7 How do Organisms Reproduce?

CHAPTER

Level - 1

MULTIPLE CHOICE QUESTIONS (MCQs) (1 Mark)

1. Option (D) is correct.
Explanation: *Plasmodium*, the parasite responsible for malaria, exhibits multiple fission, a type of asexual reproduction in which a single parent cell divides into numerous daughter cells simultaneously. During its life cycle, *Plasmodium* undergoes several rounds of multiple fission, particularly in the liver and red blood cells of the host. This process, produces numerous daughter cells called merozoites which are then released into the bloodstream, where they infect red blood cells, leading to the symptoms of malaria.
2. Option (C) is correct.
Explanation: The diagram represents budding in *Hydra*, a type of asexual reproduction. In this process, a small outgrowth or bud forms on the body of the parent *Hydra*. Over time, the bud matures, grows, and eventually detaches from the parent to live independently, completing the process of budding.
3. Option (C) is correct.
Explanation: In most flowers, petals are the parts that attract insects for pollination. They are typically brightly coloured and sometimes have patterns, which help draw the attention of pollinators like bees, butterflies and other insects. The purpose of this attraction is to facilitate the transfer of pollen from one flower to another, aiding in fertilisation.
4. Option (A) is correct.
Explanation: Vegetative propagation is a method of asexual reproduction where new plants are produced from the vegetative parts of the parent plant, such as stems, roots, or leaves, rather than from seeds. Sugarcane, roses and grapes are examples of plants raised by vegetative propagation.
5. Option (C) is correct.
Explanation: Placenta has a large surface area (due to the presence of villi) to allow efficient exchange of glucose, oxygen, and other substances between the mother's blood and the embryo. A small surface area would limit the exchange and be detrimental to the developing foetus.
6. Option (A) is correct.
Explanation: The rapid spread of bread mould on a slice of bread is primarily due to the formation of a large number of spores and the presence of moisture and nutrients in the bread. Moulds, such as *Rhizopus*, produce many spores that are easily dispersed through the air. When these spores land on the moist, nutrient-rich surface of the bread, they germinate and grow. The bread provides the ideal conditions for mould growth, with its moisture and nutrients like starches, which support the development of the mould.
7. Option (C) is correct.
Explanation: In bread mould (such as *Rhizopus*), the structure labelled A is typically the hyphae, which are the thread-like structures that grow and spread across the surface of the bread. Hyphae absorb nutrients and help the mould grow. On the other hand, the tiny blob-on-a-stick structures labelled as B are sporangia, which contain cells, or spores, that can eventually develop into new *Rhizopus* individuals.
8. Option (D) is correct.
Explanation: *Bryophyllum* propagates through its leaves.
The potato is a modified stem called a tuber.
The money plant (*Pothos*) can propagate through its stems.
Roses are typically propagated through their stems (cuttings) rather than roots.
9. Option (D) is correct.
Explanation: The flower may be unisexual when it contains either stamens or carpels. Papaya and watermelon are examples of plants which bear unisexual flowers.
10. Option (A) is correct.
Explanation: In humans, the typical chromosomal setup includes:
    - 22 pairs of autosomes (non-sex chromosomes)
    - 1 pair of sex chromosomes (XX for females, XY for males)

    When an X-bearing sperm fertilises the egg, the following occurs:
    - The egg contributes 22 autosomes + 1 X chromosome (total 23 chromosomes).
    - The X-bearing sperm contributes 22 autosomes + 1 X chromosome (total 23 chromosomes).

Therefore, the resulting zygote will have:

- 44 autosomes (22 pairs)
- 2 X chromosomes (XX)

Therefore, the correct answer is 44 + XX.

11. Option (D) is correct.
Explanation: The number of chromosomes in parents and offspring of a particular species undergoing sexual reproduction remains constant because during meiosis, the chromosome number is reduced by half to form gametes (sperm and egg cells), which ensures that upon fertilisation, the resulting zygote has the same chromosome number as the parent organism.

12. Option (D) is correct.
Explanation: The bacterial and the viral infections that may be caused due to unsafe sex are Syphilis and warts, respectively.

13. Option (C) is correct.
Explanation: The flowers that contain the ovary, develops into a fruit after fertilisation. In the provided image, both X and Y contain ovaries, therefore, they would develop into a fruit.

14. Option (D) is correct.
Explanation: Gonorrhoea is caused by the bacterium *Neisseria gonorrhoeae* and is sexually transmissible.

15. Option (A) is correct.
Explanation: Fertilisation takes place in the fallopian tubes, which are part of the female reproductive system. During ovulation, an egg is released from the ovary and travels down the fallopian tube. If sperm meets the egg in the fallopian tube, fertilisation can occur. This is where the sperm combines with the egg to form a zygote, which will then move to the uterus to develop into a baby.

