Please describe, in a few paragraphs or bulleted list, a "low" level lab activity for use with the circuit board.
This activity takes place right after learning series and parallel circuits. Low: Rank 3 different circuit setups in terms of resulting LED output/brightness. Materials: Battery, LED, resistors, alligator clips and wires, reading prompt/YouTube on resistors
Low: “Using the circuit board, construct an example of each of the following circuits. Then, use the multimeter (on resistance mode) to measure the resistance of each): 1) series circuit a. using 1 resistor b. using 2 resistors c. using 3 resistors d. using 4 resistors 2) parallel circuit a. using 1 resistor b. using 2 resistors c. using 3 resistors d. using 4 resistors 3) BONUS ROUND a. build a circuit that includes both series and parallel elements
Circuit board activities Pre-requisites: students know what a simple circuit is, Ohm’s Law, how to measure voltage and current, and the definition of series and parallel. Give the students the circuit board with 3 equal value resistors. Objectives: 1. Find an expression to give the equivalent resistance of 3 resistors in series. 2. Find an expression to give the equivalent resistance of 3 resistors in parallel. For each circuit, students will measure the voltage across each resistor and the voltage across the circuit. Students will also measure the current through each resistor and the current leaving the battery.
1. Construct a circuit that will allow a capacitor to charge and then discharge across a resistor network and then sketch a schematic of this circuit. 2. Describe how voltage across a single resistor changes as a function of time. 3. Describe how current through a single resistor changes as a function of time. 4. Describe how charge stored on the capacitor changes as a function of time. 5. List some variables and discuss how each affects the discharge rate. Justify your response. 6. How long do you need to charge the capacitor until it stabilizes?
(Note: On my board, I placed an extra capacitor in the spare slot on the board to allow this lab.) Construct a circuit containing a battery, LED, and two resistors. First, place the resistors in series and note the intensity of the LED. (See diagram 1) Next, place the resistors in parallel. (See diagram 2)

Make sure that the resistors are always between the LED and the battery so it will not blow the LED.
In a series circuit there is a single path from the positive to to the negative terminal of the power supply. Construct a series circuit with the red LED and the 100 ohm resistor. Then construct a series circuit with the red LED and the 2.4 kohm resistor. Record you observations and suggest a possible explanation.
Students are given a completed circuit with a single resistor, and by varying the voltage and measuring current, students are meant to determine the mathematical relationship between the two.

Please describe, in a few paragraphs or bulleted list, a "medium" level lab activity for use with the circuit board.
Medium: Predict and rank 3 different circuit setups in terms of resulting LED brightness. Materials: Provided based off student group predictions
Medium: “Using the circuit board, investigate (and graph) the effect that adding more resistors has on the total resistance of a) a series circuit b) a parallel circuit
Circuit board activities Pre-requisites: students know what a simple circuit is, Ohm’s Law, how to measure voltage and current, and the definition of series and parallel. Give the students the circuit board with 3 equal value resistors. Objectives: 1. Find an expression to give the equivalent resistance of 3 resistors in series. 2. Find an expression to give the equivalent resistance of 3 resistors in parallel.
1. Construct a circuit that will allow a capacitor to charge and then discharge across a resistor network and then sketch a schematic of this circuit. 2. Determine the following: By way of graphical analysis, determine the rate at which the voltage discharges as a function of time. 3. List some variables and discuss how each affects the discharge rate. Justify your response. 4. How long do you need to charge the capacitor until it stabilizes?
Compare a circuit containing capacitors in series with a circuit with capacitors in parallel. Make sure there is at least one resister in series with the LED in your circuit so it will not burn out. How do capacitors in series compare with resistors in series? How do capacitors in parallel compare with resistors in parallel?
Design a circuit that allows you to turn the blue and red LED's on or off independently from each other.
Students must create a method for determining the best configuration for various combinations of lights: (1.) 2 lights that are both bright, (2.) 2 lights with one bulb bright and one bulbs dim, (3.) 2 lights with both lights lit, but one turns off when you close a switch.

Series Circuits Draft - from Sue Ann Ness

Purpose:

Procedure:
Materials: Circuit board, wires with alligator clips, batteries

Methods:
1- Place batteries in the battery box.
2- Connect the red battery wire contact (high potential) to the left side of the LED light bulb contact.
3- Connect the black wire contact to the right side of the LED.
4- Turn on the battery box. Describe your observations.
5- Describe the observations when you switch the connections to the LED.
6-How can you connect the bulbs so both LED's are turned on. Do this and describe the connections with words and diagrams.
7-

Possible Questions for medium and high levels of Inquiry:
How are connections made to make a parallel circuit for these two LED's.
How can you connect the circuit to include switches?

Medium Inquiry-
Demonstrate lighting on bulb. Answer questions above.
Make bulb light.
Make two bulbs light.
Diagram.
Why? What ideas are essential to make the bulbs light?
Can you light the bulbs separately? How did you do this? Diagram.
What are the concepts and vocabulary? Explain concepts.