9.4 REPRODUCTION IN PLANTS

Plants can reproduce using –

- Vegetative propagation (asexual)
- Spore formation (asexual)
- Pollination (sexual)

Pollination:

- It is the process where pollen grains are transferred from anther to stigma.
- The plants that have both female and male structures can self-pollinate.
- Cross-pollination is preferred for genetic diversity

Fertilization:

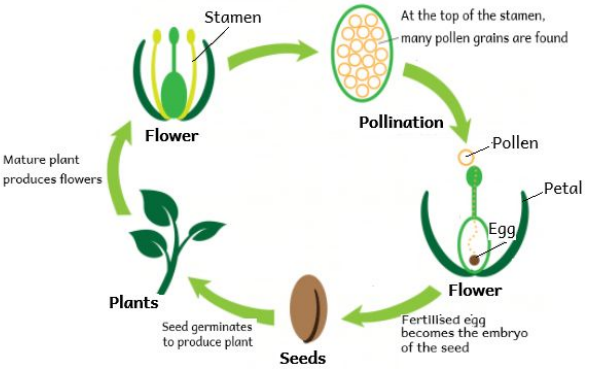
- The fusion of male and female gamete nuclei results in the formation of a zygote.
- Male gamete- pollen grains
- Female gamete - ovule

Seed dispersal:

- After the seed is formed via the process of fertilization, it moves away from the parental plant.
- This reduces the competition for resources between the germinating seed and the parental plant.

Seed dispersal mechanisms-

- Wind
- Water
- Fruits
- Animals



Pollinators-

These are animals that are involved in a mutualistic relationship with the plants where both of them benefit from each other.

Plants - they gain a means of transferring pollens for sexual reproduction.

ANimals - they gain a source of nutrition from the plants

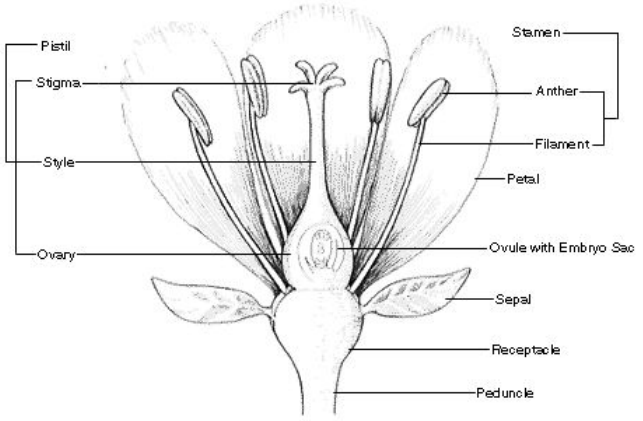
Flowering

- Flowers are the reproductive organs of plants.
- The enlargement of the shoot apical meristem is triggered by a change in gene expression.
- The tissue differentiates to form the stamen, pistil, petals, and sepals.

This activation of genes is influenced by abiotic factors and is linked to the seasons.

- The most common trigger is the day/night length

Flower structure



The male part of the flower- stamen

Structure	Function
Anther	The pollen-producing organ of the flower
Filament	slender stalk supporting the anther

The female part of the flower - pistil

Structure	Function
Stigma	Responsible for catching the pollen
Style	Connects the stigma and the ovule
Ovule	It contains the female reproductive cells.

Other support structures

Structure	Function
Petals	Attract the pollinators
Sepal	The outer covering protects the flower when it is a bud.
Peduncle	The stalk of the flower

Photoperiodism

- Flowers need to bloom when pollinators are most active and abundant which is dependent on the seasons.
- Some plants bloom in long-day conditions whereas some bloom in short-day conditions.