16. Option (D) is correct.
Explanation: In the diagram, the part labelled as S is testis, which is responsible for the secretion of testosterone in males.

ASSERTION-REASON QUESTIONS (1 Mark)

1. Option (A) is correct.
Explanation: Offsprings produced by asexual reproduction are genetically similar to the parents. The reason for this is that asexual reproduction involves only one parent, and there is no genetic recombination, which typically occurs in sexual reproduction. This means the genetic similarity of the offspring to the parent is directly linked to the fact that asexual reproduction involves only one parent. Thus, both assertion and reason are true and reason is the correct explanation of assertion.

2. Option (A) is correct.
Explanation: *Amoeba* always produces two daughter amoebae, while *Plasmodium* divides into many daughter cells. This is because binary fission in *amoeba* results in two daughter cells whereas, multiple fission in *Plasmodium* results in many daughter cells. Thus, both assertion and reason are true and reason is the correct explanation of assertion.

3. Option (A) is correct.
Explanation: Oral contraceptive pills and copper-T do not prevent sexually transmitted diseases (STDs) because they are designed to prevent pregnancy by regulating hormones. Neither of these methods provides protection against sexually transmitted diseases. Sexually transmitted diseases are indeed transmitted by contact with the mucous membranes of the infected person. Thus, both assertion and reason are true and reason is the correct explanation of assertion.

Level - 2

CASE BASED QUESTIONS (4 Marks)

1. (i) All the cut pieces of *Planaria* A (L, M, and N) and Planaria B (O and P) can regenerate to form complete organisms.

(ii) An example of another organism that follows the same mode of reproduction as *Planaria* is *Hydra*.

(iii) (a) In regeneration, 'development' refers to the organised sequence of processes by which the cells that proliferate from a part of the organism undergo differentiation and specialisation to form the various cell types and tissues required to rebuild the lost or damaged part of the organism, ultimately resulting in the restoration of the organism's lost body parts or the creation of an entirely new organism.

(b)

	Regeneration	Fragmentation
Definition	Regeneration refers to an organism's ability to regrow or replace destroyed bodily parts.	Fragmentation is a type of asexual reproduction in which an organism divides into pieces, each with the potential to develop into a new individual.

Process	It involves the development of specialised cells at the site of injury, leading to the formation of new tissues and structures.	Fragments develop into new individuals without necessarily undergoing the specialisation of cells, as seen in regeneration.
Example	*Planaria* can regenerate into complete organisms from cut pieces.	Some species of flatworms, like the tapeworm, reproduce through fragmentation.

2. (i)

Self Pollination	Cross Pollination
Self pollination occurs when pollen from the anther of a flower is transferred to the stigma of the same flower or another flower on the same plant. The plant fertilises itself.	Cross pollination occurs when pollen from the anther of one flower is transferred to the stigma of a different flower, usually of a different plant of the same species, often with the help of pollinators like insects, birds, or wind.

(ii) The colourful part of the flower that attract insects is known as the corolla (made up of petals), which are typically bright and vibrant, making them appealing to insects. The bright colours, scent, and nectar of the petals help attract pollinators like bees, butterflies, and other insects. After fertilisation, the petals typically shrivel and fall off.

(iii) (a) Fertilisation is the process in which the male gamete (pollen) fuses with the female gamete (egg cell) to form a zygote, which then develops into a seed.

After fertilisation, the ovule develops a tough coat and is gradually converted into a seed. Whereas, the ovary grows rapidly and ripens to form a fruit.

OR

(b) In a germinating seed:

- The future shoot (stem and leaves) is known as the plumule.
- The future root is known as the radicle.

The cotyledon serves as the food store for the developing seedling.

3. (i) **Sexual propagation:** The seeds (which develop from the fertilised ovule).

Asexual propagation: Various vegetative parts such as roots, stem, and leaves. Common examples include cuttings (stem), grafts, and tubers (like potatoes).

(ii) (1) Flower: Rose

(2) Fruit: Banana

(iii) (a) The two advantages of growing plants by vegetative propagation are:

- **Faster Flowering and Fruiting:** Plants raised through vegetative propagation, such as sugarcane, roses, or grapes, can bear flowers and fruits earlier than those grown from seeds. This leads to quicker yields, which is beneficial for agricultural purposes.
- **Genetic Uniformity:** Since vegetative propagation produces genetically identical plants to the parent, all new plants will have the same desirable characteristics, such as fruit quality or flower colour.

OR

(b) Objective: To demonstrate how potatoes reproduce asexually using their buds (eyes).

