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Analytical Transmitters
Vibration Measurement
Electrical Power

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TECH 3821
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Analytical Transmitters

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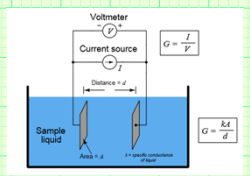
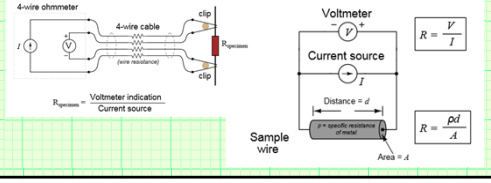
Conductivity

- Two-electrode conductivity probes





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Electrodeless Conductivity Probe

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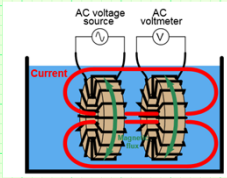
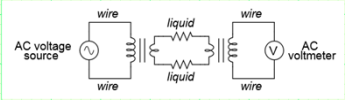
- uses electromagnetic induction rather than direct electrical contact to detect the conductivity of the liquid solution





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pH

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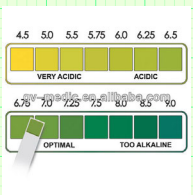
- pH is the measurement acidity or alkalinity in a liquid solution.
- Colorimetric pH measurement
  - simplest ways to measure the pH of a solution is by color (Litmus Paper)



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pH

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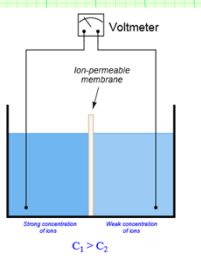
- Potentiometric pH measurement – Electrochemical measurement using special pH-sensitive electrodes that will generate a voltage dependent on pH

Nernst equation

$$V = \frac{RT}{nF} \ln\left(\frac{C_1}{C_2}\right)$$



Where,
V = Voltage produced across membrane due to ion exchange (volts)

R = Universal gas constant (8.315 J/mol*K)

T = Absolute temperature (Kelvin)

N = Number of electrons transferred per ion exchanged (unitless)

F = Faraday constant, in coulombs per mole (96485 C/mol e⁻)

C1 = Concentration of ion in measured solution (moles/liter of solution, M)

C2 = Concentration of ion in reference solution (moles/liter of solution, M)

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pH

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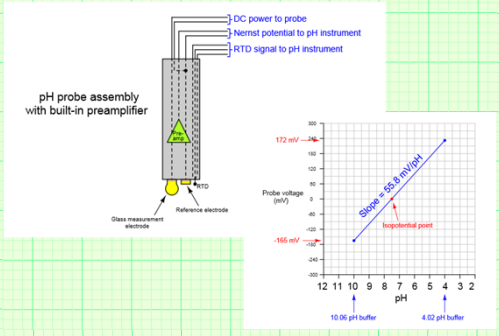
- pH Probe



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Chromatography

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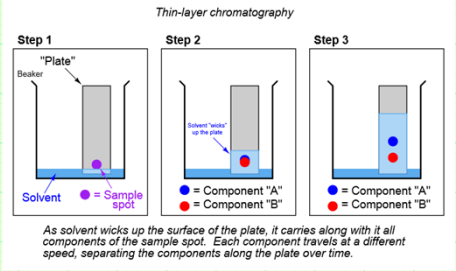
- technique of chemical separation by time-delayed travel down the length of a stationary medium (called a column)



As solvent wicks up the surface of the plate, it carries along with it all components of the sample spot. Each component travels at a different speed, separating the components along the plate over time.

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Automatic Chromatography

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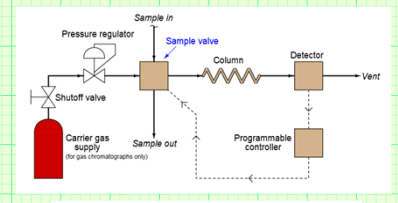

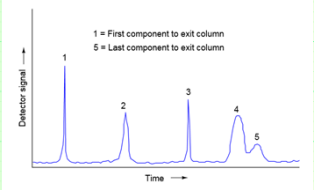

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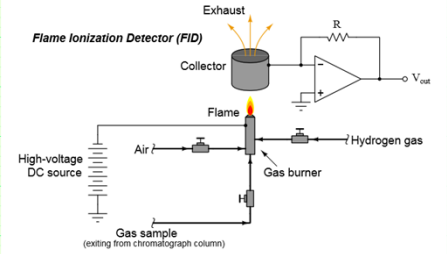
Gas Chromatography 10

- Flame ionization detectors (FID) work on the principle of ions liberated in the combust ion of the sample component



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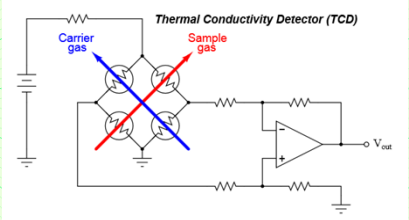
Gas Chromatography 11

- Thermal conductivity detectors (TCD) work on the principle of heat transfer by convection (gas cooling)



