

Asexual Mode of Reproduction

Reproduction is the biological process by which new **organisms** known as the offsprings are produced by their parents. It is of two types: Sexual reproduction and Asexual reproduction. The difference between the two types lies in the number of parents required for both. In Sexual reproduction, two parents are required to give rise to the offspring. In asexual reproduction, a single parent can give rise to the offspring. Asexual reproduction is commonly seen in **plants** but is less common in the **animal kingdom**.

Asexual Reproduction

Types

Asexual reproduction seen in animals are of the following types:

- Binary Fission

This method of reproduction is commonly used by bacteria and **amoeba**. In this type of reproduction, the **DNA** of the parent bacteria replicates itself and then the cell divides into two halves- each half having its own DNA. Therefore, the parent cell divides into two

identical daughter **cells**. These daughter cells are identical to the parent cell.

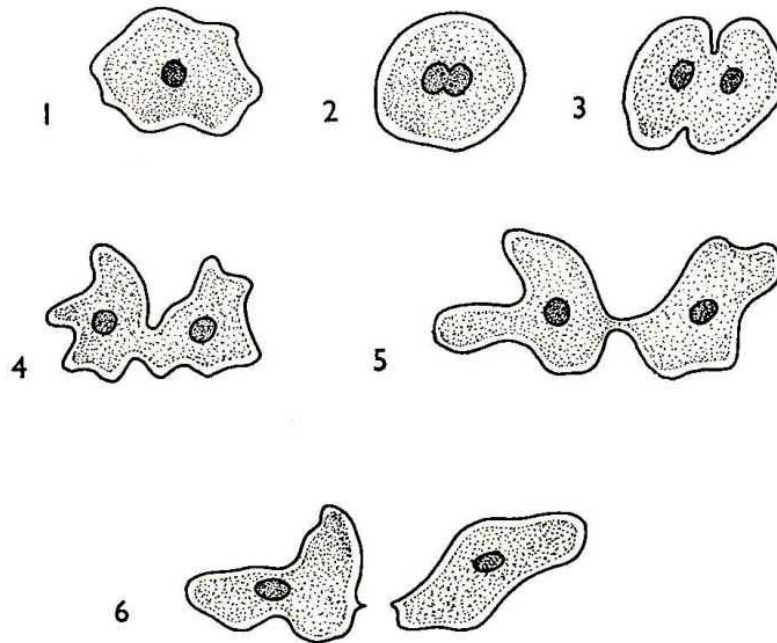


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- Budding

In this type of asexual reproduction method, the offspring develops on the parent body from a bud -like **structure**. This is commonly seen in Echinodermata and hydra. Once big enough, the buds fall off the parent body and begin their independent existence.

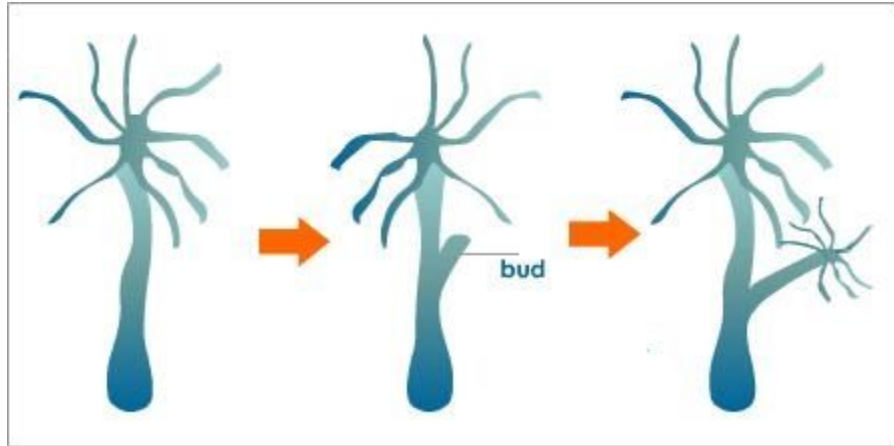


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- Fragmentation

In this type of asexual mode of reproduction, the parent organism divides into multiple fragments or segments where each of the fragments develops into a new organism. Starfishes, who show sexual reproduction, also show this form of asexual reproduction where a part of its body such as its arm can give rise to an entirely new organism.

