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B.Sc. II, Sem III

Paper VI – Biochemistry

Question Bank

1. Nucleic Acids

1. DNA serves as a genetic material for which type of cell?

a) Prokaryotes b) Eukaryotes c) Both d) None

2. Where is DNA present in the eukaryotic cells?

a) Inside the nucleus c) With other cellular contents

b) Inside the ribosomes d) Not present

3. In which year, the 3-D structure of DNA was introduced?

a) 1882 b) 1953 c) 1997 d) 2000

4. Which of the following nitrogenous base is not present in DNA?

a) Thymine b) Adenine c) Guanine d) Uracil

5. Which type of bonding is present between the N-1 of pyridine and deoxyribose of DNA?

a) Covalent bond c) Hydrogen bond

b) N-glycosidic bond d) Sometimes B and sometimes C

6. How many forms of DNA are present?

a) 2 b) 3 c) 4 d) 1

7. In which form of DNA, two anti-parallel chains are held together by base pairs?

a) A-DNA b) B-DNA c) Z-DNA d) All of the above

8. Match the following-

a) A-DNA 1. Cytosine c) Z-DNA 2. Thymine

b) Adenine 3. Left handed d) Guanine 4. Right handed

9. DNA is bound to which bio-molecule to form complex structure known as chromatin?

a) Carbohydrates b) Lipids c) Vitamins d) None of the above

10. Which carbon atom is bonded to N-9 of purine?

a) C-1 b) C-2 c) C-3 d) Both B and C

11. How many hydrogen bonds are required to form bonding between adenine and thymine?

a) Thousands b) 1 c) 2 d) Not fixed

12. Which of the following statement is NOT true?

a) A-DNA is wider and longer than B-DNA

b) Two strands of DNA are anti-parallel

c) DNA double helix is held together by two forces

d) Sequence of bases carries the genetic info

13. How are the two helical strand wounded?

a) Around the opposite axis c) Around the same axis

b) One above another d) None of the above

14. Which of the following is the function of DNA?

a) Source of info for lipid metabolism

b) Source of info for carbohydrate metabolism

c) Source of info for protein synthesis

d) All of the above

15. Which of the following enzymes is non-proteinaceous?

a) Deoxyribonuclease b) ligase c) Ribozyme d) lysozyme

16. RNA contains Uridine, it is a

a) Pyrimidine b) purine c) Nucleotide d) nucleoside

17. Anticodon is present in

a) DNA b) tRNA c) rRNA d) mRNA

18. Which of the following purine bases is present in RNA?

a) Uracil b) Thymine c) Cytosine d) Guanine

19. Which of the following is found more widely in a cell?

a) RNA b) DNA c) Sphaerosomes d) Chloroplasts

20. RNA contains repeating units of

a) Deoxyribonucleotides c) ribonucleotides

b) Deoxyribonucleosides d) ribonucleosides

21. Which of the following rRNAs in bacteria acts as a ribozyme as well as structural RNA?

a) 23S rRNA b) 18S rRNA c) 5.8S rRNA d) 5S rRNA

22. Which of the following RNAs are the most abundant in an animal cell?

a) mRNA b) tRNA c) miRNA d) rRNA

23. A single strand of mRNA attached to complex of ribosomes is called

a) Okazaki fragments b) polymer c) Polysome d) polypeptide

24. Which of the following RNAs' structure is similar to clover leaf?

a) tRNA b) rRNA c) mRNA d) hnRNA

Carbohydrate Metabolism

1. Which of the following enzymes are not involved in galactose metabolism?

a) Galactokinase
c) Glucokinase
b) Galactose-1-Phosphate Uridyl transferase
d) UDP-Galactose 4- epimerase

2. Which of the following enzymes leads to a glycogen storage disease known as Tarui's disease?

a) Glucokinase
c) Pyruvate Kinase
b) Phosphofructokinase
d) Phosphoglucomutase

3. Which of the following enzymes is defective in galactosemia- a fatal genetic disorder in infants?

a) Glucokinase
c) Galactokinase
b) UDP-Galactose 4- epimerase
d) Galactose-1-Phosphate Uridyltransferase

