

Reproduction

Long Answer Questions

Q.1 Define reproduction. Write its importance?

Ans: Reproduction

It is defined as the production of individuals of the same species i.e. the next generation of species.

importance

(a) Continuation of species

Reproduction is essential for the continuation of species.

(b) Transmission of genetic material

It ensures that the genetic material of one generation is transmitted to the next. Each generation produces more offsprings for the next generation. Only the fittest and the best survive and reach the reproductive age.

This ensures that the advantageous characteristics are transmitted to the next generation.

Q2. Define asexual reproduction. Describe the different methods of asexual reproduction.

Ans. Definition

Asexual reproduction is simple cell division that produces an exact duplicate of an organism. It does not involve the fusion of gametes.

Types of Asexual Reproduction

There are many types of asexual reproduction, they produce individuals that are genetically identical to each other and to the parent.

(1) Binary fission

(a) Introduction

Binary fission means "division into two", it is the simplest and most common method of asexual reproduction.

(b) Occurrence

Binary fission occurs in prokaryotes (Bacteria), many unicellular eukaryotes e.g. protozoa and some invertebrates.

(c) Examples

(i) Binary Fission in Bacteria

- (i) During binary fission in bacteria, the DNA is duplicated and so two copies of DNA are formed.
- (ii) The two copies move towards the opposite poles of the cell.
- (iii) The cell membrane invaginates in centre and divides the cytoplasm into two.
- (iv) New cell wall is deposited between the two cross walls. It results in the formation of two daughter bacteria, which grow in size and divides again.

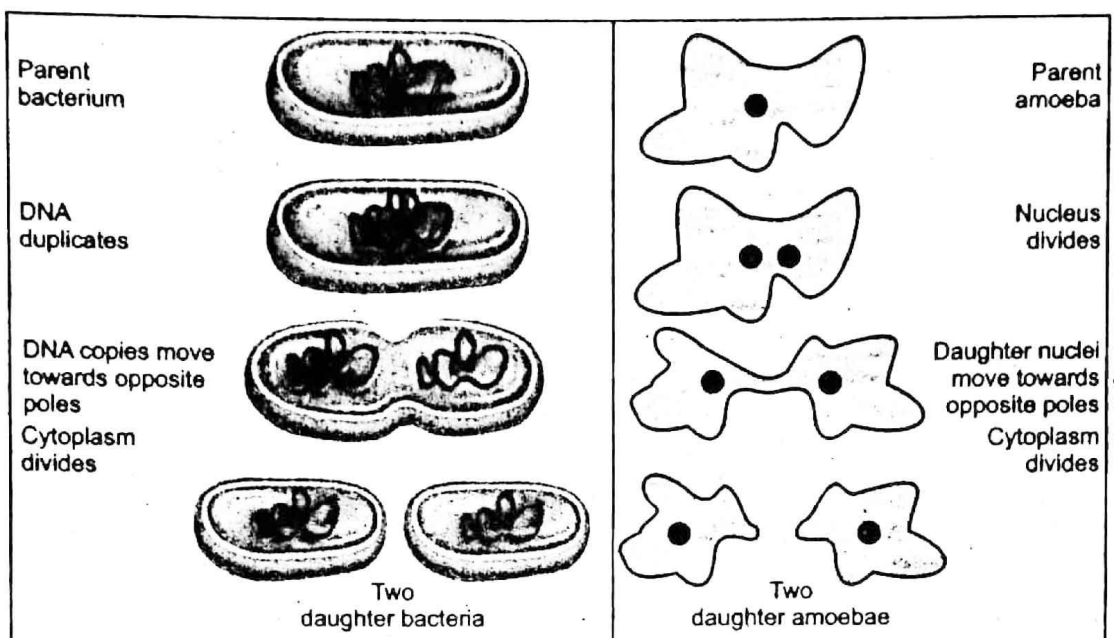


Figure 14.1: Binary fission in a bacterium (Left) and in an amoeba (right)

(ii) Binary fission in unicellular Eukaryotes (*Amoeba*)

It occurs in the following way:

- (i) The nucleus of parent organism divides into two by mitosis.
- (ii) It is followed by the division of cytoplasm.
- (iii) So two daughter cells of almost equal size are formed.
- (iv) Daughter cells grow in size and then divide again.

(iii) Binary fission in invertebrates

During this asexual reproduction, body is cut into two halves and the missing body parts are regenerated in both halves. e.g., planaria and many echinoderms.

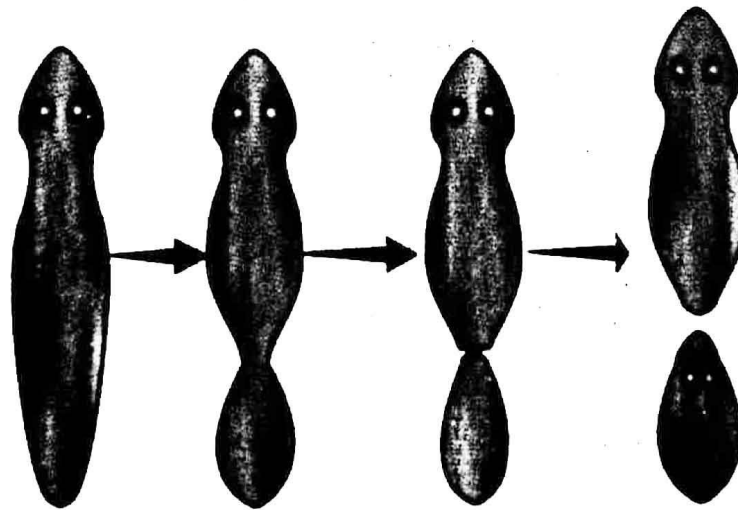


Figure 14.2: Binary Fission in a Planarian

(2) Fragmentation

Introduction

In fragmentation, certain worms grow to full size, they spontaneously break up into 8 or 9 pieces. Each piece develops into a mature worm and the process is repeated.

Example

If a planarian breaks into many pieces instead of two, it will also be called as fragmentation.

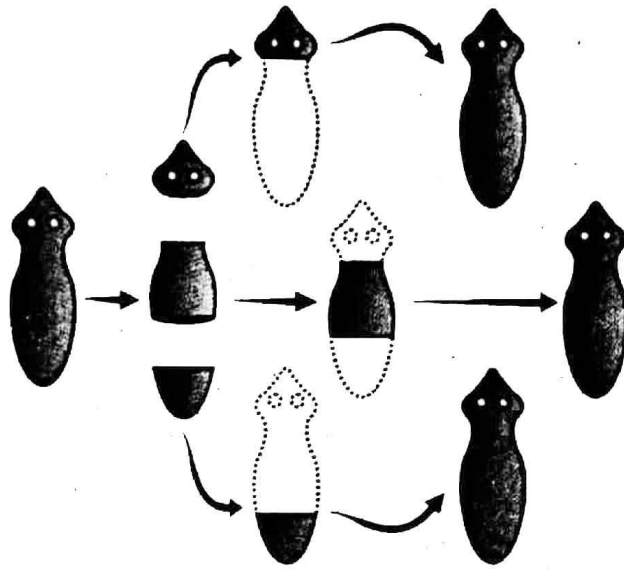


Figure 14.3: Fragmentation in a Planarian

(3) Budding / Explain budding with example.

(Board 2014)

(a) Definition

In budding, a bud develops as a small outgrowth on parent's body.

(a) Budding in yeast

- (i) In yeast, a small bud is formed on one side of the cell.
- (ii) The nucleus of the cell divides and one of the daughter nuclei is passed into the bud.
- (iii) Parent cell may form more than one bud at a time.
- (iv) Each bud enlarges and may separate from parent body.
- (v) In some cases, the buds never separate and as a result, colonies of individuals are formed.

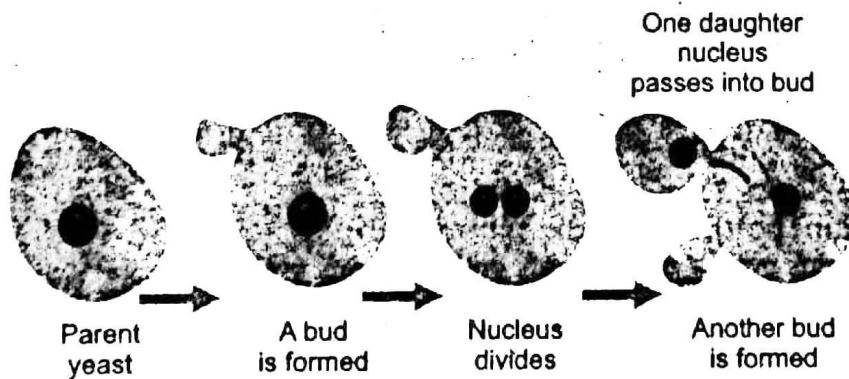


Figure 14.4: Budding in Yeast

(b) Budding in sponges, hydra and corals

- (i) A small bud is formed on the side of bodies of these organisms, by mitosis.
- (ii) This bud enlarges by the formation of more cells.
- (iii) It then detaches from the parent body and grows into new organisms in hydra. But in corals, the buds do not detach and form big colonies.

