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St Aloysius College (Autonomous)
Mangaluru

Semester I – P.G. Examination – M.Sc. Biochemistry
November - 2019

BIOMOLECULES

Time: 3 hrs.

Max Marks: 70

I. Answer any TEN of the following:

(10×2=20)

1. What is a zwitter ion? Write its structure.
2. Differentiate between N-linked and O-linked glycoproteins.
3. What is the molecular basis for sickle cell anemia?
4. State Chargaff's rule and its significance.
5. Distinguish anomers from epimers.
6. What are standard and non-standard amino acids?
7. What is T_m ? Give its significance.
8. What are trans fatty acids?
9. What are sphingolipids?
10. What is snRNA? Mention its importance and function.
11. What are rare aminoacids? Name any two.
12. Differentiate nucleoside and nucleotide.

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II. Answer any SIX of the following:

(6×5=30)

13. Explain the bacterial cell wall polysaccharides.
14. How do you classify lipids? Explain.
15. Explain the Sanger's method of sequencing of DNA.
16. Discuss the quaternary structure of hemoglobin.
17. Explain the Watson and Crick model of DNA.
18. Write a note on Ramachandran's plot.
19. Discuss in detail peptide synthesis by Merrifield solid phase method.
20. Illustrate the various steps involved in isolation and analysis of carbohydrates.

III. Answer any TWO of the following:

(2×10=20)

21. Explain the structure and classification of monosaccharides with suitable examples.
22. Give an account on Christian Anfinsen's denaturation-renaturation experiment.
23. Explain the isolation and analysis of lipids.
24. Discuss the salient features of α -helix and β -pleated sheet structures.

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St Aloysius College (Autonomous)
Mangaluru
Semester I - P.G. Examination - M.Sc. Biochemistry
November 2019

BIOCHEMICAL TECHNIQUES

Time: 3 Hours

Max.Marks:70

I Answer any TEN of the following:

(2×10=20)

1. What is the principle of "Salting in" and "Salting out"?
2. Describe the Flame ionization detector of Gas chromatography.
3. What is lyophilization? What are its applications?
4. What is Svedberg's constant? Where is it used?
5. Give the principle of Pulsed Field Electrophoresis.
6. What are the applications of preparative ultra centrifuge?
7. What is MALDI? How is it useful?
8. Distinguish between magnification and resolution of a microscope.
9. What is the principle of confocal microscope?
10. A 5 μ M solution of a dye gave an optical density of 0.25 in a spectrophotometer in a 1cm cuvette. Calculate the Molar Extinction coefficient of the dye.
11. What are the applications of spectrophotometry?
12. Depict with diagrams the stretching and bending modes of vibration of H₂O molecule.

II Answer any SIX of the following:

(5×6=30)

13. Describe any two methods for the preparation of cell homogenates.
14. How do you determine the molecular weight of a protein by gel filtration?
15. With the help of a diagram describe the NMR instrument.
16. What is the principle and application of Magnetic Resonance Imaging?
17. Explain the construction of a Mass spectrometer. What is meant by "Time of flight"?
18. Describe the principle and working of Fluorescence activated cell sorter.
19. Give the principle, instrumentation and applications of Infrared spectroscopy
20. What is the principle of circular dichroism? How is this useful in the study of macromolecules?

III Answer any TWO of the following:

(10×2=20)

21. What are ion exchangers? Give an example of Cation and Anion Exchange resins. How is ion exchange chromatography used in purifying a protein? Explain.
22. Explain the principle, operation and application of SDS-PAGE.
23. Explain the X-ray diffraction studies on DNA. Add a note on preparation of protein crystals.
24. Explain the construction of a fluorimeter and explain any three applications of the fluorescence technique.

St Aloysius College (Autonomous)**Mangaluru****Semester I – P.G. Examination – M.Sc. Biochemistry****November - 2019****ORGANIC AND PHYSICAL BIOCHEMISTRY**

Time: 3 hrs.

Max Marks: 70

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(10×2=20)**I. Answer any TEN of the following:**

1. What are enantiomers? Give an example with structure.
2. Define buffer capacity.
3. Define half life of a radioactive isotope.
4. Write the structures of biological compounds with furan and indole rings.
5. Define Gibb's free energy.
6. What is the concentration of OH^- in a solution in which the H^+ concentration is 0.0002M?
7. Write the boat and chair form of glucose.
8. Define the terms closed and open systems with example.
9. Depict the tetrahedron structure of carbon with single bonds.
10. Mention the applications of ^{32}P and ^{131}I .
11. Define ion product of water.
12. Define the units 'curie' and 'Becquerel'.

