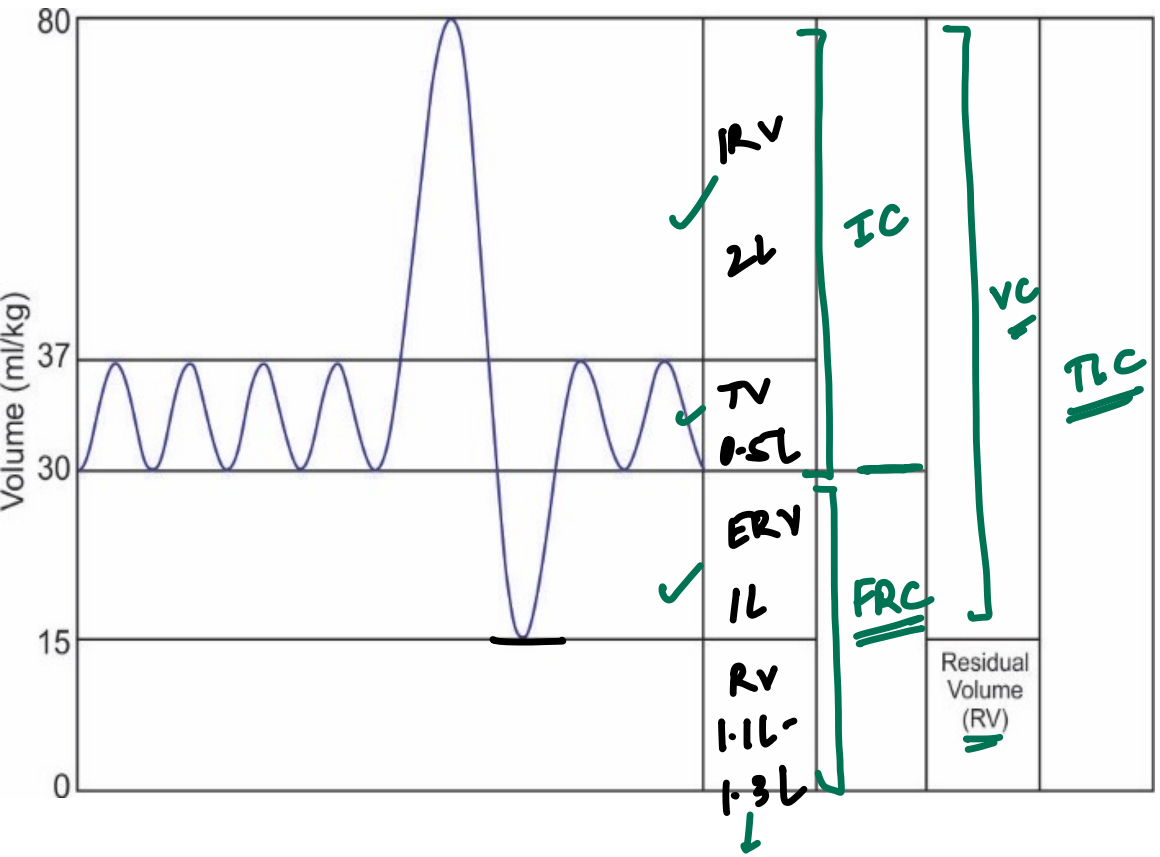
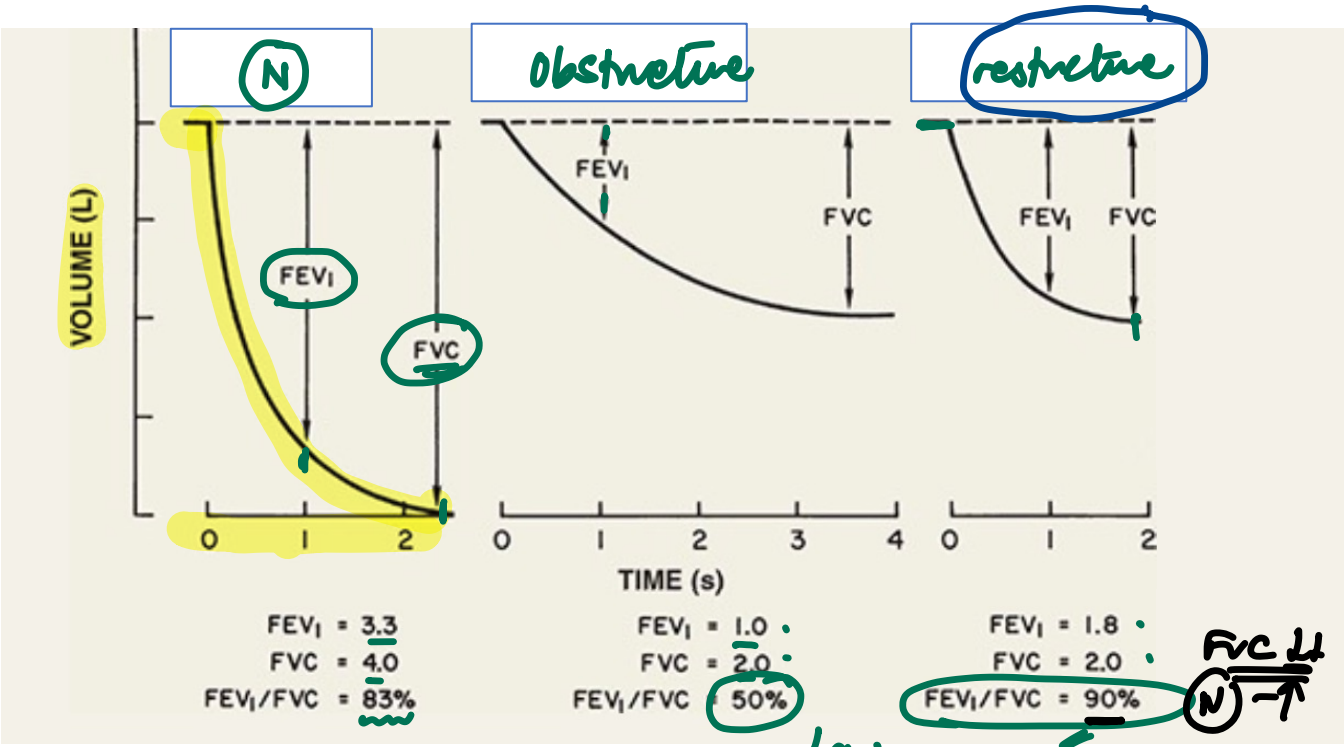
GRAPHS COMPILED

