

Descriptive Questions

Types of Asexual Reproduction

Q.1 What is reproduction? Explain its types.

09410001

Ans. Definition

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

Types

There are two main kinds of reproduction.

1. **Asexual reproduction**

- (a) The reproduction that does not involve the fusion of gametes is called asexual reproduction.
- (b) The offspring produced by asexual reproduction are genetically identical to the parents.

2. **Sexual Reproduction**

- (a) The reproduction that involves the fusion of male and female gametes is sexual reproduction.
- (b) In sexual reproduction, the offspring have variations among themselves and with the parents.

Q.2 Explain common methods of asexual reproduction in different organisms.

09410002

Ans. Definition

Some common methods of asexual reproduction in different organisms are given below.

1. **Binary Fission / Explain the process of binary fission in bacteria and describe how it leads to the formation of two daughter bacteria?**

Definition

Binary fission means division into two. It is the usual method of reproduction in bacteria.

Examples

a. **Binary Fission in Bacteria**

- i. During binary fission, the bacterial DNA replicates and the daughter DNA molecules move to opposite sides.
- ii. The cell membrane pinches in.

- iii. New cell's wall is synthesized in the middle and so two identical daughter cells bacteria are produced.

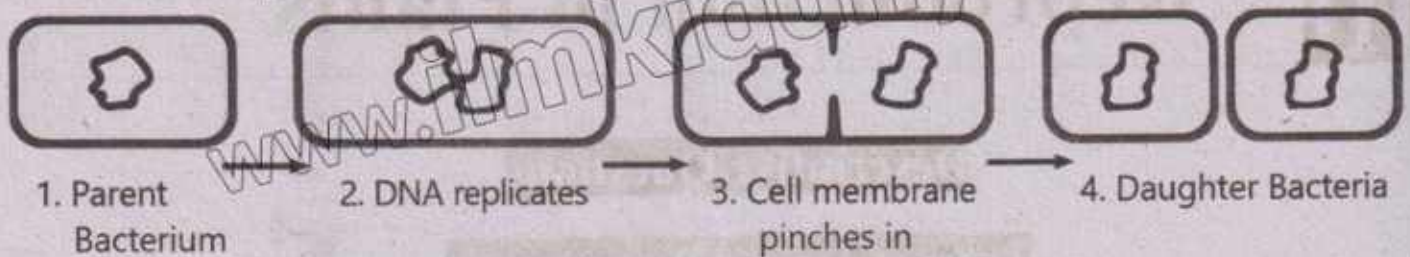


Figure 10.1: Binary fission in bacteria

b. Binary Fission in Protists (Unicellular, Eukaryotes)

- i) Many **protists** (unicellular eukaryotes e.g. Amoeba, Euglena etc.) also reproduce by binary fission.
- ii) In protists the nucleus of parent organism divides into two.
- iii) This is followed by the division of cytoplasm. So, two daughter protists are formed.

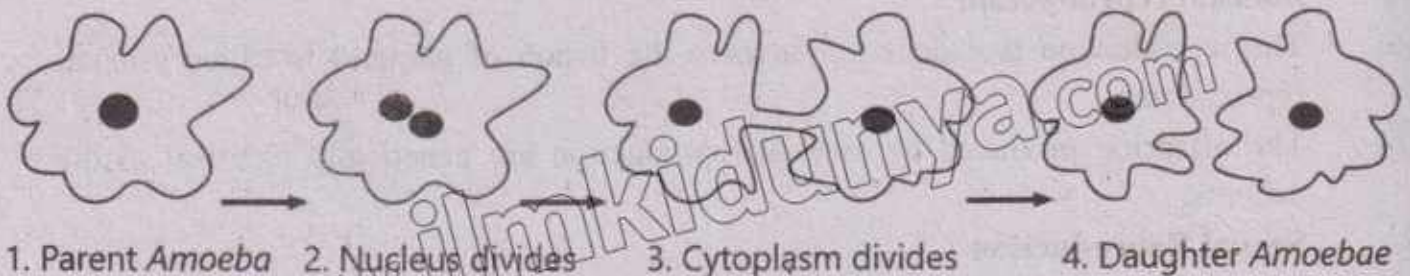


Figure 10.2: Binary fission in Amoeba

- c. Some animals e.g. planarians also reproduce asexually by binary fission.

2. Budding

a. Budding in Yeast

- i) This method is very common in yeast (a unicellular fungus)
- ii) During budding a part of the parent organism grows out from its body. This part is called a **bud**.
- iii) When the bud has grown big, it may separate from parent body or may remain attached.

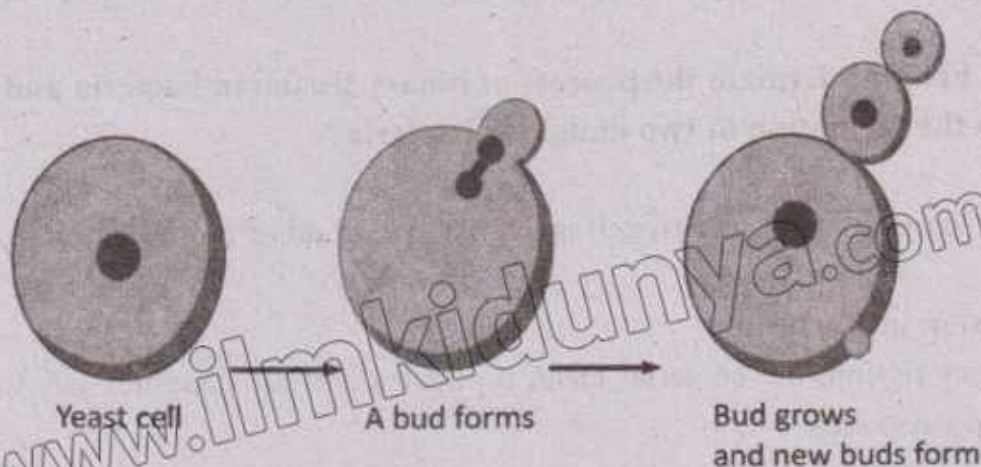


Figure 10.3: Budding in Yeast

- b. Some animals e.g. hydra also reproduce asexually by budding.

3. Spore Formation

Introduction

Spores are thick-walled asexual reproductive cells.

Explanation

a) Sporangia

i) Most fungi (e.g. Rhizopus: bread mold) produce spores in special sac-like structures called sporangia (Singular: sporangium).

ii) When spores are mature, the sporangium bursts and spores are released.

b) Germination of Spores

Spores can tolerate unfavorable conditions due to their thick walls. When favorable conditions are available the spores germinate to produce new fungus.

c) Endospores Formation

Some bacteria reproduce by forming **endospores** (spores produced inside the cell). They form endospores in unfavorable environmental conditions. Even if the original cell dies, the endospore survives. When conditions improve, the endospore grows into a new bacterium.

4. Vegetative Propagation / What do you mean by vegetative propagation?

Differentiate among different plant structures modified for vegetative propagation.

Introduction

It is a method of asexual reproduction in plants. In this method, new plant is produced from the vegetative part (root, stem or leaf) of the parent plant. Vegetative propagation takes much less time to produce new generation as compared to the sexual method. Secondly, the offspring are genetically identical to the parent plant.

Kinds of Vegetative Propagation

Vegetative propagation may be natural or artificial.

1. Natural Vegetative Propagation

Natural vegetative propagation is process where plants reproduce on their own, using structures like stems, roots, or leaves.

2. Artificial Vegetative Propagation

Artificial vegetative propagation means the processes in which humans use the vegetative parts of plants for their reproduction by methods like cuttings, grafting, or layering.

Explanation

Natural Vegetation Propagation

In the natural vegetative propagation, plants use the following vegetative parts for producing new plant.

