Final Year B. Pharm

Semester Exam

Sem - VIII

Academic Year 2022 - 23

May 2023

8th May 2023   Sem - VIII
Semester Exam
May 2023

Time:3Hours   Marks:75

Q.1A   **Choose the correct option and write it down**   **10**

1   Which of the following diseases is caused by the deficiency of Vitamin A
   A   Rickets
   B   Kwashiorkor
   C   Pellagra
   D   Night Blindness

2   A situation where family income is inadequate to buy basic things of life is called as _____ poverty.
   A   Basic
   B   Relative
   C   Comparative
   D   Absolute

3   _____ is a broad term for cancers connective tissues.
   A   Carcinoma
   B   Sarcoma
   C   Leukemia
   D   Melanoma

4   Dengue is caused by which of the following microorganism?
   A   Flavivirus
   B   Rotavirus
   C   Poxvirus
   D   Reovirus

5   Which organization is responsible for implementing the National Leprosy Eradication Plan in India?
   A   Ministry of Health and Family Welfare
   B   World Health Organization
   C   National Leprosy Control council
   D   Indian Council of Medical Research

6   Which year was the National AIDS Control Program launched in India?
   A   1982
   B   1992
   C   2002
   D   2012

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7   NPHCE stands for :
A   National Programme for Health of Elders.
B   National Programme for Health and Care of Elders.
C   National Programme for Health of Elderly.
D   National Programme for Health Care for the Elderly.

8   Regional Office of WHO for the South East Asian Region is located in _____

A   Japan
B   Beijing
C   Colombo
D   New Delhi

9   A population of about _____ in plain areas is protected by community health services.
A   10,000
B   20,000
C   30,000
D   40,000

10   National Urban Health Mission was approved by cabinet in _____.
A   2000
B   2003
C   2010
D   2013

Q.1B   Answer the following   10
1   Define Hygiene as per WHO.
2   Explain the term Urbanization in 1 to 2 lines.
3   Define Eradication.
4   Blood pressure of _____ mm Hg indicates Hypertensive crisis.
5   Which micro-organism is the most common cause of Pneumonia in children?
6   Enlist primary objectives of the National Blindness Control Program.
7   Enlist the key strategies adopted by the National Deafness Control Program to prevent and control deafness in India.
8   Which vaccine is given for protection from Hepatitis?
9   Write one principle of Health Promoting Schools.
10   Mention one functions of PHC.

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Q.2   **Answer ANY TWO of the following**   **20**

1   Write a short note on Micronutrient deficiency.

2   Enlist the objectives of the National TB Eradication Program in India and discuss various key strategies adopted by the National TB Eradication Program to prevent and control TB in India.

3   What is Tobacco Control Act? Discuss in brief about the National Tobacco Control Programme.

Q.3   **Answer ANY SEVEN of the following**   **35**

1   Define Poverty. Explain the types of poverty. Add a note on its effect on health.

2   Define Public health. Add a note on evaluation of public health.

3   Explain how Socio-Cultural Factors affect health and disease.

4   Discuss transmission of Dengue. Discuss preventive measures to be taken for Dengue.

5   Discuss transmission of Malaria. Discuss preventive measures to be taken for Malaria.

6   Discuss steps taken by the Government of India to maintain polio free status in India.

7   Write a note on Integration and decentralization of surveillance activities adopted in Integrated disease surveillance program.

8   Explain the roles of WHO in national programmes.

9   Explain in detail Health Education Programmes in School.

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Duration: 3 Hrs   **Total marks: 75 M**

Note. : 1. All questions are compulsory
         2. Figures to right indicate full marks

Q. 1. Choose the appropriate option for the following multiple choice based questions. 1×20= 20M

1. .... responsible for the conduct of the clinical trial at a trial site.
   A. Monitor
   B. Clinical Research Coordinator
   C. Investigator
   D. Sponsor

2. OECD stands for..........
   A. Organization for Economic Co-operation and Development.
   B. Outcome economy committee development.
   C. Out entry contact dossier.
   D. Organization for Evasive Co-operation and Development.

