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How do Organisms Reproduce?



This is an example of sexual reproduction where two parents are needed to contribute a gamete to create a new individual. Asexual reproduction on the other hand requires one parent to break into two or more fragments that develop into a new individual. Example: Coral, Sponges, and Starfish.

Topic Notes

- *Basic Events in Reproduction*
- *Types of Reproduction*
- *Asexual Reproduction*
- *Sexual Reproduction*

BASIC EVENTS IN REPRODUCTION

Reproduction is a biological process by which new individuals of the same species are produced by existing organisms. Reproduction is essential for the survival of a species on the earth. The process of reproduction ensures continuity of life on earth. Reproduction gives rise to more organisms with the same basic characteristics as their parents.

A basic event in reproduction is the creation of a DNA copy as the DNA in the cell nucleus is the information source for making proteins. If the information changes, different proteins will be made leading to altered body designs. Also, during cell division, an additional cellular apparatus is created so that the DNA copies separate, each with its own cellular apparatus.

Example 1. What is the importance of DNA copying in reproduction? [NCERT]

Ans. The creation of a DNA copy is a basic and an important event in reproduction. DNA in the cell nucleus contains the blueprint of body design and information for inheritance of characteristic features from parents to next generation. During Reproduction, as the cell divides, a copy of DNA along with additional cellular apparatus, is transferred from the parent cell to its offspring.

Variation

Cells use chemical reactions to build copies of their DNA but this process of copying the DNA will have some variations due to which the DNA copies will be similar but not identical to the original. If the variations are so drastic that the new DNA copy cannot work with the cellular apparatus it inherits,

then the newborn cell dies.

This tendency for variation during reproduction is the basis for evolution.

The Importance of Variation

Genetic variation is when the genes carried by the members of a population differ from one another (like hair or eye color). Genetic variation is important. If there are sudden changes in environment, the individuals of the population will vary enough that some will be able to adapt and survive.

- (1) It helps the species of various organisms to survive and flourish even in adverse environment due to the presence of some variations in some individual organisms to tolerate extreme changes in environmental conditions.
- (2) It provides stability to the population of various species by preventing them from getting wiped out during adverse conditions.

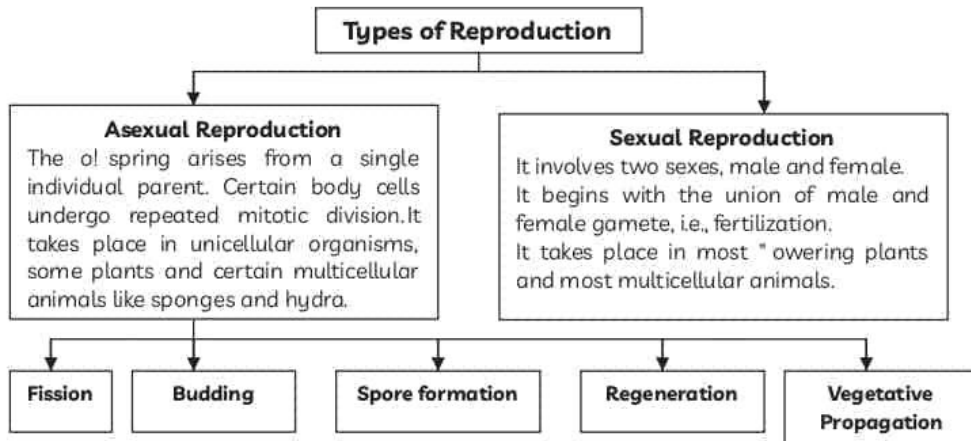
Example 2. Why is variation beneficial to the species but not necessarily for the individual? [NCERT]

Ans. If a population of reproducing organisms were suited to a particular niche and if the niche were drastically altered, the population could be wiped out. However, if some variations were to be present in a few individuals in these populations, there would be some chance for them to survive. Thus, variation is beneficial to the species but not necessarily for the individual as it helps in survival of the species.

TOPIC 2

TYPES OF REPRODUCTION

Living beings mainly reproduce by two methods—asexual reproduction and sexual reproduction. The modes by which different organisms reproduce depends on the body design of the organisms.



ASEXUAL REPRODUCTION

Characteristics

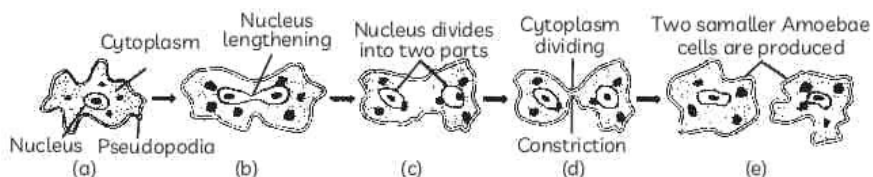
- (1) Certain body cells of an organism undergo repeated mitotic divisions and form two or more new individuals of the same kind.
- (2) The new individuals produced are genetically identical to their parents.

Advantages

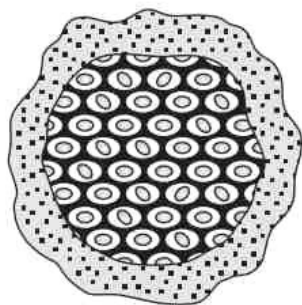
- (1) Asexual reproduction is simple and fast.
- (2) Takes place in those organisms having simple body structures.

Disadvantages

- (1) Evolutionary change is not possible as no variation is produced. A species consequently cannot adapt to changes in its environment.



- (B) In *Leishmania*, the binary fission occurs in a definite orientation in relation to the whip-like structure called flagellum present at one end of the cell.
- (C) In *Plasmodium*, the cell divides into many daughter cells simultaneously by multiple fission. Sometimes, during unfavourable conditions, a cyst or protective wall is formed around the cell and inside the cyst, the nucleus splits several times to form many daughter nuclei. This increases chances of their survival in favourable conditions.



Multiple fission in plasmodium

Example 3. How does binary fission differ from multiple fission? [NCERT]

Ans. Binary fission: Some unicellular organisms un-

- (2) Asexual reproduction produces identical organisms generation after generation. In case of any defect in the parent organism, the offspring also inherits it.

Methods of Asexual Reproduction

Asexual reproduction occurs in various ways which are described below:

Fission

It is the simplest method of asexual reproduction in unicellular organisms, such as amoeba, paramaecium and other protozoa.

Different patterns of fission have been observed:

- (A) In some organisms such as Amoeba, the splitting of the two cells during division takes place in any plane.

der favourable conditions simply split into two equal halves during cell division. This is called binary fission. Examples are different bacteria and protozoa such as Amoeba.

Multiple Fission : Some organisms like the malarial parasite, *Plasmodium*, divide into many daughter cells simultaneously. This division process is called multiple fission.

Fragmentation

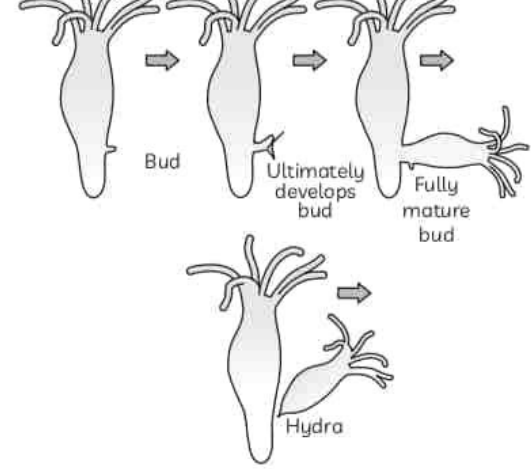
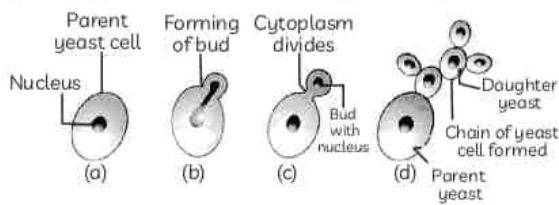
Fragmentation is the process of breaking off a piece of organism followed by mitotic cell division. Meiosis is not involved in this process as it is a mode of asexual reproduction. The broken part can develop into an independent adult.

Fragmentation process is limited to invertebrates, and it is absent in vertebrates. The ability of fragmentation depends on the complexity of the organism.

Budding

It takes place in multicellular organisms like hydra and yeast. A bulging or bud appears on the body as a result of repeated mitotic division.

Budding in Yeast: During budding in yeast, small daughter bud is formed on parent and continues to grow until it gets separated. The daughter cell is



Budding in Hydra: In hydra, the cell divides rapidly at a specific site and develops as an outgrowth called bud. These buds while attached to the parent part develop into small individual. When the small individual becomes large enough, it detaches itself from the parent body to exist as an independent individual.

Differences between Budding and Fission

S.No	Budding	Fission
(1)	The parent individual persists after the daughter individual has budded off.	The parent individual loses its identity after splitting into two or more daughter cells
(2)	Bud starts as a trace and slowly grows to an appropriate size before it pinches off but it is still smaller than the parent	The daughter individuals are identical in structure but all are smaller in size than the parent. Later they grow to attain their normal dimensions
(3)	Budding is rather slow and gradual	Fission is rapid and instantaneous

Spore Formation

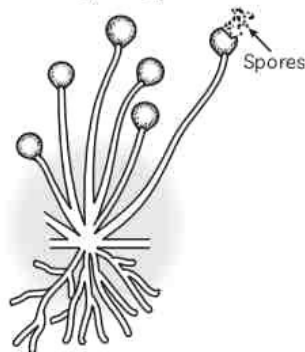
Spore formation is the most common method of asexual reproduction in majority of fungi and bacteria like rhizopus, mucor, penicillium.

During spore formation, a structure called sporangium develops from the fungal hypha.

The nucleus divides several times within the sporangium, and each nucleus, with a bit of cytoplasm, develops into a spore.

The spores are liberated and they develop into new hypha after reaching the ground or substratum.

The spores are covered by thick walls that protect them until they come into contact with another moist surface and can begin to grow.



Ans. The spores are covered by thick walls of tiny blob-on-a-stick like structures, which are not reproductive parts, but protect the spores from unfavorable conditions, until they come into contact with moist surface and begin to grow. Such spores are produced in large numbers and can spread through air, water or animals in contact. They germinate when conditions are favorable. Thus, organism like rhizopus is benefited greatly when it is produced through spores.

Regeneration

Regeneration is a modified form of fragmentation. It is known as a process that makes genomes, cells, organs, organisms, and ecosystems resilient after disturbances or damage. Regeneration is carried out by specialized cells. From this mass of cells, different cells undergo changes in an organised sequence referred to as development to become various cell types and tissues.

Planarian flatworms are highly adapted with regeneration capabilities because of their asexual reproduction method. Star fishes also have the same ability to regenerate their arm, but unlike tailed amphibians and lizards, lost arms of star fishes could regenerate a complete new organism.

Example 4. How will an organism be benefited if it reproduces through spores? [NCERT]

Example 5. Can you think of reasons why more complex organisms cannot give rise to new individuals through regeneration? [NCERT]

new individuals through regeneration because complex organisms are multi-cellular organisms. In complex organisms, specialised cells are organised as tissues, and tissues are organised into organs, which are strategically placed to perform different specialized functions. The tissues in complex organisms cannot regenerate a new individual as cell-by-cell division would be impractical.

Difference between Fission and Fragmentation:

In fission, a unicellular organism breaks up to form two or more daughter organisms, whereas in fragmentation, a multicellular organism breaks up to form two or more daughter organisms.

Difference between Fragmentation and Regeneration

Fragmentation	Regeneration
Occurs in multi-cellular organisms with relatively simple body organisation.	Occurs in several fully differentiated organisms.
Organisms simply break up into smaller pieces upon maturation. These pieces or fragments grow into new individuals.	If the individual is accidentally cut or broken up into many pieces, many of these pieces grow into separate individuals.
Fragmentation results in the production of identical offsprings.	In regeneration, the entire organism can regenerate as in certain animals like Planaria, but mostly the organism regenerates only a part of the body.
No specialised cells are involved in fragmentation.	Regeneration is carried out by specialised cells. These cells proliferate and make large number of cells. From this mass of cells, different cells undergo changes to become various cell types and tissues.
Example: Spirogyra	Example: Crabs can regenerate legs. Mammals can regenerate liver cells and blood cells. Lizards can regenerate their tail

Vegetative propagation is a method of reproduction in some higher plants in which a new plant develops from the vegetative parts of a plant such as root (as in dahlia, sweet potato), stem (as in ginger, potato, onion) or leaf (as in bryophyllum).

Advantages of vegetative propagation

- (1) Plants raised by this method can bear flowers and fruits earlier than those produced from seeds.
- (2) It is cheaper, easier and more rapid method of propagation in plants as compared to growing plants from their seeds.
- (3) The traits or characters of the parent plant are preserved. That is, all plants produced are genetically similar enough to the parent plant to have all its characteristics.
- (4) Better quality of the plants can be maintained.
- (5) Those plants which do not produce viable seeds or seeds with prolonged period of dormancy, such as banana, orange, rose, jasmine, etc., can be propagated by this method.

Example 6. Case Based:

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

Select a money-plant. Cut some pieces such that they contain at least one leaf. Cut out some other portions between two leaves. Dip one end of all the pieces in water and observe over the next few days.

