

CHAPTER # 14
REPRODUCTION

Q1. Define reproduction. Briefly describe its importance and types.**Ans: Reproduction:**

Reproduction is defined as the production of individuals of the same species i.e. the next generation of species. While it is one of the fundamental characteristics of living things, it is not an essential life process.

Importance of Reproduction:

Reproduction is thus essential for the continuation of species. It ensures that the genetic material of one generation is transmitted to the next. Each generation produces more offspring for the next generation.

Many individuals die due to various reasons like diseases, competition, genetic factors, etc. before reaching the reproductive age. Only the fittest and the best survive and reach the reproductive age. This ensures that the advantageous characteristics are transmitted to the next generation.

Types of reproduction:

There are two basic types of reproduction:

i. Asexual reproduction:

Asexual reproduction means simple cell division that produces an exact duplicate of an organism. There are many types of asexual reproduction which we shall discuss on the following pages.

ii. Sexual reproduction:

Sexual reproduction involves the joining (fusion) of male and female sex cells i.e. gametes.

Q2. Enlist the methods of asexual reproduction.**Ans: Methods of Asexual Reproduction:**

Asexual reproduction does not involve the fusion of gametes. There are many types of asexual reproduction all producing individuals that are genetically identical to each other and to the parent.

- i. Binary fission
- ii. Fragmentation
- iii. Budding
- iv. Spore Formation
- v. Parthenogenesis
- vi. Vegetative Propagation

Q3. What are the different ways by which prokaryotes, protozoans and fungi reproduce asexually?

Ans: See Q# 1 from exercise (Understanding the concepts)

Q4. Outline the methods of asexual reproduction in animals.

Ans: See Q# 5 from exercise Understanding the concepts

Q5. "Parthenogenesis is a type of asexual reproduction". Give comments on this statement.

Ans: See #3ftum exercise (Short Questions)

Q6. How are the natural and artificial vegetative propagations the methods of asexual reproduction in plants?

Ans: See Q 1 from exercise (Short Questions)

Explain the different parts of the plant that help in natural vegetative propagation.

Ans: See Q# 2 from exercise (Understanding the concepts)

Q8. Describe the process of artificial vegetative propagation.**Ans: Artificial Vegetative Propagation:**

Gardeners and farmers use artificial methods of vegetative propagation to increase the Stock of a plant. The following two are the most common methods of artificial vegetative propagation

1. Cuttings:

Artificial vegetative propagation in which cuttings are taken from stem or root of parent and are placed in soil.

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 and under right conditions (sufficient nutrients water and sunlight), they form roots and shoots Roots and shoots grow and develop into a plant identical to the parent plant from which the cuttings were taken.

Example:

Roses ivy and grapevines are propagated by stem cuttings Sweet potato is an enlarged root Farmers place it in moist sand or soil until produces several plantlets Then the plantlets are removed and planted.

Advantages:

Cutting is used to produce many plants from a single plant All new plants are exactly the same This artificial vegetative propagation has been very beneficial on sugar cane plantation.

2. Grafting:

A type of artificial vegetative propagation in which a piece of stem is cut from the plant and is inserted into another plant with established root system.

Explanation:

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.

Advantages:

This method is used to propagate many roses, peach trees, plum trees and various seedless fruits (including grapes).

Q9. Highlight advantages and disadvantages of Vegetative Propagation of Plants.

Ans: Advantages of Vegetative Propagation of Plants:

The offsprings produced through vegetative propagation are genetically identical. Therefore, beneficial characteristics can be preserved in vegetative propagation. There is no need of any mechanism of pollination. It helps to increase the number of plants at a rapid rate. The organs of vegetative propagation enable man to pass over unfavorable conditions. Plants bearing seedless fruits can be grown only by vegetative propagation.



Product of artificial vegetative propagation: Seedless oranges

Disadvantages of Vegetative Propagation of Plants:

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

Q10. Write a note on cloning.

