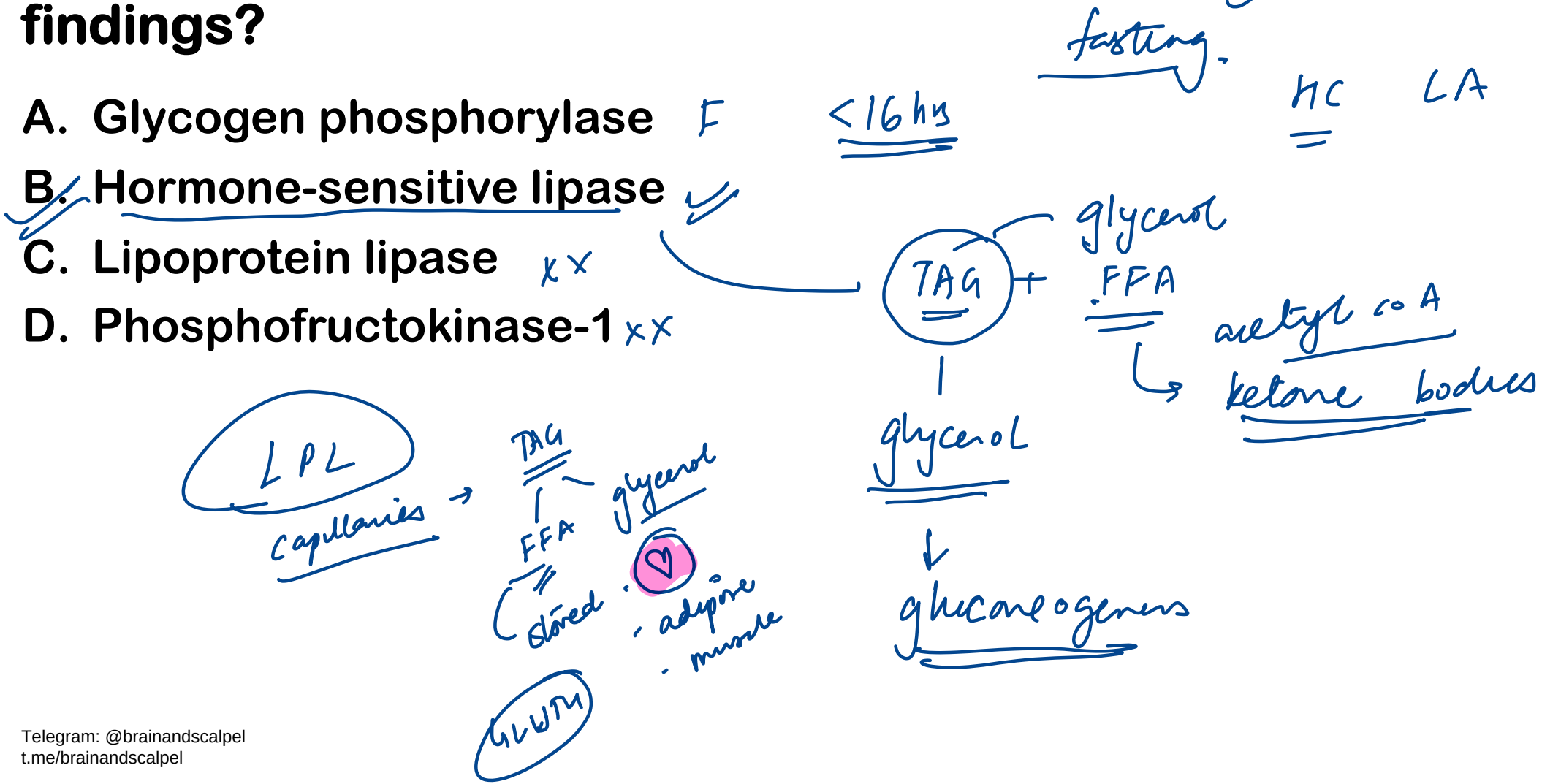
BTR Biochemistry - 19-10-2025

Dr. Zainab Vora

1. A 72-year-old woman is found after lying on the floor for 2 days. She has dehydration, urine ketones, serum glucose 72 mg/dL, and a femoral neck fracture. Which enzyme's increased activity is most likely contributing to both serum and urine findings?

A. Glycogen phosphorylase
B. Hormone-sensitive lipase
C. Lipoprotein lipase
D. Phosphofructokinase-1



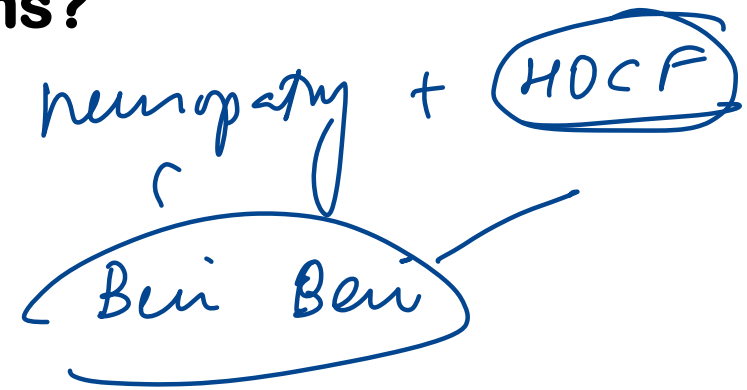
2. A 58-year-old man comes to the OPD due to a one-month history of progressive dyspnoea, generalized weakness, fatigue, and palpitations. He also reports tingling and numbness in both lower limbs. His daughter adds that since his wife's death a year ago, the patient has not been taking care of himself. Blood pressure is 105/50 mm Hg and pulse is 104/min. Cardiovascular examination shows a displaced apical impulse at the sixth intercostal space, a third heart sound, and high-volume, collapsing carotid pulses. Bilateral basal crackles, 2+ bilateral pedal edema, and mild hepatomegaly are also present. Neurologic examination shows decreased light touch and vibration sense in the feet, with decreased knee and ankle reflexes bilaterally. Laboratory evaluation shows normal blood counts. Deficiency of which of the following nutrients is most likely responsible for this patient's symptoms?

A. Ascorbic acid

B. Cobalamin

C. Niacin

D. Thiamine

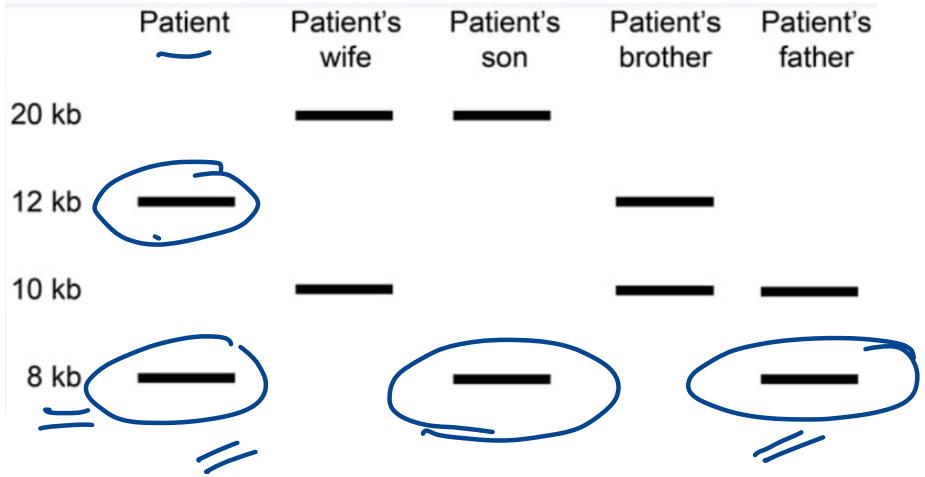


3. Which methods among the following can identify changes in the DNA sequence?

A. Restriction fragment length analysis
B. Flow cytometry
C. Pyrosequencing
D. FISH

A. 1 and 3
B. 1, 2, and 3
C. 2, 3, and 4
D. 1, 2, and 4

4. A 34-year-old man is found to have an LDL level of 310 mg/dl and a normal serum triglyceride level. His father suffered a myocardial infarction at age 39, and his paternal grandfather died of a heart attack at age 40. The patient's wife has a normal lipid profile. DNA samples are obtained from several family members for genetic analysis. Southern blotting of restriction fragments from a region containing the LDL receptor gene shows the following pattern. Identify the correct statement:



A. The disease is transmitted in an X-linked recessive fashion.

B. The mutation is probably located in the 10 kb band.

C. The patient's brother most likely inherited the mutation.

D. The patient's son most likely inherited the mutation.

5. DNA methylation is not related to?

A. Mismatch repair
B. Chromatin Remodeling
C. Capping
D. Gene silencing

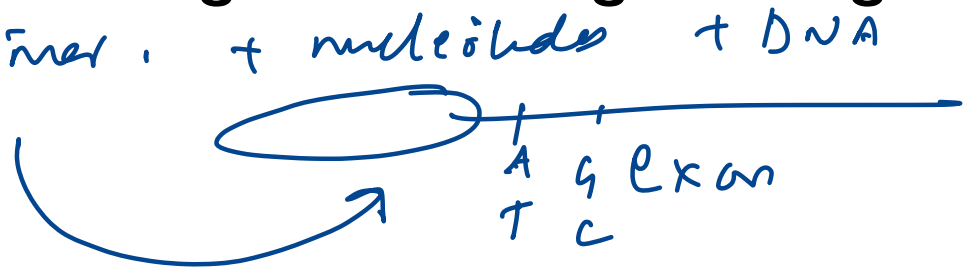
6. A 34-year-old woman comes to the OPD after her sister was diagnosed with breast cancer. Her sister was found to have a multiple base pair insertion affecting exon 11 of the BRCA 1 gene that leads to a frameshift mutation. A screening test to evaluate for a similar insertion mutation in the patient's BRCA 1 gene is performed. The test uses polymerase chain reaction (PCR) to amplify the target exon and gel electrophoresis to assess the size of the exon compared to the wild-type allele. Which of the following must be known to perform the amplification part of this analysis?

A. Restriction enzyme susceptibility sites within the target exon

B. The amino acid sequence of the abnormal BRCA 1 protein

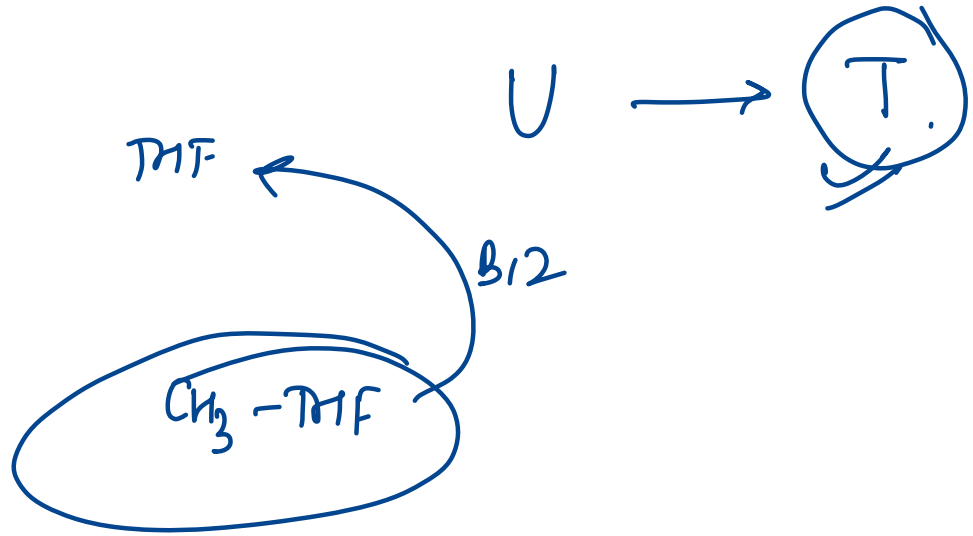
C. The complete nucleotide sequence of the target exon

D. The nucleotide sequence of the regions flanking the target exon.



7. In an animal experiment, mice proerythroblasts are cultured in 2 different growth media; the first medium is folate deficient, whereas the second (control) is supplemented with folic acid. Both media contain high concentrations of erythropoietin. Over 48 hours, cells in the control media proliferate and differentiate into reticulocytes, whereas in the folate-deficient media, cell proliferation is minimal, with most cells undergoing apoptosis. In another experiment, a substance is added to the folate-deficient media, which prevents apoptosis and permits proliferation of the proerythroblasts. Which of the following is the most likely substance added to the growth medium?

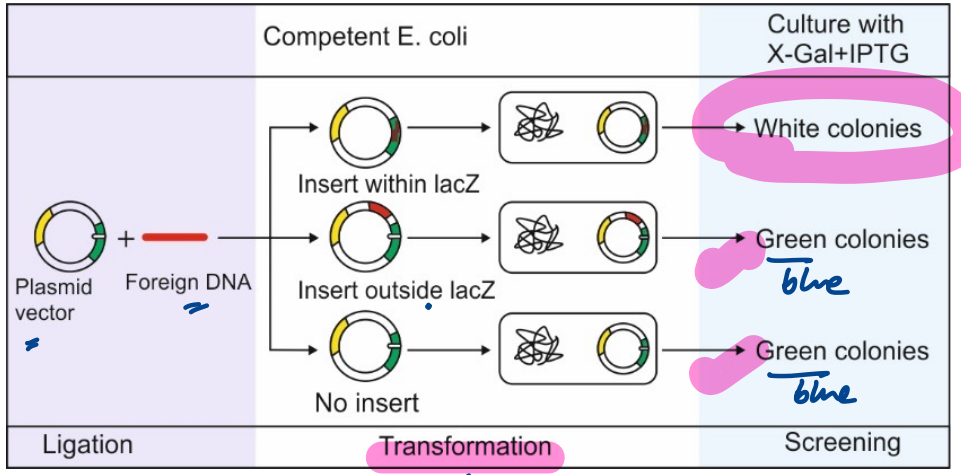
A. Cobalamin
B. Cytosine
C. Homocysteine
D. Thymidine

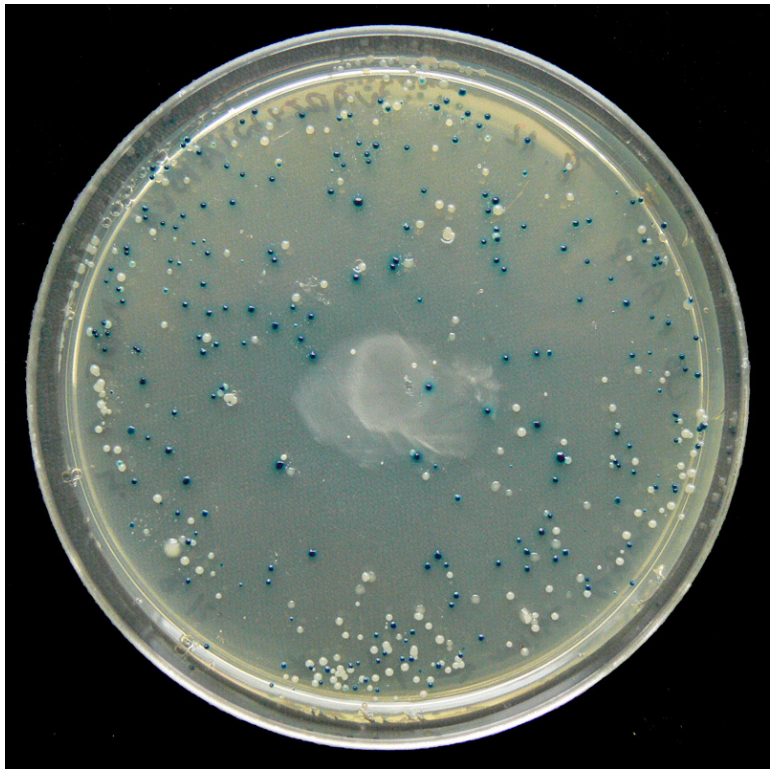


8. Identify the phenomenon shown below?

A. Translation
B. Transformation
C. Complementation
D. Conjugation

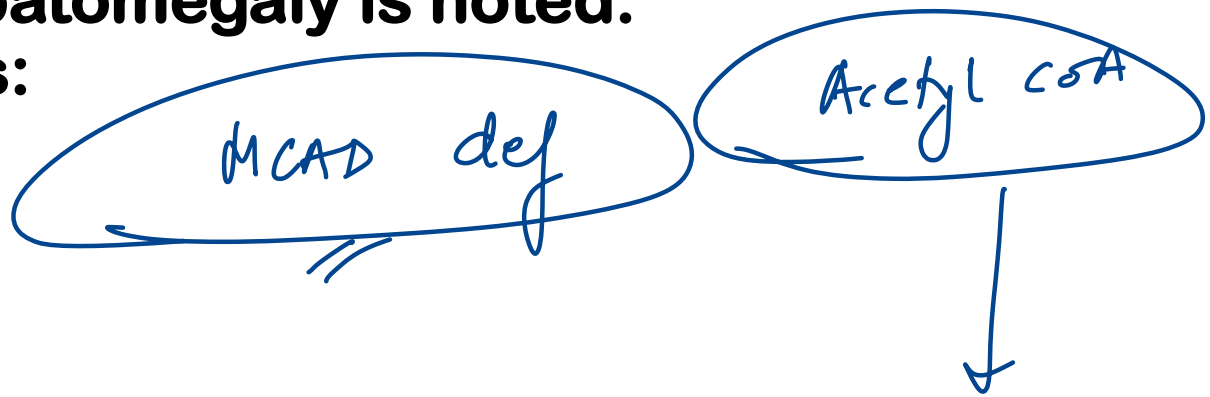
blue-white assay





Condition	Resulting Colonies	Explanation
Insert within lacZα	White colonies	Disrupts lacZ → no β-galactosidase → X-gal not cleaved
Insert outside lacZα	Blue/Green colonies	lacZα intact → β-galactosidase produced → X-gal cleaved
No insert	Blue/Green colonies	lacZα intact → enzyme active

9. A 8-year-old boy is brought to the emergency department due to vomiting and lethargy. He hasn't eaten anything for 24 hours. On examination, the patient appears listless. Mild hepatomegaly is noted.
Laboratory results are as follows:
Glucose - 22mg/dl
Acetoacetate – Undetected
ALT - 47 IU
AST - 50 IU
Patient began seizing in the emergency. The likely deficient enzyme is ?

