einstein™
imagine • explore • learn
Apr 2024

Colorimeter Sensor

Product Number ENCOL-A185

Overview

The Colorimeter is designed to determine the concentration of a solution by analyzing its color intensity. The Colorimeter measures the intensity of light transmitted through a sample at a selected wavelength. This makes the Colorimeter useful for several experiments in Chemistry and Biology.
The Colorimeter Sensor can be connected to all einstein™ data loggers.

Typical experiments

Chemistry

- Determining the concentration of an unknown colored solution
- Measuring reaction rates
- Chemical equilibrium: Finding a Constant, Kc
- The Lambert-Beer Law

Biology

- Measurements of glucose synthesis during photosynthesis
- Effect of light on chlorophyll levels in plant leaves
- The effect of enzymes on foodstuffs: Degradation of egg white proteins in the presence of the enzyme –
- pepsin.
- Concentration of pigment

How it works

A solution's ability to absorb light waves depends on or is proportional to the concentration of a solution. The Colorimeter shines a colored light through a solution and then records how much light was absorbed by the chemicals in the solution. This allows you to determine the concentration or strength of the solution.

Sensor specification

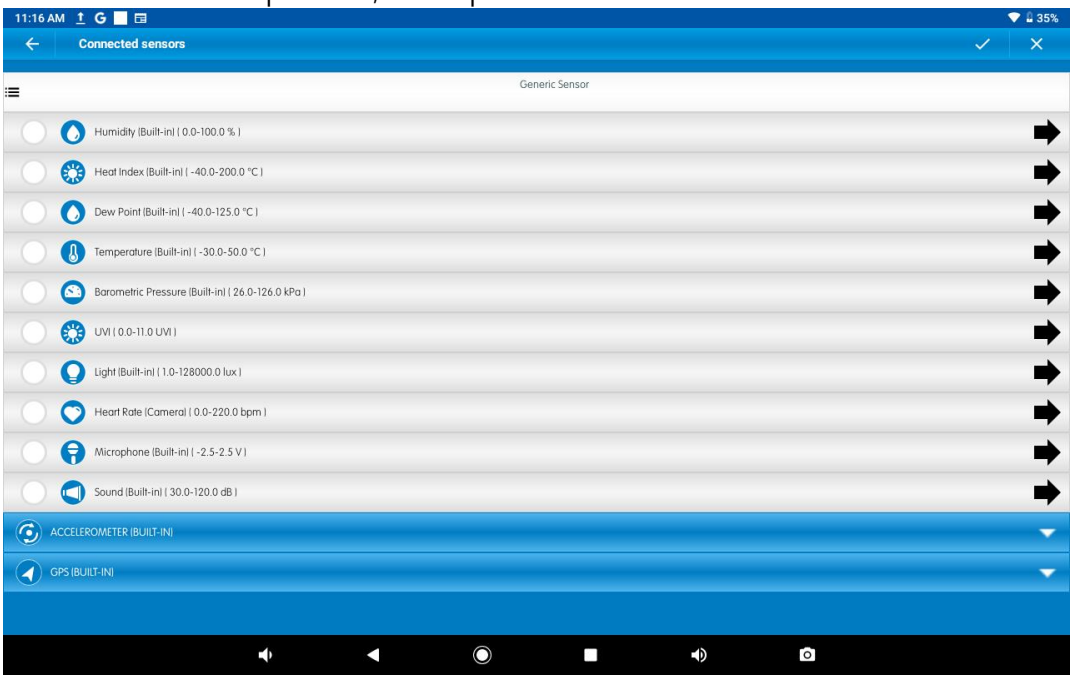
Transmittance:	20%-90%
Accuracy:	±10
Resolution (12-bit):	0.03%
Wavelength: Green (500nm) Red (650 nm)	Blue (480nm)
Cell Volume:	3.5cc
Cell Width:	1 cm
Data Logger Input Type:	Digital
Feature	Calibration Knob

