

## Alternate CBL Instructions

### Polarization of Light

#### Safety Precautions



- Use caution when plugging in, using, or unplugging the CBL 2 unit's power supply.

#### Materials

two polarizing filter sheets  
incandescent light source  
fluorescent light source  
pieces of white and black paper  
calculator with liquid crystal display  
clear, plastic protractor  
masking tape, 20 cm  
mirror  
CBL 2 unit  
link cable  
light probe  
TI graphing calculator  
DataMate program

#### Procedure

1. Connect the light probe to Channel 1 of the CBL 2 unit. Connect the CBL 2 unit to the graphing calculator using the link cable. Firmly press the ends of the link cable into each unit.
2. Turn on the graphing calculator and start the DataMate program. Press CLEAR to reset the application program. The CBL 2 unit should auto ID the light probe.
3. Create a data table like the one shown in the textbook.
4. Take a polarization filter and observe an incandescent light source. Rotate the filter. Point the light probe at the incandescent light source. Hold the polarizing filter in front of the light probe. While observing the relative intensity on the graphing calculator, rotate the filter. Record your observations in the data table.
5. Repeat step 4 using a fluorescent light source.
6. Repeat step 4 with light reflected off the surface of a mirror at approximately a  $45^\circ$  angle.
7. Repeat step 4 observing light reflected off a white piece of paper at approximately a  $45^\circ$  angle.
8. Repeat step 4 observing light reflected off a piece of black paper at approximately a  $45^\circ$  angle.
9. Use a polarizing filter to observe a liquid crystal display on a calculator. Rotate the filter. Write your observations in the data table.

10. Hold one polarizing filter against the end of the light probe. Point the light probe at the incandescent light source. Place the other filter on top of it. Practice rotating the top filter so that you can smoothly rotate it  $360^\circ$  in 9 s without blocking the light striking it. When you are able to do this, select START on the calculator and begin rotating the top filter. The CBL 2 unit will beep as it begins and completes the data collection. Observe the graph of transmitted light intensity vs. time. Record your observations in your data table.
11. Place a clear, plastic protractor between the two polarizing filters. Look at an incandescent light source with this arrangement. Do a complete rotation of one of the filters. Position the two filters the same way that produced minimal light in step 9. Record your observations in the data table.

### **Alternate lab procedure, using a CBL unit**

1. Connect the light probe into Channel 1 of the CBL unit. Connect the CBL unit to the graphing calculator using a link cable. Firmly press the ends of the link cable into each unit. Start the PHYSICS program. From the MAIN MENU select SET UP PROBES. Select ONE from the NUMBER OF PROBES. Select LIGHT from the SELECT PROBE menu. Press ENTER.
2. On the MAIN MENU select COLLECT DATA. On the DATA COLLECTION menu select MONITOR INPUT. The relative light intensity will be displayed on the graphing calculator.
3. Take a polarization filter and observe an incandescent light source. Rotate the filter. Point the light probe at the incandescent light source. Hold the polarizing filter in front of the light probe. While observing the relative intensity on the graphing calculator, rotate the filter. Record your observations in the data table.
4. Repeat step 3 using a fluorescent light source.
5. Repeat step 3 with light reflected off the surface of a mirror at approximately a  $45^\circ$  angle.
6. Repeat step 3 observing light reflected off a white piece of paper at approximately a  $45^\circ$  angle.
7. Repeat step 3 observing light reflected off a piece of black paper at approximately a  $45^\circ$  angle.
8. Use a polarizing filter to observe a liquid crystal display on a calculator. Rotate the filter. Write your observations in the data table.
9. Press the + key to end monitoring the input. From the DATA COLLECTION menu select TIME GRAPH. Enter "0.1" as the time between samples, in seconds. Enter "99" as the number of samples. Press ENTER. Select USE TIME SETUP. Select NON-LIVE DISPLAY. Hold one polarizing filter against the end of the light probe. Point the light probe at the incandescent light source. Place the other filter on top of it. Practice rotating the top filter so that you can smoothly rotate it

- 360° in 10 s without blocking the light striking it. When you are able to do this, press ENTER on the calculator and begin rotating the top filter.
10. When data collection is done, press ENTER. Observe the graph of transmitted light intensity vs. time. Record your observations in your data table.
  11. Press ENTER, and then select YES to collect more data.
  12. Place a clear, plastic protractor between the two polarizing filters. Look at an incandescent light source with this arrangement. Do a complete rotation of one of the filters. Position the two filters the same way that produced minimal light in the previous step. When you are able to do this, press ENTER on the calculator and begin rotating the top filter.
  13. When data collection is done, press ENTER. Observe the graph of transmitted light intensity vs. time. Record your observations in your data table.