(a) Stem

The following types of stems take part in vegetative propagation in plants:

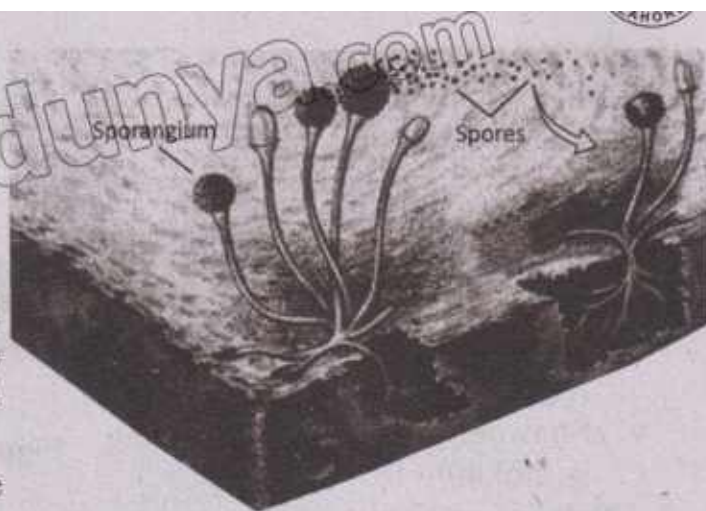


Figure 10.4:

Asexual Reproduction by
Spores (in Rhizopus)

1. Stolon (runner)

- It is a horizontal stem that grows above the ground.
- A stolon has nodes where new leaves and roots grow.
- The leaves grow upwards and roots grow down.
- In this way, a new plant is formed at the node.
- Strawberry reproduces by using its stolon.

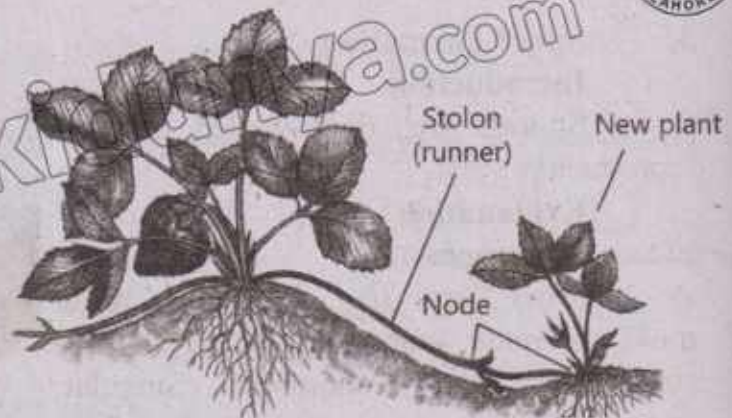


Figure 10.5: Vegetative Propagation in Strawberry (Through Runner)

2. Tuber

- It is fleshy stem that grows underground. It has "eyes" which are actually its buds.
- Eyes can grow into new plants. Potatoes reproduce by tubers.

3. Rhizome

- It is a horizontal stem that grows below the ground.
- It has nodes where new leaves and roots grow. In this way, a new plant grows from each node.
- Ferns, ginger, and sugar cane reproduce by using rhizome.

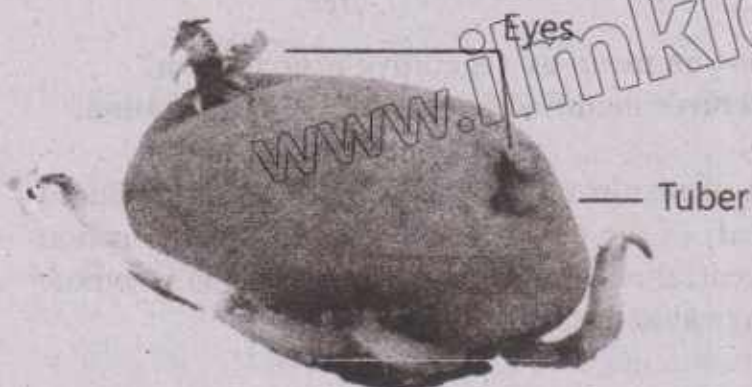


Figure 10.6:
Vegetative Propagation in Potato (Through Tuber)



Figure 10.7:
Vegetative Propagation in Ginger (Through Rhizome)

4. Bulb

- It is a very short stem that grows underground.
- It has bud and fleshy leaves.
- Bulbs grow naturally to produce new plants.
- Tulips, onions and lilies reproduce by bulbs.

5. Corm

- It resembles the bulb but does not have fleshy leaves.
- Almost all of a corm consists of stem, with a few brown non-functional leaves on the outside.
- Dasheen and garlic reproduce by corms.

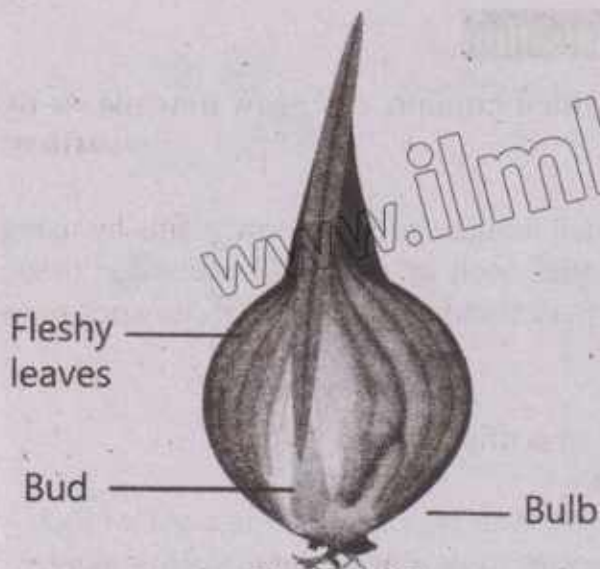


Figure 10.8:
Vegetative Propagation in Onion
(Through Bulb)

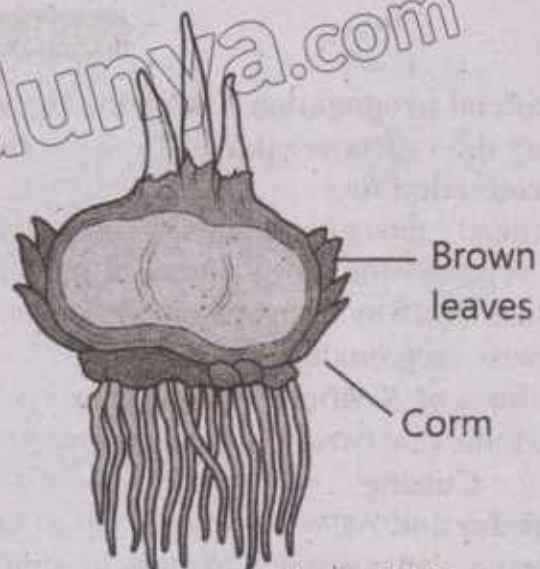


Figure 10.9:
Vegetative Propagation in Garlic
(Through Corm)

(b) Suckers

- Suckers are new shoots that emerge from the base of the parent plant or from its underground roots.
- These shoots grow into new plants while still attached to the parent.
- When suckers develop their own root system, they become independent.
- Examples are banana and raspberry plants.

(c) Modified Leaves

- 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.

