BIOCHEM-FMT

EXTRA-EDGE

BIOCHEM

45. Which of the following is an example of a glycolipid?

a) Lecithin
b) Cerebroside
c) Plasmalogen
d) Sphingomyelin

40. Which of the following is not a saturated fatty acid?

a) Linoleic acid
b) Myristic acid
c) Caproic acid
d) Palmitic acid

Types of lipids

PHOSPHO-LIPIDS

Glycero-phospholipid

- Phosphatidyl choline = Lecithin – Surfactant – Lung maturity
- P. Ethanolamine = Cephalin – myelin
- DiP glycerol = Cardiolipin – Antigen – Barth Sx → APLA
- P.Serine → apoptosis (flipping) – Tunel stain
- P.inositol → 2° messenger – Gq – IP3 /DAG
- Plasmalogen

Sphingo-phospholipid

↓

Sphingomyelin

(Ceramide + choline + Po4)

GLYCOLIPIDS: No Po4

carb + Sphingosine → FA

Cerebroside : Ceramide + Monosaccaride glc

Globoside : Ceramide + Oligosaccharide glc + gal

Ganglioside : Globoside + NANA

(N-Acetylneuraminic acid)

GM3 -> N-acetylGalactose-NH2 -> Galactose

GM2 GM1

FA

UNSATURATED

1. Palmitoleic – ω7
2. Oleic – ω9
3. Elaidic – ω9
4. Linoleic – ω6
5. γ-Linolenic – ω6
6. Arachidonic – ω6

☹ ↑ CV risk

7. Timnodonic acid/EPA – ω3
8. Cervonic acid/DHA – ω3
9. α-Linolenic – ω3

☺ ↓ CV risk fish oil

Essential fa

SATURATED ↑ CV risk

Palmitic acid

Which of the following is not amphipathic?

A) Sphingolipids

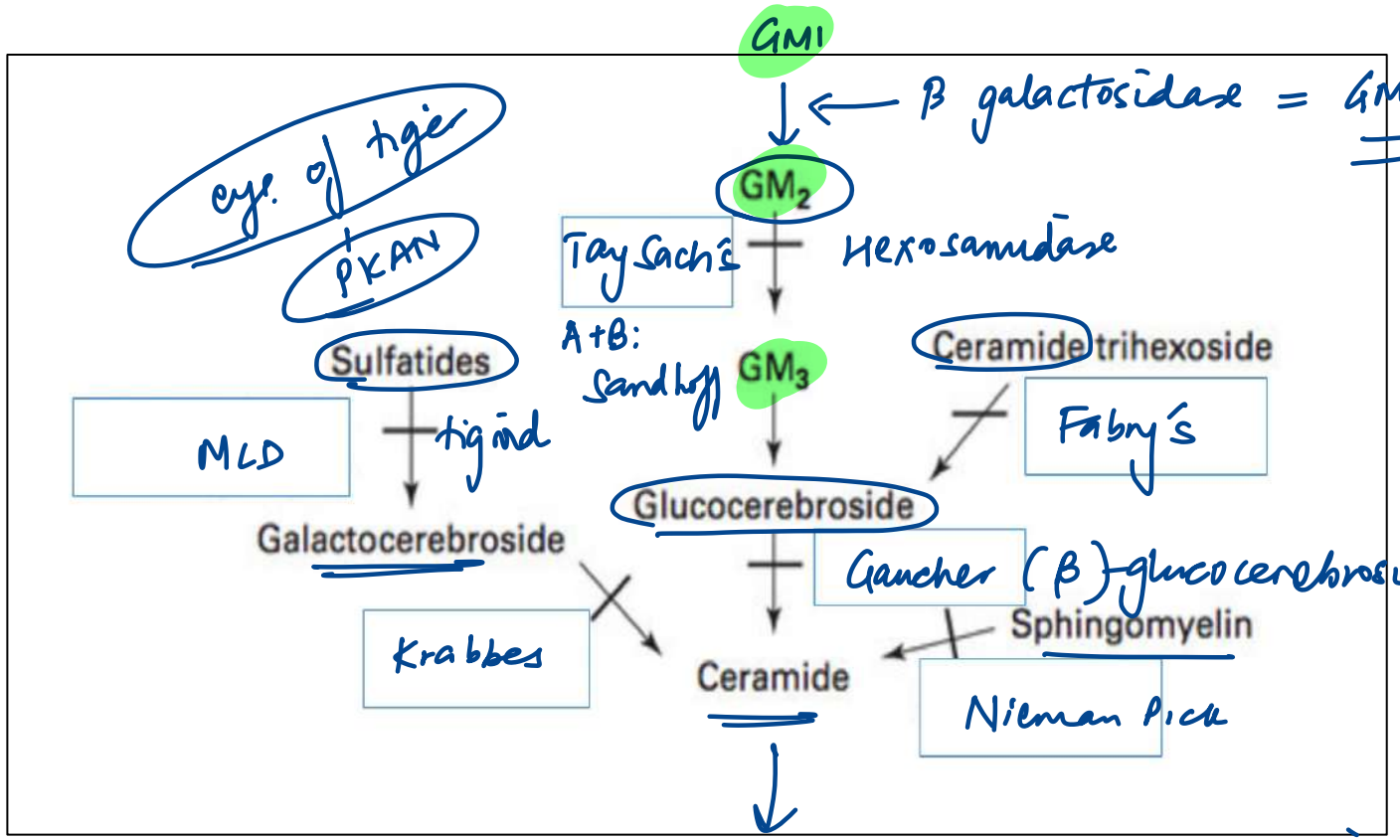
B) Phosphoglycerol

C) Triglycerides

D) Glycolipids

Hydrophilic / phobic (COO⁻ Charged)

* Krabbe's : β-galactocerebrosidase



eye of tiger
PKAN

Farber's → Ceramidase

21. A 12-month-old male baby presents with vomiting, lethargy on consuming fruit juice. Which of the following can give a positive reaction in this patient's condition that is most diagnostic?

FRUCTOSE

a) Benedict’s test
b) Seliwanoff's reagent
c) Sakaguchi's reagent
d) Millon's reagent

35. A positive Pauly's test in a neonate would indicate the accumulation of which of the following amino acids in his urine?

a. Arginine
b. Cysteine
c. Histidine
d. Tryptophan

Test for all carbohydrates	Molisch test
For reducing sugars	Benedict's test
Differentiate mono- and disaccharides	Barfoed's test, Moore's test, Fehling's test
Differentiate aldoses and ketoses (Fructose)	Seliwanoff's test, Rapid furfural test, Foulger's test
Test for pentoses	Bial's test
Test for galactose	Mucic acid test

glc + glc
Trehalose α 1,1
Maltose α 1,4
Isomaltose α 1,6

Lactose : glc + gal

Sucrose : glc + fru

Lactulose : gal + fructose

glc/gal

SPECIAL GROUPS	
Two peptide linkages	Biuret Reaction
Alpha-amino acids	Ninhydrin Reaction
Benzene ring (Phenylananine)	Xanthoproteic Reaction HNO_3
Phenolic group (Tyrosine)	Millon's Reaction, Folin-Ciocalteu's Test
Indole ring (Tryptophan)	Hopkins-Cole Reaction
Guanidine group (Arginine)	Sakaguchi Reaction
Sulfhydryl groups (Cysteine)	Nitroprusside Reaction, Sulfur Test
Imidazole ring (Histidine)	Pauly's Test

$NH_3 \rightarrow NH_4^+$
Condition

13. What is the seventh enzyme class as per The International Union of Biochemistry (IUBMB) classification of enzymes?

a) Lyases
b) Isomerases
c) Ligases
d) Translocases

Type	Function	Examples
Oxidoreductase	Transfer of electrons Results in a change in oxidation state	Dehydrogenase
Transferase	Transfer of functional group from one molecule to another	Phosphorylase, Kinase
Hydrolase	Breakdown of a covalent bond using water	Protease, Phosphatase
Lyase	Breakdown of a covalent bond without water or oxidation	Decarboxylase, Hydratase, Aldolase, Synthase
Isomerase	Rearrangement of bonds within a molecule	Mutase
Ligase	Formation of a covalent bond between two large molecules	Synthetase, Carboxylase
Translocase	Catalyze movement of ions or molecules	ATP synthase

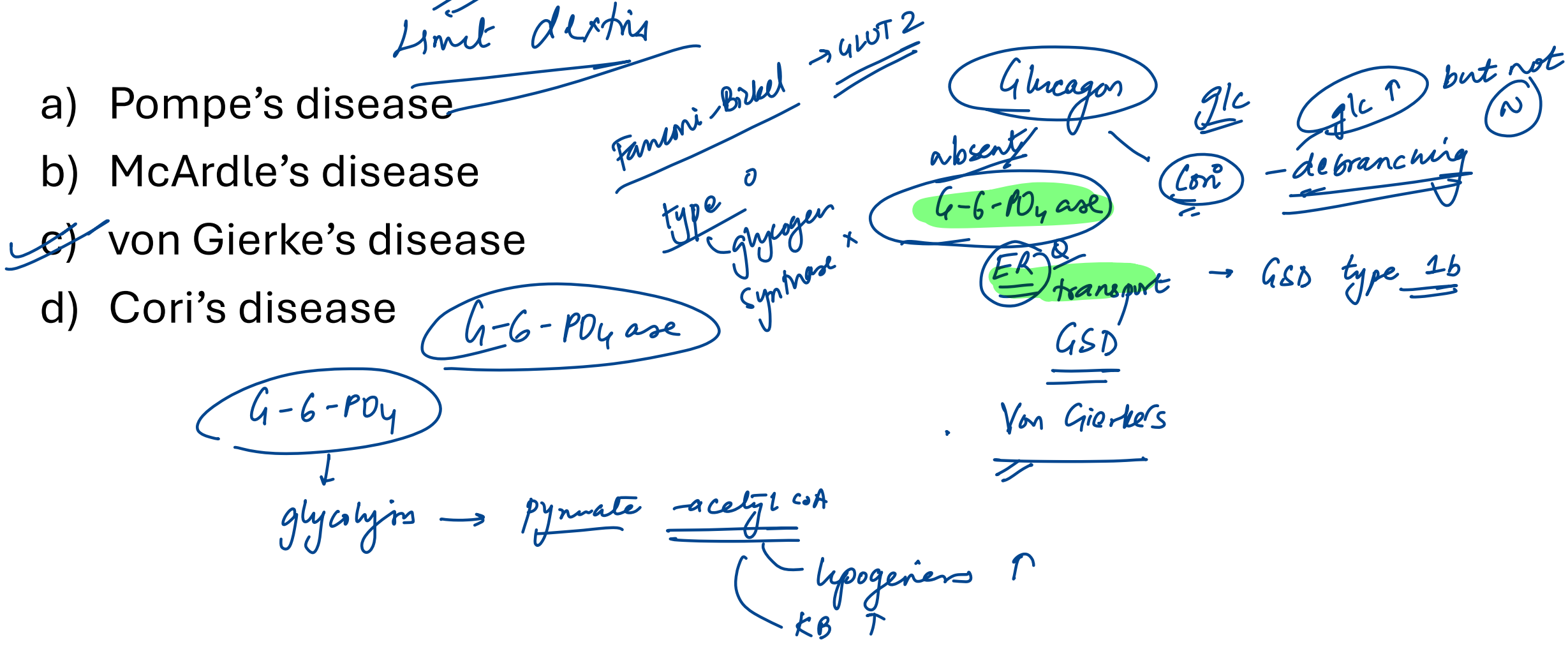
OTHLIL

All kinase/ phosphorylase/ carboxylase use Mg except pyruvate kinase-K

Synthase except:
NO synthase - 1
Glycogen synthase 2
Citrate synthase - 2
ATP synthase - 3 | 7.

10. A 5-year-old boy rapidly develops hypoglycemia after moderate activity. Blood examination reveals raised levels of ketone bodies, lactic acid, and triglycerides. Glucagon challenge test was negative. Histopathology of the liver shows deposits of glycogen in an excess amount. What is the diagnosis?

a) Pompe's disease
b) McArdle's disease
c) von Gierke's disease
d) Cori's disease



20. Which of the following pairs correctly represents the primary glycosidic bond linkage and the branch-point bond linkage in glycogen, respectively?

