# Reproduction in Plants

## REVIEW QUESTIONS

### Multiple Choice Questions:

**1. Put a tick mark (✓) against the correct alternative in the following statements**

**(a)** Pollen is produced in the:

1. Filament
2. Style
3. Pistil
4. **Anther**

**(b)** Reproductive whorls of a flower are:

1. **Stamens and carpels**
2. Sepals and petals
3. Sepals and stamens
4. Petals and carpels

**(c)** Grafting is a method of:

1. **Artificial vegetative propagation**
2. Sexual reproduction
3. Artificial pollination
4. Cross-pollination

**(d)** Which one of the following is a false fruit ?

1. Tomato
2. **Apple**
3. Potato
4. Pea

### Short Answer Questions:

**Question 1.**
Write two ways in which pollination may occur in plants.
**Answer:**
The two ways in which pollination may occur in plants are:

(a) Self-pollination.
(b) Cross-pollination.

**Question 2.**
Name the three agents of pollination.
**Answer:**
The three agents of pollination are:
(a) Insect
(b) Wind
(c) Water

**Question 3.**
Give two features of flowers which favour pollination by insects.
**Answer:**
Specialities of insect-pollinated flowers:
(a) These flowers are large with coloured petals to attract insects.
(b) These are scented so that insects locate the flowers by smell.

**Question 4.**
Name two characteristics of flowers in which pollination occur by wind.
**Answer:**
Special features of wind-pollinated flowers:
(a) They produce light pollen so that it is easily carried away.
(b) They produce a large quantity of pollen.

**Question 5.**
What is a “false fruit” ? Give one example:
**Answer:**
In false fruits the base of the flowers (thalamus) becomes the main fleshy part of the fruit, while the ovary remains a small central part containing seeds. Example: Apple and Pear.

**Question 6.**
Name any three agencies for dispersal of seeds.
**Answer:**
a. Wind
b. Water
c. Man and animals, birds, bats, squirrels.

**Question 7.**
**Fill in the blanks by selecting suitable words:**
**(unisexual, fertilisation, fruit, stamen, anther, bisexual, pollination, seed, ovary)**
**Answer:**
**a.** A flower that bears both the male and the female parts is known as **bisexual** flower.

**b.** A flower bearing only male or female parts is known as **unisexual** flower.
**c.** Transfer of pollen grains from the anther to the stigma is known as **pollination.**
**d.** Fusion of male cell with the female cell is called **fertilisation.**
**e.** The ovule develops into a **seed.**
**f.** The ovary of the flower develops into a **fruit.**

## Long Answer Questions:

### Question 1.
What is vegetative reproduction?
**Answer:**
**Vegetative reproduction:** In this method, new plants are produced by the vegetative parts of the plants. The vegetative part mean the leaf, stem and root. Potato, mint, ginger, banana etc. are reproduced by this method.
Vegetative propagation can occur by natural methods as well as by artificial methods.
Natural method includes reproduction by stem, by roots and by leaves.
Artificial method include reproduction by cutting, layering, grafting and tissue culture.

### Question 2.
Briefly explain why a gardener prefers to grow certain plants vegetatively?
**Answer:**
Gardener prefer to grow certain plants by vegetative method. The advantages in doing so are as follows:

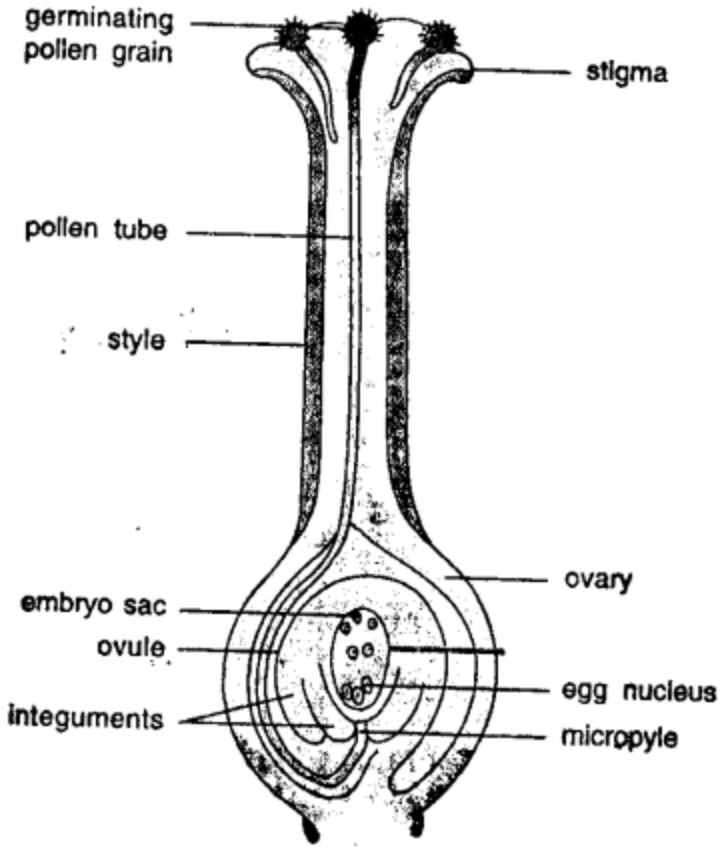
1. Reproduction by vegetative parts takes place in a shorter time.
2. New plants, thus produced, spread very fast in a small area.
3. It is a surer method.
4. All the characters of the mother plant are retained by the daughter plants.

