

Code No: M1022/R07

**Set No. 1**

**IV B.Tech I Semester Supplementary Examinations, Feb/Mar 2011**  
**ANALYTICAL INSTRUMENTATION**  
**(Electronics & Instrumentation Engineering)**

Time: 3 hours

Max Marks: 80

**Answer any FIVE Questions**  
**All Questions carry equal marks**

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1. Explain the different functional blocks of Digital readout pH meter and describe how pH is converted into counts. [16]
2. (a) What is Photoelectric effect? Discuss its use.  
(b) What are Photoelectric Cells? Describe their construction and working. [6+10]
3. (a) Sketch the components of a Gas Chromatography.  
(b) Discuss the types of applications in which gas Chromatography is particularly useful. [8+8]
4. Explain the Beckman Paramagnetic Oxygen analyzer with neat diagram. [16]
5. (a) Describe the basis for radiation detection with a silicon diode transducer.  
(b) What are the differences between a photon detector and heat detector? [8+8]
6. (a) Discuss the calibration method adopted for IR spectrometer.  
(b) Give the advantages of FT spectroscopic technique. [8+8]
7. Give the schematic diagram of different types of ion sources used in mass spectrometer and explain. [16]
8. (a) Discuss the variation of count rate with voltage using suitable counter.  
(b) What is the dead time of the counter? Explain. [10+6]

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**Set No. 2**

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Time: 3 hours

Max Marks: 80

**Answer any FIVE Questions**  
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1. (a) Write short notes on
  - i. Selective Ion Electrode. Where is it used
  - ii. Asymmetry Potential.
- (b) Define the term Conductivitymetry. Elaborate. [8+8]
2. With suitable figure present the relative Thermal Conductivity of different gases and analyze any one gas with suitable technique. [16]
3. Give in detail the classifications of Chromatography. Briefly explain Liquid Chromatography. [16]
4. (a) Write short notes on
  - i. Magnetic Susceptibility
  - ii. Importance of Oxygen gas measurement
  - iii. Relative Para magnetism of various gases.
- (b) Draw and explain Magnetic Wind Analyzer for Oxygen analysis. [2+3+3+8]
5. What is a spectrophotometer? Explain a typical UV/ visible spectrometer using double beam. [16]
6. Define
  - (a) Resonance line
  - (b) Spectral interference
  - (c) Chemical interference
  - (d) Atomization. [4+4+4+4]
7. (a) What is the need of electrostatic accelerating system in mass spectrometer?  
(b) Give the applications of mass spectrometry.  
(c) Discuss the merits of various types of mass spectrometer. [6+5+5]
8. (a) Draw the schematic of GM counter and explain the principle of operation.  
(b) Explain the constructional details and principle of operation of a surface barrier detector. [8+8]

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**Set No. 3**

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Time: 3 hours

Max Marks: 80

**Answer any FIVE Questions**  
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1. Mention the drawback of Null method for Conductivity measurement. Explain Direct reading method and how it overcomes the problem? [16]
2. (a) What are the applications of CO monitor.  
(b) What are the similarities and differences between Bolometer and Thermistor? [4+12]
3. (a) What are the desirable mobile phase qualities? Explain.  
(b) What are the applications of Liquid Chromatography? Explain. [8+8]
4. Explain Thermal Conductivity Dissolved Oxygen meter. How does this differ from others? [16]
5. (a) Explain about the advantages and disadvantages associated with single and double beam spectrometer.  
(b) Give a schematic and explain the multi channel spectrophotometer. [8+8]
6. Describe the basic design difference between a spectrometer for absorption measurements and emission studies. [16]
7. (a) Explain in detail how an inductively coupled plasma can be used as an ion source.  
(b) Describe the glow discharge ion source in detail. [8+8]
8. Discuss the construction and working principle of the counting equipment used with a proportional counter. [16]

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**Set No. 4**

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Time: 3 hours

Max Marks: 80

**Answer any FIVE Questions**  
**All Questions carry equal marks**

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1. (a) With schematic diagram describe Calomel Electrode.  
(b) What do you mean by combination Electrode? Explain.  
(c) Describe the Hydrogen Electrode. What are its advantages and disadvantages?  
[6+4+6]
2. (a) With a neat sketch explain the analysis of Nitric Oxide using CO Laser.  
(b) Discuss Laser-Opto Acoustic Detector for the detection of nitric oxides. [8+8]
3. (a) What is the principle of Electron Capture Detector? Explain.  
(b) Write short notes on
  - i. Calibration of the detector
  - ii. Chromatogram
  - iii. Retention Time.[8+8]
4. (a) Name an Oxygen analyzer used for medical applications and explain it.  
(b) What are the different electrochemical methods for Oxygen analysis? Explain any one of them.  
[8+8]
5. (a) What is non dispersive absorption type IR technique briefly explain.  
(b) By way of a schematic explain the operation of non-dispersive dual channel absorption technique of IR spectrophotometer.  
[8+8]
6. Explain in detail the construction of a premix burner with diagram.  
[16]
7. Write short notes on:
  - (a) Resonance conditions in NMR.
  - (b) NMR absorption spectra.
  - (c) Radio- frequency transmitter and receiver.  
[3+3+10]
8. (a) Describe the constructional details and applications of a proportional counter with a neat sketch.  
(b) Discuss about the dead time of the GM counter.  
(c) Write short notes on the Geiger range.  
[8+4+4]

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