Before
- Bio book
  - read ch6
  - ch 6 passage/questions
- Primer questions

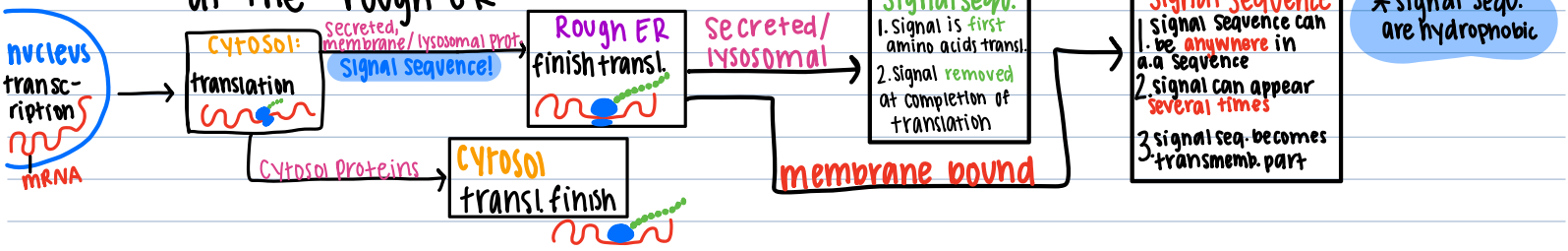
After
- FSQ Eukaryotic cells (2)
- MCAT bio passage 23-29
- Science workbook passage: 24-36

make organelle flashcards!

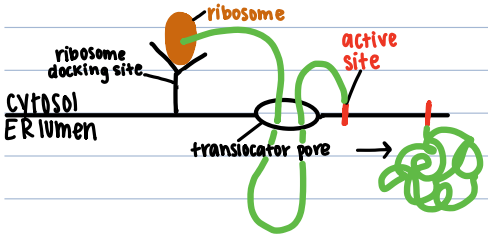
Protein Traffic

To remember...

1. all transcription in nucleus
2. all translation in cytosol
   - cytosolic proteins finish translation in cytosol
   - secreted, transmembrane, lysosomal, ER/Golgi resident proteins finish translation at the rough ER

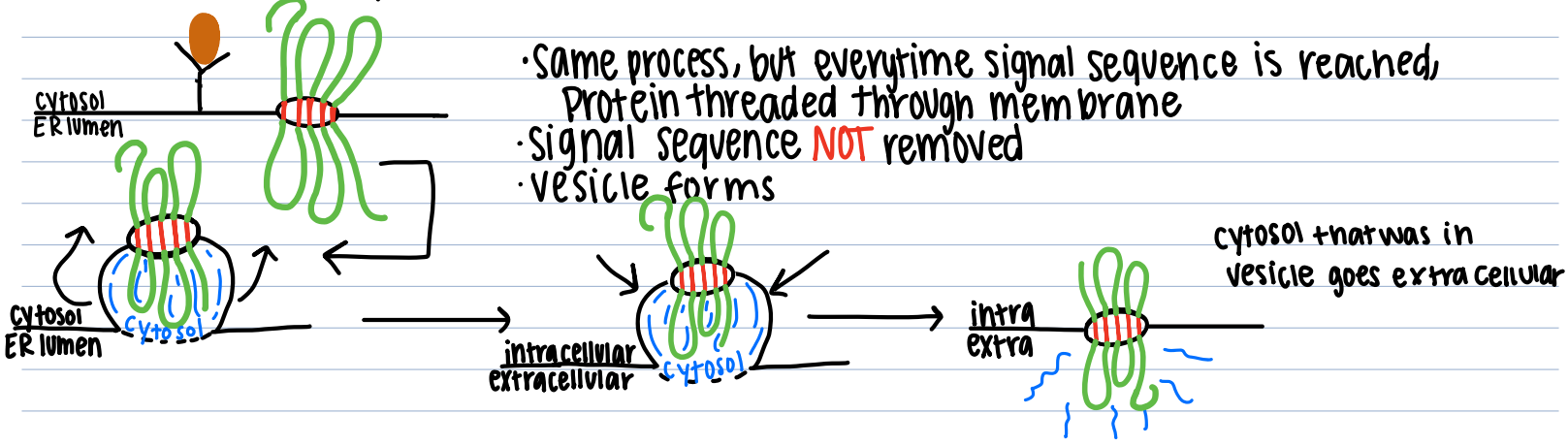


>Secreted protein synthesis



- Whole transl. complex pauses, binds to SRP (signal recognition particle) and gets docked on ER
- as protein is transl. it goes into ER lumen (stuck on membrane bc active site
- When protein finished, its clipped from active site

