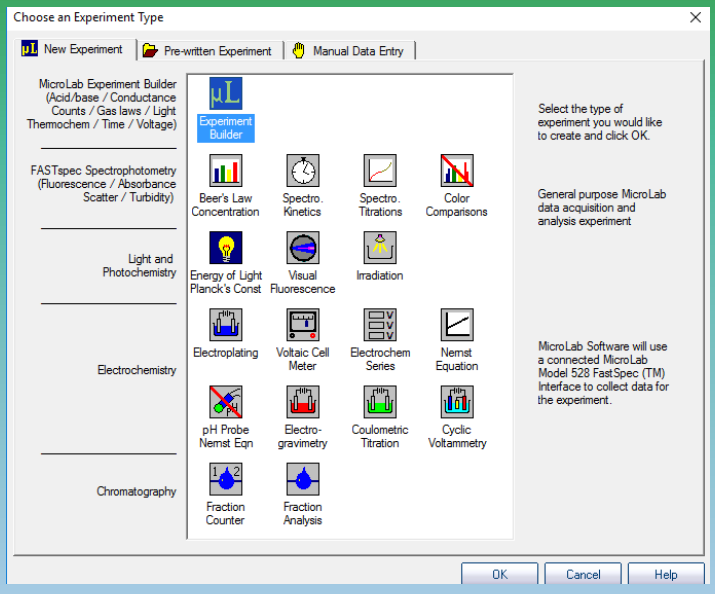
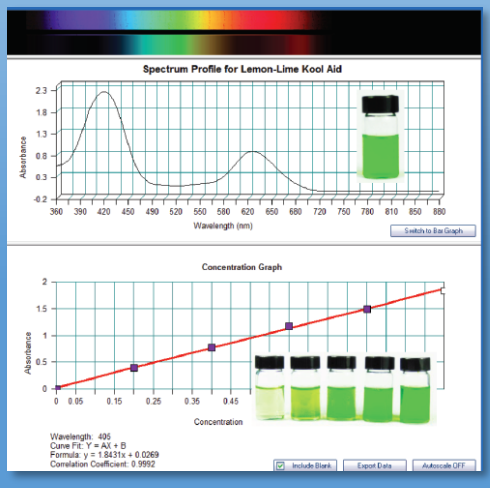
microLAB 2018



MicroLAB Instrument Programs



Tools to Measure

Temperature • Pressure • pH • Light/Spectroscopy • Counts • Conductance • Voltage/Electrochemistry • Time

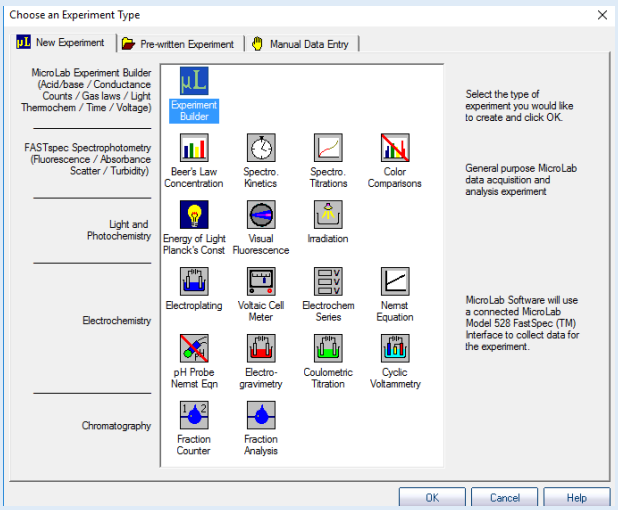
MicroLAB's software supports four kinds of experiments:

The MicroLAB Experiment Builder is a versatile canvas on which students can easily plan a broad range of experiments, calibrate sensors, set up data displays, and collect and analyze data.

Instrument Experiments (icons) provide colorful visual, digital, and graphical displays specific to spectroscopy, light, electrochemistry, and chromatography experiments. Integrated data analysis tools encourage immediate evaluation of data.

Pre-written Experiments produce quick, reliable data for proof-of-concept experiments.

Manual Data Entry programs allow students use MicroLAB's data visualization and graphic analysis tools with hand-entered data.