3. ....is the regulatory body in USA.
   A. European Medicines Agency
   B. United States Food and drug administration
   C. Ministry of Health, Labour and Welfare
   D. Central Drugs Standard Control Organization

4. Pharmacovigilance programme of india started in............
   A. 2009
   B. 2005
   C. 2012
   D. 2010

5. Average time period for phase II clinical trials study is _____
   A. Upto few month
   B. Upto 4 year
   C. Upto Two year
   D. Upto several year

6. CIOMS stands for..........
   A. Council for Indian Organization of Medical Sciences
   B. Committee for International Organizations of Medical Sciences
   C. Council for Indian Organization of Medical Sector
   D. Council for International Organizations of Medical Sciences

7. Pharmacovigilance continue throughout.........
   A. Post marketing survelliance
   B. Pre and post marketing survelliance
   C. Pre marketing survelliance
   D. None of the above

8. Sulfanilamide disaster occurred in
   A. 1948
   B. 1958
   C. 1948
   D. 1938

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9. Which one of the following is the last step of a clinical trial process?
   A. Data filed and registration
   B. Patient recruitment
   C. Statistical Analysis
   D. Investigator selection

10. _____ Is the regulatory body in India.
   A. Central Drugs Standard Control Organization
   B. United States Food and drug administration
   C. European Medicines Agency
   D. Ministry of Health, Labour and Welfare

11. MSSO under MedDRA stands for..........
   A. Maximum Support Services Organization
   B. Maintenance and Support Services Organization
   C. Maintenance and Safety Support Organization
   D. Maintenance and Support Safety Organization

12. _____ is a clinically-validated international medical terminology used by regulatory authorities and the regulated biopharmaceutical industry. The terminology is used through the entire regulatory process, from premarketing to post-marketing, and for data entry, retrieval, evaluation, and presentation
   A. Causality assessment
   B. SAE report
   C. MedDRA
   D. WHO DD

13. Indian Pharmacovigilance system is regulated by –
   A. USFDA
   B. CDSCO
   C. IPC
   D. DRDO

14. UMLS, developed by the _____, is a comprehensive list of medical terms mainly focused on developing computer systems suitable for understanding the specific vocabulary which is normally used in biomedicine and health care literature.
   A. National Vocabulary of Medicine (NVM)
   B. Natural Library of Medicine (NLM)
   C. National Library of Medicine (NLM)
   D. Natural Vocabulary of Medicine (NVM)

15. In this comparative observational study, data collected on a population of patient at a single point in time (or Interval of time) regardless of exposure or disease at us...
   A. Case control study
   B. Cross sectional study
   C. Cohort study
   D. Case series

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16. This type of report is voluntary in nature that comes under passive surveillance of pharmacovigilance

    A. Spontaneous report
    B. Registries
    C. Both A and B
    D. Sentinel sites

17. Which of the following is highest level of MedDRA hierarchy

    A. System Organ Class
    B. High Level Term
    C. Preferred Term
    D. High Level Group Term

18. The Yellow card form used for spontaneous reporting in .... country.

    A. South Africa
    B. United Kingdom
    C. Japan
    D. Ethiopia

19. .... is not a probabilistic method of causality assessment?

    A. Australian method
    B. BARDI method
    C. MacBARDI Spreadsheet
    D. Naranjo scale

20. Placebo is ....

    A. Fake treatment
    B. Patients injected with placebo and active doses
    C. The subjects do not know which study treatment they receive
    D. Signed document of the recruited patient for the clinical trial procedures.

Q. 2: Answer any __TWO__ of the following   10×2= 20M
    A. Define and classify ADR, Explain detection & monitoring of ADR.
    B. Explain factors to be considered for safe use of drugs in special populations.
    C. Write a detailed note on MedDRA and its applications

Q. No. 3: Answer any __SEVEN__ of the following   5×7= 35M
    A. Explain the goals, roles and responsibilities of CRO.
    B. Write a note on ATC classification of drugs.
    C. What is Pharmacovigilance Programme of India (PvPI)?
    D. Explain in detail good clinical practices in Pharmacovigilance studies.
    E. Explain Active surveillance methods. Write any two advantages and disadvantages of it.
    F. Write a note on ICSR & PSUR.
    G. What is the organization and objective of ICH guidelines in Pharmacovigilance?
    H. Write a detailed note on CIOMS working group.
    I. Explain the causes of vaccine failure.

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Sem - VIII
Semester Exam 2023
May 2023

Duration: 3 Hours

Total marks: 75

N.B.: 1. All questions are compulsory
2. Figures to the right indicate full marks.

