STELLA MARIS COLLEGE (AUTONOMOUS) CHENNAI-86
(For candidates admitted from the academic year 2008-09)

SUBJECT CODE: CH/PC/AI24

M. Sc. DEGREE EXAMINATION, APRIL 2009
BRANCH IV- CHEMISTRY
SECOND SEMESTER
REG.NO .....

COURSE : MAJOR CORE
PAPER : ANALYTICAL INSTRUMENTATION
TIME : 30 MINUTES **MAX. MARKS: 20**

SECTION – A
TO BE ANSWERED ON THE QUESTION PAPER ITSELF.

Answer all the questions. **(20 x 1= 20)**

I. Choose the correct answer:

1. The most suitable source of radiation for scanning the visible region is
   a) Tungsten – filament lamp b) Deuterium discharge lamp
   c) Nernst glower d) Mercury arc lamp

2. A bolometer constructed from a semiconductor is called as
   a) Thermopile b) Thermistor c) Globar d) Thermocouple

3. Typical atomization temperature of flame atomization process is
   a) 1200-3000 ^{o}C b) 4000-5000 ^{o}C c) 1700-3150 ^{o}C d) 6000-7500 ^{o}C

4. More elements can be detected in the ten-parts-per-billion range by using
   a) Atomic emission spectroscopy
   b) Atomic fluorescence spectroscopy
   c) Atomic absorption spectroscopy
   d) Inductively coupled plasma emission spectroscopy

5. The chemical composition of stationary phase carbowax 20M is
   a) Polyethylene glycol b) Polymethyl siloxane
   c) Dinonyl phthalate d) Divinylbenzene

6. Katharometer is also called as
   a) Thermal conductivity detector b) Flame ionization detector
   c) Electron-capture detector d) Sulfur chemiluminescence detector

7. The diffusion current is directly proportional to
   a) Number of analytes b) Movement of charged particles
   c) Supporting electrolyte d) Analyte concentration

8. In anodic stripping voltammetry, during the stripping step, the microelectrode behaves as
   a) anode b) Cathode c) Ultramicro electrode d) None of these

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9. A plot of mass or mass percent as a function of time is called
   a) Thermal deposition curve b) Thermal decomposition curve
   c) Thermal scanning curve d) Thermal induced curve

10. In DTA, the commonly used reference material is
   a) Alumina b) Silica c) Magnesia d) Titania

II. Fill in the blanks:

11. In ESR spectroscopy, radiation of _____ induces transition between magnetic energy levels of electrons with unpaired spins.
12. Mid-infra red region is divided into _____ and _____ regions.
13. A separation that employs a single solvent of constant composition, in HPLC, is termed as _____.
14. In voltammetry, the effect of migration is minimized by using _____.
15. The additional feature of the TG curve obtained by plotting the rate of change of weight dw/dt with temperature is called the _____ curve.

III. Give answer in one or two lines for the following questions :

16. What is meant by sputtering?

17. What are the essential qualities of a gas to be used as a carrier gas in GC?

18. Define half-wave potential.

19. Give the basic principle of amperometric titrations.

20. What are thermocouples?

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SECTION – B

ANSWER ANY FIVE QUESTIONS: (5x8=40)

1. Explain the colorimetric method of estimating ascorbic acid.
2. a) Compare the basic principles of NMR and ESR spectroscopic techniques.
   b) Sketch and explain the double-beam instrumentation of infrared spectroscopy.
3. Describe the principle and instrumentation of AAS.
4. Discuss the principle, working and applications of HPLC.
5. Explain the experimental set up for polarographic measurements.
6. Give an account of biamperometric titrations.
7. What is meant by thermometric titrations? Sketch a titration unit and explain its application in complexometric titrations.

SECTION – C

ANSWER ANY TWO QUESTIONS. (2x20=40)

8. a) Give various regions associated with UV-Vis spectrum. (2)
   b) Describe the instrumentation of double-beam UV-Vis spectrophotometer. (8)
   c) Explain the principle and essential components of mass spectrometer. (10)

9. a) Describe the instrumentation and applications of GLC. (10)
   b) Explain the theory of cyclic voltammetry. Discuss its application in studying a redox system. (10)

10. a) Explain the instrumentation and applications of ICP-AES. (10)
    b) How TGA and DTA techniques are complementary to each other. (6)
    c) Briefly explain the principle of differential scanning calorimetry. (4)

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