

REPRODUCTION

REPRODUCTION is defined as a biological process that makes more of the same kinds of individuals.

→ TYPES of Reproduction:

→ ASEXUAL REPRODUCTION:

- Process resulting in the production of genetically identical offspring from one parent
- NO specialised cells like gametes are produced.
- Large number of organisms are produced in a very short time.

→ SEXUAL REPRODUCTION:

- Process involving the fusion of haploid nuclei to form a diploid zygote & the production of genetically dissimilar offspring

→ REPRODUCTION -

- * GAMETES are sex cells produced in reproductive organs.
- * HAPLOID CELLS are the cells with only one complete set of chromosomes (n) (unpaired chromosomes)
- * DIPLOID CELLS are the cells with 2 complete sets of chromosomes ($2n$) (paired chromosomes)
- * MITOSIS is where in a cell splits to create 2 identical copies of the original cell.
- * MEIOSIS is where in cells split to form new cells with half the usual number of chromosomes, to produce gametes for sexual reproduction.
- * ZYGOTE is the single cell formed during sexual reproduction when male & female gametes come together & fuse.

→ COMPARING:

SEXUAL

ASEXUAL

→ 2 Parents are required to mate Only one parent needed.

→ Cells divide by meiosis by fusion of 2 haploid cells. Cells divide by mitosis, mostly in diploid cells.

→ Variations possible No variation between the offspring & the parent.

→ The process is very complex The process is quick

→ Requires more energy Requires less energy

→ Lesser number of organisms produced More number of organisms produced.

⇒ ADVANTAGES OF SEXUAL REPRODUCTION:

→ There is a variation in the offspring so adaption to a changing or a new environment is likely, enabling survival of the species.

→ New varieties can be created which may have resistance to disease

→ In plants, seeds are produced which allow dispersal away from the parent plant reducing competition.

⇒ DISADVANTAGES OF SEXUAL REPRODUCTION:

- 2 Parents are needed (although some plants are self-pollinated)
- The process is slow & complex.
- Fertilisation is random, so harmful variation can occur.

⇒ ADVANTAGES OF ASEXUAL REPRODUCTION:

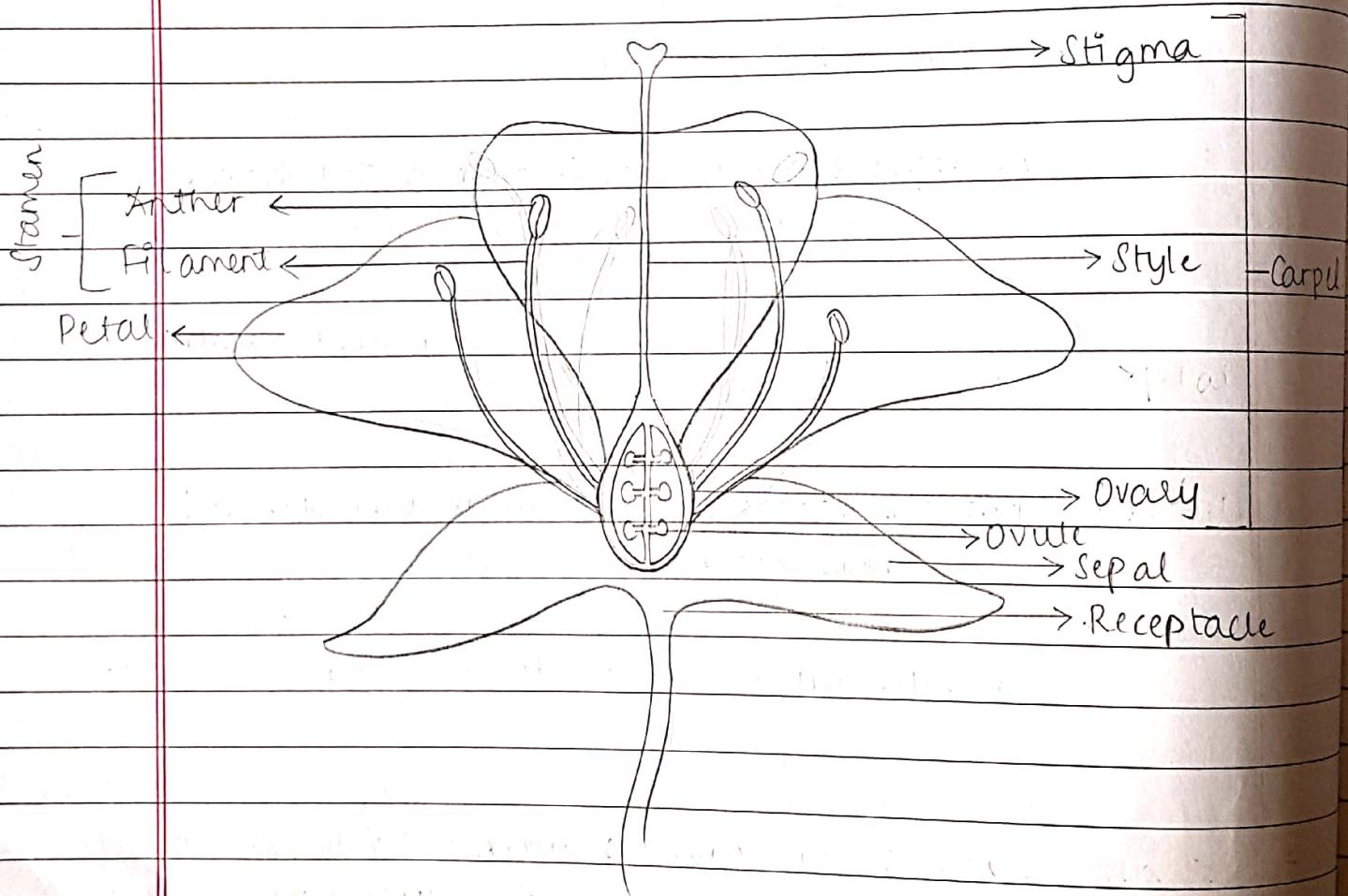
- The process is quick
- Only one parent is needed
- No gametes are needed
- All the good characteristics of the parent are passed on to the offspring
- Where there is no dispersal offspring will grow in the same favourable environment as the parent.
- Plants that reproduce asexually usually store large amounts of food that allow rapid growth when conditions are suitable.

⇒ DISADVANTAGES OF ASEXUAL REPRODUCTION:

- There is little variation created, so adaptation to a changing environment is unlikely.
- If the parent has no resistance to a particular disease, none of the offspring will have resistance.

- Lack of dispersal can lead to competition of nutrients, water & light.
- ASEXUAL REPRODUCTION IN BACTERIA:
 - Inside an individual bacterium, the DNA replicates.
 - Then the cell divides into 2 with each daughter cell containing a copy of the parental DNA
 - Once the daughter cells have grown they can also reproduce.
- ASEXUAL REPRODUCTION IN FUNGI:
 - Reproductive hyphae grow vertically above the organic matter from the mycelium (network of hyphae).
 - At the top of the hyphae, there is a spherical, sac-like sporangium
 - Inside the sporangium, spores are formed.
 - When ripe, the sporangium bursts open allowing the spores to be dispersed
 - In suitable conditions the spores germinate & grow to form new individuals
- ASEXUAL REPRODUCTION - TUBULAR PRODUCTION IN POTATOES:
 - Potatoes are stem tubers
 - The parent plant photosynthesis & stores the food produced in underground stems, which swell to form tubers.

- Each tuber contains stored starch & there are buds in depressions in the surface known as eyes.
- In suitable conditions the buds use the stored food to form shoots, from which roots also develop.
- Each tuber can form a new plant.
- SEXUAL REPRODUCTION IN PLANTS:
flowering plants carry out sexual reproduction by producing flowers.



