

PH 511.1

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ST ALOYSIUS COLLEGE (AUTONOMOUS) MANGALURU
SEMESTER I - PG EXAMINATION - M.Sc. BIOCHEMISTRY
NOVEMBER/DECEMBER - 2023

BIOMOLECULES
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MANGALORE-575 003

Time : 3 Hours

Max. Marks : 70

- I. Answer any TEN sub-divisions of the following: (10x2=20)
1. What is the primary function of peptide glutathione in the body?
 2. Explain the difference between a dipeptide and a tripeptide.
 3. Compare and contrast the charge distribution of an amino acid at its pI and at a pH above its pI.
 4. What is the primary force responsible for maintaining the tertiary structure of a protein?
 5. How does the molten globule state differ from the fully folded native state of a protein?
 6. Collagen undergoes post-translational modifications. Name one such modification and describe its significance in collagen's structure.
 7. What are aldoses and ketoses? Provide examples for each.
 8. Evaluate the significance of the high negative charge in glycosaminoglycans and its impact on their biological functions.
 9. Differentiate between the structures of Phosphatidylcholine and sphingomyelin.
 10. Which base pairs in DNA are connected by three hydrogen bonds and why is this significant for DNA stability?
 11. How does mRNA differ from DNA in terms of its chemical structure and function?
 12. Explain how variations in base composition can affect the melting temperature (T_m) of DNA.
- II. Answer any SIX of the following: (6x5=30)
13. Describe the formation and characteristics of alpha-helices and beta-sheets, two common motifs in the secondary structure of proteins. Provide examples of proteins that contain these structural elements and explain their functional significance.

Contd...2

14. Compare and contrast the structure of Collagre and Keratin.
15. What is the primary function of myoglobin and hemoglobin in the human body? Briefly describe their structural similarity in terms of the heme group. Additionally, identify the metal ion present in the heme group and its role in oxygen binding.
16. Define protein denaturation and briefly describe the primary driving forces responsible for denaturation. Provide an example of a common denaturing agent.
17. Demonstrate glycosidic bond formation in a) Maltose b) Sucrose
18. What are cis and trans fatty acids? Explain with an example.
19. Explain the key structural differences between DNA and RNA molecules at the chemical level. Include details about their respective sugars, nitrogenous bases and the types of base pairs they form.
20. Explain the Maxam-Gilbert method for DNA sequencing. Discuss the principles and key steps involved in this sequencing technique. What are some of the limitations of the Maxam-Gilbert method?

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III. Answer any TWO of the following:

(2x10=20)

21. Design a flowchart that illustrates the classification of amino acids based on their side chains. Include key characteristics and examples for each category.
22. Explain the step-by-step process of Merrifield solid-phase peptide synthesis. Highlight the key chemical reactions and reagents involved in each step.
23. Compare the structure and biological functions of the following polysaccharides; starch, cellulose, glycogen and chitin.
24. Differentiate between mRNA, rRNA, tRNA and snRNA in terms of their roles and functions within the cell. Provide specific examples of how each RNA type contributes to cellular processes.

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SEMESTER - I PG EXAMINATION - M.Sc. BIOCHEMISTRY

NOVEMBER /DECEMBER - 2023

BIOCHEMICAL TECHNIQUES

ST.ALOYSIUS COLLEGE
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MANGALORE-575 002

Time : 3 Hours

Max. Marks : 70

I. Answer any TEN sub-divisions of the following: (10x2=20)

1. List two types of non-mechanical cell disruption techniques.
2. Define lyophilization.
3. Explain the principle of gas chromatography.
4. Explain how Rayleigh interference system can be employed to visualize the migration of components during ultra centrifugation.
5. List the applications of NMR.
6. Describe the principle behind Coomassie Brilliant Blue gel visualization technique.
7. Define Gas Chromatography-Mass Spectrometry (GC-MS).
8. Explain how SEM generates images of a specimen's surface.
9. Explain the process of ionization in mass spectrometry. How does it convert neutral molecules into ions?
10. Name the type of electronic transition that is probed in fluorescence spectroscopy.
11. Recall the mathematical formula of the Beer-Lambert Law.
12. Mention the applications of Raman spectroscopy.

II. Answer any SIX of the following: (6x5=30)

13. List the main components of an HPLC system and describe their basic functions.
14. Describe how gel filtration chromatography can be used to determine the molecular weight of a protein.
15. Explain how the mobility of molecules in Capillary Electrophoresis depends on factors like buffer composition and electric field strength.

16. Describe the various factors that influence the migration of DNA through an agarose gel.
17. Explain the principle of light microscope.
18. Discuss the various methods of Protein crystallization.
19. Describe how turbidimetry can be used to measure the concentration of particles in suspension.
20. Briefly explain the principle behind circular dichroism.

III. Answer any TWO of the following:

(2x10=20)

21. Describe the different modes of paper chromatography.
22. Explain the principle, Instrumentation and applications of ESR.
23. Explain FACS with applications.
24. Explain about Flame photometry and list its applications.