Procedure:

- Look at the surface of the potato and identify the small buds or eyes.
- Cut the potato into pieces. Ensure some pieces have a bud (eye) and some do not.
- Spread cotton on a tray and moisten it with water.
- Put the potato pieces with buds on the cotton, ensuring they are kept moist. Over the next few days, observe the potato pieces for signs of growth.

Expected Result: The potato pieces with buds (eyes) will develop green shoots and roots, showing how asexual reproduction occurs. The pieces without buds will not sprout.

4. (i) *Leishmania* reproduces by binary fission, while *Plasmodium* reproduces by multiple fission.

(ii) One advantage of sexual reproduction over asexual reproduction is genetic diversity. Sexual reproduction combines the genetic material of two parents, resulting in offspring with greater genetic variation, which can enhance adaptability and survival in changing environments.

(iii) (a) (1) Colonies of yeast fail to multiply in water because they require a source of energy and nutrients, which is provided by the sugar in the sugar solution. In the presence of sugar, yeast can undergo fermentation, producing energy, and thus multiply.

(2) *Rhizopus* do not grow on a dry slice of bread because fungal spores require moisture for growth and reproduction. In the presence of moisture, fungal spores germinate and form hyphae (the filamentous structures of the fungus).

OR

(b) The filamentous structures identified in the dark green pond water are Spirogyra. These organisms multiply primarily through fragmentation, a form of asexual reproduction where the filaments break into smaller pieces, and each piece can grow into a new individual organism.

Level - 3

VERY SHORT ANSWER TYPE QUESTIONS (2 Marks)

1. ***Leishmania*** reproduces asexually by binary fission. The division occurs in a definite orientation relative to the whip-like flagellum, ensuring the flagellum's proper inheritance and function in the daughter cells. *Plasmodium* reproduces asexually by multiple fission. In this process, the cell divides into many daughter cells simultaneously, producing numerous merozoites that infect red blood cells in the human host.
2. The statement "Stability of DNA in a species is ensured during sexual reproduction" is justified because, during sexual reproduction, two gametes (sperm and egg) fuse, each contributing half of the genetic material, resulting in a zygote with a stable diploid set of chromosomes. This process maintains the chromosome number across generations, ensuring genetic stability, while allowing for genetic variation through crossing over and recombination during meiosis.
3. The glands which add their secretions to the sperms are the prostate gland and the seminal vesicles.
   Functions
   (a) The secretions help in forming a fluid (semen) that makes it easier for the sperm to move through the male reproductive tract and into the female reproductive system.
   (b) The fluid contains nutrients that provide energy and nourishment to the sperm, supporting their motility and survival.
4. In sexually reproducing organisms, the number of chromosomes is re-established through the process of meiosis and fertilisation. During meiosis, gametes (sperm and egg cells) are produced with half the number of chromosomes (haploid), i.e., 23 chromosomes. When fertilisation occurs, the sperm and egg combine to form a zygote, restoring the original diploid number of chromosomes, i.e., 46 chromosomes.
5. The parts labelled in the diagram are:
   - **A:** Stigma
   - **B:** Pollen tube
   - **C:** Egg Cell

   Function of part B (Pollen tube): It carries the pollens to the egg cell for fertilisation.
6. **(i)** *Hibiscus* and Mustard flowers are bisexual because they both have male (stamens) and female (carpel) reproductive organs within the same flower, making them more likely to undergo **self-pollination**.
   (ii) The two reproductive parts of a bisexual flower are Stamen (male reproductive part) and Carpel (female reproductive part).
7. *Planaria* reproduces by regeneration because it has the ability to regrow lost body parts and form a complete organism from a fragment.
   An example of another organism that can reproduce by the same process is the *Hydra*.
8. **(i)** Reproductive parts of bread mould (*Rhizopus*) – Sporangium
   Non-reproductive parts of bread mould (*Rhizopus*) – Hyphae.
   (ii) The two advantages of vegetative propagation are:
   (1) The plants grown through vegetative propagation (e.g., sugarcane, roses, grapes) can produce flowers and fruits earlier than those grown from seeds, leading to quicker yields.
   (2) The plants produced through vegetative propagation are genetically identical to the parent plant. This ensures that the new plants inherit desirable traits, such as fruit quality or flower colour, maintaining uniformity in the crop.
9. Puberty is the period during which adolescents reach sexual maturity and become capable of reproduction. The two changes that are common to both boys and girls during early teenage years are:
   (1) Rapid increase in height and weight.
   (2) Development of secondary sexual characteristics
10. **(i)** Uterus.
    (ii) Fallopian tube.
    (iii) Ovary.
    (iv) Placenta.
11. **(i)** **Placenta:** The placenta facilitates the exchange of nutrients, gases, and waste products between the mother and the developing foetus.
    (ii) **Fallopian tubes:** The fallopian tubes transport the egg from the ovaries to the uterus. They are also the site where fertilisation occurs.
    (iii) **Uterus:** The uterus provides a nurturing environment for the fertilised egg to implant and develop into a foetus. It is the site of implantation. It also contracts during childbirth to help deliver the baby.
    (iv) **Ovary:** The ovaries produce and release eggs (ova) for fertilisation. They also produce female sex hormones, such as estrogen and progesterone, which regulate the menstrual cycle and support pregnancy.

