

Folder: Science P4-7
Topic: 'Energy 2' Light
Level: C/D

LO4 Objects that do not allow light to pass through them are said to be 'opaque'

You will need:

A selection of 5 material samples (see 'Summary of experiment' below)

LogIT Explorer datalogger

You do not need a computer, but if you do it will draw a graph for you.

Tip:

You will get better readings if you are in a strong, steady light source. Natural light gives the best results. If using a torch as a light source, the material sample can be held over the torch, rather than over the light sensor, as long as it is the same for each piece of material.

Summary of experiment:

By placing a material over the light sensor on the datalogger, pupils can measure how much light is passing through that material. Judgements as to whether a material is transparent or opaque can be accurately tested, provided that a 'fair test' has been set up. Comparative tests can be carried out, for example:

- Which of these coloured tissue paper samples do you think lets the most light through? Are any of them truly transparent? Test to find out.
- Which of these black material samples do you think would make the best blackout curtains? Are any of them truly opaque? Test to find out.

Now here's what to do:

Step 1

Discuss the idea of a 'fair test'. The background light source must be steady for all the sample readings – for example, if one reading was taken pointing towards a window and another towards the floor, the light measurements would be inaccurate. Therefore it is important that the datalogger stays in the same position for the whole experiment. Similarly, the material samples should be placed over the light sensor in the same way each time.

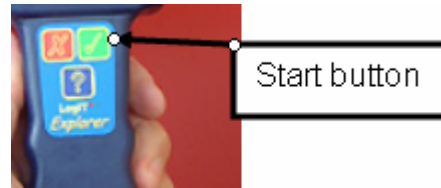
Step 2

Look at the samples, discuss the experiment and make predictions, using the worksheet with these notes.

If you have access to a computer and can plug the datalogger into it while you are doing the experiment, go straight to Step 6.

Step 3

Press the green start button to switch on the datalogger.



Step 4

Set up the datalogger in the experiment position and hold the first material sample over the light sensor (the middle one of the 3 sensors).

Note: This datalogger is hand-held to get a better photograph, but it would be difficult to hold it in one place for the whole experiment. Results will be more accurate if the datalogger (and torch light source, if used) is fixed onto a flat surface, eg with Blutak.



Step 5

Look at the datalogger digital display and take a LUX light reading for that sample.

Note: If the LUX reading is 0, and the material is not completely opaque, you will need to find a better background light source for your experiment.



Use the pupil worksheet with these notes to record the LUX reading for each material sample and see if the predictions were correct.

Pupils could make graphs from their results.

Step 6

If you have access to a computer and can plug the datalogger into it while you are doing the experiment, you can see a bar graph being drawn as the light readings are recorded.

Connect the datalogger to the computer with the USB cable.

Note: When a datalogger is plugged into the USB port of a computer for the first time, the computer has to search for a device driver. This may already have been done for you by the Network Administrator. If not, you will see the 'Add New Hardware Wizard' window on your screen. Keep pressing 'Next' on each window, and 'Finish' on the last window. (See the 'Adding New Hardware Wizard Step-by-Step Guide' document)



Step 7



LogIT Lab
Level 4

Switch on the datalogger with the green start button. Double click to open LogIT Lab Level 4. Click the Snapshot button.

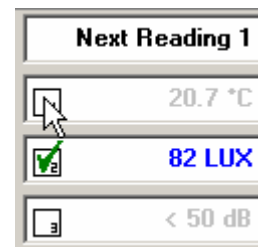


Open RM Favourites folder, then look inside the Datalogger folder.



Step 8

On the top right of the graph display, click to remove the tick from the temperature and sound sensors. Now the graph will only display the light data.



Step 9

Hold the first material sample over the light sensor (the middle one of the 3 sensors) – see Step 4. Click Store from the toolbar at the top. A bar will be drawn on the graph. Continue to hold samples over the light sensor, clicking 'Store' each time to create a bar on the graph. *Note: The bars may be very small and it is impossible to tell the difference between them. Do not panic! Finish the experiment and then see Step 10.*



When you have finished, click the Logging Stop button on the bottom right of your screen, to save the batteries in the datalogger.

