Class: 9th

Subject: Biology

Chapter 10: Reproduction Of Plants

Exercise MCQs:

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

(a) Yeast

(b) Bacteria ✅

(c) Rhizopus

(d) Plants

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

(a) Binary fission

(b) Spore formation

(c) Budding ✅

(d) Fragmentation

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

(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?

(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?

(a) Potato

(b) Strawberry ✅

(c) Onion

(d) Ginger

6. Which plant propagates through tubers?

(a) Onion

(b) Potato ✅

(c) Ginger

(d) Garlic

7. The horizontal underground stem, which produces leaves and roots at its nodes, is called:

(a) Bulb

(b) Corm

(c) Rhizome ✅

(d) Runner

8. Which of these does NOT help a plant for vegetative propagation?

(a) Rhizome

(b) Corm

(c) Runner

(d) Flower ✅

9. Which part of the flower is responsible for producing pollen?

(a) Stigma

(b) Anther ✅

(c) Ovary

(d) Petal

10. Which of the following is NOT a part of carpel?

(a) Filament ✅

(b) Style

(c) Stigma

(d) Ovary

11. Which structure forms the female gametophyte in flowering plants?

(a) Pollen grain

(b) Ovule ✅

(c) Anther

(d) Sepal

12. The male gametophyte in flowering plants is known as:

(a) Pollen grain ✅

(b) Embryo sac

(c) Ovary

(d) Carpel

13. In the life cycle of flowering plants, which structure is triploid?

(a) Egg

(b) Fusion

(c) Endosperm nucleus ✅

(d) Sperm

14. Embryo sac is formed inside:

(a) Filament

(b) Anther

(c) Style

(d) Ovule ✅

15. Double fertilization involves:

(a) Fertilization of the egg by two male gametes

(b) Fertilization of two eggs in the same embryo sac by two sperms

(c) Fertilization of the egg and the fusion nucleus by two sperms ✅

(d) Fertilization of the egg and the tube cell by two sperms

Important MCQs:

1. Binary fission is a common method of reproduction in:

(a) Fungi

(b) Algae

(c) Bacteria ✅

(d) Ferns

2. In protists like Amoeba, binary fission starts with the division of:

(a) Cytoplasm

(b) Cell wall

(c) Nucleus ✅

(d) Bud

3. Budding is commonly seen in:

(a) Bacteria

(b) Euglena

(c) Yeast ✅

(d) Amoeba

4. The outgrowth formed during budding is called:

(a) Node

(b) Sporangium

(c) Bud ✅

(d) Stolon

5. Spores are produced in fungi in special sac-like structures called:

(a) Endospores

(b) Buds

(c) Sporangia ✅

(d) Nodes

6. Spores can tolerate harsh conditions because of their:

(a) Small size

(**b**) Thick walls ✅

(c) Rapid growth

(d) High metabolism

7. Endospores are formed by:

(a) Yeast

(b) Plants

(c) Protists

(**d**) Some bacteria ✅

8. Endospores form in bacteria during:

(a) Cell division

(b) Favorable conditions

(**c**) Unfavorable conditions ✅

(d) Vegetative propagation

9. The method of producing new plants from vegetative parts is called:

(a) Pollination

(b) Budding

(c) Vegetative propagation ✅

(d) Spore formation

10. Which of the following is a natural method of vegetative propagation?

(a) Grafting

(b) Cutting

(c) Rhizome ✅

(d) Layering

11. The horizontal stem that grows above the ground is known as:

(a) Rhizome

(b) Stolon ✅

(c) Tuber

(d) Bud

12. Which structure helps potato in reproduction?

(a) Stolon

(b) Rhizome

(c) Eyes ✅

(d) Buds of leaves

13. Strawberry reproduces by:

(a) Rhizome

(b) Tuber

(c) Stolon ✅

(d) Spore

14. Which of the following is an underground horizontal stem?

(a) Stolon

(b) Rhizome ✅

(c) Bud

(d) Sporangium

15. Vegetative propagation produces offspring that are:

(a) Genetically different

(b) Identical to parent ✅

(c) Sterile

(d) Diploid only

16. Onion and tulip reproduce by which vegetative structure?

(a) Corm

(b) Bulb ✅

(c) Tuber

(d) Stolon

17. A corm differs from a bulb because it:

(a) Is found above ground

(b) Does not have fleshy leaves ✅

(c) Lacks buds

(d) Has eyes like potato

18. New shoots arising from the base of a parent plant are called:

(a) Buds

(b) Suckers ✅

(c) Rhizomes

(d) Stolons

19. In Bryophyllum, new plants grow from:

(a) Roots

(b) Stem nodes

(c) Leaf margins ✅

(d) Underground bulbs

20. The artificial propagation method in which a piece of stem or root is used is called:

(a) Grafting

(b) Cutting ✅

(c) Layering

(d) Budding

21. Grafting allows to:

(a) Speed up seed formation

(b) Produce identical offspring

(c) Combine good traits of two plants ✅

(d) Produce more flowers

22. One major disadvantage of vegetative propagation is:

(a) It takes too long

(b) It causes mutations

(c) Offspring lack genetic variation ✅

(d) Flowers are not formed

23. In sexual reproduction, the diploid generation is called:

(a) Gametophyte

(b) Sporophyte ✅

(c) Megaspore

(d) Pollen

24. Which part of the flower contains the ovules?

(a) Anther

(b) Stigma

(c) Ovary ✅

(d) Sepals

25. In angiosperms, the embryo sac contains how many cells?

(a) 2

(b) 4

(c) 6

(d) 7 ✅

26. What does each microspore mother cell produce after meiosis?

(a) Two diploid microspores

(b) Four haploid microspores ✅

(c) Two haploid pollen grains

(d) Four diploid gametes

27. The function of the tube cell in a pollen grain is to:

(a) Form sperm

(b) Form pollen sac

(c) Form pollen tube ✅

(d) Fertilize the egg

28. What is pollination?

(a) Fusion of sperm and egg

(b) Growth of pollen tube

(c) Transfer of pollen grain to stigma ✅

(d) Development of embryo

29. Double fertilization in angiosperms involves fusion of:

(a) One sperm with ovary and one with ovule

(b) Two sperms with two egg cells

(c) One sperm with egg and one with fusion nucleus ✅

(d) One sperm with stigma and one with style

30. What does the ovule become after fertilization?

(a) Fruit

(b) Embryo

(c) Seed ✅

(d) Stigma

Exercise Short Questions:

1. Write a short note on budding in yeast.

Yeast reproduces by budding. A small outgrowth (bud) forms on the parent cell, grows, and eventually separates to form a new yeast cell.

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

Fungi reproduce by forming spores. These are tiny cells that grow into new fungi when conditions are suitable.

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

Spores help fungi and bacteria survive harsh conditions. They are light, can spread easily, and grow into new organisms when the environment improves.

4. Describe how vegetative propagation occurs through runners.

In runners, a plant produces horizontal stems that grow along the ground. New plants grow from

nodes at intervals, like in strawberry plants.

5. State how potatoes reproduce through tubers.

Potatoes reproduce through underground stem tubers. Each tuber has buds (eyes) that grow into new potato plants.

6. Describe the advantages and disadvantages of vegetative propagation.

- **Advantages**: Fast reproduction, new plants are identical to parent.
- **Disadvantages**: No genetic variation, all plants may be affected by the same diseases.

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

1. Calyx – Sepals

2. Corolla – Petals

3. Androecium – Stamens (anther + filament)

4. Gynoecium – Carpels (ovary, style, stigma)

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

Inside the ovule, one megaspore develops into the embryo sac. It forms eight nuclei: one becomes the egg cell, two fuse to form polar nuclei, and five are non-functional.

9. Differentiate between:

i. Asexual and Sexual Reproduction

- Asexual reproduction: Involves one parent, no gametes, and offspring are genetically identical.
- Sexual reproduction: Involves two parents, fusion of gametes, and offspring show genetic variation.

ii. Binary Fission in Bacteria and Amoeba

- **In Bacteria**: Cell splits into two equal daughter cells without a nucleus (prokaryotic).
- **In Amoeba**: Nucleus divides first, then the cytoplasm (eukaryotic cell with nucleus).

iii. Stolon and Rhizome

- **Stolon**: A horizontal stem that grows above the ground (e.g., strawberry).
- **Rhizome**: A horizontal stem that grows underground (e.g., ginger).

iv. Bulb and Corm

- **Bulb**: Contains fleshy leaves storing food (e.g., onion).
- **Corm**: A solid underground stem storing food (e.g., taro).

v. Cutting and Grafting

- **Cutting**: A piece of stem or leaf is cut and planted to grow a new plant.
- **Grafting**: A stem (scion) from one plant is joined to the rooted plant (stock) of another.

vi. Vegetative and Artificial Propagation

- **Vegetative propagation:** Naturally occurs

through roots, stems, or leaves (e.g., potato tuber).