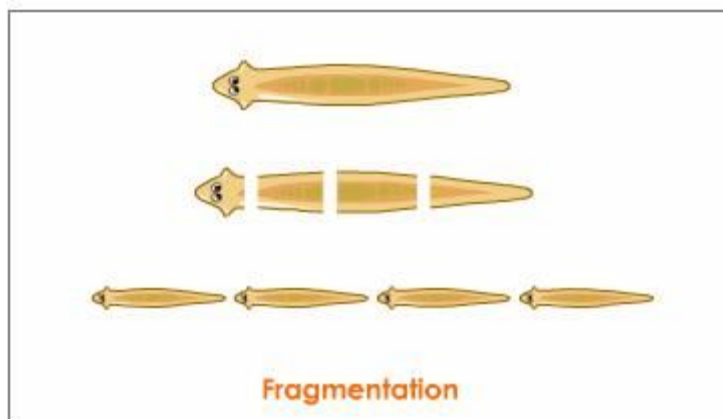


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- Parthenogenesis

In this kind of asexual reproduction, the female organism of the **species** produces egg without fertilization and the offsprings arise from that. Lizards, few insects and some fishes reproduce in this way. This type of reproduction is not seen in mammals. This kind of asexual reproduction is seen in both plants and animals.

Asexual reproduction seen in plants are of the following types:

- Vegetative Propagation

This type of asexual reproduction occurs in stems of certain plants that give rise to new plants from certain buds that arise on their leaves or [stems](#). Example of such propagation is seen in tubers, stolons, tubers, and leaves like the bryophyllum.

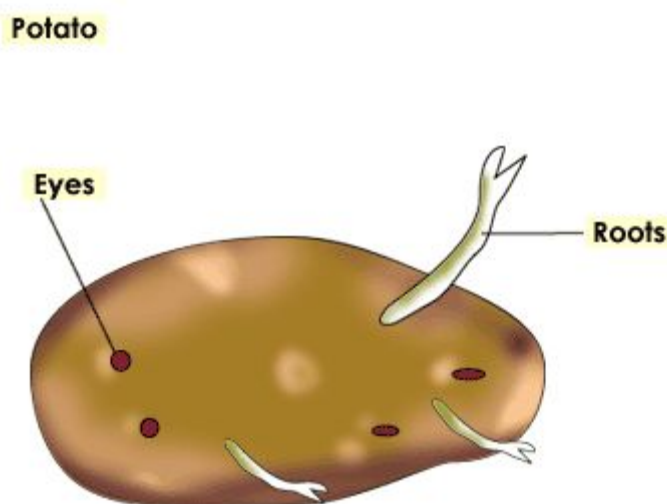


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- Sporogenesis

This involves the development and propagation of spores which give rise to a new organism. Eg. fungi.

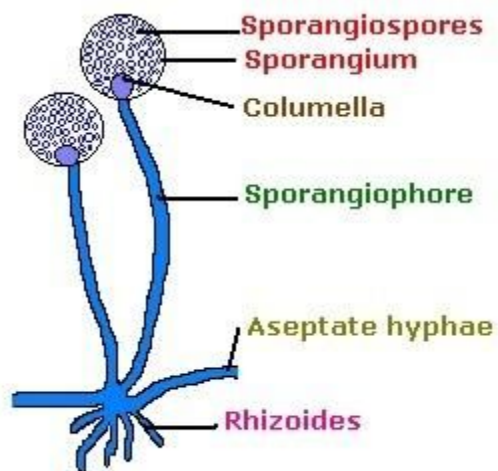


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Disadvantages of Asexual Reproduction

Asexual Reproduction requires only one parent, preferably female. Since there is no mixing of genes, the genetic material remains constant and maintains stability. Genetic variations cause the organism to become well equipped to adapt to any changes or mutations. An organism that arises from asexual reproduction cannot withstand any form of changes or disturbance in the environment. In sexual reproduction, the organism arising out of the union has better features and characteristics than the one who has the same characteristics as its parent.

Solved Example for You

Question: Which of the following is not an example of asexual reproduction?

- A. Budding in bryophyllum
- B. Spores of fungi
- C. Human baby
- D. Development of Strawberries

Solution: Option C Human Baby. Budding, sporogenesis, and development of strawberries occur by asexual methods. Human babies are a product of sexual reproduction.

Introduction to Reproduction

Reproduction is the biological process by which organisms give birth or give rise to a new **organism**. This process is seen in all living organisms- both **plants** and **animals**.

Types of Reproduction

Reproduction can be of two types:

- Asexual- Involves a single parent which gives rise to a new organism

- Sexual- Involves two parents of the opposite sex that give rise to a new organism.