INTEGRATED MODULE

RESPIRATORY SYSTEM



- Body plethysmog
- He dilu
- N washout



RV: N

↓↓ Low

↑

pulm restrictive

eg. ILD

↓

↓

extrapulm restrictive

MG

QQ

↑

N

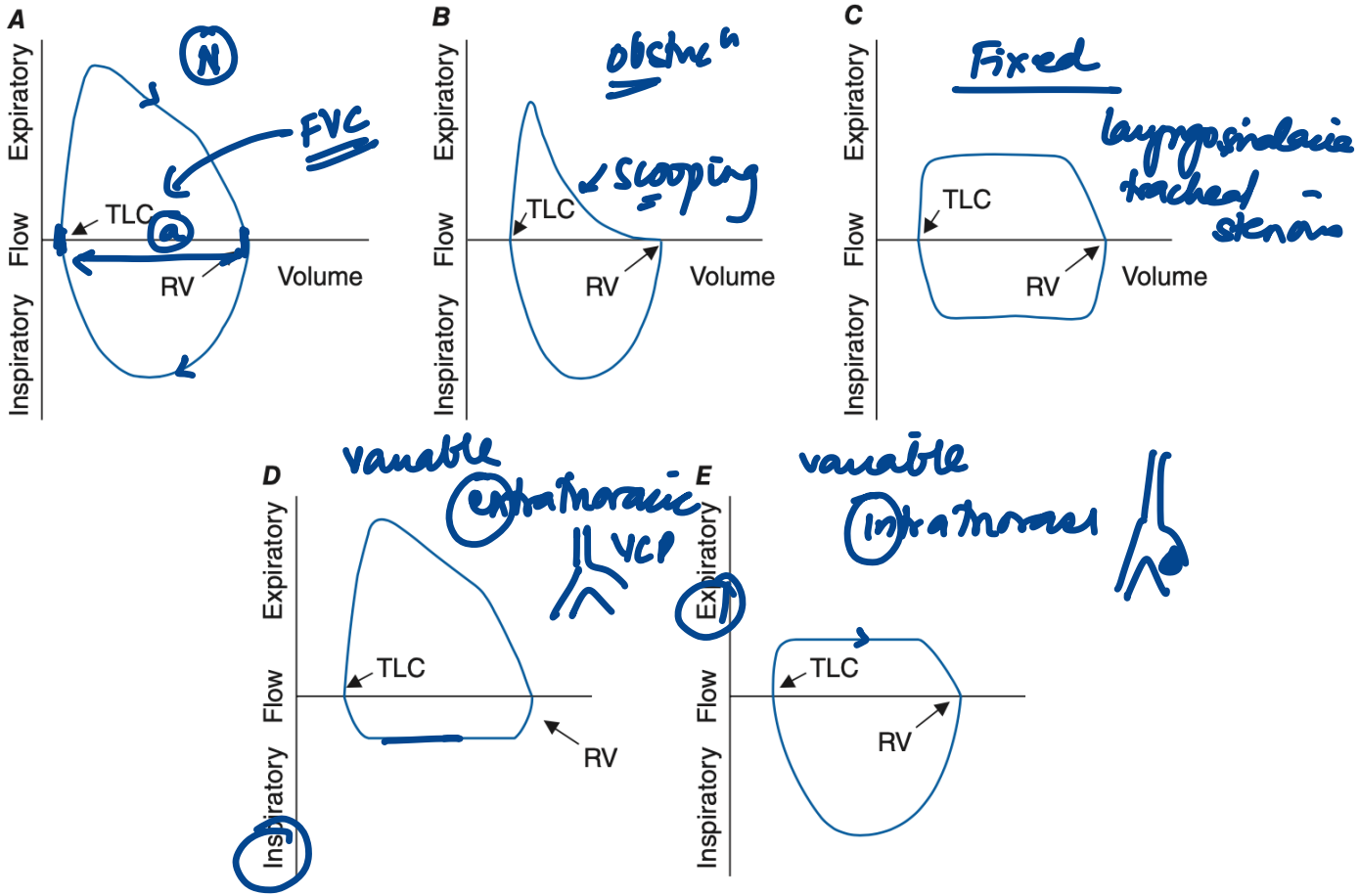
DLCO N

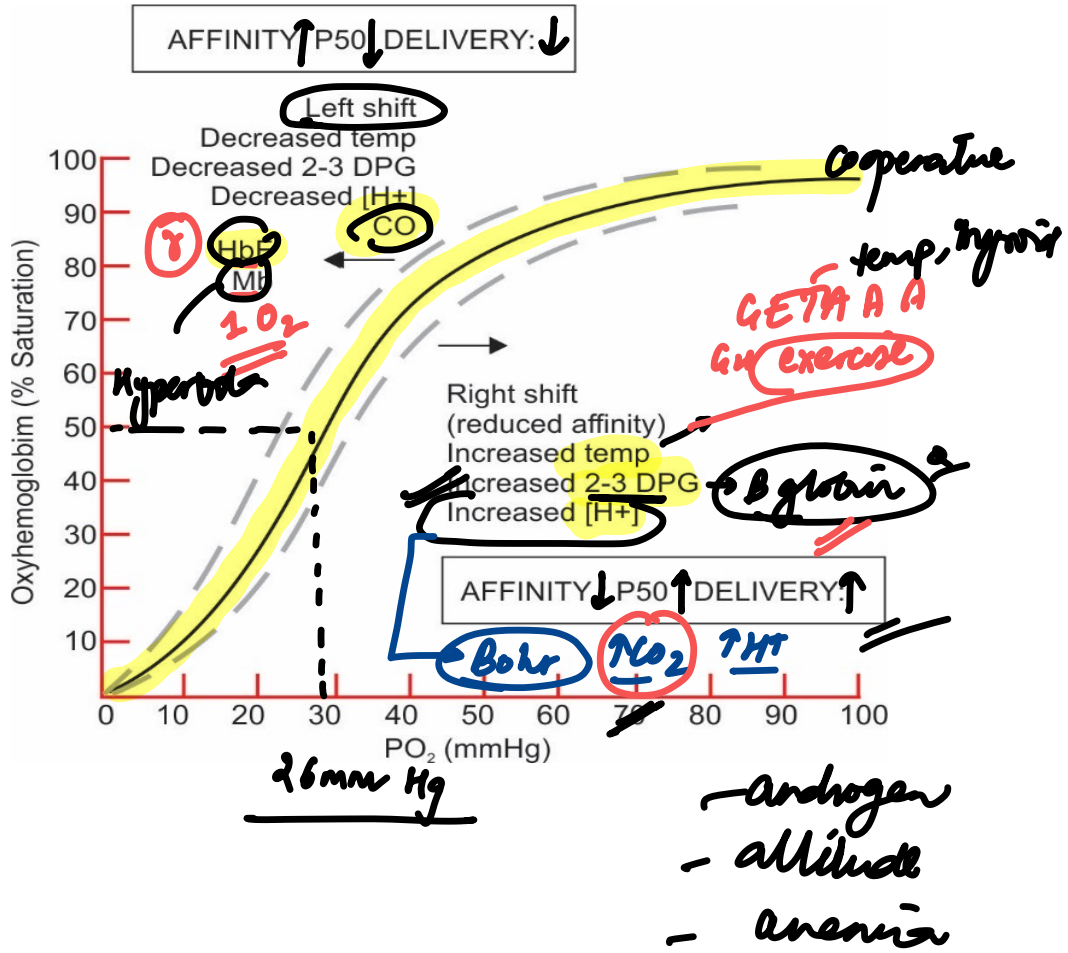
N/emphysema

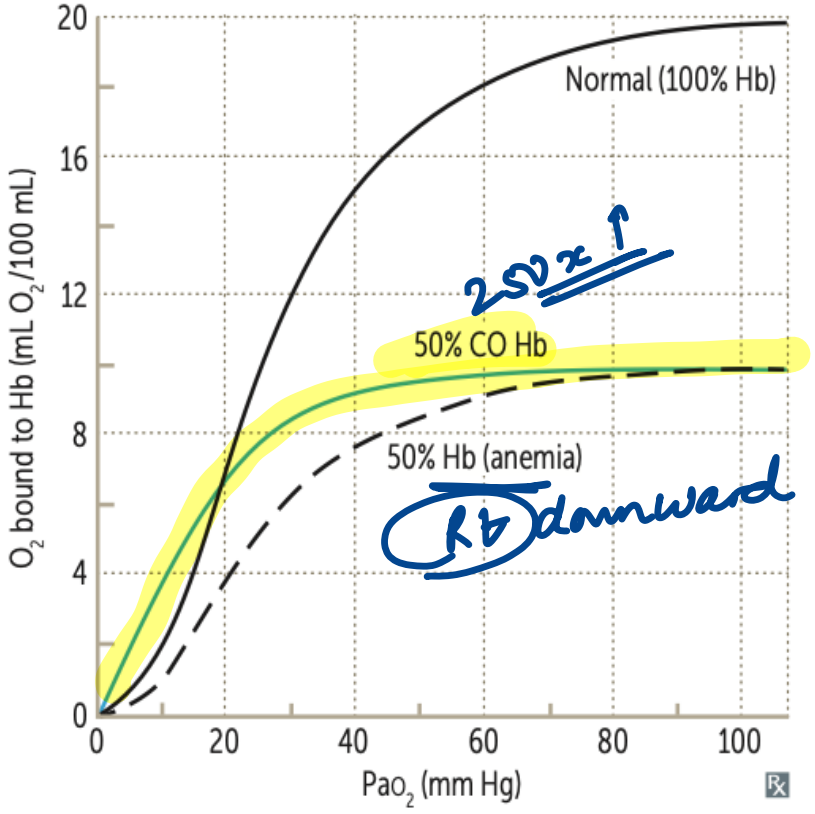
↓

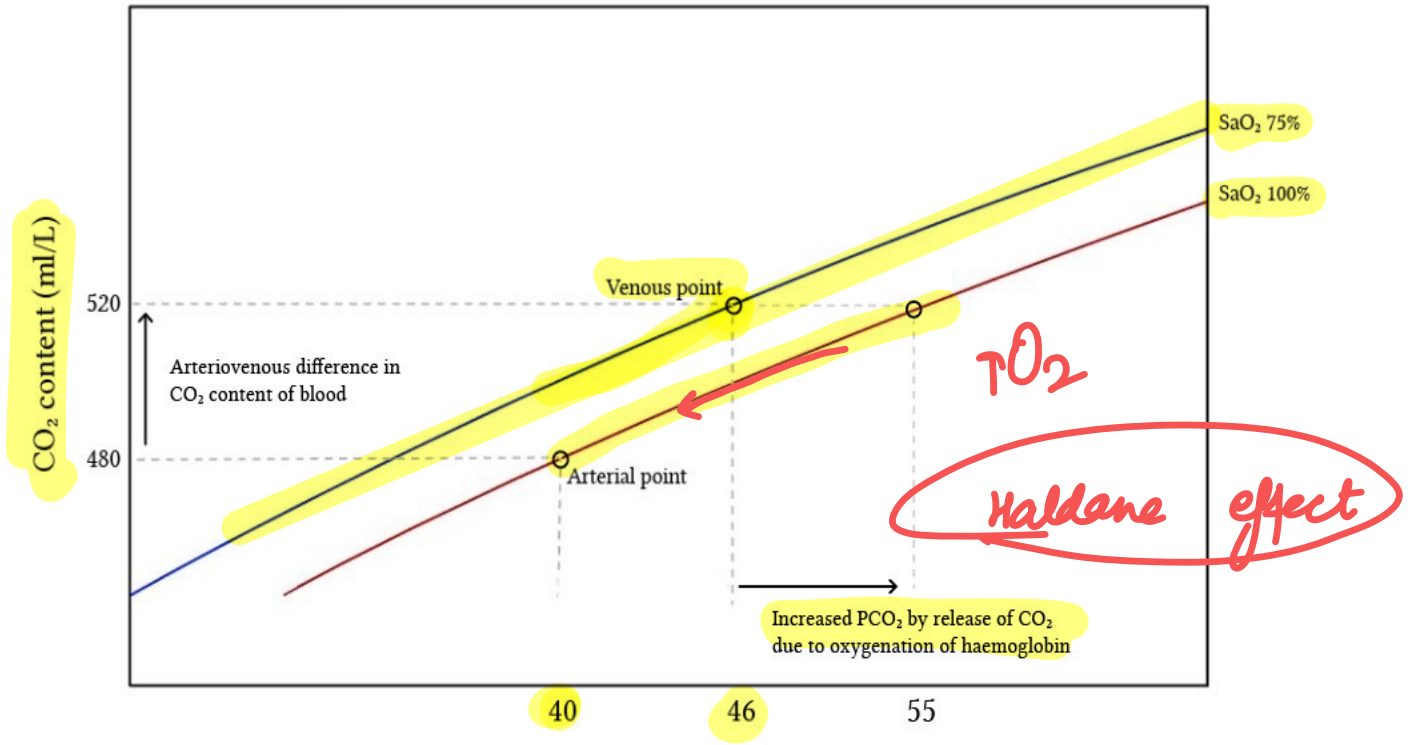
↓

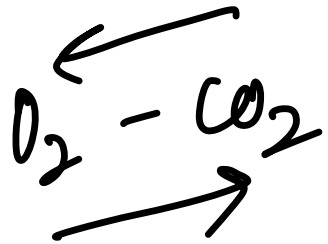
N

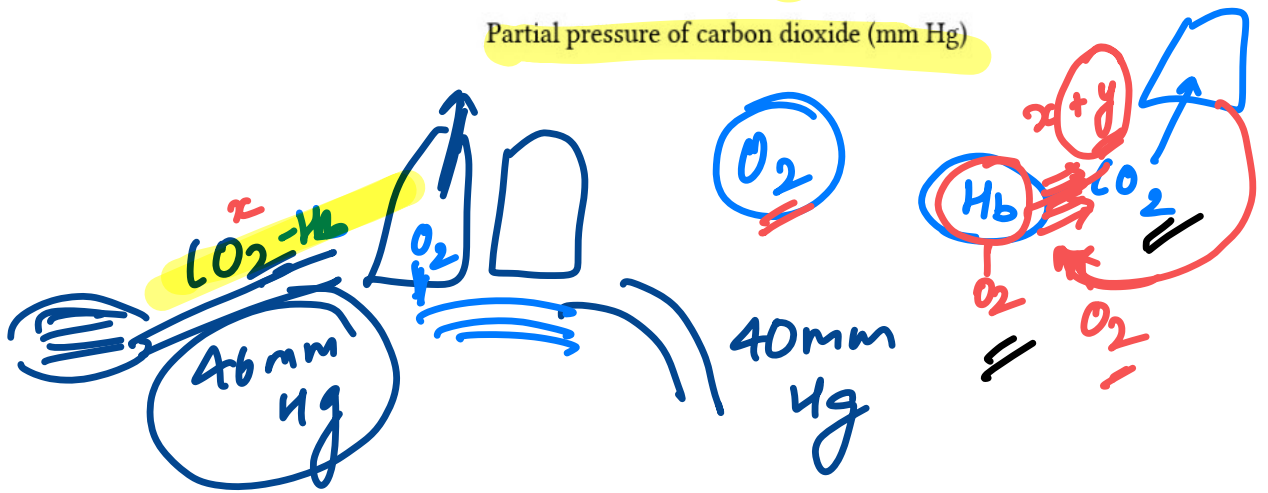


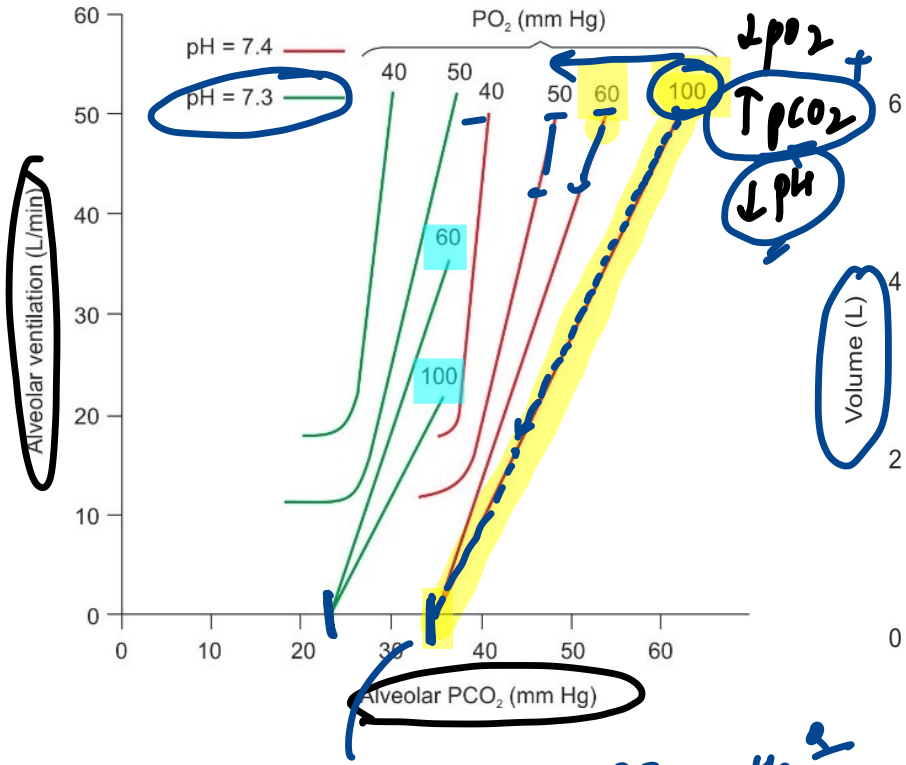






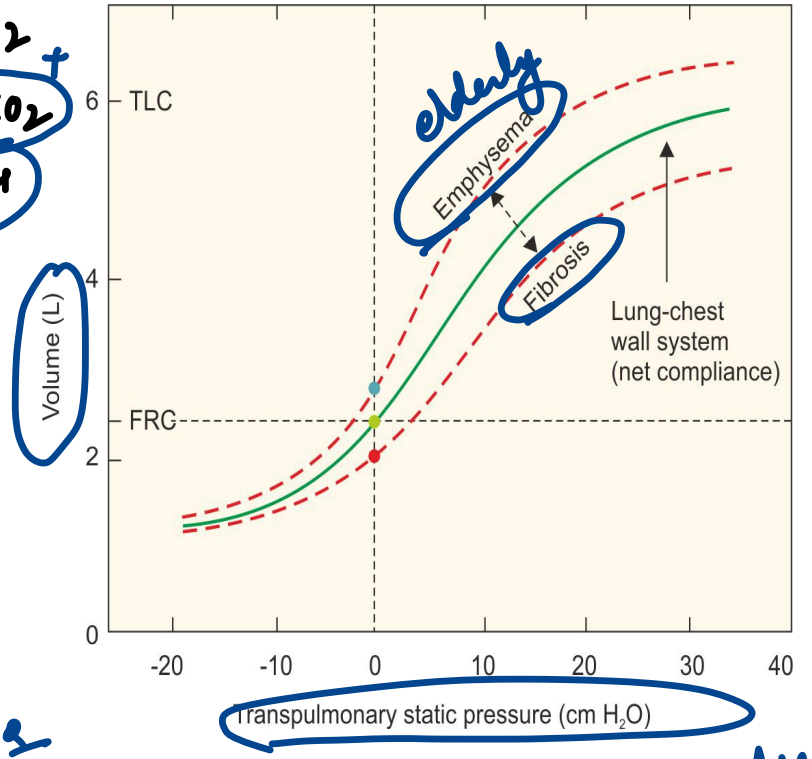




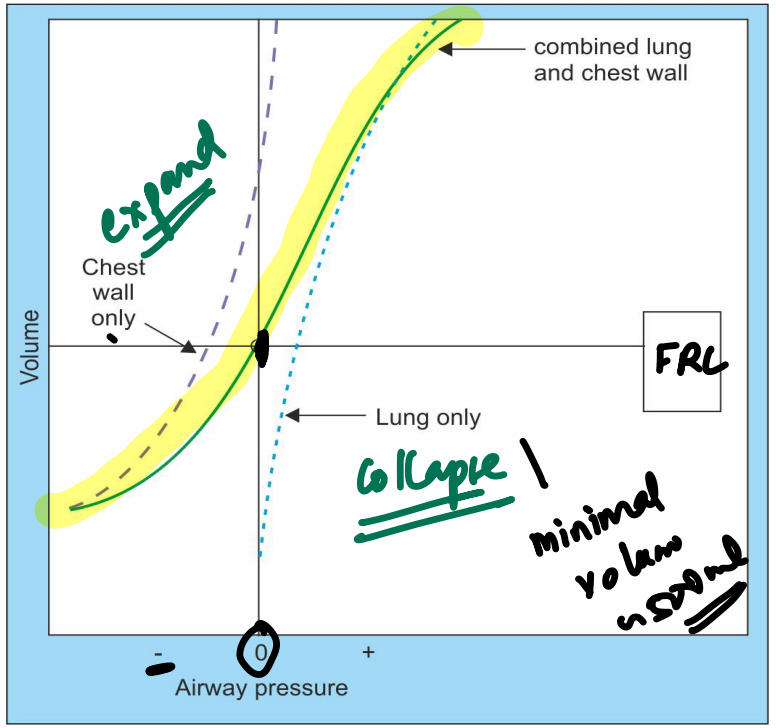


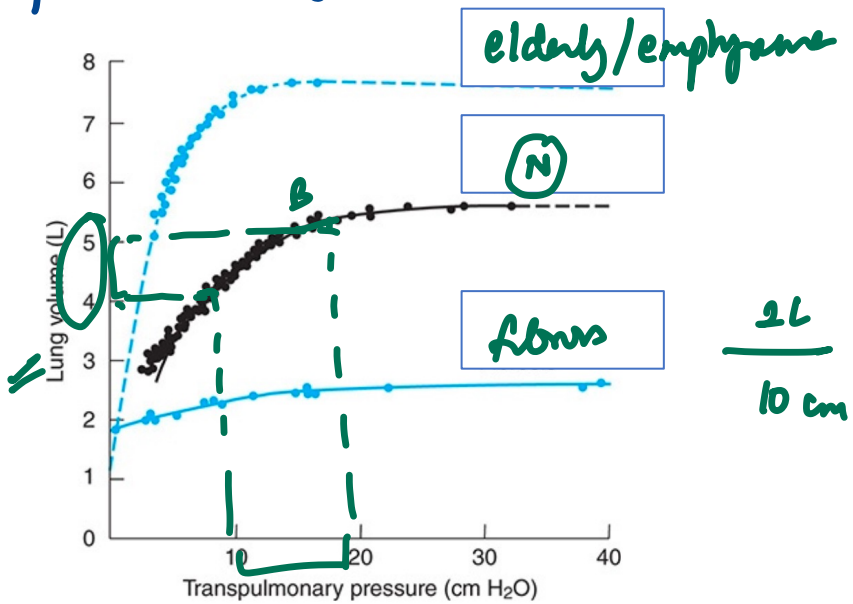
↓pO2
↑pCO2
↓pH

apnea pb = 37 mm Hg

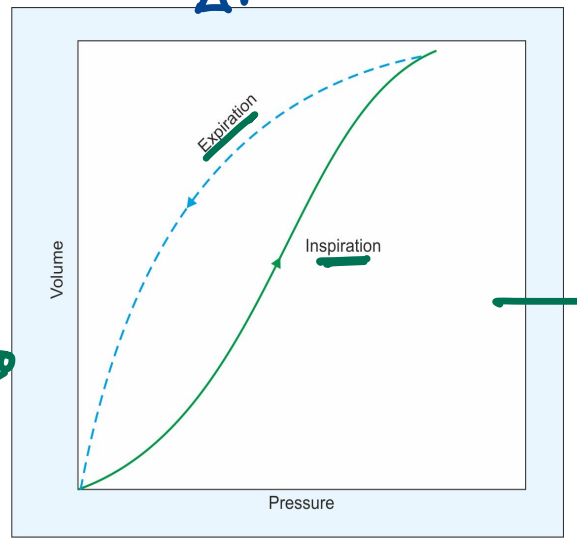


Compliance $\frac{\Delta V}{\Delta P}$ ↑↑

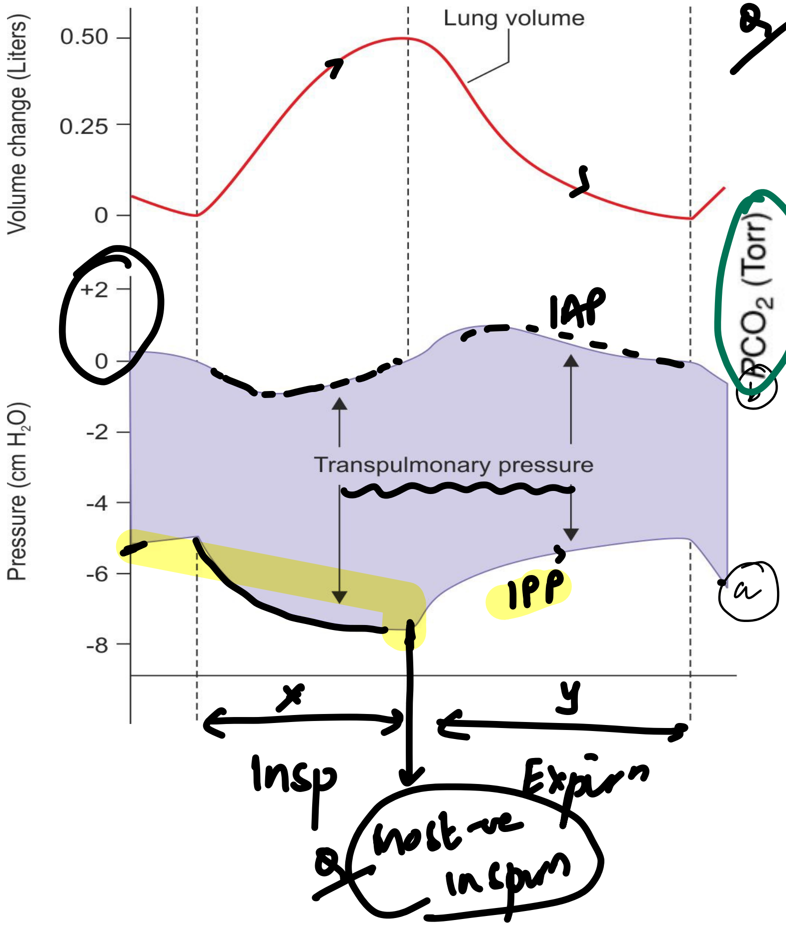


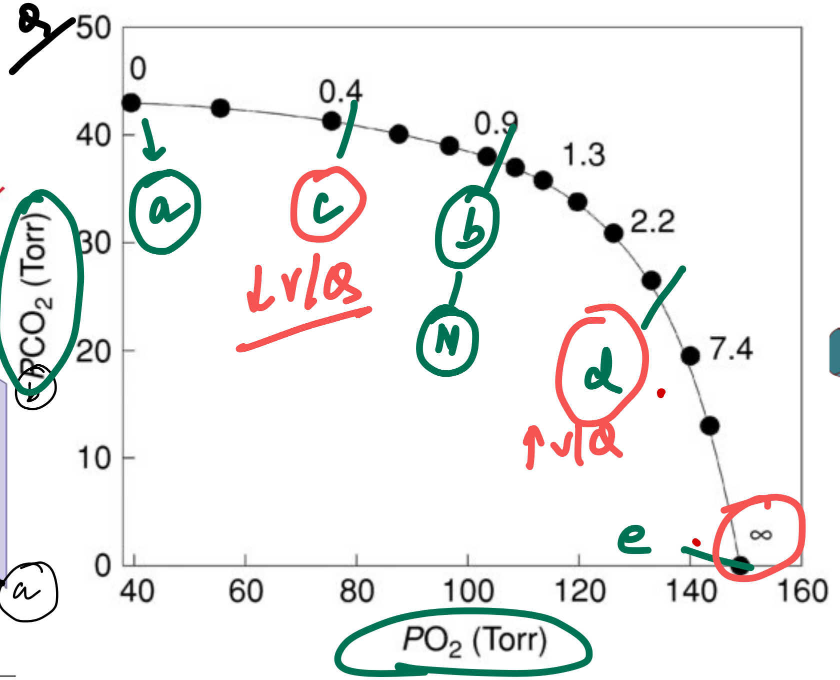


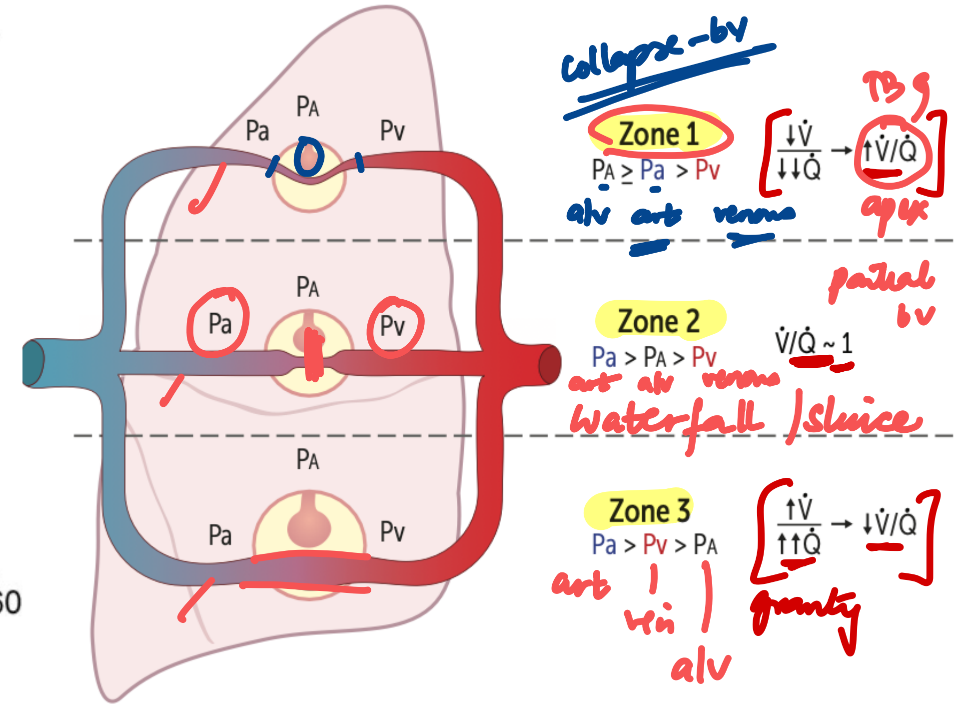
$\frac{2L}{10\ cm\ H_2O}$



→ Histeresis (surfactant)







V/Q

a: V/Q = 0 (V=0) SHUNT

pneumonia
collapse

↑O_2 → ✗ improve

c = ↓V/Q = ↓V = obstructⁿ / COPD

d = ↑V/Q = ↓Q = shock / PAH

e = ∞V/Q = Q=0 = PE

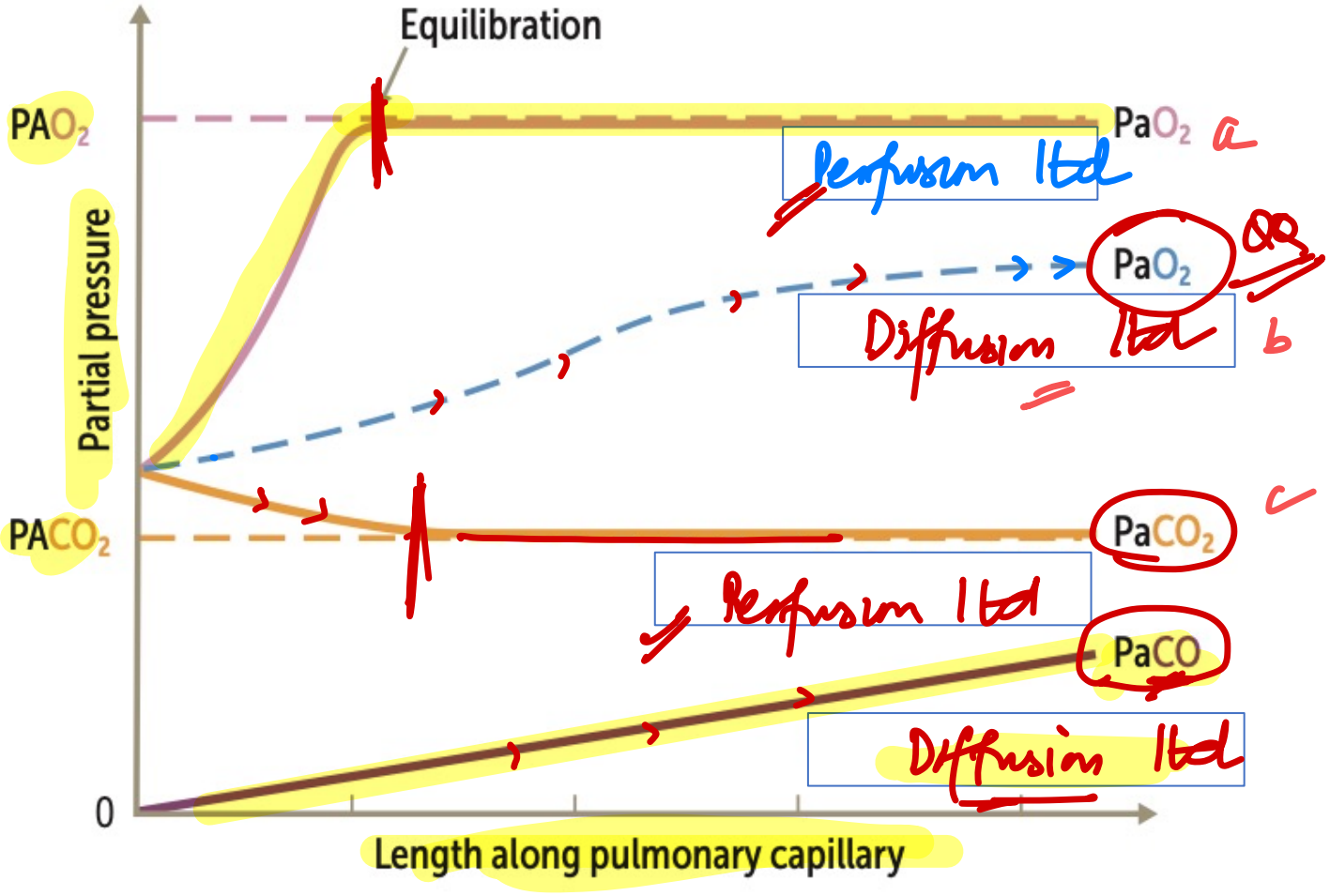
physiol dead space

zone 4: $P_{art} > P_{int} > P_{ven} > P_{alv}$
interstitial pressure

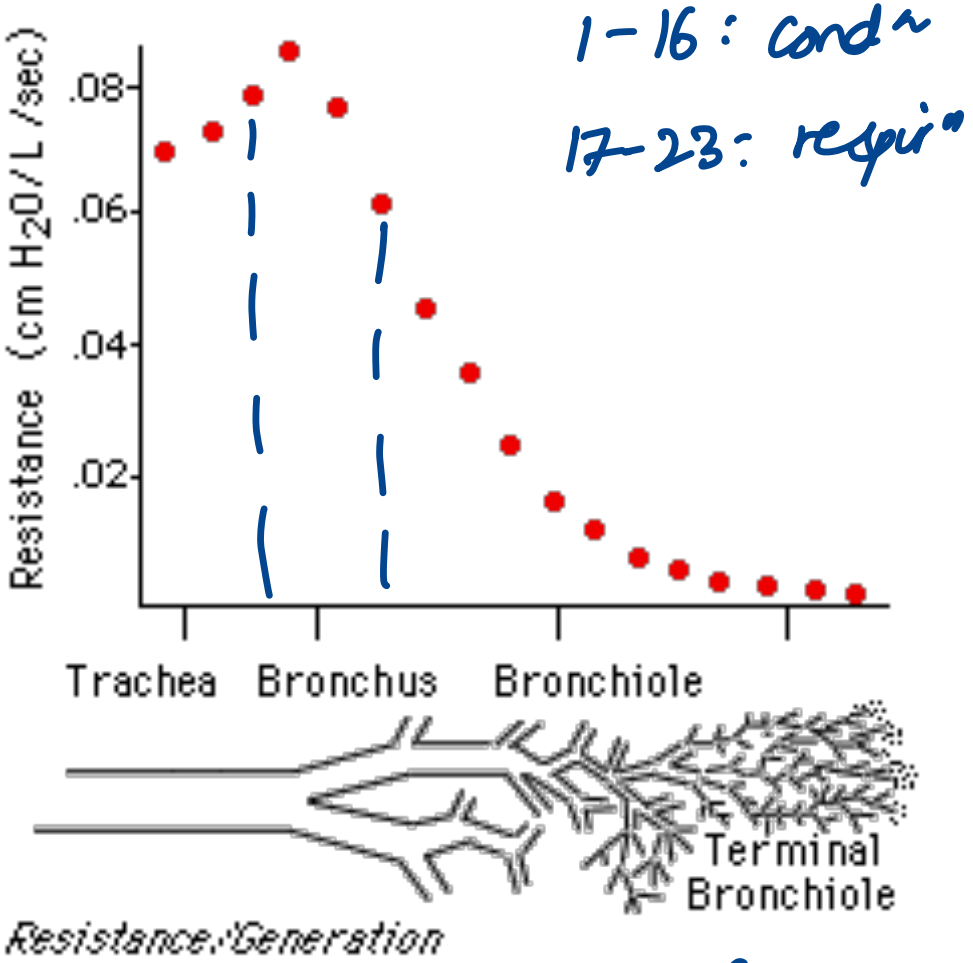
SUPINE: V/Q matching

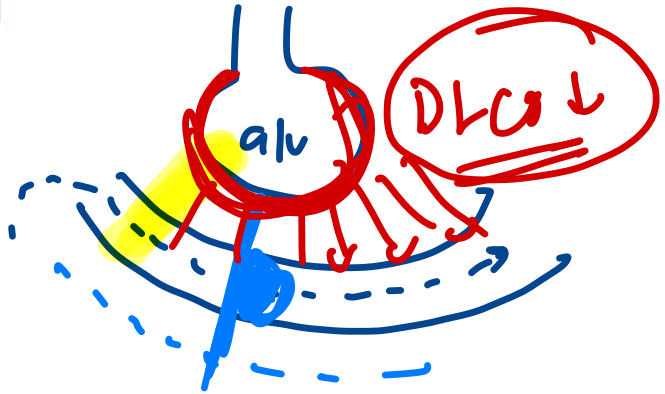
HYPOVOLEMIA:
PPV:
] zone 1 ↑↑

EXERCISE: vasodilⁿ → zone 3 ↑↑

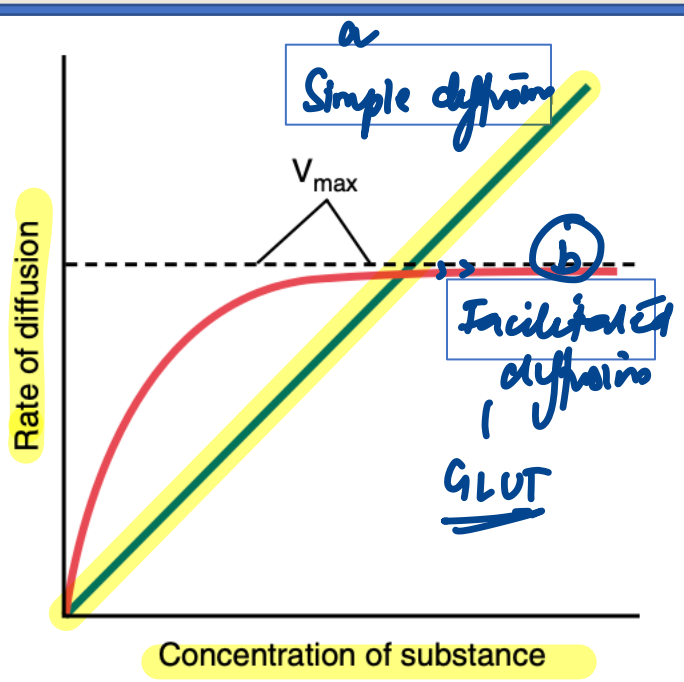


Pa = partial pressure of gas in pulmonary capillary blood
PA = partial pressure of gas in alveolar air





