HOW DO ORGANISM REPRODUCE

KEY CONCEPT -

Reproduction is essentially a process by which individuals produce new individuals of the same kind. And this process is very important for the existence of life on earth. Different organisms reproduce in different ways. There are two types of reproduction -Asexual and Sexual reproduction.

In asexual reproduction, single parent is involved and the offspring produces exact copies of parents. In sexual reproduction, both parents are involved and variation is seen in the offspring due to DNA copying. Many plants reproduce by vegetative parts like leaves, stem and roots.

In humans, sexual mode of reproduction takes place. Human male reproductive system includes the testes, scrotum, vas deferens, male accessory glands, and penis. Human female reproductive system includes ovaries, oviduct, fallopian tubes, uterus and vagina.

Contraception is any approach used to prevent the conception of unwanted pregnancy. Major contraceptive methods are categorized as barrier, surgical and chemical.

KEY WORDS -

Reproduction: It is the process by which living organisms produces new individuals similar to themselves. The process of reproduction ensures continuity of life on earth.

Asexual Reproduction: The production of new organism from a single parent.

Sexual Reproduction: The production of new organism from two parents.

Binary fission: The parent organism splits to form two new organisms.

Multiple fission: The parent organism divides repeatedly to form a number of organisms.

Fragmentation: The multicellular organisms break into smaller pieces or fragments on maturation. Each fragment has the capacity to form a new individual.

Regeneration: It is the ability of organisms to develop their lost parts. Some organisms have specialized cells that have high regenerative capacity.

Budding: In an organism, a bud develops as an outgrowth at one specific site.

Spore formation: Organisms such as fungi make spores that can grow into complete new individuals.

Vegetative Propagation: Vegetative propagation is the production of new plants from the vegetative parts of the plant.

Tissue culture : Tissue culture is an artificial method of culturing plants. In this method, a small part of the plant is used to grow cells in a nutrient solution in the sterile condition of the laboratory.

Pollination: The process of transfer of pollen grains from anther to the stigma of a flower is known as pollination.

Fertilization: The fusion of male and female gamete is called fertilization.

Testosterone: Testes releases a male sex hormone called testosterone**.**

Estrogen: A female sex hormone called estrogen is produced by ovum.

Menstruation: When an ovum is unfertilized, the uterus lining sheds and leads to hemorrhage, called menstruation.

Menarche: In a girl, menstruation starts at the age of 10 to 15. This beginning of menstruation is known as menarche.

Menopause: The ending of menstruation is known as menopause which takes place at the age of 45-50.

Placenta: It is a specialized tissue formed between foetus & uterine wall of mother to provide nourishment and oxygen. Removal of waste also takes place through it.

Gestation Period: It is the time period from fertilization upto the birth of the baby.

Reproductive Health: It means a total well-being in all aspects of reproductive system and its functions.

Contraceptive Methods: Methods to prevent pregnancy.

Intrauterine device (IUD)**:** It is a small plastic T-shaped device used for birth control. It is inserted into the uterus where it stays to prevent pregnancy.

STDs (Sexually transmitted diseases) : These are infections transmitted from an infected person to an healthy person through sexual contact.

CONTENT -

- Importance of DNA copying and Variation in Reproduction
  DNA – Deoxyribonucleic acid is the genetic material that is present in the cells of all organisms. DNA carries genetic information from one generation to the other and this helps in producing

organisms of its own type. DNA copying is a must for inheriting the traits from parents. Any variations in DNA copying will give rise to origin of new species.
In nature, variations occur during sexual reproduction. The variant species are more adapted. They can survive better and reproduce to pass the genes to the offspring.
If there were no variations among living organisms there would have been no evolution. Natural conditions do not remain constant, they keep on changing. If variations stop, we would not be able to adapt to the changing conditions and can prove catastrophic to us**.**