Ans: Cloning:

Method of asexual reproduction in which identical off springs are produced from a vegetative tissue or cell of the parent.

Cloning is the latest method of vegetative propagation. In this method, identical off springs are produced from a single parent using its vegetative tissue or cell Tissue culture is the technique applied in this method.

Q11. Write a note on tissue culture.

Ans: Tissue culture:

Tissues are taken from any part of plant and are put in a suitable nutrient medium. The tissue cells start mitosis and produce masses of cells called calluses are transferred to other medium that contains different hormones for the formation of roots, stem and leaves Calluses make these structures and grow into new small plants. The small plants are then planted in pots and then in fields

Q12. Give an introduction of sexual reproduction in plants.

Ans: Sexual reproduction in plants:

Sexual reproduction involves the production of gametes (sperms and egg cells) and their fusion i.e. fertilization Gametes are produced in special structures in plant body

The major plants groups are mosses, ferns and seed plants. The seed plants include gymnosperms and angiosperms (flowering plants) Plant groups use different methods for bringing the sperm and egg cells together.

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.

On the other hand, gymnosperms and angiosperms have special methods for carrying their sperms to egg cells. They do not need water for reproduction.

Sporophyte generation:

In the life cycle of plants, two different generations alternate with each other One generation is diploid and produces spores It is called sporophyte generation.

Gametophyte generation:

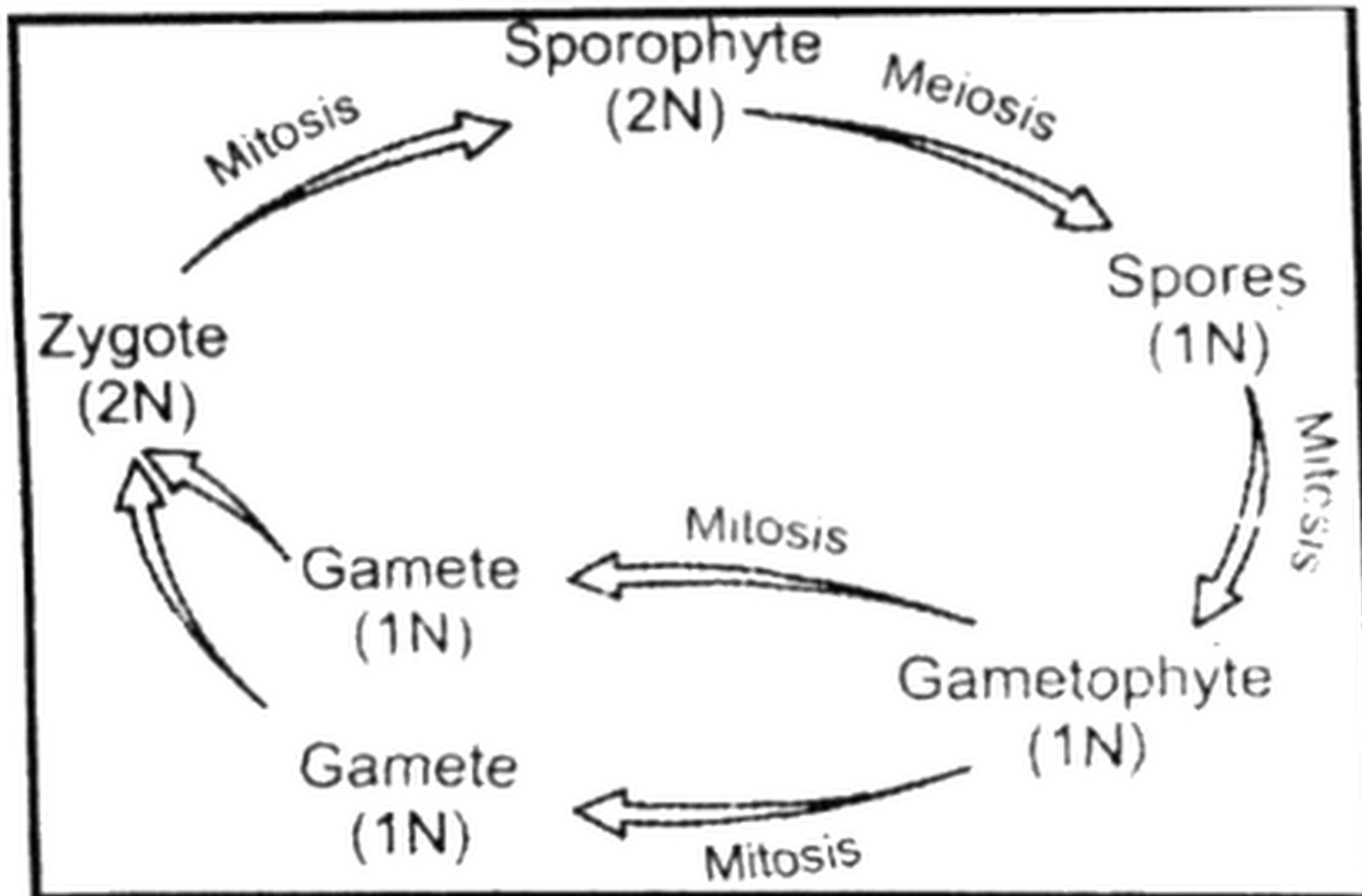
The other generations haploid and produces gametes caved gametophyte generation