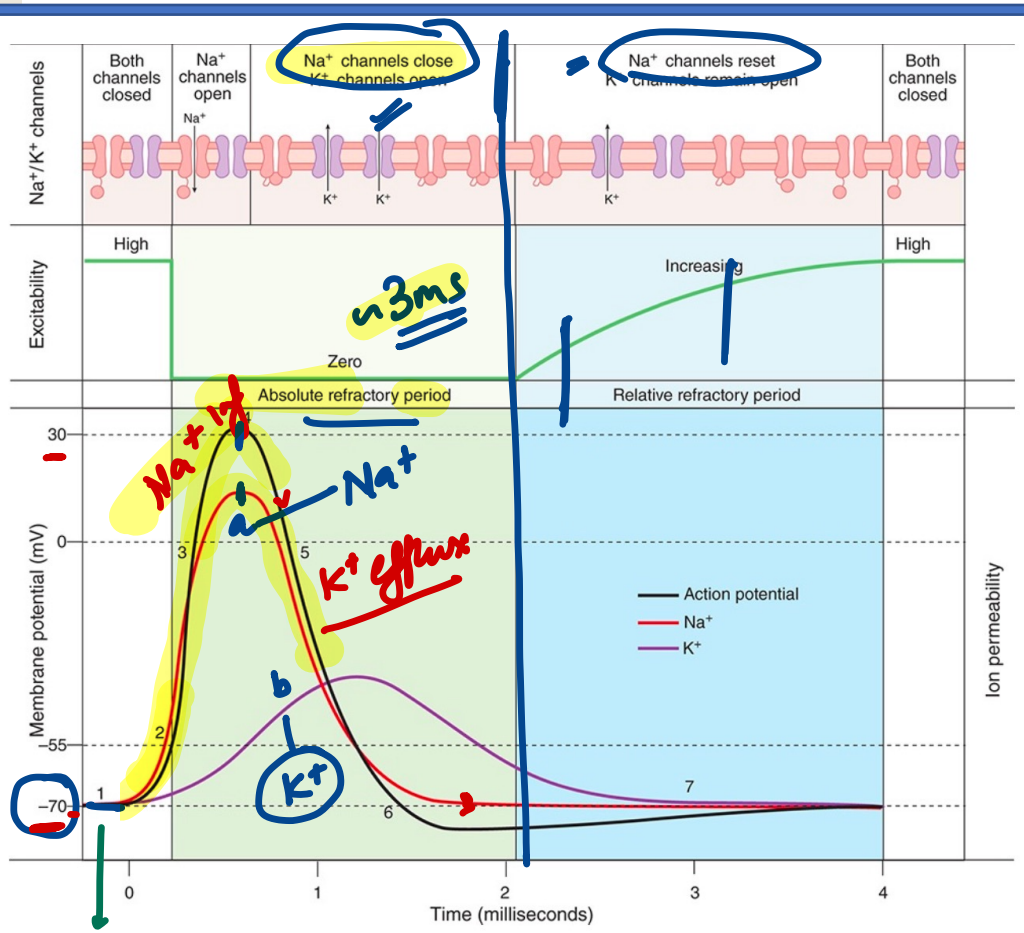
CELLULAR PHYSIOLOGY



a Simple diffusion

b Facilitated diffusion

GLUT

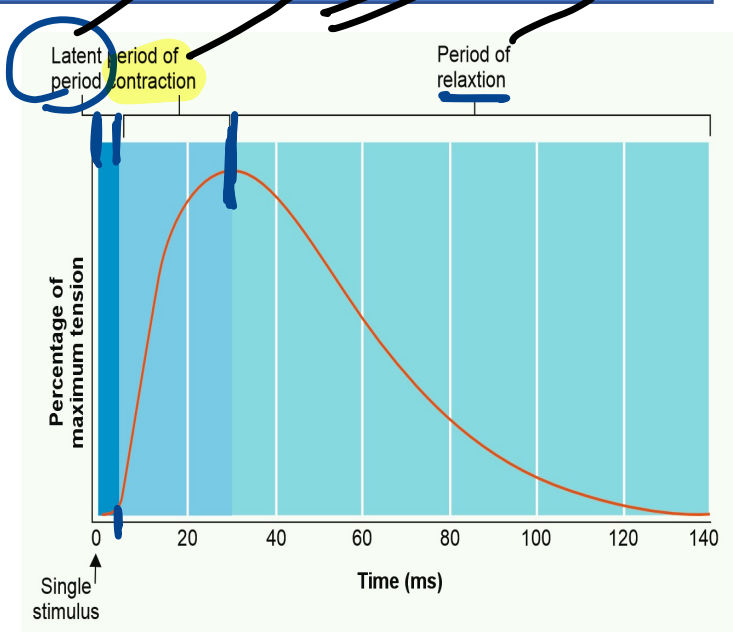


~3ms

Na+ inf

Na+

K+ efflux



tetanising freq = 1/CP

active tr — Primary
. Kt. Na
. proton

secondary
. SGLT
. Na–I symport

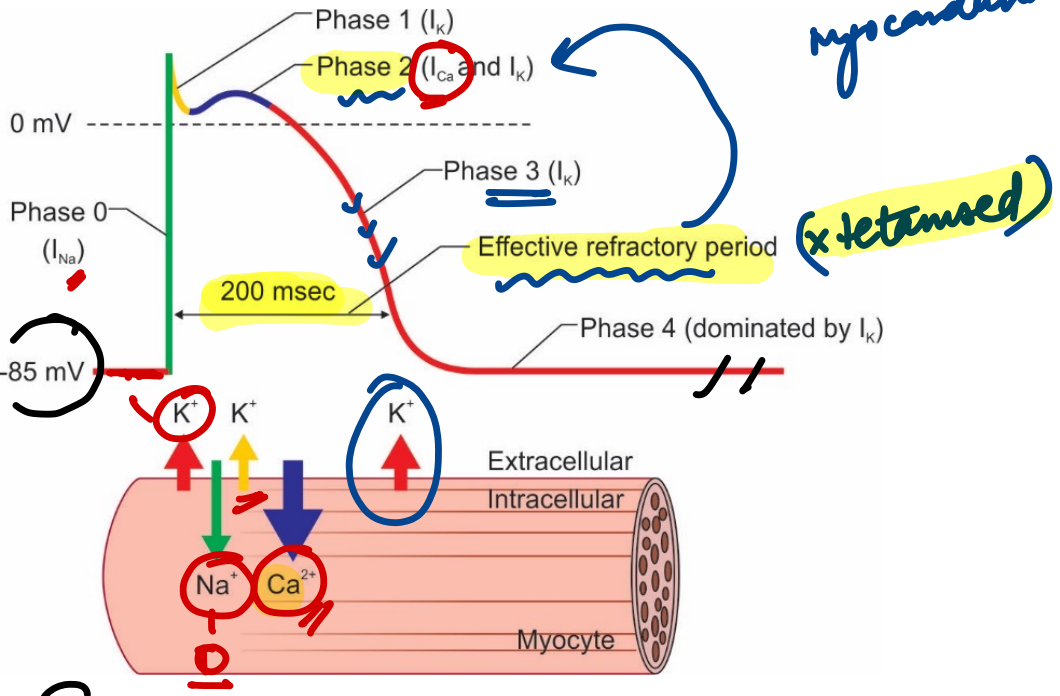
cotransp

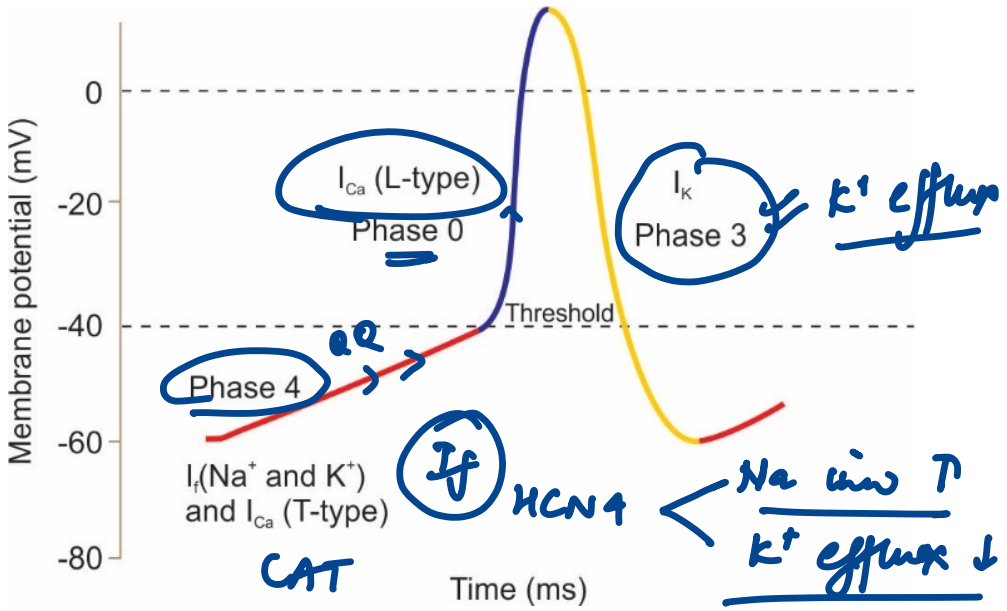
RMP → K+

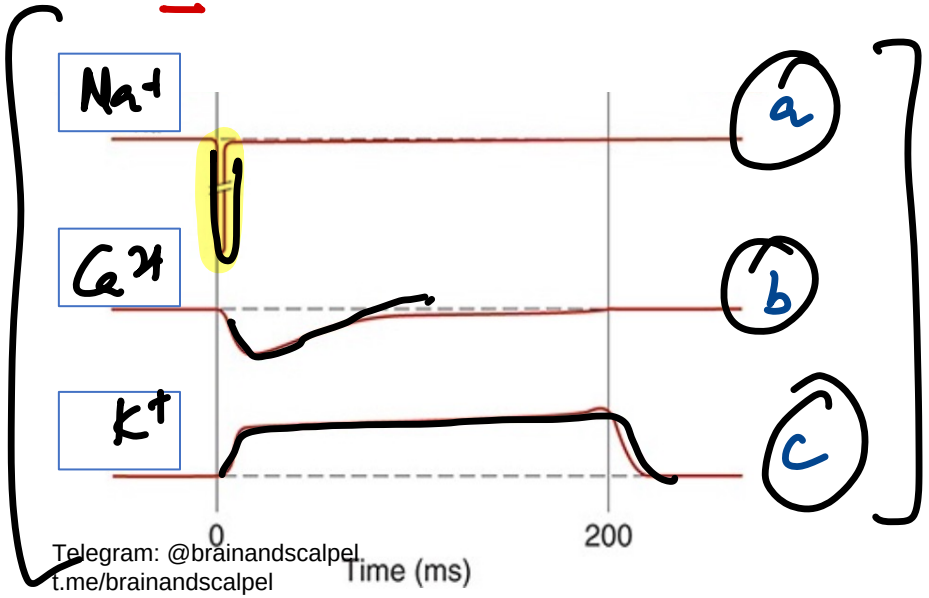
K+ K+ leaky K+

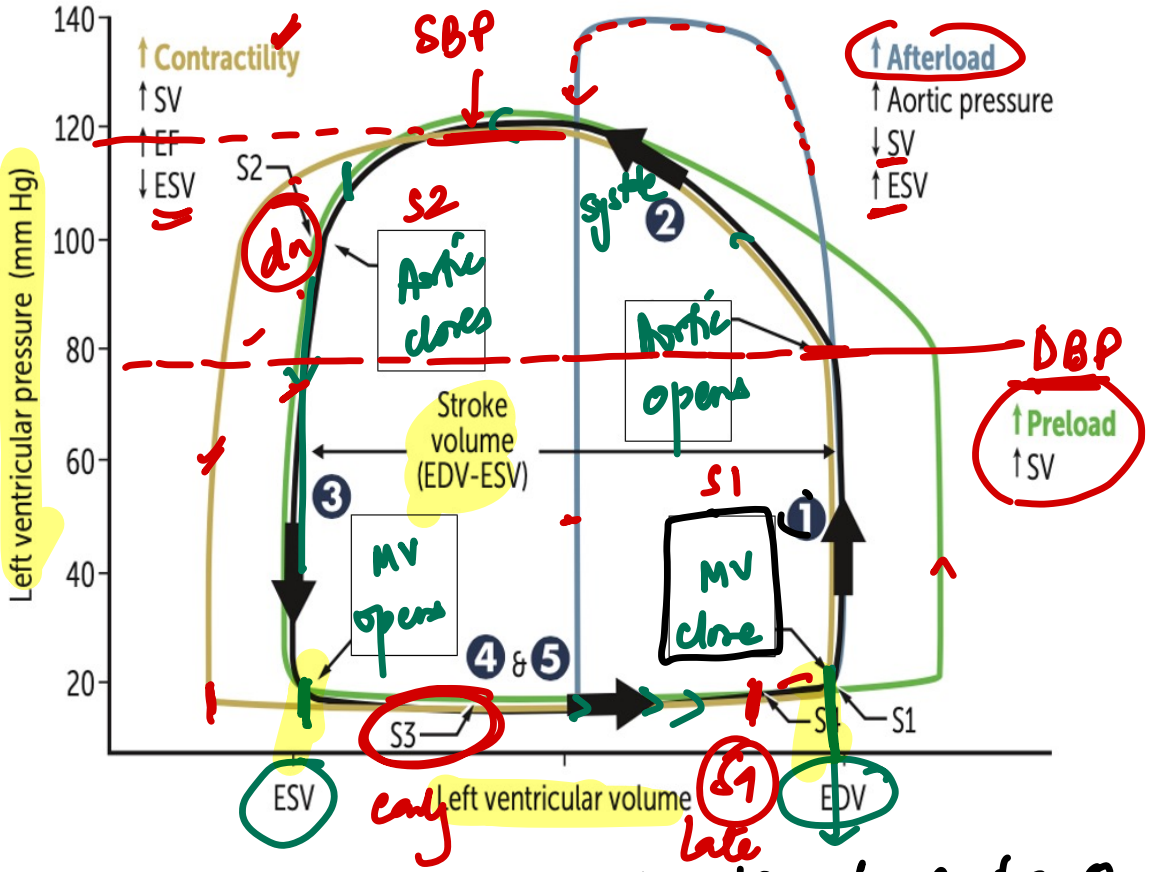
Nernst eqn – equilibrium

CVS PHYSIOLOGY





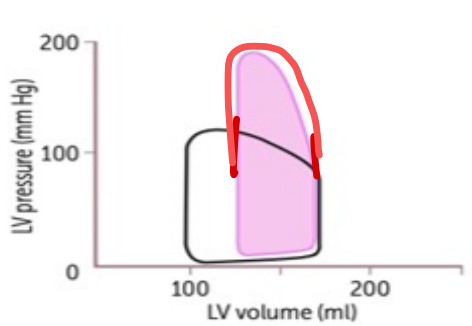




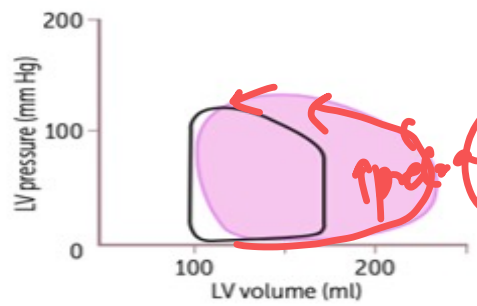
$EF = \frac{SV}{EDV}$

1- Isovol contrac

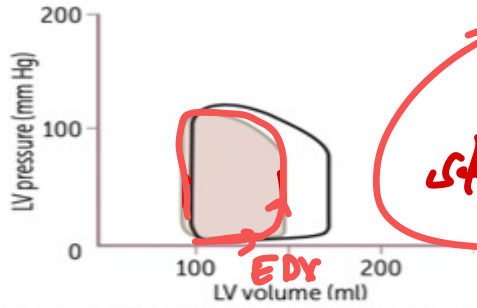
3- Isovol relax



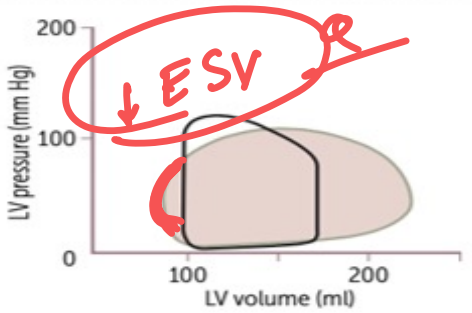
Aortic stenosis



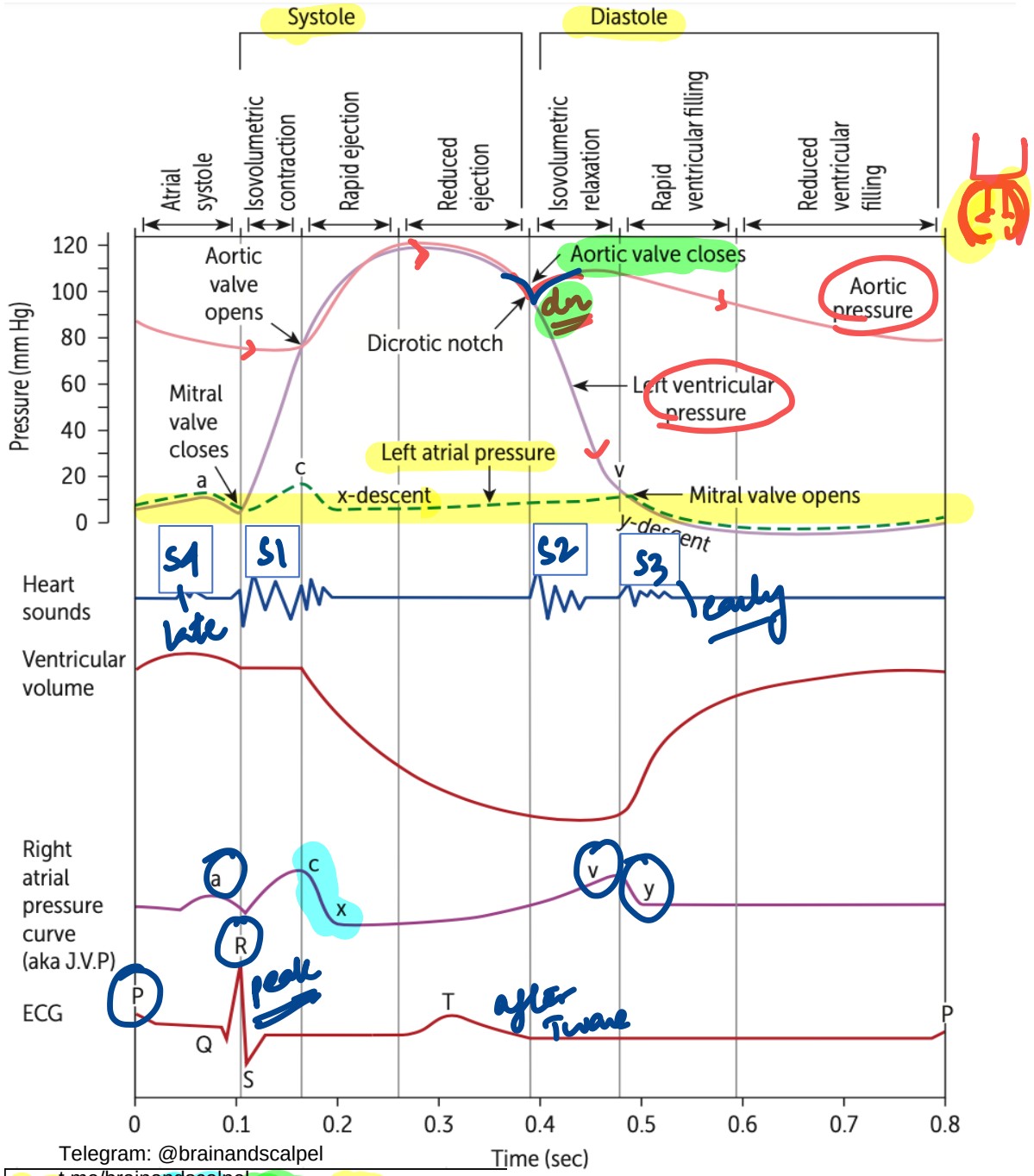
aortic regurg

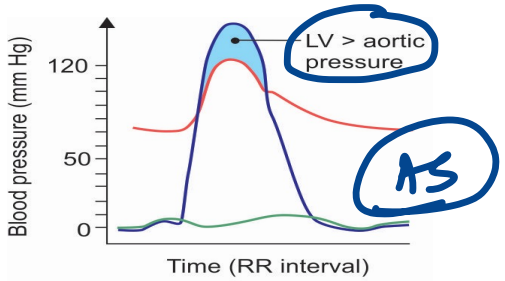


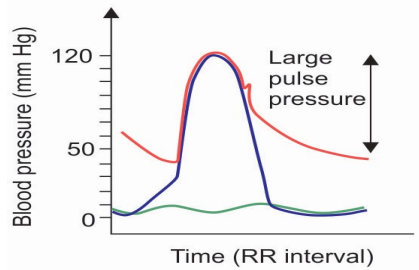
mitral stenosis

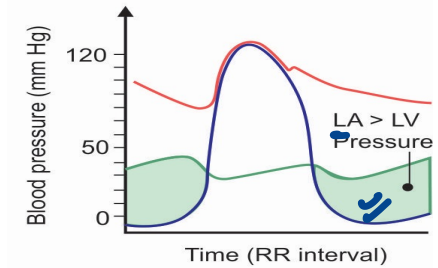


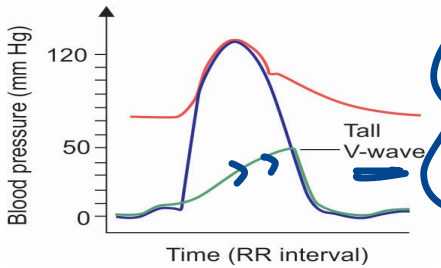
mitral regurgitation

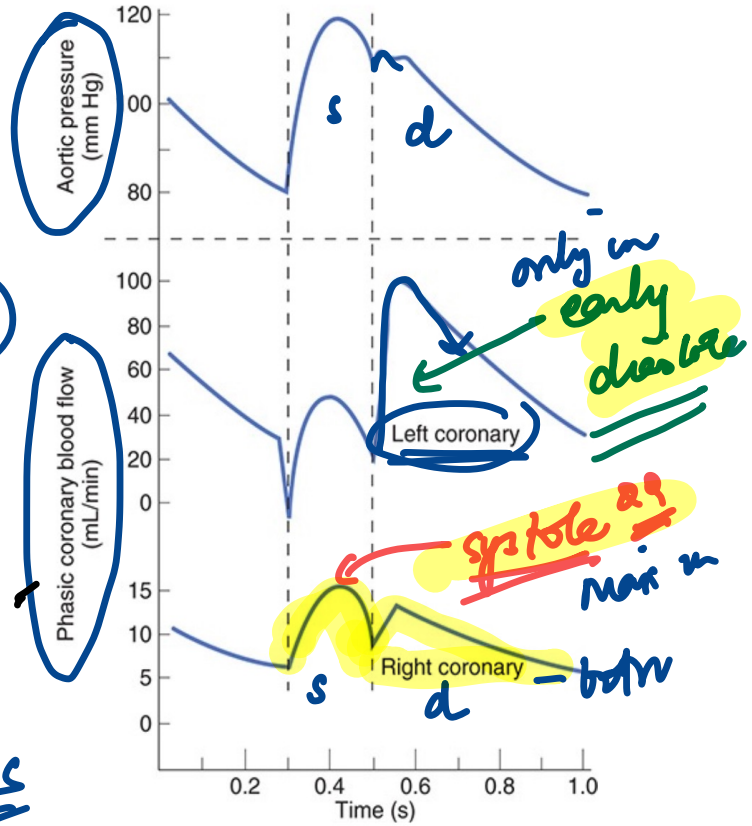




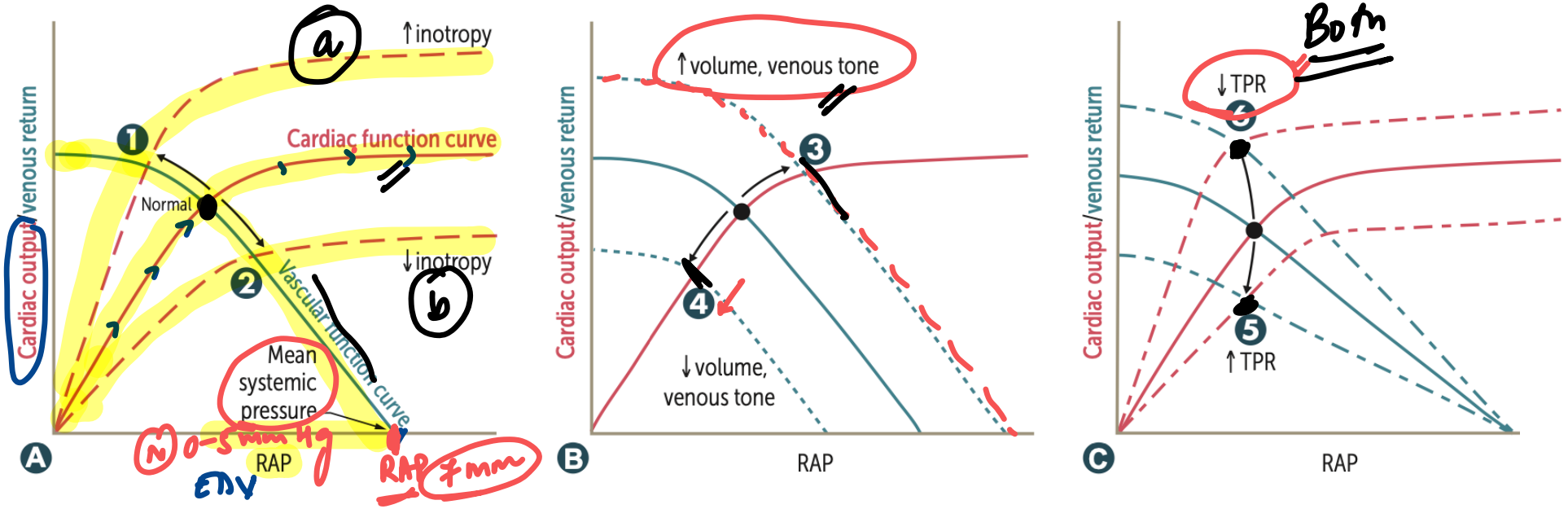






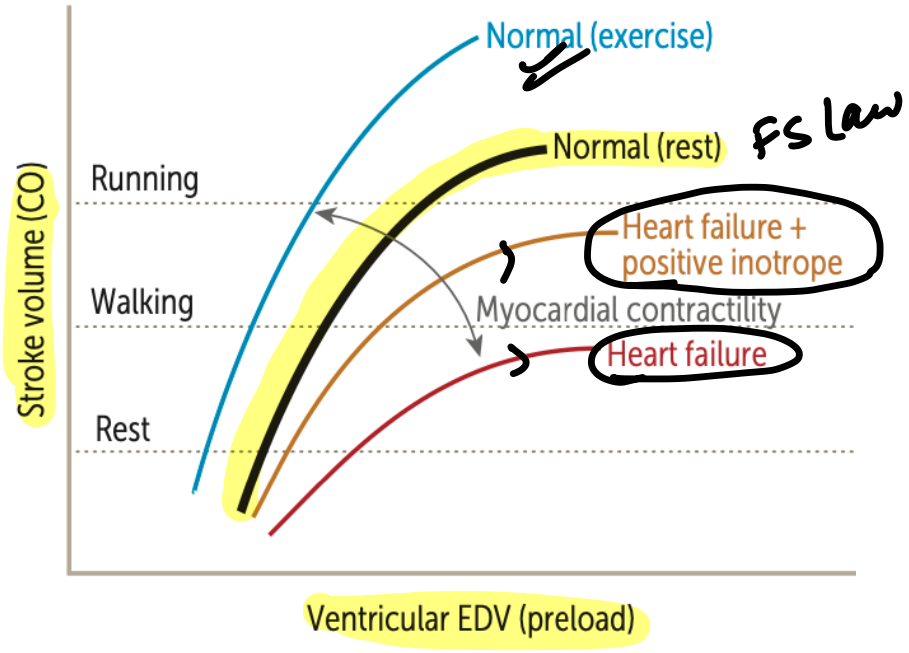


P a4 QRS 1 cx T 2dn v 3y



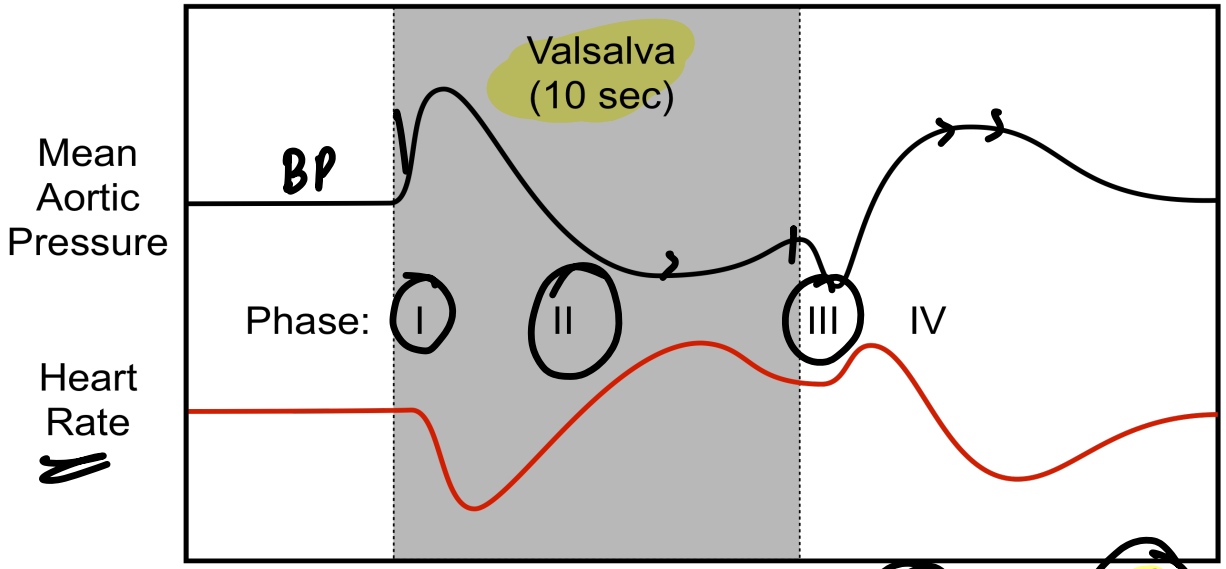
Intersection of curves = operating point of heart (ie, venous return and CO are equal, as circulatory system is a closed system).

