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RBC-004

Ph.D. IN BIOCHEMISTRY (PHDBC)

Term-End Examination

00424

December, 2017

RBC-004 : BIOPHYSICAL TECHNIQUES

Time : 3 hours *Maximum Marks : 100*

Note : *The question paper has three sections. All sections are* ***compulsory.***

SECTION A

Answer ***all*** *the questions.*

1. Expand the following abbreviations : *5×1=5*

(a) SEM

(b) FRET

(c) PMT

(d) dpm

(e) MALDI

2. Briefly define the following terms : *5×2=10*

(a) Chromophores

(b) Becquerel

(c) Molar Absorptivity

(d) Relative Centrifugal Force

(e) Beer-Lambert Law

3. State whether the following statements are *True/False* : $5 \times 1 = 5$

(a) Lectins are the plant proteins which bind to specific carbohydrate molecules.

(b) Sedimentation rate of a particle in a centrifugal field is directly proportional to its density and the centrifugal force applied on it.

(c) In the absence of a medium, the velocity of electromagnetic radiation can be greater than light.

(d) Counting efficiency of a GM-counter increases as the count rate increases.

(e) The energy of a photon of light is directly proportional to both, the frequency and the wavelength.

SECTION B

*Attempt any **five** questions.*

4. (a) Students in a biochemistry lab are instructed to pellet microsomal fraction of rat liver homogenate in an ultracentrifuge. If the speed of the rotor is 5000 rpm, what will its angular velocity in radians/second be ?

(b) Calculate the applied centrifugal force if the radial distance (r) is 5 cm from the axis of rotation. *3+3=6*

5. Describe the fate of an electronically excited molecule using Jablonski diagram. *6*

6. (a) Write a short note on the rate of radioactive decay.

(b) Calculate the decay constant of ^{32}P. ($t_{1/2}$ = 14·2 days). *3+3=6*

7. Explain any ***two*** of the following with suitable examples : *2×3=6*

(a) Chemical Shift

(b) FT-NMR

(c) Spin-Spin Coupling

8. Differentiate between 'Density Gradient' and 'Isopycnic Centrifugation'. *6*

9. Explain Electron Microcopy and its different types. *6*

10. Draw a schematic diagram showing electronic energy levels for an organic molecule and possible transitions amongst them. Arrange these transitions in the increasing order of their energies. *6*

SECTION C

*Attempt any **five** questions.*

11. (a) Explain the working principle of a light microscope.

(b) Differentiate between Bright and Dark field microscopy. *5+5=10*

12. (a) Define the terms ORD and CD. Explain the origin of these phenomena.

(b) Briefly discuss some applications of CD in biological systems. *5+5=10*

13. (a) What are Fluorophores ? Give some examples.

(b) What is Confocal Microscopy and how are fluorophores used in this technique ? *5+5=10*

14. Briefly describe the important applications in the biological systems of any ***two*** of the following : *2×5=10*

(a) Mass Spectrometry

(b) Fluorescence Spectrometry

(c) UV-VIS Spectrometry

(d) Infra-red Spectrometry

15. (a) What are Radioisotopes and what are their applications in the biological sciences ?

(b) Briefly describe any one method used for measurement of radioactivity. *2×5=10*

16. (a) Explain different types of rotors used in routine biochemical centrifugation techniques.

(b) Briefly explain three factors to be taken care of for the maintenance of rotors. *7+3=10*

17. Write short notes on any ***two*** of the following : *2×5=10*

(a) Autoradiography

(b) X-ray Diffraction

(c) Viscometry

(d) Atomic Absorption Spectrometry