[NCERT Activity 8.5, 8.6]

- (A) **Select the incorrect observation regarding the first activity.**
- (I) Notches can be seen on the surface of the potato.
 - (II) All potato pieces showed growth of young shoot and roots.
 - (III) The potato pieces which were having buds in notches did not show growth of young shoot and roots.
 - (IV) The pieces which were not having eye buds did not show any growth of shoot or root.
- (a) Both (I) and (II)
 (b) Both (II) and (III)
 (c) (I), (II) and (III)
 (d) (II), (III) and (IV)

plant which grow and give rise to fresh leaves are:

- (a) Those which have buds
 - (b) Those which have spores
 - (c) Those which have flowers
 - (d) Those which have nodes
- (C) What conclusions can be drawn from the second activity?
- (D) Which parts of a plant develop into new plants by vegetative propagation?
- (E) Assertion (A): All new Bryophyllum plants are genetically similar to their parent plant.

Reason (R): New Bryophyllum plants develop from the stems of their parent plant.

- (a) Both (A) and (R) are true and (R) is the correct explanation of the assertion.
- (b) Both (A) and (R) are true, but (R) is not the correct explanation of the assertion.
- (c) (A) is true, but (R) is false.
- (d) (A) is false, but (R) is true.

Ans. (A) (b) Both (II) and (III)

Explanation: All potato pieces did not show growth of young shoot and roots. Growth of shoot and roots was shown by those potato pieces only which were having buds.

(B) (d) Those which have nodes

Explanation: The portion of money-plant having leaves at the node show formation of fresh leaves. There are buds in the axil (point of attachment of the leaf at the node) of leaves which develop into shoots. These buds are called vegetative buds. A bud consists of a short stem around which immature overlapping leaves are

new plants.

(C) It can be concluded from the second activity that green leaves can synthesise food and have the ability to grow into a plant through vegetative propagation.

(D) Plant parts like roots, stem and leaves develop into new plants under appropriate conditions by vegetative propagation.

Explanation: All new Bryophyllum plants are genetically similar to their parent plant as they are produced when the buds produced in the notches along the leaf margin of Bryophyllum fall on the soil and these develop into new plants.

(E) (c) (A) is true but (R) is false.

Explanation: All new Bryophyllum plants are genetically similar to their parent plant as they are produced when the buds produced in the notches along the leaf margin of Bryophyllum fall on the soil and these develop into new plants.

Tissue Culture

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

Advantages of tissue culture:

- (1) It is a very fast technique. Thousands of plantlets can be produced in a few weeks time from a small amount of plant tissue.
- (2) Many plants can be grown from one parent in disease-free conditions.
- (3) It can grow plants round the year, irrespective of weather or season.

TOPIC 4

SEXUAL REPRODUCTION

Sexual reproduction is a type of reproduction in which the two sexes, namely, male and female are involved. It incorporates a process of combining DNA from two different individuals during reproduction.

DNA Content Re-establishment in New Generation

- (1) The gametes (or reproductive cells) contain only half the number of DNA (or half the number of chromosomes) as compared to the normal body cells.

- (2) The germ cell that is large and contains the food stores is called the female gamete.
- (3) The gamete that is smaller and motile is called the male gamete.
- (4) When a male gamete combines with a female gamete during sexual reproduction, the zygote formed will have the same number of DNA as present in the organism.

Significance of Sexual Reproduction

- (1) It promotes diversity of characters in the offsprings.

evolution.

- (3) It plays an important role in the origin of new species.

Example 7. What are the advantages of sexual reproduction over asexual reproduction? [NCERT]

Ans. As sexual reproduction involves two parents, the newly formed individual has characteristics of both the parents. More variations are produced in sexual reproduction as it involves two parents. Thus, it ensures survival of species in a population.

Sexual Reproduction in Plants

- (1) The reproductive parts of angiosperms are located in the flower.
- (2) Stamens and carpels are the reproductive parts of a flower which contain the germ cells.
- (3) Stamen is the male reproductive part and produces pollen grains.
- (4) Carpel is the female reproductive part and contains the ovary, style and stigma.
- (5) Some flowers are unisexual such as papaya and watermelon while some are bisexual such as hibiscus and mustard.

pels.

- (7) Bisexual flowers contain both stamens and carpels. Majority of the flowers are bisexual.
- (8) The various parts of a flower are:

- **Sepals:** These are usually green in colour.
- **Petals:** These are coloured.
- **Stamen:** It is the male reproductive part of a flower and consists of a stalk called filament and a flattened top called the anther. The anthers produce the pollen grains. Each pollen grain produces two male gametes.
- **Carpel:** It is the female reproductive part of a flower and consists of a swollen ovary at the base, an elongated middle style and a terminal stigma. The ovary contains ovules and each ovule has an egg.

Pollination

The transfer of pollen grains from anther to stigma is called pollination. The transfer of pollen grains is carried out by several agents such as water, wind, insects and other agencies.

Pollination is of two types—self pollination and cross pollination.

	Self Pollination	Cross Pollination
(1)	The transfer of pollen grains from the anther of a flower to the stigma of the same flower or another flower of the same plant.	The transfer of pollen grains from the anther of a flower to the stigma of another flower of a different plant of the same species.
(2)	It occurs in flowers which are genetically same.	It occurs between flowers which may be genetically different.
(3)	Self-pollination increases genetic uniformity and decreases variations.	Cross-pollination decreases genetic uniformity and increases variations.
(4)	Does not require pollinators for transfer of pollen grains.	Requires pollinators for transfer of pollen grains.

Fertilization in Plants

- (1) Pollination, i.e., transfer of pollen grains from anther of a flower to stigma takes place.
- (2) Pollen grains which are deposited on the stigma form tubes called pollen tubes.
- (3) One pollen tube grows through the style and

reaches the ovary where the ovules are located.

- (4) The pollen tube normally enters the ovule through a small opening called micropyle.
- (5) Inside the ovule, the pollen tube releases two male gametes into the embryo sac which contains the egg.

	Pollination	Fertilization
(1)	Pollination is a process of transferring of pollens from stamen to the stigma of a flower.	Fertilization is the fusion of male gametes and female gametes of plants
(2)	It precedes fertilization	It takes place only after pollination has taken place.

Double fertilization: Inside each embryoac, two fusions, syngamy and triple fusion take place and this mechanism of two fusions occurring in an embryo sac is called double fertilization.

Syngamy: The fusion of one male gamete with the female gamete (egg) inside the embryoac is called syngamy and it results in zygote.

times to form an embryo within the ovule.

- (2) The ovule develops a tough coat and is gradually converted into a seed.

Germination

The process by which the seed, which contains the future plant or embryo, develops into a seedling under appropriate conditions.

- (1) The ovary grows rapidly and ripens to form a fruit.
(2) The petals, sepals, stamens, style and stigma shrivel and fall off.

Example 8. Case Based:

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

(A) Select the correct observations:

- (I) One massive and fleshy cotyledon can be seen.
(II) It has a small pore called the micropyle at the pointed end.
(III) The plumule is the future root.
(IV) The radicle is the future root.
(a) Both (I) and (II)
(b) Both (I) and (III)
(c) Both (II) and (III)
(d) Both (II) and (IV)
- (B) During the germination of seeds, the seed coat ruptures due to
(a) massive imbibition of water
(b) differentiation of cotyledons
(c) a sudden increase in cell division
(d) massive glycolysis in cotyledons and endosperm
- (C) Name the part of the seed through which water enters the seed.
- (D) Name the part of the flower which develops into seed and fruit respectively.
- (E) Assertion (A): The seed of a plant contains the future plant or embryo.

Reason (R): The ovary of the flower grows rapidly and ripens to form a fruit.

correct explanation of the assertion.

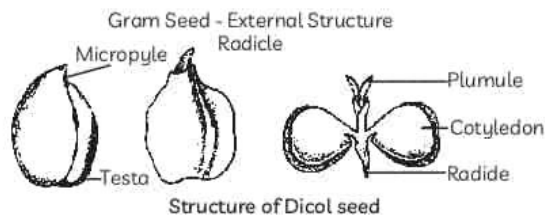
(b) Both (A) and (R) are true, but (R) is not the correct explanation of the assertion.

(c) (A) is true, but (R) is false.

(d) (A) is false, but (R) is true.

Ans. (A) (d) Both (II) and (IV)

Explanation: Gram seed has two cotyledons. Just below the hilum lies the micropyle in the form of a small pore. Water is absorbed through the micropyle during the germination of seed. The plumule is the future shoot and radicle is the future root.



(B) (a) massive imbibition of water

Explanation: During the germination of seeds, the seed coat ruptures due to massive imbibition of water through the micropyle.

(C) The part of seed through which water enters the seed is the micropyle.

(D) The ovule develops a tough coat and is gradually converted into a seed. The ovary grows rapidly and ripens to form a fruit.

(E) (b) Both (A) and (R) are true, but (R) is not the correct explanation of the assertion.

Explanation: After fertilisation, the zygote divides several times to form an embryo within the ovule. The ovule develops a tough coat and is gradually converted into a seed.

Human Reproductive System

The structures associated with reproduction are different in males and females.

Puberty

Puberty is the age in the life of human beings when the reproductive tissues begin to mature and the reproductive system becomes functional. It is 13 to 14 years for males and 10 to 12 years for females. Some changes begin to take place in both girls and boys during this period.

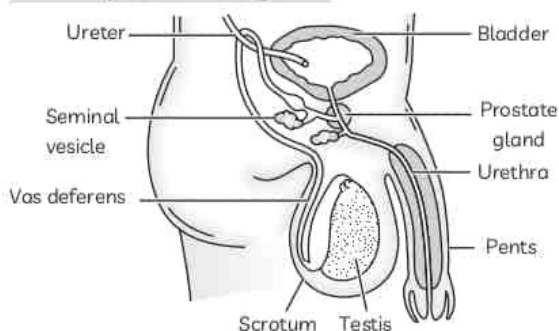
- (1) Changes such as thicker hair in armpits and genital area between the thighs, thinner hair on legs and arms, oily skin and development of pimples are common to both girls and boys.

between boys and girls. For example, increase in breast size, darkening of the skin of the nipples and beginning of menstruation are some of the changes observed in girls. Thick hair growth on the face, cracking of voice, and penis occasionally getting erect and enlarged are some of the changes observed in boys.

Role of Hormones: The testes and ovaries produce viable gametes and also secrete hormones.

- (1) The testis secretes the male hormone testosterone and the ovary secretes the female hormone estrogen.
- (2) Hormones regulate the process of gametogenesis (formation of gametes).
- (3) Hormones maintain the structure and function of accessory sex organs
- (4) Hormones develop secondary sex characters like facial, axial and pubic hair, pitch of the voice and development of mammary glands.

Male Reproductive System



The human male reproductive system consists of the following organs:

- (1) **Testes:** The primary male reproductive organ is a pair of testis which lies in a sac-like muscular structure outside the abdominal cavity called scrotum. The formation of germ-cells or sperms takes place in the testes. It secretes the male hormone testosterone, which regulates the formation of sperms and brings about changes in appearance in boys.
- (2) **Scrotum:** It provides an optimal temperature for formation of sperms which is $1-3^{\circ}\text{C}$ lower than the body temperature.
- (3) **Vas deferens:** It is a long tube which arises from each testes and which carries sperms into organs called seminal vesicles, where the sperms get nourished and stored.
- (4) **Urethra:** It is a common passage for the passage of both urine and spermatic fluid. The

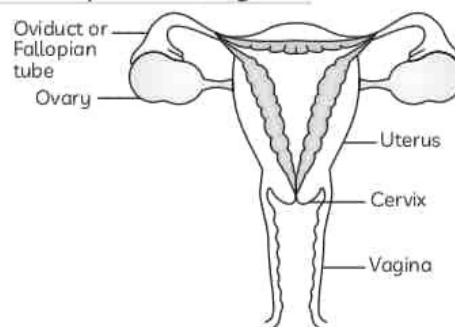
urinary bladder to form urethra.

- (5) **Penis:** It forms the external male genital organ and is a thick muscular organ which encloses the urethra. There is only one opening for the urine and sperms.

Example 9. What is the role of the seminal vesicles and the prostate gland? [NCERT]

Ans. Seminal vesicles and the prostate gland form the part of the accessory glands, which are associated with the male reproductive system. Seminal vesicles and prostate gland secrete a fluid which makes the transport of sperms easier along the path of urethra and at the same time provides nutrition to the sperms.