Q.No.	Question	Marks
Q.I	**Multiple Choice Questions (Answer all):**	20

1 The term 'cosmeceuticals' is _____   1
a) Official in USFDA
b) Official in U.S.P
c) Official in I.P.
d) Unofficial term

2 Quasi drugs must be manufactured under _____ conditions   1
a) Non-sterile
b) cGMP
c) Open conditions
d) Sterile

3 _____ is the preservative used in cosmetics   1
a) Stearic acid
b) Benzoic acid
c) Lauric acid
d) Oleic acid

4 _____ are used to increase viscosity of the cosmetic products.   1
a) Humectants
b) Preservatives
c) Rheology Modifiers
d) Surfactants

5 The uppermost layer of epidermis is called _____.   1
a) Stratum spinosum
b) Stratum granulosum
c) Stratum corneum
d) Stratum germinativum

6 All are stages of human hair growth except   1
a) Anagen
b) Catagen
c) Telogen
d) Spinogen

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7   Nonionic surfactants are not preferred in shampoos due to
   a) high viscosity
   b) inferior foaming properties
   c) high pH
   d) irritation to skin and eyes

8   Hydrogen Peroxide is used in a concentration of ____ to develop colour of oxidation hair dyes
   a) 15%
   b) 5-6%
   c) 50-60%
   d) 1%

9   UVA sunscreen
   a) Titanium dioxide
   b) Cinnamate
   c) Avobenzone
   d) Salicylate

10 Lawsone is present in
   a) Henna
   b) Neem
   c) Amla
   d) Aloe

11 Hair combing testing include all except
   a) Texture analysis
   b) Hair combing rig
   c) Wet combability
   d) Single hair stand

12 Corneometer is used for
   a) Sweat studies
   b) Invitro studies of skin permeability
   c) Skin roughness studies
   d) determining hydration levels of stratum corneum

13 The following are properties of syndet bar soap, except
   a) Expensive
   b) Neutral in pH
   c) Low in colour
   d) Vegetable based

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14 According to Fitzpatrick, Olive skin that rarely burns and always tans is   1
a) skin type I
b) skin type II
c) skin type III
d) skin type IV

15 Aloe is used in cosmetics for its   1
a) anti-plaque activity
b) anti-gingivitis activity
c) analgesic activity
d) anti-inflammatory activity

16 BIS Limit for heavy metal in skin cream (in ppm)   1

a) 2
b) 12
c) 20
d) 30

17 An anti-dandruff agent is   1
a) polyquarternium 10
b) benzalkonium chloride
c) zinc pyrithione
d) Chamomile

18 A comedogenic ingredient is   1
a) Glycerine
b) cocoa butter
c) hyaluronic acid
d) Tea tree oil

19 A function of the sweat glands is   1
a) production of sebum
b) formation of triglycerides
c) removal of free fatty acids
d) removal of lactic acid

20 A feature unseen with irritant contact dermatitis due to cosmetic use is   1
a) blisters
b) erythema
c) desquamation
d) inflammatory papules

QII   Answer any Two questions:
1 a   With the help of an example, explain drugs, cosmetics and cosmeceuticals.
  b   Define surfactants and classify with examples.   20
2   Explain the formulation and building blocks of a conditioning shampoo.   10
3a   Write in detail on test for thermal stability of skin creams.   5
  b   Discuss Clove in oral care cosmetic products.   5

QIII Answer any Seven questions:
1   Differentiate between occlusives and humectants. Give suitable examples.   35
2   Write a note on rheology modifiers.   5
3   What are cold creams? Discuss their composition.   5
4   Discuss the agents used to reduce teeth sensitivity.   5
5   Discuss Amla in hair care cosmetic products.   5
6   What is SPF. Write in detail on different methods to determine SPF .   5
7   Elaborate on Sebumeter and its applications.   5
8   What are 'antiperspirants'? Explain their mechanism of action.   5
9   Elaborate on the problem of dandruff.   5

Time: 3 Hrs   **Marks: 75**

Note:

1. Draw net labeled diagrams wherever applicable
2. Marks to the right indicate full marks

I.	**Multiple choice questions**	**20M**
1.	Position of signal in NMR spectrum indicates	**1M**
a.	Number of different kinds of the proton present in different environment	
b.	Electronic environment of each kind of proton	
c.	Relative number of protons of each kind	
d.	Number of neighboring proton present	
2.	Thermogravimetric analysis is used to measure _____	**1M**
a.	Change in temperature	
b.	Change in mass	
c.	Change in pressure	
d.	Change in polarity	
3.	Which of the following is used as a standard for calibration of 'limit of stray light' in UV-visible spectrophotometry	**1M**
a.	Potassium dichromate	
b.	Potassium chloride	
c.	Potassium nitrate	
d.	Potassium permanganate	
4.	Liquid-liquid extraction technique separates	**1M**
a.	analyte from interference by partitioning analyte between two immiscible solvents	
b.	analyte from interference by partitioning analyte between two miscible solvents	
c.	analyte from interference by adsorption of drug on stationary phase	
d.	analyte from interference by adsorption of drug on stationary phase followed by elution using solvent	

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5. In _____ interface, ionization of analyte takes place in solution before analyte reaches to the mass spectrometry.

    a.   Electro Spray Ionization

    b.   APPI

    c.   APCI

    d.   Thermospray

1M

6. The pressure inside a mass spectrometer is

    a.   Lower than atmospheric pressure

    b.   Higher than atmospheric pressure

    c.   Equal to atmospheric pressure

    d.   Almost nil

1M

7. DSC is very popularly used for?

    a.   Separation of compounds

    b.   Identification of functional groups

    c.   Drug-excipient compatibility studies

    d.   Determination of weight of a compound

1M

8. _____ is used as a calibration standard for IR spectrophotometry?

    a.   Polyvinyl pyrrolidone

    b.   Polystyrene

    c.   Polyvinyl alcohol

    d.   Divinyl benzene

1M

9. Which technique is used to determine drug concentration in plasma using radiolabeled reagent?

    a.   X-ray diffractometry

    b.   Radioimmunoassay

    c.   IR spectroscopy

    d.   Thermogravimetry

1M

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10. In GCMS, _____ is commonly used as carrier gas   **1M**

a. Air

b. Helium

c. Oxygen

d. Carbon dioxide

11. Effect of presence of electronegative atom near the proton under consideration reflects in NMR spectra as   **1M**

a. Deshielded proton with upfield shift

b. Deshielded proton with downfield shift

c. Shielded proton with upfield shift

d. Shielded proton with downfield shift

12. Thermal analysis is: **1M**

a. Measurement of physical & chemical properties as a function of temperature

b. Measurement of concentration of materials as a function of temperature

c. Measurement of solubility of materials as a function of temperature

d. Measurement of line positions of crystals as a function of temperature

13. As per ICH guidelines, for performing linearity, how many minimum concentrations of an analyte must be analyzed?   **1M**

a. 4

b. 5

c. 6

d. 7

14. Following are the advantages of SPE over liquid- liquid extraction except   **1M**

a. Cost effective

b. Greater recovery

c. Greater selectivity

d. Reproducible

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15. Peak corresponding to most stable ion in the mass spectrum is called
    a. Molecular ion peak
    b. Metastable peak
    c. Base peak
    d. Quasi molecular ion peak

    1M

16. Degree of crystallinity in a solid sample can be determined by?
    a. X-ray diffractometry
    b. Thermogravimetry
    c. Mass spectrometry
    d. NMR spectroscopy

    1M

17. Analytical method validation is covered under which of the following 'Quality' guidelines of ICH?
    a. Q1
    b. Q2
    c. Q3
    d. Q4

    1M

18. The number of peaks shown by isobutane in proton NMR spectrum are
    a. Four
    b. Two
    c. One
    d. Five

    1M

19. Which of the following is associated with X-ray diffractometry
    a. Retention Indices
    b. Miller's indices
    c. Precessional frequency
    d. Electron bombardment

    1M

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20. Which of the following validation parameter measures closeness of the result to the true value   **1M**

   a. LOD

   b. LOQ

   c. Accuracy

   d. Precision

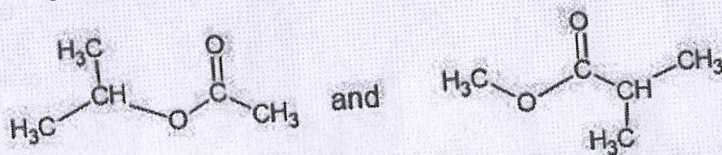II. **Long answer questions (Attempt <u>any two</u> out of three)**   **20M**

