

Lesson Topic: Solar Properties

Objective:

Students will be able to:

1. Identify the layers of the Sun and the Sun's atmosphere.
2. Determine the properties of the Sun.
3. Create a model of the properties of the Sun.

Time Required: 70 minutes

Materials Needed:

- Teacher computer with internet access
- Projector/Smartboard
- 1 computer/laptop/iPad per student with internet access
- Solar Properties handout (attached)
- Sunspot Video: [Sunspots, Prominences, and Solar Flares](#)
- 1 orange (½ orange per pair).
- Plain sugar cookies (1 per student)
 - White frosting
 - Yellow and red sprinkles
 - Chocolate chips
 - Red licorice
- Image of the Sun

Teacher Preparation:

- Assign a Legends of Learning Content Review [Quick Play](#) playlist for the day(s) you will be teaching the lesson.
 - Content Review - Middle School - Solar Properties
- Make copies of Solar Properties Worksheet (1 per student)
- Cut oranges in half.
- Put all cookie decorating materials in bags for each student/table.

Engage (5 minutes):

1. Show students the image of the Sun (attached).
2. Ask students "What can you tell me about the Sun?"
 - a. Write their ideas on the board.
3. Tell students "Today we are going to learn about all of the different properties of the Sun."

Explore (10 minutes):

1. Pass out the Solar Properties handout.
2. Hold up a half orange.
3. Tell students "Each pair of you is going to get an orange cut in half. Draw and color exactly what you observe looking at your orange in your handout."
 - a. Give students time to do that.
4. Then, have a short discussion about what they notice inside the orange.

- a. (a white core, a thick peel/rind, a juicy, soft inside, etc).
 - i. You can cut and serve the oranges for students to eat if you so choose.

Explain (25 minutes):

1. Tell students “First, we will look at the structure or layers of the Sun by drawing and labeling it. We will work our way from the inside out.”
 - a. The innermost layer is the Core (Draw a small circle on the board and label it Core).
 - i. Energy is generated here and has extreme temperatures.
 - b. The next layer is the Radiative Zone (Draw a circle around the core and label it)
 - i. Energy moves outward very slowly taking 170,000 years for the energy to get through this layer.
 - c. The last layer of the sun is the Convection Zone (Draw a circle around the radiative zone and label it).
 - i. Energy moves toward the surface through convection currents of heated and cooled gas. This is where light is created.”
2. Ask students “Look at the two drawings of your orange and the Sun.”
 - a. What similarities do you see?
 - b. Pretend your orange is the Sun. How would you label the layers? (inside of the rind/peel - convection zone, juicy/part you eat - radiative zone, core - core)
3. Tell students “The sun also has an atmosphere that surrounds it, full of gases. The photosphere reaches from the surface to 250 miles above that. It is mainly covered in granules and is the deepest layer that we can observe.”
4. Tell students “Next, is the Chromosphere. It is above the photosphere from 250 miles to 1300 miles from the surface of the Sun.”
5. Tell students “The last layer of the atmosphere is the Corona. It cannot be seen with the naked eye except during a solar eclipse.”
6. Tell students “The Sun is full of many different properties. Next, let’s jot down some vocabulary.” (Write on the board for students to copy into their handout).
 - a. Sunspots - Strong pockets of magnetism on the Sun, cooler temperature than the rest of the Sun
 - b. Prominences - huge loops of magnetic energy arc out over the sunspots, extend from the photosphere to the chromosphere. They show the magnetic field lines.
 - c. Solar Flares - Eruptions of energy near sunspots. They have tons of energy that release and create an explosion.
 - d. Rotation - The Sun rotates on its axis around once every 27 days. Because the Sun is a ball of gas it does not rotate as rigidly as a planet like Earth. The equator rotates every 24 days and the poles rotate around once every 30 days.
 - e. Convection - transfer of sun’s energy under the photosphere (surface).
7. If time allows, show students this [video](#).

Elaborate (20 minutes):

1. Tell students “You will be making a model of the Sun. We will frost our cookies first

and do this part together, however, the rest of the model you will have to complete by following the directions in the handout.

2. Give each student a plain cookie and have them spread white frosting over the top of the cookie.
 - a. Spreading frosting on it first will allow all the other materials to stick on the cookie.
3. Tell students “Be sure to follow the directions to make sure you include all of the parts.”
4. Give students a pre-made ziplock bag full of all the cookie toppings needed to make the Sun.
5. Have students complete their handout.
6. Check each student’s model for accuracy, then allow them to eat their cookie!

Evaluate (10 minutes):

1. Have your students [sign in to Legends of Learning](#). Instruct students to complete the Content Review playlist.
2. [Analyze student results](#) to determine what concepts need to be a focus for reteaching.

Additional Lesson Strategies:

- To use Legends for additional instruction, create a [custom playlist](#) with an [instructional game](#) and pre and post [assessment](#).
- To use Legends for a quick formative assessment, create a 5-question [assessment](#) in a [playlist](#).
- To use Legends for a student-directed experience, create a [targeted freeplay](#) playlist.
- Encourage students to play on their own at home in [Legends of Learning: Awakening](#) for a student-driven experience including avatars, battling, and quests all centered around topics they are covering in class.



Name: _____

Solar Properties

Draw and color your orange below.

Draw and label the Sun and its layers.



Sunspots -

Prominences -

Solar Flares -

Rotation -

Convection -



Create a Solar Cookie!

1. Add the following cookie pieces to your cookie.
2. When you are finished, draw and color what your cookie looks like.
3. Label all parts of the cookie and what they represent.
4. Have your teacher check your model for accuracy, then, eat!