a) α(1→6) linkage; α(1→4) linkage

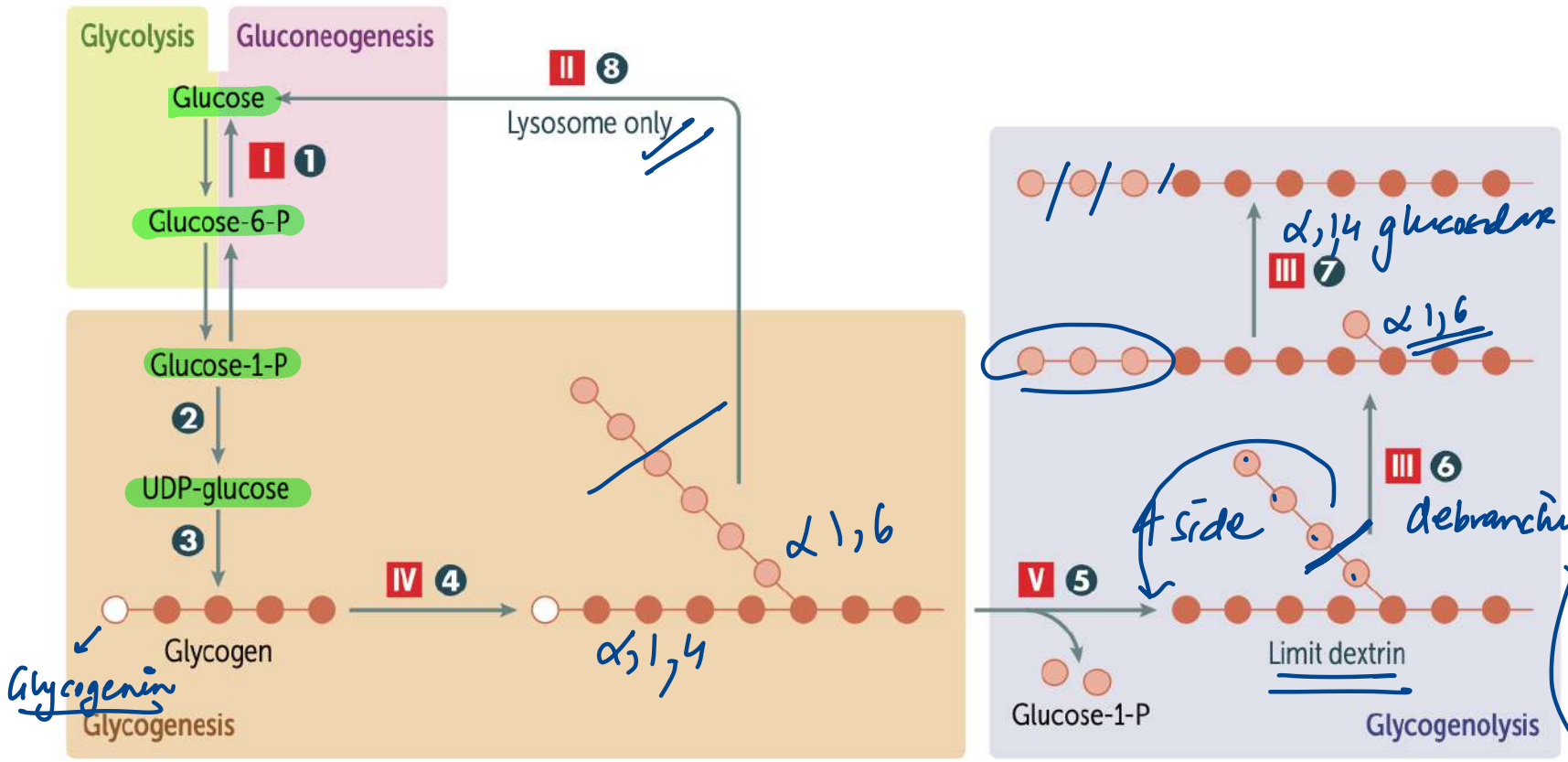
b) α(1→6) linkage; α(1→6) linkage

c) α(1→4) linkage; α(1→6) linkage

d) α(1→4) linkage; α(1→4) linkage

15. Which of the following depicts the correct sequence of enzymes involved in glycogenolysis in the liver?

a) Phosphorylase, Glucan transferase, Glucose-6-phosphatase
b) Glucose-6-phosphatase, Phosphorylase, Debranching enzyme
c) Glycogen synthase, Phosphorylase, Glucose-6-phosphatase
d) Phosphorylase, Glucose-6-phosphatase, Glucan transferase



Glycogen storage disease type

- I Von Gierke disease
- II Pompe disease
- III Cori disease
- IV Anderson disease
- V McArdle disease

Glycogen enzymes

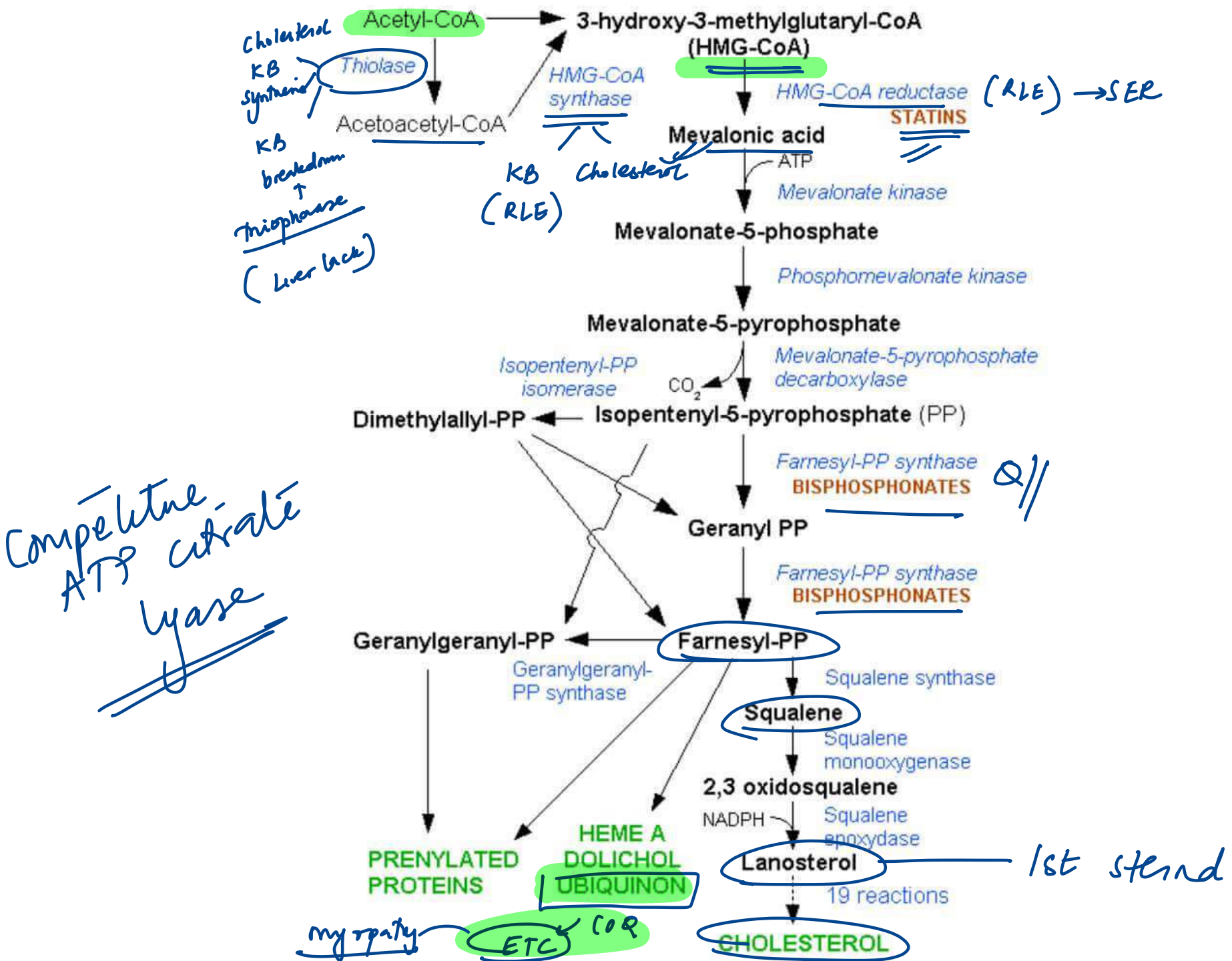
1. Glucose-6-phosphatase
2. UDP-glucose pyrophosphorylase
3. Glycogen synthase
4. Branching enzyme
5. Glycogen phosphorylase — 1st
6. Debranching enzyme (4-α-D-glucanotransferase)
7. Debranching enzyme (α-1,6-glucosidase)
8. α-1,4-glucosidase

Note: A small amount of glycogen is degraded in lysosomes by ❽ α-1,4-glucosidase (acid maltase).

Branches have α-(1,6) bonds; linear linkages have α-(1,4) bonds.

26. Identify the enzyme not involved in cholesterol biosynthesis.

a) HMG CoA Reductase
b) HMG CoA lyase → & B
c) HMG CoA synthetase
d) Thiolase


Acetyl-CoA
3-hydroxy-3-methylglutaryl-CoA (HMG-CoA)
Thiolase
Acetoacetyl-CoA
HMG-CoA synthase
HMG-CoA reductase
STATINS
Mevalonic acid
ATP
Mevalonate kinase
Mevalonate-5-phosphate
Phosphomevalonate kinase
Mevalonate-5-pyrophosphate
Isopentenyl-PP isomerase
CO_2
Mevalonate-5-pyrophosphate decarboxylase
Dimethylallyl-PP
Isopentenyl-5-pyrophosphate (PP)
Farnesyl-PP synthase
BISPHOSPHONATES
Geranyl PP
Farnesyl-PP synthase
BISPHOSPHONATES
Geranylgeranyl-PP
Farnesyl-PP
Geranylgeranyl-PP synthase
Squalene synthase
Squalene
Squalene monooxygenase
2,3 oxidosqualene
NADPH
Squalene epoxydase
Lanosterol
19 reactions
CHOLESTEROL
PRENYLATED PROTEINS
HEME A
DOLICHOL
UBIQUINON
ETC
Cholesterol
KB synthesis
KB breakdown
Thiophorase
(Liver lack)
KB
(RLE)
Cholesterol
(RLE) → SER
Compétitive ATP citrate lyase
1st step
myopathy
CoQ

27. A 2-months-old infant is found to be hypotonic. On examination, there is a large anterior fontanelle and hepatomegaly. Further investigations confirmed a diagnosis of the cerebro-hepato-renal syndrome. Which of the following is not a biochemical finding in this case?

a) Elevated levels of very long chain fatty acids
b) Elevated plasma phytanic acid
c) Elevated plasmalogen content
d) Abnormal synthesis of bile acids

17. Lorenzo oil is used in the treatment of:

a) Fabry's disease
b) Adrenoleukodystrophy
c) Hurle's disease
d) Gaucher disease

Peroxisomes

- β-oxidation of very-long-chain fatty acids (VLCFA) > 22C
- α-oxidation of branched-chain fatty acids (Phytanic) → 0 ATP
- Synthesis of bile acids and plasmalogens
- Catabolism of amino acids and ethanol

Zellweger
Sx

Rephsum
D

ALD
adreno-leukoD

ω-oxidation → MCAD def

↳ SER

0 ATP

↳ dicarboxylic aciduria

30. Richner-Hanhart syndrome is associated with a defect in which of the following?

a) Tyrosine aminotransferase

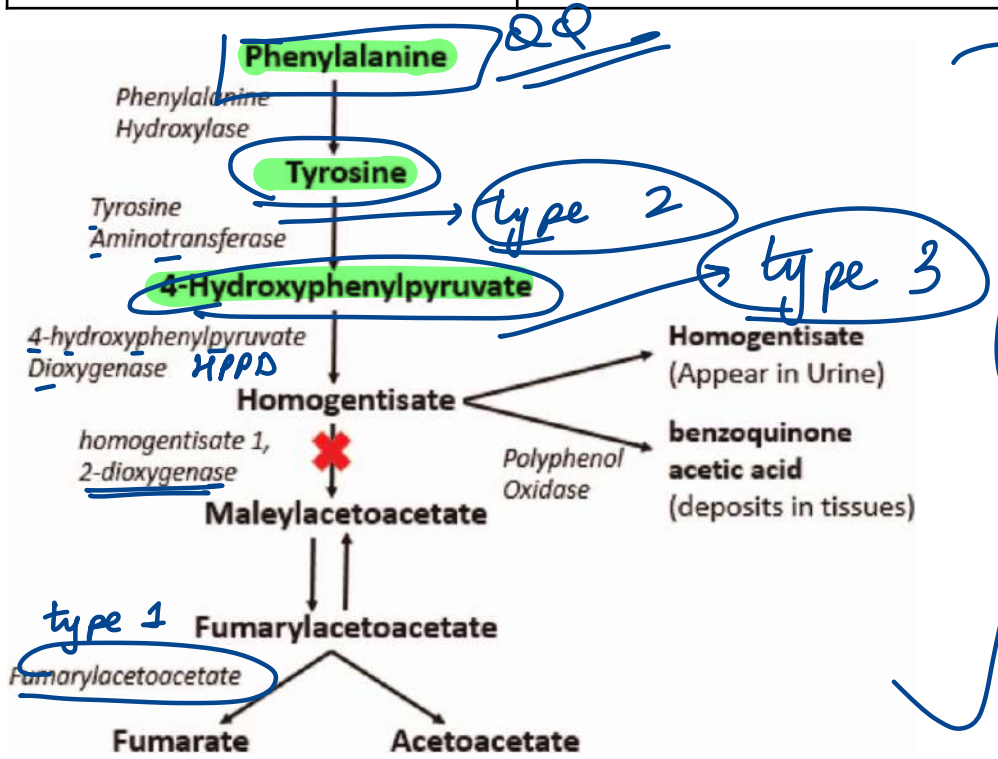
b) Homogentisate oxidase

c) p-Hydroxyphenylpyruvate hydroxylase

d) Fumarylacetoacetate hydrolase

TWO TAT type 2

Feature	Type I	Type II Richner Hanhart	Type III Neonatal tyrosinemia
Enzyme Deficiency	Fumarylacetoacetate hydrolase	Tyrosine aminotransferase	4-Hydroxyphenylpyruvate dioxygenase (HPPD)
Accumulated Substrate	Fumarylacetoacetate, succinylacetone	Tyrosine	4-Hydroxyphenylpyruvate
Clinical Features	Hepatorenal syndrome, liver failure, cabbage-like odor	Eye pain (keratitis), skin lesions, intellectual disability	Intellectual disability, ataxia, seizures
Prognosis	Poor without treatment	Good with diet	Rare, mild symptoms



