

**COCHIN UNIVERSITY OF SCIENCE AND TECHNOLOGY**

**CENTRE FOR INTEGRATED STUDIES**

**Semester Examination - I**

**23-358-0104- LABORATORY QUALITY MANAGEMENT, RESEARCH METHODOLOGY  
AND STATISTICS**

**Course- M.Sc. (Forensic Science)**

**Max Marks: 50**

**Paper Code- 23-358-0104**

**Time: 3 hours**

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**SECTION A**

**Answer any 10 questions                          (2 x 10 = 20 marks)**

1. What is ISO and why it is needed? Name its popular standards?
2. If you are working in a medical lab facility and you are drawing blood sample from a patient. What phase of the lab, are you performing and discuss the other phases of clinical laboratory processes?
3. Briefly explain the quality standard that gives the general requirements for the competence of testing/medical laboratories?
4. What is meant by calibration and standardization? Why is calibration of measuring instruments important?
5. What is a research problem? What are the steps involved in defining a research problem?
6. Define
  - a) Patent
  - b) Trademark
  - c) Geographical Indications
  - d) Literature review
7. What is accreditation and accreditation bodies? Detail the accreditation hierarchy?
8. What precautions should be taken
  - a) Before the lab work
  - b) While working in the lab
  - c) Before leaving the lab

9. What are SOPs? Outline its contents with examples?

10. Calculate the confidence interval of the sample below:

1001, 1003, 998, ~~992, 991, 994, 1002, 999, 986, 996, 997, 988, 1005, 995~~

(Use a Confidence level of 95%)

11. The probability that a foreign visitor to California's Central Valley will visit Sequoia Park is 0.15, and the probability that a foreign visitor will visit Yosemite is 0.22. The probability that the foreign visitor visits both Sequoia Park and Yosemite is 0.08. Find the probability that a foreign visitor to California's Central Valley will visit Sequoia Park or Yosemite?

## SECTION B

**Answer any 6 Questions (5 x 6 = 30 marks)**

12. What is sampling? And discuss sampling designs. Differentiate between population and sample?

13. What is Hypothesis and what is the role of hypothesis in Research? Discuss its types?  
How will you formulate hypothesis in research?

14. Enumerate the methods by which you can quantify the amount or concentration of an unknown in a solution?

15. What is QMS? Briefly explain the 12 elements of QMS?

16. Describe in detail about Proficiency Testing process including its benefits and types?

17. Explain LIMS including its components, types, functions and key benefits?

18. A U.S. magazine, Consumer Reports, carried out a survey of the calorie and sodium content of a number of different brands of hotdog. There were three types of hotdogs: beef, meat (mainly pork and beef but can contain up to 15% poultry) and poultry.

The results below are the calorie content of the different brands of beef and poultry hotdogs.

Beef hotdogs: 186, 181, 176, 149, 184, 190, 158, 139, 175, 148, 152, 111, 141, 153, 190, 157, 131, 149, 135, 132

Poultry hotdogs: 129, 132, 102, 106, 94, 102, 87, 99, 170, 113, 135, 142, 86, 143, 152, 146, 144

Carry out the appropriate t-test and interpret your findings.

19. A researcher wishes to see whether there is any difference in the weight gains of athletes following one of three special diets. Athletes are randomly assigned to three groups and placed on the diet for 6 weeks. The weight gains (in pounds) are given. Assume weight gains are normally distributed and the variances are equal. At a 0.05 significance level, can the researcher conclude that there is a difference in the diets? Substantiate with a one-way ANOVA test.

Diet A: 3, 6, 7, 4

Diet B: 10, 12, 11, 14, 8, 6

Diet C: 8, 3, 2, 5

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620 - 0.05  
700 - 0.02

**COCHIN UNIVERSITY OF SCIENCE AND TECHNOLOGY**

**CENTRE FOR INTEGRATED STUDIES**

**23-358-0106-LABORATORY- INSTRUMENTAL TECHNIQUES, RESEARCH  
METHODOLOGY AND STATISTICS**

**Course- M.Sc. (Forensic Science)**

**Max Marks: 75**

**Paper Code- 23-358-0106**

**Time: 4 hours**

**SECTION A**

**(5 x 6 = 30)**

**Each question carries 6 marks.**

1. Using M S Excel, find the equation of the line and  $R^2$  value of your calibration curve for the Beer-Lambert Law?

(Use data from Que no.7)

2. Perform Thin Layer Chromatographic Examination of the given sample.  
(Drug/Explosive sample)

3. Using the following girth at breast height data (cm) of trees of evergreen and deciduous forests construct box plots for the two habitats.

Habitat	Sp1	Sp2	Sp3	Sp4	Sp5	Sp6	Sp7
Evergreen	71	14	32	33	56	51	15
Deciduous	12	23	25	25	24	32	4

4. Extract the pollen from the given flower, mount it on a microscopic slide and note down its forensic significance.

5. Determine the pH of the given body fluid sample.

**SECTION B**

**(2 x 15 = 30)**

**Each question carries 15 marks.**

6. You want to test whether a new medicine is more effective in reducing blood pressure than the current one. You do an experiment on some patients, with group 1 using the current treatment while the second group is treated with the novel drug.