II. Answer any SIX of the following:**(6×5=30)**

13. 'Water is an important medium for the living organisms'. Justify.
14. Write a note on representation of chiral structures by Fischer projection and perspective formulae.
15. Define pKa of weak acid. Derive its relation with conjugate base using Henderson-Hasselbalch equation.
16. Write a note on the natural antioxidants and their action in biological system.
17. Write the molecular orbital diagram of oxygen molecule. Explain paramagnetism in O_2 .
18. Give examples with structures for five different types of organic reactions occurring in biological systems.
19. Explain the numbering and ring properties of heterocyclic compounds. Give the biological occurrence of purine and pyridine rings in biological system.
20. What is quenching? Describe the biological hazards of radiation and safety measures in handling radioisotopes.

III. Answer any TWO of the following:**(2×10=20)**

21. Describe sp^n hybridization with suitable examples.
22. Explain the mechanism of ortho and para substitution in benzene ring.
23. Describe the laws of thermodynamics in understanding energies in living system.
24. Explain in detail GM counter, scintillation counter and autoradiography techniques to measure the radioactivity.

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St Aloysius College (Autonomous)

Mangaluru

Semester I – P.G. Examination – M.Sc. Biochemistry

November - 2019

PHYSIOLOGY AND NUTRITION

Time: 3 hrs.

Max Marks: 70

I. Answer any TEN of the following:

(10×2=20)

1. Differentiate between blood and plasma.
2. What is ECG? What does it measure?
3. What is lymph? State any two functions of lymph.
4. What are Kupffer cells? What are its functions?
5. Name any two Gastro-Intestinal hormones and state their functions.
6. State two differences between endocrine and exocrine glands.
7. What is BMR?
8. What is specific dynamic action?
9. Enlist the characteristics of Kwashiorkor
10. What is pellagra? Write the symptoms.
11. "Heart is an endocrine organ" – Justify.
12. What is Atkins diet?

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II. Answer any SIX of the following:

(6×5=30)

13. Define a buffer. Give an account of blood buffer system.
14. Write a note on oxygen binding by haemoglobin and factors affecting oxygenation.
15. Explain the secretion of bile and enterohepatic circulation.
16. Summarise the cardiac cycle.
17. Write an account on pineal gland and its functions.
18. How do you determine the energy value of foods?
19. What are the dietary sources and deficiency disorders of Vit A, Vit K and Vit D.
20. What is a special diet? Write an account on diet formulation for lactating women.

III. Answer any TWO of the following:

(2×10=20)

21. Explain the extrinsic and intrinsic pathway of blood coagulation. Add a note on anticoagulants.
22. Explain the ultrastructure of nephron and write an account of urine formation in kidney.
23. Elaborate on Thyroid hormones and their functions.
24. Write a note on the functions and deficiency disorders of macro and micro minerals.

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St Aloysius College (Autonomous)
Mangaluru
Semester I - P.G. Examination - M.Sc. Biochemistry
November 2018
Biomolecules

Time: 3 Hours

Max.Marks:70

Note: Draw neat labeled diagrams/schematic sketches/structures wherever necessary.

I Answer any TEN of the following:**(2×10=20)**

1. What is Hoagsteen base pairing?
2. Give the significance of phosphoramidite technology?
3. What is the ring name of steroid compounds containing cyclic steroid nucleus?
4. How does sickle cell hemoglobin differ from normal hemoglobin in its structure?
5. Draw the structure of a lipid micelle.
6. What is oxidative rancidity?
7. Which is more stable: DNA or RNA? Give reasons.
8. Give laboratory identification of aldoses and ketoses.
9. Define Chargaff's rule.
10. Write the biological function of phospholipids.
11. Give any one reaction for the determination of N-terminal amino acid in a protein.
12. Between furanose and pyranose ring structure of fructose which is more stable? Why?

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II Answer any SIX of the following:**(5×6=30)**

13. Discuss structure and function of collagen.
14. Draw a graph of nucleic acid melting curve showing hyperchromicity as a function of temperature.
15. Explain DNA sequencing by Sanger's method.
16. What are the physico-chemical properties of fats and oils?
17. Give an account on Merrifield solid phase peptide synthesis.
18. Write notes on protein folding.
19. Differentiate between gram-positive and gram negative cell wall.
20. Describe functions of lectins.

