REPRODUCTION

14.1 Reproduction

14.2 Asexual Reproduction

Q.1: Define reproduction. Describe its importance and types.

Ans. Reproduction:

Learning Outcomes
- Define reproduction and describe its importance.

Reproduction is the process by which organisms produce new organisms of their own kind.

Importance of Reproduction:

1. Through reproduction, organisms continue the existence of their species.
2. Reproduction ensures that there is competition among organisms.

An individual can live without reproducing, but a species cannot survive without reproduction.

3. Only the individuals with better characteristics survive and reach the reproductive age.
4. Reproduction ensures that the advantageous characteristics are transmitted to the next generation.

Types of Reproduction:

There are two basic types of reproduction.

- Asexual Reproduction
- Sexual Reproduction

Asexual Reproduction:

It is the type of reproduction which does not involve the fusion of gametes.

Importance of Asexual Reproduction: The offspring produced by asexual reproduction are genetically identical to the parents.

Sexual Reproduction:

It is the type of reproduction which involves the joining (fusion) of male and *female* gametes.

Importance of Sexual Reproduction: In sexual reproduction, the offsprings have variations among themselves and with the parents.

Q.2: Write a *note on different* methods of asexual *reproduction in different* organisms.

Ans. Methods of Asexual Reproduction:

Different organisms use different methods for asexual reproduction. The following

are some common methods of asexual reproduction.

1. Binary Fission (Prokaryotes, Protists, Animals)
2. Multiple Fission (Protists)
3. Fragmentation (Animals)
4. Budding (Yeast, Hydra)
5. Spore formation (Fungi)
6. Parthenogenesis (Animals)

1. Binary Fission (Prokaryotes, Protists, Animals):

It is form of asexual reproduction in which the organism divides into two.

Learning Outcomes

- Describe the types (methods) of asexual reproduction in bacteria, protists, fungi, plants and animals.
- Distinguish between vegetative propagation and artificial propagation.
- Explain vegetative propagation in plants.
- Describe the two methods of artificial vegetative propagation.
- Rationalize how parthenogenesis is a type of asexual reproduction.
- Define cloning.

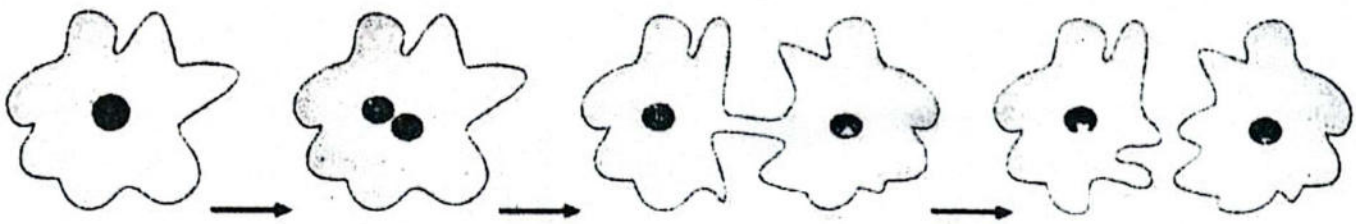
i. Binary Fission in Prokaryotes:
Prokaryotes (bacteria) usually reproduce by binary fission. During this process, their DNA replicates. The two daughter DNA molecules move apart. Finally, the cell membrane pinches in to form two identical daughter bacteria.

ii. Binary Fission in Protists: Many protists (unicellular eukaryotes e.g. Amoeba, Euglena etc.) also reproduce asexually by binary fission. In protists, the nucleus of parent organism divides into two. This is followed by the division of cytoplasm. So, two daughter protists of equal size are formed.

(a) Binary fission in bacteria:

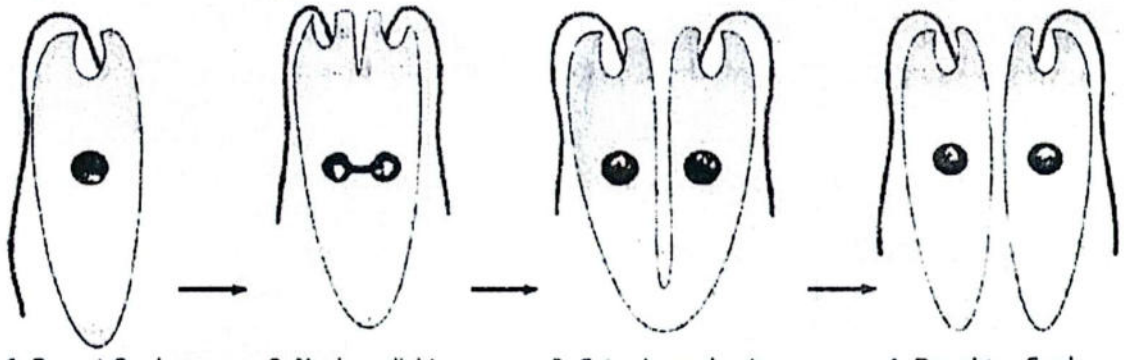
1. Parent Bacterium → 2. DNA replicates → 3. Cell membrane pinches in → 4. Daughter Bacteria

(b) Binary fission in Amoeba:



1. Parent *Amoeba* → 2. Nucleus divides → 3. Cytoplasm divides → 4. Daughter *Amoebae*

(c) Binary fission in Euglena:

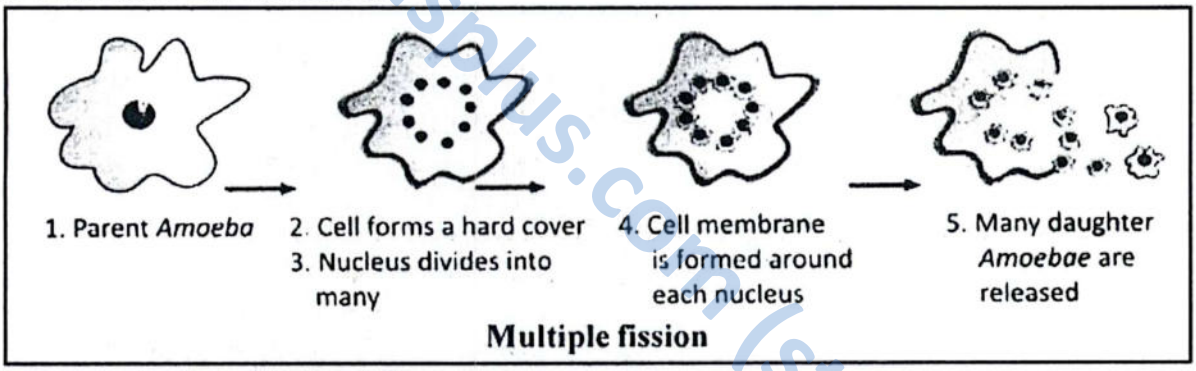


Binary fission in prokaryotes and protists

iii. **Binary Fission in Animals:** Some multicellular animals e.g. Planarians also reproduce asexually by binary fission.

2. Multiple Fission (Protists):

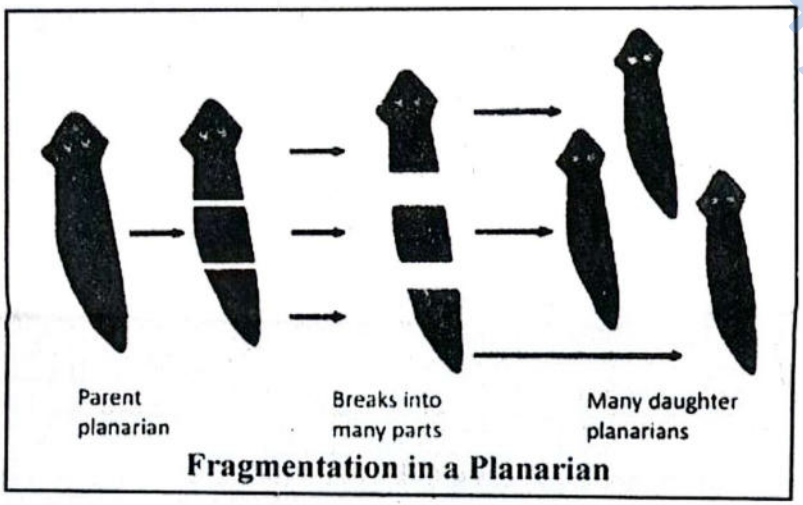
Some unicellular eukaryotes (e.g. Amoeba) also reproduce by multiple fission. In this method, Amoeba forms a hard covering over its cell. Its nucleus divides into many nuclei. Cell membrane is formed around each daughter nucleus. So, many daughter amoebae are formed. The hard covering and cell membrane of parent amoeba break and daughter amoebae are released.



Multiple fission

3. Fragmentation (Animals):

In this method, the body of the organism breaks into many parts (fragments). Each part develops into the new organism. It occurs in fungi and many small animals like planarians.

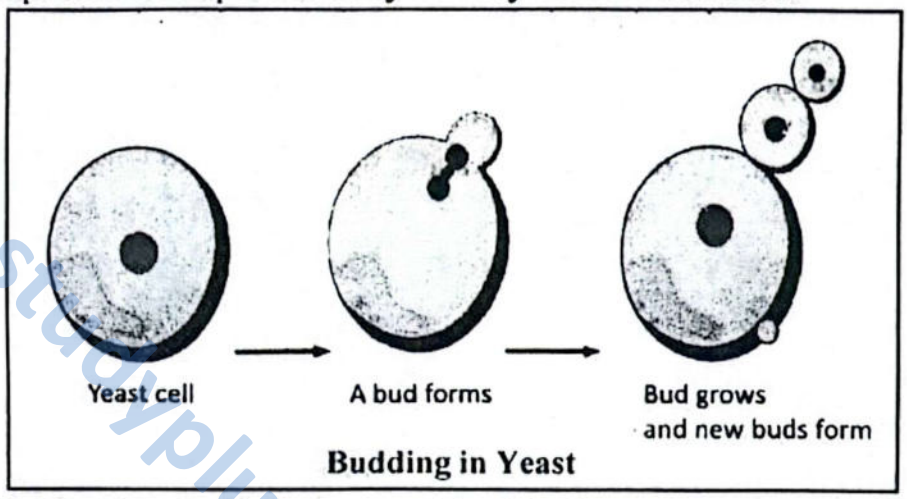


Fragmentation in a Planarian

4. Budding (Yeast, Hydra):

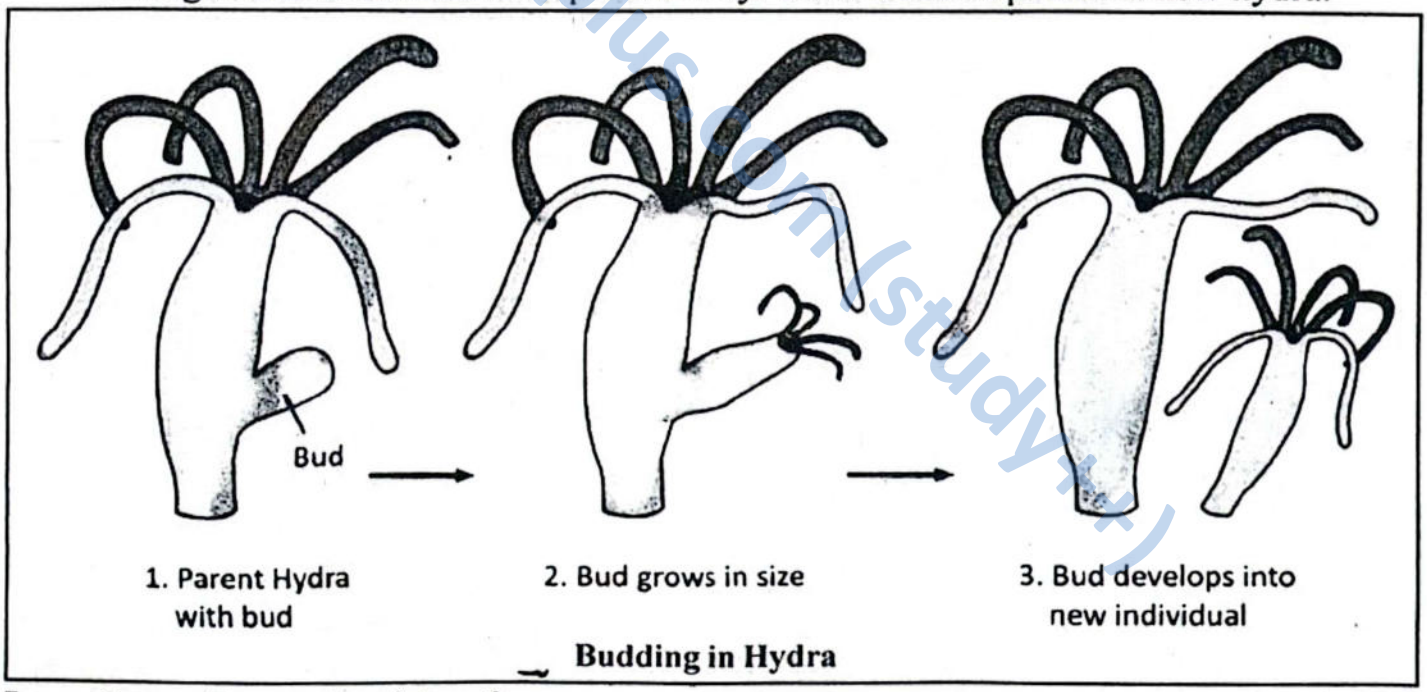
Budding is a method of asexual reproduction in which a part of the parent organism grows out from its body. This part is called a bud. It continues growing and develops into the new organism. This method is very common in yeast (a unicellular fungus) and in some animals like hydra (a freshwater invertebrate).

i. **Budding in yeast:** In case of yeast, a small bud is formed on one side of cell. The bud may separate from parent body or may remain attached.



Budding in Yeast

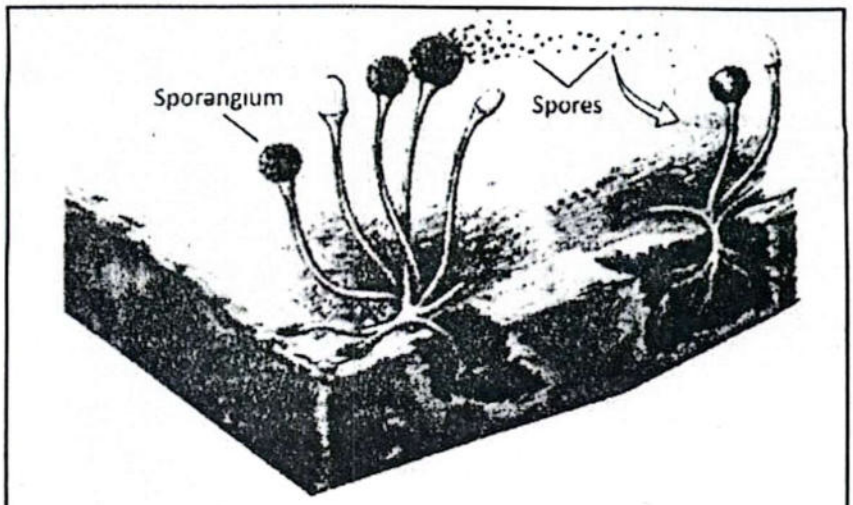
ii. **Budding in Hydra:** In hydra, a small bud is formed on the side of body. This bud enlarges and breaks from the parent body. Then it develops into a new hydra.