GRAPH	EFFECT	EXAMPLES
A Inotropy	Changes in contractility → altered SV → altered CO/VR and RA pressure (RAP)	❶ Catecholamines, dobutamine, milrinone, digoxin, exercise ⊕ ❷ HF with reduced EF, narcotic overdose, sympathetic inhibition ⊖
B Venous return	Changes in circulating volume → altered RAP → altered SV → change in CO	❸ Fluid infusion, sympathetic activity, arteriovenous shunt ⊕ ❹ Acute hemorrhage, spinal anesthesia ⊖
C Total peripheral resistance	Changes in TPR → altered CO Change in RAP unpredictable	❺ Vasopressors ⊕ ❻ Exercise, arteriovenous shunt ⊖



FS law

FS law



I

II

III

IV

[forceful expiration closed glottis]

BP↑ intrathoracic pressure + BP

BP↓

preload↓

CO↓

reversal

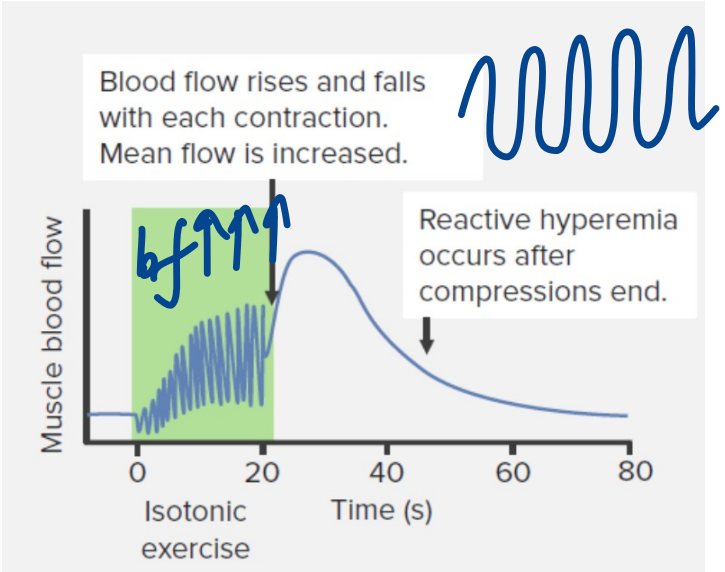
BP↓

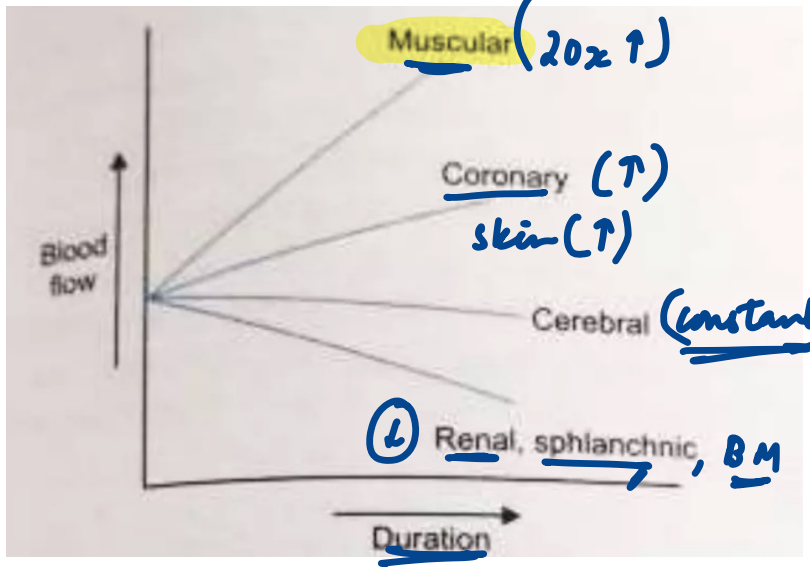
- preload↑

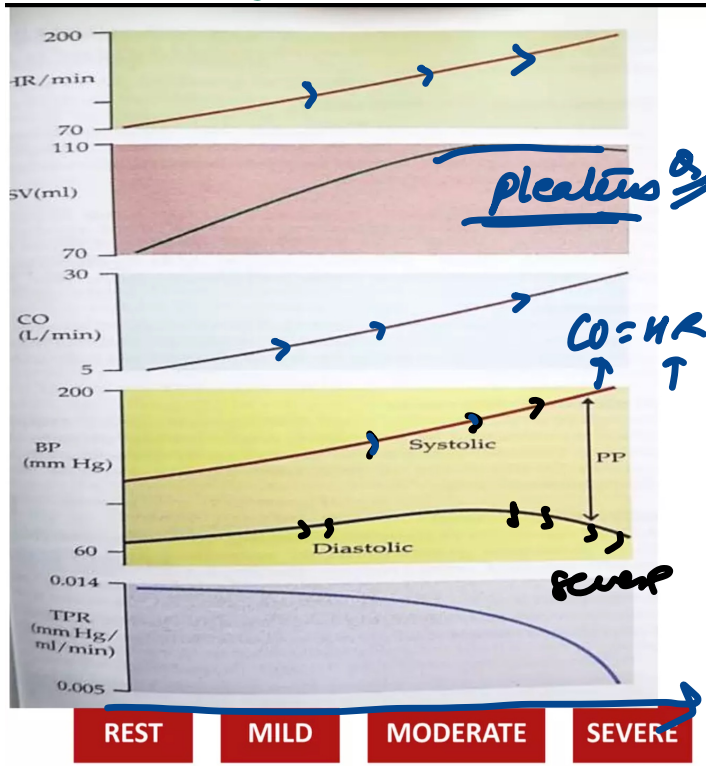
- BP↑

EXERCISE PHYSIOLOGY

Isometric - wall moving



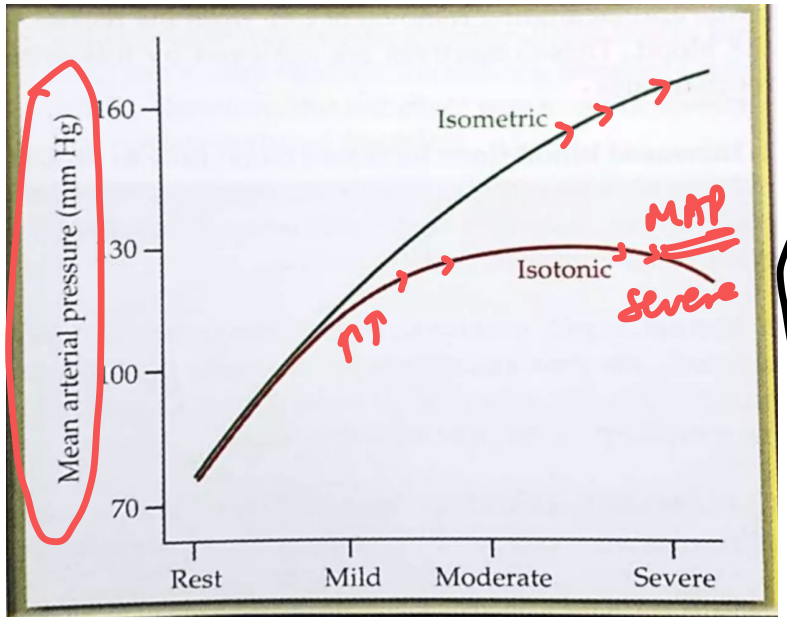




State	Skeletal muscle Blood flow
1. Rest	2-4ml/100gm/min (16% of Q)
2. Exercise	50-80ml/100gm/min (x20)

20x↑

Isotonic exercise



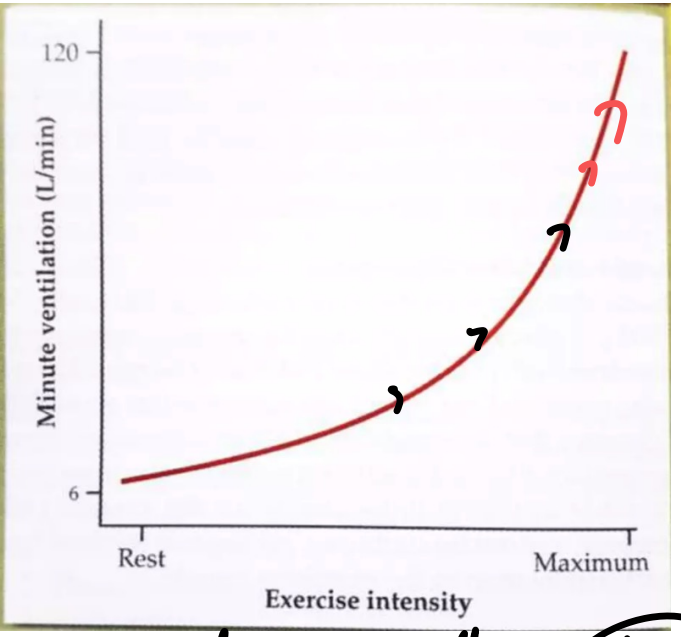
Isotonic exercise:
- CO: ↑
- HR: B_1 ↑
- SV: ↑
- SBP: ↑
- TPR: vasodilation ↓
- DBP: ↓
- MAP: ↑ ↓ severe

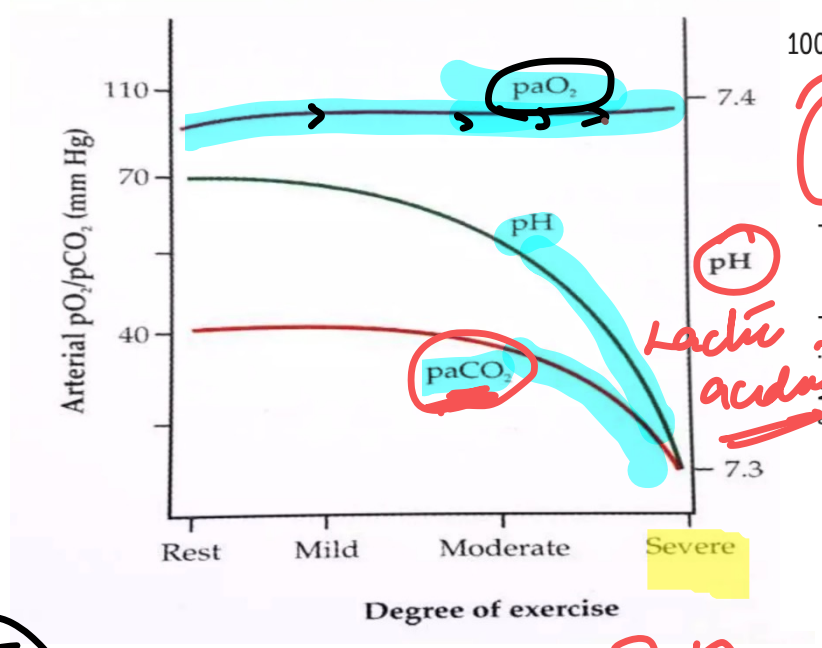
Isometric

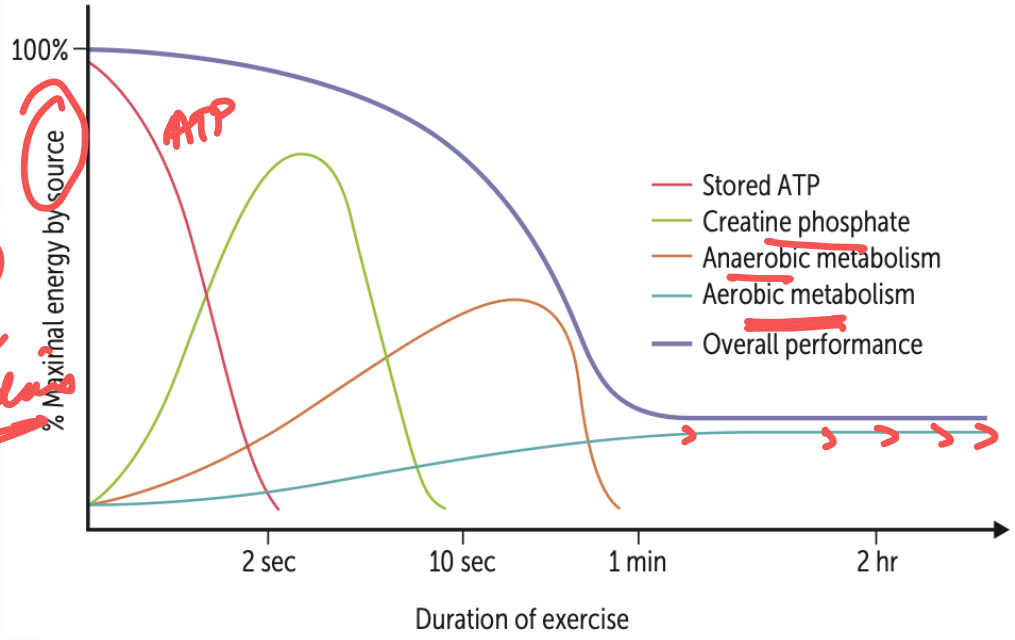
Isotonic exercise:
- CO: ↑
- HR: ↑
- SV: N
- SBP: ↑
- TPR: ↑
- DBP: ↑
- MAP: ↑