>membrane bound proteins



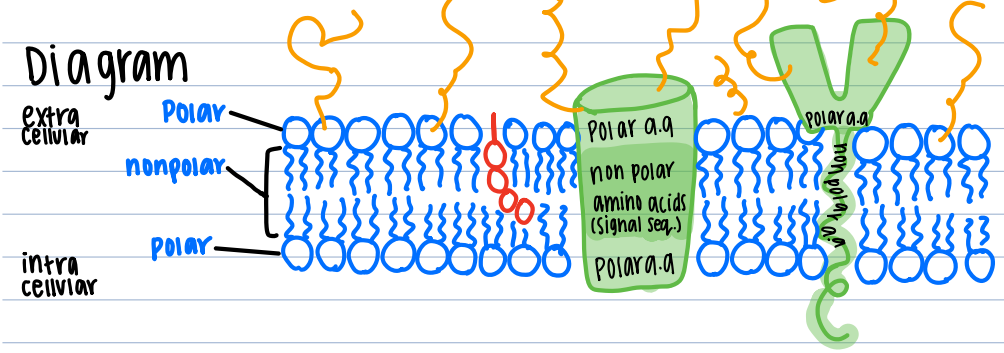
- Same process, but everytime signal sequence is reached, protein threaded through membrane
- Signal sequence NOT removed
- vesicle forms

Cell Membrane Structure

Components

1. Phospholipid: lipid of membrane, amphipathic (phead, np tail)
2. cholesterol: stabalizes membrane
   - rings in np region of phospholipid, keeps fatty acid from packing tightly
   - polar heads H bond to hyaroxy end of cholesterol, stabalizes membrane
3. Proteins: allow dynamic 'icity' rather than passive barrier
4. Carbonydrates: unique cell surface markers

Diagram



FLUID MOSAIC MODEL

Electrolytes + vant Hoff

electrolytes: free ions in soln. produced as result of dissolving ionic substances

EX: #ions produced

$NaCl \rightarrow Na^+ Cl^- \rightarrow 2$

$CaCl_2 \rightarrow Ca^{2+} + Cl^- + Cl^- \rightarrow 3$

vant hoff factor (i): # of ions produced by a single dissolved molecule

NaCl (i)=2 $CaCl_2$ (i)=3

glucose (i)=1 (does not ionize)

Colligative prop. freezing pt. depression, vapor pressure Depression

·colligative prop. depend on # of particles in solution, not their identity

4 colligative Prop.

1. Freezing point (↓)
2. vapor pressure (↓)
3. Boiling Point (↑)
4. Osmotic Pressure (↑)

Freezing point (↓)

· Point @ which solv. molec. crystallize into orderly array
· solute particles interfere w/ organization
· more solute = lower freezing pt

EX: 1kg H_2O freezes at 0°C

$\Delta T_f = -K_f i m$

$K_f = 1.9°C$

· fp H_2O w/ one mol glucose = −1.9°C
· fp H_2O w/ 1 mol sucrose = -1.9°C (i=1)
· fp H_2O w/ 1 mol NaCl = -3.8°C

Vapor Pressure (↓)

· Pressure due to evap. solv. molec. above liquid surface in container
· solute acts as anchor holding solv. molec. in soln.
· more solute = lower vapor pressure

Boiling Point (↑)

· temp where solv. molec. evaporate
· solute acts as anchor holding solv. molec. in soln
· incr. temp = more E for solvent to escape and evaporate
· more solute = higher bp

BP evolution:

$\Delta T_b = K_b i m$

$K_b = 0.5°C$

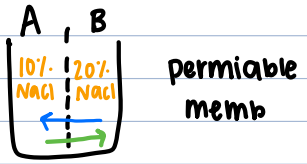
· BP of 1 kg H_2O = 100°C
· BP of 1 mol glucose in 1kg H_2O = 100.5°C
BP of 1 mol sucrose in 1kg H_2O = 100.5
BP of 1 mol NaCl in 1kg H_2O = 101°C

