

**BIOCHEM-FMT**

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**EXTRA-EDGE**

# BIOCHEM

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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

### Glycerophospholipid

**Phosphatidyl choline** = Lecithin - Lung maturity  
*Surfactant*  
 P. Ethanolamine = Cephalin - myelin  
 DiP glycerol = **Cardiolipin** - Barth's  
*Antigen*  
 P. Serine → apoptosis (flipping) - Tunel stain  
 P. inositol → 2<sup>nd</sup> messenger - Gq - IP3 / DAG  
 Plasmalogen

### Sphingophospholipid

↓  
**Sphingomyelin**  
 (Ceramide + choline + Po4)

## GLYCOLIPIDS: No Po4

carb + sphingosine → FA  
 Cerebroside : Ceramide + Monosaccharide 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
7. Timnodonic acid/EPA - ω3
8. Cervonic acid/DHA - ω3
9. α-Linolenic - ω3

### SATURATED

Palmitic acid

↑ CV risk

Which of the following is not amphipathic?

- A) Sphingolipids
- B) Phosphoglycerol
- C) Triglycerides
- D) Glycolipids

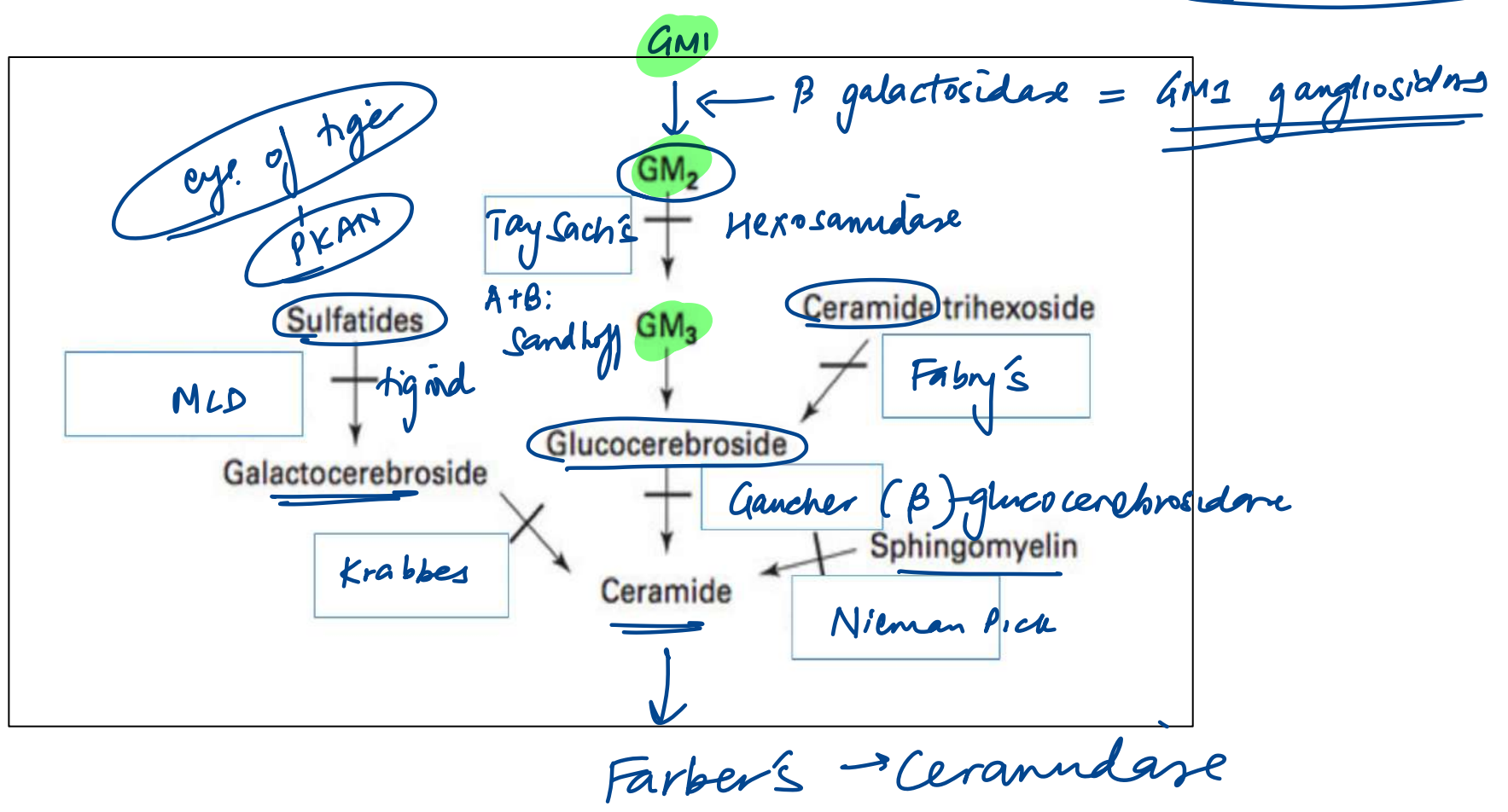
Hydrophilic / phobic  
(COO<sup>-</sup> changed)

↑ CV risk

essential fa

↓ CV risk  
fish oil

\* Krabbe's :  $\beta$ -galactocerebrosidase



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, <u>Fehling's test</u>
Differentiate aldoses and ketoses (Fructose) $\text{glc/gal}$	<u>Seliwanoff's test</u> , Rapid <u>furfural test</u> , <u>Foulger's test</u>
Test for pentoses	Bial's test
Test for galactose	Mucic acid test

Trehalose $\alpha$ 1,1 $\text{glc} + \text{glc}$
Maltose $\alpha$ 1,4
Isomaltose $\alpha$ 1,6
Lactose : $\text{glc} + \text{gal}$
Sucrose : $\text{glc} + \text{fru}$
<u>Lactulose</u> $\text{gal} + \text{fructose}$

<u>SPECIAL GROUPS</u>	
Two peptide linkages	Biuret Reaction
Alpha-amino acids	Ninhydrin Reaction
Benzene ring ( <u>Phenylalanine</u> )	Xanthoproteic Reaction $\text{HNO}_3$
<u>Phenolic group</u> (Tyrosine)	<u>Millon's Reaction</u> , <u>Folin-Ciocalteu's Test</u>
Indole ring (Tryptophan)	<u>Hopkins-Cole Reaction</u>
Guanidine group (Arginine)	<u>Sakaguchi Reaction</u>
Sulfhydryl groups (Cysteine)	Nitroprusside Reaction, Sulfur Test
<u>Imidazole ring</u> ( <u>Histidine</u> )	<u>Pauly's Test</u>

$\text{NH}_3 \rightarrow \text{NH}_4^+$   
"condens"

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 1	Transfer of electrons Results in a change in oxidation state	Dehydrogenase
Transferase 2	Transfer of functional group from one molecule to another	Phosphorylase, Kinase <i>ATP</i>
Hydrolase 3	Breakdown of a covalent bond using water	Protease, Phosphatase
Lyase 4	Breakdown of a covalent bond without water or oxidation	Decarboxylase, Hydratase, Aldolase, Synthase
Isomerase 5	Rearrangement of bonds within a molecule	Mutase
Ligase 6	Formation of a covalent bond between two large molecules	Synthetase, Carboxylase
Translocase 7	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?

Limit dextria

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

Fanconi-Bickel → GLUT 2

type 0  
 glycogen synthesis ×

Glucagon

absent

G-6-PD<sub>4</sub> ase

ER → transport → GSD → Von Gierke's

glc → glc ↑ but not 2

-debranching

→ GSD type 1b

G-6-PD<sub>4</sub>

↓

glycolysis → pyruvate → acetyl CoA

↳ lipogenesis ↑

↳ KB ↑

↳ T ↑

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

a)  $\alpha(1\rightarrow6)$  linkage;  $\alpha(1\rightarrow4)$  linkage

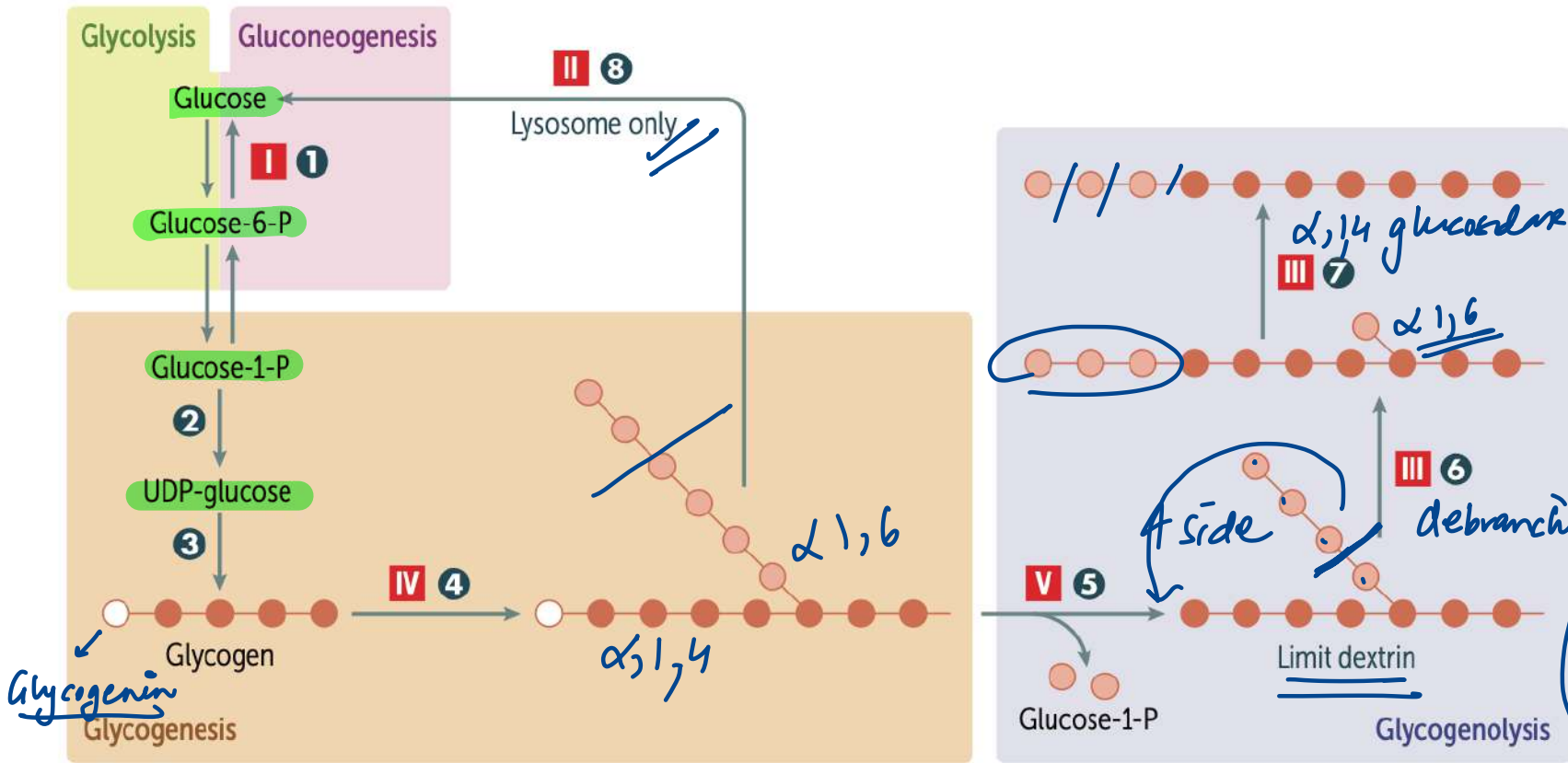
b)  $\alpha(1\rightarrow6)$  linkage;  $\alpha(1\rightarrow6)$  linkage

~~c)  $\alpha(1\rightarrow4)$  linkage;  $\alpha(1\rightarrow6)$  linkage~~

d)  $\alpha(1\rightarrow4)$  linkage;  $\alpha(1\rightarrow4)$  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- $\alpha$ -D-glucanotransferase)
- 7** Debranching enzyme ( $\alpha$ -1,6-glucosidase)
- 8**  $\alpha$ -1,4-glucosidase

Note: A small amount of glycogen is degraded in lysosomes by **8**  $\alpha$ -1,4-glucosidase (acid maltase).