After three months of consuming the drugs, the amount of reduced blood pressure for the 2 groups is:

Group 1 (Old treatment)	5,3,6,5,4,7,6,4,5,6,2,5
Group 2 (New drug administered)	8,11,7,9,10,8,6,9,10,8,7,9,5

Based on the data given, answer the following questions.

- a Which is the appropriate t-test for the hypothesis testing of this data? (0.5)
- b Formulate the null hypothesis and alternate hypothesis for the study. (2)
- c Find the Standard deviation and Variances for the two groups. (2)
- d Give the mathematical equation for  $t_{STAT}$ . (0.5)
- e What is your computed t value? (1)
- f What probability level would you choose? (1)
- g What is your  $t_{CRIT}$  from t-distribution table? (1)
- h How will you calculate the degrees of freedom? Write down your computed value. (2)
- i Is there a significant difference between the two groups? (1)
- j Interpret your answer. (2)
- k What is the 95% CI interval for mean of the two categories? (2)

7. Estimate the concentration of the unknown sample using UV-Visible Spectrophotometer.

### SECTION C

- 8. Identify the following (Each question carries 3 marks.) (4 x 3 = 12)
- 9. Write down the analysis of cannabis sativa / petroleum products using GCMS. (3)

5.9 : 5 odmrs  
6 : 8 odmrs  
0.0 : p odmrs

# **COCHIN UNIVERSITY OF SCIENCE AND TECHNOLOGY**

## **CENTER FOR INTEGRATED STUDIES**

### **SEMESTER EXAMINATION-I**

**23-358-0101 – FUNDAMENTALS OF FORENSIC SCIENCE, CRIMINAL LAWS  
AND PSYCHOLOGY**

**Course- M.Sc. (Forensic Science)**

**Max Marks: 50**

**Paper code: 23-358-0101**

**Time: 3 hours**

#### **SECTION A**

**Answer any 10 Questions (2x10=20marks)**

1. Differentiate between medical insanity and legal insanity.
2. Describe the hierarchy of courts in India.
3. Write on a) modus operandi b) corpus delicti c) chain of custody d) portrait parle
4. Comment on impulsive control stress disorder.
5. Elucidate the Role of Forensic psychologist.
6. Differentiate between Probation and parole.
7. How does a forensic scientist become admissible in the court of law?
8. Define a) delusion b) illusion c) hallucination d) delirium
9. Clarify a) Cognizable and non-cognizable case b) bailable and non bailable offence.
10. Differentiate between dying declaration and dying deposition.
11. Elaborate NDPS act.
12. Write on fundamental rights and duties.

#### **SECTION B**

**Answer any 6 Questions (5x6=30marks)**

13. Define crime and what are the theories and schools of criminology? (3)
14. A 17 year old boy raped 16 year old girl B. The medical examinations of both were done immediately after the incident was reported. What are the procedures should be followed from crime scene to court verdict?
15. FIR makes criminal law in motion Justify the statement with case laws.
16. “3<sup>rd</sup> degree interrogative techniques can be replaced with scientific techniques” support your answer.



**COCHIN UNIVERSITY OF SCIENCE AND TECHNOLOGY**

**CENTER FOR INTEGRATED STUDIES**

**SEMESTER EXAMINATION-I**

**23-358-0102 – CRIME SCENE INVESTIGATION, CRIME SCENE MANAGEMENT  
AND CRIME SCENE RECONSTRUCTION**

**Course- M.Sc. (Forensic Science)**

**Max Marks: 50**

**Paper code: 23-358-0102**

**Time: 3 hours**

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**SECTION A**

**Answer any 10 Questions (2x10=20marks)**

1. Comment on Frye case and Daubert standard.
2. Classify evidences with proper examples.
3. Describe the crime scene searching methods.
4. Write the duties of first responder in a crime scene.
5. Why the protection of crime scene is very much important?
6. Name the personals may present at the crime scene and describe their role.
7. “Personal safety is as much important as crime scene safety” justify.
8. Give two examples of advanced crime scene kits being used.
9. What are the digitals aids used on CSR?
10. Discuss about the risks associated with BPA
11. Demonstrate various filters used in forensic photography
12. Define
  - a) Photomicrography
  - b) Clandestine photography
  - c) Photogrammetry
  - d) Juxtaposition

**SECTION B**

**Answer any 6 Questions (5x6=30marks)**

13. Explain the SOP for the collection, packing, preservation and forwarding of evidence from different nature.
14. Narrate a case study and prepare forwarding note.
15. Demonstrate various crime scenes with proper examples.

✓ 16. List out the evidences should be collected from the given crime scene

- a) HBT
- b) Drowning
- c) Hanging
- d) Hit and run
- e) Arson

✓ 17. Provide a detailed account on the elements of crime scene management.