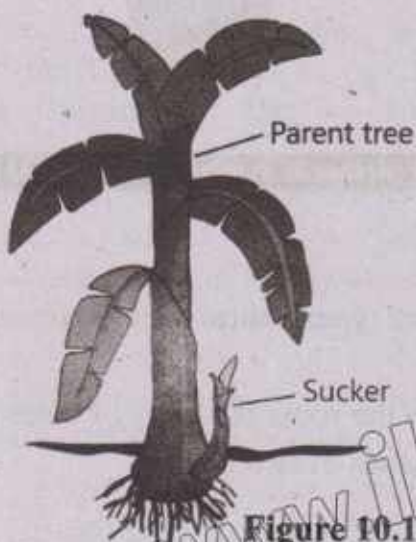


Figure 10.10:
Sucker in Banana

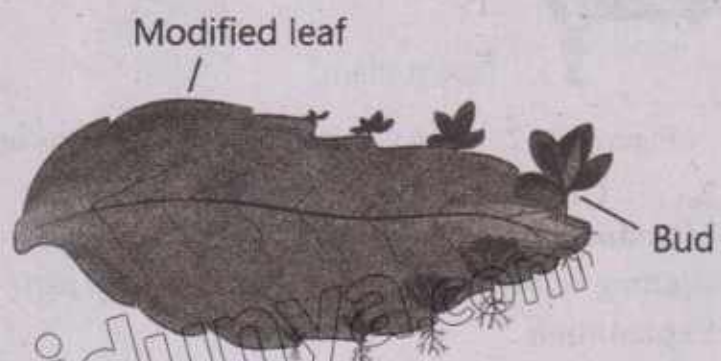


Figure 10.11:
Modified Leaf of Bryophyllum

Artificial Propagation

Artificial propagation / Describe the ways by which humans can grow new plants by using the vegetative parts of the parent plants? 09410003

Introduction

Artificial propagation includes the methods in which humans produce new plants by using the vegetative parts of plants. It includes techniques such as cutting, grafting, or tissue culture. Artificial propagation is used to cultivate plants with desirable characteristics or to increase crop production.

Methods of Artificial Propagation

The following two are the most common methods of artificial propagation.

1. Cutting

Introduction

In some plants, a piece of stem or a piece of root can form a new plant. Such a piece of stem or root that are cut from a plant and used to grow new plant is called cutting.

Examples

- Cuttings are widely used to propagate house plants, ornamental trees and shrubs, and some fruit crops.
- Roses and grapevines are grown from stem cuttings.
- Sweet potato is grown from root cuttings.

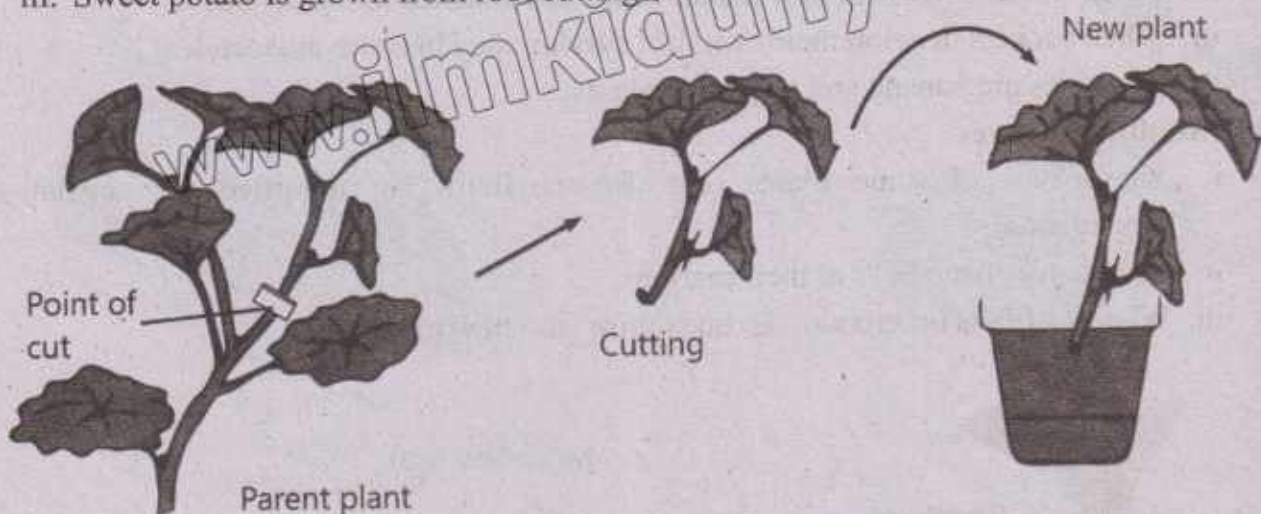


Figure 10 12: Using Cuttings for vegetative propagation (HQ picture is available on Pg # 213)

2. Grafting

Introduction

Grafting is the joining of two or more plant parts of the same type to form a single plant.

Explanation

In grafting, a bud or small stem of one plant is attached to the roots or stems of a second plant. Grafting enables to combine the beneficial characteristics of two plants.

Example

This method is used to propagate almost all commercial fruit trees and (e.g. almond, plum, cherries etc.), many ornamental trees and shrubs.

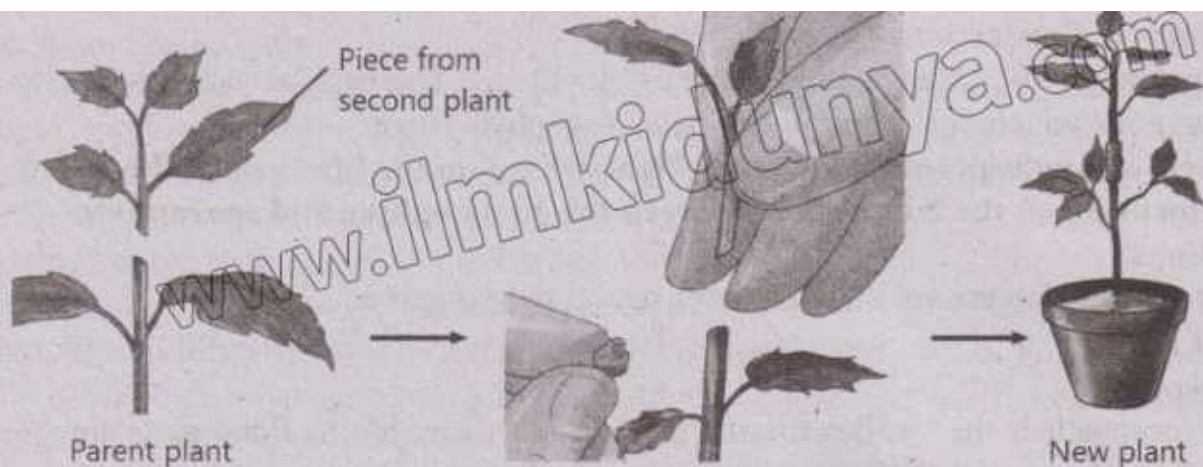


Figure 10.13: Grafting (HQ picture is available on Pg # 213)

Q.3 Describe advantages and disadvantages of vegetative propagation. 09410004

Ans. Advantages and Disadvantages of Vegetative Propagation

Advantages

- Vegetative propagation allows to produce many new plants in a short time.
- The new plants are exactly like the parent plant, so they all have same good characteristics. This means useful qualities, like good fruit or strong growth, are passed on to the next generation.

Disadvantage

- Plants produced through vegetative propagation do not have genetic differences.
- In other words all the offspring are identical. Due to it, they are equally sensitive to environmental changes and prone to the same diseases or pests.

Sexual Reproduction in Plants

Q.4 Explain sexual reproduction in flowering plants.

09410005

Ans. Introduction

The major groups of plants have two types of generations during sexual reproduction which come one after the other. These are sporophyte generation and gametophyte generation. The sporophyte generation produces spores which grow and make the new gametophyte generation. The gametophyte generation produces gametes which unite and make the new sporophyte generation. This phenomenon is called alternation of generations.

Sporophyte Generation

The sporophyte generation is diploid ($2n$) and produces haploid ($1n$) spores by meiosis. The spores develop into haploid gametophyte generation.