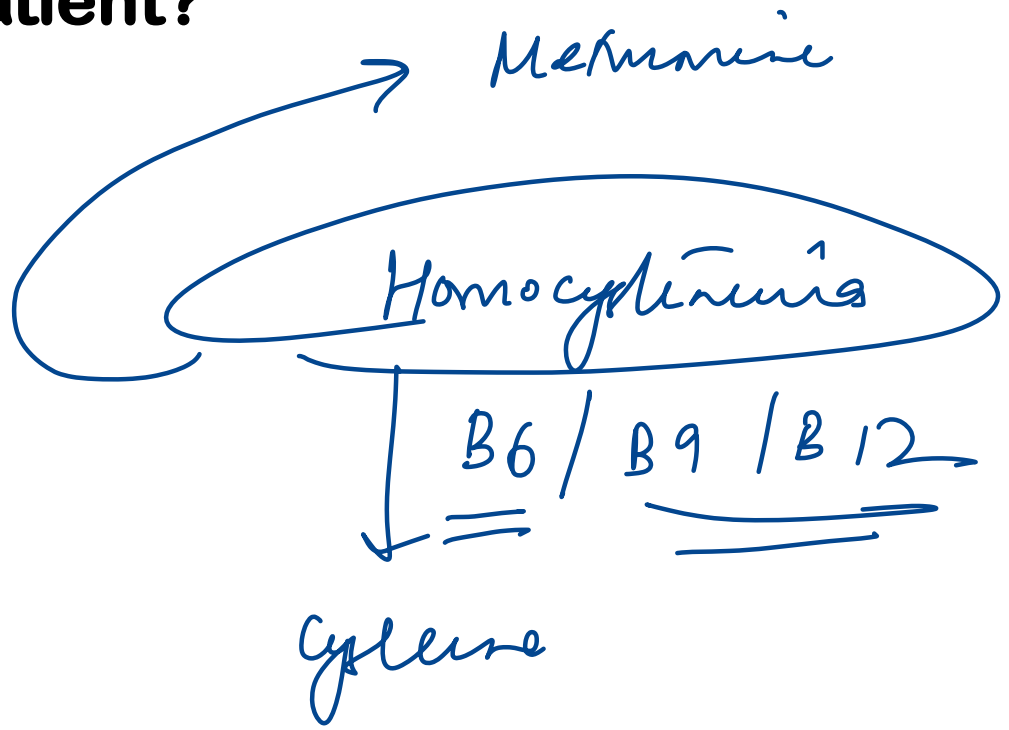


A. Acetyl-CoA carboxylase
B. Glycogen phosphorylase
C. Acyl-CoA dehydrogenase
D. Glucose 6-phosphatase

Acetoacetyl CoA
&
HMG CoA

10. A 5-year-old boy with developmental delay is brought to the OPD due to difficulty "seeing the board" at school. Examination shows a tall, thin habitus with elongated limbs. Funduscopy shows bilateral lens subluxation. Four years later, the patient dies suddenly of a massive cerebrovascular accident. Autopsy shows middle cerebral artery thrombosis and old renal infarcts. His parents wish to know if anything could have been done to have prevented his death. Which of the following would have been the most appropriate supplementation for this patient?

A. Ascorbic acid
B. Carnitine
C. Pyridoxine
D. Thiamine



11. 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

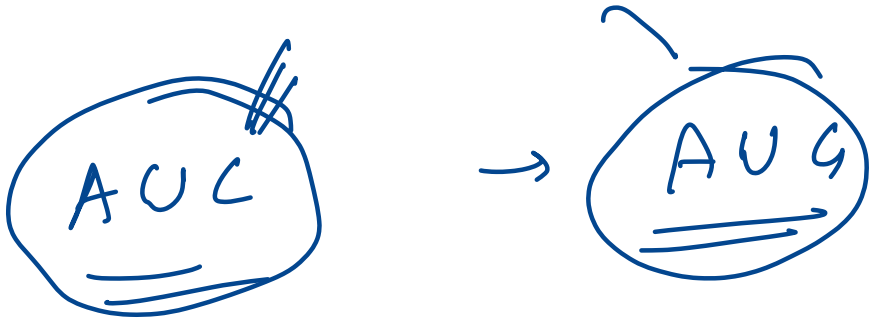
B. Addition of another normal gene

C. Deletion of the mutant gene

D. Mutation of tRNA

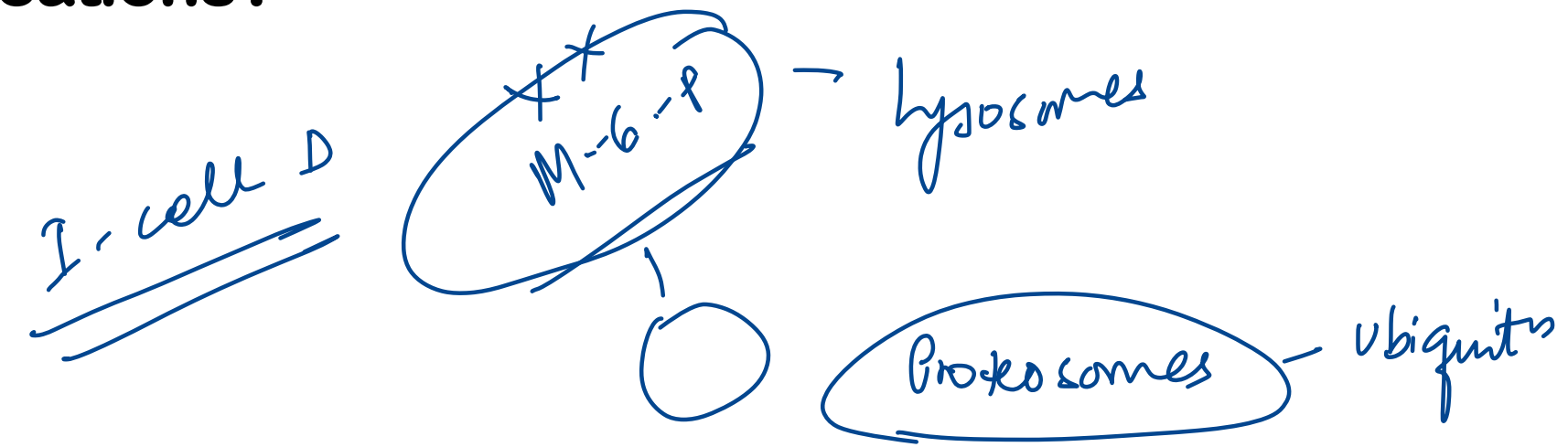
PYQ

suppressor mutation



12. A 2-year-old boy is being evaluated for failure to thrive and developmental delay. His past medical history is significant for recurrent ear infections since age 6 months. Physical examination shows coarse facial features, corneal clouding, hepatosplenomegaly, and restricted joint mobility. Mass spectrometry analysis is performed on cultured fibroblasts and reveals deficient phosphorylation of mannose residues on certain glycoproteins in the Golgi apparatus. Normally, these proteins are most likely to be transported to which of the following cellular locations?

A. Extracellular space
B. Lysosome
C. Mitochondria
D. Nucleus



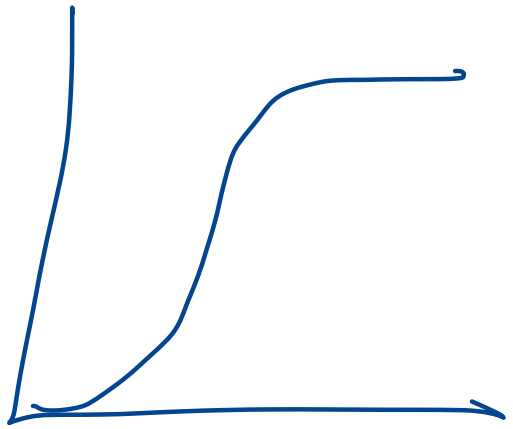
13. Substrate is present in a process at a concentration 1000 times higher than the enzyme's Km value. 1% of the substrate is converted to product (12 micrograms/ml) after 9 minutes of reaction. If the substrate concentration is doubled and the enzyme concentration is changed to 1/3, how long does it take to transform a substrate into a product with a 12 microgram/ml yield?

A. 9 minutes

B. 4.5 minutes

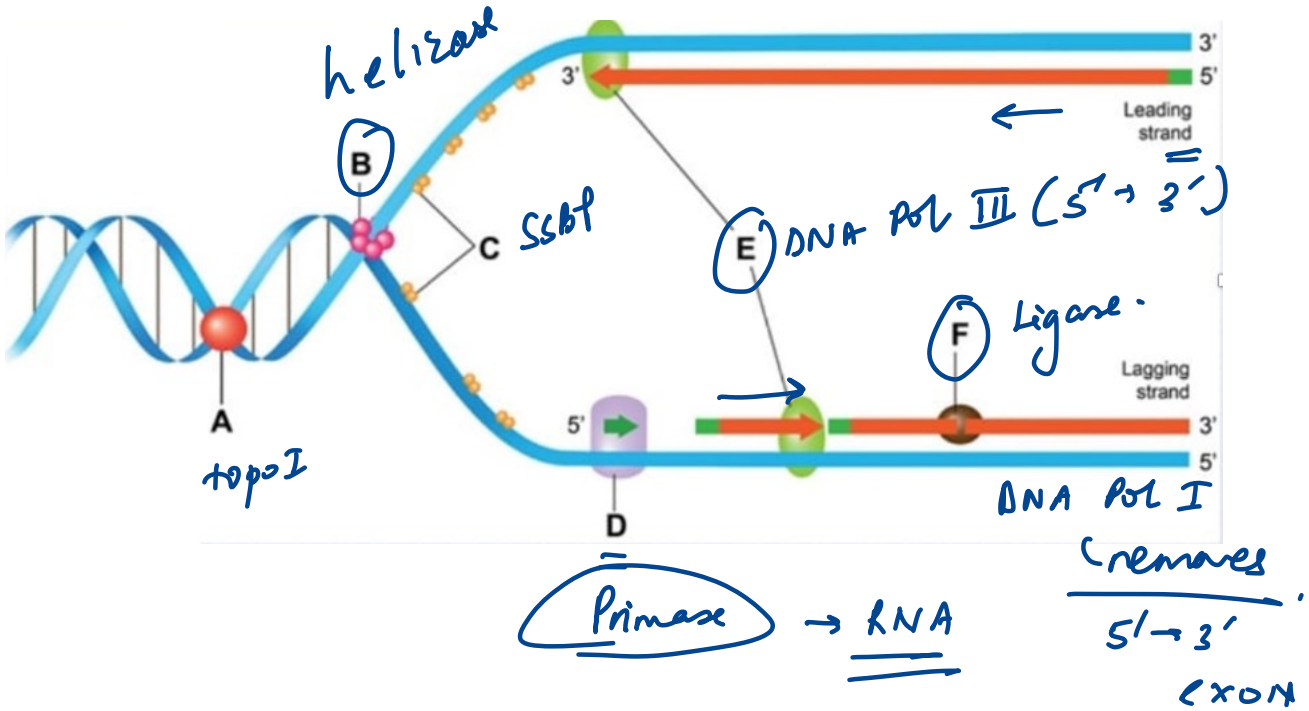
C. 27 minutes

D. 13.5 minutes



14. 13-year-old boy with growth retardation, microcephaly, sun-sensitive skin rash, and recurrent infections is being evaluated for a possible inherited genetic defect. The patient is the second-born child of a first cousin marriage. His parents and siblings are healthy, but 2 of his maternal cousins have similar signs and symptoms. Genetic analysis of the patient reveals a defect in the BLM gene that codes for DNA helicase. Which of the following is the most likely site of action of this enzyme in the DNA replication fork shown?

A. A
B. B
C. C
D. D



15. Which of the following is not used for protein precipitation?

A. Heavy metals

B. Organic solvents

C. Change in pH other than isoelectric pH

D. Trichloroacetic acid

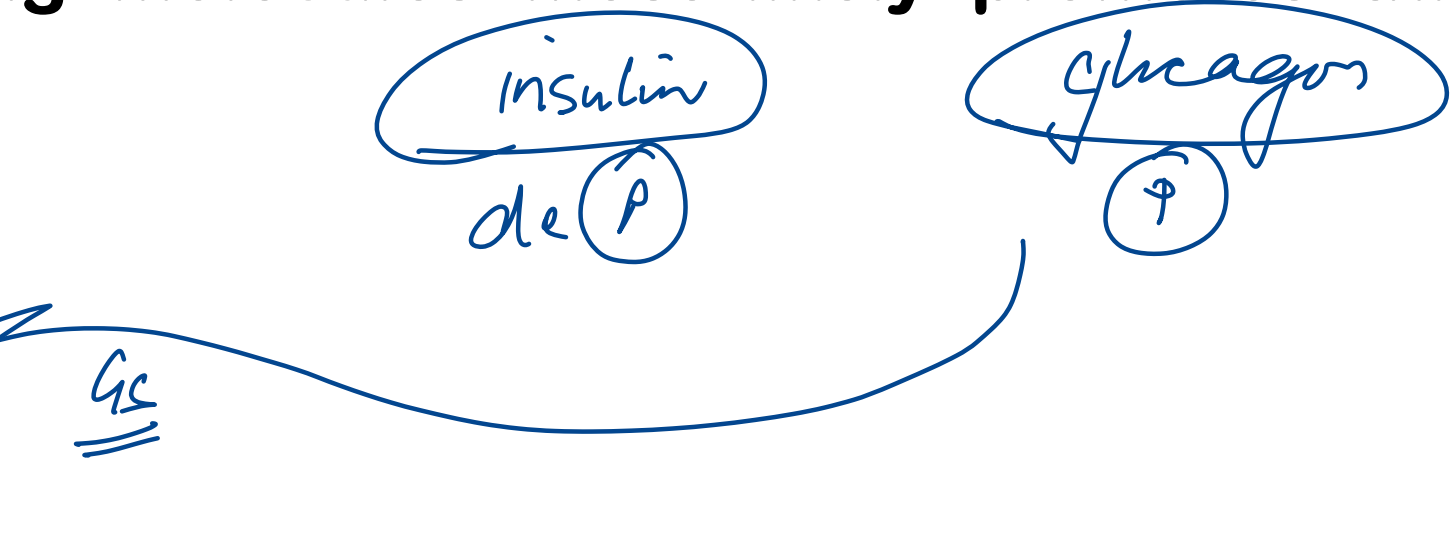
PYQ

max ppt

16. A research scientist studying the metabolic pathways that contribute to obesity, feeds experimental animals a high-carbohydrate, high-protein diet for a prolonged period. A sample of liver tissue is then obtained from the animals, and the activity of various enzymes involved in fatty acid metabolism is measured and recorded. It is determined that beta-oxidation of fatty acids is inhibited within these cells because of the diet. An increase in which of the following substances is most likely responsible for the observed effect?

A. Acetoacetate
B. Carnitine
C. Citrate
D. Malonyl-CoA

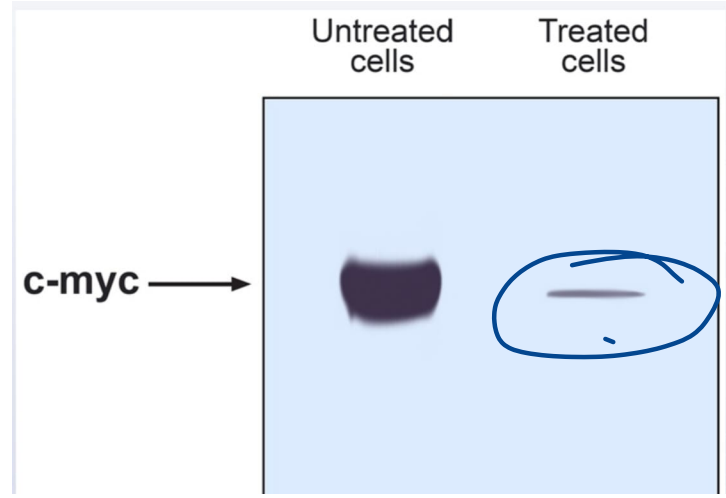
17. A 14-year-old boy is brought to the emergency department due to excessive urination and thirst. He has lost 4.5 kg in the last 3 weeks. Physical examination shows dry mucous membranes. Laboratory studies reveal blood glucose of 455 mg/dl, normal anion gap, and hemoglobin A1 c of 11.3%. The patient is diagnosed with type 1 diabetes, and treatment with insulin is initiated. In addition to lowering blood glucose, insulin increases glycogen synthesis in hepatocytes. Activation of which of the following molecules most likely promotes this metabolic effect?