Sexual Reproduction

This type of **reproduction** is seen in both plants and most animals. This involves two individuals of opposite sex having specialized sex organs that produce gametes. These gametes fuse in a favourable **environment** to give rise to a new organism or offspring.

In Plants

Sexual reproduction in plants happens in flowering plants who have both male and female in the same **flower** or in separate flowers.

Flowers that contain either male or female parts are called unisexual plants whereas those with both male and female parts are called as bisexual or hermaphrodite plants.

The female reproductive organs are called the gynoecium consisting of stigma style and ovaries. The ovaries contain ovules which contain the female gametes. The male reproductive **organs** are collectively

known as the androecium which consists of filament anther and stamens. The pollen grains on the stamens contain the male gamete.

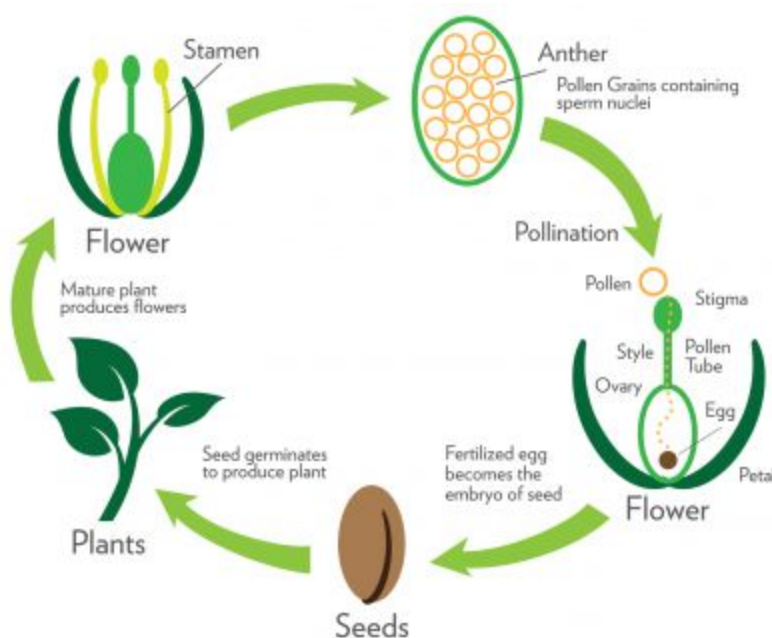


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Through different modes of **pollination**, pollen grains are carried to the stigma of the same or a different flower. Once the pollen lands on the stigma, it is passed through the style to reach the ovaries where fertilization occurs and the ovary becomes the fruit and the ovules become the **seeds**. These seeds, on finding a favourable environment, give rise to a new plant.

In Animals

- In animals, in most cases, there are separate sexes of the species that carry either the male or the female reproductive organs. Some organisms like the earthworm are hermaphrodite as they contain both sexes in the same organism.
- In humans, the reproductive systems in males and females are very different. The male reproductive system is made up of the testes, scrotum, urethra and the penis. The male gamete is known as the sperm. The female reproductive system is made up of ovaries, fallopian tubes, and the vagina. The female gamete is known as the egg. When the sperm fuses with the egg inside the female uterus, a zygote is formed. This zygote undergoes further development to give rise to a fetus and a baby is born.
- In mammals, who are not egg-laying animals, fertilization generally occurs inside the female and this type of fertilization is known as internal fertilization. In lower species such as birds, reptiles etc, the female lays the eggs from which a new organism arises. It is also the same in case of fishes and amphibians.

