



UNIVERSITY EXAMINATION 2023/2024

MEDICAL SCHOOL
DEPARTMENT OF MEDICAL BIOCHEMISTRY

BACHELOR OF MEDICINE AND SURGERY

UNIT CODE: MBMB1200 UNIT TITLE: MEDICAL BIOCHEMISTRY I (PAPER A)

UNIT CODE: MBMB1211 UNIT TITLE: CELLULAR BASIS OF LIFE

UNIT CODE: MBMB1212 UNIT TITLE: GENERAL CHEMISTRY,

UNIT CODE: MBMB1223 UNIT TITLE: STRUCTURES AND FUNCTIONS OF
BIOMOLECULES)

DATE: MON 8TH JULY, 2024 8.00AM MAIN EXAM TIME: 2 HOURS

INSTRUCTIONS TO CANDIDATES: ANSWER ALL QUESTIONS TOTAL = 100 MARKS

SECTION C: MULTIPLE CHOICE QUESTIONS MCQs - (ANSWER ALL QUESTIONS) (35 MARKS)

1. Water is.....

- A. Polar
- B. Hydrophilic
- C. Hydrophobic
- D. A and B
- E. A and C

2. Which of the following is NOT a non-polar amino acid?

- A Serine
- B Glycine
- C Methionine
- D Tryptophan
- E Phenylalanine

3. Which of the following statements is FALSE?
- A. Amino acids are the building blocks of proteins
 - B. Amino acids can be polar or non-polar
 - C. The predominant form of amino acids in proteins is the D-amino acids
 - D. Amino acids join together to form peptide bonds
 - E. Proline is the only alpha imino acid
4. Which of the following is NOT categorized as a biomolecule?
- A. Vitamins
 - B. Nucleic acids
 - C. Fats
 - D. Lipids
 - E. None of the above
5. Which of the following statements is FALSE?
- A. Proteins are made up of amino acids
 - B. The linear arrangement of amino acids in a protein is determined by nucleotide sequence in DNA
 - C. Proteins have their amino acids joined to each other by peptide bonds
 - D. Proteins can be used as a source of fuel for the body during starvation
 - E. None of the above
6. Cohesive and adhesive forces cause.....
- A. Surface tension and capillary action respectively
 - B. Are both forces of attraction to like molecules
 - C. Are properties of lipids
 - D. B and C
 - E. A and B
7. Which of the following is NOT a type of classification of amino acids based on their interaction with water?
- A. Sulfur containing amino acid
 - B. Polar charged amino acids
 - C. Non polar aliphatic amino acids
 - D. Non polar aromatic amino acids
 - E. Polar uncharged amino acids

8. Aklaptonuria is caused by an accumulation of.....
- A. Homogentisic acid
 - B. Glucuronic acid
 - C. Tyrosine
 - D. Melanin
 - E. Tryptophan
9. Phenylketonuria is due to accumulation of....
- A. Phenylalanine
 - B. Phenyltyrosine
 - C. Tyrosine
 - D. Alanine
 - E. None of the above
10. Maple syrup urine is due to a deficiency of
- A. Phenylalanine hydroxylase
 - B. Branched chain alpha keto acid dehydrogenase
 - C. Tyrosinase
 - D. Homogentisate-1,2-dioxygenase
 - E. None of the above
11. Which of the following fatty acids is required for the synthesis of arachidonate?
- A. Palmitate
 - B. Stearate
 - C. Linolenate
 - D. Oleate
 - E. Lauric acid
12. Which of the following presents a yellow color in the presence of the ninhydrin reagent?
- A. Glycine
 - B. Tryptophan
 - C. Tyrosine
 - D. Proline
 - E. Guanine

13. Carbon can make up to how many bonds?

- A. 4
- B. 2
- C. 5
- D. 3
- E. 1

14. An atomic number can be defied as.....

- A. The number of protons in an atom
- B. The sum of the number of protons and neutrons
- C. The number of neutrons in an atom
- D. The difference in protons and neutrons in an atom
- E. None of the above

