

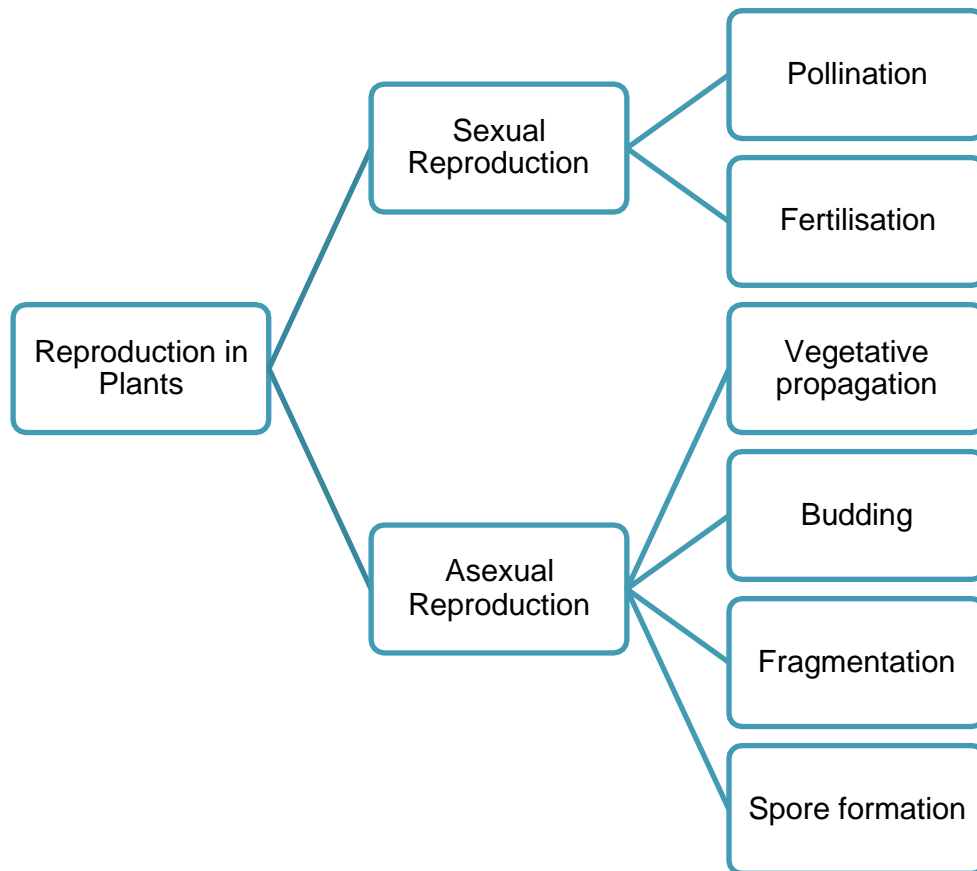
SCIENCE

CHAPTER 12: REPRODUCTION IN PLANTS



Reproduction in Plants

- The production of new individuals from parents is known as reproduction.
- Plants reproduce sexually as well as asexually.

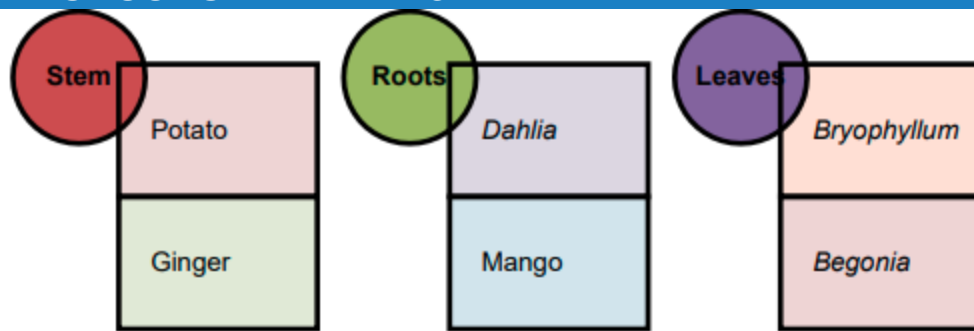


Asexual Reproduction

- In asexual reproduction, new plants are obtained without the production of seeds or spores.

Vegetative Propagation

- In this type of reproduction, new plants are produced from roots, stems, leaves and buds.
- Since these parts are known as vegetative parts of a plant, this type of reproduction is termed as vegetative propagation.



(a) Vegetative Propagation by Stems

The stems (or branches) of plants normally bear buds in the axils which can be used in vegetative propagation to produce new plants. New plants can be obtained from the stem (or branch) of an existing plant by the method of cuttings. A small part of stem (or branch) of a plant which is removed by making a cut with a sharp knife, is called a cutting. While making a cutting, care should be taken to see that there are some buds on it.