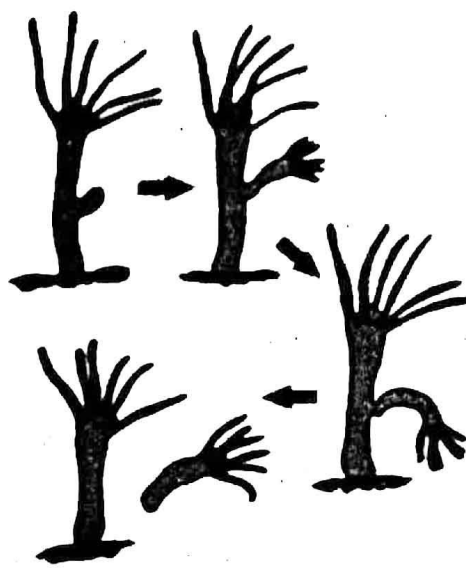


Figure 14.5: Budding in hydra

4- Spore formation

(a) Introduction

It is generally seen in most fungi.

(b) Examples

(i) Spore formation in *Rhizopus*

When *Rhizopus* reaches the reproductive age, its body cells form thick walled spore sacs called sporangia (sing: sporangium). Inside each sporangium, a cell divides many times and forms many daughter cells, called spores. Each spore is covered by a thick wall called cyst and it survive unfavourable conditions. When sporangia mature, they burst and release spores. Under favourable conditions, the spores germinate and develop into new *Rhizopus*.

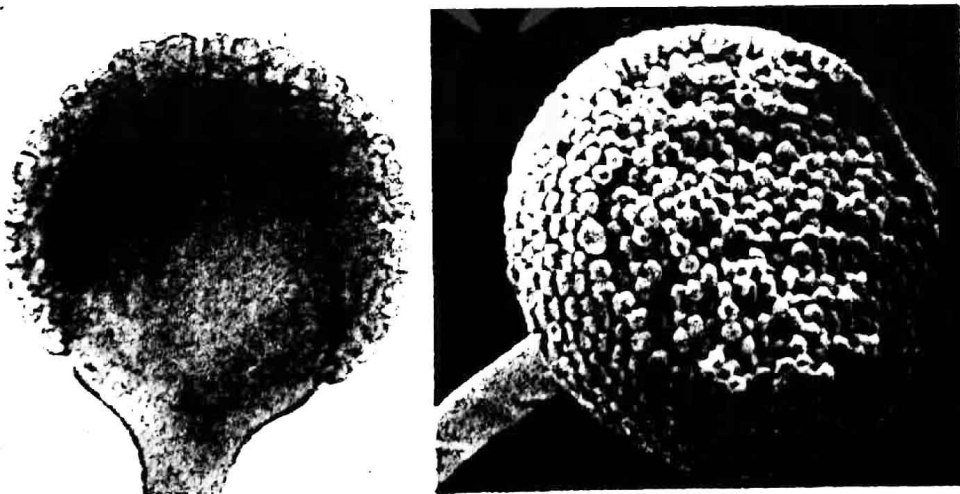


Figure 14.6: Spore Formation in *Rhizopus*,
mature sporangium (Left), Sporangium bursts (Right)

(ii) Endospore Formation in bacteria

Under unfavourable conditions, some species of bacteria reproduce by forming spores, e.g., *Clostridium* and *Bacillus* species. Thick walled spores are formed inside bacterial cells. They are called endospores.

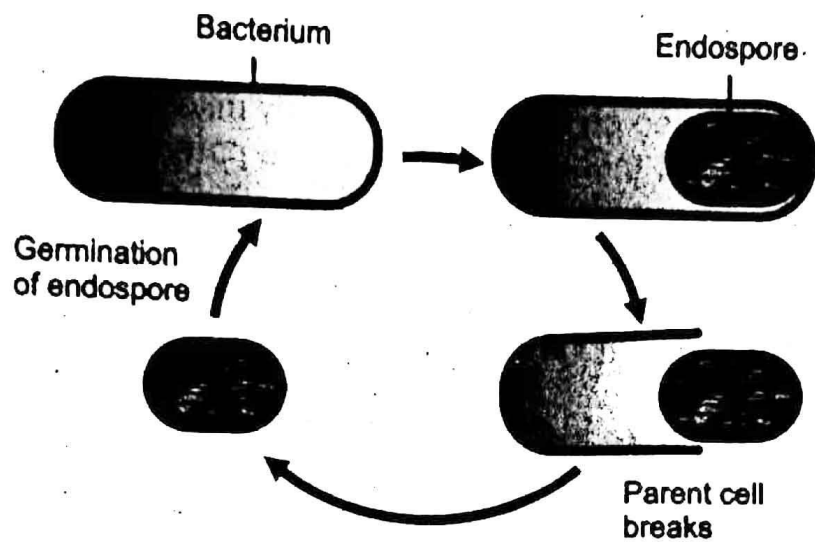


Figure 14.7: Spore Formation in a Bacterium

5- Parthenogenesis

Definition

It is also a form of asexual reproduction. In it, an unfertilized egg develops into new offspring.

Examples

(i) Some fishes, frogs and insects reproduce by means of parthenogenesis.

(ii) **Parthenogenesis in Honeybee**

Queen honeybee lays eggs in the cells of honeycomb. Many eggs remain unfertilized and develop into haploid males (drones) by parthenogenesis and eggs that are fertilized by male bees develop into diploid females.

6- Vegetative Propagation

Definition

The process in which vegetative parts of plants i.e. roots, stems or leaves give rise to new plant is called vegetative propagation.

Occurrence

It occurs naturally and artificially.

(1) **Natural Vegetative Propagation**

It occurs naturally in several ways.

(i) **Bulbs**

Definition

Bulbs are short underground stems surrounded by thick, fleshy leaves that contain stored food.

Explanation

Adventitious roots arise from the base of bulb while shoots arise from the top of the base.

Examples: Tulips, onions and lilies reproduce by bulbs

(ii) **Corms**

Introduction

Corms are short and swollen underground stems containing stored food.

Explanation

Buds are present at the top of corm. Shoot grows from a bud and forms a new plant.

Examples

Dasheen and garlic

(iii) Rhizomes

Introduction

These are horizontal underground stems with scale leaves.

Explanation

Enlarged portions on rhizome are called nodes. Buds are produced at nodes which give rise to shoot. The lower surface of rhizome produces adventitious roots.

Examples

Ginger, ferns and water lilies reproduce by rhizomes.

(iv) Stem Tubers

Definition

These are the enlarged portions of an underground stem (rhizome).

Explanation

There are aggregations of tiny buds in the form of “eyes” along the surface of tuber. Each bud develops into shoot that grows upward and also produces roots.

Examples

Potatoes and Yams

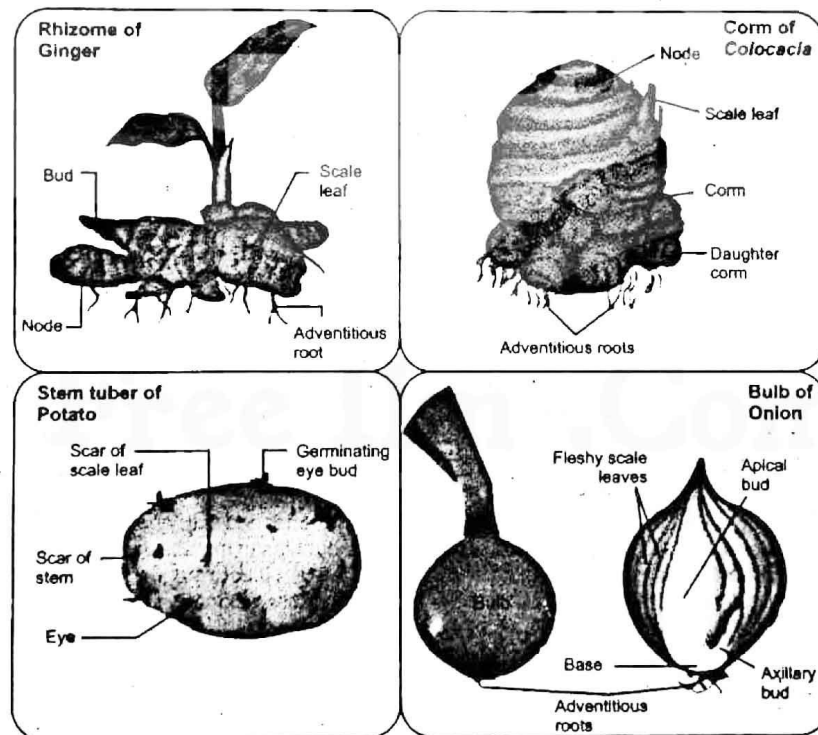


Figure 14.8: Some Types of Natural Vegetative Propagation

(v) Suckers

Definition

Suckers are lateral stems close to ground level.

