'समानो मन्त्रः समितिः समानी'

UNIVERSITY OF NORTH BENGAL

B.Sc. Sec 1st Semester Examination, 2023

UMICSEC11001-MICROBIOLOGY

BIOTECHNIQUES AND BIOSTATISTICS

Time Allotted: 2 Hours | Full Marks: 40

The figures in the margin indicate full marks.

1. Answer any ***five*** of the following: 1×5 = 5

(a) What is the resolving power of a microscope?

(b) Name one cation and one anion exchanger.

(c) What is Rf value?

(d) What is molar extinction coefficient?

(e) Study the following data series:

1, 2, 3, 4, 3, 4, 3, 4, n.

If the mode of the series is 4. Then determine the value of n.

(f) What are the measures of central tendency?

(g) What is type 2 error?

(h) What is null hypothesis?

2. Answer any ***three*** of the following: 5×3 = 15

(a) Write a note on the working principle of scanning electron microscope with ray diagram. 5

(b) Write in brief the working principle of affinity chromatography with suitable example. 5

(c) State the Lamberts Beers Law. What are the limitations of Lamberts Beers Law? 3+2

(d) A sample of 10 measurements of the diameter of WBC gave a mean of 10 micron and standard deviation was 3 micron. Find the 99% confidence limit of mean for the actual diameter. [Given $\alpha = 0.01$, degree of freedom = 9, $t_{\alpha} = 3.25$] 5

(e) In one experiment a random sample of 15 fishes were obtained from a pond and their body weight (in gram) were measured as enumerated below. Calculate their arithmetic mean. 5

Body Weight	5-5.9	6-6.9	7-7.9	8-8.9	9-9.9	10-10.9
No. of Fishes	1	2	4	3	3	2

3. Answer any ***two*** of the following: 10×2 = 20

(a) A researcher conduct the Mendel's experiments with peas, he observed 315 round and yellow, 108 round and green, 101 wrinkled and yellow and 32 wrinkled and green. According to Mendel's theory of heredity the number should be in the proportion of 9:3:3:1. Calculate the chi square value. Comment is there any evidence to doubt in Mendel's theory at the 0.01 level of significance? [Given $\alpha = 0.01$, degree of freedom = 3, chi square alpha $(\text{Chi}^2_\alpha) = 11.345$] 7+3

(b) The data given below is salinity (%) and dissolved oxygen ($\text{mg}\cdot \text{L}^{-1}$). Derive regression equation to calculate dissolved oxygen with respect to salinity. Using this equation estimate the value of dissolved oxygen when the salinity of water is 14.5%. 7+3

Salinity (%)	19	17	16	18	19	14	15	13
DO (mg/L)	12	11	12	13	15	9	10	8

(c) Write in detail with suitable diagram the working principle and resins used in cation exchange chromatography. What are the advantages of using HPLC during separation of biomolecules. 7+3

(d) Write down the working principle of differential centrifugation for separating cell organelles. Give a brief account of isopycnic centrifugation. 6+4

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