6 tedhi

4

Telegram: @brainandscalpel  
 Branches have  $\alpha$ -(1,6) bonds; linear linkages have  $\alpha$ -(1,4) bonds.

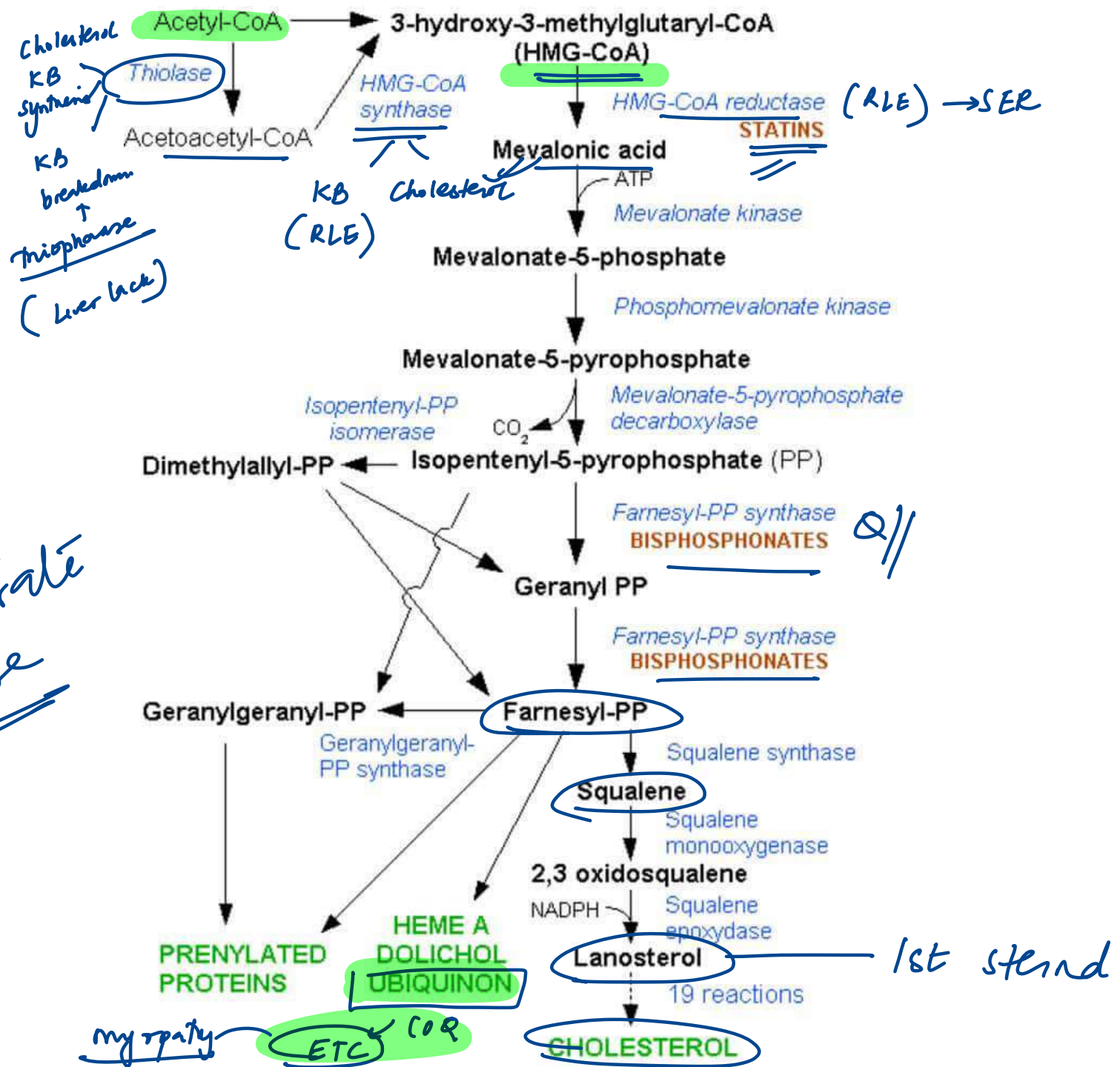
26. Identify the enzyme not involved in cholesterol biosynthesis.

a) HMG CoA Reductase

~~b) HMG CoA lyase~~ → ✗ B

c) HMG CoA synthetase

d) Thiolase



Competitive  
ATP citrate  
lyase

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?

Zellweger

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

17. Lorenzo oil is used in the treatment of:

a) Fabry's disease

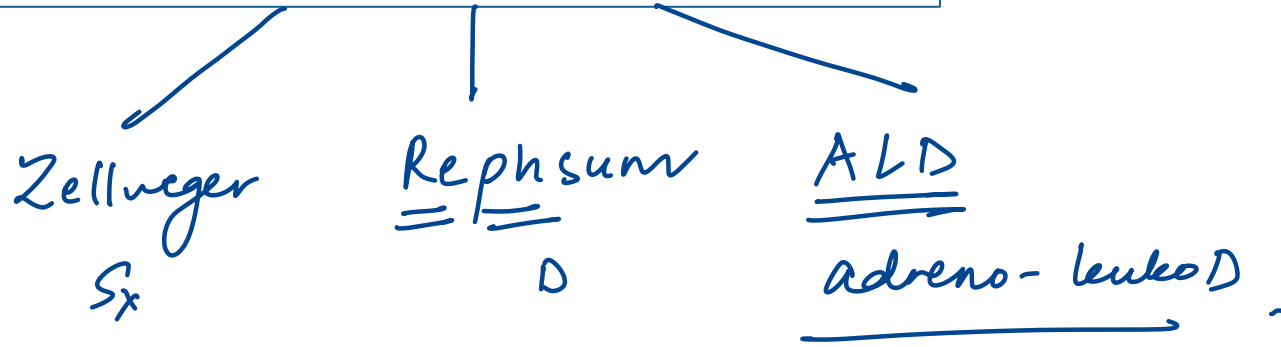
b) Adrenoleukodystrophy

c) Hurler's disease

d) Gaucher disease

Peroxisomes

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



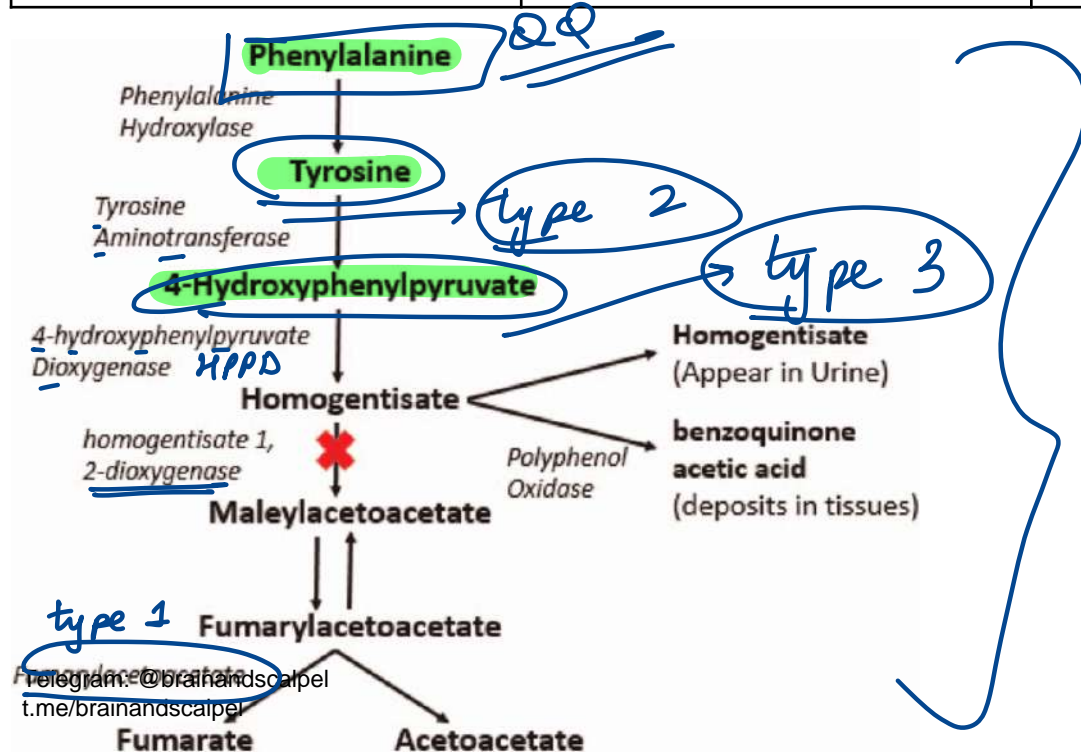
30. Richner-Hanhart syndrome is associated with a defect in which of the following?

