9.4 Reproduction in Plants Cheat Sheet

by Arsh.b via cheatography.com/179523/cs/38012/

Plant reproduction

Success in plant reproduction depends on pollination, fertilization and seed dispersal.

Plants can reproduce in a variety of different ways:
- Vegetative propagation
- Spore formations
- Pollen transfer

Sexual reproduction in flowering plants involves the transfer of pollen to an ova, and involves three distinct phases.

Pollination	The transfer of pollen grains from an anther to a stigma. Many plants possess both male and female structures (**monoecious**)and can potentially self-pollinate. from an evolutionary perspective, cross-pollination is preferable as it improves genetic diversity.
Fertilisation	Fusion of a male gamete nuclei with a female gamete nuclei to form a zygote. In plants, the male gamete is stored in the pollen grain and the female gamete is found in the ovule.
Seed dispersal	Fertili.sation of gametes results in the formation of a seed, which moves away from the parental plant. Seed dispersal reduces the competition for resources between germinating seeds and the parental plant. There are a variety of seed dispersal mechanisms, including wind, water, fruits and animals. Seed structure varies depending on the mechanisms of dispersal employed by the plant.

Most flowering plants use mutualistic relationships with pollinators in sexual reproduction.

Cross-pollination involves transferring pollen grains from one plant to the ovule of a different plant.

Pollinators are animals that are involved in a mutualistic relationship with the flowering plant where both species benefit from the interaction.
The plant gains a means of sexual reproduction whit the animal gains a source of nutrition.

Common pollinators include birds, bats and insects.

Flowers may be structured to optimise access for certain pollinators.

Photoperiodism

The switch to flowering is a response to the length of light and dark periods in many plants.

Phytochromes are leaf pigments which are used by the plant to detect periods of light and darkness.

Photoperiodism is the response of the plant to the relative lengths of light and darkness.

Phytochromes exist in two forms - an active form and an inactive form, with the active form being P^{fr} which is formed from the inactive form, P^{r} at 660nm. P^{fr} breaks down into P^{r} at ~725nm, but will also gradually revert to the inactive form in the absence of light.

Because sunlight contains more red light than moonlight, the active form is predominant during the day.

Only P^{fr} can cause flowering, however its action differs in certain types of plants.

Plants can be classed as short-day or long-day plants based on the night length required for flowering.

Short-day plants flower when the days are short – hence require the night period to exceed a critical length, meaning that P^{fr} inhibits flowering.

Long-day plants flower when the days are long – hence require the night period to be less than a critical length, meaning P^{fr} promotes flowering.

Methods used to induce short-day plants to flower out of season

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

Long-day plants require periods of darkness to be less than an uninterrupted critical length.	These plants will traditionally not flower during the winter and autumn months when night lengths are long.
	Horticulturalists can trigger flowering in these plants by exposing the plant to a light source during the night.
Short-day plants require periods of darkness to be greater than an uninterrupted critical length.	These plants will traditionally not flower during the summer months when night lengths are short.

Photoperiodism (cont)

Horticulturalists can trigger flowering in these plants by covering the plant with an opaque black cloth for ~12 hours a day.

Flowering

Flowering involves a change in gene expression in the shoot apex.

Flowers are the reproductive organs of angiospermophytes and develop from the shoot apex.

Changes in gene expression trigger the enlargement of the shoot apical meristem.
This tissue then differentiates to form the different flower structures - spears, petals, stamen and pistil.

The activation of genes responsible for flowering is influences by abiotic factors - typically linked to the seasons.

Flowering plants will typically bloom when a suitable pollinator is most abundant.

The most common trigger for a change in gene expression is day/night length (photoperiodism).

Flower structure

Drawing of half-views of animal-pollinated flowers.

Monoecious flowers contain both male and female reproductive structures.

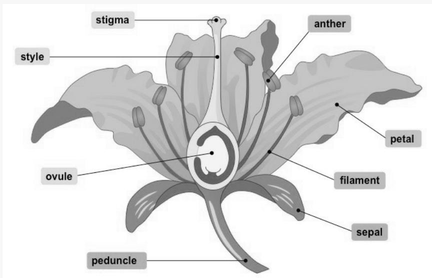
Dioecious flowers only possess one structure.

Stamen is the male part of the flower.	**Anthers** are the pollen producing organs of the flower, with the pollen being the male gamete. **Filaments** are the slender stalks that support the anther and make it accessible to pollinators.

Flower structure (cont)

Pistil is the female part of the flower.	**Stigma** is the sticky receptive tip of the pistil that is responsible for catching the pollen. **Style** is the tube-shaped connection between the stigma and the ovule that elevates the stigma to help catch pollen. **Ovule** is the structure that contains the female gametes, and will develop into the seed after fertilisation.
Support structures in flowers	**Petals** are brightly coloured modified leaves, which function to attract pollinators. **Sepal** is the outer covering that protects the flower when in the bud. **Peduncle** is the stalk of the flower.

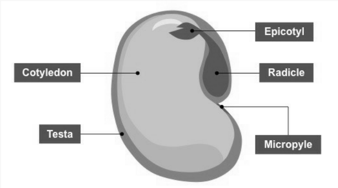
Structure of a flower



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

Internal structure of a seed



Germinations

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

Essential conditions	
Oxygen	for aerobic respiration
Water	to metabolically activate the seed
Temperature	seeds require certain temperature conditions to sprout
pH	seeds require a suitable soil pH to sprout
Specialised conditions	
Fire	some seeds will only sprout after exposure to intense heat
Freezing	some seeds will only sprout after periods of intense cold
Digestion	some seeds require prior animal digestion to erode the seed coat before the seed will sprout
Washing	some seeds may be covered with inhibitors and will only sprout after being washed to remove the inhibitors
Scarification	seeds are more likely to germinate if the seed coat is weakened from physical damage