

# Space Science Review

## 8th Grade Science Standards-Based Review

- Earth in the Solar System (Earth Sciences)
- The structure and composition of the universe can be learned from studying stars and galaxies and their evolution. As a basis for understanding this concept:
    - Students know* galaxies are clusters of billions of stars and may have different shapes.
    - Students know* that the Sun is one of many stars in the Milky Way galaxy and that stars may differ in size, temperature, and color.
    - Students know* how to use astronomical units and light years as measures of distances between the Sun, stars, and Earth.
    - Students know* that stars are the source of light for all bright objects in outer space and that the Moon and planets shine by reflected sunlight, not by their own light.
    - Students know* the appearance, general composition, relative position and size, and motion of objects in the solar system, including planets, planetary satellites, comets, and asteroids.

### Formation of the Solar System

The solar system formed out of a vast cloud of cold gas and dust called a **nebula**. Gravity and **pressure** were balanced, keeping the cloud unchanging until something upset the balance. Then the nebula began to collapse. Collapse of the solar nebula caused heating in the center. As materials crowded closer together, **planetesimals** began to form.

### Formation of the Solar System

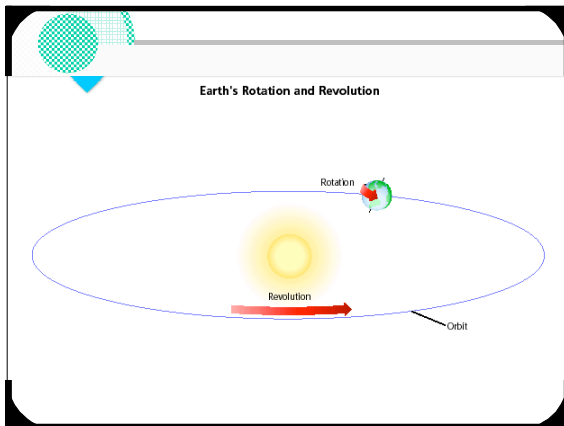
The central mass of the nebula became the **sun**. **Planets** formed from the surrounding disk of material. Because of their greater gravitational attraction, the largest planetesimals begin to sweep up more and more of the dust and gas of the solar nebula. Smaller planetesimals collide with the larger ones, and planets begin to grow. It took about **10 million** years for the solar system to form, and it is now **4.6 billion** years old.

### Planetary Motion

A planet \_\_\_\_\_ on its own axis and \_\_\_\_\_ around the sun in a path called an \_\_\_\_\_.

### Planetary Motion

A planet **rotates** on its own axis and **revolves** around the sun in a path called an **orbit**.



### Earth Takes Shape

The Earth is divided into 3 main layers:  
 \_\_\_\_\_, \_\_\_\_\_,  
 \_\_\_\_\_. Materials with different  
 densities separated because of high heat,  
 pressure, and melting inside the Earth.  
 Heavy elements sank to the center because  
 of Earth's gravity. Earth's original  
 atmosphere formed from the release of  
 gases brought to Earth by meteorites and  
 \_\_\_\_\_.

### Earth Takes Shape

Earth's second atmosphere arose from impacts by comets and volcanic eruptions. The composition was largely water and \_\_\_\_\_. The presence of life dramatically changed Earth's atmosphere, adding free \_\_\_\_\_. Earth's oceans formed shortly after the Earth did, when it had cooled off enough for rain to fall. \_\_\_\_\_ were formed when lighter materials gathered on the surface and rose above sea level

### Earth Takes Shape

The Earth is divided into 3 main layers: **crust mantle, core**. Materials with different densities separated because of high heat, pressure, and melting inside the Earth. Heavy elements sank to the center because of Earth's gravity. Earth's original atmosphere formed from the release of gases brought to Earth by meteorites and **comets**.

### Earth Takes Shape

Earth's second atmosphere arose from impacts by comets and volcanic eruptions. The composition was largely water and **carbon dioxide**. The presence of life dramatically changed Earth's atmosphere, adding free **oxygen**. Earth's oceans formed shortly after the Earth did, when it had cooled off enough for rain to fall. **Continents** were formed when lighter materials gathered on the surface and rose above sea level

### Chapter 17 Concept Map

A **solar system** begins as a **nebula** which is pulled together by **gravity** to form a **solar nebula** where bits of dust and rock form **planetesimals** which develop into **planets** which are made mostly of **gas** and **rock**.