15. Intermolecular forces.....

- A. Are forces of attraction and repulsion between molecules
- B. Are forces that hold atoms together within a molecule
- C. Are stronger than ionic and covalent bonds
- D. Include ionic boids
- E. None of the above

16. Which of the following atoms does not commonly bind to carbon?

- A. Nitrogen,
- B. Oxygen
- C. Sulfur
- D. Hydrogen
- E. Iodine

17. Nitrogen generally forms how many bond(s)?

- A. 2
- B. 4
- C. 3
- D. 1
- E. 5

18. Oxygen generally forms how many bond(s)?

- A. 1
- B. 2

- C. 3
- D. 4
- E. 5

19. Constitutional isomers are defined as
- A. Isomers that have the same molecular formula but different constitution ✓
 - B. Isomers that have the same molecular formula and similar order of connectivity of the atoms ✓
 - C. Isomers that have the same molecular formula and constitution but different spatial arrangement of atoms - *Stereoisomers*
 - D. Isomers that have the same molecular formula and different spatial arrangement of atoms ✓
 - E. None of the above
20. Which of the following biomolecules is synthesized from the fusing of cyclohexane molecules?
- A. Testosterone
 - B. Proteins
 - C. Limonene
 - D. Insulin
 - E. Hemoglobin
21. Which of the following is not a type of radiation?
- A. Gamma-rays
 - B. Microwaves
 - C. Ultraviolet rays
 - D. Radiowaves
 - E. All the above are types of radiation
22. Enthalpy is.....
- A. The heat energy exchange between the reaction and its surroundings at constant pressure
 - B. Molecular disorder
 - C. Similar to entropy
 - D. Molecular randomness
 - E. None of the above

Cell biology

23. Which of the following stages do homologous chromosomes start to separate but remain attached by chiasmata?
- A. Diakinesis
 - B. Leptotene
 - C. Diplotene
 - D. Pachytene
24. Lysosomes contain mainly.....
- A. Hydrolases
 - B. Proteases
 - C. Lipases
 - D. Cathepsin
25. Which stage in meiosis do segregation or random assortment of maternal and paternal chromosomes occur?
- A. Anaphase1
 - B. Telophase1
 - C. Metaphase1
 - D. Prophase1
26. Which of the following cell organelles is called the powerhouse of the cell?
- A. Nucleus
 - B. Lysosomes
 - C. Chloroplast
 - D. Mitochondria
27. Glucose uptake by erythrocytes, heart, adipose tissue, retina and brain is an example of.....
- A. uniport
 - B. Symport
 - C. Antiport
 - D. None of the above
28. Which of the following statements is true about cell theory?
- A. The Cell theory does not apply to fungi
 - B. The Cell theory does not apply to virus
 - C. The Cell theory does not apply to algae

D. The Cell theory does not apply to microbes

29. Which of the following cell organelles is involved in the breakdown of organic matter?

- A. Lysosomes
- B. Cytoplasm
- C. Golgi bodies
- D. Mitochondria

30. Division of the nucleus is known as.....

- A. cytokinesis
- B. karyokinesis
- C. telophase
- D. interphase

31. Which of the following lipid type decrease membrane fluidity?

- A. Saturated fatty acid Eg $\text{C}_{16:0}$
 $\text{CH}_3(\text{CH}_2)_{14}\text{COO}^-$
- B. Unsaturated fatty acid
- C. Glycerol
- D. Phospholipid

32. Division of the cell is known as...

- A. telophase
- B. interphase
- C. karyokinesis
- D. cytokinesis

33. Which of the following lipid type decrease compactness in membrane fluidity?

- A. Saturated fatty acids
- B. cholesterol
- C. Glycerol
- D. Phospholipid

34. _____ is involved in the synthesis of phospholipids.