### Question 3.
Why is it disadvantageous to grow plants vegetatively?
**Answer:**
It is disadvantageous to grow plants vegetatively because of following:

1. As all plants developed by vegetative propagation are identical, they are likely to be affected simultaneously if a disease spreads in the farm.
2. Dispersal of plants does not take place on its own. Daughter plants, so developed, tend to remain nearby and are restricted to a particular area leading to competition for resources.

### Question 4.
What is meant by pollination? Explain the structure of germinating pollen grain with the help of a labelled diagram.
**Answer:**

**Pollination:** Pollination is the process in which the pollen grains from the anthers are transferred to the stigma.
**Structure of the pollen grain:** After pollination pollen grains are deposited on the stigma of the carpel. Under suitable conditions pollen grains produce a tube known as pollen tube. This tube grows down through the stigma and style towards the ovary.




*Structure of pollen grain and fertilization in the embryo sac*

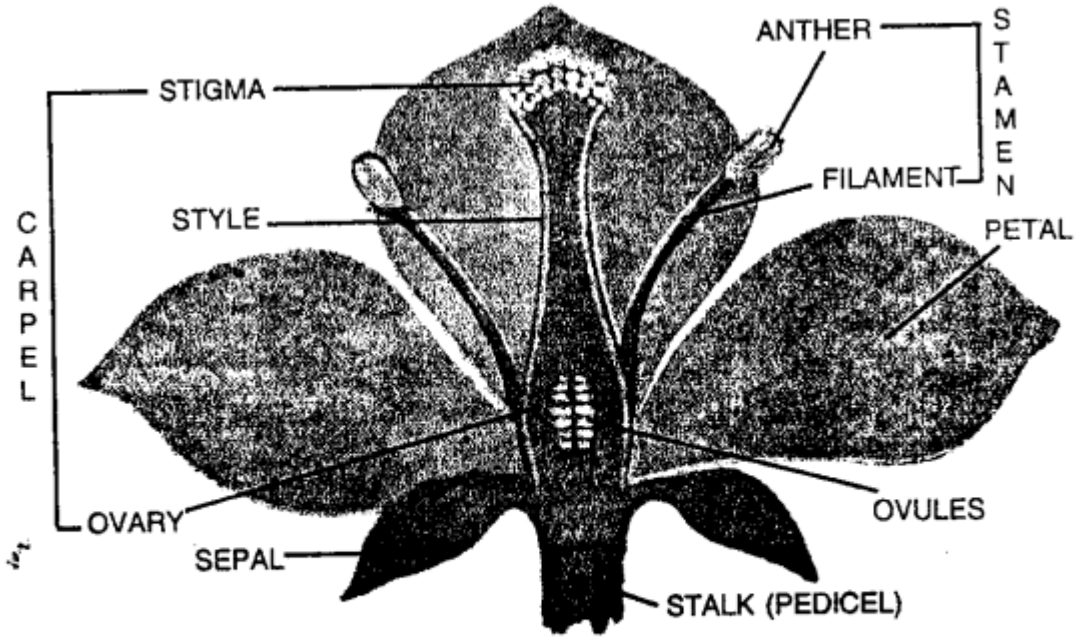
The nucleus of the pollen grains divides by mitosis and forms two male gametes. The tip of the pollen tube after entering ovary discharges the two male gametes into the embryo sac.
One of the male gametes fuses with the egg to form the zygote. This fusion is called fertilization. Another male gamete fuses with the diploid secondary nucleus and forms the endosperm, a food storing tissue.

**Question 5.**
Imagine all the seeds produced by a plant happen to fall under the same plant and sprout into new plants. Mention any two problems that will be faced by the new plants. –
**Answer:**

If all the seeds produced by a plant happen to fall under the same plant and sprout into new plants then in this situation plants will face the following problems:

1. A large number of plants will grow in a small limited space. The water and the minerals available to them in the soil will be limited.
2. The air surrounding them will not be enough and less sunshine will be available to them. As a result, most of these sprouted plants will die.

**Question 6.**
What is a flower ? Draw a neat labelled diagram showing the L.S. of a typical flower.
**Answer:**
A flower is a reproductive part of a plant. It helps in sexual reproduction as it has male parts and female parts. A fully opened flower has the following parts:



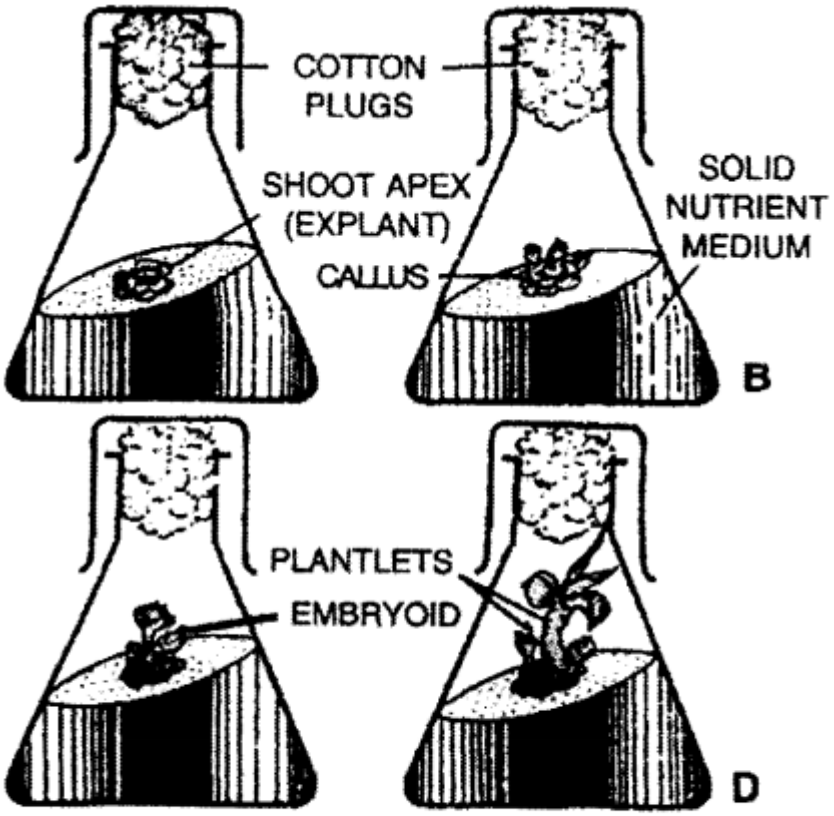

*A flower with its different parts*

**Stalk—**A flower is attached to the shoot by means of stalk or pedicel stalk. The tip of the stalk is swollen or flattened. This is called torus or thalamus or receptacle.
The different parts of a flower are inserted on the thalamus. There are usually four whorls as

Calyx (Sepals)
Corolla (Petals)
Androecium (stamens)
Gynoecium (Carpels) Present on the thalamus

1. **Sepals (Calyx):** These are the outermost part of the flower. These are leaf like and green in colour. This is the outer covering of the flower and form outer whorl in a flower. The Calyx (sepals) enclose the inner parts of the flower when it is a bud. It is protective in function.
2. **Corolla (Petals):** Petals form the second whorl inner to the sepals. These are usually coloured, gaudy, or white in colour and scented and give sweet smell. The value of a flower is due to the attractive colour of the petals. These attract the insects for pollination.
3. **Stamens (Androecium):** The third whorls inner to the petals are stamens. This third whorl is called Androecium. These are the male parts of the flower. Each stamen is formed of a long narrow, hair like structure called filament. On its tip it bears, a rounded broad sac like structure called anther. Each anther has two anther lobes. Each anther lobe has two pollen sacs which have powdery mass called pollen grains.
4. **Carpels (Gynoecium):** Carpels are the inner most or fourth whorl in a flower. It is lodged on the thalamus and forms the female part of a flower. This whorl of carpels is called gynoecium. Each carpel or pistil has three parts.
   (a) The lower most, swollen part is ovary. It is attached to the thalamus.
   (b) The middle part is style which is narrow, thread like.
   (c) **Stigma:** The style ends in a knob like, rounded structure which is sticky in nature to receive the pollen grains.
   The ovaries contain ovules which later turn into seeds after fertilization and the ovary wall forms the fruit sometimes the thalamus also becomes a part of the fruit as in apple.

**Question 7.**
Write short notes on the following:
(a) Micro propagation
(b) Bryophyllum
(c) Vegetative reproduction
(d) Grafting
**Answer:**
**(a) Micro propagation:** This is the propagation of plants involving cell and tissue culture. If vegetative propagation is not possible in a crop, then buds, shoot apex or any other part of the plant can be used as explant for micropropagation.




Micropropagation : A. Culture tube with explant ; B and C. Differentiation of callus into embryoids ; D. Development of plantlets.

1. The explants are treated with sterilisation chemicals to prevent microbial growth, and then cultured in a particular nutrient medium.
2. Cells grow and divide to form a cell mass called callus Some growth regulators (Plant hormones) are added.
3. The callus differentiates into plant parts looking like plant (plantlet). After 4-6 weeks the plantlets transferred to the soil.

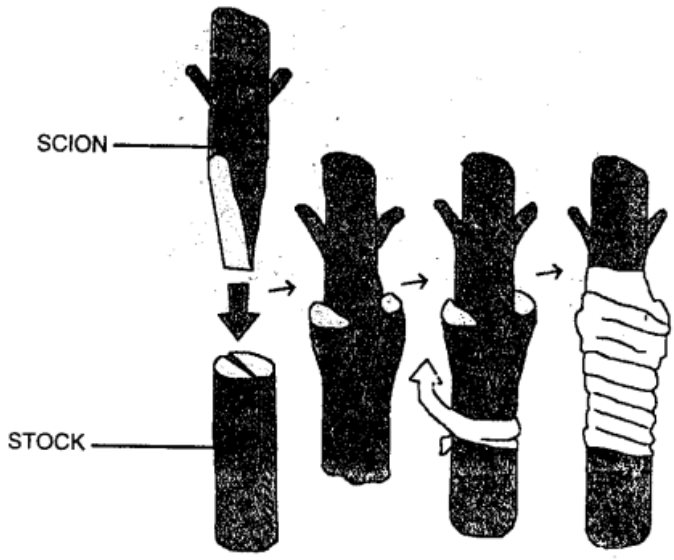
**(b) Bryophyllum:** It is a beautiful plant grown in gar xerophyte plant and can grow in any type soil or container. It requires sun and watering time to time. We can grow it vegetatively.

*Bryophyllum with growing buds*

When a leaf is put on the soil or falls off accidentally from the parent plant. It starts giving out buds in the notches of the leaves. These buds start growing when in touch with soil having moisture. They give out adventitious roots which go into the soil and small aerial shoots which go into the air. So these adventitious buds form many plants from a single plant. Thus we can get many plants from a single leaf. We can grow these tiny plants into separate pots to get independent plants. This is one of the vegetative mode of reproduction.