A. Janus kinase (JAK)
B. Phospholipase C
C. Protein kinase A
D. Protein phosphatase

18. A pharmaceutical corporation investigating new therapeutic agents for treatment of Burkitt lymphoma synthesizes a double-stranded RNA molecule that is 21 base pairs in length. The RNA molecule has a base pair sequence that is complementary to a region of mRNA encoding c-Myc. Introduction of the RNA molecule into tumor cells results in a significant reduction in cell growth. Western blot analysis of equivalent numbers of treated and untreated cells is shown below. Which of the following processes was most likely directly interrupted in the cells exposed to the RNA molecule?

A. DNA replication
B. DNA transcription
C. mRNA translation
D. Proteasome activity



19. A 7-year-old child was evaluated for night blindness. Ophthalmoscopy showed atrophic changes in the choroid, retina, and pigment epithelium. Urine and plasma ornithine levels were elevated. Defective catabolism of which of the following amino acids led to this condition?

A. Histidine
B. Glycine
C. Serine
D. Arginine

gyrate atrophy

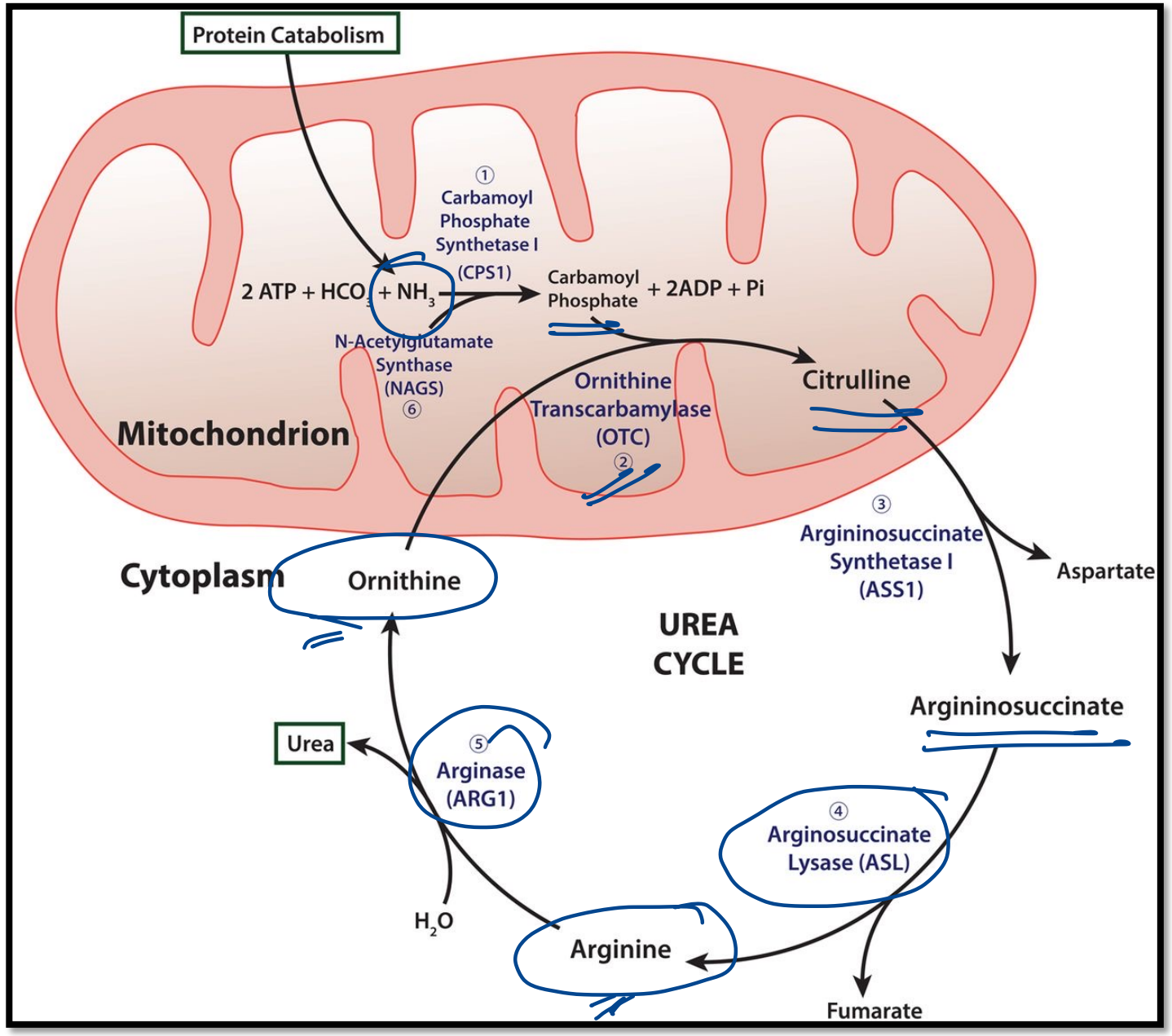
Ornithine amino-
= transferase

20. During periods of prolonged fasting, one of the following tissues preferentially uses fatty acids as energy-providing substrates. It is because this tissue has the highest concentration of lipoprotein lipase. Identify this tissue:

A. Adipose tissue
B. Skeletal muscle
C. Liver
D. Cardiac muscle

21. Deficiency of which of the following causes increased glutamine in blood?

A. Arginosuccinate lyase
B. Alpha-galactosidase-A
C. Ornithine transcarbamoylase
D. Arginase

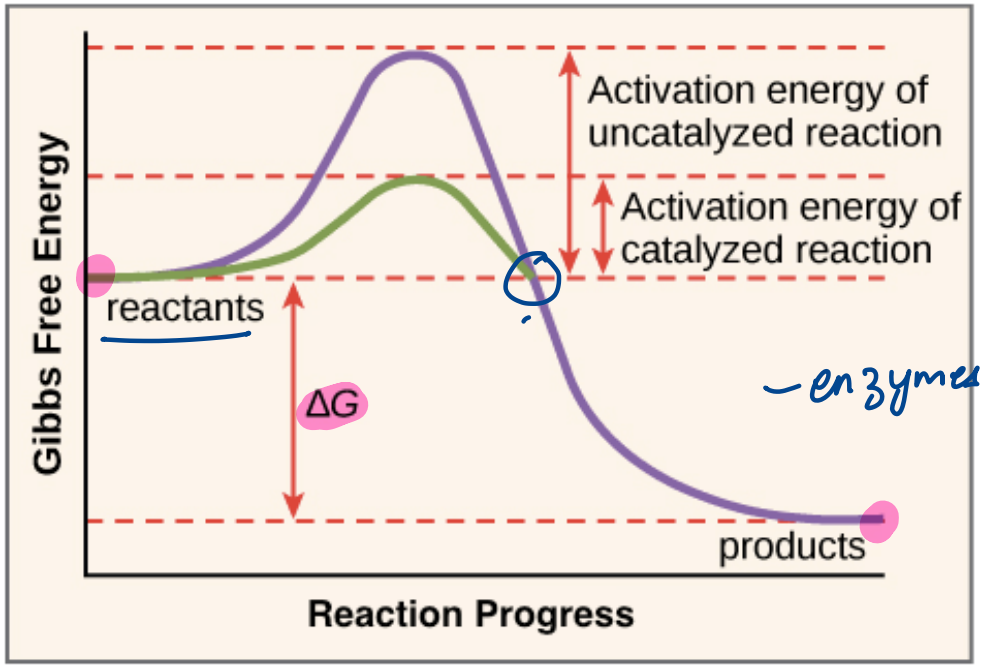


22. Which of the following does not happen in 5' to 3' direction?

A. Transcription
B. DNA replication
C. DNA repair
D. RNA editing

23. Activation energy is the free energy difference between _____.

A. Substrate & product → Gibb's
B. Substrate & transition state
C. Transition state & product
D. Sum of all the above



- enzymes - x change ΔG
[↓ activ energy

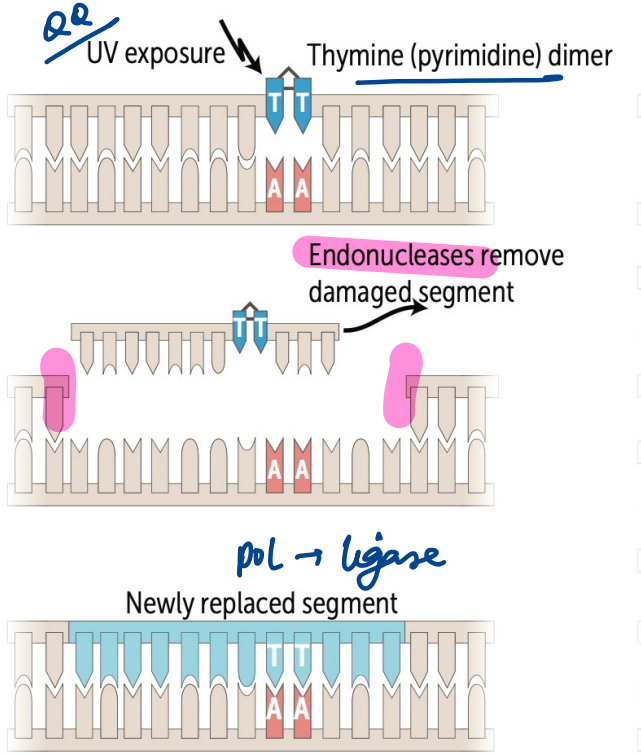
24. Which among the following are appropriate techniques for chromosomal aneuploidy?

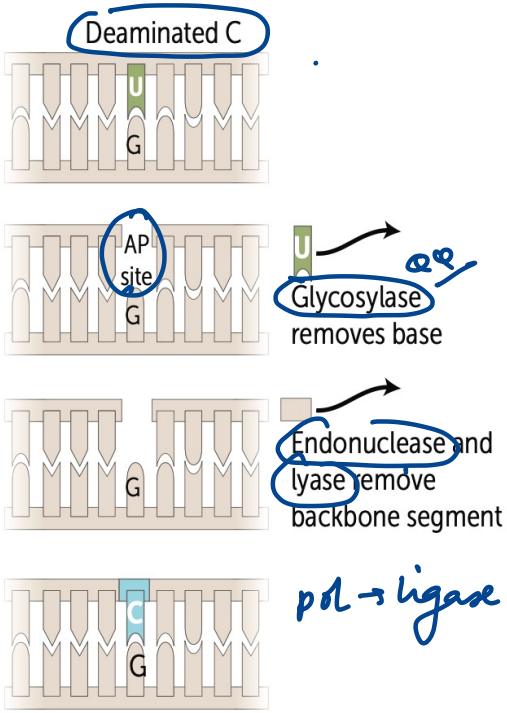
i. In situ hybridization
ii. Conventional cytogenetics
iii. Sanger sequencing
iv. Polymerase chain reaction

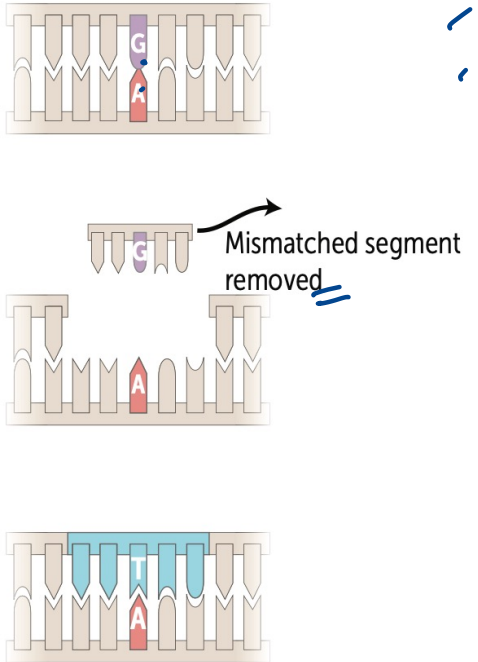
A. i, ii, iii, iv
B. i, ii
C. ii, iii
D. iii, iv

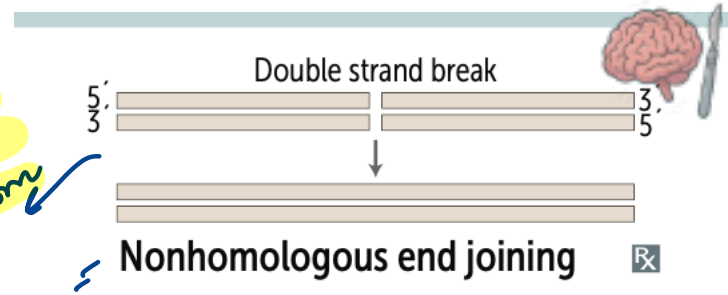
25. Which of the following DNA repair mechanisms corrects pyrimidine dimerization in DNA strands ?

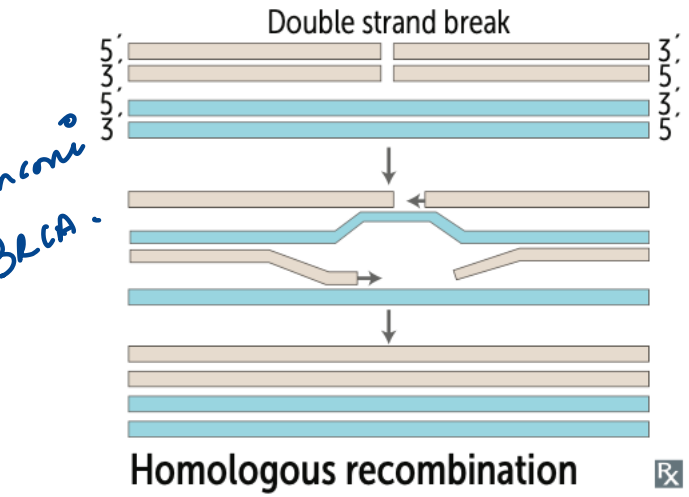
A. Nucleotide excision repair
B. Base excision repair
C. Mismatch repair
D. Homologous end joining repair



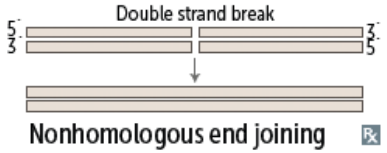
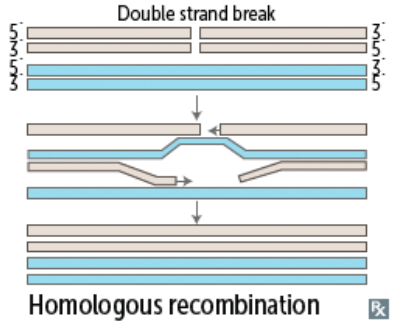








DNA repair

Double strand		
Nonhomologous end joining	Brings together 2 ends of DNA fragments to repair double-stranded breaks. Homology not required. Part of the DNA may be lost or translocated.	
Homologous recombination	Requires 2 homologous DNA duplexes. A strand from damaged dsDNA is repaired using a complementary strand from intact homologous dsDNA as a template. Defective in breast/ovarian cancers with *BRCA1* or *BRCA2* mutations and in Fanconi anemia. Restores duplexes accurately without loss of nucleotides.	
Single strand		
Nucleotide excision repair	Specific endonucleases remove the oligonucleotides containing damaged bases; DNA polymerase and ligase fill and reseal the gap, respectively. Repairs bulky helix-distorting lesions (eg, pyrimidine dimers).	Occurs in G_1 phase of cell cycle. Defective in xeroderma pigmentosum (inability to repair DNA pyrimidine dimers caused by UV exposure). Presents with dry skin, photosensitivity, skin cancer.
Base excision repair	Base-specific Glycosylase removes altered base and creates AP site (apurinic/apyrimidinic). One or more nucleotides are removed by AP-Endonuclease, which cleaves 5′ end. AP-Lyase cleaves 3′ end. DNA Polymerase-β fills the gap and DNA ligase seals it.	Occurs throughout cell cycle. Important in repair of spontaneous/toxic deamination. "GEL Please."
Mismatch repair	Mismatched nucleotides in newly synthesized strand are removed and gap is filled and resealed.	Occurs predominantly in S phase of cell cycle. Defective in Lynch syndrome (hereditary nonpolyposis colorectal cancer [HNPCC]).

26. Choose the correct statements about glucokinase.

1. Located in β cells of the pancreas.
2. Has a lower affinity for glucose.
3. Is induced by insulin.
4. Inhibited by glucose-6-phosphate
5. Mutations can lead to MODY.

A. 2, 4, 5

B. 3, 4, 5

C. 1, 2, 3, 5

D. 1, 2, 3, 4

27. All of the following are omega-3 (ω3) series fatty acid except?

A. DHA

B. Alpha-linolenic acid

C. Linoleic acid

D. EPA

Types of lipids

PHOSPHO-LIPIDS

Glycero-phospholipid

Phosphatidyl choline = Lecithin → surfactant
P. Ethanolamine = Cephalin – myelin
DiP glycerol = Cardiolipin → Barth Sx
P.Serine flipping
P.inositol GQ
Plasmalogen Peroxisomes

Sphingo-phospholipid

Sphingomyelin
(Ceramide + choline + Po4)

GLYCOLIPIDS: No Po4

Cerebroside : Ceramide + Monosaccaride
Globoside : Ceramide + Oligosaccharide
Ganglioside : Globoside + NANA
(N-Acetylneuraminic acid)
GM3 -> N-acetylGalactose-NH2 -> Galactose
GM2 GM1

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

essential fa

SATURATED

Palmitic acid <10% – diet

Which of the following is not amphipathic?