Osmotic Pressure π (↑)

pressure required to resist movement of water by osmosis
solute draws in water
↑solute = ↑osmotic pressure
$\Pi = imRT$

Diffusion, osmosis + tocinicity

Diffusion
Particle moving fm. high conc. to low conc.
'moving down gradient'



Osmosis
water moving fm high. conc to low conc.
fm high particles → low particles
'implied' water concentration

Tonicity
★comparative terms related to particles/solute
hypertonic: soln. has more particles than other soln B is hypertonic
hypotonic: soln. has less particles than other soln. A is hypotonic

Goal: create isotonic solutions
isotonic = equilibrium

Passive Transport
no E required
conc. gradient is driving force
bigger gradient = stronger df = faster transport
no gradient = no passive diffusion

Simple diffusion
- small hydrophobic molecules
- molec. moves down gradient (O_2, H_2O, steroid, etc)
- need transport enzyme to get to membrane

Facilitated Diffusion
- moves down gradient
- small hydrophilic molecules
- needs helper protein
- H_2O, glucose, a.a, ions

Helper Proteins
Pores
- nonspecific holes in membrane
- small enough to get in, you get in!

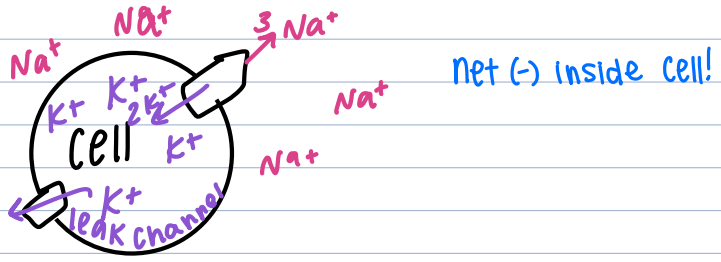
Channels
- highly specific holes in membrane
- need id to get in (Na^+ channel)

cant be next to eachother!

Porters
conformational change to move molec.
Shape shifter

Active Transport
- requires energy
- move against conc. gradient
- low conc. to high conc.

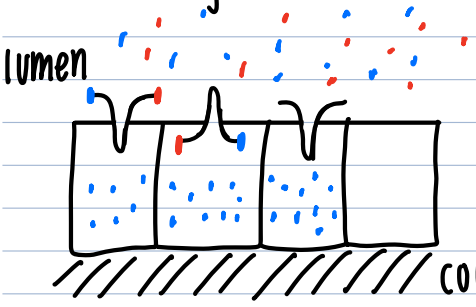
Primary:
uses ATP directly
ex: Na/K ATPase
3 Na+ out
2 K+ in
] one ATP



net (-) inside cell!

NaK ATPase
- maintain osmotic balance
- establish electrical gradient (-70mV) RMP resting memb potential
- sodium gradient for active secondary transport

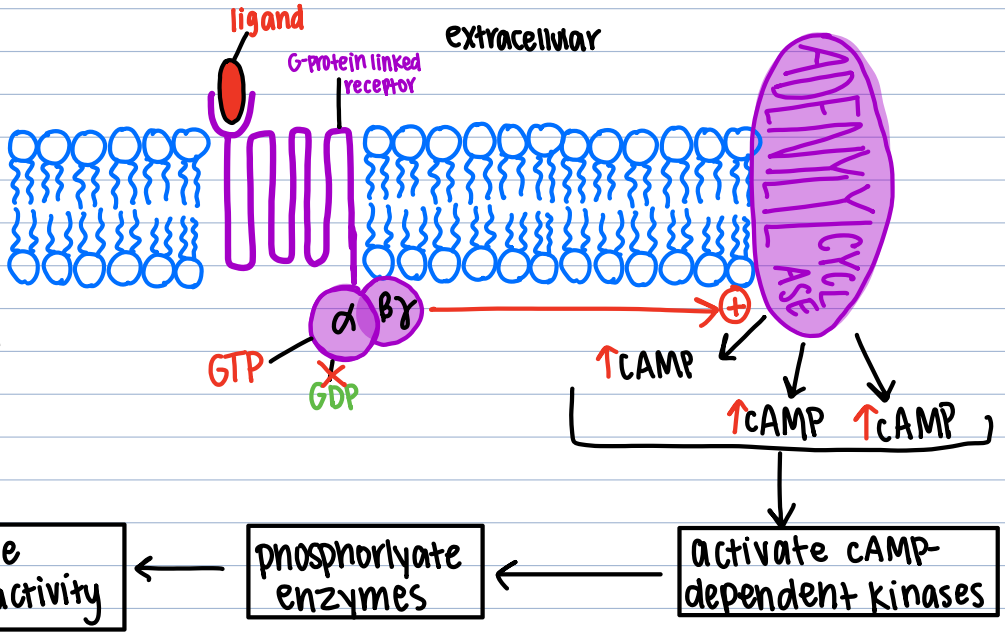
secondary
uses ATP indirectly
relies on gradient fm primary active transport for momentum
something moves down its gradient



