

## Quality control test for iron, vitamin A and C, and folic acid

QA/QC Workshop on flour fortification – Makerere University – 26/05/2016

WHO HAS ALREADY HEARD OF AES, AAS OR ICP?

WHO IS ABLE TO EXPLAIN THESE TECHNIQUES?

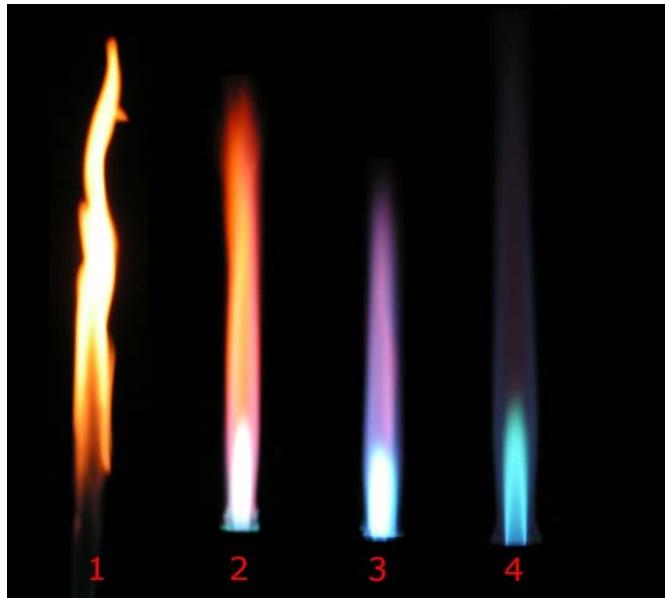
WHO HAS A LIGHTER WITH HIM/HER (*PREFERABLY WORKING*)



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## QA/QC MEETING ON FLOUR FORTIFICATION