Draw a picture of your cookie below and label what each part represents.	Cookie Pieces
	<p>Granules - sprinkles</p> <p>Sunspots – chocolate chips (usually found in pairs)</p> <p>Prominences – red licorice (shaped as arches)</p>

KEY

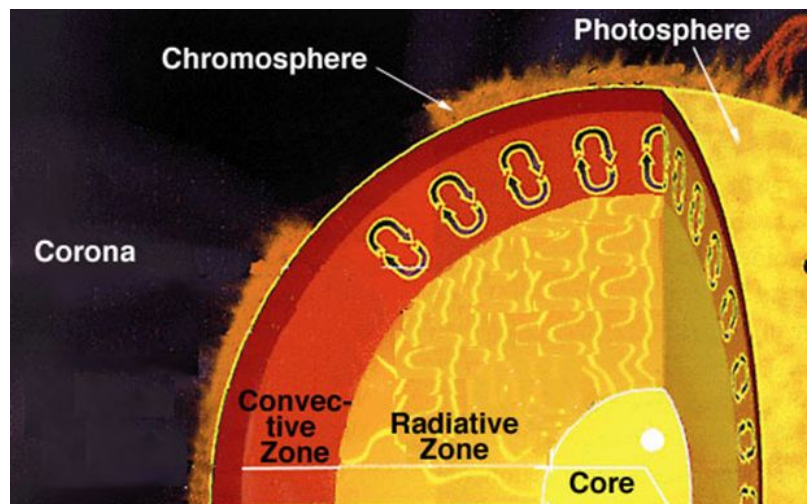
Solar Properties

Draw and color your orange below.



[This Photo](#) by Unknown Author is licensed under [CC BY-SA](#)

Draw and label the Sun and its layers.



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Sunspots - Strong pockets of magnetism on the Sun, that are cooler spots on the Sun

Prominences - huge loops of magnetic energy arc out over the sunspots, extend from the photosphere to the chromosphere. They show the magnetic field lines.

Solar Flares - Eruptions of energy near sunspots. They have tons of energy that they want to release. When two interact and explosion is created = solar flare.

Rotation - The Sun rotates on its axis around once every 27 days. Because the Sun is a ball of gas it does not rotate as rigidly as a planet like Earth. The equator rotates every 24 days and the poles rotate around once every 30 days.

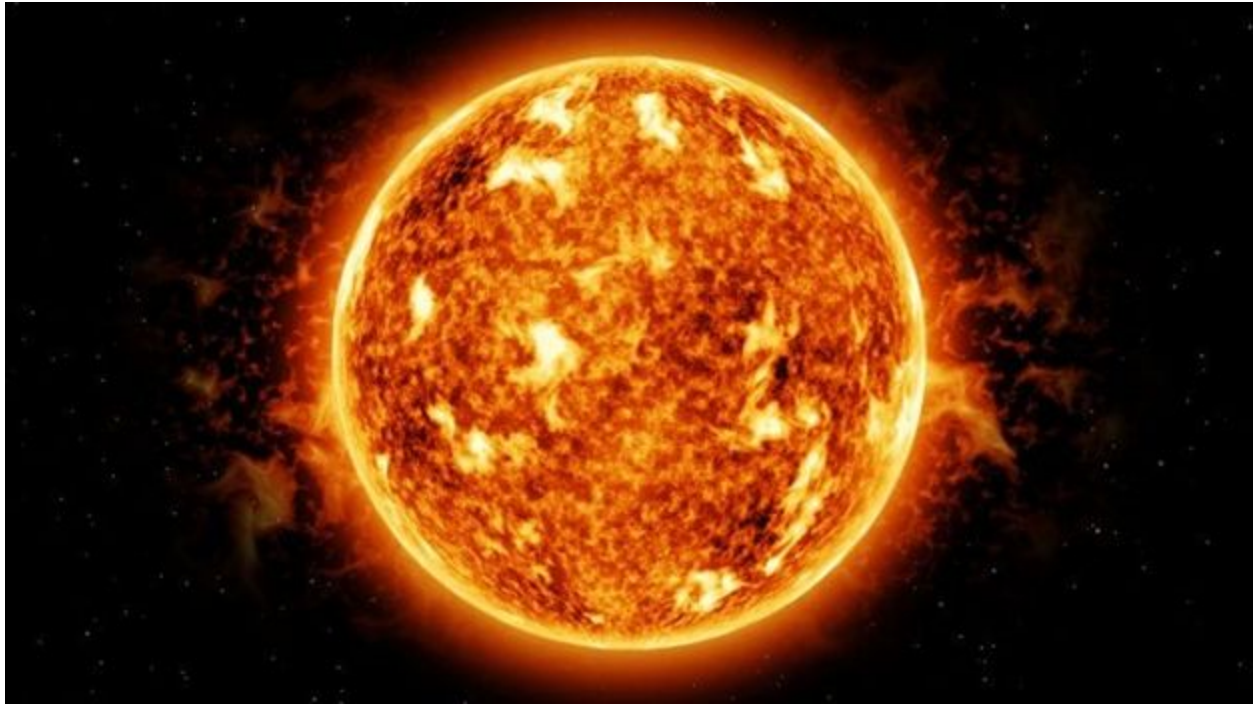
Convection - transfer of sun's energy under the photosphere (surface).

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8. Then, eat!

<p>Draw a picture of your cookie below and label what each part represents.</p>	<p>Cookie Pieces</p>
<p>Drawings will vary</p>	<p>Granules - sprinkles</p> <p>Sunspots – chocolate chips (usually found in pairs)</p> <p>Prominences – red licorice (shaped as arches)</p>

Image of the Sun



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