- Na+
- glucose

Na glucose cotransporter

G proteins
hydrolyses GTP to GDP
→ has GDP binded to it at rest
→ ligase comes and GDP leaves, and GTP binds which activates protein



To note:
1. cAMP is second messenger (ligand was first messenge
2. Signical amplification
3. fast, but temporary

Cytoskeleton + cell Junctions

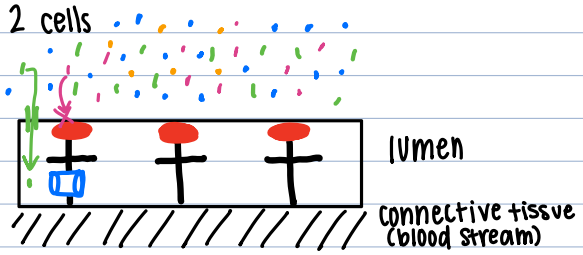
Filament type	Proteins	Diameter	Uses

cillia / flagella

microtubule	alpha and beta tubulin	large	mitotic spindle, intracell. transport, cilia + flagella	'9+2' 9 pairs + 2 individuals
microfilament	actin	small	muscle contraction, pseudopod formation, cytokinesis	
intermediate filament	multiple diff. Proteins	medium	structural roles	more permanant

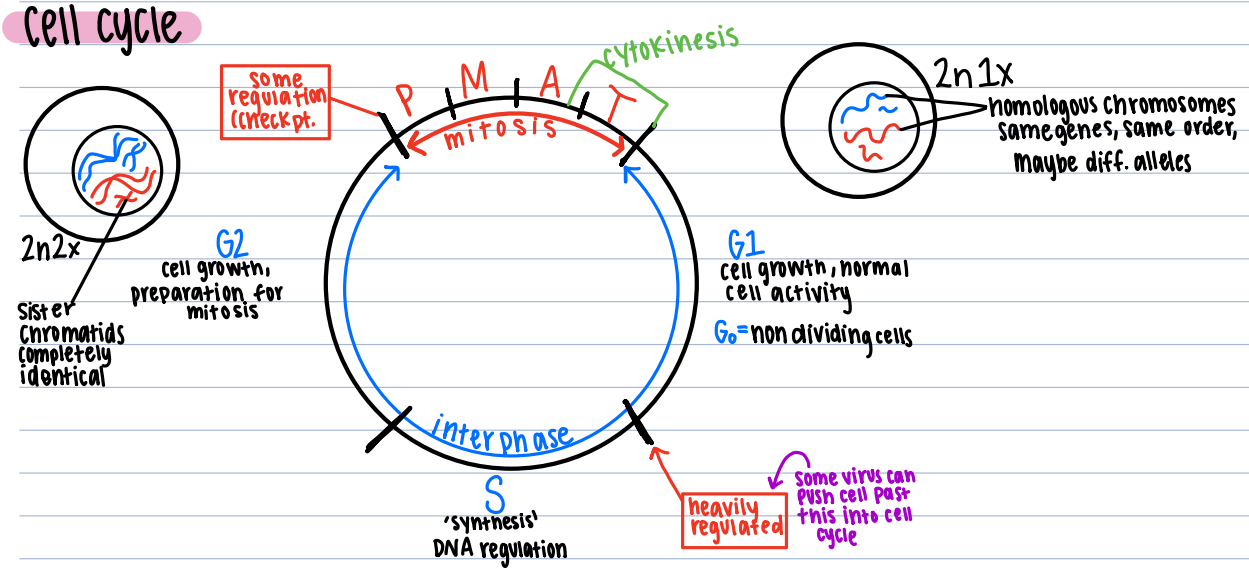
desmosome: general adhesive junction btwn 2 cells