SHORT ANSWER TYPE QUESTIONS (3 Marks)

1. Fertilisation occurs when a sperm enters the fallopian tube and encounters a mature egg (oocyte). The process of fertilisation and foetal development can be summarised as follows:
   (1) **Fertilisation:** Sperm penetrates the egg, resulting in the creation of a zygote. The merging of genetic material restores diploid chromosomes and creates a new person.
   (2) **Zygote Formation:** The zygote undergoes rapid cell division through mitosis, forming a solid ball of cells called a morula.

(3) **Blastocyst Formation:** The morula transforms into a blastocyst, a fluid-filled structure with a central cell mass. The blastocyst moves via the fallopian tube and into the uterus.

(4) **Implantation:** The blastocyst connects to the endometrial lining of the uterus and implants. In this procedure, the blastocyst invades the uterine lining.

(5) **Formation of Germ Layers:** After implantation, the blastocyst develops into three germ layers (ectoderm, mesoderm and endoderm) that produce numerous tissues and organs.

(6) **Formation of Embryo:** The blastocyst develops into an embryo, and organogenesis begins. During this stage, the body's organs and structures begin to develop.

(7) **Development of Foetus:** The developing organism is called a foetus after the eighth week. During the foetal stage, organs and tissues develop and mature more.

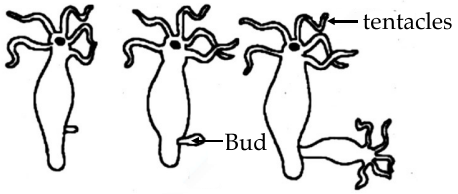
The placenta is a vital organ that forms during pregnancy and plays the following functions:

(1) It helps exchange nutrients, oxygen, and waste between the mother and the developing baby. The placenta provides the baby with essential nutrients and removes waste.

(2) It also produces hormones like hCG, progesterone, and estrogen, which are important for maintaining the pregnancy. These hormones prevent the release of eggs and help the uterine lining stay thick and supportive.

(3) The placenta also acts as a protective barrier, shielding the baby from harmful substances and preventing the mother's immune system from attacking the baby. In short, the placenta supports the baby's growth by providing nutrition, exchanging gases, and producing necessary hormones during pregnancy.

2. Organisms such as *Hydra* use regenerative cells for reproduction in the process of budding. In *Hydra*, a bud develops as an outgrowth due to repeated cell division at one specific site. These buds develop into tiny individuals and when fully mature, detach from the parent body and become new independent individuals.



The cells used for reproduction in this process are regenerative cells.

3. (i) Roles of Seminal Vesicles

(a) These gland secrete a fluid which makes the transport of the sperms easier.

(b) The fluid nourishes the sperm.

Roles of Prostate Gland

(a) Like the seminal vesicles, the prostate gland also adds its fluid to the semen.

(b) The fluid nourishes the sperm and helps them move through the urethra.

(ii) Roles of oviduct (also known as fallopian tube)

(a) The oviduct (also known as the fallopian tube) carries the egg from the ovary to the uterus (womb). After ovulation, the egg is captured by the fimbriae at the end of the oviduct and then moved toward the uterus.

(b) The oviduct is the actual site where fertilisation occurs, if sperm are present. Fertilisation can take place in the oviduct before the egg continues its journey to the uterus.

(iii) Roles of Testes

(a) The testes are responsible for formation of sperms by the process of spermatogenesis.

(b) They are also responsible for producing the male sex hormone, testosterone.

4. (i) **(1) Sepals:** Sepals persist even after a fruit is formed in some plants because they provide protection to the developing fruit and seeds.

(2) Corolla (made up of petals): The colourful petals of a flower form the corolla and attract insects, helping in the process of pollination.

(3) Anther: The anther, located on the stamen, produces pollen grains that contain male germ cells.

(4) Ovule: After fertilisation, the ovule develops into a seed.