Budding in Hydra

5. Spore Formation (Fungi):

Most fungi (e.g. Rhizopus: bread mold) reproduce asexually by producing spores. Spores are thick walled asexual reproductive cells. They are produced in special sac-like structures *called* **sporangia** (Singular: sporangium). When sporangium bursts, its spores are released. Spores can tolerate unfavourable conditions due to their thick walls. When favourable conditions are available, the spores germinate to produce new fungus.



Asexual reproduction by spores (in Rhizopus)

During harsh conditions, some bacteria can form thick-walled spores inside their cell. These are called endospores. The harsh conditions may destroy the parent cell, but the endospore can survive. When good conditions return, the endospore gives rise to a new bacterium.

The improperly sterilized canned foods may contain endospores of bacteria. These endospores may make new bacteria inside can. The bacteria make toxins, which can cause nerve diseases.

6. Parthenogenesis (Animals):

It is special type of asexual reproduction in some animals. Parthenogenesis is defined as the development of unfertilized egg cell into new organism. In parthenogenesis, female animals make gametes (egg cells) but there is no fertilization (fusion of gametes). The unfertilized egg develops into new animal. For example; in honeybees the fertilized eggs develop into females, but unfertilized eggs develop into males.

Q.3: What do you mean by natural vegetative propagation? Write various methods of natural vegetative propagation.

Ans. Vegetative Propagation (Plants):

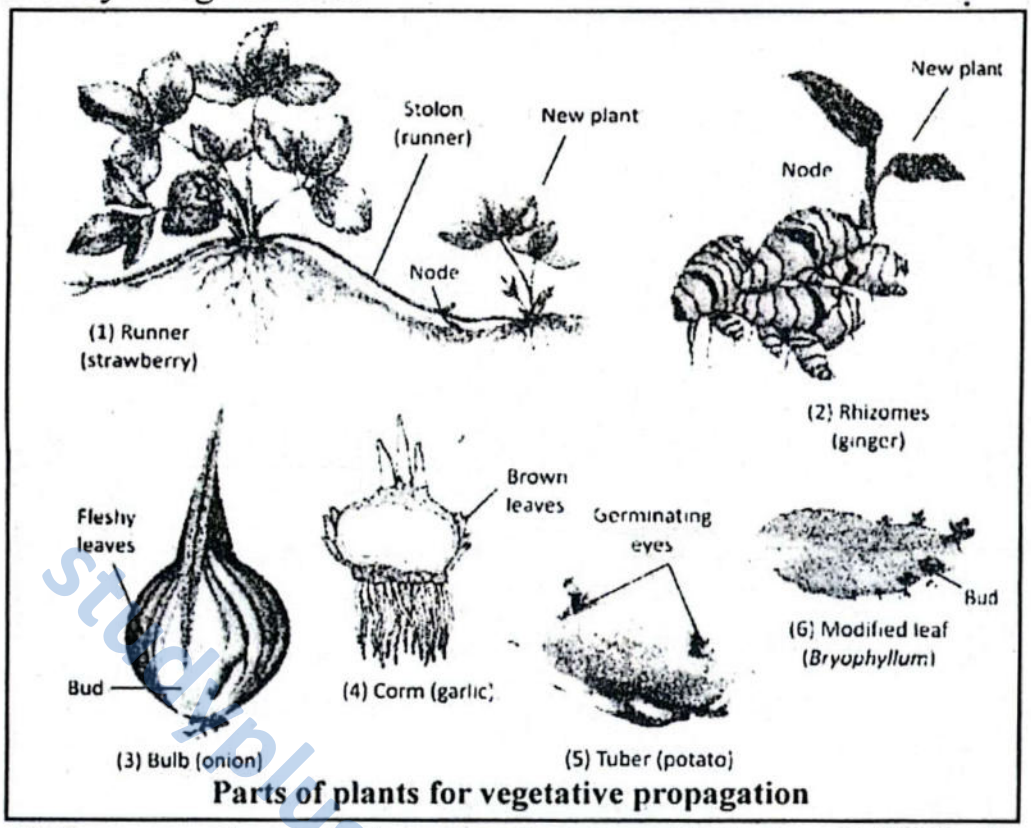
Many plants reproduce asexually by using their vegetative parts (stems, roots, leaves). It is called vegetative propagation. It occurs naturally, and can also be brought about artificially.

Methods of Natural Vegetative Propagation:

Many plants have modified many vegetative parts (especially stem) for asexual reproduction. Vegetative propagation occurs naturally in several ways:

1. **Stolon (runner):** It is a horizontal, above-ground stem. It produces leaves and roots at its nodes. A new plant can grow from each node. Strawberry *reproduces* by using its stolon.
2. **Rhizome:** It is a horizontal, below ground stem. It produces leaves and roots at its nodes. A new plant can grow from each node. Ferns, ginger, and sugarcane

reproduce by using rhizome.



Parts of plants for vegetative propagation

3. **Bulb:** It is a very short, underground stem with bud and fleshy leaves. Bulbs produce new plants. Tulips, onions and lilies reproduce by bulbs.
4. **Corm:** It resembles a bulb but does not have fleshy leaves. Almost all of a corm consists of stem, with brown non-functional leaves on the outside. Dasheen and garlic reproduce by corms.
5. **Tuber:** It is an underground, swollen, fleshy stem with food storage. It has "eyes" which are actually its buds. Eyes can grow into new plants. Potatoes reproduce by tubers.
6. **Modified Leaf:** The leaves of some plants (e.g. Bryophyllum) are modified for vegetative propagation. Such leaves have buds at their margins. When leaf falls on ground, the buds grow into new plants.

Q.4: Write a note on artificial vegetative propagation. Also describe its advantages and disadvantages.

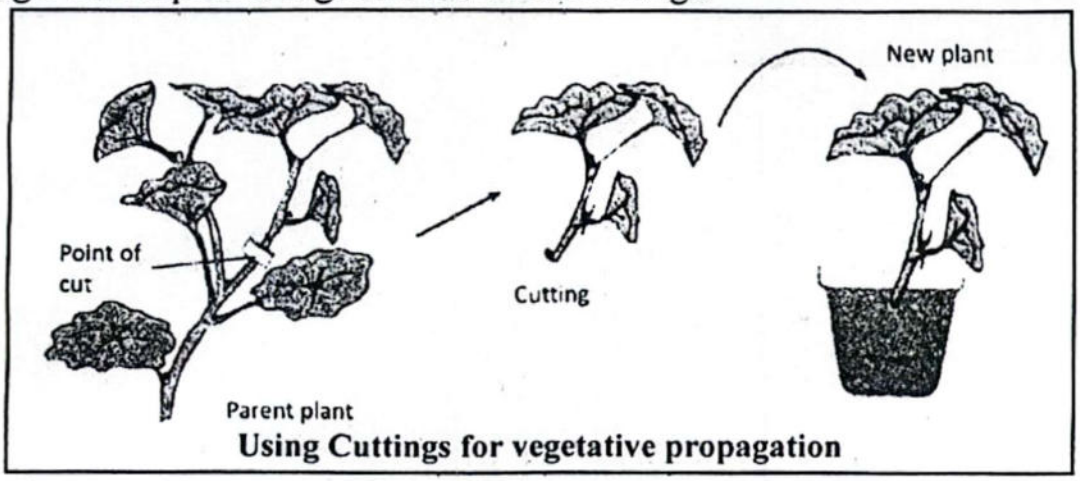
Ans. Artificial Vegetative Propagation:

In artificial vegetative propagation, humans use other vegetative parts, such as roots, for producing plants. These methods include layering, grafting, and using cuttings.

1. Cuttings:

In some plants, a piece of a stem can form new roots. Similarly, a piece of a root can form a new shoot. Such pieces of stems and roots that are cut from a plant and used to grow new plants are called **cuttings.** Cuttings are widely used to grow houseplants, ornamental trees and shrubs, and some fruit crops. Roses and grapevines are grown from

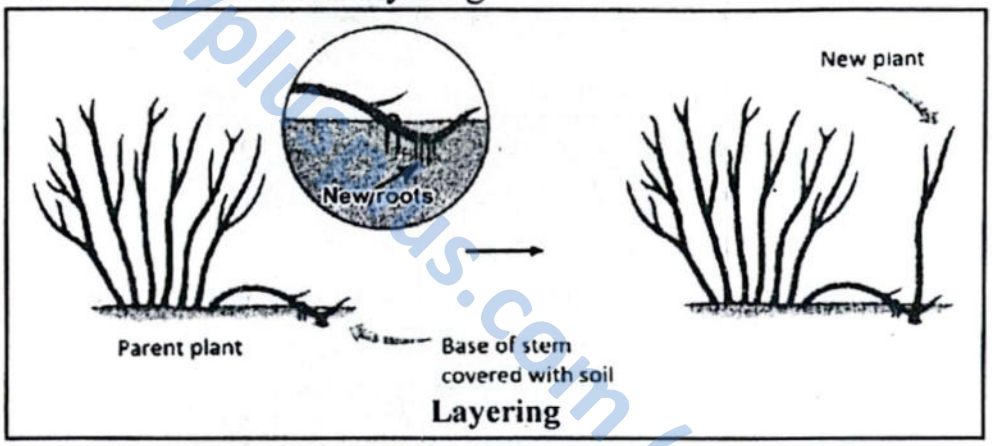
stem cuttings. Sweet potato is grown from root cuttings.



Using Cuttings for vegetative propagation

2. Layering:

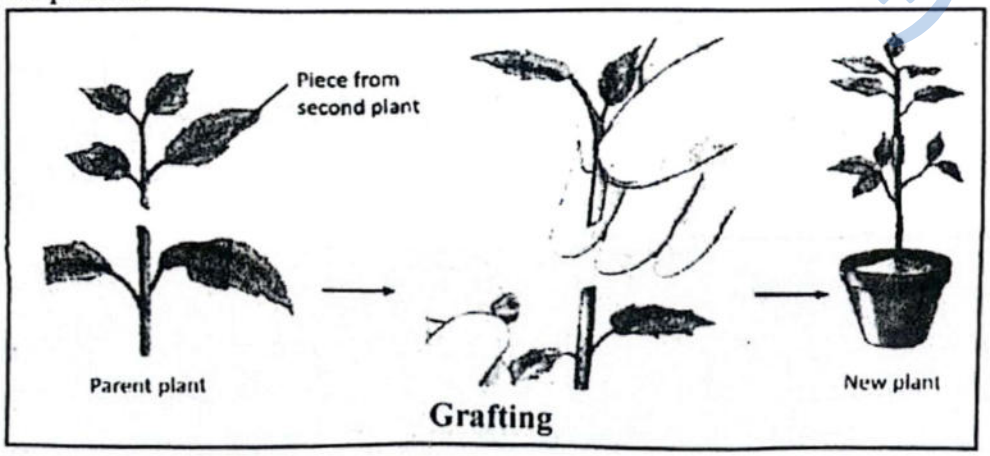
In some plants, e.g. raspberries, the stem can form root at the points where they make contact with the soil. People can cover the bases of such stems with soil. New roots are formed from the part of stem covered with soil. So, new plant is grown. The process of forming roots on a stem is called layering.



Layering

3. Grafting:

Grafting is the joining of two or more plant parts to form a single plant. In grafting, a bud or small stem of one plant is attached to the root or stem of a second plant. Grafting enables to combine the beneficial characteristics of two plants. This method is used to grow many commercial fruit trees (e.g. almond, plum, cherries etc.) and ornamental plants.

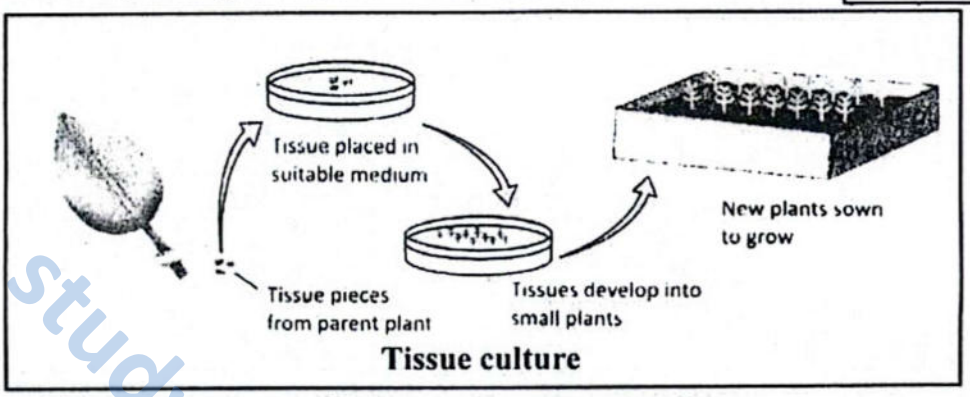


Grafting

4. Tissue Culture and Cloning:

Cloning in plants means the production of identical copies of a plant by using its tissues or cells. Tissue culture is the technique for cloning. In this technique, plant tissues are placed in a suitable medium. The tissues develop into small plants. The new plants are sown in soil where they grow. Tissue culture is used for the production of orchids, fruit plants, and ornamental plants.

In plant cells, all the genes needed to produce a new plant, are functional. Thus, it is possible for a single cell to grow into a whole plant.



Tissue culture

Advantages and Disadvantages of Vegetative Propagation

Advantages: Vegetative propagation helps to produce a large number of plants in less time. The plants produced through vegetative propagation are similar to the parent plant and are also identical to each other. So, the advantageous characteristics of plants are transmitted to the next generation.

Disadvantage: The plants produced by vegetative propagation lack genetic variations. All new plants are identical. Thus, they have the same tolerance to an environment and can be attacked by the same diseases and pests.

14.3 Sexual Reproduction in Plants

Q.5: Describe sexual reproduction in plants by explaining sporophyte and gametophyte and their roles in life cycle of plants.

Ans. Sexual Reproduction in Plants:

During sexual reproduction, the male and female gametes fuse with each other and produce zygote. The zygote then develops into offspring.

In the life cycle of the major plants, two different generations are involved.

- Sporophyte generation
- Gametophyte generation

Sporophyte generation:

It is the spore producing generation.

Gametophyte generation:

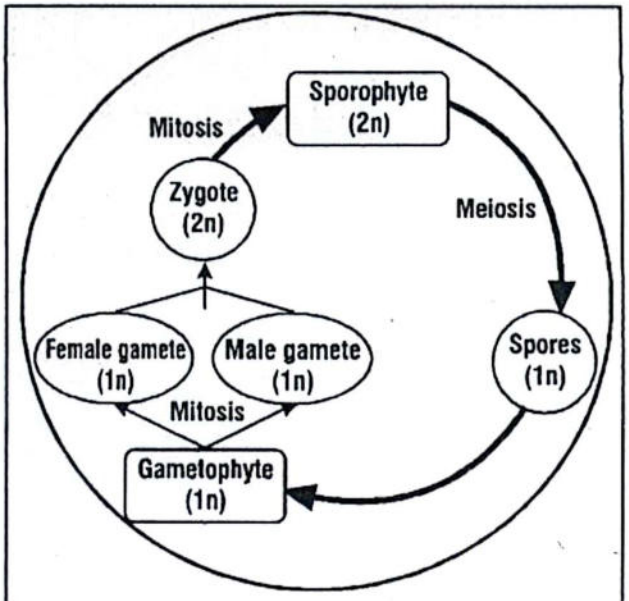
It is the gamete producing generation.