**(c) Vegetative reproduction:** This is method of producing new plants from the vegetative parts of the plants. The vegetative part means the leaf, stem, root. As potato, mint, ginger, banana, sugar beet, gul-e-daudi, asparagus, sugar cane, are produced by this method.

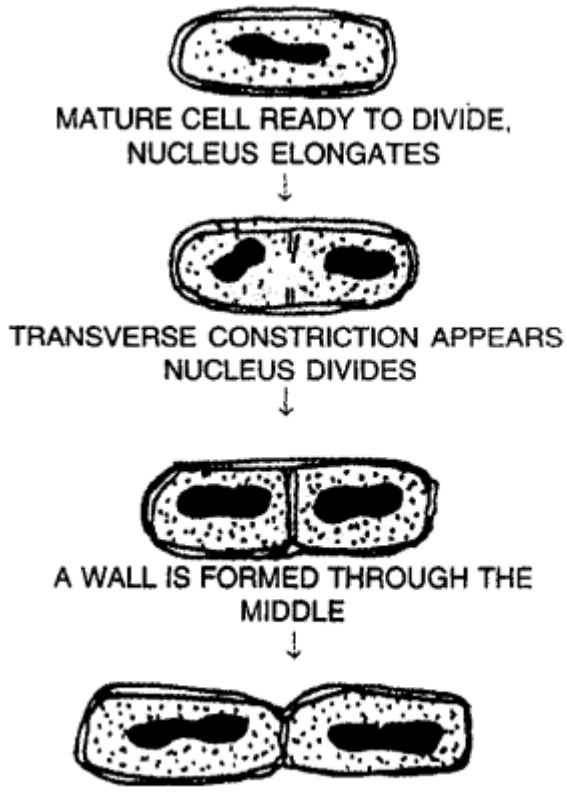
**(d) Grafting:** In plants like mango, zizyphus (ber), guava apples, fruits, roses, a small bud is fixed on the stem. Many types of apples on a single plant thus a small orchard on a single plant. So we can have different types of roses and chrysanthemums on a single plant.




*Tongue or whip grafting, Crown or wedge grafting, Bud grafting*

**Question 8.**
How artificial pollination is useful to plant breeders ? Discuss briefly.
**Answer:**
Artificial pollination means transfer of pollen to the stigma artificially. In ancient times, it was a common practice to sprinkle “male flowers of palms on the “female flowers”. However, in modem era, plant breeders use artificial pollination for developing new varieties. The breeders remove the anthers in young flowers and cover such flowers by plastic bags. Such flowers are then pollinated with pollen from the plants of the desired variety.

**Question 9.**
With the help of suitable diagrams, describe
(a) Binary fission in plants
(b) Budding in yeast cell
**Answer:**
**(a) Binary fission:** This is one of the asexual mean of reproduction. In lower plants like bacteria reproduction takes place by this process. In this process the nucleus of the cell divides into two. Then the cell wall splits across the middle of the cell. Thus each part has a nucleus. Thus each part is an independent bacterium.

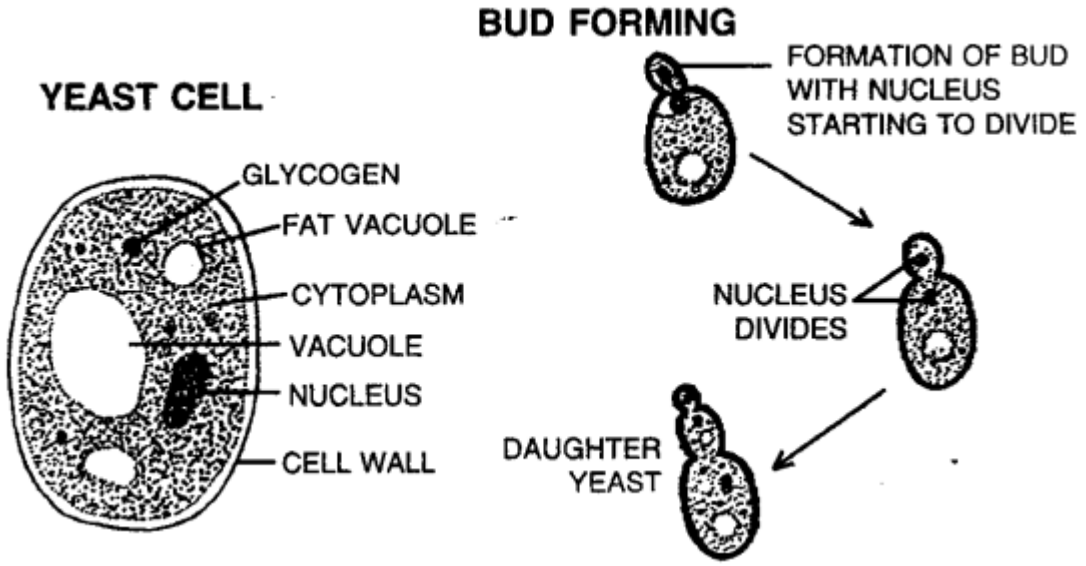


*Binary fission in bacteria*

Later on these two parts of the cell get separated from each other and form two independent individuals called daughter cells and lead independent life.