1. a. i) Define Chemical shift and give its significance.   **5M**
   ii) An organic compound with molecular formula $C_9H_{10}O_2$ exhibits the following spectral data;
   IR: 1745 cm^{-1} (s), 1225 cm^{-1} (br, s), 749 cm^{-1} (s), 697 cm^{-1} (s)
   ^{1}H-NMR (δ) = 1.96 (3H, singlet); 5.00 (2H, singlet); 7.22 (5H, singlet),
   Deduce the structure of this compound and justify your answer.

   b. Enlist any four methods of ionization in mass spectrometry. Explain a suitable method of ionization for thermolabile, polar molecules with high molecular weight.   **5M**

2. a. Explain the principle of NMR spectroscopy with reference to spinning nucleus, precessional frequency, energy transition, role of external magnetic field, internal standard and solvents used.   **5M**

   b. Mass spectrum of 1-Butanol gives peaks corresponding to 74, 56, 43 and 31 m/z values. Predict the mechanism of formation giving structure of these ions.   **5M**

3. a. Explain the concept of magnetic anisotropy with reference to alkenes and alkynes. Explain how you will distinguish between the following compounds using NMR spectroscopy.   **5M**

   b. What is the function of a mass analyzer in a mass spectrometer? Write a note on construction and working of Quadrapole mass analyzer. Enlist any two applications of Mass spectrometry.   **5M**

III. **Short answer questions (Attempt <u>any seven</u> out of nine)** 35M

1. Define the term validation as per ICH guidelines. Explain the terms: 5M
   a. LOQ   b. Specificity

2. Define 'Melting temperature'. With the help of a thermogram explain the 5M
   principle of working of DSC

3. Discuss principle involved in X-ray diffraction technique. State Bragg's law 5M
   and its equation. Describe rotating crystal technique used in X ray
   Crystallography.

4. What is the significance of DTA? Give four points of distinction between 5M
   DTA & DSC

5. Enlist the validation parameters as per ICH. Write a detailed note on how 5M
   precision is to be performed.

6. Discuss calibration of HPLC **OR** calibration of UV-visible spectrophotometer 5M
   in detail

7. Explain Principle of Radioimmunoassay. Write two advantages and 5M
   disadvantages of RIA.

8. Enlist different techniques of sample extraction. Write a note on solid phase 5M
   extraction

9. Enlist different interfaces used in GCMS. Discuss any one in detail 5M

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Paper / Subject Code: 14221 / Biostatistics and Research Methodology

Time: 3 Hours   **Marks: 75**

Q.1 Choose the appropriate option   **20 Marks**

Q.No	Description
1	Which of the following comes under descriptive statistics?

a) Non-parametric tests
b) Parametric tests
c) Frequency distribution
d) Factorial design

2. If 20 observations out of 90 belonged to a particular category, what angle would be used to plot this frequency on a pie chart?
a) 20^0
b) 90^0
c) 80^0
d) 50^0

3. In data set 15, 3, 19, 45, 12, 8, 23, 34, 40 the range is
a) 42
b) 45
c) 3
d) 9

4. If relation between a dependent variable 'a' and independent variables 'b' and 'c' is being studied, the multiple correlation co-efficient would be denoted as
a) $R_{a,b,c}$
b) R_{abc}
c) $R_{ab.c}$
d) $R_{a.bc}$

5. Correlation coefficient values can range from
a) 0 to 100
b) -1 to $+1$
c) $-\infty$ to $+\infty$
d) 0 to 1

6. In the regression model $Y = a + bx$, when $x = 2.50$, $y = 5.50$. If $a = 1.50$, the regression coefficient, b, will have the value
a) 1.75
b) 1.6
c) 2.5
d) 2

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7. In a Binomial Distribution, if 'n' is the number of trials and 'p' is the probability of success, then the mean value is given by _____.
   a) n
   b) p
   c) np
   d) $np(1-p)$

8. Suppose a Poisson probability distribution with $\lambda = 5.1$ provides a good approximation of the distribution of a random variable x. Find σ for x.
   a) 5.1
   b) 1/5.1
   c) -5.1
   d) $\sqrt{5.1}$

9. Power of a hypothesis test is
   a) α
   b) β
   c) $1-\alpha$
   d) $1-\beta$

10. Which of the following statistical tables is used for performing ANOVA
    a) F distribution
    b) t distribution
    c) Standard normal distribution
    d) Chi square distribution