(ii) After pollination, the male germ cell (sperm) reaches the ovary via the pollen tube. This process happens as follows:

(a) The pollen grain lands on the stigma of the flower.

(b) The pollen grain grows a pollen tube down through the style toward the ovary.

(c) The male germ cell (sperm) travels through this tube and reaches the ovule inside the ovary.

Significance: This event is crucial for fertilisation to occur. The sperm cell fuses with the female germ cell (egg) inside the ovule. This fusion forms a zygote, which will eventually develop into a seed, allowing the plant to reproduce and continue its species.

5. Vegetative propagation is a form of asexual reproduction in plants where new plants grow from vegetative parts of the parent plant, such as stems, roots, or leaves, without the involvement of seeds.

Methods of vegetative propagation in plants:

(i) Layering: In layering, a lower branch of the plant is bent and buried under the soil, with the tip of the branch remaining above the ground. Over time, roots develop from the buried section of

the branch, eventually forming an independent plant. This method is commonly used for propagating jasmine and other ornamental plants.

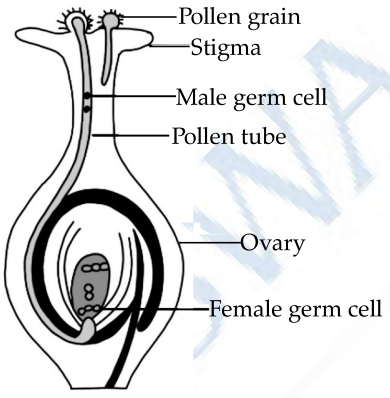
(ii) **Grafting:** Grafting involves joining two plants to grow together as a single plant. It is typically used for plants with a weak root system or those that do not root easily. The two plants are tied together to ensure direct contact between them. The new plant benefits from a strong root system and increased yield of fruits and flowers. This technique is commonly used for growing varieties of mango, lemon, grapes, and roses.

Advantages of Vegetative Propagation

(i) **Rapid Multiplication:** A large number of plants can be obtained in a short interval, making it an efficient method for quickly increasing plant populations.

(ii) **Propagation of Seedless Plants:** This method enables the propagation of seedless plants, such as certain varieties of grapes and bananas, which cannot be reproduced through seeds.

6. Upon touching a suitable stigma, the pollen grain absorbs water and nutrients, which initiates the formation of a pollen tube. This pollen tube grows down through the style towards the ovary. At its tip, the pollen tube carries two male gametes (sperm cells) and a tube nucleus. The pollen tube then enters the embryo sac within an ovule, usually through the micropyle. Upon reaching the embryo sac, the pollen tube bursts, releasing the two male gametes. One of these male gametes fuses with the egg cell to form a zygote.



This action is referred to as syngamy. When the second male gamete combines with the binucleate central cells, it creates the endosperm. This process, known as triple fusion, involves the fusion of three haploid nuclei. Thus, triple fusion is the union of a male gamete with two polar nuclei within the embryo sac of an angiosperm.

7. The process of spore formation takes place in many simple multicellular organisms.

(i) **Organism using this process to reproduce:** *Rhizopus* (a type of fungus).

(ii) **Reproductive and non-reproductive parts of such organisms:**

- **Reproductive part:** Sporangia (the structures that produce and contain spores).
- **Non-reproductive part:** Hyphae (the thread-like structures that make up the body of the fungus).

Two benefits to an organism that reproduces through spores:

(1) **Survival in Harsh Conditions:** Spores are often resistant to extreme conditions such as heat, drought, and radiation, allowing the organism to survive adverse environments.

(2) **Efficient Dispersal:** Spores can be easily dispersed by wind, water, or other agents, facilitating the spread of the organism to new locations and increasing its chances of survival and colonisation.

8. The placenta is a special disc-like structure embedded in the uterine wall, forming an intimate connection between the embryo and the uterine wall. It consists of blood spaces on the mother's side and thousands of villi (small projections) on the foetal side. These villi provide a large surface area, facilitating the exchange of nutrients and oxygen between the mother and the foetus.

Role of Placenta During Pregnancy: This multifunctional organ is crucial for the healthy growth and development of the foetus throughout pregnancy. The exchange of materials between the blood of the mother and the foetus occurs through the placenta. This structure not only provides essential nutrition to the foetus but also functions as its respiratory and excretory organ. By allowing the exchange of oxygen and carbon dioxide, the placenta ensures the foetus receives the oxygen it needs for development. Additionally, it facilitates the removal of waste products from the foetal blood into the mother's bloodstream, where they can be excreted by the mother's body.