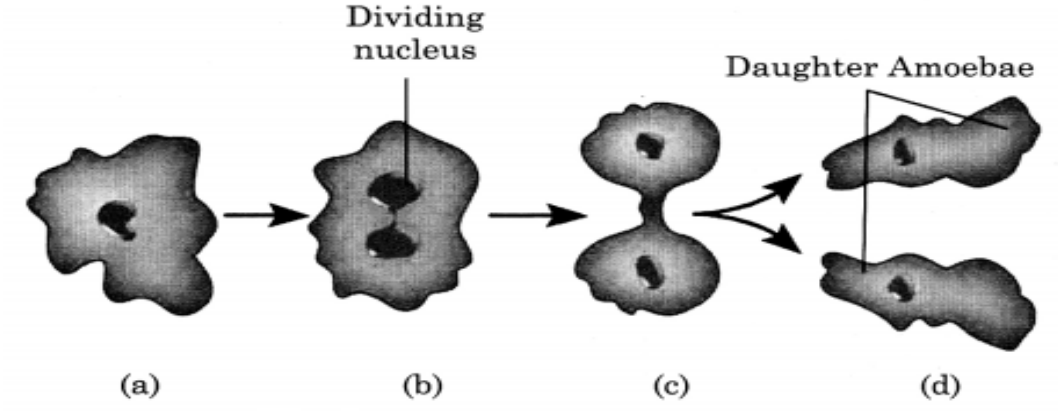
- Reproduction

  It is the process of producing new individuals of the same kind. There are mainly two types of reproduction - Asexual Reproduction and Sexual Reproduction.
  The production of new organism from a single parent without the involvement of sex cells (or gametes) is called asexual reproduction. Sexual reproduction involved two parent organisms, female and a male parent (male and female gamete).

- Types of Asexual Reproduction
  - **(i)** Fission
  - **(ii)** Budding
  - **(iii)** Spore Formation
  - **(iv)** Regeneration
  - **(v)** Fragmentation
  - (vi) Vegetative

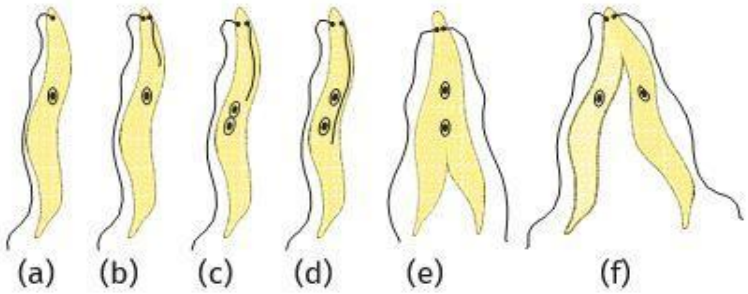
Fission - In the process of fission, a unicellular organism split to form two or more new organisms. It is of two types.

Binary fission - In Binary Fission, the parent organism splits to form two new organisms. For example - Amoeba, Paramecium, Leishmania, Bacteria etc.
When the amoeba cell has reached its maximum size of growth, then first the nucleus lengthen and divide into two daughter nuclei. After that, cytoplasm divides to form two smaller daughter amoebae.



Binary fission in Amoeba

Leishmania has a whip-like structure (flagellum) at one end of the cell and thus binary fission occurs in a definite orientation in relation to its structure. Leishmania is responsible for a disease called Kala-azar.



Multiple fission - The nucleus of the Plasmodium divides repeatedly to form a number of equal-sized daughter nuclei and each daughter nuclei breaks away together with a small portion of the cytoplasm.

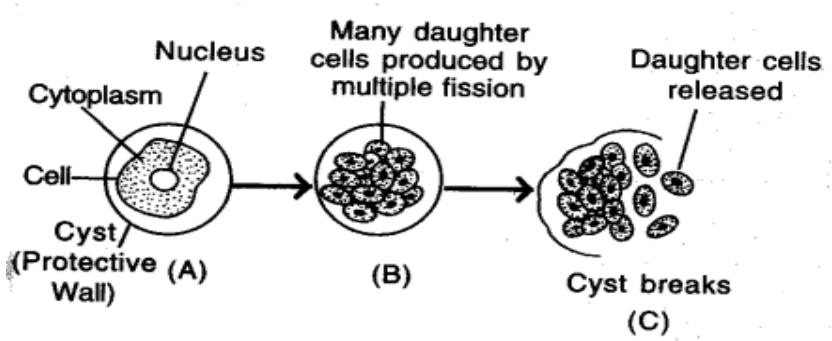
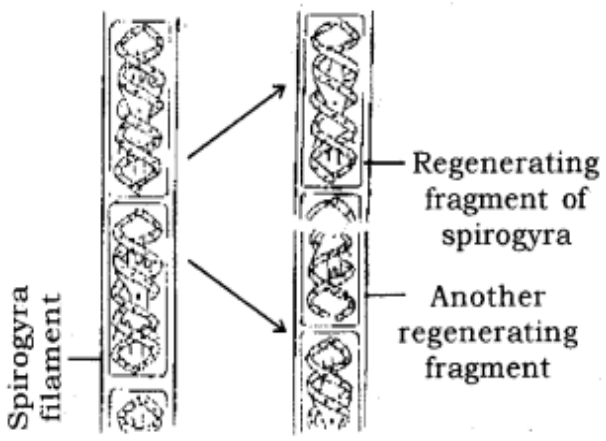