- ~~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

Hawkinsinins missense mutn

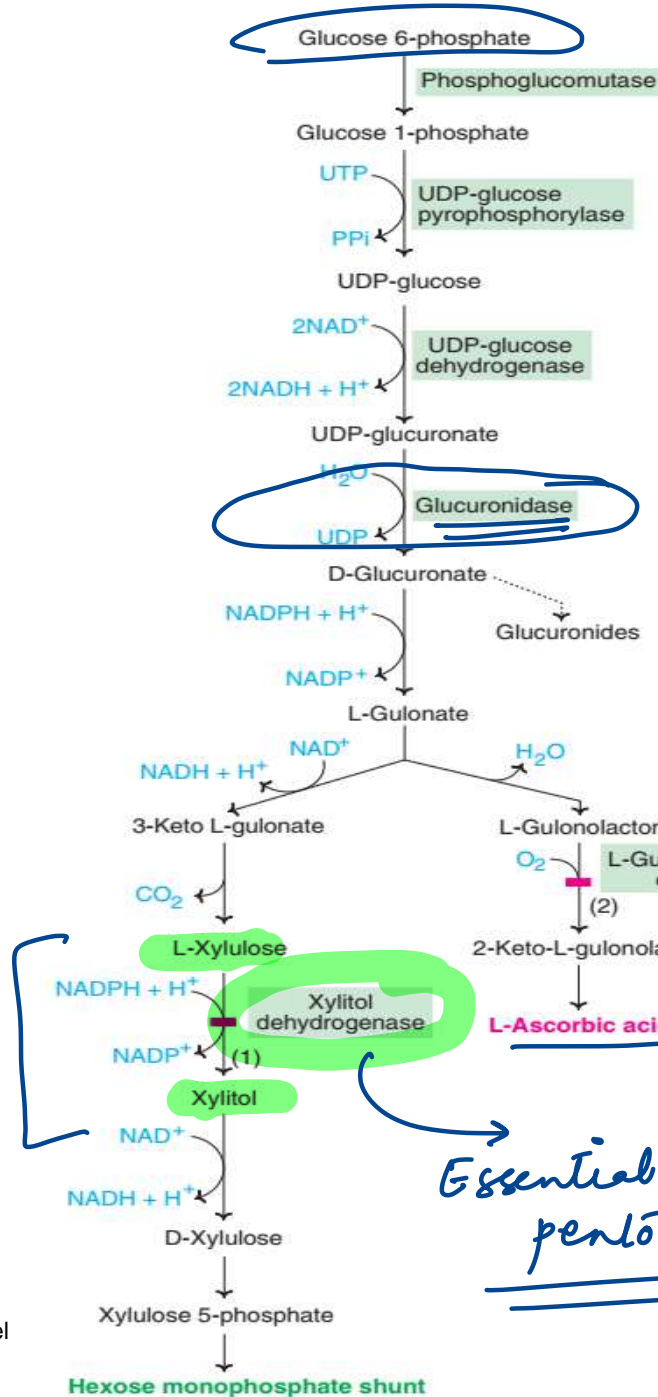


Corneal ulcer  
PP keratid

↳ →  
- withdraw tyrosine /  
PhA  
+ Nitisone

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

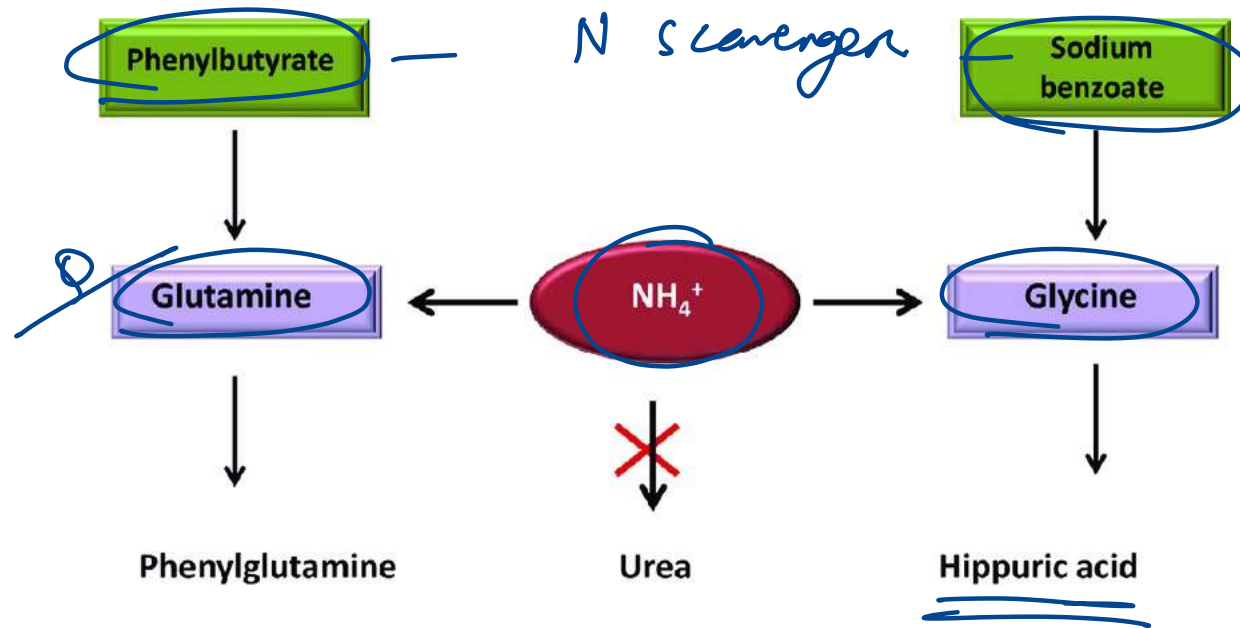
Humans (X)

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



23. Identify the correct statements

*Histidine*

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 *Hyaluronic acid*
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 endothelium.

a) 1, 2, 3, 4

~~b) 3, 4~~

c) 2, 4

d) 1, 2

HSL  
LPL

LPL  
LA

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

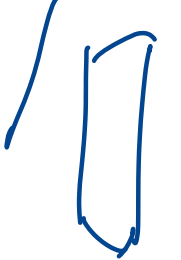
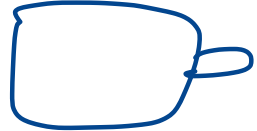
a) Hunter's disease

b) Sanfilippo disease

c) Sly syndrome

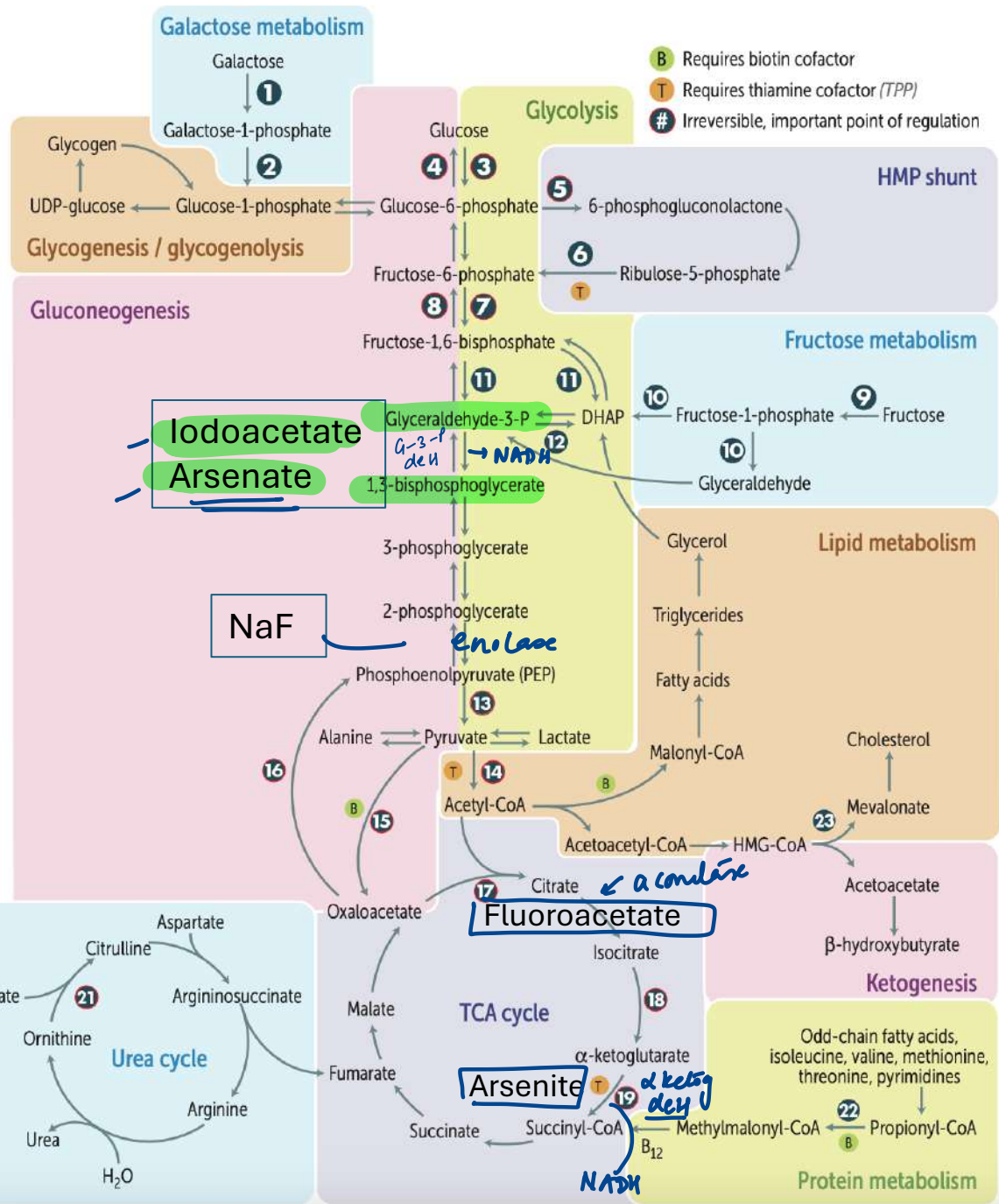
d) Hurler's disease

Syndrome	MPS Type	Enzyme Deficiency	Accumulated Substrate(s)
Hurler-, Scheie syndrome	MPS I	$\alpha$ -L-Iduronidase	Dermatan sulfate, Heparan sulfate
Hunter syndrome	MPS II	Iduronate sulfatase	Dermatan sulfate, Heparan sulfate $\rightarrow$ XLR / $\otimes$ corneal clouding
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	$\beta$ -glucuronidase	Dermatan sulfate, Heparan sulfate, Chondroitin 4-sulfate
Natowicz syndrome	MPS IX	Hyaluronidase	Hyaluronic acid

skeletal  $\rightarrow$  ++  
 oar ribs /  /   
 bullet mc      central beaking

# Summary of pathways

- 1 Galactokinase (*mild galactosemia*)
- 2 Galactose-1-phosphate uridylyltransferase (*severe galactosemia*)
- 3 Hexokinase/glucokinase
- 4 Glucose-6-phosphatase (*von Gierke disease*)
- 5 Glucose-6-phosphate dehydrogenase
- 6 Transketolase
- 7 Phosphofruktokinase-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  $\alpha$ -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 48 hours. (T)

