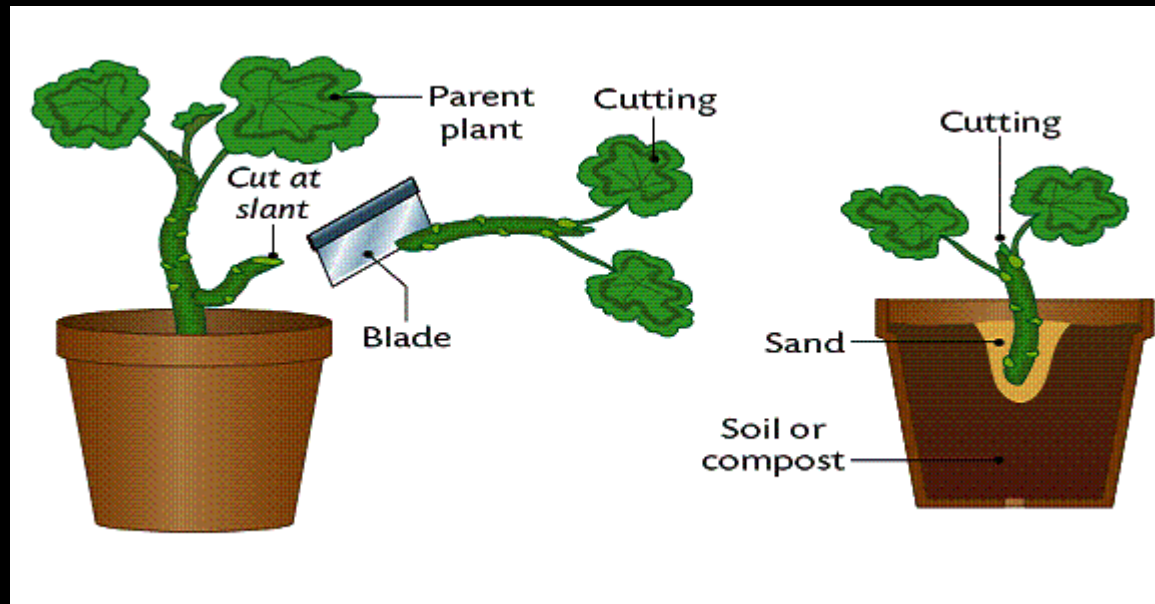
Budding

The type of asexual reproduction in which a bud is formed which develops into tiny individual. It detaches from parent body upon maturation and develops into new individual.

Ex: Hydra

Vegetative propagation

Vegetative propagation is any form of asexual reproduction occurring in plants in which a new plant grows from a fragment of the parent plant or grows from a specialized reproductive structure.

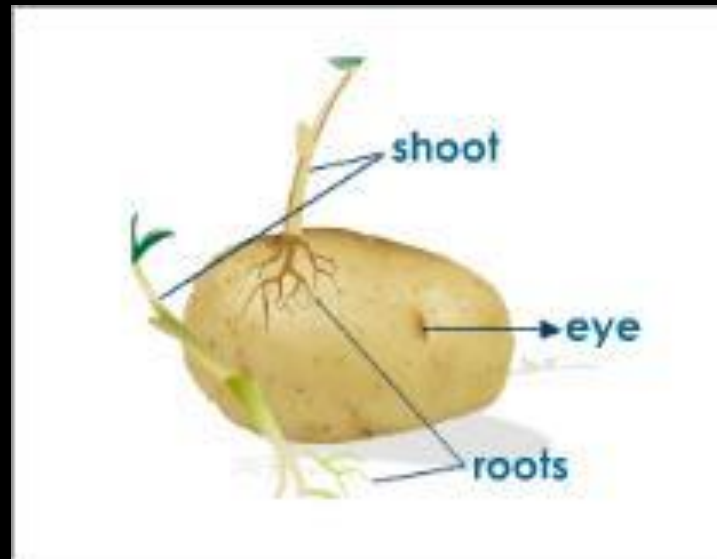


Advantages of vegetative propagation

- a) Plants raised by vegetative propagation can bear flowers and fruits earlier than those produced from seeds.
- b) It makes possible the propagation of plants such as banana, orange, rose and jasmine that have lost the capacity to produce seeds.
- c) All plants produced are genetically similar enough to the parent plant to have all its characteristics.

(Activity 8.5) Take a potato and observe its surface. Can notches be seen? Cut the potato into small pieces such that some pieces contain a notch or bud and some do not. Spread some cotton on a tray and wet it. Place the potato pieces on this cotton. Note where the pieces with the buds are placed. Observe changes taking place in these potato pieces over the next few days. Make sure that the cotton is kept moistened.

Potato with notches or buds show the growth of a new plants whereas the other pieces of potato do not show growth.



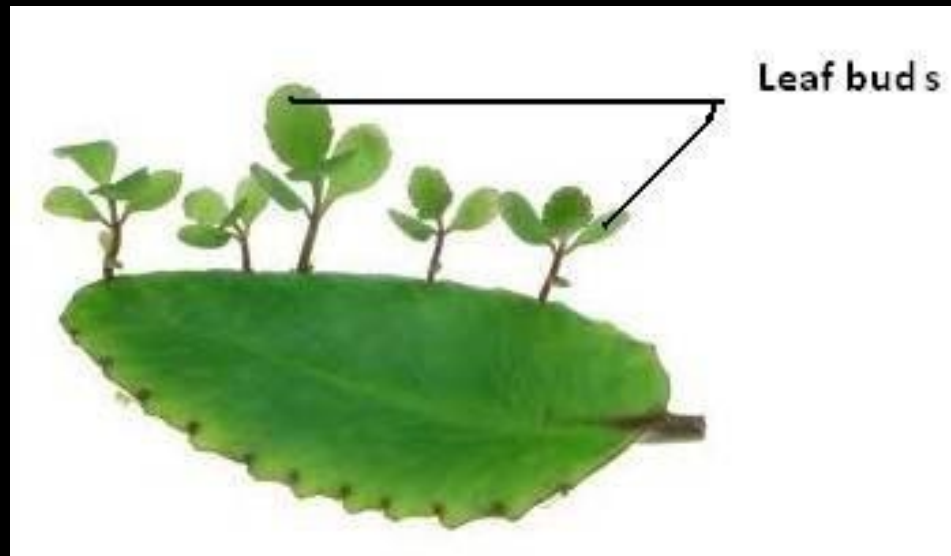
(Activity 8.6) Select a money-plant. Cut some pieces such that they contain at least one leaf. Cut out some other portions between two leaves. Dip one end of all the pieces in water and observe over the next few days. Which ones grow and give rise to fresh leaves? What can you conclude from your observations?

The piece which has at least one leaf develops fresh leaves and branch because money plant leaf has axillary bud between leaves and stem which develop into new plants.



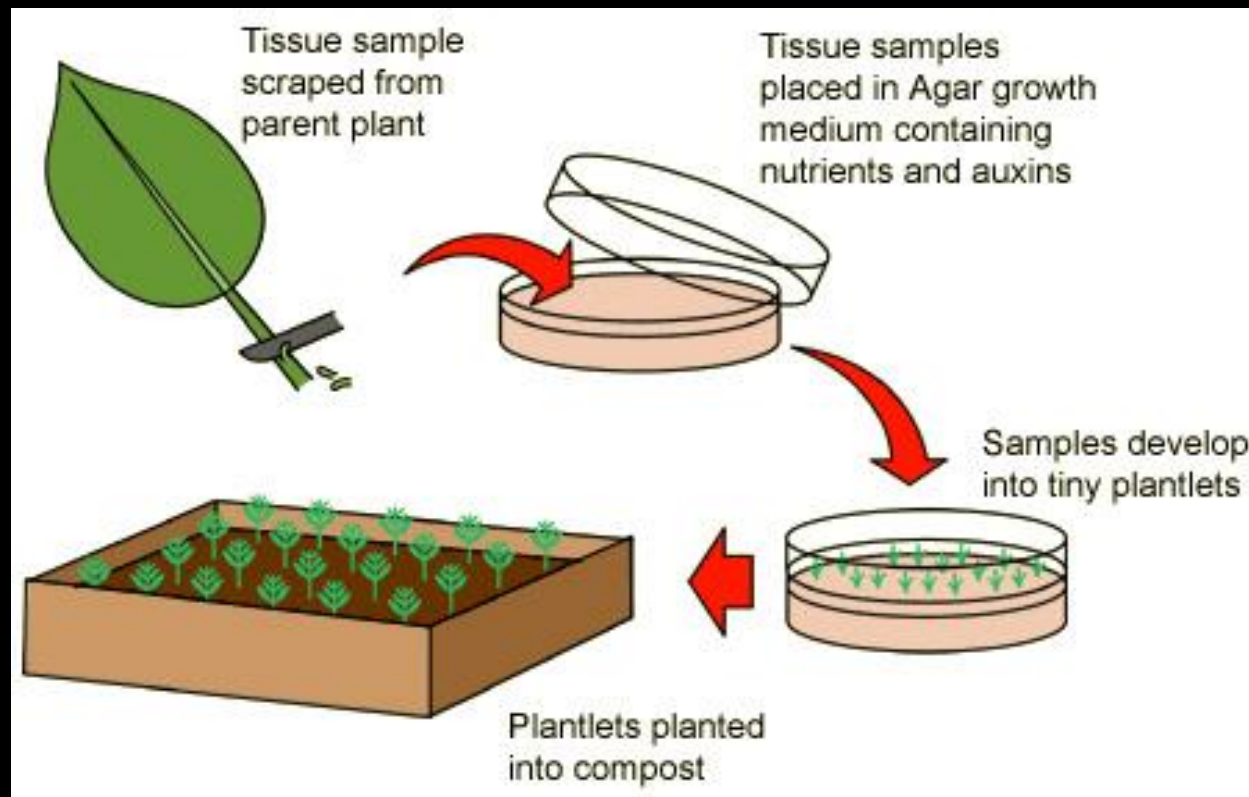
How do bryophyllum reproduce?

Buds produced in the notches along the leaf margin of Bryophyllum fall on the soil and develop into new plants.



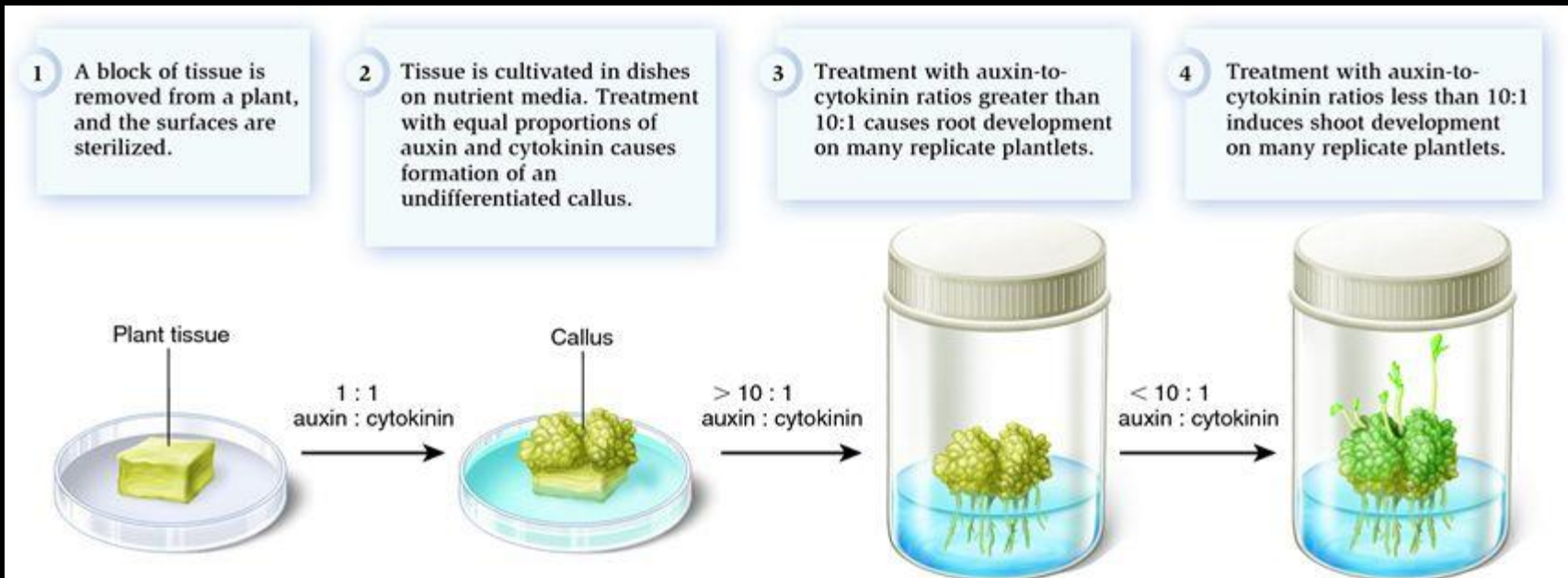
Tissue culture

A tissue culture is the cultivation of a plant through the use of a cutting or other plant tissue.



