WEST BENGAL STATE UNIVERSITY

B.Sc. Honours/Programme 4th Semester Examination, 2020

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.

Answer the following questions

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

(a) A red blood cell is placed in sea water. The outside environment is considered
_____

(i) Hypotonic   (ii) Hypertonic   (iii) Isotonic   (iv) None of these

(b) Molecular orbitals with lowest energy are the

(i) σ*-orbitals   (ii) π-orbitals   (iii) σ-orbitals   (iv) non-bonding orbitals

(c) Which of the following factor do not affect the rate of diffusion?

(i) Concentration gradient   (ii) Particle size

(iii) Temperature   (iv) Particle color

(d) Ultra Violet wavelength covers the range of electromagnetic spectrum between

(i) 100-400 nm   (ii) 1-100 μm   (iii) 1-100 nm   (iv) 100-400 μm

(e) What could happen if a person in the hospital receives pure water as the intra venous fluid instead of 0.9% NaCl?

(i) The water in the IV is hypotonic compared to the environment within their cell.

(ii) Red blood cells will swell and possibly burst.

(iii) Red blood cells will shrink.

(iv) The water in the IV is hypertonic compared to the environment within their cell.

(f) The buoyant density of double stranded DNA molecule is equivalent to CsCl density of

(i) 1.7 g/cm^3 (ii) 1.7 mg/cm^3 (iii) 1.55 g/cm^3 (iv) 1.55 mg/mm^3

(g) What is the SI unit of viscosity?

(i) Candela   (ii) Poiseiulle   (iii) Newton/m   (iv) None of them

(h) House-keeping genes are

    (i) Functional all the time throughout life

    (ii) Remain inactive for most of the time in their life span

    (iii) Regulatory genes

    (iv) None of the above

(i) Which of the following is true about plasmid molecule?

    (i) It is indispensible for the survival of bacteria

    (ii) It is found all over the living system

    (iii) It is an extra chromosomal DNA molecule

    (iv) It is exclusively single stranded, linear DNA molecule

(j) Cell carrying the F plasmid promote the synthesis of

    (i) Flagella   (ii) Pilli   (iii) Fimbriae   (iv) Capsule

(k) At what speed do you centrifuge blood?

    (i) 2200-2500 rpm   (ii) 3000-3200 rpm

    (iii) 1000-1500 rpm   (iv) 4000 rpm

(l) In the process of transformation, bacterial cell can uptake DNA molecule from

    (i) Direct contact with other bacteria

    (ii) Virus

    (iii) The environment

    (iv) All of the above

(m) A technique that can be used to compare the DNA of two or more plants is

    (i) Cloning   (ii) Chromatography   (iii) Staining   (iv) Gel electrophoresis

(n) In which type of chromatography, the stationary phase held in a narrow tube and the mobile phase is forced through it under pressure?

    (i) Column chromatography   (ii) Paper chromatography

    (iii) Liquid chromatography   (iv) Gas Chromatography

(o) In TLC, the stationary phase is made of _____ and the mobile phase is made of _____

    (i) Solid, liquid   (ii) Liquid, liquid   (iii) Liquid, gas   (iv) Solid, gas

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

(a) What do you mean by isoelectric focusing?

(b) What happens to the viscosity of a liquid with increase in temperature?

(c) What do you mean by Reynolds number?

(d) Write down two applications of centrifugation.

(e) What do you mean by artificially induced competence?

(f) What is F´ strain?

(g) What do you mean by relaxed plasmid?

(h) You are given a solution with mixture of protein, DNA and RNA. How can you identify them using centrifugation?

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

(a) State the Lambert-Beer law regarding the absorption, along with mathematical expression. A solution present in a 1 cm cuvette transmits 40% incident light. Calculate the concentration of the solution given that molar extinction coefficient is $6 \times 10^3 \text{ M}^{-1} \text{ cm}^{-1}$.   3+2

(b) Define gene. "In prokaryotes the genes and proteins are collinear" – justify the statement. Give an example of engineered plasmid.   1+3+1

(c) What is agarose? What do you mean by Native PAGE?   2+3

(d) What is transduction? Among T phage and Lambda phage which viruses are useful for the study of transduction? Explain your answer.   2+1+2

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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