✓ 18. Demonstrate the steps involved in CSR.

✓ 19. Explain in detail about the factors affecting blood pattern formation from capillary to the target surface.

✓ 20. Discuss various forensic photographic techniques used in crime scene and FSLs.

**23-358-0104- LABORATORY QUALITY MANAGEMENT, RESEARCH  
METHODOLOGY AND STATISTICS**

**Second Internal Examination**

**Marks: 35**

**Time: 2h**

**SECTION A (5x 2 = 10 Marks)**

**Answer any two questions (each question carries 5M)**

1. Briefly explain the 12 Quality System essentials needed for a QMS?
2. Describe in detail ISO and its popular standards?
- ✓ Sampling of crimes committed after alcohol consumption, among four age groups, counted 1600 cases in a test. Following numbers were observed in each of the four age groups.

Age group	20-30	30-40	40-50	50-60
Number of cases	441	404	402	353

Could it be that the age groups are equally likely? Or are the discrepancies too much to be random? Carry out appropriate hypothesis testing for the above sample and reach a conclusion.

- ✓ 4. A researcher wishes to try three different techniques to lower the blood pressure of individuals diagnosed with high blood pressure. The subjects are randomly assigned to three groups; the first group takes medication, the second group exercises, and the third group follows a special diet. After four weeks, the reduction in each person's blood pressure is recorded. Assume that the data in each group is approximately normal. Is there a significant difference between the techniques used to lower blood pressure, at  $\alpha=0.05$ ? Substantiate your answer by carrying out a hypothesis test of one-way ANOVA.

Memory Drug	Placebo	No treatment
70	37	3
77	43	10
83	50	17
90	57	23
97	63	30

**SECTION B (2 x 7 = 14 Marks)**

**All Questions are Compulsory (each question carries 2M)**

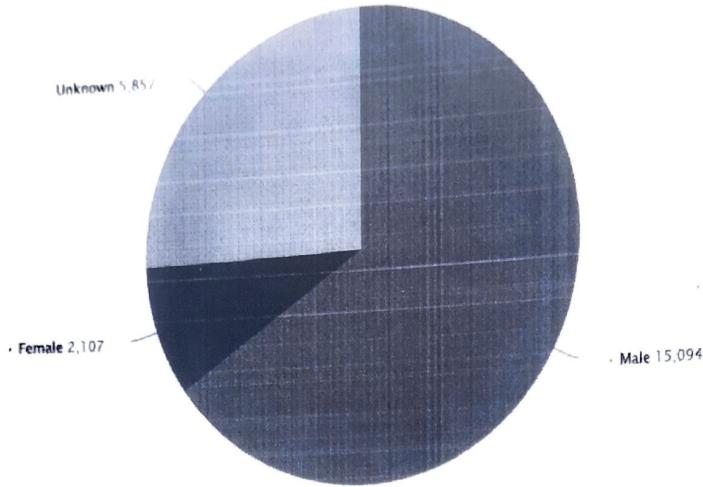
*Management  
Quality Control  
Proficiency Testing*

of quality management in a laboratory?

d for proficiency testing in a laboratory?

between accreditation, certification and licensing?

8. What is the ISO standard for forensic testing laboratory accreditation? Elaborate?
9. Given below is a pie diagram of number of murder offenders (by gender in India in the year 2022). Find the z-scores of each category.



10. Given below is the data of people suffering from throat cancer due to tobacco intake in a random sample.

~~45, 58, 50, 47, 55, 60, 40, 43, 50, 55, 40, 43, 48, 46, 56, 46~~

Construct a box plot by calculating the median and interquartile ranges.

11. The probability that Joe will get an A on the statistics exam is

0.25, and the probability that he will get a B is 0.35. Find the probability that Joe gets a B or better on the statistics exam.

### SECTION C (22 x 0.5 = 11 Marks)

**All Questions are Compulsory (each question carries 0.5 M)**

1. A successful quality strategy features which of the following elements?

- a. An organizational culture that fosters quality
- b. An understanding of the principles of quality
- c. Engaging employees in the necessary activities to implement quality
- d. a and c
- e. a, b, and c

2. A distinguishing feature of the total quality management approach is

- a. Attention to rewards
- b. Development of problem solving skills
- c. The improvement of processes
- d. Training

3. Choose whether the statement is true or false "Implementing a Laboratory Quality Management System (LQMS) is aimed at ensuring laboratory personnel safety & health in calibration and testing laboratories".