Female Reproductive System



The human female reproductive consists of the following organs:

- (1) **Ovaries:** There is a pair of small and oval-shaped organs, located in the abdominal cavity near the kidney. Ovaries are the female primary reproductive organs which perform dual functions of production of female gamete or ovum and the secretion of female sex hormones, estrogen and progesterone. Each ovary is composed of ovarian follicles and these follicles undergo maturation at puberty to produce ova.
- (2) **Fallopian tube or Oviduct:** These are a pair of long convoluted tubes that carry ova or eggs from the ovary to the uterus. The fallopian tube has a funnel-shaped opening near the ovary. These tubes from both the sides open into a muscular structure, the uterus.
- (3) **Uterus or womb:** It is a hollow, pear-shaped organ within which the embryo develops. Its upper portion is broader, while its lower portion is narrower, called cervix.
- (4) **Vagina:** The cervix opens into the vagina which is a tubular structure and also called "birth canal". Vagina receives sperms from the male and also serves as the passage through which the fully developed foetus is born.

attain the age of puberty, the ovaries exhibit a cycle of events at definite intervals which are described below:

- (1) The ovarian follicle grows into mature follicle.
- (2) One mature follicle develops to surround one ovum.
- (3) The maturing ovum is from one of the two ovaries.
- (4) **Ovulation:** The ovum is then released from the respective ovary by the process called ovulation.
- (5) As the ovarian follicles mature, the inner wall of uterus thickens to get prepared for receiving the developing zygote in case fertilization occurs.
- (6) In case fertilization does not take place, the thickened inner wall of the uterus breaks down along with its blood vessels and moves out of the vagina in the form of bleeding, called menstrual flow which lasts for 4 – 7 days.
- (7) **Menstrual Cycle:** The cycle of events taking place in the ovaries and uterus every twenty eight days and marked by the menstrual flow is called menstrual cycle or sexual cycle in human female.
- (8) Menstruation occurs every 28 to 30 days and ovulation takes place in the mid of the menstrual cycle around 14th day.
- (9) Both ovulation and menstruation stops temporarily when the women gets pregnant till birth of the offspring.
- (10) **Menarche:** The commencement of menstruation at puberty is called menarche and marks the beginning of reproductive life of a woman.
- (11) **Menopause:** The stoppage of menstrual flow and other events around the age of 50 years in human females is called menopause.

Fertilization

- (1) The fertilization in human beings is internal.
- (2) It takes place if copulation has taken place during ovulatory period, i.e., the middle of the menstrual cycle.
- (3) It takes place in the fallopian tube where only one sperm out of the millions of sperms released in the vagina fertilizes the ovum.
- (4) Fertilization is marked by the absence of menstrual flow.
- (5) Zygote is formed after the union of the sperm and the ovum.
- (6) This marks the beginning of pregnancy, i.e., the embryonic development of zygote starts in the fallopian tube.

the embryo moves down to reach the uterus and gets attached to its thickened wall and this close attachment of the embryo with the uterus is called implantation.

- (8) **Placenta:** It is a special tissue which develops between uterine wall and the embryo after implantation and through which the development needs of the foetus are met from the mother's body. This is a disc which is embedded in the uterine wall. It contains villi on the embryo's side of the tissue and blood spaces surrounding the villi on the mother's side. This provides a large surface area for glucose and oxygen to pass from the mother to the embryo. The waste substances generated by the developing embryo is also removed through the placenta.

Example 10. Why does menstruation occur? [NCERT]

Ans. In female reproductive system, the ovary releases one egg every month, during the same period, the uterus also prepares itself to receive a fertilised egg. Thus its lining becomes thick and spongy. This would be required for nourishing the embryo if fertilisation had taken place.

If the egg is not fertilised, it lives for about one day and then it is lost. The lining earlier formed to receive the fertilised egg, is not needed any longer. So, the lining slowly breaks and comes out through the vagina as blood and mucous. This cycle takes place roughly every month and is known as menstruation. It usually lasts for about two to eight days.

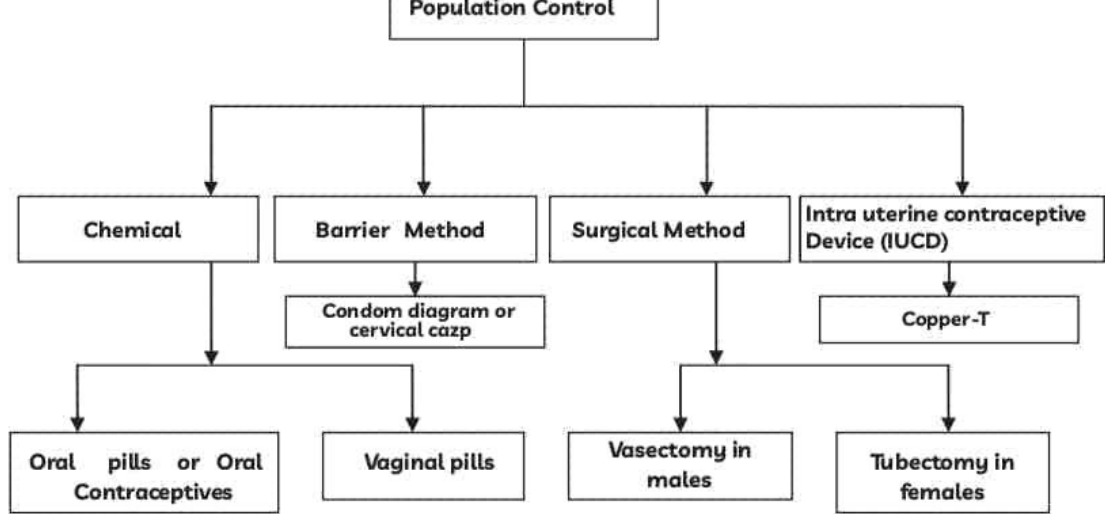
Reproductive Health

Reproductive health is important as the process of sexual maturation is gradual and making choices can become very difficult due to pressures from friends, family or government agencies. Also, many diseases can be transmitted sexually as the sexual act is a very intimate connection of bodies.

Sexually Transmitted Diseases (STDs): These are the diseases that are spread from an infected person to a healthy person by sexual contact. These include bacterial infections such as gonorrhoea and syphilis, and viral infections such as warts and HIV-AIDS.

Population Control

A number of techniques have been developed to prevent and manage pregnancy as frequent pregnancies have an adverse effect on the health of a woman. These methods are described below:



Barrier Method	Chemical Method	Surgical Method
Physical devices such as condom, diaphragm and cervical caps which prevent the entry of sperm in the female genital tract during copulation are used.	Specific drugs are used by females which are of two types-Oral pills and vaginal pills. Oral pills are hormonal preparations that inhibit the production of gametes by the action on hypothalamus, pituitary and the ovaries. IUCDs (Intrauterine Contraceptive Devices) prevent implantation in the uterus. A copper-T is placed safely inside the uterus.	A small portion of vas deferens in males and the fallopian tube in females is surgically removed or ligated (tied). It is called vasectomy in males and tubectomy in females.

Effects of contraceptives:

- (1) Since oral pills change the hormonal balance of the body so that eggs are not released and fertilization does not occur and hence can cause side-effects.
- (2) Loop or copper-T are placed in the uterus to prevent pregnancy and can cause irritation of the uterus.
- (3) Surgical methods are safe in the long run but they can cause infections and other problems if not performed properly.

Advantages of adopting contraceptive methods :

- (1) Avoiding frequent and unwanted pregnancy

- (2) Keeping population and hence birth rate under control
- (3) Helps in keeping proper gap between two pregnancies.
- (4) Helps in preventing the spread of sexually transmitted diseases.
- (5) Helps in improving the reproductive health of women.

Female Foeticide: Surgical methods can be used for removal of unwanted pregnancies and hence can be misused by people who do not want a particular child. Female foeticide is the illegal sex-selective abortion of female foetuses due to which child sex ratio is declining at an alarming rate.

[1 mark]

Multiple Choice Questions

1. Fertilisation is the process of:
- transfer of male gamete to female gamete.
 - fusion of nuclei of male and female gamete.
 - adhesion of male and female reproductive organs.
 - the formation of gametes by a reproductive organ. [CBSE 2020]

Ans. (b) Fusion of nuclei of male and female gamete.

Explanation: Fertilization is the fusion of nucleus of male and female gametes to form a single cell called as zygote. Fertilization occurs in sexually reproducing organisms.



Related Theory

- During sexual mode of reproduction germ cells (gametes) of two individuals need to fuse together. It can happen by either of the following:
- External release of germ cells from body of an individual as seen in angiospermic plants, frog, fish etc. This is known as external fertilization.
- Internal transfer of germ cells by physical contact between male and female organisms as in mammals. This is called internal fertilization.

2. Characters that are transmitted from parents to offsprings during reproduction show:
- Only similarities with parents
 - Only variations with parents
 - Both similarities and variations with parents
 - Neither similarities nor variations [CBSE 2014]

3. Choose the correct statement(s) on budding in yeast from the following:
- A parent cell divides into two or more daughter cells and here the parent identity is lost.
 - In this the elongated nucleus divides to form two or more daughter nuclei.
 - A bud arises from a particular region on a parent body.

(IV) After detaching from the parent body the bud grows into a new independent individual.

- (I) only
- (II) only
- (II) and (III) only
- (III) and (IV) only

[CBSE 2017]

Ans. (d) (III) and (IV) only

Explanation: Yeast reproduces asexually by the process of budding in which a bud arises from a particular region on a parent body. And after detaching from the parent body the bud grows into a new independent individual.

Statements I and II are for binary and multiple fission respectively.

4. The number of chromosomes in parents and offsprings of a particular species remains constant due to:

- Doubling of chromosomes after zygote formation
- Halving of chromosomes during gamete formation
- Doubling of chromosomes after gamete formation
- Halving of chromosomes after gamete formation [NCERT Exemplar]

5. In the following figure, different stages of binary fission in amoeba are depicted, which are not in the proper sequence



The correct sequence is

- (II), (III), (IV), (I)
- (I), (II), (IV), (III)
- (III), (IV), (II), (I)
- (I), (II), (IV), (II)

[CBSE 2017]

Ans. (a) (II), (III), (IV), (I)

Explanation: The correct sequence of the different stages of binary fission in amoeba is:

- Parent amoeba cell.
- Duplication of the genetic material and elongation of the nucleus.

cytoplasm

(l) Formation of two daughter amoeba cells.

6. In Rhizopus, tubular thread-like structures bearing sporangia at their tips are called:

- (a) Filaments (b) Hyphae
(c) Rhizoids (d) Roots

[CBSE 2015, 11]

7. Select the correct statements for the process of budding in yeast:

- (I) A bud arises from a particular region on a parent body.
(II) A parent cell divides into two daughter cells, here the parent identity is lost.
(III) Before detaching from the parent body a bud may form another bud.
(IV) A bud when detaches from the parent body grows into a new individual.
(a) (I), (II) and (III) (b) (II), (III) and (IV)
(c) (III), (IV) and (I) (d) (IV), (I) and (II)

[CBSE 2016]

8. Slides of binary fission in Amoeba and budding in yeast were given for observation to a group of students. Some of the observations reported by the group are given below:

- (I) Cytokinesis was observed in the yeast cell.
(II) A chain of buds were observed in Amoeba.
(III) Single cell of Amoeba and single cell of yeast were undergoing binary fission and budding respectively.
(IV) Elongated nucleus was dividing to form two daughter nuclei in Amoeba.

The correctly reported observations are:

- (a) (I) and (II) (b) (II) and (III)
(c) (III) and (IV) (d) (I) and (IV)

[CBSE 2016]

Ans. (c) (III) and (IV)

9. Which of the following statements are true for flowers?

- (I) Flowers are always bisexual
(II) They are the sexual reproductive organs
(III) They are produced in all groups of plants

(a) (I) and (IV) (b) (II) and (III)

(c) (I) and (III) (d) (II) and (IV)

Ans. (d) (II) and (IV) i.e. they are the sexual reproductive organs and after fertilization they give rise to fruits

Explanation: Flowers are the sexually reproductive organs of a plant and a fertilized flower give rise to fruit.

10. During adolescence, several changes occur in the human body. Mark one change from the following associated with sexual maturation in boys:

- (a) loss of milk teeth (b) increase in height
(c) cracking of voice (d) weight gain

11. Which among the following statements are true for sexual reproduction in flowering plants?

- (I) It requires two types of gametes.
(II) Fertilisation is a compulsory event.
(III) It always results in the formation of zygote.
(IV) Offsprings formed are clones.
(a) (I) and (IV) (b) (I), (II) and (IV)
(c) (I), (II) and (III) (d) (I), (II) and (III)

[NCERT Exemplar]

12. Characters transmitted from parents to offspring are present in:

- (a) Cytoplasm (b) Ribosome
(c) Golgi bodies (d) Genes

Ans. (d) Genes

Explanation: Genes are the unit of heredity DNA that determine genetic characters in an organism.

13. Semen which contains millions of sperms also contains secretions of seminal vesicle and prostate gland (accessory glands). It makes the transport of sperms easier and provide nutrition to sperms.

Correct sequence of organs in the male reproductive system for transport of sperms is:

- (a) Testis → vas deferens → urethra
(b) Testis → ureter → urethra
(c) Testis → urethra → ureter
(d) Testis → vas deferens → ureter

Explanation: Testis produces sperms or germ cells. The sperms formed are delivered through the vas deferens which unites with a tube coming from the urinary bladder. The urethra thus forms a common passage for both the sperms and urine.

14. Ⓐ Reproduction is essential for living organisms to order to:

- (a) Keep the individual organism alive
- (b) Fulfill their energy requirements
- (c) Maintain growth
- (d) Continue the species generation after generation [NCERT Exemplar]

15. Ⓐ Which one of the following permanently marks the end of menstrual cycle in females?

- (a) Menarche (b) Menopause
- (c) Ovulation (d) Pregnancy

16. Which among the following diseases is not sexually transmitted?

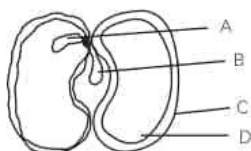
- (a) Syphilis (b) Hepatitis
- (c) HIV-AIDS (d) Gonorrhoea

[CBSE 2013, 12, 11]

Ans. (b) Hepatitis

Explanation: Hepatitis is not a sexually transmitted disease. It is a water-borne viral disease.

