



14051

**BRAINWARE UNIVERSITY****Term End Examination 2024-2025****Programme – B.Pharm-2021****Course Name – Biostatistics and Research Methodology - Theory****Course Code - BP801T****(Semester VIII)**

Library

Pharmaceutical Technology
Brainware University
Barasat, Kolkata-700125**Full Marks : 75****Time : 3:0 Hours**

[The figure in the margin indicates full marks. Candidates are required to give their answers in their own words as far as practicable.]

Group-A

(Multiple Choice Type Question)

1 x 20=20

1. Choose the correct alternative from the following :

- (i) The probability of any event is defined as the number of the favourable events divided by the number of events in the sample space. Sample space is defined as _____. Select the correct option.
- a) Even number of outcomes b) Odd number of outcomes
c) All possible outcomes of an experiment d) None of these
- (ii) If two events are independent, then _____. Select the correct option.
- a) they must be mutually exclusive b) the sum of their probabilities must be equal to one
c) their intersection probability must be zero d) None of these
- (iii) Getting a tail in a biased coin where both sides are heads is _____. Select the correct option.
- a) Sure event b) Impossible event
c) Both sure and impossible event d) None of these
- (iv) Select the option that cannot represent the probability of an event.
- a) 0 b) 1
c) -1 d) $\frac{1}{3}$
- (v) In simple linear regression, the number of independent variables involved are _____. Select the correct option.
- a) 1 b) 2

- c) Control groups are irrelevant in experimental research
- d) Control groups are assigned more variables than the experimental group
- (xvi) Choose the option that is considered research misconduct.
- a) Citing a source correctly
- b) Fabricating data to support a hypothesis
- c) Collaborating with colleagues on a project
- d) Reviewing articles for publication
- (xvii) Choose the graph that is best suited for showing the proportion of different categories in a whole.
- a) Response surface plot
- b) Pie chart
- c) Cubic graph
- d) Counter plot graph
- (xviii) Choose the type of graph that typically displays the relationship between three continuous variables and can be used to visualize optimization in response surface methodology.
- a) Histogram
- b) Response surface plot
- c) Cubic graph
- d) Counter plot graph
- (xix) Choose the graph that is used to represent a mathematical relationship in the form of a cubic function, often showing complex, non-linear relationships.
- a) Pie chart
- b) Cubic graph
- c) Histogram
- d) Counter plot graph
- (xx) Choose which phase of a clinical trial focuses on assessing the safety of a new drug in a small group of healthy volunteers or patients.
- a) Phase I
- b) Phase II
- c) Phase III
- d) Phase IV

Group-B

(Short Answer Type Questions)

5 x 7=35

2. A pharmacy is comparing the consistency of two different brands of a pain reliever (Brand A and Brand B) based on their daily sales for one week. The variance of Brand A is 4 and of Brand B is 13.43. Identify the brand which shows more consistent sales, based on the variance of the daily sales data. (5)
3. A coffee lover claims that he can distinguish between a cup of instant coffee and a cup of special coffee 75% of the time. It is agreed that his claim will be accepted if he correctly identifies at least 5 of 6 cups. Examine his chances of having the claim accepted. (5)
4. Explain Protocol and Cohort Studies in research. (5)
5. If $k=3$ and the number of levels is $n_1 = 3, n_2 = 4, n_3 = 2$, compute the total number of experiments to be performed in a full factorial design. (5)

6. Consider a simple experiment where we are testing the effects of two factors on crop yield: (5)

Factor A: Fertilizer type (A_1 = Organic, A_2 = Chemical)

Factor B: Watering frequency (B_1 = Low, B_2 = High)

Write the value of k in the 2^k factorial design to be used, as well as the conditions involved.

7. In a pharmaceutical experiment, we want to optimize the dissolution rate of a drug tablet based on two factors. The results obtained are as follows: (5)

Factor A (Compression Factor)	A_1 (Low)	A_1 (Low)	A_2 (High)	A_2 (High)
Factor B (Excipient)	B_1 (Lactose)	B_2 (Starch)	B_1 (Lactose)	B_2 (Starch)
Dissolution Rate (Response)	20	30	40	50

Write a suitable polynomial equation for a 2^2 factorial design using optimization techniques and write down the set of equations that will give the values of the coefficients.

OR

Write a short note on Central Composite Design. (5)

8. Write some pharmaceutical applications of Response Surface Methodology. (5)

OR

Consider an experiment on the dissolution rate of a tablet based on two factors: (5)

Factor A: Amount of excipient (x_1), **Factor B:** Compression force (x_2)

Define the Levels as Low level (-1), High level (+1) for both factors, and the axial points as $\alpha = 2$, i.e. at ± 2 (from the centre). Write the table that shows the

experimental setup and write the equation of response surface model in Central Composite Design.

Group-C

(Long Answer Type Questions)

10 x 2=20

9. A pharmacy records the daily number of units of a pain relief medication sold over 20 days. The data is as follows: (10)

Units sold per day: 45, 47, 52, 58, 63, 65, 70, 73, 75, 80, 82, 85, 88, 90, 92, 95, 98, 100, 105, 108.

Tabulate a continuous frequency distribution for the data.

10. Write the value of test statistic t for testing of hypothesis for the slope B in simple linear regression $y=a+BX$, mentioning the null and the alternative hypothesis. Given:
 $\sum(X - \bar{X})^2 = 2000, \sum(y - \bar{y})^2 = 1698.75, \bar{X} = 90, b = 0.915, N = 4.$

OR

Write the benefits and challenges of using R in an online or cloud-based environment for large-scale clinical trial data analysis.

(10)