The length of light and dark periods is crucial for the flowering and this is detected by **phytochromes.**

Phytochromes

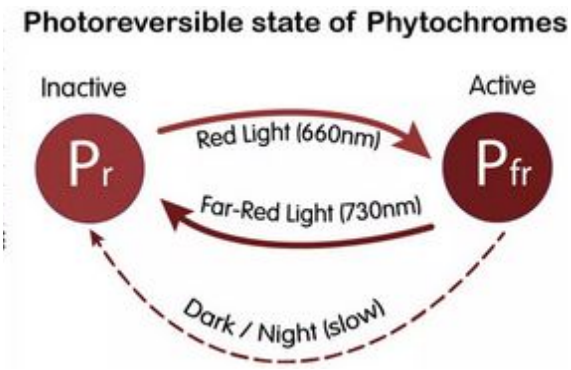
- These are leaf pigments that are used to detect periods of light or darkness.
- They exist in an active and an inactive form

Inactive phytochrome (Pr) is converted to active form after absorbing the red light.

- More active during the night

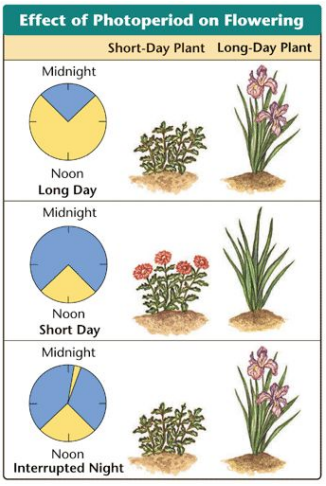
The active form of phytochrome (Pfr) is broken down into the inactive form when it absorbs far-red light (~725 nm)

- More active during the day



Photoperiodism

- Plants can be classified as short-day or long-day plants.
- The critical factor in determining their activity is the night length.



Short-day plants

- flower when the days are short.
- Pfr inhibits flowering and hence flowering requires low levels of Pfr

Sunflower

and

Strawberry

Long- day plants

- flower when the days are long
- Pfr activates flowering and hence flowering requires high levels of Pfr

Spinach

Oats

Horticulturists

- manipulate the flowering of short-day and long-day plants by controlling the exposure of light

Long-day plants

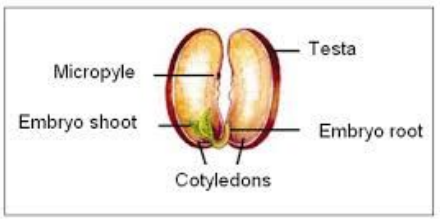
- plants will traditionally not flower during the winter and autumn months when night lengths are long
- So the horticulturists can trigger flowering in these plants by exposing the plant to a light source during the night

Short-day plants

- plants will traditionally not flower during the summer months when night lengths are short
- Horticulturalists can trigger flowering in these plants by covering the plant with an opaque black cloth for ~12 hours a day

Seed structure

- Testa – an outer seed coat that protects the embryonic plant
- Micropyle – a small pore in the outer covering of the seed, that allows for the passage of water
- Cotyledon – contains the food stores for the seed and forms the embryonic leaves
- Plumule – the embryonic shoot (also called the epicotyl)
- Radicle – the embryonic root

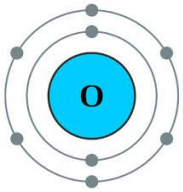
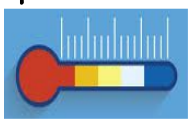
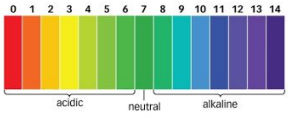


Phaseolus vulgaris

Germination

It is the process by which a seed emerges from a period of dormancy and begins to sprout.

Requirements of the seed:

Requirement	Why?
Oxygen 	Aerobic respiration as it requires ATP to develop
Water 	To activate the metabolic activity in the seed
Temperature 	They need an optimal temperature to sprout which won't denature the enzymes
pH 	Optimal pH for sprouting as the enzymes should function optimally.

Certain species may have some additional requirements such as:

weird Conditions	Why?
Fire	Some seeds only sprout when exposed to intense heat
Freezing	Some seeds only sprout when exposed to intense cold
Digestion	Require animal digestion for the removal of seed coat
Washing (NOT with detergent!)	To remove inhibitors
Scarification	Coat gets weakened from physical damage