Ch.2 - Primary Molecules

Carbohydrates - mono = glucose, ribose, fructose, di = sucrose, poly = starch, cellulose, for energy and structure

(carbs-poly) *amylose* = linear, tight helicles, harder to break down, *amylopectin* = branched, easier to mobilize

cellulose - most abundant, fibers cross link like ribbons via H-bond, herbivores cant break down

Lipids - energy storage (fats/oils), membrane structure (phospholipids, sterols), protection from UV and desiccation (waxes)

sat fat - no dd *unsat fat* - dd

oils are stored in **cytoplasm and chloroplasts**

plants make dedicated storage proteins

long term sorage of nitrogen in **protein body, vacuole and chloroplasts**

Ch.4 - Tissues

each organ is made of three tissues - dermal, vascular, ground

simple - one type of cell **complex** - more than one type of cell

herbaceous plants grow via *apical meristem*

woody plants grow using *apical and lateral mersitems*

3 kinds of tissues - parenchyma, collenchyma and sclerenchyma

parenchyma tissue - think 1º, no 2º, alive, storage

collenchyma tissue - group in strands and help support young parts of the plant shoot, unevenly thick primary wall, no 2º, alive, support

sclerenchyma tissue - extremely thick 2º wall, heavily lignified 1º, dead, support, 2 shapes sclerids star/round or long thin w/tappered ends

parenchyma = food we eat

protoderm = dermal, ground meristem = ground, procambium = vascular

xylem - water conducting, tracheids and vessels(angiosperm only), water flows through conducting cells via pits in cell wall

phloem -sugar conducting, sieve tube, companion cells

epidermis - single layer on surface of all organelle, cuticle (waxy), cell types: pavement, guard, trichomes

periderm - lateral cork cambium, cork cells (box cells), infused with tannins, suberin and ligning

lenticels are a group of parenchyma cells in periderm, pourous opening in the cork layer

Ch.6 - Stems

young parts of stem *procambium, 1º vascular cambium tissue system, 1º xylem and phloem

old parts of stem *vascular cambium, 2º vascular tissue system, periderm

monocots - scattered vasucluar bundles , one cotyledon

dicot - vascular bundles in ring, two cotyledon

vascular ray cells run radially through xylem and phloem to connect

metabolic function is to convert **xylem ray cells to heartwood**

heartwood = structural

sapwood = structural and conduction

how we we know a stem (rhizomes) isnt a root... **vascular bundle arrangement**

bulb shorterned stem with modified leaves

corms are compact underground stems, nutrient storage organs

stolons runners are above ground stem to reproduction

tubers nutrient storage, high in starch

some tendrils are modified stems

phyllodes are flat stems used for photosynthesis on a cacti

many ferns have undergound **rhizomes**

Ch.9 - Water in Plants

water potential is determined by presence of solutes, pressure, and gravity

if water potential is **lower inside the cell** than outside then its **turgid**

if water potential is **higher inside the cell** than outside its flaccid

Turgid - water moves into cell, Ys is large and negative,

water enters root cells via **osmosis**

symporters transport two compounds together eg) H+ over PM with ions

symplastic - cross PM at root hairs, **apoplastic** - cross PM at endodermis, due to casparian strip and ensodermis must cross a PM

atmosphere is always dryer than cell surface so it keeps taking water from cell which is replaced by neighbour until it is replaced by xylem, = negative pressure

photosynthesis-transpiration connundrum 0 cell surface must be wet to allow CO2 to dissolve and be used in photosynthesis this leads to H2O loss, stomata must be open to allow CO2 in, water is lost!

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Ch.9 - Water in Plants (cont)

guttation negative pressure in xylem, transpiration is very low and soil moisture is very high, water is pushed from soil to leaf surface (out of vein tip and hydathodes)

most stomata are open duiring the day and closed at night

night - flaccid, solution concentration is the same in guard cells and apoplast

day being K+ pump into guard cell

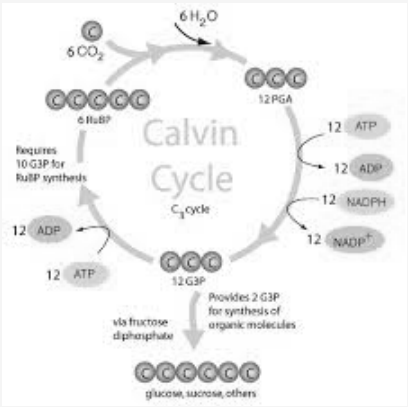
environemental factors can over ride this - water stress - high T (lots of CO2)

