Perform an F-test to determine if the two groups have equal variances at a 5% significance level.

(c) A group of scientists is investigating whether a new exercise regimen improves lung capacity in patients with respiratory conditions. The average lung capacity in the general population is 4.8 liters, with a standard deviation of 0.6 liters.

A sample of 50 patients following the new regimen has an average lung capacity of 5.0 liters.

Perform a hypothesis test at a 5% significance level to determine whether the exercise regimen significantly increases lung capacity in patients.

(6,6,6)

[This question paper contains 8 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 5037 **J**

Unique Paper Code : 3184002006

Name of the Paper : GE-Statistical Concepts in Biology (NEP-UGCF)

Name of the Course : **B.Sc. (Hons.) Biomedical Science**

Semester : IV/VI

Duration : 3 Hours Maximum Marks : 90

Instructions for Candidates

1. Write your Roll. No. on the top immediately on receipt of this question paper.
2. Attempt **any five** questions.
3. Subparts of the questions should be attempted together.
4. Use of simple/non-programmable scientific calculators is allowed
5. Statistical tables will be provided (if needed).

1. (a) Differentiate between the following (any 2)

   (i) Nominal and Ordinal Data

   (ii) Discrete and Continuous data

   (iii) Standard deviation and Coefficient of variation

   (b) Explain the following (any 4)

   (i) Biostatistics

   (ii) Spearman's Coefficient of Correlation

   (iii) Conditional Probability

   (iv) Standard Error

   (c) Find the mean, median, and mode of the following data set: 15, 28, 18, 24, 22, 35, 28, 18, 28, 23, 21

   (6,8,4)

2. (a) State True or False and justify your answer (any three):

   (i) The mean of a dataset is always one of the values in the dataset.

50-55	3
	30

Calculate cumulative frequency, relative frequency and cumulative relative frequency.

(b) A researcher wants to compare the variance in hemoglobin levels between two groups of patients: one with a specific genetic mutation and one without. The hemoglobin levels (g/dL) of randomly selected individuals in each group are:

Group A (With Mutation):

12.1, 12.5, 13.0, 13.3, 13.8, 14.2, 14.7, 15.1, 15.5

Group B (Without Mutation):

11.8, 12.0, 12.4, 12.9, 13.4, 13.9, 14.3, 14.8, 15.2, 15.7

If a participant is picked at random:

1. What is the probability that the selected participant has high blood pressure, given that the participant follows a sedentary lifestyle?

2. What is the probability of the event of having high blood pressure and following a sedentary lifestyle?

(c) Explain the role of probability in determining the validity of a diagnostic test. Why is it important in public health research? (6,6,6)

6. (a) The following Frequency Distribution shows the distance to the college campus travelled by 30 students

Distance (in Km)	Frequency
35-40	8
40-45	13
45-50	6

(ii) A bar graph is used to represent discrete data.

(iii) The range of a dataset is the difference between the highest and lowest values.

(iv) The probability of an impossible event is always 1

(b) For the given tabulated data, find out the two linear regression equations:

X	2	5	7	9	11
Y	1	3	6	8	10

(6,12)

3. (a) In a clinical trial, a new anti-inflammatory drug is tested on 30 patients. The following data represents the time (in minutes) taken by each patient to experience relief from symptoms:

Data (in minutes):

16, 18, 19, 21, 20, 23, 21, 25, 27, 20, 22, 24, 26, 28, 17, 20, 22, 25, 19, 24, 26, 21, 23, 20, 22, 27, 23, 25, 26, 21

Determine the interquartile range of this dataset, D7 and P40

(b) Differentiate between a Bar Chart and a Pie chart

(12,6)

4. Write short notes emphasising the importance/ applications of the following (Any 3):

(i) Sampling Distribution

(ii) Assessing validity of a Test

(iii) Correlation analysis

(iv) Skewness

5. (a) A sleep research institute claims that a newly

developed herbal supplement reduces insomnia, allowing patients to fall asleep in an average of 25 minutes with a standard deviation of 4 minutes.

To test this claim, a study is conducted on 8 randomly selected individuals, and their recorded sleep onset times (in minutes) are:

28, 22, 27, 30, 26, 24, 29, 23

Using an appropriate hypothesis test, determine whether the institute's claim is valid at a 5% level of significance.

(b) In a medical study on hypertension, there are 250 participants, consisting of 150 individuals with a sedentary lifestyle and 100 individuals with an active lifestyle. It is observed that 60 sedentary individuals and 20 active individuals have high blood pressure.