afterload ↑

EXERCISE PHYSIOLOGY







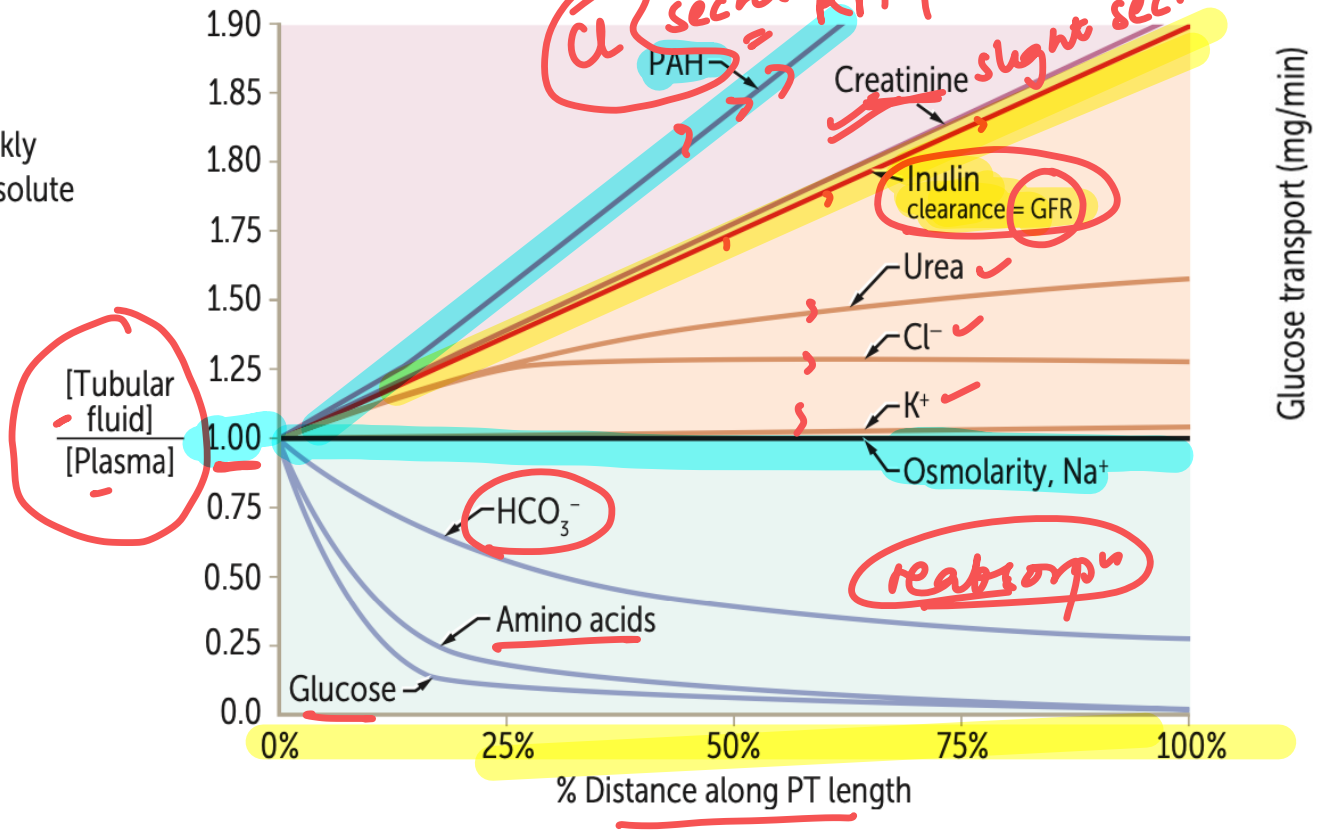
RENAL PHYSIOLOGY

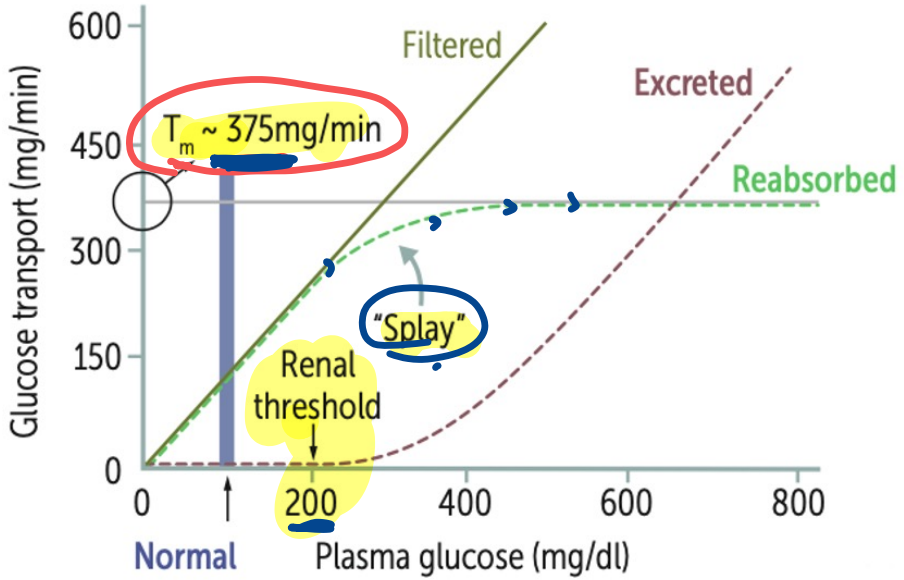
SGLT2

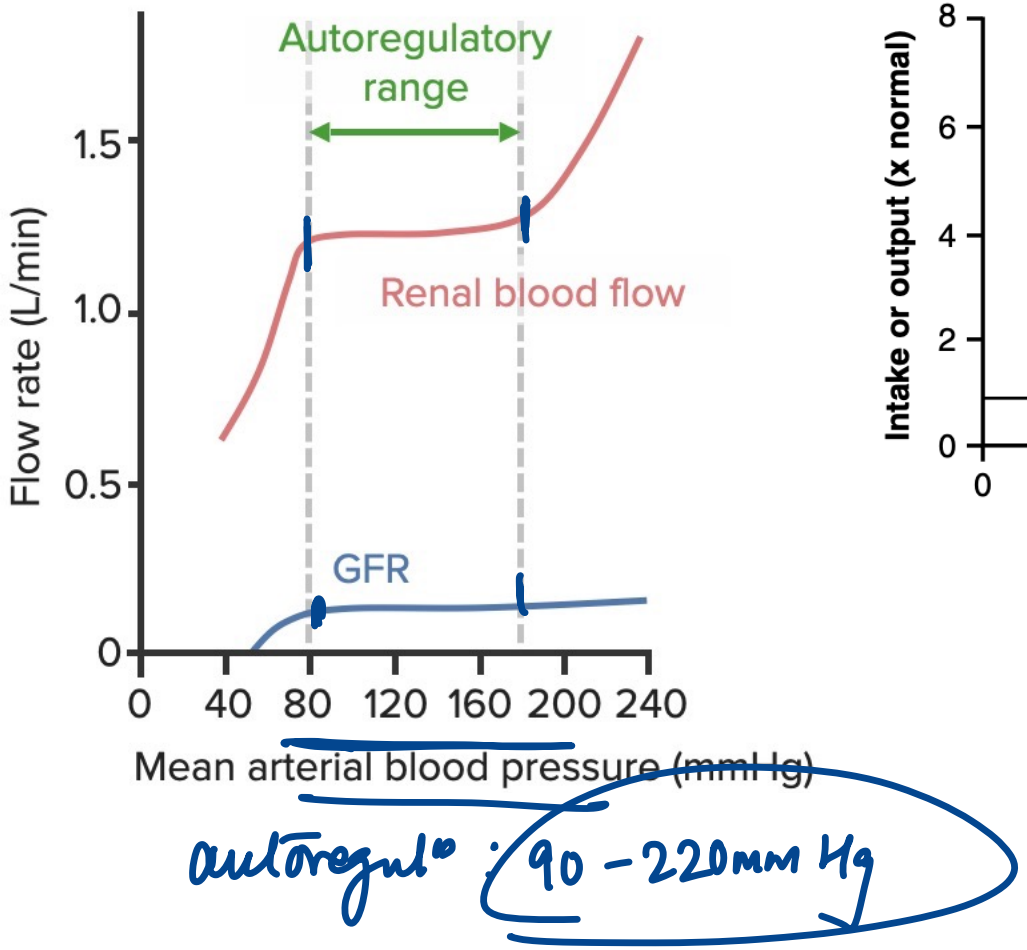
[TF/P] > 1
when solute is reabsorbed less quickly than water or when solute is secreted

[TF/P] = 1
when solute and water are reabsorbed at the same rate

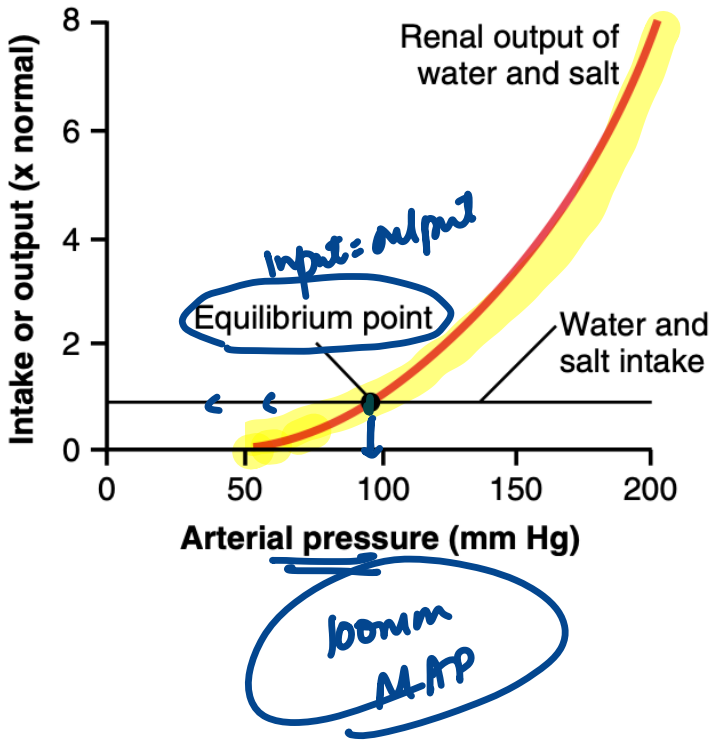
[TF/P] < 1
when solute is reabsorbed more quickly than water





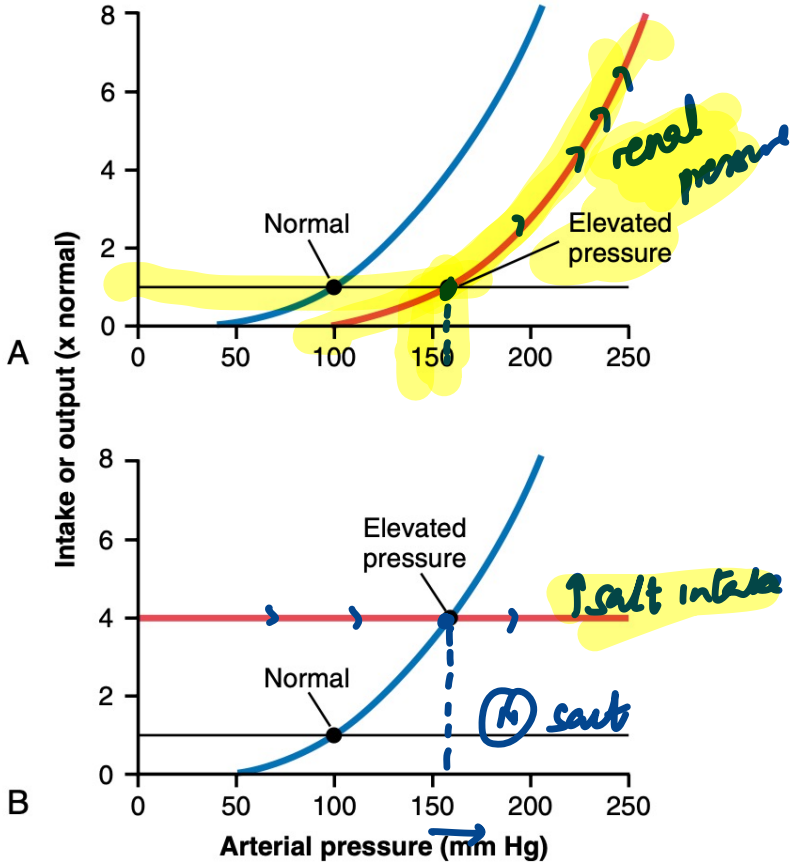


autoregul° : 90 – 220mm Hg



input = output

100mm MAP

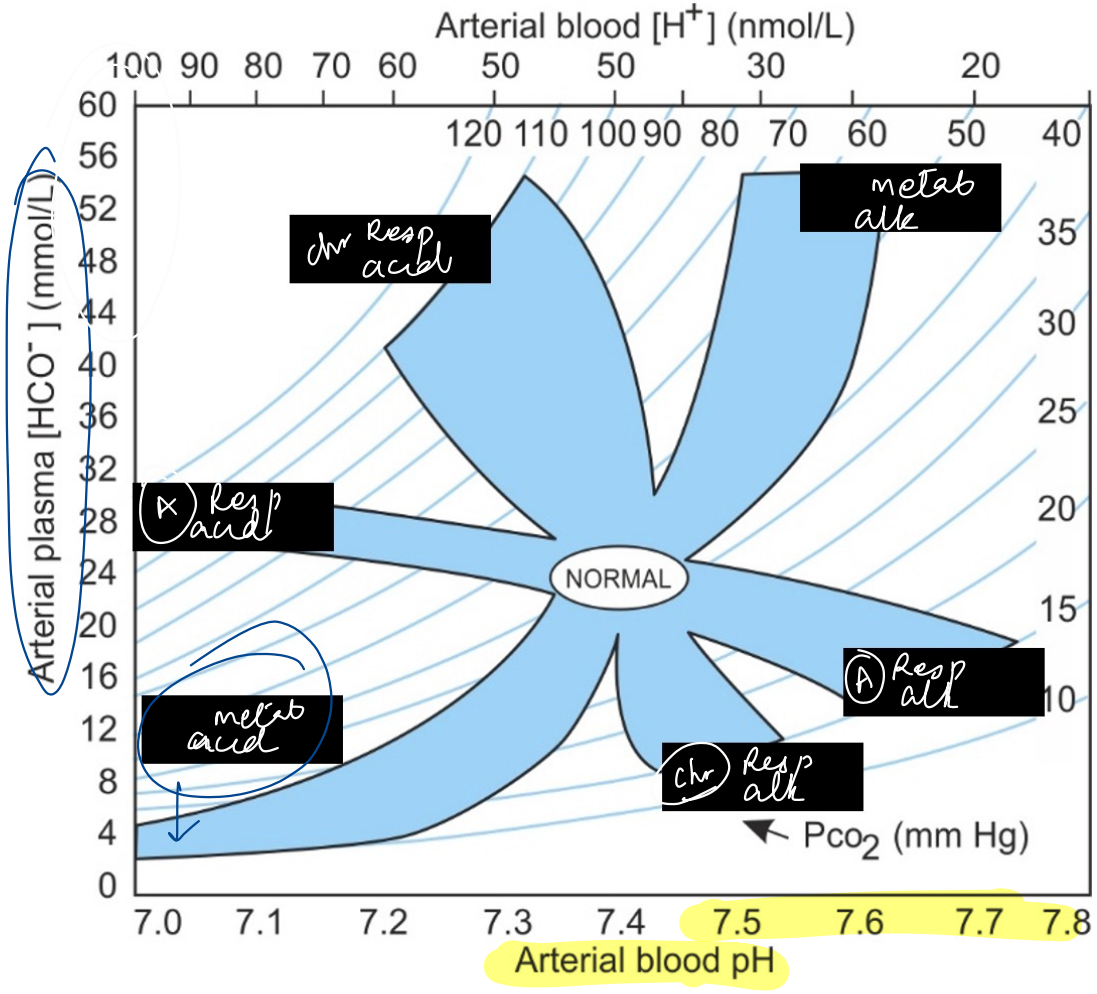


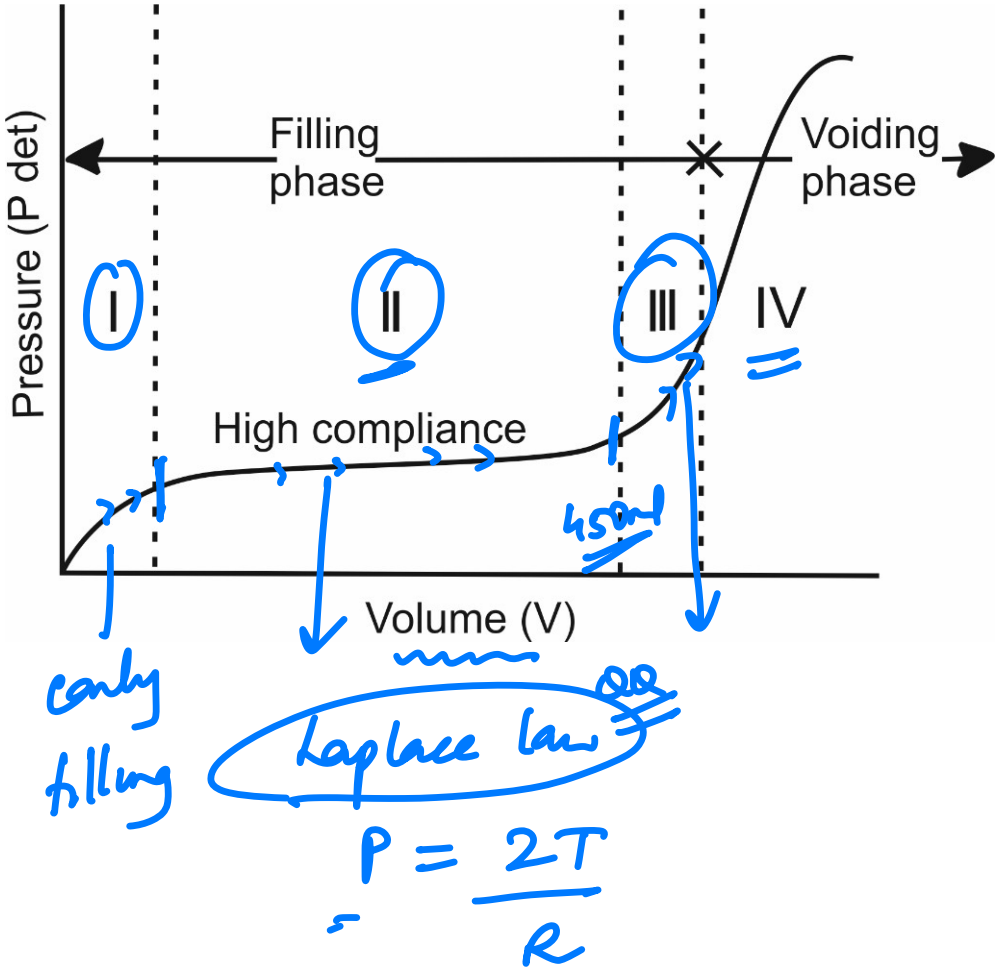
↑ renal pressure

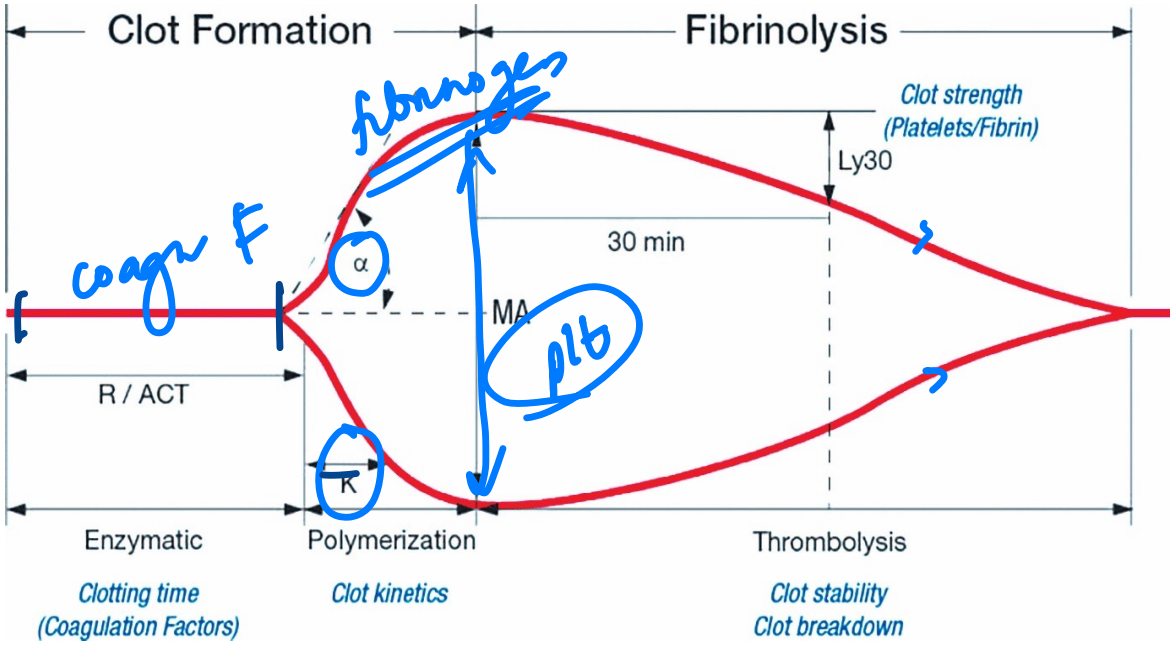
↑ salt intake

↑ salt

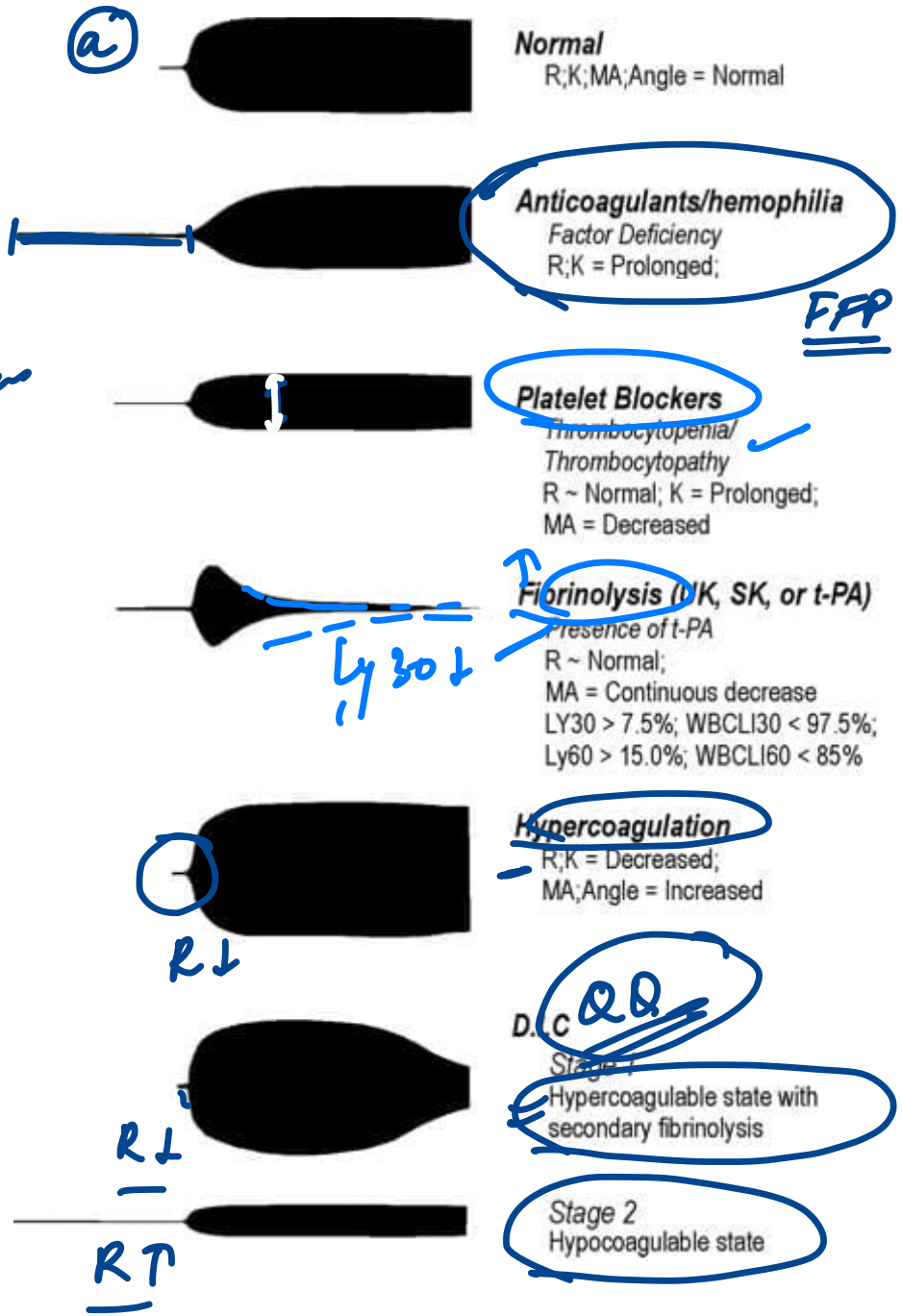
long-term determinant of arterial ↑

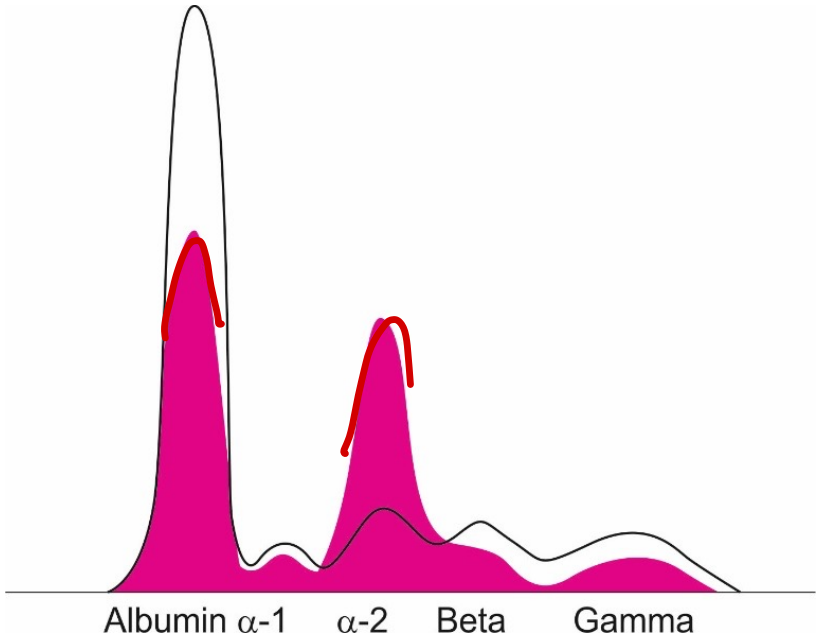


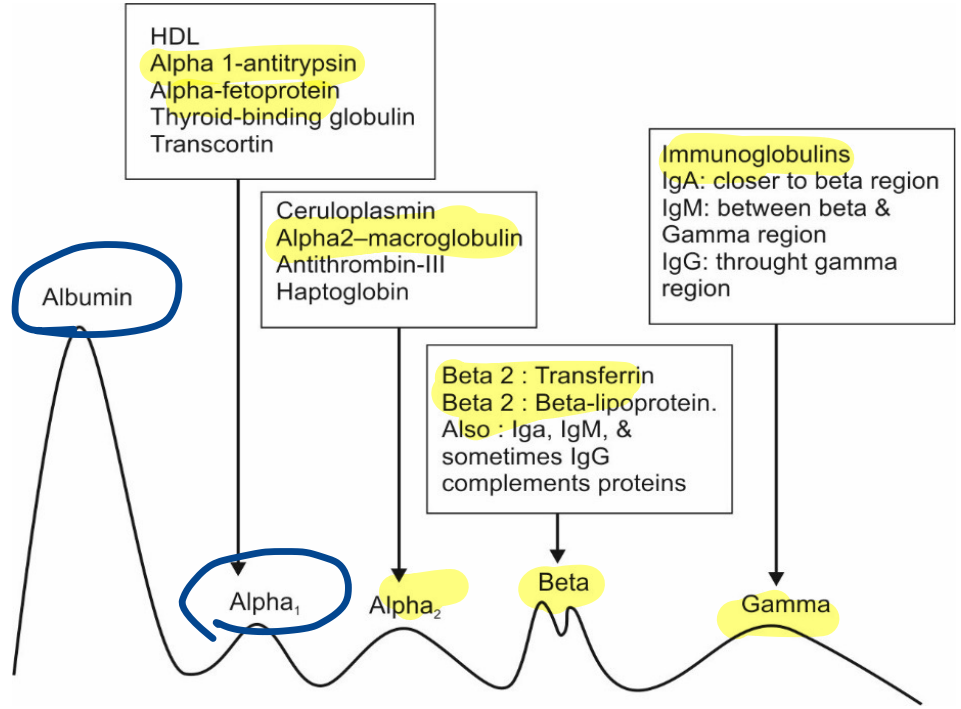




TEG	ROTEM	Description	Normal	Abnormality: Cause	Treatment
Reaction Time (R value)	Clotting Time (CT)	Time till initiation of fibrin clot formation	5 - 10 min	↑ R value: ↓ factors	FFP protamine
K value	Clot Formation Time (CFT)	Time to achieve 20 mm clot on assay representing thrombin-platelet interaction	1 - 5 min	↑ K/CFT value: ↓ fibrinogen	Cryoprecipitate Fibrinogen
α-angle	α-angle	Rate at which fibrin cross-linking occurs	45 - 75°	↓ α angle: ↓ fibrinogen	Cryoprecipitate Fibrinogen
Maximum Amplitude (MA)	Maximum Clot Firmness (MCF)	Maximum strength of clot	50 - 75 mm	↓ MA/MCF: ↓ platelet count and/or function	Platelets DDAVP
LY-30	Clot Lysis (CL)	Degradation of clot 30 minutes after MA/MCF	0 - 10%	↑ LY-30/CL: ↑ clot breakdown	TXA Amicar



