

March 28, 2005

■ Exam #2: Results!

- Range: 109 - 197
- Average: 167.9/200 (84%)
- Median: 171.5/200

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Spectrometers for AES

- Highest possible resolution gives best L/B, so invest in instrument with *high dispersion*
- For simultaneous multi-element determinations: use multichannel spectrometer (direct reader or echelle)
- With AES, you obtain a spectrum
 - qualitative analysis possible
 - easy background correction

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Applications

✓ Qualitative Analysis

- AES only (no spectrum with AAS)

✓ Quantitative Analysis

➤ Calibration Curves

- **AAS:** 1-2 decades LDR (limited by stray light)
- **AES:** 6-7 decades LDR (with ICP)
 - Deviations at *high concentrations* due to self-absorption
 - Deviations at *low concentrations* due to ionization (%-ionization greatest at low conc, so atom line emission depressed more at low concentrations)

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Interferences

■ Ionization

-signal will vary with %-ionization (a function of e^- number density):



- *easily ionizable elements* (e.g., Na, K, Li, etc.) will be more significantly ionized than other elements

-the presence of an *EIE* in a sample will affect the electron density, shifting the ionization equilibrium of the *analyte* and affecting the resulting signal, leading to an: **Easily Ionizable Element Interference Observation**

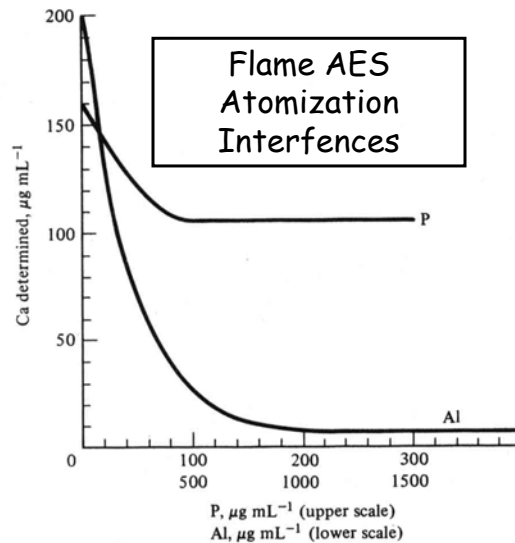
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Atomization Interferences

Again, the *variability* of the interferent is the problem

Solutions:

1. Chemistry
 - Add a *releasing agent*
 - Add a *complexing agent*
2. Higher Temperature
 - hotter flame
 - ICP**



AES versus AAS

GF-AAS

- low cost
- single element
- low sample throughput
- atomization interferences

ICP-AES

- moderate-high cost
- multielement
- high sample throughput
- spectral interferences

Complementary Techniques

- *together*, can get *low-to-sub-ppb* det. limits for ~70 elements