3. ~~Glutamine~~ is the major transporter of ammonia from muscles to liver

4. Iron should not be taken with black tea. (T)

Alanine

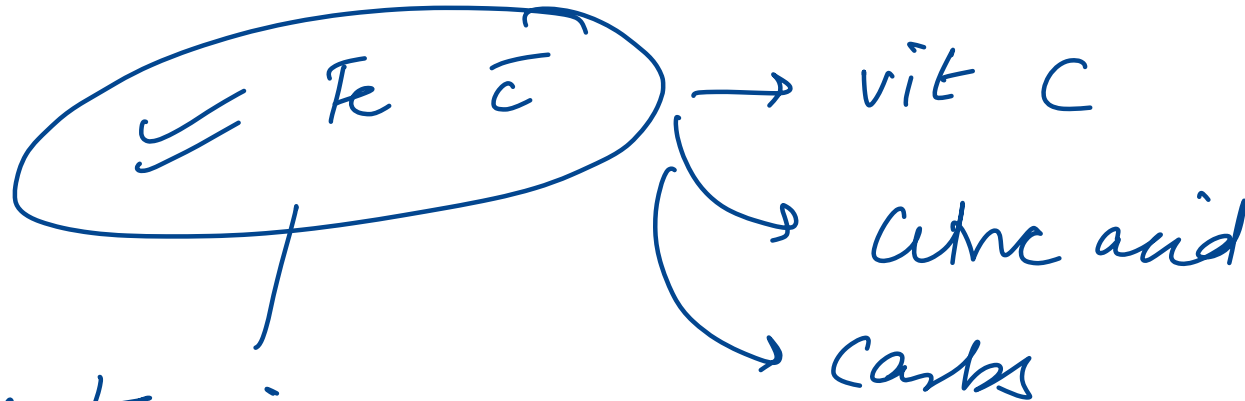
tannin

• 1, 2, 3, 4

• 1, 2, 4

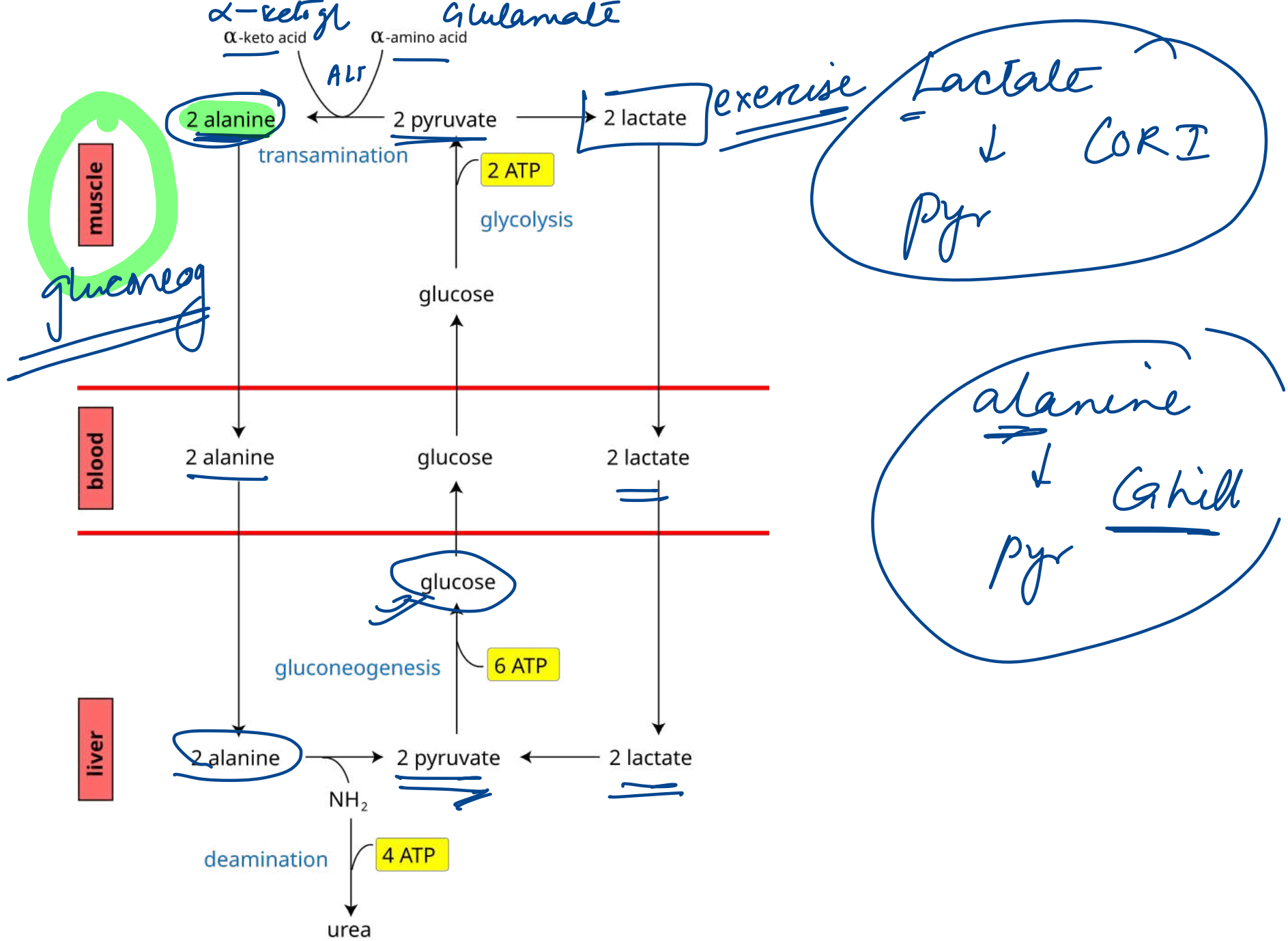
• 2, 4

• 1, 3



x tannin

x Ca / PO<sub>4</sub> / milk / PPI / oxalic acid



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 ( <i>snail</i> )
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

xanthine oxidase

b) Mycophenolate/ Ribavirin: IMP -> AMP conversion

(IMP deH)

c) Lefluomide: Carbamoyl phosphate -> Orotic acid

dihydroorotate deH

d) 5FU: Dihydrofolate reductase

Mtx

trimetoprim

bact

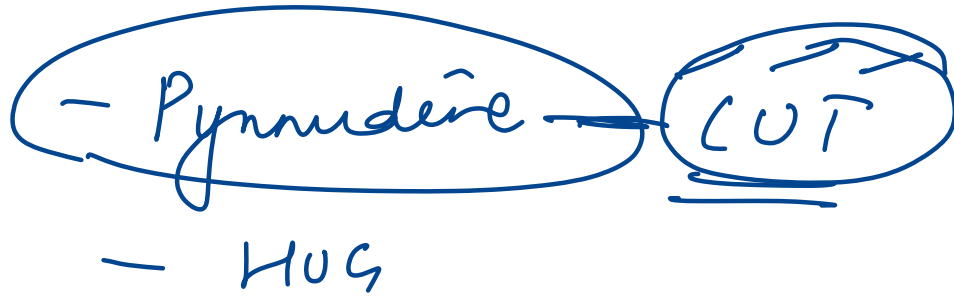
pyrimethine

prologal



Capecitabine ↓  
Thymidylate synthase

a) Hydroxyurea: Ribonucleotide reductase



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

a) MRE11

b) BRCA1

c) KU80

d) MuTL / MSH - mismatch

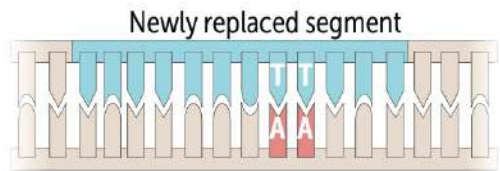
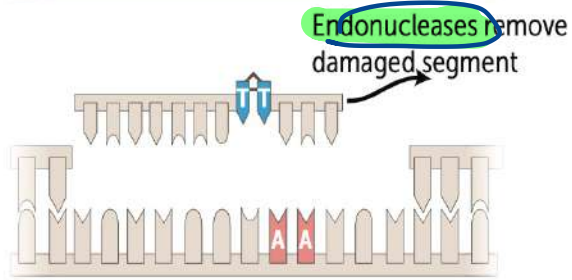
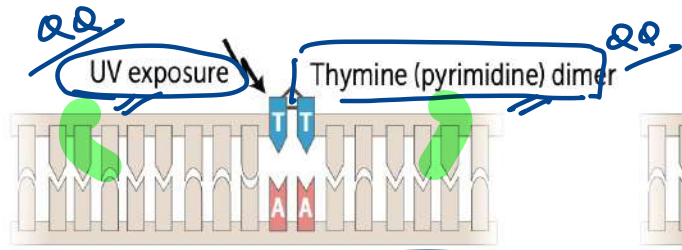
8. A 35-year-old man presents for evaluation after his father and older sister were diagnosed with colorectal cancer and endometrial carcinoma / AV - TCC respectively at an early age. He is asymptomatic but concerned about his risk. Colonoscopy reveals no significant polyposis. This patient most likely 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

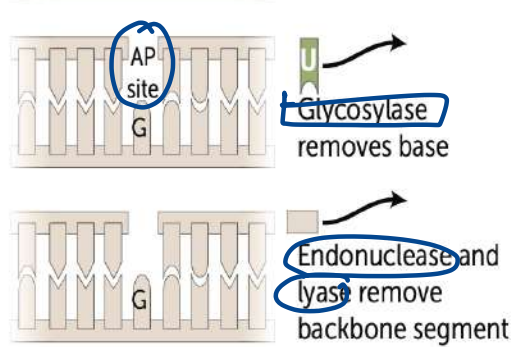
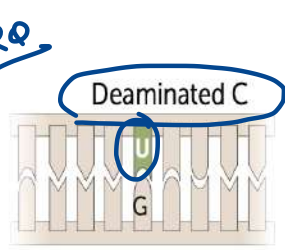
HNPCC



**Nucleotide excision repair**

→ G1

→ XP<sup>CC</sup>, Cockayne, trichotriodystrophy

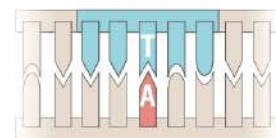
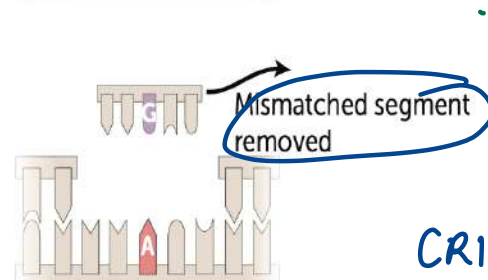
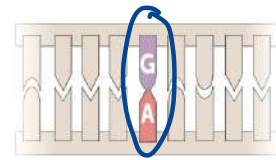


**Base excision repair**

→ any phase

→ MUTYH as polyposis

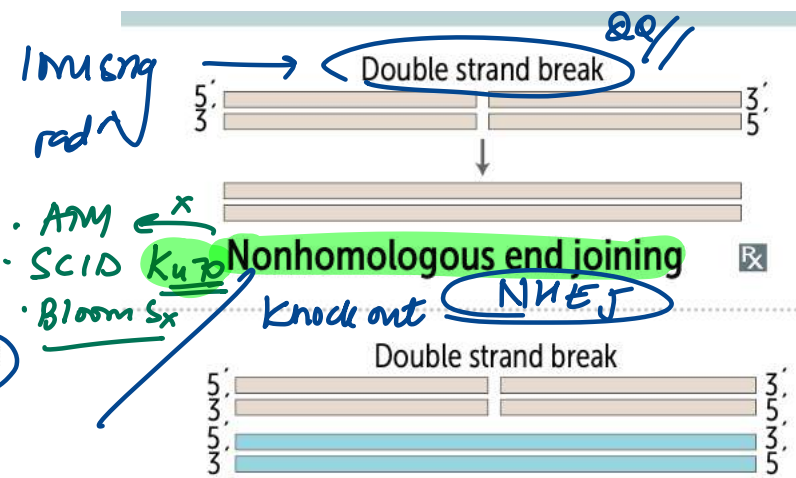
single strand



**Mismatch repair**

→ S phase

→ HNPCC



CRISPR Cas 9

MRE11  
BRCA1/Fanconi

**Homologous recombination**

knock in

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.

**$\alpha$ -amanitin**, found in *Amanita phalloides* (death cap mushrooms), inhibits RNA polymerase II. Causes dysentery and severe hepatotoxicity if ingested.