- A. Mitochondria
- B. Cytoplasm
- C. Endoplasmic Reticulum

D Smooth Endoplasmic Reticulum

35. At which mitotic phase do kinetochore appears on each chromatid opposite to the centromere?

- A. Prophase
- B. Anaphase
- C. Telophase
- D. Metaphase

SECTION B: SHORT ANSWER QUESTIONS (ANSWER ALL QUESTIONS) (25 Marks)

36. Write short notes on the five stages in meiosis 1 (5 Marks)

37. Write short notes on Molecular events associated with the operation of Na^+ / K^+ -ATPase (5 Marks)

38. a) Write short notes on catenation of carbon and oxygen (1 Mark)
b) Calculate the concentration of a conjugate base used in the preparation of a buffer with a pH of 6.3. Note the concentration of the weak acid used in the preparation of this buffer is 0.5 M. the equilibrium constant for the weak acid is (1.8×10^{-5}) (4 Marks)

39. a) Define an isotope - An element with diff # of neutrons (1 Mark)
b) Illustrate two acidic amino acids (4 Marks)

40. List FIVE hormones that are synthesised from cholesterol and state their key roles in the body (5 Marks)

SECTION C LONG ANSWER QUESTIONS (ANSWER ALL QUESTIONS) (40 Marks)

41. Discuss ATP/ADP transporter present in inner mitochondrial membrane (10 Marks)

42. Mention the two cytomembranes and mention any FOUR functions of each. (10 Marks)

43. Differentiate between solutions, colloids and suspensions. (10 Marks)

44. List and state any TEN functions of proteins while citing at least TWO examples of proteins in each case. (10 Marks)



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BACHELOR OF MEDICINE AND BACHELOR OF SURGERY

UNIT CODE: MBMB 1200 UNIT TITLE: MEDICAL BIOCHEMISTRY I
PAPER B

(*MBMB 1225: LAB PRACTICE AND INSTRUMENTATION IN BIOCHEMISTRY
AND MBMB 1224: ENZYMES, VITAMINS AND MINERALS*)

DATE: WED 10TH JULY, 2024 8.00AM MAIN EXAM TIME: 2 HOURS

INSTRUCTIONS: ANSWER ALL QUESTIONS IN SECTIONS A, B AND C

SECTION A: MULTIPLE CHOICE QUESTIONS (35 MARKS)

1. Vitamin A or retinal is a
 - A. Steroid
 - B. Polyisoprenoid compound containing a cyclohexenyl ring
 - C. Benzoquinone derivative
 - D. 6-Hydroxychromane
2. β -Carotene, precursor of vitamin A, is oxidatively cleaved by
 - A. β -Carotene dioxygenase
 - B. Oxygenase
 - C. Hydroxylase
 - D. Transferase
3. Deficiency of Vitamin A causes
 - A. Xerophthalmia
 - B. Hypoprothrombinemia
 - C. Megaloblastic anemia
 - D. Pernicious anemia

4. The most potent Vitamin D metabolite is
- A. 25-Hydroxycholecalciferol
 - B. 1,25-Dihydroxycholecalciferol
 - C. 24, 25-Dihydroxycholecalciferol
 - D. 7-Dehydrocholesterol
5. Creatinuria is caused due to the deficiency of vitamin
- A. A
 - B. K
 - C. E
 - D. D
6. Vitamin K is involved in posttranslational modification of the blood clotting factors by acting as cofactor for the enzyme:
- A. Carboxylase ✓
 - B. Decarboxylase
 - C. Hydroxylase
 - D. Oxidase
7. Concentration of pyruvic acid and lactic acid in blood is increased due to deficiency of the vitamin
- A. Thiamine
 - B. Riboflavin
 - C. Niacin
 - D. Pantothenic acid
8. Vitamin B1 coenzyme (TPP) is involved in
- A. Oxidative decarboxylation
 - B. Hydroxylation
 - C. Transamination
 - D. Carboxylation
9. Magenta tongue is found in the deficiency of the vitamin
- A. Riboflavin
 - B. Thiamin
 - C. Nicotinic acid
 - D. Pyridoxine
10. The pellagra preventive co-factor is
- A. Riboflavin
 - B. Pantothenic acid
 - C. Niacin ✓ + B3
 - D. Pyridoxine