- a. True
- b. False

- a. Proficiency testing b. Rechecking or retesting c. On-site evaluation d. All of these

14. Match the following

List I

List II

ISO 9000 family Requirements for the competence of testing & calibration laboratories

ISO 14000 family Quality management

ISO 17000 family Environmental management

ISO/IEC 17025 Conformity assessment

15. Interval and ratio scale belong to which type of data?

- a) Categorical data b) Numerical data c) Nominal data d) Qualitative data

16. What is the p-value of statistical significance for a 95% confidence level?

- a) 0.01 b) 0.05 c) 0.5 d) 0.15

17. Find the arithmetic mean of the following data

32, 27, 30, 41, 29, 38, 34

- a) 32 b) 231 c) 43 d) 33

18. The degree of flatness or peakiness in the region about the mode of a frequency curve is:

- a) Kurtosis b) Skewness c) Quartiles d) Mode

19. In a garden pea, yellow cotyledon colour is dominant to green, and inflated pod shape is dominant to the constricted form. The progenies were obtained by self-fertilization. Which test would be appropriate to check whether the genes assort independently or not?

- a) One way- ANOVA b) Paired t-test c) Chi square analysis d) z test

20. Which of the following is a number that describes a characteristic of a sample?

- a) Parameter b) Categories c) Statistic d) Data

21. When do we reject  $H_0$  in ANOVA?

- a) If  $F_{CRIT}$  is less than  $F_{STAT}$   
b) If  $F_{CRIT}$  is greater than  $F_{STAT}$   
c) If  $F_{STAT}$  and  $F_{CRIT}$  are equal  
d) If  $F_{STAT}$  is greater than  $F_{CRIT}$

22. If a given condition restricts the sample space, it is called:

- a) Classical probability b) Restrictional probability c) Computational probability  
d) Conditional probability



**SECOND INTERNAL**

**Time: 2 hrs**

**Final Mark=35**

**MULTIPLE CHOICE QUESTIONS**

**20 X 0.5= 10**

1. IR spectroscopy is useful for determining certain aspects of the structure of organic compounds because \_\_\_\_\_

- (A) Most organic functional groups absorb in characteristic region of IR spectrum
- (B) IR peak intensities are related to molecular mass
- (C) All molecular bonds absorb IR radiation
- (D) Each element absorbs at a characteristic wave length

2. The source of radiation used in Raman spectroscopy is \_\_\_\_\_

- (A) Tungsten lamp
- (B) Hollow cathode lamp
- (C) Deutrium lamp
- (D) Junable mercury-neon laser lamp

3. The plasma in ICP-AES consists of :

- (A) Positive ions only
- (B) Electrons only
- (C) Neutral molecules only
- (D) Electrons, positive ions and neutral molecules

4. Absorption spectra is a plot of

- (A) Absorbance Vs Concentration
- (B) Absorbance Vs wavelength
- (C) % T Vs Wavelength
- (D) % T Vs Concentration

5. The compartment which contains hollow cathode lamp is filled with \_\_\_\_\_ in atomic absorption spectroscopy.

- (A) Ar gas
- (B) HCl gas
- (C) HNO<sub>3</sub> vapours
- (D) Cl<sub>2</sub> gas

6. In hollow cathode lamp of atomic absorption spectroscopy, the cathode is made up of / coated with \_\_\_\_\_

- (A) Graphene
- (B) multiwalled carbon nanotube
- (C) carbon black
- (D) same as analyte element of interest

7. Choose the correct sequence of process during Atomization in atomic absorption spectroscopy

- (A) Desolvation – Nebulization – Dissociation – Volatilization – Ionization ion
- (B) Nebulization – Desolvation – Volatilization – Dissociation – Ionization ion

**MULTIPLE CHOICE QUESTIONS****20 X 0.5= 10**

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2. The source of radiation used in Raman spectroscopy is \_\_\_\_\_

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- (B) Hollow cathode lamp
- (C) Deutrium lamp
- (D) Junable mercury-neon laser lamp

3. The plasma in ICP-AES consists of :

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- (C) Neutral molecules only
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- (C)  $\text{HNO}_3$  vapours
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- (B) Nebulization – Desolvation – Volatilization – Dissociation – Ionization ion

(C) Desolvation – Nebulization – Volatilization – Dissociation – Ionization ion  
(D) Nebulization – Volatilization – Desolvation – Dissociation – Ionization

8. The possible transitions for water molecule in UV-visible region are

(A)  $\sigma \rightarrow \sigma^*$       (B)  $n \rightarrow \pi^*$ ,  $\pi \rightarrow \pi^*$       (C)  $\sigma \rightarrow \sigma^*$ ,  $n \rightarrow \pi^*$       (D)  $n \rightarrow \sigma^*$

9. In phototube, photo multiplier tube, the transmitted light from the cells produces photocurrent by falling on

(A) Photocathode    (B) Photoanode    (C) Metal junction    (D) Metal layer

10. Which of the following statements is incorrect?

(A) Taq polymerase is the polymerase,      (B) Double-stranded DNA is the template,  
(C) Oligonucleotides are the primers,      (D) 5' to 3' is the direction of synthesis.