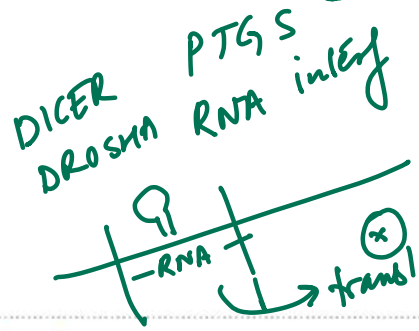
**Dactinomycin** inhibits RNA polymerase in both prokaryotes and eukaryotes.

**Rifamycins** (rifampin, rifabutin) inhibit DNA-dependent RNA polymerase in prokaryotes.

**RNA pol**

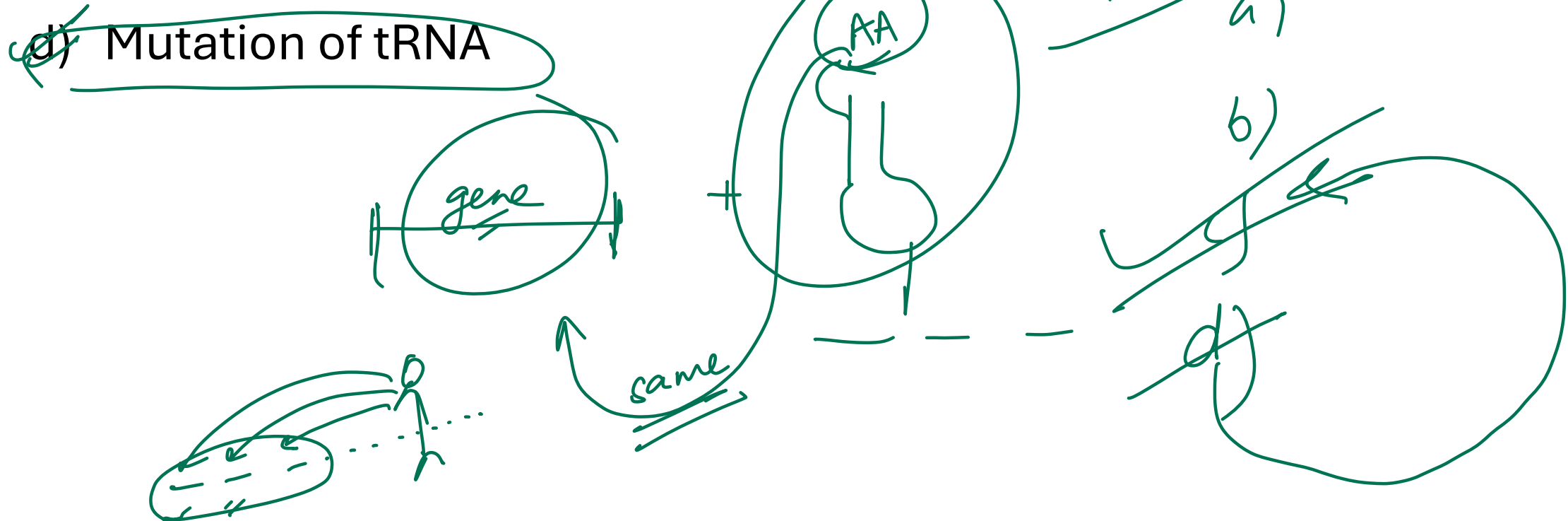
### Prokaryotes

1 RNA polymerase (multisubunit complex) makes all 3 kinds of RNA.



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?

M18

a) Aminoglycosides → *inhib 30S*

b) Tetracyclines → *30S → elong<sup>n</sup>*

c) Macrolides

d) Chloramphenicol *pt<sup>r</sup>ansf*

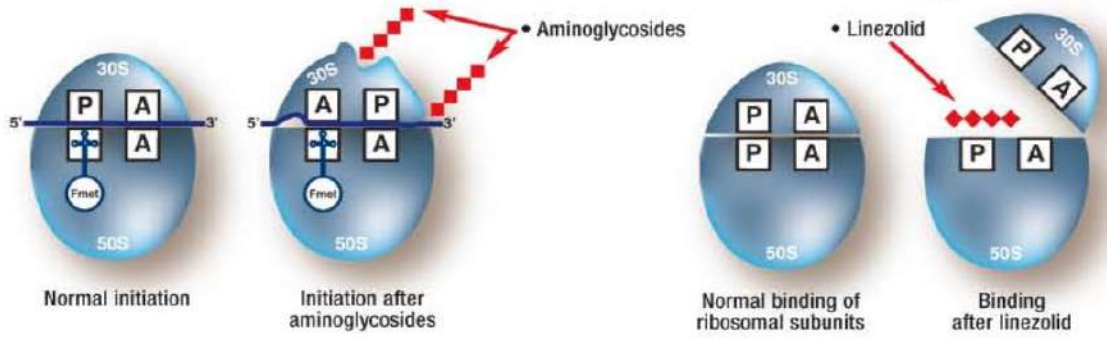
**INITIATION**

**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**

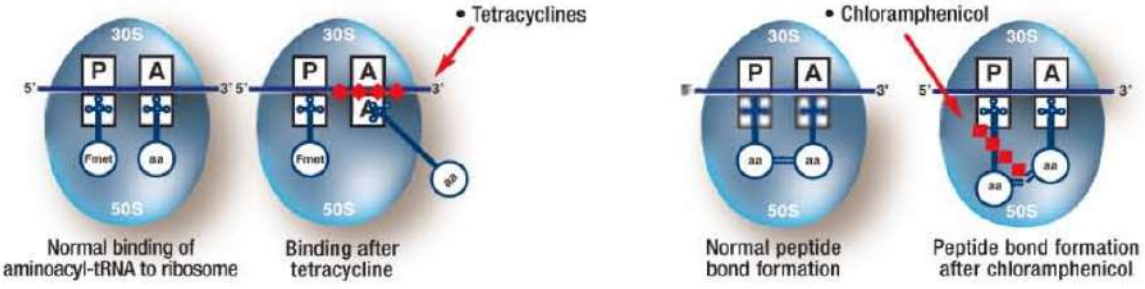
**Tetracyclines**

- 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.



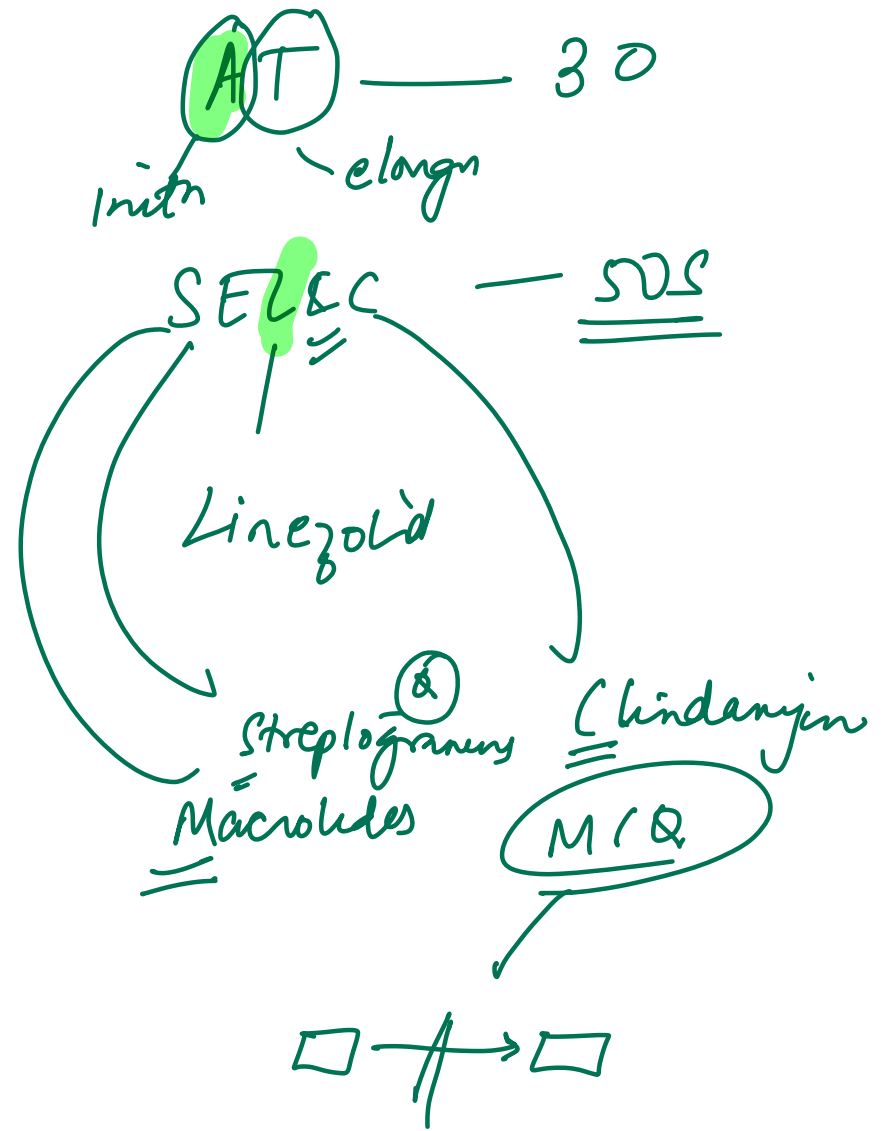
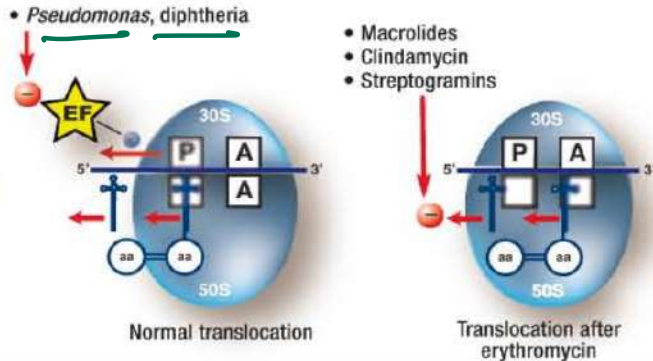
**3 Translocation**

**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 pertussis*, and *Campylobacter*.



fevercol



## 1 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

## 2 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**

## 3 Termination

- **Stop codons** (UAA, UAG, UGA) recognized by **release factors** (eRF in eukaryotes; RF1/RF2 in prokaryotes)
- GTP hydrolysis releases completed polypeptide

