IEEE's Hands on Practical Electronics (HOPE)

Week 5: Silicon & Breadboards

Objective:

Experiment with solar cells and learn how to build circuits on breadboards.

Materials Needed:

1 Breadboard
6 Solar Cells
1 9V Batttery
4 1kΩ Resistors

Hints & Refreshers:

Remember the following:

- Ohm's Law: V=IR
- Series resistance: $R_{eq} = R_1 + R_2$
- Parallel resistance: $R_{eq} = (R_1 * R_2)/(R_1 + R_2)$. (Two parallel resistors)
- To measure current:
    1. Remove power from the circuit.
    2. Disconnect the two points in the circuit you want to measure current through.
    3. Use a multimeter in current-measuring mode to connect the two points.
    4. Restore power to the circuit, read the current from the multimeter.
- For breadboards:
    - Rows of five are wired horizontally (see handout)
    - Long columns on the side are wired vertically
    - Ask for help if you need it!

Directions:

Part I:

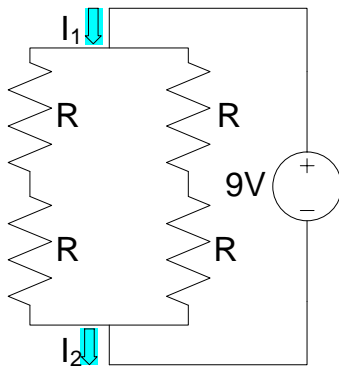Find the currents shown for each of the circuits below (all resistors are 1kΩ):
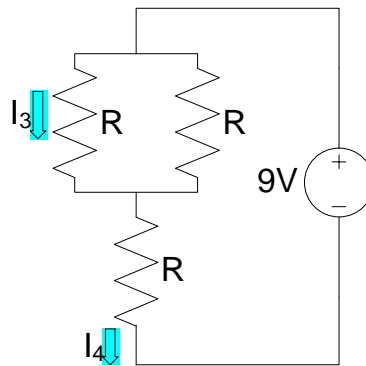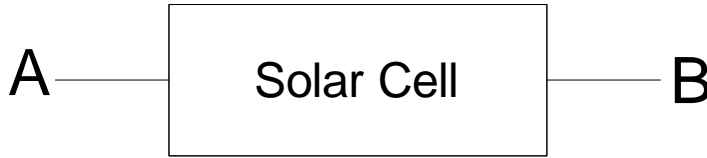

Figure 1   Figure 2

Measure I_1, I_2, I_3, and I_4. Do your results agree with your calculations?

Part II:

Measure the voltage (V_{BA}) across one solar cell. How does the voltage compare to the 9V battery you were using before?

```
A ──────┤   Solar Cell   ├────── B
```

Predict what happens to the measured voltage if:
- You cover the solar cell with your hand?
- You put 3 solar cells in series?
- You put 6 solar cells in series?

Test your predictions. Do they agree with your results?

Questions:

1. How does I_1 compare with I_2? Why?

2. How does I_3 compare with I_4? Why?

3. What would you get if you were to measure the current in the second parallel resistor in Figure 2? Why?

4. Why does the voltage change when the solar cell is covered?

5. (Optional) Would you want to use these solar cells to power your home? What problems might arise?