III Answer any TWO of the following:**(10×2=20)**

21. Give detailed classification of lipids. Add a note on structure of unsaturated Fatty acids.
22. Explain in detail about secondary structure of proteins.
23. Give detailed note on structural elucidation of oligosaccharides.
24. What are the different classes of RNA. Write in detail.

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Semester I - P.G. Examination - M.Sc. Biochemistry

November - 2018

BIOCHEMICAL TECHNIQUES

Time: 3 Hours

Max. Marks: 70

I. Answer any TEN of the following:

(10×2=20)

1. Mention the stationary and mobile phase of paper chromatography.
2. How do you determine the quality of isolated DNA?
3. State the differences between salting-out and salting-in.
4. Enlist the limitations of Beer-Lambert's law.
5. In a given total RNA sample, how can you separate the mRNA?
6. Mention the differences between R_f and R_g values.
7. Define Svedberg's constant.
8. Define Bragg's law. What is its application?
9. State the differences between rpm and RCF.
10. Name any two marker enzymes generally mentioned during sub-cellular fractionation.
11. State the role of SDS in SDS-PAGE.
12. Define Molar Extinction coefficient.

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II. Answer any SIX of the following:

(6×5=30)

13. Discuss the principles of mechanical methods for cell disruption.
14. Describe the staining of proteins and nucleic acids after electrophoresis.
15. Write a note on principle and applications of NMR.
16. Explain the principle and applications of FACS.
17. Describe instrumentation of GLC.
18. Write a note on construction and application of UV-Visible spectrophotometer.
19. Discuss SDS-PAGE in detail.
20. Comment on principle and applications of CD in protein chemistry.

III. Answer any TWO of the following:

(10×2=20)

21. Explain the principle and applications SEM detail.
22. Describe the working principle and applications of MALDI-TOF ESI-MS.
23. Discuss the ion exchange chromatography by using cation exchanger as an example.
24. Write a detail account on principle, instrumentation and applications of analytical ultra centrifuge.

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Semester I - P.G. Examination - M.Sc. Biochemistry

November - 2018

ORGANIC AND PHYSICAL BIOCHEMISTRY

Time: 3 Hours

Max. Marks: 70

I. Answer any TEN of the following:

(10×2=20)

1. Distinguish between D-glucose and d-glucose.
2. What are meso compounds? Give an example.
3. What are glycosides? Give an example.
4. With a suitable example denote the eclipsed and staggered conformations.
5. What is glutathione? Mention its role in biological system.
6. Give the structure and biological importance of isoalloxazine.
7. Calculate the ionic strength of 1.0M CaCl₂ solution.
8. Define hydrophobic interaction.
9. Differentiate between spontaneous and non-spontaneous reactions.
10. Give the relationship between decay constant and half-life of a radioisotope.
11. Define 'curie' and 'Bequerel'.
12. Give the principle of autoradiography.

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II. Answer any SIX of the following:

(6×5=30)

13. Explain the hybridization of orbitals in Methane and water.
14. How do you differentiate between enantiomers and diastereomers? Give examples.
15. State and explain the laws of thermodynamics.
16. Discuss the structure, aromaticity and biological importance of pyrrole.
17. What are oxygen free radicals? Explain autooxidation of fats and role of antioxidants.
18. Differentiate between pH and pKa. Derive Henderson-Hasselbalch equation.
19. Give the principle instrument and applications of GM counter.
20. Give an account on the use of biologically important radioisotopes.

III. Answer any TWO of the following:

(2×10=20)

21. Give a detailed account on the mechanism and factors affecting SN1 and SN2 reactions of alkyl halides.
22. Discuss the rules governing RS nomenclature. Assign RS notation to a monosaccharide and amino acid.
23. Explain the bonding and special properties of water. Add a note on buffer solutions and their action.
24. Discuss the biological hazards associated with radiation. Mention the safety measures needed while handling the radio isotopes.

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St Aloysius College (Autonomous)

Mangaluru

Semester I - P.G. Examination - M.Sc. Biochemistry

November - 2018

PHYSIOLOGY & NUTRITION

Time: 3 Hours

Max. Marks: 70

I. Answer any TEN of the following:

(10×2=20)

1. What is hematocrit? Mention the function of erythropoietin?
2. What are the buffer systems in blood?
3. Name two enzymes acting on dietary proteins in the GI tract. Where are they located?
4. Name two secretory functions of liver.
5. Give one example each for lipophilic and hydrophilic hormones. Name their function.
6. What is lymph? Mention any two function of lymph.
7. What are kuffer cells? Where are they present? State their function.
8. Heart is an endocrine organ-Justify.
9. State the role of cholecystokinin and secretin.
10. What is circadian rhythm? Name the hormone associated with it.
11. What is dietary fibre? What is its role?
12. What is negative nitrogen balance? How do you calculate it?