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

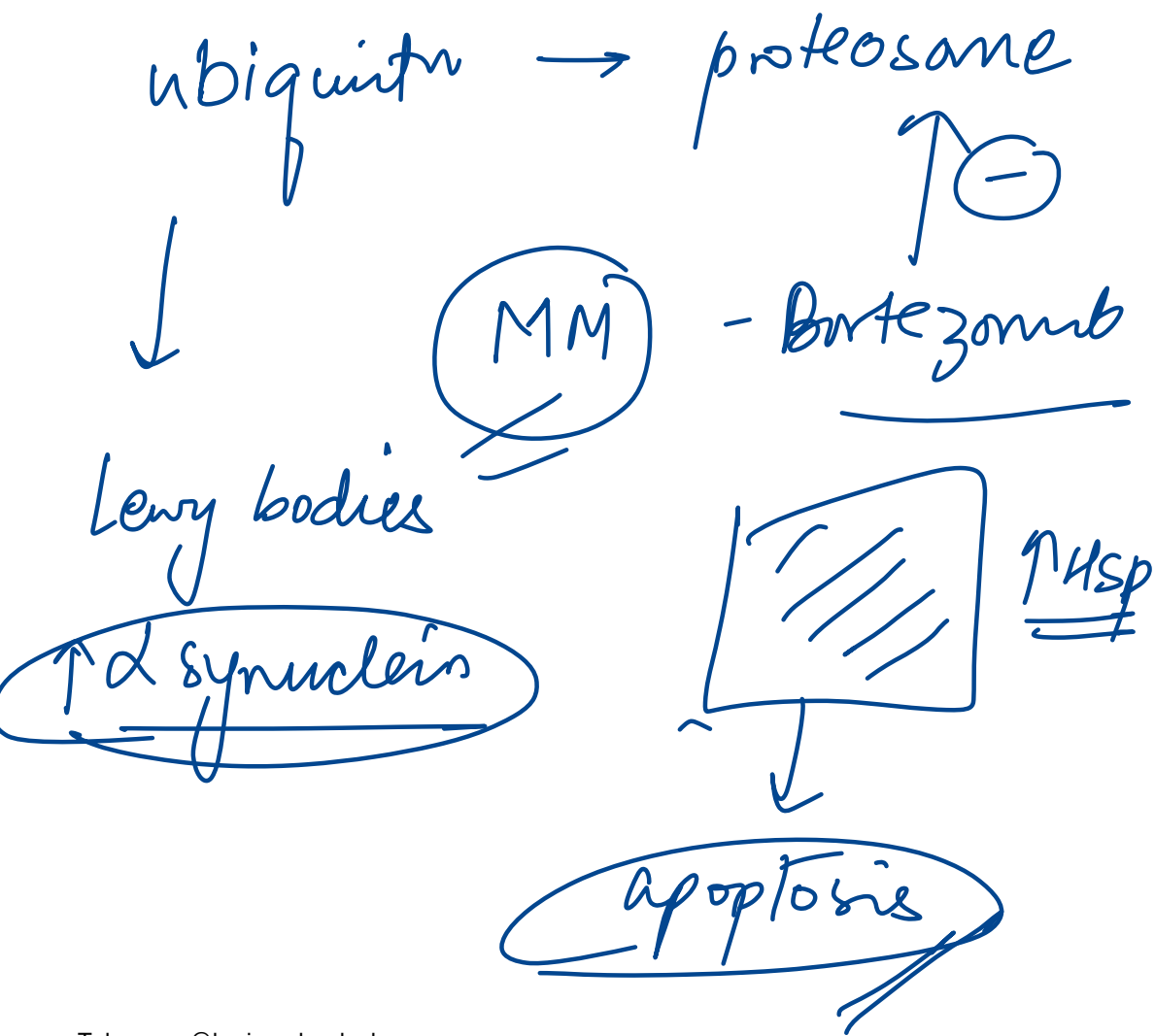
14. Researchers are working to identify new targets for drug development to treat idiopathic pulmonary fibrosis. After obtaining lung tissue samples from affected patients, they conduct a series of experiments to measure the expression and activity of various profibrotic proteins. The results for one 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 → protein ↓
- d) Decreased ubiquitination of the Galectin-3 protein