- FLOWER STRUCTURES & FUNCTIONS:
- SEPAWS - Leaf like structures which protect the flower in the bud stage.
- PETALS - Are large, brightly coloured & scented to attract insects.
- STAMEN - The male reproductive part which is made up of anther & filament.
- ANTER - Contains pollen sacs, in which pollen grains are formed. Pollen contain male sex cells/gametes.
- FILAMENT - Supports the anther.
- CARPEL - The female reproductive part of the flower which is made up of stigma, style & ovary.
- STIGMA - A sticky surface that receives pollen grains during pollination.
- STYLE - Links the stigma to the ovary, through which pollen tubes grow.
- OVARY - Contains ovules, which develop into seeds when fertilised.
- PETIOLE - Supports the flower to make it easily seen by insects & to be able to withstand wind.

- NECTARY - Produces nectar to attract insects.
- POLLINATION & ITS AGENTS:
- POLLINATION is the transfer of pollen grains from an anther to a stigma of a plant of the same species.
- The structural adaptations of a flower depend on the type of pollination the plant uses.
 - Wind Pollination.
 - Insect Pollination.

FEATURE	INSECT POLLINATED	WIND POLLINATED
FLOWER	Large & brightly coloured.	Small, green & inconspicuous.
PETALS	Present - Often large, coloured & scented to attract insects.	Absent or very small & inconspicuous.
NECTAR	Produced by nectaries to attract insects.	Absent.
STEMEN	Usually with short filaments, long filament, allowing the anthers to hang outside the flower Anthers attached firmly to the filament.	Anthers attached loosely to the filament.
POLLEN	Smaller amount Grains are often sticky & round or covered with spikes to attach to the furry bodies of the insects.	larger amounts. Grains are smooth & light which could be easily carried by the wind.

STIGMA	Sticky, small stigmas usually inside the flower for insects to rub against.	Large & feathery stigmas hanging outside the flower to catch pollen carried by the wind.
FACTS	Absent in wind-pollinated flowers.	Sometimes present.
EX.	Rose, Sunflower.	Grass flower.

→ TYPES OF POLLINATION:

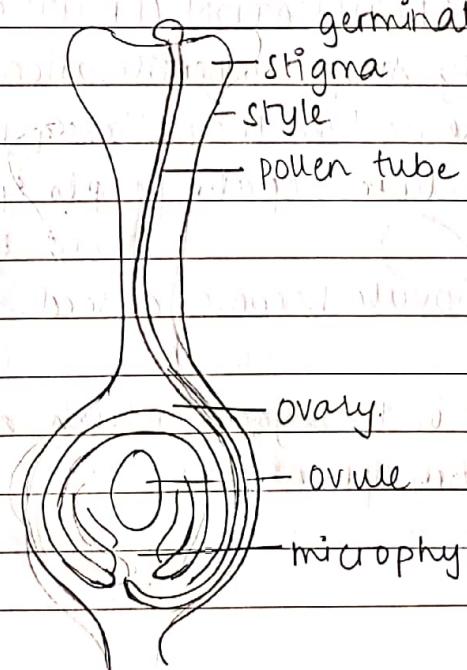
→ SELF POLLINATION -

The transfer of a pollen grain from the anther to the stigma of the same flower or the stigma of a flower of the same plant.

→ CROSS POLLINATION :

The transfer of a pollen grain from the anther to the stigma of a flower of another plant of the same species.

→ FERTILISATION :