II. Answer any SIX of the following:

(6×5=30)

13. Discuss the methods adopted for the determination of nutritional value of dietary protein.
14. Describe the nutritional requirements and importance of calcium and Vitamin D in human nutrition.
15. Explain how blood levels of T₃, T₄, TSH & TRH would change in a laboratory animal that has undergone thyroidectomy.
16. Discuss the composition and functions of CSF.
17. What are the functions of insulin and glucagon in humans?
18. What are platelets? Explain their role in hemostasis.
19. What are micronutrients? Write the significance of Iodine and selenium.
20. Explain gas exchange in lungs.

III. Answer any TWO of the following:

(2×10=20)

21. Discuss the special nutritional requirement for diabetes and cardiovascular patients.
22. Describe the hormonal regulation of menstrual cycle.
23. Discuss the mechanism of glomerular filtration and formation of urine.
24. Discuss the blood coagulation cascade.

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Semester I - P.G. Examination - M.Sc. Biochemistry
November - 2017

BIOMOLECULES

Time: 3 Hours

Max. Marks: 70

I. Answer any TEN of the following:

(10×2=20)

1. What are enantiomers? Give example.
2. What is the torsion angles in β -bend?
3. Write the structure of sucrose. Why is it a non reducing sugar?
4. How dideoxy nucleotide are useful in sequencing?
5. What are lectins? Mention its uses.
6. Give an example of a ω -3 fatty acid. Why is it labeled as ω -3?
7. What is chargaff rule?
8. Why DNA is more stable than RNA in alkali?
9. What is meant by melting temperature of DNA? Explain.
10. What are amino sugars? Write the structure of any one.
11. What are homopolysaccharides & heteropolysaccharides? Give examples.
12. Write the Zwitter ionic properties of amino acids.

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II. Answer any SIX of the following:

(6×5=30)

13. Explain α -helical and β -pleated sheets secondary structure of protein.
14. Write the characteristics of O-linked and N-linked oligosaccharides.
15. Explain triple helical structure of DNA and cruciform DNA.
16. Write a note on physico chemical properties of fats.
17. Write a note on bacterial cell wall peptidoglycans.
18. Explain thermodynamics of protein folding.
19. Write about Primary, secondary and tertiary structure of tRNA.
20. Explain Ramachandran's plot.

III. Answer any TWO of the following:

(2×10=20)

21. Explain steps involved in chemical synthesis of a peptides.
22. How to determine amino acid sequence of polypeptide chain by chemical and enzymatic method? Explain.
23. Give an account of classification, structure and biological properties of glycoproteins.
24. Explain the sequencing of DNA by Maxam Gilbert method. How it is different by Sanger's method?

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**St Aloysius College (Autonomous)
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Semester I - P.G. Examination - M.Sc. Biochemistry

November - 2017

BIOCHEMICAL TECHNIQUES

Time: 3 Hours

Max. Marks: 70

I. Answer any TEN of the following:

(10×2=20)

1. Define Rf. Mention its significance.
2. What is salting out? Mention its uses.
3. List out the limitations of Beer's law.
4. What are the applications of preparative ultracentrifuge?
5. Your friend has isolated a protein with high negative charge. Which technique can be used to purify that protein?
6. What is void volume? Mention its significance.
7. Distinguish between dialysis and ultra filtration.
8. Name the detectors used in GLC.
9. Enlist any one advantage and disadvantage of high voltage electrophoresis.
10. Name the stains you would use to visualize proteins and nucleic acids.
11. What is the principle of fluorescence?
12. What is centrifugal force?

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II. Answer any SIX of the following:

(6×5=30)

13. Write the principle and applications of TLC.
14. List out the mechanical methods of cell disruption.
15. Give a note on isoelectric focusing.
16. Enlist the principle and applications of NMR.
17. Write an account on the principle and applications of flow cytometry.
18. Discuss the principle and applications of IR spectroscopy.
19. What is polarized light? Enlist the applications of Circular Dichroism.
20. Write the instrumentation and applications of flame photometry.

III. Answer any TWO of the following:

(2×10=20)

21. Explain in detail about the instrumentation and applications of UV-Visible spectroscopy.
22. Describe in detail about the theory and instrumentation of mass spectroscopy. Add a note on the interpretation of mass spectra.
23. Elaborate on the native polyacrylamide gel electrophoresis and SDS-PAGE.
24. Write the principle, instrumentation and applications of HPLC.