The lower end of stem cutting is buried in the moist soil. The upper part of cutting having bud on it is kept above the ground. The cutting planted in soil is watered everyday. After a few days, the cutting develops roots. The bud grows and produces a shoot (branch with leaves)

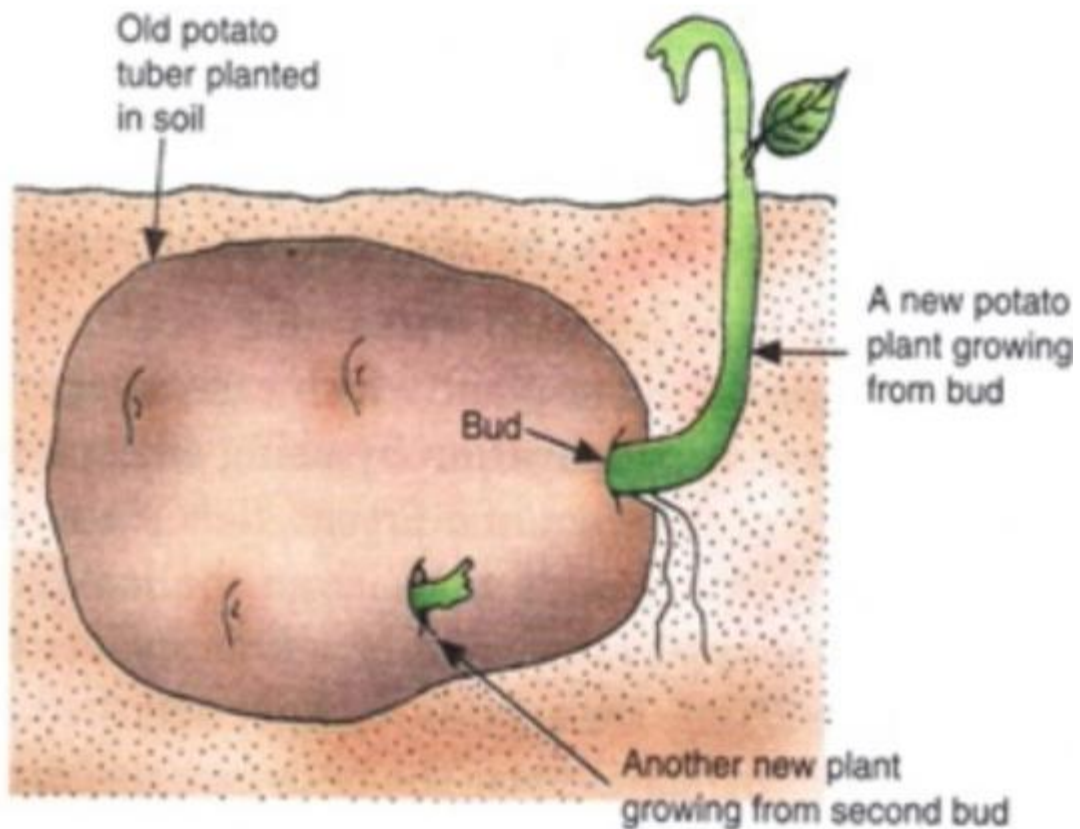
The plants like rose, champa, grapes, sugarcane, bananas, Bougainvillea can be grown by cuttings method.

Money plant can also be grown by the cuttings method of vegetative propagation. We can grow money plant even in a jar of water by taking a stem cutting (with a node) from an existing money plant.

Advantage of the cuttings method is that by using this method we can produce many new plants from just one plant quickly, without waiting for flowers and seeds.

Some of the plants have modified stems which are short and thick, and grow below the ground (or underground). The underground stems have buds from which new plants can be grown. Such underground stems are called stem tubers.

A tuber is the thickened underground stem (or root) of a plant which is swollen with stored food. The tuber has a number of buds. Each bud of the tuber can grow into a new plant when the old tuber (or its cutting) is planted in the soil in the next growing season. Tubers can be used as organs of vegetative propagation to produce new plants.



There are two types of tubers : stem tubers and root tubers.

(a) Potato is a stem tuber

A potato tuber has many buds (called eyes) on its body which appear like scars. When a potato tuber is planted in the soil, then all the buds of potato tuber start growing to produce new potato plants. Thus, one old potato tuber can produce many new potato plants. We can even plant cut pieces of potato in the soil to obtain new potato plants but each such cut piece should have a bud (or eye) on it.

Each potato plant produces more than one tuber, and each tuber has more than one bud (which produce more than one new plant). The vegetative propagation method of producing potato plants by using potato tuber cuttings is much faster than the production of potato plants from seeds.

