

### Instrument Acronym Soup

Instrument	Application	Transitions	Conc. range	Sample prep
<b>Atomic Spectroscopy</b>				
Flame Atomic Absorption spectroscopy (Flame AA)	Elemental concentration	Valence electrons	100s ppb	Aqueous, 0.45 um filtered
Inductively coupled plasma-optical emission spectroscopy (ICP-OES)	Elemental concentration	Valence electrons	High ppt	Aqueous, 0.45 um filtered
Inductively coupled plasma-mass spectrometry (ICP-MS)	Elemental concentration	Mass to charge ratio	~50 ppb/ low ppt	Aqueous, 0.45 um filtered
<b>X-Ray Spectroscopy and Scattering</b>				
Handheld X-ray fluorescence (XRF)	Elemental concentration	X-rays generated from inner-shell electron ejection	~100 ppm	Solid
Bulk XRF			~10 ppm	Solids as pressed pellets
X-ray diffraction (XRD)	Crystal structure: Minerals	Scattering from crystal lattice	~5% by mass	Solid: powder or single crystal Compounds must be crystalline
<b>Molecular spectroscopy</b>				
UV-Vis	Colors	Valence electrons	Depends on molar absorbtivity	Aqueous
Fluorescence	Colors	Valence electrons	Lower than UV-Vis	Aqueous
<b>Vibrational Spectroscopy</b>				
Fourier transform-	Chemical moieties:	Molecular vibrations and	Depends on functional	Solids: films or pellets

Infrared spectroscopy (FT-IR)	Plastics, minerals	rotations	groups probed	
Raman scattering	Chemical moieties: Plastics, minerals	Inelastic or Raman scattering		More flexible
<b>Chromatography</b>				
Gas chromatography-mass spectrometry (GC-MS)	Odors	Volatility, column sorption		Solid for headspace
High performance-liquid chromatography (HPLC)	Flavors	Partitioning b/w stationary and mobile phase		Aqueous, 0.45 um filtered
<b>Electron Microscopy</b>				
Scanning electron microscopy (SEM)	Topographic imaging	Backscattering electrons		Conductive solids or carbon coated for conductivity
Electron microprobe (EMPA)	Elemental composition	Photoelectric effect- measure energy of escaping x-rays		Conductive solids or gold coated samples Samples must be flat
Transmission electron microscopy (TEM)	Density, diffraction, particle size,	Transmitted electrons		Prepared on a ~3mm grid, must be very thin (<100s nm thick)
<b>Other</b>				
Nuclear Magnetic Resonance (NMR)		Nuclear spin		

### Technique overview

List some techniques you might use to address your project in class OR questions you might address for your project with the listed technique:

1. Metals
2. Plastics
3. Calories or colors
4. Electron microscopy
5. CYOA 1
5. CYOA 2
5. CYOA 3
6. Separations