Energy, Plants, and Humans
Grade 5

Come and learn about the how the sun fuels most life on Earth.

Overview of Unit:

- Pre-assessment
- Thought experiment, No sun
- Solar energy on Earth
- Plant cells
- Photosynthesis
- The Sun and Humans
- Field Trip
    - Food Web
    - Santa Fe Cholla
    - Leaf Dissection
- Plant cell model
- Photosynthesis, making and breaking glucose
- Post-assessment
- Glossary

Students will know:

- Related vocabulary
- Plants, leaves, and plant cells have specialized anatomy
- Plants are producers and animals depend on them for survival
- Humans rely on plants in many ways
- The process of photosynthesis

Students will be able to:

- Create a mini glossary
- Read nonfiction text and apply this knowledge
- Support ideas with evidence
- Learn directly from nature through making careful observations
- Apply knowledge to a new task
- Use drawing to record data or information
- Understand and make a chart and model
- Conduct a field study
- Use scientific tools

Links to Standards

- Common Core
    - RI.5.5
    - RI.5.10

    - W.5.2
    - SL.5.1
    - L.5.6
    -
- Next Generations Science Standards
    - Coming soon…
- NM Science Standards
    - Science Strand I.S1.5.BI.1
    - Science Strand II.S1.5.BI.3
    - Science Strand II.S1.5.BI.5
    - Science Strand II.S1.5.BII.3
    - Science Strand II.S1.5.BII.4
    - Science Strand II.S2.5.BI.2
    - Science Strand II.S2.5.BI.4
    - Science Strand II.S2.5.BIII.1
    - Science Strand II.S2.5.BIII.2

Lesson Plans:

- Pre-assessment
    - *Purpose*:
        - Assess what students already know about the topic
        - Ask students to support their thinking with evidence
    - *Time*:
        - 15 minutes
    - *Intended structure*
        - Ask students to answer the questions on page 2
        - Reassure them that it is ok if they do not know the answers, this is to see what they still need to learn

- Thought Experiment
    - *Purpose*
        - Explore the impact of the sun on Earth
        - Have students make a hypothesis and support their claims with specific examples
    - *Time*
        - 30 minutes
    - *Intended structure*
        - Introduce the writing prompt
        - Give example of what evidence is and how to incorporate it into their writing
        - If necessary, have students brainstorm together
        - Independent writing, or homework assignment

- Solar Energy on Earth
  - *Purpose*
    - Practice non-fiction reading
    - Review nonfiction text structure
  - *Time*
    - 30 minutes
  - *Intended structure*
    - Anticipatory set:
      - Revisit the paragraphs they wrote as the Thought Experiment
      - Discuss what the sun helps them do every day
    - Activity:
      - Have students read each paragraph independently
      - Have them underline the main idea
      - Have them circle words they think are important, recording these in the glossary
      - Come together at the end of both paragraphs to discuss the text features
    - Closing:
      - Have students record five ways they used solar energy
      - They could each draw one on a sticky note and bring these up to the board
      - The sticky notes could be sorted in different ways: "fossil fuels, foods, and other" or in another way

- Plant Cells, Photosynthesis, and The Sun and Me
  - *Purpose*
    - Practice non-fiction reading
    - Review nonfiction text structure
    - Use other formats to learn and share ideas (comics and diagrams)
  - *Time*
    - 45 minutes
  - *Intended structure*
    - Anticipatory set:
      - Ask students to discuss the "Imagine…" in small groups
      - Report back what this would be like
    - Activity:
      - Have students read each paragraph in Plant Cells independently
      - Have them underline the main idea
      - Have them circle words they think are important, recording these in the glossary
      - Come together at the end of both paragraphs to discuss the text features
      - Have students read the comic in small groups

- Have them compare and contrast the paragraph with the comic
- Have them discuss:
    - Which they think taught them more
    - Which was more fun
    - Why do they say that
- Share their ideas in the whole group
- Ask them what make a “good” educational comic

- Closing:
    - Have students create their own comic on page 7
    - Challenge them to include at least 3 ways humans use energy
    - This could be homework assignment
    - Let students share these with the class

- <u>The Sun on My Skin</u>
    - *Purpose*
        - Practice non-fiction reading
        - Make connections between text and personal experiences
        - Read and understand maps as a source of data
    - *Time*
        - 30 Minutes in Class, 30 Minutes of Homework
    - *Intended Structure*
        - Anticipatory Set
            - Have students close their eyes and imagine the feeling of warm sunlight on their skin
            - Ask how many have had a sun burn or had their skin get darker in the sun
            - Today we are going to learn about the impact of sun on the skin
        - Activity
            - Use your favorite reading structure to read the article
            - Ask students what information they learned
            - Ask students where the information came from
                - Explain the role of the CDC and the NIH in our country
            - Focus on the map and have a group discussion:
                - What does this map show?
                - How do you know?
                - What can you learn from this map?
                - Which states have the greatest number of people who are diagnosed with skin cancer?
                - What are the states with the lowest diagnosed rates of skin cancer?
                - Where is New Mexico in this range?
                - What do you think might be the reason that there are different rates in different states?

