Reproduction in Humans

Modes of Reproduction

Do you know what reproduction is?

Reproduction is the process by which an organism produces individuals of its own kind. Reproduction is important as it helps in the perpetuation, or continuation of species.

But how do organisms reproduce? Do they produce an offspring who resembles them or do they produce an offspring who does not resemble them? Why is it that some organisms reproduce on their own, while others need a partner for reproduction? Let us explore.

There are two modes of reproduction in both plants and animals- **Sexual and Asexual reproduction.**

Sexual reproduction

Sexual reproduction involves the fusion of male and female gametes to produce an offspring. A number of animals, including humans and plants undergo sexual reproduction.

Asexual reproduction

Asexual reproduction does not involve the fusion of male and female gametes. It requires only one parent. As a result, the offsprings produced are exact copies of their parents. This mode of reproduction is very common in plants.

Have you ever seen gardeners propagating roses through stem cuttings? This is an example of asexual reproduction.

Similarly, many other plants can be propagated with the help of their vegetative parts like stems, leaves, buds, etc.

Some Interesting Facts:

- **Do you know that sexual reproduction makes organisms more fit to survive in their environment?**
- **Do you know that some organisms like *Plasmodium,* and many plants can reproduce both sexually and asexually?**

Asexual Reproduction in Animals

Methods of Asexual Reproduction

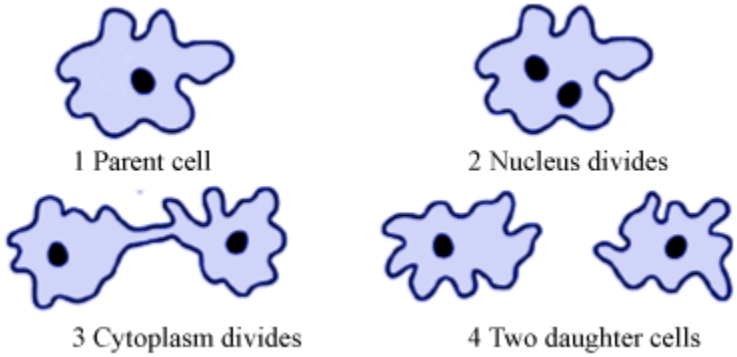
Fission

It occurs in single-celled organisms, belonging to the kingdom Protista and Monera. It is further divided into two types:

Fission [Binary fission
Multiple fission

Binary fission

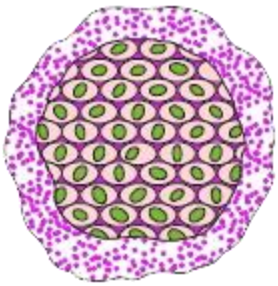
In binary fission, the single cell divides into halves. A few organisms that divide by binary fission are bacteria and *Amoeba*. In this process, the nucleus of Amoeba first divides to form two daughter nuclei. Later the body of Amoeba splits into two halves, each half receiving its own nucleus. This leads to the formation of the two daughter amoebae.



In *Amoeba*, cell division or splitting of cells can take place in any plane. Binary fission can also occur in one particular axis. For example, *Leishmania* (a parasitic flagellated protozoan), which causes *kala azar* in humans, divides only longitudinally.

Leishmania has whip-like flagella at one end of the cell. Cell division occurs in relation to these flagella.

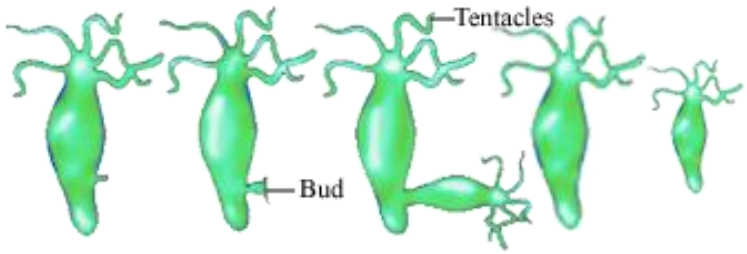
Multiple fission: In multiple fission, a single cell divides into many daughter cells simultaneously. Examples: *Plasmodium and Amoeba*



Budding

It involves the formation of a new individual from a protrusion called the **bud**. It is very common in plants, yeasts, and lower level animals such as *Hydra*.