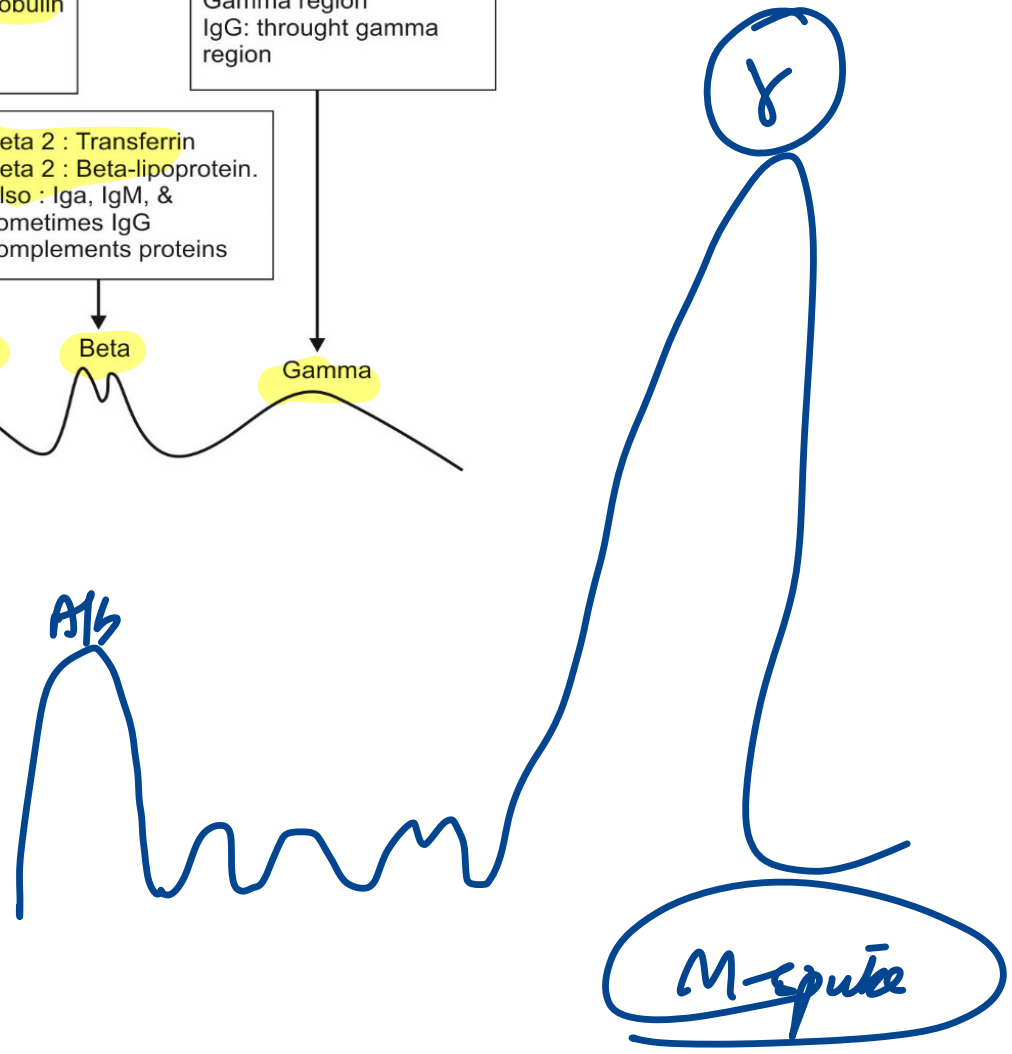


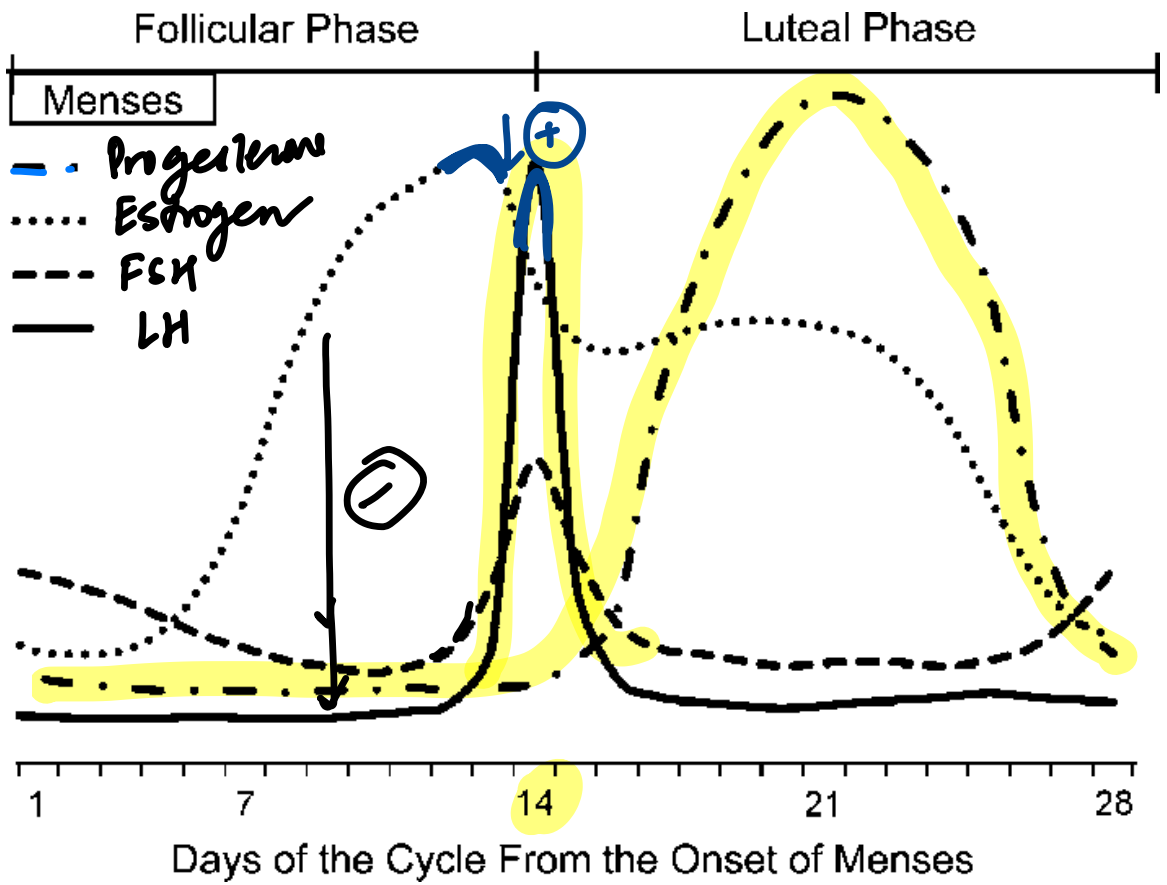


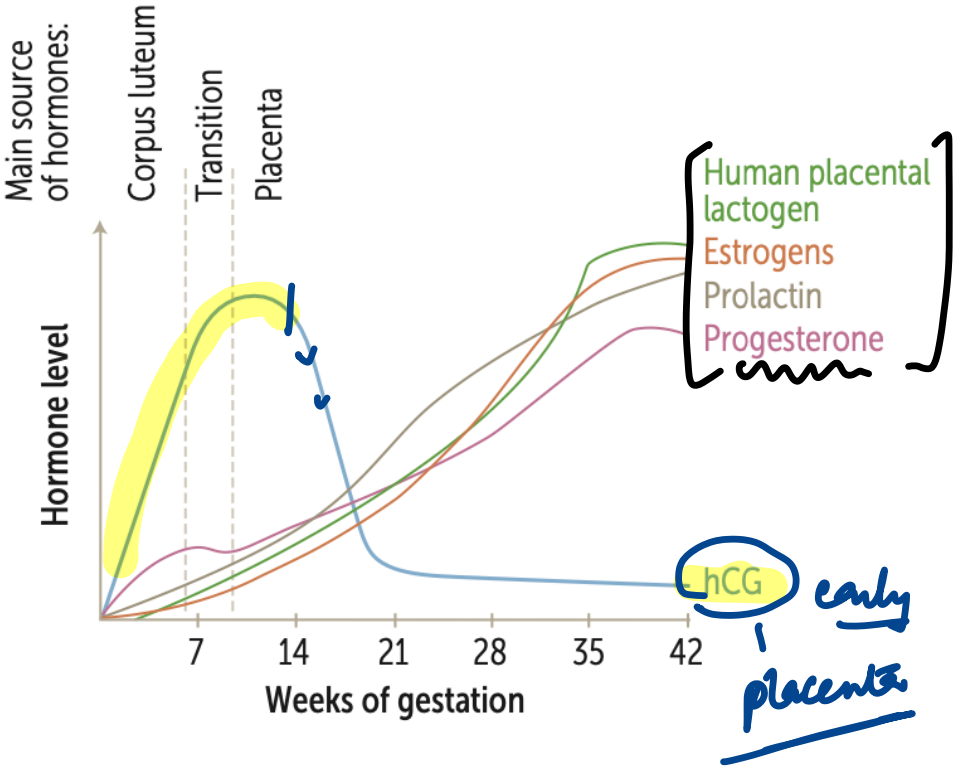
Alb ↓ α2 ↑

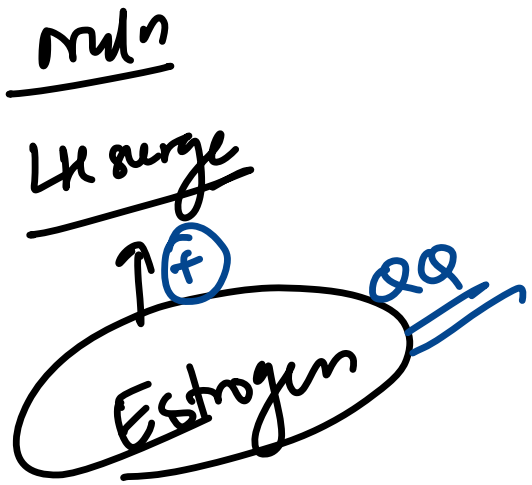
~~DD~~ Nephrotic Sx → minimal change disease

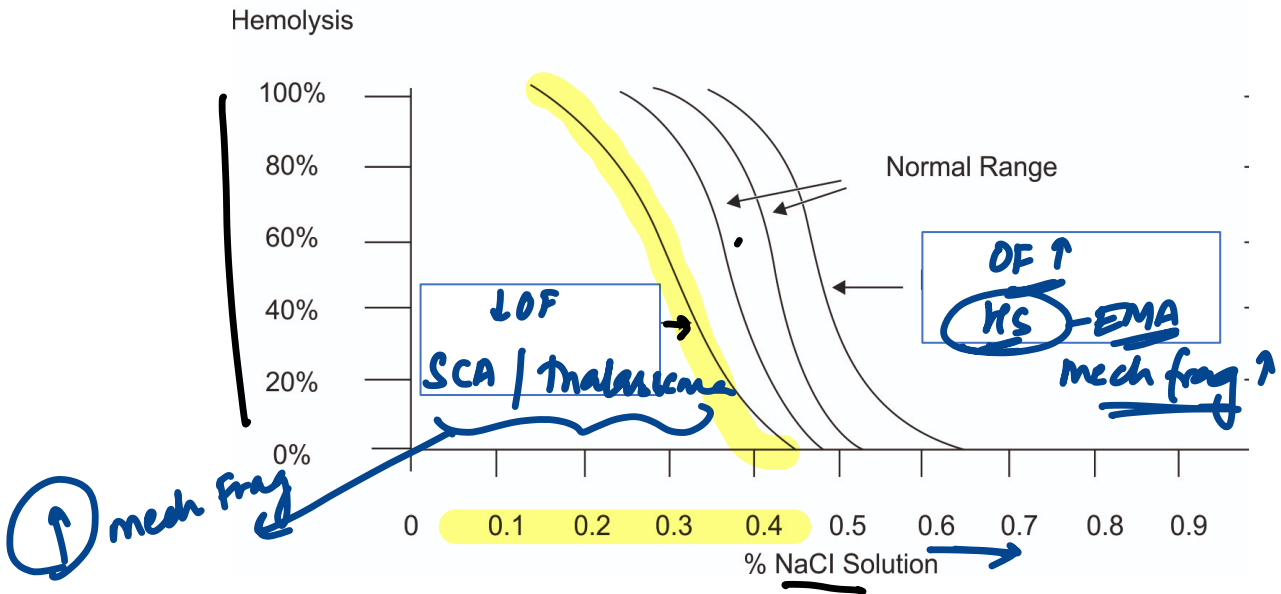
MM :