Tight junctions
- near apex, form barrier, layer of cells
- seal lumens/separate environment
- btwn tissue/blood + blood brain barrier



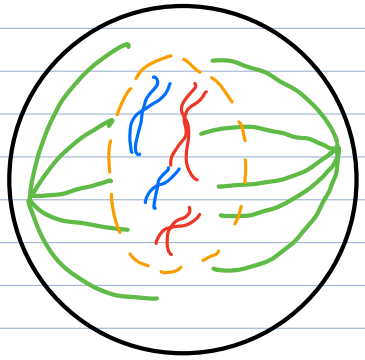
Gap junction
- allow cell-cell communication, cardiac muscles
- if you can fit, you can go through
- one cell has Na^+ increase → all cells have Na^+ increase bc gap junctions

Cell cycle

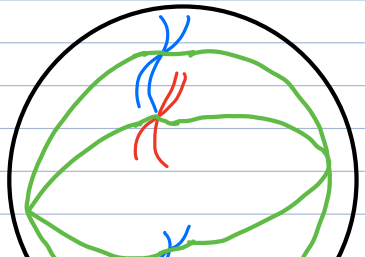


Mitosis

Prophase
1. build spindle
2. break down nuclear membrane
3. condense DNA



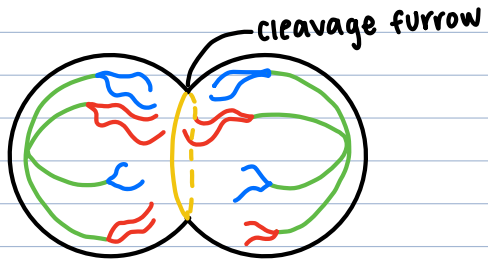
Metaphase
1. chromosomes align at cell center
   - random alignment



Overview
1. IPMAT
2. create identical daughter cells

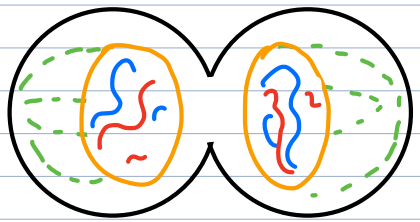
Anaphase

1. Separate sister chromatids
2. begin cytokinesis



Telophase (reverse prophase)

1. reverse prophase
   spindle + nuc. memb + condense DNA
2. finish cytokinesis



Cancer, Oncogenes, Tumor Supressors

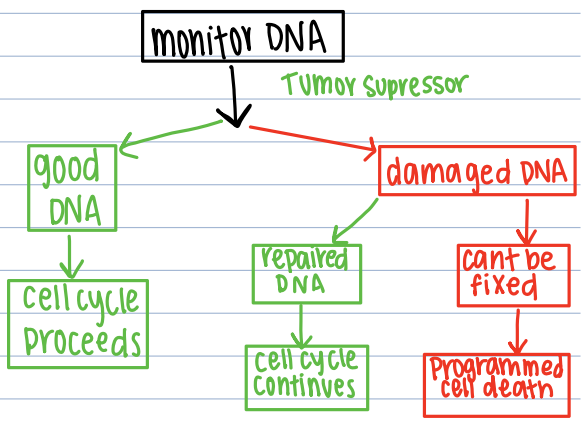
1. result fm. changes in DNA sequence (mutations) of key genes
2. starts fm. single cell w/ mutated DNA
3. cells grow + divide w/out control
4. Migrate to surrounding tissues

> Cancer causing genes

Protooncogenes: normal genes coding for proteins that regulate cell cycle
- active = cell cycle running
- inactive = cell cycle off

Oncogenes: mutated proto oncogene that is perminately active
- cell cycle perminately 'on'
- growth + division out of control!!

Tumor supressor genes
- code 4 proteins that slow/ stop cell growth + division
- monitor genome in cell cycle
- initiate repair pathways for damaged DNA
- trigger apoptosis if damage cant be fixed



Apoptosis

Caspases: proteases that mediate cell death
1. Initiator capsases: activated in response to intra/ extra cellular signals
2. Effector capsases: activated by initiators to carry out apoptosis