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

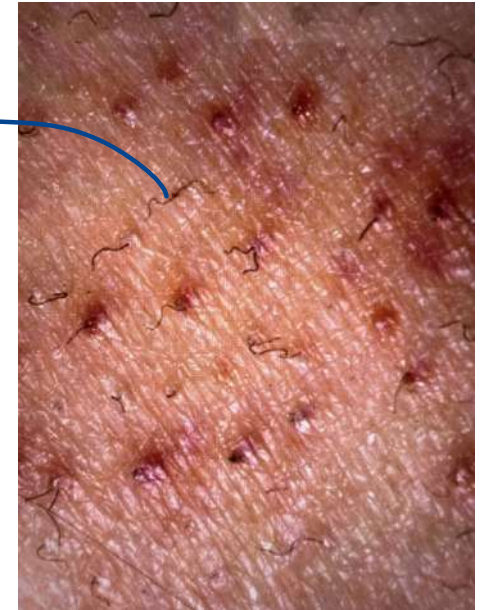
collagen



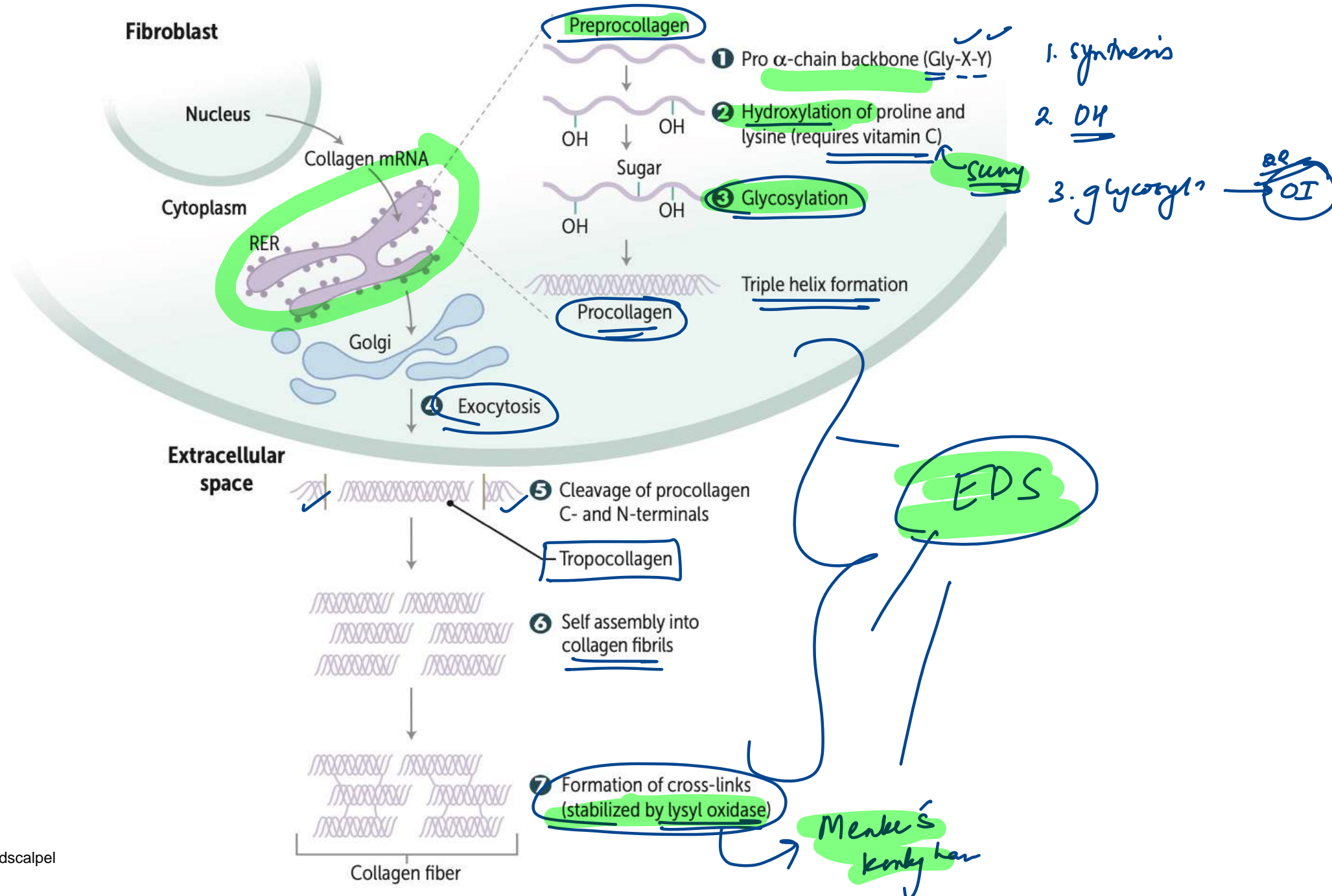
secretory

Scurvy

vit C



free ribosomes  
cytosolic  
mitochondrial



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

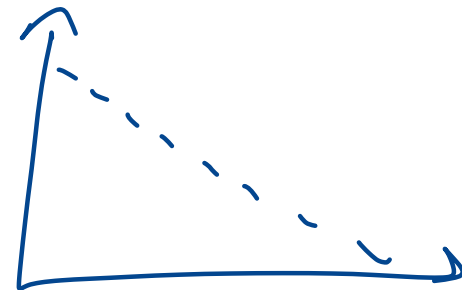
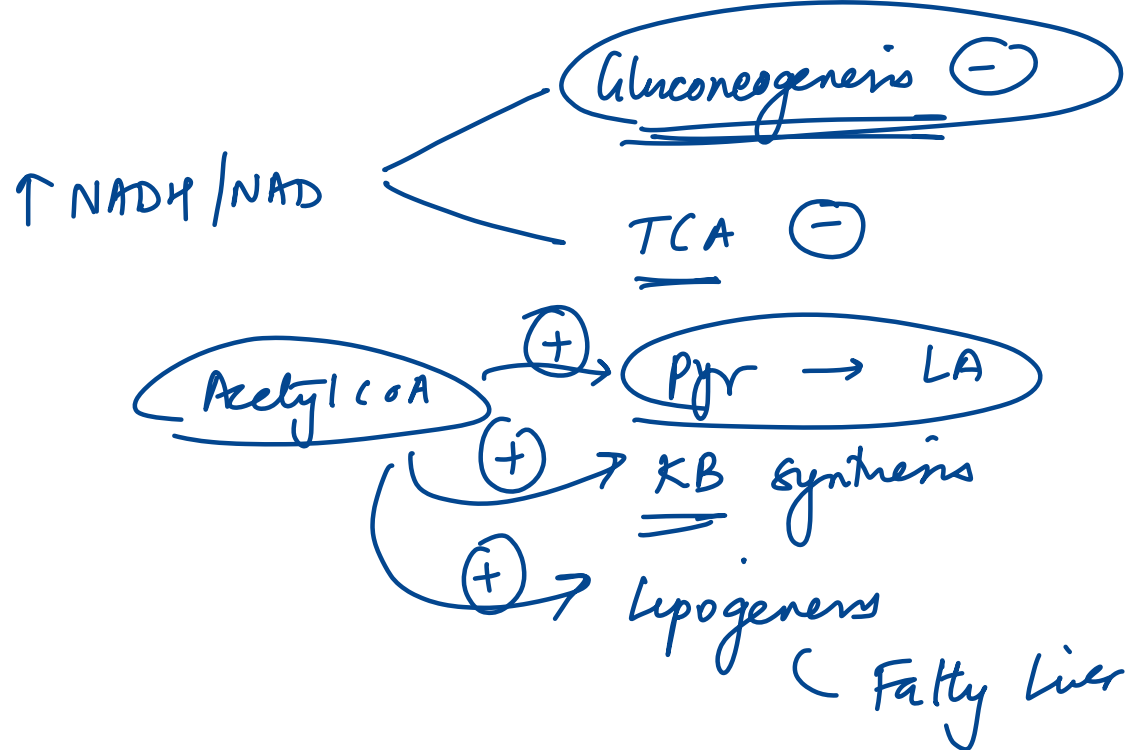
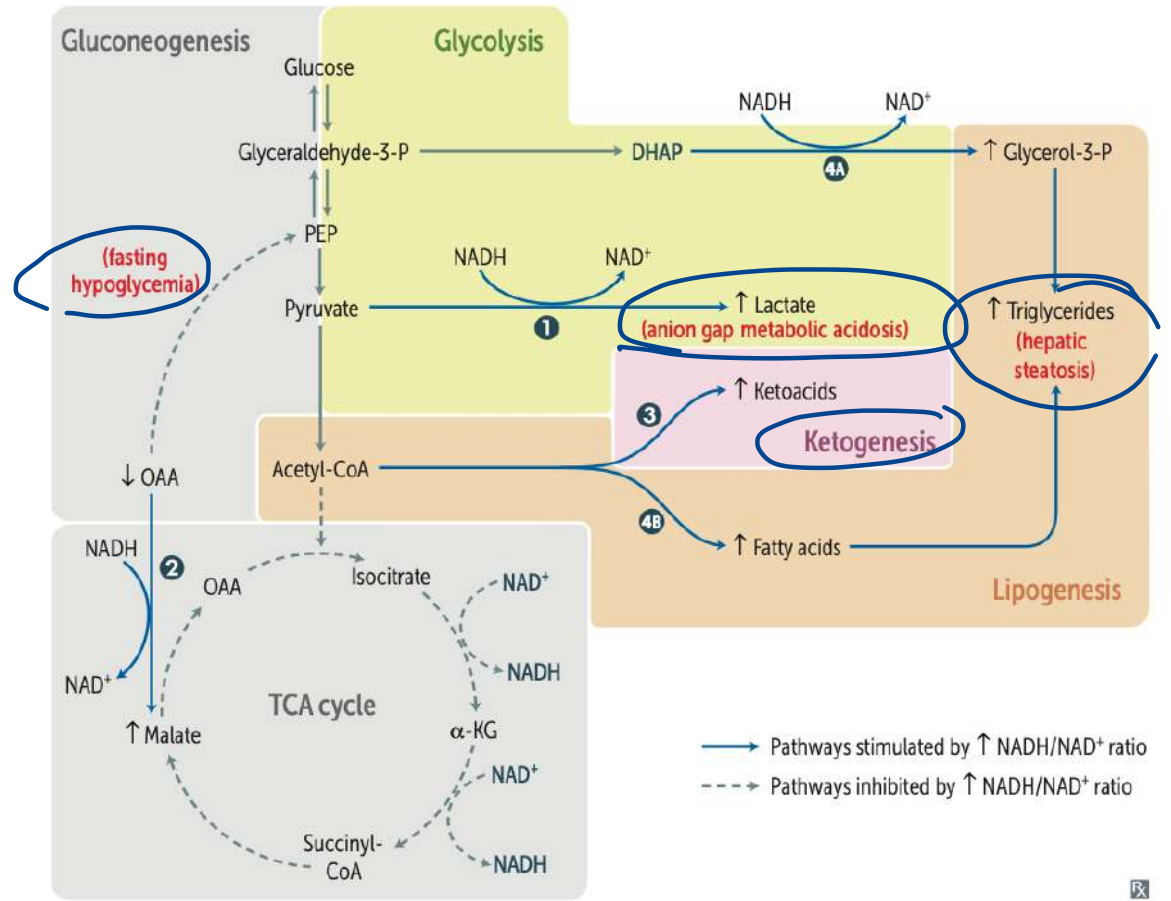
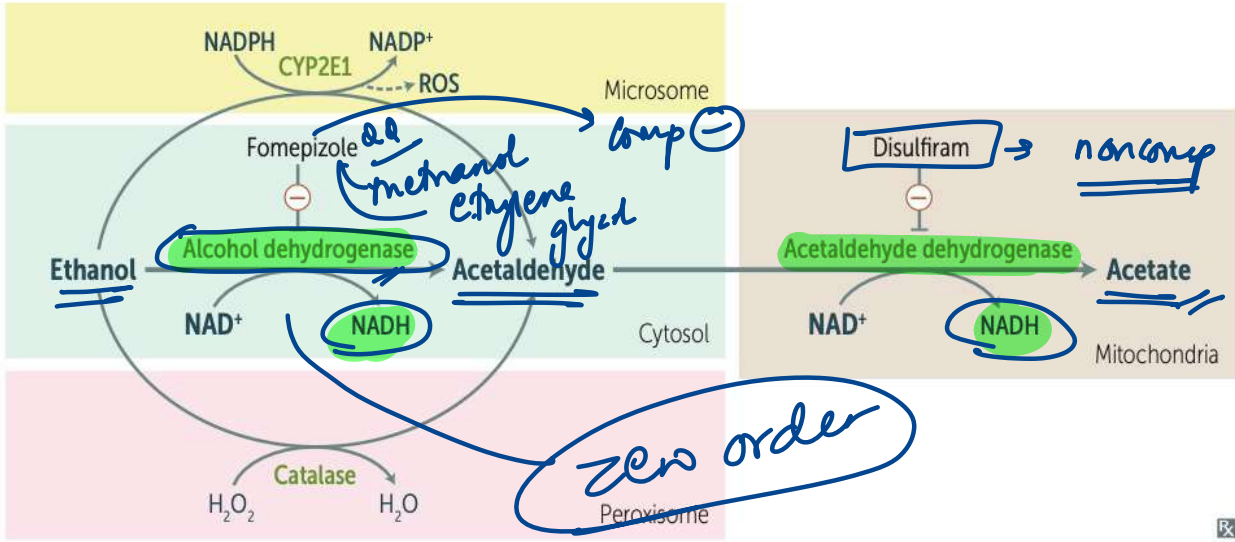
a) Glycolysis

b) TCA

~~c) Lactic acid production~~

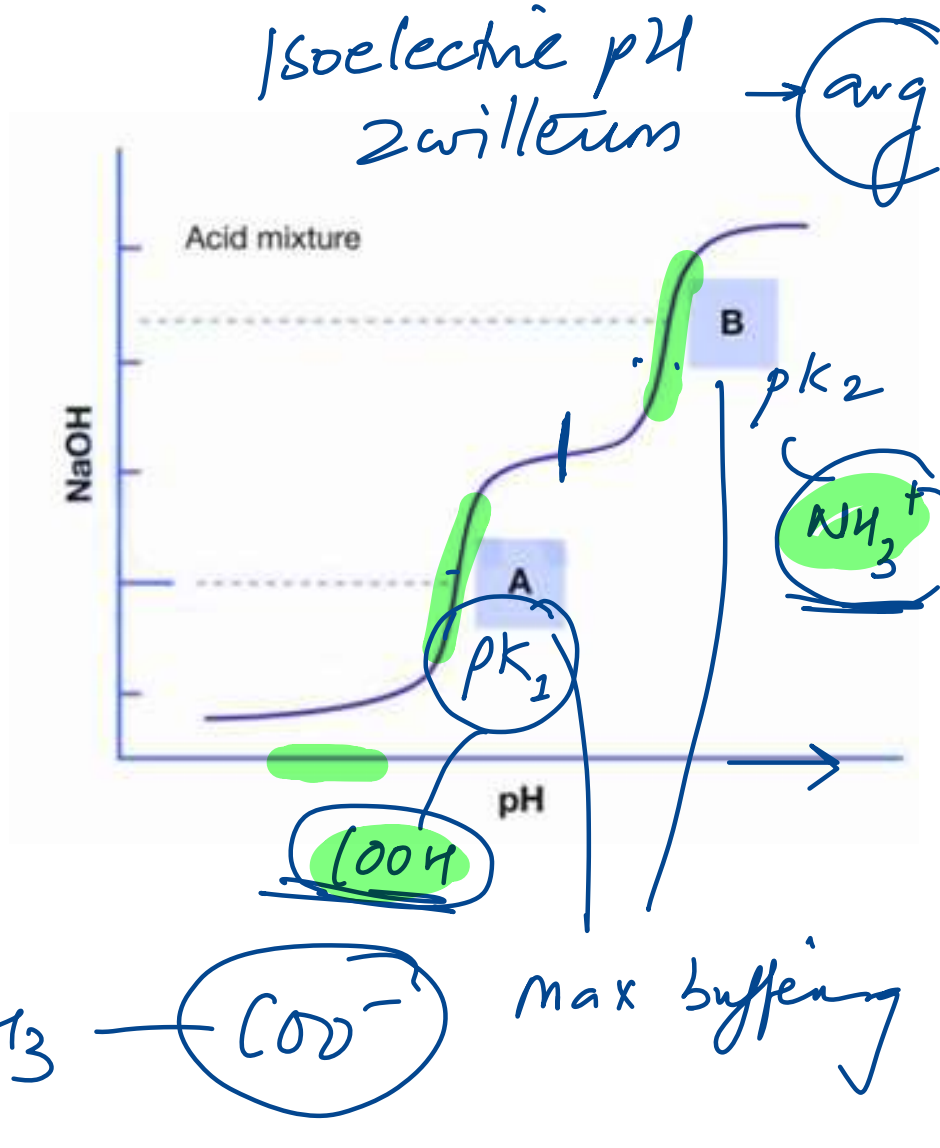
d) Fatty acid oxidation

QQ



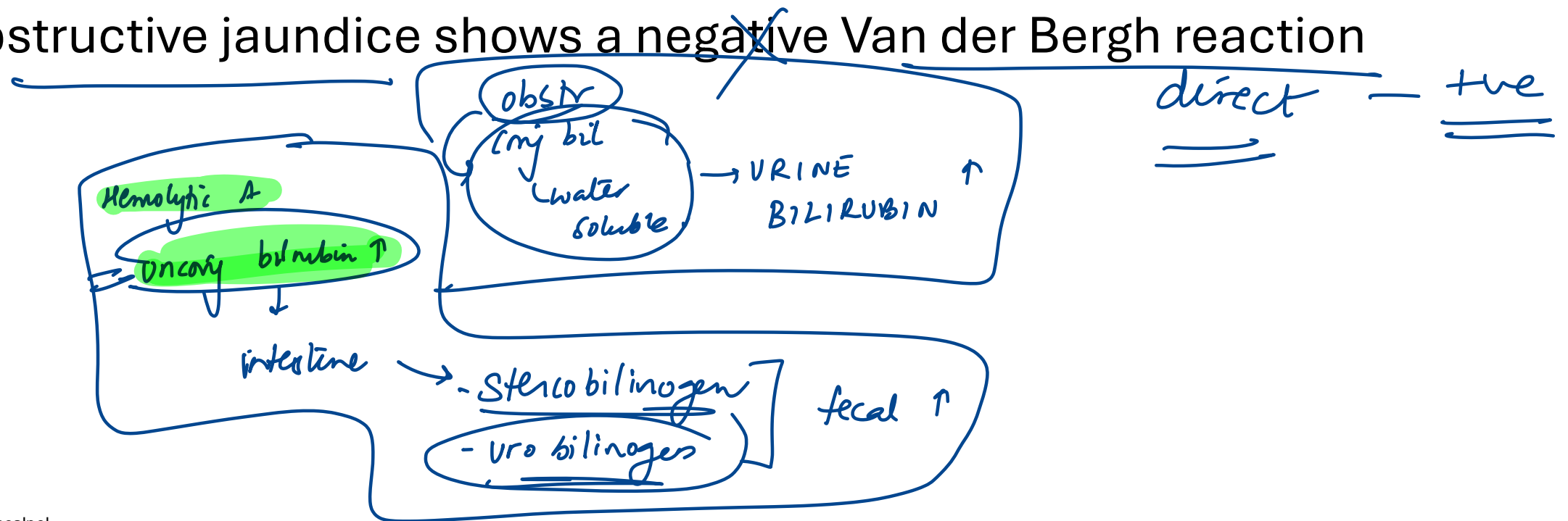
24. The graph shown below is the titration curve of a biochemical compound. Which of the following statement is true?