2<sup>n</sup>  
2<sup>n</sup>  
2<sup>n</sup>  
2<sup>n</sup>  
2<sup>n</sup>

11. After four cycles of PCR, how many DNA duplexes can be produced from one DNA duplex?

A.4      B.8      C.16      D.32

12. Which of the following statements is true with asymmetric PCR?

A. Single-stranded copies of the DNA sequence are produced using it.  
B. The double-stranded copies of the DNA sequence are produced using it.  
C. Both (1) and (2)  
D. None of the preceding

42<sup>0</sup>  
6/0<sup>11</sup>  
41

13. mRNA can be readily isolated from lysed eukaryotic cells by adding magnetic beads which have \_\_\_\_\_ covalently attached.

A. Oligo(dA)    B. Oligo(dT)    C. Oligo(dG)    D. Oligo(dC)    E. All of the above

14. In fluorescence microscopy, which of the following performs the function of removing all light except the blue light?

A. Exciter filter    B. Barrier filter    C. Dichroic mirror    D. Mercury arc lamp

15. Oil immersion objective lens has an NA value of \_\_\_\_\_

A. 0.65    B. 0.85    C. 1.33    D. 1.00

16. Which of the following is used in electron microscope?

A. electron beams      B. magnetic fields  
C. light waves      D. electron beams and magnetic fields

17. Which among the following helps us in getting a three-dimensional picture of the

specimen?

- A. Transmission Electron Microscope
- C. Compound Microscope

- B. Scanning Electron Microscope
- D. Simple Microscope.

18. The secondary electrons radiated back in scanning microscope is collected by

- A. specimen
- B. anode
- C. vacuum chamber
- D. cathode

19. On what factors do the intensity of secondary electrons depends upon?

- A. shape of the irradiated object
- B. chemical composition of the irradiated object
- C. number of electrons ejected
- D. size and chemical composition of the irradiated object, number of electrons ejected and on the number of electrons reabsorbed by surrounding

20. Which of the following are true for electron microscopy?

- A. specimen should be thin and dry
- B. image is obtained on a phosphorescent screen
- C. electron beam must pass through evacuated chamber
- D. specimen should be thin and dry, image is obtained on a phosphorescent screen and electron beam must pass through evacuated chamber

### **SHORT ANSWER QUESTIONS (ANY 5)**

**5X2= 10**

1. Write on the working of Michelson Interferometer.
2. Explain the working principle of Phase contrast microscope.
3. What are molecular probes?
4. Elaborate on IR transducers.
5. What is Northern blotting? Explain.
6. Explain the working principle of Raman spectroscopy.

### **ESSAY QUESTIONS (ANY 3)**

**3X5= 15**

1. Elucidate PCR and its different modifications.
2. Write on the principle, working and applications of SEM.
3. Explain the construction of Genomic and cDNA library.
4. Write a short note on the working of AAS.

**COCHIN UNIVERSITY OF SCIENCE AND TECHNOLOGY**

**CENTER FOR INTEGRATED STUDIES**

**SEMESTER EXAMINATION-I**

**23-358-0105- PRACTICAL ON FORENSIC SCIENCE AND CRIME SCENE  
INVESTIGATION**

Course- M.Sc. (Forensic Science)

Max Marks: 75

Paper code: 23-358-0105

Time: 3 hours

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**Part A - Major Question**

**Answer any 1 Question (1x25=25)**

1. Construct blood stain patterns and carry out its analysis

Or

Examine the crime scene carefully and perform its documentation.

**Part B – Minor Question**

**Answer all 3 Questions (3x10=30)**

2. Create the Portrait Parle of your class mate.
3. Prepare FIR of the given case study.
4. Decipher the secret writing from the given specimen.

**Part C – Spotters**

**Identify any 2 of the given Specimens (2x10=20)**

**23-358-0101- FUNDAMENTALS OF FORENSIC SCIENCE, CRIMINAL LAWS AND PSYCHOLOGY**

**First Internal Examination**

**Total Marks: 35**

**Time: 1.75 hours**

**Section A (5x2=10 marks)**

**Answer any two questions (each question carries 5 marks)**

1. Explain the criminal justice system in India.
2. A 25 year old male 'X' stabbed to death a 23 year old female 'Y' as she refused his love proposal which was witnessed by 'Z'. Explain the procedure involved from crime scene to court verdict.
3. Explain the history and development of Forensic Science.
4. Illustrate the laws and principles of forensic science.

**Section B (3x5=15)**

**Answer all the questions (each question carries 3 marks)**

5. 'A' was using the toilet of 'B' for about a week. 'B' gave repeated oral warning to 'A' regarding it, but he continued to do the same. As 'B' found his oral warning to be insufficient, he put naked copper wire carrying electricity on the passage leading to the toilet. The next day 'A' went to the toilet of 'B' and touched the fixed wire and died.  
Justify your answer regarding the criminal liability of 'B'.
6. Define the need and scope of Forensic Science in Criminal investigation.
7. Explain the code of conduct of Forensic Scientist.
8. What are the major divisions seen in FSLs ?
9. Write a note on INTERPOL & FBI.
10. Recently we heard that IPC, CrPC & IEA is going to be replaced with some new laws. What are the advantages and disadvantages that you expect? Clarify your answer.