Hawkeensinuria
Missense mutn

type 2

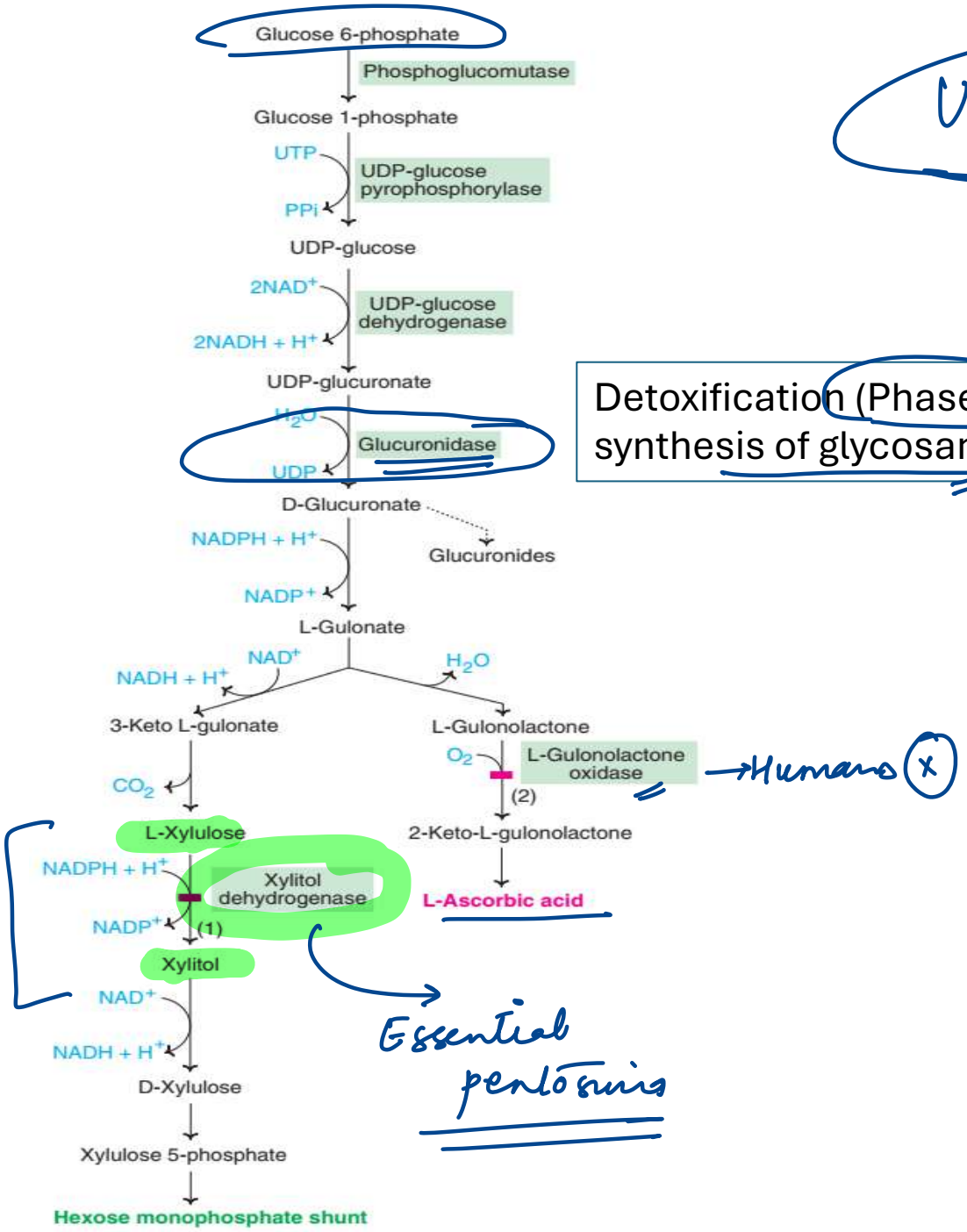
type 3

Corneal ulcer
PP keratoD

Rx →
- withdraw tyrosine / PhA
+ Nitisinone

18. Garrod’s tetrad includes all except:

a) Albinism
b) Alkaptonuria
c) Cystinuria
d) Tyrosinemia



URONIC ACID pathway → 0 ATP

Detoxification (Phase II conjugation reactions) and the synthesis of glycosaminoglycans and proteoglycans.

. UDP-GT

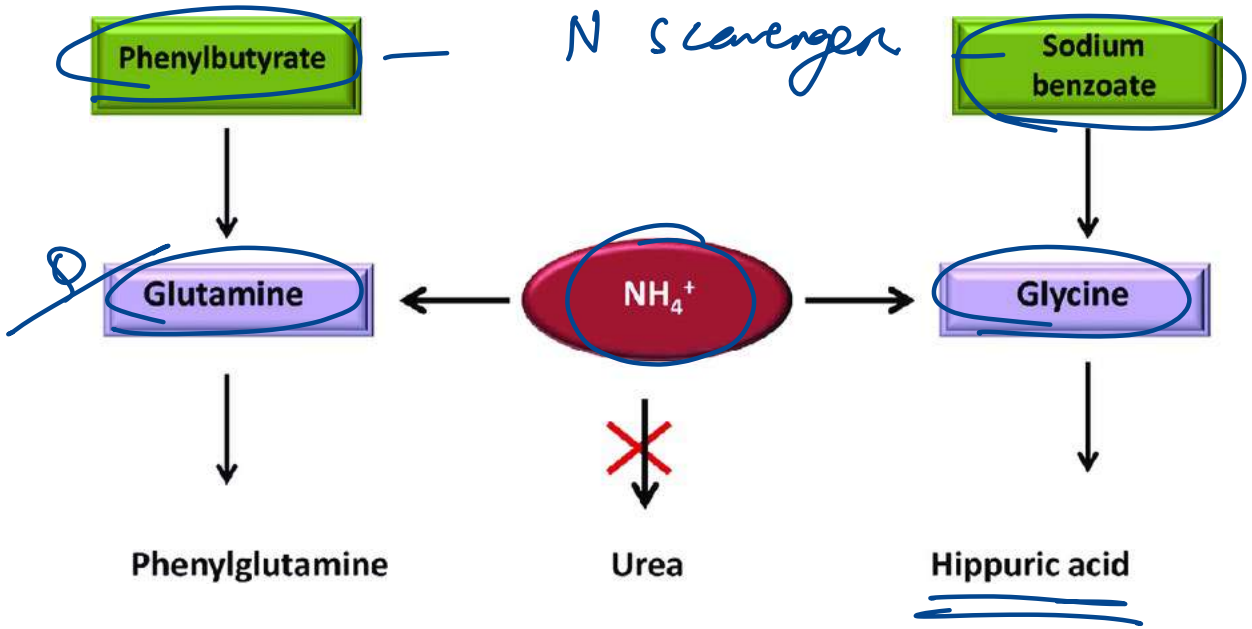
→ Humans (X)

Essential pentosuria

- Alkaptonuria
- Albinism
- Cystinuria
- Pentosuria

16. A 25-year-old man with a history of solvent abuse presents with fatigue and frequent exposure to toluene. Laboratory tests reveal elevated hippuric acid in his urine. Hippuric acid is formed by the conjugation of which of the following compounds?

a) Benzoyl glycine
b) Benzoyl acetate
c) Benzoyl lactate
d) Benzoyl glutamine


Phenylbutyrate
N scavenger
Sodium benzoate
Glutamine
NH_4^+
Glycine
Phenylglutamine
Urea
Hippuric acid

23. Identify the correct statements

1. Tryptophan acts as a buffer in blood due to its ability to accept and donate protons at physiological pH
2. Natowicz disease is characterized by accumulation of keratan sulfate
3. Phosphatidylserine on the outer leaflet of cell membrane is a key marker of apoptosis
4. Lipoprotein lipase is responsible for hydrolyzing triglycerides from circulating chylomicrons and VLDL at the

a) 1, 2, 3, 4

b) 3, 4

c) 2, 4

d) 1, 2

25. Which of the following is the most common mucopolysaccharidosis?

a) Hunter's disease
b) Sanfilippo disease
c) Sly syndrome
d) Hurler's disease

Syndrome	MPS Type	Enzyme Deficiency	Accumulated Substrate(s)
Hurler-, Scheie syndrome	MPS I	α-L-Iduronidase	Dermatan sulfate, Heparan sulfate
Hunter syndrome	MPS II	Iduronate sulfatase	Dermatan sulfate, Heparan sulfate
Sanfilippo syndrome	MPS III A	Heparan sulfate-N-sulfatase	Heparan sulfate
Morquio syndrome	MPS IV A	Galactosamine 6-sulfatase	Keratan sulfate, Chondroitin 6-sulfate
Maroteaux-lamy syndrome	MPS VI	N-acetylgalactosamine 4-sulfatase	Dermatan sulfate
Sly syndrome	MPS VII	β-glucuronidase	Dermatan sulfate, Heparan sulfate, Chondroitin 4-sulfate
Natowicz syndrome	MPS IX	Hyaluronidase	Hyaluronic acid

mc

→ X LR / ⊗ corneal clouding

Skeletal ++

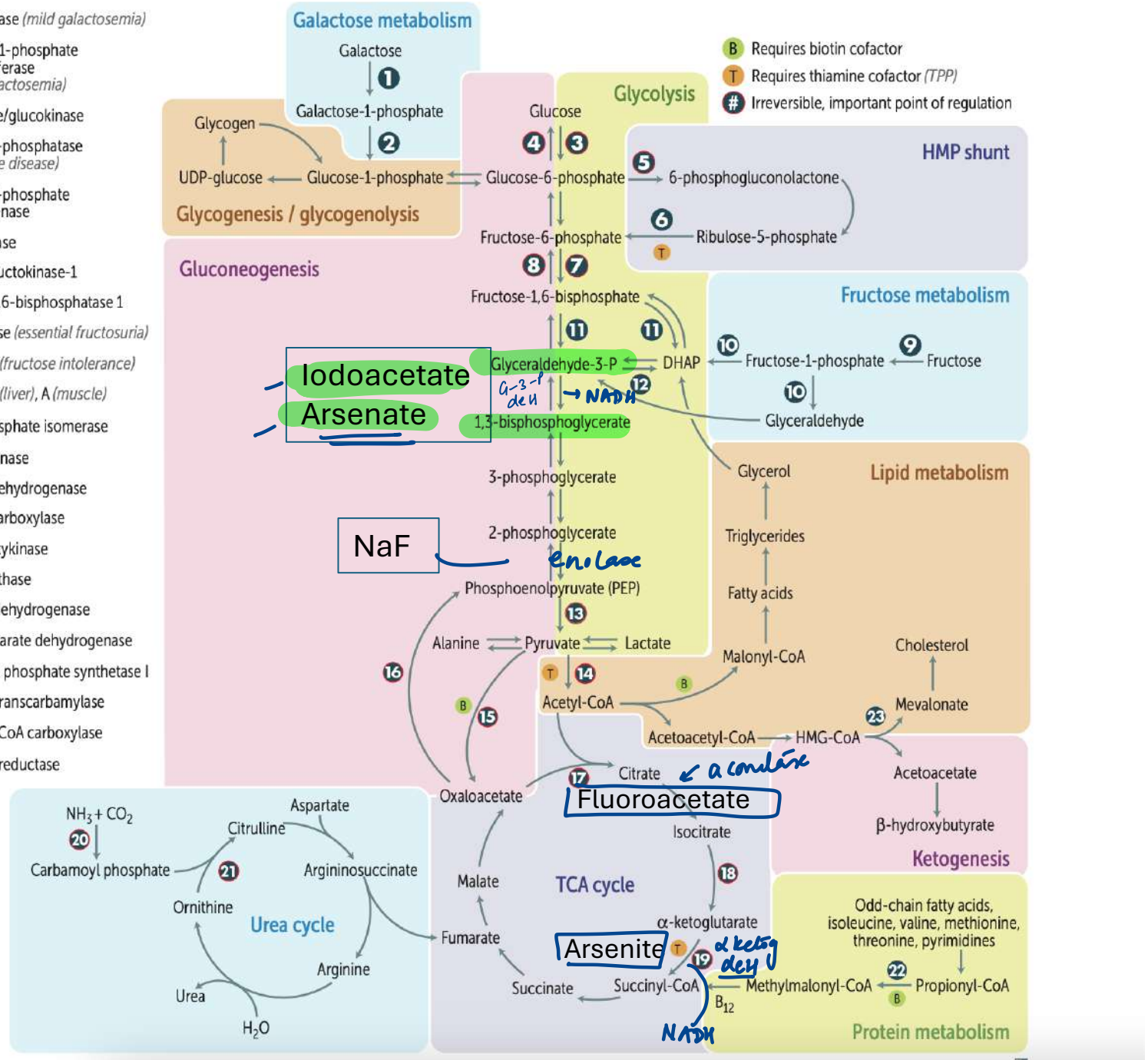
oar ribs

bullet mc

central bearing

Summary of pathways

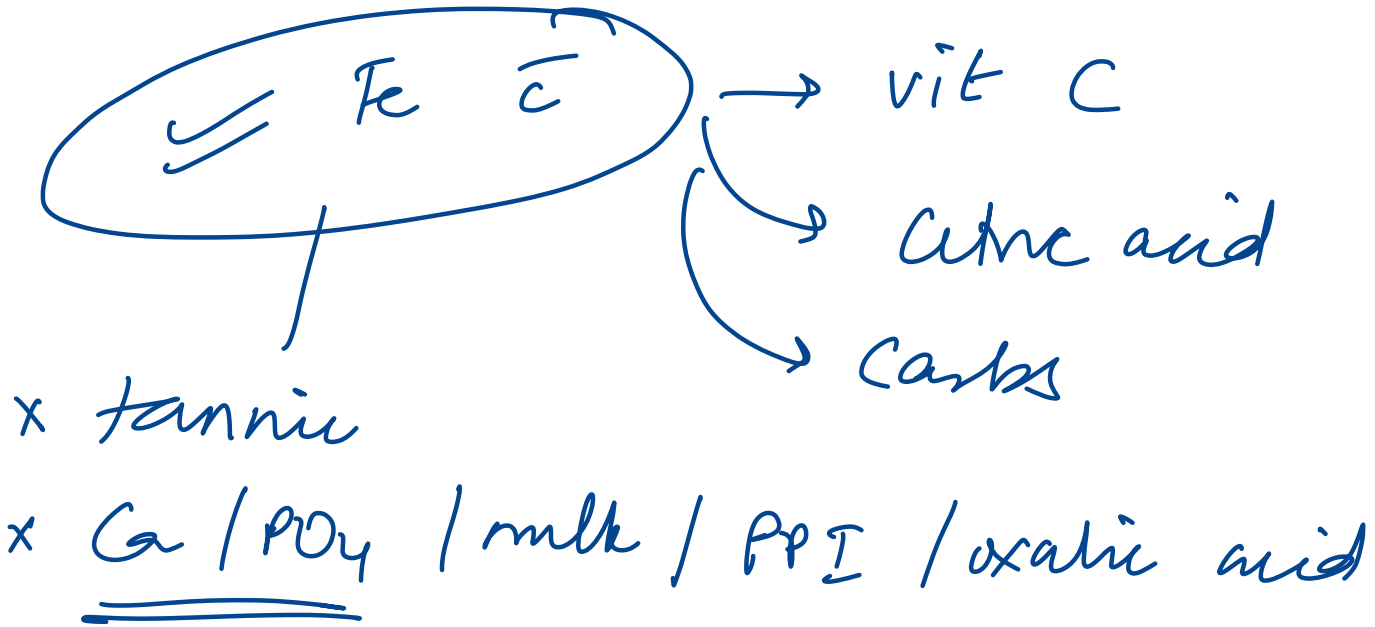
1. Galactokinase *(mild galactosemia)*
2. Galactose-1-phosphate uridyltransferase *(severe galactosemia)*
3. Hexokinase/glucokinase
4. Glucose-6-phosphatase *(von Gierke disease)*
5. Glucose-6-phosphate dehydrogenase
6. Transketolase
7. Phosphofructokinase-1
8. Fructose-1,6-bisphosphatase 1
9. Fructokinase *(essential fructosuria)*
10. Aldolase B *(fructose intolerance)*
11. Aldolase B *(liver)*, A *(muscle)*
12. Triose phosphate isomerase
13. Pyruvate kinase
14. Pyruvate dehydrogenase
15. Pyruvate carboxylase
16. PEP carboxykinase
17. Citrate synthase
18. Isocitrate dehydrogenase
19. α-ketoglutarate dehydrogenase
20. Carbamoyl phosphate synthetase I
21. Ornithine transcarbamylase
22. Propionyl-CoA carboxylase
23. HMG-CoA reductase

