13 The Sun, The

The sun, the moon and the earth are the three heavenly bodies that spin in coordination with each other in space.

- Star – A heavenly body that has light of its own.
- Ignited – Burnt.
- Nuclear Fusion – The reaction producing a lot of heat and light.

The Sun

The sun is a giant star that provides energy for life on earth.

Sun in the universe

Our sun is not unique in the universe. It is a common middle-sized yellow star which scientists ha named Sol. This is why our system of planets called the solar system. There are trillions of oth stars in the Universe just like it. Many of these sta have their own systems of planets, moo asteroids, and comets.

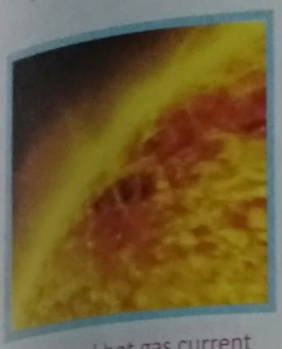
The sun was born in a vast cloud of gas and dust around 5 billi years ago. Over a period of many millions of years, this gas and d began to fall into a common centre under the force of its own gravi

This orientation towards the centre, generated a tremendous amount of heat and pressure. As it grew, the baby sun became hotter and hotter. Eventually, when it reached a temperature of around one million degrees, its core ignited, causing nuclear fusion to begin.

When this happened, the

Convection

The surface of the sun like the earth also experiences warm and cold currents. Because heat rises, while cooler gases fall, the gas within stars is constantly rising and falling. This creates massive streams of circular motion within the star. This is called convection.



Cool and hot gas current

As the gases near the core of the sun are heated, they begin to rise towards the surface. As they do so, they cool somewhat. Eventually, they become cool enough that they begin to sink back down towards the core.

> The surface of the Sun is much cooler than its atmosphere.
>
> The Sun's surface is a warm 6,000 degrees Celsius. This is the same temperature as the Earth's core. However, as you travel away from the Sun's surface, the atmosphere heats up to millions of degrees. Scientists are not sure how the atmosphere can be as hot as it is, with such a cool surface.

Spots

Ans C3 We don't often think of the sun as having cooler areas on its surface. The Sun is far too hot for an astronaut to ever visit; however there are areas which are slightly cooler. These areas are known as sun spots. Sun spots are still very hot. However, because they are slightly cooler than the rest of the surface of the sun, they appear slightly darker in colour.

Sun spots

Sun spots come and go on a regular basis. At times they are very few and at other times they are far more. They generally increase in intensity and then decrease over a period of 11 years. This 11 year cycle is known as the Saros Cycle.

Solar Winds

Ans C2 As the sun burns hydrogen at its core, it releases vast amounts of atomic particles, or pieces of atoms into outer space. These atomic particles, along with the sun's radiation create a sort of wind, known as the solar wind.

This wind blows particles outward directions from the sun. Even as you read this, there are atomic particles which are travelling from the sun towards you. Often particles pass right through your body, without you ever realizing it.

Sun winds

Eventually, this wind reaches out beyond the solar system, begins to mix with the winds from other stars.

The Sun's Family

Comparison of Sun and Earth

The sun is by far the largest object in the solar system. 98% of all matter within the solar system is found within the sun. This means that all the planets, moons, asteroids, minor planets, comets, gas and dust would all combine to make up only 2% of all the matter in the solar system.

Because the sun is so large compared to everything else, it is easily able to hold on to the rest of the matter, causing everything else to orbit around it.

Quick Revision:

Write True or False against the following statements:

1. Sun was born in a cloud of gas and dust. — True
2. The entire surface of the sun is very hot. — false
3. Solar winds carry atomic particles from space to sun. — False
4. The sun makes up 98% of the solar system. — True
5. Saros cycle completes in a period of 24 years. — False

The Earth

The earth is an oasis of life in the Universe. The temperature, the weather and many other factors contribute to sustain life on earth. The temperature at the earth's centre

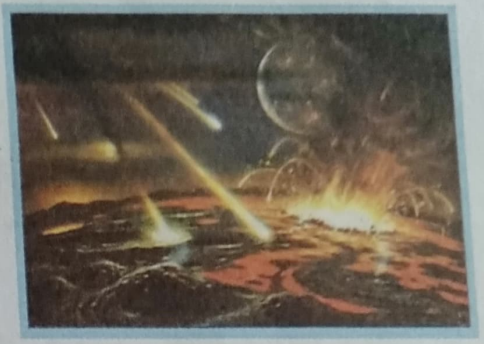
Earth

or the core may be as high as 7000°C , hotter than the surface of the sun.