In *Hydra,* the cells divide rapidly at a specific site and develop as an outgrowth called a **bud**. These buds, while attached to the parent plant, develop into small individuals. When this individual becomes large enough, it detaches itself from the parent body to exist as an independent individual.



Regeneration
This mode of asexual reproduction takes place in some invertebrates belonging to the animal kingdom. Individual body parts of these animals have the ability to grow into new organisms.

Do you know that lizards can regenerate their lost tails? When a predator attacks, the lizard breaks off its tail. This is done to distract the predator so that it eats the tail, and the lizard escapes. Later, the lizard regenerates its lost tail.

Spore Formation
Some organisms like *Rhizopus* (fungi) reproduce with the help of spores. They are produced in sporangia (blob like structures) attached to thread like structures called hyphae. These spores are capable of giving rise to new individuals.

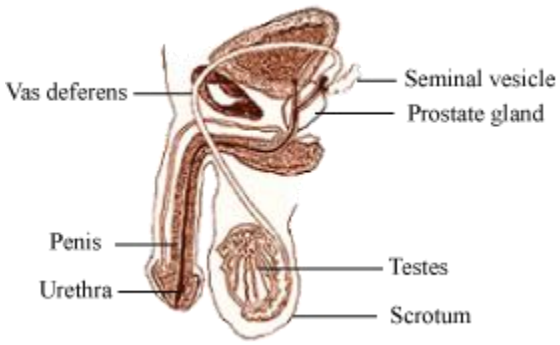
They are covered by thick walls which provide them protection until they come in contact with a moist surface and begin to grow.

Structure of the Human Reproductive System

Structure and Functions of the Male Reproductive System

Male Reproductive System

It consists of various organs, which are involved in the production and transfer of germ cells into the female body.



The organs present in the male reproductive system consist of a pair of testes, vas deferens, prostate gland, and seminal vesicles.

Testes

They are located outside the abdominal cavity within a pouch called the **scrotum**.

The testes produce sperms. But for this they require a temperature, which is 2 – 2.5°C lower than the temperature of the rest of the body. Therefore, they are protected inside the scrotum.

The function of the testes is to produce sperms and a hormone called **testosterone**, which brings about secondary sex characteristics in boys.

Vas deferens

It carries the sperms from the testes to the urethra. It also receives the ducts, which bring products from the seminal vesicles and prostate glands.

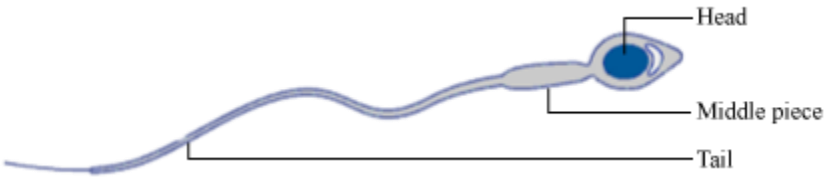
Seminal vesicles and prostate glands

The fluids from these organs provide nutrients in the form of fructose, calcium, and some enzymes. The sperms produced in the testes are carried by the vas deferens. The secretions from the seminal vesicles and prostate glands lubricate the sperms. The sperms are now dispersed in a fluid, which makes their transport easier. This milky white fluid that contain mixture of sperms along with secretions from seminal vesicles

and prostate glands is called **semen**. The urethra extends through the penis to an external opening and carries either urine or semen.

Structure of a sperm

It consists of a head, middle piece, and a tail.



The **head** contains a nucleus, containing the chromosomal material.

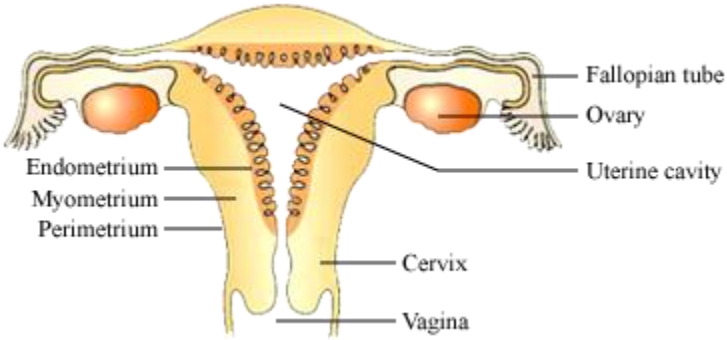
The **middle piece** has many mitochondria to provide energy for the movement of the tail.