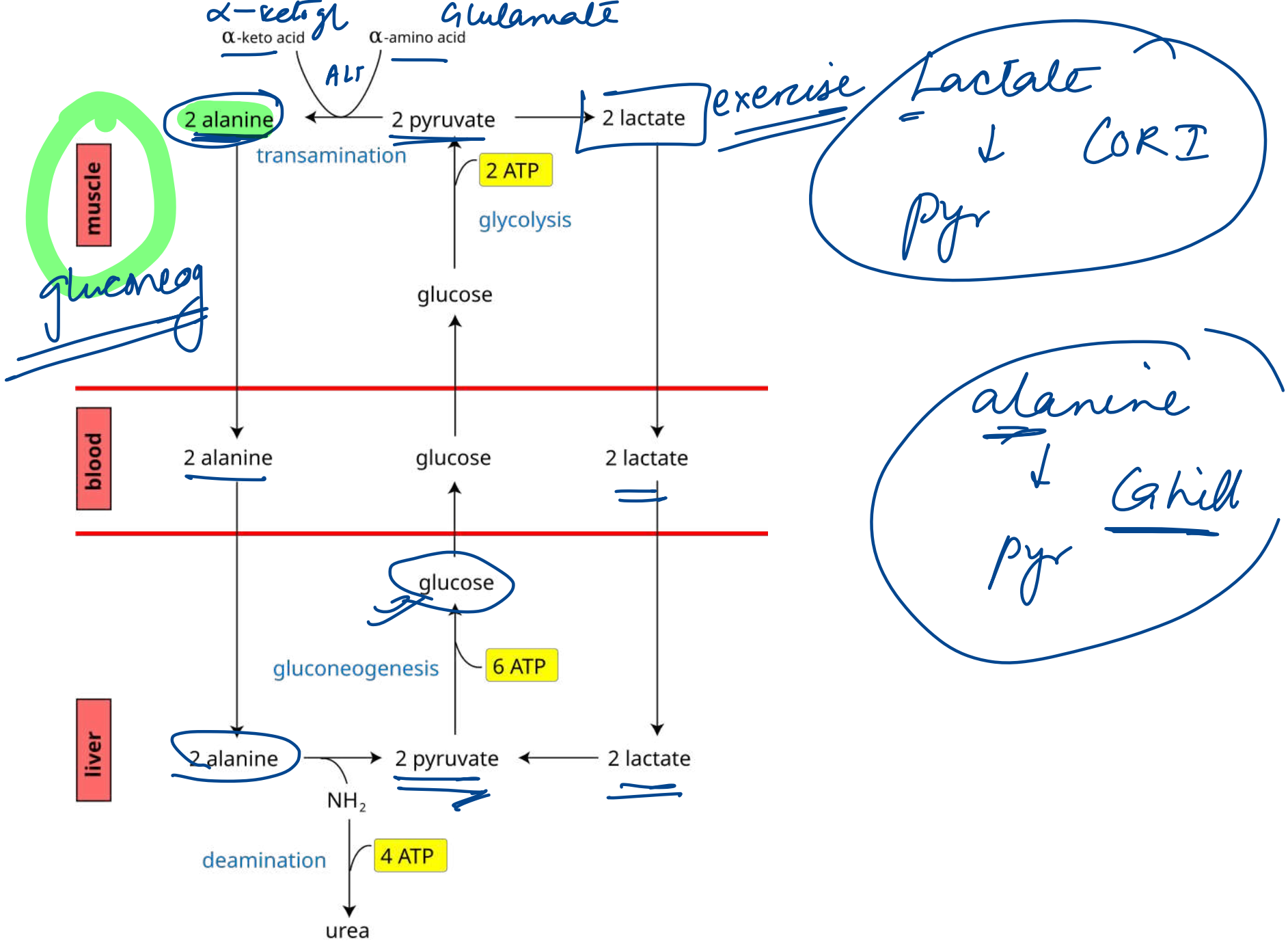


50. Identify the correct statements

1. GB is distended in chronic starvation. (T)
2. When a person dies in a car accident, according to the "DELHI ANATOMY ACT" the body is deemed abandoned after 48hours. (T)
3. Glutamine is the major transporter of ammonia from muscles to liver. (Alanine)
4. Iron should not be taken with black tea. (T) (tannin)

- 1, 2, 3, 4
- 1, 2, 4
- 2, 4
- 1, 3




α-keto acid
α-amino acid
ALT
2 alanine
2 pyruvate
2 lactate
transamination
2 ATP
glycolysis
glucose
muscle
blood
liver
2 alanine
glucose
2 lactate
glucose
gluconeogenesis
6 ATP
2 alanine
2 pyruvate
2 lactate
NH2
deamination
4 ATP
urea

11. Erythropoietin is produced by all of the following organs except:

a) Kidney – main
b) Liver
c) Spleen
d) Brain

37. Match the following glycoproteins with their function:

Function	Glycoprotein
A. Lubricative	1. Collagen
B. Folding	2. Calreticulin
C. Development regulation	3. Mucin (snail)
D. Structural	4. Notch

a) A-4, B-3, C-2, D-1

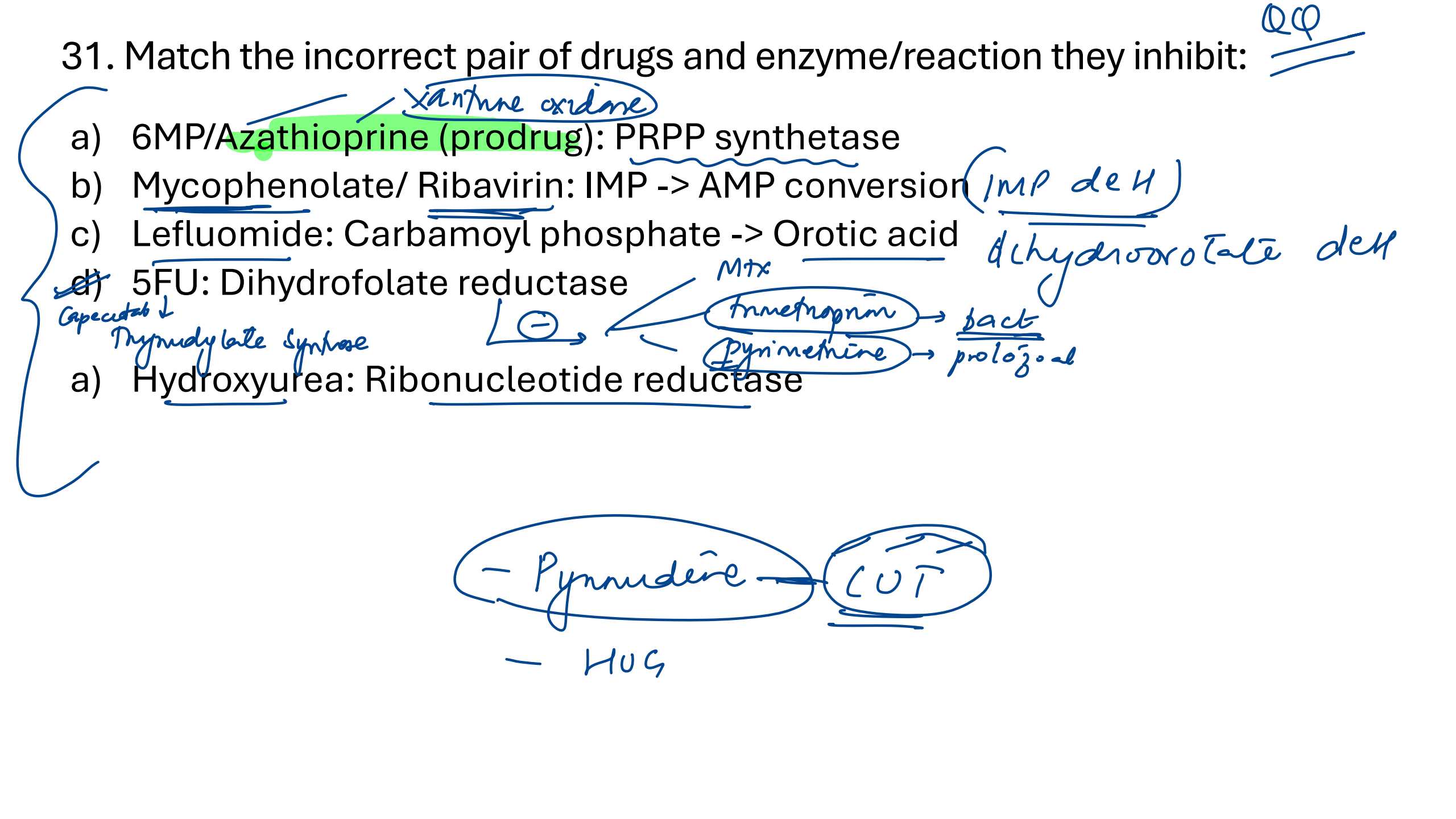
b) A-3, B-4, C-1, D-2

c) A-3, B-2, C-4, D-1

d) A-4, B-3, C-1, D-2

31. Match the incorrect pair of drugs and enzyme/reaction they inhibit:

a) 6MP/Azathioprine (prodrug): PRPP synthetase
b) Mycophenolate/ Ribavirin: IMP -> AMP conversion
c) Lefluomide: Carbamoyl phosphate -> Orotic acid
d) 5FU: Dihydrofolate reductase
a) Hydroxyurea: Ribonucleotide reductase



28. Which gene is not involved in double strand DNA break repair mechanism?

a) MRE11
b) BRCA1
c) KU80
d) MuTL /MSH – Mismatch

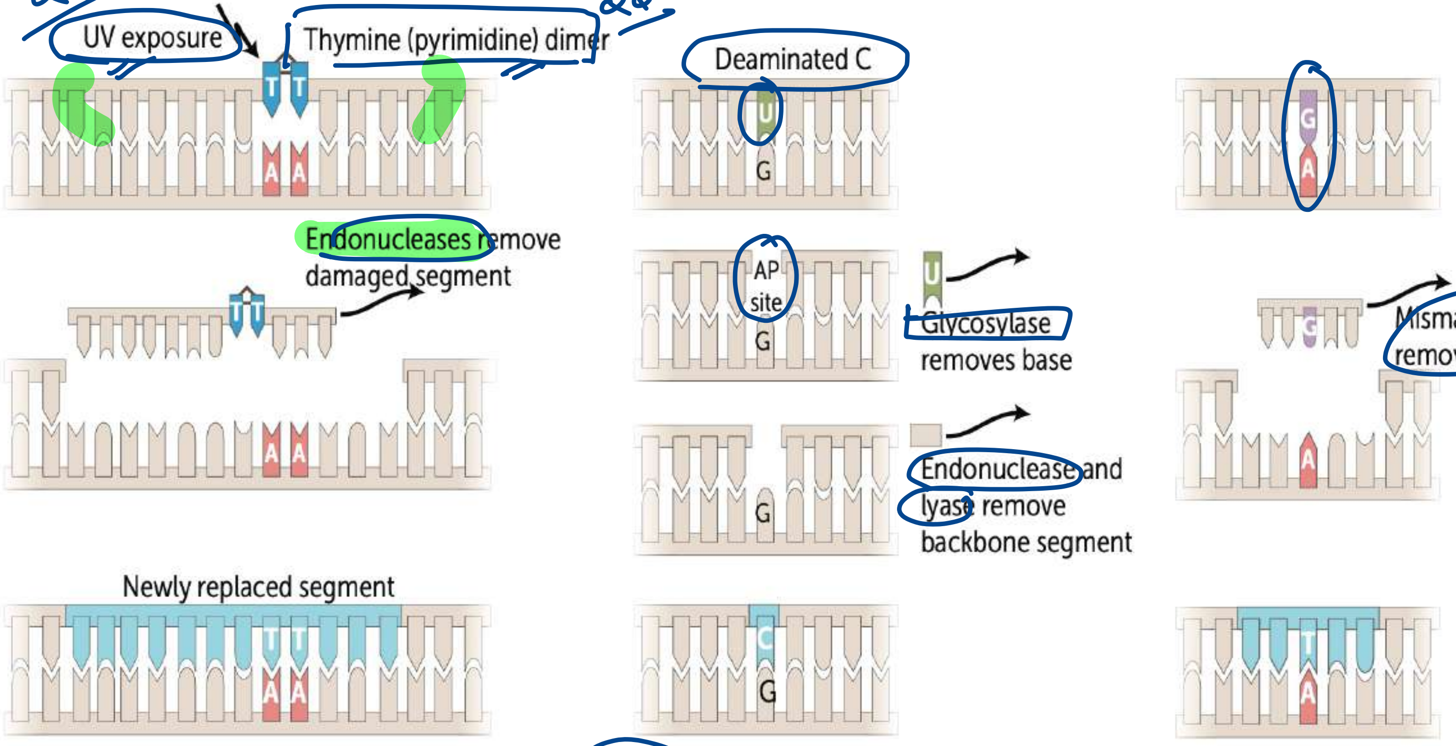
8. A 35-year-old man presents for evaluation after his father and older sister were diagnosed with colorectal cancer and endometrial carcinoma respectively at an early age. He is asymptomatic but concerned about his risk. Colonoscopy reveals no significant polyposis. This patient most likely has a defect in which of the following pathways?

a) Mismatch repair
b) Nucleotide excision repair
c) Base excision repair
d) Point mutation