Tissue culture

New plants are grown by removing tissue or separating cells from the growing tip of a plant. The cells are then placed in an artificial medium where they divide rapidly to form a small group of cells or callus. The callus is transferred to another medium containing hormones for growth and differentiation. The plantlets are then placed in the soil so that they can grow into mature plants.



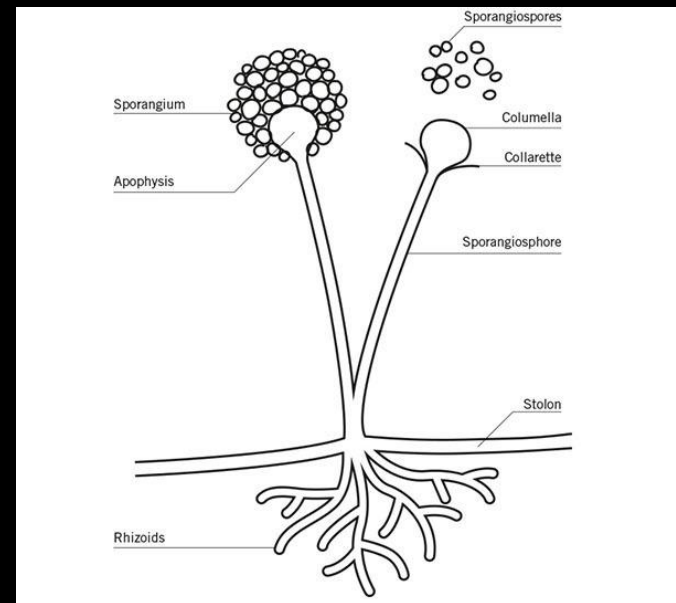
Advantage of tissue culture

Using tissue culture, many plants can be grown from one parent in disease-free conditions.



Sporangia

The tiny blob-on-a-stick structures that are involved in reproduction are called sporangia. They contain cells or spores that can develop into new *Rhizopus* individuals.



Benefits of producing spores

Spores are tiny, spherical, asexual reproductive bodies which under favourable conditions, like damp and warm conditions, germinate to produce new plants. They are covered by the hard protective wall, which enables the plant to survive unfavourable conditions.

Sexual reproduction

Sexual reproduction

The type of reproduction that depends on the involvement of two individuals before a new generation can be created is called **sexual reproduction**.

Significance Sexual reproduction

In asexual reproduction there are very little variations between parent and offspring. This reduces the chance of survival and evolution of species. But in sexual reproduction these variations are more because of combining of variations from two individuals. Therefore, chances of survival and evolution of species are more in organisms produced by sexual reproduction.

Advantage of variations

Variations are useful for ensuring the survival of the species.

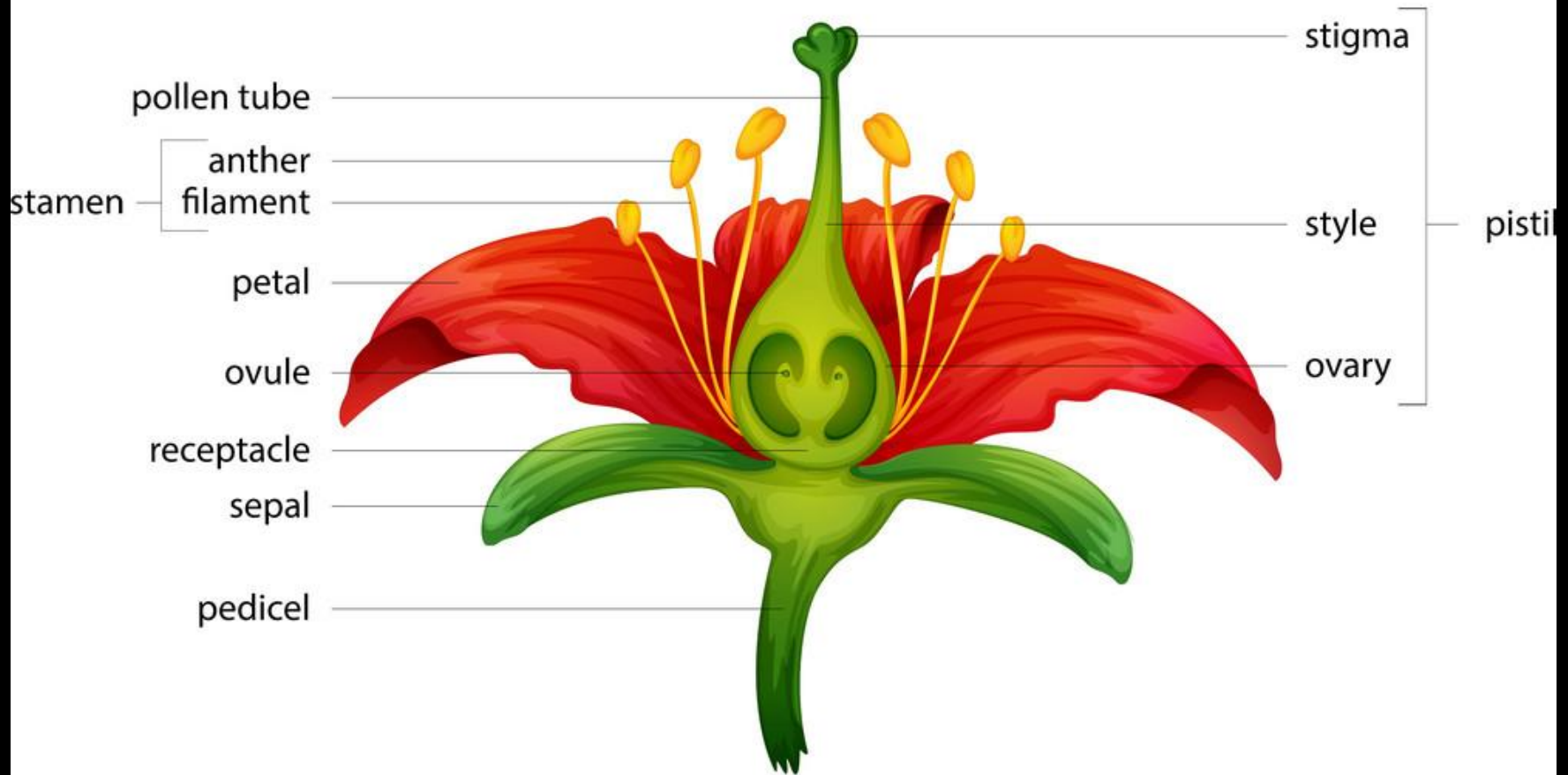


How does DNA copying mechanism allow variations?

As DNA copying is not absolutely accurate. Each new variation is made in a DNA copy that already has variations accumulated from previous generations. The two different individuals in a population would have quite different patterns of accumulated variations. Combining variations from two or more individuals would create new combinations of variants.

Flower

Parts of a Flower



Function of sepals

Sepals serve the purpose of protection at the time of bud stage from infection or any other harm to the flower from any external agent and also serves the purpose of providing starch to the flower by the process of photosynthesis.



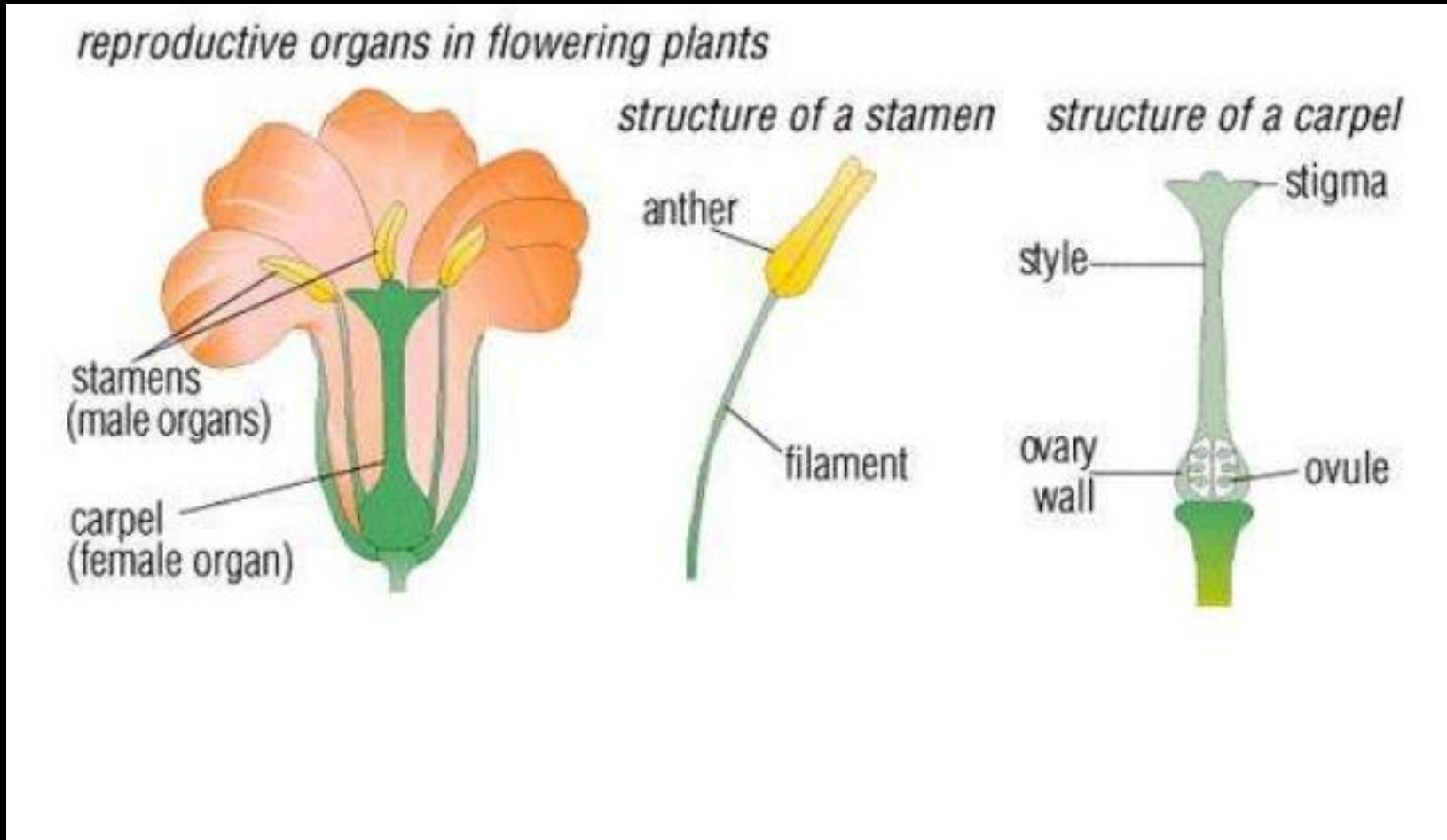
Function of petals

Petals are sometimes very colourful and also scented so as to attract insects or any other creatures towards them so that these creatures become the medium for the transfer of pollen grains from anther to stigma which will result in fertilization.