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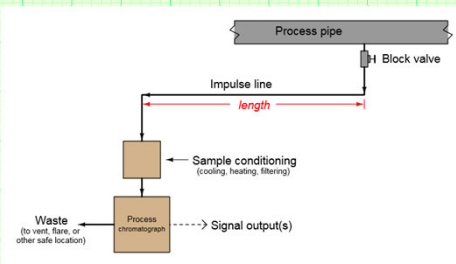
Gas Chromatography 12



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Spectroscopy

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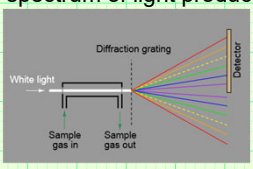
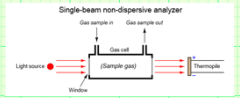
- Spectroscopy is the use of the absorption, emission, or scattering of electromagnetic radiation by matter to qualitatively or quantitatively study the matter or to study physical processes.
- ie use light through a substance and look at the spectrum of light produced





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Luft Detector

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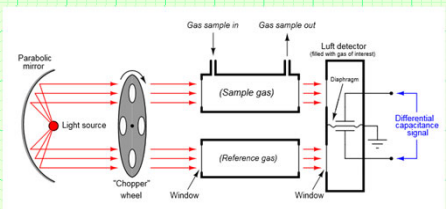

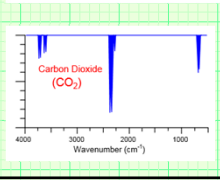

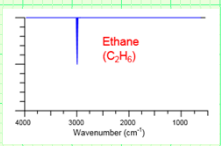

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Safety Gas Analyzers

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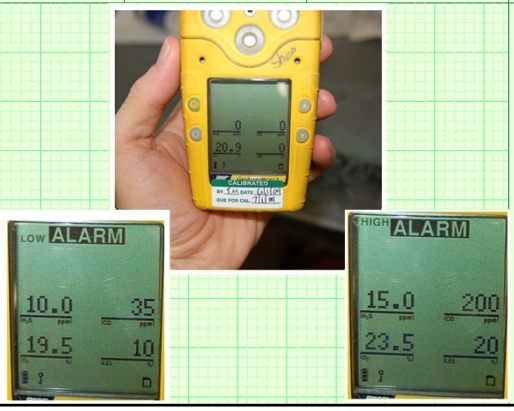

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Vibration Measurement

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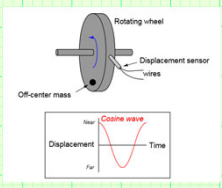
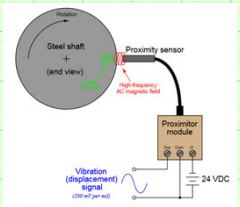
Sinusoidal Vibrations

- a rotating wheel is unbalanced by the presence of an off-center mass, the resulting vibration will take the form of a cosine wave as measured by a displacement (position) sensor





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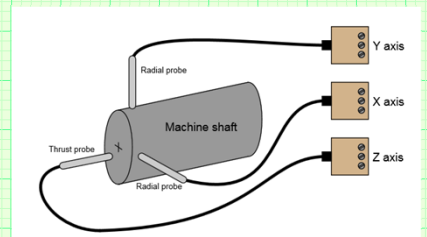
Vibration



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Mechanical vibration Switches

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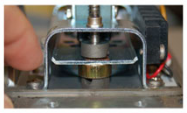
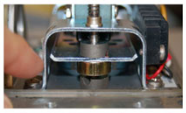
This switch works on the principle of a weighted lever generating a force when shaken. A pair of magnets located at the weighted end of the lever hold it in either the "reset" (normal) or "tripped" position:





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Electrical Power

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Current Transformer

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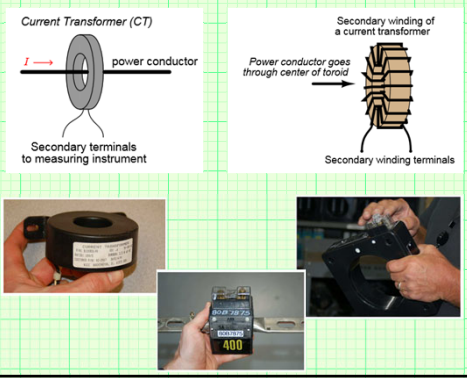

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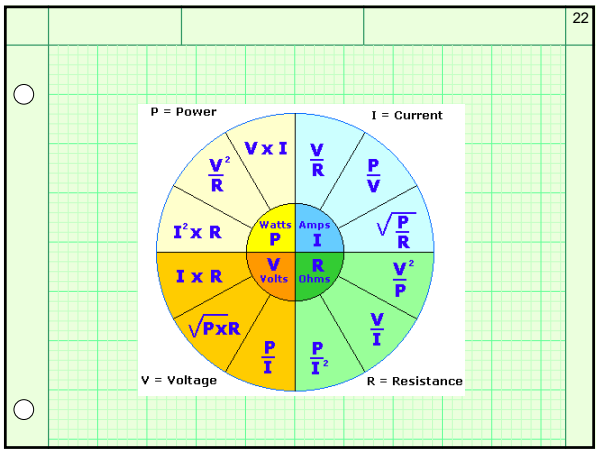
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P = Power
I = Current
V x I
V/R
P/V
√(P/R)
V²/R
I²x R
Watts P
Amps I
I x R
V Volts
R Ohms
V²/P
√PxR
V/I
P/I
P/I²
V = Voltage
R = Resistance

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