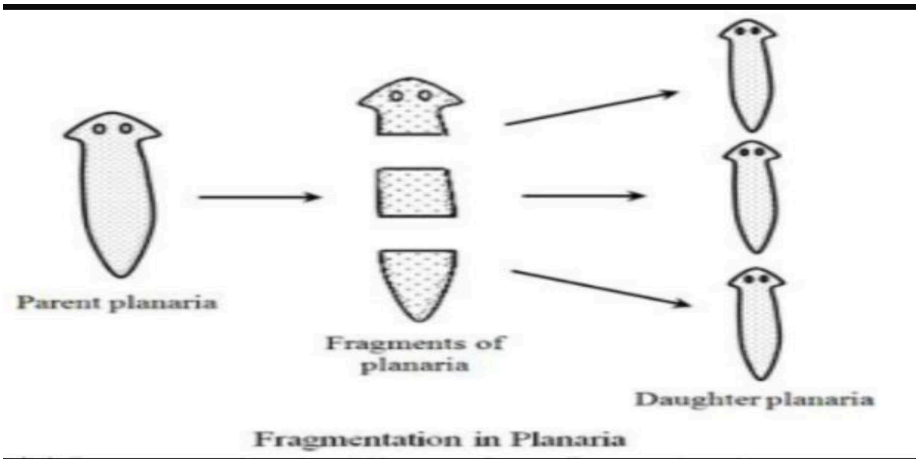
Fig. Multiple fission in Plasmodium.

Fragmentation - Spirogyra has a filamentous body. If breaks into smaller pieces or fragments on maturation. Each fragment develops into a new individual.



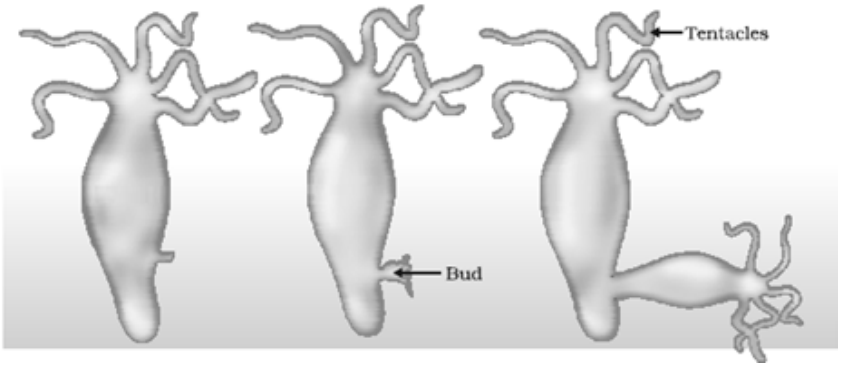
Fragmentation in Spirogyra

Regeneration - It is the ability of organisms to develop their lost parts. Some organisms have specialized cells that have high regenerative capacity for example; Planaria, Hydra. These cells divide to form a mass of cells from which different cells undergo changes to become different cell types and tissues. These changes occur in an organized sequence known as development. It is not same as reproduction.

