



Course Code SNC1W

Duration 75 min

Date:

## CURRICULUM EXPECTATIONS

## Learning Goal

Students will:

- apply scientific processes and an engineering design process in their investigations to develop a conceptual understanding of the science they are learning.

## Specific Expectations

Students will:

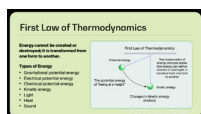
- A1.2** apply a scientific experimentation process and associated skills to conduct investigations, making connections between their observations and findings and scientific concepts they are learning.
- A1.3** apply an engineering design process and associated skills to design, build and test devices, models, structure, and/or systems.
- D2.8** determine the efficiency of various electrical devices that consume or produce electrical energy, and identify the energy transformations in each device.

## PRE-PLANNING REFLECTION

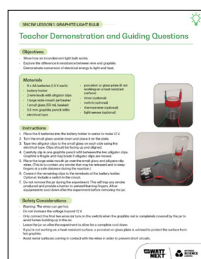
| Prior Learning Connections                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Reason for Lesson                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Relevance to Student<br>(why do they need to know this)                                                                                                                                                                                                                                                                                                                                                      |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>· Students are familiar with building simple circuits.</li> <li>· Students are familiar with the engineering design process, data collection and analysis.</li> <li>· Energy transformations have been covered in previous science classes.</li> </ul>                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <input type="checkbox"/> introduce<br><input checked="" type="checkbox"/> reteach<br><input checked="" type="checkbox"/> extend                                                                                                                                                                                                                                                                                                                                      | <ul style="list-style-type: none"> <li>· Students use light bulbs every day but may not think about the engineering design process that went into this invention.</li> <li>· Impressive demonstration of the transformation of electrical energy into light and heat.</li> <li>· Reinforces the scientific method, concepts of experimental controls and of only changing one variable at a time.</li> </ul> |
| Anticipated Learning Gaps and Barriers                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Modifications and Student Variability                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                              |
| <ul style="list-style-type: none"> <li>· Some students may struggle with the fine motor skills required for circuit assembly, resulting in breaking the thin graphite rod.</li> <li>· Students may lack knowledge of incandescent light (Grade 10 science topic) as these light bulbs are being phased out of everyday use.</li> </ul>                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <ul style="list-style-type: none"> <li>· Consider heterogenous groups (maximum three students) to assist struggling students.</li> <li>· Consider alternatives to a class discussion to debrief the activity (e.g., record answers digitally or on handout, individually or as a group).</li> </ul>                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                              |
| Resources and Materials                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Assessment                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Accessibility/Media</b><br>(as applicable)<br><input type="checkbox"/> Whiteboard<br><input checked="" type="checkbox"/> LCD projector<br><input type="checkbox"/> Web cam<br><input type="checkbox"/> Digital camera<br><input type="checkbox"/> Document camera<br><input checked="" type="checkbox"/> Computer<br><input type="checkbox"/> FM system<br>Other: | <b>Equipment/Materials</b> <ul style="list-style-type: none"> <li>· 0.5 mm graphite pencil refills</li> <li>· 2 wire leads with alligator clips</li> <li>· Small glass (50 mL beaker)</li> <li>· Large wide-mouth jar or beaker</li> <li>· 8 AA batteries (1.5 V each)</li> <li>· Battery holder</li> <li>· Electrical tape</li> <li>· Porcelain or glass plate (if not working on a heat resistant surface)</li> </ul> <p>Optional: timer, thermometer, light meter, switch</p> | <input checked="" type="checkbox"/> Observation <input checked="" type="checkbox"/> Conversation <input type="checkbox"/> Product<br><ul style="list-style-type: none"> <li>· Demonstrate knowledge of energy conversions.</li> <li>· Identify independent and dependent variables.</li> <li>· Understand the requirement to only change one variable at a time during scientific investigations.</li> <li>· Analyze the results to make recommendations.</li> </ul> |                                                                                                                                                                                                                                                                                                                                                                                                              |



## LESSON SEQUENCE &amp; RELEVANT SLIDES

**Minds On**  
 [slides 3-16]  
 15 min


1. Review of Energy Transformation (first law of thermodynamics). [Slides 3-11]  
Identify the energy transformations in common devices. (Answers provided on slide click.)  
Remind students that not all energy transformations provide useful energy, energy can be lost to the system, often as heat.
2. Identify the energy transformations in electricity generation. [Slides 12-16]
  - a. Assign an electricity generation source to each group. Groups creatively demonstrate the transformation(s) of energy required to make electricity. (Students may choose to act it out, make a rap or song, interpretive dance, etc., but remind students to keep it simple due to time restraints.)
  - b. Use the WattNext Website (<https://wattnext.ca/>) to see illustrations of energy transformations.
  - c. Identify the common energy transformations among various electricity generation sources.

**Action**  
 [slides 17-27]  
 45 min


1. Introduce the incandescent light bulb.
2. Introduce the graphite light bulb demonstration. (See: SNC1W Lesson 1: Graphite Light Bulb - Teacher Demonstration and Guiding Questions.)
3. Gather observations about the demo (pros and cons).
4. Review the engineering design process and how it can be used to make a better light bulb.  
The teacher demo is the prototype; students evaluate and decide how to revise and retest with their change. Repeat the demonstration to record baseline measurements (e.g.: time, temperature, light intensity).
  - a. Organize the students into small groups. Each group chooses a different change to the original prototype. Possible improvements may include using two or more graphite rods, shortening the graphite.
  - b. Provide students with time to decide on an alteration and to set up their circuit.
  - c. Circuit troubleshooting check list is provided. [Slide 26]
  - d. **Safety consideration:** Use only one battery pack for the class. Perform the tests one at a time while the whole class is watching and recording.
  - e. Record class results in the table.
5. Answer the discussion questions in class. Answers will vary. [Slide 27]

**Consolidation/  
Practice**  
 [slide 28]  
 5 min


Graphite Light Bulb: Exit Ticket (two per page)  
Optional Extension Activity [Slide 28]

**Thought Lab:** There are several types of light bulbs: incandescent, halogen, CFL and LED. How can you compare how much energy is lost as heat by each different type?

- a. When comparing the light bulbs, what factors should remain constant to ensure your experiment is fair?
- b. What measurements would you take? How would you set up and carry out this experiment?
- c. Can you use this information to rank the efficiency of different types of light bulbs?

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**POST PLANNING REFLECTION**

Teacher notes

Areas of the lesson  
that went well

Areas of the lesson  
to be improved

Considerations for  
how to deliver the  
lesson next time