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Semester I - P.G. Examination - M.Sc. Biochemistry
November 2017

ORGANIC AND PHYSICAL BIOCHEMISTRY

Time: 3 Hours

Max.Marks:70

Note: Draw neat labeled diagrams/schematic sketches/structures wherever necessary.

I Answer any TEN of the following:

(2×10=20)

1. What is Sp^3 hybridization? Mention its orientation and bond angle.
2. What are structural isomers? Write the structural isomers for C_4H_{10} .
3. What are epimers? Give the structure of C4 epimer of D.glucose.
4. What is a rearrangement reaction? Give an example.
5. Why pyrrole is aromatic and not a base despite the presence of lone pair of electrons on nitrogen atom.
6. How do you calculate the specific rotation $[\alpha]$ of a compound?
7. Between phenol and nitrobenzene, which one readily undergoes aromatic electrophilic substitution? Explain why.
8. Give the structure and biological importance of isoalloxazine.
9. Differentiate between an open, closed and isolated system.
10. What is a redox reaction? Give an example.
11. ^{14}C has a half life of 5730 years? How many years it would take 4.0 g sample to decay to 0.5 g?
12. Give any two applications of radioisotopes in biology.

II Answer any SIX of the following:

(5×6=30)

13. What are anomers? Explain mutarotation by taking D-Glucose on an example.
14. What is periodic acid oxidation? Write the periodic acid oxidation products of α - D-glucopyranose.
15. Give an account on the impact of substituent's on the aromatic electrophilic substitution of benzene.
16. Discuss the mechanism of E_1 and E_2 elimination reactions.
17. Explain the mechanism of auto oxidation of fats.
18. Using Alanine as an example explain R and S nomenclature.
19. How will you prepare a buffer using Henderson Hasselbach equation? Comment on buffer capacity and ionic strength of the buffer.
20. What are radiation hazards? Discuss the safety measures in handling radioisotopes.

III Answer any TWO of the following:

(10×2=20)

21. What are antioxidants? Explain the antioxidant action of any three biological molecules.
22. Discuss the mechanism of nucleophilic substitution reactions. Explain why a primary alkyl halide follows SN^2 mechanism?
23. Discuss the structure and properties of water. Add a note on the importance of water in biological systems.
24. Give a detailed account on the use of GM counter and scintillation counter to measure the radioactivity.

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St Aloysius College (Autonomous)
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Semester I - P.G. Examination - M.Sc. Biochemistry
November 2017

PHYSIOLOGY AND NUTRITION

Time: 3 Hours

Max. Marks: 70

Note: Draw neat labeled diagrams/schematic sketches/structures wherever necessary.

I Answer any **TEN** of the following:

(2×10=20)

1. How do citrate and fluoride act as anticoagulants.
2. Oxygenation is the delivery of oxygen to the body tissues and cells. Write the factors affecting oxygenation.
3. What is the role of pancreas in digestion?
4. Name the regions of pituitary gland and name any two hormones of one region.
5. Give any two symptoms of Beri-Beri. Deficiency of which Vitamin causes Beri-Beri?
6. What is meant by calorific value of food? Mention calorific values of carbohydrates, proteins and lipids.
7. What are Kupffer cells? Give their functions.
8. Give the concept of pro-vitamins and anti vitamins with one example each.
9. Define specific dynamic action of food and write its significance.
10. What is melatonin? Write its significance.
11. Name any two lipophilic hormones. Mention functions of these hormones.
12. What is CSF? What is its role?

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II Answer any **SIX** of the following:

(5×6=30)

13. Give the events in hematopoiesis.
14. Mechanism of HCl production in the stomach.
15. Role of kidneys in acid base balance.
16. Liver function tests.
17. Biological functions of endorphins and enkephalins.
18. Hormonal regulation of menstrual cycle.
19. Protein calorie malnutrition.
20. Sources, RDA, functions and deficiency symptoms of calcium.

III Answer any **TWO** of the following:

(10×2=20)

21. Explain the mechanism of blood coagulation by intrinsic and extrinsic pathways.
22. What are the exocrine and endocrine activities of pancreas? Discuss the biological functions of insulin and glucagon.
23. Discuss the digestion and absorption of proteins.
24. Write the sources, RDA, functions, deficiency symptoms and hyper-vitaminosis of Vitamin A.
