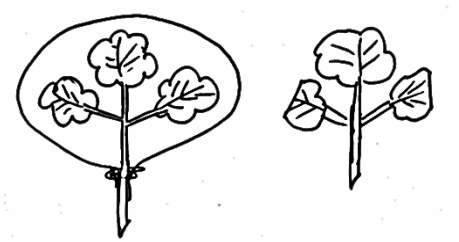
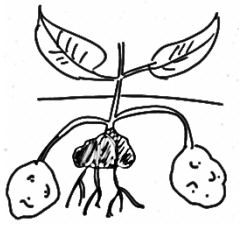
AS 90928: Demonstrate understanding of biological ideas relating to the life cycle of flowering plants

(Not the whole topic but some KEY IDEAS).

Sexual reproduction – involves flowers.	Vegetative reproduction – involves cuttings, tubers, rhizomes, runners etc.
Cell division – meiosis – makes gametes to produce seeds	Cell division – mitosis – makes clones of parent plant
Greater variety in the offspring (due to crossing over and independent assortment during gamete formation by meiosis)	Reduces competition from other species – offspring form all around parent plant so other plant species find it hard to establish themselves
Greater variety may lead to better ability to survive in a changing environment – survival of the fittest	Maintains desirable qualities – offspring are clones
"Expensive" process – life cycle from seed to seed takes a lot of time and resources	"Cheaper" process – sex structures don't have to be produced; doesn't require another partner; is guaranteed; faster
Good at colonising new areas – by seed dispersal	Good at colonising (existing) favourable areas - produce new individuals with same genetic make-up that was already successful in that environment.

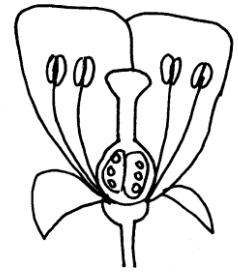
Asexual reproduction – produces genetically identical offspring - CLONES

- cuttings: cut a bit of stem, remove excess leaves or put plastic bag over leaves (to reduce water loss by transpiration); stick in soil or water – roots will form from the base of cut stem e.g. geranium
- tubers: swollen, fleshy, underground stem of a plant, which bear buds from which new plant shoots arise e.g. potato
- rhizomes: stem that grows below soil level, sending out roots and shoots from nodes e.g. ginger
- runners: stem grows along ground and at a node roots grow down, shoots up. Stem withers between parent and new plant e.g. strawberry
- bulbs: short stem with fleshy leaves. "Daughter bulbs" grow inside parent bulb forming a clump e.g. daffodil


Flower – reproductive structure of plant. Sexual reproduction may include:

Animal pollinated flowers (the pretty, smelly ones!)



Petals – white or brightly coloured – attract insects which help pollinate the flower. Nectaries – swellings, at base of ovary produce sugary solution = nectar – insects visit flower and drink / collect this nectar.

Sepals – usually small and green – enclose & protect flower in bud. Male part of flower = stamens (filament & anther). Anther contains pollen grains – male reproductive cells (gametes). Female part of flower = carpels – each carpel consists of an ovary which contains ovules which are female gametes. Style extends from ovary – ends in a stigma which receives the pollen from another flower (pollination). Fertilised ovules become seeds – the whole ovary then becomes known as the fruit.

Shape of flower and arrangement of petals, stamens and carpel means insects have to pass anthers and stigma to get nectar – increased chance of pollination occurring. Pollen is rough, large, sticky – designed to stick to insect. Not made in such large amounts as wind pollinated flower as insects "improve the odds" of pollen reaching another flower.

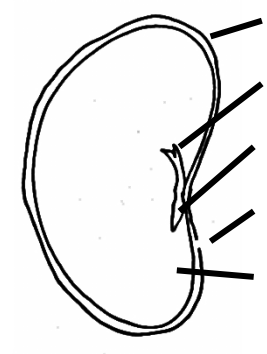
Pollination can be self-pollination (same flower or different flower on same plant) – or cross-pollination (between flowers on different plants – of same species of course).

Wind pollinated flowers e.g. grasses (the dangly ones!)

Flowers are tiny, inconspicuous and in groups on the same stalk. No petals or sepals – reproductive organs enclosed in green, leaf-like structures (bracts). No nectar – no scent – because NO NEED for either! Ovary contains ovules and has styles with feathery stigmas. Stamens with their anthers, hang outside the bracts releasing pollen. Feathery stigmas protrude and trap wind-carried pollen. Think DANGLY – THINK ALL HANGING OUT! The pollen grains are very plentiful, light and smooth – can be blown for long distances. "Plentiful" as there are "no guarantees" of delivery to another flower of same species depending on wind strength/direction.

Events from pollination to fertilisation: Once the pollen grain reaches the stigma, it produces a pollen tube, which grows down through the style to the ovary. This enables male pollen cell to fuse with female cell inside ovule – process known as fertilisation. Fertilised ovules become the SEEDS.

Structure of (dicotyledon) seeds:



testa – seed coat – encloses and protects seed from insects and fungi – usually hard and dry.

plumule – embryo shoot – responds initially to gravity – and later to light (once above soil).

radicle – embryo root – responds to water AND gravity.

micropyle – hole that water enters – starts germination.

cotyledons – modified leaves containing starchy food reserves.