Beer's Law Concentration

Spectro. Kinetics

Spectro. Titrations

MicroLAB's *FASTspec*™ Scanning Spectrophotometer

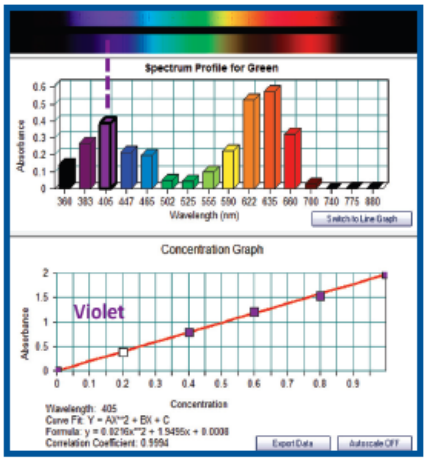
simultaneously measures Fluorescence, Absorbance, Scatter, and Turbidity 360-880 nm range.

Four **Spectrophotometer** programs provide data collection and analysis for ...

- Beer's Law and concentration experiments *(Absorbance/turbidity/fluorescence vs concn)*
- Timed kinetics *(A vs time)*
- Spectrophotometric titrations *(A vs volume)*
- Chromatographic fraction analysis *(A vs fraction #)*

Fraction Analysis

Software also provides programmable control of sample illumination, stirring, and temperature control ± 0.02 C.



Photographic spectra showing the blank and visual absorbance bands are presented across the top of the display. Spectral profiles are displayed as histograms (here) or traditional line graphs (front cover) below. An absorbance plot follows at the bottom of the display. The slope of the Beer's Law plot relates to the molar absorptivity constant measured at each wavelength.

Color Comparisons

The *FASTspec*™ Scanning Spectrophotometer

can be used to collect and compare spectral profiles in the 360-880 nm range.

The **Color Comparisons** program enables students to compare spectral profiles of colored solutions, predict spectral profiles of mixtures of colored solutions, and quantify concentration ratios of acid/base forms of pH indicators.

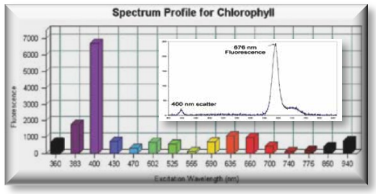
Visual Fluorescence

Visual Fluorescence

excites fluorescence at 16 selectable wavelengths 360-880 nm.

Students can view or photograph this fluorescence by viewing down into the sample vial. The ***FASTspec*™ spectrophotometer** quantitatively measures fluorescent emission at each excitation wavelength.

Model 211C Spectrophotometer

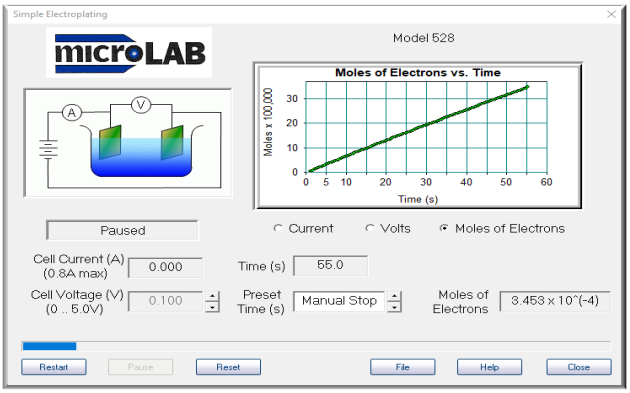


Chlorophyll fluoresces when excited in the 400 and 635 nm regions. The inset graph used a fiber-optic diode array spectrophotometer to show the fluorescent emission peak at 676 nm , demonstrating Stoke's Shift.

Electroplating

Electroplating

With adjustable voltage (0-5 V DC up to 750 mA), students can quantitatively record current, time, and moles of electrons while viewing the reduction of the metal ion. Students often electroplate a key.

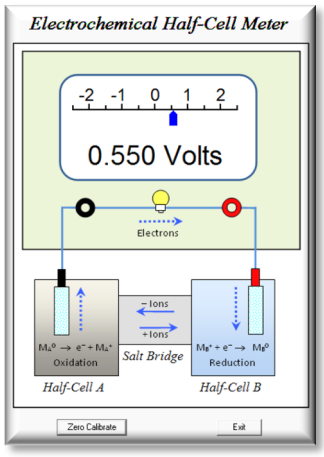


Half-cell Meter

Half-cell Meter

provides three types of information:

- A digital voltage reading with an analog display.
- A light bulb with a blue arrow indicating the direction of electron flow.
- Generic half-cells indicating oxidation and reduction reactions
- Range ± 2.5 volts