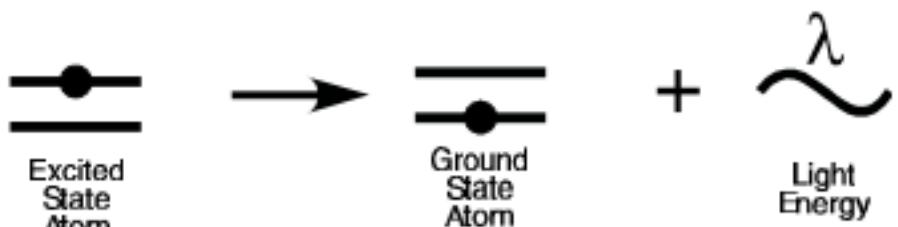


1 = NO OXYGEN ADDED; 4 = 100 % OF OXYGEN

### EXCITATION



### DECAY



AES = Atomic Emission Spectrophotometry

AAS = Atomic Absorption Spectrophotometry

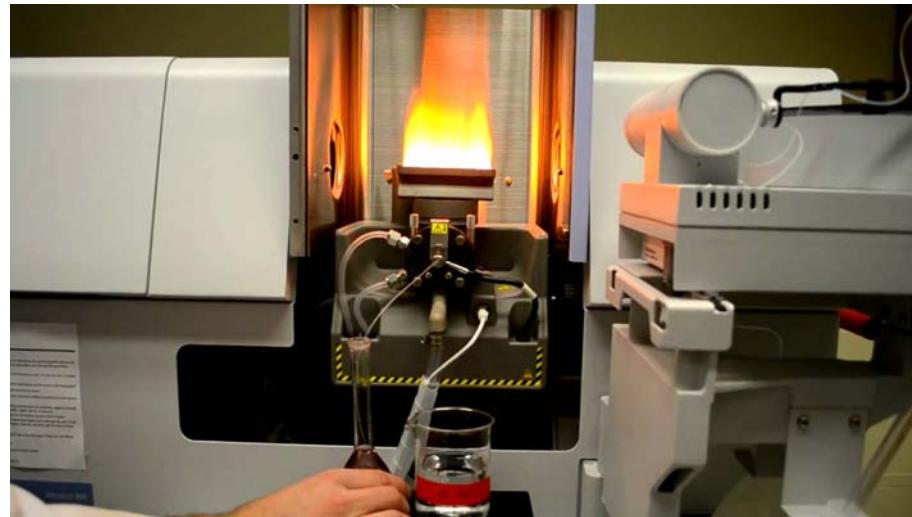


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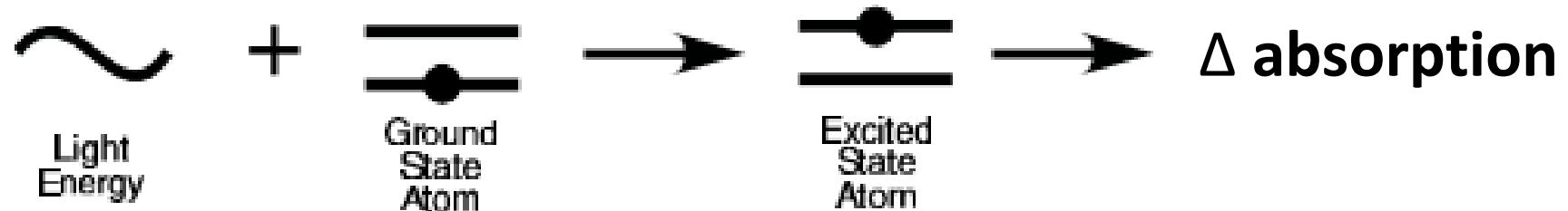


## QA/QC MEETING ON FLOUR FORTIFICATION

### Atomic Absorption Spectrophotometry



SETUP OF AN ATOMIC ABSORPTION SPECTROPHOTOMETER



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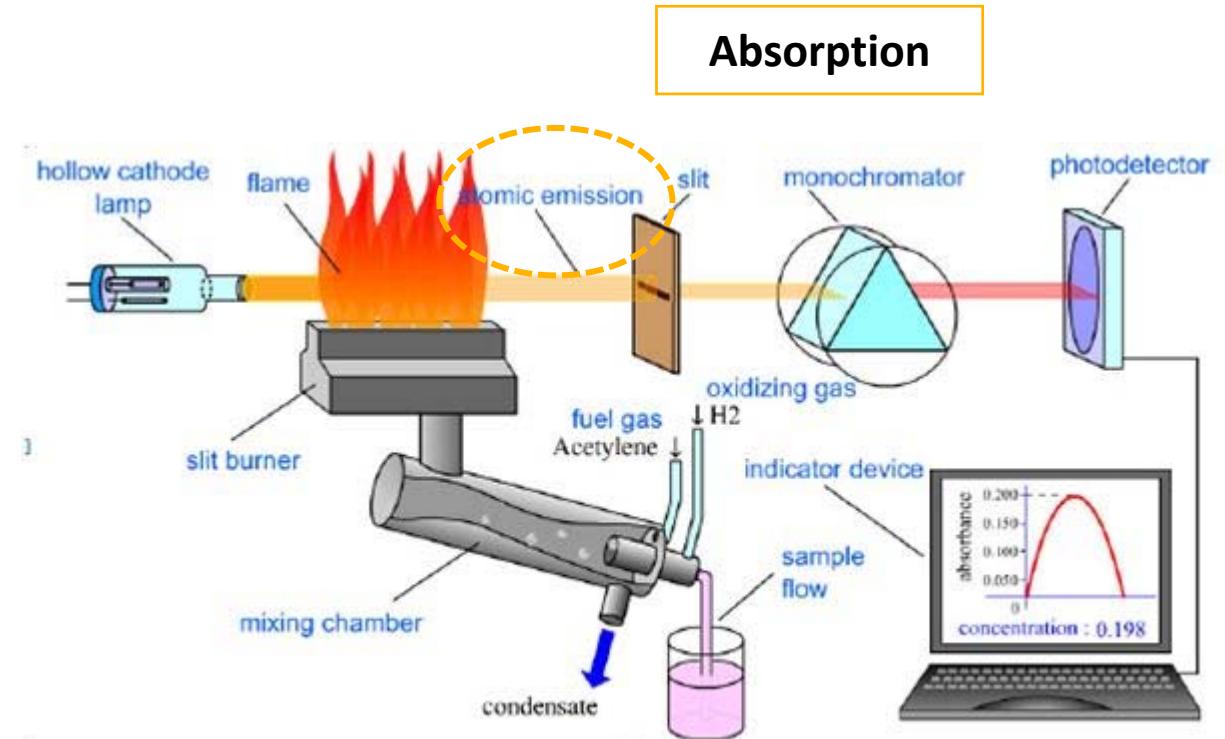
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### Atomic Absorption Spectrophotometry