- **Artificial propagation**: Done by humans using methods like cutting, layering, and grafting.

vii. Male and Female Gametophytes

- **Male gametophyte:** Pollen grain; produces two sperms.
- **Female gametophyte:** Embryo sac; contains egg cell and polar nuclei.

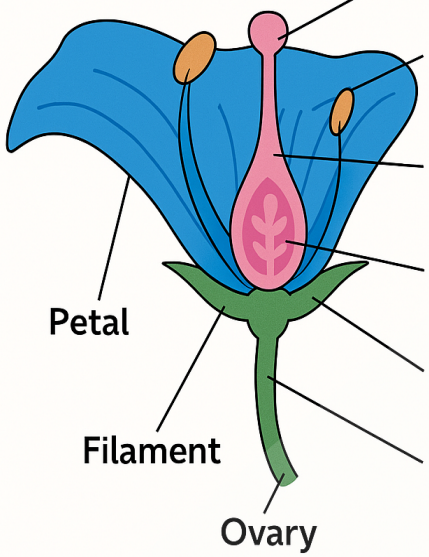
viii. Calyx and Corolla

- **Calyx**: Outermost whorl made of green sepals; protects the flower bud.
- **Corolla**: Second whorl made of colorful petals; attracts pollinators.

ix. Stamen and Carpel

- Stamen: Male reproductive part (anther + filament); produces pollen.
- Carpel: Female reproductive part (stigma, style, ovary); contains ovules.

10. Label the given diagram of flower.



Stigma – The top part of the carpel where pollen grains land.

Style – The stalk that connects the stigma to the ovary.

Anther – The part of the stamen that produces pollen.

Ovary – The swollen base of the carpel that contains ovules.

Ovule – The structure inside the ovary where seeds develop.

Petal – Brightly colored part of the flower that attracts pollinators.

Sepal – Green leaf-like structure that protects the flower bud.

1. **Stigma** – The top part of the carpel where pollen grains land.

2. **Style** – The stalk that connects the stigma to the ovary.

3. **Anther** – The part of the stamen that produces pollen.

4. **Filament** – The stalk of the stamen that holds the anther.

5. **Ovary** – The swollen base of the carpel that contains ovules.

6. **Ovule** – The structure inside the ovary where seeds develop.

7. **Petal** – Brightly colored part of the flower that attracts pollinators.

8. **Sepal** – Green leaf-like structure that protects the flower bud.

Exercise Long Questions:

Q1: Explain the process of binary fission in bacteria and describe how it leads to the formation of two daughter bacteria.

Binary fission is the most common method of asexual reproduction in bacteria. It is a simple and quick process in which a single bacterial cell divides into two identical daughter cells. Here's how it occurs step by step:

Step 1: DNA Replication

The single circular DNA molecule of the bacterium is duplicated. Now, there are two identical copies of the bacterial genome.

Step 2: Cell Growth and DNA Segregation

The cell grows longer, and the two DNA copies begin to move towards opposite ends (poles) of the cell.

Step 3: Formation of Septum

The cell membrane starts to pinch inward from the center, forming a partition called the septum.

Step 4: Division into Daughter Cells

Eventually, the septum divides the original cell into two equal halves. Each daughter cell receives one copy of DNA and becomes an independent bacterium.

Result:

Two genetically identical daughter cells are produced. Binary fission is very rapid under ideal conditions and allows bacteria to multiply quickly.

Q2: What do you mean by vegetative propagation? Differentiate among different plant structures modified for vegetative propagation.

Vegetative propagation is a type of asexual reproduction in plants in which new plants grow from vegetative parts such as stems, roots, or leaves, instead of seeds. This process can occur naturally or be done artificially by humans.

Here are the types of modified plant structures that help in vegetative propagation:

1. Runners (Stolons):

These are horizontal stems that grow above the soil surface. At nodes, they form roots and shoots to grow into new plants.

Example: Strawberry, grass.

2. Tubers:

These are swollen underground stems that store food. Each “eye” of a tuber has a bud that can grow into a new plant.

Example: Potato.