AD

2 relatives

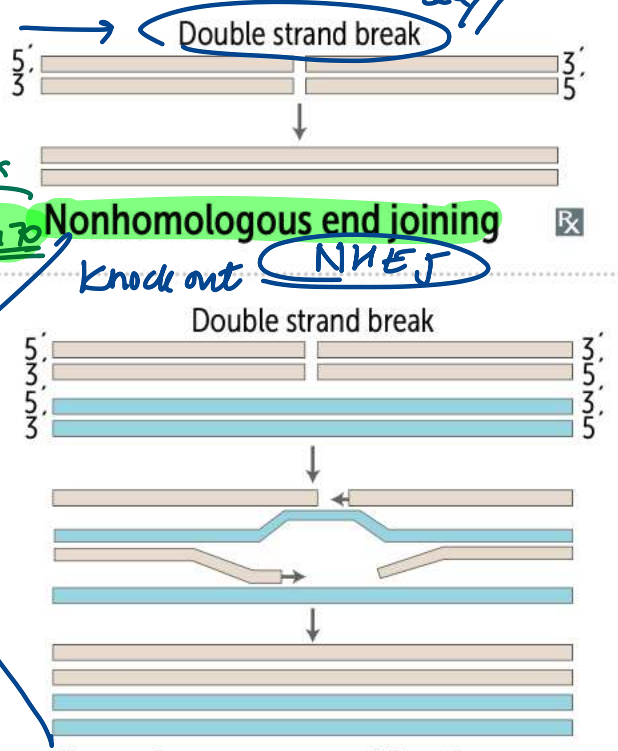
HNPCC



Nucleotide excision repair

Base excision repair

Mismatch repair



QQ UV exposure, Thymine (pyrimidine) dimer QQ

Ionising rad → Double strand break QQ

· ATM ← x
· SCID Ku70
· Bloom Sx

Knock out NHEJ

CRISPR Cas 9

MRE11 x → BRCA / Fanconi

Knock in

Nucleotide excision repair → G1 → XP QQ, Cockayne, trichothiodystrophy

Base excision repair → any phase. → MUTYH ass polyposis

Mismatch repair → S phase → HNPCC

single strand

double strand

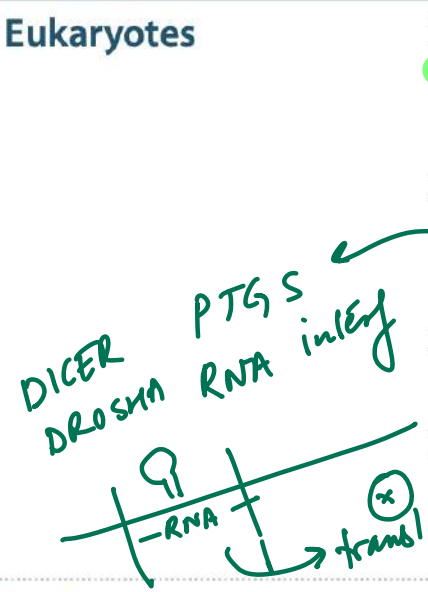
QQ

32. A 24-year-old man comes to emergency department complaining of abdominal pain, vomiting, and severe watery diarrhea. He recently returned from a camping trip and admits to eating wild mushrooms that he collected in the woods. On physical examination, he is ill-appearing and jaundiced. His liver edge is soft, tender, and palpable 4 cm below the right costal margin. Laboratory tests are significant for elevated levels of alanine aminotransferase, aspartate aminotransferase, and bilirubin. Synthesis of which of the following is most likely to be directly inhibited by the responsible toxin?

a) DNA
b) Messenger RNA
c) Protein
d) Ribosomal RNA

RNA polymerases

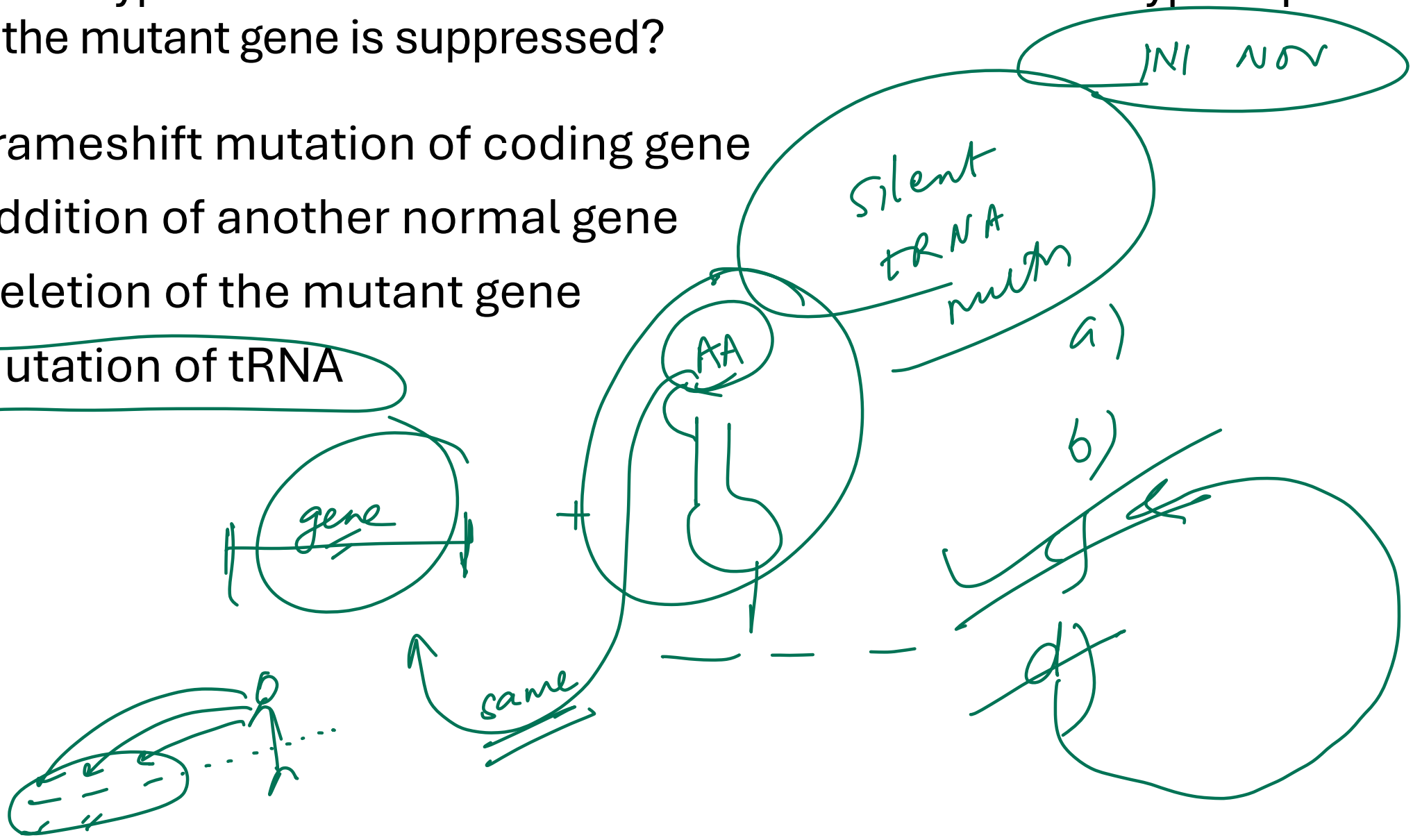
Eukaryotes	RNA polymerase I makes rRNA, the most common (rampant) type; present only in nucleolus. RNA polymerase II makes mRNA (massive), microRNA (miRNA), and small nuclear RNA (snRNA). RNA polymerase III makes 5S rRNA, tRNA (tiny). No proofreading function, but can initiate chains. RNA polymerase II opens DNA at promoter site.	I, II, and III are numbered in the same order that their products are used in protein synthesis: rRNA, mRNA, then tRNA. α-amanitin, found in *Amanita phalloides* (death cap mushrooms), inhibits RNA polymerase II. Causes dysentery and severe hepatotoxicity if ingested. Dactinomycin inhibits RNA polymerase in both prokaryotes and eukaryotes.
Prokaryotes	1 RNA polymerase (multisubunit complex) makes all 3 kinds of RNA.	Rifamycins (rifampin, rifabutin) inhibit DNA-dependent RNA polymerase in prokaryotes.



RNA pol

47. Which type of mutation results in the reversal to the wild type of phenotype when the mutant gene is suppressed?

a) Frameshift mutation of coding gene
b) Addition of another normal gene
c) Deletion of the mutant gene
d) Mutation of tRNA



3. Which of the following drugs acts by inhibiting translocation in protein synthesis?

MRB

a) Aminoglycosides → Init 30S

b) Tetracyclines → 30S → elongn

c) Macrolides

d) Chloramphenicol ptransf

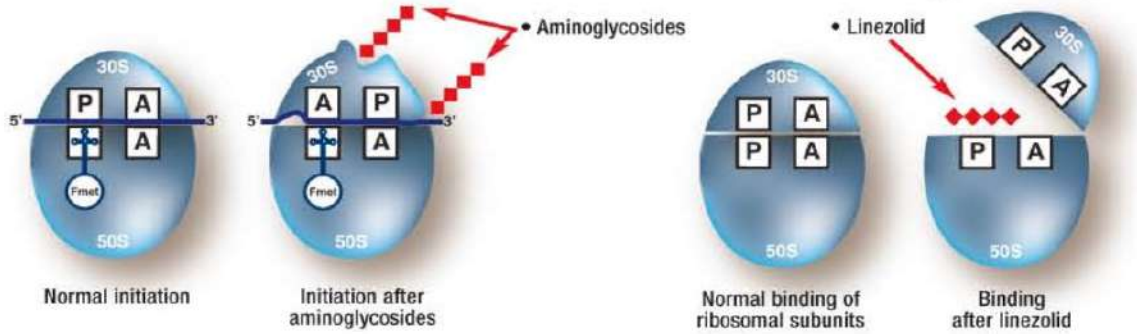
INITIATION

Aminoglycosides

- Aminoglycosides (e.g., gentamicin) **bind to the 30S subunit and distort its structure**. They also cause **misreading of mRNA**.
- Used to treat infections with *Escherichia coli*, *Klebsiella*, and *Pseudomonas*.

Linezolid

- Binds to the 50S subunit of the ribosome and **stops its binding to the 30S subunit**.
- Used to treat methicillin-resistant *Staphylococcus aureus* (MRSA).



ELONGATION

1 Binding aminoacyl-tRNA to the ribosome

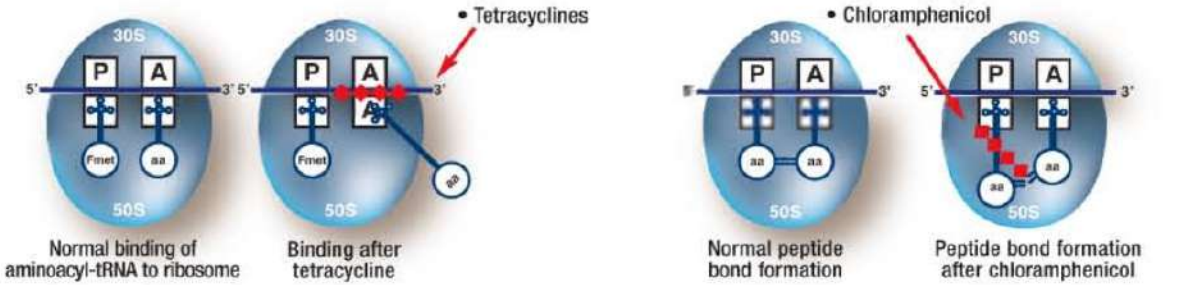
Tetracyclines

- Bind to the 30S subunit and **prevent the binding of aminoacyl-tRNA to the ribosome**.
- Used in the treatment of rickettsial infections and Lyme disease.

2 Peptide bond formation

Chloramphenicol

- Inhibits **peptidyl transferase**.
- Used as a backup in treatment of typhoid fever and bacterial meningitis.



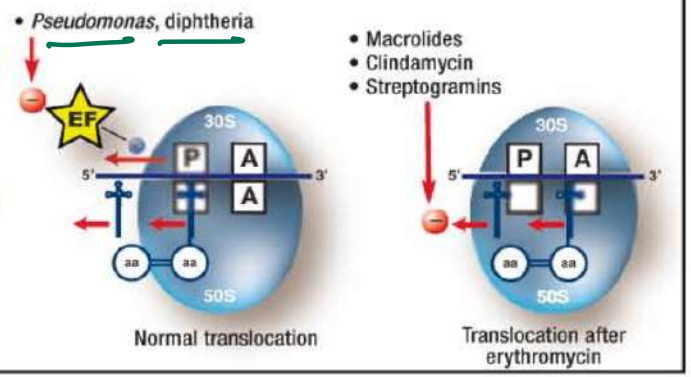
3 Translocation

Pseudomonas and diphtheria

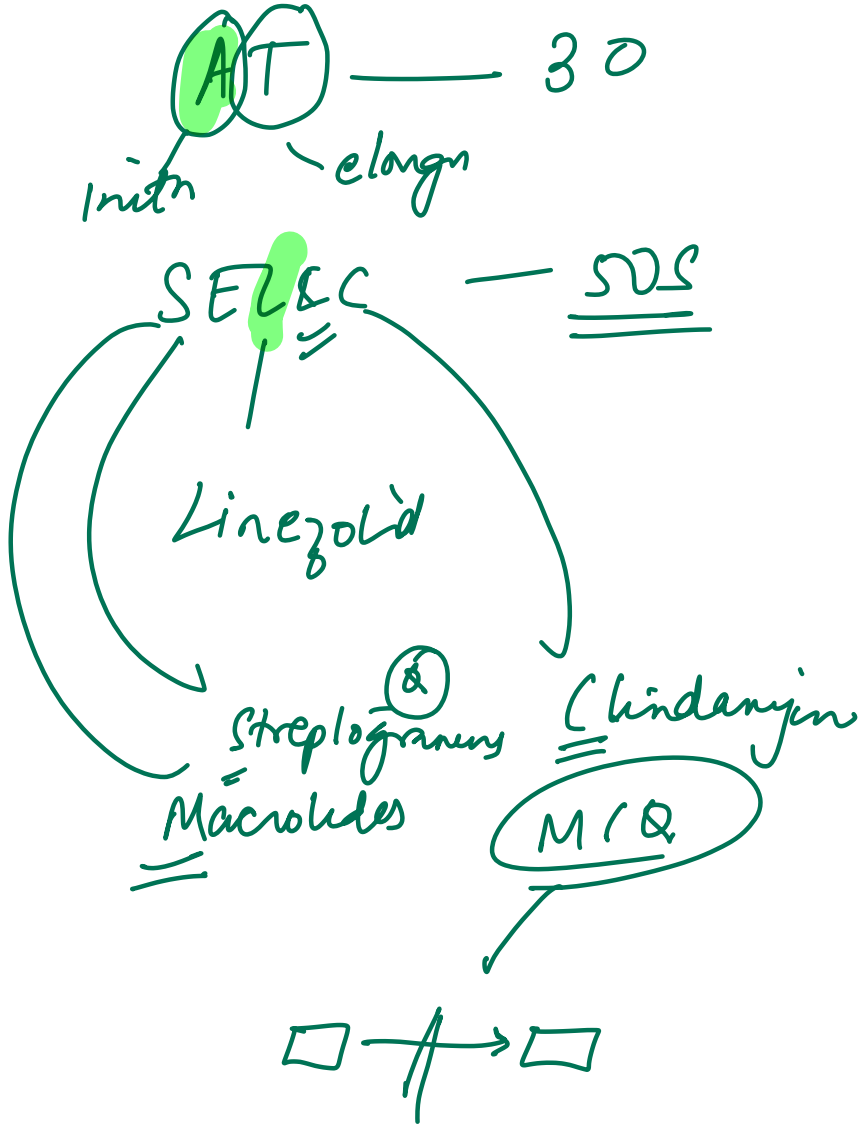
- *Pseudomonas* and diphtheria toxin catalyze the **ADP-ribosylation of elongation factor-2 (EF2)**, inhibiting eukaryotic protein synthesis.