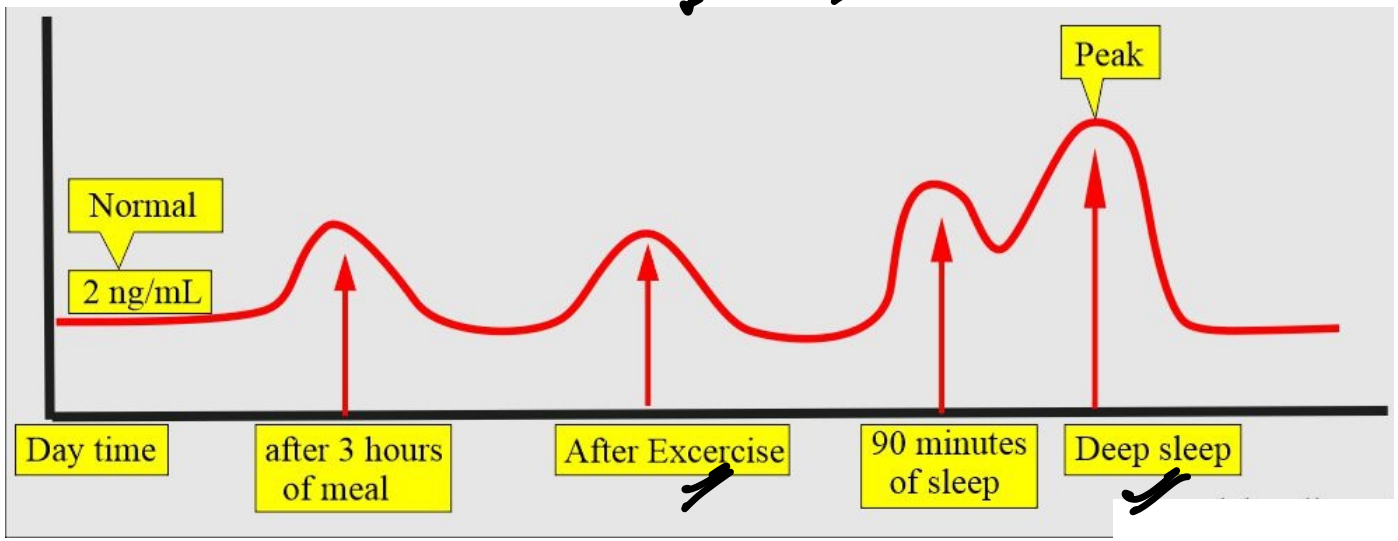


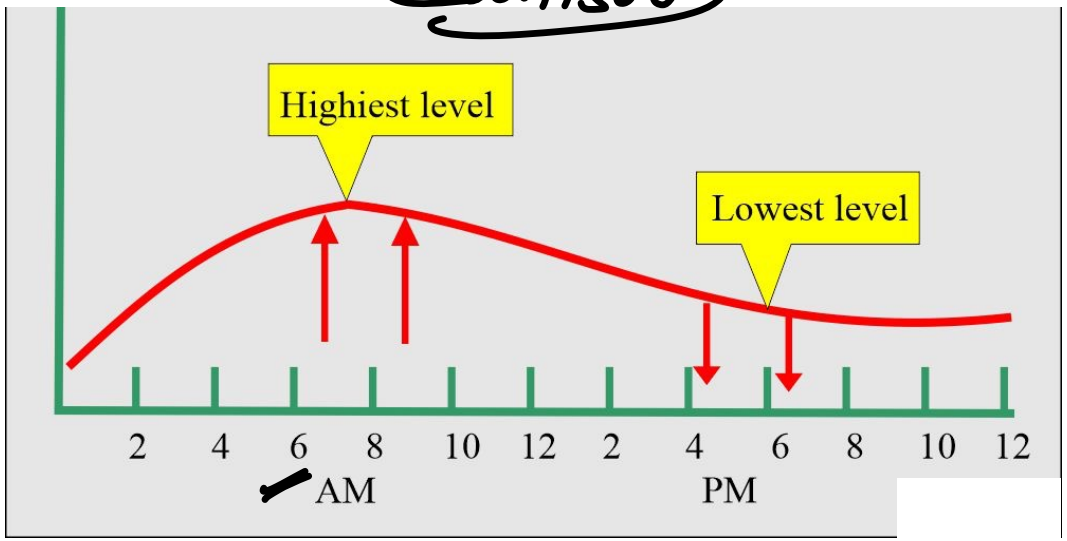


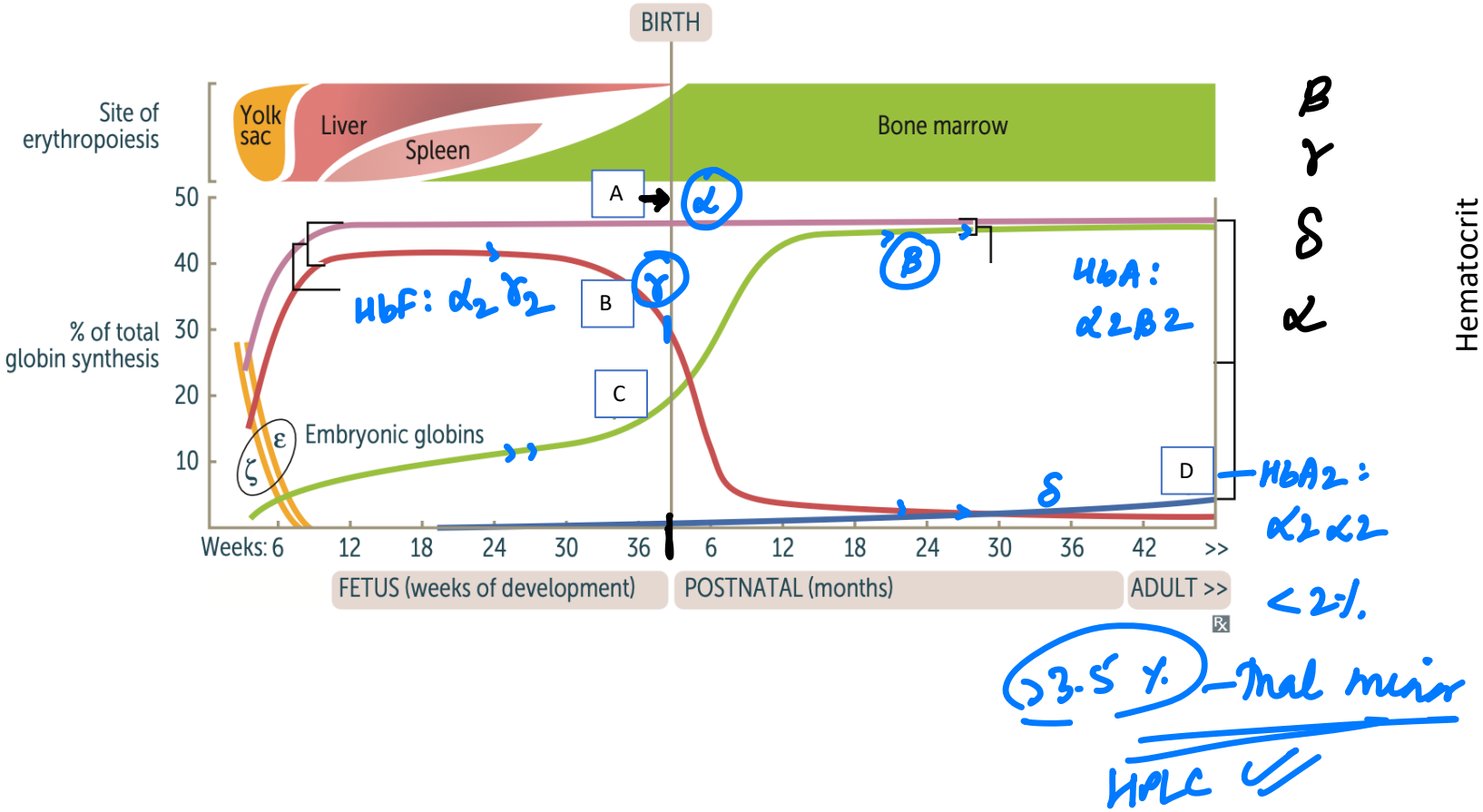


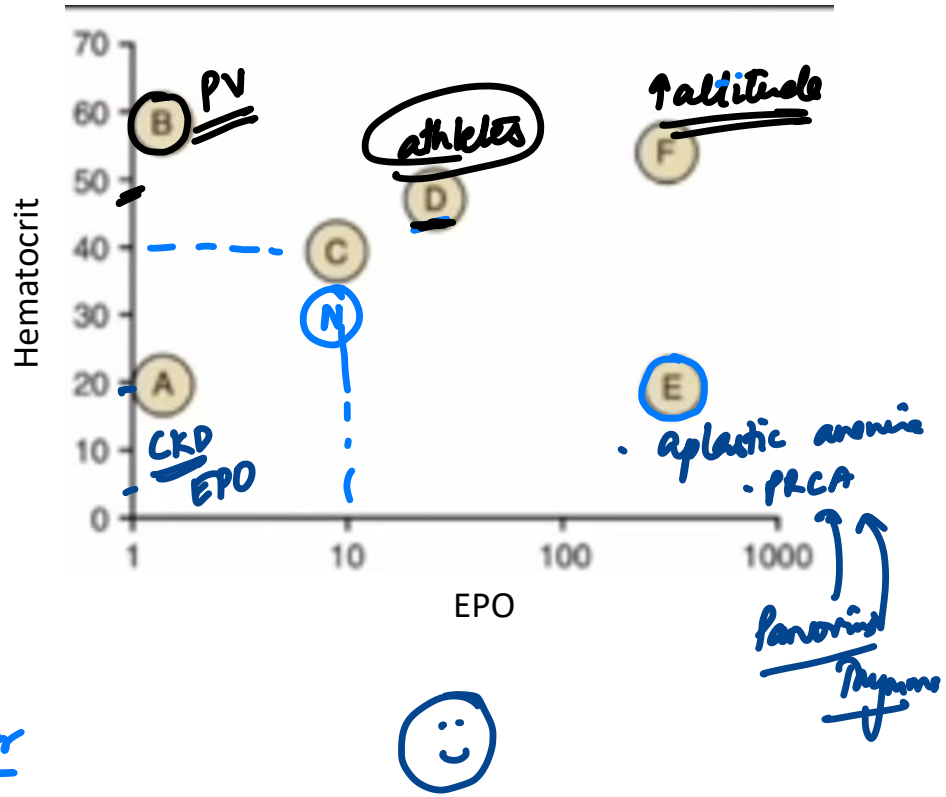


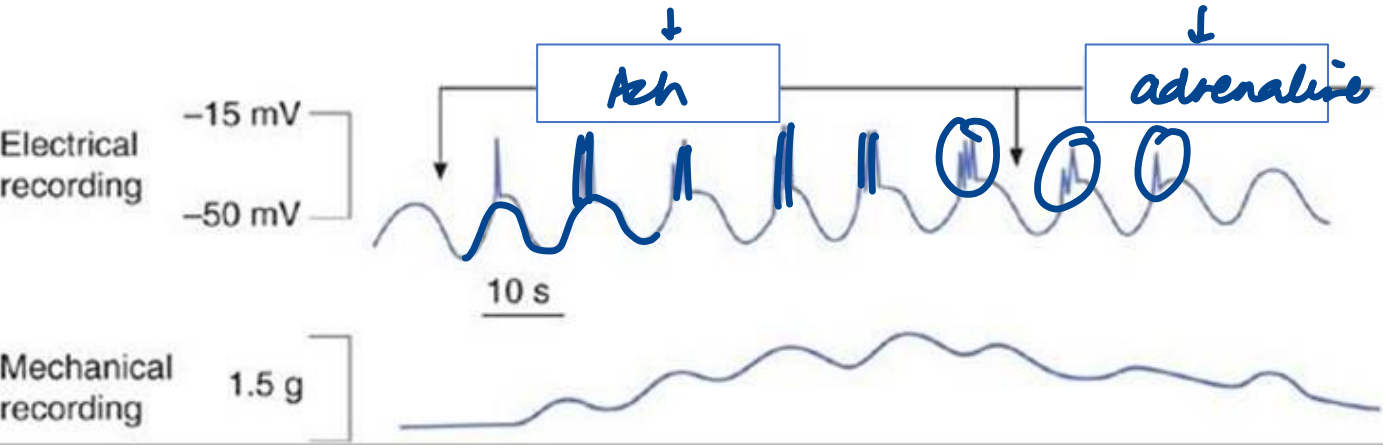


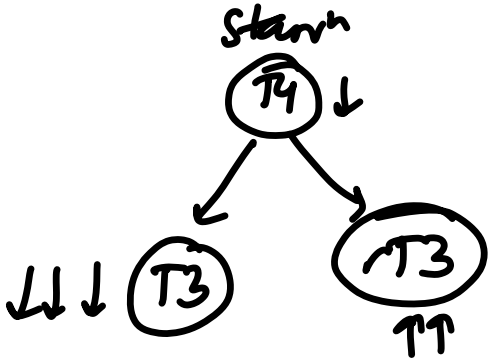


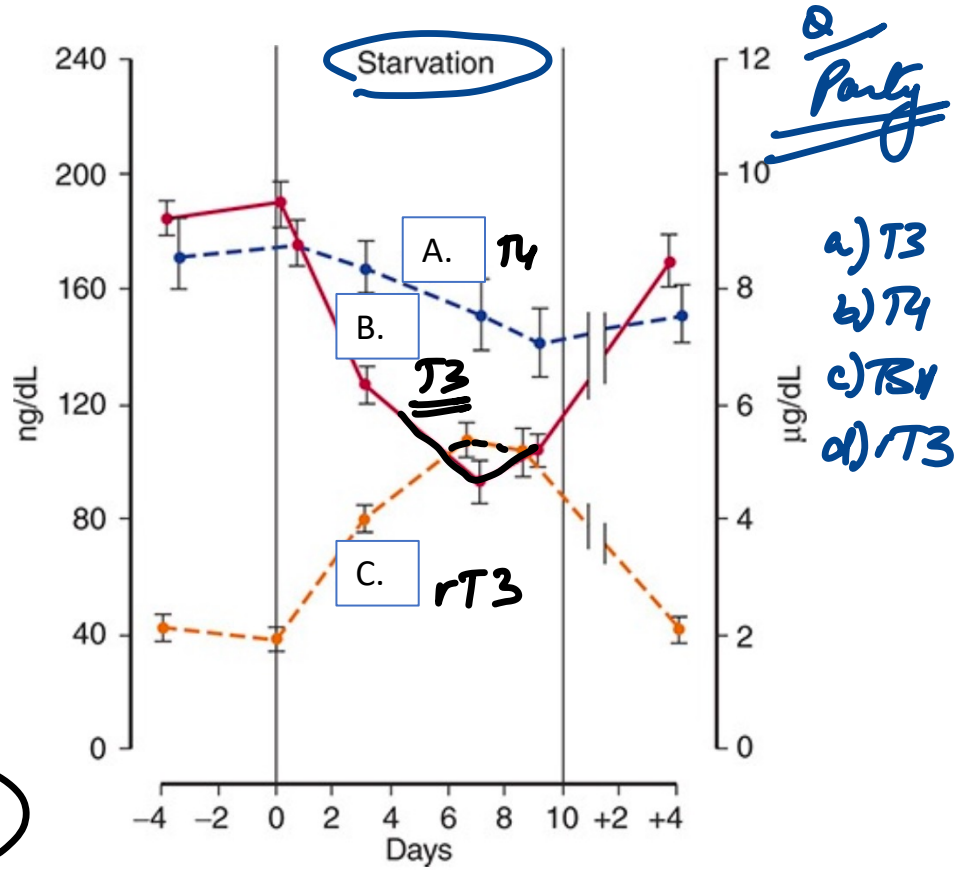






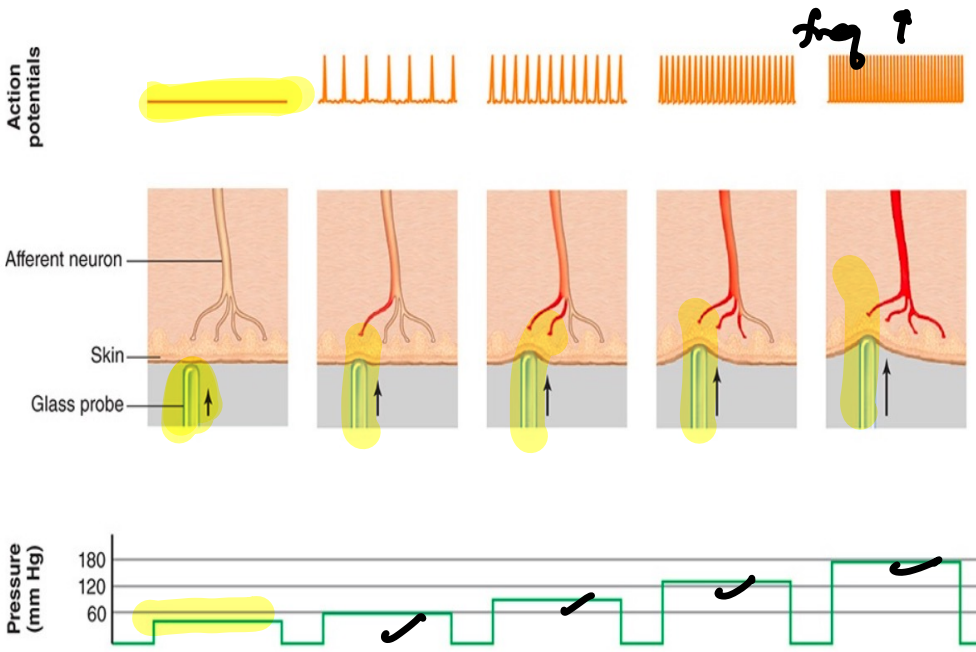






Q Party

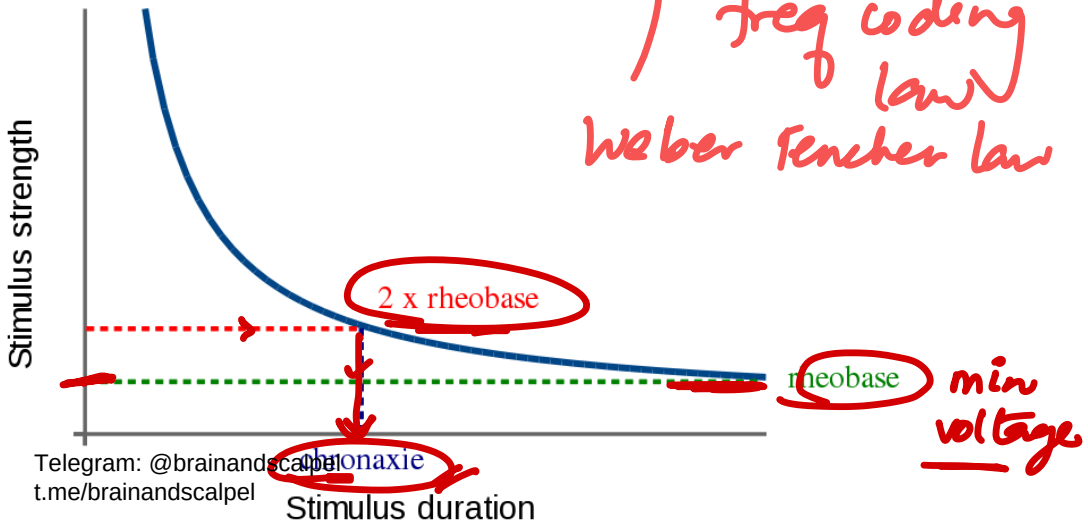
a) T3
b) T4
c) TBG
d) rT3

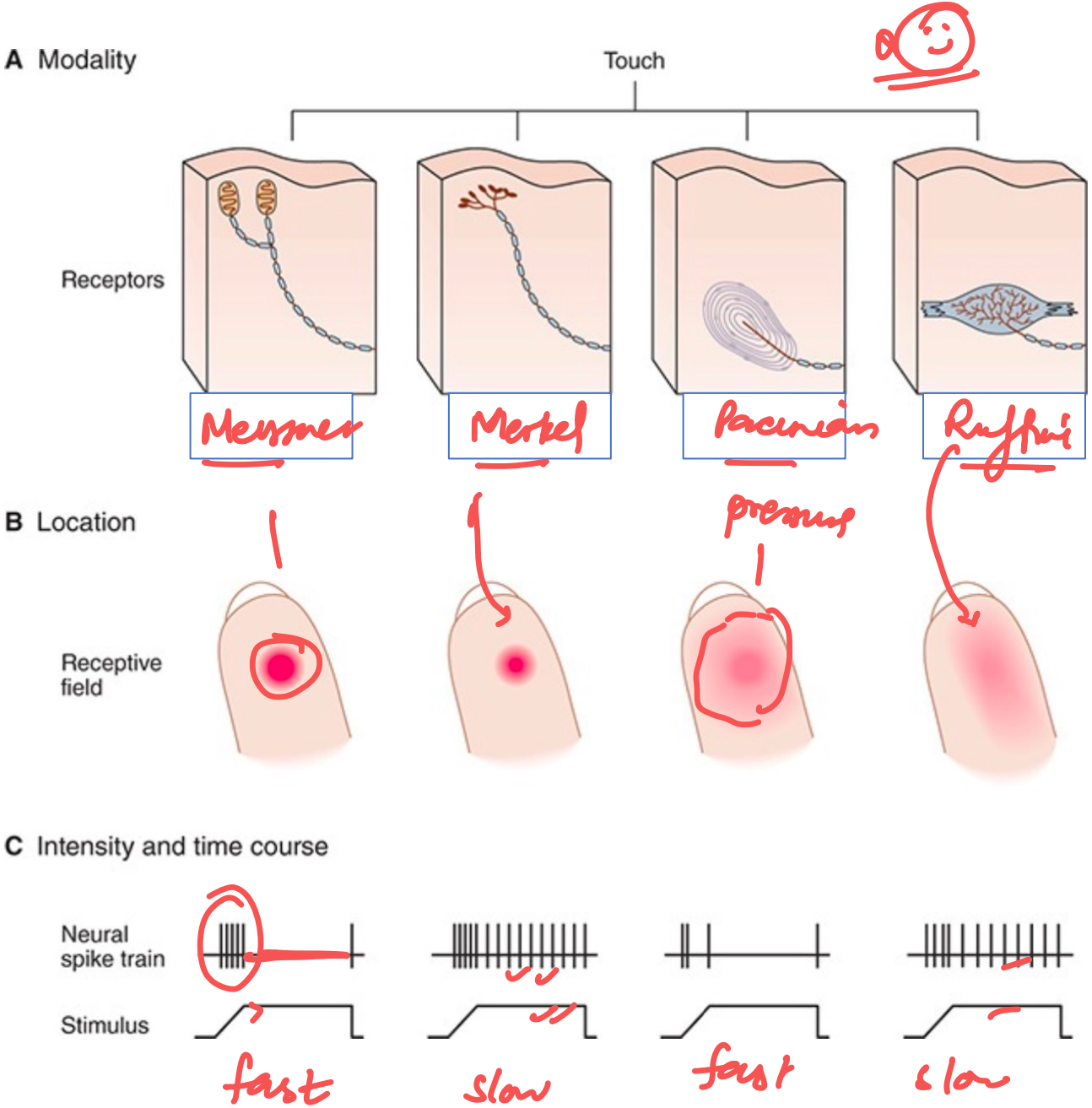


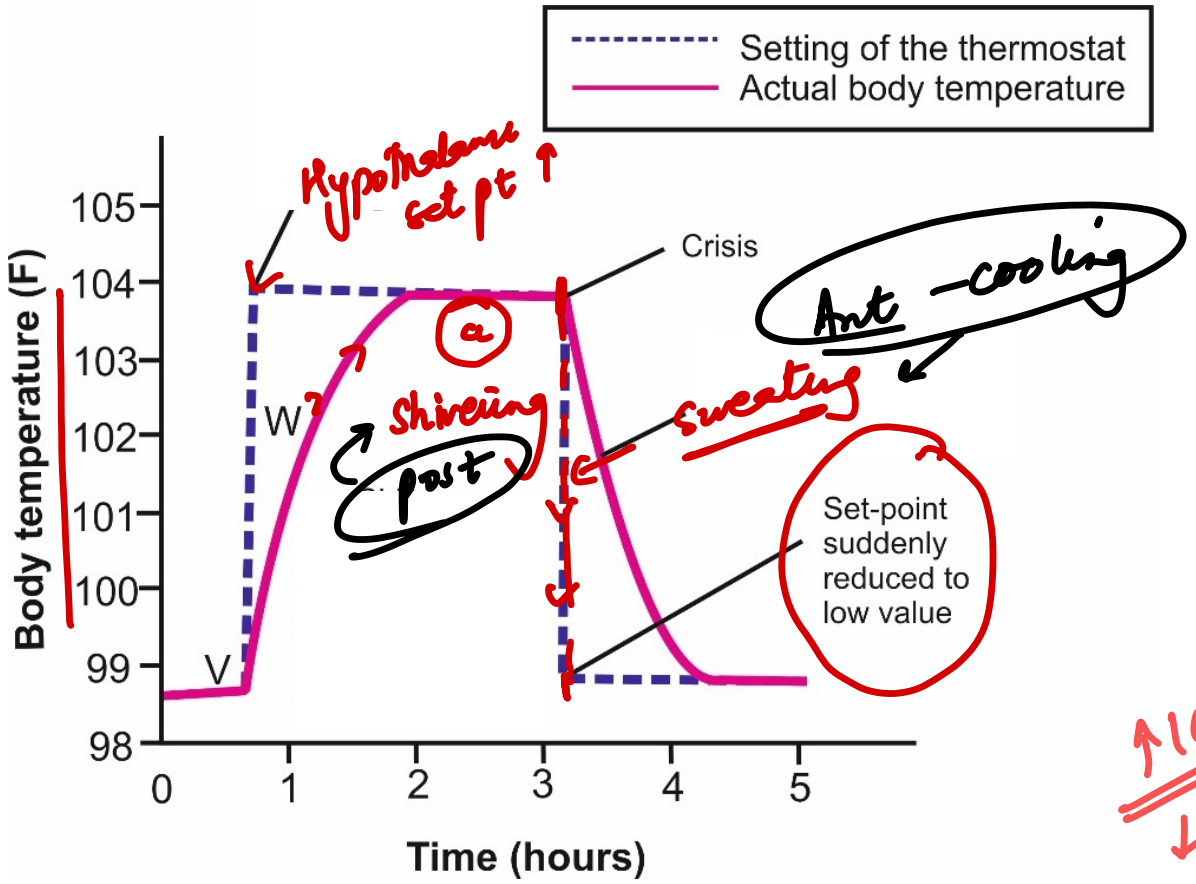
↑ Stimulus strength ∝ ↑ AP freq ∝ ↑ percept

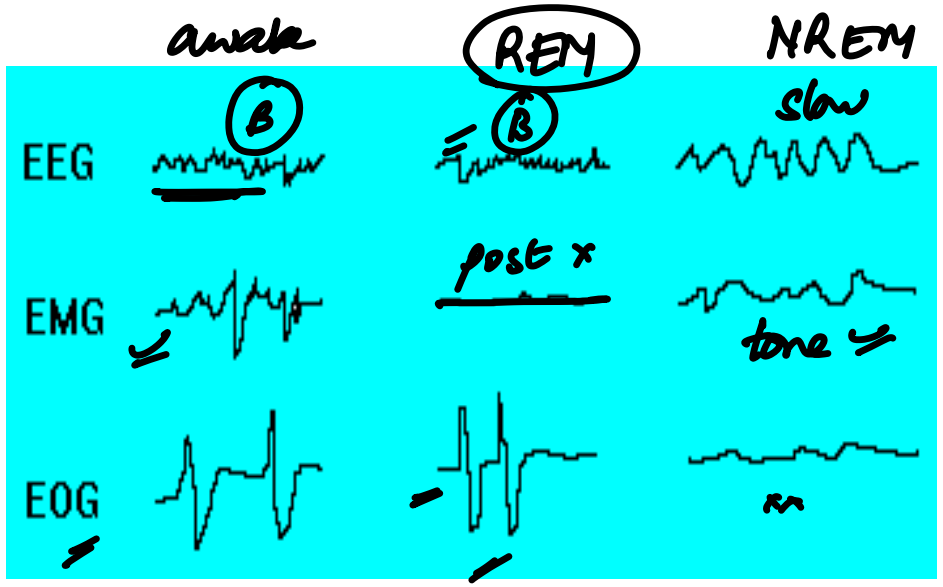
freq coding law

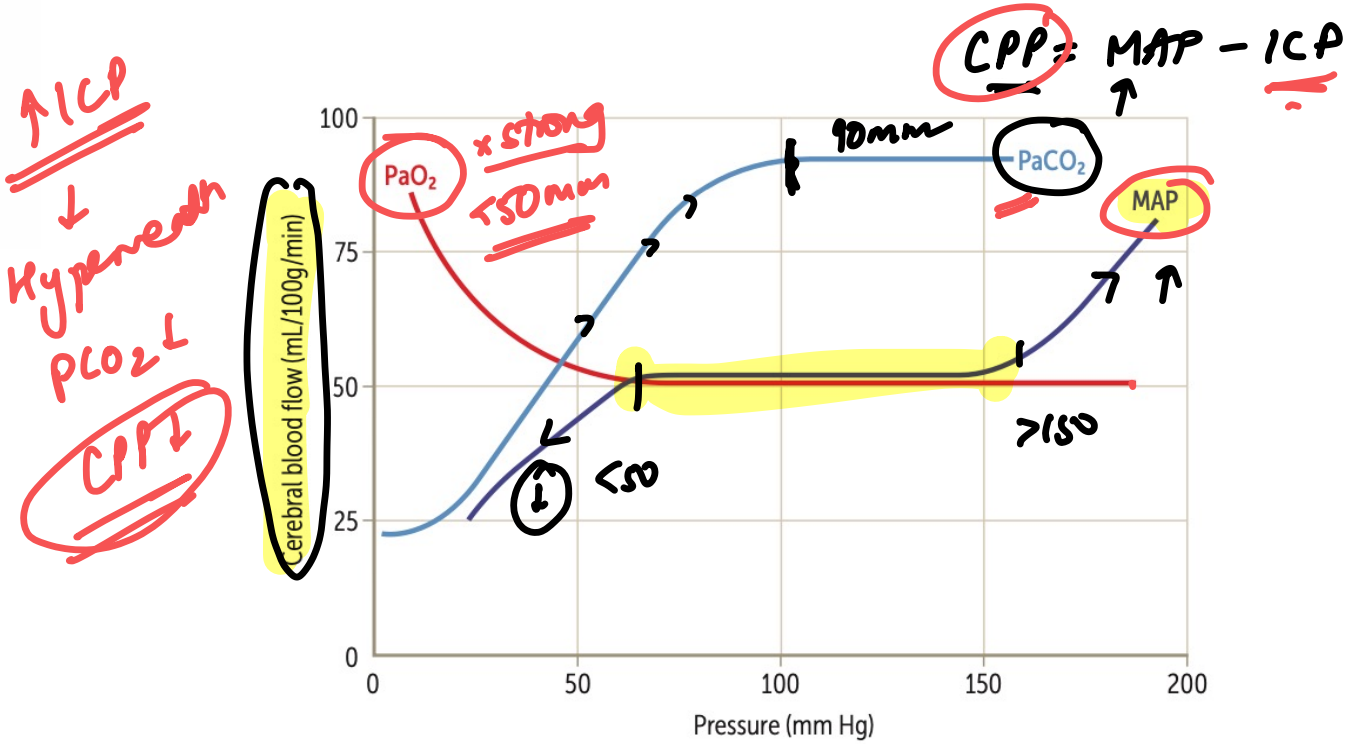
Weber Fechner law







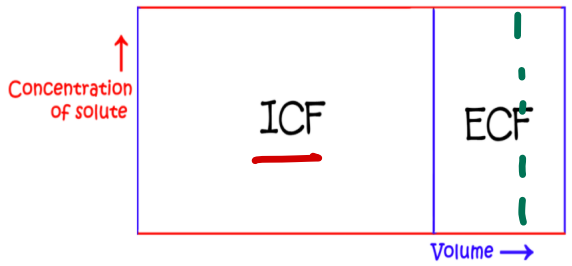




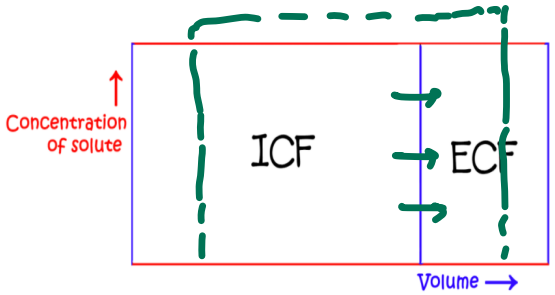
Darrow-Yannet diagrams

Osm ECF

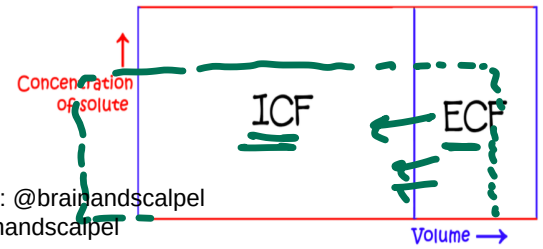
Loss of isotonic fluid – diarrhea



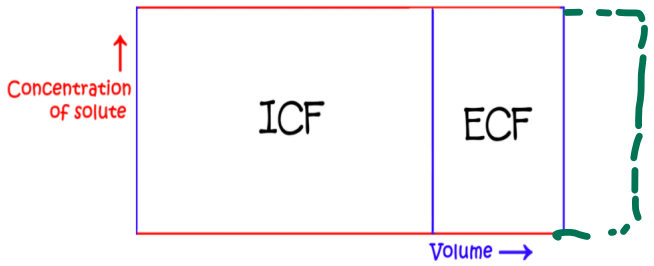
Loss of hypotonic fluid – sweating



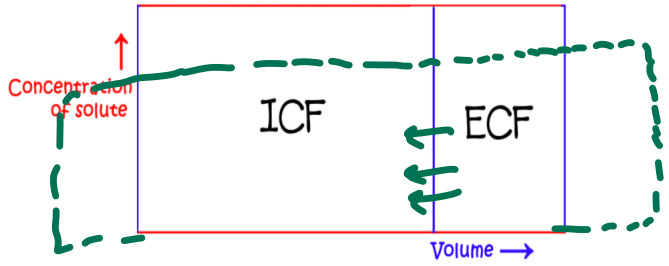
Loss of hypertonic fluid addison / loop diuretics