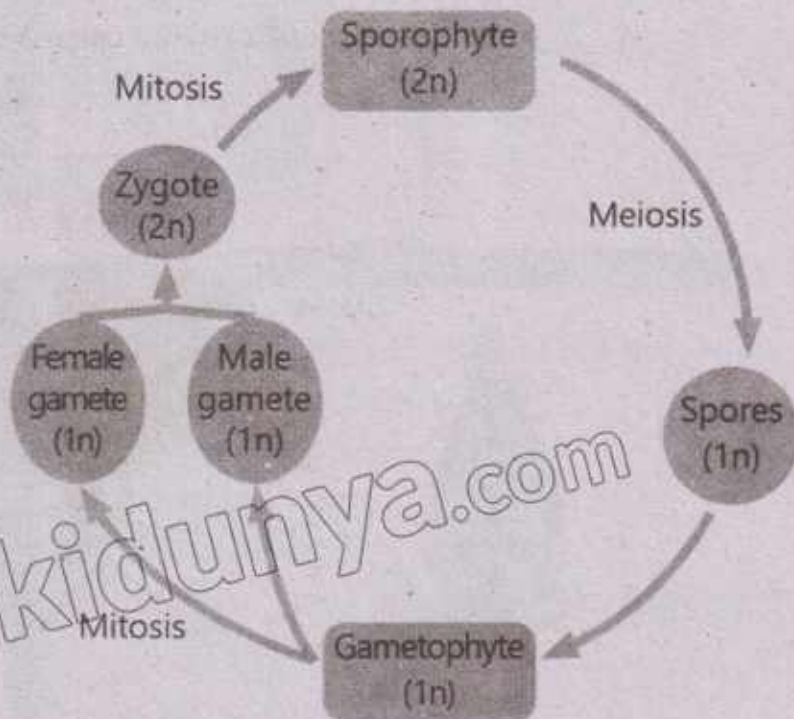


Figure 10.14: Alternation of generations in Plants

Gametophyte Generation

The gametophyte produces haploid gametes by mitosis. The haploid gametes fuse to form diploid zygote, which develops into the next sporophyte stage.

Life Cycle of Angiosperms (Flowering Plants)/Explain the life cycle of flowering plants, focusing on the alternation between the gametophyte and sporophyte generations.

In angiosperms, flowers are the organs for sexual reproduction.

Parts of Flower

i. Receptacle

The receptacle is the swollen tip of a flower stalk where all the floral parts are attached. It serves as the base that supports the flower's structure.

ii. Floral Parts

Floral parts are in the form of the following four concentric whorls, or rings:

1. **Calyx:** It is the outermost whorl. It is made of green leaf-like sepals. Sepals protect the inner parts of a developing flower before it opens.
2. **Corolla:** It is the second whorl and made of petals. Most flowers have coloured petals.
3. **Androecium:** It is the third whorl and is made of male reproductive structures called stamens. Each stamen consists of an anther and a filament. Anther contains pollen sacs (microsporangia), which produce microspores. The stalk-like filament supports the anther.
4. **Gynoecium:** It is the innermost whorl made of the female reproductive structures called carpels. A carpel consists of three parts.
 - i. The enlarged base of carpel is called ovary. It is the part where ovules are produced. Ovules produce megaspores during reproduction.
 - ii. The stalk-like part attached to ovary is called style.
 - iii. The tip of style is called stigma.
 - iv. In some flowers, one or more carpels are fused to form a structure called pistil.

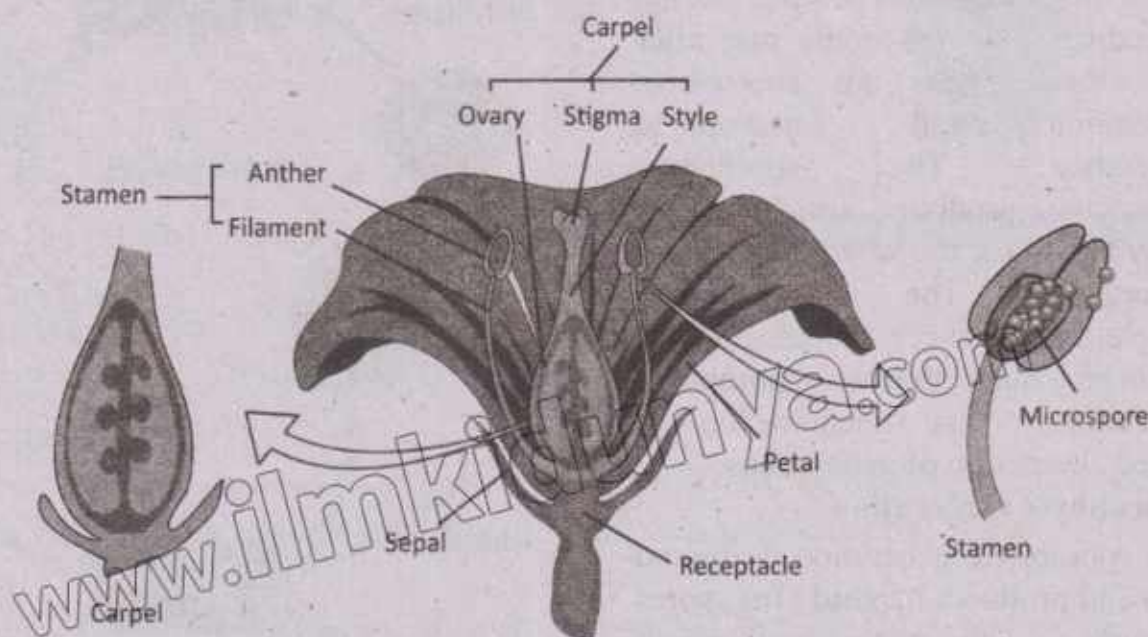


Figure 10.15: Parts of a flower

Stages of the Life Cycle

An angiosperm plant represents the sporophyte generation. When a flower matures, it produces spores. The spores germinate and make female and male gametophytes. The gametophytes are small structures consisting of few cells only. They make gametes which combine to form zygote that develops into new sporophyte.

Following are the main stages in the life cycle of an angiosperm:

1. Development of Female Gametophyte (Embryo Sac). /Describe how the female gametophyte (embryo sac) develop within the ovule of a flower?

- The ovule acts as megasporangium. It contains diploid megaspore mother cell which undergoes meiosis, and produces four haploid megaspores.
- Only the megaspore 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 female gamete i.e., egg cell.