Step 10

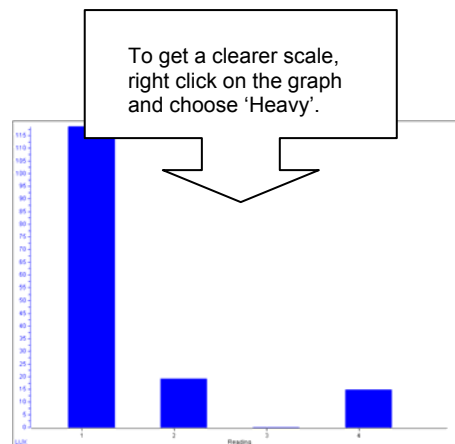
If you do not have a very strong background light source, the scale of the graph may mean that it is impossible to differentiate between the measurements. Click the Auto-Zoom tool from the toolbar at the top to improve the graph. You can only do this once the graph is complete.



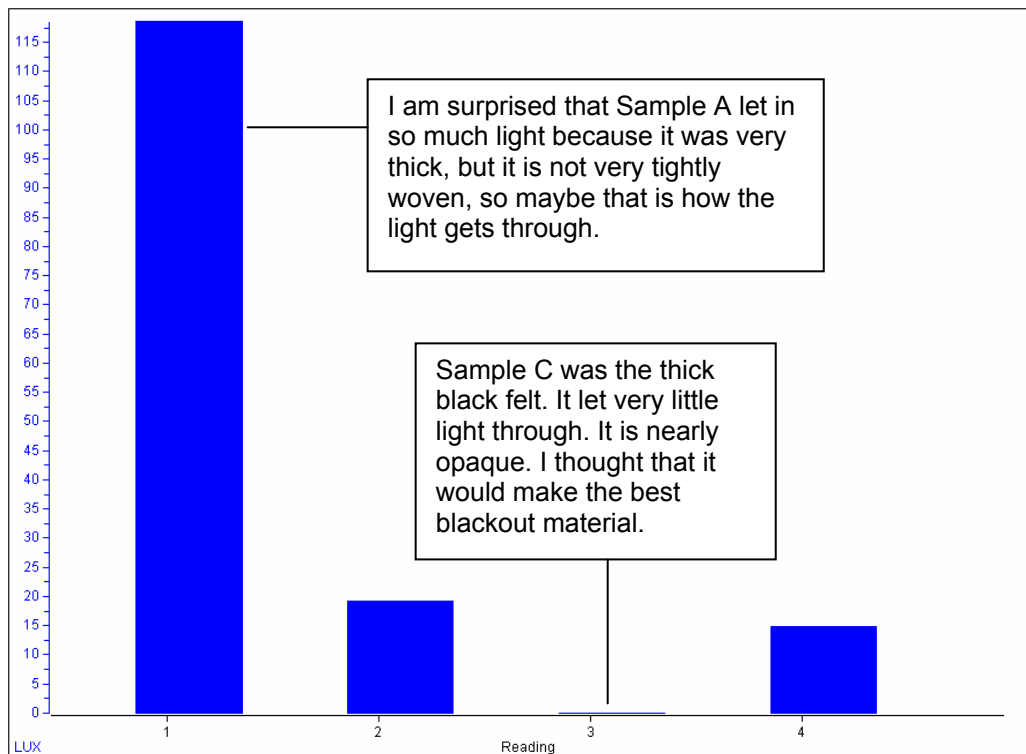
Step 11

Analyse the graph, which may look something like this:

Pupils should be able to decide whether the results match their predictions. They should be able to label the graph. This can be done in 3 ways:



1. Discuss orally as a group/class OR
2. Print out the graph and photocopy it. Pupils add written labels. OR
3. Copy the graph, using the Edit menu – Copy Graph. Paste the graph into Word and add text box labels.



Step 12

If you get unusual results from your experiment, it may be that the experiment conditions altered between samples. Pupils should be aware that a 'fair test' is crucial for accurate results. Could a finger have been accidentally put over the light sensor? Did the sun shine through the window just as that reading was taken? Pupils may be able to suggest solutions for a fairer test, for example repeating readings to check for accuracy, or checking the background light level before taking a snapshot reading.