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    - Closing and Homework
        - Closing question: What will you do to protect yourself against the sun?
        - Homework: Have students imagine that they worked at the CDC or NIH. Their job is to share information about the dangers that the sun can have. Their assignment: create some sort of information that could teach the public about the potential harmful impact of the sun. This can take any form from a piece of art, film, pamphlet, poster, etc.

- <u>Field Trip to the Botanical Garden</u>
    - Structure of Field Trip
        - 15 minutes – Begin as a group
        - 1 hour 45 minutes – Rotate through 3 Activities
        - 15 minutes – Closing activity as a group
        - Time for teacher and class to explore
    - They will participate in three activities around the garden
        - Make a Food Web with native Santa Fe animals
        - Learn about the endangered Santa Fe Cholla and plant a piece of a cholla to grow in the classroom
        - Explore the anatomy of two different leaves in the garden and look at how plants breathe

- <u>Making Models of Plant Cells</u>
    - *Purpose*
        - Create a model of something too small to see
    - *Time*
        - Variable, depending on materials choice
    - *Materials*
        - If you decide to make edible cells:
            - Small Tupperware containers, representing the cell wall
            - Clear or light colored Jello, representing the cytoplasm
            - Variety of at least 9 different fresh fruit and/or dried fruit, such as grapes, blueberries, cherries, strawberries, etc, representing all of the organelles
        - If you decide to make a non-edible model:
            - Small Tupperware containers, representing cell walls
            - Variety of craft materials, beads, plastic, fun foam, etc, representing the organelles
            - Clear drying glue, representing the cytoplasm
    - *Structure*
        - Anticipatory set
            - Discuss what students learned about leaves at the Botanical Garden

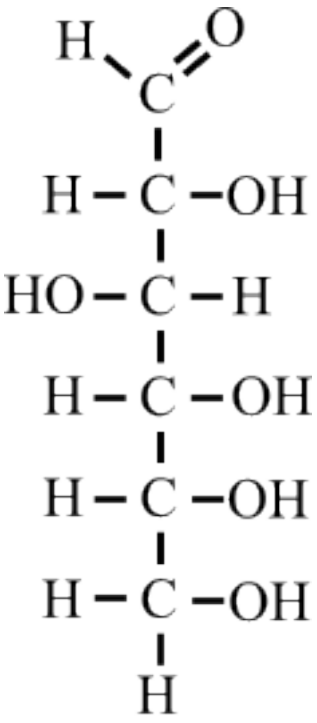
        - Review what all of the organelles in a cell do and why they are important, pg 11 and 12
    - Activity
        - Have students build cells
        - Start by showing them all the components and filling out the Cell Wall line together
        - Have students decide what each organelle should be represented by before starting to build
        - Allow students to build the cells
    - Closing
        - Look at the different models they build
        - Complete page 13, even as a homework assignment
        - Discuss why models are important

- <u>Photosynthesis, Chemical Equation</u>
    - *Purpose*
        - Have students create another form of a model that represents something too small to see
        - Understand that cells can pull molecules apart and put them back together in a different way
        - Everything is made of smaller parts
        - Understand that matter is not destroyed or created, just transformed from one form to another
    - *Time*
        - 45 minutes – 1 hour
    - *Materials*
        - Periodic table
        - Copies of what glucose looks like, see last page of teacher guide
        - Toothpicks
        - Gumdrops or three colors of clay
    - *Structure*
        - Anticipatory Set
            - Together, read the article on cellular respiration and the elements
            - Reflect on what this means
            - Show a copy of the periodic table – interactive version from LANL: http://periodic.lanl.gov/index.shtml
            - Discuss how the elements can be joined together in different ways, giving some examples (H_2O have 2 Hydrogen and 1 Oxygen)
            - Review what happens during photosynthesis
        - Activity
            - Give each group a pile of materials
            - Discuss that just like a mathematical equation, there needs to be the same number of each type of element on both sides of the equation

- Have students start with hydrogen, how many are on the right side of the equation? Answer: 12
- How many need to be on the left of the equation? Answer: 12
- Where do you find hydrogen now? Answer: H_2O
- How many H_2O will it take to make there be 12 hydrogen on the left? Answer: 6
- Fill in 6 on the left
- Move on to carbon, there are 6 carbon atoms on the right, which means there need to be 6 CO_2 on the left
- Now, it gets complicated… if there are 6 CO_2 and 6 H_2O on the left, that means there are 18 oxygen atoms on the left
- How many oxygen are on the right side of the equation? Answer: 6
- That means we have 12 oxygen left over. Oxygen like being in pairs… so how many O_2 are there on the right? Answer: 6
- The final should read:
  - 6 CO_2 + 6 H_2O becomes 1 $C_6H_{12}O_6$ + 6 O_2