4. Which of the following enzyme deficiency leads to hemolytic anaemia?

a) Glucokinase
c) Pyruvate Kinase
b) Phosphoglucomutase
d) Phosphofructokinase

5. Which of the following glucose transporters are important in fructose transport in the intestine?

a) GLUT5 b) GLUT3 c) GLUT4 d) GLUT7

6. Which of the following is a tricarboxylic acid?

a) Acetic acid b) Succinic acid c) Oxaloacetic acid d) Citric acid

7. Which of the following enzymes plays an important role in tumour metabolism?

a) Glucokinase
c) Pyruvate Kinase M2
b) Phosphoglucomutase
d) Phosphofructokinase

8. Which of the following metabolites negatively regulates pyruvate kinase?

a) Citrate b) Alanine c) Acetyl CoA d) Fructose-1,6-Bisphosphate

9. The glycerol phosphate shuttle functions in_____.

a) Lipid catabolism
b) Triglyceride synthesis
c) Anaerobic glycolysis for the regeneration of NAD

d) Aerobic glycolysis to transport NADH equivalents resulting from glycolysis into mitochondria.

10. In muscles, the pyruvate is converted into lactate. Find the correct statement

a) During lactate formation, NADH is reconverted into NAD
b) During the product of lactate two ATP are produced
c) Lactate is the substrate from the downstream pathway
d) Lactate acts as the substrate for the formation of amino acid

11. Which of the following glycolytic enzyme is inhibited by an accumulation of long-chain fatty acid in the liver?

a) Glucokinase b) Hexokinase c) Pyruvate kinase d) Phosphofructokinase

12. Which of the following statements is known as the rate-limiting step in glycolysis?

a) Enolase
b) Phosphofructokinase
c) Phosphohexose isomerase
d) Glyceraldehyde-3-phosphate dehydrogenase

13. Which of the following hormones decreases blood glucose and increases the uptake of glucose in various tissues like skeletal muscle, adipose tissues?

a) Insulin b) Cortisol c) Glucagon d) Epinephrine

14. What is the net gain of ATP during the conversion of glucose to pyruvate?

a) 2 ATP b) 4 ATP c) 6 ATP d) 1 ATP +1 GTP

15. Which of the following hormones is responsible for increasing gluconeogenesis in the liver during prolonged starvation?

a) TSH b) Insulin c) Thyroxine d) Glucagon

Protein Metabolism

1. Albumin is synthesized by

a) Liver b) Kidney c) Muscle d) Spleen

2. Proteins are absorbed from GIT as

a) Amino acids b) Peptides c) peptones d) All of the above

3. One of the following is not an amino acid

a) Glycine b) Hydroxyproline c) Glutamic acid d) Choline

4. Which of the following amino acids is essential in infants and non essential in adults?

a) Lysine b) Arginine c) Leucine d) Tryptophan

5. One of the following is non essential amino acid

a) Tyrosine b) Valine c) Methionine d) Cystine

6. Heme is converted to bilirubin mainly in

a) Kidney b) Liver c) Spleen d) Bone marrow

7. The reducing end of glutathione, the amino acid

a) Glycine b) Leucine c) Lycine d) Valine

8. Hydroxylation of proline require the following except

a) Fe+2 b) O_2 c) Ascorbic acid d) Succinate

9. The enzyme involved in the conversion of glutamate to Ammonia is

a) Glutamase dehydrogenase c) Glutamase

b) Glumase decarboxylase d) Glutamic oxidase

10. Ammonia in the brain is converted into

a) Urea b) Glutamine c) Glutamic acid d) Creatinine

11. Which of the following factors is not responsible for the denaturation of proteins?

a) Heat b) Charge c) pH change d) Organic solvents

12. Which of the following is responsible for specifying the 3D shape of a protein?

a) The peptide bond c) The amino acid sequence

b) Interaction with other polypeptides d) Interaction with molecular chaperons

13. _____is not a classified form of conjugated proteins.