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

28. Which of the following amino acid is necessary for conversion of nor-epinephrine to epinephrine?

A. Tyrosine
B. Tryptophan
C. Phenyl alanine
D. Methionine

PNMT

29. Succinate dehydrogenase (SDH) is an enzyme complex located within the inner mitochondrial membrane that catalyses the oxidation of succinate to fumarate. An experiment is conducted to determine if malate alters the rate of SDH activity. Reaction velocity is measured with and without a fixed quantity of malate as succinate concentration is gradually increased. Which of the following is the most accurate statement about malate in this experiment?

A. It alters the maximal velocity of the reaction
B. It binds the enzyme at a different site than succinate
C. It decreases affinity of the enzyme for succinate
D. It is a competitive inhibitor of the enzyme

Succinate concentration (mM)	Rate of reaction without malate (µmol/L/sec)	Rate of reaction with malate (µmol/L/sec)
2	80	40
8	200	120
16	280	200
64	400	400
128	400	400

Vmax ↓

Comp ↔

30. A researcher placed two functional mRNA sequences that contain trinucleotide repeats of CUC and CUU into a solution containing functional ribosomes and tRNAs that have the appropriate amino acids. After a few hours, it was observed that both mRNA sequences resulted in the production of polypeptide chains with repeated leucine amino acids. Which genetic principle can explain the observed outcome in this experiment?

A. Ambiguity

B. Degenerate / Wobble.

C. Universality

D. Overlapping

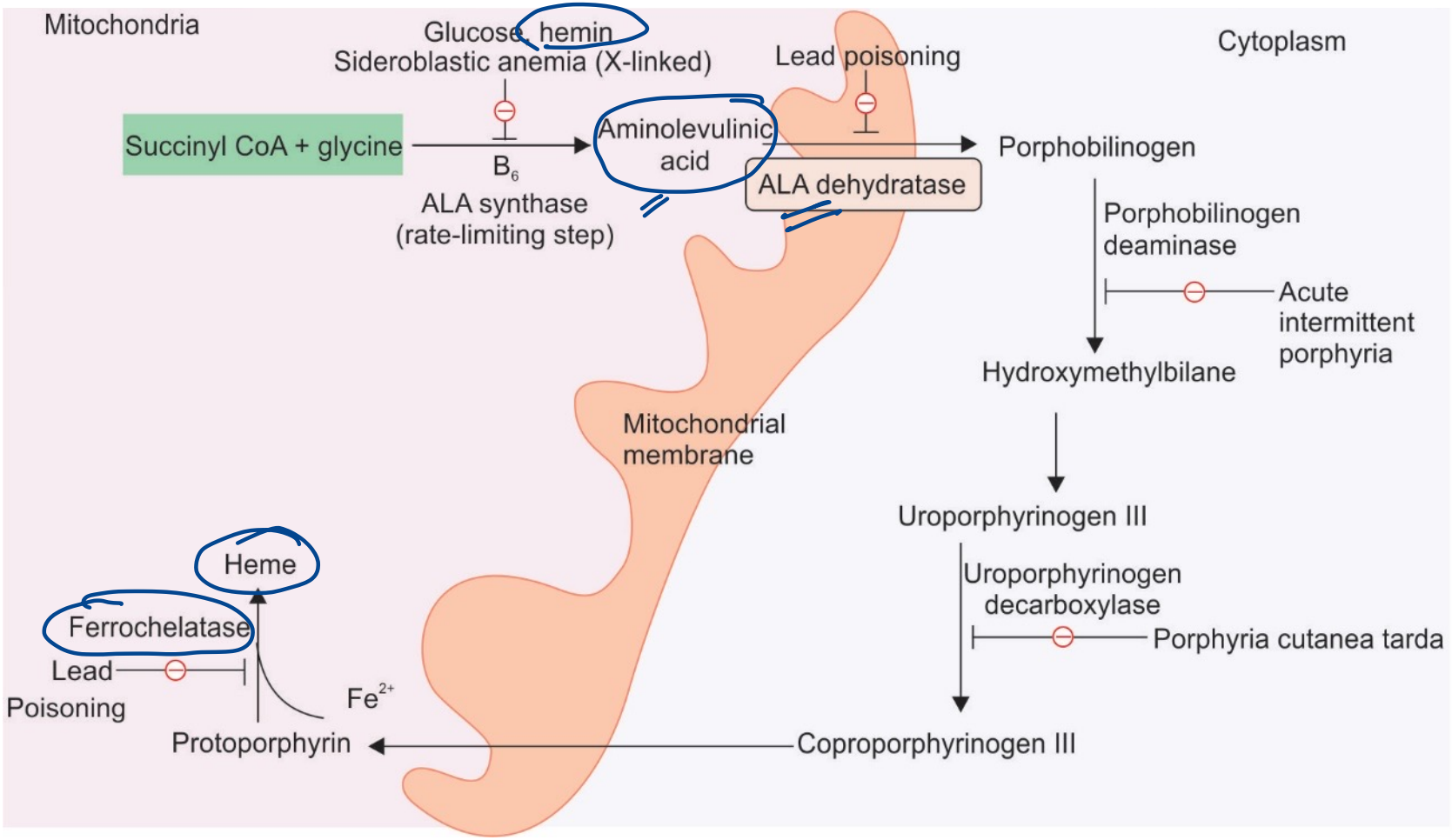
31. A 1-day-old boy is diagnosed with hyperphenylalaninemia by newborn screening. He is placed on a special phenylalanine-restricted diet with tyrosine supplementation. The parents are extensively counseled on the boy's condition and informed of the necessary dietary restrictions. They are also instructed to return to his physician for regular follow-up visits. Several months later, laboratory test results indicate that the infant has a normal serum phenylalanine level. Careful examination, however, reveals some neurological abnormalities, including axial hypotonia and microcephaly. Further workup is notable for elevated prolactin, and his physician suspects a cofactor deficiency. Which of the following enzymes is most likely deficient in this patient?

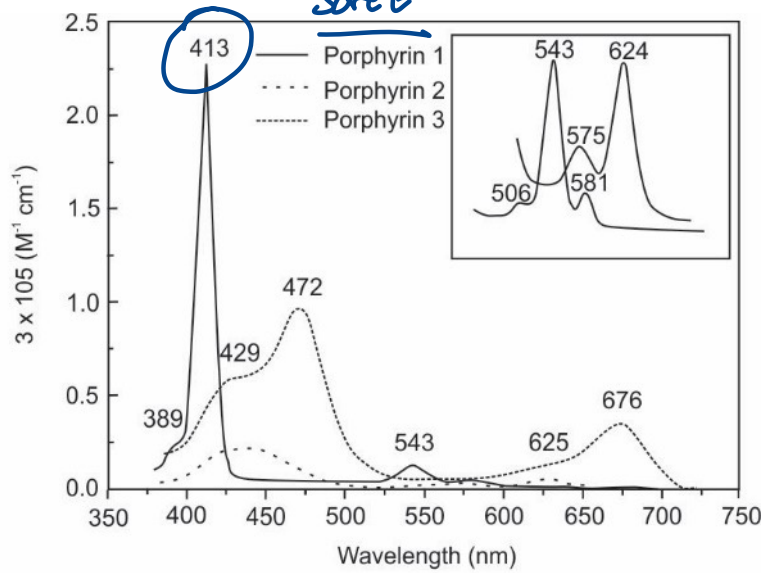
A. Dihydrobiopterin reductase
B. Dopamine ß-hydroxylase
C. Phenylalanine hydroxylase
D. Phenylethanolamine N-methyltransferase

32. Which of the following enzymes is produced in increased amounts than normal in the liver of a patient with lead toxicity?

A. ALA synthase
B. Heme oxygenase
C. Ferrochelatase
D. Porphobilinogen deaminase

HEME SYNTHESIS AND PORPHYRIAS





33. A 20-year-old woman comes to the clinic for evaluation of fatigue that has progressively worsened over the past month. The patient was recently diagnosed with celiac disease, but she has not strictly adhered to a gluten-free diet. Laboratory evaluation reveals macrocytic anemia with a low folate level but normal vitamin B12 level. Oral folic acid is prescribed. Which of the following biochemical changes is most likely to occur to homocysteine, methionine and MMA respectively, in this patient after starting treatment?

A. Increase, decrease, increase

B. Decrease, increase, no change

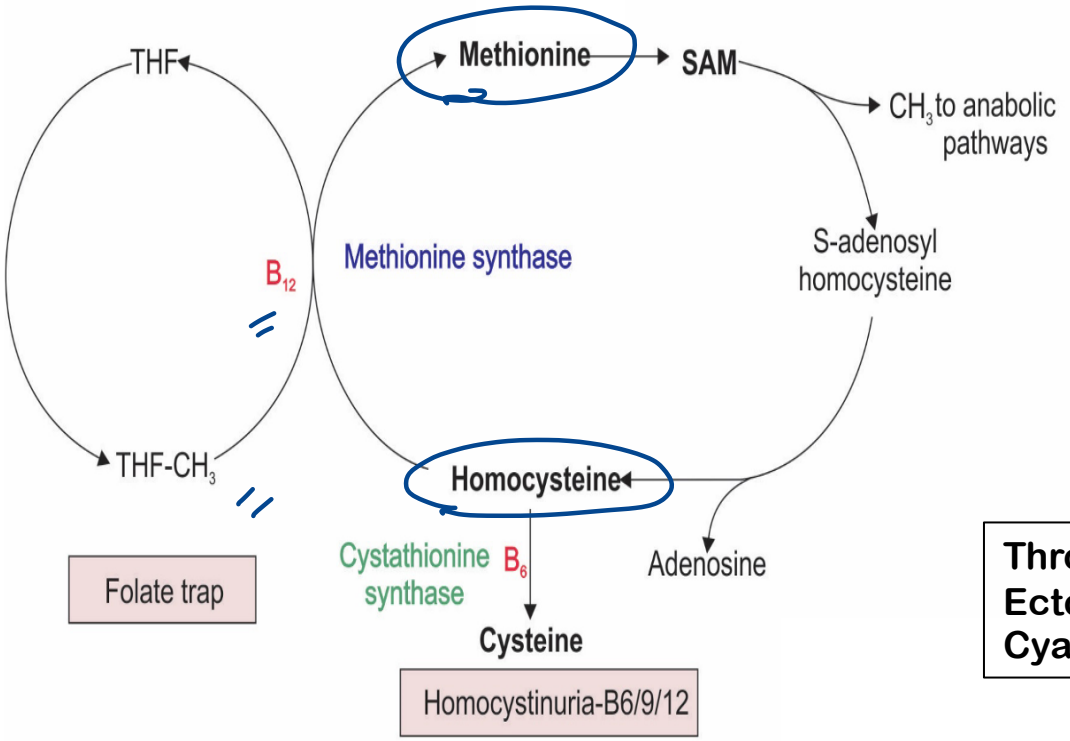
C. Decrease, increase, decrease

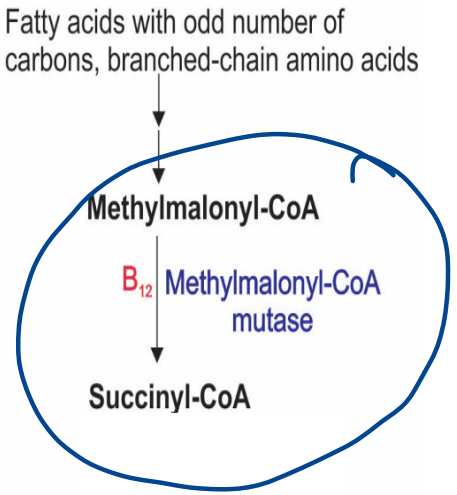
D. Increase, decrease, no change

B12

Methionine

Homocysteine





Thromboembolism, Marfanoid habitus, Ectopia lentis:
Cyanide nitroprusside test

34. 6-year-old boy is brought to the OPD by his mother due to bleeding gums for the past 3 months. Height is below the 5th percentile and weight is at the 25th percentile for age. Several small patches of hypopigmentation are noted on the trunk. X-ray of the hand is shown below

Laboratory results are as follows:

Leukocytes - 3,000/mm3

Hemoglobin - 6.5 g/dL

Mean corpuscular volume-112 um

Platelets-40,000/mm

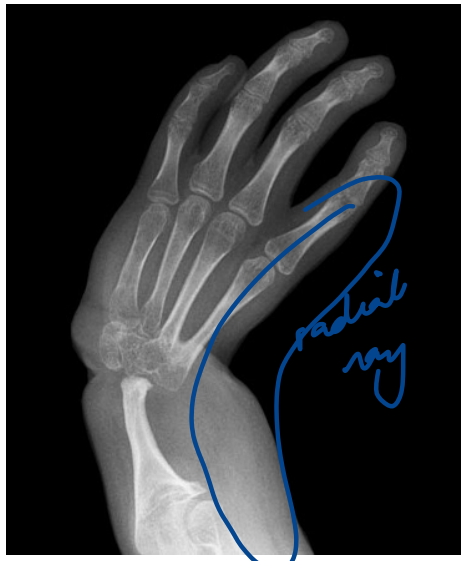
Which of the following is the most likely cause of this patient's condition?

A. Cobalamin deficiency

B. Congenital infection

C. DNA repair defect

D. Thymic tumor



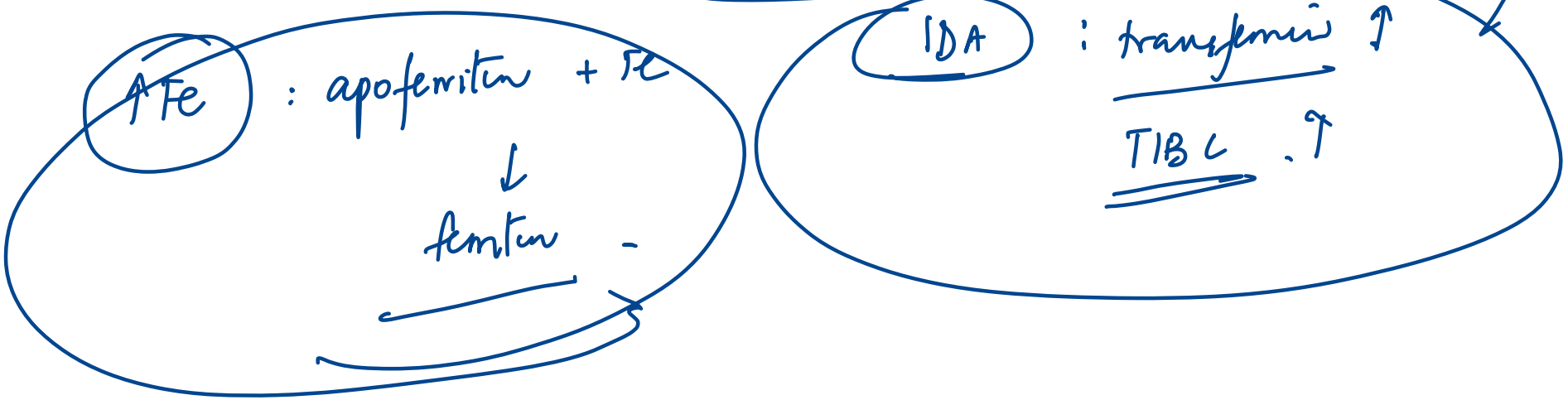
35. Which of the following is true about Hemochromatosis?