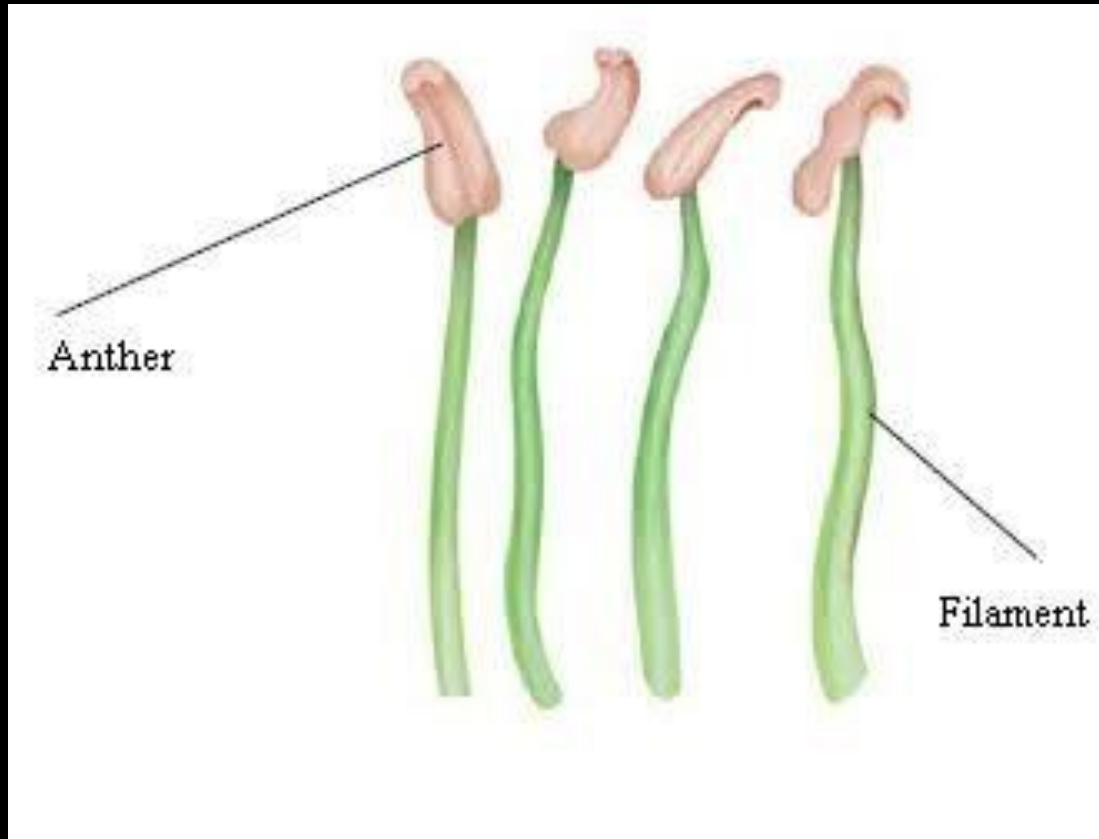
Parts of Unisexual flowers

Stamens or carpels



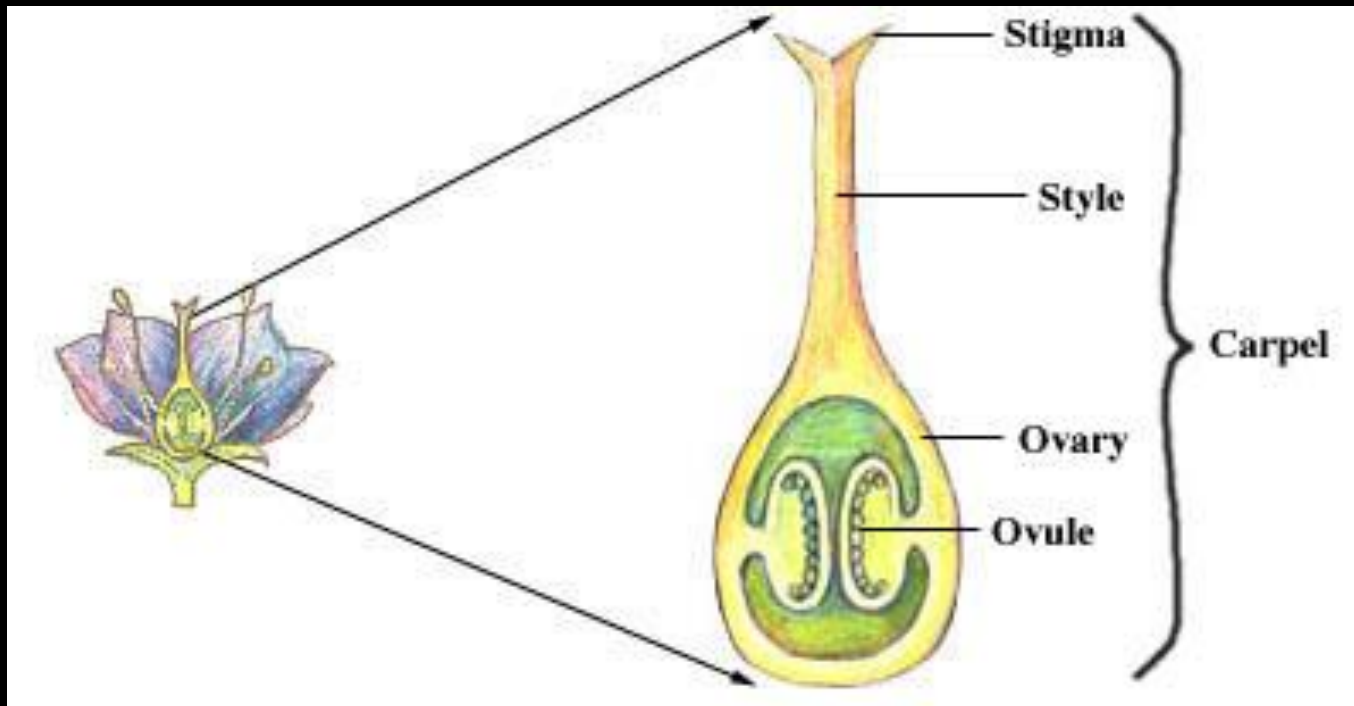
Stamen

Stamen is the male reproductive part which produces pollen grains that are yellowish in colour.



Carpel

Carpel is the female reproductive part present in the centre of a flower. It is made of three parts, ovary, style and stigma.



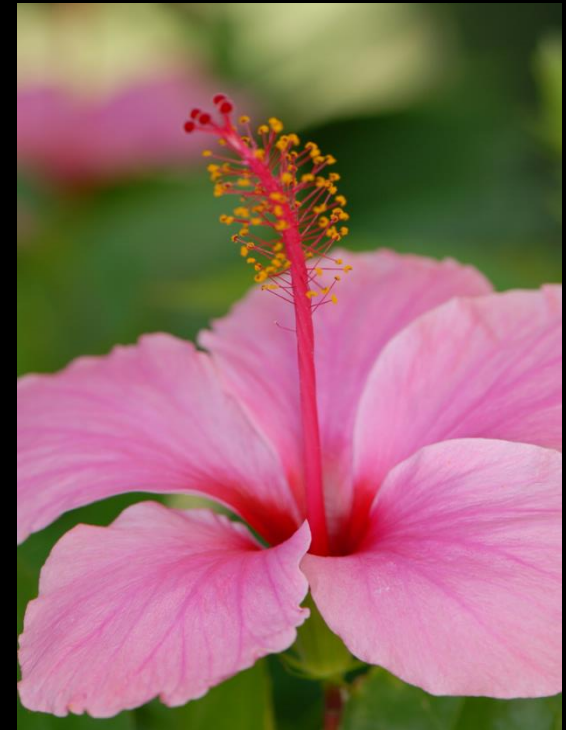
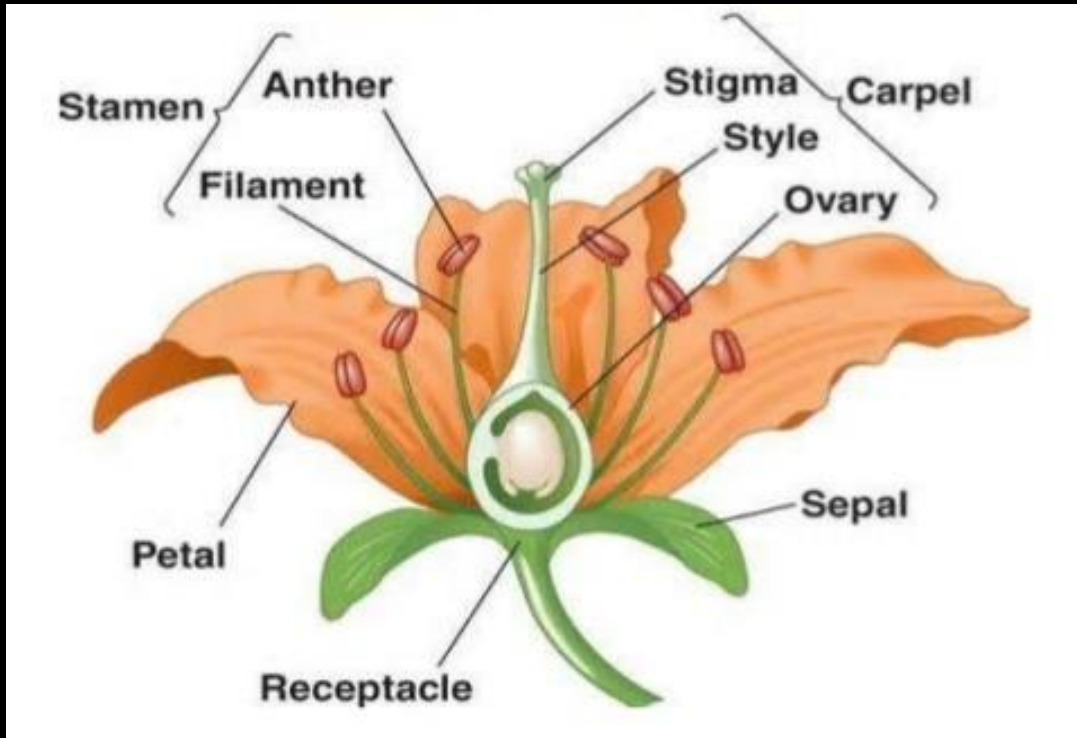
Unisexual flowers

Papaya, watermelon



Bisexual flowers

Hibiscus, mustard

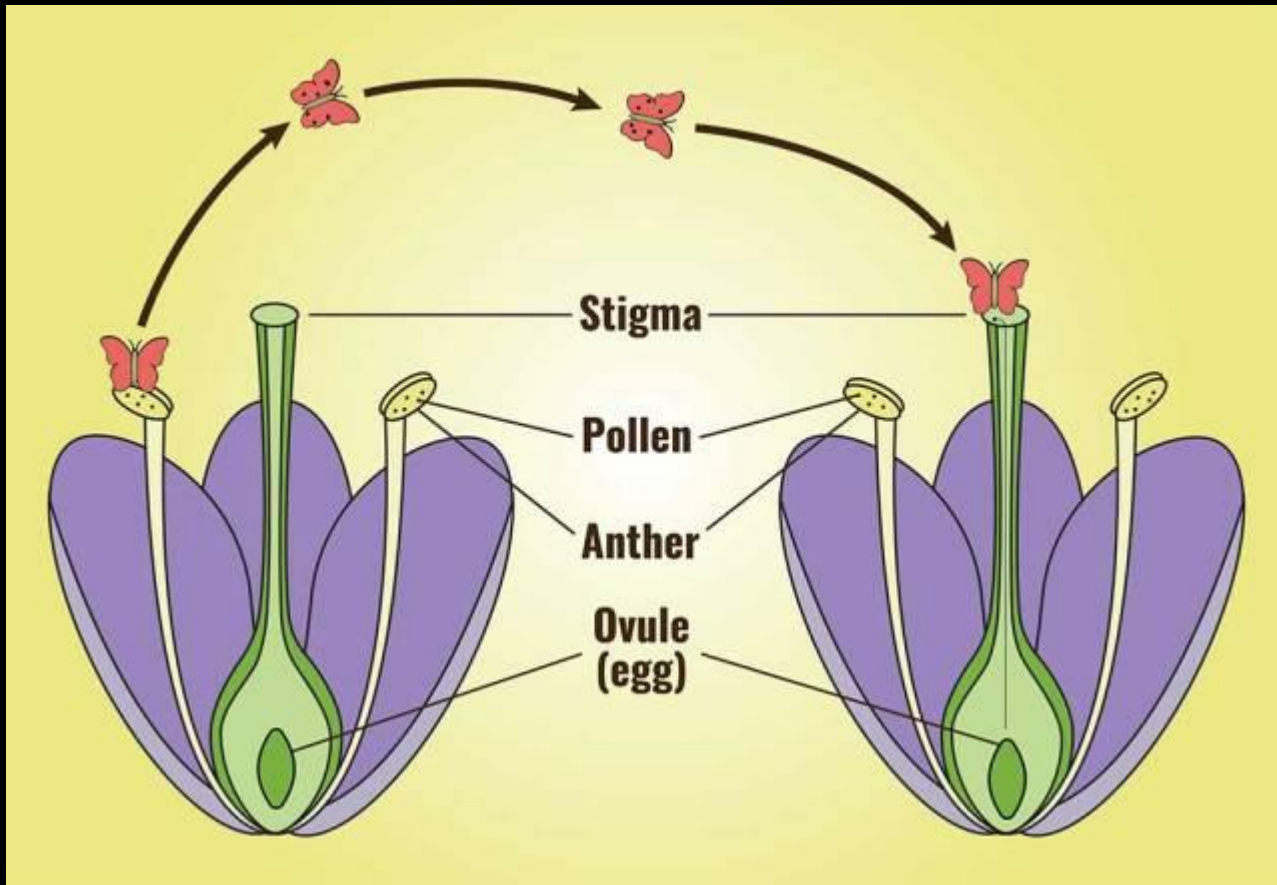


Unisexual Vs Bisexual flowers

| Unisexual flower | Bisexual flower |
|--|--|
| <p>The flower contain only one type of reproductive organ.</p> <p>They contain either stamens or carpel</p> <p>Example: Papaya, watermelon</p> | <p>They contain both type of reproductive organs.</p> <p>They contain both stamens and carpels in the same flower.</p> <p>Example: Hibiscus, mustard</p> |

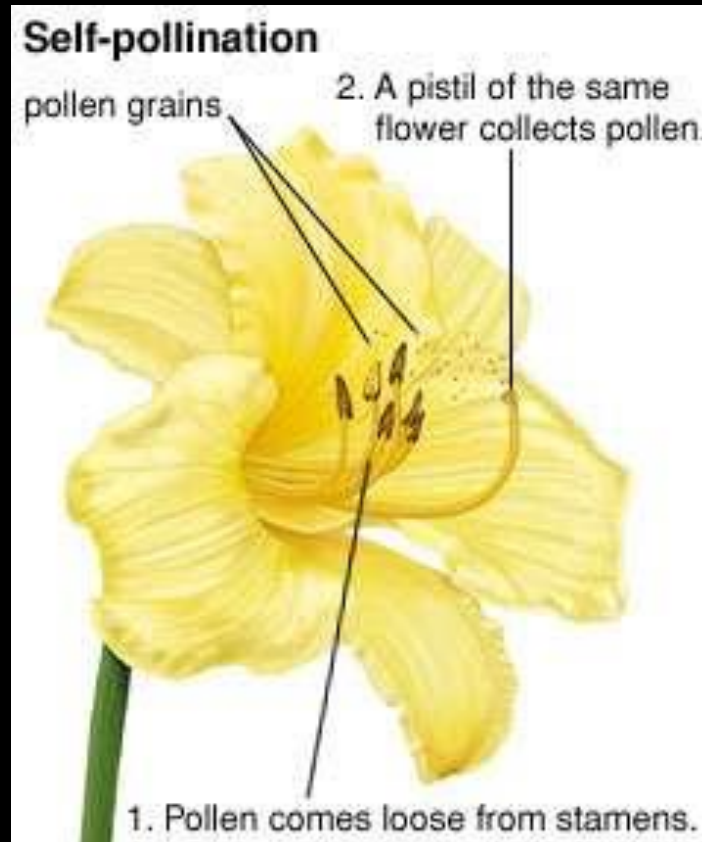
Pollination

Transfer of pollen grains from the anther to the stigma is called **pollination**.



