

## **PRINCIPLE TYPES OF CHEMICAL INSTRUMENTATION**

### **Spectroscopic Tehniques:**

Ultraviolet and Visible (UV/Vis) Spectrophotometry  
Fluorescence and Phosphorescence Spectrophotometry  
Atomic Spectrometry (Emission and Absorption)  
Infrared (IR) Spectrophotometry  
Raman Spectroscopy  
X-Ray Spectroscopy  
Radiochemical Techniques  
Nuclear Magnetic Resonance (NMR) Spectroscopy  
Electron Spin Resonance (ESR) Spectroscopy

### **Electrochemical Techniques:**

Potentiometry (pH and ion selective electrodes)  
Voltammetry  
Voltametric Techniques  
Coulometry  
Stripping Techniques  
Electrogravimetry  
Conductance Techniques

### **Chromatographic Techniques:**

Gas Chromatography  
High-Performance Liquid Chromatographic Techniques

### **Miscallenous Techniques:**

Thermal Analysis  
Mass Spectrometry  
Kinetic Techniques

### **Hyphenated Techniques:**

GS-MS (Gas Chromatography- Mass Spectrometry)  
ICP-MS (Inductively Coupled Plasma-Mass Spectrometry)  
GS-IR (Gas Chromatography- Infrared Spectrometry)

### **SIGNALS USED IN INSTRUMENTAL METHODS:**

<b>SIGNAL</b>	<b>INSTRUMENTAL METHODS</b>
Emission of Radiation	Emission Spectroscopy (X-ray, UV, Visible, electron) Fluorescence, Phosphorescence and Luminescence (X-ray, UV, Visible)
Absorption of Radiation	Spectrophotometry and Photometry (X-ray, UV, Visible, IR) Photoacoustic Spectroscopy NMR, ESR
Scattering of Radiation	Turbidimetry Raman Spectroscopy
Refraction of Radiation	Refractometry
Diffraction of Radiation	X-Ray Diffraction Electron Diffraction
Rotation of Radiation	Polarimetry Optical Rotary Dispersion (ORD) Circular Dichroism
Electrical Potential	Potentiometry
Electrical Charge	Coulometry
Electrical Current	Polarography
Electrical Resistance	Conductometry
Mass-to-Charge Ratio	Mass Spectrometry
Rate of Reaction	Kinetic Methods
Thermal Properties	Thermal Conductivity
Radioactivity	Activation and Isotope Dilution Methods