Pupil Worksheet

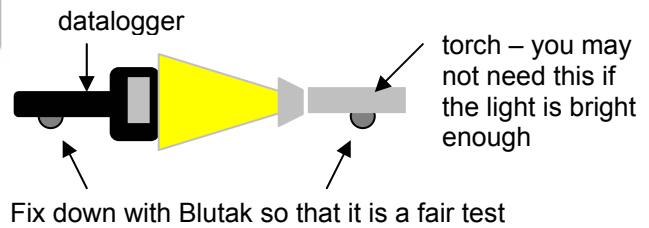
You will need: 5 material samples and the datalogger

Testing materials to see how much light passes through them

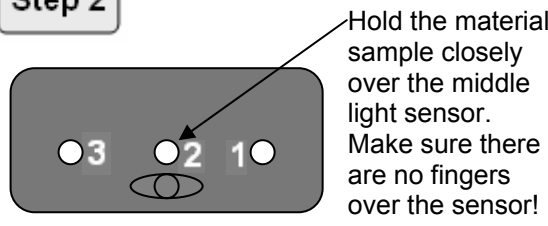
Preparation

Set up the experiment:

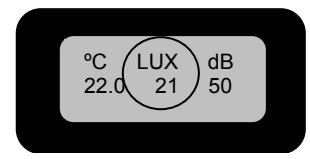
Step 1



Step 2



Step 3



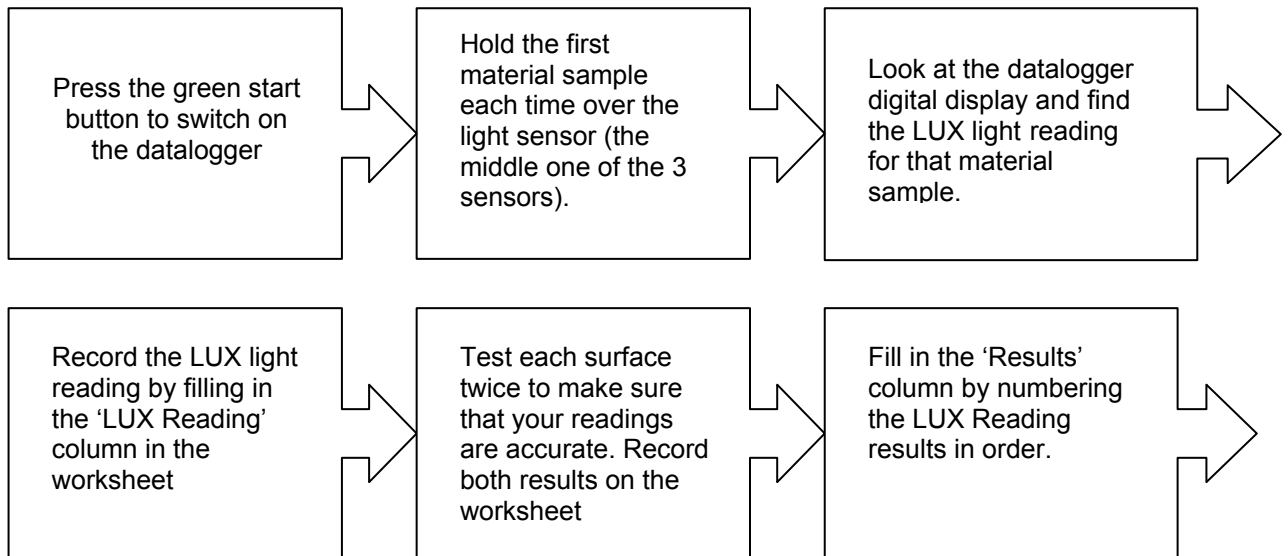
Read the LUX reading and record it on the table

Predicting Results

1. Fill in the 'Description' column in the table below
2. Decide which sample you think is the most opaque and fill in the 'Prediction' column. Number the most opaque 1, and the least opaque 5. Number the other samples in order.

	Description <i>Describe what the material is like. Use a few words like 'thick, black felt' or 'pink tissue paper'</i>	Prediction <i>Decide which material is the most opaque and which is the most transparent. Number them all in order – most opaque 1 and least opaque 5</i>	LUX Reading <i>Take the readings from the digital display</i>	Results <i>Which material is the most opaque and which is the most transparent? Number them all in order– most opaque 1 and least opaque 5</i>
Sample A			1.	
			2.	
Sample B			1.	
			2.	
Sample C			1.	
			2.	
Sample D			1.	
			2.	
Sample E			1.	
			2.	

Carrying out the Experiment



Analysing the Results

Which samples were most opaque and least opaque in your experiment?
Complete these sentences: (Use words like 'let most/least light through')

1. _____ was most opaque because it

2. _____ was least opaque because it

Were your predictions correct?

How do your results compare to other people's results?

Did any of your results surprise you? Why?

Complete these sentences about light. (Use 'opaque' and 'transparent')

3. Objects that allow light to pass straight through are said to be _____

4. Objects that do not allow light to pass through are said to be _____