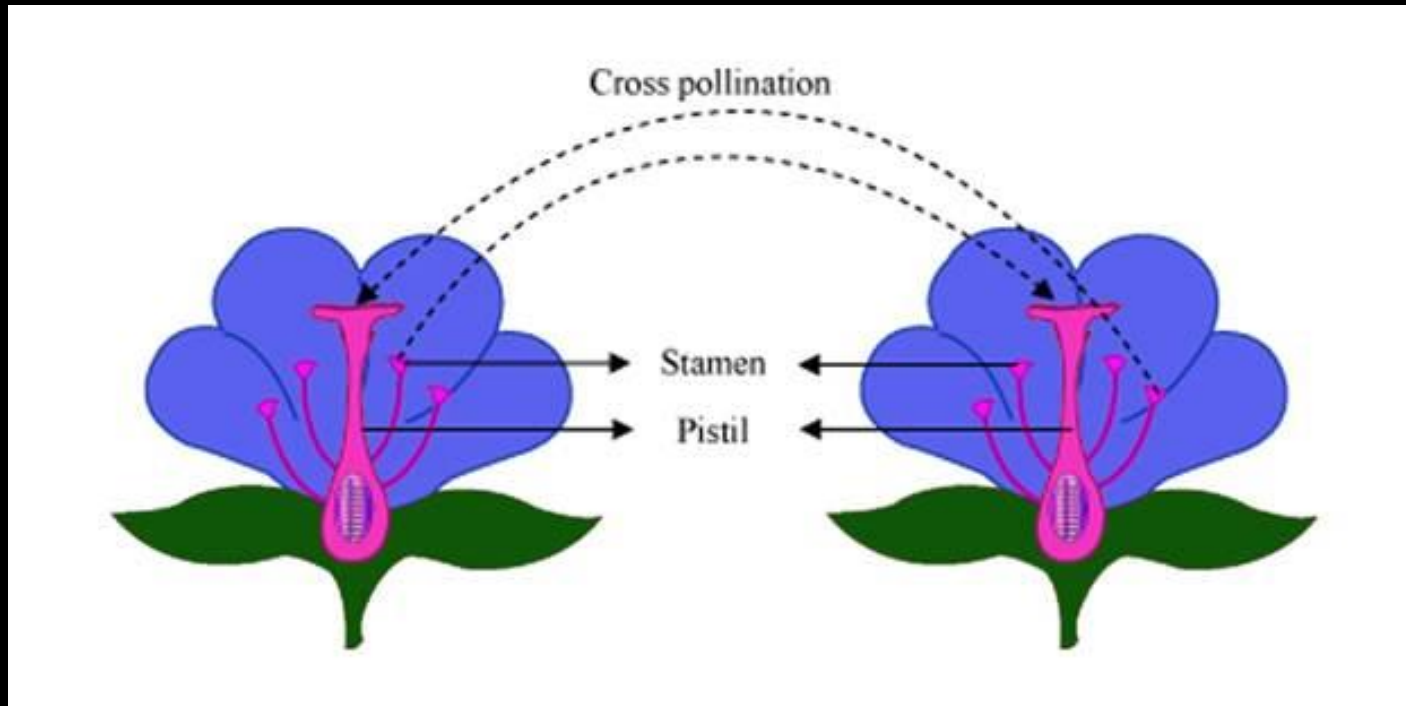
Self-Pollination

The pollination of a flower by pollen from the same flower or from another flower on the same plant is called **self-pollination**.



Cross-Pollination

The transfer of pollen grains of a flower to the stigma of another flower of a different plant of the same species is called **cross pollination**.

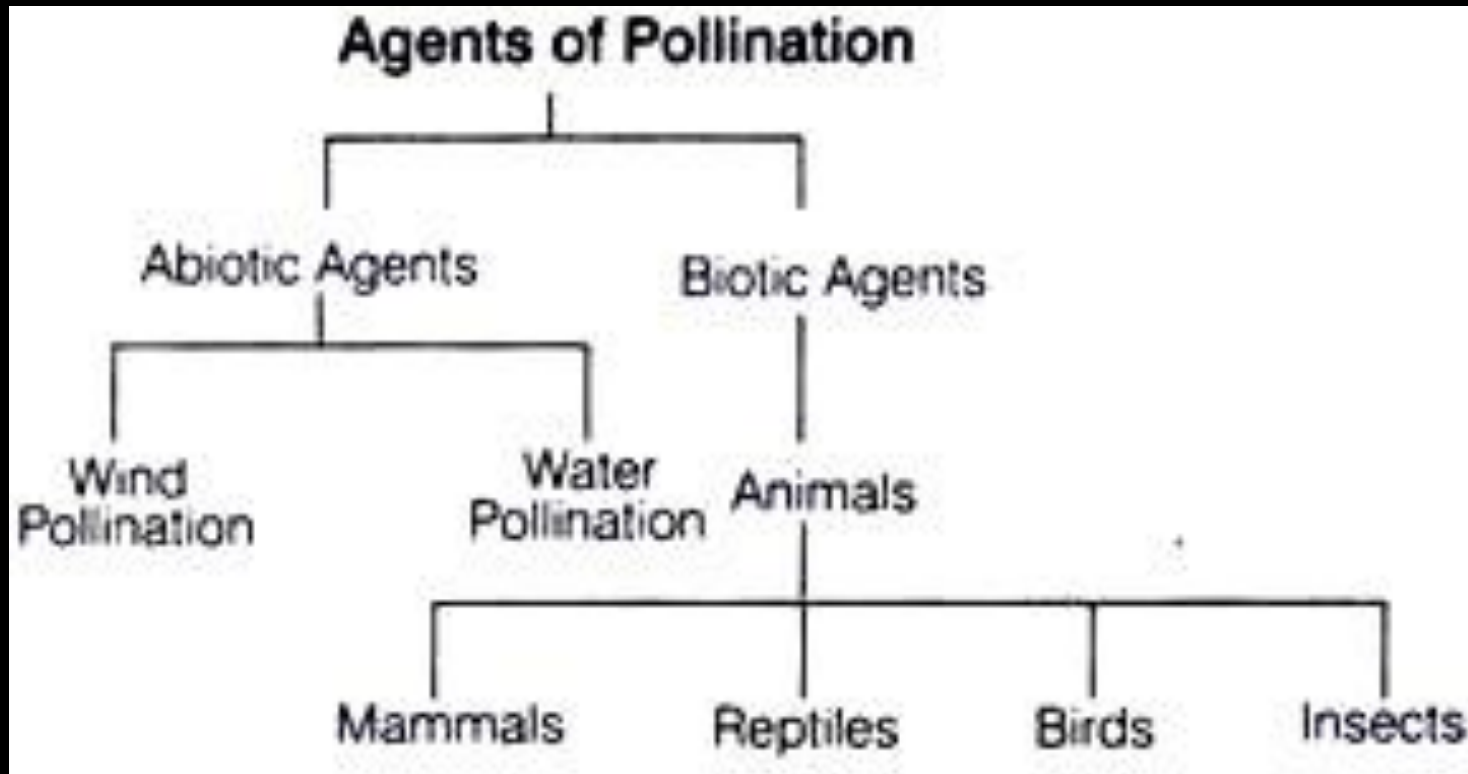


Self-pollination Vs Cross-Pollination

| S. No. | Self-pollination | Cross-pollination |
|--------|--|---|
| (i) | It is transfer of pollen to stigma of the same flower. | It is the transfer of pollen to stigma of another flower of same plant or another plant of same kind. |
| (ii) | It occurs only in bisexual flowers. | It takes place both in unisexual and bisexual flowers. |
| (iii) | It does not lead to genetic diversity. | It leads to genetic diversity. |

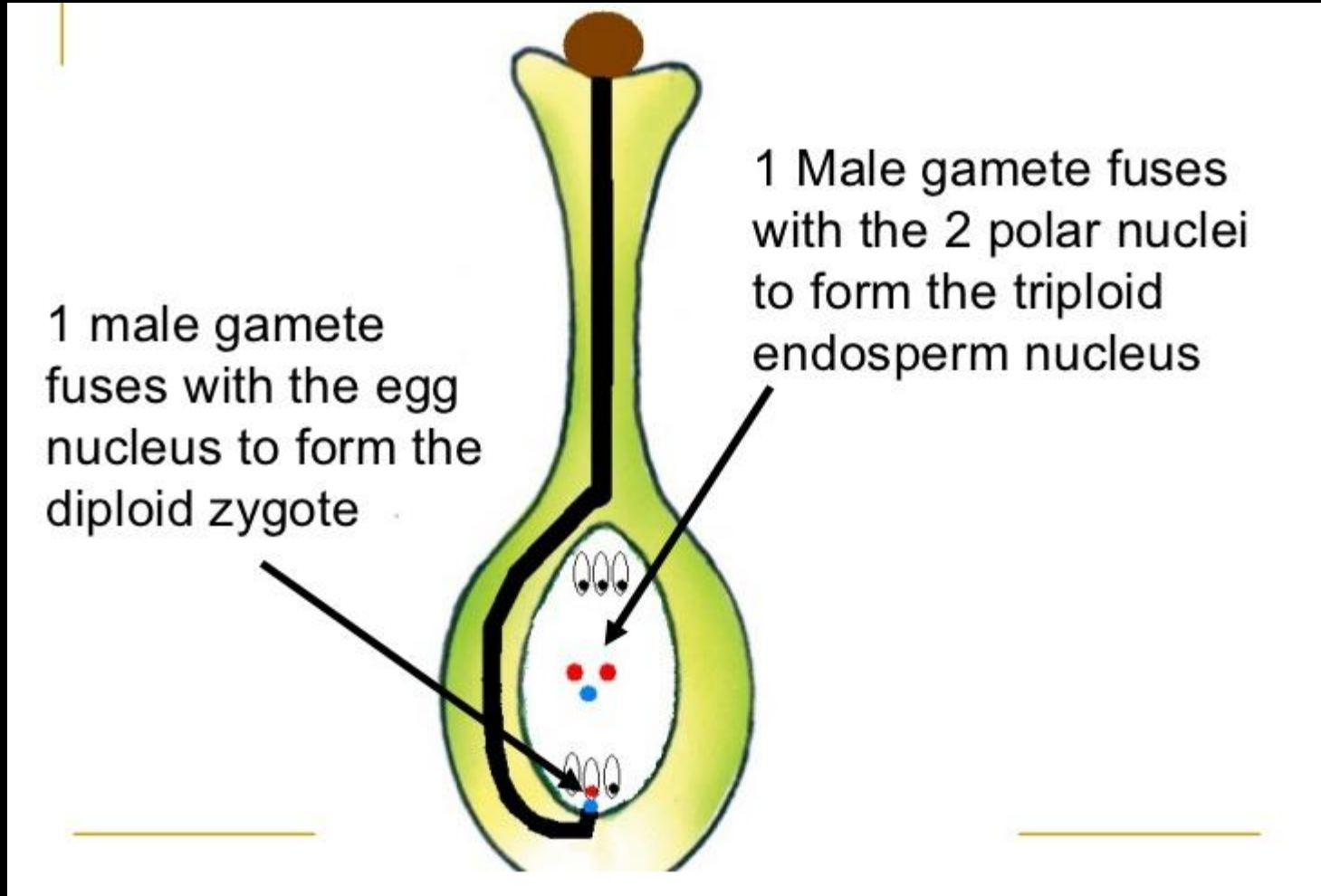
Agents of pollination

The agents of pollination are wind, water or animals.