**Answer all the questions (each question carries 2 marks)**

**Answer all the questions (each question carries 2 marks)**

11. Differentiate FIR & Complaint.
12. "No self-incrimination", justify the statement based on Indian law.
13. What is cognizable and non-cognizable offence?
14. What is DFSS? Write its functions.
15. Draw the organizational hierarchy of CFSLS

**16. Briefly explain any four reasons advances in forensic science**

**23-358-0104- LABORATORY QUALITY MANAGEMENT, RESEARCH  
METHODOLOGY AND STATISTICS**

**First Internal Examination**

**Marks: 35**

**Time: 2h**

**SECTION A (5x2= 10 Marks)**

**Answer any two questions (each question carries 5M)**

1. Briefly explain the different types of calibration methods available?
2. What is sampling? And discuss sampling designs in detail?
3. Elaborate on the methods and tools of data collection?

**SECTION B (2 x 7 = 14 Marks)**

**All Questions are Compulsory (each question carries 2M)**

4. Define standards of analysis? What are the different types of analytical standards?
5. What is Intellectual Property and types? What do you mean by intellectual property rights?
6. How to Define a Research Problem? What are the components of a Research problem?
7. What is hypothesis? What are the major criteria for a good workable hypothesis?
8. Briefly explain the advantages or need for sampling? What are sampling errors?
9. What is meant by data? On the basis of nature of the collection procedure data can be classified into?
10. What are the types of research reporting?

**SECTION C (22 x 0.5 = 11 Marks)**

**All Questions are Compulsory (each question carries 0.5 M)**

1. How is random sampling helpful?
  - a. Reasonably accurate b. An economical method of data collection
  - c. Free from personal biases d. All of the above
2. In order to pursue the research, which of the following is priorly required?
  - a. Developing a research design b. Formulating a research question
  - c. Deciding about the data analysis procedure d. Formulating a research hypothesis

3. The format of thesis writing is the same as in
- Writing of Seminar representation
  - Preparation of research paper/article
  - A research dissertation
  - Presenting a workshop/conference paper
4. Which one among the following statement is true in the context of the testing of hypotheses?
- It is only the alternative hypotheses that can be tested.
  - It is only the null hypotheses that can be tested.
  - Both the alternative and the null hypotheses can be tested.
  - Both the alternative and the null hypotheses cannot be tested.
5. Research and Development become the index of development of the country. Which of the following reasons are true with regards to this statement?
- R&D targets human development
  - R&D can enhance people's standard of living in the country
  - R&D reflects the actual economic and social conditions being prevailed in the country
  - All the above
6. Evaluation Research is concerned with \_\_\_\_\_
- How well are we doing?
  - Why are we doing?
  - What are we doing?
  - None of the above
7. Which of the following options are the main tasks of research in modern society?
- To learn new things
  - To keep pace with the advancement in knowledge
  - To systematically examine and critically analyze the investigations/sources with the objective
  - All of the above
8. The main aim of the scientific method in the research field is to \_\_\_\_\_
- Improve data interpretation
  - Confirm triangulation
  - Introduce new variables
  - Eliminate spurious relations
9. A researcher is interested in studying the prospects of a particular political party in an urban area. So, what tool should he prefer for the study?

Rating Scale b. Inter  
10. The conclusions/f  
situations?  
a. Casual Comp  
c. Descriptive  
11. How to  
a. By re  
d. By  
12

nique

, Rating Scale b. Interview c. Questionnaire d. Schedule

10. The conclusions/findings of which type of research cannot be generalized to other situations?

a. Casual Comparative Research b. Historical Research

c. Descriptive Research d. Experimental Research

11. How to judge the depth of any research?

a. By research title b. By research duration c. By research objectives

d. By total expenditure on research

12. Who can successfully conduct Research?

a. Someone who is a hard worker b. Possesses post-graduation degree

c. Has studied research methodology d. Possesses critical thinking and reasoning ability

13. A research problem is feasible only when

a. It has utility and relevance b. It is new and adds something to knowledge

c. It is researchable d. All of the above

14. What are the core elements of a dissertation?

a. Introduction; Data Collection; Data Analysis; Conclusions and Recommendations

b. Executive Summary; Literature Review; Data Gathered; Conclusions; Bibliography

c. Research Plan; Research Data; Analysis; References

d. Introduction; Literature Review; Research Methodology; Results; Discussions and Conclusions

15. Action-research can be understood as \_\_\_\_\_

a. A longitudinal research b. An applied research

c. A kind of research being carried out to solve a specific problem d. All of the above

16. Which one among the following variables cannot be expressed in quantitative terms?

a. Numerical Aptitude b. Marital Status c. Socio-economic Status d. Professional Attitude

