3. Life Processes in Living Organisms Part – 2

- **Reproduction: Asexual and Sexual reproduction.**
- **Reproduction and modern technology**
- **Reproductive health**
- **Population Explosion**

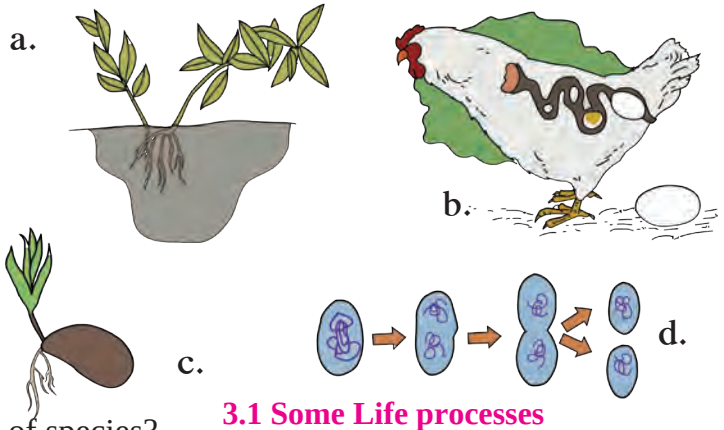
Can you recall?

1. Which are the important life processes in living organisms?
2. Which life processes are essential for production of energy required by body?
3. Which are main types of cell-division? What are the differences?
4. What is the role of chromosomes in cell-division?

We have studied various life processes in previous classes. All those life processes i.e. nutrition, respiration, excretion, sensation & response (control & co-ordination), etc. are essential to each living organism to remain alive. Besides these life processes, one more life process occurs in living organisms; it is reproduction. However, reproduction does not help the organism to remain alive but it helps to maintain the continuity of the species of that organism.

Observe

Observe the pictures and tell the life process which you identified.



Can you tell?

1. What do we mean by maintenance of species?
2. Whether the new organism is genetically exactly similar to earlier one that has produced it?
3. Who determines whether the two organism of a species will be exactly similar or not?
4. What is the relationship between the cell division and formation of new organism of same species by earlier existing organism?

Formation of new organism of same species by earlier existing organism is called as reproduction. Reproduction is one of the various important characters of living organisms. It is also one of the various reasons responsible for evolution of each species. In living organisms, reproduction occurs mainly by two methods. Those two methods are- asexual and sexual reproduction.

Asexual reproduction

Process of formation of new organism by an organism of same species without involvement of gametes is called as asexual reproduction. As this reproduction does not involve union of two different gametes, the new organism has exact genetic similarity with the reproducing organism. This is uniparental reproduction and it occurs by mitotic cell division. Absence of genetic recombination is a drawback whereas fast process is advantage of this reproductive method.

A. Asexual reproduction in unicellular organisms

1. Binary Fission

Try this

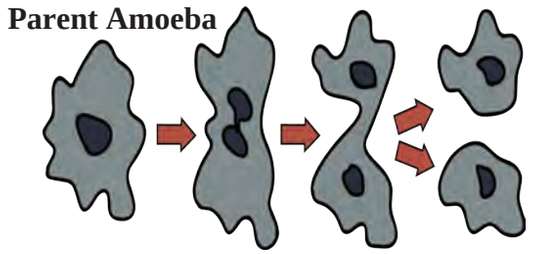
Activity 1 : Take a conical flask and collect the water in it from a pond having stagnant water and aquatic plants. Add some wheat grains and aquatic plants to it. Keep it for 3 – 4 days so that wheat grains & plants will decompose. Early in the morning on fourth day, take a glass slide and put a drop of that water over it. Carefully, put a cover-slip on that drop and observe under compound microscope.

You will be able to see many paramecia performing the binary fission.

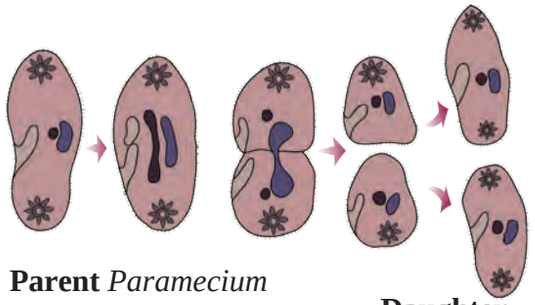
Prokaryotes (Bacteria), Protists (*Amoeba*, *Paramecium*, *Euglena*, etc.) and eukaryotic cell-organelle like mitochondria and chloroplasts perform asexual reproduction by binary fission. In this process, the parent cell divides to form two similar daughter cells. Binary fission occurs either by mitosis or amitosis.

Axis of fission / division is different in different protists. Ex.: *Amoeba* divides in any plane due to lack of specific shape; hence it is called as 'simple binary fission'. *Paramecium* divides by 'transverse binary fission' whereas *Euglena* by 'longitudinal binary fission'.

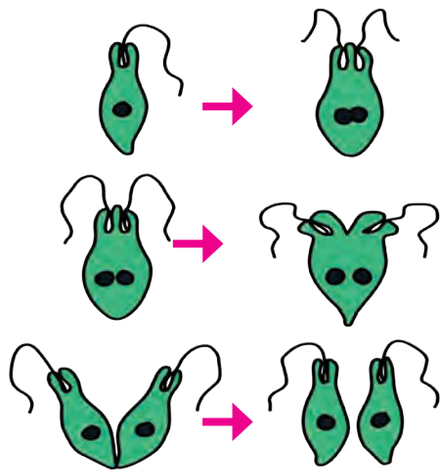
Binary fission is usually performed by living organisms during favourable conditions i.e. availability of abundant food material.



