WEST BENGAL STATE UNIVERSITY

B.Sc. Honours/Programme 4th Semester Examination, 2022

MLBHGEC04T/MLBGCOR04T-MOLECULAR BIOLOGY (GE4/DSC4)

PHYSICOCHEMICAL TECHNIQUES AND MICROBIAL GENETICS

Time Allotted: 2 Hours | Full Marks: 40

The figures in the margin indicate full marks.
Candidates should answer in their own words and adhere to the word limit as practicable.
All symbols are of usual significance.

1. Pick up the correct alternatives from the following: (any ***ten***) 1×10 = 10

(a) A red blood cell is placed in sea water. The outside environment is considered as
(i) Hypotonic (ii) Hypertonic (iii) Isotonic (iv) None of these

(b) The silica gel matrix present in TLC sheet is
(i) Polar (ii) Non-polar (iii) Ionic (iv) None of these

(c) Molecular orbitals with lowest energy are
(i) σ* orbitals (ii) π orbitals
(iii) σ orbitals (iv) Non-binding orbitals

(d) If the sedimentation constant of a macromolecular solution is 2.5×10^{-12} sec. In Svedberg unit the value will be
(i) 0.025 (ii) 0.25 (iii) 25 (iv) 2.5

(e) The unit of Diffusion constant is
(i) m^2/sec (ii) m^2 sec (iii) $\frac{1}{m^2\,sec}$ (iv) $\frac{sec^2}{m}$

(f) The water from the roots reaches to the stem due to
(i) Osmotic pressure (ii) turgor pressure (iii) diffusion (iv) root pressure

(g) Absorbance of a sample is
(i) proportional to its concentration (ii) inversely proportional to its concentration
(iii) independent of the concentration (iv) proportional to its polarity

(h) Ion exchange chromatography is used for the separation of
(i) Polar molecules (ii) Pathogenic molecules
(iii) Non-polar molecules (iv) None of these

(i) Unit of R.C.F. is
(i) mS^{-2} (ii) radian N^{-1} (iii) ms^{-2} (iv) none of these

(j) At what speed do you centrifuge blood?
(i) 2200-2500 rpm (ii) 1000-1500 rpm (iii) 3000-3200 rpm (iv) 4000 rpm

(k) In which type of chromatography, the stationary phase held in a narrow tube and the mobile phase is moving through it under pressure?
(i) Column Chromatography (ii) Liquid Chromatography
(iii) Paper Chromatography (iv) Gas Chromatography

(l) Which of the following factors do not affect the rate of diffusion?
(i) Concentration gradient (ii) Particle size
(iii) Temperature (iv) Particle mass

(m) U-V wavelength covers the range of electromagnetic spectrum between
(i) 100-400 nm (ii) 1-100 μm (iii) 1-100 nm (iv) 100-400 μm

(n) The buoyant density of double stranded DNA molecule is equivalent to CsCl density of
(i) 1.55 $g\,cm^{-3}$ (ii) 1.55 $mg\ m^{-3}$ (iii) 1.7 $g\,cm^{-3}$ (iv) 1.7 $kg\ m^{-3}$

(o) Stokes' law is applicable only for
(i) Cuboidal particles (ii) Spheroidal particles
(iii) any type of particles (iv) Spherical particles

2. Answer any ***ten*** questions from the following: 2×10 = 20

(a) What are the limitations of Lambert-Beer's law?
(b) Write down two biological applications of centrifugation.
(c) Explain the stationary and mobile phase in chromatography.
(d) What do you mean by transduction?
(e) How does the viscosity of a liquid depend on temperature?
(f) What is PAGE? Mention its use.
(g) What do you mean by conjugative plasmid?
(h) Define R_f factor in chromatography.
(i) Explain the basic principle of electrophoresis.
(j) Why descending paper chromatography is more efficient than ascending paper chromatography?
(k) What is Van't Hoff's equation?
(l) Distinguish between Newtonian and non-Newtonian fluid.
(m) What do you mean by Fick's first law of diffusion?
(n) What do you mean by iso-electric focussing?
(o) What do you mean by artificially induced competence?

3. Answer any ***two*** questions from the following: 5×2 = 10

(a) Explain the similarity between the osmosis and diffusion. Explain the gaseous exchange in lungs in terms of diffusion. 2+3 = 5

(b) Write the steps of conjugation between F^+ cell and F^- cell. Explain the effects of tonicity in RBC. 2+3 = 5

(c) Using Einstein-Stokes' law calculate the molecular weight of a spherical protein.

(d) Write short note on any ***one*** of the following:
(i) Reynolds Number (ii) Messelson-Stahl Experiment.

N.B. : *Students have to complete submission of their Answer Scripts through E-mail / Whatsapp to their own respective colleges on the same day / date of examination within 1 hour after end of exam. University / College authorities will not be held responsible for wrong submission (at in proper address). Students are strongly advised not to submit multiple copies of the same answer script.*

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