11. Man-Whitney U test is the nonparametric equivalent of
    a) One way ANOVA
    b) Paired t test
    c) Two-way ANOVA
    d) Two independent samples t test

12. The Kruskal Wallis is a test is the non-parametric test alternative to _____.
    a) Z test
    b) One-way ANOVA
    c) Two-way ANOVA
    d) t-test

13. Which one of the undermentioned diagrams is three dimensional?
    a) Histogram
    b) Pie chart
    c) Surface response plot
    d) Contour plot

14. In data set 15, 3, 19, 45, 12, 8, 23, 34, 40 the median is
    a) 12
    b) 19
    c) 23
    d) 8

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15. Out of the following, what sample size would be associated with Phase I of a clinical trial
   a) 300 - 3000
   b) Less than 20
   c) 20 - 80
   d) More than 3000

16. The factorial design provides an opportunity to study the _____ of two treatment variables.
   a) Combined effect
   b) Separate effect
   c) Joint effect
   d) Interaction effect

17. A multiple regression model has_____
   a) Only one Independent Variable
   b) More than one Dependent Variable
   c) More than one Independent Variable
   d) One Dependent variable.

18. Which of the following is an example of experiential design?
   a) Virtual reality
   b) Crossover design
   c) Case control study
   d) Factorial design

19. In a 3 factors, 2 levels design, the number of main effects studied would be
   a) 3
   b) 8
   c) 4
   d) 2

20. Central Composite Design is used in _____.
   a) Control groups.
   b) Formulation of Pharmaceuticals.
   c) Transportation of Pharmaceuticals.
   d) Selection of API.

Q II   **Answer the following (Any 2)**

1A   In a study of physical endurance levels of male college freshman, the following composite   **(5 marks)**
endurance scores based on several exercise routines were collected

202 233 280 262 248 286 226 292 224 254
260 255 259 240 219 237 282 276 265 248
258 247 237 259 238 257 257 289 252 300
243 239 241 282 229 205 285 234 253 224
289 260 233 244 238 247 277 207 294 254
295 247 234 271 214 211 218 252 252 272
256 253 241 260 295 238 245 239 213 244
270 263 270 236 263

For the above data
i. Construct a frequency distribution table
ii. Calculate the mean

1B   The times in minutes for 50% dissolution of tablets drawn from three different batches   **(5 marks)**
are given below

Batch I	Batch II	Batch III
15	17	13
18	18	10
19	24	16
21	20	11

Is there a significant difference between the three batches in terms of dissolution time.

2A   A new approach to prenatal care is proposed for pregnant women living in a rural   **(5 marks)**
community. The new program involves inhome visits during the course of pregnancy in
addition to the usual or regularly scheduled visits. A pilot randomized trial with 15
pregnant women is designed to evaluate whether women who participate in the program
deliver healthier babies than women receiving usual care. The outcome is the APGAR
scores measured 5 minutes after birth. The data are shown below. (MW)

Usual Care   8   7   6   2   5   8   7   3
New Program   9   9   7   8   10   9   6

Is there statistical evidence of a difference in APGAR scores in women receiving the new
and enhanced versus usual prenatal care? Decide by applying Mann – Whitney U test.
The critical U value is 10.

2B   Which are the different types of research study designs? Write a note on cohort studies.
3A   What is plagiarism? How can it be controlled?   **(5 marks)**
3B   The mean drug content in a sample of 9 tablets was found to be 256mg. The standard   **(2.5 marks)**
deviation was 3.4mg. Is there sufficient evidence in support of the label claim of 250mg   **(2.5 marks)**
of drug per tablet? Test at 5% level of significance.
3C   Given below are the ages of persons and their systolic blood pressures.

   (5 marks)

Age in years	Blood pressure
20	120
43	128
46	128
53	136
63	141
26	126

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Calculate the correlation co-efficient. Generate the linear regression equation and estimate the blood pressure of a 40-year-old individual.