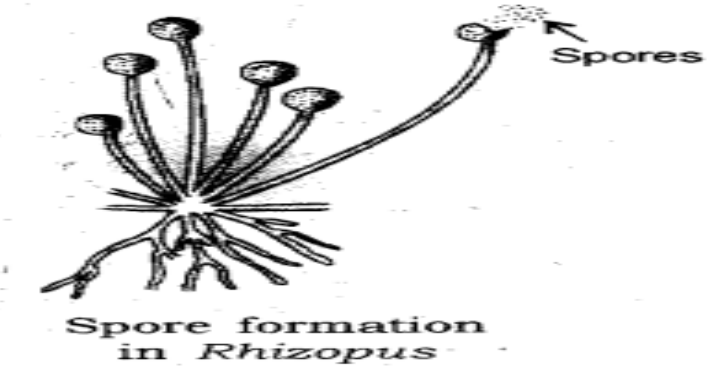


Fragmentation in Planaria

In Hydra, a bud develops as an outgrowth due to repeated cell division at one specific site. These buds develop into tiny individuals and, when fully mature, detach from the parent body and become new independent individuals.



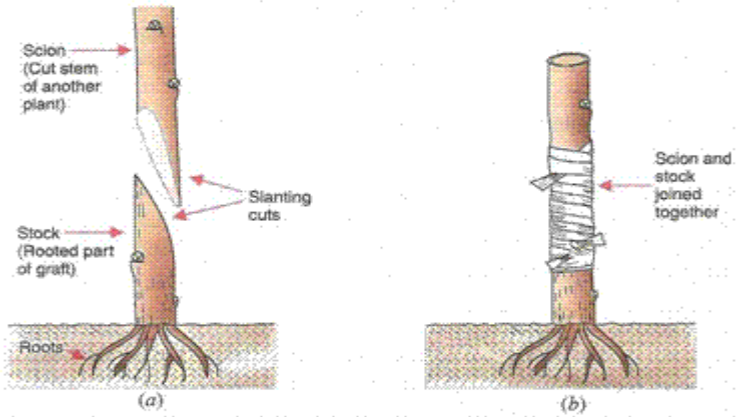
Spore formation - Organisms such as fungi make spores that can grow into complete new individuals when dispersed from a blob called sporangium. Once these spores mature, the sporangia burst and these matured spores reach different areas by air, wind and water. For e.g. Rhizopus. Spores are covered with thick wall.



Spore formation in *Rhizopus*

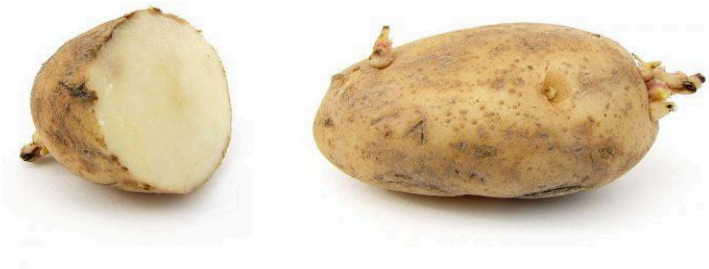
Vegetative Propagation - Vegetative propagation is the production of new plants from the vegetative parts of the plant. Roots, stems and leaves are called the vegetative parts of a plant. Vegetative propagation takes place by both natural methods and artificial methods. Artificial methods of vegetative propagation include grafting, layering and cutting.

Grafting is a method in which the cut stems of two different plants (one with roots and other without roots) are joined together in such a way that the stems join and grow as a single plant. The part of the combination that provides the root is called stock and added piece is called scion.

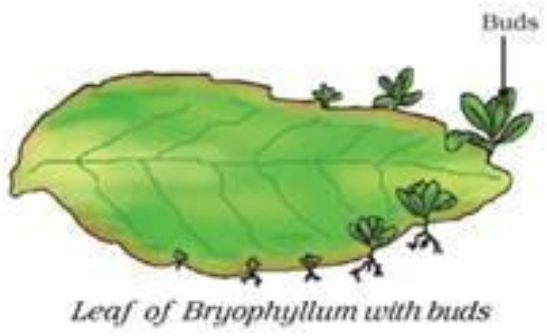


The grafting method for the artifical propagation of plants (or trees).

Buds are formed on potato tuber which are cut and used to grow new plants.



The leaf of Bryophyllum has many buds on its margins. A new plant arises from these buds when the leaf falls in moist soil.