**(b) Budding in yeast cell:** Budding is the most common method in yeast. The Parent cell produces an outgrowth called a bud. The bud grows, and then gets detached from

the parent body to lead an independent life.




## ADDITIONAL QUESTIONS

## REPRODUCTION — INTRODUCTION AND ASEXUAL REPRODUCTION IN PLANTS

**I. Multiple choice questions. Tick (✓) the correct choice:**

1. The common method of reproduction in bacteria is

    1. budding
    2. fragmentation
    3. **binary fission**
    4. all the above.

2. Budding is commonly seen in

    1. **yeast**
    2. grasses
    3. Amoeba
    4. Spirogyra

3. Reproduction or propagation by stem is common in

    1. begonia
    2. **potato**
    3. sweet potato

4. Bryophyllum

**II. Fill in the blanks:**

1. Budding is a kind of **asexual** reproduction.
2. The amount of cytoplasm in the parent cell is **more** than the amount in the bud.
3. Yeast cells reproduce by **budding.**
4. Amoeba reproduces by **binary fission.**
5. Binary fission produces cells of **equal** size.
6. Budding produces cells of **different** size.
7. Fungi, ferns and mosses reproduce by **spore formation.**

**III. State whether the following statements are true (T) or false (F):**

1. Asexual reproduction is more common than the sexual reproduction.
   **False.** Sexual reproduction is more common than the asexual reproduction.
2. Producing life is called respiration.
   **False.** Producing life is called reproduction.
3. Dogs and cats reproduce from two parents.
   **True.**
4. Bacteria and yeast reproduce by sexual reproduction.
   **False.** Bacteria and yeast reproduce by asexual reproduction.
5. Reproduction by spores is a method of asexual reproduction.
   **True.**
6. A potato tuber is really an underground stem.
   **True.**
7. A whole new plant can grow from the eye of a tuber.
   **True.**
8. Cutting and grafting are natural means of reproduction.
   **False.** Cutting and grafting are artificial means of reproduction.
9. Most organisms have the capacity of regeneration in some or the other way.
   **True.**

**IV. Find the odd-one out, giving reasons.**

**Question 1.**
Gamete, budding, fragmentation, regeneration.
**Answer:**
Gamete is the odd-one out as it is responsible for sexual reproduction while rest three are methods of asexual
reproduction.

**Question 2.**
Cutting, grafting, layering, binary fission.
**Answer:**

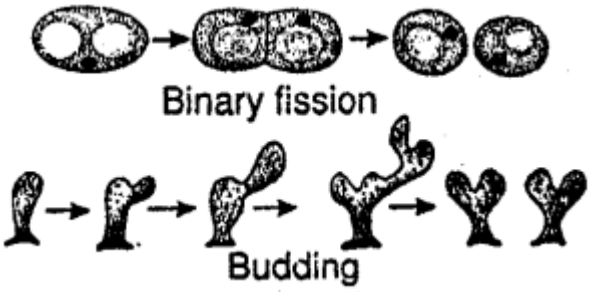
Binary fission is the odd-one out as it a method of asexual reproduction while the rest three are artificial methods of vegetative propagation.

**V. Differentiate between the following:**

**Question 1.**
Binary fission and budding
**Answer:**

**Binary fission**

1. It is the kind of asexual reproduction in which a parent cell splits into two new organisms of same size.
2. Mostly unicellular organisms like bacteria show binary fission
3. Parent cell and newly formed cells are similar in size.
4. Cytoplasm of parent cell divides equally.
5. It is a natural process and can not be done artificially.




**Budding**

1. It is the kind of asexual reproduction in which a parent cell forms an out- growth as a bud and this but detaches to form a new individual multicellular.
2. Multicellular organisms like yeast reproduce using budding.
3. Parent cell is larger than the newly formed bud.
4. Cytoplasm divides unequally parent cell has more cytoplasm than bud.
5. It is a type of vegetative propagation and can be done artificially.

**Question 2.**
Cutting and grafting
**Answer:**
**Cutting**

1. It is a method of vegetative propagation in which a part of stem, root or leaf is used to grow a new plant.

2. The new plant is same as parent plant with no variation.
3. Rose, cactus, sugarcane are propagated by stem cutting. Lemon, tamarind, etc. are propagated by root cutting.

**Grafting**

1. It is a method of vegetative propagation in which parts of two different plants are joined and grown to get a new plant, i.e., stem part of one plant (scion) is joined on root part of another plant (stock).
2. The new plant shows variation from the parent plants.
3. Apple, mango, rose, etc. are grafted to get better varieties.

**VI. Define the following:**

1. Grafting
2. Vegetative reproduction
3. Binary fission
4. Tissue culture
5. Budding
6. Regeneration

**Answer:**

1. **Grafting:** Grafting is an artificial method of vegetative propagation in which a desired plant is obtained from two different individual plants called stock (root portion from one plant) and scion (stem portion from other plant).
2. **Vegetative reproduction:** Vegetative reproduction is a form of asexual reproduction tn plants where vegetative parts, namely the root, stem or leaf give rise to new plants. No reproductive part or seeds are involved in the growth of new plants.
3. **Binary fission:** Binary fission is a method of asexual reproduction generally shown by unicellular organisms like bacteria in which a parent cell divides into two new cells of equal sizes.
4. **Tissue culture:** Tissue culture is an artificial method of vegetative propagation in which tissue from the plant tip is grown in artificial nutrient medium to produce callus which can produce new plants.
5. **Budding:** Budding is a form of asexual reproduction in which a bud like outgrowth on the body of an organism detaches to form a new organism.
6. **Regeneration:** The ability of living things to repair themselves or grow lost parts is called regeneration.

