TEACHER INFORMATION

Lights Out!
Periodic Phenomena

1. When using a Light Sensor in this activity, it must be connected to a CBL 2 or LabPro and not directly to the calculator using an EasyLink. The activity requires data be collected at a rate that surpasses the EasyLink's 200 pts/sec capability.

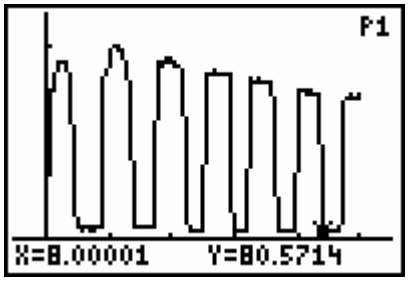
2. The second part, Short Period, will work with most fluorescent lights. However, some high-efficiency lighting systems are not powered directly from the power line, and do not exhibit the standard 120 Hz intensity variation. Sometimes the rate is 400 Hz, and sometimes much higher so that the variation would not be observed when data are collected as instructed here. If you do not see the 120 Hz variation, try a cheaper light fixture. You can also see the variation when using some incandescent lamps, but the magnitude of the variation is much smaller.

3. In taking data for part II, hold the sensor near a single fluorescent bulb and away from daylight. If daylight is also striking the light sensor, the flicker from the bulb may be washed out making the variations too small to observe.

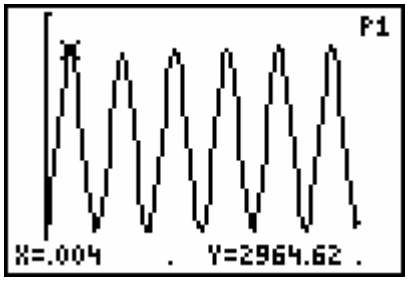
4. It is possible that the light from your fluorescent fixture will saturate the Light Sensor. While you may have the option to change the range to the 150 000 lux setting, a simple strategy is to cover part of the sensor with your fingers until the sensor reading on the main screen is less than 6000 lux (Vernier sensor) or less than 1 (TI sensor). As long as your fingers are not moving significantly during the $1/20^{th}$ second data collection, the time variation shown will be that of the light.

5. The observed 120 Hz variation in the fluorescent light corresponds to the power curve of the light.

SAMPLE RESULTS



Part I



Part II

DATA TABLE – ANALYSIS I

***A* (s)**	1.00	**frequency (s^{-1})**	0.71
***B* (s)**	8.00	**frequency * 60**	42
average ΔT (s)	1.40 s		

number of cycles	5

ANSWERS TO QUESTIONS – ANALYSIS I

1. The plateaus represent the maximum light intensity, occurring when the sensor was uncovered. The minima represent the times when the light intensity was small, or when the sensor was covered.

2. The frequency times sixty represent the number of cycles per *minute*.

DATA TABLE – ANALYSIS II

***A* (s)**	0.0040	**frequency (s^{-1})**	120
***B* (s)**	0.0455		
average ΔT (s)	0.0830		
number of cycles	5		

ANSWERS TO QUESTIONS – ANALYSIS II

1. As before, the peaks represent times when the light intensity was high, and the valleys are times when the intensity was low. It appears that fluorescent lights are flickering!

2. The observed flicker frequency is 120 Hz, which is twice the line voltage frequency. This make sense because the fluorescent light will light regardless of the direction the current is flowing, so the light intensity would peak as the current flows first one way and then the other, or twice per cycle of the line voltage.