Note: Sensor cable sold separately

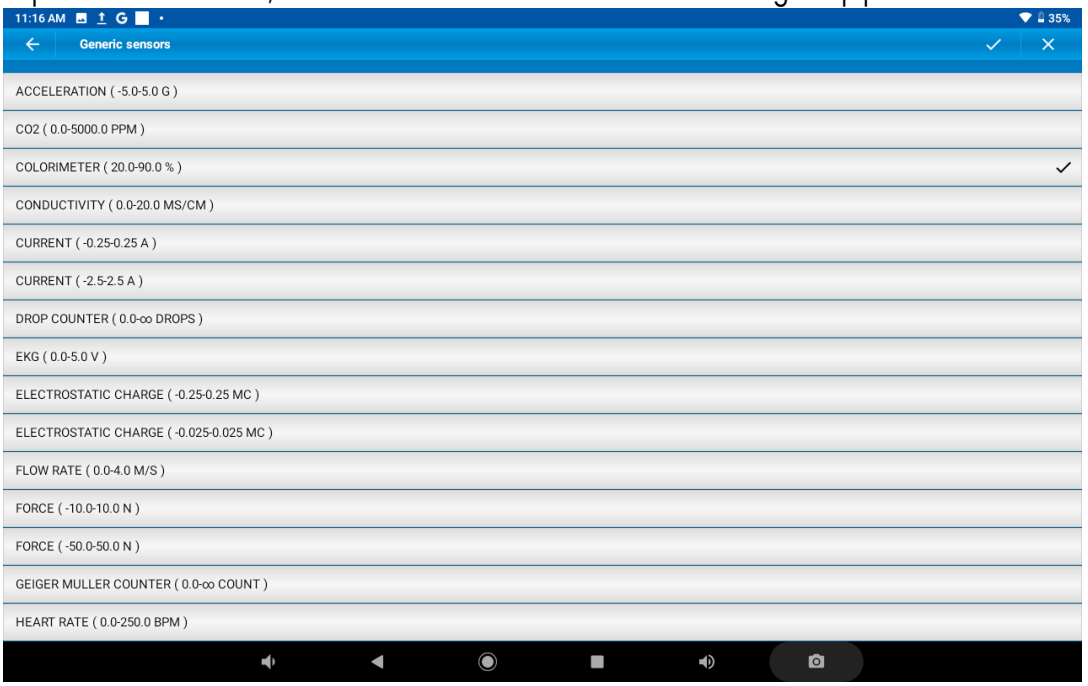
Connect the sensor

MiLAEBx™ Android

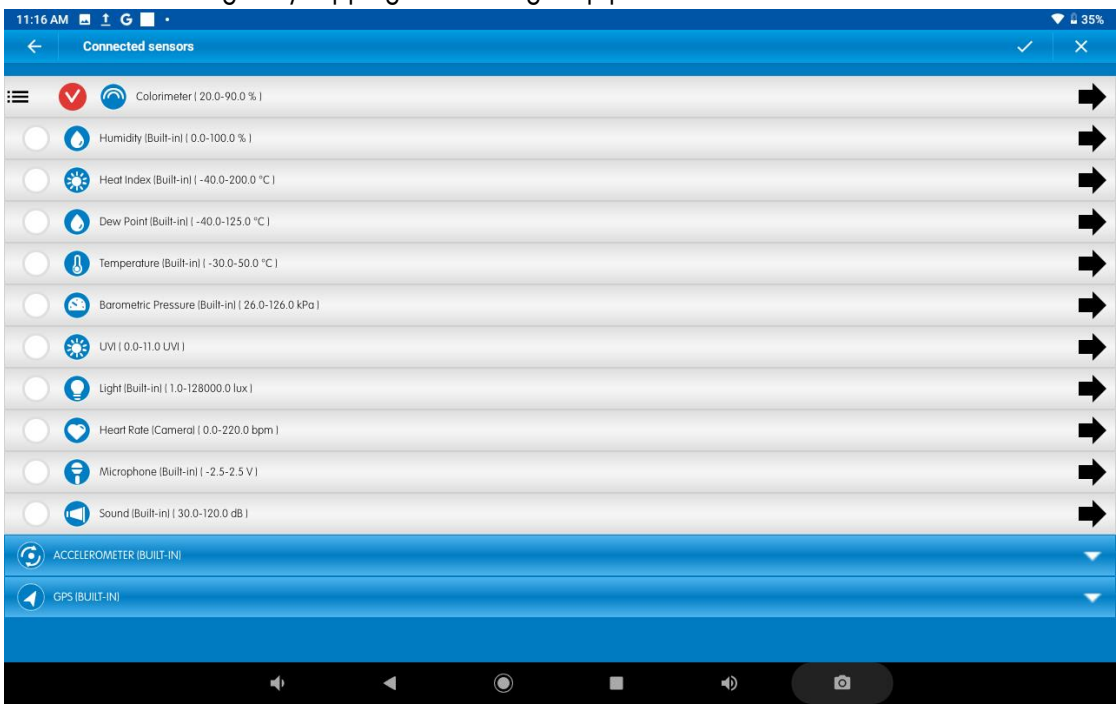
1. Take your einstein™ Tablet or pair your einstein™ LabMate™ with your Android or iOS tablet via Bluetooth
2. Insert the sensor cable into one of the sensor ports via the DT to einstein™ sensor adaptor
3. Launch MiLAEBx
4. Go to LAB – Start an Experiment, then tap on Sensors