Learning Outcomes

- Describe sexual reproduction in plants by explaining the life cycle of a flowering plant.
- Describe the adaptations in the structure of wind-pollinated and insect-pollinated flowers.
- Describe the structure of seed.
- Distinguish between epigeal and hypogeal germination.
- Describe the conditions necessary for germination of seeds.
- State the contributions of Theophrastus in the discovery of sex in plants.

Alternation of Generation:

Sporophyte generation and gametophyte generation alternate each other i.e. the sporophyte develops into gametophyte and gametophyte develops into sporophyte. This type of life cycle is called alternation of generations.



Alternation of generations in plants

Explanation:

The sporophyte generation is diploid (2n) and produces haploid (In) spores by meiosis. The spores develop into haploid gametophyte generation. The gametophyte produces haploid gametes by mitosis. The haploid gametes fuse to form diploid zygote, which develops into the next sporophyte generation.

Theophrastus was a Greek philosopher of the period 371-287 BC. He wrote two important series of books. He described the parts of plants and their methods of reproduction. He was the first philosopher, who discovered the male and female reproductive parts of flower.

Q.6: Describe the parts of a flower.

Ans. Parts of a flower:

A flower is actually a specialized branch. Its parts are specialized leaves, which are present on the swollen tip of a "branch" or receptacle.

Many flowers have bright colours, attractive shapes, and pleasing aromas. Due to these characteristics, animals are attracted towards flowers. These animals transfer pollen grains from one flower to the other. In this way, they help flowers in sexual reproduction

Whorls: Flower parts are in the form of four whorls.

Sepals: Sepals make the outermost whorl (Calyx). Sepals are usually green. They protect the inner parts of a flower before it opens.

More than one carpel fuse together and make up the structure called pistil.

Petals: Petals make the next whorl (Corolla). Most flowers have colored petals.

The two inner whorls contain the reproductive structures.

Androecium: The androcium is the third whorl of the flower that contains the male reproductive structures called stamens.

Stamen: Each stamen consists of an anther and a filament.

Anther: Anther contains pollen sacs (microsporangia), in which microspores are produced.

Filament: The stalk-like filament supports the anther.

Gynoecium: *The innermost whorl is called gynoecium.*

Carpels: Gynoecium contains the female reproductive structures, which are called carpels.

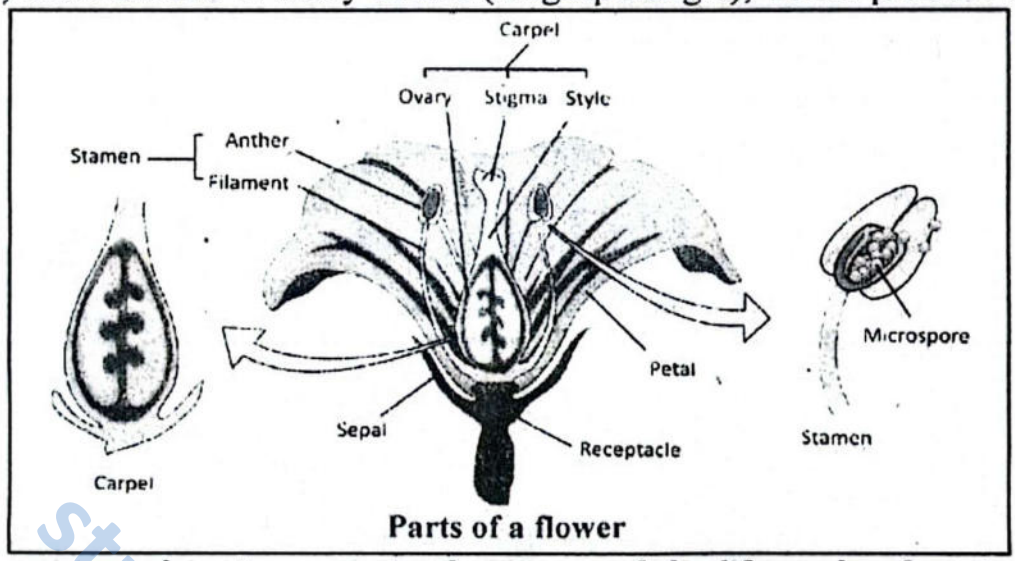
Parts of carpels: The carpels have three parts:

(i) Ovary: It is the enlarged base of a carpel.

(ii) Style: It is stalk-like part of a carpel.

(iii) Stigma: The tip of the carpel is called stigma.

Inside ovary, there are one or many ovules (megasporangia), which produce megaspores.



Parts of a flower

Q.7: Write a comprehensive note on the stages of the life cycle of angiosperms.

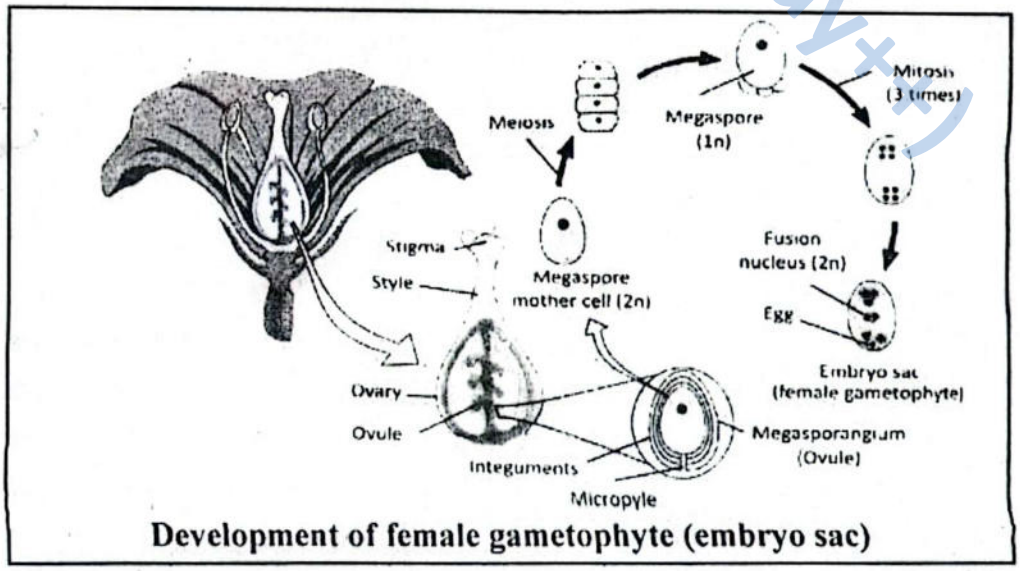
Ans. Stages of Life cycle of Angiosperms:

The stages of life cycle of angiosperms are as follows:

1. Development of Gametophytes
2. Pollination
3. Fertilization
4. Seed and Fruit Formation
5. Development of new sporophytes

Stage 1- Development of Gametophytes: In angiosperms, gametophytes develop within flowers. The female gametophytes are called **embryo sacs**. They are made from megaspores. The male gametophytes are called **pollen grains**. They are made from microspores.

Development of Embryo Sac: The ovule present in the ovary is the megasporangium. It contains a diploid **megaspore mother cell.** It undergoes meiosis and produces four haploid **megaspores** out of which only one remains alive. Inside megaspore, eight haploid nuclei are formed by mitosis. Two nuclei migrate to the center and fuse to form a fusion nucleus. One nucleus out of the remaining six forms the **egg cell.**

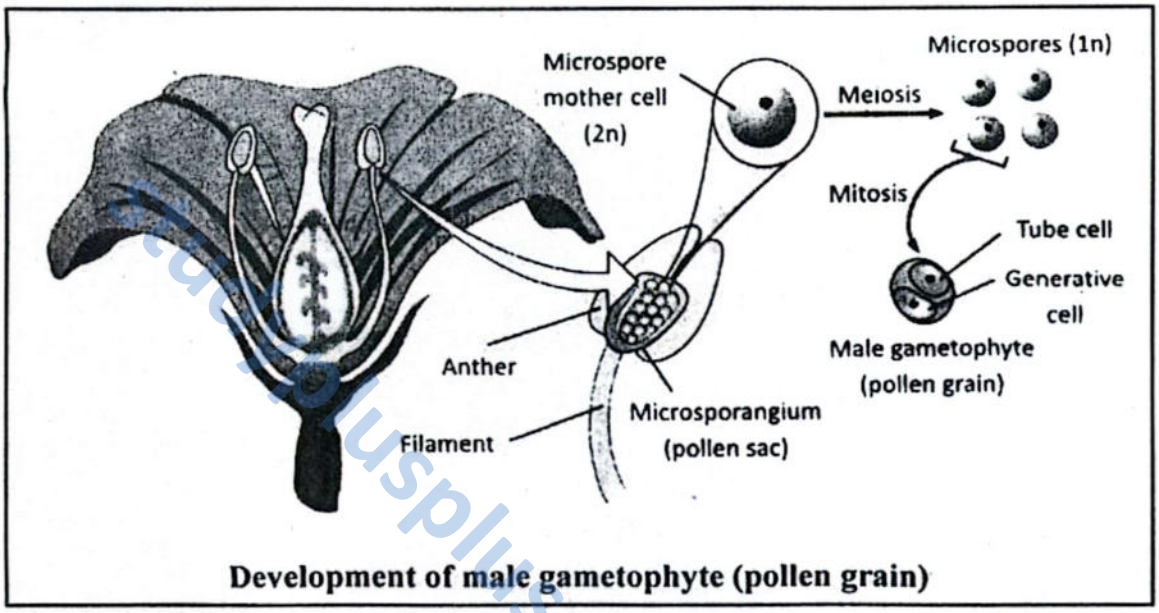


Development of female gametophyte (embryo sac)

The resulting structure is the embryo sac. It contains seven cells (an egg cell, five non-functional cells, and a fusion nucleus).

Development of Pollen Grain:

An anther contains four microsporangia, or pollen sacs. Each pollen sac contains many diploid **microspore mother cells**. Each microspore mother cell undergoes meiosis and produces four haploid **microspores**. Each microspore undergoes mitosis. The resulting two-celled structure is a pollen grain, which is the male gametophyte. One cell in pollen grain is the **tube cell.** The other cell is the **generative cell**.



Development of male gametophyte (pollen grain)

Stage 2- Pollination:

The male gametophyte (pollen grains) contains sperms while the female gametophyte (embryo sac) contains egg. For the fertilization of egg, the pollen grains are transferred to the stigma. It is called pollination i.e. the transfer of pollen grains from an anther to a stigma.

Pollination that involves just one flower, or flowers on the same plant is called self-pollination. In contrast, pollination that involves two flowers of different plants of the same species is called cross-pollination.

Stage 3- Fertilization:

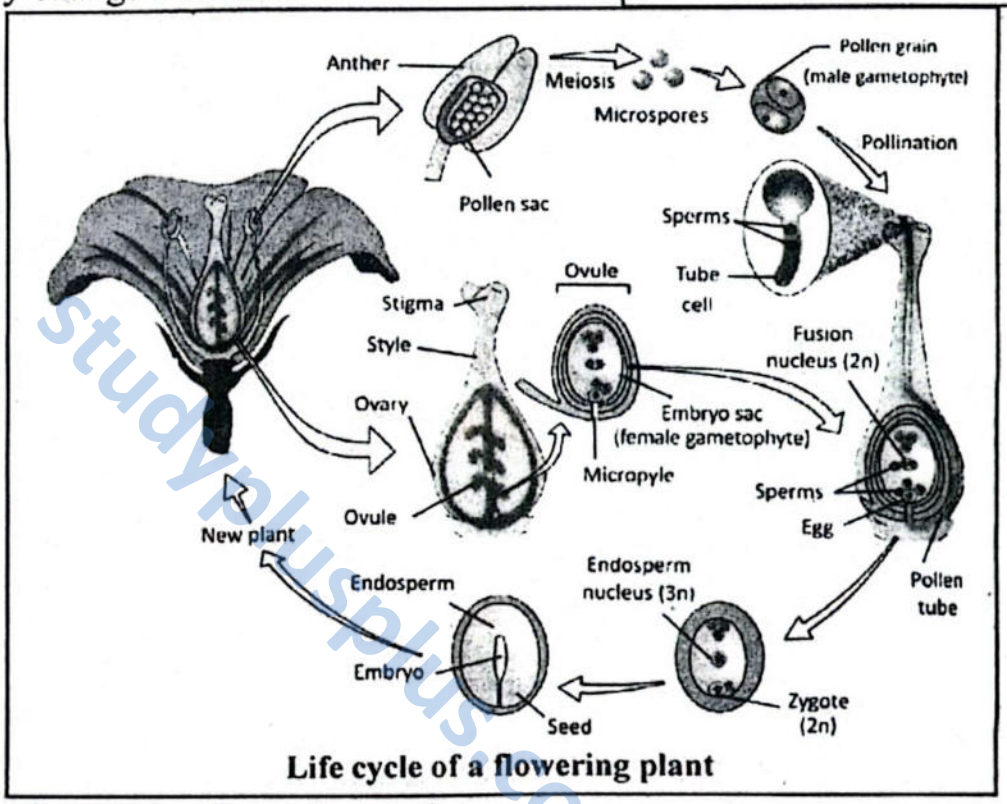
When pollen grain has reached the stigma, its tube cell forms a pollen tube that grows through the stigma and style towards the ovary. The pollen tube grows to the ovule and enters in it through the micropyle. The generative cell of pollen grain forms two sperms, which enter the embryo sac.

One sperm fuses with the egg, forming a diploid zygote. The zygote develops into an embryo. The second sperm fuses with the fusion nucleus, producing a triploid (3n) nucleus. This nucleus develops into a tissue called endosperm. The endosperm provides nourishment for the embryo. This process of the fusion of one sperm with the egg and the other with the fusion nucleus is called double fertilization. It is a unique characteristic of angiosperms.

Stage 4- Seed and Fruit Formation:

After double fertilization, zygote develops into embryo and the triploid nucleus develops into endosperm. After these developments, the matured ovule is called seed. During the same time, the walls of ovary change into fruit.

In some plants, ovaries develop into fruits without fertilization of egg in ovule. This process is known as parthenocarpy. It results in seedless fruits e.g. bananas and seedless varieties of grapes.



Life cycle of a flowering plant

Stage 5- Development of new Sporophytes:

When seeds mature, they are dispersed. If seeds get suitable conditions, their embryos develop into new plants (the sporophytes of the next generation).

Q.8: What do you know about insect-pollinated and wind-pollinated flowers?