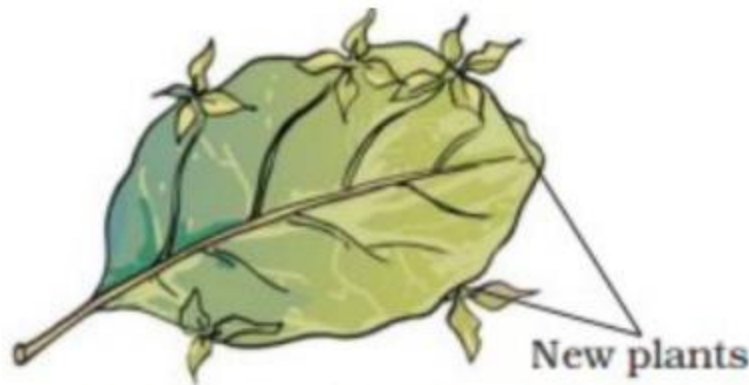
Ginger and turmeric are also modified, underground stems swollen with food. The underground stems of ginger and turmeric plants have buds on their body.

(b) Vegetative Propagation by Roots

There are some plants which have modified, thickened roots which bear buds.

For example: sweet potato plant has modified roots thickened with stored food which are called root tubers. The root tubers of sweet potato have buds (eyes) on them which can grow to produce new sweet potato plants. Dahlia also has root tubers. The root tubers of Dahlia have buds in them which can grow to produce new Dahlia plants.

(c) Vegetative Propagation by Leaves



The leaves of some plants develop buds on them. Such leaves having buds can be used as structures of vegetative reproduction in plants.

A plant which can reproduce from its leaves is Bryophyllum (Bryophyllum is also called sprout leaf plant). The leaves of Bryophyllum plant develop some buds in its margins (or edges) When a mature leaf of the Bryophyllum plant falls on the ground, then each bud can grow into a new plant.

Another plant called Begonia also reproduces by vegetative propagation through its leaves. The Begonia plant which can grow into new plants when the leaves fall on the ground.

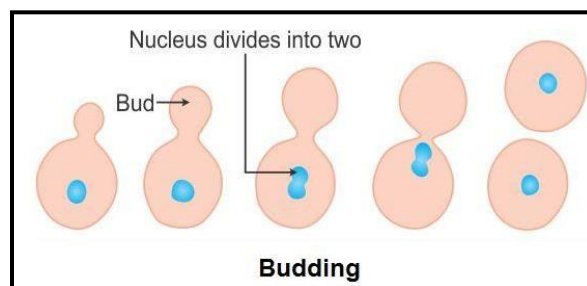
The plants such as cacti produce new plants when their parts get detached from the main body and fall on the ground (singular of cacti is cactus). Each detached part of a cactus plant which falls on ground can grow into a new plant.

Advantages of Vegetative Propagation Of Plants

- 1) The new plants produced by vegetative Propagation take much less time to grow and bear flowers and fruits as compared to the plants grown from seeds.
- (d) 2) The new plant produced by Vegetative Propagation are exactly like the parent plant .So all the desirable features of the parent plant will be replicated in the new plant.

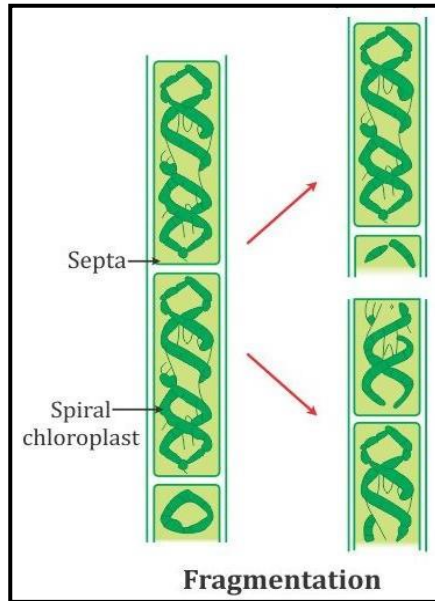
Budding

- In budding, a small part of the parent plant body grows out as a bulb-like projection called the bud, which detaches and becomes a new plant. Example: Yeast.