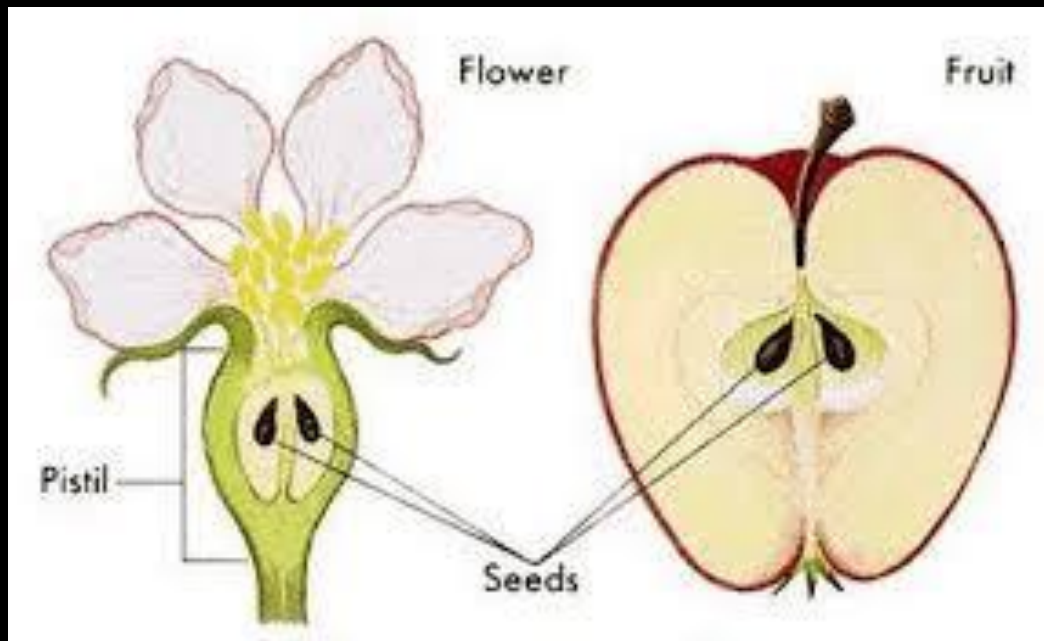
Fertilization

The fusion of a male gamete with egg is known as **fertilization**.



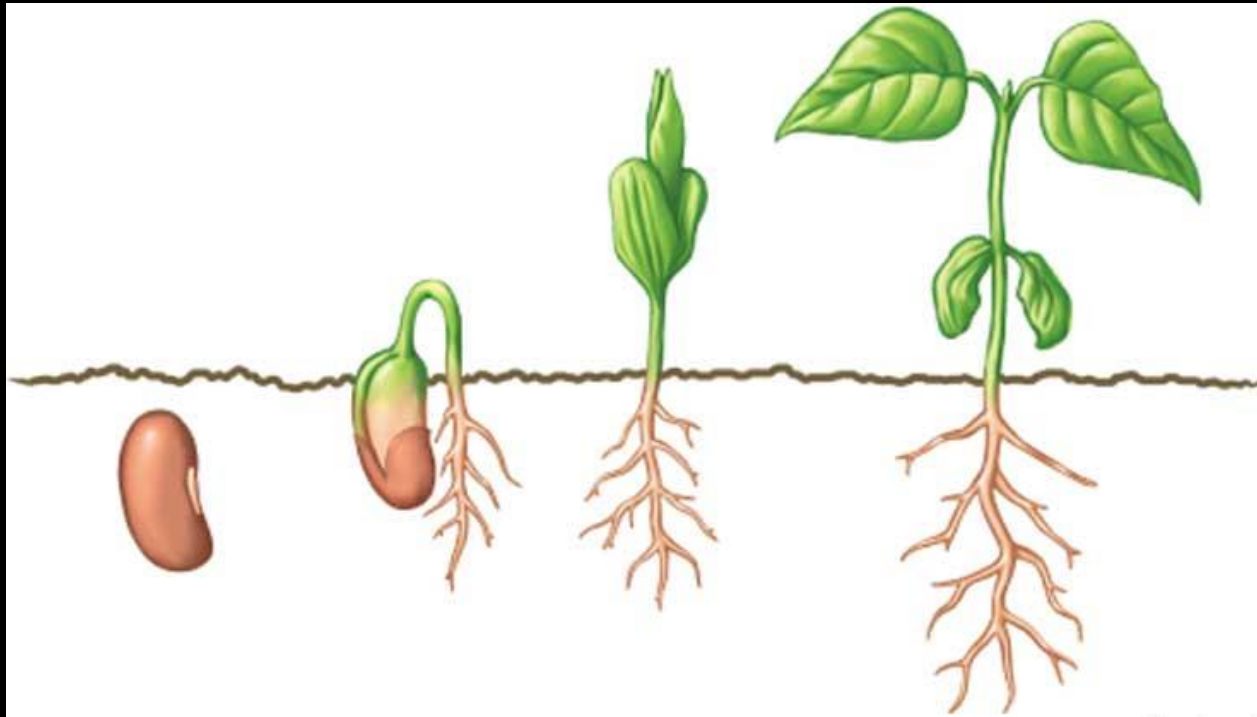
Post Fertilization changes

The ovules develop a tough coat and convert into seeds. The ovary grows rapidly and ripens to form a fruit.



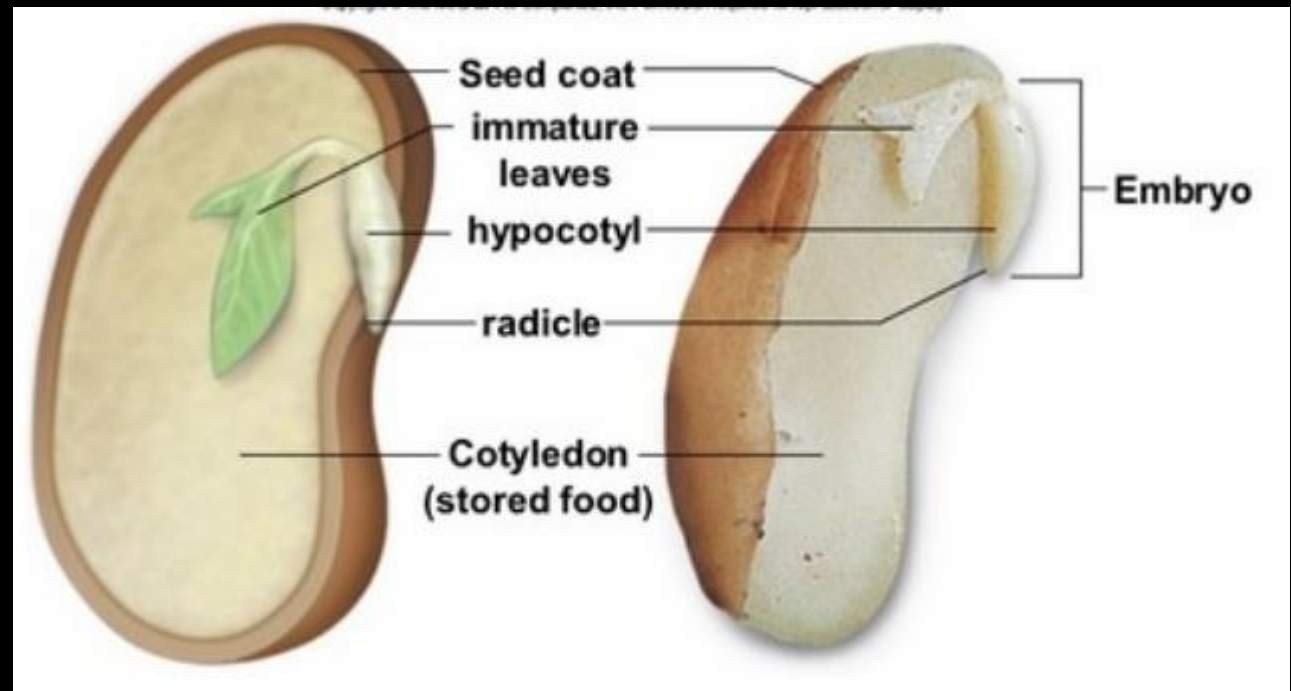
Germination

The process in which seed (containing the future plant or embryo) develops into a seedling under appropriate conditions is called **germination**.



(Activity 8.7) Soak a few seeds of Bengal gram (chana) and keep them overnight. Drain the excess water and cover the seeds with a wet cloth and leave them for a day. Make sure that the seeds do not become dry. Cut open the seeds carefully and observe the different parts.

The parts of the seed are cotyledons containing plumule (future shoot) and radicle (future root).



Sexual reproduction in humans

Changes that are noticed in boys in early teenage/puberty

- a) Thick hair growing in armpits and the genital area between the thighs.
- b) The area between the thighs also become darker in colour.
- c) Thinner hair can also appear on legs and arms.
- d) Thick hair growth on the face.
- e) The skin frequently becomes oily and might begin to develop pimples.
- f) Their voices begin to crack.

Changes that are noticed in girls in early teenage/puberty

- a) Thick hair growing in armpits and the genital area between the thighs.
- b) The area between the thighs also become darker in colour.
- c) Thinner hair can also appear on legs and arms.
- d) The skin frequently becomes oily and might begin to develop pimples.
- e) The breast size begins to increase.
- f) They begin to menstruate at around this time.

Why does the body show sexual maturation at teenage?

Human beings develop special tissues for the purpose of reproduction. While the body of the individual organism is growing to its adult size, the resources of the body are mainly directed at achieving this growth. The maturation of the reproductive tissue is not likely to be a major priority. As the rate of general body growth begins to slow down, reproductive tissues begin to mature.

Puberty

The period during adolescence which marks the attainment of sexual maturity is called puberty.

Boys & girls attain puberty at an age of 10-12 years.

Male Reproductive system

Male reproductive system

The male reproductive system consists of

a) Structure which produce the germ-cells

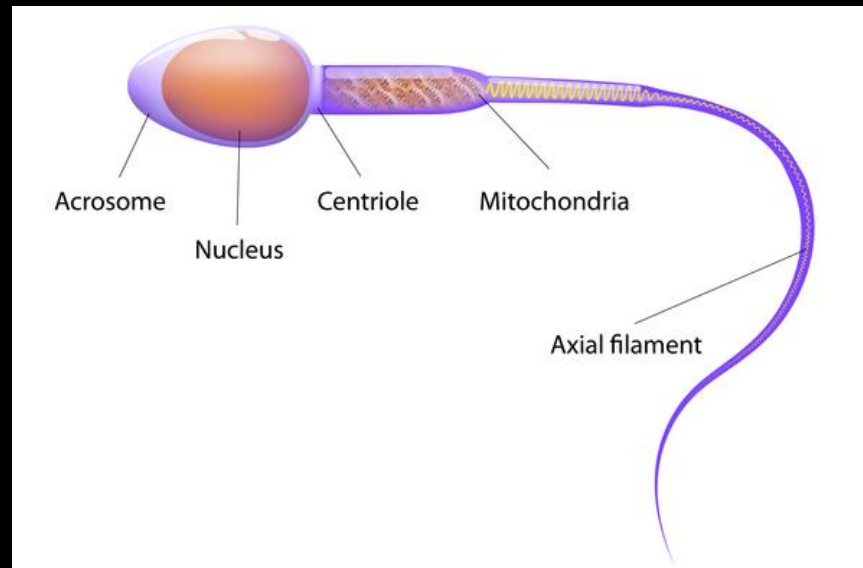
b) Structure that deliver the germ-cells to the site of fertilization.

Germ cell of male

The germ-cells of male are called **sperms**.

The sperms are tiny bodies that consist of mainly genetic material and a long tail that helps them to move towards the female germ-cell.

The formation of germ-cells or sperms takes place in the testes.

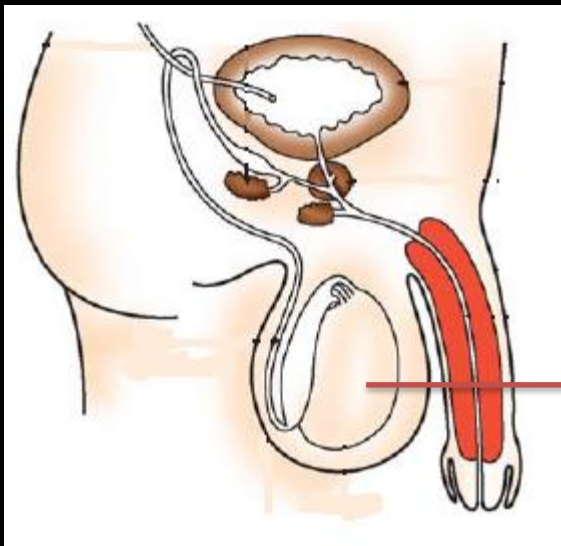


Testes

Testes are the male reproductive structures that form the germ-cells of sperms.