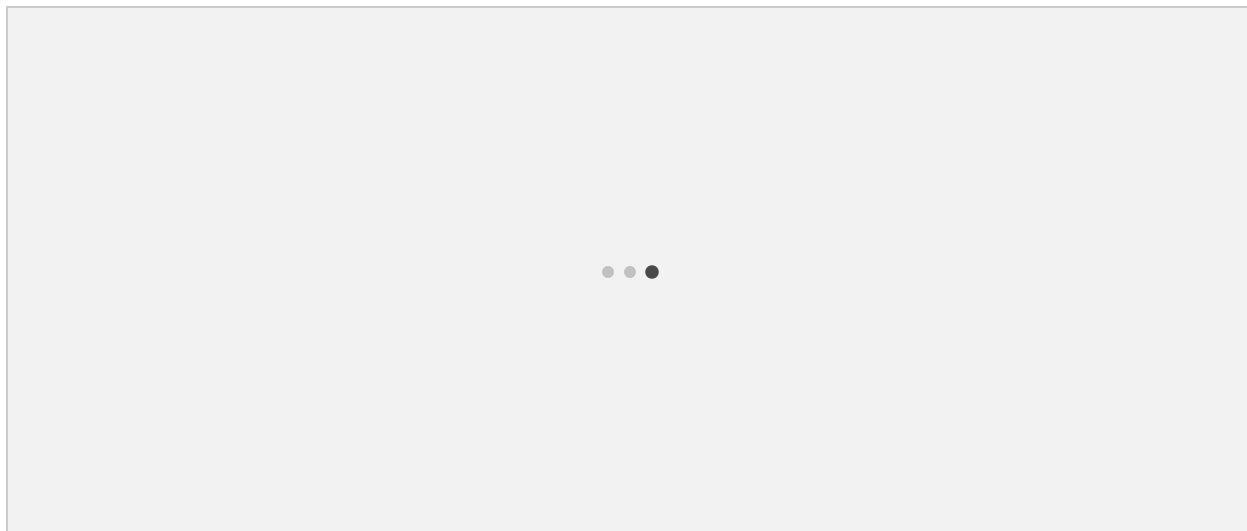


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Animals that lay eggs are known as oviparous while those who give rise to an embryo are called as viviparous.

Asexual Reproduction

As mentioned earlier, this type of reproduction needs only one parent. The process of fertilization does not occur as there is no fusion of gametes. Unlike sexual reproduction, there is no mixing of genetic material as the offsprings have the same genetic material as the parent.

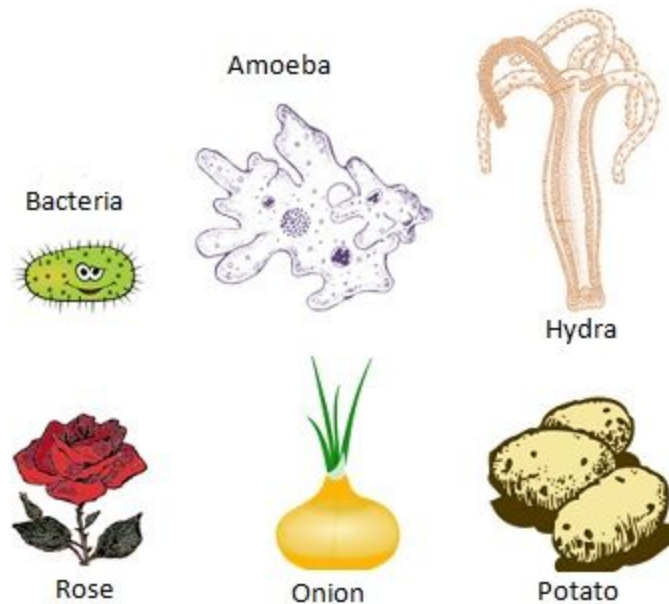


Image Source: examfear

There are many forms of asexual reproduction:

- Budding- Ex: Yeast
- Binary fission: Ex: Bacteria, amoeba
- Fragmentation: Ex: Flatworms, sponges, hydra
- Vegetative propagation: Ex: Runner and stolons in plants

This type of reproduction is seen in both plants and animals but is more common in plants than in animals. Apart from these two types of

reproduction methods, there are artificial modes of reproduction that have evolved due to advances in medicine.

Solved Example for You

Question: What is the female reproductive organ in a flowering plant known as?

- A. Ovaries
- B. Testes
- C. Androecium
- D. Gynoecium

Solution: Option D Gynoecium. The female reproductive organ in a flowering plant is collectively known as the gynoecium. It is composed of the stigma, style, ovary, and ovules.

Reproduction in Human Beings

Reproduction in **human beings** is by **sexual reproduction** where both the male and female gametes fertilize to give rise to an embryo. The fertilization of human embryo occurs inside the body of the female. Thus, it is called Internal Fertilization. Human Beings are viviparous

organisms who give rise to Embryos directly instead of laying eggs.

Let us understand a little more about the male and female reproductive **organs** and the process of **fertilization** in them.