The earth is 4.5 to 4.6 billion years old, but the oldest known rocks are less than 4 billion years old. The oldest fossils of living organisms are less than 3.9 billion years old.

Formation of Earth

Earth was hot when it was formed. Earth is thought to have arisen from a cloud of gas and dust in space. Solid particles, called 'planetesimals' condensed out of the cloud, just like the rain. They are thought to have stuck together and created the early earth.) Bombarding planetesimals heated earth to a molten state.



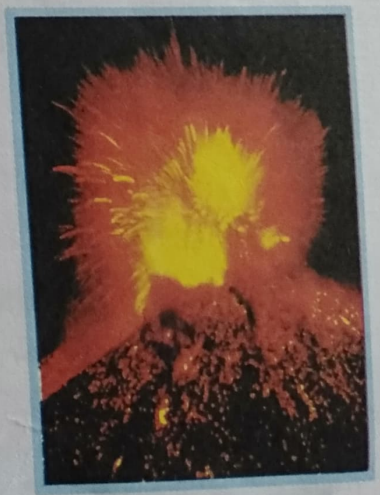
Formation of Earth

So earth started out with a lot of heat.

Earth makes some of its own heat.

Earth is cooling now but very, very slowly, because it makes heat in its interior.

In other words, earth has been losing heat since it was formed billions of years ago. But it is producing almost as much heat as it is losing. The process by which earth makes heat involves breaking down of natural radioactive elements inside the earth's core like uranium. Uranium is a special kind of element because when it decays, heat is produced. It is this heat that keeps earth from cooling off completely.



Volcano

Without this process, there would be fewer volcanoes and earthquakes and less building of earth's vast mountain ranges.

While the heat energy produced inside earth is enormous, it is 5,000 times less powerful than what earth receives from the sun's heat drives the weather and ultimately causes erosion of mountains to tiny rocks and sand.

Quick Revision:

Fill in the blanks:

1. Planetesimals bombarded against each other to form the molten earth
2. Earth was formed about 4.5 to 4.6 billion years ago.
3. Earth produces heat by breaking down of radioactive elements.
4. The molten matter inside the earth comes out as volcanoic eruption
5. The temperature at the core of the earth is as high as 7000°C.

The Moon

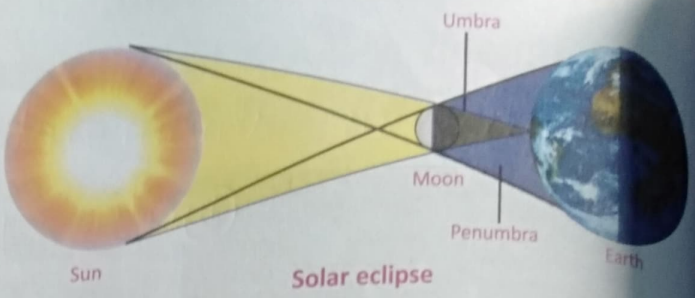
The moon is about 250,000 miles (384,400 kilometres) from e and has a diameter of 2,000 miles (3,476 kilometres). It orbits earth at an average speed of 2,288 miles per hour (3,683 kilome per hour). It travels at different speeds during different parts o orbit. It moves slowest when it is at furthest distance from earth fastest when it is closest to earth.

The surface of the moon has about the same area as the continen Africa. It has many things on it such as craters, lava plains, mounta and valleys. Scientists believe the craters were formed around 3.5 4.5 billion years ago by meteors hitting the moon's surface. T moon has no atmosphere. There is no wind or weather on it. Wa was discovered on the moon in November 2009 by a space shut named the Chandrayaan.

Footprints left on the moon by Apollo astronauts will remain visil for at least 10 million years because there is no erosion due to wi or water on the moon.

Types of Eclipses

Solar Eclipse



Solar eclipse

Solar eclipse occurs when the moon passes between the sun and the earth. The moon appears to fully or partially cover the sun from different locations on the earth.


Total solar eclipse

During a total eclipse all you can see from earth is a ring of light around the moon which is part of the sun, the moon did not cover. It is dangerous to look at a solar eclipse directly, even if you have sun glasses or smoked glass. It is better to view solar eclipses through a pin hole projector.