a) Lipoproteins b) Glycoproteins c) Metalloproteins d) Complete proteins

14. What is the average molecular weight of an amino acid residue in a protein?

a) 120 b) 110 c) 130 d) 140

15. Which of the following proteins was first sequenced by Frederick Sanger?

a) Myosin b) Insulin c) Myoglobin d) Haemoglobin

16. Which of the following statements is true about proteins?

a) Proteins are made up of amino acids.

b) Proteins are essential for the development of skin, teeth and bones.

c) Protein is the only nutrient that can build, repair and maintain body tissues.

d) All of the above

17. How many amino acids make up a protein?

a) 10 b) 20 c) 30 d) 50

18. What is a bond between amino acids called?

a) Ionic bond b) Acidic bond c) Peptide bond d) Hydrogen bond

19. Which of the following statements is true about proteins?
    a) Proteins are polymers of glucose
    b) Proteins are polymers of amino acids
    c) Proteins are polymers of peptide bonds
    d) Proteins are polymers of disulfide bridges
20. Which of the following food products are high in protein content?
    a) Tofu and eggs
    b) Grains and legumes
    c) Milk and milk products
    d) All of the above
21. Which of the following statements is true about the complete proteins?
    a) High-protein foods that stabilize body weight
    b) Food that has a balanced amount of fat and protein
    c) Foods that provide all the amino acids that the body needs
    d) All of the above
22. Which of the following techniques is used to determine the protein structures?
    a) X-ray crystallography
    b) Kryptonics X-ray vision
    c) Magnetic resonance imaging (MRI)
    d) None of the above
23. Which of the following disorders is caused by the deficiency of proteins?
    a) Weight loss
    b) Muscle fatigue
    c) Loss in muscle strength
    d) All of the above
24. Which of the following cell organelles is involved in the process of protein synthesis?
    a) Vesicles b) Ribosomes c) Synchrotrons d) Mitochondria
25. Which of the following is not the function of proteins?
    a) Helps in digesting food
    b) Carries genetic information
    c) Fights against the invading pathogens
    d) Helps in transporting oxygen in the blood
26. The 3-D structure of proteins can be determined by_____.
    a) Spectroscopy

b) X-ray crystallography

c) Nuclear magnetic resonance

d) Both (b) and (c)