A. The mRNA for Transferrin receptor is stabilised by binding of IRP to 3' stem-loop structures known as IRE.

B. The mRNA for the Transferrin receptor is not bound by IRP and is rapidly degraded.

C. The mRNA for apoferritin is not bound by IRP at 5' stem loop IRE and is rapidly degraded.

D. The mRNA for apoferritin is bound by IRP and is not translated.



36. All of the following statements regarding the respiratory quotient (RQ) are true, except:

A. The respiratory quotient is the ratio of CO_2 produced to O_2 consumed.

B. The RQ for carbohydrate metabolism is 1.0.

C. The RQ for fat is ~~1.0~~ 0.7.

D. The RQ for protein is approximately 0.8.

37. In an electron Transport system, which part will be the last to get electrons?

A. Coenzyme Q

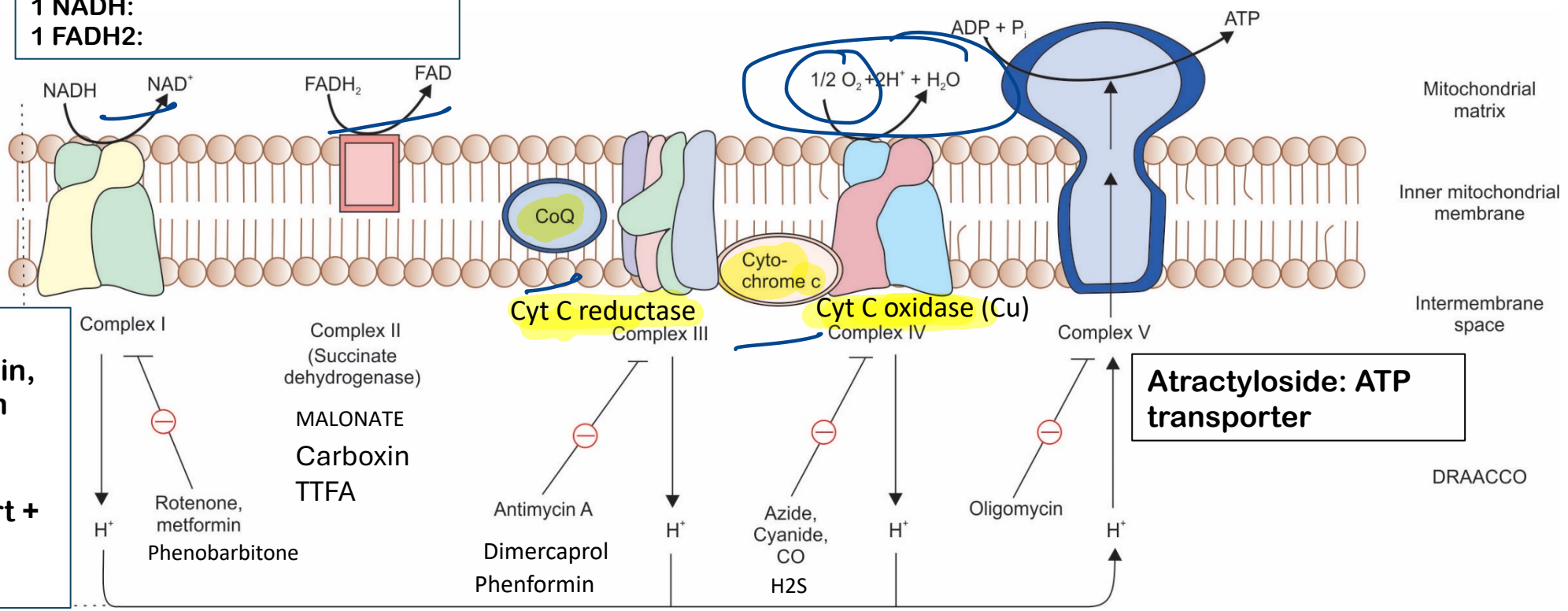
B. FADH2

C. O2

D. Cytochrome C

ETC

1 NADH:
1 FADH2:



Dinitrophenol, Thyroxine, Bilirubin, Brown fat, Aspirin overdose

Electron transport + ATP –

Atractyloside: ATP transporter

38. All of the following statements regarding lipoprotein lipase (LPL) are true, except:

A. It is an extracellular enzyme located on capillary walls.
B. It is activated by Apo C-II on chylomicrons.
C. It hydrolyzes triglycerides in chylomicrons into free fatty acids.
D. It degrades triglycerides within adipose tissue in response to glucagon.

Insulin

HC LA

39. Identify the incorrect statements:

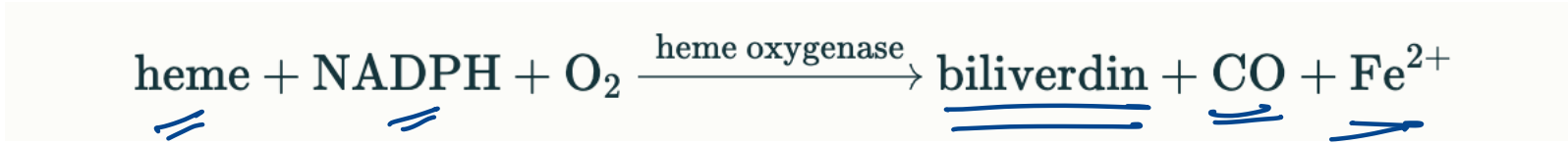
1. A xenobiotic undergoes hydroxylation with the help of oxygen and NADPH as a cofactor.
2. Heme catabolism produces bilirubin, CO, Fe^{2+}.
3. Copper deficiency can lead to anemia, neutropenia,neuropathy.
4. Tandem mass spectrometry is the gold standard for screening inborn errors of metabolism in children

A. 1, 2, 4

B. 1, 3

C. 2

D. 2, 3



40. A 32-year-old patient suffering from chills, vomiting and cramping was rushed to the casualty. He had eaten wild mushrooms for dinner that he had picked earlier in the day. His symptoms are due to an inhibition of which of the following enzymes?

A. RNA polymerase I
B. RNA polymerase II
C. RNA polymerase III
D. DNA primase

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.

41. 20 cycles of PCR will yield how many copies of DNA?

A. 1 raised to the power of 20

B. 2 raised to the power of 20

C. 2 x 20 copies

D. 1 x 20 copies

2^{20}

42. Arrange the following steps of base excision repair in order:

1. Endonuclease excises the sugar backbone
2. Glycosylase removes the altered base
3. DNA-polymerase adds a nucleotide
4. Creation of apurinic/apyrimidinic site

A. 1 → 2 → 3 → 4

B. 2 → 1 → 4 → 3

C. 1 → 2 → 4 → 3

D. 2 → 4 → 1 → 3

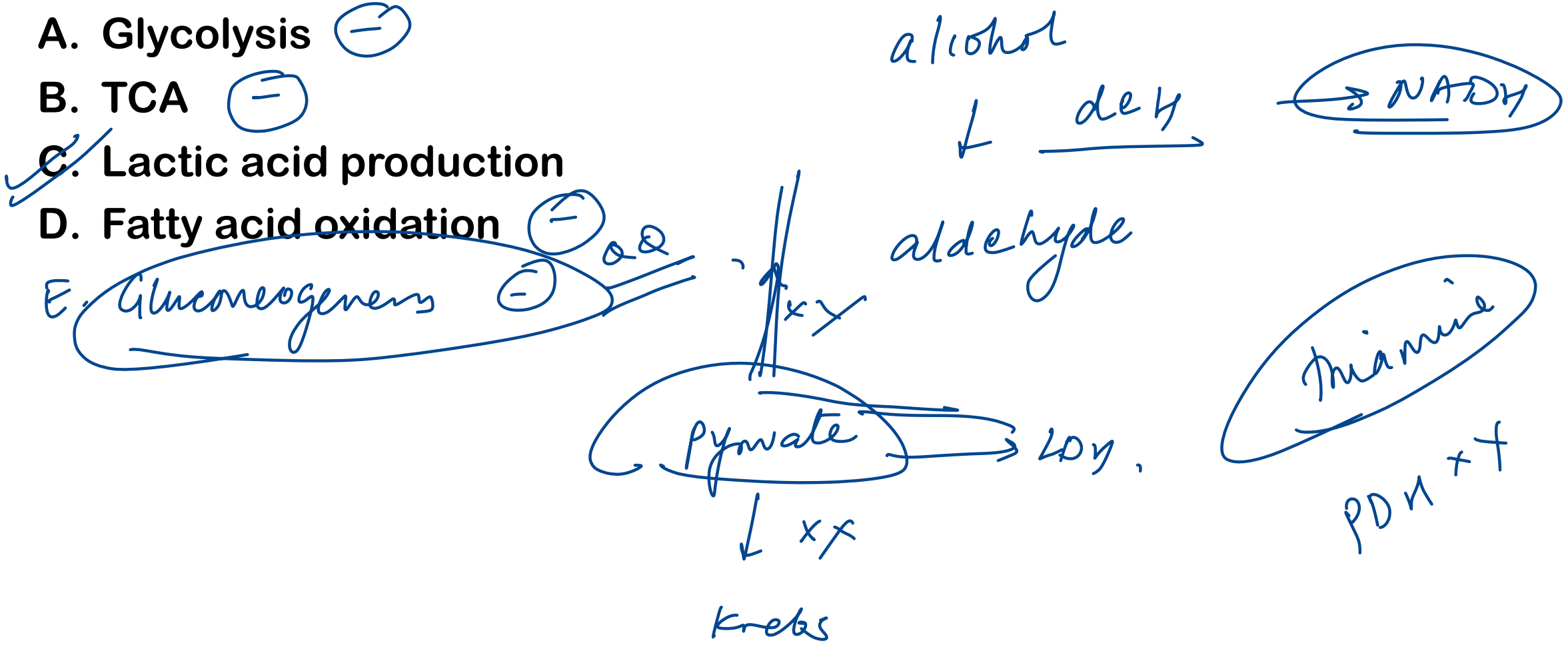
2 – 4 – 1 – 3

43. All of the following lysosomal storage disorders have enzyme replacement therapy available, except:

A. Gaucher disease
B. Fabry disease
C. Hurler syndrome
D. I-cell disease

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

A. Glycolysis
B. TCA
C. Lactic acid production
D. Fatty acid oxidation
E. Gluconeogenesis



45. You are expected to produce a protein of interest. Arrange the following steps in a sequence.

a. Lysis of bacterial cell

b. Incorporating gene of interest into bacteria

c. SDS-PAGE

d. Hybridization

e. Protein elution/extraction

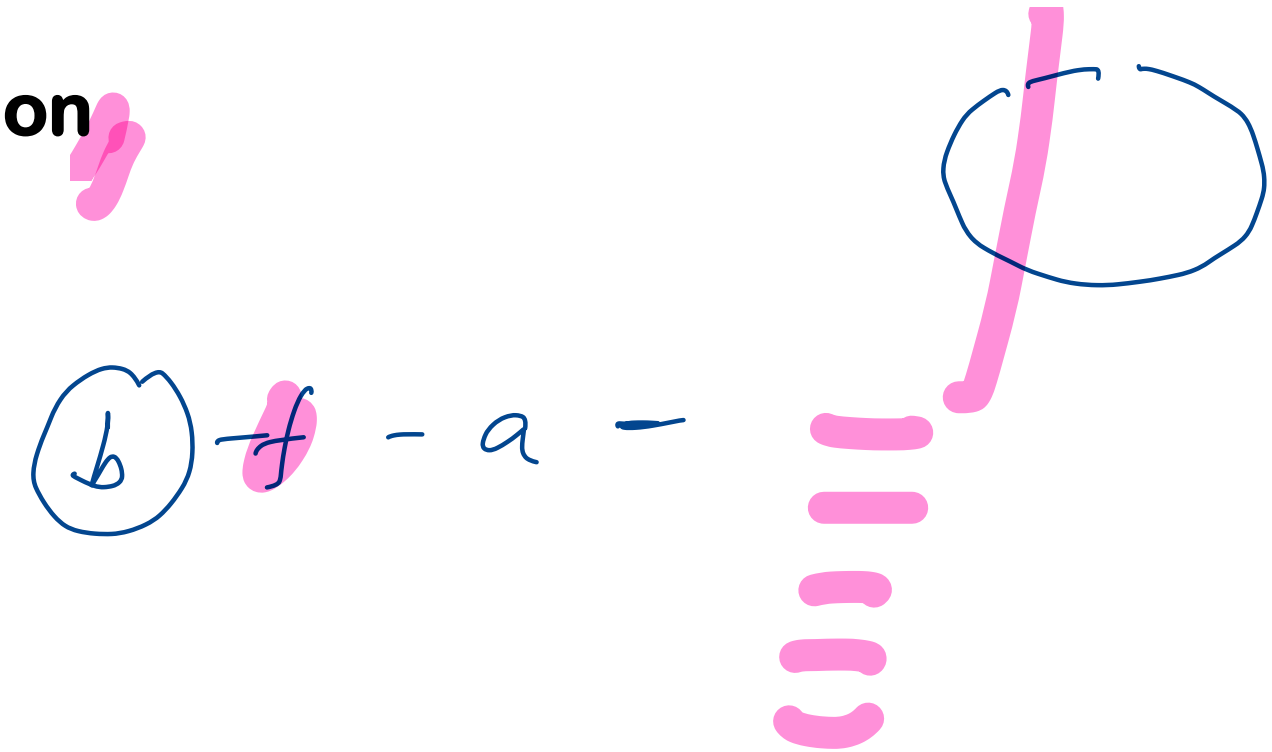
f. Expression of protein

A. a-b-c-d-e-f

B. b-c-d-a-f-e

C. b-d-a-c-e-f

D. b-f-a-c-d-e



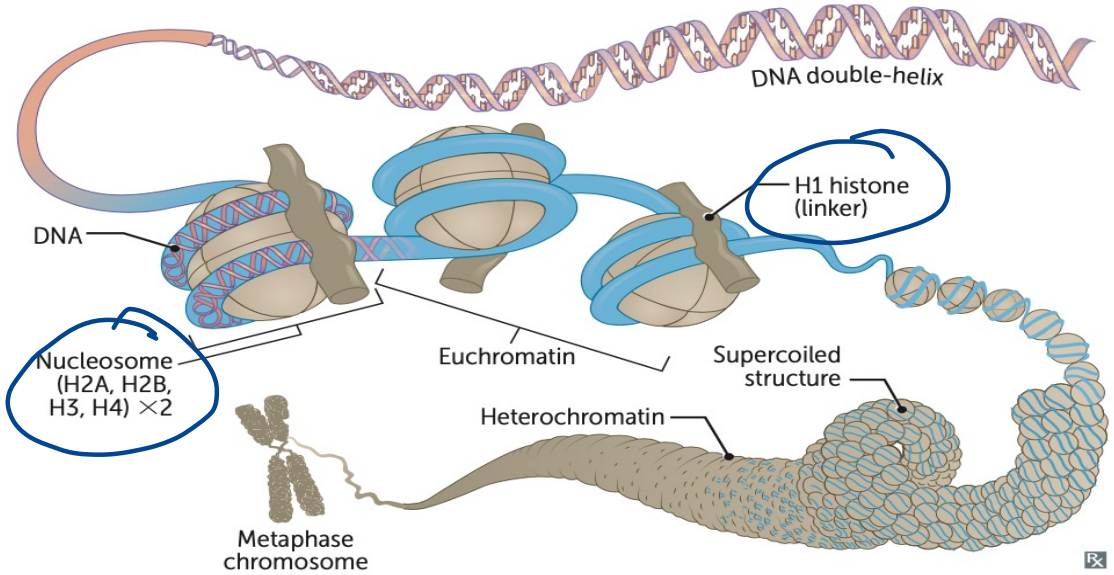
46. Which of the following statements is incorrect about histones?

A. Histones are synthesized during S phase of the cell cycle

B. H1 histone does not contribute to formation of nucleosome

C. Mitochondrial DNA has histone proteins

D. Histones are rich in arginine and lysine



47. Identify the incorrect pair of UV absorption wavelength with respective compound:

A. Tryptophan- 280 nm

B. Nucleic acids - 260 nm (N-bases)

C. NADH/NADPH - 340 nm

D. Porphyrins - 200 nm

400nm

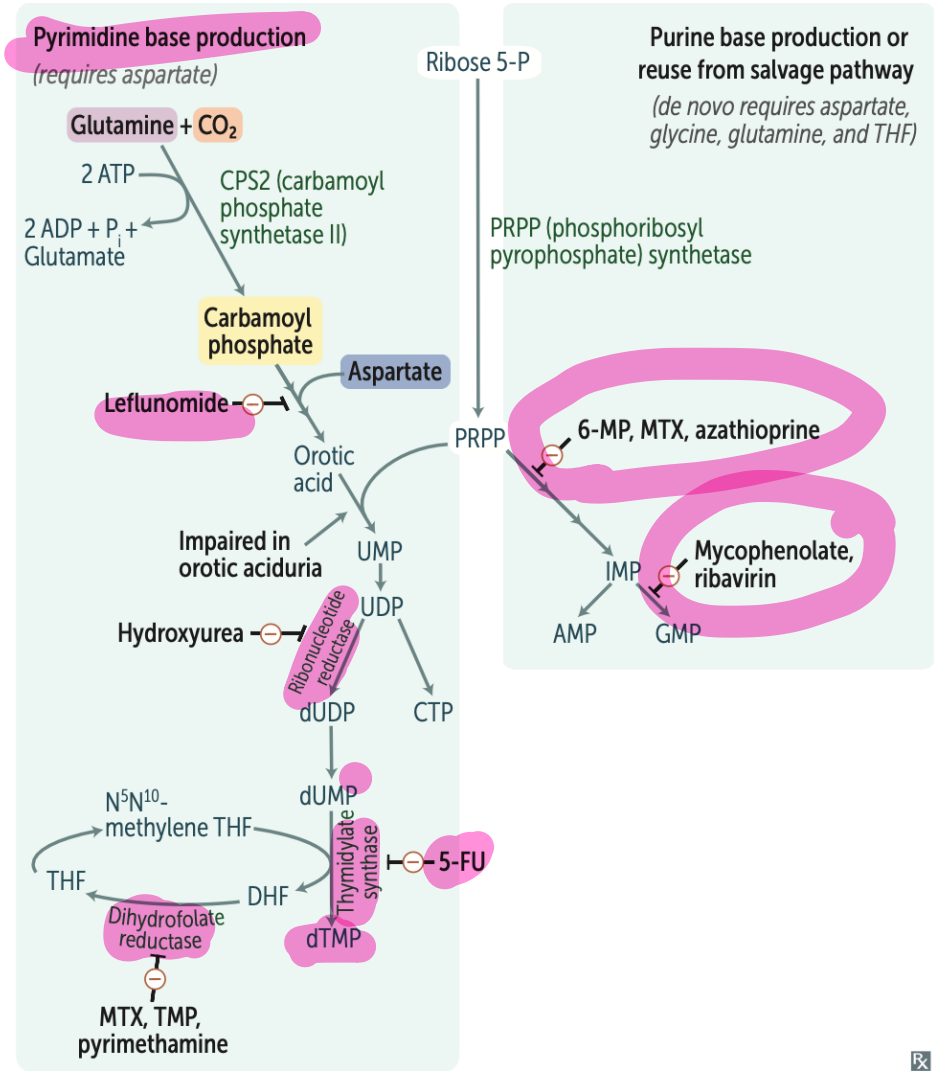
Fluorescent

48. All of the following drugs inhibit pyrimidine synthesis, except:

A. Leflunomide
B. 5-Fluorouracil (5-FU)
C. Methotrexate (MTX)
D. 6-Mercaptopurine

De novo pyrimidine and purine synthesis

Various immunosuppressive, antineoplastic, and antibiotic drugs function by interfering with nucleotide synthesis:



Pyrimidine synthesis:

- Leflunomide: inhibits dihydroorotate dehydrogenase
- 5-fluorouracil (5-FU) and its prodrug capecitabine: form 5-F-dUMP, which inhibits thymidylate synthase (↓ dTMP)

Purine synthesis:

- 6-mercaptopurine (6-MP) and its prodrug azathioprine: inhibit de novo purine synthesis (guanine phosphoribosyltransferase); azathioprine is metabolized via purine degradation pathway and can lead to immunosuppression when administered with xanthine oxidase inhibitor
- Mycophenolate and ribavirin: inhibit inosine monophosphate dehydrogenase

Purine and pyrimidine synthesis:

- Hydroxyurea: inhibits ribonucleotide reductase
- Methotrexate (MTX), trimethoprim (TMP), and pyrimethamine: inhibit dihydrofolate reductase (↓ deoxythymidine monophosphate [dTMP]) in humans (methotrexate), bacteria (trimethoprim), and protozoa (pyrimethamine)

CPS1 = mitochondria, urea cycle, found in liver
CPS2 = cytosol, pyrimidine synthesis, found in most cells

49. Which of the following amino acids disrupts the α-helix structure of a protein?

A. Alanine
B. Proline
C. Serine
D. Glycine

– introduces bends α helix

50. Cancer cells consume more glucose by which of the following processes?

A. Increased conversion of pyruvate to acetyl CoA

B. Increased fatty acid oxidation

C. Increased GLUT-2 transporters, oxidative phosphorylation

D. Increased lactate is produced even in the presence of oxygen

Warburg

aerobic glycolysis

51. A 45-year-old homeless man comes to the emergency department due to a "pins-and-needles" sensation in his legs. He also has painful lesions on his lips and corners of his mouth. Abdominal examination reveals hepatomegaly. Laboratory evaluation shows very low urinary riboflavin excretion. Activity of which of the following enzymes is most likely directly impaired in this patient?