- 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



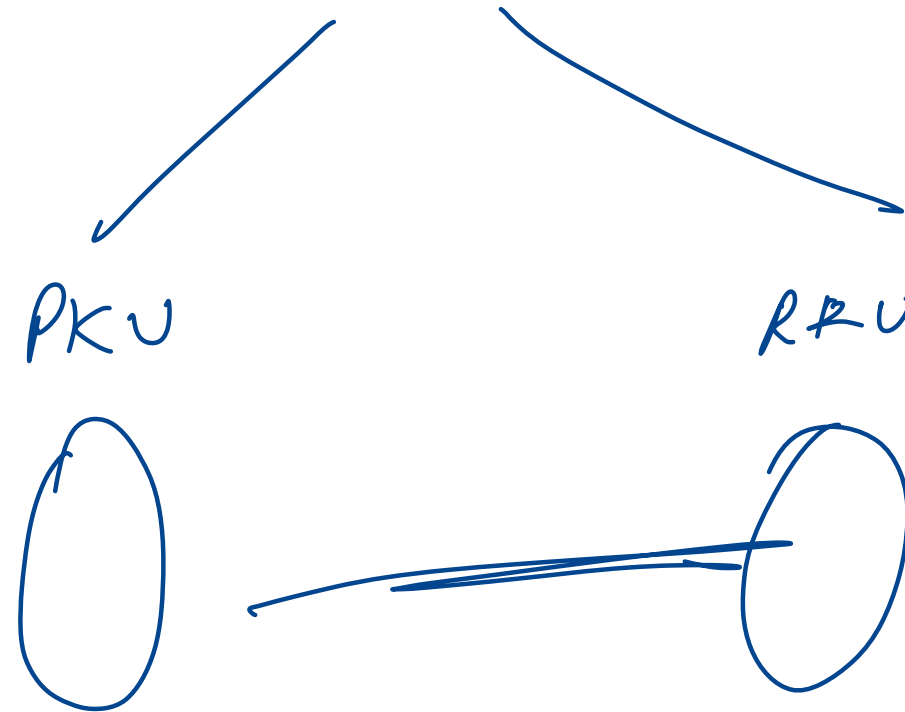
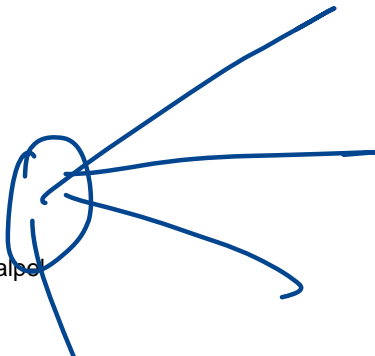
12. Which of the following is false regarding jaundice?

- 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

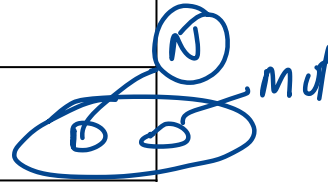


7. A 9-month-old boy is brought to the physician by his mother for the evaluation of seizures and musty-smelling urine. His immunizations are up-to-date. His height and weight are both below the 10th percentile. He is pale and has blue eyes. He cannot pull himself up from a seated position to stand and 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
<b>Dominant negative mutation</b>	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 <i>Marfan's - fibrillin<sub>xx</sub> → elastin<sub>xx</sub></i>
<b>Mosaicism</b>	Presence of genetically distinct cell lines in the same individual. Somatic: post-fertilization Germline: confined to egg/sperm.	McCune-Albright syndrome <i>(XO; xy)</i>
<b>Heteroplasmy</b>	Presence of both normal and mutated mtDNA, resulting in variable expression in mitochondrial inherited disease.	Leber hereditary optic neuropathy <i>oo</i>
<b>Variable expressivity</b>	Same genotype leads to varying phenotypes among individuals.	Neurofibromatosis type 1 (NF1) with different severities
<b>Incomplete penetrance</b>	Not all individuals with a pathogenic variant show the disease.	BRCA1 mutation not always causing cancer
<b>Pleiotropy</b>	One gene contributes to multiple phenotypic effects.	Cystic fibrosis affecting lungs, pancreas, male fertility
<b>Anticipation</b>	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 Pax3

Transcription Factor	DNA Response Element	Domain Type	Related Drug or Condition
PPAR $\gamma$ , PPAR $\alpha$	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  
llll

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) <i>'one'</i>	mtDNA mutation (complex I)	Acute <b>vision loss</b> , optic nerve atrophy
<u>Leigh Syndrome</u>	mtDNA mutation (mainly complex I)	Developmental delay, hypotonia, <b>spasticity</b>
<u>MELAS</u>	Mutation in <b>mitochondrial leucine tRNA</b>	Myopathy, <b>lactic acidosis</b> , stroke, encephalopathy

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

A. Cachexia ✓

B. Cold environment ✓

Fever ↑

C. Hyperthyroidism ✓

D. Starvation

Cushing / Addison's — ↓ 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

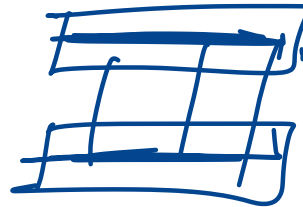
FISH - MAT ✓✓

**Microarray / CGH (GWAS)**

probes

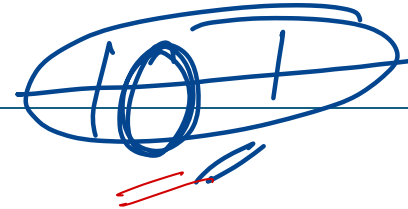
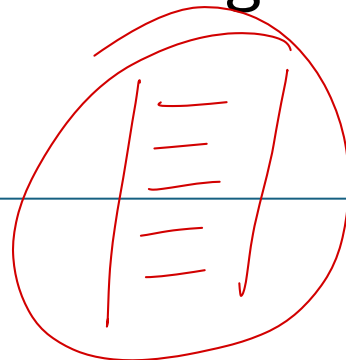
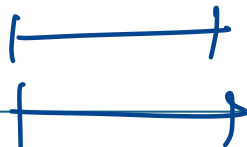
⊗ pt mutn

=



- **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 T

B. <7 years — No criminal responsibility T IPC 84 / BNS 22

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

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

12 yrs

< 18 yrs — girl  
→ rape - 375 / BNS 63

7-12yr  
>12yr ✓

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 NEGLIGENCE

- 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 (Gnt)
- B. Res ipsa liquor: ~~Government~~ Dr will have to prove
- C. Civil negligence: Plaintiff (pnt)
- D. Contributory negligence: Doctor

→ 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

PM AM  
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:

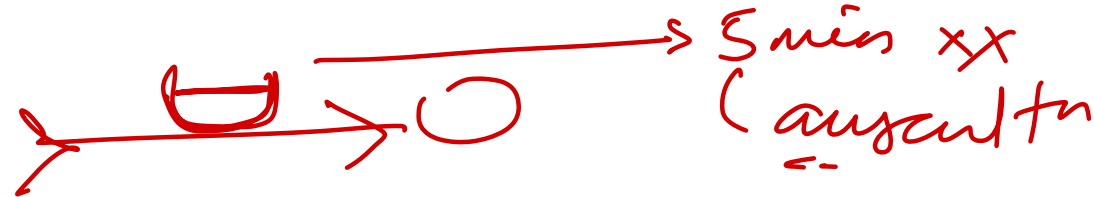
A. Diaphanous test

B. Winslow's test

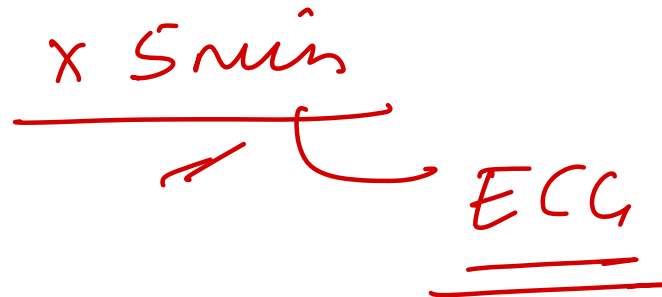
C. Magnus's test

D. Icard's test

*respirations*



*circul<sup>n</sup>*



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

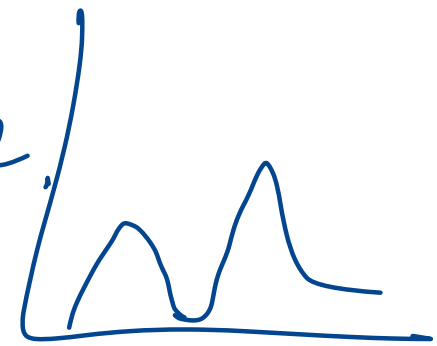
- A. Binding of carbon monoxide to myoglobin
- B. Binding of carbon monoxide to hemoglobin
- C. Inhibition of cytochrome oxidase a3
- D. Conversion of hemoglobin from T state to R state

CO-Hb

CO-Mb

2nd wind

- McArdle



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

- A. Coarse intentional tremors *Danbury*
- B. Psychosis *cretinism*
- C. Erythema of limbs *Pink feet*
- D. Bowen's disease

↓  
*skin hyperkeratosis*  
↓  
ARSENIC CHRONIC



Mercuria lentis  
Membranous nephropathy/ colitis  
Excess salivation

**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

↓  
Digitalis

Hemlock → Conium

Rosary pea → Abus

Deadly nightshade → Atropine

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  $\mu\text{g}/\text{dL}$ . What is the antidote preferred for this patient?

- A. DMPS
- B. Penicillamine
- C. DMSA  $\leftarrow$  FOC - oral.
- D. Dimercaprol

Pb poisoning

encephalopathy / acute

$\textcircled{\text{iv}}$   
EDTA + 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~~ <sup>poisoning</sup>

C. EDTA — Contraindicated in mercury poisoning (T)

~~D. Penicillamine — Contraindicated in Lead poisoning~~ (AS)

CI - a / Fe / Liver /  
= / - / G6PD

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. (T)
- B. ~~Potassium levels in vitreous humor fall linearly after death and are a useful measure of time of death.~~ (T)
- C. Suspended animation can be seen after electrocution.
- D. Industrial workers most frequently develop inorganic lead poisoning through inhalation. (T)

A B C D E  
anesthetics babies Cholera drowning "ecétrois"

## 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

new growth

Margolin ulcer

sg cc