27. Which of the following is true about enzymes?

a) Proteins b) Nucleic acids c) Carbohydrates d) DNA molecule

28. Which of the following statements is true about the (primary) 1° structure of proteins?

a) The helical structure of the protein

b) Subunit structure of the protein

c) Three-dimensional structure of the protein

d) The sequence of amino acids joined by a peptide bond

29. Which of the following diseases is caused by protein deficiency?

a) Anaemia b) Kwashiorkor c) Hypothyroidism d) All of the above

30. The process of protein synthesis takes place in which of the following cell organelles?

a) Nucleus b) Vacuoles c) Cytoplasm d) Mitochondria

Lipid Metabolism

1. The major lipids that make up the cell membrane are

a) Triglycerides b) Phospholipids c) Sphingomyelins d) Fatty acids

2. Triglyceride is a

a) Simple lipid b) Complex lipid c) Derived lipid d) None of the above

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

a) Linoleic acid b) Oleic acid c) Palmitic acid d) Stearic acid

4. A deficiency of choline in the diet causes abnormalities in the metabolism of

a) Carbohydrates b) Proteins c) Minerals d) Lipids

5. Which of the following does not significantly contribute to gluconeogenesis in humans

a) Lactate b) Fatty acids c) Pyruvate d) Amino acids

6. Fatty acid synthesis occurs in

a) Cytosol b) Mitochondria c) Endoplasmic reticulum d) All of the above

7. Which of the following undergoes auto oxidation

a) Free fatty acids b) Polyunsaturated fatty acids c) Chylomicrons d) Cholestrol

8. How many ATPs are formed in case of stearic acid by beta oxidation

a) 7 b) 18 c) 56 d) 147

9. Ketone bodies are by products of metabolism of

a) Carbohydrate b) Protein c) Fat d) All of the above

10. HMG CoA is formed during metabolism of all except

a) Leucine b) Cholesterol c) ketone bodies d) Bile acids

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

a) Bile acid synthesis c) Steroid hormone synthesis

b) Aldosterone synthesis d) Thyroid hormone synthesis

12. Which of the following lipids act as lungs surfactants?

a) Phosphatidylcholine c) Phosphatidylethanolamine

b) Ceramide d) Phosphatidylinositol

13. Identify the simple lipid from the following?

a) Lecithin b) Fatty acid c) Triacylglycerol d) Steroids

14. All of the following are complex lipids, Except?

a) Phosphatidic acid b) Cerebroside c) Cardiolipin d) Cholesterol

15. Which of the following is an essential fatty acid?

a) Linolenic acid b)Arachidonic acid c) Oleic acid d) Palmitic acid

16. Bile acid is derived from:

a) Cholesterol b) Amino acids c) Fatty acids d) Bilirubin

17. Which of the following lipid is mostly present in mitochondrial membranes?

a) Lecithin b) Cephalin c) Cardiolipin d) Ceramide

18. Insulin enhances the uptake of triacylglycerols in adipose tissues. Which of the following enzyme is activated that facilitates the uptake?

a) Hormone-sensitive lipase b) Lipoprotein lipase c) LCAT d) Apo C-II

19. Familial hypercholesterolemia is a genetic disorder of cholesterol metabolism. The defect lies in the.....

a) Transport of cholesterol from extrahepatic tissue to the liver

b) Impairment of cholesterol degradative pathway

c) Impairment of uptake of cholesterol by tissues

d) Impairment of HDL metabolism due to deficiency of Apo-A

20. Which of the following inhibits acetyl CoA carboxylase- a rate-limiting enzyme of fatty metabolism?

a) Citrate b) ATP c) Malonyl CoA d) Acyl CoA

21. Acetyl CoA serves as the precursor for the synthesis of cholesterol, and the biosynthesis of cholesterol is tightly regulated.

Which of the following step is a regulatory step of cholesterol biosynthesis?

a) Formation 3-hydroxy-3-methylglutaryl COA c) Formation of Mevalonate

c) Formation of Isoprenoid Unit d) Formation of Lansterol

22. The enzyme that regulates the biosynthesis of cholesterol also serves as the druggable target for the reduction of hypercholesterolemia (increase blood cholesterol).

Identify the regulatory enzyme from the following options:

a) HMG-CoA synthase c) HMG- CoA reductase

b) Lansterol oxidase d) Cholesterol synthase

23. Which of the following hormone increases the synthesis of cholesterol by regulating the enzyme HMG CoA reductase?

a) Insulin c) Glucagon

c) Glucocorticoids d) All of the above

24. Sterol Regulatory Binding Protein binds to DNA at the sterol regulatory element to increase the expression of HMG CoA reductase, and synthesis of cholesterol.

What happens when there is the presence of a high cellular concentration of cholesterol?

a) Increases the proteolytic cleavage, release, and shuttling of SREBP into the nucleus

b) Decreases the proteolytic cleavage and release of SREBP from ER

c) Activates SREBP by inducing the conformational change

d) Inhibit SREBP by competitively binding to DNA binding site of SREBP

25. Hormones such as insulin & glucagon regulate HMG CoA reductase by a phosphorylation and dephosphorylation process.

Phosphorylation of HMG CoA reductase results in decreased enzyme activity.

Identify the correct statement from the following:

a) Insulin inhibits kinase that phosphorylates HMG CoA reductase

c) Insulin activates kinase that phosphorylates HMG CoA reductase

c) Insulin activates the phosphatase that removes a phosphate group from HMG CoA reductase

d) Insulin inhibits kinase that phosphorylates HMG CoA reductase

26. Hypercholesterolemia refers to a condition with high cholesterol with a serum cholesterol level of.....

a) >160 mg/dL c) >200 mg/dL

b) >240 mg/dL d) >280 mg/dL

27. Which of the following enzyme is responsible for the conversion of cholesterol to cholesterol ester inside the cells?