LONG ANSWER TYPE QUESTIONS (5 Marks)

1. (i) Three techniques/devices used by human females to avoid pregnancy are:

(1) Barrier Method (Condoms)
Function: Condoms create a mechanical barrier that prevents sperm from reaching the egg, serving as a method of contraception.
Side Effects: Generally minimal, but some individuals may experience irritation or allergic reactions to the material (such as latex).

(2) Hormonal Method (Pills)
Function: These pills alter the hormonal balance in the female body to prevent

the release of eggs, making fertilization impossible.

Side Effects: Hormonal contraceptives can cause side effects such as nausea, weight gain, mood changes, headaches, and a potential increase in the risk of blood clots due to changes in hormone levels.

(3) Surgical Method [IUD (Intrauterine Device) or Copper-T]

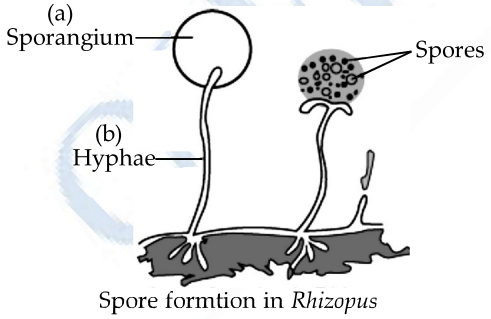
Function: These devices are inserted into the uterus to prevent pregnancy by either altering the uterine lining or preventing sperm from reaching the egg.

Side Effects: IUDs may cause side effects such as cramping, irregular bleeding, and irritation of the uterus. There is also a small risk of pelvic infections or the device being expelled.

(ii) (a) Fertilisation Takes Place: If fertilisation occurs, the sperm meets the egg in the oviduct, forming a zygote. The fertilised egg (zygote) travels to the uterus and implants itself in the uterine lining. The uterus, which has thickened and is richly supplied with blood, provides the necessary nutrients for the growing embryo. The placenta, a special tissue embedded in the uterine wall, allows the exchange of nutrients, oxygen, and waste between the mother and the embryo. The embryo continues to develop inside the mother's body for about nine months until birth.

(b) An Egg is Not Fertilised: If the egg is not fertilised, it dies after about one day. The uterus, having prepared itself to receive a fertilised egg, now sheds its thickened lining, as it is no longer needed. This lining, along with blood and mucous, is expelled through the vagina in a process called menstruation. This cycle typically occurs every month and lasts for about two to eight days.

2. (i)



Spore formtion in *Rhizopus*

(a) Reproductive parts of bread mould (*Rhizopus*) - Sporangium

(b) Non-reproductive parts of bread mould (*Rhizopus*) is hyphae

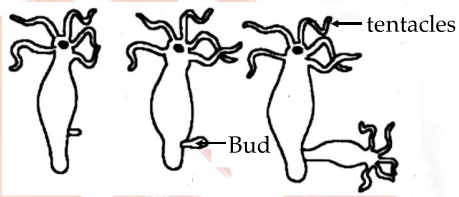
Rhizopus, like other fungi, needs moisture to grow and reproduce. On dry bread, the lack of moisture prevents the growth of hyphae and the absorption of nutrients, which stops the fungus from multiplying.

(ii) Reproduction in *Hydra* takes place through a process called budding. It occurs as follows:

(1) Budding: In *Hydra*, a bud forms as an outgrowth from a specific site on the parent's body. This happens due to repeated cell division at that particular spot.

(2) Development of Bud: The bud grows into a small, fully-formed individual while still attached to the parent. Over time, it develops all the necessary structures to function as an independent organism.

(3) Separation: Once the bud matures, it detaches from the parent and becomes a new, independent *Hydra*.



Budding in *Hydra*

3. (i) Spores are tiny, reproductive cells that can grow into new individuals under suitable conditions. In the case of fungi, spores are formed in sporangia, which are specialized structures that look like small blobs on a stick.

Spores have thick walls that protect them from harsh environmental conditions, such as dryness or temperature extremes. This protection allows them to survive until they come into contact with a moist surface, where they can begin to grow and develop into new *Rhizopus* individuals. The organism that multiplies using spores in this manner is *Rhizopus*, commonly known as bread mould.

Sporangium multiplies with the help of spores.

(ii) Two reasons why some plants are grown by vegetative propagation:

(1) Slow Germination and Maturation of Seeds: For certain plants, seeds take a long time to germinate and mature. Vegetative propagation allows for faster growth and earlier production of flowers and fruits. Sugarcane and potato are examples where vegetative propagation is preferred for quicker harvests.

(2) Retention of Parent Plant Characteristics: Vegetative propagation ensures that specific characteristics of the parent plant, such as fruit quality, flower colour, or disease resistance, are retained in the new plants. This is especially important for maintaining desirable traits in plants like roses or grapes.

