(16)

[This question paper contains 6 printed pages.] 8/12/17

Your Roll No.....

Sr. No. of Question Paper : 5542 **H**

Unique Paper Code : 249103

Name of the Paper : Biophysics

Name of the Course : **B.Sc. (H) Biochemistry**

Semester : I

Duration : 3 Hours Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt **five** questions in all.
3. Question **1** is compulsory.

1. (a) Indicate whether True or False with justification.

   (i) Dark field microscopy is used to examine cells that are difficult to see in bright field.

   (ii) ^{1}H NMR spectra of proteins show no change upon denaturation.

   (iii) Glass cuvettes are not used to measure absorbance of DNA solutions.

P.T.O.

(iv) The brightness of an image increases as the magnification decreases.

(v) Gamma rays are used to study crystallographic diffraction.

(vi) The triplet state is lower in energy than the singlet state.

(vii) Dissolving glucose but not groundnut oil in water is an energetically favorable process.

(viii) Two monochromators are used in a fluorimeter.

(b) Name the microscopic technique that can be used for the following applications :

(i) To look at bacterial cells

(ii) To visualize fluorescently labeled lymphocytes.

(iii) To visualize surface morphology of cells.

(16,3)

2. (a) Differentiate between the following **(any 4)** :

(i) Metallic conductors and electrolyte conductors.

(ii) Scanning and transmission electron microscopy.

(iii) Weak electrolytes and strong electrolytes with one example of each.

(iv) Fluorescence and phosphorescence.

(v) CD and ORD spectroscopy

(vi) Differential and density gradient centrifugation

(b) What do you understand by the solubility product of a salt? Will a precipitate of AgCl form if 20 ml of 0.01M $AgNO_3$ and 20 ml of 0.0004 M NaCl are mixed. (K_{sp} of AgCl = 1.7×10^{-10}) (12,2)

3. (a) Explain the following statements :

(i) Phase contrast microscopy can be used to study living cells.

(ii) Fluorescence emission always has a longer wavelength than the incident light.

(iii) X-ray crystallography is a form of elastic scattering.

(iv) Live samples cannot be visualized under an electron microscope.

(b) Explain the principle of light field microscopy with a ray diagram. Write one advantage of dark field microscopy over light field microscopy. (10,4)

P.T.O.

4. (a) What are the major postulates of Arrhenius theory of electrolytic dissociation? Mention the limitations of the same.

(b) What do mean by the term birefringence? Write two applications of polarization microscopy.

(c) Explain one application each of intrinsic fluorescence and extrinsic fluorescence. (6,4,4)

5. (a) What is the basis and procedure of separation of organelles by differential centrifugation?

(b) A solution containing 2g/litre of a light absorbing substance in a 1 cm cuvette transmits 75% of the incident light of a certain wavelength. Calculate

(i) Transmittance of a solution containing 4g/litre

(ii) If the molecular weight of the compound is 250, calculate the molar extinction coefficient.

(c) What is the theory of Spontaneous Generation? List the experiments that disapproved it. Briefly comment on the contributions of the following **(any 2)** scientists :

(i) Miller and Urey

(ii) Eigen

(iii) Haldane and Oparin (4,4,6)

6. (a) Draw a simple geometric construction to deduce Bragg's law of diffraction.

(b) What is the purpose of growing protein crystals in the presence of heavy atoms like Cu, Co for X-ray diffraction studies?

(c) How are neutron diffraction studies complementary to X-ray diffraction studies? (6,4,4)

7. (a) Write the principle of radioactive measurement by the liquid scintillation counter and indicate any one biologically relevant radioisotope which can be measured.

(b) Give a brief account on the Geiger Mueller counter and its use.