The tail facilitates the movement of the sperm into the female body.

Structure and Functions of the Female Reproductive System

Female Reproductive System

It consists of a pair of ovaries, a pair of oviducts, uterus, and vagina.



The ovaries are located on each side of the lower abdomen. It produces thousands of eggs in the female body. It also produces a hormone called **oestrogen**, which brings about secondary sex characteristics in the female body.

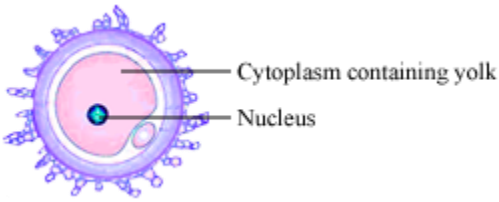
The eggs produced in the ovary start maturing on reaching puberty. One egg from each ovary grows and matures, and is carried from the ovary to the **uterus** by a thin **oviduct** or the **fallopian tube.**

Sperms from the male reproductive system enter the body of the female through the **vagina**.

Do you know that a female child at birth has around 1 -2 million potential eggs? The average life span of an egg is 12 -24 hours, after it is released from the ovary.

Structure of the ovum

It contains a single nucleus, surrounded by the cytoplasm.



We have studied the different parts of the human reproductive system. But how does reproduction take place in humans? Let us explore.

Passage of sperms inside the female body

Sperms, which are ejaculated from the male reproductive organ (penis), enter the female body through the vagina. They travel towards the fallopian tubes, where they meet the egg. The process of fusion of the sperm and ovum is called **fertilization**. Fertilization takes place in the fallopian tubes.

During fertilization, the haploid nucleus of the sperm and ovum fuse to form a zygote. This zygote divides to form an embryo.

Menstrual cycle

The ovary releases one egg every month. The uterus also prepares itself every month to receive a fertilized egg. The inner uterus lining (endometrium) becomes thick and is supplied with blood to nourish the embryo.

If the egg is not fertilized, then the uterus lining is not required. Hence, it breaks down and is released in the form of blood and mucous through the vagina.

This process lasts for 2-8 days. This cycle occurs every month and is known as **menstruation**. Hence, the menstrual cycle is the reproductive cycle in the female body. It begins with the onset of puberty.

Development of secondary sex characteristics

Growth of beard may vary among different individuals (males). While some have a thick growth, others may have a very sparse growth.

This is because each individual matures at a different pace. This pace is determined by the individual's biological clock.

But, why do such changes occur at a certain age and not gradually since childhood?

Development into an adult or reaching maturity is essential for reproduction. The period of life where changes set in for the development of a young individual into an adult is

called **puberty**. During puberty, many changes occur that allow an individual to attain sexual maturity as the sex organs become well developed, and the body becomes capable of reproduction.

Therefore, **puberty** is a period during which body changes such as growth of beard, hair growth in armpits, appearance of pimples, development of breasts etc. occur in a child's body. With the onset of puberty, the body becomes capable of reproduction.

Time of occurrence of puberty

Puberty occurs when the body is ready to change.

- **For girls:** Puberty can start anywhere between the ages 8 and 13. However, the age of puberty may vary in different individuals.
- **For boys:** Puberty in boy's starts somewhat later than girls. It occurs between 9.5 and 14 years.

What controls the occurrence of puberty?

When a child reaches the age of puberty, the pituitary gland in the brain secretes a hormone called **follicle-stimulating** hormone. This hormone acts as a signal to the reproductive organs (the testes in males and ovaries in females). In response to this signal, the reproductive organs produce hormones that cause changes in the male and female body. These changes are referred to as **secondary sex characteristics**.

Secondary sex characteristics in boys

- Under the influence of hormones, the larynx develops prominently. The vocal cord become longer and thicker in boys, causing the voice to become hoarse.
- Growth of hair in other areas of skin like underarms, face, hands, and legs.
- Enlargement of the testicles followed by penis.
- Testes grow and start producing sperms.

