Biology Revision Notes

Auxins: Plant growth Hormones

Auxins are hormones and are "chemical messengers"
The have many roles in plants including:

1. Growth of cells by cell elongation
2. Prevention of side shoot development

Growth of cells

The auxin in the cells makes the cells stretchy and this is called cell elongation without it the cell would just continue to multiply
Auxins allow the cellulose cell walls of young plant cells to become stretchy
Because the cells contain sugars and salts, they will take up water (by osmosis) and expand.
Light influences the movement of Auxin within a plant i.e. the Auxin MOVES AWAY FROM THE LIGHT. This causes the pants to grow towards the light
The reason that it does this is because the auxin elongates the cells on the side that it is on (the side opposite the light) and elongates the cells making the plant longer on one side so naturally the plants bends towards the light

Summary

- Auxin causes cell elongation and hence growth
- Auxin is produced in the tip of a shoot
- Auxin is a water soluble chemical which can be absorbed into agar

Prevention of side shoot development

The apical bud is the source of Auxin .If the bud is present it will prevent side shoot development =Apical dominance
This means that it is a tall plant to out compete all other plants for light.
If the bud is removed it will allow side branches to grow into a bushy plant
Summary
Plant hormones co-ordinate + control growth in a plant

Commercial applications of hormones

1. Produce large numbers of plants quickly by simulating growth of roots from plant cuttings.
2. Regulate the ripening of fruit on the plant and during transport to consumers e.g. bananas
3. Kills weeds by disrupting normal growth patterns(weedkillers)

Stomata

Stomata- open to allow CO_2 into leaf for p/s
-Close to reduce water loss by transpiration
On a very hot day or if in dry soil, a plant may close stomata during hottest time to avoid wilting.
Wilt = more water lost than taken in which means loss of turgidity which means the loss of support which means the collapse of the plant.

Growth movements by plants

Plant shoots respond to gravity and Light

A plant growth response is called tropism
When shoots grow towards light it is called positive phototropism
When shoots grow in the opposite direction to gravity it is called negative geotropism
When roots grow in the same direction as gravity it is called positive geotropism
Obvious advantages to these responses

1. Plant sheets grow vertically up through soil following germination (negative geotropism
2. Plant shoots grow towards the brightest source of light for maximum/s(positive phototropism)
3. Roots live in dark environment will grow downwards tap water stores in the soil and to anchor the plant more firmly in the soil.(positive geotropism)

Transpiration

The process by which weather loss from a lead draws water and dissolved minerals up the xylem inside of the plant from the roots. This creates the transpiration stream

- Plant loses about 90% of all water taken up by roots to transpiration
- Provides a transport mechanism for minerals within the plant
- Evaporation at leaf helps to cool leaf down. P/s is not very efficient at high temperature
- Water evaporates on the surface of the spongy mesophyll cells in a leaf
- Water vapour passes out of the leaf via stomata high concentration of water vapour in leaf, lower concentration in air so passes out by diffusion
- Rate of diffusion - rate of transpiration will be affected by:

1. Temperature - heat speeds it up
2. Humidity – drier the air the faster it is
3. Wind flow -wind blows damp air away from the leaf
4. Light- stomata close in dark
5. Air pressure – water loss greater at top of a mountain

Mineral take up from soil
Minerals from soil water taken up mainly by root hairs
Transport of chemicals inside plant

1. Xylem – carry products and mineral salts (in solution upwards from roots to all other parts of the plant
2. Phloem- carry products of p/s (sugars)from p/sing leaves (+stems) upwards or downwards to all other parts of the plant (esp. roots + developing shoots, flowers etc)

Adaptation of the leaf for photosynthesis

There are three main adaptations that a leaf makes for p/s

1. Leaves are thin and flat so providing a large surface area for the diffusion of gases (oxygen, carbon dioxide) and absorption of light.
2. The have stomata controlled by guard cells which allow the diffusion of gases into and out of the leaf.

3. Most of the chlorophyll is packed into chloroplasts in the palisade cells which are just below the upper epidermis for maximum light absorption.

Action of the guard cell

In the light when the plant is photosynthesising, it produces Glucose which increases the concentration of the cell sap and causes it to absorb water by osmosis. This increases the pressure in the guard cells and causes them to stretch and bend, thus opening the stoma. In the inflated state , the cells are said to be Turgid

In the dark , photosynthesis stops producing glucose, and the glucose already present is used up by respiration. The guard cells may lose some water by osmosis to the surrounding cells , so they become limp or flaccid.

This is the equation for photosynthesis:

$$\text{Carbon dioxide + water} \xrightarrow[\text{Chlorophyll}]{\text{Light energy}} \text{glucose + oxygen}$$

Limiting factors of photosynthesis

The rate at which photosynthesis occurs is limited by the following factors:

1. Water- this has and an indirect affect. Lack of water causes the stoma to close and this reduces the amount of carbon dioxide the leaves can absorb Extreme water shortage kills the plant.
2. Carbon dioxide- increasing the carbon dioxide levels leads to increased photosynthesis up to a certain point after which further increase in carbon dioxide levels has no beneficial effect. It is no longer a limiting factor
3. Light intensity is the same as CO2
4. Light wavelength
5. (colour)Plants reflect green light9 which is why they look green) and strongly absorb Blue and RED light. Plants most like orange / red.

Mineral requirements of plants

Plants require many elements form the soil e.g.