17. Ⓐ The sketch of a dicotyledonous seed is shown below.



The correct labelling for parts A, B, C and D in proper sequence is

- (a) radicle, plumule, cotyledon, seed coat.
- (b) radicle, plumule, seed coat, cotyledon.
- (c) plumule, radicle, cotyledon, seed coat.
- (d) plumule, radicle, seed coat, cotyledon

[CBSE 2017]

18. Which of the following is not the part of female reproductive system?

- (b) fallopian tube
- (c) uterus
- (d) vas deferens

Ans. (d) vas deferens

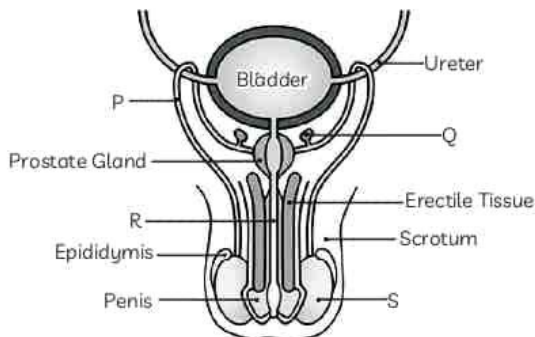
Explanation: Vas deferens is part of male reproductive system.

19. Ⓐ Select the statements that are incorrect about reproduction in human beings.

- (I) When a girl is born, the ovaries already contain thousands of mature eggs.
- (II) One egg is produced every month by one of the ovaries.
- (III) The egg is carried from the ovary to the womb through oviduct.
- (IV) The two oviducts unite into an elastic bag-like structure known as the cervix.

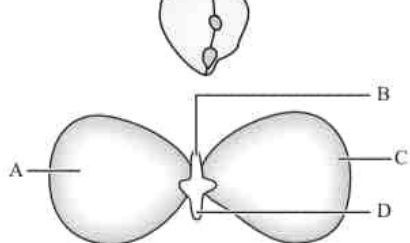
- (a) Both (I) and (III)
- (b) Both (I) and (IV)
- (c) Both (II) and (III)
- (d) Both (II) and (IV)

20. Ⓐ Study the diagram given below of male reproductive organ and select the row containing incorrect information.



	Name of Part	Function
(a)	P is Vas deferens	Transport sperms
(b)	Q is Seminal vesicle	Provide fluid medium to sperms
(c)	R is ureter	Passage for sperms
(d)	S is Testis	Formation of sperms

21. Study the figure below and identify the row containing incorrect information.

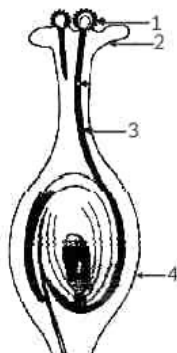


	Part Name	Function
(a)	A is Cotyledon	It is the future plant
(b)	B is Plumule	It is the future shoot
(c)	C is Seed coat	It is the outer covering of the ovule
(d)	D is Radicle	It is the future root

Ans. (a) Part Name: A is cotyledon; Function: It is the future plant

Explanation: A is cotyledon and is the food store of the future plant.

22. Study the figure showing parts of a flower and identify the correct statements.



- (I) Part labelled 1 is the pollen grain and contains the male germ cell.
- (II) Part labelled 3 is the stigma on which the pollen grains land.
- (III) The male germ cell travels through the pollen tube (part labelled 3) after fertilization.
- (IV) Part labelled 4 is the ovary which contains the female germ cells.
- (a) Both (I) and (III)
- (b) Both (II) and (IV)
- (c) Both (I) and (III)
- (d) Both (I) and (IV)

the following statements for unisexual flowers.

- (a) They always possess stamen and pistil
- (b) They possess either stamen or pistil
- (c) They show cross pollination
- (d) Unisexual flowers possessing only stamens cannot produce fruits

Ans. (a) They always possess stamen and pistil

Explanation: Unisexual flowers contain either stamens or carpels. Bisexual flowers contain both male and female reproductive organs stamen and carpel.

24. The part where fertilization occurs in human females is:

- (a) cervix (b) vagina
- (c) uterus (d) oviduct

25. The table below lists the organs/parts of human reproductive system and their functions. Identify the row containing incorrect information.

	Part/ Organ of Reproductive system	Function
(a)	Prostrate gland and seminal vesicles	Production of fluid to provide a medium for sperms.
(b)	Testis	Secretes the hormone that regulates formation of sperms.
(c)	Uterus	Provides nutrition from mother's blood to embryo.
(d)	Fallopian tube	Carries egg from ovaries to the womb

Ans. (c) Part/Organ of Reproductive system : Uterus; Function : Provides nutrition from mother's blood to embryo.

Explanation: The embryo gets nutrition from the mother's blood with the help of a special tissue called placenta which is a disc embedded in the uterine wall and contains villi on the embryo's side of the tissue.

For the following questions two statements are given-one labeled Assertion (A) and the other labeled Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below:

- (a) Both (A) and (R) are true and (R) is correct explanation of the assertion.
- (b) Both (A) and (R) are true but (R) is not the correct explanation of the assertion.
- (c) (A) is true but (R) is false.
- (d) (A) is false but (R) is true.

26. Assertion (A): Variation is useful for the survival of species over time.

Reason (R) : Populations of organisms fill well-defined places in the ecosystem, using their ability to reproduce.

Ans. (b) Both (A) and (R) are true but (R) is not the correct explanation of the assertion.

Explanation: Although populations of organisms fill well-defined places in the ecosystem, using their ability to reproduce, the consistency of DNA copying during reproduction is important for the maintenance of body design features. Reproduction is linked to the stability of populations of species.

However, variation is useful for the survival of species over time as niches can change drastically but only those organisms will be able to survive which have some variations in them.

27. Assertion (A): All multi-cellular organisms can divide cell-by-cell.

Reason (R) : Many multi-cellular organisms are not simply a random collection of cells.

Ans. (d) (A) is false but (R) is true

Explanation: All multi-cellular organisms cannot simply multiply cell-by-cell as they are not just a random collection of cells. Specialized cells are organized as tissues and tissues are organized into organs, which occupy definite positions in the body. Multi-cellular organisms, therefore, need to use more complex ways of reproduction.

28. Assertion (A) : Vegetative propagation makes possible propagation

capacity to produce seeds.

Reason (R) : New plants are developed from seeds in vegetative propagation.

29. Assertion (A): Pollen grains are produced by all flowers.

Reason (R) : Stamen is the male reproductive part of a flower and produces pollen grains.

Ans. (d) (A) is false but (R) is true

Explanation: All flowers do not produce pollen grains as flowers may be unisexual when it contains either stamens or pistil or bisexual when it contains both stamens and pistil. Stamen is the male reproductive part of a flower and produces pollen grains that are yellowish in colour.

30. Assertion (A): Testes in human males are located outside the abdominal cavity in scrotum.

Reason (R) : Testes secrete the male sex hormone testosterone.

Ans. (b) Both (A) and (R) are true but (R) is not the correct explanation of the (A)

Explanation: The testes in human males are located outside the abdominal cavity in the scrotum as sperm formation requires a lower temperature than the normal body temperature. Testes secrete the male sex hormone testosterone which regulates the formation of sperms and brings about changes in appearance seen in boys at the time of puberty.

31. Assertion (A): The human embryo gets implanted in the fallopian tube.

Reason (R) : Embryo gets nutrition from the mother's blood with the help of special tissue called the Placenta.

32. Assertion (A): A basic event in reproduction is the creation of a DNA copy.

Reason (R) : The DNA in the cell nucleus is the information source for making proteins.

Very Short Answer Type Questions

33. Where is the zygote located in the flower after fertilisation?

present in the ovary.



Related Theory

- After the pollen lands on a suitable stigma, it has to reach the female germ cells which are in the ovary. For this, a tube grows out of the pollen grain and travels through the style to reach the ovary. After fertilisation, the zygote divides several times to form an embryo within the ovule. The ovule develops a tough coat and is gradually converted into a seed. The ovary grows rapidly and ripens to form a fruit.

34. Give an example each of unisexual and bisexual flowers. [CBSE 2017]

Ans. An example of unisexual flower is papaya, water melon (write any one) and of bisexual flower is hibiscus, mustard (write any one).



Related Theory

- Unisexual flowers contain either stamens or carpels.
- Bisexual flowers contain both stamens and carpels.
- Majority of the flowers are bisexual.

35. Name the organs producing sperms and ova respectively in humans. [CBSE 2017]

36. Name the method by which Spirogyra reproduces under favourable conditions. Is

Ans. The method by which Spirogyra reproduces under favourable conditions is Fragmentation. This is an asexual mode of reproduction.

37. Name one organism which reproduces by:

(A) multiple fission

(B) binary fission [CBSE 2016]

38. Name the part of Bryophyllum where the buds are produced for vegetative propagation. [CBSE 2010]

39. What is meant by the term regeneration?

Ans. Regeneration: The process of getting back a full organism from its body parts is called regeneration. The simple animals like Hydra and Planaria shows regeneration, i.e. if Hydra or Planaria somehow get cut into a number of pieces, then each body part can grow into a new complete organism.

40. How is reproduction in leishmania different from that in plasmodium, even though both are unicellular? [NCERT]

Ans. Leishmania undergoes binary fission, whereas plasmodium reproduces through multiple fission.

COMPETENCY BASED Questions (CBQs)

[1, 4 & 5 marks]

41. Rahul left a slice of bread in his tiffin box by mistake. As his schools had closed for Diwali vacations, he forgot to take the tiffin box out. When he opened his tiffin box after about 6 to 7 days, he observed black growth on the bread slice and also that the slice smelt very bad.



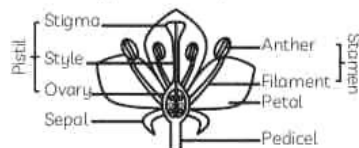
Identify the organism, the thread like structures seen on the bread and the mode of reproduction of the organism.

Ans. The organism seen on the bread is Rhizopus and the thread like structures are the hyphae of the bread mould. The mode of reproduction in Rhizopus is by spore formation.

42. The reproductive parts of angiosperms are located in the flower. The different parts of a flower are sepals, petals, stamens and carpels. Stamens and carpels are the reproductive parts of a flower which contain the germ-cells.

The flower may be unisexual (papaya, watermelon) when it contains either stamens or carpels or bisexual (Hibiscus, mustard) when it contains both stamens and carpels. Stamen is the male reproductive part and it produces pollen grains that are yellowish in colour.

is the female reproductive part.



- (A) Where are the plant's sex organs located?
 (B) What is the function of a flower?
 (C) Where are the male and female gametes formed in flowering plants?
 (D) What changes take place in the flower after fertilisation which lead to the formation of seeds and fruit?

Ans. (A) Plant's sex organs are located in the flower.

- (B) The function of a flower is to produce male and female gametes and to ensure that fertilisation will take place to make new seeds for the reproduction of plant.
 (D) The fertilised egg divides several times to form an embryo within the ovule which develops a tough coat around it and is gradually converted into a seed. The ovary of the flower develops and becomes a fruit with seeds inside it.

43. Asexual reproduction in starfish takes place by fission or through autotomy of arms. In fission, the central disc breaks into two pieces and each portion then regenerates the missing parts. In autotomy, an arm is shed with part of the central disc attached, which continues to live independently as a "comet", eventually growing a new set of arms. Although almost all sea stars can regenerate their limbs, only a select few sea star species are able to reproduce in these ways.



Offspring formed by asexual method of reproduction have greater similarity among themselves because:

- (I) Asexual reproduction involves only one parent
 (II) Asexual reproduction does not involve gametes

sexual reproduction

(IV) Asexual reproduction occurs after sexual reproduction

- (a) (I) and (II) (b) (I) and (III)
 (c) (II) and (IV) (d) (III) and (IV)

[NCERT Exemplar]

44. The growing size of the human population is a cause of concern for all people. The rate of birth and death in a given population will determine its size. Reproduction is the process by which organisms increase their population.

The process of sexual maturation for reproduction is gradual and takes place while general body growth is still going on. Some degree of sexual maturation does not necessarily mean that the mind or body is ready for sexual acts or for having and bringing up children.

Various contraceptive devices are being used by human beings to control the size of population.

(A) List two common signs of sexual maturation in boys and girls.

(B) What is the result of reckless female foeticide?

(C) Which contraceptive method changes the hormonal balance of the body?

(D) Write two factors that determine the size of a population. [CBSE 2020]

- Ans. (A) Common signs of sexual maturation in boys and girls: Hair growth in armpits and the genital area between the thighs, which also becomes dark in colour.

Thinner hair appear on legs and arms as well as on the face.

Pimples begin to develop as skin becomes oily.

Become conscious and aware of their own bodies and those of others in new ways. (Any two)



Related Theory

➤ Prenatal sex determination is misused by people who do not want a particular child. Pre-conception and Pre-Natal Diagnostic Techniques (PC PNDT) Act, 1994 is an act of the Parliament of India enacted to stop female foeticides and arrest the declining sex ratio in India.

(C) The contraceptive method is chemical method (Taking Pills orally) changes the hormonal balance of the body.

hormonal balance of the body changes and eggs are not released and fertilization does not occur. Since they cause change in hormonal balance can cause side effects like nausea, headache, weight gain, mood changes etc.