3.2 Simple binary fission: *Amoeba*



3.3 Transverse binary fission : Paramecium

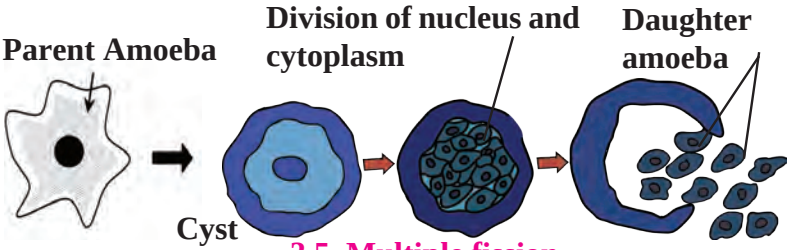


3.4 Longitudinal binary fission: *Euglena*

2. Multiple Fission

Asexual reproduction by multiple fission is performed by Amoeba and other similar protists. Amoeba stops the formation of pseudopodia and thereby movements whenever there is lack of food or any other type of adverse condition. It becomes rounded and forms protective covering around plasma membrane. Such encysted Amoeba or any other protist is called as 'Cyst'.

Many nuclei are formed by repeated nuclear divisions in the cyst. It is followed by cytoplasmic division and thus, many amoebulae are formed. They remain encysted till there are adverse conditions. Cyst breaks open on arrival of favourable conditions and many amoebulae are released.



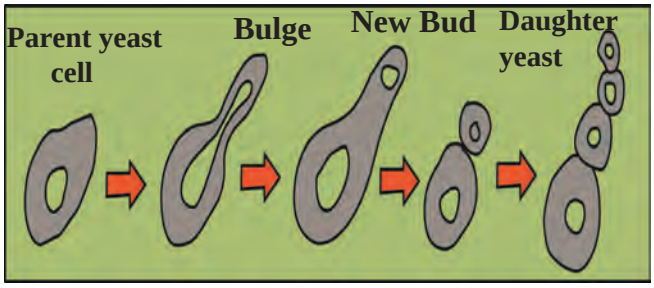
3.5 Multiple fission

Use your brain power

Does the parent cell exist after asexual reproduction- fission?

3. Budding:

Activity 2 : Bring the active dry yeast powder from market. Take 50 ml lukewarm water in a conical flask. Add 5 gm of active dry yeast powder and 10 gm table sugar to that water and mix well the mixture. Keep the flask in warm place and after an hour take a drop of that mixture on a clean glass slide. Put a cover-glass on that drop and observe it under the compound microscope.



3.6 Budding

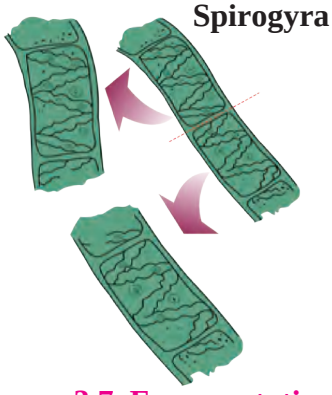
You will see the yeast cells performing budding i.e. a small bud coming out of many parent cells. Asexual reproduction occurs by budding in yeast- a unicellular fungus. Yeast cell produces two daughter nuclei by mitotic division, so as to reproduce by budding. This yeast cell is called as parent cell. A small bulge appears on the surface of parent cell. This bulge is actually a bud. One of the two daughter nuclei enters this bud. After sufficient growth, bud separates from the parent cell and starts to live independently as a daughter yeast cell.

B. Asexual reproduction in Multicellular organisms

1. Fragmentation:

This type of asexual reproduction occurs in multicellular organisms. In this type of reproduction, the body of parent organism breaks up into many fragments and each fragment starts to live as an independent new organism. This type of reproduction occurs in algae like *Spirogyra*, and sponges like *Sycon*.

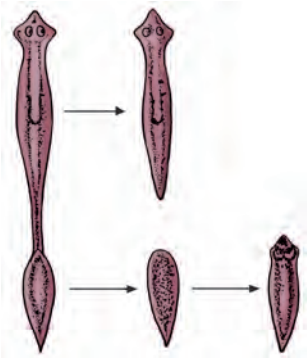
Whenever there is plenty of water and nutrients are available to *Spirogyra*, its filaments grow up very fast and break up into many small fragments. Each fragment starts to live independently as a new *Spirogyra* fiber.If the body of *Sycon* breaks up accidentally into many fragments, each fragment develops into new *Sycon*.



3.7 Fragmentation

2. Regeneration

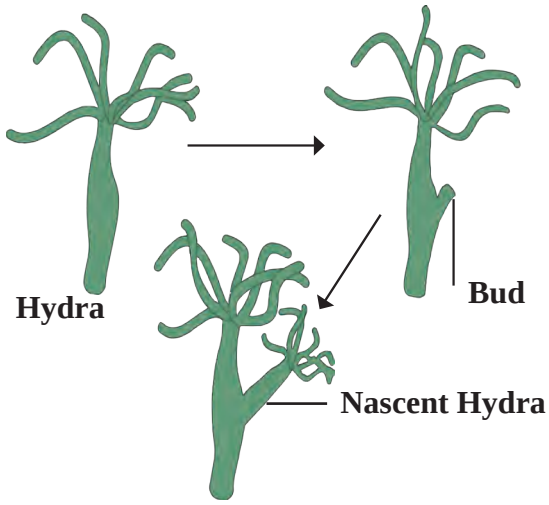
You may know that the wall lizard breaks up and discards some part of its tail in emergency. Discarded part is regenerated after a period. This is an example of limited regeneration. However, under certain situations, an animal-Planaria breaks up its body into two parts and thereafter each part regenerates remaining part of the body and thus two new Planaria are formed. This is called as regeneration.