QIII Answer the following (Any 7)

1A If the mean and standard deviation of the potency of a batch of tablets are 50mg and 5 mg respectively. Assuming that the distribution is normal, what proportion of the tablets have potency (2.5 marks)
less than 45mg
between 40mg and 60mg

1B A drug is found to cure 60% of patients. If it is administered to 6 patients, what is the probability that- (2.5 marks)
Exactly 3 patients are cured
At least 1 patient is cured

2 What is the difference between simple and multiple regression? What are the null and alternate hypotheses in hypothesis testing in simple and multiple regression? Enlist the steps in this hypothesis test. (5 marks)

3 Explain the term response surface methodology. Give two points of difference between factorial design and central composite design. What is the meaning of historical design? (5 marks)

4 To know if the median reaction times of subjects is different for three different drugs, a clinical study was undertaken and the results are given below. With the help of Friedman test, state if there is a difference in the mean reaction time. $\chi^2_{critical} = 6.4$ (5 marks)

Patient number	Reaction time in minutes		
	Drug 1	Drug 2	Drug 3
1	4	5	2
2	6	6	4
3	3	8	4
4	4	7	3
5	3	7	2

5 What are factorial designs? Give one advantage of factorial designs. Discuss the number and design of experiments to be performed in a 2^3 factorial design. (5 marks)

6 The following are the ages of 10 patients admitted in a hospital (5 marks)
35, 82, 21, 43, 39, 62, 36, 12, 74, 45, 87, 53
Calculate the standard deviation and standard error of the mean

7 6 patients were administered and experimental drug. Given below are the levels of blood protein, in g/100ml, before and after treatment. (5 marks)

Patient	Plasma Protein	
	Before Treatment	After Treatment
1	8.1	9
2	9.4	9.9
3	7.2	8
4	8.6	8.2
5	6.6	7.9
6	7.7	8.8

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Test whether there was a significant difference in blood protein before and after the treatment. ($\alpha = 0.05$)

8   What is blocking? When is it used in experimental design? What is confounding in two   (5 marks)
     level factorial design? If low and high levels of two excipients (ethyl cellulose and talc)
     are to be studied for their effect on disintegration time of tablets and if the excipients are
     to be sourced from two batches, how would you perform the blocking and confounding
     so that the main effects are not confounded?

9   Explain the terms response surface plots and contour plots. Enlist statistical software and   (5 marks)
     give the salient points of any one software.

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t Table

cum. prob	$t_{.50}$	$t_{.75}$	$t_{.80}$	$t_{.85}$	$t_{.90}$	$t_{.95}$	$t_{.975}$	$t_{.99}$
one-tail	0.50	0.25	0.20	0.15	0.10	0.05	0.025	0.01
two-tails	1.00	0.50	0.40	0.30	0.20	0.10	0.05	0.02
df								
1	0.000	1.000	1.376	1.963	3.078	6.314	12.71	31.82
2	0.000	0.816	1.061	1.386	1.886	2.920	4.303	6.965
3	0.000	0.765	0.978	1.250	1.638	2.353	3.182	4.541
4	0.000	0.741	0.941	1.190	1.533	2.132	2.776	3.747
5	0.000	0.727	0.920	1.156	1.476	2.015	2.571	3.365
6	0.000	0.718	0.906	1.134	1.440	1.943	2.447	3.143
7	0.000	0.711	0.896	1.119	1.415	1.895	2.365	2.998
8	0.000	0.706	0.889	1.108	1.397	1.860	2.306	2.896
9	0.000	0.703	0.883	1.100	1.383	1.833	2.262	2.821
10	0.000	0.700	0.879	1.093	1.372	1.812	2.228	2.764
11	0.000	0.697	0.876	1.088	1.363	1.796	2.201	2.718
12	0.000	0.695	0.873	1.083	1.356	1.782	2.179	2.681
13	0.000	0.694	0.870	1.079	1.350	1.771	2.160	2.650
14	0.000	0.692	0.868	1.076	1.345	1.761	2.145	2.624
15	0.000	0.691	0.866	1.074	1.341	1.753	2.131	2.602
16	0.000	0.690	0.865	1.071	1.337	1.746	2.120	2.583
17	0.000	0.689	0.863	1.069	1.333	1.740	2.110	2.567
18	0.000	0.688	0.862	1.067	1.330	1.734	2.101	2.552
19	0.000	0.688	0.861	1.066	1.328	1.729	2.093	2.539
20	0.000	0.687	0.860	1.064	1.325	1.725	2.086	2.528

F table (5% significance)

