

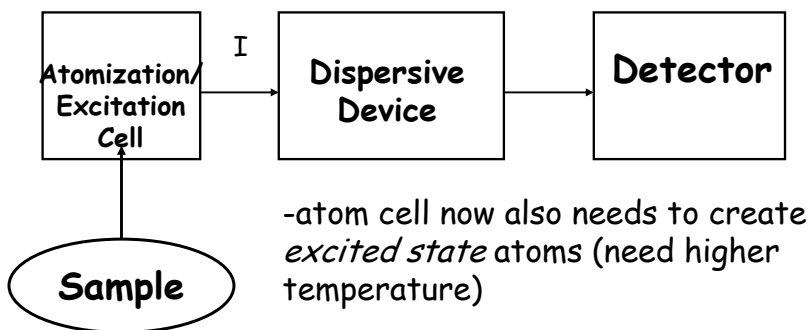
March 18, 2005

- **Exam #2** - solution key to be posted this weekend
- **Office Hours Cancelled for today** ☹

1

Instrumentation for AES

- Simple! Get rid of source and change the atom cell:



2

Atomization/Excitation Sources for AES

■ Flames

- need high temperatures
(4500 °C possible with O₂/(CN)₂ flame)
- need a short pathlength
(eliminates problems with *self-absorption*)
- use a total consumption burner
(noisy, small, inefficient)
- complementary with Flame AAS
(ppm - ppb detn limits)

3

Plasma Sources for Atomization/Excitation

Plasmas: hot, ionized gas

■ Arcs and Sparks

- electrical (directly coupled) ionization
- useful for solid samples

■ Laser-Induced Plasmas

- optical ionization/atomization
- micro-atomization

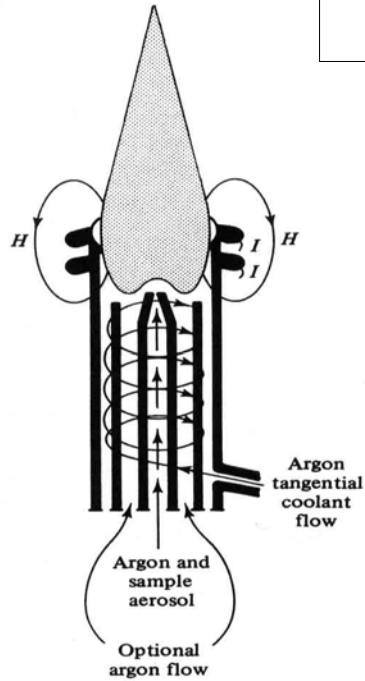
■ The Inductively Coupled Plasma (ICP)

- electrical (inductively coupled) ionization
- most common AES source for solution samples

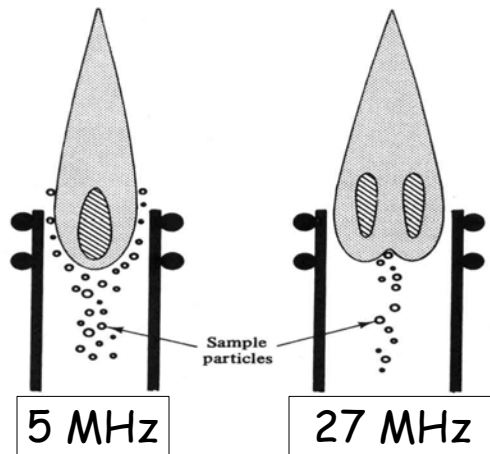
4

ICP Sources

- **RF Power Source**
(1-2 kW @ 27 MHz)
- **Three Argon Flows**
 1. Plasma Gas (10-20 L/min)
 2. Nebulizer Gas (~1 L/min)
 3. Auxilliary Gas (~0.5 L/min)
- **High Temperature** (~8000 K)
- **Heated from Outside-In**
 - *Skin-depth effect*



Effect of Frequency



More on ICPs

• Sample Introduction

- Nebulization (aqueous)

• High temperature gives:

- Efficient atomization
- Efficient excitation

• ppb detection limits

• No self-absorption

- 6 decades LDR