B2

FMN/FAD

A. Glucose-6-phosphate dehydrogenase

B. HMG-CoA reductase

C. Isocitrate dehydrogenase

D. Succinate dehydrogenase

52. All of the following are correct except:

A. Hydrophobic part of protein is found in the transmembrane portion of membranous receptors

B. Cell membrane proteins are synthesised in the RER

C. Selenocysteine is coded by UGA

D. Heme synthesis occurs in BM, RBCs and hepatocytes

53. How many cycles of PCR are required to generate half the copies of 26 cycles?

A. 13

B. 12

C. 25

D. 27

54. A 2-year-old child with delayed milestones, organomegaly, corneal clouding, and α-L-iduronidase deficiency will accumulate which compounds?

A. Dermatan sulphate + Heparan sulphate
B. Keratan sulphate + Chondroitin sulphate
C. Dermatan sulphate only
D. Sphingolipids

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

55. A frameshift mutation at the 4th nucleotide of a 900-nucleotide coding gene will most likely cause:

A. No biological change
B. No change due to post-translational modification
C. Partial function of altered protein
D. Complete loss of protein function

56. The attachment of Eukaryotic mRNA to the ribosome initiation factor is mediated through?

A. Poly A tail
B. tRNA
C. 5'methylGuanyl Cap
D. Shine-Dalgarno Sequence — prokaryotic

57. A 24-month-old boy is brought to the physician for the evaluation of intellectual and behavioral abnormalities and abnormal movements of his extremities. His mother reports that he often hits his head and limbs against furniture. He is unable to walk without support and speaks in unclear 2-word phrases. Examination shows multiple bruises on the forehead and several healing wounds over the fingers. There is increased muscle tone in all extremities. Laboratory studies show an increased serum uric acid concentration. The serum concentration of which of the following substances is most likely to also be increased in this patient?

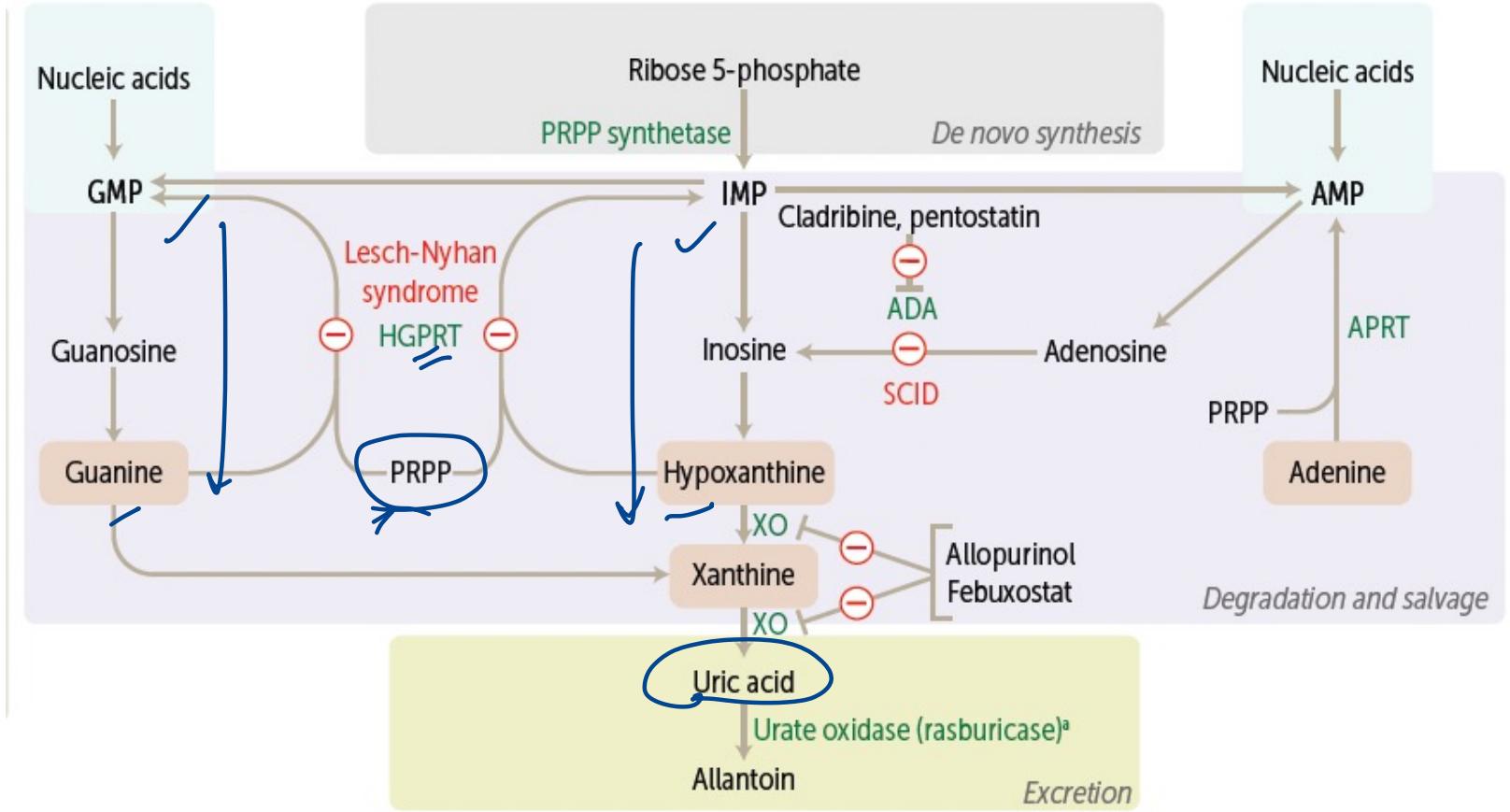
A. HGPRT

B. Phosphoribosyl pyrophosphate

C. Deoxyadenosine trisphosphate

D. Branched-chain amino acids

Lesch - Nyhan



58. Which is correct about isoenzymes?

A. Same action with similar kinetics

B. Same quaternary structure

C. Catalyse the same reaction.

D. Cannot be separated from each other on Electrophoresis.

structure

CK-MM / CK-MB

59. Which of the following enzymes degrade the triglycerides present in the chylomicrons coming from the intestine?

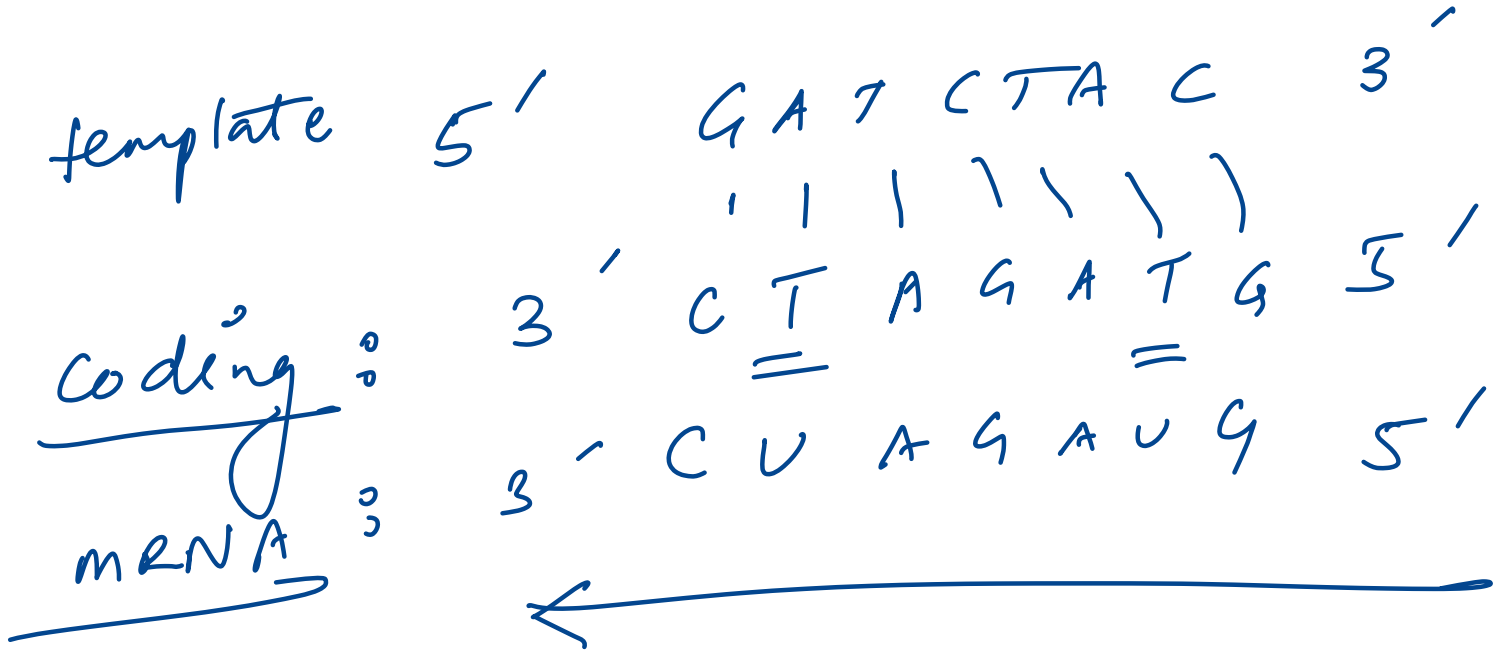
A. Pancreatic lipase
B. Lipoprotein lipase
C. Hormone sensitive lipase
D. Hepatic lipase

60. As part of an experiment, healthy volunteers undergo a 12-hour fast and then drink a solution containing radiolabeled alanine. Consecutive blood samples are drawn every 15 minutes for the next 3 hours. Initial blood samples detect the radiolabeled alanine, but analysis of later samples shows that the radiotracer is present in blood primarily in the form of glucose. Before alanine can be converted to glucose, its amino group is transferred to which of the following?

A. α- Ketoglutarate
B. L-citrulline
C. Malate
D. Citrate

61. The base sequence of the strand of DNA used as the template for transcription has the base sequence GATCTAC. What is the base sequence of RNA product?

A. CUAGAUG
B. GTAGATC
C. GAUCUAC
D. GUAGAUC



62. Which of the following represents dark stained areas on a karyotype?

A. Heterochromatin
B. Euchromatin
C. GC rich
D. Exons

Euchromatin	Heterochromatin
Transcriptionally active	Transcriptionally inactive
DNA is loosely packed	DNA is highly packed
Actively present in Prokaryotic and eukaryotic genome	Only present in eukaryotic genome
Genetically active	Genetically inactive
Present at inner side of the nucleus	Present at nucleus periphery
Stained lighter	Stained dark
Early replicative	Late replicative
Aren't sticky	Are usually sticky
Allow gene to form a protein	Regulates genetic integrity, and control gene expression
Low genetic density	High genetic density
Consist 2 to 3% part of the genome	Consist 97 to 98% part of the genome

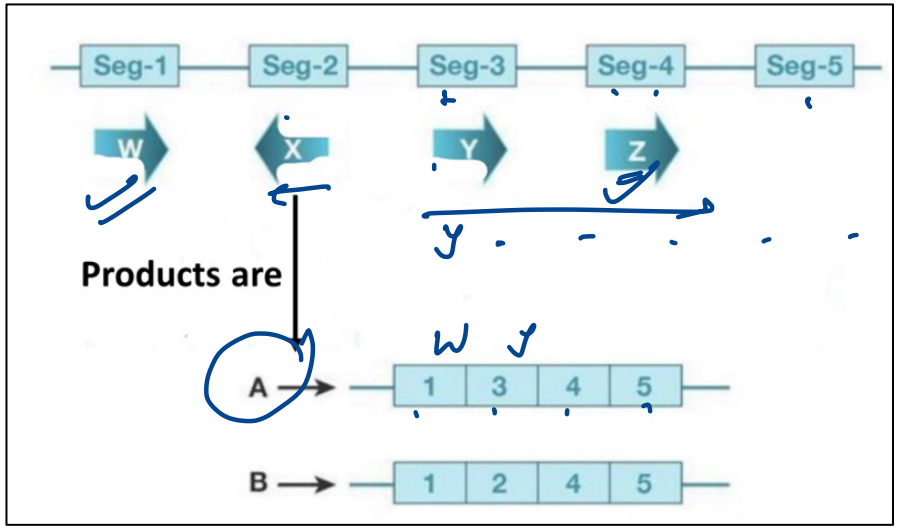
63. The illustration below shows alternative splicing of a gene which has intron segments 1, 2, 3, 4, and 5. It yields two products A and B, by the action of different promoters. You are provided with the promoters W, X, Y, and Z, each of which binds to a different segment as shown below and acts in the marked direction. Which of the following promoters will you use to get product A?

A. W, X, Y

B. W, Z

C. WX

D. W Y



64. Which of the following causes the inactivation of acetyl-CoA carboxylase?

A. Phosphorylation
B. Insulin
C. High levels of citrate
D. Dephosphorylation

FA Synthesis = anabolic, fed.

65. 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?

A. Benedict's test
B. Seliwanoff's reagent
C. Sakaguchi's reagent
D. Millon's reagent

#cc

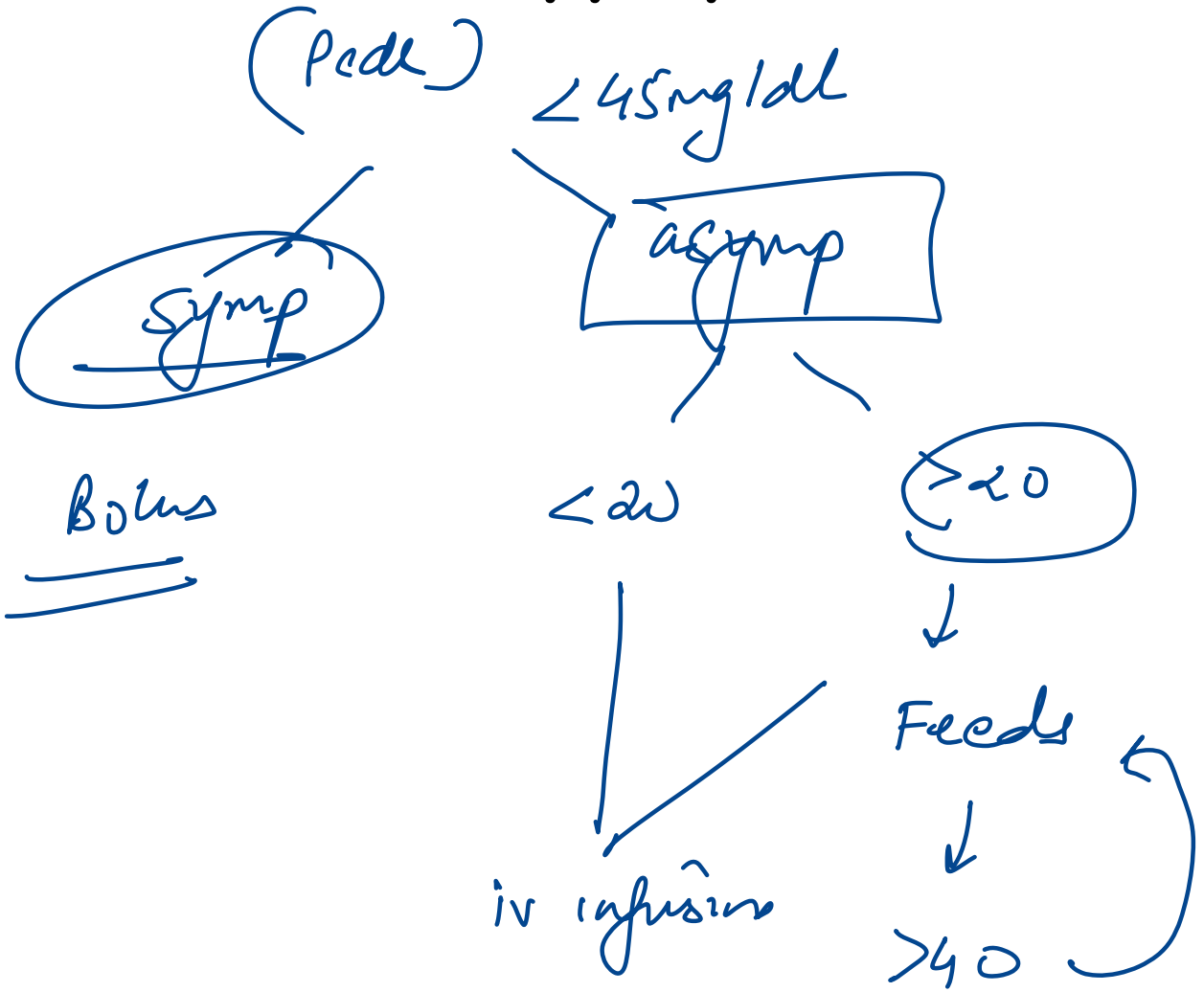
Test for all carbohydrates	Molisch test
For reducing sugars	Benedict's test
Differentiate mono- and disaccharides	Barfoed's test, Moore's test, Fehling's test
Differentiate aldoses and ketoses (Fructose)	Seliwanoff's test, Rapid furfural test, Foulger's test
Test for pentoses	Bial's test
Test for galactose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

aa

SPECIAL GROUPS	
Two peptide linkages	Biuret Reaction
Alpha-amino acids	Ninhydrin Reaction
Benzene ring (Phenylananine)	Xanthoproteic Reaction
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

66. A term neonate born to a GDM mother has asymptomatic hypoglycemia. Blood glucose is 25 mg/dL, improves to 45mg/dL after a trial of oral feeds. What is the appropriate next step?

