Sexual Reproduction: The formation of new plants through the fusion of male and female gametes is called sexual reproduction. Most plants reproduce sexually. Flowers are the reproductive organs of plants. A complete flower is made up of the following four whorls:

1. **Calyx or sepals:** These are green like structures, sometimes coloured protected the bud.
2. **Corolla:** This whorl contains bright and colourful petals.
3. **Androecium or Stamen**: It is the reproductive organ of the flower. It has a long stalk called the filament bears anther. An anther is made up of two chambers or pollen sacs. Each chamber is filled with pollen grains (male gametes)
4. **Gynoecium:** A flower can have a number of carpels or pistil. It is the female reproductive - part of the flower. The pistil has a feathery stigma, a tubular style and which contains ovules.

Types of Flowers: Flowers can be of the following types based on or absence of stamens and pistils:

Sexual flowers: These flowers contain either stamens or pistils. It means these flowers do not have all the four whorls i.e. sepals, petals, androecium (stamens) and gynoecium (pistils). These are also called incomplete flowers. For example, the flowers of plants like sunflower, castor, cucumber, bottlegourd (lauki), and bittergourd (karela) are unisexual.

Bisexual flowers: These flowers have both stamens and pistils. It means bisexual have all the four whorls present. So, these are also called complete flowers. For example, flowers of rose, oleander, hibiscus, sweet pea and temple flower are bisexual

- Flowers are the reproductive organs of plants.
- A flower contains both male and female reproductive cells called gametes. These flowers are called bisexual flowers.
- When flowers have either male gametes or female gametes, they are called unisexual flowers.
- Flower has four parts- sepals, petals, stamens and pistils.

Sepals and petals are called non-essential whorls as they are not directly involved in reproduction. They only help in attracting insects for pollination. The stamens and pistils form essential whorls because they are directly involved in reproduction. ***Stamens:*** They bear the anthers that contain pollen grains. ***Pistil*** The pistil is divided into a stigma, style and ovary. Ovary contains the female gametes called ovules.

Pollination The transfer of pollen grains from the anther to the stigma is known as pollination. When the anthers grow and mature; they burst open and release pollen grains (male gametes). These pollen grains are then carried to the stigma (female part) of another flower (of the same type) by insects, birds, wind or water. Insects and birds visit flowers to collect nectar. While collecting nectar from a flower, some pollen grains stick L.o their wings and legs and get transferred to the flower on which they sit. This transfer of pollen grains from one flower to another of the same kind is called pollination. The process of pollination can occur in two ways:

Cross-pollination: The transfer of pollen grains from the anther of one flower to the stigma of another flower of another plant of the same type is known as cross-

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pollination. Cross-pollination can be observed in plants of maize, coconut, grasses, etc.

Self-pollination: The transfer of pollen grains from the anther to the stigma of the same flower or to the stigma of another flower on the same plant, it is termed as self-pollination. It can be seen in pea, rice, wheat, etc.

Agents Of Pollination: - wind, water and insects.

Wind: Wind blows away pollen grains from the anthers of one flower to the stigma of another flower. Pollen grains are very light. E.g. wheat, rice and maize.

Water: Water pollinated flowers release their pollen grains into the water and slowly carried to other flowers by water currents. E.g. sea grass.

Insects*:* Some pollen stick to the body parts of the insect .when these insects visit another flower, the pollen grains fall on the stigma .e.g. sweet pea, orchids and jasmine.

Fertilization- Successful pollination is followed fertilization in plants. Pollen grain gamete) which falls and sticks to the stigma starts to germinate. It starts developing a pollen tube which grows downwards into the style. The pollen tube carries the male gamete through the style into the ovary, The gamete then enters an ovule which contains the female gamete or egg. These male female gametes fuse together and form fertilised egg or the zygote. This fusion of male and female gametes in the ovam called fertilisation. The other parts of the flower such as the sepals, petals and stamens fall off. Sometimes, style and stigma also fall off and only the ovary remains there after fertilisation. This grows into a fruit.

After pollination, stigma secretes nutrients-

- Pollen grain absorbs these nutrients and starts growing
- A thin tube grows out of the pollen grain.
- It keeps growing till it reaches the ovule inside the ovary and enters it.
- Once the pollen tube reaches the ovule, the male gametes is released and it fuses with female gametes.
- The process of fusion of male and female gametes is called fertilization.
- A zygote is formed after fertilization take place.

Fruit Formation: After Fertilisation, the zygote grows to become an embryo. The embryo develops into a seed (mature ovule) while the surrounding ovary develops into a fruit. The embryo consists of a plumule, radicle and an embryonic axis to which two fleshy cotyledons are attached. The cotyledons store food for the embryo. Seeds are attached to the fruits by a stalk. The stalk on maturity becomes detached and leaves a scar called hilum. Seeds are covered by a protective layer called the seed coat. When a seed gets suitable temperature, air and water, it germinates and grows into a new plant. This process is called germination. The plumule develops into the shoot system whereas the radicle grows as the root system.

Seed Formation: The ovary grows into a fruit. The fruit is actually a ripened and mature ovary, generally sweet, juicy or pulpy. It encloses seeds. Some fruits are fleshy and juicy such as mango, apple, peach, orange, etc. Almonds and walnuts have hard and woody shell of nuts. These are the examples of hard fruits or dry fruits. After fertilization-after fertilization the ovary enlarge to from the fruit.

- The wall of the ovary becomes the fruit wall.
- The ovules become seeds.

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• A fruit may have one or more seeds
• Petals sepals and other parts of the flower dry up and fall off
• The fruit is the seed bearing part of the ripened ovary of the flower plant.
• The seed is the ripened ovule which contains an embryo and is covered by a protective coat

Seed Dispersal -

Once the seeds are produced, it becomes necessary that they should be dispersed to different places to produce new plants. If all the seeds fall off just underneath the parent plant, there would be competition for food, water, minerals, light and space. As a result, seeds may not grow as healthy plants or they may die due to scarcity of essential conditions for germination.

To avoid this competition, the fruits and seeds are carried away to distant places normally by wind, water and animals or by their own fruit explosion mechanism.

Dispersal by Wind: Seeds and fruits dispersed by wind are small and light. These seeds and fruits have following features:

1. Some seeds have wings which help them in their dispersal. For example, the seeds of drumstick and maple.
2. The seeds of madar have tufts of hair that can be carried away easily by the wind.
3. Fruits of some trees like sheesham and siris become flattened and light to be blown away by air.

4. Some seeds are dispersed by wind by the censer mechanism. Their fruits become perforated to release seeds by swinging in the air. Examples are seeds of Luffa (tori) and datura.

Dispersal by Animals: Many seeds and fruits are dispersed by animals and even by human beings. These seeds have the following characteristics:

1. Some seeds are swallowed by animals as food and eliminated with their faeces. When these seeds get suitable conditions they germinate and grow into new plants.
2. The seeds of xanthium and tiger nail stick to the hair of animals and are carried away to far off places.
3. The seeds of cucumber and watermelon stick to the animal bodies and get dispersed to distant areas.
4. Human beings eat fruits like mango, apple, orange, pear, etc., and throw their seeds. This helps in their dispersal.

Dispersal by Water: The seeds of plants in coastal areas or near lakes and river sides are dispersed by water. For example, coconut and lotus. They can float on water and travel long distances. Coconut has a fibrous which helps in its dispersal. The spongy thalamus of Lotus seeds helps in its dispersal

Dispersal by Explosion: Some plants like pea, cotton, bean, etc. store seeds in their pods. These pods explode when ripe and the seeds are scattered.

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