## Anatomy of the Sun

A. Corona  
B. Chromosphere  
C. Photosphere  
D. Convective Zone  
E. Radiative Zone  
F. Core

(remember... starting from the core - every other layer starts with a C)

The diagram shows the Sun's internal structure with labels A through F. A is the outer atmosphere (2,000,000°C), B is the inner atmosphere (5,000-10,000°C), C is the convective zone (5,500°C), D is the radiative zone, E is the photosphere, and F is the nuclear fusion core. Arrows indicate heat transfer: radiation of hot gas from the core, convection through light energy in the convective zone, and radiation of heat energy from the photosphere.

## Structure of the Sun and Its Atmosphere

1. The **core** is at the center of the sun. This is where the sun's energy is produced. The core has a radius of about 200,000 km and a temperature near 15,000,000°C.

2. The **radiative zone** is a very dense region about 100,000 km thick. The atoms in this zone are so closely packed that light, which is absorbed and released by atoms along the way, takes millions of years to pass through this zone.

3. The **convective zone** is a region about 200,000 km thick where hot and cooler gases circulate in convection currents. Hot gases rise from the interior while cooler gases sink toward the interior. It is only about 10% as thick as the sun's energy reaches the surface.

4. The **photosphere** is where the gases are thick enough to see. The photosphere is what we know as the surface of the sun. It has a temperature of about 6,000°C and is only about 500 km thick.

5. The **chromosphere** is a thin region below the corona, only 3,000 km thick. Like the corona, the dense, hot chromosphere is too faint to see unless there is a total solar eclipse. It ranges in temperature from 4,000°C to 50,000°C.

6. The **corona** forms the sun's outer atmosphere and can extend outward a distance equal to 10-12 times the diameter of the sun. The gases in the corona are so thin that it is visible only during a total solar eclipse. The corona can reach temperatures up to 2,000,000°C.

The diagram shows the solar system with the Sun at the center. The planets are labeled: Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune, and Pluto. A scale bar indicates 1.4 million kilometers.

## Chapter 18 Concept Map

The **solar system** is composed of one central **star** surrounded by: (left) **planets** which are often circled by natural **satellites** which we call **moons** and (right) **small bodies** such as **comets** which are icy and **asteroids** which are rock.

```

    graph TD
      A[The solar system] --> B[is composed of one central star]
      B --> C[surrounded by]
      C --> D[planets]
      C --> E[small bodies]
      D --> F[which are often circled by natural satellites]
      F --> G[which we call moons]
      E --> H[comets]
      E --> I[asteroids]
      H --> J[which are icy]
      I --> K[which are rock]
  
```

## Understanding Light Years

- An **Astronomical Unit (AU)** is  $1.496 \times 10^8$  km (the distance from Earth to the sun). This unit is usually what is used to measure distances within our solar system.
- To measure longer distances (like the distance between Earth and stars and other galaxies), the **light year (ly)** is used. A light year is the distance that light travels through space in one year, or  $9.468 \times 10^{12}$  km.

## Understanding Light Years

Convert each number of light years to kilometers:

- 6 light years = **Answer:  $5.69 \times 10^{13}$  km**
- 11 light years = **Answer:  $1.04 \times 10^{14}$  km**

## The Universe Beyond

1. **Parallax** is the apparent shift of nearby stars relative to more-distant stars as Earth orbits the sun.
2. A **globular** cluster is a group of older stars located in the halo of spiral galaxies.
3. A **black hole** is so small and massive that its gravity does not even let light escape.
4. A **white dwarf** is a small, hot star that is near the end of its life.

## The Universe Beyond

5. A **spiral** galaxy has distinctive arms and a nuclear bulge.
6. A **neutron star** is a star of about two solar masses formed from a supernova.
7. An **elliptical** galaxy has a very bright center and contains almost no gas and dust.
8. A **nebula** is a giant cloud of gas and dust.
9. A large, cool star formed when a star runs out of hydrogen is a **red giant**.

## The Universe Beyond

10. The **apparent** magnitude of a star is how bright it looks.
11. The explosive death of a star is a **supernova**.
12. A large grouping of stars in space is called a **galaxy**.
13. A group of stars that form when a lot of gases and dust come together is known as an **open** cluster.
14. The diagonal pattern of stars on an H-R diagram is known as the **main sequence**.