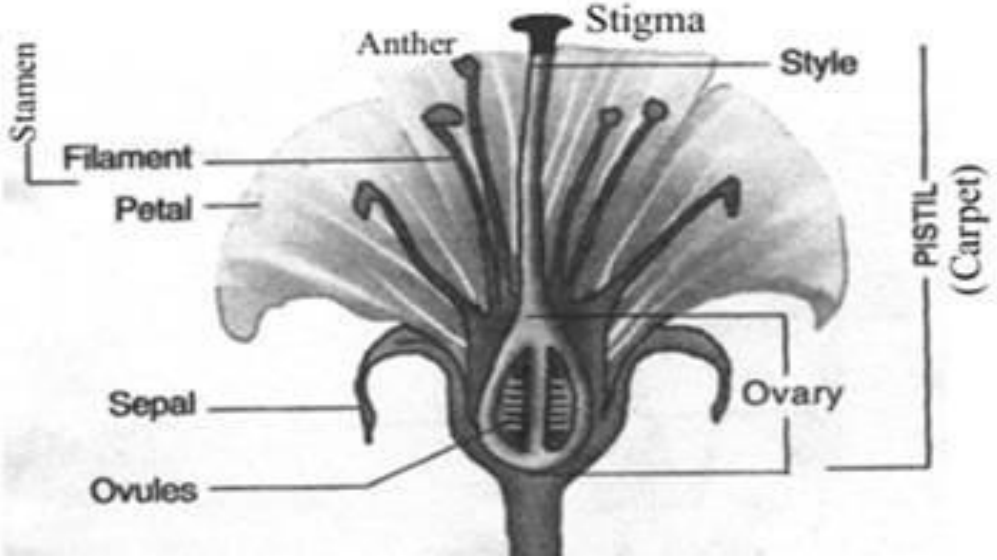
Leaf of Bryophyllum with buds

Tissue culture : Tissue culture is an artificial method of culturing plants. In this method, a small part of the plant is used to grow cells in a nutrient solution in the sterile condition of the laboratory. Tissue culture is a very fast technique. The new plantlets can be grown in a short period of time.

- Sexual reproduction in flowering plants

  It ensures the combination of genetic material (DNA) from two different individuals. Germ cells having half the number of chromosomes is produced and then fused together to form a new individual. This results in re-establishment of genetic material.

  In bisexual flowers, both male and female reproductive part i.e. stamen & carpel are present. Ex. Hibiscus, Mustard etc.

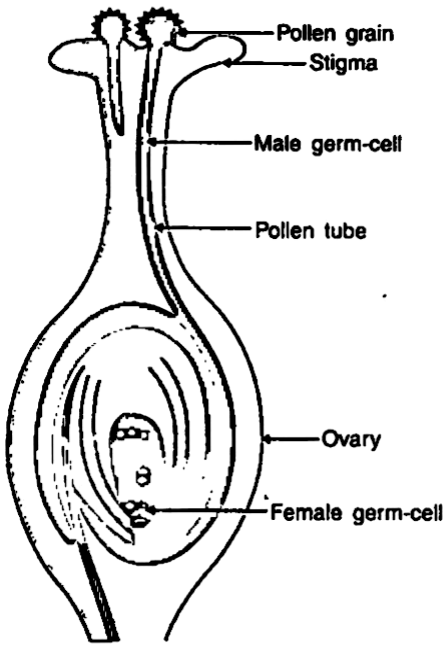


In unisexual flowers, male and female reproductive part are present in different flowers. Ex. Papaya, Watermelon etc.