Explanation

A sucker grows underground from some distance and then turn up, producing the new plant.

Example

Mint and *chrysanthemum*

(vi) By Leaves

Introduction

Vegetative propagation by leaves is not common and is seen in plants such as *Bryophyllum* (*Pather Chut*).

Explanation

This plant has fleshy leaves and adventitious buds are present at the margins of leaves. When leaf falls on ground, the buds grow into new plants.



Figure 14.9: A *Bryophyllum* leaf with Buds

2- Artificial Vegetative Propagation

The following two are the most common methods of artificial vegetative propagation:-

(i) Cuttings

Introduction

In this method, cuttings may be taken mainly from the stems or roots of parent plant. These cuttings must have a meristematic region from which growth can occur. When cuttings are placed in a suitable soil (sufficient nutrients, water and sunlight), they form roots and shoots which develop into a new plant identical to parent.

Examples

Stem Cuttings

Roses, ivy, grapevines, and sugarcane

Root Cuttings

Sweet potato is an enlarged root. Farmers place it in moist sand or soil until it produces several plantlets. Then the plantlets are removed and planted. This process is used to produce many plants from a single plant and all plants are same. This method has been very beneficial on sugarcane plantation.

(ii) Grafting

Introduction

In grafting, a piece of stem is cut from the plant and is attached with another plant with established root system. After a while, the vascular bundles of the attached stem piece and the host plant are connected to each other. The stem piece and the plant begin to grow together.

Examples: Roses, peach trees, plum trees and grapes.

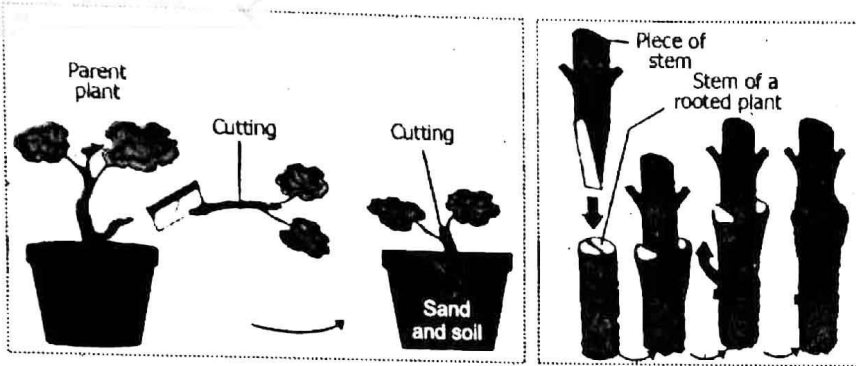


Figure 14.10: Product of Artificial Vegetative Propagation: Cutting (left) and Grafting (right)



Figure 14.11: Product of Artificial vegetative propagation: Seedless oranges

Q.3 What are advantages and disadvantages of vegetative propagation of plants. (Board 2014)

Ans: Advantages

- (i) The offsprings produced are genetically identical. Therefore beneficial characteristics can be preserved.
- (ii) No need of any mechanism of pollination.
- (iii) It helps to increase number of plants at a rapid rate.
- (iv) The organs of this method enable many plants to pass over unfavourable conditions.
- (v) Seedless fruits can be grown only by vegetative propagation.

Disadvantages

- (i) The plants do not have genetic variations.
- (ii) Species specific diseases can attack and this can result in the destruction of an entire crop.

Q.4 Describe Tissue culture and Cloning. (Board 2014)

Ans: (1) Cloning

Cloning is the latest method of vegetative propagation.

Explanation

Identical offsprings are produced from a single parent using its vegetative tissue or cell.

Micro-Propagation

This method of propagation is also called micro-propagation since it uses only a small part of plant.

(2) Tissue Culture

Introduction

It is the technique applied in cloning.

Explanation

- (i) Tissues are taken from any part of plant and are put in a suitable nutrient medium.
- (ii) The tissue cells start mitosis and produce masses of cells called calluses which are transferred to other medium containing different hormones.
- (iii) Calluses grow into new small plants which are then planted in pots and then in fields.

Q5. Explain the sexual reproduction in plants.

Ans.

1. Sexual Reproduction

Sexual reproduction involves the production of gametes and their fusion i.e., fertilization.

2. Production of Gametes

Gametes are produced in special structures in plant body.

3. Sexually Reproducing Plants

- Non-Seed Producing plants (Mosses and ferns)
- Seed Producing Plants

- Gymnosperms
- Angiosperms (flowering plants)

4. Use of Different Methods for Fertilization

Plant groups use different methods for bringing the sperm and egg cells together.

a. In Mosses and Ferns

Sperms are motile and can swim to egg cells. Therefore, these plants require water (in the form of dew or rain) for sexual reproduction.

b. Gymnosperms and angiosperms

These plants have special methods for carrying their sperms to egg cells. They do not need water for reproduction.

5. Alternation of generation (Board 2013)

In the life cycle of flowering plants, two different generations alternate with each other. One generation is diploid and produces spores called sporophyte. The other generation is haploid and produces gametes called gametophyte generation. This phenomenon in which two generations alternate with each other during life cycle is called alternation of generation.

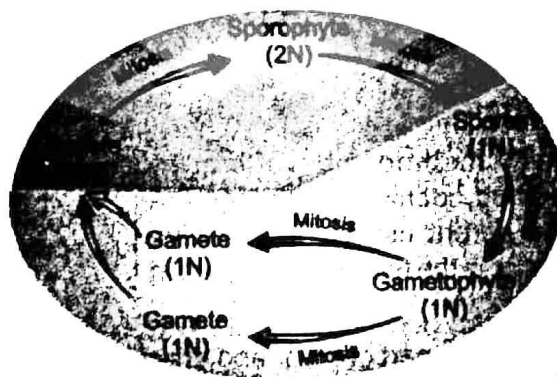


Figure 14.12: An overview of Alternation of generation

6. Sporophyte Generation

i. Dominant

In most plants, sporophyte generation is dominant. It means that it is big in size and is independent.

ii. Production of Spores

Sporophyte produces haploid spores by meiosis and spores develop into gametophyte.

7. Gametophyte Generation

i. Small in size:

It is small in size and depends upon sporophyte.

ii. Production of gametes

It produces gametes by mitosis. The male and female gametes fuse and form diploid Zygote. The zygote undergoes repeated mitosis and develop into a new diploid sporophyte.

8. Structure of flower

(Board 2013)

Flower is the reproductive structure. The flower components are arranged in the form of whorls. The outer two whorls in a flower are the non-reproductive whorls while the inner two whorls are the reproductive whorls.

(i) Calyx

It is the outermost whorl and usually green in colour. Its individual units are called sepals.

(ii) Corolla

It is the second whorl and is often coloured brightly. Its individual units are called petals. It attracts the insects which are the agents of pollination.

(iii) Androecium

It is the male reproductive part and its units are called stamens. Each stamen has a thread like filament at the end of which anther is attached. Anther has pollen sacs in which haploid microspores (pollen grains) are produced during meiosis. Microspore makes the male gametophyte generation. The nucleus of microspore undergoes mitosis and produces two nuclei i.e. tube nucleus and generative nucleus. The generative nucleus produces two sperms by mitosis. So a germinated microspore has a tube nucleus and two sperms. This is the male gametophyte.

(iv) Gynoecium

It is the female reproductive part of flower. Its units are called carpels. Each carpel is made up of basal ovary, middle style and upper stigma. Inside ovary, there is one to many ovules. Each ovule has one haploid macrospore (produced by meiosis). Macrospore undergoes mitosis and produces an egg cell and some associated structures. This is the female gametophyte.

9. Pollination

When pollen grains mature, they are transferred to stigma and it is called pollination. On reaching the stigma, the tube nucleus of pollen grain makes a pollen tube. The pollen tube contains a tube nucleus and two sperms.

Entry of Sperms in Female gametophyte

The tube grows through style and ovary and enters ovule. Here, it bursts and releases the sperms. Both sperms enter the female gametophyte.