Functions of testes is:

- (i) Produce male sex cells-sperms.
- (ii) Produce male sex hormone testosterone.



Testes

Function of testosterone

- a) Testosterone helps in regulating the formation of sperms.
- b) Testosterone brings about changes in appearance seen in boys at the time of puberty.

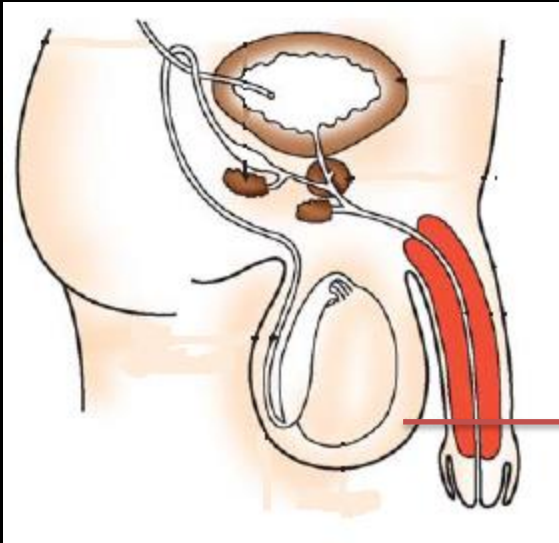
Why are the testes located outside the abdominal cavity?

abdominal cavity?

Testes are located outside the abdominal cavity in scrotum because sperm formation requires a lower temperature than the normal body temperature.

Scrotum

The testes lie in a skin pouch called scrotum.



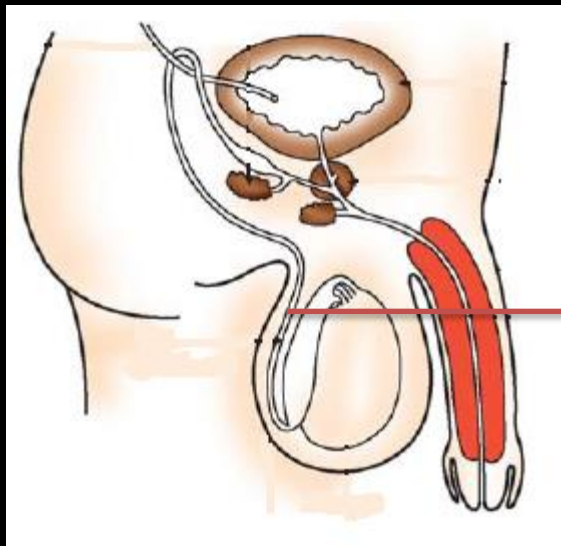
Scrotum

How are the sperms delivered to outside the body?

The sperms formed in the testes are delivered through the vas deferens which unites with a tube coming from the urinary bladder.

Vas deferens

Vas deferens is the tube which carries sperms to the seminal vesicle.



Vas deferens

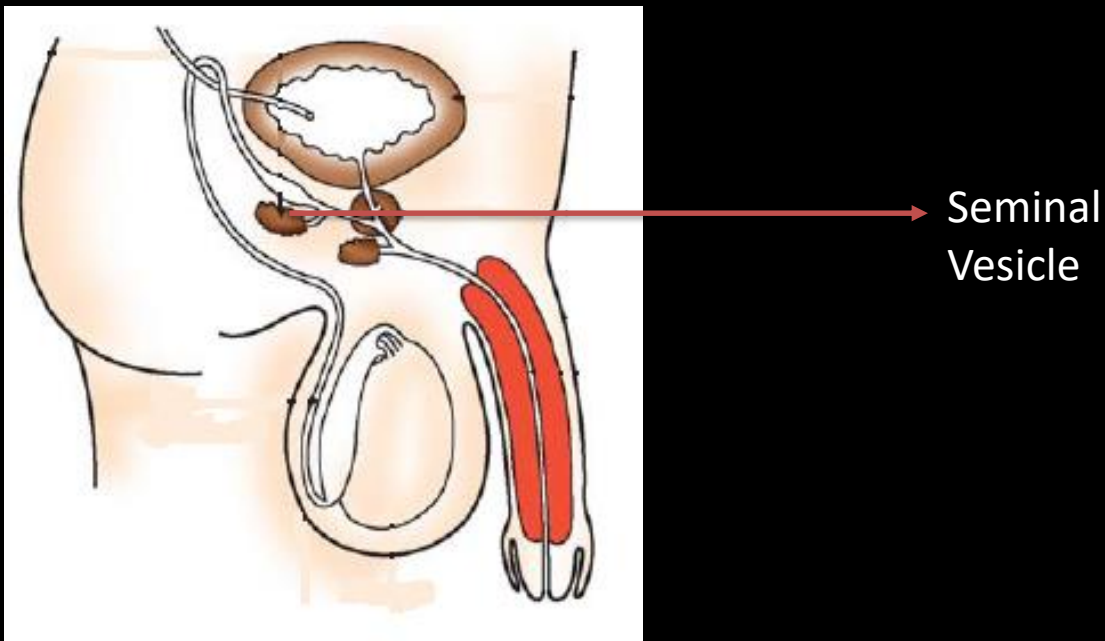
Factors affecting sperms



Seminal vesicle

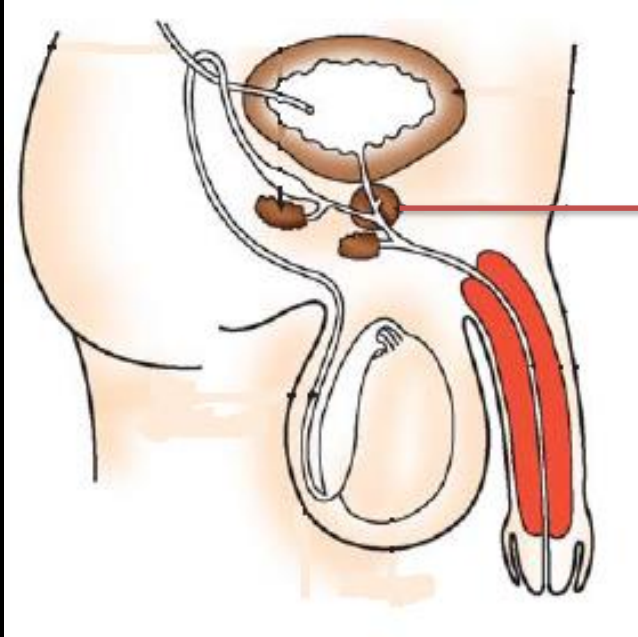
Seminal vesicles is the place where sperms are stored.

Secretions from seminal vesicles provide nutrition to the sperms and make their transport easier by providing them a fluid medium.



Prostate gland

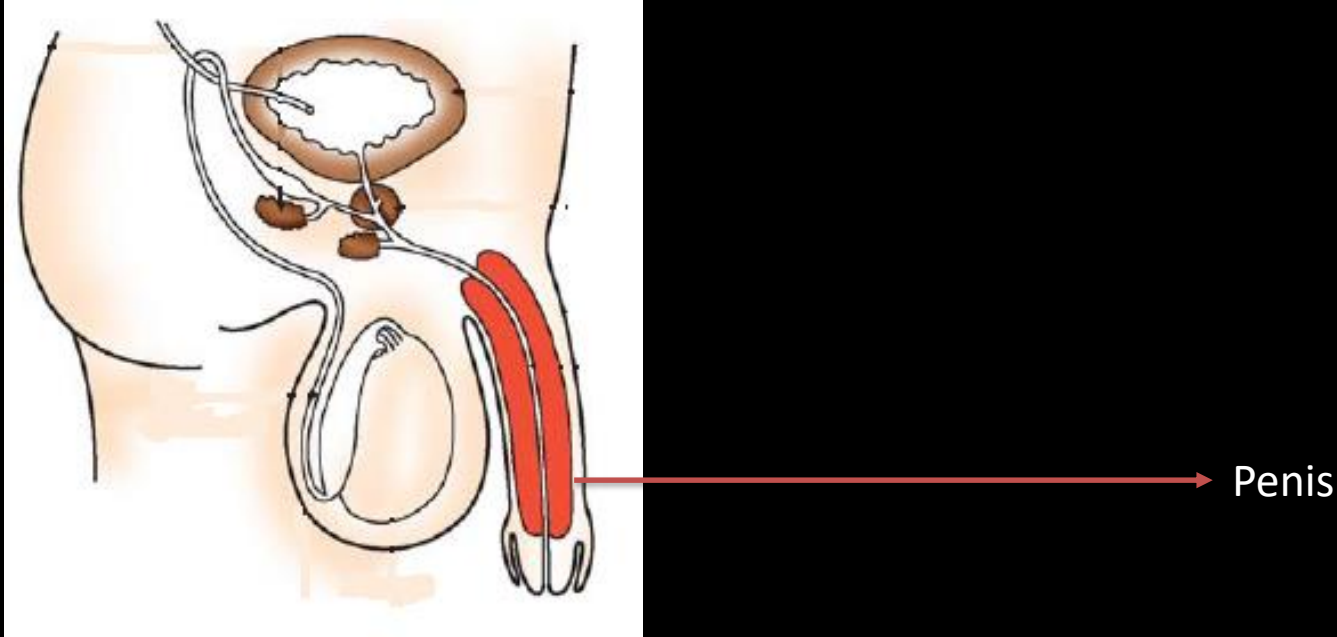
Prostate Gland provides nutrition and helps in the transport of sperms.



Prostate Gland

Penis

It is an organ which passes the sperms from the man's body into the vagina in the women's body during sexual intercourse.



Female Reproductive system

Female germ cell

Female germ-cells are called eggs.

Female germ-cells or eggs are produced in the ovaries.

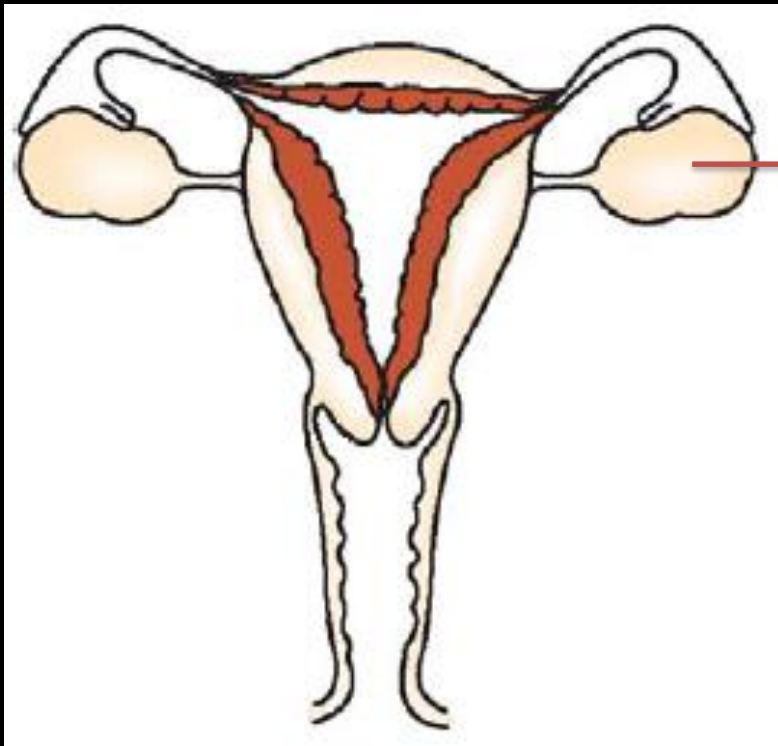
Female Reproductive system

Female reproductive system consists of:

- a) A pair of ovaries.
- b) A pair of oviducts or fallopian tubes.
- c) A uterus.
- d) A vagina.

Ovaries

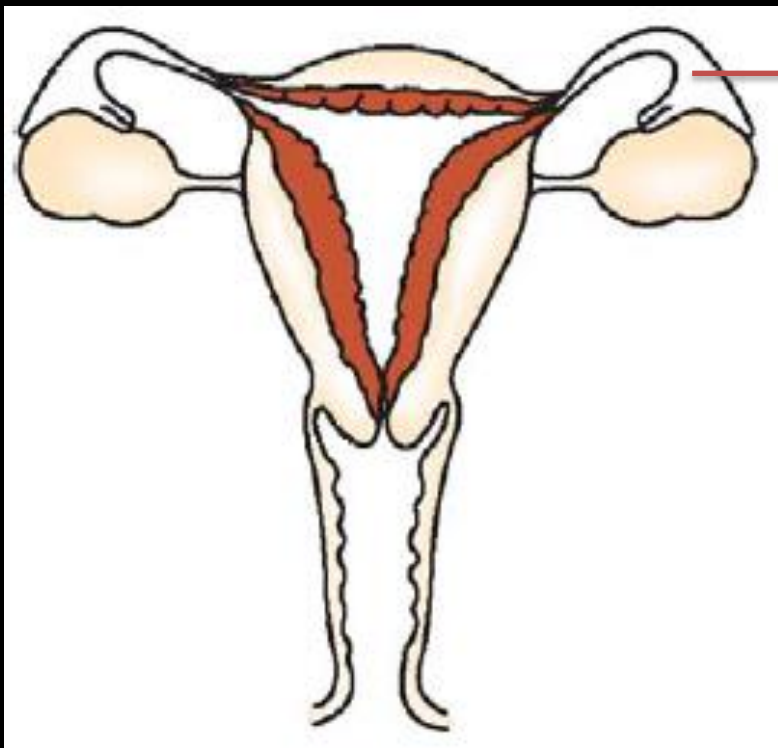
The ovaries are a pair of female reproductive glands in which the ova or eggs are formed.