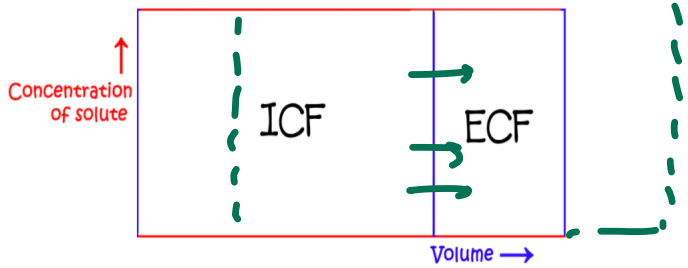
Gain of isotonic fluid – isotonic saline

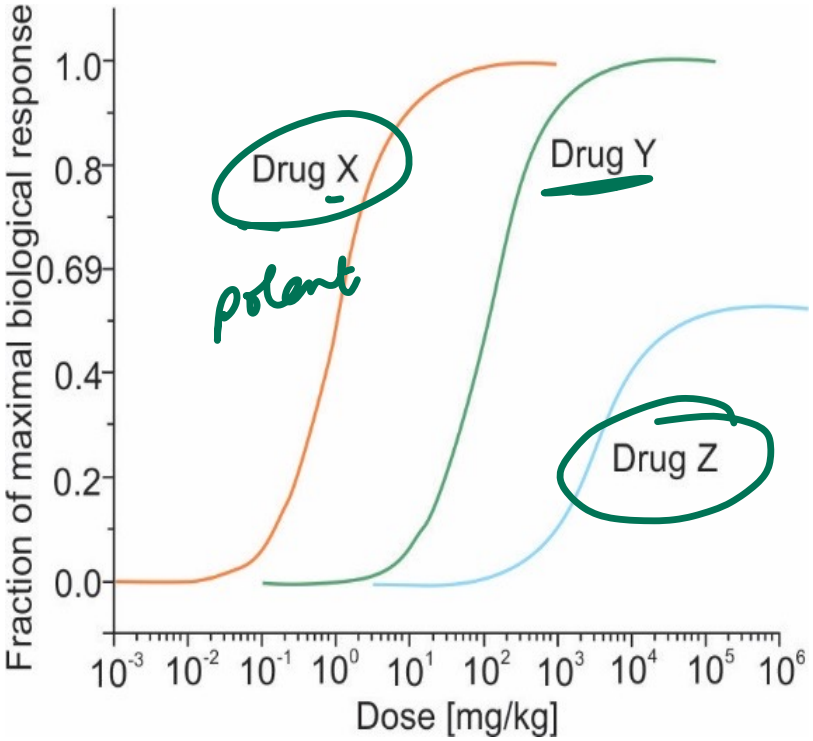


Gain of hypotonic fluid polydipsia

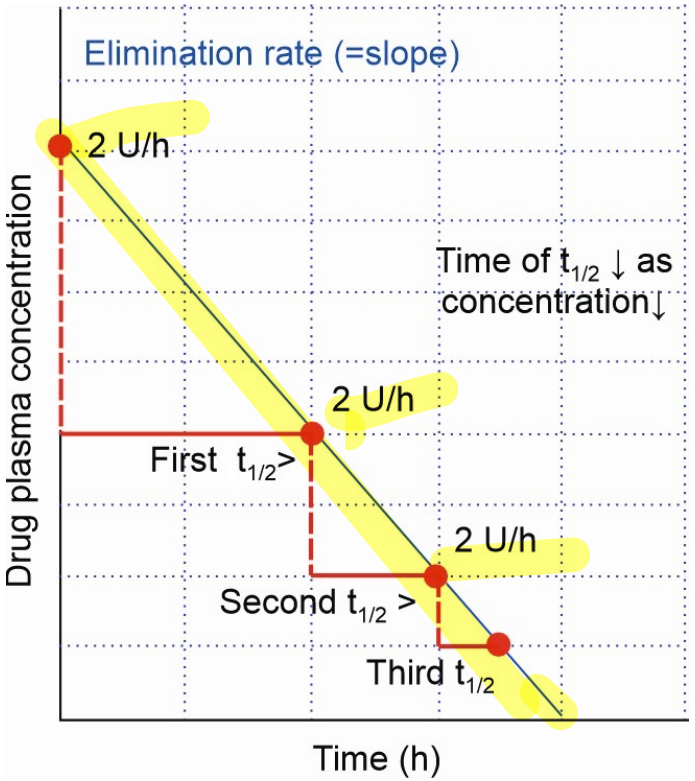


Gain of hypertonic fluid hypertonic saline





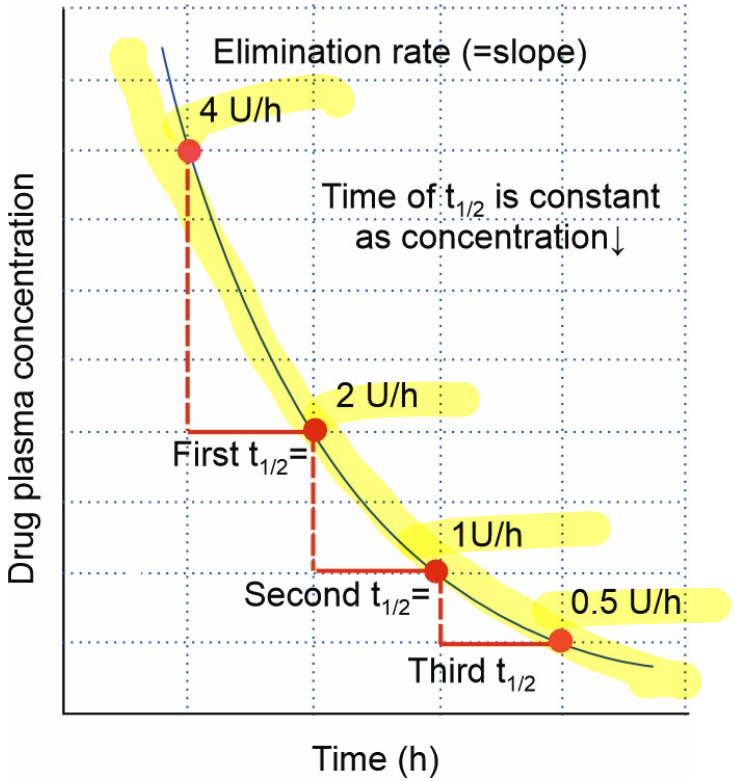
HELP



↓

Zero order

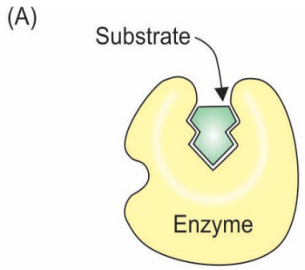
amt

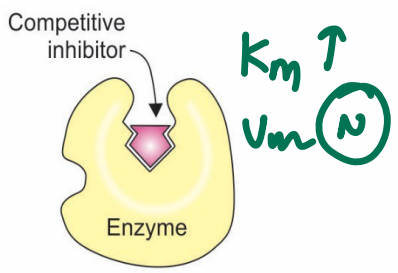


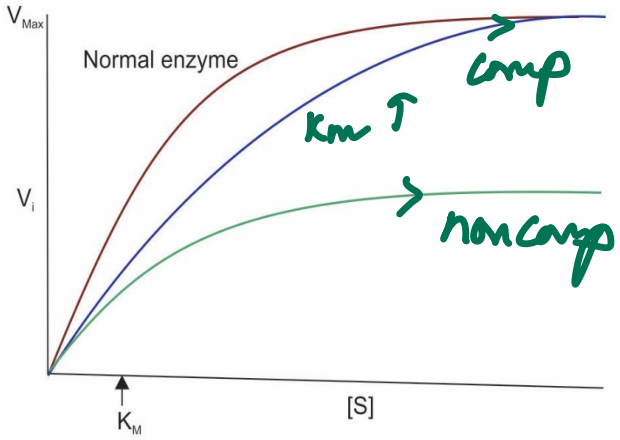
↓

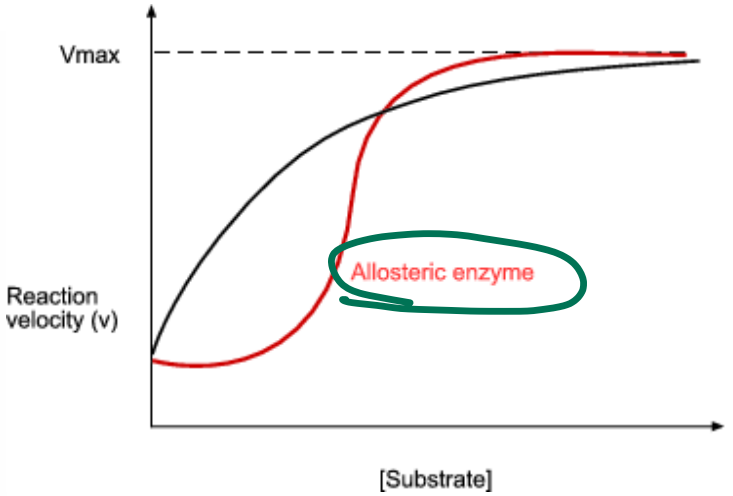
1st order

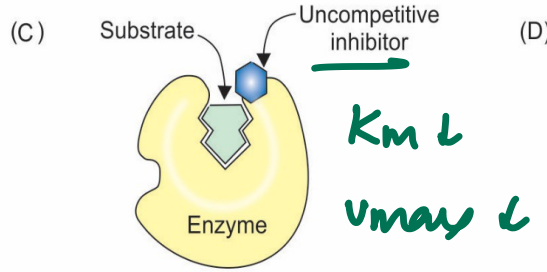
fraction

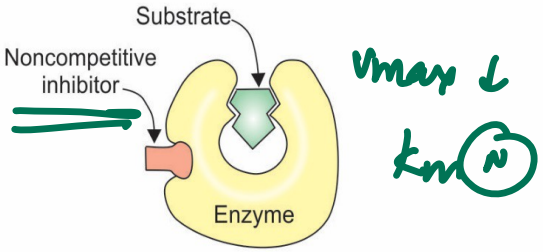




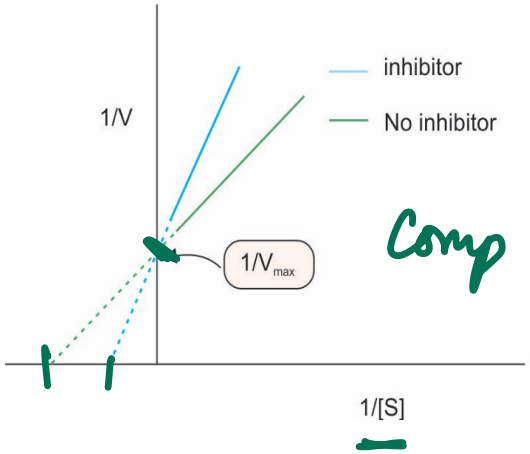


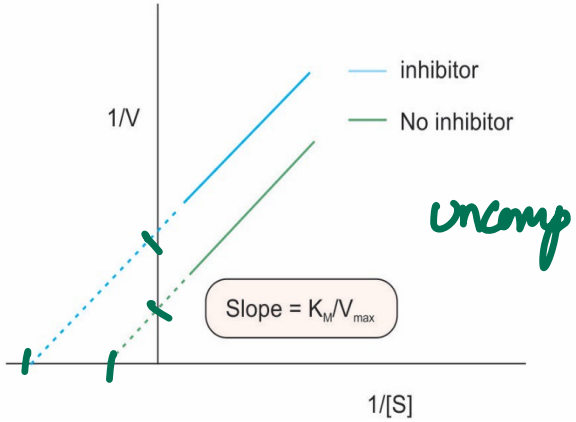


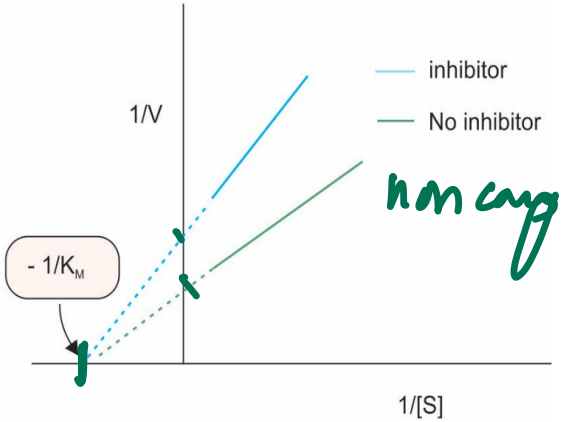


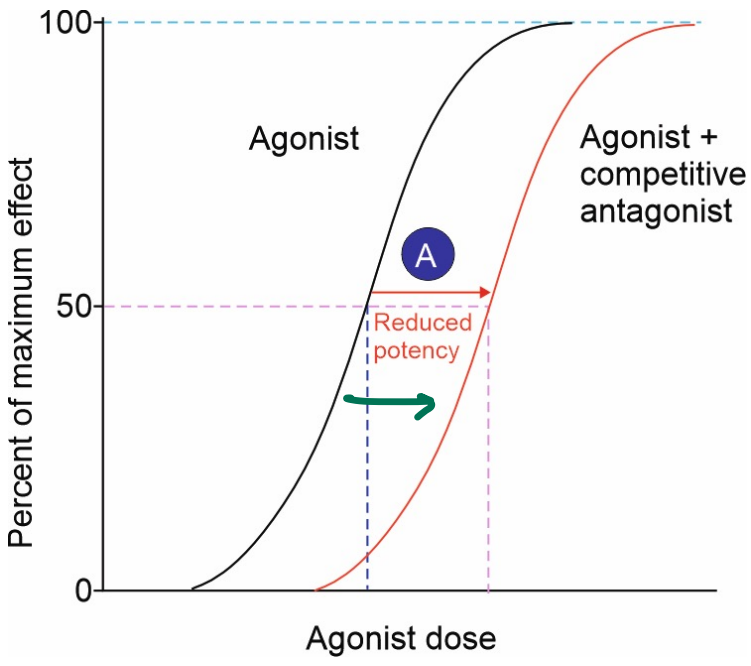


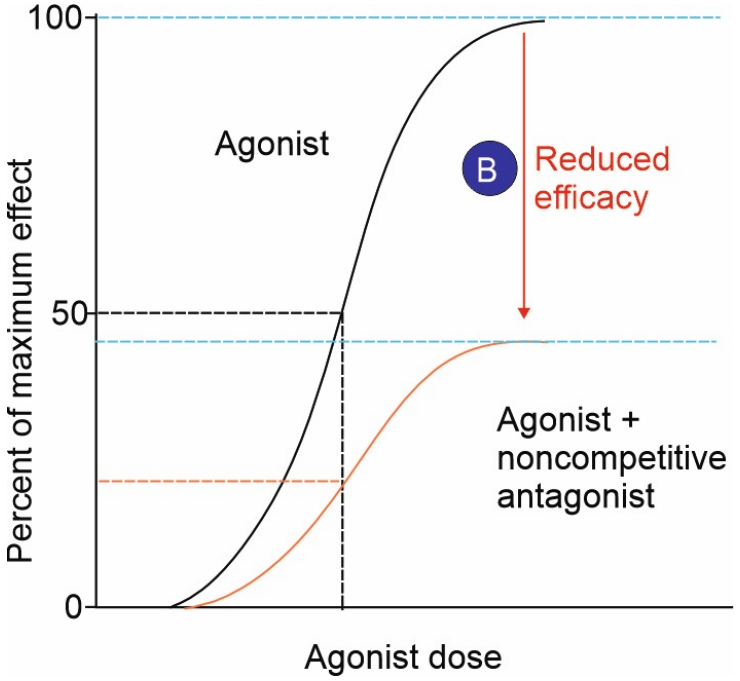
The lineweaver-burk plots for inhibition

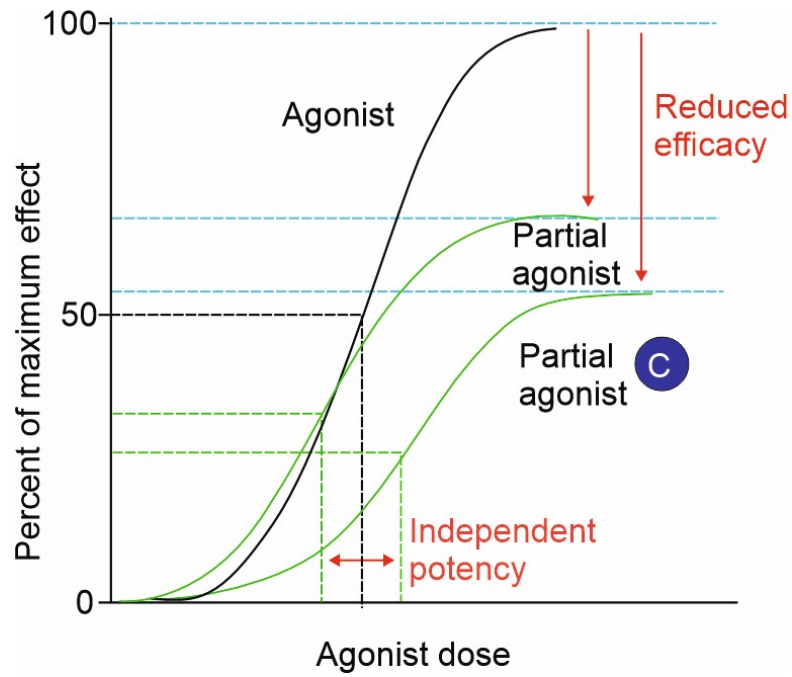




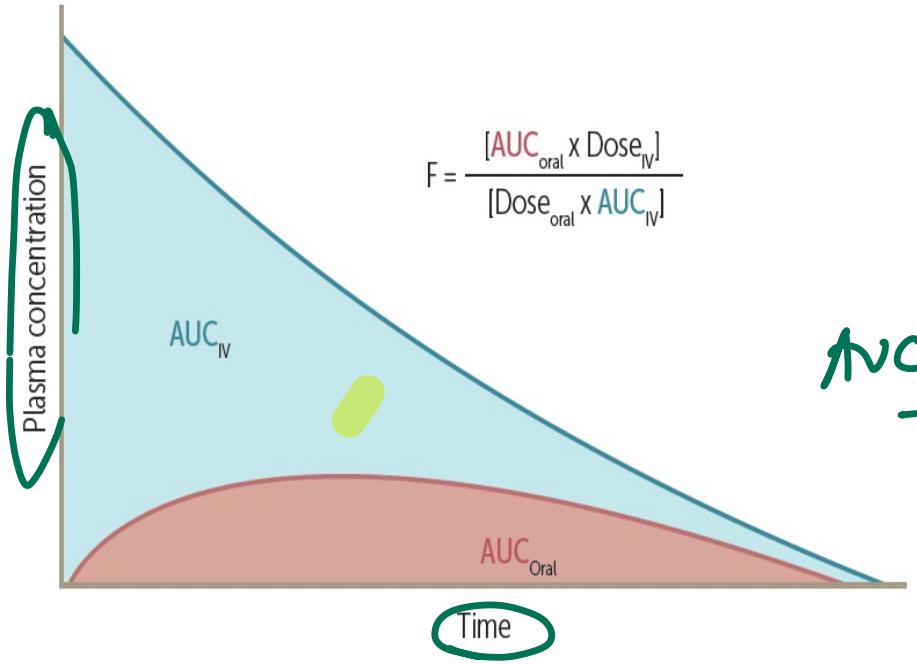






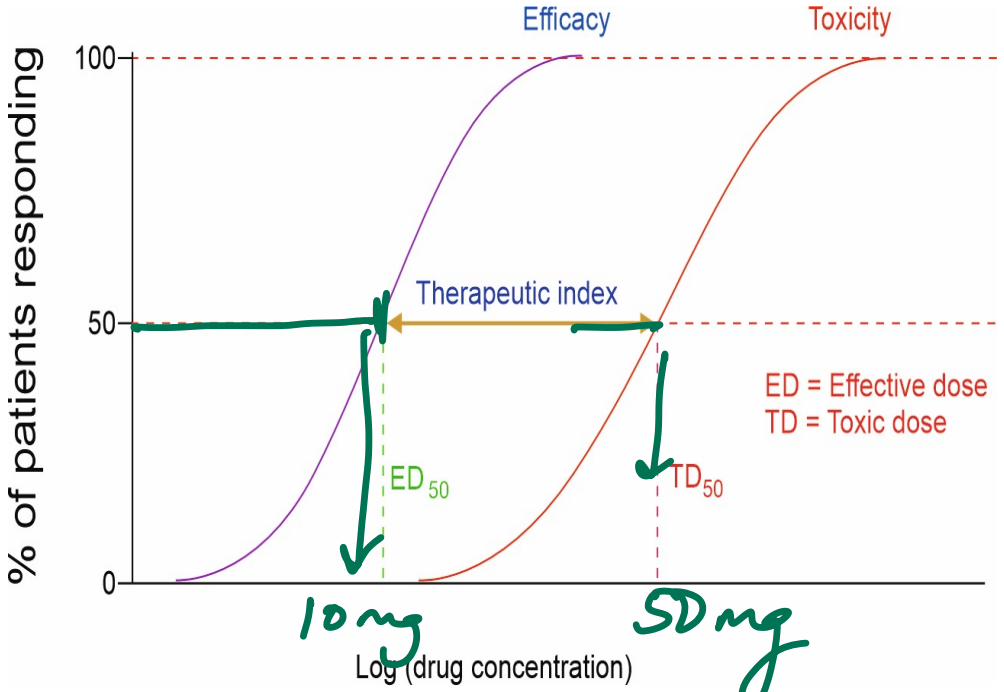


AGONIST WITH	POTENCY	EFFICACY	REMARKS	EXAMPLE
A Competitive antagonist	↓	N	**Can** be overcome by ↑ agonist concentration	Diazepam (agonist) + flumazenil (competitive antagonist) on $GABA_A$ receptor.
B Noncompetitive antagonist	N	↓	**Cannot** be overcome by ↑ agonist concentration	Norepinephrine (agonist) + phenoxybenzamine (noncompetitive antagonist) on α-receptors.
C Partial agonist (alone)	Independent	↓	Acts at same site as full agonist	Morphine (full agonist) vs buprenorphine (partial agonist) at opioid μ-receptors.



$$F = \frac{[AUC_{oral} \times Dose_{IV}]}{[Dose_{oral} \times AUC_{IV}]}$$

AUC = BA (F)



$$TI = \frac{TD_{50} / LD_{50}}{ED_{50}}$$

$$= \frac{50}{10} = 5$$