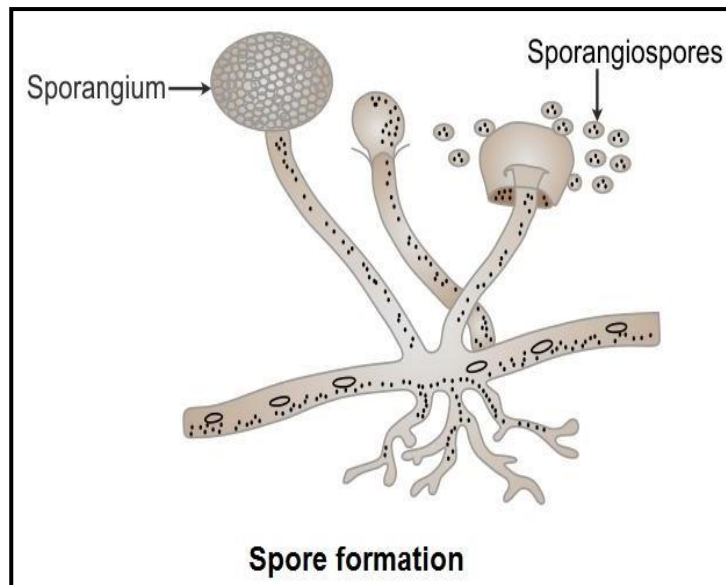
Fragmentation

- Fragmentation involves breaking up of the plant body into two or more pieces on maturing, each of which subsequently grows to form a new plant. Example: *Spirogyra*.



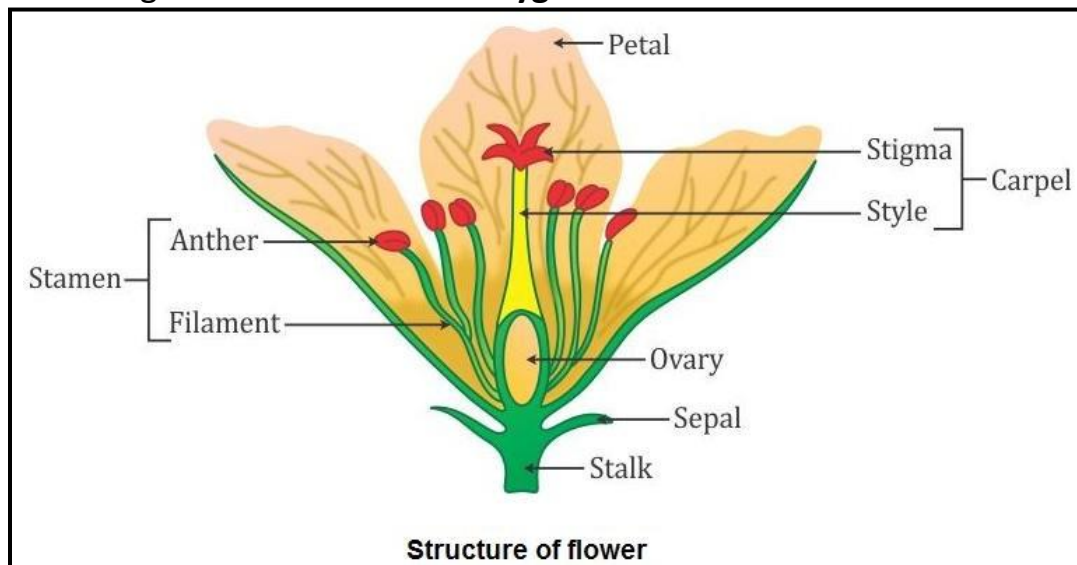
Spore Formation

Parent plants produce hundreds of tiny spores in spore cases. When these spore cases burst, spores are spread into the air. Under favourable conditions, the spores germinate and develop into new individuals. Examples: Rhizopus (bread mould), mosses and ferns.



Sexual Reproduction

- Flowers are reproductive parts of a plant. The **stamen** is the male reproductive part, while the **pistil** is the female reproductive part.
- Flowers with either only stamen or only pistil are known as **unisexual** flowers. Examples: Corn, papaya and cucumber.
- Flowers which contain both stamen and pistil are called **bisexual** flowers. Examples: Mustard, rose and Petunia.
- The stamen consists of **anther** and **filament**. The anther contains **pollen grains** which produce male gametes.
- The pistil consists of **stigma**, **style** and **ovary**. The ovary contains one or more **ovules**. The female gamete or egg is formed in an ovule.
- Male and female gametes fuse to form a **zygote**.



Pollination

- Pollination** is the transfer of pollen grains from the anther to the stigma of a flower.
- When pollen grains are transferred from the anther to the stigma of the same flower, it is termed as **self-pollination**.
- When the pollen grains of a flower land on the stigma of another flower of the same plant, or that of a different plant of the same kind, it is known as **cross-pollination**.
- The pollen grains are light and can be easily carried by **wind** or water.
- Insects** help in the transfer of pollen by carrying the pollen on their body on their visit to the flower.
- Pollination in aquatic plants such as *Vallisneria* and *Hydrilla* is carried out by **water**.