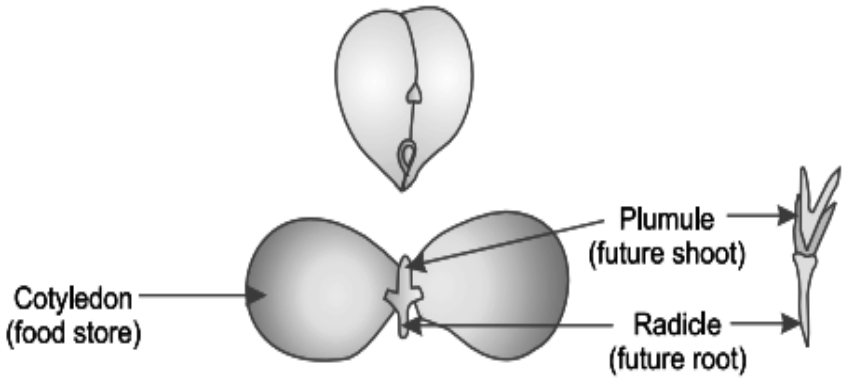
Pollination - The process of transfer of pollen grains from anther to the stigma of a flower is known as pollination. It takes place by various agents like water, wind, insects, birds, bats, etc. It is of two types - self-pollination (autogamy) and cross-pollination (allogamy).

In self-pollination, transfer of pollen grains takes place from anthers to the stigma of the same flower or another flower of the same plant. In cross-pollination, pollens are transferred from anthers to the stigma of another flower.

Fertilization - The fusion of male and female gamete is called fertilization. It occurs inside the ovary. Zygote is produced in this process. Zygote divides several times to form an embryo within the ovule. The ovule develops a tough coat and is converted into a seed. Ovary grows rapidly and ripens to forms a fruit, while the seed contains the future plant or embryo.



Germination - The seed contains the future plant or embryo which develops into a seedling under appropriate conditions. This process of growth of seed into seedling is known as germination.



Germination of gram seed

- Reproduction in Human Beings**:** In humans, sexual reproduction takes place. Both male and female parent are involved.

  Adolescence - It is that time of life when a child reaches reproductive maturity. This is indicated by a number of changes occurring in the body. The process of these changes is known as puberty. It begins at the age of around 10 and lasts until the age of 19. The period of adolescence is known as the teenage.

  Secondary sexual characters - It refers to the external features that distinguish a male from a female. The onset of puberty brings about a lot of changes in the body of a children. They undergo development of secondary sexual characters in them.

  The secondary sexual characters in girls are as follows:

  - Breasts start developing due to secretion of female hormone i.e. Estrogen.
  - Mammary glands also develop.
  - Growth of hair in armpits and in pubic areas.
  - Sweat glands and oil glands develop.

  The secondary sexual characters in boys are as follows:

  - They grow moustaches and beards.
  - They too develop pubic hair, hair in armpits, and on their chest.
  - The testes in male release male hormone i.e. testosterone.
  - Their voice begun to crack

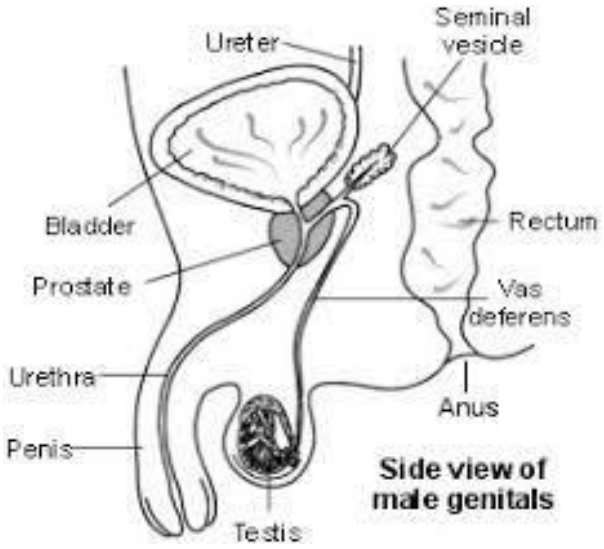
  Human Male Reproductive System - It consists of the following parts :

  - ► Testes - It occurs in pairs, produces sperms and produces male hormone, called testosterone.
  - ► Scrotum - It is extension of abdominal cavity containing testes. Protects testes and maintains a temperature lower than body temperature.

- ► Vas deferens - It is tube like structure emerging from testes and carries Sperms.
- ► Penis - It is muscular organ and discharge semen when stimulated.
- ► Urethra - A tube like structure and it is common passage for both sperms & urine.

