

SECRET LIVES OF STARS

STUDENT WORKBOOK

LAUNCH



INSIDE STORY OF A STAR

Why does the Sun have weather – what is happening within the Sun that causes it to send electromagnetic radiation toward Earth?

LEARNING GOALS:

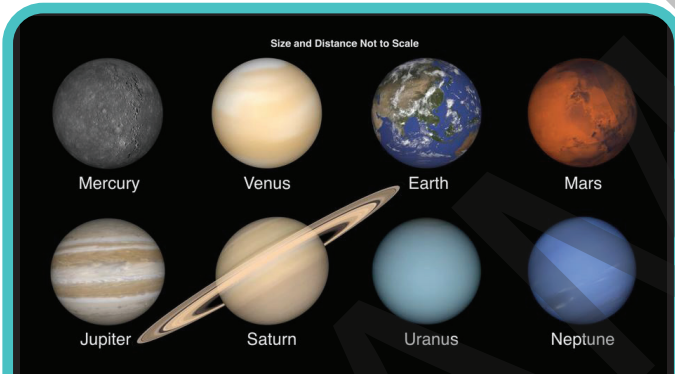
- ✓ I can use evidence to develop a model that describes the life span of the Sun and shows how nuclear fusion in the Sun’s core leads to the release of energy that reaches Earth as radiation.

SUN AND EARTH

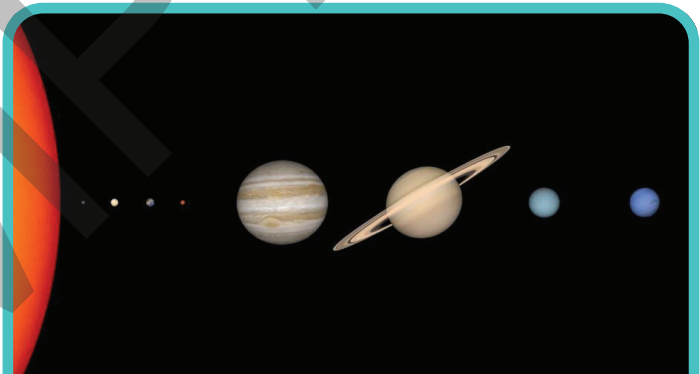
The Solar System

Earth is one of eight planets, or large celestial objects, which orbit the Sun, a star. Any group of planets orbiting a star is called a **planetary system**, and our specific planetary system is called the **Solar System**.