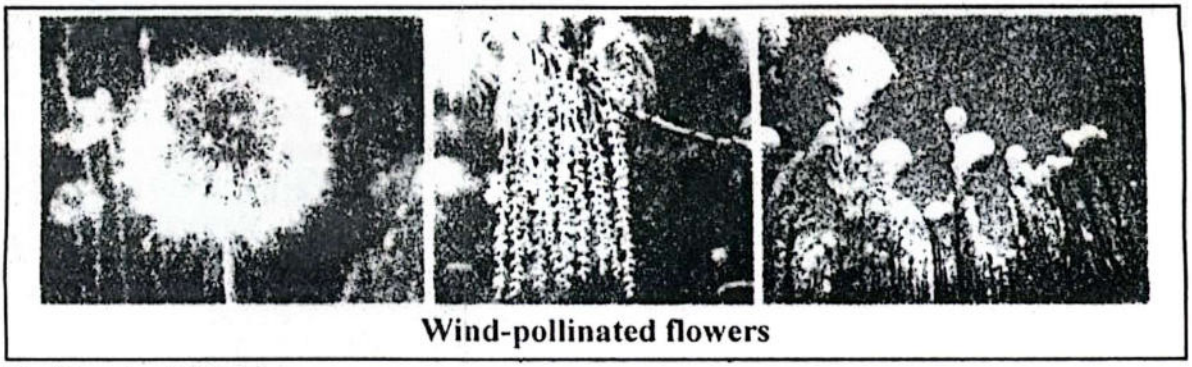
Ans. Insect-pollinated and Wind-pollinated Flowers:

In most land plants, cross-pollination is carried out by wind or insects. The wind- pollinated and the insect-pollinated flowers have different adaptations which help them in crosspollination.

In self-pollinated flowers, the petals completely enclose both the male and female flower parts.

Wind-Pollinated Flowers:

The wind-pollinated flowers (e.g. oak tree and grasses) are usually small and lack bright coloured petals and sepals. Successful wind pollination depends on four conditions: the release of large number of pollen grains, good circulation of air to carry pollen grains, nearness of other plants where the pollen grains can reach, and dry weather to ensure that pollen is not washed from the air by rain.



Wind-pollinated flowers

Insect-Pollinated Flowers:

The **insect-pollinated flowers** (e.g. rose, sunflower, orchid etc.) are colorful. They have colourful petals, distinctive odours and nectar (a solution of sugars) glands. Insects come to them to feed nectar.

Insect-pollinated flowers

Insect pollinators include bees, beetles, moths, butterflies, mosquitoes etc. When these insects gather nectar, pollen grains stick to their bodies. When they go to other plants to collect more nectar, they deposit pollen grains there.

Q.9: Describe structure of seed.

Ans. Structure of Seed:

The seed coat (testa):

It develops from the integument, present around the ovule. In some seeds, it is very thin (e.g. peanut) and in some seeds, it is thick and hard (e.g. coconut).

Function: It protects embryo from mechanical injury and from drying out.

Hilum: There may also be a scar on seed coat, called hilum. It is the point where the seed is attached to ovary wall (fruit).

Micropyle: There is a small opening, micropyle, at one end of hilum. This is the same micropyle through which the pollen tube enters ovule.

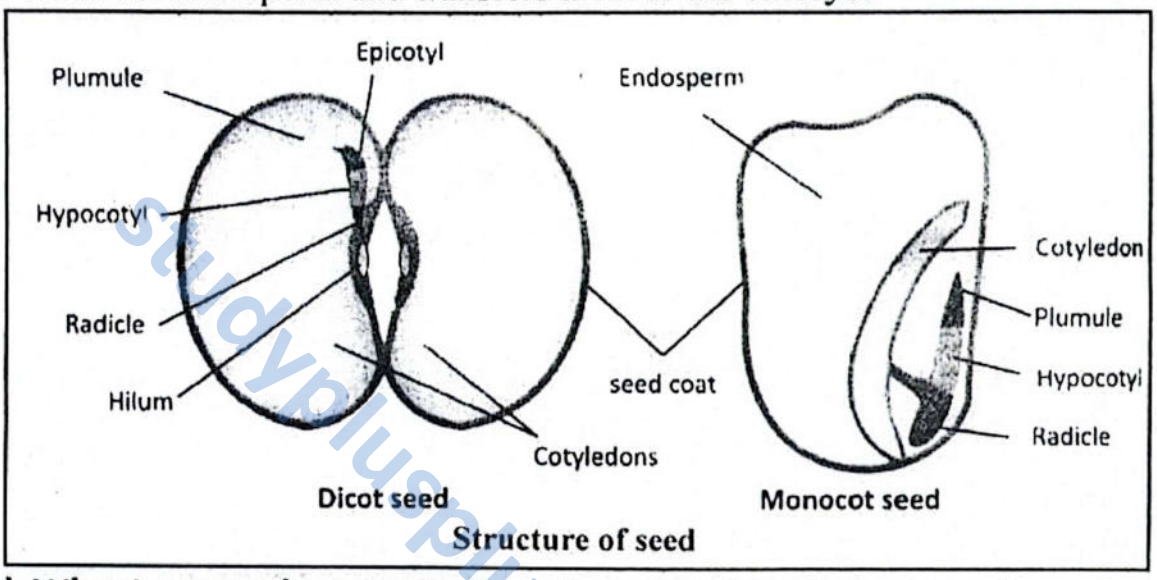
The Embryo: It is formed from zygote. The embryo consists of the following:

- Cotyledons
- Plumule
- Radicle

Recalling:
There are two groups of angiosperms i.e. dicots and monocots. Dicots have two cotyledons in their seeds while monocots have one cotyledon.

Cotyledons: In dicot seeds, there are two large, fleshy cotyledons while there is one cotyledon in monocot seeds.

Plumule: Plumule is attached with the cotyledons. The plumule is the tip of new shoot.
Radicle: Radicle is also attached with the cotyledons. The radicle is the tip of new root.
Epicotyle: The portion between the plumule and cotyledons is called epicotyl.
Hypocotyl: The portion between cotyledons and radicle is called hypocotyl.
The Endosperm: The endosperm tissue is formed from endosperm nucleus.
Function: It stores nutrients. A dicot seed has no endosperm. Its endosperm is absorbed by the fleshy cotyledons. The monocot seeds have endosperm. Their cotyledon absorbs nutrients from the endosperm and transfers them to the embryo.



Structure of seed

Q.10: (a) What is meant by germination of seed and seed dormancy?

Ans. Germination of Seed:

Germination of a seed means the development of the embryo of seed into a seedling.

Seeds do not usually germinate until the environmental conditions are favourable. Such seeds go through dormancy.

Dormancy: It is a state when there is reduced metabolism in seeds.

During dormancy, growth and development do not occur.

The delay of germination often assures the survival of a plant. For example, if seeds are in soil in fall season and they start germination immediately, the young plants could be killed by cold weather.

(b) Write down the steps of seed germination and what are types of germination?

Ans. Steps of Seed Germination:

The steps of seed germination are as follows:

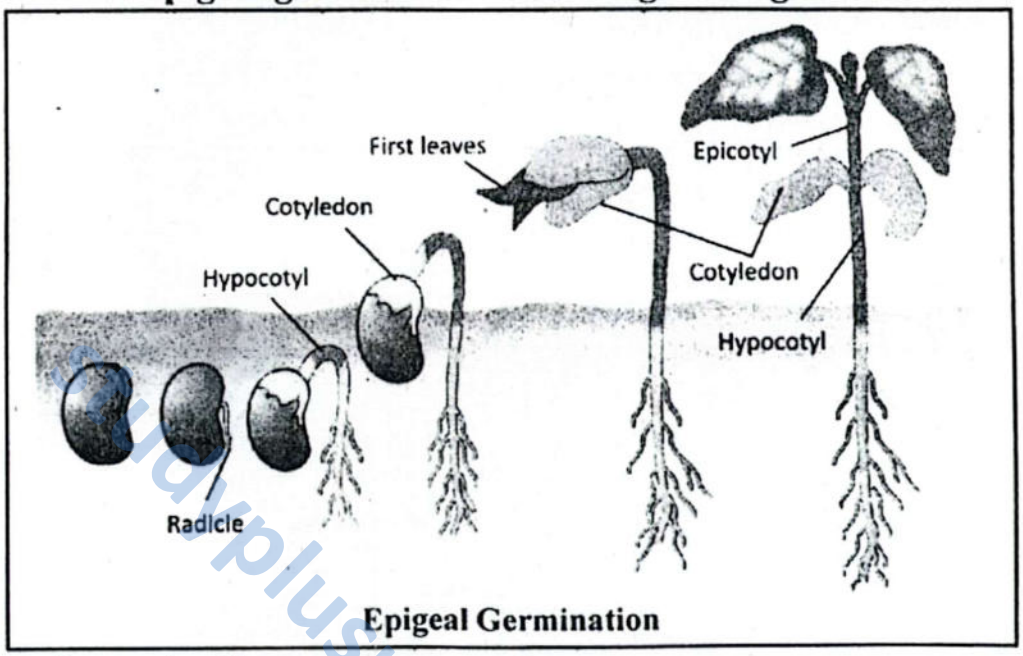
1. The seed germination starts with the absorption of water through the micropyle.
2. In the next step, the radicle of the seed emerges out and forms the first root.
3. After the radicle breaks the seed coat, the shoot begins to grow.

Types of germination:

The growth of shoot happens in two ways. Hence there are two types of germination.

1. Epigeal germination:

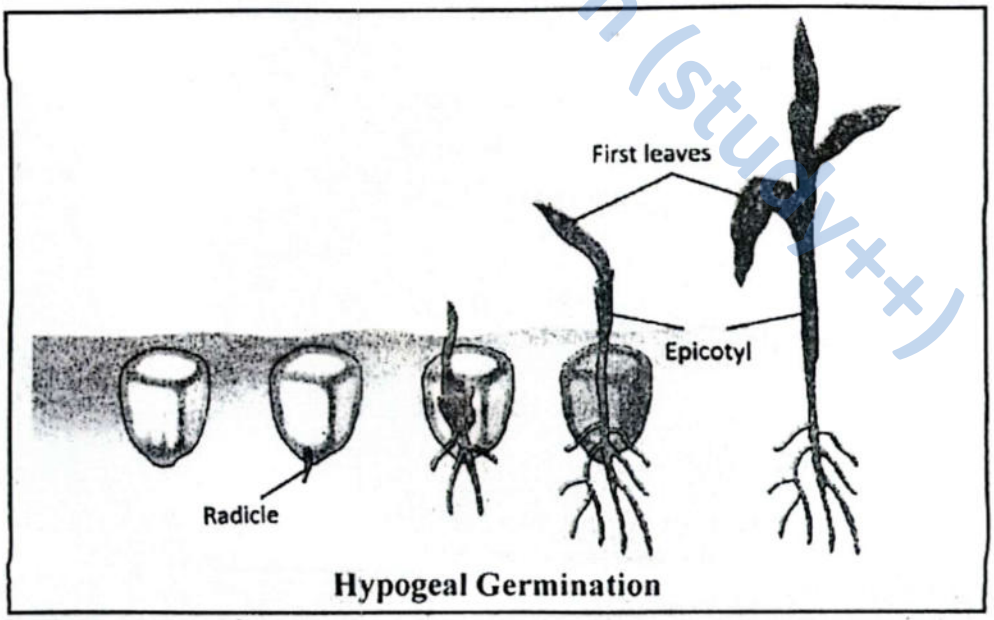
In some seeds (e.g. beans, cotton etc.), the hypocotyl curves and then straightens. Due to it, the cotyledons are pulled up into the air. New leaves are formed on the shoot. When they begin photosynthesis, the shrunken cotyledons fall off. This type of seed germination is called **epigeal germination** or **above-ground germination**.



Epigeal Germination

2. Hypogeal germination:

In some seeds (e.g. pea, corn), the cotyledon remains underground and transfers nutrients from the endosperm to the growing embryo. Their plumule comes out through the soil. This type of seed germination is called **hypogeal germination** or **under-ground germination.**



Hypogeal Germination

Q.11: Describe the conditions for seed germination.

Ans. Conditions For Seed Germination:

Environmental factors such as water, oxygen, and temperature, play important

roles during the germination of seeds.

Water: Most mature seeds are very dry. They must absorb water to germinate. Water softens the seed coat. It is also necessary to convert starch in the cotyledons or endosperm into simple sugars. The simple sugars then provide energy to the embryo.

Many seeds also need light for germination. Such seeds do not begin germination if they are buried too deeply in the soil.

Oxygen: The developing embryo needs oxygen for cellular respiration.

Temperature: The enzymes present in embryo require specific temperature to carry out metabolism.

Some seeds germinate after going through extreme conditions. For example; when animals eat fruits, they swallow seeds. Acids in the digestive system break the hard seed coat, but the embryo remains alive. Such seeds germinate after passing through the digestive systems of animals.

14.4 Sexual Reproduction in Animals

Q.12: Describe the process of gametogenesis in animals.

Ans. Gametogenesis:

The process of making gametes is called gametogenesis.

Learning Outcomes

- Define fertilization and differentiate between external and internal fertilization.
- Describe different organs of the male and female reproductive systems of rabbit.
- Describe the processes of gametogenesis in rabbit.
- Rationalize the need for population planning.
- Explain AIDS as an example of sexually transmitted diseases.
- State the role of National AIDS Control Program and different NGOs in educating people with reference of AIDS.

Formation of Gametes:

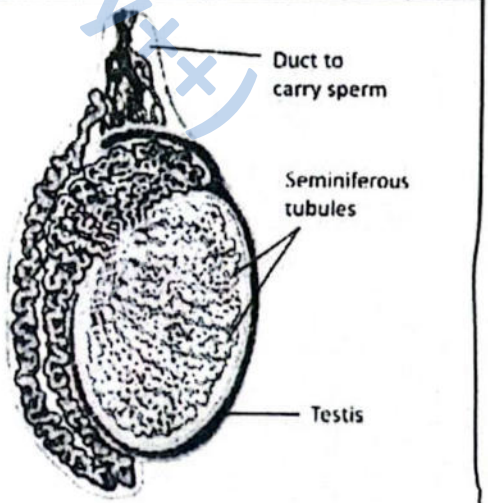
Gamete mother cells are present in gonads. Like all body cells, gamete mother cells are diploid. The formation of gametes involves meiosis. Meiosis results in a reduction of the number of chromosomes in gametes to haploid (1n).

(a) Formation of Male Gametes:

Spermatogenesis: The formation of male gametes (sperms) is called spermatogenesis.

This process occurs in the male gonads i.e. testes. The male sex hormone i.e. testosterone stimulates sperm production in the seminiferous tubules of testes.

In seminiferous tubules, the diploid gamete mother cells, called primary spermatocytes are present. Each primary spermatocyte divides by meiosis and makes four haploid spermatids. These are immature sperms. Changes occur in spermatids and they change into motile sperms.