PRINCIPLE BEHIND ATOMIC ABSORPTION SPECTROPHOTOMETRY



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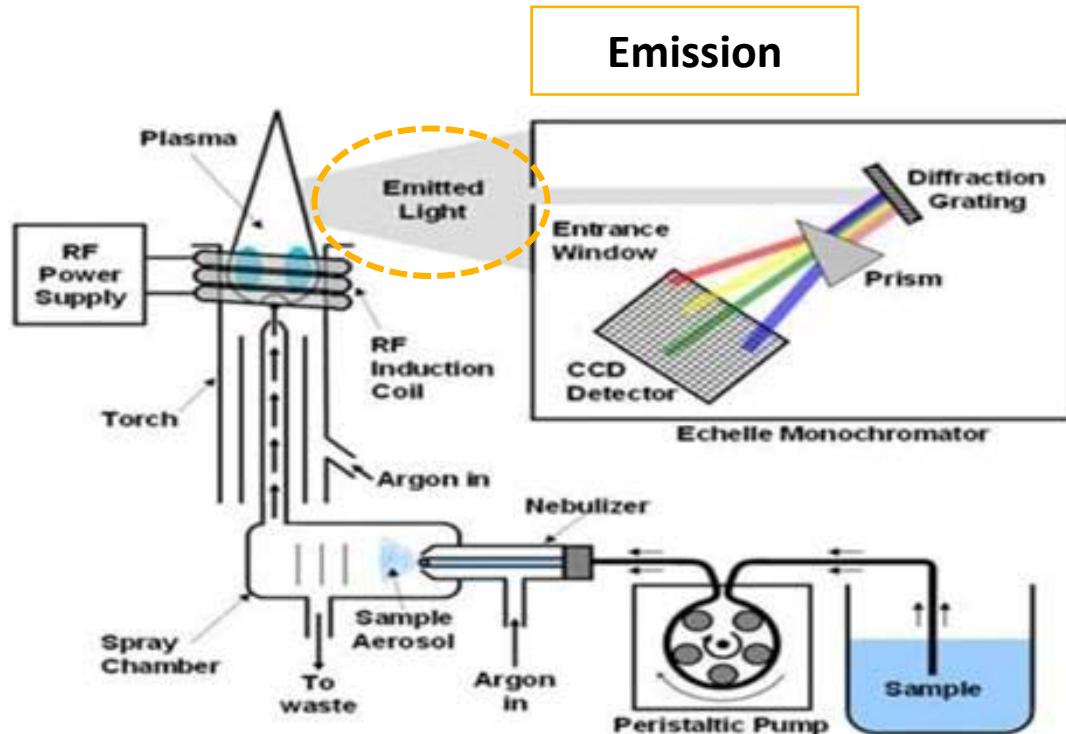
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### Inductively Coupled Plasma (ICP)

6000 – 10 000 °C

AES and AAS  
1900 – 3000 °C



PRINCIPLE BEHIND ICP-OPTICAL EMISSION SPECTROPHOTOMETRY



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### ADVANTAGES

- Many mineral components can be determined in one single run (Fe, Br, Ca, Cu, Mg, Mn, N, K, S, Zn,...)
- Relatively low cost per run
- Sample preparation is not that complex or time consuming
- Accuracy of  $\pm$  7 to  $\pm$  30 %