Male Reproductive System

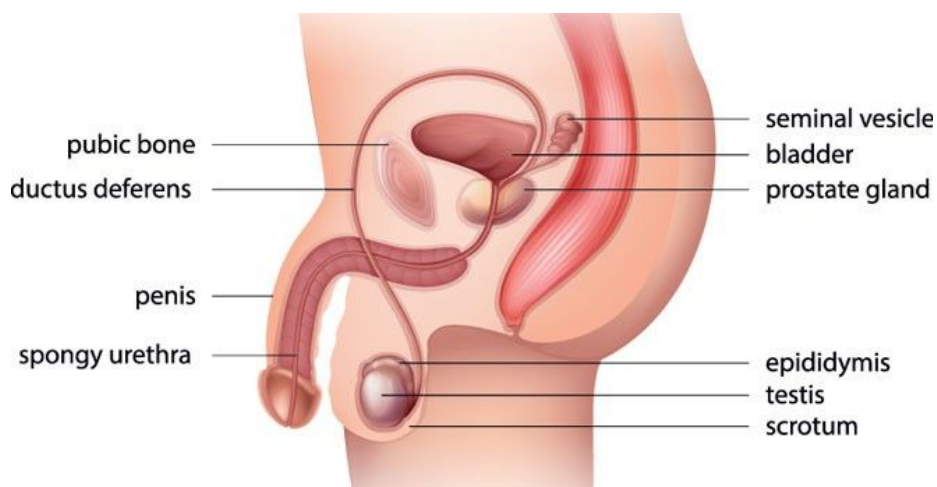


Image Source: plannedparenthood

- **Testes:** Male humans have two testes. They are situated in a bag of skin known as the scrotum. Scrotum lies outside the pelvic cavity.
- **Sperm Duct:** These are thin ducts that arise from the testes.
- **Prostrate Gland:** This gland is an accessory gland in males which pours its secretions into the sperm duct along with the seminal fluid from the testes and into the penis.

- Urethra: **Functions** as a common pathway for the seminal fluid and urine in males. It is longer in males and shorter in females.
- Penis: Is an organ which lies outside the body and functions to eliminate both urine and semen.

The testes are the primary organs of **male reproduction**. They are responsible for producing the male gamete known as the sperm by a process called as spermatogenesis. This occurs in the seminiferous tubules of the testes. The testes are also responsible for secreting the male reproductive **hormone** testosterone.

Leydig **Cells** of the testes synthesizes Testosterone. The hormone testosterone not only helps in the formation of the sperm but also in the **development** of secondary sexual characters in males such as deepening of the voice, facial and pubic hair during **puberty**.

Female Reproductive System

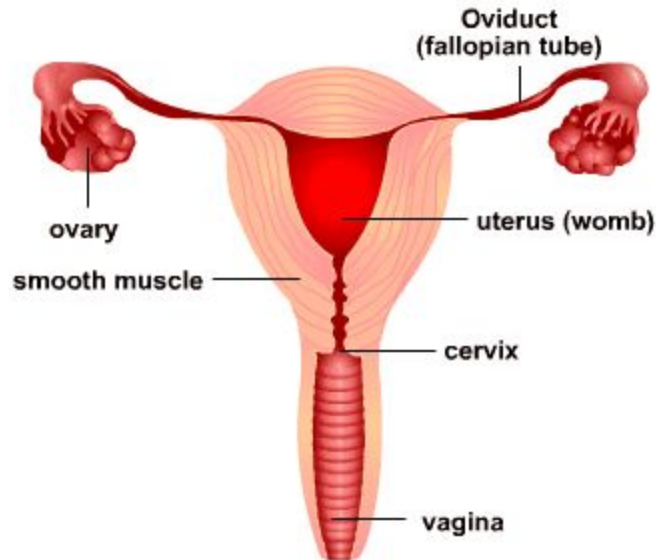


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The [female reproductive system](#) in humans is entirely within the pelvic cavity. It comprises of the following structures:

- Ovaries: They give rise to the female gamete or the egg. Each ovary releases one egg alternatively each month. Ovulation is the process of release of an egg from either one of the ovaries.
- Fallopian tubes: Also known as the oviducts, these tubes arise from the ovaries and end at the uterine fundus. Their function is to carry the egg once it is released into the uterus where it can fuse with the male sperm.

- Uterus: It is a large muscular organ that is present in the pelvic cavity. The uterus is the region of action during the [menstrual cycle](#), fertilization and the development of the fetus.
- Cervix: Is a circular muscle ring that is present towards the lower end of the uterus that dilates at the time of delivery of the baby.
- Vagina: Is a muscular tube-like structure that is present at the lower end of the cervix and leads towards the outside of the female body. The vagina functions as the pathway for the penis to enter the female body and deposit the sperms which then swim their way to the uterus to fertilize with the female egg.
- Urethra: It is shorter than that found in males. In females, the urethra serves only for passage of urine.

The egg is formed under the influence of both female sex hormones estrogen and progesterone. This process is known as Oogenesis.