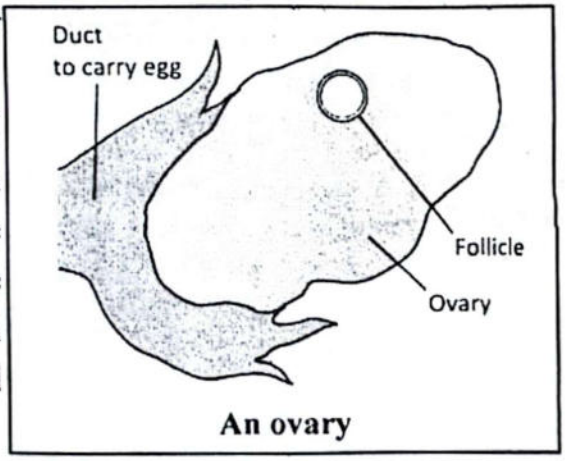
A testis

(b) Formation of Female Gametes:

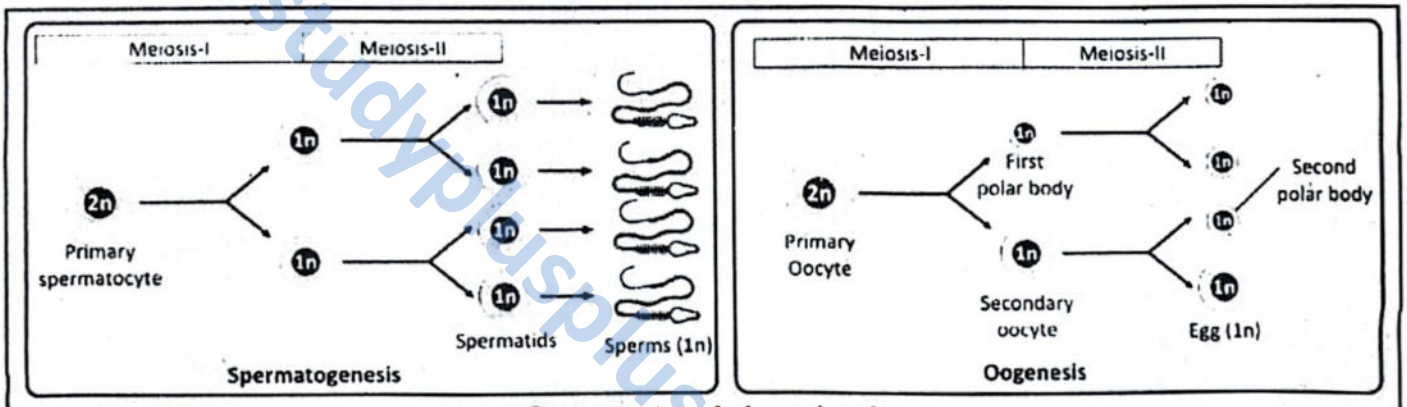
The formation of female gametes (egg or ovum) is called oogenesis.

It occurs in the female gonads i.e. ovaries. The female sex hormone i.e. follicle stimulating hormone stimulates the formation of ovum in the follicle of ovary.

In follicle there is a diploid gamete mother cell called primary oocyte. It divides by meiosis. As a result of first meiotic division, two haploid cells are produced. The larger cell is called secondary oocyte while the smaller cell is called first polar body. In meiosis II, secondary oocyte produces two haploid cells i.e. a second polar body and an egg.



An ovary



Gametogenesis in animals

Q.13: Define fertilization. Differentiate between external and internal fertilization.

Ans. Fertilization:

Fertilization means the fusion of male and female gametes to form a new cell, called zygote.

It is an essential step of sexual reproduction. It restores the diploid number of chromosomes in the zygote.

Types of Fertilization: In animals, fertilization may be:

- External fertilization (outside the bodies of female)
- Internal fertilization (Inside the body of female)

External Fertilization: External fertilization occurs mostly in water.

Explanation: For external fertilization, the male and female animals release their gametes in water almost at the same time. They release gametes in great numbers because there are more chances of the loss of gametes. External fertilization occurs mainly in aquatic animals (e.g. fish) or in amphibians.

Internal Fertilization: Internal fertilization occurs inside the body of female.

Explanation: The egg of the female animal is not released out of the body. It stays in the reproductive duct of the female. The sperm of the male fertilize the egg here.

Development of Embryo:

After internal fertilization, there are two ways for the development of embryo.

1. Many animals (e.g. reptiles and birds) lay the fertilized eggs and further development of embryo takes place inside the egg, but outside the body of female. In such animals the eggs are covered by hard shell for the protection of embryo.
2. In many animals (e.g. majority of the mammals), the fertilized egg remains in the reproductive duct of female and the development of embryo takes place there. In this case, extra protection is provided to the developing embryo.

Q.14: (a) Which parts are rasponsible for the reproducetive system of rabbit?

Ans. The reproductive system of rabbit consists of gonads and associated ducts and glands.

Gonads: Gonads are organs which make gametes. Gonads also secrete sex hormones. From gonads, the gametes enter in the associated ducts.

(b) Describe the main parts of the male and female reproductive systems of rabbit.

Ans. The Reproductive System of Male Rabbit:

Testes: There is a pair of male gonads, called testes, which are located in a scrotum.

Seminiferous Tubules: Testis contains coiled tubes called seminiferous tubules. In these tubules, sperms are formed.

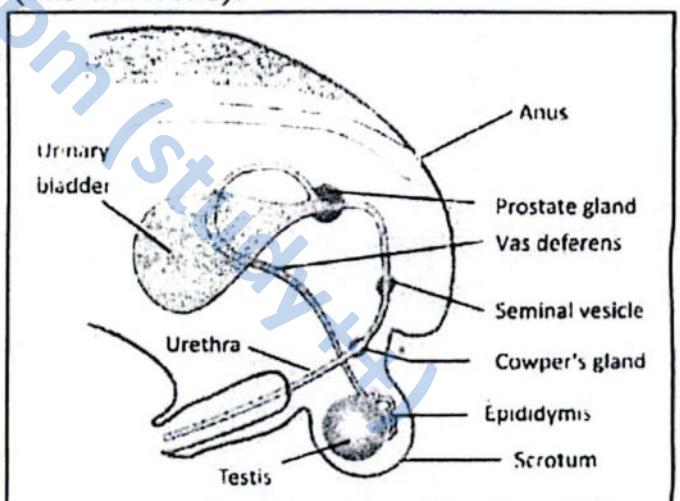
Epididymis and Vas deferens: The associated ducts in male reproductive system consist of two epididymis and two sperm ducts (vas deferens).

Urethra: Both sperm ducts open in urethra, which transports sperms to outside.

Glands: Along with the associated ducts, there are some glands which add secretions to the sperms.

Secretion of Seminal Vesicles: The secretion of seminal vesicles has nutrients for sperms.

Secretion of Prostate Gland: The secretion of prostate gland neutralizes the acidity.



The reproductive system of male rabbit

Secretion of Cowper's Gland: The secretion of Cowper's gland lubricates the ducts.

The Reproductive System of Female Rabbit:

Ovaries: There is pair of female gonads, called ovaries, present in abdominal cavity just ventral to kidneys.

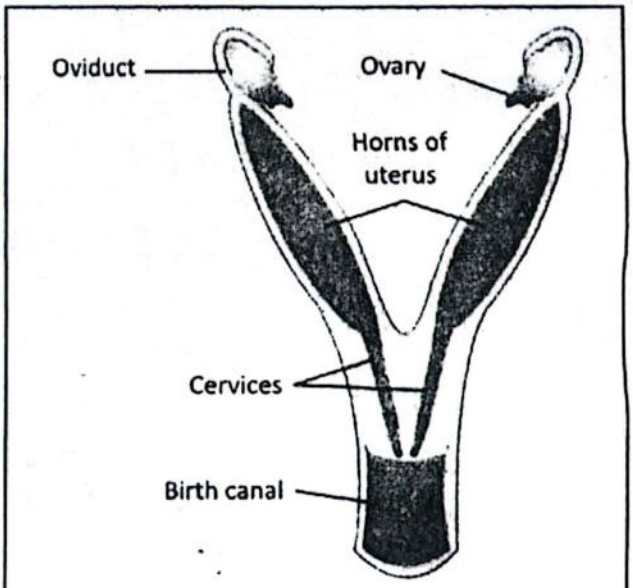
Follicle: In an ovary, egg is formed inside a special structure called follicle.

Oviducts: The associated ducts in female reproductive system consist of two oviducts (or fallopian tubes) and a uterus.

Each oviduct opens into a part of uterus (horn of uterus).

Cervix: Each horn of uterus opens in a narrow portion called cervix (Plural: cervices).

Birth Canal or Vagina: Both cervices open into a single canal, called birth canal or vagina.



The reproductive system of female rabbit

(c) How fertilization and development occur in rabit?

Ans. Fertilization and Development in Rabbit:

The sperms of male rabbit reach the oviducts of female rabbit. Fertilization occurs in oviducts. After fertilization, zygote is carried to the horn of uterus. Here its development is completed in about 30 days, after which the baby rabbit is born.

Q.15: Define population census. State its importance and give example.

Ans. Population Census:

It is the process in which data is collected about the inhabitants of a country.

China (1.4 billion) and India (1.3 billion) are the two largest countries of the world. In 1950, Pakistan was at 14th position. In 2015, we stand at 6th position.
(Source: UN-DESA/Population Division)

Importance of Census:

1. Population census provides information about the size, composition, and location of the population.
2. Population census provides a lot of information about population density of different areas, urban/rural proportion, male-female ratio, average household size, population growth of major cities, literacy rate, population speaking mother tongue, un-employment rates, migrant population, and disabled population etc.

Example: Census in Pakistan:

In Pakistan, the conduct of Census is the responsibility of Pakistan Bureau of Statistics. The last population census in Pakistan was conducted in 1998. According to **United Nation's Department of Economic and Social Affairs (UN- DESA),** the world population reached 7.3 billion in 2015.

In 2015, the percentages of age groups in Pakistan are 35% (0-14 years), 58.4% (15-59 years), 6.6% (above 60 years), and 0.6% (above 80 years). 38.6 % of our population is urban (lives in cities).
(Source: UN-DESA/Population Division)

Q.16: Write a note on population growth in Pakistan.

Ans. Population Growth in Pakistan

As per the data of UN-DESA, Pakistan's population in the year 2015 was 188,925,000. Pakistan has the fourth highest annual population increase (after India,

China and Nigeria).

Population of Azad Jammu And Kashmir:

According to the data of the AJK Information Technology Board, the population of Azad Jammu and Kashmir in 2015 is 4,361,000.

Annual Population Growth Rate In AJK: The annual population growth rate is 2.4%.

The Rural Urban Ratio In AJK: The rural urban ratio in AJK is 88:12.

Overall Literacy Rate In AJK: The overall literacy rate is 74%.

Q.17: Describe why population planning is important?

Ans. Overpopulation:

When population size of an area (country) exceeds its capacity to meet the needs of everyone, it is called overpopulation.

> Sixty one percent children in Pakistan suffer from iron deficiency, 54 percent from Vitamin A deficiency, 40 percent from Vitamin D deficiency and 39 percent from zinc deficiency.
> ***(Source: Save the Children)***

Problems of Overpopulation: Overpopulation leads to many social and economic problems, like shortage of natural resources (fresh water, oil, gas etc.), joblessness, and lack of facilities like education and health.

Population Planning:

Control of overpopulation: We have to check overpopulation otherwise we will have to face huge problems because of our limited resources.

Contribution of Pakistan: Pakistan has been addressing the overpopulation issue in its plans since 1960. Since 1990s, lowering the population growth rate had become permanent features of Pakistan's five-year plans.

Contribution of Federal And Provincial Governments: The federal and provincial governments have been taking steps to educate the people about the hazards of overpopulation.

Q.18: (a) What do you mean by STD or STI?

Ans. Sexually Transmitted Disease (STD), also called Sexually Transmitted Infection (STI), is an infection which a person gets through sexual act with an already infected person. This group of diseases includes many bacterial and viral infections. AIDS is the most severe and fatal sexually transmitted disease.

(b) What do you mean by AIDS? How HIV affects the defence system?

Ans. Acquired Immuno-Deficiency Syndrome (AIDS):

Acquired Immuno-Deficiency Syndrome (AIDS) is a viral infection, caused by Human Immuno-deficiency Virus (HIV).

How HIV Affects the Defence System of the Body?

As the name indicates, the infection affects *the immune* (defence) system of the body. Our white blood cells provide the main defence to our body. They kill the pathogens (disease causing

> Pakistan is a signatory to the Sustainable Development Goals (SDGs) of United Nations. The SDG 3 targets the end of AIDS, tuberculosis, malaria, hepatitis, and water-borne diseases etc. by 2030.

germs) that enter the blood. White blood cells kill pathogens in different ways e.g. by engulfing them, breaking them with enzymes and making special proteins (antibodies) against them. When a person is infected with HIV, the viruses attack white blood cells and destroy them. It means that the affected person will not be able to kill the pathogens which enter his/her blood.

The HIV can pass from an infected person to a healthy person through body fluids. Thus the main means of transfer of AIDS are sexual activities, use of infected needles or transfusion of infected blood.

According to UNAID's 2015 report, in Pakistan AIDS is more common in people who inject drugs, followed by sex worker.

Q.19: (a) Describe the main objective of the National AIDS control program of Pakistan.

Ans. Role of National AIDS Control Programme (NACP):

Pakistan's Federal Ministry of Health established NACP in 1987. Its objectives are the prevention of HIV transmission, safe blood transfusions, reduction of STD transmission, training of health staff, and research studies. The program is now run by its federal and provincial units.

Pakistan's HIV epidemic started in 1980s when most of the cases were reported in people who were working abroad. After two decades, studies in Karachi exposed an expanding epidemic in injecting drug users in Sindh.

AJK Central Blood Transfusion Services:

In Azad Jammu and Kashmir, the department known as AJK Central Blood Transfusion Services, Muzaffarabad perform the activities of the NACP.

Establishment of NACP:

The NACP has established 15 HIV Treatment and Care centres nationwide. These centres provide services of free diagnosis, treatment, management of HIV related infections, and counselling services to HIV positive people. Nearly 4000 HIV positive people are receiving treatment from these centres.

NACP plays important role for educating the common people as well as parliamentarians, media personnel, educationists, and religious leaders etc. It also performs awareness raising activities for migrant workers. It also organizes events like the World AIDS Day.

(b) Describe role of Non-Government organization (NGOs) as AIDS Control programme .

Ans. Role of Non-Governmental Organizations (NGOs):

Many Civil Society Organization, also called NGOs, work in Pakistan for public awareness about HIV/AIDS and for the support of AIDS patients.

Pakistan National AIDS Consortium **(PNAC)** is network of more than 300 NGOs, working in all the provinces and regions of Pakistan.

Kashmir AIDS Consortium (KAC) is an alliance of NGOs working for prevention and control of HIV and AIDS throughout Kashmir. It was established under the patronage of National AIDS Control Program.

Important NGOs:

Some important NGOs are:

- AIDS Awareness Society (AAS)
- Association of People Living with HIV (APLHIV)
- Nai Zindagi
- SAHIL

KEY POINTS

- Asexual reproduction does not involve the fusion of gametes while sexual reproduction involves the joining (fusion) of male and female gametes.
- In binary fission (in prokaryotes), the DNA replicates, two daughter DNA molecules are pulled apart, and the cell membrane pinches in to form two identical daughter cells.
- In binary fission in protists, the nucleus divides into two and then the cytoplasm divides.
- In multiple fission (in Amoeba), many daughter amoebae are formed from a single parent.
- Spores are thick walled asexual reproductive cells.
- Parthenogenesis is the development of unfertilized egg cell into new organism.
- When plants use their vegetative parts to reproduce asexually, the method is called vegetative reproduction or vegetative propagation.
- Cloning in plants means the production of identical copies of a plant by using its tissues or cells.
- Tissue culture is a technique in which new plants are made from the tissue of a plant.
- In major plants, two different generations i.e. the sporophyte (spore producing) generation and the gametophyte (gamete producing) generation alternate each other.
- In flowers, the third whorl (androecium) contains stamens while the innermost whorl (gynoecium) contains carpels.
- The structure, which contains seven cells (an egg, five non-functional cells, and a large fusion nucleus), is the embryo sac.
- When microspore undergoes mitosis, the resulting two-celled structure is a pollen grain (male gametophyte).
- Pollination is the transfer of pollen grains from an anther to a stigma.
- The fusion of one sperm with the egg and the other sperm with the fusion nucleus is called double fertilization.
- After fertilization, the zygote develops into embryo and the triploid nucleus develops into endosperm.