Alternation of generations:

The phenomenon in which two different generations alternate with each other during life cycle is known as alternation of generations

Significance of sexual reproduction in plants:

in most plants, sporophyte generation is dominant. It means that it is big in size and is independent Sporophyte produces haploid spores by meiosis. The spores develop into gametophyte it is small in size and depends upon sporophyte It produces gametes by mitosis. The male and female gametes fuse and form diploid zygote. The zygote undergoes repeated mitosis and develops into a new diploid sporophyte.



An overview of alternation of generations in plants

Q13. Outline the life cycle of a flowering plant.

Ans: See Q# 4 from exercise (Short Questions)

Q14. Briefly describe the structure of flower.

Ans: Structure of flower:

in angiosperms, parent plant is diploid sporophyte generation Flower is the reproductive structure in this generation. 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.

Calyx:

Calyx is the outermost whorl It usually green in colour

Sepals:

Individual units (leaflets) of calyx are called sepals. Sepals protect the inner whorl which is at bud stage

Corolla:

Corolla is the next inner whorl and is often coloured brightly

Petals:

Individual units (leaflets) of corolla are called petals. They serve to attract bees, birds etc which are the agents of pollination

Androecium:

Third whorl androecium is the male reproductive part of flower its units are called stamens. Each stamen has a thread-like filament at the free end of which anther is attached. Anther has pollen-sacs in which haploid microspores (pollen grains) are produced through meiosis

Tube nucleus and generative nucleus:

Each microspore germinates into the male gametophyte generation. During it the nucleus of microspore undergoes mitosis and produces two nuclei i.e. a tube nucleus and a generative nucleus. The generative nucleus again undergoes mitosis and produces two sperms. So, a germinated microspore has a tube nucleus and two sperms. All these structures are the male gametophyte generation of plant

Gynoecium:

Fourth whorl gynoecium is the female reproductive part of flower its units are called carpels or each carpel made up of the basal ovary, middle style and upper stigma. Inside ovary, there is one to many ovules.

Macrospore:

Inside each one haploid macrospore is produced through meiosis. Macrospore germinates into the female gametophyte generation. During

macrospore undergoes mitosis and produces an egg cell and some associated structures (e.g. fusion of nucleus). Egg cell and associated structures are the female gametophyte generation of plant.

Q15. Explain Sexual Reproduction in Flowering Plants.