3.8 Regeneration

3. Budding

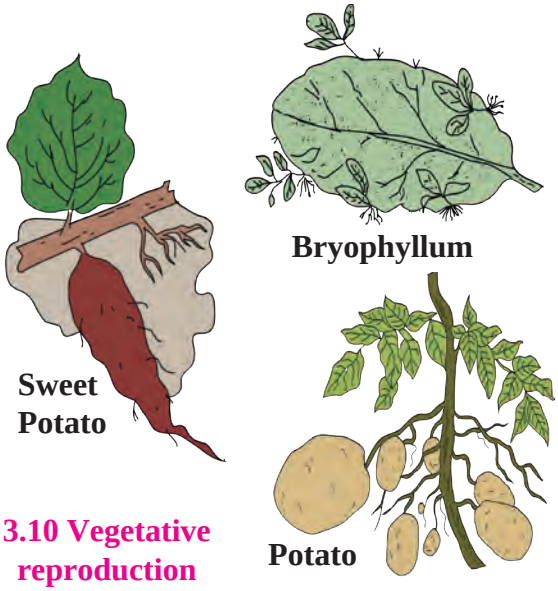
In case of *Hydra*, under favourable conditions, at specific part of its body, an outgrowth is formed by repeated divisions of regenerative cells of body wall. This outgrowth is called as bud. Bud grows up progressively and finally forms a small hydra. Dermal layers and digestive cavity of the budding hydra are in continuity with those of parent hydra. Parent hydra supplies nutrition to the budding hydra. Budding hydra separates from parent hydra and starts to lead an independent life when it grows up and becomes able to lead an independent life.



3.9 Budding

4. Vegetative Propagation

Reproduction in plants with the help of vegetative parts like root, stem, leaf and bud is called as vegetative reproduction. Vegetative propagation in potatoes is performed with the help of 'eyes' present on tuber whereas in *Bryophyllum* it is performed with the help of buds present on leaf margin. In case of plants like sugarcane & grasses, vegetative propagation occurs with the help of buds present on nodes.



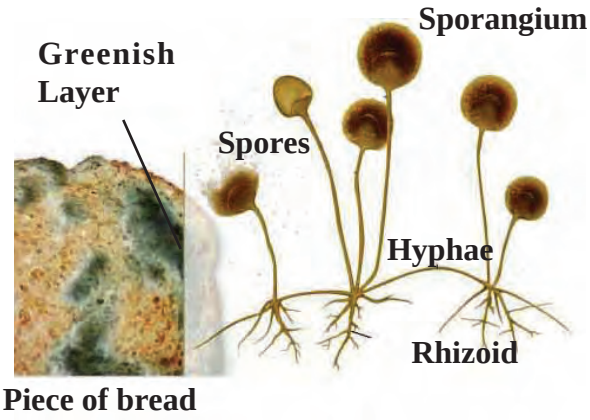
3.10 Vegetative reproduction

Try this

5. Spore Formation

Take a piece of wet bread or 'bhakari' and keep it in humid place. Fungus will grow on it within 2 – 3 days. Observe the fungus under compound microscope and draw its diagram.

Fungi like *Mucor* have filamentous body. They have sporangia. Once the spores are formed, sporangia burst and spores are released. Spores germinate in moist and warm place and new fungal colony is formed.



3.11 Spore formation

Sexual Reproduction

Sexual reproduction always occurs with the help of two germ cells. Female gamete and male gamete are those two germ cells. Two main processes occur in the sexual reproduction.

1. Gamete formation: Gametes are formed by the meiosis. In meiosis, chromosome number is reduced to half; hence haploid gametes are formed.

2. **Fertilization:** A diploid zygote is formed in this process by union of haploid male and female gametes. The zygote divides by mitosis and embryo is formed. The embryo develops to form new individual.

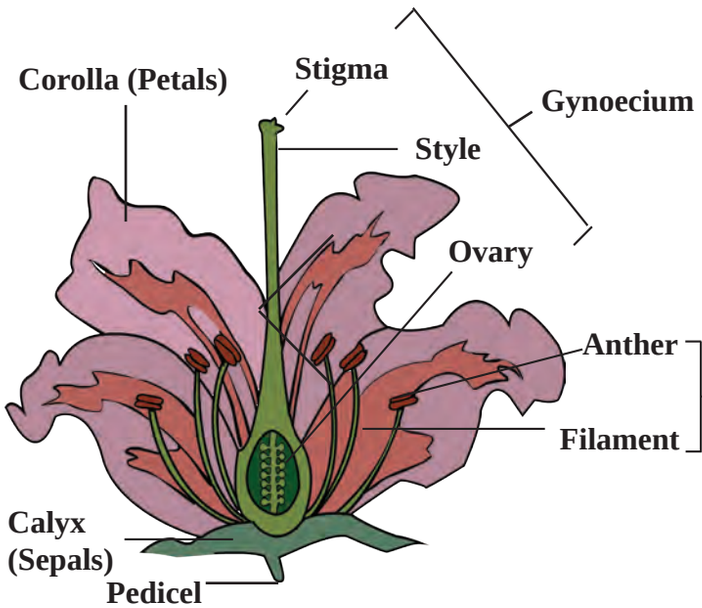
Two parents i.e. male parent and female parent are involved in this type of reproduction. Fusion of male gamete of male parent and female gamete of female parent occurs. Due to this, new individual always has the recombined genes of both the parents. Hence, the new individual shows similarities with the parents for some characters and has some characters different than both parents. Diversity in living organisms occurs due to genetic variation. Genetic variation helps the organisms to adjust with the changing environment and thereby to maintain their existence. Due to this, plants and animals can save themselves from being extinct.

Let's Think

1. What would have been happened if the male and female gametes had been diploid?
2. What would have been happened if any of the cells in nature had not been divided by meiosis?

A. Sexual reproduction in plants

Flower is structural unit of sexual reproduction in plants. It consists of four floral whorls as calyx, corolla, androecium and gynaecium; arranged in sequence from outside to inside. Androecium and gynoecium are called 'essential whorls' because they perform the function of reproduction whereas calyx and corolla are called as 'accessory whorls' because they are responsible for protection of inner whorls. Members of calyx are called as 'sepals' and they are green coloured. Members of corolla are called as 'petals' and they are variously colored.