17. What is a hypothesis in research?

a. A conclusion drawn from data analysis b. A summary of research findings

c. A measurement of data accuracy

d. A statement of predicted relationship between variables

18. What is the purpose of a literature review in research?

a. To identify the research gaps

b. To summarize research findings

c. To collect primary data

d. To analyze data

19. What is a dependent variable in research?

a. The variable that is manipulated by the researcher

b. The variable that remains constant throughout the research

c. The variable that is measured and observed

d. The variable that is not relevant to the research question

20. What is the purpose of a control group in an experiment?

a. To provide a baseline for comparison

b. To receive the experimental treatment

c. To control for confounding variables

d. To ensure internal validity

21. \_\_\_\_\_ is the main purpose of a research hypothesis.

a. To provide a clear research direction b. To analyze data

c. To establish causality d. To summarize research findings

22. Which of the following is NOT a characteristic of a good research question?

a. Clear and Focused b. Relevant and significant

c. Testable and measurable d. Broad and ambiguous

\*\*\*\*\*

**23-358-0103 INSTRUMENTAL TECHNIQUES**  
**FIRST INTERNAL**

**Time: 2 hrs**

**Final Mark=35**

**MULTIPLE CHOICE QUESTIONS**

**10 X 0.5= 5**

1. When is electrophoresis not used?  
a) Separation of proteins      b) Separation of amino acids  
c) Separation of Lipids      d) Separation of nucleic acids
2. If proteins are separated according to their electrophoretic mobility, then the type of electrophoresis is:  
a) SDS PAGE      b) Affinity Electrophoresis  
c) Isoelectric focusing (IEF)      d) Free flow electrophoresis
3. What does the electrophoresis apparatus consist of?  
a) Gel, buffer chamber and fire pack      b) Buffer chamber and electrophoresis unit  
c) Electrophoresis unit and gel separator      d) Power pack and electrophoresis unit
4. The fluorescent dye such Ethidium is used for visualizing DNA. How do ethidium binds to DNA?  
a) Stacked between histone molecules      b) Binds to the nucleotide base  
c) Intercalated between the stacked bases      d) Binds to the phosphodiester backbone
5. For the separation of DNA by electrophoresis, which of the following method is commonly used?  
a) Agarose – vertical      b) Agarose – horizontal  
c) PAGE – vertical      d) PAGE – horizontal
6. Sodium dodecyl sulfate (SDS) used in SDS PAGE is \_\_\_\_\_.  
a) An anionic detergent      b) A cationic detergent  
c) A non-ionic detergent      d) An anion exchanger
7. The different types of energies associated with a molecule are \_\_\_\_\_.  
a) Electronic energy      b) Vibrational energy  
c) Rotational energy      d) All of the mentioned
8. The region of electromagnetic spectrum for nuclear magnetic resonance is \_\_\_\_\_.  
a) Microwave      b) Radio frequency  
c) Infrared      d) UV-rays
9. Select the correct statement from the following option.  
a) Spectroscopic methods require less time and more amount of sample than classical

methods

- b) Spectroscopic methods require more time and more amount of sample than classical methods
- c) Spectroscopic methods require less time and less amount of sample than classical methods
- d) Spectroscopic methods require more time and less amount of sample than classical methods

10. Which of the following is false about the wavelengths of electromagnetic radiation?

- a) Radiation with short wavelengths have high energies
- b) Energy does not depend on wavelength
- c) Radiation with long wavelengths have low energies
- d) Energy depends on wavelength

### **SHORT ANSWER QUESTIONS (ANY 5)**

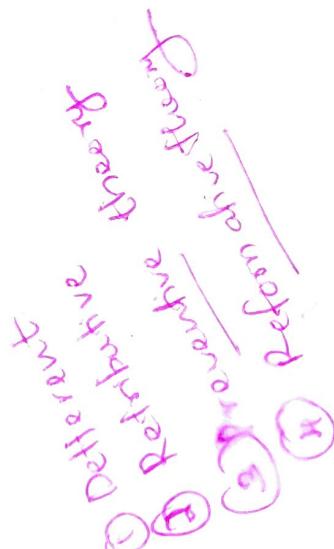
**5X2= 10**

- 1. Which are the factors affecting Electrophoresis? Explain.
- 2. Write a short note on detectors, Transducers and sensors.
- 3. Differentiate between Horizontal and Vertical Gel electrophoresis.
- 4. What are Electrical and Non-Electrical Domains?
- 5. Write on Preparative Electrophoresis.
- 6. Write a short note on wavelength selectors.

### **ESSAY QUESTIONS (ANY 4)**

**4X5= 20**

- 1. Explain the working mechanism of Laser source.
- 2. What is Chromatography? Briefly explain any 3 types of chromatographic techniques?
- 3. Elucidate SDS-PAGE and its Applications.
- 4. How will you analyse a viscera sample suspected to contain benzodiazepine using TLC?
- 5. Discuss IEF gel Electrophoresis and its Applications.