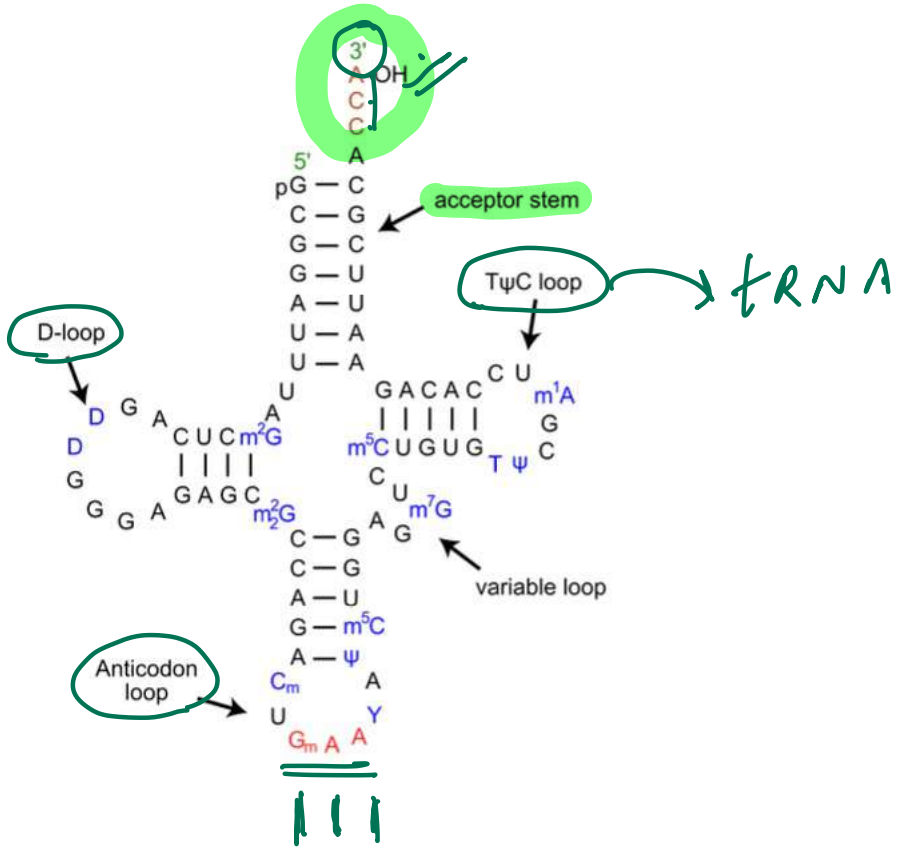
Macrolides

- Macrolides (e.g., erythromycin) bind to the 50S subunit and **inhibit translocation**.
- Used to treat infections with *Mycoplasma*, *Chlamydia*, *Legionella*, *Bordetella*, *Helicobacter*, and *Corynebacterium*.



fevicol





Region	Function
3' CCA tail	Site where **amino acid attaches** (Mnemonic: Can Carry Amino acids)
T arm	Involved in **binding ribosome and tRNA**
D arm	Contains **dihydrouridine** residues for **tRNA recognition** by synthetase
Anticodon loop	Binds **complementary codon** on mRNA

- 1️⃣ **Initiation**
- **Prokaryotes**: IF-1, IF-2, IF-3, 30S binds Shine-Dalgarno (~7 bases upstream of AUG)
- **Eukaryotes**: eIF2, 40S subunit binds 5' cap → scans for AUG (start codon) in **Kozak sequence**
- **Start codon AUG** codes for **Met (eukaryotes)**, **formyl-Met (prokaryotes)**
- Once AUG is identified, **60S/50S** large subunit joins → complete **80S/70S** ribosome
- 2️⃣ **Elongation**
- **Aminoacyl-tRNA** enters **A site** using GTP
- **Peptide bond formation** occurs via **rRNA (peptidyl transferase)**
- Ribosome moves along mRNA → peptide chain shifts to **P site**
- Empty tRNA exits via **E site**
- 3️⃣ **Termination**
- **Stop codons** (UAA, UAG, UGA) recognized by **release factors** (eRF in eukaryotes; RF1/RF2 in prokaryotes)
- GTP hydrolysis releases completed polypeptide

Feature	**Prokaryotes**	**Eukaryotes**
Ribosome	30S + 50S = 70S	40S + 60S = 80S
Initiation Factors	IF-1, IF-2, IF-3	eIFs (eIF1, eIF2, etc.)
Sequence before AUG	Shine-Dalgarno	Kozak sequence
Initiating Amino Acid	fMet	Met

14. Researchers are working to identify new targets for drug development to treat idiopathic pulmonary fibrosis. After obtaining lung tissue samples from affected patients, they conduct a series of experiments to measure the expression and activity of various profibrotic proteins. The results for one such protein, galectin-3, are as follows:

- mRNA concentration: Normal
- Protein concentration: Increased
- Protein activity: Intact

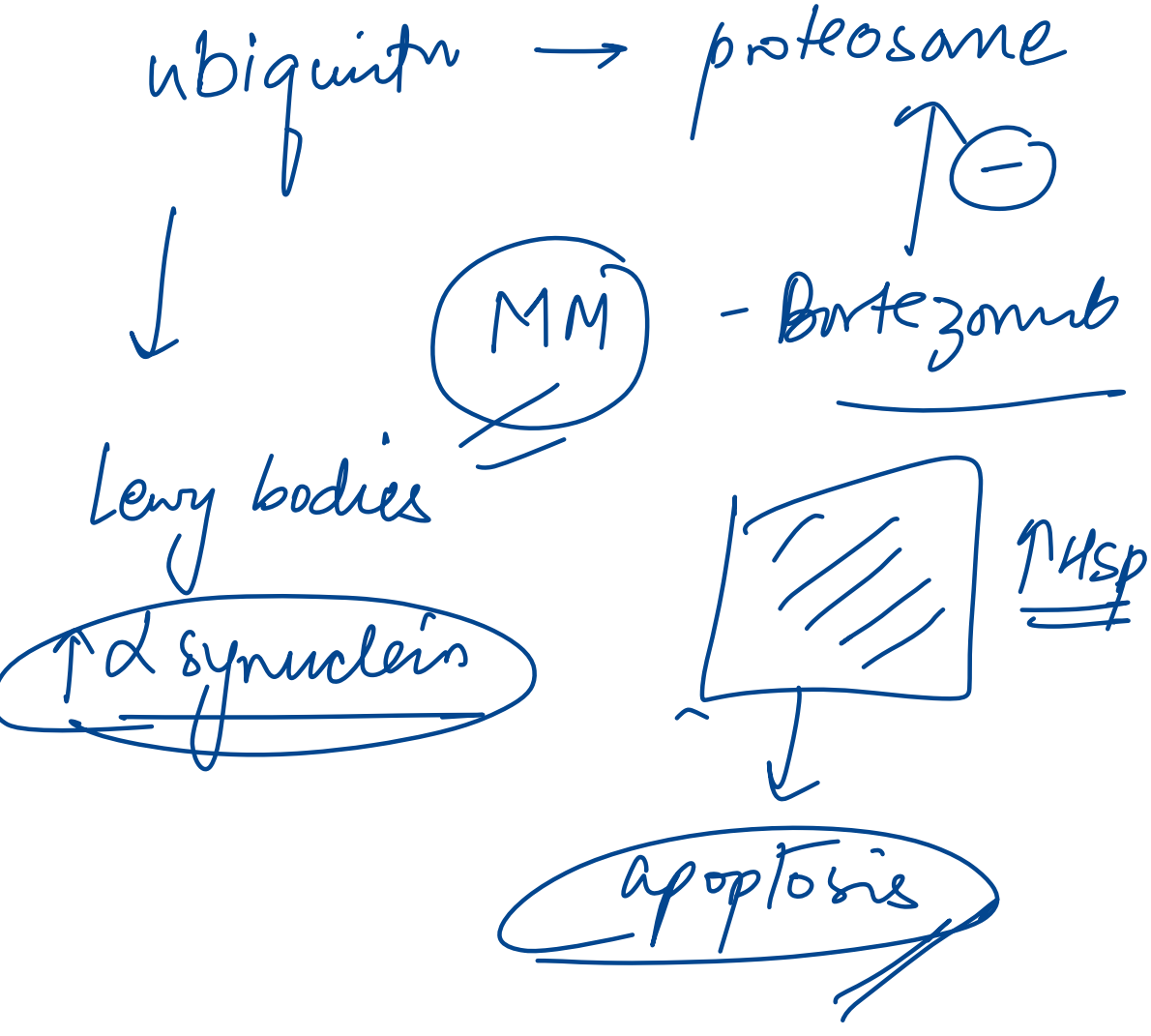
Which of the following processes best explains these findings?

a) Mutation in the Galectin-3 promoter region → mRNA ↓

b) Decreased methylation of the Galectin-3 gene → mRNA ↑

c) Shortening of the Galectin-3 mRNA poly-(A) tail → protn ↓

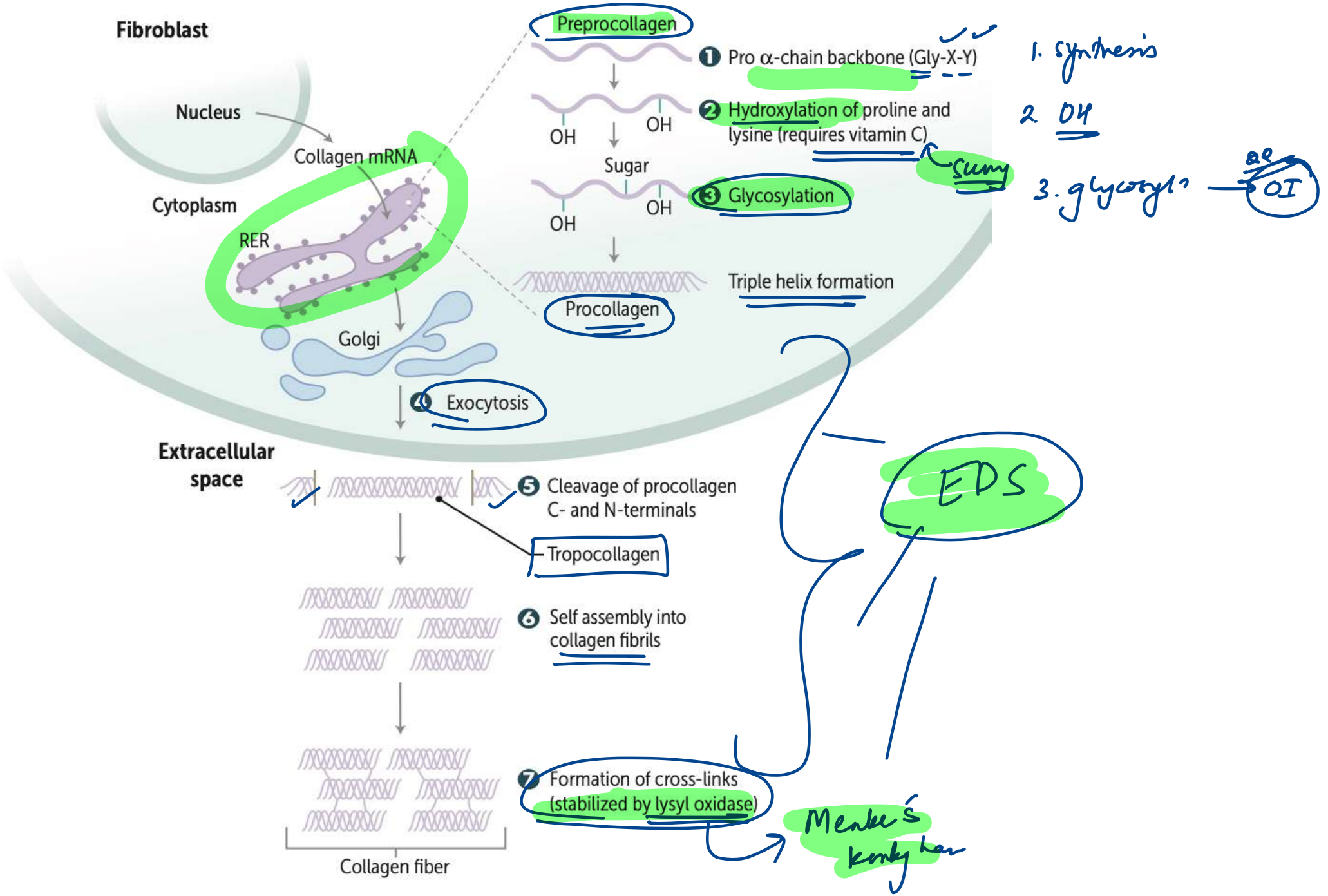
d) Decreased ubiquitination of the Galectin-3 protein


ubiquitin
proteosome
MM
- Bortezomib
Lewy bodies
↑α synuclein
↑Hsp
apoptosis

4. A 78-year-old woman comes to the OPD due to tenderness and easy bleeding of the gums when she brushes her teeth. Her skin findings are shown in the image. Further questioning reveals that the patient lives alone and that her diet consists primarily of tea and toast. Her symptoms are most likely caused by hypoactivity of an enzyme found in which of the following compartments?