Secondary sex characteristics in girls

- Development of breasts, darkening of skin around nipples (present at the tip of breasts).
- Growth of hair in other areas of skin like underarms, face, hands, and legs.
- Increase in the size of uterus and ovary.

- Beginning of the menstrual cycle.

  However, some body changes are common to both boys and girls.

  These common changes are:

- Growth of pubic hair
- Growth of the reproductive organs
- Secretions of sebum (oil) from the skin, which results in pimples

  Puberty or sexual maturation should not be confused with adolescence. Adolescence is the period between the beginning of puberty and adulthood. An Adolescent experiences not only physical growth, but changes in emotional, psychological, and social status as well.

Fertilization and Embryo Development

Do you know what fertilization is?

Fertilization is the process of the union of an egg and sperm. Let us study how fertilization takes place.

Whom does the new individual resemble – the father or the mother? The new individual shows characteristics of both, the father and the mother.

Fertilization takes place inside the body in dogs, cats, and human beings. This type of fertilization is known as **internal fertilization**.

But do you know that in some animals, fertilization takes place outside the body of the organism?

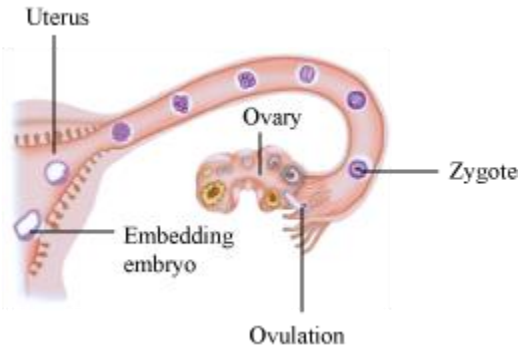
In animals such as frog and fish, the process of fertilization takes place outside the body. This type of fertilization is known as **external fertilization**. In external fertilization, both the male and the female release their gametes in water. The gametes then fuse in water and result in the formation of a zygote, which develops into a new individual.

Do you know how eggs of animals, in which external fertilization occurs, are protected?

Eggs of animals such as frogs are covered with jelly, which holds all the eggs together and also protects the eggs from the external environment.

You know that the process of fertilization leads to the formation of a zygote. **But what happens to this zygote afterwards? How does it give rise to a new individual?** Let us explore.

The zygote formed after fertilization divides repeatedly to form a mass of cells known as the **embryo**. The cells of the embryo start dividing into groups, which leads to the formation of future tissues and organs of the baby.



Development of an embryo inside the female body

The zygote formed after fertilization in the fallopian tubes is implanted in the uterus. The uterus is also known as the womb. Here, the zygote divides to form an embryo, which develops into a foetus.

How is the embryo attached in the uterus?

The uterus is a sac-like structure which opens into the vagina. The wall of the uterus has three layers of tissues:

1. The outer-thin layer is known as the **perimetrium**.

2. The middle layer is thick and is made up of smooth muscles. It is known as the **myometrium**. These muscles contract strongly during the delivery of a baby.

3. The inner layer lines the uterine cavity, which has many glands and is known as the **endometrium**. It thickens every month and is supplied with blood to nourish the embryo. It undergoes cyclic changes during the menstrual cycle.

Therefore, the zygote in the uterus or womb divides many times to form an embryo. This leads to pregnancy.

Within a span of some months, the embryo starts developing limbs, hands, and legs and begins to resemble a miniature human being. When all the body parts of an embryo can be recognised it is known as a **foetus**.

The full term of development of an embryo into a fully developed foetus is known as **gestation**. In humans, the gestation period is of about 280 days. When the foetus is fully developed, the mother gives birth to the baby. During child birth the baby is pushed out of the female's body through vagina by powerful contractions of uterus muscles.

The process discussed above explains the development of an embryo in humans.

But what about the process of embryo development in animals, which lay eggs like birds?

In hens, after fertilization, when the egg travels through the oviduct, it gets covered with various protective layers, including the shell.

The hen lays eggs, and it takes around three weeks for the embryo to develop into a chick.

You must have seen hens sitting on their eggs. A hen does this to keep the egg warm and to maintain a proper temperature for the growth of the embryo inside the egg.