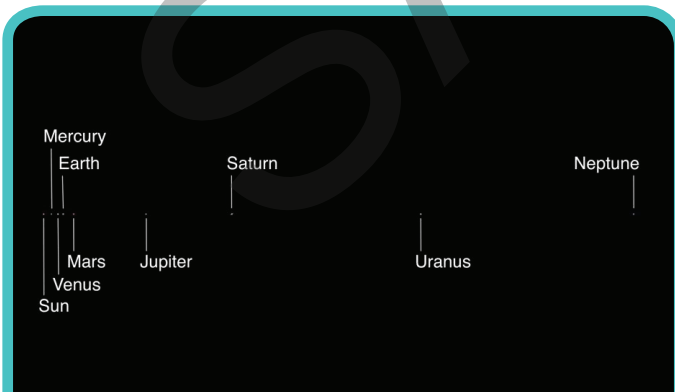
VIEWS OF THE SOLAR SYSTEM



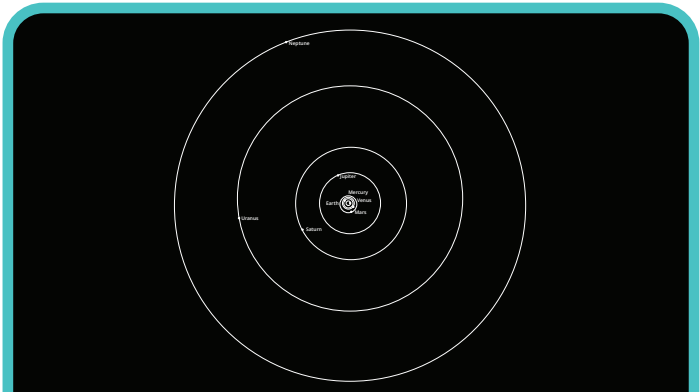
View 1: Size and distance not to scale



View 2: Size to scale but distance not to scale



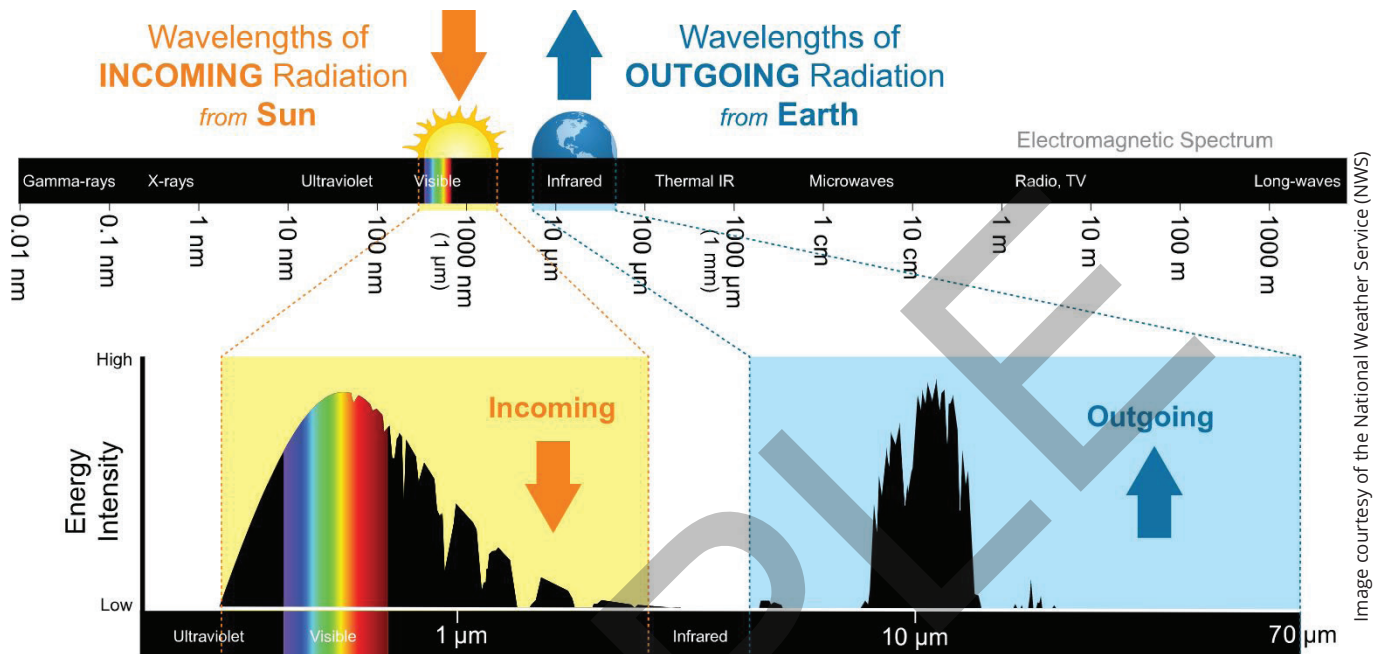
View 3: Size and distance to scale



View 4: Shapes of orbits

The planets of the Solar System vary in size, distance from the Sun, and shape of orbit.

All the types of electromagnetic radiation, including those from the Sun and more, are part of the **electromagnetic spectrum**, which is the order of electromagnetic waves in terms of frequency and wavelength.



This illustration shows the electromagnetic radiation that reaches Earth from the Sun as well as the types re-radiated back into space from Earth.