Process of Fertilisation and Further Development

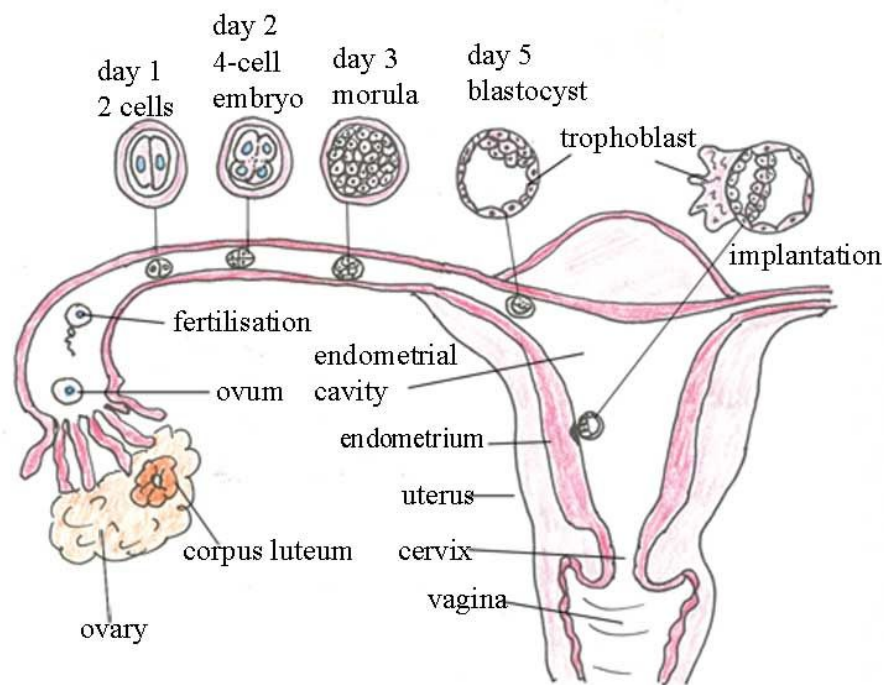


Image Source: open.edu

The male gametes i.e the sperms are deposited in the female body by the process called as sexual intercourse. Once the sperms are deposited in the vagina, they need to travel upwards to reach the egg that is released from the ovaries and picked up by the fallopian tubes. When the sperm meets the egg, it needs to penetrate through its layers to cause fertilization. Both the Egg and the Sperm fertilize and form the diploid zygote.

Each parent provides 23 chromosomes at the initial fertilization. Thus, the zygote contains double the number of chromosomes (46). It is called diploid. Once this happens, zona pellucida from the egg forms a thick layer around the zygote to prevent more than one sperm to fertilize the egg. this zygote now forms into a morula and then into a blastocyst. It then develops chorionic villi from the outer layer of the blastocyst known as the chorion.

These villi attach themselves to the inner wall of the uterus.

Implantation is the process of attachment of the embryo to the uterine wall. The tissues between the growing embryo and the mother's uterine walls form the placenta. Placenta functions to provide nutrition to the embryo until its birth. The hormones estrogen and progesterone both help in maintaining the placenta and the fetus inside the uterus. The normal gestation period for humans is 38 weeks which is a little over 9 months.

At the end of this term, the uterine contractions begin under influence of hormones. A major hormone that plays a role in this is oxytocin. It affects the cervix and causes it to dilate to allow the baby to pass

outside the body of the mother. The umbilical cord with its blood vessels and the placenta are also expelled along with the baby.

The mother's hormones come back to normalcy from the next menstrual cycle.

