General Light Level Sensor
for the LogIT Microsense® system

Instructions

Overview
This light sensor is designed for general purpose measurement of light levels. It uses a silicon device which is sensitive to a wide spectrum of light, from blue through to Infra red.

In Use
The sensor can be plugged directly into your Microsense compatible instrument or used remotely with an extension lead.
Because it is so sensitive you may need to attenuate light in very bright conditions (never point directly at the sun).

The sensor is not water or weatherproof and should be protected from hostile environments.

Calibration:
This sensor is not calibrated in specific units but to 0-100% (0 being no light); if it were pre-calibrated it would have to be fixed at a specific sensitivity and wavelength which would severely limit its versatility. Most general lab experiments are concernd with relative change, but you can convert the % reading to your own scale if required using appropriate software (LUX sensors are available).

Built in filter to remove the flicker from AC flourescent lamps etc (NB the light sensor with lens does not).

Specification:
Sensitivity bandwidth: 450 nm (blue) - 1050 nm (Infra red) (850 nm peak)

Care
Do not disassemble this sensor.
Do not look directly at the sun if using the sensor outside.

Example Applications
Change of transmitted light during a reaction
The effect of light levels on voltage output from solar panels
The relationship between plant growth and light levels
Use to record when lights are switched on/off eg. in a fish tank

Resources

The resources shown overleaf are available along with others for download in PDF format at www.logitworld.com

Waste electrical and electronic products must not be disposed of with household waste.
Please recycle where facilities exist.
Check with your Local Authority or Retailer for recycling advice.

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"Perfect curtains"

Physics

Subject: Physics

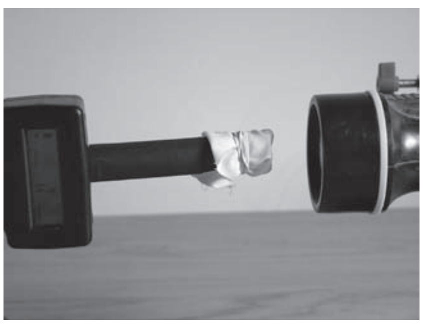
Sensor: Light

Overview:
Have you ever woken up in the morning with the light from the sun coming through your window curtains? When you need to get up this is fine but if you worked at night and slept during the day (or were Count Dracula!) this might not be so good. This experiment uses the light sensor to measure how much light is blocked by different materials.

Equipment required: LogIT Datalogger
Light Sensor
Tube of cardboard to simulate the room
Range of different materials to test
Tape/elastic band to attach to the 'window'
Light source such as a torch, low wattage lamp or sunshine

Hazards:
Do not look directly into sources of light as damage to the eye could result.
Do not allow pupils or materials to touch the light source.
Always check your local regulations or the school advisory service such as CLEAPSS or SSERC for guidance on the use of any hazardous materials or chemicals.

Setup:



1. Place the small tube over the light sensor to form the room.
2. Place the light source at the end of the tube.
3. Measue or mark the distance from the light source to the end of the tube. Keep this distance constant for each material.

Note: The use of the tube over the light sensor prevents any stray light from entering the light sensor without passing through the material first.

Method:
1. Connect the sensor to the datalogger.
2. Run the datalogging software and setup the 'snapshot' facility to take individual readings.
3. Discuss which materials will block the most light and which will let the most through.
4. Choose a piece of material and write down its description.
5. Place the material over the end of the tube fixing with an elastic band.
6. Point the material at the light source and take a reading via the software.
7. Repeat for each material being tested.

Note: If computers are limited, you can use the remote snapshot facility on most LogIT dataloggers. The results can then be downloaded to the computer for further analysis.

Results:
- Which material kept out the most light?
- Which material let the most light through?
- Would the best material at blocking light be suitable for curtains?
- Decide how best to show the results found.

Going further
- Try moving the light source closer or further away.
- Try using two pieces of material stuck together.
- Design a shower curtain. What are the different properties requred for a shower curtain over a room's curtain? How might you investigate these properties?

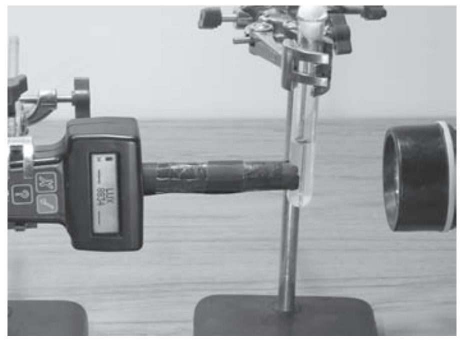
“Rates of reaction”

Subject: Chemistry

Sensor: Light

Overview:
When Sodium Thiosulphate and Hydrochloric Acid are reacted together, a precipitation of sulphur is produced and the solution becomes cloudy. By measuring the light intensity through the solution, timing how long the precipitate takes to form, the rate of reaction can be found. The products of this reaction are Sodium Chloride, Sulphur, Water and Sulphur Dioxide.