WAVE VOCABULARY REVIEW :

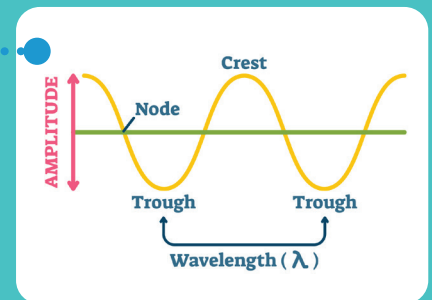
A **wave** is a pattern of moving energy.

Every wave has a certain wavelength, frequency, and amplitude.

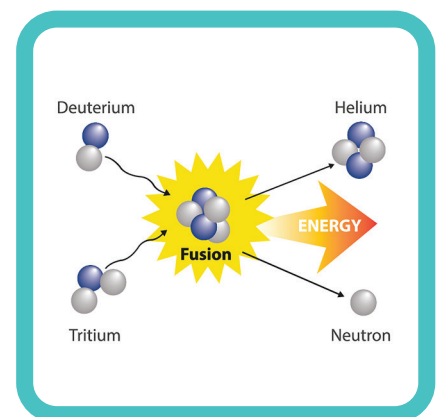
Wavelength is the distance from one wave to the same point on the next wave.

Frequency is the number of times per second the wave passes a reference point.

Amplitude is the height of a wave from the midline to the crest or trough.



How does the Sun produce the energy that is released from it and reaches Earth? The energy coming from the Sun has led scientists to conclude that nuclear fusion is happening in the Sun. **Nuclear fusion** is a reaction in which two or more atomic nuclei join to form one or more different nuclei along with subatomic particles, releasing energy. In the Sun's core, hydrogen atoms fuse together, forming helium atoms and releasing several types of electromagnetic radiation. All stars perform some type of nuclear fusion, as you will learn more about in Activity 3.





THINK ABOUT IT!

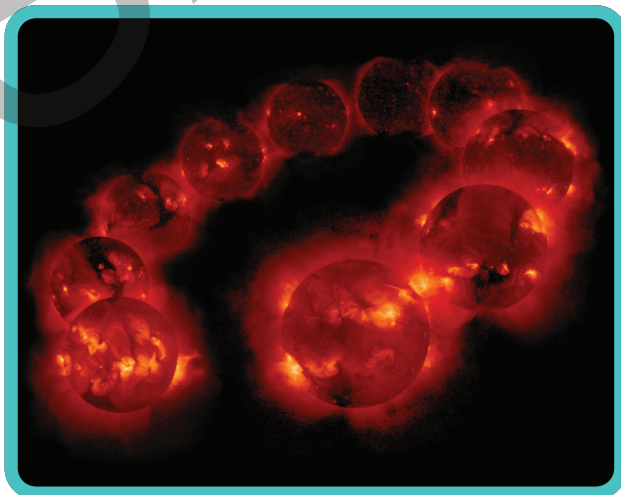
1. Summarize your results: what happened when you moved the magnet into and out of the coiled wire? Was there any difference in which pole of the magnet was inside the coil first?

2. What does this experiment show about the relationship between the magnetic field of the Sun and the electrical devices of Earth?

5 Solar Weather Situation

The electromagnetic radiation released by the Sun, including magnetic field, visible light, ultraviolet, and infrared, is not constant. It varies or fluctuates, sometimes predictably and sometimes not as predictably.

For example, scientists who study the Sun have observed a cycle of magnetic field fluctuations on the Sun that lasts about 22 years, or two 11-year sunspot cycles. The sunspot cycle is identified by observing sunspots. These darker, relatively cooler (but still very hot) areas show irregularities in the Sun's magnetic field.



This composite photo shows the cycle of sunspots over 10 years.



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Kit	SU-SECRET
Instructions	IN-SECRETS
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