3.12 Parts of flower

Female flower

Male flower

3.13 Papaya Flower

A flower is called as 'bisexual' if both whorls i.e. androecium and gynoecium are present in the same flower. Ex. *Hibiscus*. A flower is called as 'unisexual' if any one of the abovementioned two whorls is present in the flower. If only androecium is present, it is 'male flower' and if only gynoecium is present, flower is 'female flower'. Ex. Papaya.

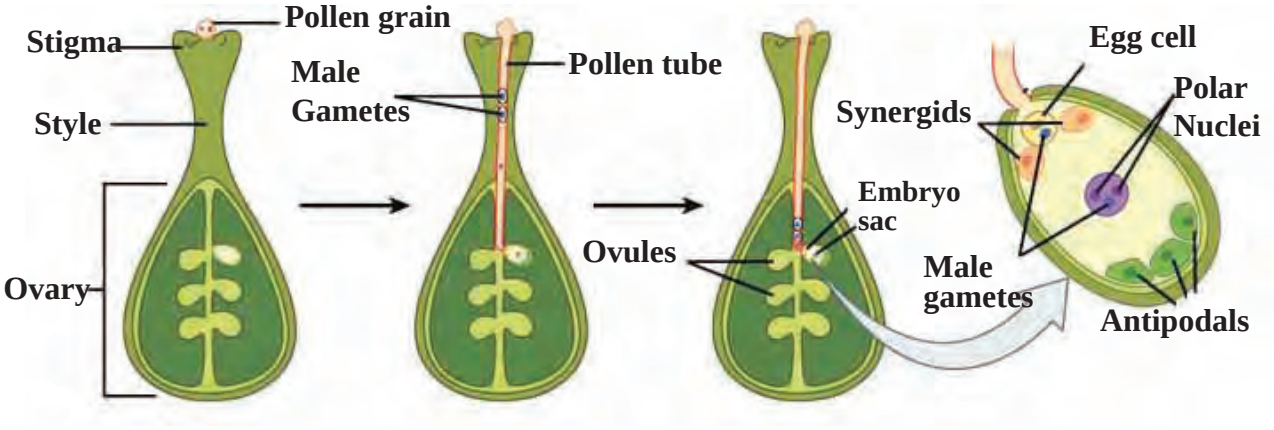
Many flowers have the stalk for support, called as 'pedicel' and such flowers are called as 'pedicellate' whereas flower without stalk is called as 'sessile'.

Androecium is male whorl and its members are called as stamens. Gynaecium is female whorl and its members are called as carpels.

These may be separate or united. Ovary is present at the basal end of each carpel. A hollow 'style' comes up from the ovary. Stigma is present at the tip of style. Ovary contains one or many ovules. Embryo sac is formed in each ovule by meiosis. Each embryo sac consists of a haploid egg cell and two haploid polar nuclei.

Pollen grains from anther are transferred to the stigma. This is called as pollination.

Pollination occurs with the help of abiotic agents (wind, water) and biotic agents (insects and other animals). Stigma becomes sticky during pollination Pollens germinate when they fall upon such sticky stigma i.e. a long pollen tube and two male gametes are formed. The pollen tube carries male gametes. Pollen tube reaches the embryo sac via style. Tip of the pollen tube bursts and two male gametes are released in embryo sac. One male gamete unites with the egg cell to form zygote. This is fertilization. Second male gamete unites with two polar nuclei and endosperm is formed. As two male nuclei participate in this process, it is called as double fertilization.



3.14 Double fertilization in angiosperms

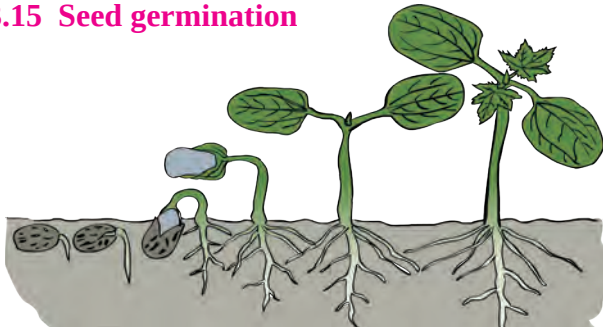
Do you know?

When pollination involves only one flower or two flowers borne on same plant, it is called as self-pollination whereas if it involves two flowers borne on two plants of same species, it is cross-pollination. While discovering the new high yielding and resistant varieties of plants, scientists bring about the pollination with the help of brush.

Use of ICT Make an video album of pollination and show it in the class.

Try this

Take a suitable glass vessel like conical flask or beaker. Add some garden soil in it and sow some pulse grains in it in such a way that you can observe them through glass. Water it every day and record the changes.



3.15 Seed germination

Ovule develops into seed and ovary into fruit after fertilization. Seeds fall upon the ground when fruits break up and they germinate in the soil under favourable conditions. Zygote develops at the cost of food stored in endosperm of seed and thus a new plantlet is formed. This is called as seed germination.

B. Sexual reproduction in human being

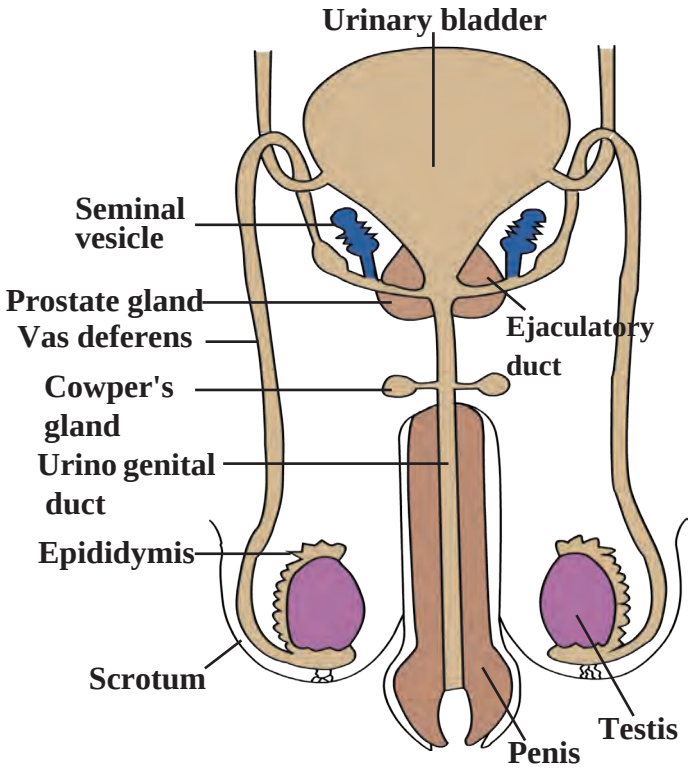
Can you recall?