Phloem - source - mature leaves to sinks - young leafs

how does phloem move? from source (sucrose is accumulated into sieve tube by ATP) to sink (uptake of water into phloem) , positive pressure moves water and sucrose by bulk flow

short distance = diffusion, active transport/pumpting **long distances** = bulk flow

Ch. 10 - Metabolism (Photosynthesis2)



Ch.11 - Growth and Development

Ch.11 - Growth and Development (cont)

Ethylene - leaf abcission, senescence, ripening, allows seedling to break through soil

tropic = directional **nastic** = nondirectional

phototropism - growing towards light, detected by blue light receptors where they touch PM auxin accumulates

heliotropism - solar tracking

gravitropism - gravity, resting position of statoliths where they touch PM auxin accumulates

thighmotropism - response to touch by curling of tendrils to get support (nutation)

2 types of photoreceptor - **phytochromes** - red light, seed germination and shade avoidance **cryptochromes** - blue light, germination, elongation, photoperiodism

PFr - seed germination and flowering

Pr - stem elongation

Ch. 17 - Cyanobacteria

photosynthesis began by cyanobacteria being absorbed through **endosymbiosis** into a eukaryotic cell

cyanobacteria live in moist locations as well as symbionts

biological soil - sediments that root down soil and protects tilting from dust

nitrogen fixing cyanobacteria are an attractice symbiotic partner

what inhibits nitrogen fixing and how does the plant get around it - oxygen and by making lots of ATP this takes place in specialized cells called heteocysts

N2 fixing prokaryotes stored in **root nodules** (protect from oxygen)

heterocysts - large thick walled cell in the filament of certain cyanobacteria that perform nitrogen fixation

cyanobacteria have high concentrations of **caretenoid pigments**

cyanobacterial bloom - toxic, smothering,when its decomposing it causes an oxygen deficiency in water

overuse of fertilizer - phosphorus is limiting - leaks into water it can create algae or cyanobacterial bloom, creates dead zones in water

cyanobacteria can move via **surface waves or slime expulsion**

Rhytisma Punctatum - tarspot fungus that causes green spots on bigleaf maple

3 phases of physiological responses - 1.perception (signal) 2. transduction (receptor and messenger molecules)

Auxin - promotes organ formation at SAM, encourages fruit growth, control branching, apical dominance and advantageous roots, promotes cell and organ growth by cell loosening which leads to cell expansion

leaf miners use **bacterial endosymbiosis** to make enough cytokinins to keep plant alive

green revolution crops are shorter so they will yield more this is done by **Rht genes**

removal of auxillary bud branching issues and auxillary bug flush**add auxin** auxilary bug stay dormant and branching is suppressed

Gibberellins - promotes juvenile to adult, cell expansion, seed germination, breaking seed dormancy and mobilize stored nutrients

Cytokinins - promotes cell division and shoot formation, making them live longer (made in root tips and transported up through plant)

Absisic Acid - (tolerance) inhibitory, seed dormancy and resistance to cold/drought, control closing of stomata (in response to water stress)

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Ch. 19 Fungi

defining characteristics - eukaryotic, heterotrophic, cell walls made of chitin, glycogen storage, haplontic

unicellular = yeasts, **multicellular** = hyphae make up

septate hypae = crosswalls **coenocytic hyphae** = no crosswalls

fungi eat dead and moist plants and animal material, biotrophs/parasites

mutualistic fungi - mycorrhiza(N2 fixing), endophytes(in plants between cells), lichens(mutualistic relationship with fungi and algae/-cyanobacteria)

septate make asexual spores into a conidium (beads sausage links)

coenocytic make asexual spores in bound sporangium (ballon of spores)

Chytridiomycetes - aquatic, decomposers, parasites, mutualists, coenocytics, flagellated spores and gams eat algae

Zygomycetes - pin/sugar molds, eat fluff mycelium, coenocytic hyphae, asexual spores in sporangium, thick walled resistant zygospores

soy needs ot be treated before we eat it because it has defence mechanisms that protect seeds

Ascomycota - largest group, unicellular = yeast, multicellular = morel,fungi, asex spore = conidia sex spore = asek

Basidiomycetes - cub fungi, spores on basidium, septate hyphae, sexual only, big diversity, spores exposed to outside, gills, teeth, inside open pores on convoluted outside of the mushroom

Lichens - symbiotically associated to green alga, ascomycete or basidiomycetes

Ch.23 - Seed Plants and Angiosperms

angiosperms make flowers and the fruit around their flowers

eudicots have a fixed number of organs

basal angiosperms have a variable number of organs

flowers are anefficient way to communicate to pollinators and disperse seeds/communicate with seed dispersers

what is a flower? - shoot apical meristem that transitions to a terminal flower meristem, needs all four organs