- In seeds, the portion between the plumule and cotyledons is called epicotyl. The portion between cotyledons and radicle is called hypocotyl.
- A dicot seed has no endosperm because its endosperm is absorbed by the cotyledons. The monocot seeds have endosperm.
- In epigeal germination, the hypocotyl curves and then straightens, due to which the cotyledons are pulled up into the air.
- In hypogeal germination, the cotyledon remains underground and transfers nutrients from the endosperm to the growing embryo.
- The formation of gametes is called gametogenesis (spermatogenesis and oogenesis.
- External fertilization is the fusion of male and female gametes outside the body of female. Internal fertilization occurs inside the body of the female.
- In male rabbits, there is a pair of testes which contain seminiferous tubules.
- In female rabbits, there is pair of ovaries where egg is formed inside follicle.
- Population census is the process in which data is collected about the inhabitants of a country.
- Overpopulation occurs when population size of an area (country) exceeds its capacity to meet the needs of everyone.
- Sexually Transmitted Disease is an infection which a person acquires through sexual act with an infected person.
- AIDS is a viral infection, caused by Human Immuno-deficiency Virus (HIV). Its viruses attack the white blood cells and destroy them.
- Pakistan's National AIDS Control Programme was established for the prevention of HIV transmission.
- The AJK Central Blood Transfusion Services, Muzaffarabad performs the activities of the NACP in Azad Kashmir.

Activities

1. **Identify different stages of budding in the prepared slides of yeast and draw diagrams.**
2. **Examine the specimens of onion, corn, ginger and potato and write the mode of their reproduction and describe their cultivation to get new plants.**
3. **Identify different parts of flower.**
4. **Identify and draw the component of the seeds of pea or gram.**
5. ***Perform experiment to investigate the necessary conditions for seed germination.***
6. **Draw different stages of binary fission in amoeba after observing through slides or charts.**

Ans. Practical work

1. Grow plants at home using asexual reproduction methods.

Ans. Practical work

2. Describe commercially important applications of asexual reproduction in plants.

Ans. Commercial applications of asexual reproduction in plants:

(i) Many commercial fruit trees (e.g. almond, plum, cherries etc.) and ornamental plants are reproduced asexually by artificial vegetative propagation method (grafting).

(ii) Some plants, e.g. raspberries are reproduced asexually by layering method.

(iii) Production of orchids, fruit plants and ornamental plants is done by tissue culture and cloning. Tissue culture and cloning are forms of asexual reproduction.

(iv) Houseplants, ornamental trees, shrubs and some fruit crops are grown asexually by cuttings

(v) Roses, grapvines and sweet potato are grown asexually by stem cuttings.

(vi) Strawberry reproduces asexually by stolen.

(vii) Ferns, ginger and sugarcane reproduce asexually by using rhizome.

3. Justify cloning as a form of asexual reproduction.

Ans. Cloning is the latest method of artificial vegetative propagation. In this method, identical offsprings are produced from a single parent using its vegetative tissues or cells. As the offsprings produced by asexual reproduction are also genetically identical to each other and to the parent, therefore, cloning as a form of asexual reproduction.

4. State the advantages and disadvantages of having large families.

Ans. Disadvantages of large families:

Large families lead to many social and economic problems, like.

The most terrible thing is the big quarrel. For example a quarrel about money can lead the whole family to depression and anger. If a father gets fixed, his family's expenses will be considerably cut down. Then it's very difficult for his children to get higher education therefore, they have little chance of being successful in *society*.

Advantages of large families: A large family usually consists of grandparents, parents and children. It is so happy to be together with family in front of television watching favorite shows or around delicious dishes in the kitchen. Whenever a member gets into trouble, he or she can talk with other members and may get a lot of useful advices from people of all generations. Besides, being in a large family makes you get used to co-operating with others which you will have to practice many times in your future job. Many people still enjoy being a member of a large family. Living in a large family is actually a very good thing if we always try our best to make our family happy.

5. **Debate the social implications of AIDS and other sexually transmitted diseases.**

Ans. Practical work

SOLVED EXERCISE

A. Select the correct answers for the following questions.

1. **Some bacteria can form thick-walled reproductive structures inside their cell. These structures are called;**
   a) microspores b) megaspores c) endospores d) generative cells
2. **Hydra reproduces asexually by;**
   a) binary fission b) budding c) multiple fission d) spore formation
3. **In parthenogenesis, new individual develops from;**
   a) sperm b) fertilized egg c) unfertilized egg d) body cell
4. **The horizontal above ground stem, which produces leaves and roots at its nodes;**
   a) stolon b) bulb c) rhizome d) corm
5. **The technique in which a new plant is grown from some cells of the parent plant;**
   a) cutting b) grafting c) layering d) tissue culture
6. **The outermost whorl in a flower consists of green leaves and is called;**
   a) calyx b) corolla c) androecium d) gynoecium
7. **Stamens are the male reproductive parts of flower and are collectively known as;**
   a) calyx b) corolla c) androceium d) gynoecium
8. **In flowering plants, which of the following contains male gametes?**
   a) ovary b) ovule c) stigma d) pollen grain
9. **In flowering plants, which structure develops into seed?**
   a) anther b) pollen grain c) ovary d) ovule
10. **What is TRUE about the life cycle of flowering plants?**
    a) The sporophyte generation is diploid and produces haploid spores
    b) The sporophyte generation is haploid and produces haploid spores
    c) The gametophyte generation is diploid and produces diploid gametes
    d) The gametophyte generation is diploid and produces haploid gametes
11. **In the life cycle of flowering plants, which structure is triploid (3n)?**
    a) egg b) fusion nucleus c) endosperm nucleus d) sperm
12. **In different plants, cross pollination is carried out by;**
    a) wind b)insects c) water d) all of these
13. **Embryo sac is formed inside;**
    a) filament b) anther c) style d) ovule

14. Double fertilization involves;

a) Fertilization of an egg by two sperms
b) Fertilization of two eggs in the same embryo sac by two sperms
c) Fertilization of an egg and a fusion nucleus by two sperms
d) Fertilization of an egg and the tube cell by two sperms

15. Which of the following contains reserved food for embryo?

a) seed coat b) micropyle c) endosperm d) integument

16. In which groups of animals, fertilization is internal?

a) fish b) amphibians c) reptiles d) both 'a' and 'b'

17. In which groups, fertilization is internal but the development of baby is external?

a) fish b) amphibians c) reptiles and birds d) mammals

18. In female rabbit, the egg from ovary enters;

a) oviduct b) horns of uterus c) cervix d) birth canal

19. In rabbit, fertilization takes place in;

a) testes b) ovary c) birth canal d) oviduct

20. In male rabbit, the epididymis continues as;

a) oviduct b) uterus c) vas deference d) urethra

ANSWERS

1. endospores **2.** budding **3.** unfertilized egg **4.** stolon
5. tissue culture **6.** calyx **7.** androceium **8.** pollen grain
9. ovule **10.** The sporophyte generation is diploid and produces haploid spores
11. endosperm nucleus **12.** all of these **13.** ovule
14. Fertilization of an egg and a fusion nucleus by two sperms **15.** endosperm
16. reptiles **17.** reptiles and birds **18.** oviduct **19.** oviduct
20. urethra

B. Give short answers.

1. Differentiate between asexual and sexual reproduction.

Ans. Asexual Reproduction: It is a type of reproduction which does not involve the fusion of gametes.

Sexual Reproduction: It is a type of reproduction which involves the joining (fusion) of male and female gametes.

2. How is the process of binary fission of bacteria different from that of amoeba?

Ans. In bacteria, the DNA replicates during binary fission. The two daughter DNA molecules move apart. Finally, the cell membrane pinches into form two identical daughter bacteria.

In amoeba, during binary fission, the nucleus of parent organism divides into two.

This is followed by the division of cytoplasm. So, two daughter amoeba of equal size are formed.

3. Write a short note on budding in yeast.

Ans. Budding in Yeast: In case of yeast, a small bud is formed on one side of cell. The bud may separate from parent body or may remain attached.

4. How budding occurs in hydra?

Ans. Budding In Hydra: Budding is a method of asexual reproduction.
In hydra, a small bud is formed on the side of body. This bud enlarges and breaks from the parent body. Then it develops into a new hydra.

5. Differentiate between corm and stolon.

Ans. Corm: It resembles a bulb but does not have fleshy leaves. Almost all of a corm consists of stem, with brown non-functional leaves on the outside.
Example: Dasheen and garlic reproduce by corms.
Stolon (Runner): It is a horizontal, above-ground stem. It produces leaves and roots at its nodes. A new plant can grow from each side.
Example: Strawberry reproduces by using its stolon.

6. In some animals, the egg cells develop into offspring without fertilization. What kind of reproduction is it? Sexual or asexual!

Ans. In some animals, the egg cells develop into offspring without fertilization. It is asexual reproduction.

7. Name the four whorls present in a flower and also tell the components of each whorl.

Ans. (i) Calyx: It is the first whorl of the flower. It contains sepals.

(ii) Corolla: It is the second whorl of the flower. It contains petals.

(iii) Androecium: It is the third whorl. It contains male reproductive structures called stamens. Each stamen consists of an anther and a filament. Anther contains pollen sacs (microsporangia), in which microspores are produced. The stalk-like filaments supports the anther.

(iv) Gynoecium: It is the fourth (inner most) whorl. It contains the female reproductive structures, which are called carpels. The enlarged base of a carpel is called the ovary. Style is stalk-like and its tip is called the stigma. Inside ovary, there are one or many ovules (megasporangia), which produce megaspores.

8. How are the wind-pollinated flowers different from insect-pollinated flowers?

Ans. The wind pollinated flowers (e.g. oak tree and grasses) are usually small and lack bright coloured petals and sepals.
While the insect-pollinated flowers (e.g. rose, sunflower, orchid etc.) are colourful. They have colourful petals, distinctive odours and nectar glands.

9. Why seeds need water and oxygen for germination?

Ans. Seeds need water for germination because water softens the seed coat. It is also necessary to convert starch in the cotyledons or endosperm into simple sugars. The simple sugars then provide energy to the embryo.

Similarly, the developing embryo needs oxygen for cellular respiration.

10. Define gametogenesis? What are its types?

Ans. **Gametogenesis:** The process of making gametes is called gametogenesis.

Types of Gametogenesis: There are two types of gametogenesis:

- Spermatogenesis
- Oogenesis

Spermatogenesis: The formation of male gametes (sperms) is called spermatogenesis.

Oogenesis: The formation of female gametes (egg or ovum) is called oogenesis.

11. Name the parts of the testis and ovary where gamete formation takes place.

Ans. In the seminiferous tubules of testes, the male sex hormone testosterone stimulates the production of male gametes (sperms).

In the follicle of ovary, the female sex hormone follicle stimulates the production of female gametes (egg or ovum).

12. In animals, gametes are produced by meiosis while in plants they are produced by mitosis. How is that?

Ans. Meiosis is a reduction division. In animals, diploid (2n) parent cell divides by meiosis resulting haploid (1n) gametes (sperm and egg).

While in plants there is alternation of generation consisting of sporophyte (spore producing generation) and gametophyte (gamete producing generation). Gametophyte is already haploid (1n) so it produces gametes (sperm and egg) by mitosis.

13. Differentiate between epicotyl and hypocotyl.

Ans. **Epicotyl:** The portion between the plumule and cotyledons is called epicotyl.

Hypocotyl: The portion between cotyledons and the radical is called hypocotyl.

14. Name the three parts of the plant embryo. Also state the function of each part.

Ans. **Parts of Embryo Plants:** The embryo plants consists of:

(i) Cotyledons (ii) Plumule (iii) Radicle

Function of Cotyledons: They form first green leaves during germination *and* help in the photosynthesis. In some seeds, the cotyledons remain underground and transfer nutrients from the endosperm to the growing embryo.

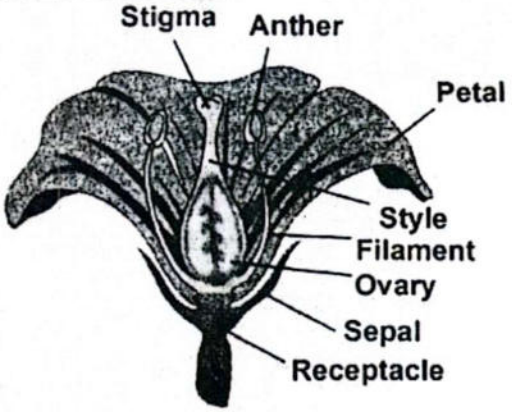
Function of Plumule: The plumule is the tip of new shoot. Its function is to give out leaves and makes the plant capable of carrying out photosynthesis.

Function of Radicle: It is the first thing to emerge out of a seed and down into ground to allow the seed to suck up water and sends out it to leaves so that it can

start photosynthesis.

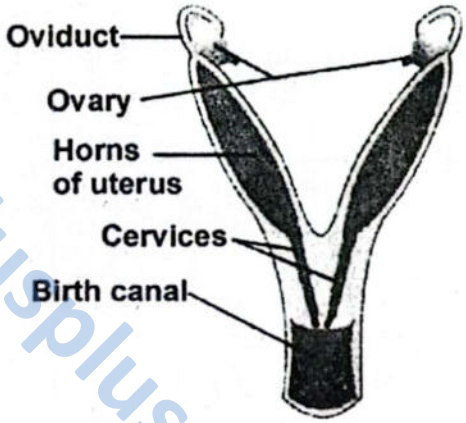
15. *Label the following diagram of flower.*

Ans.



16. Label the following diagram of the female reproductive system of rabbit.

Ans.



C. Give answers in detail.

1. Write a note on different methods of asexual reproduction in animals.

Ans. For answer see Question No. 2

2. What do you mean by vegetative propagation? Differentiate among different plant structures modified for vegetative propagation.

Ans. For answer see Question No. 3

3. Describe the ways by which humans can grow new plants by using the vegetative parts of the parent plants?

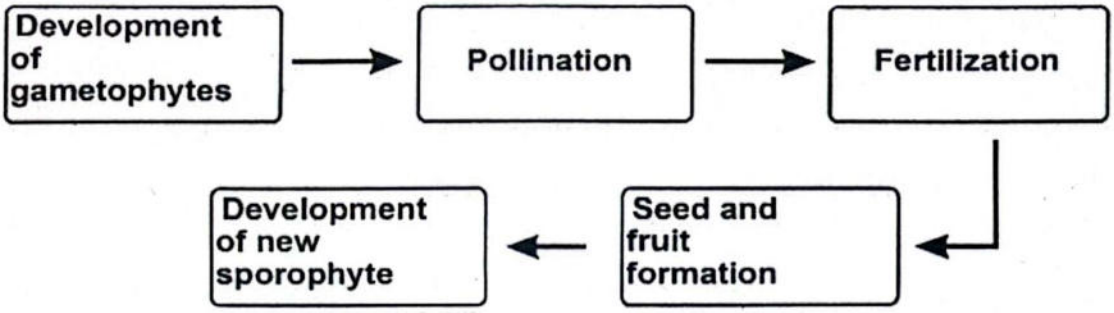
Ans. For answer see Question No. 4

4. Define sporophyte and gametophyte. State their roles in the life cycle of plants.

Ans. For answer see Question No. 5

5. Make a flow chart to show the steps that take place in a flower during reproduction.

Ans. A flow chart to show the steps that take place in a flower during reproduction is as follows:



6. Write down the steps of seed germination?

Ans. For answer see Question No. 10 (b)

7. Describe the main parts of the male and female reproductive systems of rabbit.

Ans. For answer see Question No. 14 (b)

8. Describe steps of cell divisions that occur during the formation of gametes in animals.

Ans. For answer see Question No. 12

9. Describe why population planning is important?

Ans. For answer see Question No. 17

10. What do you mean by AIDS? How HIV affects the defense system of the body?

Ans. For answer see Question No. 18 (b)

11. Describe the main objective of the National AIDS Control Program of Pakistan.

Ans. For answer see Question No. 19 (a)

Objective Type Questions

14.1 Reproduction

14.2 Asexual Reproduction

Choose the correct option.