1. Which different hormones control the functions of human reproductive system through chemical coordination?
2. Which hormones are responsible for changes in human body occurring during on set of sexual maturity?
3. Why has the Government of India enacted the law to fix the minimum age of marriage as 18 in girls and 21 in boys?

We have studied in the chapter of heredity and variation that men have XY sex-chromosomes and women have XX sex-chromosomes. Reproductive system with specific organs develops in the body of men and women due to these sex-chromosomes only. X-chromosome is present in men and women whereas Y-chromosome is present in men only. Now we shall study the structure and functions of human reproductive system.

Human male reproductive system

Male reproductive system of humans consists of testes, various ducts and glands. Testes are present in the scrotum, outside the abdominal cavity. Testes contain numerous seminiferous tubules. Germinal epithelium present in the tubules divide by meiosis to produce sperms. Those sperms are sent forward through various tubules. Sequence of those tubules is as- rete testes, vas eferens, epididymis, vas deferens, ejaculatory duct and urinogenital duct. As the sperms are pushed forwards from one duct to next, they become mature and able to fertilize the ovum.



3.16 Male reproductive system of human

Seminal vesicles secrete their secretion in ejaculatory ducts whereas prostate gland and Cowper's glands secrete their secretions in urinogenital duct. Semen is formed of sperms and secretions of all these glands. Semen is ejaculated out through penis. All the organs of male reproductive system are paired except urinogenital duct, prostate gland, penis & scrotum.

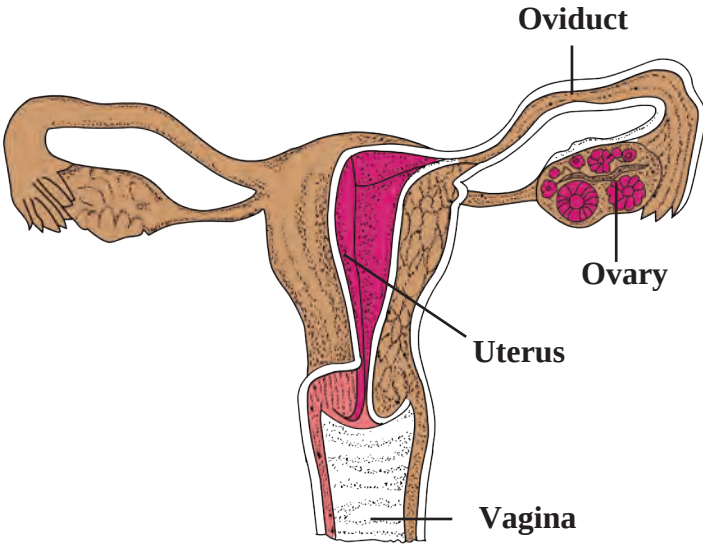
Surprising Facts

1. Length of each epididymis is about 6 meters.
2. Length of a sperm is about 60 micrometers.
3. Such a small sperm has to cross the distance of approximately 6.5 meter while passing out of male reproductive system.
4. Sperm needs large amount of energy. For this purpose, fructose is present in the semen.

Human female reproductive system

All organs of female reproductive system are in abdominal cavity. It includes a pair of ovaries, a pair of oviducts, single uterus and a vagina. Besides, a pair of Bartholin's gland is also present.

Generally, every month, an ovum is released in abdominal cavity alternately from each ovary. Free end of oviduct is funnel-like. An opening is present at the center of it. Oocyte enters the oviduct through that opening. Cilia are present on inner surface of oviduct. These cilia push the oocyte towards uterus.



3.17 Human female reproductive system

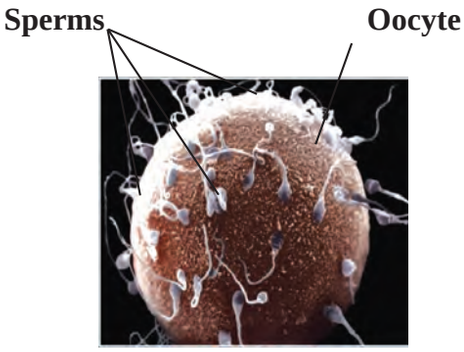
Gamete Formation

Both gametes i.e. sperm and ovum are formed by meiosis. Sperms are produced in testes of men from beginning of maturation (puberty) till death. However, in case of women, at the time of birth, there are 2 – 4 million immature oocytes in the ovaries of female foetus. An oocyte matures and is released from ovary every month from the beginning of maturity up to the age of menopause (approximately 45 years of age). Menopause is the stoppage of functioning of female reproductive system. At the age of about 45 – 50 years, secretion of hormones controlling the functions of female reproductive system either stops or becomes irregular. This causes the menopause.

Fertilization

Formation of zygote by union of sperm and ovum is called as fertilization. Fertilization is internal in humans. Semen is ejaculated in vagina during copulation. Sperms, in the numbers of few millions start their journey by the route of vagina – uterus – oviduct. One of those few million sperms fertilize the only ovum present in the oviduct.

From the age of puberty up the menopause (from 10 – 17 years of age up to 45 – 50 years), an ovum is released every month from the ovary. i.e. out of 2 – 4 million oocytes, approximately only 400 oocytes are released up to the age of menopause. Remaining oocytes undergo degeneration.