11. Niacin or nicotinic acid is a monocarboxylic acid derivative of
A. Pyridine
B. Pyrimidine
C. Flavin
D. Adenine
12. Niacin is synthesized in the body from
A. Tryptophan
B. Tyrosine
C. Glutamate
D. Aspartate
13. Pellagra occurs in population dependent on
A. Wheat
B. Rice
C. Maize
D. Milk
14. Pantothenic acid is a constituent of the coenzyme involved in
A. Decarboxylation
B. Dehydrogenation
C. Acetylation ✓
D. Oxidation
15. The precursor of CoA is
A. Riboflavin
B. Pyridoxamine
C. Thiamin
D. Pantothenate
16. 'Burning foot syndrome' has been ascribed to the deficiency of
A. Pantothenic acid
B. Thiamin
C. Cobalamin
D. Pyridoxine
17. 'Xanthurenic acid index' is a reliable criterion for the deficiency of the vitamin
A. Pyridoxal
B. Thiamin
C. Pantothenic acid
D. Cobalamin

B7

18. Biotin is a coenzyme of the enzyme
A. Carboxylase ✓
B. Hydroxylase
C. Decarboxylase
D. Deaminase
19. Folate deficiency causes
A. Microcytic anemia
B. Hemolytic anemia
C. Iron deficiency anemia
D. Megaloblastic anemia
20. Niacin can be synthesized in human beings from
A. Histidine
B. Phenylalanine
C. Tyrosine
D. Tryptophan
21. Which of the following molecules gives a positive test for Bicinchoninic acid assay?
A. Enzymes
B. Malt
C. Table salt
D. Table sugar
E. Triacylglycerols
22. During DNA extraction, DNA is at risk of degradation by the enzyme
A. Proteinase K
B. RNase
C. DNAse
D. Ligase
E. None of the above
23. Which of the following gives a positive test for Biuret's?
A. Hemoglobin ✓
B. Tryptophan
C. Enzymes ✓
D. A and C
E. Galactose

24. Which dye is used in the visualization of DNA after electrophoresis? /
- A. Ethidium bromide
 - B. Propidium bromide
 - C. Bromophenol blue
 - D. Coomassie Brilliant blue dye
 - E. Silver nitrate
25. In polyacrylamide gel electrophoresis what is the importance of mercaptoethanol?
- A. It coats the protein with a negative charge
 - B. It linearizes the protein
 - C. It breaks disulfide bond
 - D. It is the anionic detergent
 - E. It is not used in PAGE gels
26. ^(sandwich) Direct ELISA detects the presence of
- A. Proteins
 - B. Antibodies
 - C. Antigens
 - D. Mutagens
 - E. Toxins
27. Ethidium bromide is required as
- A. An intercalating dye for gel electrophoresis
 - B. A tracking dye for gel electrophoresis
 - C. A polymerization enhancer for gel electrophoresis
 - D. A component of agarose during gel electrophoresis
 - E. A protein dye during gel electrophoresis
28. Volumetric pipettes include _____
- A. Mohr's pipette
 - B. Graduated pipettes
 - C. Serological pipettes
 - D. Measuring pipettes
 - E. None of the above

29. Which of the following is not a component of ion exchange chromatography?

- A. Sodium chloride ✓
- B. Carboxymethyl cellulose beads ✓
- C. Diethyaminoethyl cellulose beads✓
- D. All the above are components of ion exchange chromatography analysis
- E. Ligand

30. Immunofluorescence detects

- A. Antigens on the surface of cells and tissues
- B. Antibodies on the surface of cells and tissues
- C. Antigens in serum
- D. Antibodies in serum
- E. None of the above