V1	V2 1	2	3	4	5
1	39.86	49.50	53.59	55.83	57.24
2	8.53	9.00	9.16	9.24	9.29
3	5.54	5.46	5.39	5.34	5.31
4	4.54	4.32	4.19	4.11	4.05
5	4.06	3.78	3.62	3.52	3.45
6	3.78	3.46	3.29	3.18	3.11
7	3.59	3.26	3.07	2.96	2.88
8	3.46	3.11	2.92	2.81	2.73
9	3.36	3.01	2.81	2.69	2.61
10	3.29	2.92	2.73	2.61	2.52
11	3.23	2.86	2.66	2.54	2.45
12	3.18	2.81	2.61	2.48	2.39
13	3.14	2.76	2.56	2.43	2.35
14	3.10	2.73	2.52	2.39	2.31
15	3.07	2.70	2.49	2.36	2.27
16	3.05	2.67	2.46	2.33	2.24
17	3.03	2.64	2.44	2.31	2.22
18	3.01	2.62	2.42	2.29	2.20
19	2.99	2.61	2.40	2.27	2.18

Standard normal distribution table

	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.5000	0.5040	0.5080	0.5120	0.5160	0.5199	0.5239	0.5279	0.5319	0.5359
0.1	0.5398	0.5438	0.5478	0.5517	0.5557	0.5596	0.5636	0.5675	0.5714	0.5753
0.2	0.5793	0.5832	0.5871	0.5910	0.5948	0.5987	0.6026	0.6064	0.6103	0.6141
0.3	0.6179	0.6217	0.6255	0.6293	0.6331	0.6368	0.6406	0.6443	0.6480	0.6517
0.4	0.6554	0.6591	0.6628	0.6664	0.6700	0.6736	0.6772	0.6808	0.6844	0.6879
0.5	0.6915	0.6950	0.6985	0.7019	0.7054	0.7088	0.7123	0.7157	0.7190	0.7224
0.6	0.7257	0.7291	0.7324	0.7357	0.7389	0.7422	0.7454	0.7486	0.7517	0.7549
0.7	0.7580	0.7611	0.7642	0.7673	0.7704	0.7734	0.7764	0.7794	0.7823	0.7852
0.8	0.7881	0.7910	0.7939	0.7967	0.7995	0.8023	0.8051	0.8078	0.8106	0.8133
0.9	0.8159	0.8186	0.8212	0.8238	0.8264	0.8289	0.8315	0.8340	0.8365	0.8389
1.0	0.8413	0.8438	0.8461	0.8485	0.8508	0.8531	0.8554	0.8577	0.8599	0.8621
1.1	0.8643	0.8665	0.8686	0.8708	0.8729	0.8749	0.8770	0.8790	0.8810	0.8830
1.2	0.8849	0.8869	0.8888	0.8907	0.8925	0.8944	0.8962	0.8980	0.8997	0.9015
1.3	0.9032	0.9049	0.9066	0.9082	0.9099	0.9115	0.9131	0.9147	0.9162	0.9177
1.4	0.9192	0.9207	0.9222	0.9236	0.9251	0.9265	0.9279	0.9292	0.9306	0.9319
1.5	0.9332	0.9345	0.9357	0.9370	0.9382	0.9394	0.9406	0.9418	0.9429	0.9441
1.6	0.9452	0.9463	0.9474	0.9484	0.9495	0.9505	0.9515	0.9525	0.9535	0.9545
1.7	0.9554	0.9564	0.9573	0.9582	0.9591	0.9599	0.9608	0.9616	0.9625	0.9633
1.8	0.9641	0.9649	0.9656	0.9664	0.9671	0.9678	0.9686	0.9693	0.9699	0.9706
1.9	0.9713	0.9719	0.9726	0.9732	0.9738	0.9744	0.9750	0.9756	0.9761	0.9767
2.0	0.9772	0.9778	0.9783	0.9788	0.9793	0.9798	0.9803	0.9808	0.9812	0.9817
2.1	0.9821	0.9826	0.9830	0.9834	0.9838	0.9842	0.9846	0.9850	0.9854	0.9857
2.2	0.9861	0.9864	0.9868	0.9871	0.9875	0.9878	0.9881	0.9884	0.9887	0.9890
2.3	0.9893	0.9896	0.9898	0.9901	0.9904	0.9906	0.9909	0.9911	0.9913	0.9916
2.4	0.9918	0.9920	0.9922	0.9925	0.9927	0.9929	0.9931	0.9932	0.9934	0.9936
2.5	0.9938	0.9940	0.9941	0.9943	0.9945	0.9946	0.9948	0.9949	0.9951	0.9952

Cumulative Probability

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