5. Tap on Generic Sensor, select Colorimeter and then the V on the right top panel



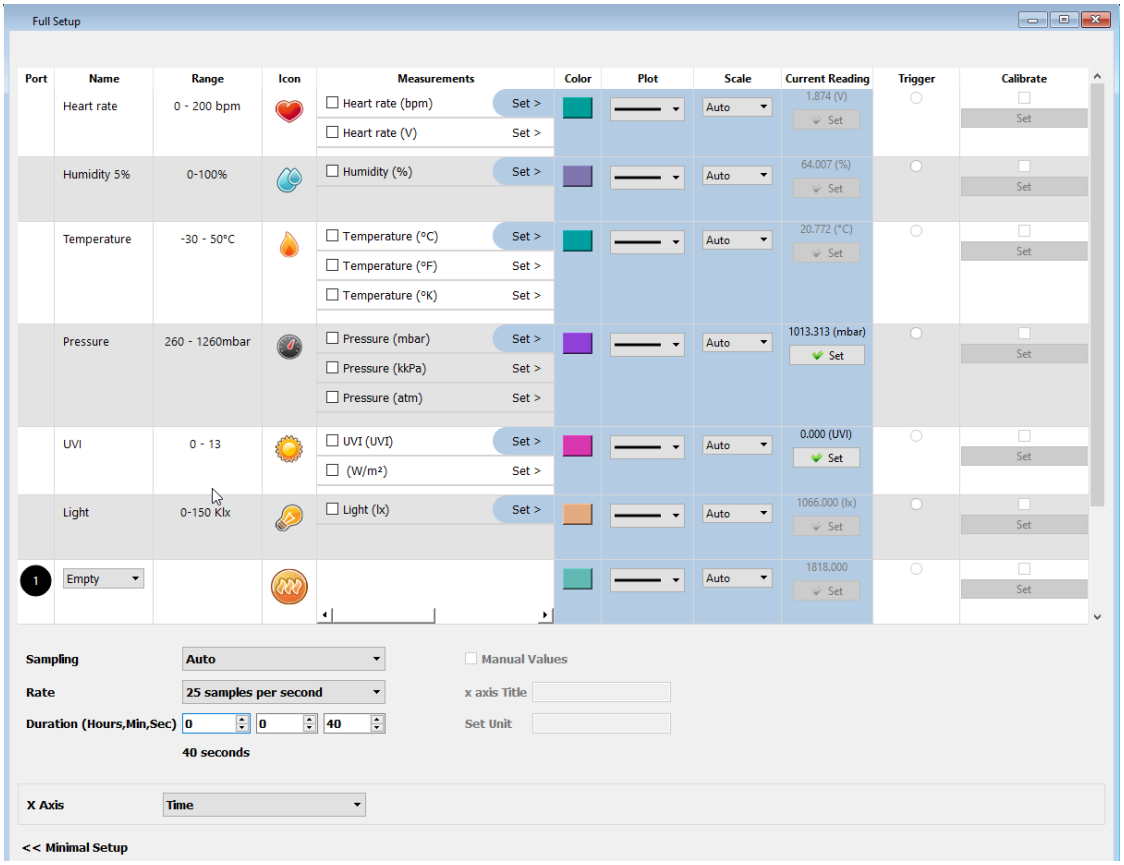
6. Save the changes by tapping V on the right op panel