Equipment required:
LogIT Datalogger
Light sensor
Small test-tube and cotton wool (used to seal the tube)
Pipette or small burette
0.15 Molar Sodium Thiosulphate
1 Molar Hydrochloric Acid
Distilled water
Paper towels to dry the test tube
Light source such as a torch
Piece of black card



Hazards:
Children must be supervised at all times.
Goggles must be worn.
Avoid inhalation of any gas given off if not contained in the test-tube.
Always check your local regulations or the school advisory service such as CLEAPSS or SSERC for guidance on the use of any hazardous materials or chemicals.

Chemistry

Setup:
In this procedure the amount of Acid was kept constant at 1 ml. You can increase/decrease the amount of acid depending on time.
The concentration of Sodium Thiosulphate was altered by adding varying amounts of distilled water.

Sodium Thiosulphate (ml)	3	2.5	2.0	1.5	1.0
Distilled water (ml)	0	0.5	1.0	1.5	2.0
Hydrochloric Acid (ml)	1	1	1	1	1
Total volume of liquid (ml)	4	4	4	4	4

For this experiment, you need to make a tube of cardboard to channel the light to the light sensor.

Method:
1. Connect datalogger to the computer.
2. Set up the datalogging facility time span between 5 and 15 minutes.
3. Carefully measure out 3 ml of Sodium Thiosulphate and place it into the test-tube.
4. Start logging and after about 15 seconds, add 1 ml of Hydrochloric Acid. (The dropping of the acid should be enough to mix the reactants.)
5. Keep collecting data until the light level no longer drops ie. the reaction has finished.
6. Stop logging and then repeat for the different concentrations shown in the above table.

Note: It is important to clean the test-tube thoroughly with distilled water between readings.
The reaction time can be obtained from the graph from where the plot starts to fall to where the plot levels off again. The rate of reaction can be expressed as:- Rate of reaction = 1 / Time taken

Results:
What do the results show about how the rate of reaction can be changed?
How does this method ensure it was a fair test?
Why was it important to ensure the test-tube was thoroughly cleaned each time?

Going further:
How might the temperature affect the reaction rate?
How might this experiment relate to reactions at home?

"Eutrophication"

Subject: Biology

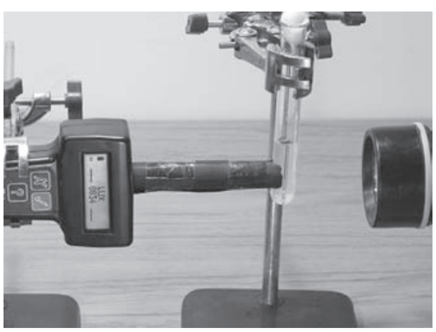
Sensor: Light

Overview:
When eutrophication occurs in streams and ponds, it is usually a result of human activity where the amount of nitrogen and phosphorus inorganic plant nutrient levels have been artificially increased due to fertilizer wash off from fields. This process without human interference, normally happens over a long period of time as dead organic matter accumulates.
Where an increase in either the phosphorus or nitrogen nutrients occurs then an algae bloom can result. Anyone who has set up an aquarium at home knows that this can be a real problem as the light struggles to reach plants and fish at the bottom, particularly if it is a deep tank.
This procedure uses the light sensor to monitor the light transmission through the water samples to see when algae is formed and what effect differing levels of liquid fertilizer has on the algae formation.

Equipment required: LogIT DataLogger
1 Light level sensor
Some 2 litre plastic drink bottles
Liquid household fertilizer
Test tubes and black card
Pond water
Aquarium fluorescent light or lights (You can of course use natural sunlight)
Distilled water
Large cardboard box to cover the water bottles

Hazards:
Water samples must never be consumed.
Always check your local regulations or the school advisory service such as CLEAPSS or SSERC for guidance on the use of any hazardous materials or chemicals.

Setup:



1. Fill 5 plastic bottles with pond water.
2. Label the bottles 1 to 5.
3. Put 5 ml of liquid fertilizer into bottle 1 and add 5 ml increments to bottles 2, 3 and 4. (ie. bottle 4 has 20 ml of liquid fertilizer) Don't add any to bottle 5.
4. Put an aquarium fluorescent tube or lamp over the bottles in a large cardboard box.

Biology

Method:
1. Each day, take some liquid out of each bottle and place in a test tube. (You could simply use the bottles if they are clear enough)
2. Shine a light through the test tube, place the light sensor in a black tube as shown.
3. Monitor the light transmission using the light sensor daily as shown in the photo using 'snapshot mode'. (You can note the results in a spreadsheet)

Note: You might like to use more bottles so as to have repeat data on each of the fertilizer concentrations.

Results:
Hopefully the results will show an algae 'bloom' occurring either sooner or later in the bottles and the time taken should relate to the levels of fertilizer in the water.

Going further:
You may like to monitor a real aquarium. If so, do so with a newly set up one as these very often develop algae problems early on in their life.
Try monitoring an aquariums light, pH and dissolved oxygen levels. Can produce some interesting results.

Product ref: D2000088 ; Document ref: D773088/3