A. Frequent feeding
B. Glucose monitoring only
C. Bolus of 10% dextrose
D. IV glucose infusion



67. A 24-year-old woman with a history of recurrent urinary tract infections comes to the physician with dysuria and increased urinary frequency. Her urine culture grows colonies of Gram-negative bacteria. The bacteria are isolated and placed in a growth-enhancing nutrient solution, where they undergo rapid cellular division. As they are actively dividing, the bacterial cells are lysed, and their DNA is extracted and purified. Analysis of the partially replicated DNA fragments shows the presence of uracil. This finding is most likely mediated by which of the following enzymes?

A. DNA ligase

B. DNA polymerase I

C. DNA polymerase III

D. Primase

RNA

Primakes

68. 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 7

69. A 10-year-old boy with persistent fatigue presents with fatigue and biopsy of muscle shows accumulation of triglycerides esterified with long chain fatty acid (LCFA). Which of the following is the diagnosis?

A. Carnitine deficiency
B. FA synthase defect
C. LPL defect
D. LDL receptor defect

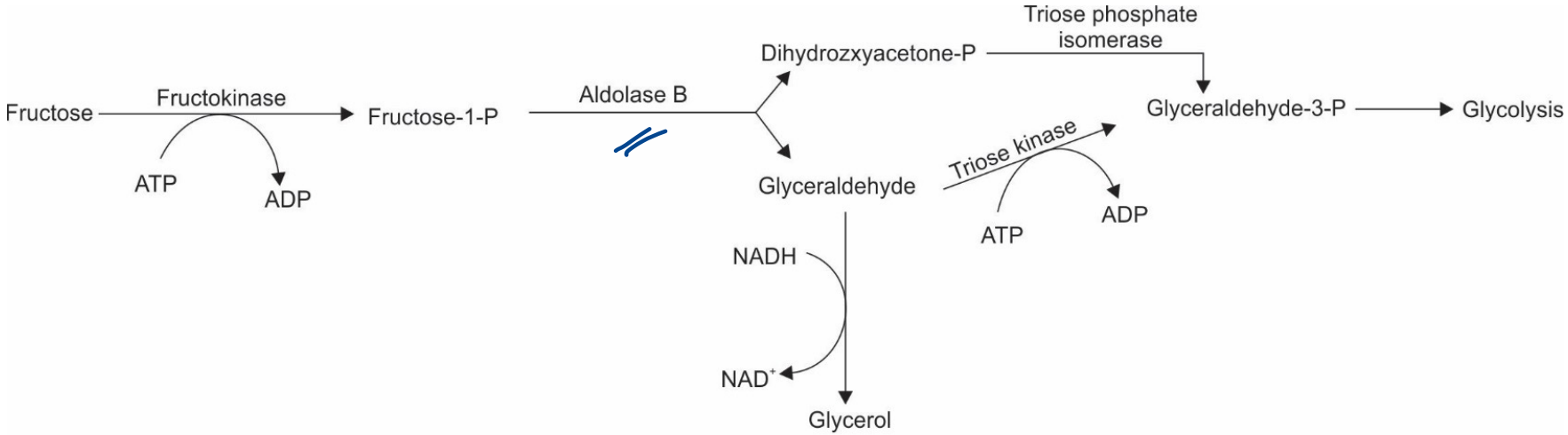
70. Which enzyme is responsible for cataract development in diabetics?

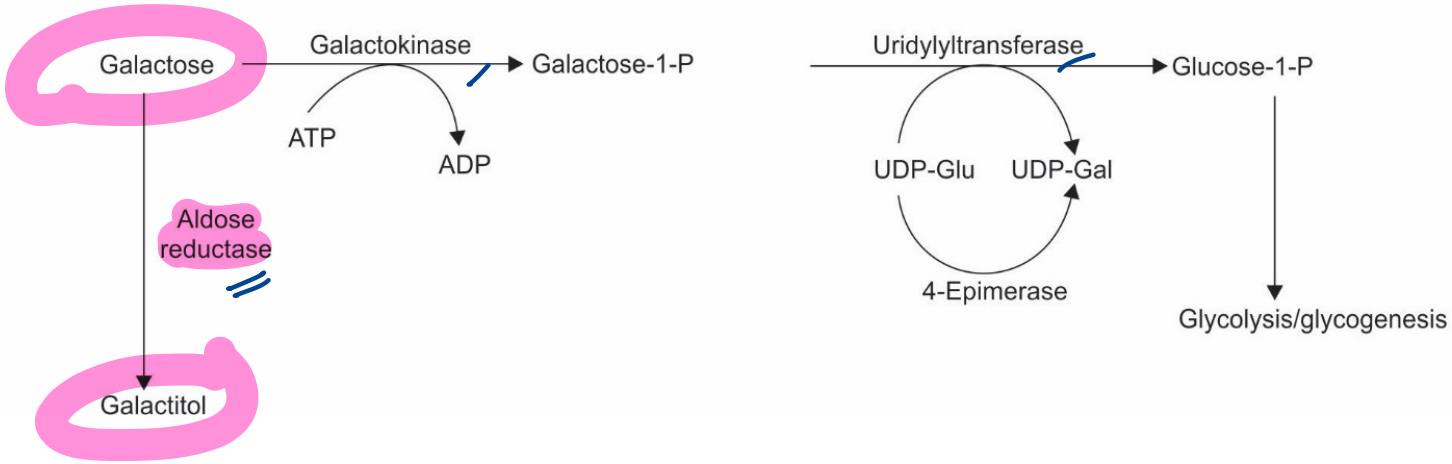
A. Aldolase B

B. Galactose-1-phosphate uridyltransferase

C. Galactokinase

D. Aldose reductase





71. A 30-year-old man is being evaluated for a deficiency of lipoprotein lipase and on further investigation, he too was diagnosed with the same condition. Which of the following lipoproteins will be elevated in this patient's plasma?

A. Chylomicron and Triglycerides

B. LDL and HDL

C. HDL and VLDL

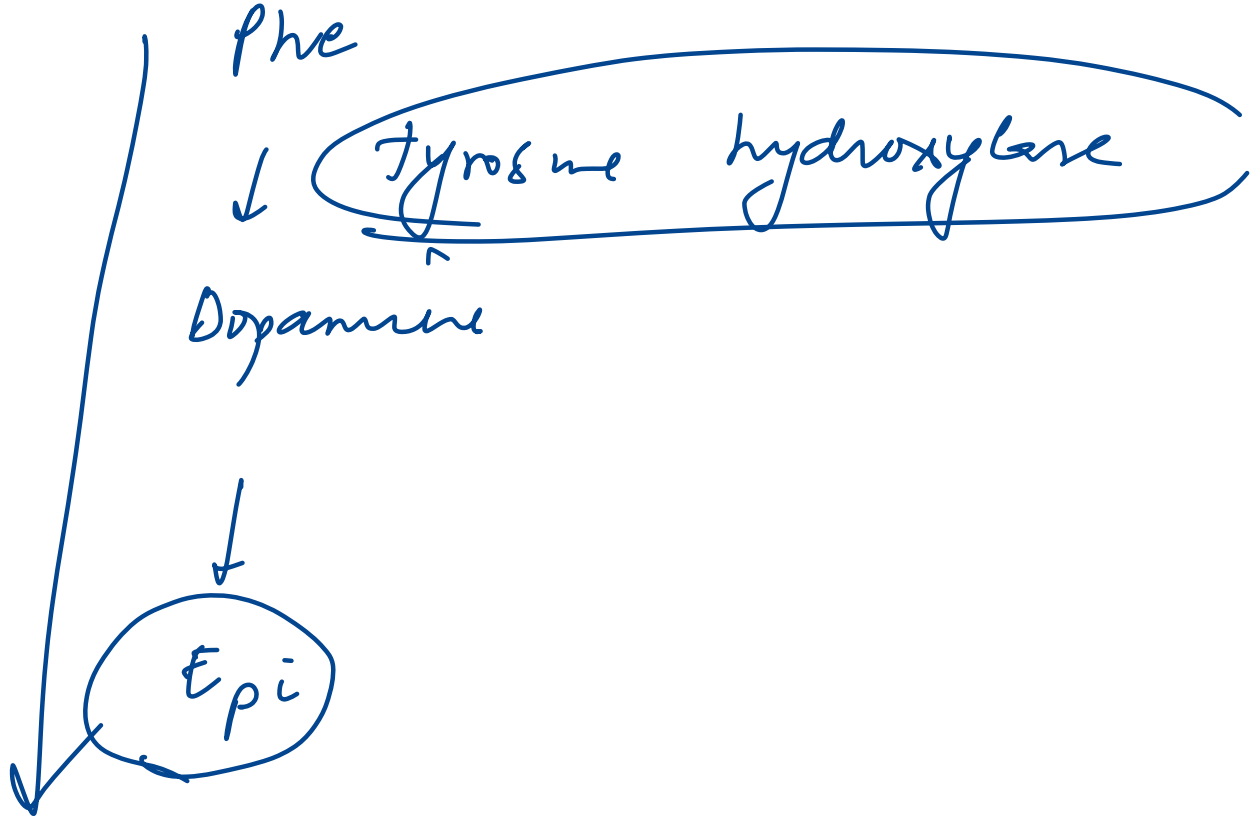
D. Chylomicron and LDL

Type 1 . NEET '25

"milky plasma"

72. Which enzyme shows increased activity in a patient with methamphetamine use disorder?

A. DOPA decarboxylase
B. Dopamine β-hydroxylase
C. Tyrosinase
D. Tyrosine hydroxylase



73. A 25-year-old patient presented with dark urine, which further blackens on exposure to air. What's the enzyme defect in this case?

A. Fumaryl acetoacetate hydrolase

B. Di Hydroxy Phenyl Acetate Dioxygenase

C. Homogentisate Dehydrogenase

D. Phenyl alanine hydroxylase

oxidase / dioxygenase

74. Which of the following tests is useful for detecting bile salts in urine?

A. Ehrlich's test → Urobilinogen
B. Hay's test
C. Fouchet's test – bile pigment
D. Rothera test → KB

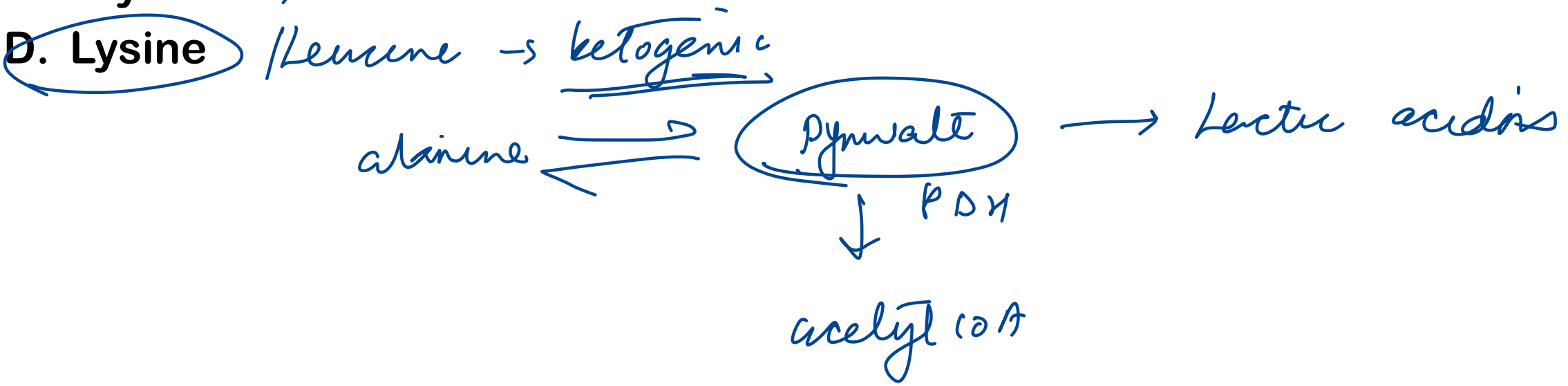
75. Increasing which of the following substances in his diet is most likely to help a patient with PDH deficiency generate energy without further elevating lactate levels?

A. Alanine ✗

B. Asparagine

C. Glycerol ✗

D. Lysine



76. Identify the correct statements:

1. In a patient with Wilson's disease, 3-methylhistidine is decreased in urine.

2. Direct positive Van der bergh's reaction is seen in a case of obstructive jaundice.

3. If the percentage of thymine residues in DNA is 28%, percentage of cytosine is 22%

4. Thermogenin is present in the mitochondria.

A. 1, 2, 3, 4

B. 1, 2, 3

C. 2, 3, 4

D. 1, 4

A - T

28 + 28

56

44

77. Which of the following enzyme activity decreases in fasting?

A. Hormone-sensitive lipase ↑
B. Glycogen phosphorylase ↑
C. Pyruvate carboxylase ↑
D. Phosphofructokinase 1 ↓

HC = LA

78. DNA methylation is not related to?

A. Mismatch repair
B. Chromatin Remodelling
C. DNA replication
D. Gene silencing

79. Pyruvate from glycolysis can go in different directions based on the type of tissue, cell, and if oxygen is present or not. There's a big enzyme complex that guides pyruvate towards aerobic metabolism. This complex does many things, except:

A. Remove a carbon group from a molecule.

B. Substrate level phosphorylation

C. Turn pyruvate into an acetyl group.

D. Attach the acetyl group to a cofactor.

pyr deH

oxidative

decarb

CO_2

NADH

80. Which of the following site does the restriction enzyme act when RFLP is used in-order to identify the five different species of staphylococci in a surgical ICU?