Related Theory

→ The population size is actually population density, the number of individuals per unit area. The size of human population is a cause for concern for many people because increase in population size makes it harder to improve everybody's standard of living.

45. Bees are one of the most important animals which help in the pollination process. Bees hit plants because they give them an essential source called nectar. There are many flowering plants which are fertilized by insects like bees, and without them, many of our plant population of the planet would decline as there would be no pollination, so it's clearly known the relevance of these pollinators. Bees transport seeds from one flower to another, pollinating these plants so that it can develop and provide food. The pollen grains travel through the pollen tube to the ovary.



The length of pollen tube depends on the distance between:

- (a) Pollen grain and upper surface of stigma
- (b) Pollen grain on upper surface of stigma and ovule
- (c) Pollen grain in anther and upper surface of stigma
- (d) Upper surface of stigma and lower part of style

[NCERT Exemplar]

Ans. (b) Pollen grain on upper surface of stigma and ovule

suitable stigma, it has to reach the female germ-cells which are in the ovary. For this, a tube grows out of the pollen grain and travels through the style to reach the ovary.

Hence, length of the pollen tube depends on the distance between the pollen grain on the upper surface of stigma and ovule.

46. Pre-Conception and Pre-Natal Diagnostic Techniques (PCPNDT) Act, 1994 is an Act of the Parliament of India enacted to stop female foeticides and arrest the declining sex ratio in India. The act banned prenatal sex determination. This process began in the early 1990 when ultrasound techniques gained widespread use in India. There was a tendency for families to continuously produce children until a male child was born. Social discrimination against women and a preference for sons have promoted female foeticide in various forms skewing the sex ratio of the country towards men.

- (A) Why is child sex-ratio declining at an alarming rate in India?
- (B) How can unwanted pregnancies be terminated?
- (C) What is contraception?
- (D) Write names of any two contraceptive methods.

- Ans. (A) The child-sex ratio is declining at an alarming rate because of preference in Indian societies for a male child and reckless female foeticides.
- (B) Unwanted pregnancies can be terminated by surgery.

47. When Sunidhi's niece was born, she observed that something resembling a cord was tied near the baby's naval. Her uncle explained to her that it was the umbilical cord, which is a tube that connects the baby to her mother during pregnancy.



function of the umbilical cord?

- (a) feeds the embryo with digested substances
- (b) conveys nutrients and wastes to and from the embryo respectively
- (c) removes waste matter from the embryo to the mother's blood
- (d) supplies oxygenated blood from the mother to the embryo

Ans. (b) conveys nutrients and wastes to and from the embryo, respectively.

Explanation: The exchange of nutrients, oxygen and waste products between the embryo and the mother's body takes place through the umbilical cord.



Related Theory

- Umbilical cord is connected to a special tissue called placenta which is a disc like structure embedded in the uterine wall.
- It contains villi on the embryo's side of the tissue and blood spaces are present on mother's side, which surround the villi.
- Villi provide large surface area for glucose and oxygen to pass from the mother to the embryo.

48. In the first activity, dissolve about 10 gm of sugar in 100 mL of water. Take 20 mL of this solution in a test tube and add a pinch of yeast granules to it. Put a cotton plug on the mouth of the test tube and keep it in a warm place.

After 1 or 2 hours, put a small drop of yeast culture from the test tube on a slide and cover it with a coverslip. Observe the slide under a microscope.

In the second activity, wet a slice of bread, and keep it in a cool, moist and dark place. Observe the surface of the slice with a magnifying glass. Record your observations for a week.

[NCERT Activity 8.1, 8.2]

(A) Select the correct statement:

- (a) Yeast cells multiply in water as they require a fluid medium for reproduction.
- (b) Sugar solution provides nutrition to the yeast cells.
- (c) Sugar solution provides a liquid medium for sustaining all life processes in yeast.
- (d) Water provides energy to yeast cells

yeast.

- (B) The main method by which yeast multiplies is:
 - (a) Sporogenesis
 - (b) Fragmentation
 - (c) Budding
 - (d) Vegetative propagation
- (C) The rapid spreading of bread mould on slices of bread are due to:
 - (I) Presence of a large number of spores in air
 - (II) Presence of large number of hyphae
 - (III) Presence of moisture and nutrients
 - (IV) Formation of round shaped sporangia
 - (a) (I) and (III)
 - (b) (II) and (IV)
 - (c) (I) and (II)
 - (d) (III) and (IV)
- (D) A student noted down some observations regarding yeast and bread mould. Select the row containing incorrect information(s).

	Yeast	Bread Mould
(a)	It is a fungus	It is a fungus
(b)	It multiplies by budding	It multiplies by spore formation
(c)	In this process, a small outgrowth in the form of a bud grows on the parent cell.	It has sporangia, which are the reproductive structures on the hyphae and which produce many spores.
(d)	The bud grows on the parent cell and then detaches from the parent cell and grows as a new individual.	At maturity the hyphae bursts open and the spores are released. When conditions are favourable for growth, the spores give rise to new individuals.

- (E) Two organisms which reproduce by budding are:
 - (a) Rhizopus and Yeast
 - (b) Yeast and Hydra
 - (c) Rhizopus and Spirogyra
 - (d) Yeast and Spirogyra

yeast cells.

Explanation: Water does not provide any energy to the yeast cells. So, yeast cells fail to multiply in water due to inadequate energy in its cells. Sugar provides energy to them to carry out reproduction by multiplying rapidly.

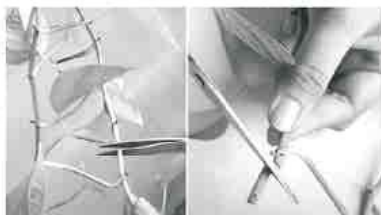
It divides asexually by formation of buds. A small bud is formed on the parent cell. The nucleus of the parent cell divides and enters the daughter cell. The bud grows and detaches itself from the parent cell and grows into a new cell. Asexual reproduction also occurs by fission in some yeasts.

(C) (a) (I) and (III)

(D) (d) *Yeast:* In this process, a small outgrowth in the form of a bud grows on the parent cell; *Bread Mould:* It has sporangia, which are the reproductive structures on the hyphae and which produce many spores.

Explanation: The thread-like structures that develop on the bread are the hyphae of the bread mould (rhizopus). They are not reproductive parts. On the other hand, the tiny blob-on-a-stick structures are involved in reproduction. The blobs are sporangia, which contain cells, or spores, that can eventually develop into new rhizopus individuals. The spores are covered by thick walls that protect them until they come into contact with another moist surface and can begin to grow. At maturity the sporangium bursts open and the spores are released. When conditions are favourable for growth, the spores give rise to new individuals.

49. An all India lockdown was announced throughout the country in March 2020 to control the spread of Corona virus. During the lockdown period, Megha developed an interest in gardening and successfully propagated several money plants through cutting.



Vegetative propagation refers to formation of new plants from:

(b) stem, roots, leaves

(c) stem, flowers, fruit

(d) stem, leaves, flowers

Ans. (b) stem, roots, leaves

Explanation: It is a method of reproduction in some higher plants in which a new plant develops from the vegetative parts of a plant such as root (as in Dahlia, sweet potato), stem (as in ginger, potato, onion) or leaf (as in Bryophyllum).

50. Observe a permanent slide of amoeba under a microscope. Similarly observe another permanent slide of amoeba showing binary fission. Now, compare the observations of both the slides. Next, collect water from a lake or pond that appears dark green and contains filamentous structures. Put one or two filaments on a slide. Put a drop of glycerine on these filaments and cover it with a coverslip. Observe the slide under a microscope.

[NCERT Activity 8.3, 8.4]

(A) Select the correct observations from the following statements regarding a permanent slide showing amoeba cell and another slide showing binary fission in amoeba.

(I) The nucleus of an amoeba cell is always elongated with a constriction in the cytoplasm.

(II) A dense nucleus and normal cytoplasm can be seen in the permanent slide showing amoeba cell.

(III) An elongated nucleus can be seen in the slide showing binary fission in amoeba.

(IV) In the final slide showing binary fission in amoeba, four daughter cells can be seen.

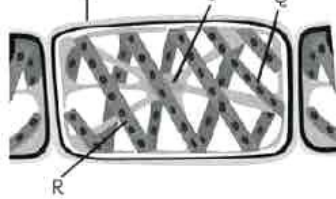
(a) Both (I) and (III)

(b) Both (II) and (III)

(c) Both (I) and (IV)

(d) Both (II) and (IV)

(B) A student labelled the parts and noted their functions after observing the filaments taken from a pond under a microscope.

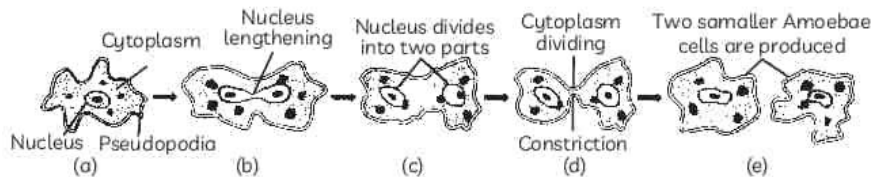


Select the row containing incorrect information.

	Part Name	Function
(a)	P is cell wall	Makes the spirogyra slippery to touch
(b)	Q is Vacuole	Stores starch and protein
(c)	R is chloroplast	Performs photosynthesis
(d)	S is nucleus	Controls activities of cell

(C) Spirogyra reproduces by:

- (a) Fragmentation
- (b) Binary fission
- (c) Budding



(B) (b) Part Name : Q is vacuole; Function : Stores starch and protein.

Explanation: Q is pyrenoid and it stores starch and protein.

(C) (a) Fragmentation

Explanation: Spirogyra reproduces by fragmentation in which the body of spirogyra when matures break into many smaller pieces or fragments due to strong water current. These different pieces later grow into new individuals.

51. *Paramecia* can reproduce either asexually or sexually, depending on their environmental conditions. Most of the time, *paramecia* reproduce asexually by splitting one cell into two cells, a process called "Binary Fission". Binary fission takes place when ample nutrients are available. Under favorable conditions, they may divide two or three times a day. The size of the *paramecia* population can grow rapidly by the binary fission.

(D) (a) The reproduction in which parental identity is lost is:

- (a) Budding
- (b) Spore formation
- (c) Fission
- (d) Vegetative propagation.

(E) (a) The First step in binary fission of amoeba is:

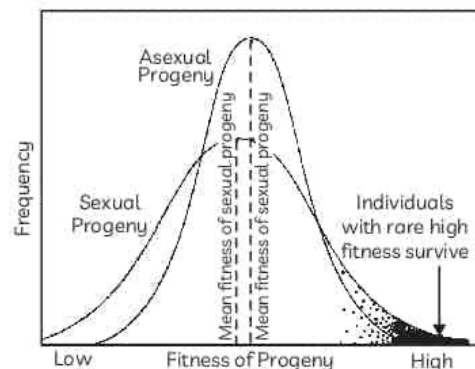
- (a) Division of nucleus.
- (b) Division of cytoplasm
- (c) Constriction of cytoplasm
- (d) Elongation of nucleus

Ans. (A) (b) Both (II) and (III)

Explanation: In the permanent slide of amoeba, an amoeba cell is seen containing normal cytoplasm and nucleus. In permanent slide showing binary fission, nucleus seen to be dividing and the constriction is also seen in cytoplasm.

Sexual reproduction of *paramecia* takes place under conditions of starvation. There are two mating types for *paramecia*, which are referred to as odd and even. Odd types can only mate with the even types, but the same mating types can not mate with each other. Moreover, only cells within a single *paramecium* species can mate with one another.

The graph below shows a comparison between sexual and asexual modes of reproduction.



correct statements.

- (I) The mean fitness of asexual progeny is adapted optimally for a particularly narrow niche.
 - (II) The mean fitness of sexual progeny is adapted optimally for a particularly narrow niche.
 - (III) Asexual progeny may survive when niche changes.
 - (IV) Sexual progeny have a higher chance of survival when niche changes.
- (a) Both (I) and (III)
 - (b) Both (I) and (IV)
 - (c) Both (II) and (IV)
 - (d) Both (II) and (III)
- (B) Reason why paramecium decides for sexual reproduction is:
- (a) It can produce more number of progenies.
 - (b) Progenies can be considered to be clones of their parents
 - (c) It leads to genetic variations
 - (d) Asexual reproduction is unreliable.
- (C) Select the row containing incorrect information.

	Asexual Reproduction	Sexual Reproduction
(a)	Only one parent is involved	Involves two parents
(b)	No production and hence no fusion of gametes	Involves production of gametes and their fusion
(c)	Requires meiotic division followed by mitotic division.	Requires only mitotic division
(d)	Low genetic variability	High genetic variability

- (D) Which of the following organisms divide by binary fission?
- (a) Amoeba and Plasmodium
 - (b) Paramecium and Plasmodium
 - (c) Paramecium and Amoeba
 - (d) Plasmodium and Leishmania

on sexual reproduction. Identify the incorrect statement:

- (a) Each new variation is made in a DNA copy that already has variations accumulated from previous generations.
- (b) Two different individuals in a population would have quite different patterns of accumulated variations.
- (c) Combining variations from two or more individuals would create new combinations of variants.
- (d) Each new generation will end up having twice the amount of DNA that the previous generation had.