- Closing
  - Have students test this:
  - Start by choosing a color for each atom (E.g. blue = O)
  - Build 6 CO_2 and 6 H_2O
  - Deconstruct these
  - Build the $C_6H_{12}O_6$
  - See what is left over, there should be 12 O
  - Build 6 O_2
  - There should be nothing left over.
  - Remind them that cellular respiration is the reverse process
  - Have students make the original 6 CO_2 and 6 H_2O with these glucose and oxygen

- <u>Post-assessment</u>
  - *Purpose*
    - Assess what was learned in the Garden and through the unit
  - *Time*
    - 15-20 minutes
  - *Intended structure*
    - Have students take the assessment individually



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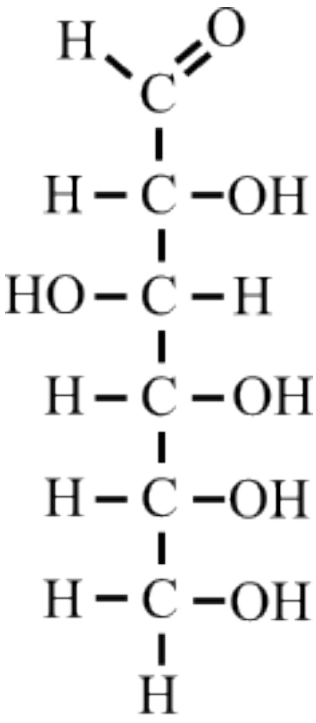

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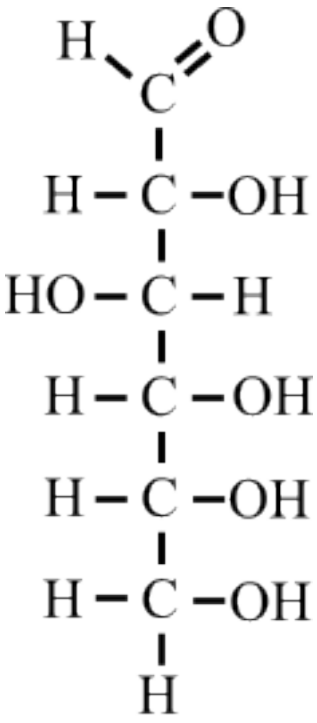

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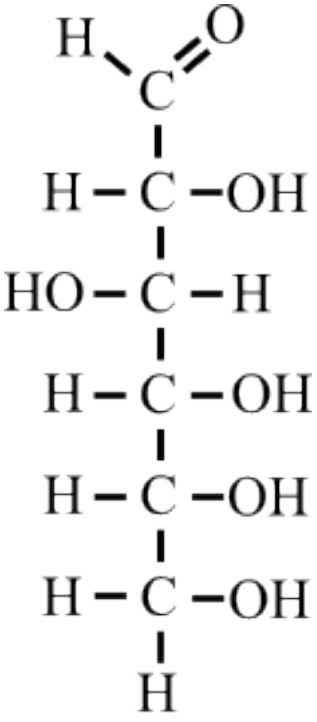

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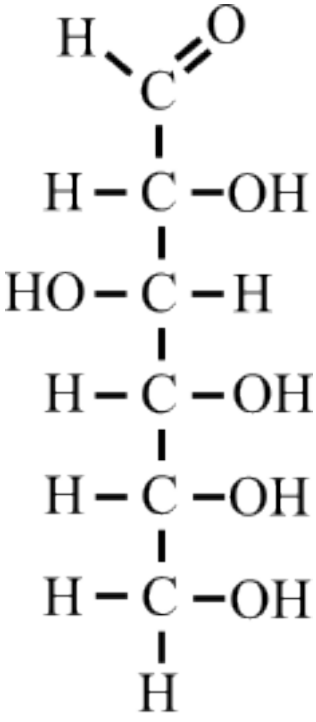

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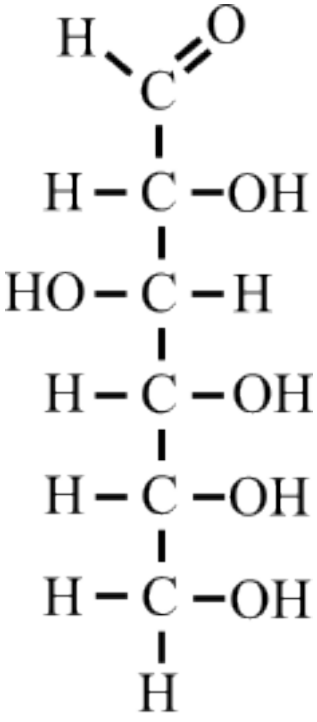

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