Two methods used to grow plants vegetatively:

(1) Layering: A method where a stem or branch of the plant is bent down to the ground and

covered with soil. It develops roots and can later be separated to grow as a new plant.

(2) **Grafting:** A technique where a part of one plant (called the scion) is joined with a part of another plant (called the rootstock), allowing them to grow together as one plant. This is commonly used in fruit tree cultivation.

4. (i) **A:** Pollen grain (containing the male gamete or sperm).

B: Pollen tube (the tube that grows from the pollen grain after it lands on the stigma and travels down the style toward the ovary.)

C: Female germ cell (egg cell) (Located inside the ovule within the ovary.)

When the pollen tube (B) reaches the female germ cell (C) in the ovule, fertilisation occurs. This fusion of the male and female gametes forms a zygote, which will develop into an embryo.

Significance of this Event:

- Fertilisation is essential for the formation of seeds. The zygote formed after fertilisation will develop into a seed containing the genetic material from both parents, ensuring genetic diversity and the continuation of the plant species.

(ii) After fertilisation, several changes occur in the flower. The zygote divides to form an embryo within the ovule, which develops a tough outer coat and becomes a seed. The ovary grows and ripens into a fruit, which protects the seeds. Meanwhile, the petals, sepals, stamens, style, and stigma wither and fall off, as they are no longer needed. The process of seed formation ensures protection, dispersal, and dormancy, and it contributes to genetic diversity. When conditions are right, the seed undergoes germination, where the embryo develops into a new plant.

5. (i) **(1)** The ovaries are responsible for the maturation of eggs.

(2) The fusion of the egg and sperm occurs in the fallopian tubes.

(3) The implantation of the zygote takes place in the lining of the uterus.

(ii) **(1)** When the egg is fertilised, the zygote travels to the uterus and implants in the thickened uterine lining, which has become rich in blood to support the growing embryo. The placenta forms, a disc-like structure that attaches to the uterine wall. The placenta provides nutrients and oxygen from the mother's blood to the embryo and removes waste products from the embryo's blood. This exchange happens through the villi in the placenta. The embryo develops inside the uterus for about nine months, and the baby is born as a result of rhythmic contractions of the uterine muscles.

(2) If the egg is not fertilised, it survives for about one day. The uterus still prepares itself monthly to receive a fertilised egg, making the lining thick and spongy. Since fertilisation did not occur, the uterine lining is no longer needed. It slowly breaks down and is shed through the vagina as blood and mucous. This process is called menstruation, and it typically lasts for about two to six days.

6. (i) **(1)** **Unisexual Flowers:** A flower that possesses either stamens or carpels but not both are called unisexual flowers. Examples include papaya, watermelon, etc.

(2) **Bisexual Flowers:** A flower that possesses both stamens and carpels. Examples include mustard, Hibiscus, etc.

(ii) **A:** Pollen grain

B: Stigma

C: Pollen tube

D: Female germ-cell

(iii) Pollination is the process by which pollen is transferred from the male part of a flower (anther) to the female part (stigma). This process can occur without fertilisation because pollination merely involves the transfer of pollen. Whereas, fertilisation is the process that occurs after pollination when the pollen grain germinates on the stigma, and the pollen tube grows down the style to reach the ovule in the ovary. The sperm cells travel through the pollen tube to fuse with the egg cell, leading to the formation of a zygote. Therefore, pollination is a prerequisite for fertilisation as it enables the sperm to reach the egg. Without pollination, the pollen would not reach the stigma, and fertilisation would not occur.

7. (i) The parts of a bisexual flower that are not directly involved in reproduction are:

- **Petals:** They attract pollinators through their colour and scent, but do not play a direct role in fertilisation.
- **Sepals:** They protect the flower bud before it opens, ensuring the flower remains safe during development but do not directly participate in reproduction.

(ii)

Self Pollination	Cross Pollination
This occurs when the pollen from the same flower or from a flower on the same plant fertilises the egg. The pollen is transferred from the stamen to the stigma of the same flower or another flower on the same plant.	This occurs when pollen is transferred from the stamen of one flower to the stigma of a different flower, either on the same plant or a different plant. This transfer is usually facilitated by external agents like wind, water, or animals.

Significance of Pollination:

(1) **Genetic Diversity:** Cross-pollination promotes genetic variation, which helps plants adapt to different environmental conditions.

(2) **Seed and Fruit Formation:** Pollination is essential for fertilisation, leading to the formation of seeds and fruits, ensuring the continuation of plant species.

(iii) After fertilisation, the ovule develops a tough coat and is gradually converted into a seed. Whereas, the ovary grows rapidly and ripens to form a fruit.

