Core Concepts -- Earth and Space (Astronomy)
2.1a Earth systems have internal and external sources of energy, both of which create heat.
1.1a Most objects in the **solar system** are in regular and predictable motion
> These motions explain such phenomena as the **day**, **year**, **seasons**, **phases of the Moon**, **eclipses**, and **tides**.
> **Gravity** influences the motions of celestial objects. The force of gravity between two objects in the **Universe** depends on their masses and the distance between them.
1.1b Nine **planets** move around the **Sun** in nearly circular orbits.
>The **orbit** of each planet is an **ellipse** with the Sun located at one of the **foci**.
> Earth is orbited by one Moon and many artificial **satellites**.
1.1c Earth's **coordinate system** of **latitude** and **longitude**, with the **equator** and the **prime meridian** as reference lines, is based upon Earth's rotation and our observation of the Sun and stars.
1.1d Earth **rotates** on an imaginary **axis** at a rate of 15 degrees per hour. To people on Earth, this turning of the planet makes it seem as though the Sun, Moon, and stars are moving around Earth once a day. Rotation provides a basis for our system of **local time**. Meridians of longitude are the basis for **time zones**.
1.1e The **Foucault pendulum** and the **Coriolis effect** provide evidence of Earth's rotation.
1.1f Earth's changing position with regard to the Sun and Moon has noticeable effects.
>Earth revolves around the Sun with its rotational axis tilted at 23.5 degrees to a line perpendicular to the plane of its orbit, with the **North Pole** aligned with **Polaris**.
>During Earth's one-year period of revolution, the **tilt of its axis** results in changes in the **angle of incidence** of the Sun's rays at a given latitude. These changes cause variations in the heating of the surface. This produces seasonal variation in weather.
2.2b The transfer of heat energy within the atmosphere, hydrosphere, and surface occurs as a result of **radiation**, **convection**, and **conduction**.
> Heating of Earth's surface and atmosphere by the Sun drives convection within the atmosphere and oceans.

1.1g Seasonal changes in the apparent positions of **constellations** provide evidence of Earth's revolution.
1.1h The Sun's **apparent path** through the sky varies with latitude and season.
1.1i Approximately 70% of Earth's surface is covered by a relatively thin layer of water which responds to the gravitational attraction of the Moon and Sun with a daily cycle of high and low tides.
1.2a The Universe is vast and estimated to be over 10 billion years old. The current theory is that the Universe was created from an explosion called the **Big Bang**. Evidence for this theory includes:
> **cosmic background radiation**
> a **red-shift** (**Doppler effect**) in light from very distant galaxies
1.2b Stars form when gravity causes clouds of molecules to contract until **nuclear fusion** of light elements into heavier elements occurs. Fusion releases great amounts of energy over millions of years.
> The stars differ from each other in size, temperature, and age.
> Our Sun is a medium-sized star within a **spiral galaxy** known as the **Milky Way**. Our galaxy contains billions of stars, and the Universe contains billions of galaxies.
1.2c Our solar system formed about 5 billion years ago from a giant cloud of gas and debris. Gravity caused Earth and the other planets to become layered according to density differences in their materials.
> The characteristics of the planets of the solar system are affected by each planet's location in relationships to the Sun.
> The **terrestrial planets** are small, rocky, and dense. The **Jovian planets** are large, gaseous, and of low density.
1.2d **Asteroids**, **comets**, and **meteors** are components of our solar system.
> **Impact events** have been correlated with **mass extinction** and **global climate change**.
> **Impact craters** can be identified in Earth's crust.
1.2e Earth's early atmosphere formed as a result of the outgassing of water vapor, carbon dioxide, nitrogen, and lesser amounts of other gases from its interior.
1.2f Earth's oceans formed as a result of precipitation over millions of years. The presence of an early ocean is indicated by sedimentary rocks of marine origin dating back about 4 billion years.

1.2g Earth has continuously been recycling water since the outgassing of water early in its history. This constant recirculation of water at and near Earth's surface is described as the hydrologic (water) cycle.
1.2h The evolution of life caused dramatic changes in the composition of earth's atmosphere. Free oxygen did not form in the atmosphere until oxygen-producing organisms evolved.