31. Anion exchange chromatography helps to isolate form a mixture a molecule of interest that is:

- A. Positively charged
- B. Negatively charged
- C. Neutral in charge
- D. None of the above
- E. All of the above

32. During TLC which reagent is used to identify the molecule of interest?

- A. Ninhydrin
- B. Iodine solution
- C. Biuret's reagent
- D. Chloroform
- E. Molisch reagent

33. Size exclusion chromatography facilitates the bio-separation of molecules based on?

- A. Size only
- B. Size and Charge
- C. Size and shape
- D. Shape only
- E. Charge only

34. In competitive ELISA the presence of dark colored product indicates?
- A. The absence of antigen in serum
 - B. Low concentration of antigen in serum
 - C. High concentration of antigen in serum
 - D. Presence of antigen in serum
 - E. Presence of antibody in serum
35. The importance of Dithiothreitol in SDS-PAGE is?
- A. To identify the proteins, present in sample
 - B. To break the disulfide bonds during denaturation of the protein
 - C. Coats the protein with an overall negative charge
 - D. Is used as a tracking dye
 - E. Is important in the polymerization of the acrylamide gel

SECTION B: ANSWER ALL QUESTIONS (25 MARKS)

- 4 36. Use a simplified schematic diagram ONLY to illustrate how you will obtain a 3D structure of an enzyme by applying X-ray crystallography. (5 Marks)
37. With the help of an appropriate chemical structure explain why RNase A an enzyme that digests RNA cannot catalyze the hydrolysis of DNA. (5 Marks)
38. a) Determine the molarity of a solution prepared using 10g of sodium chloride in 500ml of solvent. Molecular weight of sodium chloride is 58.44g. (2.5 Marks)
- b) Determine the amount of acetate anion required to prepare a buffer with a pH of 6.2, if the concentration of acetic acid use is 0.01 M. K_a of acetic acid is (1.8×10^{-5}) . (2.5 Marks)
39. State the principle of the following lab techniques (1 Mark each)
- i. Western blotting
 - ii. Ion exchange chromatography
 - iii. Affinity chromatography
 - iv. TLC chromatography
 - v. Molisch test

(39). ✓ List FIVE personal protective equipments and indicate their importance. (5 Marks)

SECTION C: ANSWER ALL QUESTIONS (40 MARKS)

41. Discuss in detail acid-base catalytic mechanism of an enzyme. (10 Marks)
42. What are fat soluble vitamins? Discuss the biochemistry of any TWO fat soluble vitamins with respect to chemical structure, function, deficiency and toxicity. (10 Marks)
43. Discuss in detail FIVE tests for protein analysis, stating the importance, principle of each test, procedure and expected results. (10 Marks)
44. List and explain the importance of TEN components of agarose gel electrophoresis. (10 Marks)



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UNIT CODE: MBMB1200

UNIT TITLE: MEDICAL
BIOCHEMISTRY I PAPER C

(*MBMB 1236A: Carbohydrates metabolism, MBMB 1236B: Lipid Metabolism and MBMB 1236 C: Nitrogen Metabolism*)

DATE: FRI 12TH JULY, 2024 8.00AM MAIN EXAM TIME: 2 HOURS

INSTRUCTIONS: ANSWER ALL QUESTIONS IN SECTION A, B AND C

SECTION A: MULTIPLE CHOICE QUESTIONS (35 MARKS)

1. Which of the following is *not* true of the reaction catalyzed by the pyruvate dehydrogenase complex?
 - a) Biotin participates in the decarboxylation.
 - b) Both NAD⁺ and a flavin nucleotide act as electron carriers.
 - c) The reaction occurs in the mitochondrial matrix.
 - d) The substrate is held by the lipoyl-lysine "swinging arm."
 - e) Two different cofactors containing —SH groups participate.

