Solar Energy

Topic	Solar Energy
Subject	Science
Grade Level	7-9 (also available for 5-6)
Recommended Time	1 hour
Curriculum Alignment	Science 5-5,4: Demonstrate that a continuous loop of conducting material is needed for an uninterrupted flow of current in a circuit Science 6-1,3: Construct, with guidance, an object that achieves a given purpose, using the materials that are provided Science 8 Unit C Performing and Recording: Students will construct and test prototype designs and systems Science 9 Unit D 1: Investigate and interpret the use of devices to convert various forms of energy to electrical energy, and electrical energy to other forms of energy ● identify, describe and interpret examples of mechanical, chemical, thermal, electrical and light energy Science 9 Unit D 2: Describe technologies for transfer and control of electrical energy ● use switches and resistors to control electrical flow ● develop, test and troubleshoot circuit designs for a variety of specific purposes, based on low voltage circuits

Hook:	**Notes:**
Show Ex-Alta 1 3D Model Video	https://m.youtube.com/watch?v=Ew2N9OqL-F4

Introduction:	**Notes**
What is AlbertaSat? ● AlbertaSat is a student group at the University of Alberta that builds CubeSats	Ex-Alta 1 Deployment: https://www.youtube.com/watch?v=l2sMkNNGVCM

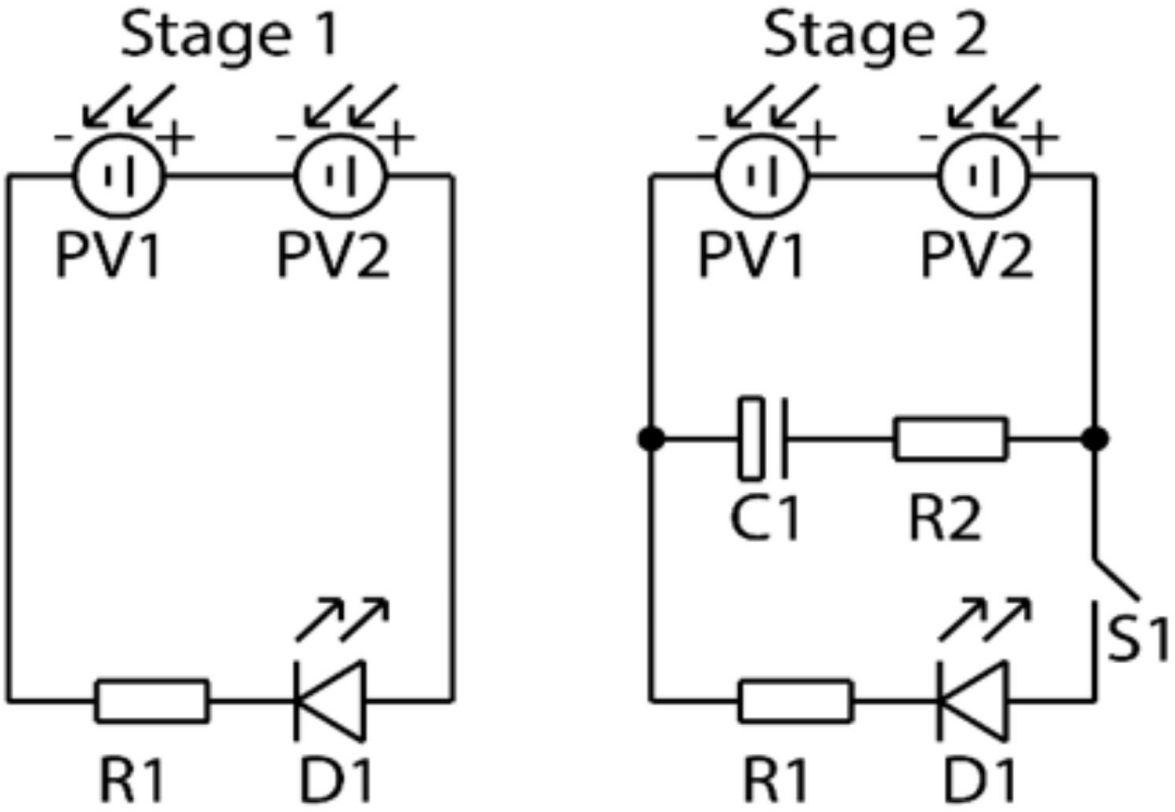
• CubeSats are small (like a loaf of bread) satellites made up of standardized cubes. These cubes (known as units) are 10cm x 10cm 10cm • Ex-Alta 1 (Experimental Albertan 1) is a 3U (3 unit/3 cube) CubeSat. It was the first satellite built by AlbertaSat. • Ex-Alta 1 was built as part of an international project, QB50. This project was lead by the European Space Agency (ESA) to study space weather. • Ex-Alta 1 was launched to the International Space Station (ISS) in April of 2017 and into orbit in May of 2017. • Show Map of QB50 Satellites • Ex-Alta 1 includes the following payloads: MNLP (Langmuir Probes), Dosimeter (studies radiation), Athena On-board Computer, Magnetometer	

Background Information:	**Notes:**
<u>How Solar Energy Works</u> • Solar panels absorb light (Photons). Electrons in the solar panel are knocked out of their energy state into the conductor panel, this creates a "hole" in the materials electrical charge/ makes a charge imbalance and electrons start moving • They are in wires, which are kind of like tunnels and they move around these. The running electrons produce electricity, kind of like a hamster wheel or a bike powering a light bulb.The solar panel can then be used to power things • Explain how a breadboard works: draw a picture of the circuit that the students will be creating on the	

whiteboard (if a whiteboard is available). See the sample photo at the bottom of the document. Explain what the symbols in the drawing mean.	

Explanation of Activity (Stage 1)	**Notes:**
1. Split students into pairs or groups of three (depending on how many kits are available and how many students there are) 2. Handout Kits to students 3. Using the document camera or by drawing on the board. explain how to assembly a circuit **step-by-step.** It should be something like this: a. Person 1, take out the breadboard and one solar panel. Place the red wire into the third row on the left side. Now place the black wire into the third row on the right side. b. Person 2, take out the other solar panel. Place the red wire into the third row on the left side. Now place the black wire into the third row on the right side. c. Person 1 (or 3), take out the resistor. Place the resistor in the third row on the right side (by the black wire). Then take the other end and place it on the left side about halfway down the breadboard (row doesn't matter) d. The LED has a flat lip on one side. This side also has a shorter wire. The short end of wire needs to be closest to the red wire of the solar panels. e. Person 2. Place the rounded side of the LED/the long wire in the same row as your resistor. Put the short end near the red	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 solar cell with clear tape. b. Do not put 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 6. Provide time for questions 7. Extension Activity (stage 2): a. Have students redo the circuit, this time with a diode, capacitor(s), and a switch. b. Have students 'charge' the capacitors by shining a lit on the solar panels. Have students cover the panels and then press the switch. 8. Alternative Extensive Activity a. Have students use a multimeter to measure current and voltage. b. Students can then use ohm's law to find the resistance.

wires of the solar cells. If it doesn't reach all the way, use the extra wire to bridge the gap. f. LEDs should now light up. If they don't, switch the LED around. If this doesn't work give students a new LED.	



Materials Required (per kit):
• Simple Circuit: 1 Breadboard, 1 LED, 2 Wires, 1 Resistor (any ohms), 2 solar cells (need at least 2.5 V output total) • Extension Activity: 1 Breadboard, 1 LED, 2 Wires, 2 Resistors (any ohms), 2 solar cells (need at least 2.5 V output total), Switch, Capacitors (2 recommended), Diode