**COCHIN UNIVERSITY OF SCIENCE AND TECHNOLOGY**

**CENTRE FOR INTEGRATED STUDIES**

**Semester Examination - I.**

**23-358-0103- INSTRUMENTAL TECHNIQUES**

**Course- M.Sc. (Forensic Science)**

**Max Marks: 50**

**Paper Code- 23-358-0103**

**Time: 3 hours**

**SECTION A**

**Answer any 10 questions**

**(2 x 10 = 20)**

1. Briefly explain the significance of chemical shift in NMR spectroscopy.
2. What is the principle of
  - a. Electrophoretic technique
  - b. Centrifugation technique.
3. Write a short note on the working principle of Mass spectrometer.
4. Differentiate TLC from Preparative TLC.
5. What is monoclonal Antibody? Briefly explain the principle of the technique used for its screening process.
6. Describe your answer briefly with full form
  - a. Nd-YAG
  - b.  PMT
  - c. HOMO
  - d.  QCM
7. Match the following
  - I. TEM
  - II. IR Microscopy
  - III. SEM
  - IV. Comparison Microscope
  - Scintillator
  - Calvin Goddard
  - Cassegrain Objective
  - Thermal emitter.
8. Comment on
  - a.  Confluence
  - b. Humanized antibody

- c. HGPRT
- d. RIA

9. The sample preparation steps in TEM are given below. Arrange them in the correct order and briefly explain each step.

- a. Infiltration, b. cutting, c. fixation, d. rinsing, e. polishing, f. secondary fixation, g. Dehydration, h. Staining

10. Explain the principle of AFS.

11. Write a short note on Noncompetitive ELISA. Which type of ELISA is used for the detection of Human Immunodeficiency Virus.

## SECTION B

Answer any 6 Questions

(5 x 6 = 30)

12. Discuss the principles of chromatographic separation.

13. Explain the working principle of

A. UV-Visible spectroscopy.

B. IR Spectroscopy.

14. Elaborate on the principles followed in proton NMR spectroscopy with suitable example.

15. Illustrate a technique which enables you to monitor the effects of a particular gene and explain different methods for the technique.

16. Elucidate on different detectors and radiation sources used in various spectroscopic techniques.

17. Explain different types of centrifugation techniques.

18. Write a short note on the production of monoclonal antibodies.

**FIRST INTERNAL EXAMINATION**

**TOTAL MARKS: 25**

**TIME: 1 Hour**

**SECTION A (6 X1 =6 marks)**

**Answer all questions (Each question carries 1 marks)**

1. What is the primary function of the CPU in a computer system?
  1. To store data
  2. To perform arithmetic and logic operations
  3. To manage network connections
  4. To control peripheral devices
2. Which type of memory is typically used to store the BIOS firmware?
  - a) RAM
  - b) ROM
  - c) Cache
  - d) Hard Drive
3. What is the role of the kernel in an operating system?
  - a) It provides the user interface
  - b) It manages hardware resources and system calls
  - c) It manages files and directories
  - d) It provides network services
4. Which file system is commonly used in Windows operating systems?
  - a) ext4
  - b) NTFS
  - c) FAT32
  - d) HFS+
5. Multiprocessing refers to:
  - a) Running multiple operating systems simultaneously
  - b) Using multiple CPUs or cores to execute processes
  - c) The ability to run multiple programs at once
  - d) Running multiple threads within a single process
6. During the boot process, what is the first step performed by the BIOS?
  - a) Load the operating system into memory
  - b) Initialize hardware and perform POST

- c) Load the kernel into memory
- d) Display the operating system boot menu

**Section B (3 X 3 = 9 marks)**

**Answer any three questions (Each question carries 3 marks)**

- 7. Explain the role of the CPU in a computer system.
- 8. Differentiate between RAM and ROM.
- 9. What is BIOS, and what role does it play in the functioning of a computer?
- 10. How does multiprocessing improve the performance of a computer system?

**Section C (2 X 5 = 10 marks)**

**Each question carries 5 marks.**

- 11. Discuss the booting process of a computer in detail, from the moment the power button is pressed until the operating system is loaded.
- 12. Describe the key functions of an operating system (OS) and explain how they contribute  to the overall performance and usability of a computer system.

**23-358-0303-FORENSIC MEDICINE AND TOXICOLOGY**

**FIRST INTERNAL**

**Time: 1 hr**

**Final mark:25**

**SECTION A (Answer Any 5)**

**(2 X 5= 10)**

1. Comment on Suspended Animation.
2. Write on Nerium Odorum.
3. Differentiate between coagulation necrosis and Liquifaction necrosis.
4. Explain the role of postmortem hypostasis in determining time since death.
5. Briefly explain the classification of poisons.
6. What are Cardiac poisons, Explain with an example.

**SECTION B (Answer All)**

**(5 X 3= 15)**

1. Elucidate the given plant poisons
  - (a) Datura.
  - (b) Nux Vomica
2. Elaborate on the significance of various post mortem changes in determining the cause and time of death.
3. Explain the signs and symptoms and medicolegal aspects of any two irritant plant poison.

**23-358-0103 INSTRUMENTAL TECHNIQUES**

**FIRST INTERNAL**

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