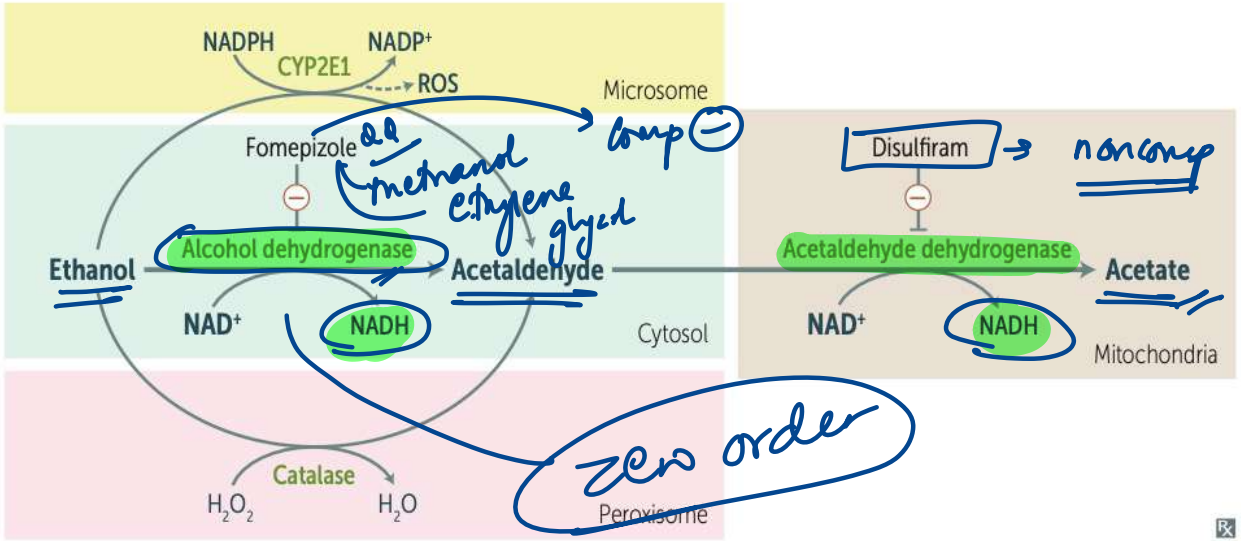
a) Extracellular space
b) Rough Endoplasmic Reticulum
c) Mitochondria
d) Nucleus

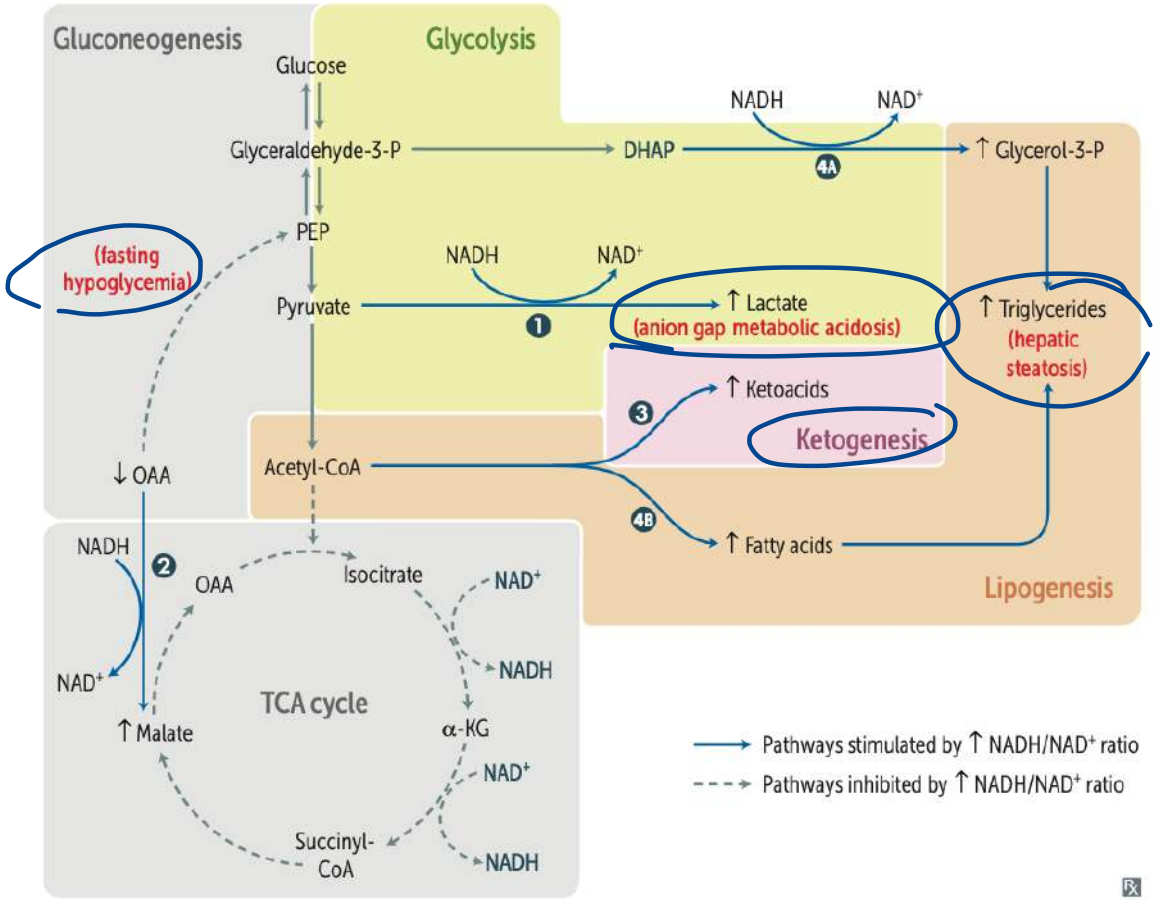
collagen
↓
- secretory
Scurvy
vit C
free ribosomes
cytosolic
mitochondrial


Fibroblast
Nucleus
Collagen mRNA
Cytoplasm
RER
Golgi
Preprocollagen
1 Pro α-chain backbone (Gly-X-Y)
2 Hydroxylation of proline and lysine (requires vitamin C)
OH
OH
Sugar
OH
OH
3 Glycosylation
Triple helix formation
Procollagen
4 Exocytosis
Extracellular space
5 Cleavage of procollagen C- and N-terminals
Tropocollagen
6 Self assembly into collagen fibrils
7 Formation of cross-links (stabilized by lysyl oxidase)
Collagen fiber
1. synthesis
2. OH
sunny
3. glycosyl
OI
EDS
Menke's kinky hair

46. All of the following reactions may be inhibited in an alcoholic except

a) Glycolysis
b) TCA
c) Lactic acid production
d) Fatty acid oxidation



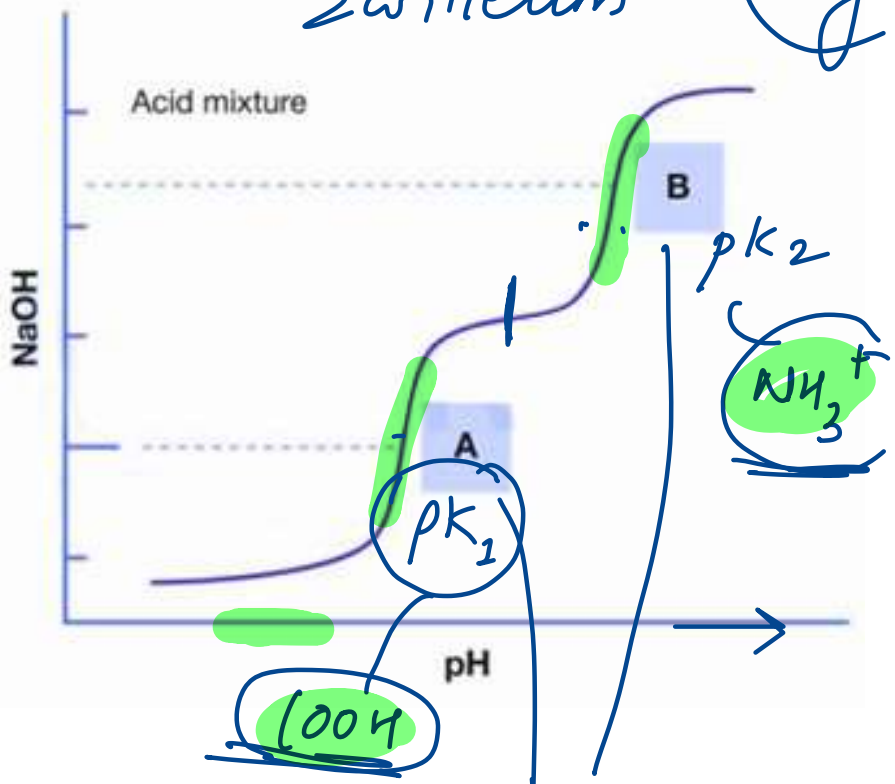


↑ NADH/NAD

- Gluconeogenesis (−)
- TCA (−)
- Acetyl CoA (+) → Pyr → LA
- (+) → KB synthesis
- (+) → Lipogenesis
  - Fatty Liver

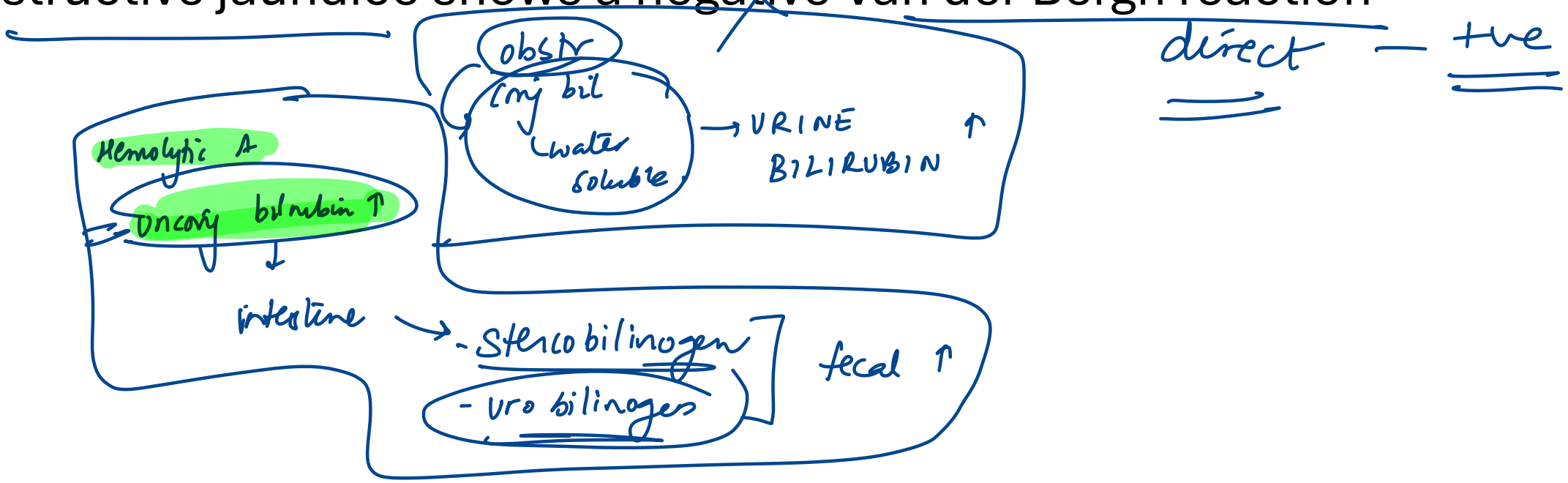
24. The graph shown below is the titration curve of a biochemical compound. Which of the following statement is true?

- The maximum buffering capacity of the compound is represented by points A and B
- The points A and B represent the range of maximum ionization of the amine and carboxyl group
- The compound has three ionisable side chains
- The compound has one ionisable group



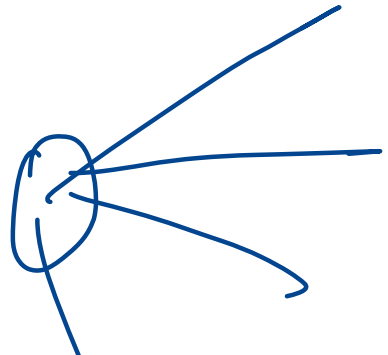
12. Which of the following is false regarding jaundice?