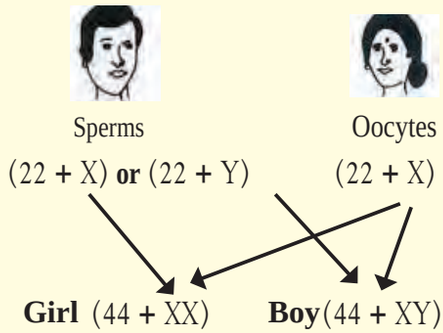


3.18 Fertilization

Oocytes released from ovaries during last few months nearing the age of menopause are 40 – 50 years old. Their ability of division has been diminished till now. Due to this, they cannot complete meiotic division properly. If such oocytes are fertilized, the new-borns produced from them may be with some abnormalities like Down's syndrome.

Do you know?

1. The chromosome number in germ cells producing the gametes are diploid i.e. 2n. It includes 22 pairs of autosomes and 1 pair of sex-chromosomes i.e. (44 + XX or 44 + XY). These germ cells divide by meiosis. Due to this, gametes contain only haploid (n) number of chromosomes i.e. (22 + X or 22 + Y). Two types of sperms are produced as (22 + X) or (22 + Y) whereas oocytes are produced of only one type as (22 + X).

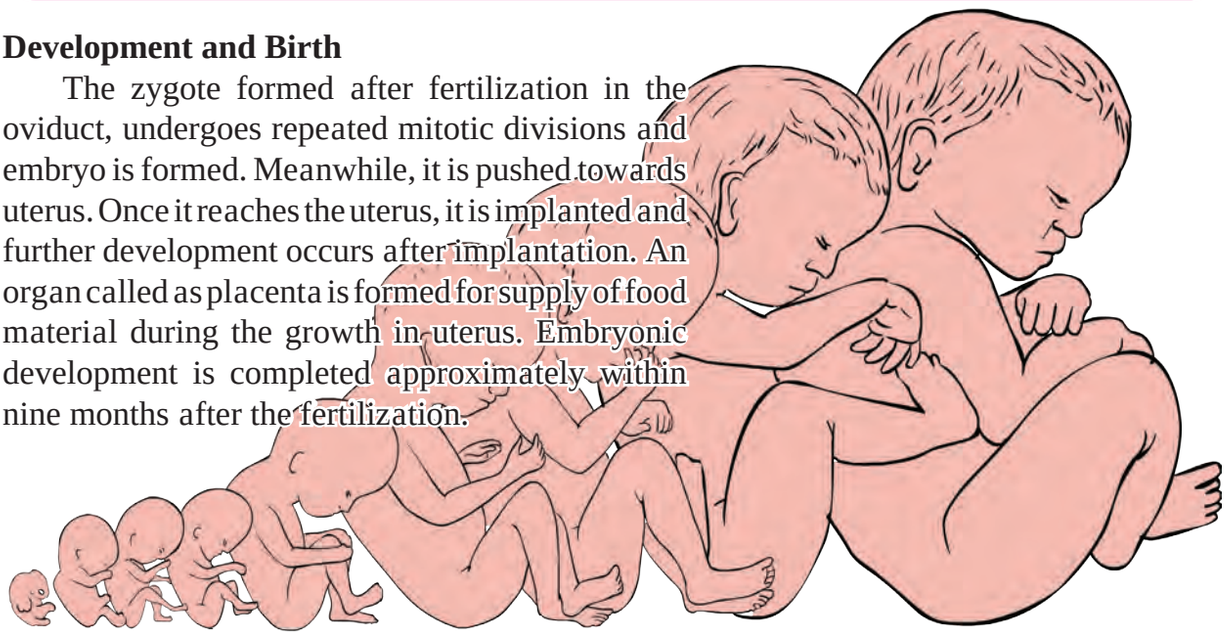


3.19 Sex determination in human being

2. Both, sperms and oocytes are produced by meiosis. In case of sperms, process of meiotic division is completed before the sperms leave male reproductive tract. However, in case of oocytes, process of meiotic division completes after ovulation; during fertilization in oviduct.

Development and Birth

The zygote formed after fertilization in the oviduct, undergoes repeated mitotic divisions and embryo is formed. Meanwhile, it is pushed towards uterus. Once it reaches the uterus, it is implanted and further development occurs after implantation. An organ called as placenta is formed for supply of food material during the growth in uterus. Embryonic development is completed approximately within nine months after the fertilization.