Nitrogen, Phosphorus, potassium

Nitrate

Most important chemical is nitrate is deficient = stunted growth , yellowing of the leaf.

Phosphate

Needed for reactins in respiration =+ photosynthesis forms a chemical way of handling packages of energy using ATP

If phosphate is deficient = poor root growth Younger leaves are purple

Potassium

Helps enzymes involves in respiration + p/s to work

I potassium is deficient= yellow of leaves , dead spots on leaves

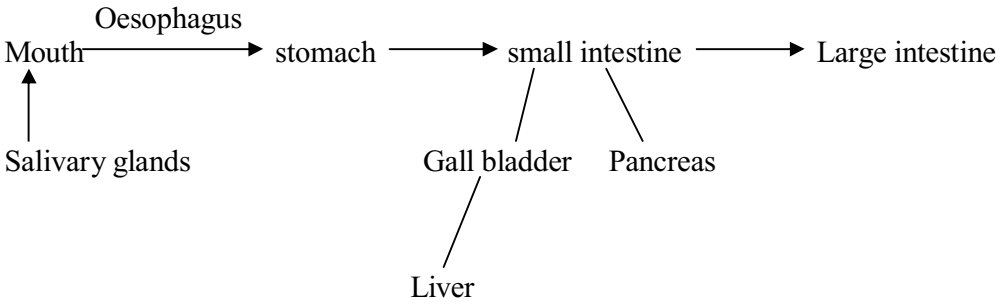
Digestion of Food

The digestion of food can be summarised as

Food —(Enzymes / Proteins)→ products (on to the blood system)

Large	Small
Complex	Simple
Insoluble	Soluble

Happens within the digestive system



Digestion	Absorption	Defecation
Mouth	Mouth	Mouth
Stomach	Stomach	Stomach
Small intenstine	Small intestine	Small intestine
	Large intestine	large intestine (rectum + anus)

Lock and – key hypothesis- to get enzyme action

Location	Action
Mouth	Amylase(in saliva) Starch → maltose
oesophagus	Carries food through the chest
Stomach	1. hydrochloric acid kills bacteria; creates correct conditions for enzyme actions Protease 2. Proteins → amino acids
Small intestine	• BILE (from liver; stoned in the gall bladder) = dteregent , large fat globules onto the small bladder onto emulsion = easier for enzyme to break it down • PANCREAS (produces a cocktial of enzymes) AMYLASE: Starch → maltose Lipase: Fats → Glycerol fatty acids • Walls of small intestine Maltose, maltose + glucose Protease: completes digestion of proteins → amino acids Lipase: " " " fats
Large intestine	Absorption for water only

Proteins

Protein —(Pepsin (stomach))→ Peptide chains —(Peptidase)→ Amino acids

e.g. from meat
fish or dairy
products only

Lipids —(Bile from liver acts like a detergent not an enzyme)→ small droplets of lipids —(Lipase from pancreas is an enzyme)→ Glycerol fatty acids

Enzymes "Biological catalysts"

- They are all made of Protein
- Each living cell has over 50 different enzymes
- Enzymes are affected by:

Temperature – up to a certain point which after a certain temperature the cells get destroyed
pH- Enzymes do not do so well if conditions are too acid or alkali.
Enzymes + Substrate concentration- on increase either speeds up chemical reactions

Food types in diet

1. Carbohydrate → starch
   → sugar e.g. sucrose(soluble)
2. Lipids- fats (solids) + oils (liquid0 for energy + building cell membranes
3. ProteinsFor growth and repair
4. Minerals- e.g. iron for red blood cells , calcium for bones
5. Vitamins (organic chemicals from plants)
   e.g. vitamin A – eye pigments
   vitamin C- good skin condition
6. Water
7. Roughage+ cellulose

Useful but not essential

The eye

SCLERA: tough outer part of the eye; keeps shape of the eye and protects it

RETINA: inner layer which contains the light sensitive cells
CONES for colour
RODS for black and white
CORNEA: clear , curved part at front of eye. Begins the focusing of light. This is protected from physical damge by the conjunctiva
LENS: this completes the focussing of the image onto the retina
IRIS/PUPIL : muscles in the iris can pull the pupil open or closed. Regulates the amount of light going into the eye.
BLINDSPOT/OPTIC NERVES: the optic nerve leaves the eye at the blind spot and carries all of the sensory nerves to the brain

FOVEA; part of the retina opposite the lens with the highest concentration of light receptors
for the most detailed images.

The heart

Arteries :carry blood to tissues
Veins: carry it back to the heart
Capillaries: allow exchange of chemicals with tissues e.g. glucose + O2

Artery
- Carrie sblood away from the heart
- blood is under high pressure
- therefore they have a tough outer coat to prevent damage
- Elastic fibres to smooth out pressure
- Circular in cross section

Veins
- Blood towards heart
- under low pressure
- Valves to prevent back flow
- Irregular in cross section

Capillary
- the vessels in which chemicals are carries in blood stream are exchanged with living tissue
- Link arteries to veins
- One cell thick – to speed up diffusion
- No valves

Blood
1. Red blood cells
- Shape inportant- the shape of the red blood celss have a large surface area for maximum uptake of oxygen
- RBC's filled with heamoglobin(even the nucleus is excluded to make more room)

Heamoglobin (hb) reacts with oxygen but can but can give up that oxygen in the tissues whereit is being usedup i.e.

$$Hb + o2 \xrightarrow[\text{Tissues}]{\text{Lungs}} Hbo2$$

Oxy heamoglobin