Menstrual Cycle

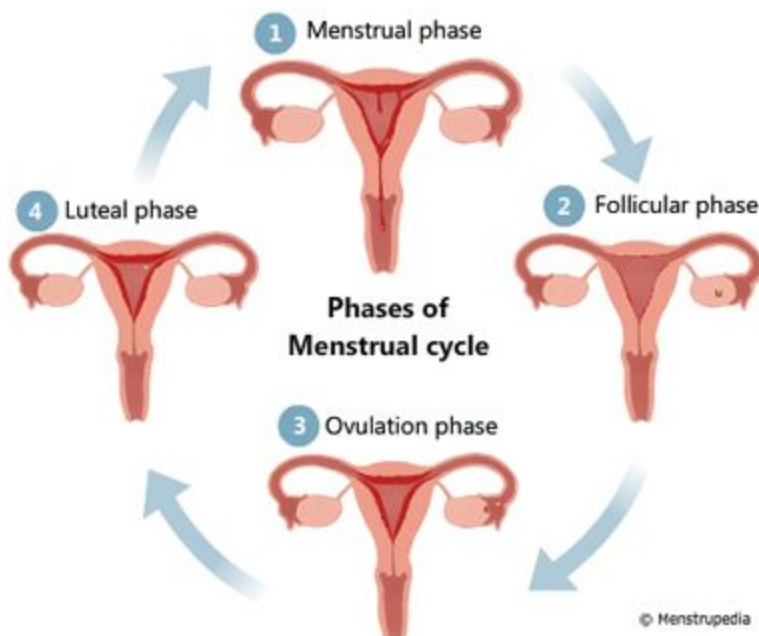


Image Source: menstrupedia.com

This is a biological process that occurs in human females from the time they attain puberty. When a girl child is born, the primary oocytes already occur. When the child reaches puberty, the process of

meiosis continues to give rise to the secondary oocyte. This secondary oocyte is released from each ovary alternatively in every alternate month.

Each ovary releases this secondary oocyte alternatively. The fallopian tube picks it up and transports it to the uterus. The surface of the ovary that has released the egg is called the corpus luteum. It releases progesterone. If the egg doesn't fertilize, the corpus luteum disintegrates after 14 days and the progesterone levels fall.

This causes disintegration of the uterine lining which is called menses or the monthly cycle. If fertilization occurs, the corpus luteum stays and no shedding of the uterine lining occurs. The uterus prepares for the implantation of the fetus.

Learn more about [Sexual Reproduction in Flowering Plants](#).

Solved Example for You

Question: The corpus luteum releases which hormone?

- A. Oxytocin
- B. Progesterone

C. Estrogen

D. Testosterone

Solution: Option B Progesterone. The corpus luteum releases progesterone. If fertilization does not occur, the corpus luteum disintegrates. If fertilization occurs, the corpus luteum stays.

Sexual Reproduction in Flowering Plants

Sexual reproduction is the type of reproduction that involves two different parents that belong to the opposite sex. This type of reproduction is seen in both plants and [animals](#). In plants, sexual reproduction occurs in [flowering plants](#). Before we learn more about sexual reproduction in flowering plants, we must understand the [anatomy](#) of a flower.

Flower

A flower is the sexual reproductive organ in plants. Flowers are often the most attractive [structures](#) of a plant. The flower's anatomy can be divided into following layers:

- Calyx

- Corolla
- Androecium
- Gynoecium

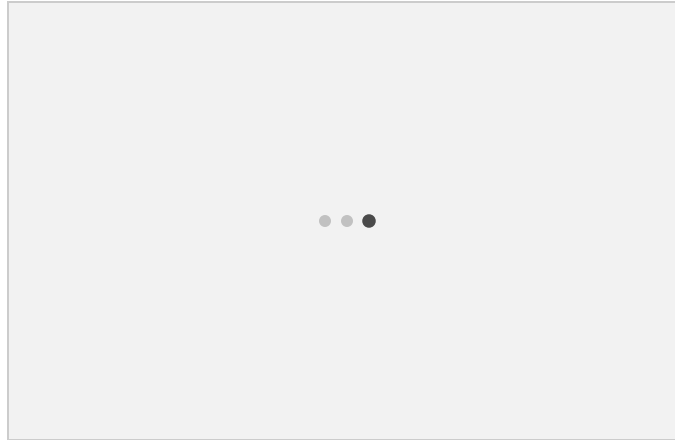


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Calyx

These are green petal-like structures that are found right above the base of the flower called the receptacle. The calyx is formed of sepals. Their main **function** is to protect the flower while it is still in the bud stage.

Corolla

Corolla is the collective name given to the petals which are colourful parts of the flower. The petals of different flowers are found in

different colours and in addition, most of the times they are fragrant as well. It is the petals that attract the pollinating **agents** to the flower.

The corolla is located above the calyx layer.

Androecium

The androecium is the male reproductive part of a flower. It is considered the third whorl in a flower. The androecium is the name given to a group of stamens. Each stamen is made up of a filament and anther at the top of it. The anthers are lobed structures that produce pollen which contains the male gamete.