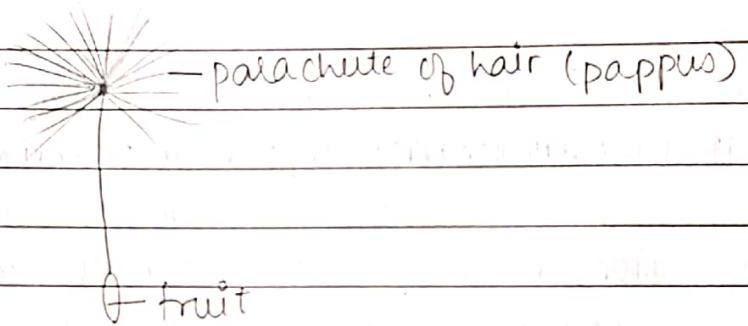
- After successfully landing on the stigma of flower of the same species, the pollen starts to germinate.
- Pollen grains absorb a sugary solution from the stigma.
- The pollen produces a pollen tube. A pollen tube is the pathway in which the pollen moves downwards to reach the ovule.
- At the tip of the pollen tube, enzymes are secreted that digest the tissue of the style digging the pollen tube further down till it opens on the other end in the ovule.
- The male gametes/nucleus enters the pollen tube & starts its journey downwards to ovule through microphyte in ovule.
- Fertilisation is fusion of male gamete with a female gamete which produces a diploid zygote.
- ⇒ EVENTS AFTER FERTILISATION / FRUITS & SEEDS:
- During the early stages of fertilisation, some parts of the fruit become useless. They die & fall off. These parts include sepals, petals & stamens.
- The fertilised ovule becomes a seed.
- Inside the seed is the zygote which divides by mitosis to form an embryo plant.

- The embryo plant has a plumule & a radical.
 - The plant makes food & brings it to the seed where it is stored in food stores of the seed called cotyledons.
 - The outside layer of the ovule becomes thicker & harder & is now known as testa (coat).
 - In the seed, there is a hole called micropyle (the hole through which male gamete entered the ovule).
 - When the seed is fully grown, it becomes dormant. That means it loses its water & metabolic reactions inside it stop.
 - These reactions are reactivated when the seed is planted in favourable conditions & the seed grows into a new plant.
 - The ovary wall develops into a fruit which could be fleshy or dry pod.
- ⇒ **SEED DISPERSAL:**
- Seed dispersal is the scattering of the seeds all over the place to colonise the area.
 - Seeds need to be dispersed away from the parent plant in order to reduce competition for - Space
 - Light
 - Nutrients
 - Water

- Seeds can be dispersed by - Wind
 - Animals
 - Water
 - Mechanical

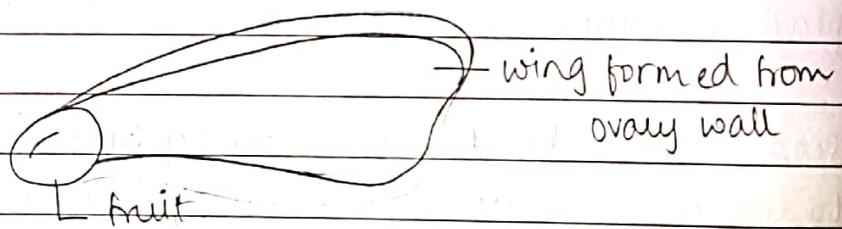
→ SEEDS DISPERSED BY WIND:

- May have wings or parachute
- Are light weight seeds
- Ex - Dandelion.



The fruit counter balances the pappus.

- Sycamore.



Wing provides large surface area
The fruit spins in the air.

- ⇒ SEEDS DISPERSED BY ANIMALS:
- Succulent fruit (fleshy & brightly coloured fruits)
- Hooked fruits
- Eg - Berry.
- Fleshy fruit
- Brightly coloured to attract animals such as birds, monkeys etc
- Tough seed coats protect the seeds from digestion by gut enzymes.