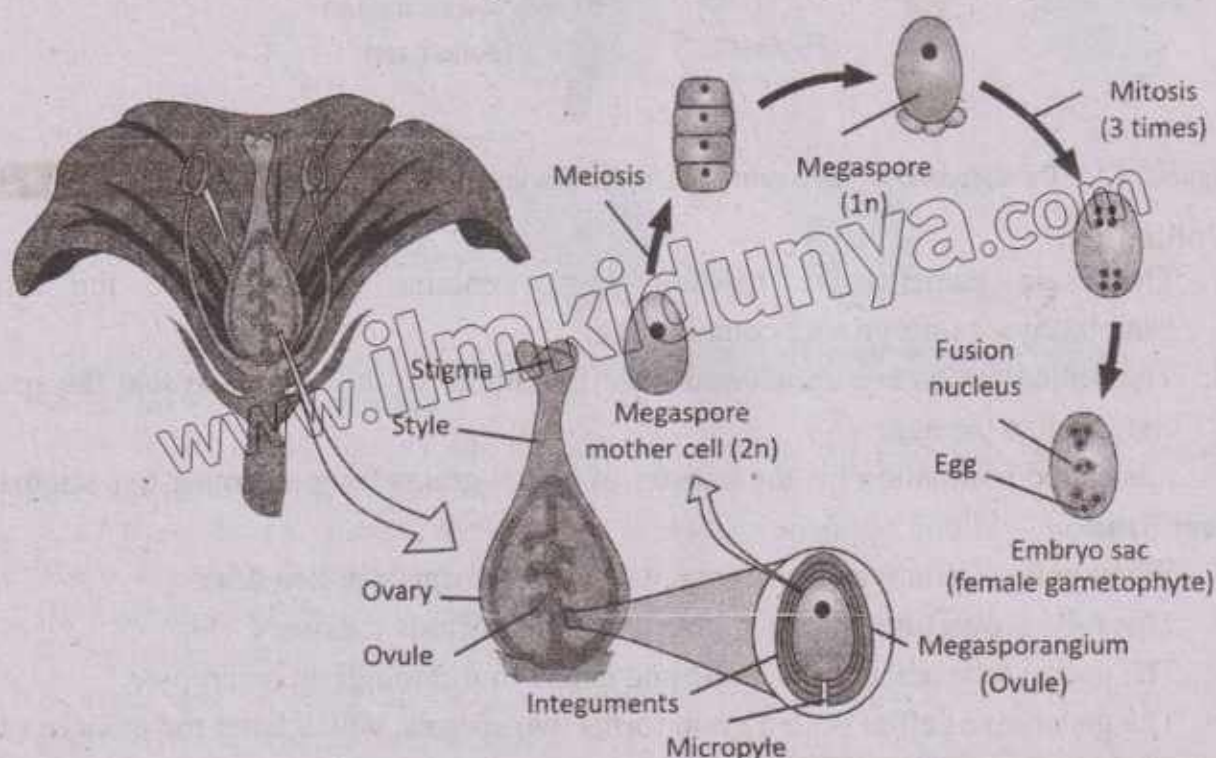


Figure 10.16: Development of female gametophyte (embryo sac) (HQ picture is available on Pg # 213)

- The resulting structure, which contains seven cells (one egg cell, one fusion nucleus, and five non-functional cells), is the female gametophyte or embryo sac.

2. Development of Male Gametophyte (Pollen Grain)

- The pollen sacs present in anther act as microsporangia.
- Each pollen sac contains many diploid microspore mother cells.
- Each microspore mother cell undergoes meiosis and produces four haploid microspores.
- A microspore undergoes mitosis.
- The resulting two-celled structure is a pollen grain, which is the male gametophyte.

- vi. One cell in pollen grain is the tube cell, which will form the pollen tube. The other cell is the generative cell, which will form two sperms.

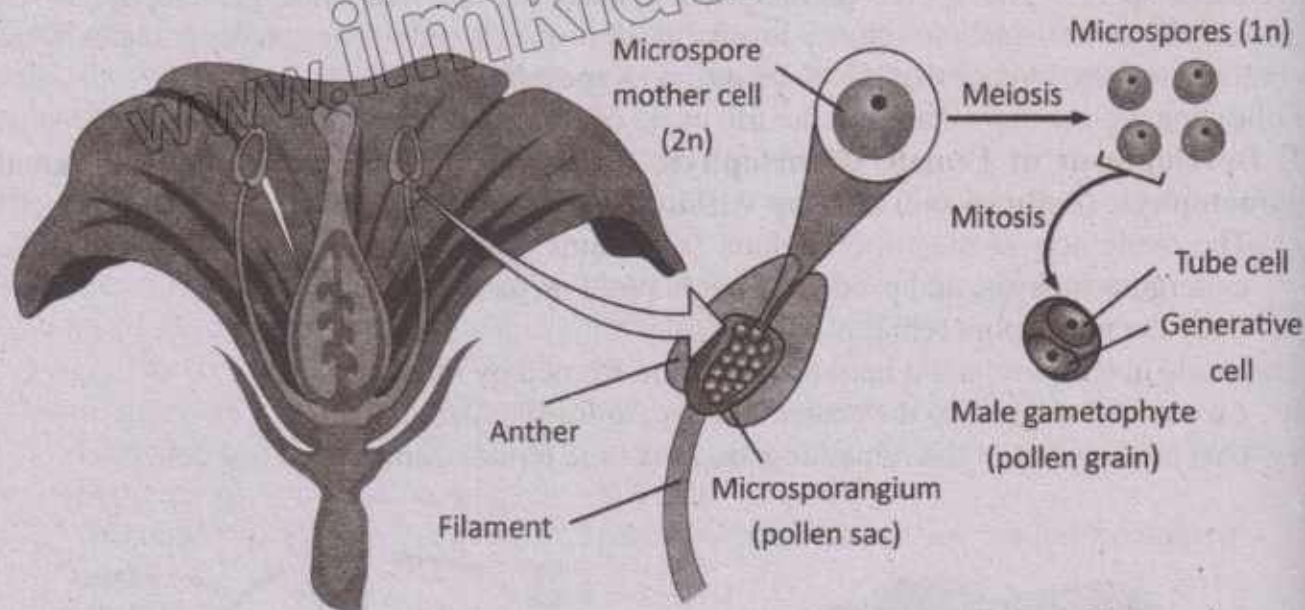


Figure 10.17: Development of male gametophyte (pollen grain) (HQ picture is available on Pg # 214)

3. Pollination

- The male gametophyte (pollen grain) contains sperms while the female gametophyte (embryo sac) contains egg.
- The pollen grains are transferred from the anther to the stigma so that the sperms can fertilize the egg.
- It is called pollination i.e. the transfer of pollen grains from an anther to a stigma.

4. Fertilization

- When pollen grain reaches stigma, its tube cell forms a pollen tube.
- This tube grows through the stigma and style towards the ovary.
- The pollen tube reaches the ovule and enters in it through the micropyle.
- The generative cell of pollen grain forms two sperms, which enter the embryo sac to reach the egg.
- Formation of Zygote and Embryo:** One sperm fuses with the egg, forming a diploid zygote. The zygote eventually develops into an embryo.

vi. Formation of Endosperm

The second sperm fuses with the fusion nucleus, producing a triploid (3n) nucleus. This nucleus then develops into tissue called endosperm. The endosperm provides nourishment for the embryo.

vii. Double Fertilization

This process of the fusion of two sperms (one with the egg and the other with the fusion nucleus) is called, double fertilization. It is a unique characteristic of angiosperms.