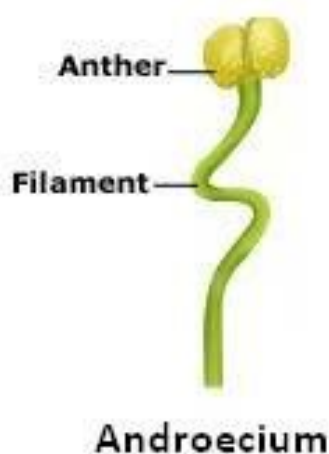


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Gynoecium

The gynoecium is the female reproductive organ in a flower. It is composed of the stigma, style, and ovary. The style is a slender filament on top of which lies the stigma which functions to hold transferred pollen grains. Once the pollen **lands** on the stigma, it is passed downwards through the style to the ovary. The ovary is lobed and consists of ovules which contain the female gamete.

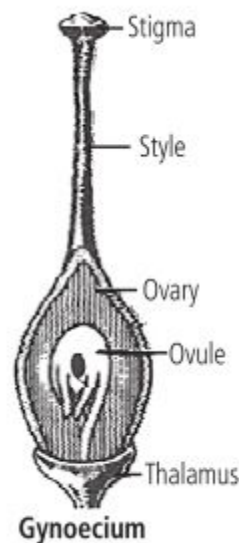


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Pollination and Fertilization

The pollen grains and ovules by themselves cannot travel from one place to another. There are other factors such as wind, **water**, or animals that enable the pollen grains to travel to reach the stigma of

the same or another flower. The [process](#) by which pollen grains are transferred from the anthers of one flower to the stigma of the same or another flower is known as pollination. Learn more about [the Concept of Pollination in more detail here](#).

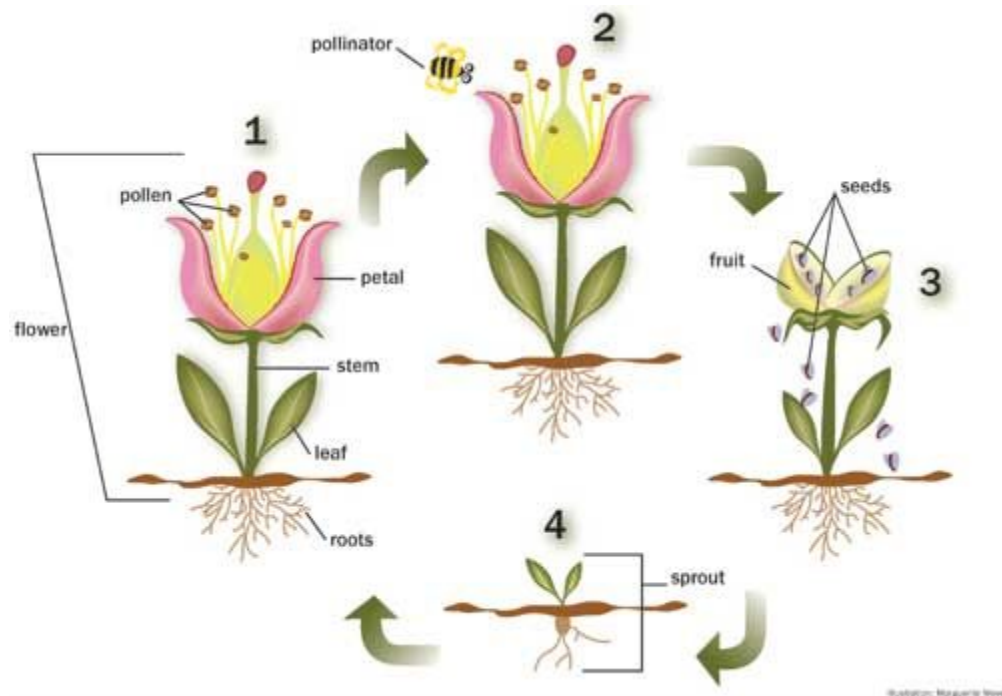


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Once the pollen grain carrying the male gamete reaches the stigma of the same or different flower, it is transported downwards via a pollen tube that arises from the pollen grain to reach the ovary. The ovary is

present at the base of the flower and is lobed. These lobes contain the ovules carrying the female gamete.

The male gamete from the pollen now fuses with the female gamete in the ovule to form a zygote. This zygote undergoes cell division to form an embryo. Once the embryo starts developing, the ovary develops into the fruit, the other structures like the calyx and corolla fall off. The embryo becomes the seed which has the potential to give rise to a new plant.

Learn more about [the Morphology of Flower here](#).

Solved Example for You

Question: Which of the following carries the male gamete for sexual reproduction in flowering plants?

- A. Ovary
- B. Ovules
- C. Stigma
- D. Pollen grain

Solution: Option D. Pollen grains carry the male gamete for sexual reproduction in flowering plants which fuses with the ovules to form the zygote.