3.20 Growth of an embryo

Always remember

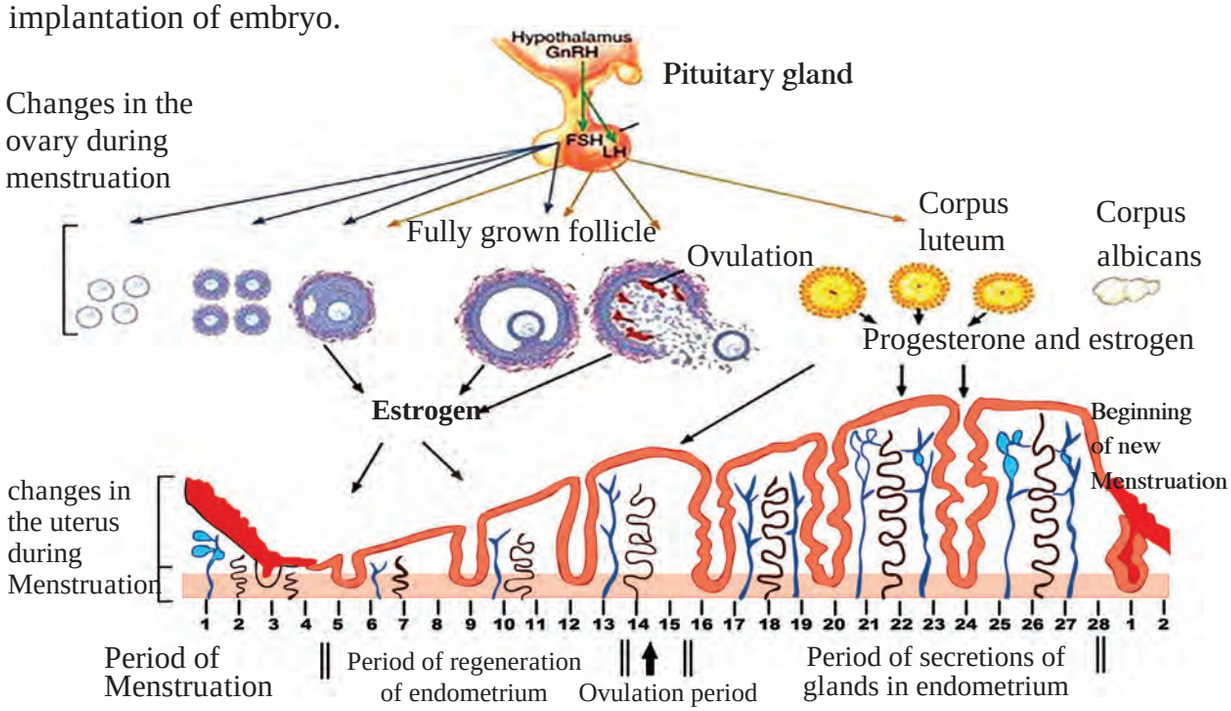
The man is totally responsible, whether the couple will have a boy or a girl child. During zygote formation, man contributes either X or Y chromosome to the next generation, but woman contributes only X-sex chromosome to the next generation. At the time of fertilization, if X- chromosomes comes from male, the child will be a girl and if Y-chromosome comes then the child will be a boy. **Thinking of this, is it right to consider the mother responsible for a girl child? We all must take efforts to stop female foeticide.**

Can you tell?

1. Which hormone is released from pituitary of mother once the foetal development is completed?
2. Under the effect of that hormone, which organ of the female reproductive system starts to contract and thereby birth process (Parturition) is facilitated?

Menstrual Cycle:

Female reproductive system undergoes some changes at puberty and those changes repeat at the interval of every 28 – 30 days. These repetitive changes are called as menstrual cycle. Menstrual cycle is a natural process, controlled by four hormones. Those four hormones are follicle stimulating hormone (FSH), luteinizing hormone (LH), estrogen and progesterone. One of the several follicles in the ovary starts to develop along with the oocyte present in it, under the effect of follicle stimulating hormone. This developing follicle secretes estrogen. Endometrium of the uterus starts to develop (during first cycle) or regenerate (during subsequent cycles) under the effect of estrogen. Meanwhile, developing follicle completes its development. It bursts under the effect of luteinizing hormone and oocyte is released. This is called as ovulation. Remaining tissue of the burst follicle forms the corpus luteum. Corpus luteum starts to secrete progesterone. Endometrial glands secrete their secretion under the effect of progesterone. Such endometrium is ready for implantation of embryo.



3.21 Menstrual cycle

If oocyte is not fertilized within 24 hours, corpus luteum becomes inactive and transforms into corpus albicans. Due to this, secretion of estrogen and progesterone stops completely. Endometrium starts to degenerate in absence of these two hormones. Tissues of degenerating endometrium and unfertilized ovum are discarded out through vagina. This is accompanied with continuous bleeding. Bleeding continues approximately for five days. This is called as menstruation.

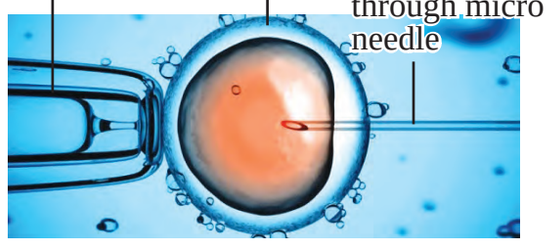
Unless the oocyte is fertilized and embryo is implanted, this process is repeated every month. If the embryo is implanted, repetition of this cycle is temporarily stopped till the parturition and thereafter period of breast feeding. Menstrual cycle is a natural process and the women experience severe pains during this period. Severe weakness is felt due to heavy bleeding. There is higher possibility of infections too during this overall period. Due to all such reasons, there is need of rest along with special personal hygiene.

Reproduction and Modern Technology

Many couples cannot have children due to various reasons. In case of women, irregularity in menstrual cycle, difficulties in oocyte production, obstacles in the oviduct, difficulties in implantation in uterus and many other reasons are responsible for this. Absence of sperms in the semen, slow movement of sperms, anomalies in the sperms are the reasons in case of males. But now with the help of advanced medical techniques like IVF, Surrogacy, Sperm bank the childless couples can have a child.

In Vitro Fertilization (IVF)

In this technique, fertilization is brought about in the test-tube and the embryo formed is implanted in uterus of woman at appropriate time. IVF technique is used for having the child in case of those childless couples who have problems like less sperm count, obstacles in oviduct, etc.



3.22 Fertilization in a test tube

Surrogacy

Some women have problems in implantation of embryo in uterus. Such women can take the help of the modern remedial technique called as surrogacy. In this technique, oocyte is collected from the ovary of the woman having problem in implantation in uterus. That oocyte is fertilized in test-tube with the help of sperms collected from her husband. The embryo formed from such fertilization is implanted in the uterus of some other woman having normal uterus. Such a woman, in whose uterus the embryo is implanted, is called as surrogate mother.

3.23 Surrogacy

Sperm Bank/ Semen Bank

There are various problems in sperm production as mentioned above, in case of many men. So as to have the children in case of such couples, new concept of sperm bank has been introduced. This concept is similar to blood bank. Semen ejaculated by the desired men is collected after their thorough physical and medical check-up and stored in the sperm bank.

As per the wish of needful couple, oocyte of woman of the concerned couple is fertilized by IVF technique using the semen from sperm bank. Resultant embryo is implanted in the uterus of same woman. Name of the semen donor is strictly kept secret as per the law.