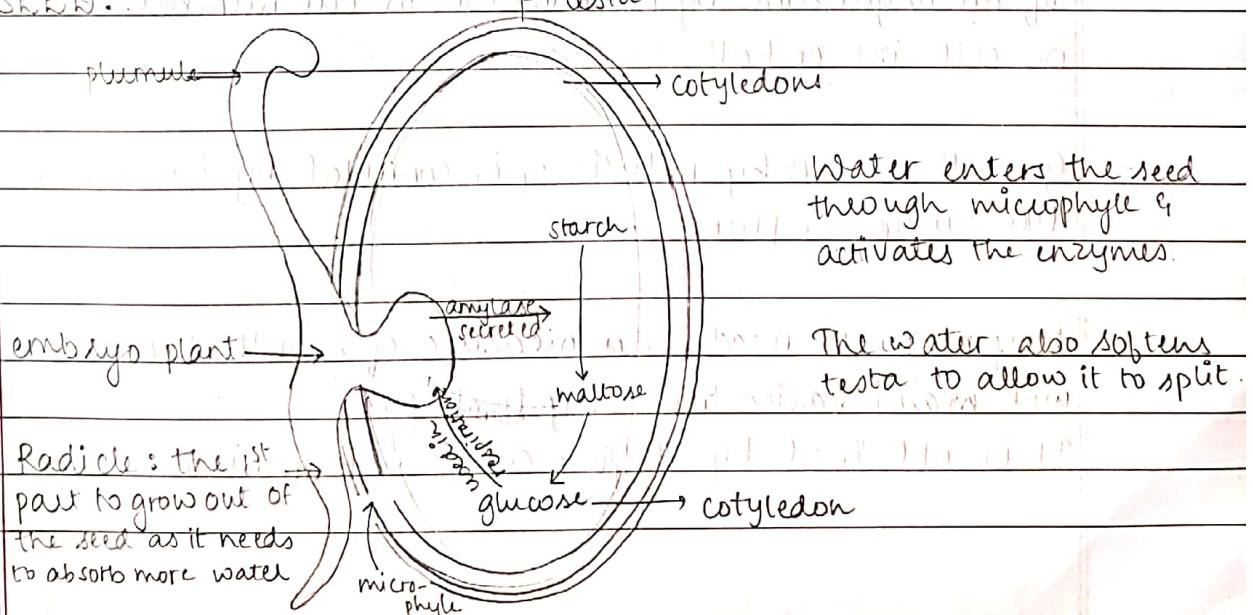
Thus they are regested in the faeces, away from the plant.

- Cocklebur.

- Fruits are covered with stiff hooked spines which catch onto animal fur or onto our clothes.
- They can be carried a long distance before animals drop them off.

⇒ SEED DORMANCY is a condition of plant seeds that prevents germination under optimal environmental conditions are available to the seed.

⇒ SEED:



⇒ SEED GERMINATION:

→ Process by which a dormant seed begins to sprout & grow into a seedling under the right / optimal growing conditions.

→ Conditions for seed germination:

- Water / Moisture.

- Needed for the seed to swell.
- This swelling breaks testa of some seeds.
- Activate enzymes
- Transport of simple materials to embryo.

- Oxygen

- Needed for aerobic respiration to provide the embryo for energy.

- Warm temperature

Suitable warm temperature is needed for efficient enzyme action.

⇒ GROWTH & DEVELOPMENT:

→ GROWTH is permanent increase in size & dry mass of an organism by an increase in cell number or cell size or both.

→ Growth occurs by mitosis & is controlled by hormones like auxins in plants.

→ Dry mass is used as a measure of growth because wet mass varies from day to day.

It is obtained by drying out the organism in an oven.

- The mass slightly decreases when the seed germinates because the stored food in cotyledons is used in respiration.
 - When the plumule starts to photosynthesise, the foliage leaves form & continue the process, so the mass increases.
 - During the end of the growth period, the mass decreases as leaves die & there is a loss of seeds & fruits.
- ⇒ DEVELOPMENT:

As the plant & animal grows, the cells become specialised & the organism becomes more complex. This is termed as DEVELOPMENT.

Development is the process by which an organism increases in size and develops into a complex adult structure.

The process of development is controlled by genetic material.

Genes are the units of heredity found in every living thing.

Genes control the development of an organism.

Development can be divided into two main stages:

(i) Embryonic Development: It is the development of the embryo from the zygote.

(ii) Postembryonic Development: It is the development of the embryo after it has hatched from the egg.

Postembryonic development is further divided into two stages:

(i) Larval Stage: It is the stage between hatching and metamorphosis.

(ii) Juvenile Stage: It is the stage between metamorphosis and sexual maturity.

Development is a continuous process throughout the life of an organism.

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