2. Which of the following is *not* required for the oxidative decarboxylation of pyruvate to form acetyl-CoA?
 - a) ATP
 - b) CoA-SH /
 - c) FAD
 - d) Lipoic acid /
 - e) NAD+ /

3. Which of the following is *not* true of the citric acid cycle?
- (a) All enzymes of the cycle are located in the cytoplasm, except succinate dehydrogenase, which is bound to the inner mitochondrial membrane.
 - b) In the presence of malonate, one would expect succinate to accumulate.
 - c) Oxaloacetate is used as a substrate but is not consumed in the cycle.
 - d) Succinate dehydrogenase channels electrons directly into the electron transfer chain.
 - e) The condensing enzyme is subject to allosteric regulation by ATP and NADH.
4. Which of the following is *not* an intermediate of the citric acid cycle?
- (a) Acetyl-CoA
 - b) Citrate
 - c) Oxaloacetate
 - d) Succinyl-CoA
 - e) α -Ketoglutarate
5. In mammals, each of the following occurs during the citric acid cycle *except*:
- a) Formation of α -ketoglutarate.
 - b) Generation of NADH and FADH_2 .
 - c) Metabolism of acetate to carbon dioxide and water.
 - (d) Net synthesis of oxaloacetate from acetyl-CoA.
 - e) Oxidation of acetyl-CoA.
6. Citrate synthase and the NAD^+ -specific isocitrate dehydrogenase are two key regulatory enzymes of the citric acid cycle. These enzymes are inhibited by:
- a) Acetyl-CoA and fructose 6-phosphate.
 - b) AMP and/or NAD^+ .
 - c) AMP and/or NADH.
 - d) ATP and/or NAD^+ .
 - (e) ATP and/or NADH.

7. The glyoxylate cycle is:

- a) A means of using acetate for both energy and biosynthetic precursors.
- b) An alternative path of glucose metabolism in cells that do not have enough O₂.
- c) Defective in people with phenylketonuria.
- d) Is not active in a mammalian liver.
- e) The most direct way of providing the precursors for synthesis of nucleic acids (e.g., ribose).

8. Entry of acetyl-CoA into the citric acid cycle is *decreased* when:

- a) [AMP] is high.
- b) NADH is rapidly oxidized through the respiratory chain.
- c) the ratio of [ATP]/[ADP] is low
- d) The ratio of [ATP]/[ADP] is high.
- e) The ratio of [NAD⁺]/[NADH] is high.

9. Intermediates in the citric acid cycle are used as precursors in the biosynthesis of:

- a) Amino acids.
- b) Nucleotides.
- c) Fatty acids.
- d) Sterols.
- e) All of the above

10. The conversion of 1 mol of pyruvate to 3 mol of CO₂ via pyruvate dehydrogenase and the citric acid cycle also yields _____ mol of NADH, _____ mol of FADH₂, and _____ mol of ATP (or GTP).

- a) 2; 2; 2
- b) 3; 1; 1
- c) 3; 2; 0
- d) 4; 1; 1
- e) 4; 2; 1

11. *De novo* fatty acid synthesis usually signifies which of the following?

- a) An excess of fat intake
- b) A depletion of energy yielding substrates
- c) Only occurs with prolonged fasting
- d) An excess of energy yielding substrates

e) Excess carbohydrates in the body

12. Which of the following statements is incorrect regarding fatty acid β -oxidation?

- a) The major site of fatty acid β -oxidation is the peroxisomes, the mitochondria also contain enzymes for this pathway
- b) Within the liver peroxisomes serve to oxidise very long chain fatty acids to medium chain products
- c) The rate of β -oxidation is regulated by the availability of fatty acids and the rate of utilisation of β -oxidation products
- d) Peroxisomes are the site for the degradation of xenobiotics and eicosanoids
- e) Occur in the endoplasmic reticulum