8. (i) (1) **Regeneration:** Many fully differentiated organisms have the ability to give rise to new individual organisms from their body parts, i.e., if the individual is somehow cut or broken up into many pieces, many of these pieces grow into separate individuals. For example, *Hydra* has the ability to regenerate lost body parts. If the *Hydra* is cut into pieces, each piece can regenerate the missing parts and grow into a new, complete individual. This process occurs because of specialised cells that proliferate and differentiate into various cell types, helping to rebuild the missing structures.

(2) **Budding:** Organisms such as *Hydra* use regenerative cells for reproduction in the process of budding. In *Hydra*, a bud develops as an outgrowth due to repeated cell division at one specific site. These buds develop into tiny individuals and when fully mature, detach from the parent body and become new independent individuals.

(ii) Vegetative propagation is a form of asexual reproduction in plants where new plants grow from parts of the parent plant such as roots, stems, or leaves. This can occur naturally or artificially through various methods like cuttings, grafting, layering, and tissue culture.

The two advantages of growing plants by vegetative propagation are:

(1) **Faster Flowering and Fruiting:** Plants raised through vegetative propagation, such as sugarcane, roses, or grapes, can bear flowers and fruits earlier than those grown from seeds. This leads to quicker yields, which is beneficial for agricultural purposes.

(2) **Genetic Uniformity:** Since vegetative propagation produces genetically identical plants to the parent, all new plants will have the same desirable characteristics, such as fruit quality or flower colour.

9. (i) (1) When the leaves of *Bryophyllum* fall on the soil, the buds produced in the notches along the leaf margin develop into new plants. These buds, after falling, take root in the soil and grow into independent, complete plants. The mode of reproduction in *Bryophyllum* is asexual reproduction through vegetative propagation.

(2) When *Planaria* is cut into many pieces, each piece has the ability to regenerate and grow into a complete organism. This process, known as regeneration, involves specialised cells that divide and proliferate. These cells then differentiate into various cell types and tissues, forming the missing parts and eventually developing into a fully functional organism. The mode of reproduction in *Planaria* is asexual reproduction through regeneration.

(3) The sporangia of *Rhizopus* release spores when they mature. These spores are protected by thick walls until they find a suitable, moist surface to grow. The spores germinate and develop into new *Rhizopus* individuals, all of which are genetically identical to the parent. This type of reproduction is asexual reproduction through spore formation.

(ii) Once fertilisation takes place in a flower, several changes occur which are as follows:

(1) **Zygote formation:** The male germ-cell (pollen) fuses with the female gamete (egg cell) in the ovule to form a zygote.

(2) **Embryo development:** The zygote divides and develops into an embryo inside the ovule.

(3) **Ovule to seed:** The ovule undergoes changes and develops a tough outer coat, gradually turning into a seed.

(4) **Ovary to fruit:** The ovary swells and ripens to form a fruit that contains the seeds.

(5) **Other parts of the flower:** The petals, sepals, stamens, style and stigma may shrivel and fall off, as they are no longer needed for reproduction.

10. (i) Inheritance involves the transmission of genetic information from parents to offspring through genes. Genes code for proteins, which are responsible for various structural and functional aspects of an organism's body. Variations in the genes inherited can lead to differences in the types and functions of proteins produced, resulting in altered body designs.

(ii) Pollination is the transfer of pollen from the male anther to the female stigma of a flower. This process is essential for fertilisation because it allows the male gametes (sperm cells) contained within the pollen to reach the female ovules (egg cells). Without pollination, the male and female gametes cannot come into contact, preventing the fusion of their nuclei and thus fertilisation cannot occur.

(iii) Fragmentation and regeneration are specific forms of asexual reproduction that are feasible

in certain simple multicellular organisms, such as some invertebrates and lower plants. However, most multicellular organisms, especially more complex ones like mammals, birds, and many plants, do not have the capability to reproduce or regenerate complete individuals from fragments due to their specialised and differentiated cells and tissues.

(iv) Vegetative propagation is particularly effective for plants that can reproduce through their vegetative parts like stems, roots, or leaves. It is commonly used to grow plants that do not produce viable seeds, have slow germination, or where maintaining the genetic consistency of the offspring is desired. Examples include banana, orange, rose, jasmine, etc.

(v) During sexual reproduction, gametes (sperm and egg cells) are produced through meiosis, which halves the chromosome number, i.e., 23. When fertilisation occurs, the fusion of these haploid gametes restores the diploid chromosome number, i.e., 46 in the offspring. This ensures that the offspring have the same chromosome number as their parents, maintaining the offsprings chromosomal integrity across generations.