Fertilisation

- The fusion of male and female gametes to form a zygote is termed as **fertilisation**.
- Male and female gametes fuse to form a **zygote** which develops into an embryo.
- The **embryo** is that part of the seed which develops into a new plant.

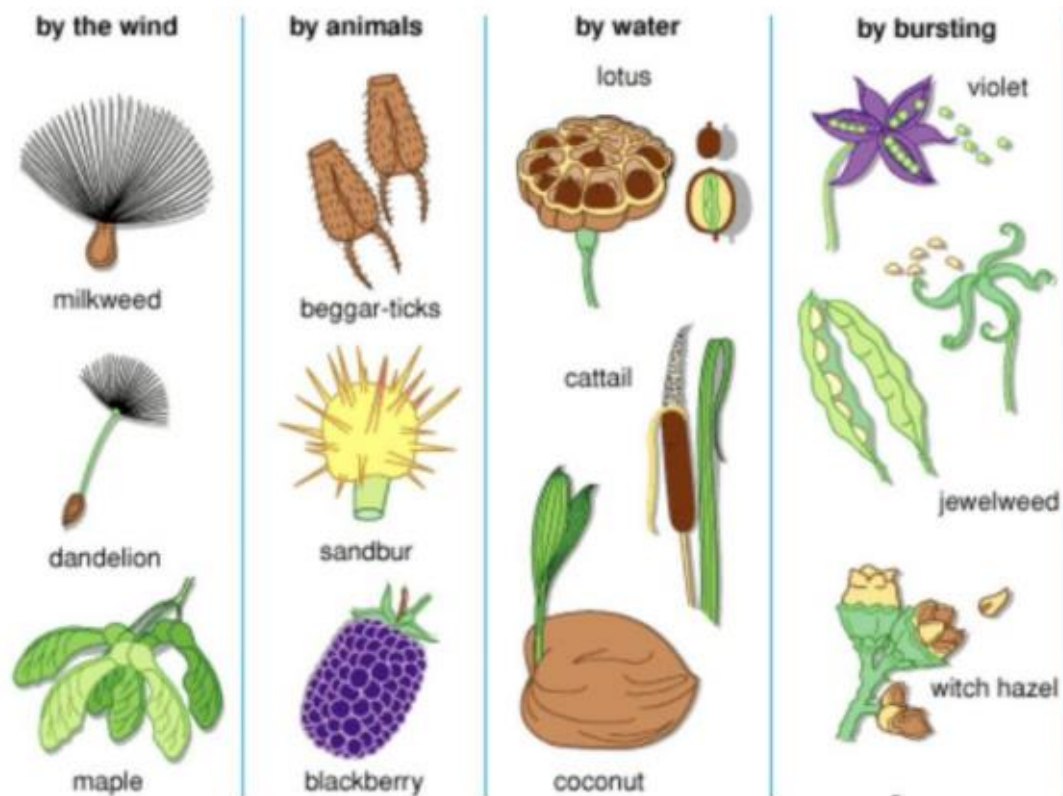
Fruit and Seed Formation

- After fertilisation, the ovule present in the ovary grows to become a **seed** and the ovary grows into a **fruit**.
- The other parts of the flower dry up and fall off.
- The seed contains the embryo enclosed in a protective **seed coat**.
- Apples, oranges, mangoes, plums, tomatoes, walnuts and almonds are fruits with seeds.

Seed Dispersal

- If all the seeds germinate in the same place, then there would be an unhealthy competition for food and light between plants.
- This is avoided due to dispersal of seeds.

How seeds and fruits are dispersed



The main agents for the dispersal of seeds and fruits are wind, water and animals. Some seeds are also dispersed by an explosive mechanism in which the ripe fruits of some plants burst on their own by making a little explosion and throw their seeds away from the plant with a great force. The various seeds and fruits have some special features in them due to which they are adapted to be carried away easily by wind, water or animals.

1) Dispersal of Seeds and Fruits by Wind

The seeds and fruits dispersed by wind either have wing-like structures or they have hair or they are very small and light, which helps them to be easily carried away by the blowing wind.

For example:

- (a) The seeds of drumstick plant have wings so that they can be carried away by wind to far away places and dispersed. Thus, drumstick plant has winged seeds. Similarly, the seeds of maple plant also have wings which help in their dispersal by the wind.
- (b) The seeds of madar (aak) have hair which allow them to be carried away easily by the wind. The fruits of sunflower have hair which enable them to be blown away by wind and get dispersed. So, the sunflower plant has hairy fruits. The cotton plant has also hairy seeds which are easily carried away by wind and dispersed.
- (c) The plants like grass, orchids and Begonia have very small and light seeds which can be easily blown away by the wind for dispersal.