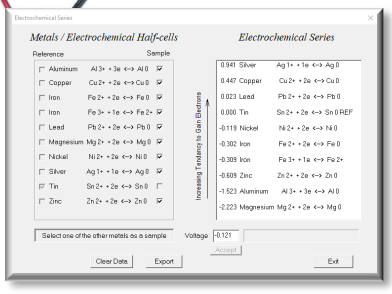


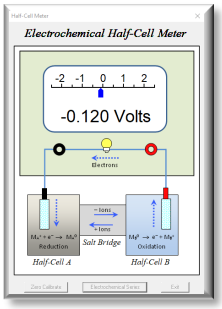
Electrochem Series

Electrochem Series

guides students through generation of an electrochemical series. Students select a reference electrode, collect cell potentials for several metal/metal-ion pairs, and create an electrochemical activity series.

Model 152 Half-cell module

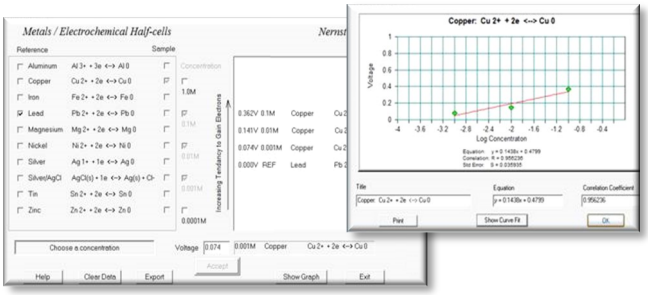




Nernst Equation

Nernst Equation

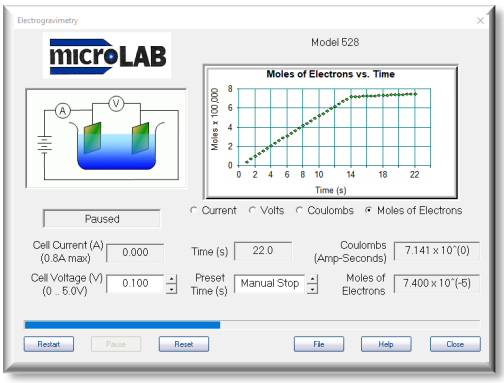
enables students to select a reference electrode and collect data for several sample ion concentrations. They graph the resulting cell voltage versus log of ion concentration. The plot illustrates the 59 mV/n change in cell voltage per decade concentration change predicted by the Nernst Equation. (n is the number of electrons transferred in the half-cell reaction. Cu 2+ illustrated here transfers two electrons.)



Electro-gravimetry

Electro-gravimetry

uses charge transfer data and manual input of the change in mass after electroplating to calculate Avogadro's number, ionic charge, or atomic mass. Students can adjust voltage (0-5 V DC up to 750 mA), and record current, time, coulombs, and moles of electrons transferred.

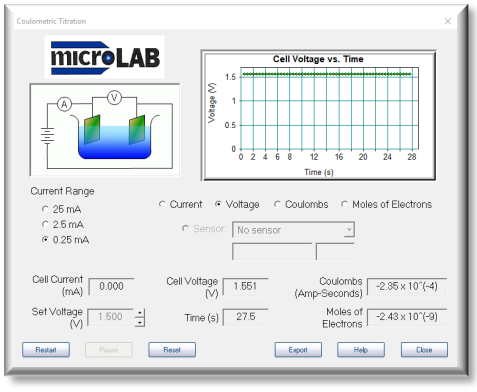


Coulometric Titration

Coulometric Titration

With the **Coulometric Titration** program and Model 292, students can monitor current, voltage, coulombs, or moles of electrons over time while using a isolated redox, pH, or amperometric detector to identify an end point.

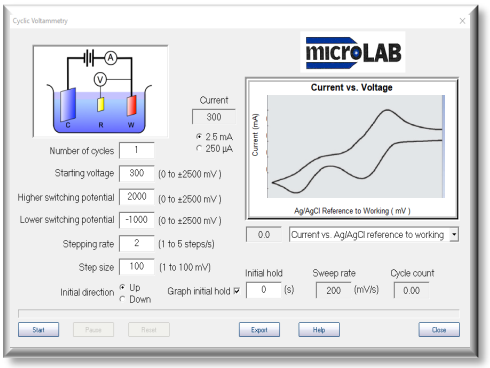
Model 292 Coulometric Titration Module



Cyclic Voltammetry

Cyclic Voltammetry scans in 1-20 mV steps (± 2500 mV) while plotting current vs applied voltage or current vs voltage referenced to an Ag/AgCl electrode. Uses Pine Instruments screen-printed electrodes.