Germination – process by which embryo plant grows & develops. Seed usually dry and hard – contains very little water – DORMANT – can survive drought and extreme temperatures. When conditions become suitable for germination (water, warmth, oxygen *) seed takes in water – through micropyle – tissues absorb water & swell – testa becomes soft so radicle can emerge. Water activates enzymes which break down the stored food resources into useful chemicals for energy & growth. Radicle grows first entering the soil – absorbing more water. Next plumule grows upwards through soil and above ground. Energy & raw materials required for growth come from food (starch) stored in cotyledon. Once above soil, plant can photosynthesise – makes own food – is no longer dependent on food reserves of the cotyledons. (*some seeds need light, others need dark!)

Methods of seed dispersal. (Do NOT say insects – just imagine a bee flying off with a strawberry between its knees!! No! Dispersal ≠ Pollination!

Winged fruits: ones with "parachutes", exploding fruits, hooked fruits, edible fruits, floating seeds etc.

Animals: spiked and hooked fruits/seeds stick to fur and feathers e.g. bidibids, taken away as meals and buried e.g. acorns, or consumed as food – and excreted elsewhere – fleshy fruits e.g. blackberries.

Wind: seeds are winged e.g. sycamore or have parachutes e.g. dandelion

Self dispersal: e.g. "pepper pot" shaking fruits e.g. poppy; exploding fruits e.g. kowhai, beans; propulsive fruits e.g. squirting cucumber!

Water: e.g. coconut.

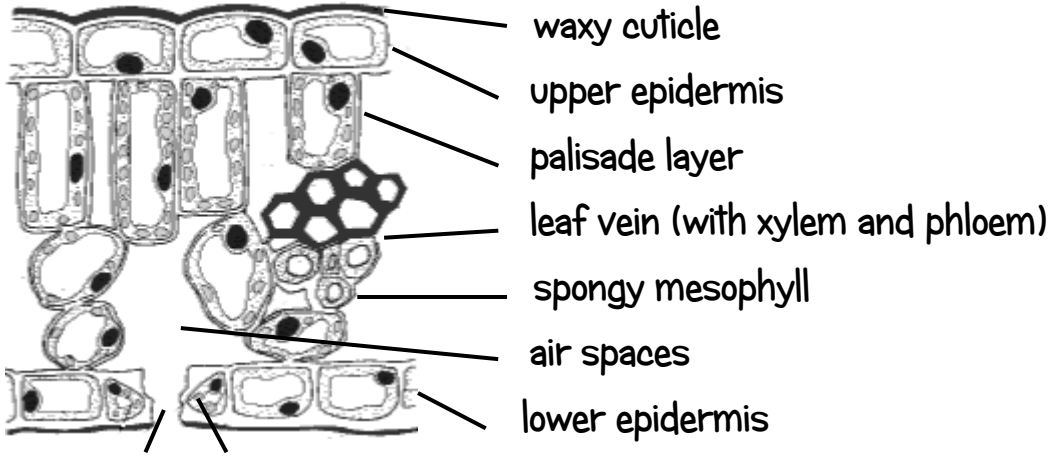
Advantages of dispersal – seedlings less likely to compete with each other AND new areas can be colonised. Disadvantage – large % of seeds may land where they can't grow. Seeds carried by wind often carried long distances before they fall to ground. Seeds carried by animals –on fur or deposited in faeces – depend on normal range of animal. Birds are likely to carry seeds the greatest distances. Wind dispersal – random distribution of a seeds in air currents – fall to the ground – may germinate.

Photosynthesis. The process of photosynthesis is the way in which plants use water and carbon dioxide, in the presence of chlorophyll and light energy, to make glucose (sugar) and oxygen.

All points should be related to: light capture, CO_2 absorbance or water use, water retention etc. for photosynthesis.

- root hairs gain water from the soil by osmosis; long & numerous root hair cells = increased SA
- broad, flat, thin shape leaf = large SA / vol ratio to absorb max light and gases for photosynthesis; BIGGER leaves in low light / SMALLER more numerous leaves in high light conditions).
- behaviour of stomata related to environment for water control / CO_2 intake; guard cells open/close the stomata
- branching veins through leaves bring water in xylem to cells / take food away in phloem
- chloroplasts – contain chlorophyll - usually found in upper parts of leaves in the highest density - maximises ability to absorb the sun's energy.
- waxy cuticle (allows light through but reduces water loss), closely packed palisade cells (MANY chloroplasts – site of photosynthesis), loosely packed arrangement of spongy mesophyll cells (spaces between cells allow gases to circulate by diffusion), stomata & surrounding guard cells (let CO_2 in but close to avoid excessive H_2O loss).
- most stomata arranged at bottom of the leaf to lessen evaporation of water
- CO_2 into (and O_2 out of) the stomata occurs by diffusion

Structure and function of a leaf. Basic structure of a dicotyledonous leaf:



The rate of photosynthesis will always correspond to that factor which is in least supply (named the LIMITING FACTOR).

Factors that affect the rate of photosynthesis include

- light intensity
- temperature
- the amount of chlorophyll
- lack of water (plant wilts so stomata close to prevent this = CO_2 can't enter = photosynthesis can't occur)
- CO_2 concentration.