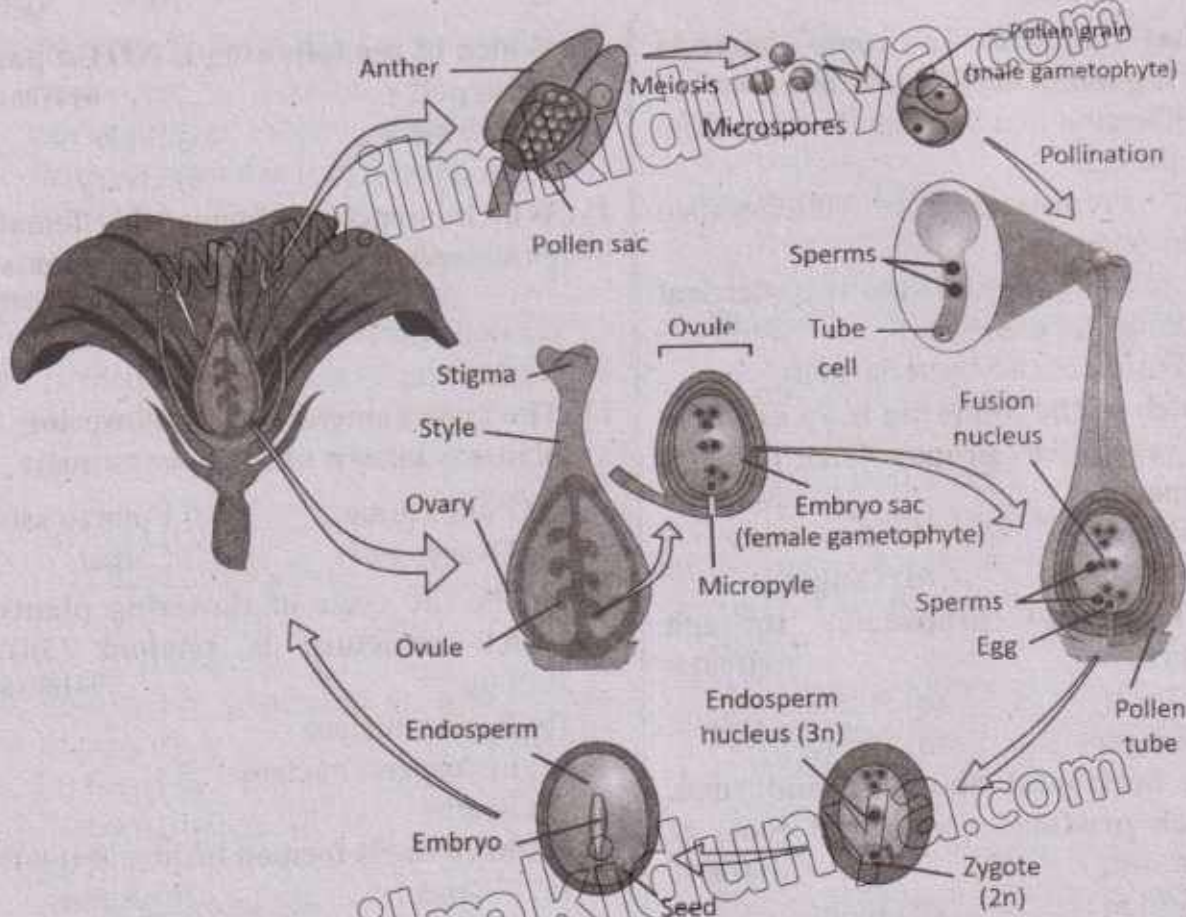


Figure 10.18: Life cycle of a flowering plant (HQ picture is available on Pg # 214)

5. Seed and Fruit Formation

- After fertilization, the zygote develops into embryo and the triploid nucleus develops into endosperm tissue.
- After these developments, the ovule is said to be matured and is now called seed. The ovary changes into fruit.

6. Development of Sporophytes

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

Multiple Choice Questions (Exercise)

1. Which of the following organisms commonly reproduce by binary fission? 09410006

- (a) Yeast (b) Bacteria
(c) Rhizopus (d) Plants

2. What is the primary method of reproduction in yeast? 09410007

- (a) Binary fission
(b) Spore formation
(c) Budding
(d) Fragmentation

3. Which of the following statements is true about spore formation in fungi? 09410008

- (a) They produce spores during sexual reproduction
(b) They produce two kinds of spores
(c) Spores can only grow into new fungi in dry environments
(d) Spores are produced to withstand harsh conditions

4. What happens in some bacteria during harsh conditions? 09410009
 (a) Creation of a bud that detaches from the cell
 (b) Formation of thick-walled endospores
 (c) Splitting the cell into two identical daughter cells
 (d) Fusion of two bacterial cells
5. Which of the following is an example of vegetative propagation through runners? 09410010
 (a) Potato (b) Strawberry
 (c) Onion (d) Ginger
6. Which plant propagates through tubers? 09410011
 (a) Onion (b) Potato
 (c) Ginger (d) Garlic
7. The horizontal above ground stem, which produces leaves and roots at its nodes; 09410012
 (a) Stolon (b) Bulb
 (c) Rhizome (d) Corm
8. Which of these does NOT help a plant for vegetative propagation? 09410013
 (a) Rhizome (b) Corm
 (c) Runner (d) Flower
9. Which part of the flower is responsible for producing pollen? 09410014
 (a) Stigma (b) Anther
 (c) Ovary (d) Petal
10. Which of the following is NOT a part of carpel? 09410015
 (a) Filament (a) Style
 (c) Stigma (d) Ovary
11. Which structure forms the female gametophyte in flowering plants? 09410016
 (a) Pollen grain (b) Ovule
 (c) Anther (d) Sepal
12. The male gametophyte in flowering plants is known as: 09410017
 (a) Pollen grain (b) Embryo sac
 (c) Ovary (d) Carpel
13. In the life cycle of flowering plants, which structure is triploid ($3n$)? 09410018
 (a) Egg
 (b) Fusion nucleus
 (c) Endosperm nucleus
 (d) Sperm
14. Embryo sac is formed inside: 09410019
 (a) Filament (b) Anther
 (c) Style (d) Ovule
15. Double fertilization involves: 09410020
 (a) Fertilization of egg by two male gametes
 (b) Fertilization of two eggs in the same embryo sac by two sperms
 (c) Fertilization of egg and fusion nucleus by two sperm
 (d) Fertilization of egg and the tube cell by two sperms

Multiple Choice Questions (Additional)

Types of Asexual Reproduction

16. Which of the following is incorrect about asexual reproduction? 09410021
 (a) Single parent contributes genetic material
 (b) No gamete formation is involved
 (c) Offspring are genetically identical
 (d) Contributes in evolution of new species
17. Which of the following modes of asexual reproduction generally occurs during unfavorable conditions? 09410022
 (a) Binary fission
 (b) Budding
 (c) Spore formation
 (d) Parthenogenesis

18. Which of the following is compact, thickened, vertically growing, underground stem enveloped by thick, succulent (fleshy) leaves, surviving as reservoir of stored nutrients? 09410023
 (a) Bulb (b) Corm
 (c) Rhizome (d) Stem tuber
19. In Bryophyllum, small plantlets that are much like tiny versions of the parent plant, are created along the: 09410024
 (a) Root tip
 (b) Edges of its leaves
 (c) Stem surface
 (d) All of these
20. Spores are produced in a structure known as: 09410025
 (a) Capsule
 (b) Sporangium
 (c) Bud
 (d) Sporangophore
21. The offspring from asexual reproduction in plants are likely to: 09410026
 (a) Be more resistant than their parent to disease
 (b) Develop into a new variety
 (c) Grow bigger than their parent
 (d) Have the same flower colour as their parent
22. A horizontal underground stem with scale leavers and nodes is called: 09410027
 (a) Tuber (b) Bulb
 (c) Rhizome (d) Corm
23. In binary fission of amoeba, the offspring lack genetic variation because they: 09410028
 (a) Are limited in number
 (b) Are produced asexually
 (c) Are unicellular organism
 (d) Contain a single chromosome
24. Growing an entirely new plant from part of the original plant is called: 09410029
 (a) Budding
 (b) Regeneration
 (c) Fragmentation
 (d) Vegetative propagation
25. Rhizopus reproduces asexually by: 09410030
 (a) Binary fission
 (b) Budding
 (c) Spore formation
 (d) Endospore formation
26. A corm develops into new garlic plant. This process of reproduction is called: 09410031
 (a) Vegetative propagation
 (b) Regeneration
 (c) Meiosis
 (d) Gametogenesis
27. During binary fission, the nucleus of parent organism divides into two by: 09410032
 (a) Sexual reproduction
 (b) Meiosis
 (c) Mitosis
 (d) Asexual reproduction
28. In fungi, the spore is covered by a thick wall called: 09410033
 (a) Sporangium (b) Sporophyte
 (c) Cyst (d) Endospores
29. Spores which are formed inside bacterial cells are called: 09410034
 (a) Cysts (b) Spores
 (c) Endospore (d) All of these
30. It reproduces by bulbs: 09410035
 (a) Garlic (b) Ginger
 (c) Ferns (d) Tulips
31. During binary fission, the nucleus of parent organism divides into two by: 09410036
 (a) Sexual reproduction
 (b) Meiosis
 (c) Mitosis
 (d) Asexual reproduction