Ans. (A) (b) Both (I) and (IV)

Explanation: The mean fitness of an asexual clone of organisms is adapted optimally for a particularly narrow niche. They are perfect in the current environment, but, once the condition changes, the entire population may suddenly become extinct. Sexual reproduction can produce a wider range of sub-optimally adapted types. Some may not be able to survive under the current environment (an example is the genetic diseases in humans). However, an ecological disaster that eliminates the asexual progeny will not have as severe an impact on the sexual progeny, because of the diversity of genotypes.

(B) (c) It leads to genetic variations

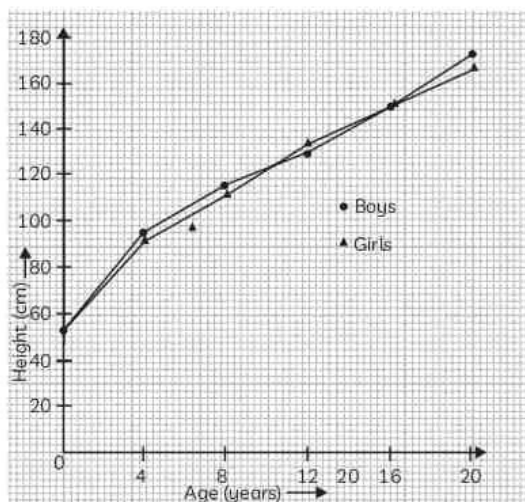
Explanation: The reason why the paramecia decide to sexual reproduction is that they need to create "genetic variations" to increase their chance of survival under a harsh condition. In order to do so, two paramecia of compatible mating types exchange parts of their genetic materials and rearrange their DNA to create genetic variations. As a result, the offsprings of sexual reproduction have different genetic DNA sequences compared to their parents. On the other hand, the daughter cells generated from binary fission have identical genome like their parent cell. We call them "clones".

division followed by Mitotic division;
Sexual Reproduction: Requires only Mitotic division.

Explanation: Asexual Reproduction requires only mitotic cell division as no gametes are produced. Sexual reproduction requires meiotic division followed by mitotic division as first gametes are formed and then their fusion takes place.

52. Puberty is the time when boys and girls move through a series of significant, natural and healthy changes. These physical, psychological and emotional changes signal that they are moving from childhood to adolescence. Puberty starts when changes in their brain cause sex hormones to start being released in girls' ovaries and boys' testes. This usually happens around 10-11 years for girls and around 11-13 years for boys. But it's normal for the start of puberty to range from 8-13 years in girls and 9-14 years in boys.

The graph below shows the average height of girls and boys up to the age of 18 years.



(A) Select the correct observations:

- (I) During 8-12 years, girls experience a sudden growth.
- (II) During 12-16 years, boys experience sudden growth.
- (III) Boys are always taller than girls of their age.

after 16 years.

- (a) Both (I) and (II)
- (b) Both (II) and (III)
- (c) (I), (II) and (III)
- (d) (I), (III) and (IV)

(B) The table below lists some changes observed in girls and boys during puberty. Select the row containing incorrect observation.

	Changes in Girls	Changes in Boys
(a)	Height increases very quickly and earlier than in boys	Height increases very quickly and later than girls
(b)	Voice pitch becomes higher	Voice pitch becomes lower
(c)	Shoulders become broad	Hips become broad
(d)	Menstruation starts	Nocturnal emissions occur

(C) The most rapid growth in girls takes place during:

- (a) 0 - 4 years
- (b) 4 - 8 years
- (c) 8 - 12 years
- (d) 12 - 16 years

(D) Significant spurt in height of boys is seen during:

- (a) 4 - 6 years
- (b) 6 - 8 years
- (c) 8 - 12 years
- (d) 12 - 16 years

(E) The slowest growth in height of girls is seen during:

- (a) 0 - 4 years
- (b) 12 - 16 years
- (c) 8 - 12 years
- (d) 4 - 8 years

Ans. (A) (a) Both (I) and (II)

Explanation: We note that during 8-12 years, girls experience a sudden growth and have more height as compared to boys. This is because puberty occurs earlier in girls (10-12 years), so they grow rapidly during this phase.

sudden grown and their height becomes the same as girls. This is because puberty occurs later in boys (12-13 years) and they grow rapidly during puberty.

- (B) (c) *changes in Girls: Shoulders become broad; Changes in Boys: Hips become broad*

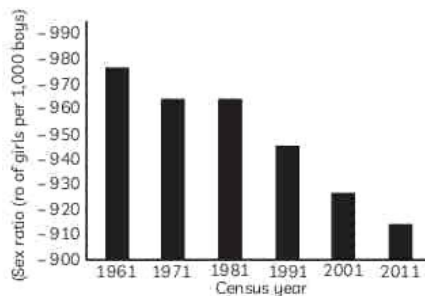
Explanation: Changes are seen in both boys and girls during puberty due to the secretion of testosterone hormone in boys and oestrogen in girls. The hips become broad in girls, whereas shoulders become broad in boys.

- (C) (a) *0 – 4 years*

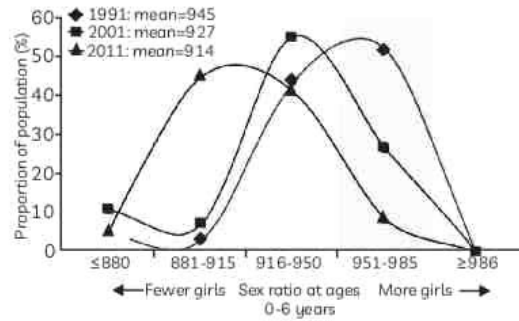
Explanation: The most rapid growth in girls takes place in 0-4 years as after that the rate of growth slows down. It again becomes fast from 8-12 years, when girls attain puberty.

53. Family planning is about deciding how many children you choose to have and when you want to have them (timing of pregnancies and birth spacing). Spacing births allows the mother to recover physically and emotionally before she gets pregnant again, and faces the demands of pregnancy, birth and breast feeding. STIs including HIV/AIDS can also be prevented with correct and consistent use of condoms. Younger women (adolescents) can delay pregnancy until their bodies are mature and they are ready in terms of their life course. Older women (over 35) can prevent unwanted pregnancies that are often risky for their health and can lead to complications for both mothers and infants.

India's 2011 census revealed a growing imbalance between the numbers of girls and boys aged 0–6 years, which may be due to increased prenatal sex determination with subsequent selective abortion of female fetuses. The sex ratio from the years 1961 to 2011 shows a very disturbing trend.



states with varying child sex ratios (girls per 1000 boys at ages 0–6 years), 1991, 2001, and 2011 is shown below.



Mean national values for each of the censuses are shown. The vertical grey bar represents a natural sex ratio at birth of 950–975 girls per 1000 boys, where the distribution of child sex ratios at ages 0–6 years would be centred in the hypothetical absence of selective abortion of girls and equal girl and boy child mortality rates.

- (A) (2) Observe the graphs above and select the correct statements.
- (I) The sex ratio from 1961 to 1981 was almost equal to the natural sex ratio at birth shown by vertical grey bar.
 - (II) Sex ratio in 2001 was less than the sex ratio in 2011.
 - (III) Sex ratio in 1991 was greater than the sex ratio in 2011.
 - (IV) The number of girls per 1000 boys of population has increased from 1991 to 2001.
- (a) Both (I) and (II)
 (b) Both (I) and (III)
 (c) Both (II) and (III)
 (d) Both (II) and (IV)
- (B) The main reason for the sex ratio as seen in the graph above is:
- (a) Male foeticide
 - (b) Child labour
 - (c) Female Foeticide
 - (d) Child trafficking
- (C) (2) Which of the following are surgical methods for avoiding pregnancies?
- (a) Oral pills
 - (b) Copper-T

(d) Blocking urethra in males.

(D) The use of which contraceptive methods can prevent sexually transmitted diseases ?

- (a) Condoms
- (b) Oral pills
- (c) Copper-T
- (d) Surgical methods

(E) A list of few sexually transmitted diseases are given below along with their cause. Select the row containing incorrect information:

	Sexually Transmitted Disease Name	Cause
(a)	Syphilis	Bacteria
(b)	Gonorrhoea	Bacteria
(c)	AIDS	Virus
(d)	Warts	Bacteria

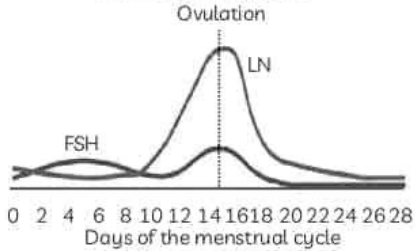
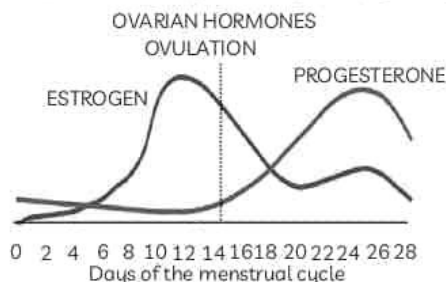
Ans. (B) (c) Female Foeticide

Explanation: Female foeticide is the illegal sex-selective abortion of female fetuses due to which child sex ratio is declining at an alarming rate.

(D) (a) Condoms

Explanation: As condoms are the only contraceptives that create a mechanical barrier between the partners sex organs during sexual intercourse, they can prevent sexually transmitted diseases.

54. Human reproduction is a form of sexual reproduction resulting in human fertilization. It typically involves sexual intercourse between a man and a woman. During sexual intercourse, the interaction between the male and female reproductive systems results in fertilization of the woman's ovum by the man's sperm. Offspring are produced by the fusion of gametes (sex cells) from each parent. Hence, the newly formed individual will be different from parents, both genetically and physically.



(A) Study the graphs above showing the levels of ovarian hormones and pituitary hormones in human females and select the correct statements.

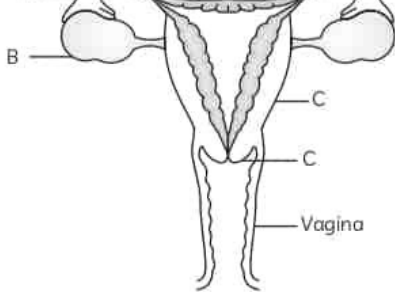
- (I) The level of oestrogen hormone increases in the first 12 days of the menstrual cycle.
- (II) The level of LH secreted by the pituitary gland reaches a peak when ovulation takes place.
- (III) The level of progesterone hormone decreases when ovulation takes place.
- (IV) The level of FSH secreted by the pituitary gland is minimum when ovulation takes place.

- (a) Both (I) and (III)
- (b) Both (I) and (IV)
- (c) Both (I) and (II)
- (d) (I), (II) and (IV)

(B) The table below gives the differences between menopause and menarche. Select the row containing incorrect information.

	Menopause	Menarche
(a)	It is the end of menstruation in human females	It is the start of menstruation in human females
(b)	It occurs at around 45-50 years of age	It occurs at around 11-16 years of age
(c)	It marks the end of reproductive phase of a female	It marks the beginning of the reproductive phase of a female
(d)	There is an elevated level of oestrogen.	There is a decline in the level of oestrogen

(C) Refer to the diagram of female reproductive system of humans given below:



The correct labelling of parts A, B, C and D is :

- (a) A: Oviduct, B: Ovary, C: Uterus, D: Cervix
 (b) A: Oviduct, B: Fallopian Tube, C: Ovary, D: Uterus
 (c) A: Fallopian Tube, B: Uterus, C: Ovary, D: Cervix
 (d) A: Oviduct, B: Ovary, C: Cervix, D: Uterus
- (D) The part of female reproductive system through which the uterus opens into the vagina is:
- (a) Clitoris
 (b) Cervix
 (c) Scrotum
 (d) Abdomen
- (E) The onset of reproductive age in human females is known as:
- (a) Menstruation
 (b) Menopause
 (c) Menarche
 (d) Ovulation

Ans. (A) (c) Both (I) and (II)

Explanation: The level of progesterone hormone increases when ovulation takes place. The level of FSH secreted by the pituitary gland is maximum when ovulation takes place.

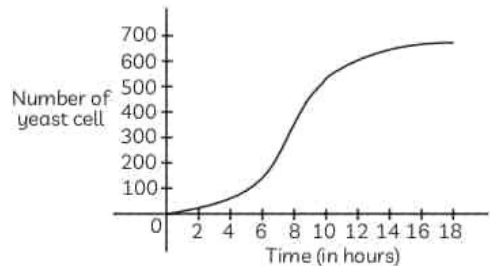
(B) (d) *Menopause* : There is an elevated level of oestrogen; *Menarche*: There is a decline in the level of Oestrogen.

Explanation: During menopause, there is a decline in the level of oestrogen hormone as it indicates the end of reproductive phase of a women. Whereas, during menarche, which marks the beginning of the reproductive phase of women, there is an elevated level of oestrogen hormone

Cervix

55. Asexual reproduction is a type of reproduction that does not involve the fusion of gametes or change in the number of chromosomes. The offspring that arise by asexual reproduction from either unicellular or multicellular organisms inherit the full set of genes of their single parent. Asexual reproduction is the primary form of reproduction for single-celled organisms such as archaea and bacteria. Many eukaryotic organisms including plants, animals, and fungi can also reproduce asexually. In vertebrates, the most common form of asexual reproduction is parthenogenesis, which is typically used as an alternative to sexual reproduction in times when reproductive opportunities are limited.

(A) Which of the following observations are incorrect?