a) Lecithin Cholesterol Acyl Transferase c) Cholesterol Esterase

c)Acyl CoA Cholesterol Acyl Transferase d) None of the Above

28. Which of the following glycolytic intermediates serves as the precursor for the backbone for the synthesis of Triglycerides, Phosphatidylcholine, Phosphatidylethanolamine?

a) Glyceraldehyde-3-phosphate c) Pyruvate

b) 1-3 Bisphosphoglycerate d) 3-Phosphoglycerate

29. Ceramide is synthesized in the endoplasmic reticulum from the amino acid serine. Ceramide is an important signaling molecule (second messenger) that regulates the pathways including which of the following process?

a) apoptosis c) cell senescence

b) cell differentiation d) All of the above

30. Identify the phospholipid that possesses a surfactant activity and is synthesized shortly before parturition in full-term infants, and its deficiency in the lungs can cause respiratory distress syndrome.

a) Dipalmitoyl phosphatidyletholamine c) Ceramide

c) Dipalmitoyl phosphatidylcholine d) All of the above

Enzymes

1. Ribozymes are

a) RNA acting as enzymes b) Ribose sugar acting as enzyme

b) Antibodies acting as enzymes d) Protein acting as enzyme

2. Holoenzyme is made of

a) Apoenzyme and Zymogen b) Apoenzyme and Co-enzyme

b) Co-enzyme and Prosthetic group d) Prosthetic group and Co-factor

3. Example of a Pro-enzyme

a) Pepsinogen b) Trypsin c) Chymotrypsin d) Lysine

4. Which of the following is not a co-enzyme

a) NAD b) NADP c) FAD d) Mn++

5. Which enzymes do not require co-enzymes for their activity ?

a) The extracellular enzymes c) The intracellular Enzymes

b) The mitochondrial enzymes d) The Proenzymes

6. What are ribozymes ?

a) RNA acting as enzymes c) Protein acting as enzymes

b) Ribose sugar acting as enzymes d) Antibodies acting as enzymes

7. Activity of allosteric enzymes are influenced by

a) Allosteric modulators c) Allosteric site

b) Catalytic site d) None of the above

8. Enzyme acts best at a particular temperature called

a) Catalytic Temperature c) At normal Body temperature

b) Optimum temperature d) None of the above

9. Uncatalyzed reaction shows _____ activation energy

a) Lower b) Higher c) Moderate d) Optimum

10. Lock and Key model is also known as

a) Template model c) Induced fit model

b) Khosland's Model d) Enzyme-substrate interaction model

11. Which bond is not associated with Enzyme-substrate interaction –

a) Hydrogen bonds c) Ionic bonds

b) Di-sulfide bonds d) Van deer Waal's force of attraction

12. Which of the following statement is incorrect

a) Enzymes are protein in nature c) Enzymes are colloidal in nature

b) Enzymes are thermolabile d) Enzymes are inorganic catalyst

13. Apoenzymes dissociates from co-enzymes due to

a) Change in pH c) Change in temperature

b) Change in substrate concentration d) Change in inhibitor concentration

14. Which of the following enzyme inhibitions shows decreased Km Value ?

a) Competitive inhibition c) Un-competitive inhibition

b) Non-competitive inhibition d) Feed back inhibition

Long Questions

1) What id DNA Describe in details Watson and Crick Model of DNA.

2) Describe structure and types of RNA

3) Describe in details Krebs Cycle.

4) What is metabolism. Describe in details process of glycolysis.

5) Describe in details pentose phosphate pathway.

6) Describe electron transport chain.

7) Describe B oxidation of fatty acids.

8) What is enzyme. Describe in details classification of enzymes with suitable examples.

9) What is enzyme. Describe theories of enzyme action.

Write Short notes of following

1. RNA
2. r RNA
3. t RNA
4. M RNA
5. Nucleotide
6. Nucleoside
7. Glycolysis
8. gluconeogenesis
9. Glycogenolysis
10. Transamination
11. Deamination
12. Urea cycle
13. Classification of enzymes
14. Isoenzyme
15. Co- enzyme
16. Co-factor