Ovary

Ovi duct or fallopian tube

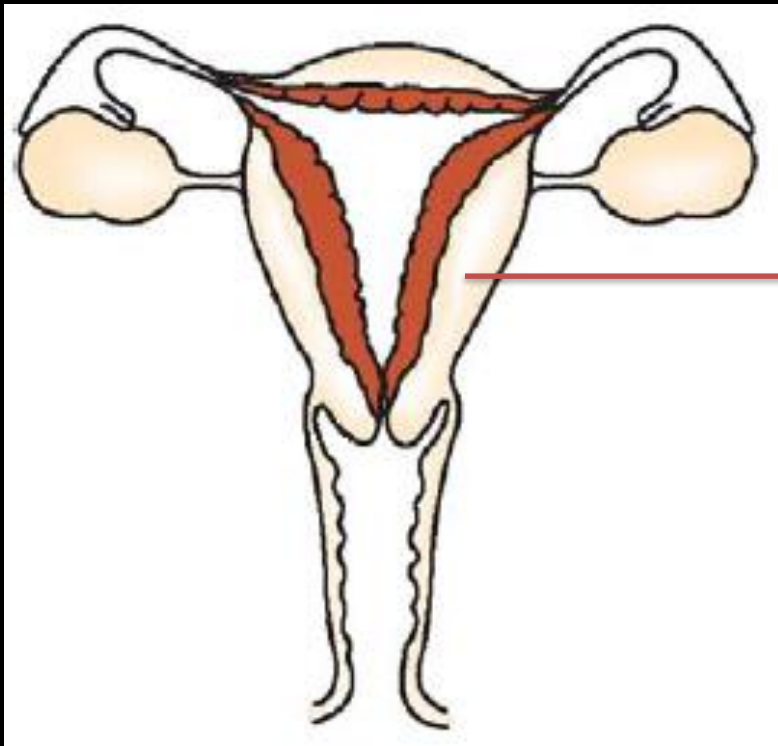
Oviduct or Fallopian tube is a tube which receives the egg produced by the ovary and transfer it to the uterus.



Ovi duct
Or
Fallopian tube

Uterus

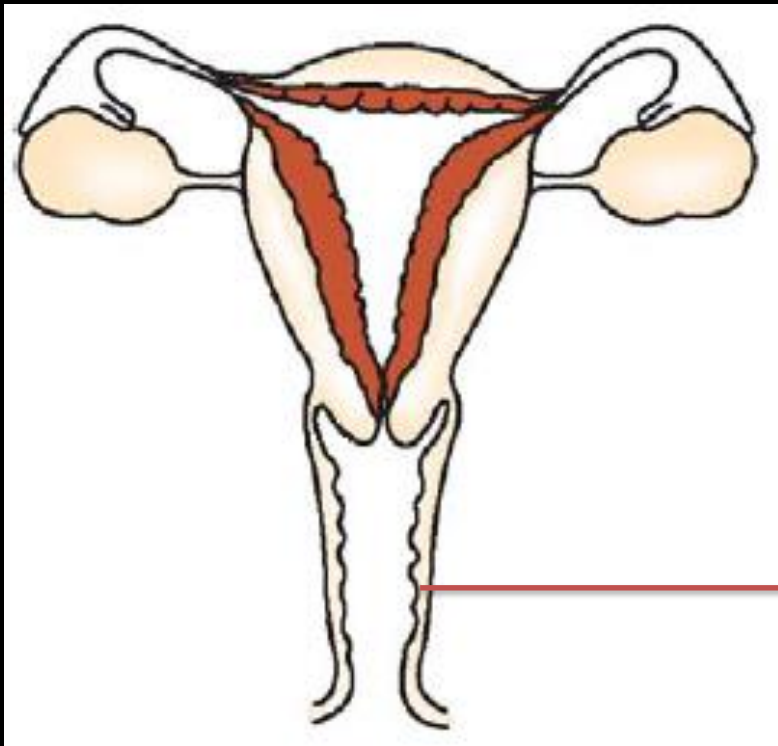
Uterus is a bag-like structure where the two oviducts unite and development of the baby takes place.



Uterus

Vagina

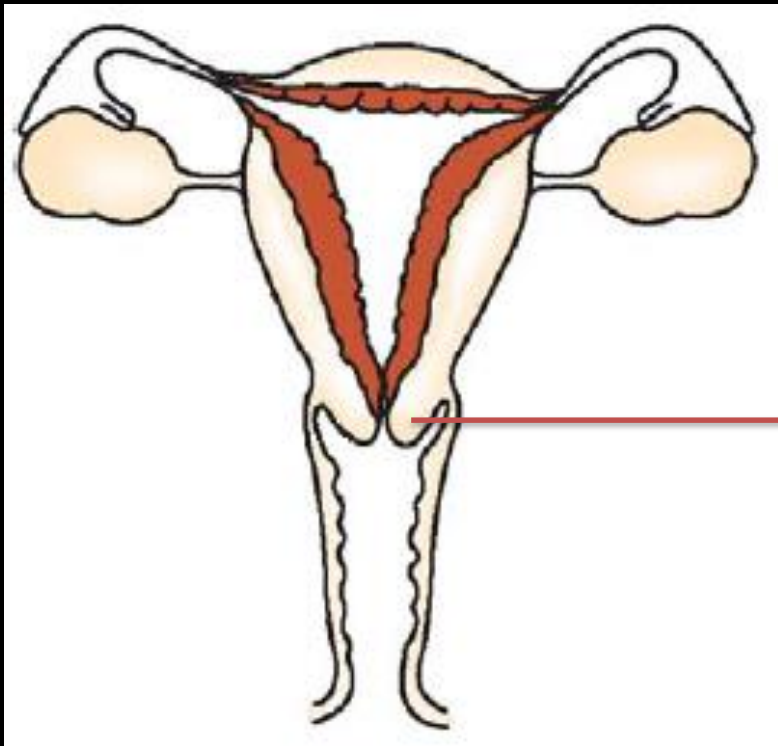
Vagina is a muscular tube starting from the lower end of the uterus upto the outside. It receives the male penis during sexual intercourse.



Vagina

Cervix

The Uterus is connected to the vagina through a narrow opening called **cervix**.



Cervix

Fertilization

The process of fusion of the male gamete (sperm) with the female gamete (ovum) of the same species is known as **fertilization**.

The process of fertilization takes place inside the fallopian tube of females.

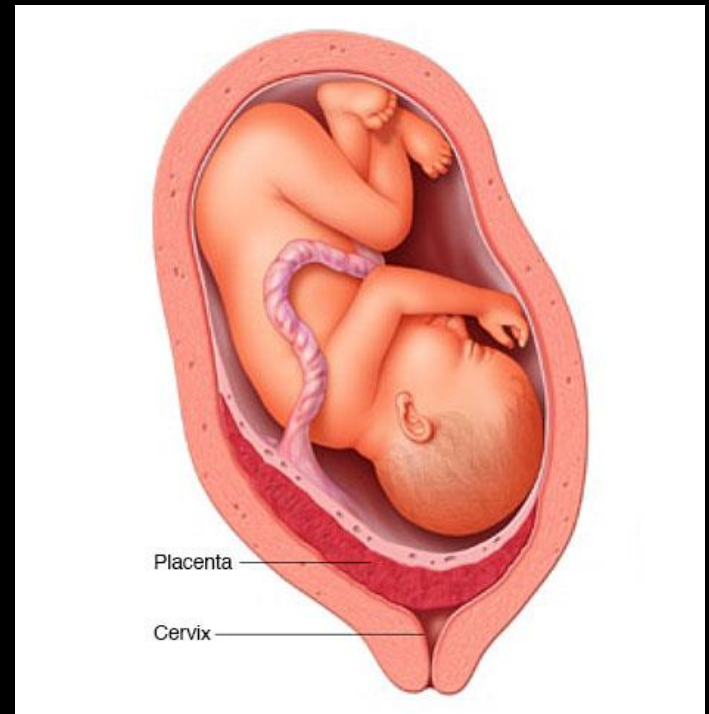


How does the embryo get nourishment inside the mother's body?

The embryo gets nutrition from the mother's blood with the help of special tissue called **placenta**. This is a disc-like tissue which develops between the uterine wall and embryo. It has villi on embryo side of the tissue. On the mothers side are blood spaces which the villi. This gives a large surface area for oxygen and glucose to pass from the mother to the embryo.

Placenta

Placenta is a special tissue that develops in the uterus during pregnancy. It provides oxygen and nutrients to the growing baby and removes waste products from the baby's blood.



What happens when the egg is not fertilized?

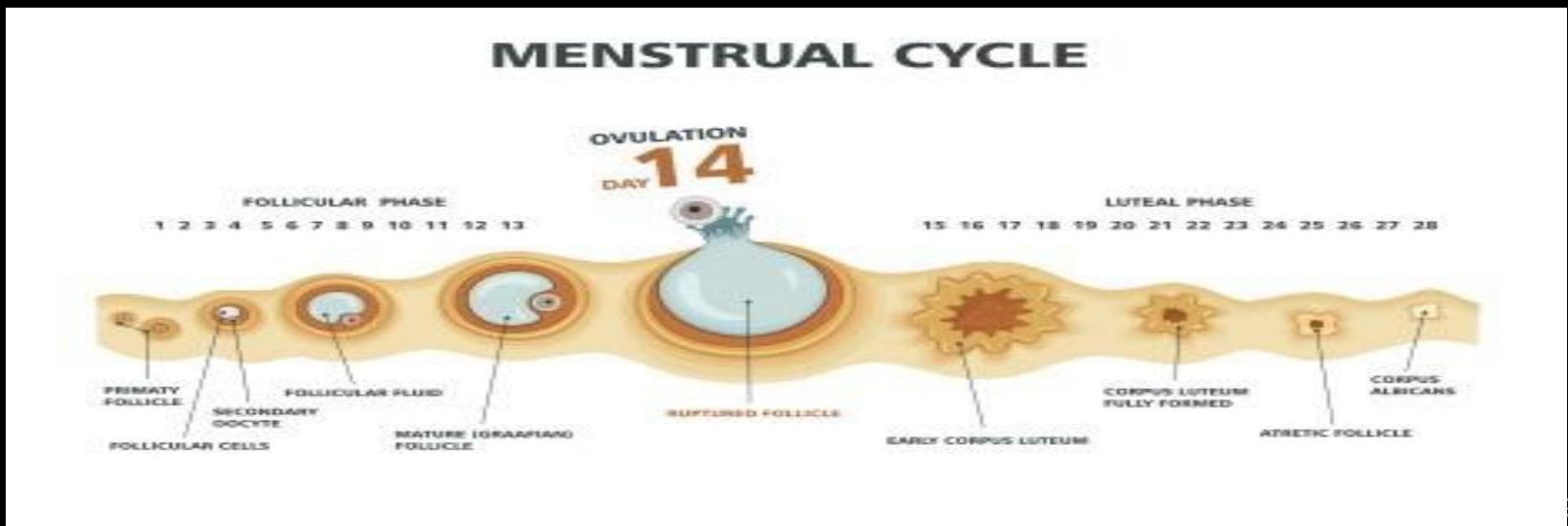
If the egg is not fertilized, it lives for about one day. The lining of the uterus slowly breaks and comes out through the vagina as blood and mucous.

Menstruation

Menstruation is the regular discharge of blood and mucosal tissue from the inner lining of the uterus.

Menstrual cycle

The cycle of events taking place in the ovaries and the uterus every 28 days and marked by the menstrual flow is known as the menstrual cycle.



Sexually Transmitted Disease [STD]

The diseases which are spread by sexual contact with an infected person are called Sexually Transmitted Diseases.

a) Bacterial infections such as Gonorrhoea and syphilis.

b) Viral infections such as warts and HIV-AIDS.