**VII. Mention the common method of reproduction in the following organisms:**

1. Bacteria
2. Yeast

3. Spirogyra
4. Mucor
5. Mosses
6. Ferns
7. Dahlia
8. Potato
9. Ginger
10. Gladiolus
11. Strawberry
12. Rose
13. Jasmine
14. Mango
15. Bougainvillea

**Answer:**

1. Bacteria — Binary fission
2. Yeast — Budding
3. Spirogyra — Fragmentation
4. Mucor — Spore formation
5. Mosses — Spore formation
6. Ferns — Spore formation
7. Dahlia — Vegetative propagation by roots
8. Potato — Vegetative propagation by stems (tuber)
9. Ginger — Vegetative propagation by stems (rhizome)
10. Gladiolus — Vegetative propagation by stems (corm)
11. Strawberry — Vegetative propagation by stems (runners)
12. Rose — Cutting
13. Jasmine — Layering
14. Mango — Grafting
15. Bougainvillea — Cutiing and Layering

**VIII. Answer the following questions:**

**Question 1.**
Why is reproduction necessary for living organisms?
**Answer:**
If the living organisms would not reproduce, then after their death, there would be no organisms left. The species would thus perish. Reproduction is, thus, the means of perpetuation of species.

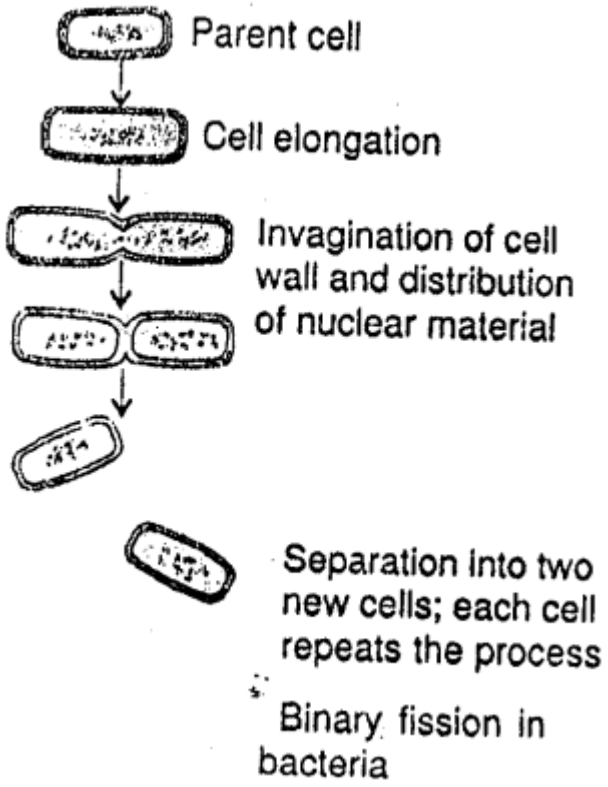
**Question 2.**
Describe the advantages of vegetative reproduction.
**Answer:**
**Advantages of vegetative reproduction:**

1. It is an easier, rapid and less expensive method of propagation.
2. Seedless plants can be raised.
3. Plants produced by this method are identical copies of the parent plant and show no variations.
4. Plants like banana, rose and jasmine do not produce viable seeds. Such plants can be easily grown by this method.

**Question 3.**
Describe the various methods of vegetative reproduction.
**Answer:**
Vegetative reproduction is an asexual method of reproduction in plants where no seeds are produced but plant parts give rise to new plants. Various methods of vegetative reproduction are:

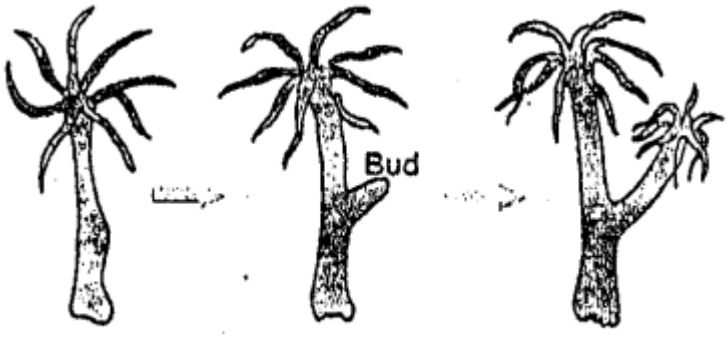
1. **Vegetative propagation by roots:** New plants arise from the swollen roots buried in the soil.
   **Example:** Sweet potato, dahlia, Asparagus.
2. Vegetative propagation by leaves: Buds and plantlets along the leave's margin detach and form new plants.
   **Example:** Begonia, Bryophyllum.
3. **Vegetative propagation by stems:** Many plants multiply by stems or their modifications like:
   (a) Potato is an underground swollen stem (tuber) which has eyes that form new plants.
   (b) Ginger is a modified underground swollen stem (rhizome) which has buds to form new plants.
   (c) Gladiolus and saffron have short swollen underground stem (corm) forming new plants.
   (d) Strawberry has long stems called runners. Buds on them form new plants.

**Question 4.**
4. Explain the process of
(i) binary fission in bacteria, and
(ii) budding in Hydra
**Answer:**
**(i) In binary fission in bacteria,** the single parent cell elongates and divides itself into almost two equal haves. Nucleus also divides into two parts. Each of the two parts then grow into full size. Each cell repeats the process.