3. Rhizomes:

Horizontal underground stems that grow new shoots upward and roots downward at nodes.

Example: Ginger.

4. Bulbs:

These are underground buds surrounded by fleshy leaves. They store food and can grow into new plants.

Example: Onion, garlic.

5. Corms:

Solid, short, underground stems that contain stored food and buds for new growth.

Example: Gladiolus, crocus.

Difference between structures:

- Runners are above ground, while tubers, rhizomes, bulbs, and corms are underground.
- Tubers have eyes (buds), bulbs have fleshy leaves, rhizomes grow horizontally, and corms

are solid structures.

Q3: Describe the ways by which humans can grow new plants by using the vegetative parts of the parent plants.

Humans use artificial vegetative propagation techniques to grow new plants from parts of existing plants. These methods are especially useful in agriculture and horticulture to grow desired plants quickly.

Here are the main methods:

1. Cutting:

A piece of stem, root, or leaf is cut from the parent plant and planted in moist soil. It develops roots and grows into a new plant.

Example: Rose, money plant, sugarcane.

2. Grafting:

A part of one plant (scion) is joined with the rooted part of another plant (stock). They grow together as a single plant and combine traits of both.

Example: Mango, citrus fruits.

3. Layering:

A branch of a plant is bent down and covered with soil. It forms roots while still attached to the parent. After rooting, it is cut and grows independently.

Example: Jasmine, strawberry.

4. Tissue Culture (Micropropagation):

Tiny pieces of plant tissue are grown in nutrient-rich labs under sterile conditions. These cells grow into complete plants.

Used for: Orchids, bananas, disease-free plants.

Benefits of these methods:

1. Plants retain desirable traits (e.g., fruit taste, flower color).
2. Faster reproduction.
3. Useful for plants that don't produce viable seeds.

Q4: Define sporophyte and gametophyte. State their roles in the life cycle of plants.

Sporophyte:

The sporophyte is the diploid (2n) phase of the plant life cycle, meaning it has two sets of chromosomes. It produces spores by the process of meiosis. These spores are haploid (n), containing only one set of chromosomes.

Gametophyte:

The gametophyte is the haploid (n) phase that develops from spores. It produces male and female gametes (sperm and egg) through mitosis.

Roles in Life Cycle:

- The sporophyte produces spores which develop into gametophytes.
- The gametophyte produces gametes that fuse during fertilization to form a new sporophyte.
- Together, these two phases alternate in the plant life cycle, a process known as alternation of generations.

Q5; Explain the lifecycle of flowering plants, focusing on the alternation between gametophyte and sporophyte generations.

Sporophyte stage:

The main body of the flowering plant is the sporophyte, which is diploid. In this stage, meiosis occurs producing spores — male spores develop into pollen grains and female spores develop into ovules.

Gametophyte stage:

These spores grow into the gametophyte stage. The male gametophyte is the pollen grain, containing two cells: the tube cell and the generative cell. The female gametophyte is the embryo sac, containing the egg and polar nuclei.

Fertilization:

When a pollen grain lands on the stigma, the tube cell forms a pollen tube. The generative cell divides to form two sperms. The pollen tube grows down the style to the ovule where fertilization happens.

One sperm fuses with the egg to form a diploid zygote, while the other sperm fuses with the two polar nuclei to form a triploid endosperm.

Outcome:

The zygote develops into the new sporophyte (embryo), and the endosperm provides nourishment for the developing embryo. This cycle continues alternating between sporophyte and gametophyte generations.

Q6: Describe how the female gametophyte (embryo sac) develops within the ovule of a flower.

- Inside the ovule, there is a diploid cell called the megaspore mother cell. It undergoes meiosis to produce four haploid megaspores.
- Out of these four, only one megaspore survives; the other three degenerate.
- The surviving megaspore undergoes three rounds of mitotic division, resulting in eight nuclei.

These nuclei are arranged within the embryo sac as follows:

- One egg cell
- Two synergid cells (near the egg)
- One central cell containing two polar nuclei
- Three antipodal cells at the opposite end
- Together, these cells form the embryo sac, which is the female gametophyte ready for fertilization.

Note:

This chapter is designed to provide a solid foundation of knowledge, with the goal of deepening understanding and encouraging further

exploration of the subject. The content has been carefully selected to support effective learning and inspire students to engage with the topic more deeply.

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Purpose: To contribute to education by offering insightful, valuable content that enhances learning and understanding.

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