Artificial Propagation

32. Almond, plum, cherries etc. are reproduced by: 09410037

- (a) Cutting (b) Suckers
(c) Grafting (d) Corm

33. In which one of the following method of artificial vegetative propagation, a new plant can be grown on another plant? 09410038

- (a) Cutting (b) Tissue culturing
(c) Cloning (d) Grafting

34. Roses, ivy, grapevines and sugar cane are reproduced: 09410039

- (a) Leaves
(b) Suckers
(c) Cuttings
(d) Suckers and cuttings

Sexual Reproduction in Plants

35. Which of the following is the benefit of sexual reproduction? 09410040

- (a) This is rapid way of reproduction
(b) This is complex mechanism of reproduction
(c) It can occur any time in life cycle
(d) It contributes genetic variability in successive generations

36. Zygote in flowering plants develops into: 09410041

- (a) Endosperm (b) Embryo
(c) Micropyle (d) Seed coat

37. The process by which an embryo is activated to form a seedling is called: 09410042

- (a) Propagation (b) Vegetation
(c) Germination (d) Fertilization

38. Which of the following part of the plant that's been changed and adapted for the job of reproduction? 09410043

- (a) Flower (b) Leaf
(c) Root (d) Meristematic tissue

39. Which of the following parts of the flower are called accessory whorls? 09410044

- (a) Androecium and gynoecium
(b) Calyx and corolla
(c) Androecium and corolla
(d) Calyx and gynoecium

40. Fruit is formed by the enlargement of: 09410045

- (a) Embryo in the ovule
(b) Ovary containing the seed
(c) Anthers
(d) Sepal

41. How many sperms are involved in fertilization in a flower? 09410046

- (a) One (b) Two
(c) Three (d) Four

42. After fertilization which structure develops into the seed of a flowering plant? 09410047

- (a) Carpel (b) Ovum
(c) Ovule (d) Style

43. Which flower structure produce pollen? 09410048

- (a) Anther (b) petal
(c) Carpel (d) Stigma

44. In a flower, the embryo sac is formed inside the: 09410049

- (a) Anther (b) Filament
(c) Ovule (d) Style

45. The endosperm nucleus is: 09410050

- (a) Haploid (b) Diploid
(c) Triploid (d) Tetraploid

46. Pollination is the transfer of pollens: 09410051

- (a) Anther to stigma
(b) Stigma to anther
(c) Sepal to petal
(d) Petal to sepal

47. Part of flower which changes into fruit is: 09410052

- (a) Ovule (b) Ovary
(c) Petals (d) Anther

48. The second whorl of the flower is: 09410053

- (a) Calyx
(b) Corolla
(c) Androecium
(d) Gynoecium

Answer Key

1	b	2	c	3	d	4	b	5	b
6	b	7	a	8	d	9	b	10	a
11	b	12	a	13	c	14	d	15	c
16	d	17	c	18	a	19	b	20	b
21	d	22	c	23	b	24	d	25	c
26	a	27	c	28	c	29	c	30	d
31	c	32	c	33	d	34	c	35	d
36	b	37	c	38	a	39	b	40	b
41	b	42	c	43	a	44	c	45	c
46	a	47	b	48	b				

Short Answer Questions (Exercise)

Q.1. Write a short note on budding in yeast? 09410054

Ans. This method is very common in yeast (a unicellular fungus). During budding a part of the parent organism grows out from its body. This part is called a bud.

When the bud has grown big, it may separate from parent body or may remain attached.

Examples

Some animals e.g. hydra also reproduce asexually by budding.

Q.2. Write a short note on spore formation in fungi. 09410055

Ans. Spores are thick-walled asexual reproductive cells. Most fungi (e.g. Rhizopus: bread mold) produce spores in special sac-like structures called sporangia (Singular: sporangium). When spores are mature, the sporangium bursts and spores are released.

Q.3. What are the advantages of spore formation in fungi and bacteria? 09410056

Ans. Spores can tolerate unfavorable conditions due to their thick walls. When favorable conditions are available the spores germinate to produce new fungus.

Example

Some bacteria reproduce by forming **endospores** (spores produced inside the

cell). They form endospores in unfavorable environmental conditions. Even if the original cell dies, the endospore survives. When conditions improve, the endospore grown into a new bacterium.

Q.4. Describe how vegetative propagation occurs through runners? 09410057

Ans. It is a horizontal stem that grows above the ground. A stolon has nodes where new leaves and roots grow. The leaves grow upwards and roots grow down. In this way, a new plant is formed at the node.

Example

Strawberry reproduces by using its stolon.

Q.5. State how potatoes reproduce through tubers. 09410058

Ans. Potatoes reproduce by tubers. It is fleshy stem that grows underground. It has "eyes" which are actually its buds. Eyes can grow into new plants.

Q.6. Describe the advantages and disadvantages of vegetative propagation. 09410059

Ans. Advantages

- Vegetative propagation allows to produce many new plants in a short time.
- The new plants are exactly like the parent plant, so they all have same good

characteristics. This means useful qualities, like good fruit or strong growth, are passed on to the next generation.

Disadvantage

- Plants produced through vegetative propagation do not have genetic differences.
- In other words all the offspring are identical. Due to it, they are equally sensitive to environmental changes and prone to the same diseases or pests.

Q.7. Name the four whorls present in a flower and also tell the components of each whorl. 09410060

Ans. Floral Parts

Floral parts are in the form of the following four concentric whorls, or rings.

- Calyx:** It is the outermost whorl. It is made of green leaf-like sepals.
- Corolla:** It is the second whorl and made of petals. Most flowers have coloured petals.
- Androecium:** It is the third whorl and is made of male reproductive structures called stamens. Each stamen consists of an anther and a filament. Anther contains pollen sacs (microsporangia), which produce microspores.
- Gynoecium:** It is the innermost whorl made of female reproductive structures called carpels. A carpel consists of three parts.
 - The enlarged base of carpel is called ovary, where ovules are produced.
 - The stalk-like part attached to ovary is called style.
 - The tip of style is called stigma.

Q.8. Briefly describe the formation of egg cell and polar nuclei within embryo sac of a flower. 09410061

Ans. The ovule acts as mega sporangium. It contains diploid megaspore mother cell which undergoes meiosis, and produces four haploid megaspores.

Only one megaspore 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 female gamete i.e., egg cell.

Q.9. Differentiate between: 09410062

i. Asexual and sexual reproduction

Ans.