10. Double Fertilization

One sperm fuses with egg and forms a diploid zygote, the other sperm fuses with diploid fusion nucleus and forms a triploid (3N) nucleus called endosperm nucleus. Since the process of fertilization involves two fusions, it is called double fertilization.

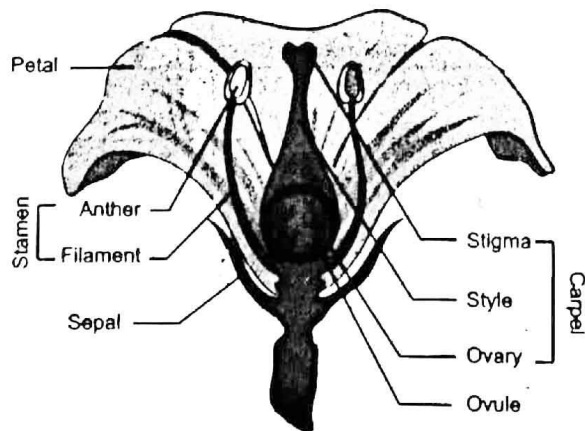


Figure 14.13: Structure of a Flower

11. Formation of embryo and Endosperm

Zygote develops into embryo and endosperm nucleus.

12. Formation of seed and Fruit

Ovule then becomes seed and ovary changes into fruit.

13. Formation of a new plant

When seeds mature, they are dispersed. If seeds get suitable conditions, their embryos develop into new plants.

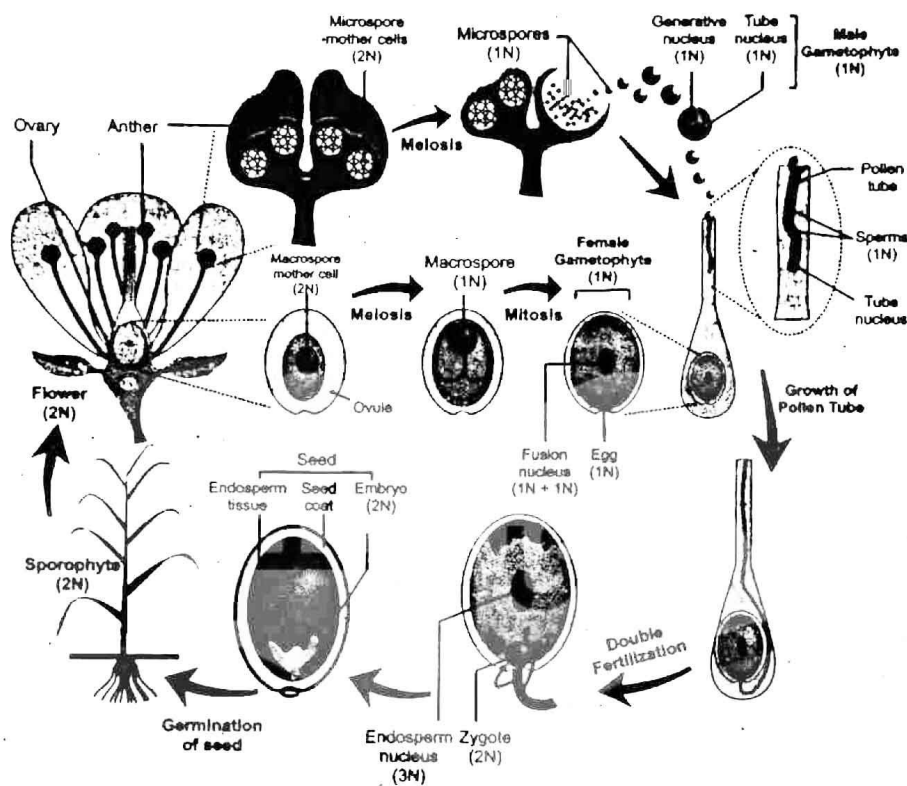


Figure 14.14: Life Cycle of a Flowering Plant

Q6. What is pollination? Write its types.

Ans. Pollination

The transfer of the pollen grains from flower anther to stigma is called pollination.

Types of Pollination

There are two types of pollination:

(i) Self pollination

The transfer of pollen grains from the anther to the stigma of same flower or other flower of same plant is called self pollination.

(ii) Cross pollination

The transfer of pollen grains from the flower on one plant to the flower on other plant of same species. It is brought about by various agencies like wind, water, birds etc. and man.

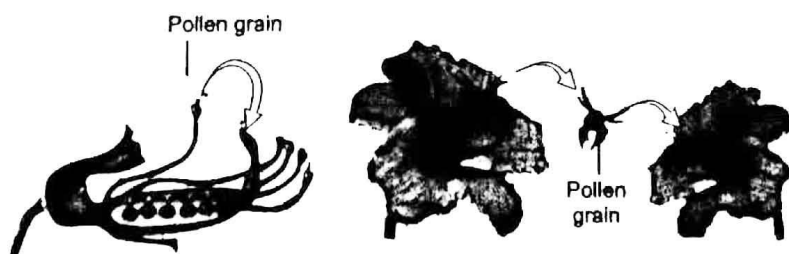


Figure 14.15: Self Pollination (Left) and Cross Pollination (Right)

Q.7 Describe the structural adaptations of insect pollinated and wind pollinated flowers.

Ans: The insect pollinated and wind pollinated flowers have structural adaptations that facilitate the transfer of pollen grains between two plants. Some of these adaptations are described below:

Table 14.1: Adaptations in insect-pollinated and wind-pollinated flowers		
Feature	Insect Pollinated Flowers	Wind pollinated Flowers
Size	Generally large	Generally small
Colour	Petals brightly coloured	Petals green or dull in colour
Nectar	Produce nectar	Do not produce nectar
Floral arrangement	Flowers face upwards	Flowers hang down for easy shaking
Stamens and stigmas	Enclosed inside ring of petals	Hang out of ring of petals
Pollen grains	Small number produced/ heavy and sticky	Large number produced/light with smooth surface
Stigma	Pinhead shaped with no branches	Feathery branches for catching pollen
Examples:	Buttercup, rose, wallflower, sunflower, orchid etc.	grasses, hazel, willow, corn etc.

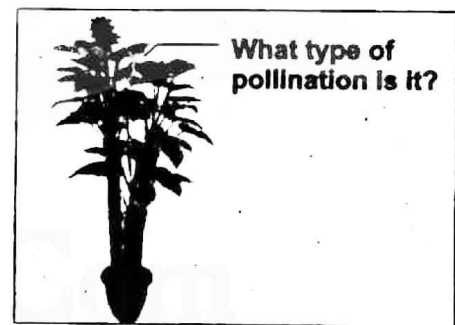


Figure 14.16: Insect-pollinated flower (left) and a wind-pollinated (right) flowers)

Q8. Explain the development and structure of seed.

Ans. Introduction

After fertilization in female gametophyte, zygote divides repeatedly by mitosis and develops into an embryo. At this stage, ovule changes into seed and this completes process of sexual reproduction in plants.

Structure of seed

It consists of three parts

1. Embryo formed from zygote.
2. Endosperm tissue formed from endosperm nucleus.
3. Seed coat developed from the wall of ovule.

Seed coat

It develops from the wall of ovule. It may be a thin or thick layer. Seed coat protects embryo from mechanical injury and from drying out.

Hilum

There is a scar on the seed coat called hilum. It is where the seed is attached to the ovary wall.

Micropyle

At one end of hilum, is micropyle. Seed uses this micropyle for absorption of water.

Development of seed

Embryo is an immature plant. It consists of a radicle, a plumule and two cotyledons. The radicle of the embryo develops into new root while plumule develops into new shoot. The embryonic stem above the point of attachment of cotyledons is called epicotyl and embryonic stem below the point of attachment of cotyledon called hypocotyl. In angiosperms, the stored food is derived from the endosperm tissue.

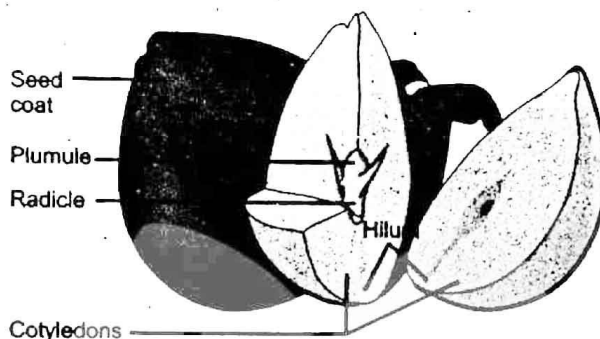


Figure 14.17: The Structure of seed

Q9. Explain the germination of seed.

Ans. Definition

Seed germination is a process by which a seed embryo develops into a seedling.