13. Which of the following statements is correct regarding intracellular fat metabolism?

- a) The mechanism by which non-esterified fatty acids are taken up by cells is by diffusion only.
- b) The mechanism by which non-esterified fatty acids are taken up by cells is by a combination of diffusion and carrier-mediated transport involving fatty acid binding, translocase and transport proteins.
- c) The mechanism by which non-esterified fatty acids are taken up by cells is by a combination of diffusion and carrier-mediated transport involving fatty acid esterification, synthesis and transport proteins.
- d) The mechanism by which non-esterified fatty acids are taken up by cells is by carrier-mediated transport only involving fatty acid binding, translocase and transport proteins.
- e) It is physiologically controlled

14. Which membrane fatty acids are precursors for eicosanoids?

- a) C20 and C22 saturated fatty acids
- b) C18 and C22 polyunsaturated fatty acids
- c) C20 and C22 monounsaturated fatty acids
- d) C20 and C22 polyunsaturated fatty acids
- e) C18 and C16 polyunsaturated fatty acids

15. The major lipids that make up the cell membrane are?

- a) Triglycerides
- b) Phospholipids
- c) Sphingomyelins
- d) Fatty acids
- e) Lipoproteins

16. A fatty acid that is not synthesized in man is...

- a) Linoleic acid
- b) Oleic acid
- c) Palmitic acid
- d) Stearic acid
- e) Myristic acid

17. Fatty acid synthesis occurs in....

- a) Cytosol
- b) Mitochondria
- c) Endoplasmic reticulum
- d) A and B
- e) Kidney

18. How many ATPs are formed from stearic acid by beta oxidation?

- a) 7
- b) 18
- c) 56
- d) 147
- e) 120

19. The cholesterol serves as the precursor for the following biosynthetic pathways, EXCEPT?

- a) Bile acid synthesis
- b) Steroid hormone synthesis
- c) Aldosterone synthesis
- d) Thyroid hormone synthesis
- e) Phospholipid synthesis

20. Which of the following steps is a regulatory step of cholesterol biosynthesis?

- a) Formation 3-hydroxy-3-methylglutaryl CoA
- b) Formation of Mevalonate
- c) Formation of Isoprenoid Unit
- d) Formation of Lanosterol
- e) Formation of Acetyl CoA

~~Hydrogen~~
21. The amino acid that undergoes oxidative deamination at a highest rate is _____

- a) Glutamine
- b) Glutamate
- c) Aspartate
- d) Alanine
- e) Cysteine

22. Choose the incorrect statement about cysteine

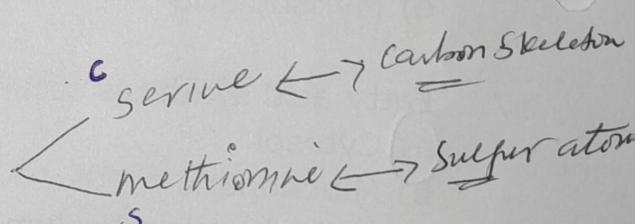
- a) Carbon skeleton is provided by serine ✓
- b) Sulfur group is provided by Methionine ✓
- c) Forms Hippuric acid for detoxification of xenobiotics ✓
- d) Required for Bile salt formation
- e) Responsible for the disulphide bonds in the cell ✓

23. Which out of the following statements about Glutamate dehydrogenase is *correct*?

- a) Required for transamination reactions
- b) Universally present in all the cells of the body
- c) Can utilize either of NAD^+ / NADP^+
- d) Catalyzes conversion of glutamate to glutamine
- e) None of the above

24. Dopamine is synthesized from which of the following amino acids

- a) Tyrosine
- b) Tryptophan
- c) Histidine
- d) Methionine
- e) Alanine



25. In mammalian tissue, serine can be a biosynthetic precursor for which amino acid?

- a) Methionine
- b) Phenylalanine
- c) Arginine
- d) Lysine
- e) Glycine

26. Delta-aminolevulinic acid synthase:

- 1. Requires pyridoxal phosphate for activity.
 - 2. Synthesis can be induced by phenobarbital and some steroids.
 - 3. Is inhibited by heme.
 - 4. Is inhibited by lead.
- a) 1, 2 and 3
 - b) 1 and 3
 - c) 2 and 4
 - d) 4 only
 - e) All of the above