1. sepals 2. petals 3. stamen 4. carpel

after polination and initiation of seed development the petal and stamen tend to dry up and fall off

4 types of modified leaves

1 flower at the end of a stalk(aka penduncle) (or inflorenscent)

perfect vs. imperfect - perfect is f/m imperfect is f or m

Ch.23 - Seed Plants and Angiosperms (cont)

imperfect can be monoceious - f/m on same plant or dioecious - f/m on different plants

angiosperm life cycle - mitiotic divisions make 3 nuclei (1 tube nucleus, 2 sperm nucleus - 1 to egg(zygote2n) 1 to polar nuclei(endosperm3n))

main diff. betwen gymno/angio - ovule placement gym = surface of sporo, ang = in sporo seed nutritive tissue - gym = fem gam, ang = endosperm

mature ovary pepicarp has 3 layer **(enocarp, mesocarp, exocarp)**

dry - indehiscent and dehiscent *corn and acorn*

fleshy - berries, drupes and pommes *apples and pears* each fruitlet of a berry is a drupe

Ch.3 - Cells

cellulose - linear b glucose polymer, extend cell wall space through the plasma membrane made via cellulose synthase, control layout of micro tubule tracks to control the shape

hemicellulose and **pectin** are made via golgi apparatus and excytosed to cell wall

hemicellulose keeps fibrils in place hetero polysaccharide: glucose, xylose, arabin

pectin *plays big role in middle lamella* hetero polysaccharide: galacturonic acid, gel forming making cell walls pliable

GMO dont want food to degrade (reduce levels of polygalacturonase)

cell wall and cell division - cytokinisis

Primary Cell Wall - thin, growing and dividing, pliable and eleastic, cellulose, hemicellulose and pectin

Secondary Cell Wall - thick, inside primary, hard and rigid(cellulose, hemicellulose and pectin), dead, often lignified

plasmodesmata - cytoplasmic connections between plants , a tube of plasma membrane that has ER running through it, made during mytotic division

apoplast - cell wall space of connected cells *symplast* = cytoplasm of connected cells

Golgi Apparatus - where glycoproteins and complex polysacchairdes are made *important for diving or secretory cells*

Plastids - chloro(contain caretenoids, and chlorophyll), amylo(in starch storage organs), proplast, own genome, self replicating, endosymbiotic origin,

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Ch.3 - Cells (cont)

chromoplasts are *yellow, red or orange**

Vacuole - peanut in an M&M, storage, anthocyanin pigments, **Cheap growth**

sometimes plant over accumulate CA2+ and it gets put in the vacuole then precipitated out as crystals *defensive!*

tannins denature and precipitate proteins

Ch.5 - Roots

cortex (ground tissue) stores starch

dicots root's vascular cylinder froms a solid central core, in monocots its a parenchyma central pth

xylem in center/phloem towards outside, endodermis and oericycle surround x/p

top and bottom and side walls of roots are impregnanted with endodermal cell and are lignified and suberinized = apoplastic barrier

significance of endodermis only minerals that have corresponding plasma membrane transport proetins are allowed into vascular systems

pericycle - meristematic acticity,, in plant with secondary growth, vascular cork cambium originates here

young root = PAM **old root** = SAM or LAM, VC or CC

in roots that undergo secondary growth... cortex and endodermis are destroyed as roots expand in girth from activity of vascular cambium, in old thick roots periderm (made from cork cambium) functionally repalces the endodermis

drop roots = air

propagative roots = cloans

aerial roots = prop roots

buttress = architectural support, compost bins

pneutophore = underwater airflow

contractile

mycorrhizae symbiotic mutualistic relationship between vascular plant and fungus

fungal hyphae is better than root hairs, (finer and reach furthur)

root nodules - symbiotic (mutualistic) association between roots and nitrogen fixing bacteria

Ch. 7 - Leaves

where do leaves come from - leaf auxillary bud primordia produced on flanks of SAM

phyllotaxy - leaf arrangement on stem, alternate/spiral, opposite, whorled

spiral phyllotaxy follows **fibonacci sequences**

leaves have different shapes based on age stage

colourful modified leaves are called **bracts** and are used to bring attention to inconspicuous flowers

parts of the leaf - petiole, blade, sheath

shapes - simple, compound

vein pattern - parallell(mono) or netted(di)

simple leaves - smooth, toothed, lobed

compound leaves - pinnately, palmately

tissues are the same as the rest of the body **dermal = epidermis, ground = mesophyll, vascular = x/p**