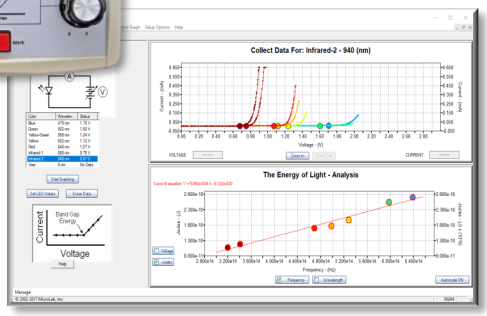
Model 170 Cyclic Voltammetry Module



Energy of Light

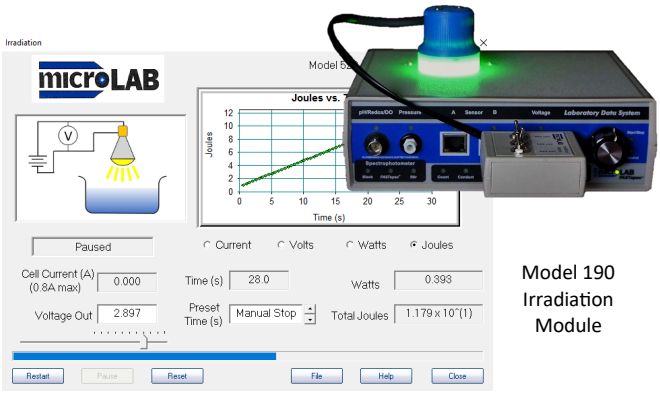
Energy of Light Students can measure the band-gap voltage for seven LEDs 940-470 nm. They visualize the color/energy relationship, and generate a plot of energy versus frequency to calculate Planck's Constant.

Model 214 Energy of Light module



Irradiation

Irradiation powers three selectable (625 nm, 525 nm, and 465 nm) high power LEDs. Students can adjust power and monitor joules of energy delivered over time for photochemistry investigations. UV LED's are also available.



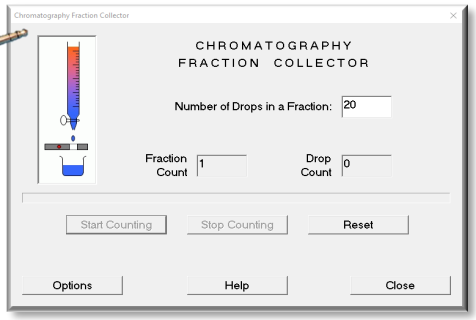
Model 190 Irradiation Module

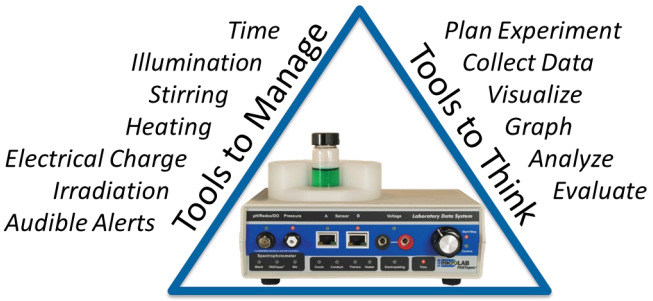
Fraction Collector

Fraction Collector counts drops for from a liquid-chromatography column. The program sounds an alarm two drops before the selected volume is reached and a second alarm at the target volume. The student can then change the collection vial.

The **Fraction Analysis** program plots spectral profiles for each chromatographic fraction.

Model 226 IR –reflective drop counter





Tools to Measure

Temperature • Pressure • pH • Light/Spectroscopy • Counts
Conductance • Voltage/Electrochemistry • Time

A good laboratory provides:

- ***Physical tools*** to manage sample and experimental conditions.
- ***Electronic tools*** to measure chemical behavior.
- ***Software tools*** to help plan, collect data, visualize, graph, analyze, and evaluate the experiment.

The MicroLAB FS-528 provides all of this in one integrated high-resolution, affordable package.

MicroLAB's easy-to-use software provides transparent communication between an experiment and student.

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