Ans: Sexual Reproduction in Flowering Plants:

Pollination:

When pollen grains mature, they are transferred to stigma. It is called pollination

Pollen tube:

On reaching the stigma the tube nucleus of pollen grain constructs a pollen tube. The pollen tube contains a tube nucleus and two sperms. The tube grows through style and ovary and enters ovule. Here it bursts and releases the sperms. Both sperms enter the female gametophyte. 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.

Double fertilization:

Since the process of fertilization involves two fusions, it is called double fertilization.

Seed and Fruit Formation:

Zygote develops into embryo and endosperm nucleus develops into endosperm tissue (food of the growing embryo). Ovule then becomes seed and ovary changes into fruit. When seeds mature, they are dispersed. If seeds get suitable conditions, their embryos develop into new plants (the diploid sporophytes of the next generation).

Q16. Differentiate between self and cross pollination.**Ans: Pollination:**

The transfer of pollen grains from flower's anther to stigma is called pollination

Self pollination:

Self-pollination is defined as the transfer of pollen grains from the anther to the stigma of the same flower or other flower of the same plant

Cross pollination:

Cross pollination is the transfer of pollen grains from the flower on one plant to the flower on other plant of the same species Cross pollination is brought about by various agencies like wind water bees birds bats and other animals including man.



Self pollination (left) and right

Interesting Information

Different flowers have one to many carpels These many either be fused or free

Interesting Information

Theophrastus (the successor of Aristotle) was a Greek philosopher. He laid a solid foundation of botany including the morphology and function of the

flower He recognized the male and female sex parts of the flowers and described the pollination and fertilization in flowers

Interesting Information

The flower is actually a condensed shoot with the nodes present very close to each other The different parts of flower are attached to the nodes All the structures present at one node are collective called the whori

Q17. What structural adaptations will you find in a wind pollinated flower?

Ans: See Q# 5 from exercise (Short Questions)

Q18. What structural adaptations will you find in insect and a wind pollinated flowers?

Ans: 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



An insect pollinated flower (left) and a wind – pollinated (right) flowers

Q19. Give examples of insect and wind pollinated flowers.

Ans: Examples of insect pollinated flowers:

Examples of insect pollinated flowers are buttercup, rose, wallflower, sunflower, orchid etc.

Examples of wind pollinated flowers:

Examples of wind pollinated flowers are grasses, hazel, Willow corn etc

Q20. Hypothesize why Me del used Pea plants for his experiments.

Ans: Gregor Mendel chose the pea plants for his experiments because the garden Pea is an ideal subject in the study of genetics for the following reasons

- i. Presence of observable traits with contrasting forms
- ii. Produces many offspring in one cross
- iii. Short life cycle
- iv. Ease in manipulating pollination (cross pollination)

OR

Pea plants had the following characteristics:

1. Plants were sexually reproducing with bisexual flowers
2. Self-pollination and self-fertilization is possible
3. The life cycle was completed in one season
4. Hybrids were perfectly fertile
5. Many varieties with well-defined characters were available e presence of seven pairs of contrasting or allelomorphic characters

OR

Mendel used pea plants in his experiments because they were easy and fast to grow Pea plants also have very little traits, which made observations easier

OR

Mendel chose the pea plant because it is easy to cultivate, small in size and reproduces quickly with a large amount of offspring

Q21. What is parthenocarpy?

Ans: Parthenocarpy:

In some plants, ovaries develop into fruit without the fertilization inside their ovules. This process is known as parthenocarpy and it result in seedless fruit. bananas and seedless varieties of grapes

Q22. Explain the development and structure of a dicot seed

Ans: Development/formation of Seed:

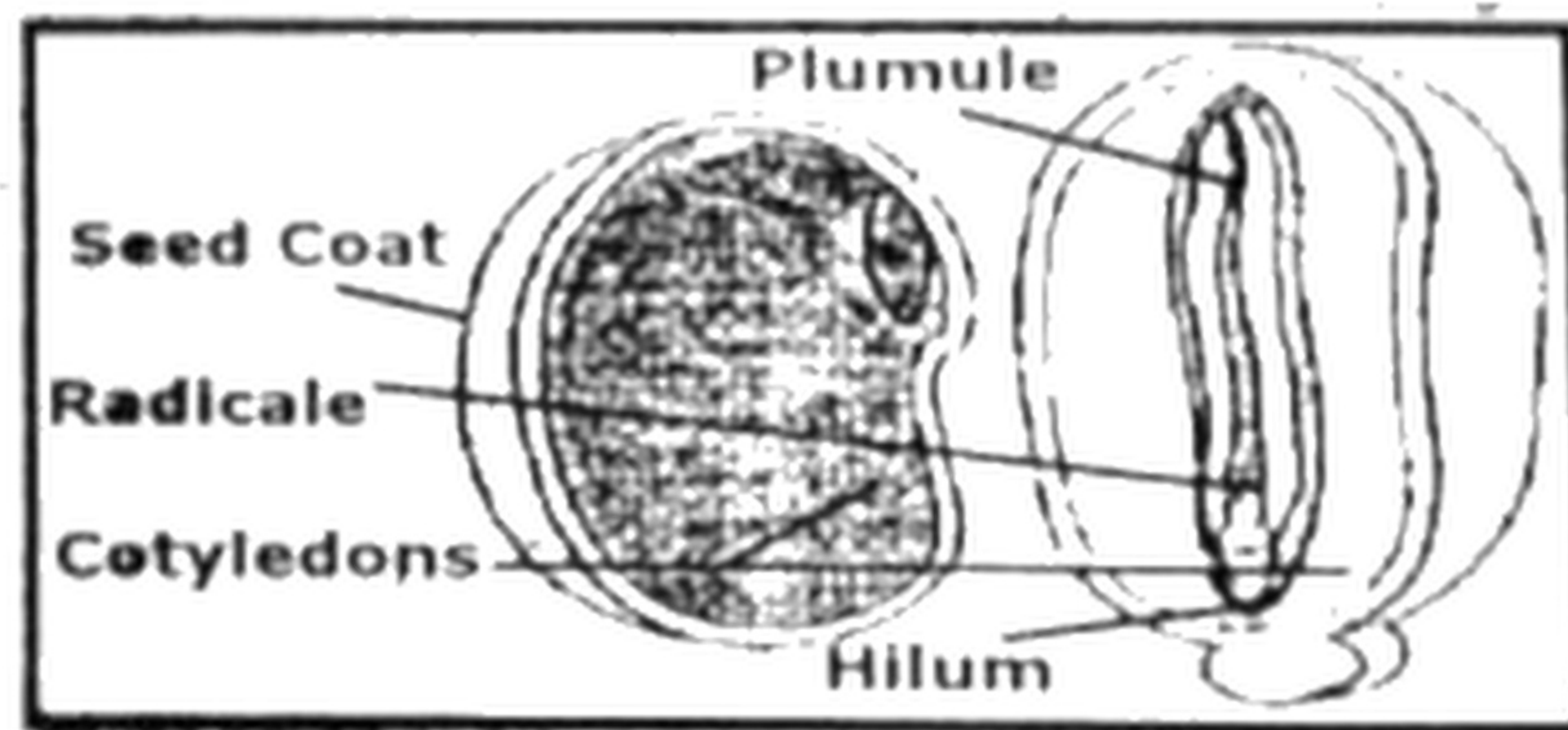
We know that after fertilization in the female gametophyte, zygote divides repeatedly mitosis and develops into an embryo. At this stage (in gymnosperms and angiosperm), ovule changes into seed. The formation of seed completes the process of sexual reproduction seed plants

Development/formation of Seed:

The structure of a dicot Seed:

Angiosperm seeds consist of three distinct parts

- i. The embryo formed from zygote
- ii. II. The endosperm tissue formed from endosperm nucleus
- iii. The seed coat which develops from the wall of ovule (integument)



The structure of a dicot seed

Seed coat:

Seed coat (or testa) develops from the integument originally surrounding the ovule may be a paper-thin layer e.g. peanut or thick and hard e.g. coconut)

Function of seed coat:

Seed coat protects embryo from mechanical and from drying out

Hilum:

There is a scar on seed coat called hilum is where the seeds attached to ovary wall (fruit)

Micropyle:

At one end of hilum there is micropyle This is the same opening through which the pollen tube entered ovule. Seed uses for the absorption of water

Embryo:

Embryo is actually an immature plant consists of a radicle a plumule and one or two cotyledons (seed leaves) The radicle of embryo develops into new root while the plumule develops into new shoot

Epicotyl:

The embryonic stem above the point of attachment of cotyledons) is called epicotyl

Hypocotyl:

The embryonic stem below the point of attachment is hypocotyl Within seed there is a store of nutrients for the seedling that will grow from embryo in angiosperms the stored food is derived from the endosperm issue This issue is rich in oil or starch and protein

Cotyledons:

In many seeds the food of the endosperm absorbed and stored by cotyledons

Q23. Write a note on germination of Seed.**Ans: Germination of Seed:**

The process by which a seed embryo develops into a seedling is called germination

For the germination of seeds, they must arrive at suitable location and be there at a time favorable for germination and growth

During germination embryo soaks up water which causes 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.

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

The evolution of seeds has been proved as an important step in the success and spread of flowering plants, as compared to the seed-less plants like mosses and ferns.

Q24. Explain, how the epigeal and hypogeal germinations are different?

Ans: See Q 3 from exercise Understanding the concepts)

Q25. What do you mean by dormancy?**Ans: Dormancy:**

Most seeds go through a period in which there is no growth. This period is called dormancy of the seed. Dormant seeds are ripe seeds but do not germinate. Under favorable conditions the seeds break dormancy and begin to germinate.

Q26. What conditions are necessary for the germination of seeds?

Ans. See Q8 4 from exercise Under Standing the Concept

Q27. What is the future of ovule and ovary after fertilization in flower?

Ans: Ovule develops into seed while ovary wall develops into fruit

Q28. Give an introduction of sexual reproduction in animals.

Ans: Sexual Reproduction in Animals:

Most animals reproduce sexually. The sexual reproduction is based on the formation and the fusion of male and female gametes

Q29. Write a note on the formation of gametes (Gametogenesis):

Ans: Formation of Gametes (Gametogenesis):

The formation of gametes scaled gametogenesis in this process diploid (2N) gamete mother cells undergo meiosis and form haploid (1) gametes. The male and female gametes sperms and egg cells or ova) are produced in specialized organs called gonads

Testes: Male gonads are called testes (Singular testis)

Ovaries: While female gonads are called ovaries

Spermatogenesis:

The production of sperms in testes is called spermatogenesis

Oogenesis:

The production of egg cells in ovaries is called oogenesis

Q30. Describe the processes of Spermatogenesis and Oogenesis.

OR

Explain Gametogenesis in animals.

Ans: See ON 7 from exercise (Understanding the concepts)

Q31. Explain, how the external and internal Fertilizations are different.

OR

Write a note on the fertilization.

