Enrollment No......................................

Faculty of Science
End Sem Examination May-2024
FS3EL08 Advance Instrumentation
Programme: B.Sc. (Hons.)   Branch/Specialisation: Forensic Science

Duration: 3 Hrs.   **Maximum Marks: 60**

Note: All questions are compulsory. Internal choices, if any, are indicated. Answers of Q.1 (MCQs) should be written in full instead of only a, b, c or d. Assume suitable data if necessary. Notations and symbols have their usual meaning.

Q.1 i. Trueness from the reference measures-   **1**
(a) Precision   (b) Mean   (c) Accuracy   (d) Recall

ii. Which measures central tendency includes the magnitude of scores?   **1**
(a) Mean   (b) Median   (c) Mode   (d) Range

iii. In which type of chromatography, the stationary phase held in a narrow tube and the mobile phase is forced through it under pressure?   **1**
(a) Column chromatography
(b) Planar chromatography
(c) Liquid chromatography
(d) Gas chromatography

iv. Which of the following types of chromatography involves the separation of substances in a mixture over a 0.2mm thick layer of an adsorbent?   **1**
(a) Gas liquid (b) Column   (c) Thin layer (d) Paper

v. The lifetime for an electron in an excited state is-   **1**
(a) 10-5 sec   (b) 10-6 sec   (c) 10-7 sec   (d) 10-8 sec

vi. The region of electromagnetic spectrum responsible for nuclear magnetic resonance is _____.   **1**
(a) Microwave   (b) Radio frequency
(c) Infrared   (d) UV rays

vii. Noise signals are produced in analysis of any sample is due to- **1**
(a) Callibration defect
(b) Presence of contamination in sample
(c) Wrong dillutions
(d) Instrumental error

viii. Which of the following has minimum wavelength? **1**
(a) Gamma waves   (b) Infrared waves
(c) Microwaves   (d) Blue light

ix. ELISA (enzyme-linked immunosorbent assay) allows for rapid **1**
screening and quantification of the presence of _____ in a
sample.
(a) Amino acid   (b) DNA
(c) Antigen   (d) Protein

x. The technique electrophoresis, for separation of charged particles **1**
was developed by-
(a) Tswett   (b) Senger   (c) Svedberg (d) Tiselius

Q.2 i. Differentiate between accuracy and precision. **2**
ii. Define analytical chemistry. **3**
iii. Define mean, median and mode with example. **5**
OR iv. Give the formula of median. What is the median of the following **5**
data set?
32, 6, 21, 10, 8, 11, 12, 36, 17, 16, 15, 18, 40, 24, 21, 23, 24, 24,
29, 16, 32, 31, 10, 30, 35, 32, 18, 39, 12, 20.

Q.3 i. Differentiate between stationary phase and mobile phase. **2**
ii. Describe the history of chromatography. Tell how **8**
chromatographical techniques are significant forensically.
OR iii. Give a detailed note on classification of chromatography. **8**

Q.4 i. Define spectroscopy. What is various spectrophotometer that **3**
employed in forensic science?
ii. What is electromagnetic spectrum? Arrange the radiation **7**
according to decreasing frequency along with their uses in
science.
OR iii. What are the light sources for UV, Visible, IR and X-RAY **7**

radiations utilised in spectrophotometer? Describe it in detail.

Q.5 i. Differentiate between GCMS and LCMS. **4**
ii. Describe NMR spectroscopy in detail. Tell the forensic **6**
significance.
OR iii. Write about the principle and working procedure of HPLC. Tell **6**
how this technique is useful in forensic science.

Q.6 Attempt any two:
i. What is ELISA? Explain the principle and working procedure of **5**
ELISA.
ii. Define RIA. Tell the working principle of RIA along with its **5**
working procedure.
iii. Differentiate between horizontal and vertical electrophoresis with **5**
diagram. Give examples of each technique.

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Marking Scheme
FS3EL08 Advance Instrumentation

Q.1 i) c. Accuracy   1

         a. Mean   1

         a. Column Chromatography   1

          c. Thin layer   1

          a. 10^{-5} sec   1

           b.   Radio frequency   1

          b. It can be generated with low intensity   1

           a.   Gamma Rays   1

           c.   Antigen   1

           d. Tisselius   1

Q.2 i.   Difference   1 Marks for each difference   2

     ii. Definition   2
          Examples   1
     iii. Definition - 1 Marks for each term
          Examples - 0.5 Marks for one example   3
                                                                     2
OR   iv. Definition   1 Mark   2
          Formula   1 Mark   3
           Solution for solving -   3 Marks

Q.3 i.   1 Marks for Each Difference   2

     ii. Definition   2
          History   3
          Significance   3
OR   iii. Definition   2
          Classification   6

Q.4 i.   Definition   2
          Types of spectrophotometer   1
     ii. Definition   2
          Diagram of spectrum with frequency and wavelength   5

OR   iii. Definition of spectroscopy   1
          Various light source for each radiation   6

Q.5 i.   Differences   (1 Mark*4)
                                                                     4
     ii. Definiion   1 Mark   3
          Instruction   2 Mark   3
          Forensic Significance   3 Marks

OR   iii. Definition   2
          Principle and working procedure   2
          Forensic significance   2

Q.6

     i.   Definition   2
          Principle and working procedure   3
     ii. Definition   2
          Principle and working procedure   3
     iii. Difference   1
          Diagram   2
          examples   2

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