- (I) The population of yeast grows slowly in the first 6 hours.
 (II) The growth rate of yeast is fastest from $t = 6$ hours to $t = 9$ hours.
 (III) The growth rate increases further from $t = 9$ hours to $t = 12$ hours.
 (IV) The growth rate increases linearly from $t = 2$ hours to $t = 12$ hours.
- (a) Both (I) and (III)
 (b) Both (II) and (IV)
 (c) Both (I) and (IV)
 (d) Both (III) and (IV)

(B) Select the row containing incorrect information:

	Name of Organism	Method of reproduction
(a)	Plasmodium	Fission
(b)	Spirogyra	Regeneration
(c)	Rhizopus	Spore formation
(d)	Bryophyllum	Vegetative propagation

of growth of bread mould (or mold) under different conditions:

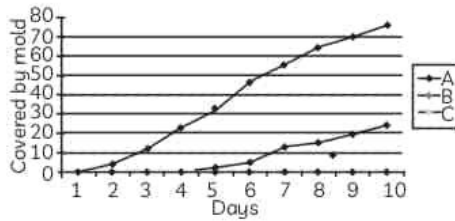
A: Bread slices kept at normal room temperature

B: Bread slices kept in refrigerator

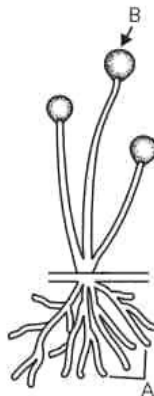
C: Bread slices kept in freezer.

Select the incorrect statement after observing the graph.

Mould Growth



- (a) Mould growth is fastest and covers 80% of the slice in 10 days when kept at room temperature.
- (b) Mould growth is slowest and covers 25% of the slice in 10 days when kept at room temperature.
- (c) Mould growth is slowest and covers 12% of the slice in 7 days when kept in refrigerator.
- (d) No mould growth observed for 10 days when bread slice kept in freezer.
- (D) The structures labelled A and B are:



(b) A is root and B is Sporangium

(c) A is hyphae and B is Sporangium

(d) A is root and B is Spores

(E) Select the correct statements for the process of budding in yeast:

(I) A small bud arises as an outgrowth of the parent body.

(II) The parent cell divides into two daughter cells and hence the parental identity is lost.

(III) The nucleus divides by meiosis, one daughter nucleus passes into the bud and the other remains in the parent cell.

(IV) The bud either separates off from the parent cell or new bud appears before its separation from the parent cell resulting in the formation of branched or unbranched chain of buds.

(a) Both (I) and (II)

(b) Both (I) and (IV)

(c) Both (II) and (III)

(d) Both (III) and (IV)

Ans. (A) (d) Both (III) and (IV)

Explanation: The growth rate decreases and levels off from $t = 9$ hours to $t = 12$ hours. The growth rate increases linearly from $t = 2$ hours to $t = 12$ hours.

(C) (b) Mould growth is slowest and covers 25% of the slice in 10 days when kept at room temperature.

Explanation: Mould growth is the fastest at room temperature and covers about 80% of the slice in 10 days when kept at room temperature.

SHORT ANSWER Type-I Questions (SA-I)

[3 marks]

56. In a bisexual flower, inspite of the young stamens being removed artificially, the

flower produces fruit. Provide a suitable explanation for the above situation. [NCERT]

reproductive organs. It consists of both stamen (male reproductive part) and carpel (female reproductive part). If in a bisexual flower, stamens are removed artificially and carpel remains intact in the flower, then, cross-pollination may occur in this flower, leading to the formation of fruit. The pollens from another flower of the same kind land on the stigma of this flower and fertilisation takes place and hence produces a fruit.

57. Can you consider cell division as a type of reproduction in unicellular organisms? Give one reason. [NCERT Exemplar]

Ans. Unicellular organisms reproduce by asexual reproduction, which is a simple division of parent cell into two daughter cells. Now, these two daughter cells grow into mature organisms. Hence, cell division can be considered as the mode of reproduction in single celled organisms as it results in the production of more individuals of the organism.

58. Give two reasons for the appearance of variations among the progeny formed by sexual reproduction. [NCERT Exemplar]

59. In a tobacco plant, the male gametes have 24 chromosomes. What is the number of chromosomes in the female gamete? What is the number of chromosomes in the zygote?

[NCERT Exemplar]

Ans. Male and female gametes of a species have the same number of chromosomes. Hence, the number of chromosome in the female gamete of tobacco plants is 24. Zygote is formed by the fusion of male and female gametes, so it will have 48 chromosomes.

The number of chromosomes in the female gamete is 24.

The number of chromosomes in zygote is 48.

numbers between an egg and a zygote? How is the sperm genetically different from the egg? [NCERT Exemplar]

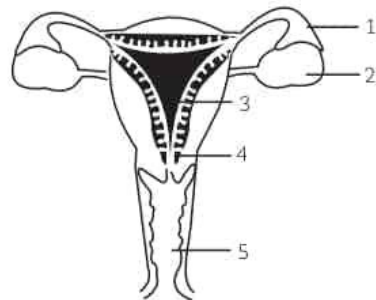
61. What is the effect of DNA copying which is not perfectly accurate in the reproductive process? [NCERT Exemplar]

Ans. The effect of DNA copying in reproductive process is that the characteristics of the parent organisms are transmitted to its offspring and at the same time some variations are also produced in the offspring. The importance of variations in organisms is that these help the species of various organisms to survive and flourish even in adverse environment.

62. Why is reproduction so essential in living organisms? [NCERT Exemplar]

Ans. Reproduction is essential for the survival of a species on Earth. Living organisms produce more organisms of their kind to maintain their species on Earth. The process of reproduction ensures the continuity of life on Earth. It also leads to the evolution of the species in the long run.

63. (A) Identify the given diagram. Name the parts 1 to 5



(B) What is contraception? List three advantage of adopting contraceptive measure. [CBSE 2019]

SHORT ANSWER Type-II Questions (SA-II)

[3 marks]

64. (A) What provides nutrition to humansperms? State the genetic constitution of a sperm.

(B) Mention the chromosome pair present in zygote which determines the sex of (i) a female child, and (ii) a male child.

[CBSE 2020]

Ans. (A) The secretions of seminal vesicles and prostate gland provide nutrition to the sperms. The genetic constitution of a human sperm is DNA (Deoxy ribo nucleic acid). The head of the sperm cell contains

form of DNA that is passed on to the next generation. Sex chromosomes in males is XY so sperms produced either have X or Y chromosome.

- (B) Chromosome pair present in zygote which determines the sex of:
- a female child-XX
 - a male child-XY.



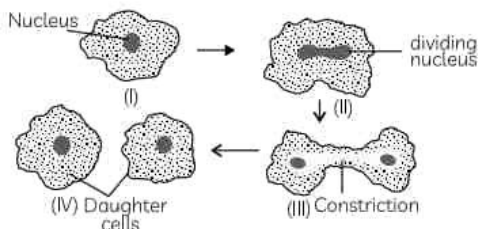
Related Theory

Women have a perfect pair of sex chromosomes, both called X. But men have mismatched pair normal sized X and short one Y. Women have XX and men have XY chromosomes. The sex of the children will be determined by what they inherit from their father. A child who inherits an X chromosome from her father will be a girl and one who inherits a Y chromosome from his father will be a boy.

65. Define the term pollination. Differentiate between self-pollination and cross-pollination. What is the significance of pollination?
[CBSE 2020]
66. What is vegetative propagation? Write the names of any two plants grown by this method.
[CBSE 2017]
67. Draw a labelled diagram to show that particular stage of binary fission in Amoeba in which its nucleus elongates and a constriction appears in its cell membrane.
[CBSE 2014]
68. Draw a diagram showing the different parts of an embryo of gram seed and label them.
[CBSE 2019]
69. A student is given a permanent slide showing binary fission in Amoeba. Write two steps to focus the slide under microscope. Draw diagram and label the parts.

Ans. Steps to focus the slide under microscope:

- Move the stage down to its lowest position.
- Place the glass slide onto the stage.
- Select the lowest power objective lens.
- Turn the focus knob slowly until the cells are not seen.
- There is a proper management of light.



Binary fission in Amoeba

in which two individuals are formed from a single parent and the parental identity is lost. Write the first step from where such a type of reproduction begins. Draw first two stages of this reproduction. [CBSE 2017, 16]

71. Explain how DNA copying is an essential part of the process of reproduction? What are the advantages of sexual reproduction over asexual reproduction?

Ans. DNA copying is an essential part of the process of reproduction because it makes possible the transmission of genetic information from parents to offspring in the next generation. DNA contains information for the inheritance of characteristics from the parents to the next generation.

Advantages of sexual reproduction over asexual reproduction:

- In sexual reproduction, more variations are produced. Thus, it ensures survival of species in a population.
- Variations favour evolution and play an important role in origin of new species.
- It maintains chromosome number in future generation.
- The new formed individual has characteristics of both the parents.
- Variations are more viable in sexual mode than in asexual one. This is because in asexual reproduction, DNA has to function inside the inherited cellular apparatus.

72. Answer the following:

- Name any 2 plants that reproduce by grafting.
- List any two benefits to an organism that reproduces through spores.

73. Answer the following:

- What is a clone? Why do offspring formed by asexual reproduction exhibit remarkable similarity?
- Explain how offspring and parents of organisms reproducing sexually have the same number of chromosomes?

74. Rohan's friend gifted him a beautiful plant. He liked it so much that he wanted to make more plants of the same kind. He asked his teacher how he can make more plants. The teacher explained the process of tissue culture.

separating cells from the growing tip of a plant. These cells are placed in an artificial medium. Where they divide rapidly to form a small group of cells which is called callus. The callus is transferred to another medium containing hormones. After some time plantlets are seen which are then placed in the soil to have mature plants.

Based on the above case study, answer the following questions:

(A) Tissue culture is a type of asexual reproduction. Justify.

(B) What are the advantages of growing plants by vegetative propagation?

Ans. (A) Tissue culture is a type of asexual reproduction as many plants can be grown

identical.

(B) Advantages of growing plants by vegetative propagation.

(1) The new plants produced are exactly like the parent plants.

(2) Plants which do not form viable seeds can be grown by this method.

(3) This method is a rapid, cheaper and convenient method for growing plants.

(4) Survival rate of new plants is it is upto 10% when raised by seeds.

75. You have to perform the experiment, "To identify the different parts of an embryo of a gram seed." Describe the procedure that you would follow. [CBSE 2017]

LONG ANSWER Type Questions (LA)

[5 marks]

76. Write two points of difference between asexual and sexual types of reproduction. Describe why variations are observed in the offspring formed by sexual reproduction.

77. Distinguish between a gamete and zygote. Explain their roles in sexual reproduction.

[NCERT Exemplar]

Ans.

	Gamete	Zygote
(1)	The germ cells that are fused during sexual reproduction are called gametes. Examples are sperm (male) and ova (female).	It is the product of fertilisation in which a male and a female gamete fuse with each other.
(2)	Gametes are unfertilised reproductive cells.	Zygote is fertilised egg or fertilised ovum.
(3)	It carries characters of only one parent.	It carries characters of both the parents.

Importance of gametes and zygote in sexual reproduction:

Gametes are the reproductive cells which actually take part in sexual fertilisation. The gametes are carriers of the genetic material from one generation to the other and also help in the maintenance of the chromosome number of a species. The two fusing gametes possess characters of their parents in their DNA. Fertilisation brings characters of both the parents into one zygote cell.

Zygote is the name given to the cell produced by fertilisation of male and female gametes in sexual reproduction. It represents the first cell of the next generation which subsequently grows into a new individual and carries genetic information from both the parents involved.

It is divided repeatedly to give rise to a new individual. Gametes are a product of meiosis and hence carry half the chromosome number as that of parent cells. This chromosome number is restored during fertilisation and zygote formation. Hence, gamete and zygote are the two phases of sexually reproducing organisms that help maintain a constant chromosome number in each species.

78. Mrs. Seghal's family was very happy after the birth of their second child. Her friend, Mrs. Raman, suggested her to undergo tubectomy. [NCERT Exemplar]

- (B) Why do you think Mrs. Raman gave her such a suggestion?
- (C) Can tubectomy prevent the spread of sexually transmitted diseases?
- (D) Give reason for your answer. Why is there a need of adopting contraceptive methods? [NCERT Exemplar]

79. (A) List two reasons of using contraceptive methods by married couples.

(B) Write in proper sequence the process going on in the different organs of the reproductive system of a human female starting from the time of egg production to childbirth. [CBSE 2020]

80. (A) Identify the modes of asexual reproduction in each of the following organisms:

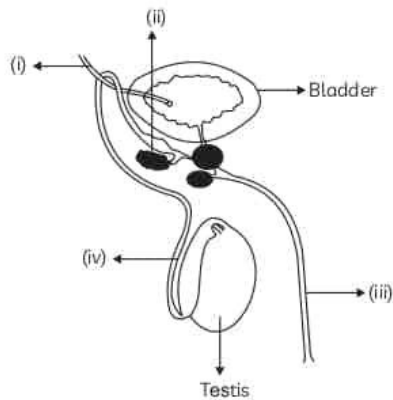
- (i) Hydra (ii) Planaria
(iii) Amoeba (iv) Spirogyra
(v) Rhizopus

(B) List three advantages of vegetative propagation.

