

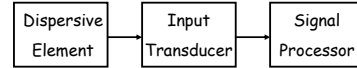
January 21, 2005

- Thanks for the emails - still waiting for some . . .
- **NOTE:** 1st problem set/reading assignments are posted!
- **Office Hours:** will be posted by Monday

1

Signal Processor

- Buffers input and output transducers (*impedance matching*)



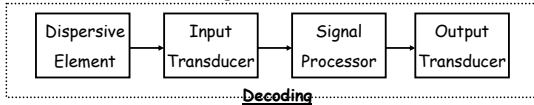
Examples:

- Amplification
- Current-to-voltage conversion
- AC-to-DC conversion
- Modulation/waveshaping
- ADC and/or DAC
- Math (log, FT, integration)

2

Output Transducer

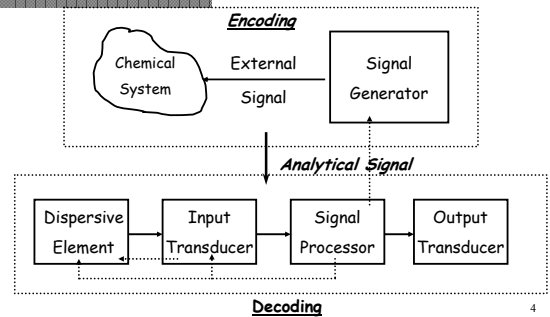
- Converts electrical signal into a "human-understandable" signal



- Most often, a computer
- Also does much of the signal processing

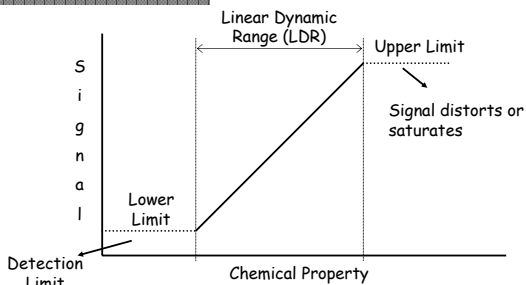
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The General Instrument



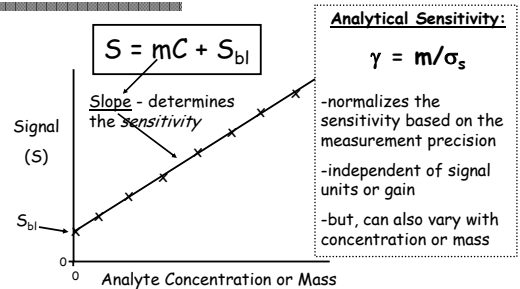
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Quantitative Properties of Analytical Instrumentation



5

The Analytical Curve



6

Detectability

- **Bottom Line Question:**

Is the Analytical Signal distinguishable from the Blank?

- **Example: Pb analysis**

Concentration	Signal	NET Signal
0 ppm (blank)	0.136	0.000
10. ppm	0.721	0.585
1.0 ppm	0.195	0.059
0.10 ppm	0.142	0.006
0.010 ppm	0.137	0.001

We need to know the uncertainty of the measurements.

↑

Std Deviation (σ)
(NOISE)

Which of these are detectable?

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Defining the Detection Limit

- We use the *Signal-to-Noise Ratio (S/N)* as the defining figure of merit.

- Most commonly accepted definition:

*The detection limit is the concentration of analyte needed to produce a **S/N = 3***

- **Where:** S = signal due to analyte
N = σ_{blank}

Signal different from blank at about 89% confidence level

So, Det. Limit occurs when **S = 3 σ_{blank}**

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