### DISADVANTAGES

- Device and maintenance costs are very high (> 50000 USD + 1000 USD/year)
- Need for a trained laboratory technician
- Requires standard curve and frequent (elaborate) calibration should be performed
- Not suitable for routine analysis



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### Iron spot test

1. Solution A: Thiocyanate / HCl
2. Solution B: hydroperoxide

Ferreus fumarate =  $\text{Fe}^{2+}$

$\text{Fe}^{2+} \rightarrow \text{Fe}^{3+}$

$\text{Fe}^{3+} + \text{thiocyanate} = \text{red dot}$

$\text{NaFeEDTA} = \text{Fe}^{3+}$

$\text{Fe}^{3+} + \text{thiocyanate} = \text{red dot}$



Low concentration



Higher concentration



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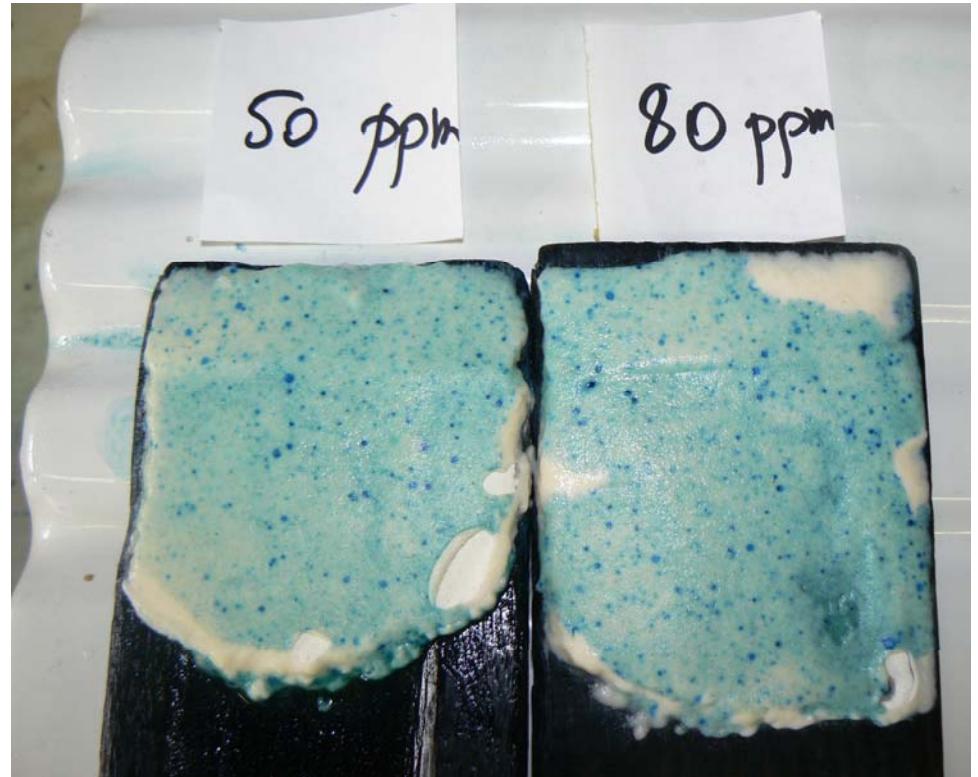


### Vitamin C – Ascorbic acid

1. Solution A: Ferric sulphate and sulphuric acid
2. Solution B: Potassium ferricyanide

Oxidation-reduction reaction leads to the formation of a blue color complex  
→ Semi-quantitative

QC check to look if flour improvers are added (correctly). Ascorbic acid is no flour fortificant



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### Vitamin A and B9 (Folic Acid)

HPLC is the most precise way to quantitatively determine concentrations of vitamin A and folic acid