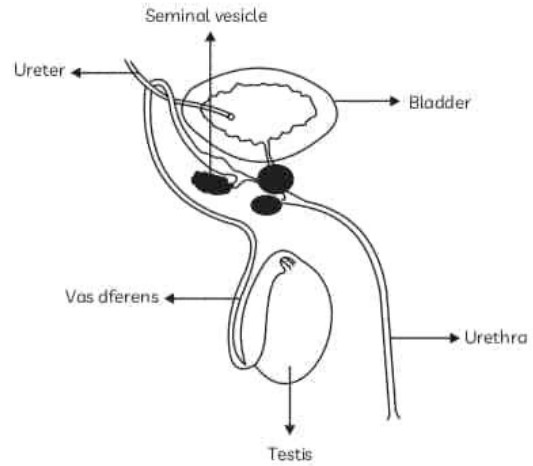
(C) Why can fertilisation not take place in flowers if pollination does not occur?

[CBSE 2020]

81. Based on the given diagram answer the questions given below:



- (A) Label the parts (i), (ii), (iii) and (iv).
- (B) Name the hormone secreted by testis and mention its role.
- (C) State the functions of (ii) and (iii) in the process of reproduction. [CBSE 2020]



- (A) (i)—Ureter
(ii)—Seminal vesicle
(iii)—Urethra
(iv)—Vas deferens.

(B) **Hormone secreted by testis:** Testosterone
Role of testosterone: It brings about changes in appearance seen in boys at the time of puberty (secondary sexual characteristics).

(C) **Functions of B (Seminal vesicle):** Along the path of vas deferens, seminal vesicle along with prostate gland and their secretions which make the transport of sperms easier and this fluid provides nutrition to sperms.

Functions of C (Urethra): Urethra carries urine from the bladder and sperms from vas deferens through the penis.

82. (A) What is puberty?

(B) Why are testes located outside the abdominal cavity?

(C) State how sperms move towards the female germ cell. [CBSE 2020]

83. (A) What is reproduction? List its two types.

(B) How are the modes of reproduction different in unicellular and multicellular organisms? [CBSE 2019]

84. Differentiate between pollination and fertilisation. What is cross-pollination? State any two carriers (agents) that carry out this process. [CBSE 2017]

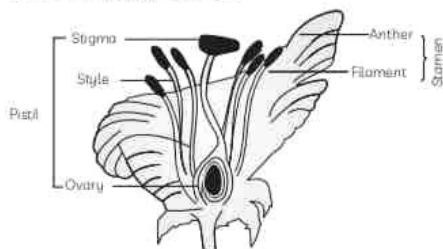
bisexual flower and label the following:

Ovary, anther, style, stigma, filament

Identify from these the female reproductive organs and state one function of each.

[CBSE 2017, 16]

Ans. Diagram of longitudinal section of a bisexual flower is drawn below:



The female reproductive organs are ovary, style and stigma. Their functions are mentioned below:

Ovary: It is the swollen bottom part of the pistil and contains ovules which has the female gamete, the egg cell.

Style: A pollen tube grows out of the pollen grain and travels through the style, which is the middle part of the pistil, to reach the ovary.

Stigma: It is the terminal part of the pistil and may be sticky and on which the pollen grains are deposited.

86. How do variations arise in organisms? "Variation is useful for the survival of species." Justify this statement with the help of an example. [CBSE 2017]

87. What is regeneration? Give one example of an organism that shows this process and one organism that does not. Why does regeneration not occur in the latter? [CBSE 2017]

88. Give one example each of unisexual and bisexual flowers. Differentiate between the two types of pollination that occur in flowers. What happens when a pollen lands on a suitable stigma? Write about the events that occur till the seed formation in the ovary. [CBSE 2019]

89. (A) Write the functions of the following parts in human female reproductive system:
(i) Ovary

(ii) Uterus

(B) Describe the structure and functions of placenta. [CBSE 2017]

Ans. (A) Function of following parts in human female reproductive system is given below:

(i) **Ovary:** Ovaries are the female primary reproductive organs which perform dual functions of production of female gamete or ovum and the secretion of female sex hormones, estrogen and progesterone.

(ii) **Fallopian tube:** These are a pair of long convoluted tubes that carry ova or eggs from the ovary to the uterus and is also the site of fertilization of the ovum.

(iii) **Uterus:** It is a hollow, pear-shaped organ within which the embryo develops after implantation. After fertilization has taken place, the embryo moves down to reach the uterus and gets attached to its thickened wall.

(B) Structure and functions of placenta:

Structure:

- (1) It is a special disc like tissue which develops between uterine wall and the embryo after implantation.
- (2) It contains villi on the embryo's side of the tissue and blood spaces surrounding the villi on the mother's side.

Functions:

- (1) It is through the placenta that all the development needs of the foetus are met from the mother's body.
- (2) It provides a large surface area for glucose and oxygen to pass from the mother to the embryo.
- (3) The waste substances generated by the developing embryo is also removed through the placenta.

90. (A) Write the functions of the following parts of the human male reproductive system:

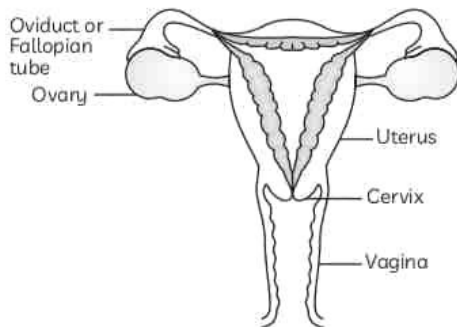
- (i) Testis (ii) Vas deferens (iii) Urethra (iv) Prostate

(B) List any two common pubertal changes

91. (a) In our country the legally prescribed minimum age for marriage is 18 years for females and 21 years for males. Why is it essential to fix the minimum age for marriage? Give three reasons to justify your answer. List three methods for preventing unwanted pregnancy. [CBSE 2017]

92. Draw neat diagram of human female reproductive system. Label oviduct and uterus on it. State the role of placenta. How the waste generated by the developing embryo removed? [CBSE 2017]

Ans.



Role of Placenta: Placenta is a special tissue connection between embryo and uterine wall. It acts as an endocrine gland:

- (1) It possess villi that increase the surface area for absorption of nutrients.
- (2) Waste substances produced by embryo are removed through placenta into mother's blood.
- (3) Facilitate passage of nutrients and oxygen to embryo from mother through blood.

The waste generated by the developing embryo removed through placenta into mother's blood.

93. (A) (a) Fertilization is possible if ovulation has taken place during middle of menstrual cycle. Give reasons.

- (B) (a) List in tabular form two distinguishing features between a sperm and an ovum.

[CBSE 2016]

94. (a) How do organisms, whether reproduced asexually or sexually maintain a constant chromosome number through several generations? Explain with the help of suitable example. [CBSE 2016]

process of binary fission with the help of a diagram.

- (B) (a) Why do multicellular organisms use complex way of reproduction?

[CBSE 2019]

96. (A) Although Amoeba and Leishmania, both show same mode of reproduction, but the process of reproduction is carried out in different ways.

Identify their mode of reproduction and mention the way it is carried out in the two species.

- (B) What is regeneration? Explain with the help of a diagram how this process is carried out in Planaria.

- (C) Name the part of Rhizopus in which spores are formed.

State the condition under which spores grow into a new individual.

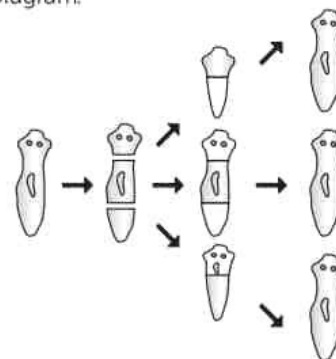
- Ans. (A) Mode of asexual reproduction in Amoeba and Leishmania is Binary Fission.

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

In Leishmania, binary fission occurs in a definite orientation in relation to the whip like structures present at one end of the cell.

- (B) Regeneration is a process in which an organism is broken/ cut into pieces, these pieces may grow into separate individuals.

Diagram:



- (C) Spores are formed in Sporangia.

Spores grow into a new individual under moist conditions.

97. (a) Answer the following:

- (A) Give an example of bisexual flower. What is its female reproductive part known as?

showing the process of germination of pollen on stigma and label the following on it:

- (i) Male germ cell
- (ii) Female germ cell
- (iii) Ovary
- (iv) Pollen tube

(C) Pollination may occur without fertilization but fertilization will not take place without pollination. Give reasons.

98. List six specific characteristics of sexual reproduction.

- (2) Two parents are involved,
- (3) Two dissimilar gametes are formed, gamete formation involves meiosis,
- (4) Variations are produced,
- (5) Occurs in all the higher and some of the lower organisms,
- (6) Fertilization/fusion of gametes leading to zygote formation Slow.

[CBSE Marking Scheme 2015]

99. 📌 List four points of significance of reproductive health in a society. Name any two areas related to reproductive health which have improved over the past 50 years in our country.



VERY SHORT ANSWER Type Questions

[1 mark]

1. List two functions of ovary of human female reproductive system.

Ans. Ovary is the ^{part of} female reproductive system. Its functions are
 * It secretes the female hormones called Oestrogen and Progesterone
 * It also releases the female gamete called ovum for the act of fertilisation
 * It also releases ovum every month during menstrual cycle.

[CBSE Topper 2016]

2. When a cell reproduces, what happens to its DNA?

Ans. → When a cell reproduces, its DNA makes two copies, each divided cell getting one.

[CBSE Topper 2017]

3. What is DNA ?

Ans. The DNA is found in the nucleus of a cell.

[CBSE Topper 2015]

SHORT ANSWER Type-I Questions (SA-I)

[2 marks]

4. What is the main difference between sperms and eggs of humans ? Write the importance of this difference.

Ans.

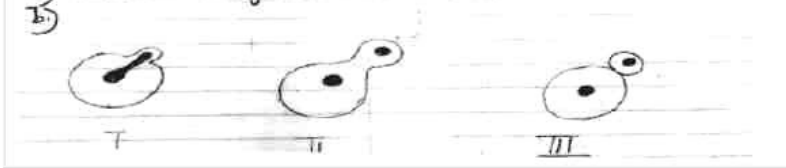
	Sperms	Egg cells
	Male gamete	Female gamete
	Small and motile	Large and non motile
	contains 23 chromosomes	contains food stores
Main difference	contains 23 chromosomes	contains only X chromosome.

Since female gamete always contains X chromosome, the sex of the child is independent of mother's genes. The chromosome in the male gamete (sperm) determines the sex of the child.
 [if its X, child will be female, if its Y child will be male.]

[CBSE Topper 2014]

5. A student is viewing under a microscope a permanent slide showing various stages of asexual reproduction by budding in yeast. Draw diagrams of what he sees (in proper sequence).

Ans.



[CBSE Topper 2015]

SHORT ANSWER Type-II Questions (SA-II)

[3 marks]

6. Write one main difference between asexual and sexual mode of reproduction. Which species is likely to have comparatively better chances of survival— the one reproducing asexually or the one reproducing sexually? Give reason to justify your answer.

Ans.

Asexual mode of reproduction is uniparental & thus, doesn't involve any fusion of gametes & hence, fertilization.

Sexual mode of reproduction is biparental & thus involves fusion of both male & female gametes.

Among the two, sexually reproducing species have a better chance of survival. It's because reproduction in such species require contribution of equal genetic material from both the parents. This results in various combinations for genes.

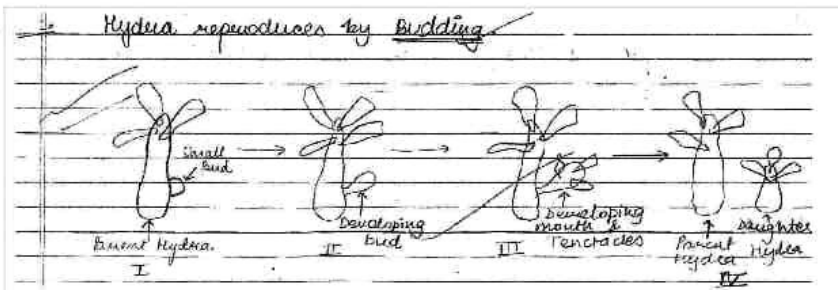
Hence, the process of creation of variations is increased manifold ^{as compared to asexually reproducing organisms}. Thus, accumulation of such variations for long time may lead to evolution.

Not only this, we also know that variations are helpful for continuation of species in case the niche changes drastically due to factors not under our control like global warming, meteorite hits etc. Asexual reproduction involves slight variations & thus, will not be very beneficial to produce a variation adaptable to drastically changed

[CBSE Topper 2018]

7. A student observed a permanent slide showing asexual reproduction in Hydra. Draw labelled diagram in proper sequence of the observations that must have been made by the student. Name the process of reproduction also.

Ans.



[CBSE Topper 2019]

reproduction ?

Ans.

Planaria ~~has the~~ is a fully differentiated multicellular organism which has the ability to grow into a new individual if it is cut up or broken into pieces. Each piece grows into a new individual. This is due to the regenerative cells which are present in its body. These cells grow, ~~and~~ proliferate and ~~grows~~ rise to a mass of cells. From this mass ~~of~~ cells different types of ~~and~~ tissues will develop. This process takes place in an organized sequence called development.

This process is different from reproduction as most organisms would not depend on being cut up in order to reproduce.

[CBSE Topper 2014]