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ST ALOYSIUS COLLEGE (AUTONOMOUS) MANGALURU
SEMESTER I - PG EXAMINATION - M.Sc. BIOCHEMISTRY
NOVEMBER/DECEMBER - 2023
ORGANIC AND PHYSICAL BIOCHEMISTRY

Time : 3 Hours

Max. Marks : 70

I. Answer any TEN sub-divisions of the following: (10x2=20)

1. List the ortho, para, and meta directing groups in benzene rings.
2. List the six major types of organic reactions.
3. Explain the relationship between Gibbs free energy and the equilibrium constant.
4. Assess the role of hydrogen bonds in protein structure.
5. What is the SI unit for measuring absorbed dose, and what does it represent?
6. Provide a definition of a radioisotope and list some commonly used radioisotopes in research and medicine.
7. Define what a free radical is.
8. Define isomerism.
9. Explain the differences between an electrochemical cell and a galvanic cell.
10. Analyze the types of protective shielding used in radiation safety.
11. Distinguish between meso compounds and racemic mixtures.
12. A chemist wants to prepare a buffer solution with a pH of 7.4. She has 0.1 M acetic acid ($pK_a = 4.75$) and 0.1 M sodium acetate. What ratio of acetic acid to sodium acetate should she use?

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II. Answer any SIX of the following:

(6x5=30)

13. Explain the principle and application of Autoradiography.
14. Describe the arrangement of water molecules in the solid phase (ice) compared to the liquid phase, considering hydrogen bonding.

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15. Explain the concept of half-life in the context of radioactive decay and how it is used to quantify the stability of a radioactive isotope.
16. Compare and contrast the response of GM counters to different types of ionizing radiation, including alpha, beta, and gamma radiation.
17. Explain the role of vitamin E as an antioxidant.
18. Explain the second law of thermodynamics.
19. Describe the different types of radiation emitted during radioactive decay, including alpha, beta, and gamma radiation. What are their characteristics?
20. Rank single bond, double bond, and triple bond in terms of bond length and bond strength. Define bond length and bond strength.

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III. Answer any TWO of the following:

(2x10=20)

21. Given a hypothetical scenario involving a radiological incident, outline the steps that should be taken to ensure the safety of responders, the affected population, and the environment.
22. Use the Aufbau principle, Pauli exclusion principle, and Hund's rule to write the electron configuration for the following elements: Hydrogen, Helium, Lithium, Beryllium, Boron, Carbon, Nitrogen, Oxygen, Fluorine, Neon.
23. Evaluate the role of lone pair of electrons in determining the molecular geometry of sp^3d^2 hybridised molecules.
24. Explain how the Henderson-Hasselbalch equation can be used to calculate the pH of a solution.

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ST ALOYSIUS COLLEGE (AUTONOMOUS) MANGALURU
SEMESTER I - PG EXAMINATION - M.Sc. BIOCHEMISTRY
NOVEMBER/ DECEMBER - 2023
PHYSIOLOGY AND NUTRITION

Time : 3 Hours

Max. Marks : 70

I. Answer any TEN sub-divisions of the following: (10x2=20)

1. Name the different types of cells found in the pancreas and describe their functions.
2. What is ECG? What is its significance?
3. Explain the relationship of partial pressure and exchange of gases during respiration.
4. When we begin to get dehydrated, we usually get thirsty, which causes us to drink fluids? Is thirst part of a negative or a positive feedback control system? Defend your choice.
5. Why are mature red blood cells uniquely devoid of a nucleus and other organelles? How does this structural characteristic benefit their primary function?
6. Name the hormones secreted from thyroid gland. List out two important functions of thyroid hormones.
7. "Posterior pituitary gland is also called as neurohypophysis". Justify the statement.
8. What are lipotropins? Give examples.
9. Define target cell concept with an example.
10. "Mediterranean diet is believed to be the healthiest diet". Comment.
11. What is the Daily energy requirement for a sedentary male and a female above 50 years of age?
12. What is the function of Sodium and Potassium ions in our body?

II. Answer any SIX of the following: (6x5=30)

13. Write a note on Total and Differential blood count.
14. Explain the process of Haematopoiesis.

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15. What is the importance of Net Filtration Pressure (NFR)? Calculate net filtration pressure given the following values: glomerular hydrostatic pressure = 50 mm Hg, blood colloid osmotic pressure = 25 mm Hg, capsular hydrostatic pressure = 20 mm Hg.
16. Analyze the differences in hormone production between the adrenal cortex and adrenal medulla, and how these hormones contribute to various physiological responses.
17. Explain the hormonal mechanisms by which combinational oral contraceptives suppress ovulation and alter the cervical mucus.
18. Describe the biological actions of Atrial natriuretic factor.
19. Why were fats classified as "good fats" and "bad fats"? How has this idea changed in recent times?
20. What is protein efficiency ratio? How is it determined? What are the advantages and limitations?

III. Answer any TWO of the following:

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(2x10=20)

21. Describe the composition of bile and its synthesis and secretion by the liver.
22. In what general way do the intrinsic and extrinsic mechanisms of clotting differ? Explain the intrinsic and extrinsic clotting pathways.
23. Describe the anatomy and functions of hypothalamus.
24. Describe the construction and use of the Bomb calorimeter.