27. Which of the following is a required substrate for purine biosynthesis?

- a) 5- methyl thymidine
- b) Ara -C
- c) Ribose phosphate
- d) PRPP
- e) 5-Fluoro uracil

28. Which one of the following is required as a coenzyme for the transamination reactions?

- a) Coenzyme A
- b) Pyridoxal-phosphate
- c) Folic acid
- d) Cobalamine
- e) Vitamin D

29. Urea is synthesized in.....

- a) Cytoplasm
- b) Mitochondria
- c) Both cytoplasm and mitochondria
- d) In lysosomes
- e) Cell membrane

30. Which one of the following amino acids is *not* required for creatine synthesis?

- a) Methionine
- b) Tyrosine
- c) Glycine
- d) Arginine
- e) Serine

31. Histamine, a chemical mediator of allergies and anaphylaxis, is synthesized from amino acid Histidine by which of the following processes?

- a) Deamination
- b) Deamination and transamination
- c) Transamination
- d) Dehydrogenation
- e) Decarboxylation

32. A rise in serum "direct" bilirubin would be expected in:

1. Hemolytic jaundice.
2. Absence of glucuronyl transferase as in the newborn.
3. Decreased hepatic uptake of bilirubin (Gilbert's Disease)
4. Biliary obstruction.

- a) 1, 2 and 3
- b) 1 and 3
- c) 2 and 4
- d) 4 only
- e) All of the above1.

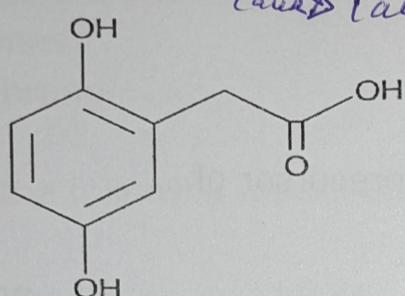
33. The end product of protein digestion in G.I.T. is?
- a) Dipeptide
 - b) Tripeptide
 - c) Soluble protein
 - d) Polypeptide
 - e) Amino Acids
34. Tryptophan could be considered as precursor of.....
- a) Melatonin
 - b) Thyroid hormones
 - c) Melanin
 - d) Epinephrine
 - e) Cortisol
35. The following are allosteric inhibitors of glutamine synthetase
- a) Alanine and Glycine
 - b) AMP and CTP
 - c) Histidine and Tryptophan
 - d) Carbomyl 6-phosphate and Glucosamine 6-phosphate
 - e) ATP and Ammonia

SECTION B: ANSWER ALL QUESTIONS (25 MARKS)

36. Briefly discuss any TWO inhibitors of the ETC and oxidative phosphorylation. (5 Marks)
37. a) Explain the role of eicosanoids in inflammatory disorders. (2.5 Marks)
- b) Discuss the regulation of LDL uptake by extrahepatic tissues. (2.5 Marks)
38. Explain conditions that contribute to fatty liver disease. (5 Marks)
39. Write down the chemical equation involving the salvage pathway for guanine. (5 Marks)

40. Briefly discuss the metabolic disorder associated with the inability of the body to breakdown homogentisic acid shown in the picture below.

- Hypophenyluria (Black urine disease) (5 Marks)



caused due to lack of homogentisate oxidase

↓
No breakdown of Tyrosine + ^{phenylalanine} Tryptophan

↓
Accumulation of Homogentisic Acid
which turn urine black.

SECTION C: ANSWER ALL QUESTIONS (40 MARKS)

41. a) Illustrate the glyoxylate cycle and explain its importance.

(5 Marks)

b) List any FIVE reactions during the cellular respiration pathways where NADH is released. (5 Marks)

42. Illustrate the energy producing phase of glycolysis. (10 Marks)

43. Describe the synthesis of mevalonate. (10 Marks)

44. Give a detailed account of the *de novo* biosynthesis of Uridine-5'-monophosphate. (10 Marks)