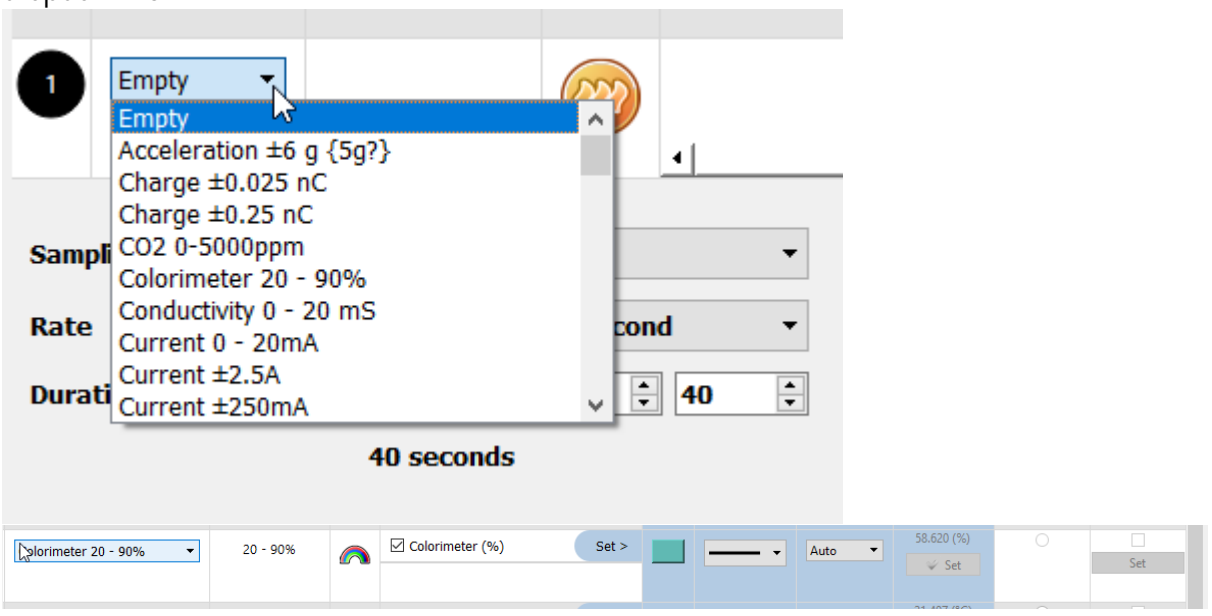
7. You are ready to start an experiment

MiLAEBx™ Desktop

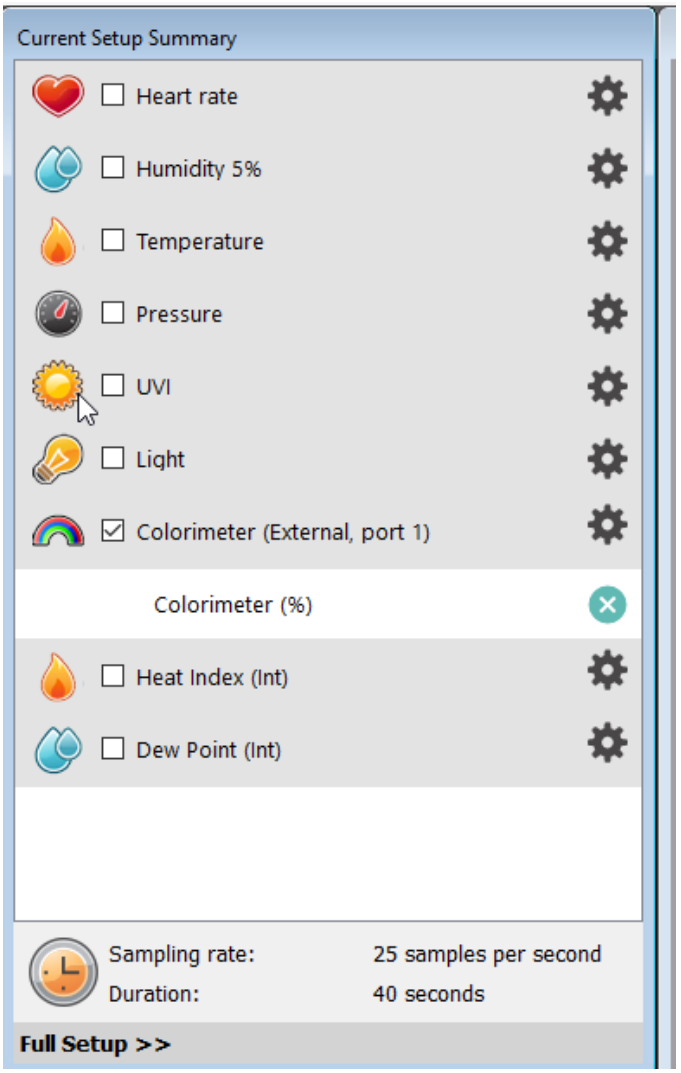
1. Pair your einstein™LabMate™ with your PC, MAC, or Linux machine via Bluetooth, or connect it via the USB cable (found in the einstein™LabMate™ box).
2. Insert the sensor cable into one of the sensor ports via the DT to einstein™ sensor adaptor
3. Insert the sensor cable into one of the sensor ports
4. Launch MiLAEBx
5. Go to LAB Start an Experiment
6. Click on Full Setup on the sensors area



7. Open the list in the sensor name ("Empty") and select Colorimeter from the dropdown list



8. Minimize the setup and make sure the sensor is checked



9. You are ready to start an Experiment

Data logging and Calibration

The Colorimeter should be recalibrated before any new experiment, or when changing colors. To calibrate:

1. After connecting the sensor to your LabMate or to your Einstein device - Insert one of the three filters into the sensor (the one you want to use).
2. Lift up the rubber cover and insert a cuvette filled with distilled water into the sensor. Tightly closeto the rubber cover.
3. Click Run
4. Turn the calibration knob, located on top of the Colorimeter, until the reading is 90%. (Make sure to find the exact point when the reading turns to 90%).

5. you are ready for your experiment

what's in?

The Colorimeter comes with:

- 3 colored slides
- Cuvettes and cuvette caps
- DT-to-einstein™ sensor adaptor

Example of using the Colorimeter Sensor

Beers Law

According to Beer's Law, the more concentrated a solution, the less light will be able to pass through it. In this experiment you will use the Colorimeter to demonstrate this principle.

For this experiment you will need:

- The Colorimeter
- One cuvette
- Distilled water
- Red food coloring

Set up

1. Prepare 3 mL of distilled water in the beaker
2. Calibrate the Colorimeter as described in Calibration above
3. Insert the blue filter into the Colorimeter
4. Pipette 20uL of red food coloring into the cuvette with the distilled water

5. Blend the solution until the food coloring is spread evenly
6. Insert the cuvette into the Colorimeter
7. Click Run
8. Wait for the reading to stabilize and click Stop

Experiment

9. Add another 20ul of the red food coloring into the cuvette and repeat the measuring process.
10. Repeat steps 4-9 three more times.
11. Analyze the results. Please notice that the colorimeter output is %T –the percentaged transmittance. In order to calculate the absorbance we should use the equation:

$A = 2 - log_{10}(\%T)$. Beer-Lambert Law: $A = \varepsilon bc$

- **Note:** The accuracy of the results may be affected by the solution concentration if it exceeds the sensor's range. If you see any significant deviations, dilute the food coloring with distilled water.

Technical support

For technical support, you can contact the Fourier Education's technical support team at: Web: www.einsteinworld.com/support
Email: support@fourieredu.com

Copyright and Warranty

All standard Fourier Systems sensors carry a one (1) year warranty, which states that for a period of twelve months after the date of delivery to you, it will be substantially free from significant defects in materials and workmanship.
This warranty does not cover breakage of the product caused by misuse or abuse.
This warranty does not cover Fourier Systems consumables such as electrodes, batteries, EKG stickers, cuvettes and storage solutions or buffers.