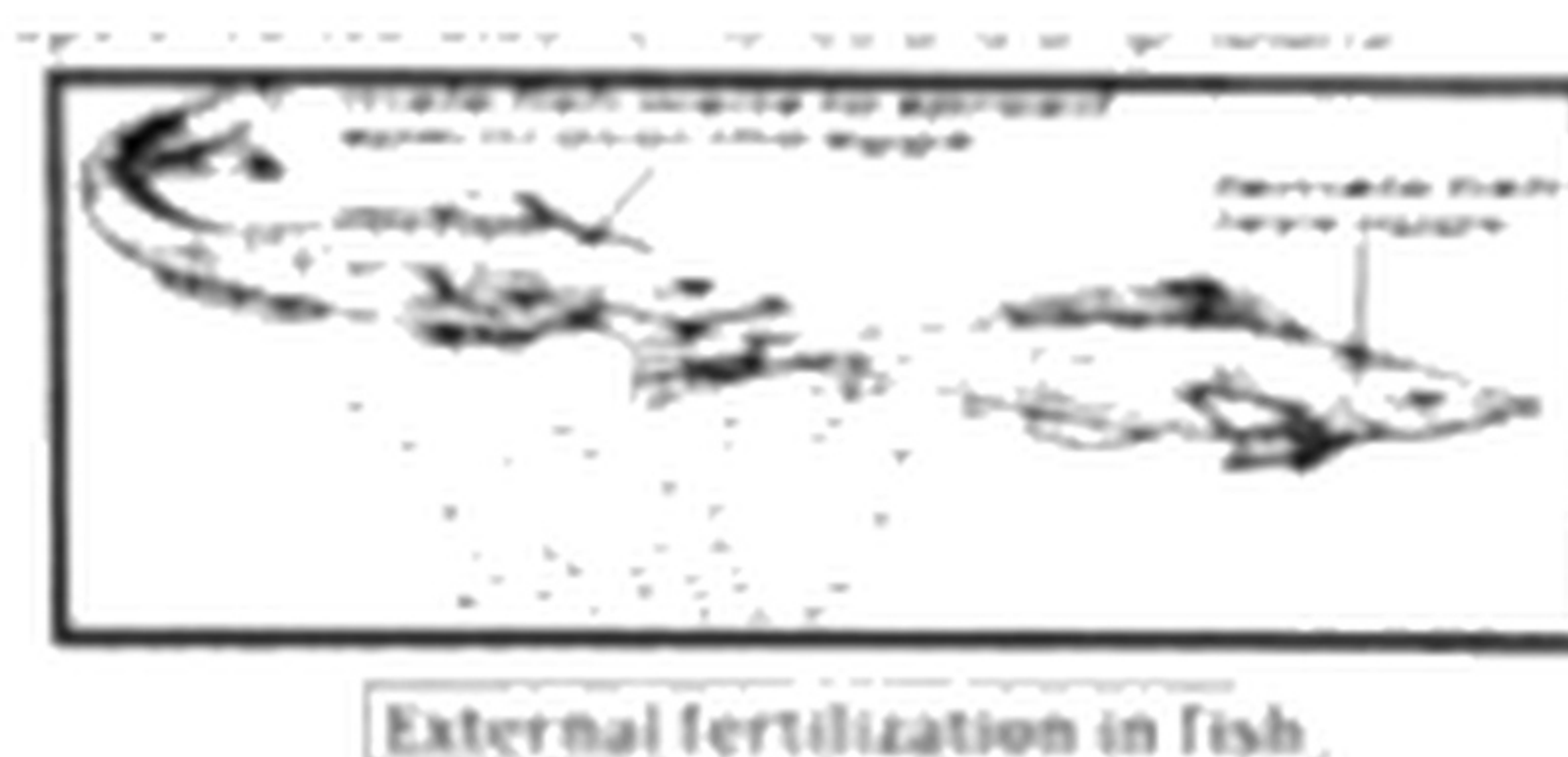
Ans: Fertilization:

After the formation of gametes fertilization occurs There are two mechanisms by which fertilization can take place i.e. external fertilization and internal fertilization

External fertilization:

In external fertilization egg cells are fertilized outside of body External fertilization occurs mostly in aquatic environment requires both the male and the female animals to release the gametes into the surroundings at almost the same time for external fertilization the animals have to release great number of gametes

in external fertilization there is not of loss of gametes due to environmental hazards such as predators. External fertilization occurs in many invertebrates and the first two groups of vertebrates e Fishes and amphibians.



