Progressive Education Society's
Modern College of Arts, Science and Commerce, Ganeshkhind, Pune-411016 (Autonomous)

B.Sc. Blended Program

(A degree of Savitribai Phule Pune University equivalent to the degree of University of Melbourne)

End Semester Examination: MAR/APR 2025

Program: B.Sc. Blended **Semester: VI** **SET: A**
Program (Specific): B. Sc. Blended (Chemistry) **Course Type: Core**
Class: T. Y. B. Sc. Blended **Max. Marks: 50**
Name of the Course: Separation Techniques & Advanced Analytical Techniques
Course Code: CHM604 **Time: 2.5 hrs**
Paper: IV **Credit: 3**

Note:

1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Draw diagrams wherever necessary.
4) Use of Scientific Calculator is allowed.

Q.1. Select the correct option. (Any 10) **[1 M x 10 = 10 M]**

Write the entire statement in the answer sheet with the correct option.

1) The process of extraction is more complete if it is carried out -------.
   a) Only once
   b) Twice
   c) Thrice
   d) No. of times
2) The detector used for the determination of aspirin, phenacetin and caffeine in a mixture, by HPLC technique is ---------.
   a) Electrochemical detector
   b) Refractive Index detector
   c) Ultraviolet detector
   d) Fluorescence detector
3) In GLC, the stationary phase is ---------.
   a) Non-volatile liquid coated on an inert support
   b) Volatile liquid coated on an inert support
   c) Volatile liquid coated on polar support
   d) Non-volatile liquid coated on polar support
4) There should be ------ distribution ratio for solute and ------- distribution ratio for undesirable impurities.
   a) Low, low
   b) High, high
   c) Low, high
   d) High, low
5) HETP in chromatography indicates ----------.
   a) Mobile phase velocity
   b) Polarity of mobile phase
   c) Efficiency of separation
   d) Nature of stationary phase

6) What type of detector is typically used in GCMS system?

a) Flame ionization detector (FID)
b) Photodiode array detector
c) Electron multiplier detector
d) Mass spectrometer detector

7) All liquid-liquid extractions depend upon ----------.

a) Partition
b) Non- partition
c) Mixing
d) None of these

8) Which type of sensor is commonly used to detect air pollutants like Cox and NOx?

a) pH sensor
b) Electrochemical sensor
c) Temperature sensor
d) Humidity sensor

9) The ratio of the time spent by a solute component in the stationary phase to the mobile phase is called as --------.

a) Retention time
b) Retention factor
c) Selectivity factor
d) Resolution

10) Which ionization technique is commonly used in GCMS?

a) Electron Impact (EI)
b) Chemical Ionization (CI)
c) Atmospheric Pressure Ionization (API)
d) Matrix-Assisted Laser Desorption Ionization (MALDI)

11) Determination of copper is carried out by using ----------.

a) 8-hydroxyquiniline
b) Sodium diethyldithiocarbamate
c) Acetylacetone
d) Diphenyl thiocarbazone

12) Which of the following is not a unit of a common mass spectrometer?

a) ion source
b) mass analyzer
c) ion detector
d) Monochromator

Q.2. Answer in brief (Any 10). **[2 M x 10 = 20 M]**

1) What are the features of the Solvent Extraction Technique?
2) What is the role of a Biosensor?
3) Calculate the retention factor of a component having retention time of 55 mm and a dead time of 9 mm.
4) Give some applications of GC-MS.

5) Define: Retention time and Dead time in chromatographic analysis.
6) What is the fragmentation pattern in mass spectrometry?
7) Give the stationary and mobile phases in both, the Normal-phase and the Reverse-phase chromatographic analysis.
8) Discuss in brief how iron is determined by solvent extraction.
9) Write the principle of Gas Solid Chromatography.
10) What is the significance of the base peak in a mass spectrum?
11) What is synergistic extraction? Explain with one example.
12) Discuss in short two types of columns used in GC.

Q.3. Answer in detail. (Any 4) **[5 M x 4 = 20 M]**

1) Explain various steps involved in quantitative analysis of a sample.
2) Discuss classification of biosensors based on the physical phenomenon they measure.
3) Sketch an ideal HPLC chromatogram and explain the terms; retention time, peak area and peak height.
4) A 100 ml solution contains 50 mg of a substance. The substance is to be extracted with an organic solvent. The distribution ratio is 12. Calculate:
   (i) The amount of unextracted solute for a single extraction using 75 ml of organic solvent
   (ii) The amount of unextracted solute for 3 successive extractions using 25 ml of organic solvent.
5) Give a schematic diagram of the apparatus used in GC and describe various components.
6) Give the classification of chromatographic separations.

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