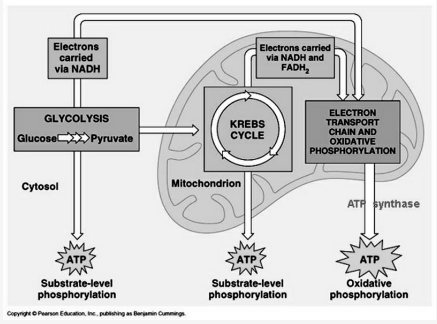
epidermal - gives strength to leaf, transparent, cuticle, sotmata, specialized cells = trichomes, bulliform

guard cells define site of stomata, random in dicots, lines in monocot

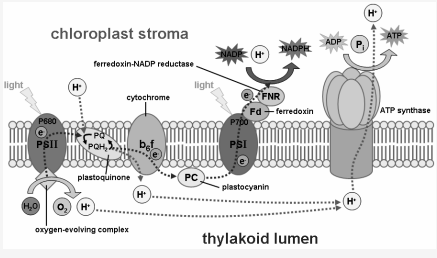
leaf modifications - tendrils, insect traps, bromends

why do leafs fall in the winter? **degredation fo pectin in middle lamella causes cells to separate from each other, leaf falls off**

Ch. 10 - Metabolism (Cellular Respiration)



Ch. 10 - Metabolism (Photosynthesis1)



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Ch. 12 - Alternation of Generations

mitosis - asexual reproduction one cell = two cells, (G2, prophase, prometaphase, metaphase, anaphase, telophase/cytokinesis)

meiosis - same process steps but they do it twice, sexual (crossing over, segregation of alles), 1 cell = 4 cells

how to determine the life cycle? **phase of meiosis**, **product of spores**

diplontic life cycle - mitosis = diploid, meiosis = gamete

haplodiplontic/alternation of generation - mitosis in haploid/diploid phase, diploid = sporophyte, haploid = gametophyte, haploid spores divide via mitosis to make gametes

alternation of generation - meiosis in ovule makes haploid megaspore -> mitosis = female gam, meiosis in anther makes haploid microspore -> mitosis = male gam,

similarities between cycles - haploid/diploid phases, differences between cycles, mitotic divisions (where), what types of cell mitosis makes

Ch. 18 - Protists

habitat - mostly aquatic, and some terrestrial

nutrition - auto, mix, hetero

Chlorophyta - green algae, such diversity, land pants and green algae (chlorophyll b, starch is energy storage, similar type of cell wall)

paralytics shellfish poisoning = saxitoxins

Chlorella - unicellular green algae, CBC, superfood

Chromophyta - brown algae and diatoms, diatoms are important primary producers, rich in lipids and carbs, silica glass cell *thickner - alginate*

Diatoms - big part of sediments(dynamite), reproduce until they are too small

amnestic shellfish poisoning - domoic acid bio accumulates

Charophyta - close relative of land plants

snow algae - green microalgae, chlamydomoans, chloromoans, astaxanthins = red colour

Rhydophyta - red algae, red due to physcobilins, grows deepest, largest, most common, nori

Dinoflagellates - complez chloro, hetero and auto,

add iron dust to ocean to improve algal growth

Ch. 22 - Angiosperms

where did seeds come from? retention of female gametophytes on sporophyte

limited resources when female gametophyte is out on its own

what if we kept the megaspore snide the megasporangium **integument invention!**

how will the sperm get in now? via **pollen**

vascular seedless - sporophyte dominant hetero and homogenous free living gametophyte nourishes young sporophyte spore in dispersal phase

seed plants - sporophyte dominant heterosporous integument microgametphyte is released new sporophyte is in a seed seed in disperal phase

Cycads look like palm trees cycads male cone sporophylls in cone carry microsporangia full cycad female cone envision ovules on surface of sporophylls

Ginko no fruit nuts are smelly, and can cause skin irritation, but are delicacy in some places

Gnetophyte CAM vessels in xylem half ephedra - joint stems and leaves half gnetum - broad leafs and occur in the tropics primarily as vines welwitschia is confined to southwest african deserts, its stem is in the form of a shallow cup with strap like leaves that extend from the rim; basal meristem on leaves continually add to the length

Conifers old and tall extra tough seeds needles for leaves male cones hold microsporangium female/ovulate hold megasoprangium some cones shatter instead of falling apart many cupressaceace make globose cones juniper berries are globose cones that have scales that have fused together conifers make lots of resin - absorbed via resin ducts or canals resin has lots of uses amber is fossilized resin

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