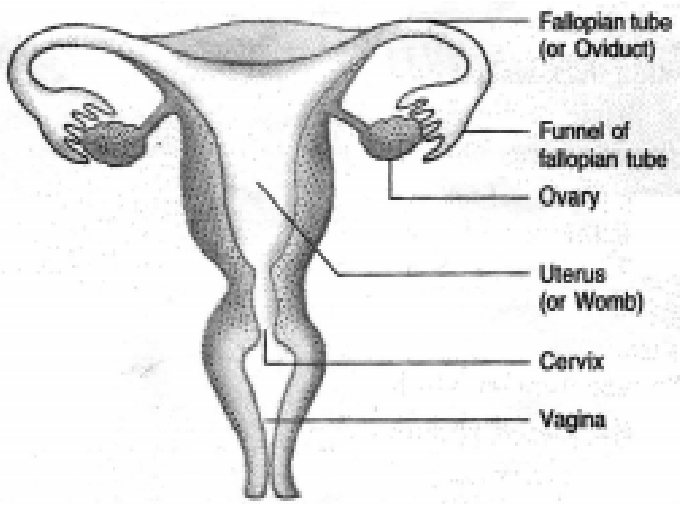
Function of Testosterone - It regulates the production of sperm. It bring about changes in appearance seen in boys at the time of puberty (secondary sexual characters).

Semen - The sperms along with the secretion of prostate gland and seminal vesicle together constitute semen, which is released and made to enter into the female genital tract during **c**opulation.



Female reproductive system - The human female reproductive system consists of a pair of ovaries, a pair of fallopian tubes/oviducts and the accessory organs such as the uterus and the vagina.

Ovaries produces the female sex cells called eggs or ova and also produce female sex hormones called estrogen and progesterone. One egg is produced every month by one of the ovaries.



The Egg is carried from the ovary to the womb through a fallopian tube. These two fallopian tube unite into an elastic bag like structure known as uterus also called as womb. The Uterus opens into the vagina through the cervix. Fertilization occurs in the fallopian tube.

After Fertilization, it leads to the formation of single-celled Zygote. Zygote undergoes repeated divisions, and gets implanted in the uterus. This is called Embryo. Embryo in advanced stages of development is termed as Foetus. Uterus also prepares itself to receive the embryo. It thickens its walls. Embryo descends into uterus in 4-5 days from the day of fertilization. Embryo in the uterus receives nutrients from the mother's body through the Umbilical cord which in turn is connected to the uterine wall of mother through Placenta. Nutrients enter through this cord, and wastes go out of the foetus body. Umbilical cord also has arteries & veins for exchange of oxygenated and deoxygenated blood.

Placenta - The embryo gets nutrition from the mother's blood with the help of a special tissue called Placenta. It provides a large surface area for glucose and oxygen to pass from the mother to the embryo. Similarly, the wastes from developing embryo are removed to mother's blood through placenta.

Gestation Period: The time period from fertilization up to the birth of the baby is called gestation period. In humans, it is about nine months (36 weeks).

What happens If fertilization doesn't take place – Zygote formation doesn't takes place in this case. Inner lining of uterus along with the unfertilized egg release out through Vagina.
Menstruation - It is the process of bleeding though vagina due to breakage endometrium, the uterus lining sheds and leads to hemorrhage is termed as 'Menstruation'. This bleeding lasts for 2-6 days. This occurs approximately 14 days after ovulation. Since Menstruation occurs every 28 days; this is also referred as Menstrual cycle.

Reproductive Health - Reproductive Health means a total well-being in all aspects of reproductive, i.e., physical emotional, social and behavior.

Contraceptive Methods - There are four methods of contraception:

- Barrier methods are the physical devices that prevent conception by inhibiting the entry of sperms in the female genital tract. Example: condoms, diaphragms, cervical caps, etc.

- Surgical methods include vasectomy (blocks vas deferens to prevent sperms from coming out) and tubectomy (blocks fallopian tubes to prevent the entry of eggs in it) in males and females respectively.

- Chemical methods include oral and vaginal pills.

- IUDC includes intrauterine contraceptive devices. Example Copper T.

STDs (Sexually transmitted diseases) - are Infections transmitted from an infected person to a healthy person through sexual contact. STDs can be caused by bacteria, viruses, or parasites. Examples include gonorrhea and syphilis are caused by bacteria while HIV/AIDS, genital herpes are caused by virus.

FLOW CHART -