Asexual Reproduction	Sexual Reproduction
- The reproduction that does not involve the fusion of gametes is called asexual reproduction - The offspring produced by asexual reproduction are genetically identical to the parents.	- The reproduction that involves the fusion of male and female gametes is sexual reproduction. - In sexual reproduction, the offspring have variations among themselves and with the parents.

ii. Binary Fission in bacteria and amoeba

Binary Fission in Bacteria	Binary Fission in Amoeba
- During binary fission the bacterial DNA replicates and the daughter DNA molecules move to opposite sides. - Cell membrane pinches in. New cell's wall is synthesized in the middle and so two identical daughter cells are produced.	- During binary fission in amoeba, the nucleus of parent organism divides into two - This is followed by the division of cytoplasm. So two daughter protists are formed.

iii. Stolon and Rhizome

Stolon	Rhizome
- It is a horizontal stem that grows above the ground. - A stolon has nodes where new leaves and roots grow.	- It is a horizontal stem that grows below the ground. - It has nodes where new leaves and roots grow. In this way, a new plant grows from each node.

iv. Bulb and Corm

Bulb	Corm
- It is a very short stem that grows underground. - It has bud and fleshy leaves.	- It resembles the bulb but does not have fleshy leaves. - Almost all of a corm consists of stem, with a few brown non-functional leaves on the outside.

v. Cutting and Grafting

Cutting	Grafting
- Cuttings are widely used to propagate house plants, ornamental trees and shrubs, and some fruit crops. - Roses and grapevines are grown from stem cuttings.	- Grafting is the joining of two or more plant parts of the same type to form a single plant. - In grafting, a bud or small stem of one plant is attached to the roots or stems of a second plant.

vi. Vegetative and Artificial Propagation

Vegetative Propagation	Artificial Propagation
- It is a method of sexual reproduction in plants. In this method, new plant is produced from the vegetative part (root, stem or leaf) of the present plant. - Vegetative propagation takes much less time to produce new generation as compared to the sexual method. - Secondly, the offspring are genetically identical to the parent plant. - Vegetative propagation may be natural or artificial.	- Artificial propagation includes the methods in which humans produce new plants by using the vegetative parts of plants. - It includes techniques such as cutting, grafting, or tissue culture. - Artificial propagation is used to cultivate plants with desirable characteristics or to increase crop production. - The following two are the most common methods of artificial propagation.

vii. Male and Female Gametophytes

Male Gametophytes	Female Gametophytes
- The pollen sacs present in anther act as microsporangia. - Each pollen sac contains many diploid microspore mother cells.	- The ovule acts as megasporangium. It contains diploid megaspore mother cell which undergoes meiosis, and produces four haploid megaspores. - Only one megaspore remains alive.

viii. Calyx and Corolla

Calyx	Corolla
• It is the outermost whorl. • It is made of green leaf-like sepals. • Sepals protect the inner parts of a developing flower before it opens.	• It is the second whorl. • It is made of petals. • Most flowers have coloured petals. • Play role in pollination.

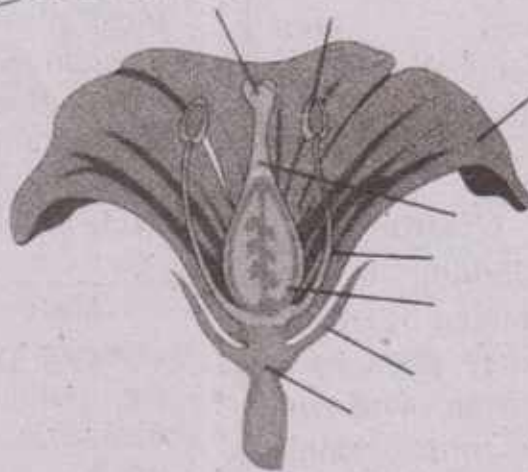
stamens. • Each stamen consists of an anther and a filament. Anther contains pollen sacs (microsporangia, which produce microspores). • The stalk-like filament supports the anther.	produced. • Ovules produce megaspores during reproduction. • The stalk-like part attached to ovary is called style.
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ix. Stamen and Carpel

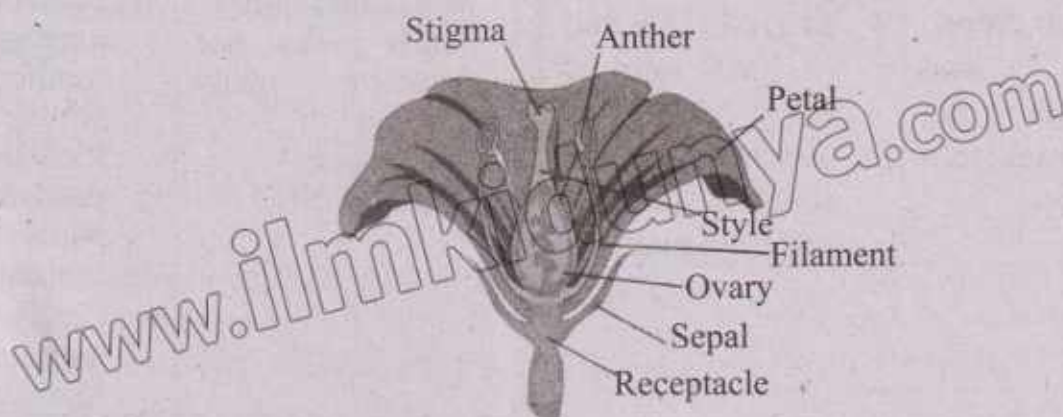
Stamen	Carpel
• It is the third whorl and is made of male reproductive structures called	• The enlarged base of carpel is called ovary. It is the part where ovules are

Q.10. Label the given diagram of flower:

09410063



Ans.



Short Answer Questions (Additional)

Types of Asexual Reproduction

Q.11. Differentiate between spore and endospore. 09410064

Ans.

Spore	Endospore
In most of fungi like <i>Rhizopus</i> , when they reach at reproduction age, then body cells form thick walled sacs called sporangia. Inside each sporangia, a cell divides many times and forms many daughter cells called spores.	Under unfavourable conditions, some species of bacteria reproduce by forming spores e.g. <i>Clostridium</i> and <i>bacillus</i> . Thick walled spores are formed inside bacterial cell. These are called endospores.

Sexual Reproduction in Plants

Q.12. Double fertilization is a unique event in the life cycle of an angiospermic plant. Describe and sketch the process, also explain the fate of products of double fertilization. 09410066

Ans. After pollination pollen grains germinates to develop a pollen tube containing a tube nucleus and two sperm nuclei. Inside the ovule megaspore undergo three consecutive mitosis to produce female gametophyte containing an egg (1N), fusion nuclei (2N) and other associated cells. Pollen tube enters the ovule and transfer both the sperms for fusion with two different cells of female gametophyte so called "double fertilization".

Q.13. Differentiate between self-pollination and cross-pollination.

Ans.

09410067

Self-Pollination	Cross Pollination
(i) If the pollination occurs within the same flower or between two flowers of the same plant, it is called self-pollination	(i) If it occurs between two flowers of separate plants, of same species it is called cross pollination which ensures more genetic variability in coming generations.
(ii) Conifers, Grasses, Cereals etc.	(ii) Rose, Sunflower, Buttercup etc.

Inquisitive Questions

Q1. Why a spore considered as adaptation for survival in harsh environmental conditions? 06410068

Ans: A spore is seen as an adaptation for surviving harsh environmental conditions because it is a durable reproductive structure capable of withstanding extreme factors like drought, heat, and cold. They can also remain dormant for a long time and grow into a new organism when conditions become favorable. That is why they are considered as an adaptation for survival in harsh environmental conditions.

Q2. How do asexual and sexual reproduction contribute differently to genetic diversity of plant populations? 06410069

Ans: Asexual Reproduction produces offsprings that are genetically identical to the parent, as there is no mixing of genetic material. This enables rapid population growth, but it restricts the ability to adapt to shifting environmental conditions.

Sexual Reproduction increases genetic diversity in plants by combining genes from two parents. This genetic recombination leads to variation which helps the organisms to adapt according to changing environmental conditions, which supports long-term survival.

So Asexual reproduction produces identical offspring, making it suitable for stable environments, whereas sexual reproduction promotes genetic diversity, helping populations in adapting to new challenges.

Q3. How does the pollen tube facilitate the process of fertilization in flowering plants? 06410070

Ans: The pollen tube facilitates fertilization in flowering plants because it grows from pollen grain on stigma through the style to the ovary. When the pollen grain lands on the stigma, it absorbs water and begins to grow, forming a pollen tube. This tube extends down the style, through the ovary, and into the ovule. It carries the male gametes to the ovule, where one gamete fuses with the egg cell to form a zygote, completing the fertilization process. In short, the pollen tube serves as a transport system, ensuring the sperm reaches the egg for fertilization.