AlbertaSat

Solar Energy

Grade Level	9	**Workable grades**	7, 8, 9, 10
Recommended Time	1 hour		
Curriculum Alignment	Science Unit D 2: Describe technologies for transfer and control of electrical energy Science Unit E 2: Identify problems in developing technologies for space exploration, describe technologies developed for life in space, and explain the scientific principles involved Science Unit E 3: Describe and interpret the science of optical and radio telescopes, space probes and remote sensing technologies		

Background Information (Science required for the lesson) :

Solar Power

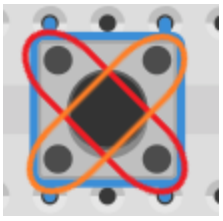
- Energy radiates from the sun to the earth in the form of photons, or light. Solar panels absorb these photons, exciting the electrons in the material and the electrons begin to move in the circuit.
- The excited electrons can only move along conductive surfaces, like metal wires. With a completed circuit, the electrons will move along this closed path and can power lights or other loads.

Electronic Kit Instruments

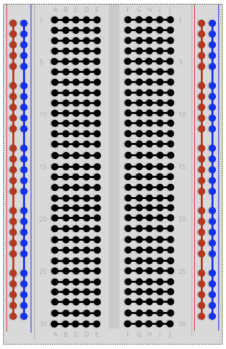
- Resistor: resistor is used to reduce current flow.
- LED (Light Emitting Diode): device that gives off light when current flows through it.
- Breadboard: A device used for prototyping electronic circuits. When you are connecting two things together, they have to be in the same row.
- Capacitor: device which stores electric charge.

Explanation of Activity:	**Notes:**
1. Split students into groups and hand out kits (smallest size possible based on how many kits are available and how many students there are)	Breadboard connections:

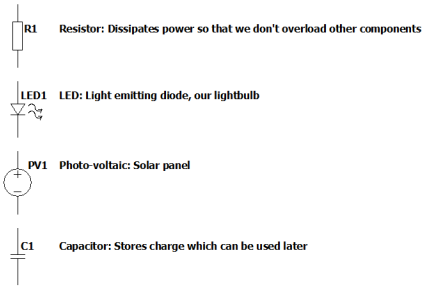
2. Show the students the stage 1: simple circuit by drawing it on the board and explain what all the symbols are, highlighting that it is a loop.
3. Have students find the resistor, a solar cell, and the LED.
4. Using the document camera or by drawing on the board, explain how to assemble the stage 1: simple circuit step-by-step.
5. Highlight that the LED has a flat lip and a shorter wire on one side, and that this side needs to be closest to the black (negative) wire of the solar panels.
6. Add the switch, when the button is pressed the connections are below:



7. Ask students what they think will happen if they add another solar cell in parallel. Have the students add this and investigate the effects.
8. Have the students create the advanced solar circuit. Add a capacitor to their circuit to store charge and then power the light.
9. Have the students shine a light on their solar panels, to charge the capacitor, and then cover the solar panels and turn on their light.



Components:



Troubleshooting Steps:

1. **Check students' work after each step.**
2. If the LED doesn't turn on:
    a. Shine a flashlight on the solar panels
    b. Swap the way LED is sitting
    c. Check circuit step-by-step
    d. Give Students a new LED
3. If the wires break on the solar panels
    a. Temporary Fix: tape 'extra wires' to a solar cell with clear tape.
    b. Do not put these cells back in kits at the end of the lessons, set them aside to be soldered later.
4. Let students ask questions in between
5. Don't give instructions when students aren't listening

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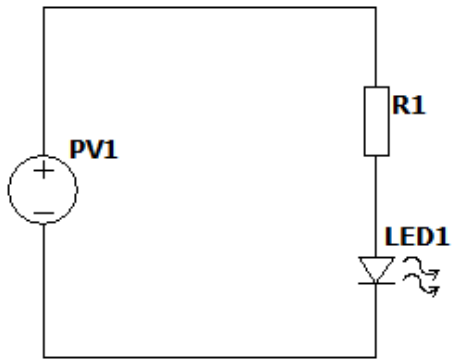
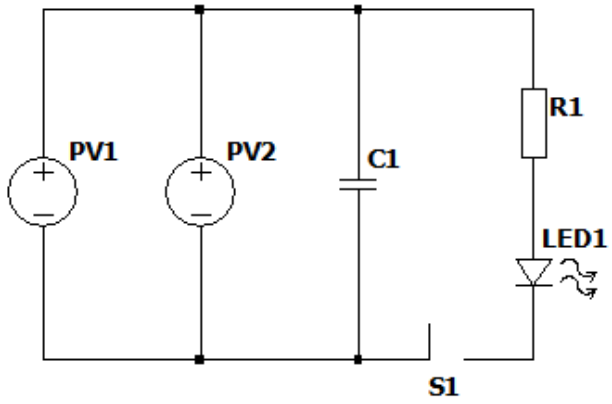
Stage 1: Simple Circuit



Stage 2: Advanced Circuit



Materials Required (INCLUDE ALL MATERIALS NEEDED EVEN PEN AND PAPER)
• 1 breadboard • 1 LED • 2 wires • 1 resistor (any ohms) • 2 solar cells • 1 capacitor • 1 switch

Changes to the activity for COVID-19
Send the teacher the pre-made kits (ziplock bags with all material for one student) and have AlbertaSat members present the slides remotely