Process of germination

During germination, the embryo soaks up water which causes it to swell, splitting the seed coat. Root is the first structure that emerges from the radicle present in seed. It grows rapidly and absorbs water and nutrients from soil. In the next phase, plumule develops into tiny shoot which elongates and comes out of soil.

Types of germination

On the basis of elongation of hypocotyl and epicotyl, there are two types of germination:

(i) Epigeal germination

In epigeal germination, the hypocotyl elongates and forms a hook pulling the cotyledons above the ground. Examples are beans, cotton and papaya.

(ii) Hypogeal germination

In this germination, the epicotyl elongates and forms the hook. In this type, the cotyledons stay underground. Examples are pea, maize and coconut.

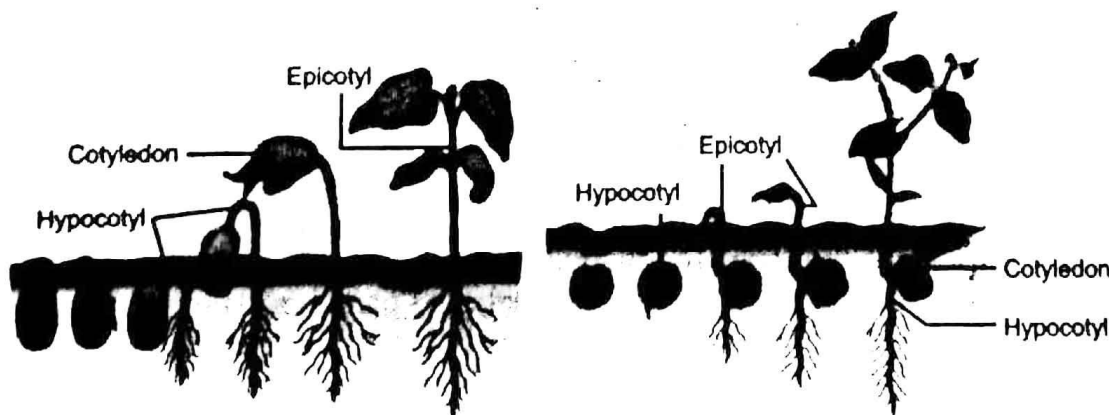


Figure 14.18 Types of Seed Germination. Epigeal (Left) and hypogeal (Right)

Q10. Describe the conditions for seed germination.

Ans. External conditions

The most important external conditions include water, oxygen and favourable temperature.

Water (moisture)

Seeds of most plants have low water content, and germination cannot occur until seed coat or other tissues have imbibed water. The absorbed water is used in the digestion of stored food and helps in elongation of hypocotyl and epicotyl.

Oxygen

Oxygen is essential for the respiration in the cells of embryo.

Temperature

Seeds differ greatly in their temperature, required for germination. The optimum temperature for the germination of the seeds of most plants ranges from $25-30^{\circ}\text{C}$.

Internal Conditions

The internal conditions include a live embryo and sufficient food storage.

Q11. What is gametogenesis? Explain the spermatogenesis and oogenesis in detail.

Ans. Definition

The formation of gametes is called gametogenesis.

Explanation

During gametogenesis, diploid ($2N$) gamete mother cells undergo meiosis and form haploid ($1N$) gametes. The male and female gametes are formed in specialized organs called gonads.

Male Gonads

Male gonads are called testes and the production of sperms in testes is called spermatogenesis.

Female Gonads

Female gonads are called ovaries and the production of egg cells in ovaries is called oogenesis.

Spermatogenesis

Some cells in the walls of the seminiferous tubules of testes divide repeatedly by mitosis to form large number of diploid spermatogonia. Some spermatogonia produce primary spermatocytes. Each primary spermatocyte undergoes meiosis-I and produces two haploid daughter cells called secondary spermatocytes. By meiosis-II, they produce four haploid spermatids. Their nuclei shrink and some structures are formed e.g. a corner called acrosome, a tail and a mitochondrial ring. After these changes, the spermatids are called sperms.

Oogenesis

Some cells of ovary prepare structures called follicles in which many diploid oogonia are present. Some oogonia produce diploid primary oocytes. One of the primary oocyte produces two haploid cells by meiosis. The smaller cell is called first polar body and the large one is called secondary oocytes. The secondary oocyte completes meiosis II and produces two haploid cells i.e. a second polar body and an egg cell.

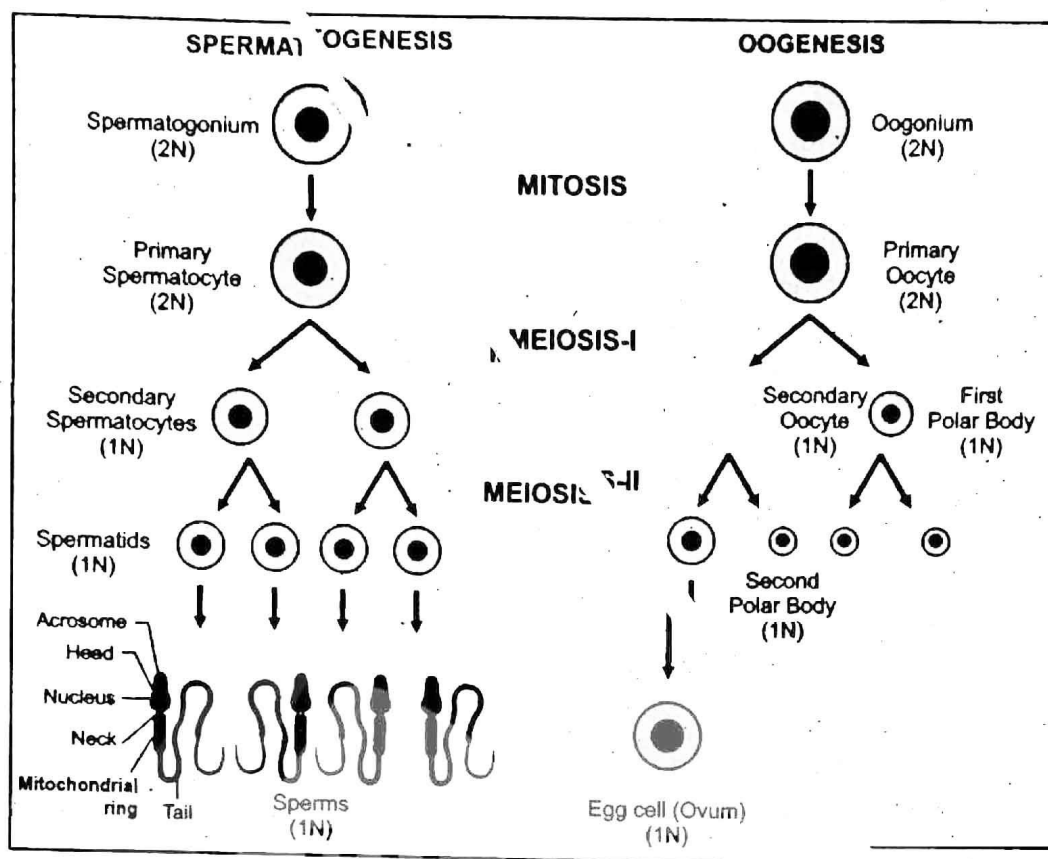


Figure 14.19 Gametogenesis in Animals

Q.12 Define fertilization and explain its types.

Ans. Fertilization

After the formation of gametes, fertilization occurs. There are two mechanisms by which fertilization can take place:

(1) External fertilization

Introduction

In external fertilization, egg cells are fertilized outside the body.

Explanation

It occurs in aquatic environment and both the male and female animals release their gametes into their surroundings at almost the same time. In external fertilization, there is risk of loss of gametes due to environmental hazards such as predators.

Examples

It occurs in many invertebrates and the first two groups of vertebrates i.e. fishes and amphibians.



Figure 14.20: External Fertilization in Fish

Internal fertilization

Introduction

Egg cells are fertilized within the reproductive tract of female.

Explanation

Such animals provide protection to the developing embryo. After fertilization, reptiles and birds make protective shells around their egg cells and then lay these eggs. Extra protection is provided to embryo and mother supplies all that embryo needs. In mammals, the development of fertilized egg into new body takes place within the mother's body.

Examples

Examples are reptiles, birds and mammals.



Figure 14.21: Reptiles and bird's egg provided protection and Food to Embryo

Q.13 Explain reproduction in Rabbit.

Ans. Rabbits are small mammals found in several parts of the world.

Male reproductive system

The male reproductive system of rabbit consists of:

- i) A pair of testes
- ii) Associated ducts
- iii) Glands

Testes produce sperms, ducts transport these sperms to external genitalia and glands add secretions to sperms.

(1) Testes

They are located in a bag of skin called scrotum. Each testis consists of coiled tubes called seminiferous tubules. Sperms are formed in these tubules.