Twins

Two embryos develop simultaneously in the same uterus and thus two offsprings are delivered simultaneously. Such offsprings are called as twins. Many couples have twins. There are two main types of twins as- monozygotic twins and dizygotic twins.

Monozygotic twins are formed from single embryo. During early period of embryonic development (within 8 days of zygote formation), cells of that embryo divide into two groups.

3.24 Twin girls: age 18 months

Those two groups develop as two separate embryos and thus monozygotic twins are formed. Such twins are genetically exactly similar to each other. Due to this, such twins are exactly similar in their appearance and their gender is also same i.e. both will be either boys or girls.

In case of monozygotic twins, if the embryonic cells are divided into two groups 8 days after the zygote formation; there is high possibility of formation of conjoined twins (Siamese twins). Such twins are born with some parts of body joined to each other. Some organs are common in such twins.

Occasionally, two oocytes are released from the ovary of woman and both oocytes are fertilized by two separate sperms and thus two zygotes are formed. Two embryos are formed from those two zygotes and both of those embryos are separately implanted in the uterus and thus dizygotic twins are delivered after complete development. Such twins are genetically different and may be same of different by gender.

Internet is my friend

You may have read that sometimes a woman may deliver more than two offsprings at a time. Collect more information from internet about reasons for such incidences.

Reproductive health

A person's state of being physical, mental and social strongness is called as health. In our country, there seems to be lack of awareness regarding reproductive health due to various reasons like social customs, traditions, illiteracy, shyness, etc. Especially, there seems to be indifference towards the reproductive health of women.

Occurrence of menstrual cycle is related with reproductive and overall health of women. Now a day, women are working at par with men. Due to this, they have to stay outdoors for whole day. Bleeding occurs during menstrual cycle. Due to this, private organs (genitals) need to be maintained clean time to time, otherwise, problems regarding reproductive health may arise. Some problems regarding reproductive health may arise in men too. It is essential to maintain the cleanliness of their genitals.

Among the various sexual diseases, syphilis and gonorrhoea occur on large scale. Both of these diseases are caused by bacteria. Occurrence of chancre (patches) on various parts of body including genitals, rash, fever, inflammation of joints, alopecia, etc. are the symptoms of syphilis. Painful and burning sensation during urination, oozing of pus through penis and vagina, inflammation of urinary tract, anus, throat, eyes, etc. are symptoms of gonorrhoea.

Do you know?

Population Explosion

Excessive growth of population within short duration is called as population explosion. You may have realized from the table given besides about fast population growth of India. We have to face various problems like unemployment, decreasing per capita income and increasing loan, stress on natural resources, etc. There is only one solution for all such problems and it is population control. Family planning is essential for this.

Year	Population
1901	238396327
1911	252093390
1921	251321213
1931	278977238
1941	318660580
1951	358142161
1961	439234771
1971	548159652
1981	683329097
1991	846421039
2001	1028610328
2011	1210854977

Get information

Visit a public health center nearby your place and collect the information through an interview of health officer about meaning and various methods of family planning.

Exercise

1. Complete the following chart.

Asexual reproduction	Sexual reproduction
1. Reproduction that occurs with the help of somatic cells is called as asexual reproduction.	1. …….. ……..… …….....
2 …… ……..	2. Male and female parent are necessary for sexual reproduction.
3. This reproduction occurs with the help of mitosis only.	3. ……... …….....
4. …….. ……..….	4. New individual formed by this method is genetically different from parents.
5. Asexual reproduction occurs in different individuals by various methods like binary fission, multiple fission, budding, fragmentation, regeneration, vegetative propagation, spore production, etc.	5. …….. ……..… …….. ……..… …….. ……..… ……..

2. Fill in the blanks.

a. In humans, sperm production occurs in the organ ----------.

b. In humans, ------ chromosome is responsible for maleness.

c. In male and female reproductive system of human, ---------- gland is same.

d. Implantation of embryo occurs in ------

e. ---------- type of reproduction occurs without fusion of gametes.

f. Body breaks up into several fragments and each fragment starts to live as a new individual. This is -- -- -- -- -- -- -- type of reproduction.

g. Pollen grains are formed by -- ----- -- -- -- division in locules of anthers.

3. Complete the paragraph with the help of words given in the bracket.

(Luteinizing hormone, endometrium of uterus, follicle stimulating hormone, estrogen, progesterone, corpus luteum)

Growth of follicles present in the ovary occurs under the effect of ----- This follicle secretes estrogen. -- --- - -- -- -- grows / regenerates under the effect of estrogen. Under the effect of --- ---, fully grown up follicle bursts, ovulation occurs and -- --- -- -- is formed from remaining part of follicle. It secrets --- --- -- -- and --- --- -- -- --. Under the effect of these hormones, glands of -- -- -- -- are activated and it becomes ready for implantation.

4. Answer the following questions in short.

a. Explain with examples types of asexual reproduction in unicellular organism.

b. Explain the concept of IVF.

c. Which precautions will you follow to maintain the reproductive health?

d. What is menstrual cycle? Describe it in brief.

5. In case of sexual reproduction, new-born show similarities about characters. Explain this statement with suitable examples.

6. Sketch the labelled diagrams.

a. Human male reproductive system.

b. Human female reproductive system.

c. Flower with its sexual reproductive organs.

d. Menstrual cycle.

7. Give the names.

a. Hormones related with male reproductive system.

b. Hormones secreted by ovary of female reproductive system.

c. Types of twins.

d. Any two sexual diseases.

e. Methods of family planning.

8. Gender of child is determined by the male partner of couple. Explain with reasons whether this statement is true or false.

9. Explain asexual reproduction in plants.

10. Modern techniques like surrogate mother, sperm bank and IVF technique will help the human beings. Justify this statement.

11. Explain sexual reproduction in plants.

Activity :

1. Collect the official data about present and a decade old population of various Asian countries and plot a graph of that data. With the help of it, draw your conclusions about demographic changes.

2. With the help of your teacher, compose and present a road show to increase the awareness about prenatal gender detection and gender bias.