2) Dispersal of Seeds and Fruits by Water

The seeds and fruits which are dispersed by water develop floating ability in the form of spongy or fibrous outer coats.

The seeds of water lily plant and coconut plant are dispersed by water.

The seeds of water lily plant have a spongy outer coat which allows them to float in water and move to other places along with water currents. The coconut fruits have a fibrous outer coat which enables them to float in water and carried away by flowing water to far off places. It is due to the dispersal of coconut fruits by sea-water that coconut trees grow in all the coastal areas.

3) Dispersal of Seeds and Fruits by Animals

Some fruits develop hooks on their surface by which they get attached to the hairy bodies of the passing animals and carried away to distant places.

These fruits may be carried several kilometres by the moving animals before they are rubbed off from their body and fall to the ground. When the fruits are dispersed by an animal, the seeds present in them are automatically dispersed.

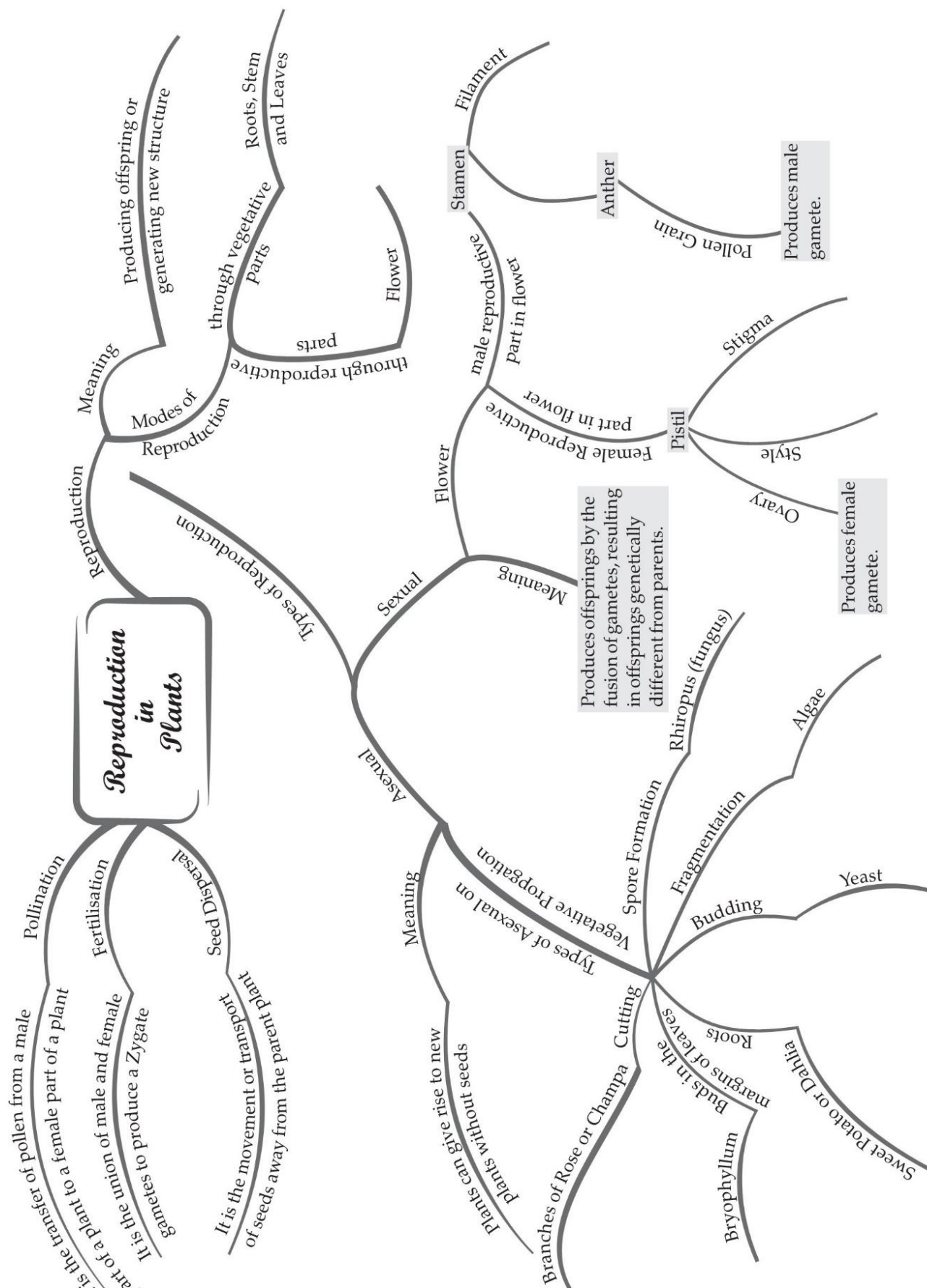
When the fruits of Xanthium and Urena are dispersed by animals, the seeds of Xanthium and Urena present inside these fruits also get dispersed.