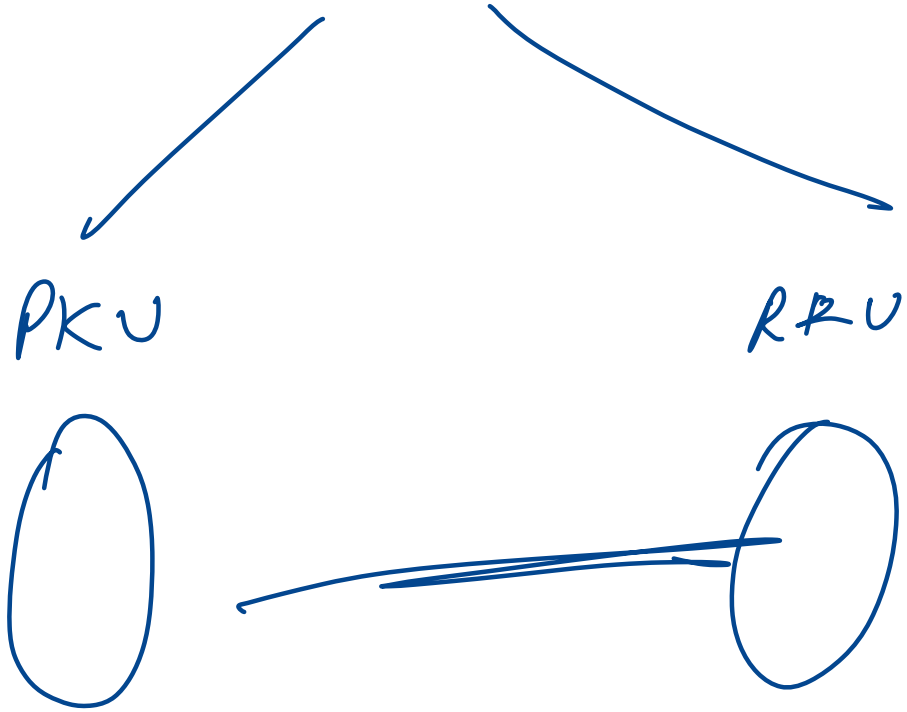
a) Urobilinogen is usually increased in hemolytic jaundice ↑
b) Urine bilirubin is absent in hemolytic jaundice. ↑
c) Crigler-Najjar syndrome presents with unconjugated hyperbilirubinemia T
d) Obstructive jaundice shows a negative Van der Bergh reaction



7. A 9-month-old boy is brought to the physician by his mother for the evaluation of seizures and musty-smelling urine. His immunizations are up-to-date. His height and weight are both below the 10th percentile. He is pale and has blue eyes. He cannot pull himself up from a seated position to stand and does not crawl. Which of the following genetic principles best explains the variety of phenotypic traits seen in this patient?

a) Anticipation
b) Incomplete penetrance
c) Pleiotropy
d) Variable expressivity





Term	Definition	Example
Dominant negative mutation	Exerts a dominant effect. A heterozygote produces a nonfunctional altered protein that also prevents the normal gene product from functioning.	Mutant p53 inhibits normal p53
Mosaicism	Presence of genetically distinct cell lines in the same individual. Somatic: post-fertilization. Germline: confined to egg/sperm.	McCune-Albright syndrome
Heteroplasmy	Presence of both normal and mutated mtDNA, resulting in variable expression in mitochondrial inherited disease.	Leber hereditary optic neuropathy
Variable expressivity	Same genotype leads to varying phenotypes among individuals.	Neurofibromatosis type 1 (NF1) with different severities
Incomplete penetrance	Not all individuals with a pathogenic variant show the disease.	BRCA1 mutation not always causing cancer
Pleiotropy	One gene contributes to multiple phenotypic effects.	Cystic fibrosis affecting lungs, pancreas, male fertility
Anticipation	Increased severity or earlier onset of disease in succeeding generations.	Huntington disease

2. All of the following are correctly matched with transcription factors except:

a) Zinc finger — Steroid hormone receptors
b) Leucine zipper — CREB protein
c) Helix-turn-helix — PPARs
d) Helix-turn-helix — Homeodomain proteins PAX 3

Transcription Factor	DNA Response Element	Domain Type	Related Drug or Condition
PPARγ, PPARα	PPRE	Zinc finger	Glitazones, Fibrates
Steroid receptor	GRE	Zinc finger	Cortisol
CREB	CRE	Leucine zipper	Glucagon signaling
PAX3	Enhancer/promoter	Helix-turn-helix	Waardenburg syndrome

2° mess
cAMP

DNA resp element

5. All of the following are correctly matched except:

a) Leber hereditary optic neuropathy — Complex I mutation
b) Leigh syndrome — Complex I mutation
c) MELAS — Mutation in mitochondrial leucine tRNA
d) MELAS — Only Complex II is impaired

Disorder	Cause	Key Features
Leber Hereditary Optic Neuropathy (LHON)	mtDNA mutation (complex I)	Acute **vision loss**, optic nerve atrophy
Leigh Syndrome	mtDNA mutation (mainly complex I)	Developmental delay, hypotonia, **spasticity**
MELAS	Mutation in **mitochondrial leucine tRNA**	Myopathy, **lactic acidosis**, stroke, encephalopathy

1. Which of the following conditions will cause a decreased BMR?

A. Cachexia
B. Cold environment
C. Hyperthyroidism
D. Starvation / Cushing / Addison's

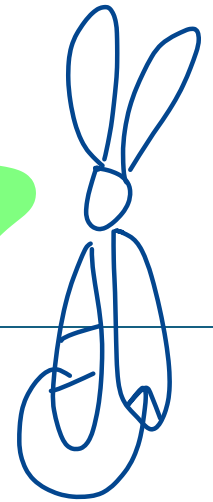
Fever ↑

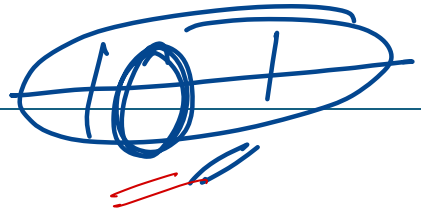
—— ↓BMR.

38. Autopsy of a patient shows an absence of fat in the omentum, mesentery as well as subcutaneous tissue. Which of the following is the most likely cause?

a) Starvation
b) Cancer
c) Chronic disease
d) Bariatric surgery with liposuction

MOLECULAR BIOLOGY





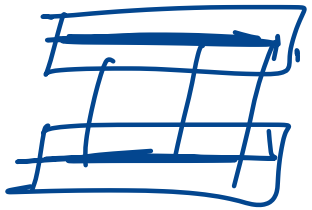
- Cytogenetics

Karyotype → aneuploidy

FISH – MAT ✓ ✗ pt mutn

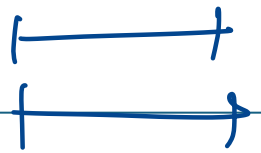
Microarray/ CGH (GWAS)

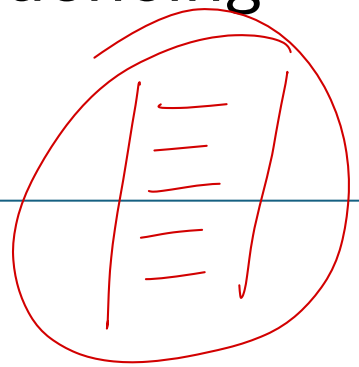
probes



- Known mutation site

DNA extraction -> PCR -> RFLP / sequencing





FMT

39. Match the correct pair regarding medicolegal importance with respect to age. All are correctly matched except:

A. 7 months gestation — Infanticide can't be charged if fetus < 7 months

B. <7 years — No criminal responsibility

C. 10 years — Consent by parent or guardian required before examination

D. <16 years — Taking away boy without consent amounts to kidnapping

41. A man was driving on a highway when he saw a car accident. The victim was unconscious and trapped inside a burning car. The driver carefully removed the victim from the car despite being instructed by paramedics not to move him. The victim, who already had a cervical spine fracture, developed permanent paralysis after being pulled out. Which of the following is true in this situation?

A. The man will be charged for contributory negligence.

B. The man will not be charged as Good Samaritan doctrine applies.

C. The man is guilty of rash and reckless behavior.

D. The man will be charged for criminal negligence.

CONTRIBUTORY NEG

- Doctor didn't provide instructions — dr guilty
- Last clear chance doctrine — dr guilty
- Avoidable consequences rule-Applying urine on scorpion sting — dr innocent
- Good Samaritan doctrine

intent ✓

49. Burden of proof lies of the following parties except:

A. Criminal negligence: Prosecution (Govt)
B. Res ipsa liqutor: Government
C. Civil negligence: Plaintiff (plnt)
D. Contributory negligence: Doctor

Dr will have to prove

→ Innocent until proven guilty

22. Which of the following indicate abrasions produced after death?

A. Vital reaction positive
B. Present over bony prominences
C. Congestion seen
D. Bright reddish brown in color

29. Which of the following is a reliable indicator that a victim was alive while the fire was in progress?

A. Vital reaction in the burned area

B. Elevated carboxyhemoglobin levels

C. Redness of the exposed skin surface

D. Blistering of the skin

Livor mortis vs contusion:

Dependent: LM
Well defined: LM
Blanch: LM
Extravasation: C
Colour change: C

Antemortem vs Postmortem clot:

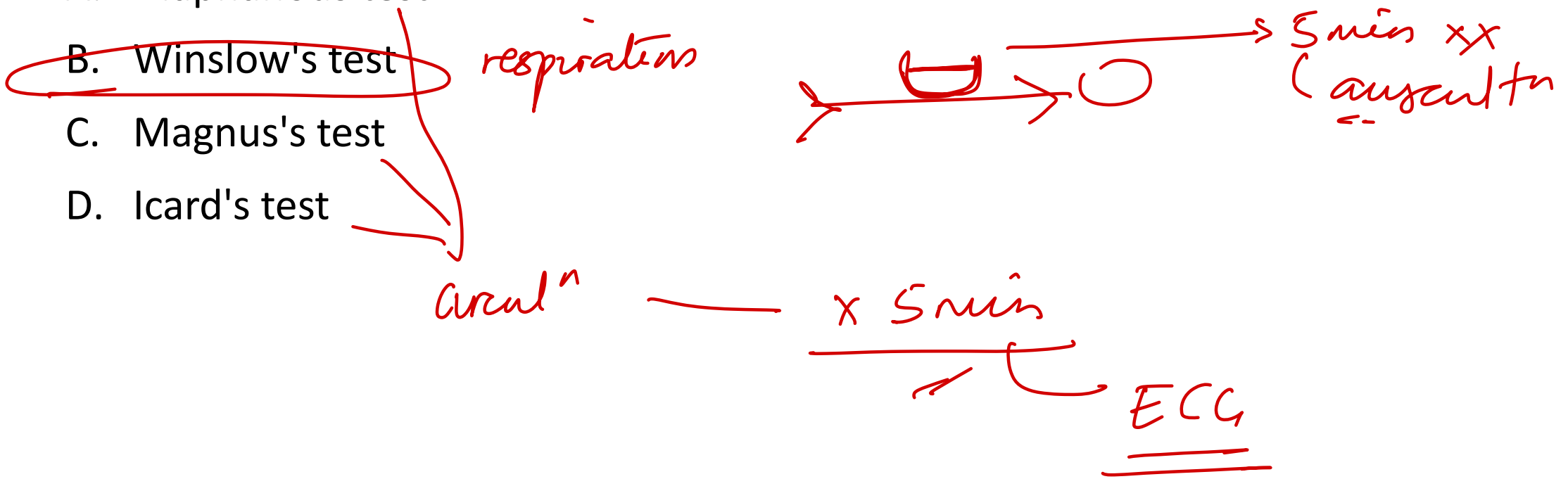
Firm, dark red- AM
Striae of Zahn - AM
Coralline platelet thrombus- AM
Chicken fat clot- PM

Antemortem vs Postmortem burn:

Cherry red blood (CO) -strongest AM
Soot in airway AM
Line of redness AM
Vital sign AM
Blister containing fluid AM
Blister containing gas PM
Congested organs AM

34. A critically ill patient who is a registered organ donor collapses even after resuscitative measures. All of the following tests can be used to check the cessation of circulation, except:

A. Diaphanous test
B. Winslow's test
C. Magnus's test
D. Icard's test



9. Which of the following mechanisms is responsible for the rebound effect seen with carbon monoxide poisoning?

A. Binding of carbon monoxide to myoglobin

B. Binding of carbon monoxide to hemoglobin

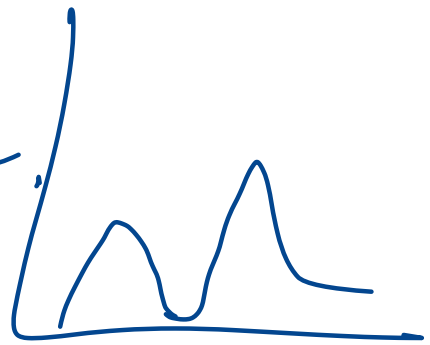
C. Inhibition of cytochrome oxidase a3

D. Conversion of hemoglobin from T state to R state

CO - Hb

CO - Mb

2nd wind - McArdle



33. All of the following may be seen in patients with hydrargyrism except?

A. Coarse intentional tremors
B. Psychosis
C. Erythema of limbs
D. Bowen's disease

Hg

Mercuria lentis
Membranous nephropathy/ colitis
Excess salivation

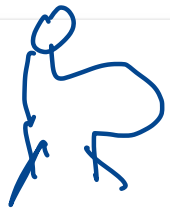
Skin hyperkeratosis

ARSENIC CHRONIC

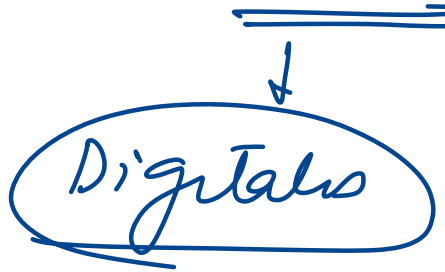
43. Which of the following findings are seen in a non-poisonous snake?

A. Incomplete belly scales
B. Compressed tail
C. Long and canalized fangs
D. Small head scaled

Feature	Poisonous snake	Non-poisonous snake
Belly scales	Large and it covers the entire belly	Small and do not cover the entire belly
Head scales	Small	Large
Fang	Long and canalised	Short and solid
Tail	Compressed	Not markedly compressed
Habits	Nocturnal	Not so
Bite	Two fang marks	A number of small teeth marks in a row



48. Which of the following is the most specific treatment for foxglove poisoning?



A. Potassium supplementation

B. IV hydration

C. Digoxin immune Fab

D. Atropine administration

Hemlock → Conium

Rosary pea → Abrus

Deadly nightshade → Atropa

19. A 45-year-old painter presents with complaints of constipation, abdominal cramps, and tingling in the extremities. His bloodwork shows a lead level of 50 µg/dL. What is the antidote preferred for this patient?

A. DMPS

B. Penicillamine

C. DMSA

D. Dimercaprol

44. All of the following antidotes are correctly matched with their contraindications except:

A. BAL — Contraindicated in liver damage

B. BAL — Contraindicated in Cadmium deficiency

C. EDTA — Contraindicated in mercury poisoning

D. Penicillamine — Contraindicated in Lead poisoning

42. All of the following are features of drug addiction except:

A. Psychological and physical dependence

B. Compulsion is present

C. Tendency to increase dose

D. No withdrawal symptoms

withdrawal symp

vs

Habituation

↓

– psychological dep.

36. All of the following are correct statements except:

A. Integrins and fibronectin work together for tissue remodelling.

B. Potassium levels in vitreous humor fall linearly after death and are a useful measure of time of death.

C. Suspended animation can be seen after electrocution.

D. Industrial workers most frequently develop inorganic lead poisoning through inhalation

A B C D E

anesthesia babies Cholera drowning ecchoic

6. Which of the following options is related to Ewing's postulates?

A. Complication resulting from trauma
B. Growth after neurological injury
C. Congenital anomalies caused by drugs
D. Old seminal stains