(c) Lambert Beer's law is not obeyed at high concentrations. Explain. (6,5,3)

Write short notes on the following :

(a) Flow cytometry and its applications

(b) Biological applications of the radioisotopes

(c) Ultracentrifugation and its applications (4,5,5)

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This question paper contains 7 printed pages]

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Roll No. | | | | | | | | | | | |

S. No. of Question Paper : **6421**

Unique Paper Code : **32491101** **HC**

Name of the Paper : **Molecules of Life**

Name of the Course : **B.Sc. (H) Biochemistry**

Semester : **I**

Duration : **3 Hours** Maximum Marks : **75**

(Write your Roll No. on the top immediately on receipt of this question paper.)

Attempt *five* questions in all.

Question No. **1** is compulsory.

Subparts of the questions should be attempted together.

Use of scientific calculator/log tables may be allowed.

1. (A) Fill in the blanks :

(*a*) ..... is biologically active form of folic acid.

(*b*) ..... is an amino acid containing an imidazole ring.

P.T.O.

(c) ..... is a glycolipid.

(d) ..... is an unusual structure formed by DNA sequences.

(e) ..... is a parent molecule for all the sphingolipid.

(f) Optical activity is shown by all amino acids except ..... .

(g) ..... is a water soluble vitamin having an antioxidant property.

(h) ..... type of DNA predominantly exists in dehydrated state.

(i) ..... is an example of lung surfactants. 9

(B) Explain the following :

(a) Nicotinamide coenzyme can be used to study the progress of enzymatic reactions.

(b) Nucleosides are more soluble in water than corresponding bases.

(c) Amino acids do not give biuret reaction.

(d) Vitamin D is a hormone.

(e) α-D galactopyranose rotates the plane of polarized light, but its reduction product does not. 10

2. Draw the structures of (any **14**) :

(a) Triacylglycerol

(b) Glutamic acid at pH 7.0

(c) Lactose

(d) Pseudouridine

(e) cAMP

(f) NADPH

(g) D-Glucuronic acid

(h) Retinol

(i) Vitamin D_3

(j) N-Acetyl galactosamine

(*k*) S-Adenosyl methionine

(*l*) Pyridoxal

(*m*) Methyl uracil

(*n*) D-Mannitol

(*o*) Ascorbic acid

(*p*) Phosphatidyl choline

(*q*) Ornithine 14

3. What are the products formed when :

(*a*) Alanine is treated with ninhydrin and then heated

(*b*) RNA is treated with alkali

(*c*) Phosphatidyl serine (PS) is treated with phospholipase A_2

(*d*) Glucose is treated with phenylhydrazine

(*e*) Cystine is treated with a reducing agent

(*f*) Cardiolipin is hydrolyzed completely

(*g*) Oxidation of galactose 14

4. (A) Name the deficiency disease for the following :

(*a*) Niacin

(*b*) Ascorbic acid

(*c*) Thiamin

(*d*) Vitamin D

(*e*) Folic acid

(*f*) Retinol 6

(B) Draw the titration curve of glycine. Explain why its shape changes in the presence of formaldehyde ? 5

(C) Draw structures of three non-standard amino acids. 3

5. (A) Define the following and give one example of each :

(*a*) Enantiomers

(*b*) Diastereoisomers

(*c*) Epimers

(*d*) Anomers. 6

(B) Diagrammatically show how phosphodiester bond links successive nucleotides in nucleic acids. 4

(C) What are essential fatty acids ? Write structures of two essential fatty acids. 4

6. (A) What are waxes ? Discuss their biological roles. 4

(B) Describe the clover-leaf model of tRNA. 4

(C) Explain why the absorption of UV light by double stranded DNA increases when the DNA is denatured ? 4

(D) Name the repeating units of two structural homopolysaccharides. 2

7. (A) Describe different non-covalent interactions which are crucial for the structure and functions of macromolecules. 5

(B) Calculate the approximate molecular weight of a protein in kilodaltons (kD) with 55 amino acids. 2

(C) Given 0.1 M solution of acetic acid (pKa=4.76) and sodium acetate, describe how you would go about preparing 1 L of 0.1 M acetate buffer of pH=4.0. 3

(D) Draw the structure and write the functions of any *two* glycosaminoglycans. 4

8. Write short notes on the following :

(*a*) Watson and Crick model of DNA

(*b*) Phospholipids

(*c*) Role of nucleotides

(*d*) Glycogen. 14

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Roll No. | | | | | | | | | | | |

S. No. of Question Paper : **6422**

Unique Paper Code : **32491102** **HC**

Name of the Paper : **Cell Biology**

Name of the Course : **B.Sc. (Hons)/Biochemistry**

Semester : **I**

Duration : **3 Hours** Maximum Marks : **75**

(Write your Roll No. on the top immediately on receipt of this question paper.)