(4) Dispersal of Seeds by an Explosive Mechanism

When some fruits ripen, strain is set up in their walls until the fruits split into two halves (making a small explosion) and their seeds are thrown away from the plant with a great force in all directions.

Thus, some seeds are dispersed when their fruits burst with a sudden jerk.

The ripe fruits of castor plant burst suddenly with a jerk and scatter the seeds far away from the parent plant. Similarly, the ripe fruits of balsam plant burst suddenly with a jerk and throw their seeds far away from the parent plant. Thus, the two plants whose seeds are dispersed by an explosive mechanism involving the sudden bursting of their ripe fruits are : Castor and Balsam



Important Questions

➤ Multiple Choice Questions:

Question 1. Plants produced by vegetative propagation take

- (a) long time to grow
- (b) less time to grow
- (c) both (a) and (b)
- (d) none of these

Question 2. Part of the plant that take part in sexual reproduction is

- (a) seed
- (b) fruit
- (c) flower
- (d) branch

Question 3. Vegetative propagation in sweet potato takes place by

- (a) root
- (b) leaves
- (c) seed
- (d) stem

Question 4. The 'eye' of the potato plant is what

- (a) the root is to any plant
- (b) the bud is to a flower
- (c) the bud is to Bryophyllum leaf
- (d) the anther is to stamen

Question 5. Vegetative propagation is a type of

- (a) asexual reproduction
- (b) sexual reproduction
- (c) binary fission
- (d) none of these

Question 6. The ovaries of different flowers may contain

- (a) only one ovule
- (b) many ovules
- (c) one to many ovules

(d) only two ovules

Question 7. Yeasts reproduce by

(a) fragmentation

(b) budding

(c) vegetative propagation

(d) layering

Question 8. In fungus, reproduction takes place by

(a) budding

(b) spore formation

(c) fragmentation

(d) binary fission

Question 9. Spirogyra reproduces asexually by

(a) spore formation

(b) fragmentation

(c) budding

(d) cutting

Question 10. In fern, asexual reproduction takes place through

(a) spore formation

(b) fragmentation

(c) budding

(d) binary fission

Question 11. Which of the following contains male gamete?

(a) Filament

(b) Ovule

(c) Pollen

(d) Anther

Question 12. The zygote develops into

(a) a seed

(b) an ovule

(c) a fruit

(d) an embryo

Question 13. Which of the following plant bear bisexual flower?

- (a) Corn
- (b) Papaya
- (c) Cucumber
- (d) Mustard

Question 14. Which of the following is a part of a pistil?

- (a) Stigma
- (b) Anther
- (c) Filament
- (d) Pollen

Question 15. Which of the following is not a part of pistil?

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

➤ Fill In the Blanks:

1. There are modes of reproduction in plants.
2. holds the spores inside it.
3. Mosses reproduce by
4. In the process of budding, a small bulb-like outgrowth called is formed from the cell.
5. In the method of spore formation, small spherical bodies called are produced.
6. Spirogyra reproduces by

➤ True or False:

1. Sweet potato reproduces by seeds.
2. The roots of Dahlia give rise to new plants.
3. Plants produce seeds as a result of sexual reproduction.
4. Any detached part of a plant can grow into a new plant.
5. In vegetative propagation, the new plants are not same as that of the parent plant.
6. Plants produced in sexual reproduction have the characters of only male parent.

➤ Very Short Question:

1. What is unisexual flower?
2. The fusion of male and female gametes is termed as.

3. Name the different modes of asexual reproduction.
4. Name vegetative parts of plants.
5. Name the reproductive organ of a flowering plant.
6. State the two types of reproduction in plants.
7. What happens in sexual reproduction?
8. Where the seeds are formed?
9. What is a node?
10. Plant has buds on the edges of its leaves are known as.

➤ **Short Questions:**

1. Why reproduction is an essential life process?
2. What do you mean by vegetative propagation? Explain with example.
3. What is sexual reproduction? Explain with example.
4. Explain different parts of a flower?
5. Explain vegetative propagation.
6. How is zygote formed in plants?
7. How does Differentiate between self-pollination and cross-pollination.
8. Explain flower of a plant.

➤ **Long Questions:**

1. What is the function of RBCs?
2. Does transpiration serve any useful function in the plants? Explain.
3. Explain stomata and its function in plants.