1. The process through which the organisms continue the existence of their species:

(a) respiration (b) digestion (c) reproduction (d) excretion

2. A form of asexual reproduction in which the organism divides into two is called:

(a) multiple fission (b) binary fission (c) fragmentation (d) parthenogenesis

3. It is a method of asexual reproduction in which a part of the parent organism grows out from its body.

(a) layering (b) grafting (c) parthenogenesis (d) budding

4. **It reproduces by multiple fission.**
(a) amoeba (b) planaria (c) yeast (d) rhizopus

5. **In this method of asexual reproduction, the body of the organism breaks into many parts (fragments).**
(a) budding (b) fragmentation (c) binary fission (d) spore formation

6. **Which of the following organisms reproduce by binary fission?**
(a) bacteria (b) amoeba (c) euglena (d) all of these

7. **Hydra reproduces by:**
(a) multiple fission (b) fragmentation (c) binary fission (d) budding

8. **It reproduces asexually by producing spores:**
(a) planaria (b) amoeba (c) rhizopus (d) yeast

9. **The development of unfertilized egg cell into new organism is called:**
(a) spore formation (b) parthenogenesis (c) budding (d) cutting

10. **The honeybee reproduces by asexual reproduction through:**
(a) multiple fission (b) parthenogenesis (c) fragmentation (d) binary fission

11. **During harsh conditions, some bacteria can form thick-walled spores inside their cells called:**
(a) sporangia (b) fragments (c) endospores (d) buds

12. **It is a horizontal above ground stem that produces leaves and roots at its nodes.**
(a) corm (b) tuber (c) stolon (d) bulb

13. **It is a horizontal, below ground stem, that produces leaves and roots at its nodes.**
(a) modified leaf (b) bulb (c) tuber (d) rhizome

14. **It is a very short, underground stem with bud and fleshy leaves.**
(a) stolon (b) corm (c) bulb (d) tuber

15. **It resembles a bulb but does not have fleshy leaves.**
(a) corm (b) runner (c) rhizome (d) tuber

16. **It is an underground, swollen, fleshy stem with food storage:**
(a) tuber (b) corm (c) rhizome (d) stolon

17. **It has "eyes" which are actually its buds.**
(a) corm (b) bulb (c) stolon (d) tuber

18. **The pieces of stems and roots that are cut from a plant and used to grow new plants are called:**
(a) grafting (b) layering (c) cutting (d) coloning

19. **The process of forming roots on a stem is called:**
(a) coloning (b) grafting (c) cutting (d) layering

20. It is the joining of two or more parts to form a single plant.
(a) cutting (b) tissue culture (c) grafting (d) layering

21. In plants, it means the production of identical copies of a plant by using its tissues or cells.
(a) coloning (b) tissue culture (c) grafting (d) layering

22. It is the technique for cloning.
(a) grafting (b) layering (c) tissue culture (d) cutting

23. It is widely used to grow houseplants, ornamental trees and shrubs and some fruit crops.
(a) layering (b) grafting (c) tissue culture (d) cutting

24. This method is used to grow many commercial fruit trees.
(a) binary fission (b) layering (c) grafting (d) cloning

25. It is used for the production of orchids, fruit plants and ornamental plants.
(a) grafting (b) tissue culture (c) cloning (d) layering

ANSWERS

1. reproduction	**2.** binary fission	**3.** budding	**4.** amoeba
5. fragmentation	**6.** all of these	**7.** budding	**8.** rhizopus
9. parthenogenesis	**10.** parthenogenesis	**11.** endospores	**12.** stolon
13. rhizome	**14.** bulb	**15.** corm	**16.** tuber
17. tuber	**18.** cutting	**19.** layering	**20.** grafting
21. coloning	**22.** tissue culture	**23.** cutting	**24.** grafting
25. tissue culture			

Write short answers of the following questions.

1. Define reproduction.

Ans. Reproduction: It is the process by which organisms produce new organisms of their own kind.

2. What is asexual reproduction?

Ans. Asexual Reproduction: The type of reproduction that does not involve the fusion of gametes is called asexual reproduction.

3. Define sexual reproduction.

Ans. Sexual Reproduction: The type of reproduction that involves the fusion of male and female gametes is called sexual reproduction.

4. Differentiate between asexual and sexual reproduction.

Ans.

Asexual Reproduction	Sexual Reproduction
It does not involve the fusion of gametes.	It involves the fusion of gametes.
The offsprings produced are genetically identical to the parents.	The offsprings produced have variations among themselves and with the parents.

5. What are different methods of asexual reproduction?

Ans. Different methods of asexual reproduction are:

- Binary Fission
- Fragmentation
- Spore Formation
- Vegetative Propagation
- Multiple Fission
- Budding
- Parthenogenesis

6. What is *binary fission*?

Ans. Binary fission is a form of asexual reproduction in which the organism divides into two.

Example: Bacteria, amoeba, euglena etc., reproduce asexually by binary fission.

7. What do you know about fragmentation?

Ans. **Fragmentation:** It is a type of asexual reproduction in which the body of the organism breaks into many parts (fragments). Each part develops into the new organism.

Example: It occurs in fungi and many small animals like planarians.

8. Define budding.

Ans. **Budding:** Budding is a method of asexual reproduction in which a part of the parent organism grows out from its body. This part is called a bud. It continues growing and develops into the new organism.

Examples: Yeast, hydra, sponges etc., reproduce asexually by budding.

9. Give example of fungi that reproduce asexually by producing spores.

Ans. Rhizopus (bread mold) is fungus that reproduces asexually by producing spores.

10. What are sprongia?

Ans. Sprongia are special sac-like structures in which spores are produced.

11. What are spores?

Ans. Spores are thick walled asexual reproductive cells.

12. Under which conditions do spores germinate?

Ans. Spores can tolerate unfavourable conditions due to their walls. When favourable conditions are available, the spores germinate to produce new fungus.

13. What are endospores? How are they formed?

Ans. **Endospores:** Endospores are thick-walled spores.

During harsh conditions, some bacteria can form thick-walled spores inside their cell. These are called endospores.

14. Define parthenogenesis.

Ans. **Parthenogenesis:** It is a special type of asexual reproduction. It is defined as: "The development of unfertilized egg cell into new organism."

15. Who do make gametes (egg cells) during parthenogenesis? Give example.

Ans. During parthenogenesis, the female animals make gametes (egg cells) but there is

no fertilization (fusion of gametes). The unfertilized egg develops into new animal.

Example: In honeybees the fertilized eggs develop into females, but unfertilized eggs develop into male.

16. Which eggs in honeybees do develop into females and males?

Ans. In honeybees, the fertilized eggs develop into female while the unfertilized eggs develop into male.

17. Define vegetative propagation.

Ans. Vegetative propagation: When plants use their vegetative parts to reproduce asexually, the method is called vegetative reproduction or vegetative propagation.

18. What is stolon?

Ans. Stolon: It is a horizontal, above-ground stem. It produces leaves and roots at its nodes. A new plant can grow from each node.

Example: Strawberry reproduces by using its stolon.

19. What is rhizome?

Ans. Rhizome: It is a horizontal, below ground stem. It produces leaves and roots at its nodes. A new plant can grow from each node.

Examples: Ferns, ginger and sugar cane reproduce by using rhizome.

20. What do you know about bulb?

Ans. Bulb: It is very short, underground stem with bud and fleshy leaves. Bulbs produce new plants.

Examples: Tulips, onions and lilies reproduce by bulbs.

21. What is a corm?

Ans. Corm: Corm is a very short, underground stem. It resembles a bulb but does not have fleshy leaves. Almost all of a corm consists of stem, with brown non-functional leaves on the outside.

Examples: Dasheen and garlic reproduce by corms.

22. What do you know about tuber?

Ans. Tuber: It is an underground, swollen, fleshy stem with food storage. It has "eyes" which are actually its buds. Eyes can grow into new plants.

Example: Potatoes reproduce by tubers.

23. How do plants reproduce by modified leaf through natural vegetative propagation?

Ans. Plants reproduce through natural vegetative propagation by modified leaf.

Modified Leaf: The leaves of some plants are modified for vegetative propagation. Such leaves have buds at their margins. When leaf falls on ground, the buds grow into new plants.

Example: Bryophyllum.

24. How do plants reproduce by natural vegetative propagation?

Ans. Many plants have modified many vegetative parts (especially stem) for asexual reproduction. For example;

- Stolen
- Bulb
- Tuber
- Rhizome
- Corm
- Modified leaf

25. What do human use in artificial propagation for producing plants?

Ans. In artificial propagation, humans use other vegetative plants, such as roots, for producing plants.

26. Which methods are used in artificial propagation?

Ans. The following methods are used in artificial propagation.

- Cuttings
- Grafting
- Layering
- Tissue culture and cloning

27. Define cutting in artificial propagation.

Ans. Cutting: The pieces of stem and roots that are cut from a plant and used to grow new plants are called cuttings.

Example: Roses and grapevines are grown from stem cuttings. Sweet potato is grown from root cuttings.

28. What is layering?

Ans. Layering: It is a method of artificial vegetative propagation. It is defined as: "The process of forming roots on a stem is called layering."

Example: In raspberries, the stem can form root at the points where they make contact with the soil.

29. Define Grafting.

Ans. Grafting: Grafting is a method of artificial vegetative reproduction. It is the joining of two or more plant parts to form a single plant.

Example: This method is used to grow many commercial fruit trees (e.g. almond, plum, cherries etc.) and ornamental plants.

30. Differentiate between cloning in plants and tissue culture.

Ans. Cloning in Plants: It means the production of identical copies of a plant by using its tissues or cells.

Tissue culture: It is a technique in which new plants are made from the tissue of a plant. Tissue culture is the technique for cloning.

31. Describe the advantages of vegetative propagation.

Ans. Advantages of vegetative propagation:

1. Vegetative propagation helps to produce a large number of plants in less time.
2. The plants produced through vegetative propagation are similar to the parent plant

and are also identical to each other. So, the advantageous characteristics of plants are transmitted to the next generation.

32. Explain the disadvantages of vegetative propagation.

Ans. Disadvantages of Vegetative propagation:

1. The plants produced by vegetative propagation lack genetic variations.
2. All the new plants are identical. Thus, they have the same tolerance to an environment and can be attacked by the same diseases and pests.

14.3 Sexual Reproduction in Plants

Choose the correct option.

1. The sporophyte generation is:

(a) 1n haploid (b) 2n diploid (c) 3n nucleus (d) all of these

2. They make the outermost whorl of the flower:

(a) petals (b) stamens (c) sepals (d) carpels

3. They make the second whorl of the flower.

(a) carpels (b) sepals (c) stamens (d) petals

4. Androecium makes the _____ whorl of the flower.

(a) 1st (b) 2nd (c) 3rd (d) 4th

5. Which of the following makes the fourth whorl of the flower?

(a) calyx (b) corolla (c) androecium (d) gynoecium

6. The green parts of the flower that protect the flower before it opens.

(a) carpels (b) petals (c) stamens (d) sepals

7. Anther and filaments are the part of:

(a) stamens (b) corolla (c) calyx (d) carpels

8. It contains the female reproductive structures, called carpels of the flower.

(a) androecium (b) gynoecium (c) corolla (d) calyx

9. The enlarged base of a carpel is called:

(a) ovary (b) style (c) filament (d) stigma

10. The female gametophytes are called:

(a) pollen grains (b) egg cell (c) embryo sacs (d) fusion nucleus

11. An embryo sac contains:

(a) 3 cells (b) 5 cells (c) 7 cells (d) 9 cells

12. The male gametophytes are called the:

(a) embryo sacs (b) tube cell (c) generative cell (d) pollen grains

13. After double fertilization, it develops into endosperm.

(a) (1n) haploid spore (b) (2n) diploid gamete

(c) (3n) triploid nucleus (d) all of these

14. It results in seedless fruits.

(a) parthenocarpy (b) double fertilization
(c) parthenogenesis (d) budding

15. Successful wind pollination depends on conditions:

(a) 3 (b) 4 (c) 5 (d) 6

16. Example of insect pollinated flowers is/are:

(a) rose (b) sunflower (c) orchid (d) all of these

17. The matured ovule is called:

(a) fruit (b) megaspore (c) seed (d) zygote

18. The transfer of pollen grains to the stigma is called:

(a) fertilization (b) sporophyte generation
(c) pollination (d) gametophyte generation

19. The generative cell of pollen grain forms:

(a) 1 sperm (b) 2 sperms (c) 3 sperms (d) 4 sperms

20. The nucleus develops into a tissue called endosperm which is shown as:

(a) 1n (b) 2n (c) 3n (d) all of these

21. It develops from the integument, present around the ovule:

(a) cotyledon (b) seed coat (c) plumule (d) radicle

22. A scar on the seed coat is called:

(a) epicotyl (b) micropyle (c) hilum (d) hypocotyl

23. The part of embryo is:

(a) cotyledons (b) plumule (c) radicle (d) all of these

24. It is the tip of a new shoot.

(a) radicle (b) hilum (c) plumule (d) cotyledons

25. The portion between the plumule and cotyledons is called:

(a) hypocotyl (b) epicotyl (c) hilum (d) micropyle

26. A state when there is reduced metabolism in seeds.

(a) dormancy (b) parthenocarpy
(c) sporophyte generation (d) gametophyte generation

27. It softens the seed coat.

(a) light (b) temperature (c) water (d) oxygen

28. For cellular respiration, the developing embryo needs:

(a) carbondioxide (b) hydrogen (c) oxygen (d) nitrogen

29. The portion between cotyledons and radicle is called:

(a) hilum (b) hypocotyl (c) epicotyl (d) micropyle

30. It absorbs nutrients from the endosperm and transfers to the embryo.

(a) plumule (b) radicle (c) cotyledon (d) seed coat

ANSWERS

1.	2n diploid	**2.**	sepals	**3.**	petals	**4.**	3rd
5.	gynoecium	**6.**	sepals	**7.**	stamens	**8.**	gynoecium
9.	ovary	**10.**	embryo sacs	**11.**	7 cells	**12.**	pollen grains
13.	(3n) triploid nucleus	**14.**	parthenocarpy	**15.**	4	**16.**	all of these
17.	seed	**18.**	pollination	**19.**	2 sperms	**20.**	3n
21.	seed coat	**22.**	hilum	**23.**	all of these	**24.**	plumule
25.	epicotyl	**26.**	dormancy	**27.**	water	**28.**	oxygen
29.	hypocotyl	**30.**	cotyledon				

Write short answers of the following questions.