Contraception

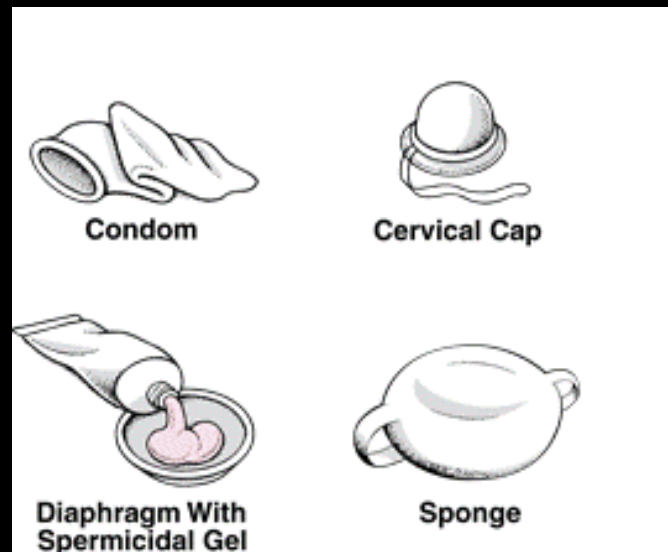
The prevention of pregnancy in women (by preventing fertilisation) is called contraception.

Methods used for birth control (or regulating child birth)

- (a) Barrier method – Condom.
- (b) Chemical method – Oral pills.
- (c) Surgical method – Vasectomy.

Barrier method

In the barrier method of contraception, a mechanical barrier like condom is worn on the penis by men to prevent the sperm from reaching the vagina. Similar covering can also be worn in the vagina by women to prevent the entry of sperms into the uterus.

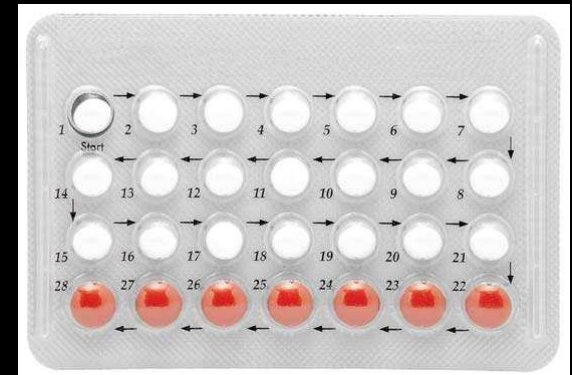


Chemical method of contraception

The chemical method of contraceptives is in the form of oral pills. The oral pills contain hormones which change the hormonal balance of the body so that eggs are not released and fertilization cannot occur.

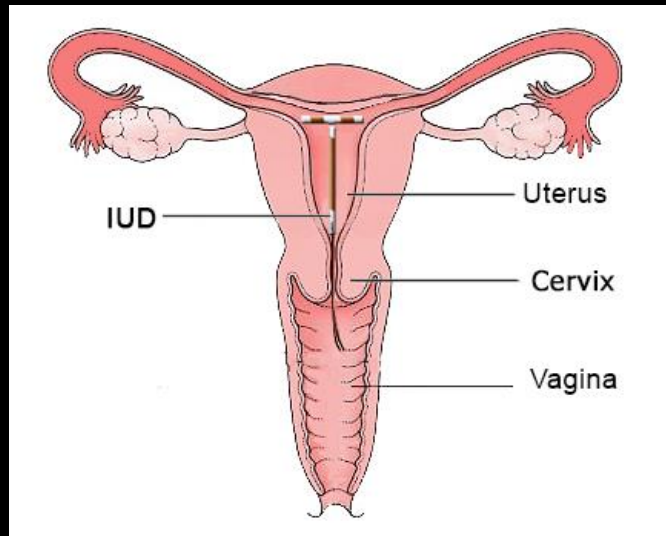
Disadvantage of chemical method of contraceptives

Since the oral pills change hormonal balance, they can cause side-effects.



Contraceptive devices

Other contraceptive devices such as the loop or the copper-T are placed in the uterus to prevent pregnancy.

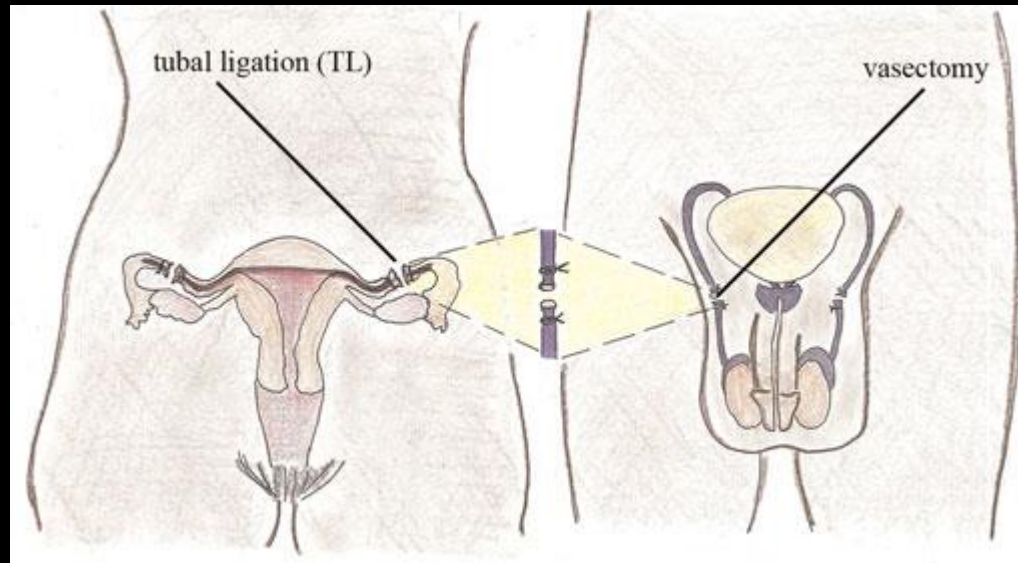


Surgical methods of contraception

a) In men, the vas deferens in the male is blocked, sperm transfer will be prevented.

b) In women, the fallopian tube in the female is blocked, the egg will not be able to reach the uterus.

In both cases fertilization will not take place.



What could be the reasons for adopting contraceptive methods?

The reasons for adopting contraceptive methods are:

- (i) To avoid frequent pregnancies, which in turn helps in population control
- (ii) To prevent the spread of sexually transmitted diseases.

Other Questions

Asexual Vs Sexual reproduction

| Asexual Reproduction | Sexual reproduction |
|---|--|
| The offspring arises from a single parent. | The offspring arises from two parents of different sexes. |
| The production of new organism does not involve gametes | The production of new organisms involves the use of gametes. |
| Example: Amoeba, Yeast. | Example: Fish, Frogs, etc. |

Vas deferens Vs Fallopian tube

| Vas Deferens | Fallopian tube |
|---|---|
| <p data-bbox="79 368 749 525">It is a part of the male reproductive system.</p> <p data-bbox="79 558 900 801">Two vas deferens from two testes transport sperms to penis in male.</p> | <p data-bbox="987 368 1715 525">It is a part of the female reproductive system.</p> <p data-bbox="987 558 1850 972">Two fallopian tubes join to the uterus in females. Ovum released by ovary enters the fallopian tube where fertilization occurs.</p> |

Sperm Vs Ovum

| Sperm | Ovum |
|--|--|
| <p>It is produced in testis. Lakhs of sperms are formed continuously.</p> <p>Capable of movement, has tail</p> | <p>It is produced in ovary. Only one ovum (egg) is formed in a menstrual cycle. Incapable of movement, does not have tail.</p> |

The diagram shows female reproductive system.

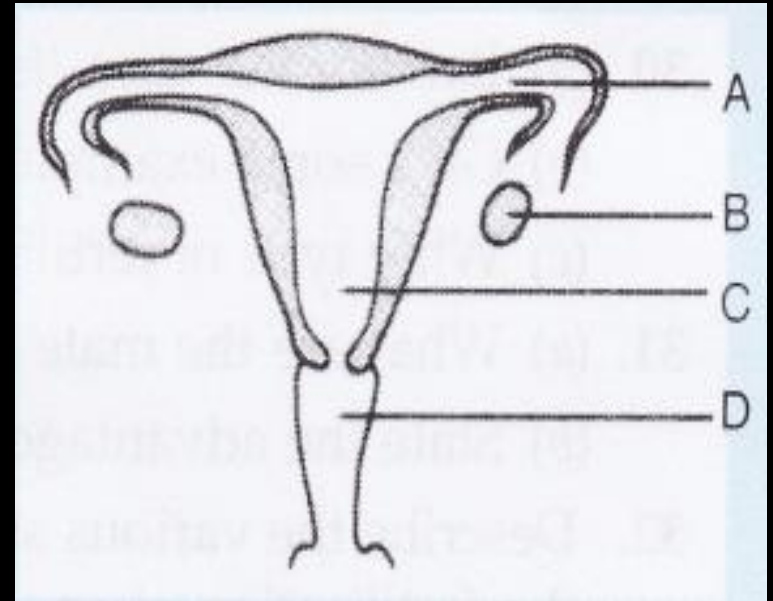
Name the parts labelled A to D.

A – Oviduct (Fallopian tube)

B – Ovary

C – Uterus (Womb)

D – Vagina



The diagram shows female reproductive system.

(a) In which part do the sperms enter?

Part D – (Vagina)

(b) Which part releases the egg?

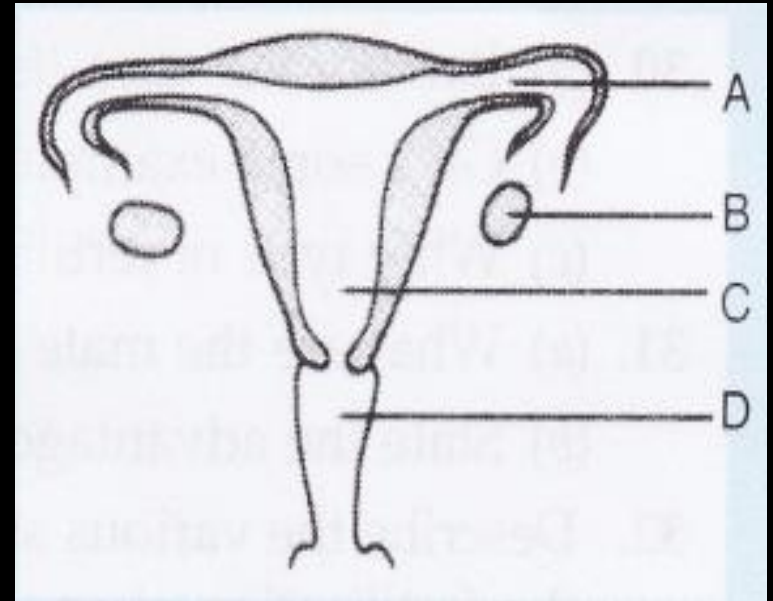
Part B – (Ovary)

(c) In which part does fertilisation take place?

Part A – (Oviduct)

(d) In which part does the foetus develop?

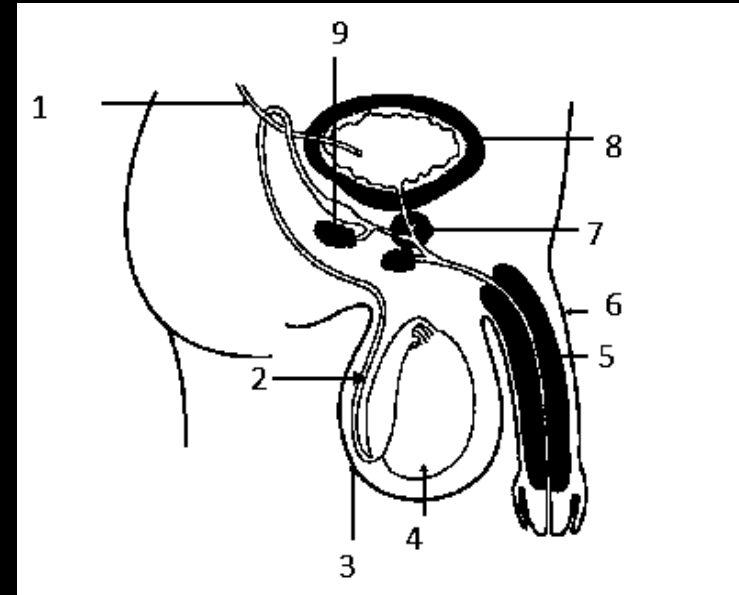
Part C – (Uterus)



Given below is the schematic diagram of the sectional view of the human male reproductive system.

a) Name the parts numbered 1 to 9

- | | |
|---------------------|-----------------|
| 1 – Ureter | 2- Vas deferens |
| 3 – Scrotum | 4 – Testis |
| 5 – urethra | 6 – penis |
| 7 – prostate gland | |
| 8 – Bladder | |
| 9 - seminal vesicle | |



Exercise (MCQ)

1) Asexual reproduction takes place through budding in

- (a) amoeba.
- (b) yeast.
- (c) plasmodium.
- (d) leishmania.

2) Which of the following is not a part of the female reproductive system in human beings?

- (a) Ovary
- (b) Uterus
- (c) Vas deferens
- (d) Fallopian tube

3) The anther contains

- (a) sepals.
- (b) ovules.
- (c) carpel.
- (d) pollen grains.

END