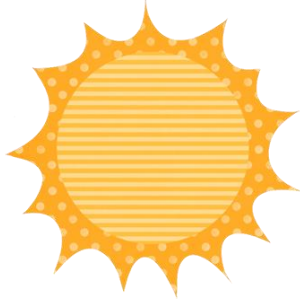


What Comes from the Sun?



We know that the Sun is very important for life on Earth. What do we get from the Sun? Place an X next to each correct answer.

_____ Visible light

_____ Heat

_____ Ultraviolet (UV) radiation

_____ Infrared radiation

Explain the thinking you used to make your choices.

How does the Earth get warm?

What Comes from the Sun?

Teacher Notes

Purpose

The purpose of this assessment probe is to elicit students' ideas about solar radiation. The probe is designed to examine students' ideas about whether heat comes from the sun.

Related Concepts

Electromagnetic spectrum, light, heat, solar radiation, absorption, reflection, albedo, energy, temperature

Explanation

The best choices are visible light, ultraviolet radiation, and infrared radiation. Heat does not come from the sun directly. Instead, solar radiation (particularly visible light) is absorbed by earth's land, water, and atmosphere. The energy from the absorbed light causes the increase in temperature.

Curricular and Instructional Considerations

Elementary students will most likely be unfamiliar with the electromagnetic spectrum, so infrared radiation may be a new term. (Students are more likely to have heard of ultraviolet radiation because of the emphasis on sun safety and sunscreen.) Teachers may choose to remove these choices if they are not meaningful to their students.

Elementary students will most likely not comprehend the importance of the word "visible" when describing light. Teachers may choose to provide a simple explanation, or omit the word visible. Most elementary students will naturally equate the terms "visible light" and "light."

Administering the Probe

The probe can be used as an anticipatory set before instruction about the sun and light, or after instruction to assess student understanding of the concepts.

Related Ideas in *National Science Education Standards* (NRC 1996)

K-4 Light, Heat, Electricity, and Magnetism (Physical Science)

Light travels in a straight line until it strikes an object. Light can be reflected by a mirror, refracted by a lens, or absorbed by the object.

What Comes from the Sun?

Heat can be produced in many ways, such as burning, rubbing, or mixing one substance with another. Heat can move from one object to another by conduction.

K-4 Objects in the Sky (Earth and Space Science)

The sun provides the light and heat necessary to maintain the temperature of the earth.

5-8 Transfer of Energy (Physical Science)

Energy is a property of many substances and is associated with heat, light, electricity, mechanical motion, sound, nuclei, and the nature of a chemical. Energy is transferred in many ways.

Light interacts with matter by transmission (including refraction), absorption, or scattering (including reflection).

The sun is a major source of energy for changes on the earth's surface. The sun loses energy by emitting light. A tiny fraction of that light reaches the earth, transferring energy from the sun to the earth. The sun's energy arrives as light with a range of wavelengths, consisting of visible light, infrared, and ultraviolet radiation.

5-8 Earth in the Solar System (Earth and Space Science)

The sun is the major source of energy for phenomena on the earth's surface, such as growth of plants, winds, ocean currents, and the water cycle. Seasons result from variations in the amount of the sun's energy hitting the surface, due to the tilt of the earth's rotation on its axis and the length of the day.

Related Ideas in *Benchmarks for Science Literacy* (AAAS 1993)

K-2 Energy Transformations

The sun warms the land, air, and water.

Related Research

- The majority of elementary students and some middle school students who have not received any systematic instruction about light tend to identify light with its source (e.g., light is in the bulb) or its effects (e.g., patch of light). They do not have a notion of light as something that travels from one place to another. As a result, these students have difficulties explaining the direction and formation of shadows, and the reflection of light by objects (AAAS 1993, p. 338).

What Comes from the Sun?

Suggestions for Instruction and Assessment

Activities that involve the reflection and absorption of various materials and colors may help students differentiate between visible light and heat. When students are studying the solar system, a comparison of the temperatures of planets with and without atmospheres may help the students better understand that the absorption of energy, not the light itself, leads to increased temperature.

Related NSTA Science Store Publications and Journal Articles

Ashbrook, P. 2007. The early years: The sun's energy. *Science and Children* 44 (6): 18-20.

Childs, G. 2007. A solar energy cycle. *Science and Children* 44 (6): 26-29.

Keeley, P., F. Eberle, and L. Farrin. 2005. *Uncovering student ideas in science, vol. 1: 25 formative assessment probes*. Arlington, VA: NSTA Press.

Keeley, P., F. Eberle, and J. Tugel. 2007. *Uncovering student ideas in science, vol. 2: 25 more formative assessment probes*. Arlington, VA: NSTA Press.

Keeley, P., F. Eberle, and C. Dorsey. 2008. *Uncovering student ideas in science, vol. 3: Another 25 formative assessment probes*. Arlington, VA: NSTA Press.

Related Publications

American Association for the Advancement of Science (AAAS) and National Science Teachers Association (NSTA). 2001. *Atlas of science literacy*. Washington, DC: AAAS and NSTA.

American Association for the Advancement of Science (AAAS). 1993. *Benchmarks for science literacy*. New York: Oxford University Press.

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