(2) Associated ducts

Epididimys: When sperms are mature, they accumulate in the collecting ducts of testes and then pass to epididimys.

Vas Deferens

From epididimys, sperms move to a sperm duct called vas deferens.

Both sperm ducts join urethra just below urinary bladder and it transports both sperm and urine.

Semen

Semen is the material containing 10% sperms and 90% fluid.

(3) Glands

As sperm pass down the ducts from testes to urethra, associated glands add various secretions.

- i) **Prostate Gland:** It produces a secretion to neutralize the acidity of fluid.
- ii) **Cowper's Gland:** It produces secretions that lubricate the ducts.
- iii) **Seminal Vesicles:** They produce secretions that provide nutrients for sperms.

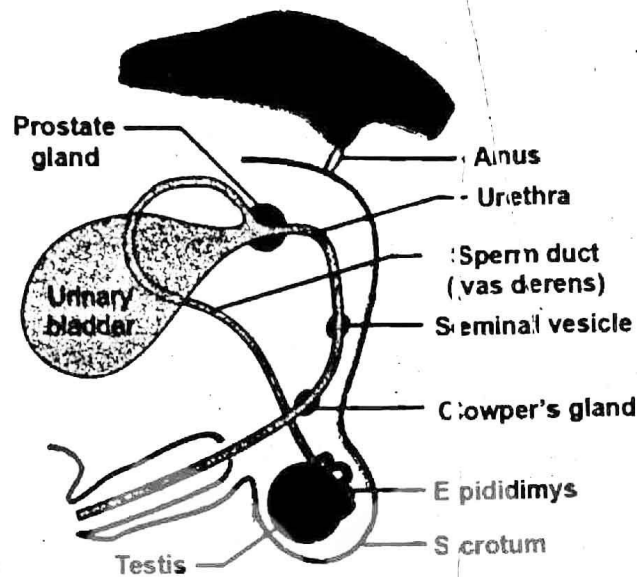


Figure 14.22: Male Reproductive System of Rabbit

Female reproductive system

(Board 2014)

It consists of:

- (i) Ovaries
- (ii) Associated ducts.

(i) Ovaries

a. Definition

Ovaries are small oval organs situated in the abdominal cavity just ventral to kidneys.

b. Egg Cells

The outer region of ovary produces egg cells.

c. Follicles

The specialized cells called follicles surrounds and nourishes each egg cell.

(ii) Associated ducts

a. Fallopian tube

From ovaries, egg cells are released into fallopian tubes

b. Uterus

Fertilization occurs in fallopian tubes and the fertilized egg is carried to uterus.

c. Uterus horns

The uterus is divided into two parts or horns.

d. Birth canal

The horns join and open into vagina or birth canal.

e. Cervix

Cervix is the portion of uterus where sperms of male are deposited.

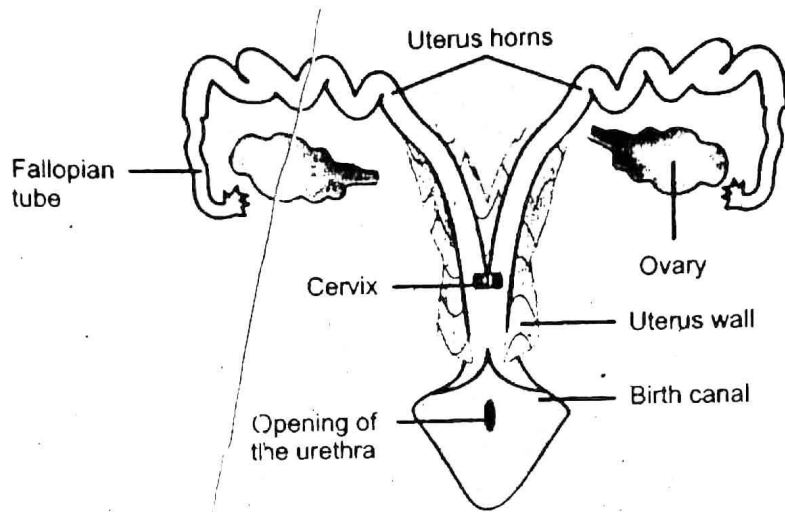


Figure 14.23: Female Reproductive System of Rabbit

Fertilization and development

Rabbit can breed throughout the year but male rabbits are commonly sterile during the summer months. Male rabbit deposits its sperms into female vagina. Sperms swim through cervix and uterus to fallopian tubes where they fertilize the egg cells.

Embryo

Zygote is carried to uterus where zygote started dividing and is now called embryo. Embryo is implanted in uterus walls.

Placenta

A connection called placenta is established between embryo and uterus wall.

Development of new Offspring

Embryo develops into a new offspring in 30-32 days after which it is born.

Q.14 Describe Growth in Human population and its consequence.

Ans: Pakistan's Population

Pakistan's population in the year 2007-08 was 163,775,000. By the end of this decade, our population is expected to exceed 176 million.

High growth rate in past

Pakistan's population had relatively high growth rate in past. When population exceeds the carrying capacity of an area, it results in overpopulation.

Problems with human overpopulation

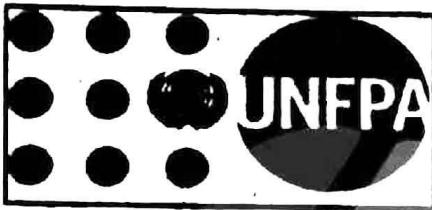
- (i) Shortage of Fresh Water
- (ii) Deforestation and loss of ecosystem.
- (iii) More population and global warming
- (iv) High infant and child mortality rate due to poverty.
- (v) Shortage of housing units, hospitals, jobs, educational institutions and food.

Preventive measures to control population

- (i) People should be educated about the problems of overpopulation.
- (ii) Pakistan's Ministry of Population Welfare has taken a number of steps to make people aware of the hazards of overpopulation and to stabilize the population to match our resources.



Logo of an organization working for awareness of overpopulation



The United Nations Population Fund

UNFPA began operations in 1969. It is the largest international organization funding for population and health programmes. The UNFPA works in over 140 countries, for awareness about the consequences of overpopulation.

Q15. Explain the social implications of AIDS and other Sexually Transmitted Diseases (STD's).

Ans. AIDS

AIDS is a sexually transmitted disease and transmitted through sexual act. AIDS stands for Acquired Immuno Deficiency Syndrome. It is caused by Human Immuno Deficiency Virus (HIV). The virus destroys white blood cells which results in the loss of resistance against infections. It is a fatal disease.

Spreading

It spreads through transfer of body fluid such as blood and semen.

Cause: Main causes are:

- i) Unprotected sexual activities.
- ii) Use of infected needles.
- iii) Transfusion of infected needles.

Role of National AID control programme (NACP) and Non-Government organizations (NGOs)

Pakistan Federal Ministry of health established NACP in 1987. The main objective of this programme is to help the public for the prevention of HIV transmission. The frequency of HIV infection in Pakistan is low but still at risk.

For improvement, NACP started services through TV and radio channels and print media in 2005. The objective are:

- Change public attitude for safe sexual activities
- Create demand for information on HIV and AIDS
- Improve attitudes and behaviour among health care workers.

Multiple Choice Questions

1. Growing an entire new plant from part of the original plant is called;
(a) Budding
(b) Regeneration
(c) Fragmentation
(d) Vegetative propagation
2. *Rhizopus* reproduces asexually by;
(a) Binary fission
(b) Budding
(c) Spore formation
(d) Endospore formation
3. A corm develops into new garlic plant. This is the process of;
(a) Vegetative propagation
(b) Regeneration
(c) Meiosis
(d) Gametogenesis
4. Which is not an advantage of grafting?
(a) The graft is identical to the parent plant
(b) Grafting allows the propagation of seedless fruits
(c) The graft combines the characteristics of two plants
(d) Grafting may allow for the faster production of desirable fruits
5. Pollination is the transfer of pollens from;
(a) Anther to stigma
(b) Stigma to anther
(c) Sepal to petal
(d) Petal to sepal
6. Double fertilization in plants means;
(a) Fusion of two sperms with two egg cells
(b) Fusion of one sperm with egg cell and other sperm with fusion nucleus
(c) Fusion of two sperms with single egg cell
(d) Fusion of tube nucleus with fusion nucleus and sperm egg cell
7. After fertilization in plants, the fruit develops from;
(a) Ovule wall
(b) Ovary wall
(c) Petals
(d) Anther
8. Which part of female reproductive system receives egg cells from the ovary?
(a) Fallopian tube
(b) Uterus
(c) Vagina
(d) Collecting duct
9. Inside testes, sperms are produced in;
(a) Vas deferens
(b) Sperm duct
(c) Seminiferous tubules
(d) Collecting duct
10. Which of these cell has haploid number of chromosomes?
(a) Spermatogonium
(b) Primary spermatocyte
(c) Secondary spermatocyte
(d) All of these
11. During binary fission, the nucleus of parent organism divides into two by;
(a) Sexual reproduction
(b) Meiosis
(c) Mitosis
(d) None of these
12. If a planarian breaks into many pieces instead of two, it will be called;
(a) Budding
(b) Spore formation
(c) Binary fission
(d) Fragmentation