Binary fission in bacteria

**(ii) During budding in Hydra,** an outgrowth called bud is formed on the parent plant by cells dividing rapidly at a specific site. These buds, while attached to the parents plant develop into small individuals. When this individual becomes large enough, it detaches itself from the parent body to exist as an independent individual.




Budding in *Hydra*

# SEXUAL REPRODUCTION IN PLANTS

## I. Multiple choice questions. Tick (✓) the correct choice:

1. Unisexual flowers are found in

    1. **mulberry**
    2. mustard
    3. pea
    4. sunflower

2. The male gamete is present inside the which germinates.

    1. the style
    2. the stigma
    3. **the anther**
    4. the ovary

3. High-yielding seeds can be produced by

    1. self-pollination
    2. cross pollination
    3. **artificial pollination**
    4. all the above methods

## II. Fill in the blanks:

1. Male sex cells in plants are called **pollens.**
2. The two kinds of pollination are **self pollination** and **cross pollination.**
3. A carpel consists of **ovary, style** and **stigma.**
4. A stamen consists of **anther** and **filament.**
5. Seeds are formed from **ovule.**

## III. State whether the following statements are true (T) or false (F):

1. Stamens make egg cells.
   **False.** Carpels make egg cells.
2. A fertilised egg becomes a seed.
   **False.** A fertilised egg becomes an embryo.
3. Flowers which possess stamens and carpel are called unisexual.
   **False.** Flowers which possess stamens and carpel are called bisexual.
4. Insect-pollinated flowers are brightly coloured.
   **True.**
5. Wind-pollinated flowers produce pollen grains in large quantity.
   **True.**
6. The plumule of an embryo gives rise to the root system.
   **False.** The plumule of an embryo gives rise to the shoot system.

## IV. Find the odd-one out, giving reasons:

**Question 1.**
Ovary, style, pollen grain, stigma
**Answer:**
Pollen grain is the odd-one out as it is part of the stamen (male reproductive part) while the rest three are parts of a carpel (female reproductive part of the flower).

**Question 2.**
Anther, pollen grain, ovule male gamete
**Answer:**
Ovule is the odd-one out as it is a part of female reproductive organ (carpel) of a flower while the rest three are parts of male reproductive organ (stamen) of the flower.

## V. Differentiate between the following:

**Question 1.**
Asexual reproduction and sexual reproduction.
**Answer:**

**Asexual reproduction**

1. Asexual reproduction does not involve fusion of gametes.
2. New individual is formed from a single parent.
3. Offsprings are identical to the parents and show no variation.
4. No fertilization takes place.
5. It is generally found in lower organisms like bacteria, fungi, etc.

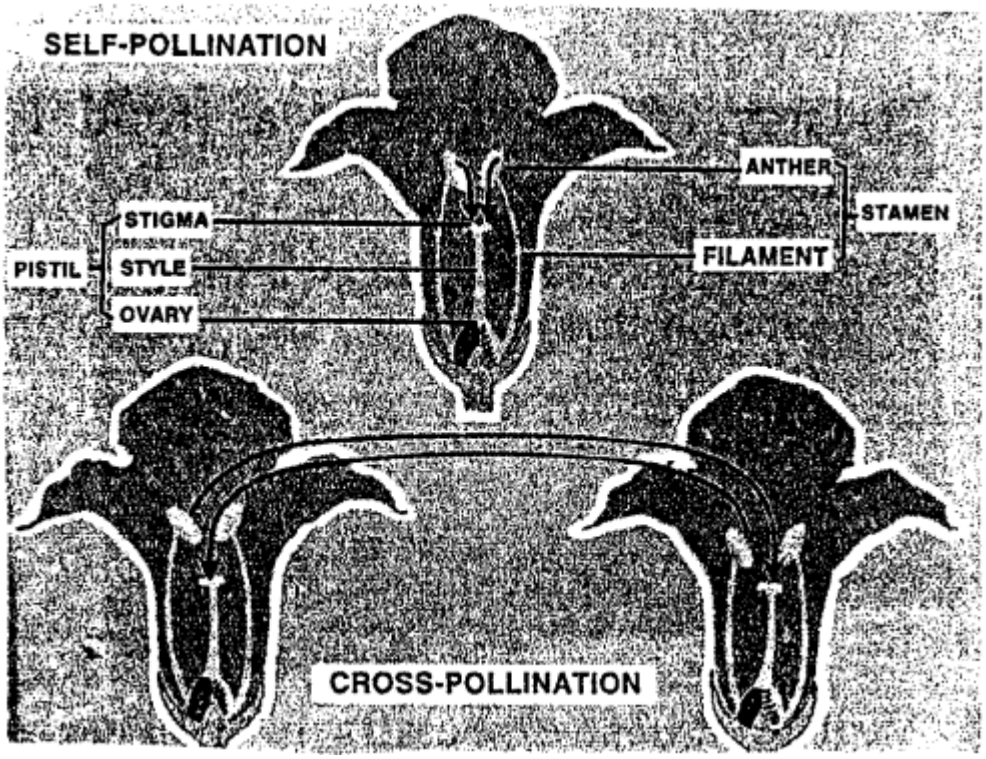
**Sexual reproduction**

1. It is a reproduction involving fusion of male and female gametes.
2. New individual is formed from union of two parents.
3. Variation occurs in the offspring.
4. Fertilization takes place.
5. It is found in higher organisms like flowering plants , vertebrates, etc.