External fertilization in fish.

Internal fertilization:

In internal fertilization egg cells are fertilized within the reproductive tract of female. It occurs in birds and mammals. Such animals provide protection to the developing embryo.

After fertilization reptiles and birds make protective shells around their egg cells and then lay them. The shell is resistant to water loss and damage. In mammals (with the exception of egg-laying mammals) the development of fertilized egg into new baby takes place within mother body in this case, there is extra protection to the embryo and mother also supplies everything that embryo needs.



Reptiles and Birds egg provides protection and food to embryo

Interesting Information

Rabbits reingest their own pallet-like faeces to digest their food further and extract sufficient nutrients.

Q32. Write a note on the male and female reproductive systems of rabbit.

Ans: See Q#6 from exercise (Understanding the concepts)

Q33. Write a note on the fertilization and development in rabbit.

Ans: Fertilization and Development in Rabbit:

Rabbits can breed throughout the year but male rabbits are commonly sterile during the summer months. Male rabbit deposits its sperms in the vagina (birth canal) of female. Sperms swim through cervix and uterus to fallopian tubes where they fertilize the egg cells, released from ovary.

After fertilization zygote is rained to uterus. By this time the zygote has started dividing and is now called embryo. The embryo is implanted in uterus walls.

Placenta:

A connection called placenta is established between embryo and uterus wall. Embryo develops into new offspring (rabbit kit) in 30-32 days, after which it is born.

Q34. What is the population of Pakistan in the year 2007-2008?**Ans: Population of Pakistan:**

Pakistan population in the year 2007-2008 was 163,775,000. By the end of this ...
Pakistan's population had relatively

Q35. Why do we consider that overpopulation is a global problem?

Ans: See Q# 8 from exercise (Understanding the concepts)

Q36. Why do we Aware the people from the hazards of overpopulation?**Ans: Hazards of overpopulation:**

We have to check overpopulation otherwise we will have to face huge problems because of our limited resources. People should be educated about the problems of overpopulation. 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

Interesting information

Pakistan has a multicultural and multiethnic society and hosts the largest refugee population

Interesting information

In the world logo of an organization working for awareness of overpopulation



Logo of an organization working for awareness of overpopulation

The United Nation Population Fund UNFPA:

The United Nation Population Fund UNFPA began operation in 1969. It is the largest international organization funding for population and health program. The UNFPA works in over 140 countries for awareness about the consequences of overpopulation.



Q37. Write a note on AIDS.

Ans: AIDS A Sexually Transmitted Disease:

Sexually Transmitted Diseases (STDs) are defined as the diseases that are transmitted through sexual act. The most serious and challenging health problem faced by the world today is AIDS. It is also a sexually transmitted disease

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 loss of resistance against infections It is a fatal disease

It spreads through transfer of body fluids... Thus the main causes are unprotected... or transfusion of infected blood

Interesting Information

UNAIDS:

According to United Nations Programme on AIDS | UNAIDS estimates some 70 000 to 80 000 persons or 0.1 percent of adult's population in Pakistan are infected with HIV

Q38. Give an introduction of Pakistan's National AIDS Control Program.

Ans: See Q 6 from exercise (Short Questions)

Q39. Give an introduction of NGOs AIDS Control Program.

Ans: NGOs AIDS Control Program:

According to the latest data by the World Bank, at least 54 NGOs are working in Pakistan for HIV/AIDS public awareness and for the care and support of persons living with HIV/AIDS. These NGOs also work on AIDS education and prevention for sex workers and other high-risk groups NGOs serve as members of

the Provincial consortium on HIV/AIDS which has been set up in all the provinces of Pakistan.

The number of drug addict in Pakistan is currently estimated to be about 500,000 of whom 60,000 inject drugs.

Although NGOs are very busy in HIV/AIDS prevention activities, it is believed that they are reaching less than 5 percent of the vulnerable population.