Attempt *five* questions in all.

Question No. **1** is compulsory.

1. (A) Fill in the blanks :

(*a*) The progression of animal cells through cell cycle stops at restriction point in the absence of ..... .

(*b*) ..... allow communication between adjacent plant cells.

(*c*) ..... is the largest organelle in an animal cell.

P.T.O.

(*d*) Enzyme catalase is a marker enzyme for .....

(*e*) ..... is a technique that analyses cells on the basis of their size and internal complexity.

1×5=5

(B) Explain the significance of the following :

(*a*) Caspases

(*b*) Nuclear Lamina

(*c*) Cadherins

(*d*) PDI

(*e*) MPF. 2×5=10

(C) Comment on the following statements :

(*a*) Golgi complex disappears as an organized structure if vesicular transport from ER is blocked.

(*b*) *E.coli* is widely used as an experimental model organism. 2×2=4

2. (A) Give principle of laser scanning confocal microscopy with ray diagram. Why is it better over conventional fluorescence microscopy ? 6

(B) Write the localization and function of the following :

(*a*) Emerin

(*b*) Glycophorin

(*c*) Integrin

(*d*) Kinetochore complex. 2×4=8

3. (A) Explain biochemical basis of the following diseases :

(*a*) Gaucher's Disease

(*b*) Zellweger Syndrome

(*c*) Scurvy. 2×3=6

(B) Compare and contrast the structure, organization and role of microfilaments and intermediate filaments in cell. 5

(C) Define resolution of a microscope. Discuss factors that limit resolution of a light microscope. 3

4. (A) Draw the structure of axoneme and explain the mechanism of movement of cilia and flagella. 4

(B) Explain why :

(*a*) Mannose 6-phosphate receptors are found in TGN as well as on cell surface.

(*b*) Extracellular surfaces of transmembrane and secretory proteins often undergo glycosylation.

(*c*) The presequences of mitochondrial proteins are positively charged whereas the transit peptides of chloroplast proteins are not.

(*d*) Tight junctions are important for maintaining integrity of polarized cells.

(*e*) Bright field microscopy cannot be used for live cell imaging. 2×5=10

5. (A) Discuss the principle of differential centrifugation. Give *one* limitation of this technique. 3

(B) Which of these proteins will have a ER signal sequence ?

(*a*) RNA polymerase

(*b*) BiP Chaperone

(*c*) Insulin

(*d*) Actin.

(C) Discuss *five* salient features of transformed cells. 5

(D) Explain the function of smooth endoplasmic reticulum and correlate it with its positioning within the cell. 4

6. (A) Differentiate between :

(*a*) Adherens Junctions and Desmosomes

(*b*) SEM and TEM

(*c*) Actin bundles and Actin networks

(*d*) Primary and Secondary plant cell wall. 2.5×4=10

(B) Explain the process of nuclear import of proteins. 4

7. Write short notes on :

(*a*) Oncogenes

(*b*) Organization of skeletal muscle

(*c*) Checkpoints in cell cycle

(*d*) Endosymbiotic origin of organelles. 3.5×4=14

8. (A) Explain the process of cotranslational translocation of proteins into ER. Why are these two processes coupled ? 6

(B) If the number of chromosomes is 10 and the amount of DNA is C in a gamete, how many chromosomes and what amount of DNA will be present in a somatic cell at :

(*a*) End of S phase

(*b*) End of Cell division. 2×2=4

(C) Discuss the process of formation of lysosomes in a cell. 4