✓ **Answer Key-**

➤ **Multiple Choice Answers:**

1. (b) less time to grow
2. (c) flower
3. (a) root
4. (c) the bud is to Bryophyllum leaf
5. (a) asexual reproduction
6. (c) one to many ovules
7. (b) budding
8. (b) spore formation

9. (b) fragmentation
10. (a) spore formation
11. (c) Pollen
12. (d) an embryo
13. (d) Mustard
14. (a) Stigma
15. (c) Anther

➤ **Fill In the Blanks:**

1. two
2. Sporangium
3. spore formation
4. bud, parent
5. spores
6. fragmentation

➤ **True or False:**

1. False
2. True
3. True
4. False
5. False
6. False

➤ **Very Short Answers:**

1. Answer: A flower may have either male or female reproductive parts. Such a flower is called unisexual flowers.
2. Answer: Fertilisation
3. Answer: There are different methods by which plants reproduce asexually. They are vegetative propagation, budding, fragmentation and spore formation
4. Answer: Root, stem and leaves.
5. Answer: Flower
6. Answer: Asexual and sexual.
7. Answer: In sexual reproduction, the male and the female gametes fuse to form seeds that eventually develop into new plants.

8. Answer: Inside the Fruits.
9. Answer: A node is a part of the stem from where a leaf grows.
10. Answer: Bryophyllum

➤ Short Answers:

1. Answer: Reproduction is essential for continuation of the species from generation to generation.
2. Answer: Vegetative propagation is the ability of plants to reproduce by using vegetative parts like roots, stems and leaves. example: Yeast, Hydra, Bryophyllum reproduce by budding, algae and fungi reproduce by spores
3. Answer: Sexual reproduction is the process in which two components male and female are involved to produce offspring of their own kind. The flower is a reproductive organ of a flowering plant.
4. Answer: Following are the parts of flowers:
 - Sepal: Green leafy part of flower that protect flower in bud condition.
 - Petal: Coloured leafy part of flower that attract insect for pollination
 - Stamen: The male parts of flower that contain pollen grain
 - Pistil: The female parts of flower that contain ovary at bottom
5. Answer: It is a type of asexual reproduction in which new plants are produced from roots, stems, leaves and buds. Since reproduction is through the vegetative parts of the plant, it is known as vegetative propagation. The plants like rose or champa can be propagated through Vegetative propagation.
6. Answer: When male gamete present in pollen grain moves into ovules and fuse with female egg cell inside ovules and zygote is formed. This process is called fertilization.
7. Answer: After pollination, pollen grain germinates on the stigma and moves through style to reach into ovules and fuse with female gamete, thus fertilization occurs. Inside ovary, the ovule develops into seed. As seed forms, the ovary increases in size and became fruit.
8. Answer: It is a type of asexual reproduction in which new plants are produced from roots, stems, leaves and buds. Since reproduction is through the vegetative parts of the plant, it is known as vegetative propagation. The plants like rose or champa can be propagated through Vegetative propagation.

➤ Long Answers:

1. Answer: Modes of reproduction that involve only one parent is called Unisexual reproduction.
 - (a) Fission: The mode of reproduction in which unicellular organism split into two equal halves and produce new ones is called binary fission. For example amoeba and bacteria
 - (b) Fragmentation: The mode of reproduction in which body of plant breaks up into smaller

fragments and each fragment grows into a new individual is known as Fragmentation, e.g. Spirogyra, algae.

(c) Budding: The mode of reproduction in which small buds develop and get separated and matured into new organisms is called Budding. E.g. Yeast, Hydra, Bryophyllum.

(d) Spore formation: The mode of reproduction takes place by means of spores is called spore formation, e.g., algae and fungi

The spores are covered by thick walls that protect them until they come into contact with another moist surface and can begin to grow.

2. Answer: The sexual reproduction in flowering plants involves pollination and fertilization.

- Pollination: Transfer of pollen grains from the anther to the stigma is called pollination. Pollen grains are transferred mainly by wind, water and insects. They are called as pollinating agents.
- Fertilization: The fusion of a male gamete with egg is known as fertilization. The fertilized egg is known as zygote which develops into embryo.

3. Answer:

- Cutting: Here the cuttings of the "parent" plant are removed and placed in a suitable environment so that they can grow into a whole new plant. For example rose cutting.
- Layering: The stem is bent down and the target region buried in the soil. The buried part of stem develops roots and is detached from the plant and develops into new plant.
- Grafting: In grafting a shoot or bud of a selected, desired plant (scion) is grafted onto the stock of another type of plant.

4. Answer:

Following are the advantages of vegetative reproduction:

- Vegetative production allows plants to produce new plants quickly without any reproductive organs.
- The plants produced by this method are exact copies of the parent plant.
- New varieties of plants having required characteristics can be developed by this method.