13. ~~The fungus~~ the spore is covered by a thick wall called;
(a) Sporangium
(b) Sporophyte
(c) Cyst
(d) Endospores
14. The eggs of the honeybee remain unfertilized and develops into haploid males by;
(a) Budding
(b) Parthenocarpy
(c) Regeneration
(d) Parthenogenesis
15. In tissue culture technique, cell starts mitosis and produce masses of cells called;
(a) Clonning
(b) Graftings
(c) Calluses
(d) Rhizome
16. During binary fission, how many cells are formed?
(a) Two daughter cells
(b) Four cells
(c) Many cells
(d) All of these
17. In _____, the buds do not detach from the parent body.
(a) Hydra (b) Amoeba
(c) Bacteria (d) Corals
18. Spores which are formed inside bacterial cells are called;
(a) Cysts (b) Spores
(c) Endospores (d) All of these
19. Which of followings reproduces by bulbs?
(a) Garlic (b) Ginger
(c) Ferns (d) Tulips
20. Which method of propagation is also called micro-propagation?
(a) Cuttings (b) Tissue culture
(c) Grafting (d) Suckers
21. Flowers of wind pollination produce;
(a) Petals
(b) Nectar
(c) No nectar
(d) Do not reproduce
22. Buttercup is an example of;
(a) Wind pollinated flower
(b) Insect pollinated flower
(c) Water pollinated flower
(d) None of these
23. Which of these germinate by epigeal germination?
(a) Pea (b) Maize
(c) Beans (d) Coconut
24. The optimum temperature for the germination of the seeds of most plants ranges from;
(a) 20 - 30° C (b) 25 - 35° C
(c) 25 - 30° C (d) 20 - 25° C
25. Many diploid oogonia are present in;
(a) Follicles (b) Sperms
(c) Spermatids (d) Scrotum
26. In which group of mammals, the fertilized egg does not develop inside the mother's body?
(a) Chordates
(b) Egg laying mammals
(c) Placental mammals
(d) All of these
27. Where the sperms of rabbit are produced?
(a) Cowper's glands
(b) Prostate gland
(c) Collecting ducts
(d) Seminiferous tubules
28. Where the sperms of male rabbit are deposited in the female rabbit?
(a) Horns (b) Cervix
(c) Follicle (d) Ovaries
29. Horizontal underground stems are called:
(a) Corms (b) Rhizomes
(c) Tubers (d) Bulbs

30. Which part of flower is changed into fruit? (Board 2013)
 (a) Ovule (b) Ovary
 (c) Petals (d) Anther
31. An example of Rhizome is: (Board 2013)
 (a) Onion (b) Garlic
 (c) Ginger (d) potato
32. Method of asexual reproduction found in *Amoeba* is: (Board 2013)
 (a) Binary Fission (b) Fragmentation
 (c) Budding (d) Spore formation
33. Double fertilization is a feature of:
 (a) Seedless plants
 (b) Gymnosperms
 (c) Flowering plants
 (d) Ferns
34. Simplest and common method of asexual reproduction is:
 (a) Tissue culture (b) Parthenogenesis
 (c) Cloning (d) Binary fission
35. Gametophyte is produced from:
 (a) Gametes (b) Zygote
 (c) Spores (d) Sporophyte
36. Roses, ivy, grapevines and sugarcane reproduce by:
 (a) Leaves
 (b) Suckers
 (c) Cuttings
 (d) Suckers and Cuttings
37. In which of the following, hypogeal germination takes place;
 (a) Beans (b) Maize
 (c) Cotton (d) Papaya
38. When was NACP established?
 (a) 1947 (b) 1997
 (c) 1987 (d) 2000
39. Into which part, ovule changes after fertilization?
 (a) Fruit (b) Seed
 (c) Flower (d) Leaf
40. In Honeybee the drones are:
 (a) Female flies
 (b) Male flies
 (c) Workers
 (d) Male and female flies
41. When Pakistan Federal Ministry of Health established NACP?
 (a) 1947 (b) 1977
 (c) 1987 (d) 2010
42. In rabbit, embryo develops into a new offspring in:
 (a) 40 – 42 days (b) 30 – 40 days
 (c) 30 – 32 days (d) 280 days
43. By the end of 2010, our population was:
 (a) 176 million (b) 400 million
 (c) 180 million (d) 500 million
44. In male rabbit, each testis consists of a mass of coiled tubes called the:
 (a) Epididymis
 (b) Cowper's gland
 (c) Seminiferous tubules
 (d) Vas deferens
45. When secondary oocyte completes Meiosis II, how many haploid cells result:
 (a) 2 (b) 3
 (c) 4 (d) 5
46. Which of the following are internal conditions for germination of seed:
 (a) Oxygen
 (b) Live embryo
 (c) Sufficient food storage
 (d) Live embryo and sufficient food storage
47. The endosperm nucleus is:
 (a) Haploid (b) Diploid
 (c) Triploid (d) Tetraploid
48. Which of the following reproduces by grafting?
 (a) Ivy
 (b) Pather Chut
 (c) Plum Trees
 (d) Both Ivy and Pather Chut

49. The second whorl of the flower is:
 (a) Calyx (b) Corolla
 (c) Androecium (d) Gynoecium
50. In which of the following, an unfertilized egg develops into new offspring?
 (a) Vegetative propagation
 (b) Spore formation
 (c) ☒ Parthenogenesis
 (d) Budding
51. Binary fission does not take place in:
 (a) Echinoderms (b) Bacteria
 (c) Planaria (d) Hydra
52. Which of the following also reproduces through fragmentation?
 (a) ☒ Planaria (b) Hydra
 (c) Bacterium (d) Yeast
53. Which generation is haploid?
 (a) Sporophyte
 (b) Endospore
 (c) ☒ Gametophyte
 (d) Sporophyte and Endospore
54. Female reproductive part of flower is:
 (a) Androecium (b) Calyx
 (c) Corolla (d) ☒ Gynoecium
55. Ferns reproduce by:
 (a) Corms (b) ☒ Rhizome
 (c) Tubers (d) Bulb
56. In most plants, Sporophyte is:
 (a) Small in size
 (b) Dominant
 (c) Independent
 (d) ☒ Dominant and independent
57. Spermatids are:
 (a) Motile (b) Active
 (c) ☒ Non-motile (d) Sperms
58. Which forms egg cell?
 (a) Follicles
 (b) Primary oocytes
 (c) First polar body
 (d) ☒ Secondary oocyte
59. Placenta is a structure which belongs to:
 (a) birds (b) ☒ mammals
 (c) reptiles (d) amphibians
60. UNFPA works in how many countries?
 (a) 150 (b) 160
 (c) ☒ 140 (d) 100
61. Ovary change into after ripen:
 (Board 2014)
 (a) Into seed (b) ☒ Into fruit
 (c) Into flower (d) Into nectar
62. Sperms and fluid collectively called:
 (Board 2014)
 (a) Hormones (b) ☒ Semen
 (c) Follicle (d) Scrotum
63. In which of the following animal groups, external fertilization takes place;
 (a) Reptiles (b) Amphibians
 (c) ☒ Birds (d) Mammals
64. Pollen grains are produced in anther of flower by:
 (a) ☒ Meiosis
 (b) Mitosis
 (c) Binary fission
 (d) Multiple fission
65. *Rhizopus* reproduces by: (Board 2013)
 (a) Binary Fission
 (b) Budding
 (c) ☒ Spore formation
 (d) Parthenogenesis

Answer Key

1	d	2	c	3	a	4	c	5	a	6	b
7	b	8	a	9	c	10	c	11	c	12	d
13	c	14	d	15	c	16	a	17	d	18	c
19	d	20	b	21	c	22	b	23	c	24	c
25	a	26	b	27	d	28	b	29	c	30	b
31	c	32	a	33	c	34	d	35	c	36	c
37	b	38	c	39	b	40	b	41	c	42	c
43	a	44	c	45	a	46	d	47	c	48	c
49	b	50	c	51	d	52	a	53	c	54	d
55	b	56	d	57	c	58	d	59	b	60	c
61	b	62	b	63	b	64	a	65	c		

Short Answer Questions

Q1. Define reproduction.