**Question 2.**
Self pollination and cross pollination.
**Answer:**
**Self pollination**

1. The pollen grains are transferred from anther to stigma of the same flower or different flowers present on the same plant.
2. Pollinating agents are not required.
3. Hardly any variation is seen.
4. It is seen in potato, pea, sunflower, wheat, etc.

5. The flowers are generally small producing small number of pollen grains.




**Cross pollination**

1. The pollen grains are transferred from anther to stigma of another flower present on a different plant of same specie.
2. External pollinating agents are required.
3. Variation occurs in the next generations.
4. It is seen in apple, pear, strawberry, daffodil etc.
5. The flowers are bright with long stamens and pistils producing large number of pollen grains.

**VI. Define the following:**

1. Gamete
2. Pollinating
3. Zygote

**Answer:**

1. **Gamete:** Gamete is a male or female reproductive cell that unites with another gamete during sexual reproduction to form zygote.

2. **Pollination:** Pollination is the transfer of pollen grains from the ripe anther to the stigma of a flower in same plant or another plant.
3. **Zygote:** Zygote is a product formed by the fusion of the male and female gametes.

**VII. Mention the functions of the following:**

1. Flower
2. Ovary
3. Anther
4. Stigma
5. Seeds

**Answer:**

1. **Flower:**
    1. It possess sexual reproductive organs of the plant i.e., stamen and carpel.
    2. It helps in attracting insects, birds etc. which help in pollination.
    3. Fertilization takes place within a flower leading to formation of seed and fruit.
2. **Ovary:** Ovary in flowers has ovules containing female gametes (eggs). After fertilization, ovary develops into a fruit.
3. **Anther:** Anther is the part of the male reproductive organ of the plant that produces male gametes called pollen grains.
4. **Stigma:** Stigma is a part of the female reproductive organ of a plant that is sticky and hence receives pollens (the male flower gametes) and sends it down to style to get fertilized in the ovary.
5. **Seeds:**
    1. Seeds nourish the embryo inside them and germinate to form plants.
    2. Seeds also allow the plant varieties to disperse to new locations.
    3. During unfavourable conditions, seeds become dormant, ensuring their germination later.

**VIII. Answer the following questions:**

**Question 1.**
Can a unisexual flower be self pollinated?
**Answer:**
Unisexual flower can self pollinate where both male and female flowers are present on the same plant. Stigma of the female flower can be pollinated by the pollen of the male flower present on the same plant.

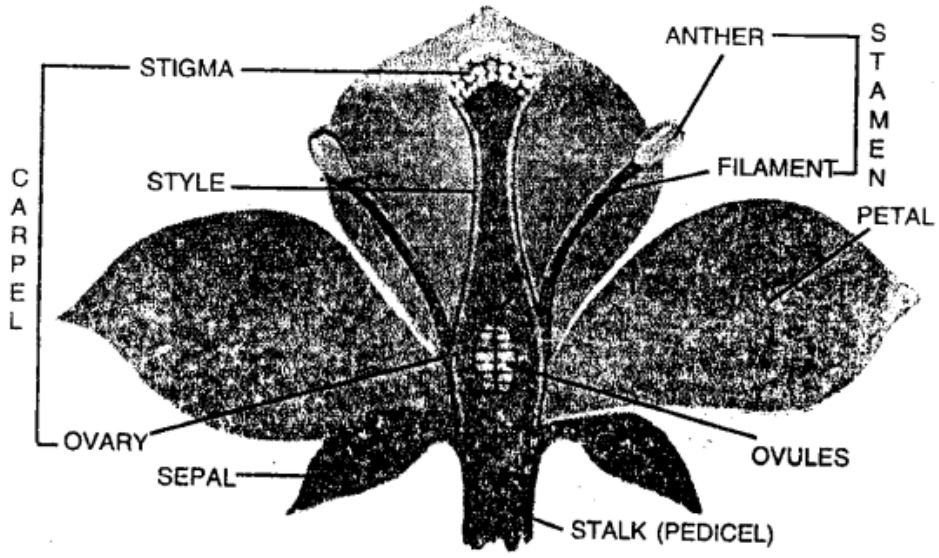
**Question 2.**
What are the male and female gametes in a flowering plant?
**Answer:**

The male gamete in a flowering plant is a nucleus in the pollen grain.
The female gamete in a flowering plant is an egg cell in the ovule.

**Question 3.**
What part is played by stamens and carpels in reproduction?
**Answer:**
Stamen is the male reproductive organ of the plant which consists of an anther and a filament. Anther produces male gametes in the pollen grains. The anthers release the pollens which fertilize the eggs after pollination. Carpel is the female reproductive organ of the plant which consists of the stigma, the style and the ovary. The stigma is sticky and receives pollens. Ovary contains ovules which has female gametes (eggs). After pollination on stigma, pollen is sent to ovary. The fertilization of male gamete and female gamete takes place within the ovule which becomes a seed and ovary becomes the fruit.

**Question 4.**
Write a brief note on artificial pollination.
**Answer:**
Artificial pollination is a pollination brought about by humans by transferring the pollens of the male plant to the stigma of the female plant to get desirable characters like better quality seeds and flowers, disease resistant seeds, high-yielding and better nutritive value varities. Flowers with desired features are selected to be pollinated and fertilized.

**Question 5.**
Draw a labelled diagram of a bisexual flower.
**Answer:**




*A typical flower with its internal parts*