A. ATGGAC - TACCGTG

B. GATATC - CTATAG

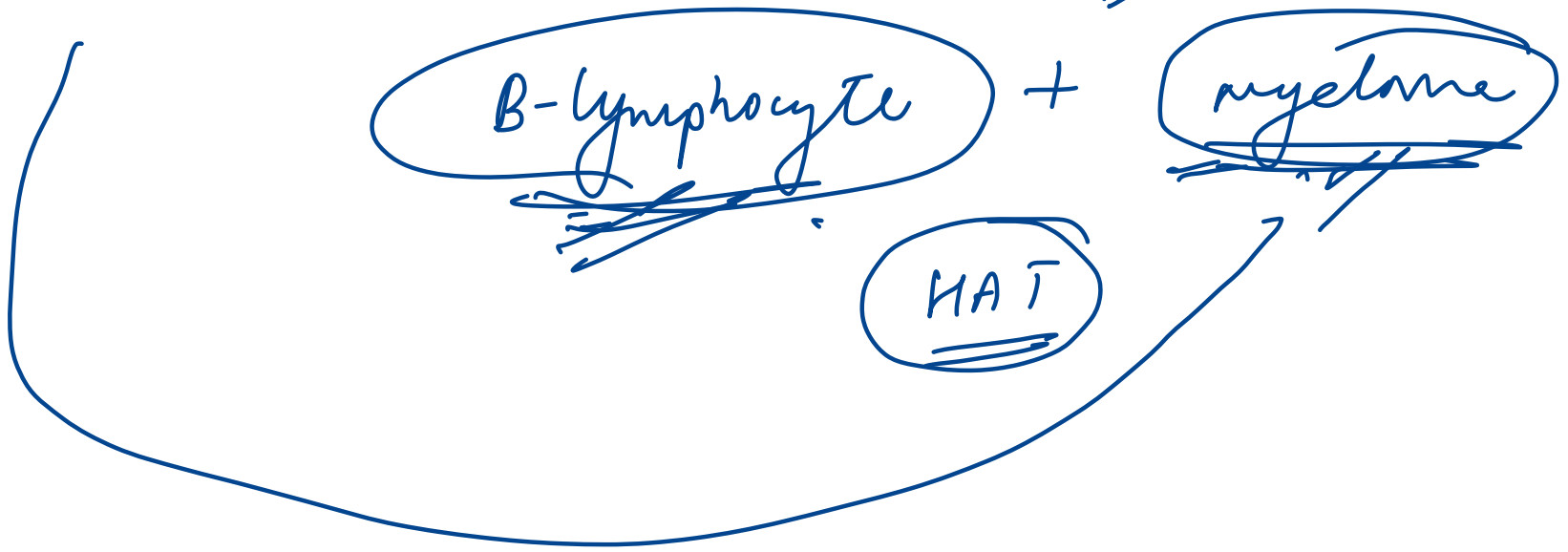
C. TAGATA - ATCTAT

D. AATATA - TATAAT

81. Which of the following is correct about monoclonal antibody production by hybridoma technique?

1. Antibody-producing B-lymphocytes are fused with immortal myeloma cell lines from mice
2. HAT medium contains Hypoxanthine-Aminopterin-Thymidine
3. HAT medium inhibits conversion of T->U
4. HGPRT is deficient is myeloma cells

A. 1, 2, 3, 4
B. 1, 2, 4
C. 2, 3
D. 1, 3, 4



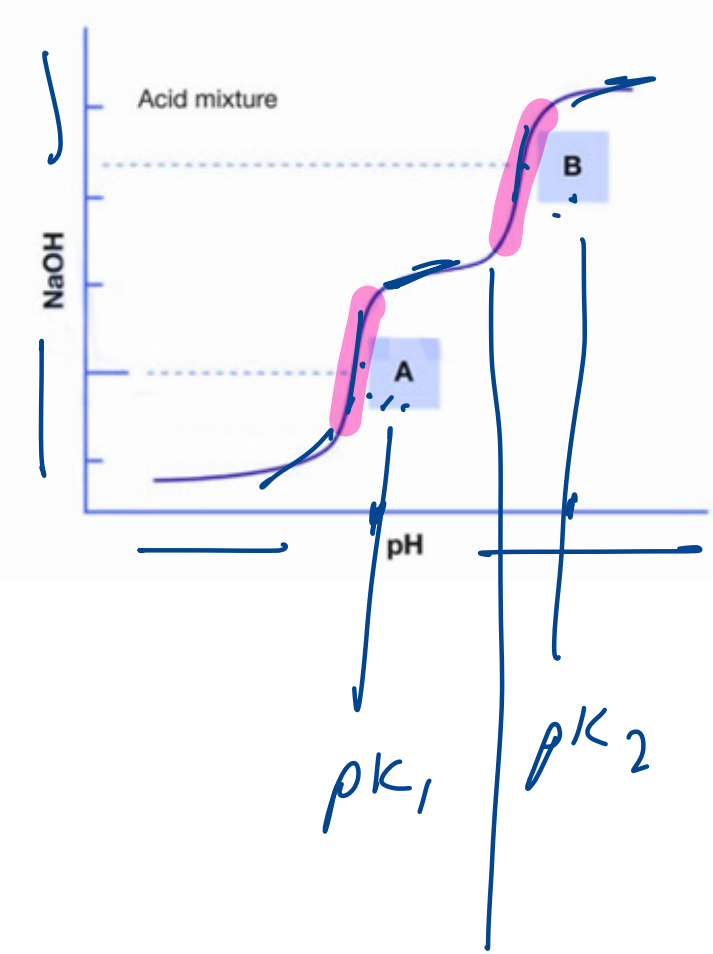
82. The graph shown below is the titration curve of a biochemical compound. Which of the following statement is true?

A. The maximum buffering capacity of the compound is represented by points A and B

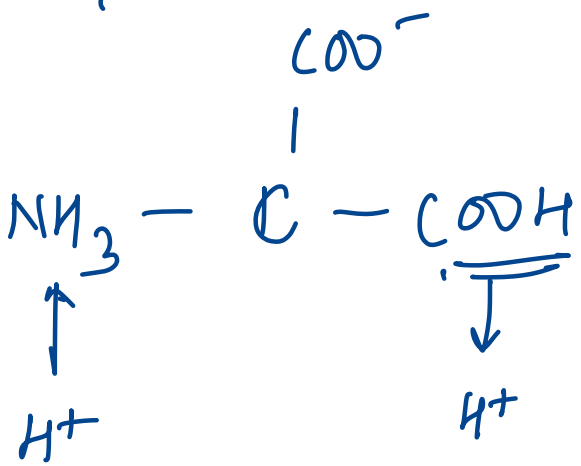
B. The points A and B represent the range of maximum ionization of the amine and carboxyl group

C. The compound has three ionisable side chains

D. The compound has one ionisable group



(2)



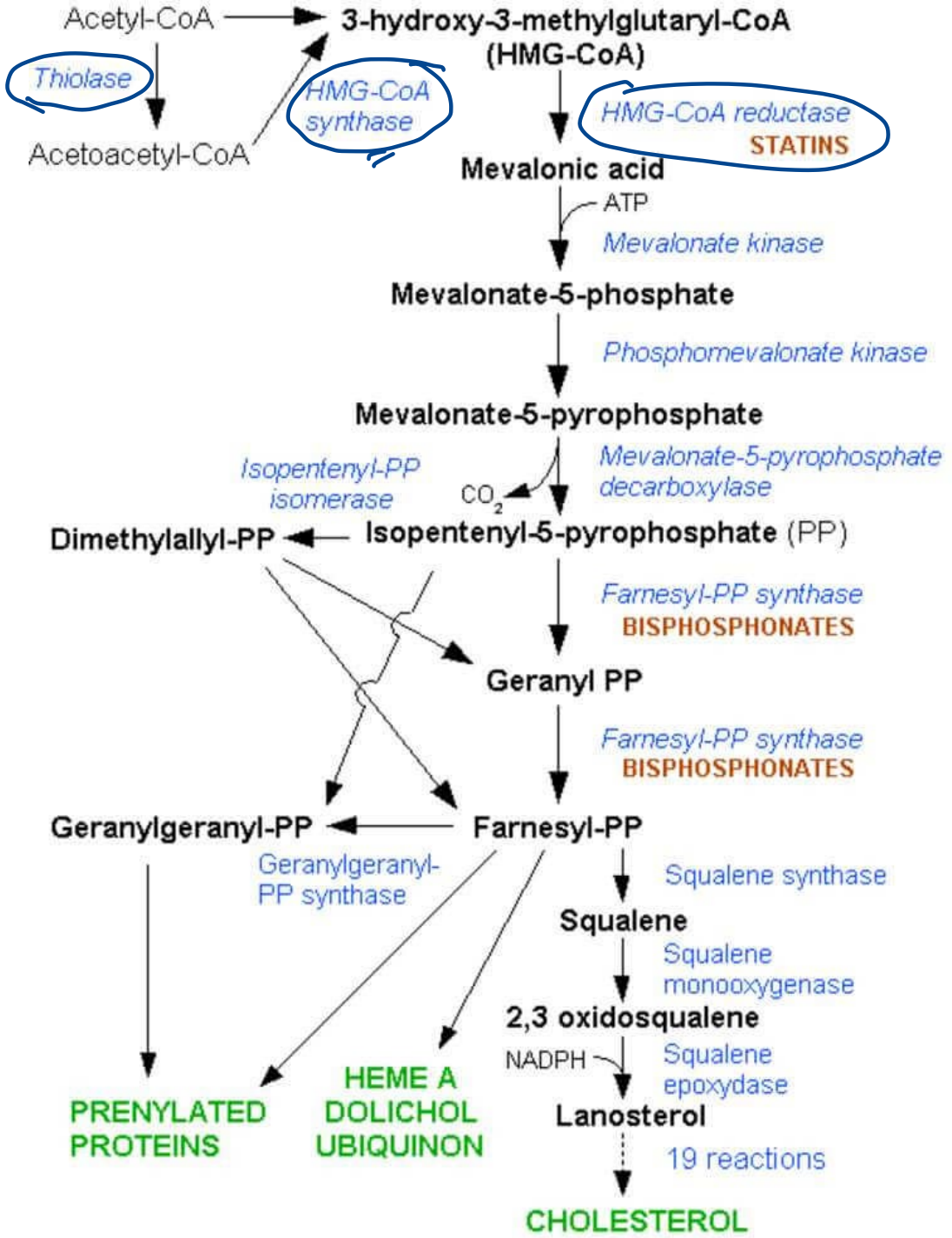
pK1 pK2

Isoelectric pH

$pI = \frac{pK_1 + pK_2}{2}$

83. The enzyme that is not used in cholesterol synthesis?

A. Thiolase
B. HMG CoA reductase
C. HMG CoA synthase → KB
D. HMG CoA lyase



84. In an isolated mitochondria, in a medium containing Succinate, Fumarate, ADP and Pi, ATPs were produced. Later a compound was added, and oxidative phosphorylation was decreased. What's that compound?

A. Oligomycin
B. 2,4 dinitrophenol
C. Antimycin
D. Rotenone

85. In which of the genetic material, Number of Adenine will not be equal to that of Thymine?

A. Pseudomonas
B. Mitochondrial DNA of human
C. Mycoplasma
D. Measles

86. Which equation is used to calculate the pH of a buffer solution?

A. Nernst equation
B. Henderson-Hasselbalch equation
C. Goldman equation
D. Gibbs-Donnan equation

87. Match the cell organelle with its marker enzymes:

1. Plasma membrane	a. Galactosyltransferase
2. Golgi bodies	b. Lactate dehydrogenase
3. Cytosol	c. Acid phosphatase
4. Lysosomes	d. 5'-nucleotidase

A. 1-a, 2-b, 3-c, 4-d

B. 1-a, 2-c, 3-b, 4-d

C. 1-d, 2-a, 3-b, 4-c

D. 1-d, 2-c, 3-a, 4-b

SUB-CELL ORGANELLE	MARKER ENZYMES
Plasma membrane	5’-nucleotidase
Nucleus	DNA polymerase
Endoplasmic reticulum	Glucose-6-phosphatase
Golgi bodies	Galactosyltransferase
Lysosomes	Acid phosphatase and B-glucuronidase
Mitochondria	Succinate dehydrogenase and Cytochrome-c-oxidase
Peroxisomes	Catalase
Cytosol	Lactate dehydrogenase and Glucose-6-phosphate dehydrogenase

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

A. MRE11 ✓

B. BRCA1 ✓

C. KU80 ✓

D. MuTL mismatch MSH / MLH

89. Serotonin production involves:

A. Carboxylation → Hydroxylation of tryptophan

B. Hydroxylation → Carboxylation of tryptophan

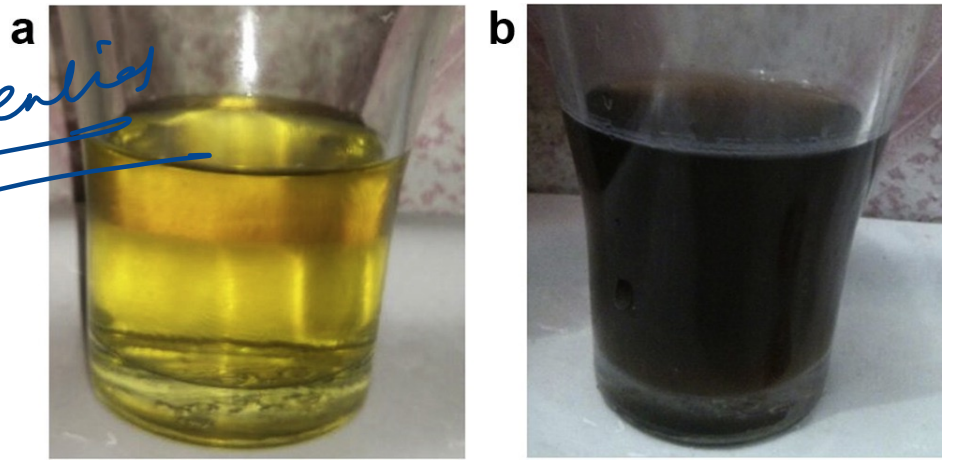
C. Hydroxylation → Decarboxylation of tryptophan

D. Decarboxylation → Hydroxylation of tryptophan

5 Hydroxy tryptamen

90. An infant is brought by his parents with complaints that his urine turns black on standing. Which of the following must be restricted in this infant's diet?

A. Tryptophan
B. Phenylalanine
C. Alanine
D. Vitamin C



91. A 45-year-old woman undergoes routine health screening, including a lipid profile, while fasting. Her results show a total cholesterol of 300 mg/dL, HDL cholesterol of 25 mg/dL, and triglycerides of 150 mg/dL. Utilizing the Friedewald equation to assess her cardiovascular risk, what is the LDL cholesterol level in this patient?

A. 245 mg/dl

B. 135 mg/dl

C. 285 mg/dl

D. 45 mg/dl

$$LDL = 300 - \frac{150}{5} - 25$$

$$= 300 - 55$$

LDL = Total Cholesterol - HDL - (Triglycerides/5)

92. A molecular biologist is working on isolating a specific gene within a large DNA fragment ranging from 50 to 100 kilobases (KB) in length. Which technique is most suitable for this purpose?

A. Notch
B. RFLP
C. SSLP
D. Chromosome walking

93. A 7-year-old girl is brought to the clinic due to several months of fatigue and difficulty walking. She ambulates normally at first but rapidly becomes weak and tired. Examination shows mildly decreased power in all extremities but no ataxia. Cardiac auscultation reveals a 1/6 systolic murmur and an S3 gallop. Laboratory results are as follows:

Serum chemistry
- **Glucose: 37 mg/dL**
- **Creatine kinase: 304 U/L**

Urinalysis
- **Protein: none**
- **Glucose: negative**
- **Ketones: negative**
- **Leukocyte esterase: negative**
- **Nitrites: negative**

Muscle biopsy shows a very low carnitine content. This patient most likely has deficient synthesis of which of the following substances?

A. Acetoacetate
B. Arachidonic acid
C. Lactate
D. Palmitate

94. An 8-month-old infant is brought to the pediatrician for evaluation of multiple episodes of seizures and hypoglycemia. A liver biopsy demonstrates hepatocytes with large glycogen stores. Biochemical analysis reveals glycogen with short outer chains. Which of the following is the likely diagnosis?

A. Cori disease
B. Anderson disease
C. Von-Gierke disease
D. Pompe disease

debranching
Cori

95. 6-year-old boy is brought to the physician because of behavioral problems. His mother says that he has frequent angry outbursts and gets into fights with his classmates. He constantly complains of feeling hungry, even after eating a full meal. Physical examination shows central obesity, undescended testes, almond-shaped eyes, and a thin upper lip. Which of the following genetic changes is most likely associated with this patient's condition?

A. Microdeletion of long arm of chromosome 7

B. Mutation of paternal chromosome 15

C. Mitotic nondisjunction of chromosome 21

D. Silencing of paternal chromosome 15

Prader willi

Chr 15

pat del?

96. The enzyme that is common for both glycolysis and gluconeogenesis is?

A. Pyruvate kinase
B. Phosphofructokinase
C. Phosphoenolpyruvate carboxykinase
D. Phosphoglycerate kinase

97. Identify the correct statements

1. The binding site of miRNA on mRNA is typically the 3' UTR.

2. Vitamins A and C are required in significantly higher quantity during the lactation while Folate and iron are required in higher quantity during pregnancy.

3. Fomepizole acts as an antidote of methanol poisoning by inhibiting aldehyde dehydrogenase.

4. AT bonds will require a lower Tm (melting temperature) compared to GC bonds.

A. 1, 2, 3, 4

B. 1, 4

C. 2, 3

D. 1, 2, 4

98. A 14-month-old boy is evaluated for failure to thrive and developmental delay. The toddler has not started babbling or forming words. He is at the 10th percentile for height and 5th percentile for weight. Laboratory results are as follows:
HB- 8.9
MCV- 112
Reticulocytes- 1%
Ammonia-42µg/dl (Normal: 40-80 µg/dl)
Urine specimens contain large amounts of orotic acid crystals.
Supplementation with which of the following substances would most likely benefit this patient?

A. Phenylbutyrate
B. Guanine
C. Pyridoxine
D. Uridine

99. Identify the correct statements

1. Warburg effect is aerobic glycolysis which is responsible for cancer cachexia.
2. Telomeres are TTACCC sequences which tend to shorten with each cell division and are associated with aging.
3. Telomerase has RNA dependent DNA polymerase activity
4. Cholera toxin binds to the GM-1 ganglioside receptor on the surface of intestinal epithelial cells.

A. 1, 3, 4

B. 1, 4

C. 2, 3

D. 1, 2, 3

100. Identify the correct statements:

1. Glucagon challenge test can be used to distinguish Von
2. Gierke's disease and Cori's disease.
3. Choline should be avoided by patients with trimethylaminuria.
4. Oculocutaneous albinism type 1 (tyrosinase deficiency) is AR.
5. Creatine is synthesized from glycine, arginine and methionine.

A. 1, 2, 3, 4

B. 1, 4

C. 2, 3

D. 1, 3, 4

Thank You

Telegram: @brainandscalpel
t.me/brainandscalpel