Ans. Reproduction is defined as the production of individuals of the same species i.e. the next generation of species.

Q2. What are types of reproduction?

Ans. (i) Asexual reproduction

It means the simple cell division that produces an exact duplicate of an organism.

(ii) Sexual reproduction

It involves the joining of male and female sex cells i.e gametes.

Q3. Define binary fission.

Ans. Binary fission means division into two. It is the simplest and most common method of asexual reproduction. It occurs in prokaryotes, many unicellular eukaryotes e.g. protozoa and some invertebrates.

Q4. What is Fragmentation?

Ans. The type of asexual reproduction in which the organisms break up into pieces. For example, planarian breaks into 8-9 pieces instead of two.

Q5. Define Budding.

Ans. It is the type of asexual reproduction in which a bud develops as a small outgrowth on parents body. For example, in yeast, a small bud is formed on one side of body of cell. The nucleus of cell divides and one of the nucleus is passed on to bud and form new cell.

Q6. Differentiate between spore and endospore.

(Board 2013)

Ans. Spore

In most of fungi like *rhizopus*, when they reaches at reproduction age, its body cells form thick walled sacs called sporangia. Inside each sporangia, a cell divides many times and forms many daughter cells called spore.

Endospore

Under unfavourable conditions, some species of bacteria reproduce by forming spores e.g., *Clostridium* and *Bacillus* species. Thick walled spores are formed inside bacterial cell. This is called endospores.

Q7. Define Parthenogenesis.

Ans. Type of asexual reproduction in which an unfertilized egg develops into new offspring. For example, some fishes, frogs and insects reproduce by means of parthenogenesis.

Q8. What is Vegetative propagation?

Ans. When vegetative parts of plants i.e. the roots, stems or leaves give rise to new plants, the process is called vegetative propagation.

Q9. What is Cuttings?

Ans. In this method, cuttings may be taken mainly from stems or roots of parent plant. When cuttings are placed in a suitable soil and under light conditions, they may form roots and shoots. These roots and shoots grow and develop into a new plant. Examples are roses, ivy and grapevines.

Q10. Define Grafting.

Ans. In this method, a piece of stem is cut from the plant and is attached with another plant. After a while, the vascular system of attached stem and the host plant are connected. The stem piece and the plant begin to grow together. Examples are Roses, peach trees and various seedless fruits.

Q11. What is Alternation of Generation in plants. (Board 2014)

Ans. In the life cycle of flowering plants, the two generations alternate with each other. The phenomenon in which the sporophyte generation gives rise to gametophyte and gametophyte generation gives rise to sporophyte is called alternation of generation.

Q12. Define Double fertilization. (Board 2013)

Ans. The type of fertilization in which one sperm fuses with egg and forms a zygote. The other sperm fuses with the diploid fusion nucleus and forms a triploid endosperm nucleus. This process is called double fertilization.

Q13. What is Pollination?

Ans. The transfer of pollen grains from flower's anther to stigma.

Types

a) Self pollination

The transfer of pollen grains from the anther to the stigma of the same flower or the other flower of same plant.

b) Cross pollination

The transfer of pollen grains from the flower on one plant to the flower on other plant of same species.

Q14. What is seed coat?

Ans. It is the outer protective covering of a seed. It may be paper thin layer or thick and hard. Seed coat protects embryo from mechanical injury and from drying.

Q15. Define Hilum.

Ans. Hilum is a scar on seed coat, where the seed is attached to ovary wall.

Q16. Give the Difference between epicotyl and hypocotyl.

Ans. The embryonic stem above the point of attachment to cotyledon is called epicotyl and the embryonic stem below the point of attachment to cotyledon is called hypocotyl.

Q17. Differentiate between epigeal and hypogeal germination. (Board 2013)

Ans. In epigeal germination, the hypocotyl elongates and forms a hook, pulling the cotyledons above the ground, e.g. beans and cotton while in hypogeal germination, the epicotyl elongates and forms the hook, the cotyledons stay underground e.g. pea and maize.

Q18. Define Germination.

Ans. It is a process by which a seed embryo develops into a seedling.

Q19. What is Fertilization?

Ans. After the formation of gametes, fertilization occurs. These are of two types:

(a) External fertilization

In external fertilization, egg cells are fertilized outside the body. It requires both the male and the female animals to release their gametes into their surroundings at the same time. It occurs in most of the invertebrates, fishes and amphibians.

(b) Internal fertilization

In internal fertilization, egg cells are fertilized within the reproductive tract of female. It occurs in reptiles, birds and mammals.

Q.20. Define Semen.

Ans. It is the materials containing sperms in a fluid. It consists of 10% sperms and 90% fluid.

Q.21 Define acrosome.

Ans. Cap-like head of sperm cell which helps it in penetrating the egg cell is called acrosome.

Q.22 What do you know about cervix?

Ans: In female reproductive system, the part which separates uterus from vagina is called cervix.

Q.23 What is Cowper's gland? Where sperms of male are deposited.

Ans: An accessory gland in rabbit's male reproductive system which provides lubrication to the ducts. Cervix is the portion of uterus where sperms of male are deposited.

Q.24 Define Epididimys.

Ans: A storage area for sperms on the upper part of the testes is called epididimys.

Q.25 Define Fallopian tube.

Ans: A part of the female reproductive system, receives egg cell discharged from the ovary.

Q.26 What is Follicle?

Ans: A structure in the ovary in which the mature egg develops.

Q.27 What is parthenocarpy?

Ans: The process in which ovaries develop into fruit without the fertilization inside the ovules present in them, it results in seedless fruits e.g. bananas.

Q.28 What is prostate glands?

Ans: An accessory gland in the male reproductive system, produces a secretion that neutralizes the acidity.

Q.29 What is seminal vesicle?

Ans: The associated gland in male reproductive system produces secretions having nutrients for the sperms.

Q.30 Define seminiferous tubule.

Ans: These are coiled tubes present in testes and sperms are formed in these tubules.

Q.31 Define uterus horn.

Ans: The two separate parts of the uterus in the female rabbit are like horns so they are called uterus horns.

Q.32 What is vas deferens?

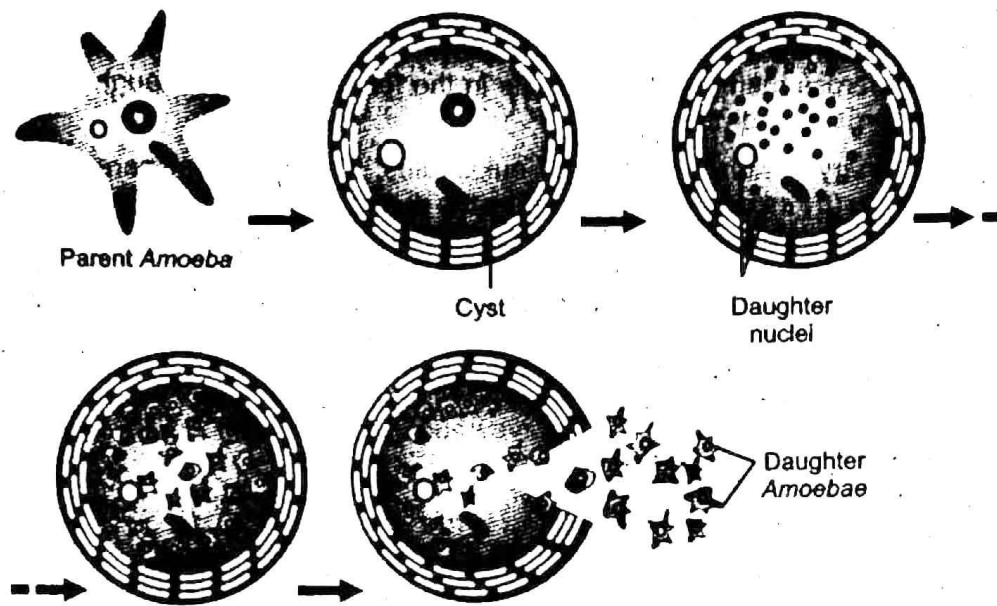
Ans: The tubes that carry sperms from each testis to the urethra.

Q.33 How multiple fission in *Amoeba* takes place?

Ans: Some unicellular organisms (e.g. *Amoeba*) form hard walls called cysts around them under unfavourable conditions.

When favourable conditions return, the nucleus of parent divides into many daughter nuclei and the division of cytoplasm occurs.

Each cytoplasm along with nucleus form daughter cell, so a large number of daughter cells are formed from a single parent. This is how multiple fission takes place in *Amoeba*.



Q.34 What is difference between spermatogenesis and oogenesis? (Board 2013)

Ans: The process of formation of sperms in testes is called spermatogenesis while the process of formation of eggs in ovaries is called oogenesis.