1. Differentiate between sporophyte and gametophyte generations.

Ans. Sporotphyte Generation: Sporophyte generation is the spore producing generation.

Gametophyte Generation: Gametophyte generation is the gamete producing generation.

2. Define alternation of generation.

Ans. Alternation of Generation: Sporophyte generation and gametophyte generation alternate each other i.e. the sporophyte develops into gametophyte and gametophyte develops into sporophyte. This type of life cycle is called the alternation of generation.

3. What is receptacle?

Ans. Receptacle: It is a branch of a flower on which specialized leaves are present.

4. Differentiate between calyx and corolla.

Ans. Calyx: It is the first whorl of a flower. It contains sepals.

Corolla: It is the second whorl of a flower. It contains petals.

5. What are sepals and petals?

Ans. Sepals: These are the green part of flower. They protect the inner parts of a flower before it opens.

Petals: These are the coloured and fragrant part of the flower. They attract the insects for pollination.

6. Differentiate between androceium and gynaceium.

Ans. Androecium: It is the third whorl of a flower. It contains male reproductive structures called stamens.

Gynoecium: It is the fourth whorl of a flower. It contains female reproductive structures called carpels.

7. Describe the structure of stamen.

Ans. Structure of Stamen: Each stamen consists of an anther and a filament.

Anther: It contains pollen sacs (microsporangia), in which microspores are produced.

Filament: The stalk like filament supports the anther.

8. Who discovered the male and female reproductive parts of flowers?

Ans. Theophrastus, a Greek philosopher, discovered the male and female reproductive parts of flowers.

9. What are the organs for sexual reproduction in angiosperms?

Ans. Flowers are the organs for sexual reproduction in angiosperms.

10. What is *pistil*?

Ans. More than one carpel fuse together and make up the structure called pistil.

11. Explain the structure of carpel.

Ans. **Structure of carpel:** Each carpel consists of ovary, style and stigma.

Ovary: The enlarged base of a carpel is called the ovary.

Style: The stalk-like structure of carpel is called the style.

Stigma: The tip of the style is called the stigma.

Inside ovary, there are one or many ovules (megasporangia), which produce megaspores.

12. Differentiate between embryo sacs and pollen grains.

Ans. **Embryo sacs:** The female gametophytes are called the embryo sacs. They are made from megaspores. Embryo sac contains egg.

Pollen grains: The male gametophytes are called the pollen grains. They are made from microspores. Pollen grains contain sperms.

13. What does embryo sac contain?

Ans. Embryo sac contains seven cells (an egg cell, five non-functional cells, and a fusion nucleus).

14. Define pollination.

Ans. **Pollination:** The transfer of pollen grains from an anther to a stigma is called pollination.

15. Differentiate between self pollination and cross-pollination.

Ans. **Self pollination:** Pollination that involves just one flower, or flowers on the same plant is called self-pollination.

Cross-pollination: Pollination that involves two flowers of different plants of the same species is called cross-pollination.

16. Define double fertilization.

Ans. **Double fertilization:** The process of the fusion of one sperm with the egg and the other with the fusion nucleus is called double fertilization.

17. Define seed.

Ans. **Seed:** The matured ovule is called seed.

18. Which part of the ovary changes into fruit?

Ans. The walls of ovary changes into fruit.

19. Define parthenocarpy.

Ans. Parthenocarpy: The development of ovaries into fruits without fertilization of egg in ovule is called parthenocarpy. It results in seedless fruits.
Examples: Bananas and seedless varieties of grapes.

20. What is difference between wind-pollinated flowers and insect-pollinated flowers?

Ans. Wind-pollinated flowers: The wind pollinated flowers (e.g. oak tree and grasses) are usually small and lack bright coloured petals and sepals.
Insect-pollinated flowers: The insect pollinated flowers (e.g. rose, sunflower, orchid etc) are colourful. They have colourful petals, distinctive odours and nectar (a solution of sugars) glands.

21. On what conditions do the successful wind pollination depend?

Ans. The successful wind pollination depends upon four conditions:

(i) The release of large number of pollen grains.
(ii) Good circulation of air to carry pollen grains.
(iii) Nearness of other plants where the pollen grains can reach.
(iv) Dry weather to ensure the pollen is not washed from the air by rain.

22. What do insect pollinators include?

Ans. Insect pollinators include bees, beetles, moths, butterflies, mosquitoes etc.

23. Tell the function of seed coat (testa).

Ans. Seed coat protects embryo from mechanical injury and from drying out.

24. What is hilum?

Ans. Hilum: It is a scar on seed coat. It is a point where the seed is attached to ovary wall (fruit).

25. What is micropyle?

Ans. At one end of hilum, there is a small opening called micropyle. Through micropyle, the pollen tube enters ovule.

26. What is difference between dicot seed and monocot seed?

Ans. Dicot Seed: In dicot seed, there are two large, fleshy cotyledons.
Monocot Seed: In monocot seed, there is one cotyledon.

27. Differentiate between epicotyl and hypocotyl.

Ans. Epicotyl: The portion between the plumule and cotyledons is called epicotyl.
Hypocotyl: The portion between cotyledons and radicle is called hypocotyl.

28. What do you mean by germination of a seed?

Ans. Germination of a Seed: Germination of a seed means the development of the

embryo of seed into a seedling.

29. What is dormancy?

Ans. ***Dormancy:*** It is a state when there is reduced metabolism in seeds. During dormancy, growth and development do not occur.

30. Differentiate between epigeal germination and hypogeal germination.

Ans. **Epigeal Germination:** In epigeal germination, the hypocotyl curves and then straightens, due to which the cotyledons are pulled up into the air.

Hypogeal Germination: In hypogeal germination, the cotyledon remains underground and transfers nutrients from the endosperm to the growing embryo.

31. Which environmental factors do play important roles during the germination of seeds?

Ans. Environmental factors that play important roles during the germination of seeds are:

- water
- oxygen
- Temperature
- Light

32. Why does developing embryo need oxygen and temperature?

Ans. Developing embryo needs oxygen for cellular respiration. Similarly, the enzymes present in the embryo require specific temperature to carry out metabolism.

33. What happens if seeds are buried too deeply in the soil?

Ans. With water, oxygen and temperature many seeds also need light for germination. Such seeds do not begin germination if they are burried too deeply in the soil.

14.4 Sexual Reproduction in Animals

Choose the correct option.

1. For sexual reproduction, animals make gametes in their:

(a) ovary (b) testis (c) gonads (d) duct

2. The process of making gametes is called:

(a) fertilization (b) gametogenesis (c) fermentation (d) budding

3. The formation of gametes involves:

(a) binary fission (b) parthenogenesis
(c) multiple fission (d) meiosis

4. The formation of male gametes (sperms) is called:

(a) gametogenesis (b) oogenesis
(c) spermatogenesis (d) germination

5. The formation of female gametes (egg or ovum) is called:

(a) spermatogenesis (b) gametogenesis
(c) parthenogenesis (d) oogenesis

6. **Each primary spermatocyte divides by meiosis and makes four haploid:**
(a) primary oocyte (b) primary spermatocytes
(c) spermatids (d) first polar body

7. **It is a fusion of male and female gametes to form a new cell called zygote.**
(a) gametogenesis (b) fertilization (c) fermentation (d) spermatogenesis

8. **Rabbits belong to the group of _____ of vertebrates.**
(a) birds (b) fish (c) mammalia (d) reptiles

9. **Rabbits are _____ and eat grass and weeds.**
(a) omnivores (b) carnivores (c) herbivores (d) decomposers

10. **The average life span of rabbit is about:**
(a) 2 years (b) 3 years (c) 4 years (d) 5 years

11. **Its secretion has nutrients for sperms:**
(a) seminal vesicles (b) prostate gland (c) cowper's gland (d) a and b

12. **Its secretion neutralizes the acidity:**
(a) prostate gland (b) seminal vesicles (c) cowper's gland (d) all of these

13. **The secretion of _____ lubricates the ducts.**
(a) seminal vesicles (b) cowper's gland (c) prostate gland (d) none of these

14. **In an ovary, the egg is formed inside a special structure called:**
(a) follicle (b) birth canal (c) epididymis (d) urethra

15. **Both cervices open into a single canal, called the:**
(a) urethra (b) vagina (c) vas deferens (d) follicle

16. **Each horn of uterus opens in a narrow portion called:**
(a) cervix (b) follicle (c) vas deferens (d) prostate gland

17. **The last population census in Pakistan was conducted in:**
(a) 1998 (b) 2010 (c) 2015 (d) 1989

18. **In 2015, according to United Nation's Department of Economic and Social affairs (UN-DESA), the world population reached:**
(a) 6.3 billion (b) 7.3 billion (c) 8.3 billion (d) 9.3 billion

19. **It has the fourth highest annual population increase:**
(a) China (b) India (c) Pakistan (d) Nigeria

20. **The *NACP* has established ____ HIV treatment and care centres nation wide.**
(a) 6 (b) 8 (c) 12 (d) 15

21. **In 2015, according to the data of AJK Information Technology Board, the population of Azad Jammu and Kashmir is:**
(a) 3,361,000 (b) 4,361,000 (c) 2,361,000 (d) 5,361,000

22. **The AJK annual population growth rate is:**
(a) 2.4% (b) 3.4% (c) 4.4% (d) 5.4%

23. The rural urban ratio in AJK is:

(a) 88:11 (b) 88:12 (c) 88:13 (d) 88:14

24. The overall literacy rate in AJK is:

(a) 71% (b) 72% (c) 73% (d) 74%

25. As per the data of UN-DESA, Pakistan's population in the year 2015 was:

(a) 198,925,000 (b) 189,825,000 (c) 188,925,000 (d) 198,285,000

ANSWERS

1. gonads	**2.** gametogenesis	**3.** meiosis	**4.** spermatogenesis
5. oogenesis	**6.** spermatids	**7.** fertilization	**8.** mammalia
9. herbivores	**10.** 3 years	**11.** seminal vesicles	**12.** prostate gland
13. cowper's gland	**14.** follicle	**15.** vagina	**16.** cervix
17. 1998	**18.** 7.3 billion	**19.** Pakistan	**20.** 15
21. 4,361,000	**22.** 2.4%	**23.** 88:12	**24.** 74%
25. 188,925,000			

Write short answers of the following questions.

1. Define gametogenesis.

Ans. Gametogenesis: The process of making gametes is called gametogenesis.

2. Differentiate between spermatogenesis and Oogenesis.

Ans. Spermatogenesis: The formation of male gametes (sperms) is called spermatogenesis.

Oogenesis: The formation of female gametes (egg or ovum) is called oogenesis.

3. Where does spermatogenesis occur?

Ans. Spermatogenesis occurs in the male gonads i.e. testis.

4. Which hormone does stimulate the sperm production in the seminiferous tubules of testes?

Ans. The male sex hormone i.e. testosterone stimulates sperm production in the seminiferous tubules of testes.

5. Where does oogenesis occur?

Ans. Oogenesis occurs in the female gonads i.e. ovaries.

6. Which hormone does stimulate the formation of ovum in the follicle of ovary?

Ans. The female sex hormone i.e. follicle stimulating hormone stimulates the formation of ovum in the follicle of ovary.

7. Define fertilization.

Ans. *Fertilization:* *Fertilization is the fusion of male and female gametes to form a* new cell, called zygote.

8. Differentiate between external and internal fertilization.

Ans. External Fertilization: It is the fertilization that occurs mostly in water.

Internal Fertilization: It is the fertilization that occurs inside the body of female.

9. Which are the two ways for the development of embryo after internal fertilization?

Ans. The two ways for the development of embryo after internal fertilization are as follows:

(i) Many animals (e.g. reptiles and birds) lay the fertilized eggs and further development of embryo takes place inside the egg, but outside the body of female. In such animals the eggs are covered by hard shell for the protection of embryo.

(ii) In many animals (e.g. majority of the mammals), the fertilized egg remains in the productive duct of female and the development of embryo takes place there. In this case, extra protection is provided to the developing embryo.

10. What does the reproductive system of rabbit consist of?

Ans. The reproductive system of rabbit consists of gonads, associated ducts and glands.

11. What are gonads?

Ans. Gonads are organs which make gametes. Gonads also secrete sex hormones.

12. What are testis? Tell their location in rabbit.

Ans. Testes are pair of male gonads. They are located in scrotum.

13. Which ducts transports sperms to outside?

Ans. Urethra transports sperms to outside.

14. What the secretion of seminal vesicles has?

Ans. The secretion of seminal vesicles has nutrients for sperms.

15. What does the secretion of prostate gland do?

Ans. The secretion of prostate gland neutralizes the acidity of sperms.

16. Which secretion does lubricate the ducts of rabbit?

Ans. The secretion of cowper's gland lubricates the ducts of rabbit.

17. What are ovaries? Tell their location in rabbit.

Ans. Ovaries are pair of female gonads, present in abdominal cavity just ventral to kidneys.

18. Where is egg formed in an ovary?

Ans. In an ovary, the egg is formed inside a special structure called follicle.

19. What do the associated ducts in female reproductive system consist of?

Ans. The associated ducts in female reproductive system consist of two oviducts (or follapian tubes) and a uterus.

20. Define population census.

Ans. Population census: It is the process in which data is collected about the inhabitants of a country.

21. What is the importance of population census?

Ans. Population census provides information about the size, composition and location of

the population.

It also provides a lot of information about population density of different areas, urban/ rural population, male-female ratio, average household size, population growth of major cities, literacy rate, population speaking mother tongue, un-employment rates, migrant population and disabled population etc.

22. Who is responsible for the conduct of census in Pakistan?

Ans. In Pakistan, the conduct of census is the responsibility of Pakistan Bureau of statistics.

23. Define overpopulation.

Ans. **Overpopulation:** When population size of an area (country) exceeds its capacity to meet the needs of everyone, it is called the overpopulation.

24. What is sexually transmitted disease (STD)?

Ans. Sexually Transmitted Disease (STD), also called Sexually Transmitted Infection (STI), is an infection which a person gets through sexual act with an already infected person.

25. To which problems does over population lead?

Ans. Over population leads to many social and economic problems, like shortage of natural resources (fresh water, oil, gas, etc), joblessness and lack of facilities like education and health.

26. Which is the most severe and fatal sexually transmitted disease?

Ans. AIDS is the most severe and fatal sexually transmitted disease.

27. What is AIDS? How it is caused?

Ans. AIDS is a viral infection. It is caused by Human Immuno-deficiency Virus (HIV).

28. How can HIV pass from an infected person to a healthy person?

Ans. HIV can pass from an infected person to a healthy person through body fluids. Thus the main means of transfer of AIDS are sexual activities, use of infected needles or transfusion of infected blood.

29. Describe the services of HIV treatment and Care centres established by the NACP.

Ans. The NACP has established 15 HIV treatment and Care centres nationwide. These centres provide services of free diagnosis, treatment, management of HIV related infections and counselling services to HIV positive people. Nearly 4000 HIV positive people are receiving treatment from these centres.