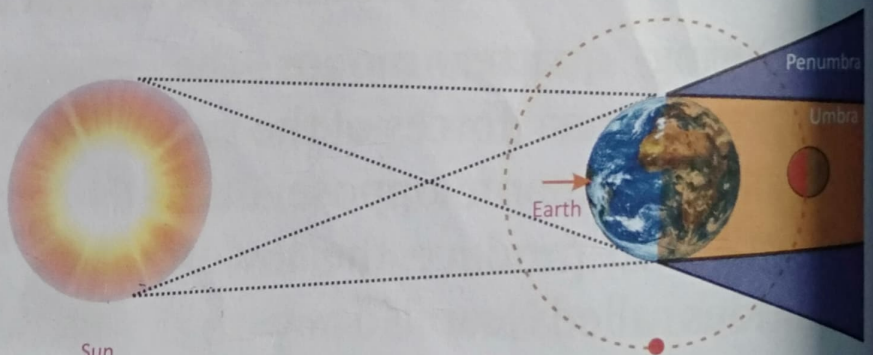
The area of umbra is the area where an observer shall see a total eclipse (moon fully hides the sun).

Around this area is the area of the penumbra, an observer there will see a partial eclipse (the moon only hides a piece of the sun).


Partial solar eclipse

Lunar Eclipse

A lunar eclipse occurs when the moon passes through the shadow of the earth. A lunar eclipse can last up to an hour and a half. During a lunar eclipse the moon may turn reddish in colour. It is not dangerous at all to look at a lunar eclipse because the moon does not make its own light.



Lunar eclipse

Fact File

A solar eclipse always occurs two weeks before or after a lunar eclipse.

New Words

Convection – Streams of circular motion of hot and cold gases.
Sun Spots – The cooler, darker areas on the surface of the sun.
Saros Cycle – The cycle in which the sun spots increase in intensity and then decrease.
Solar Winds – The burst of atomic particles from the sun into space.
Spring Tides – The higher tides during full and new moon.
Neap Tides – The low tides during quarter moons.

Let's Revise

1. The solar system is named after Sol, the name for the sun.
2. The rise of hot gases and fall of cooler gases forms convection currents on the sun.
3. Sun spots come and go on a regular basis.
4. Hydrogen is burnt at the core of the sun.
5. Sun makes up 98% mass of the solar system.
6. The core of the earth heats up due to the breakdown of radioactive Uranium.
7. The moon has no air or water to cause erosion.
8. Tides are caused due to gravitational force between the earth and the moon.

Let's Answer

A. Rewrite the following statements correctly:

1. Hot gases fall while cool gases rise on the sun's surface.
   Hot gases rise while cool gases fall on the sun's surf
2. Saros cycle is the decrease and increase in solar winds.
   Saros cycle is the decrease and increase in Sun spot
3. Lunar eclipse is caused when the moon blocks the sun.
   Lunar eclipse is caused when the moon passes through the shadow of the earth
4. The earth is constantly cooling.
   The earth is constantly cooling but very very slowly.
5. The moon travels around the earth at a constant speed.
   The moon travels around the earth at different speed.

B. Fill in the blanks with suitable words from the brackets:

1. The _____ remain on the moon's surface forever.(pugmark/footprint)
2. The _____ illuminates one side of the moon at a time.(Sun/Earth)
3. _____ eclipse is caused when the moon passes through the shade of the earth. (Lunar/Solar)
4. The gravitational forces of the sun and the moon _____ each other to produce Spring Tides. (combine with/oppose)
5. _____ is the yellow star which we also know as the sun. (Khol/Sol)

C. Answer these:

1. Tabulate the differences between:
   a. Solar Eclipse Vs Lunar Eclipse
   b. Spring Tide Vs Neap Tide
   c. Total Eclipse Vs Partial Eclipse
2. How are solar winds created? Where do they travel? Pg. no. 125 and 126
3. What causes sun spots? Page no. - 125
4. Why is it dangerous to look at the sun during a solar eclipse? Pg. no. - 130
5. How was the earth formed? Pg. no. 127

D. Find the given words in the word grid:

S	A	V	T	S	R	U	K	L	M	J	K	W	A	P	O	A
U	S	D	T	P	O	T	S	X	C	V	H	O	P	W	Y	I
N	A	B	G	R	E	U	O	F	P	M	N	O	L	Y	T	E
S	S	E	Q	I	U	V	L	U	N	A	R	A	A	J	K	F
P	C	H	A	N	D	R	A	Y	A	A	N	S	N	Q	K	L
O	D	F	H	G	E	O	R	P	A	S	E	V	E	N	K	I
T	W	X	I	T	O	P	W	S	B	P	A	R	T	I	A	L
S	C	R	T	I	O	R	I	W	X	F	P	O	E	R	S	A
E	J	O	A	D	C	B	N	M	E	T	T	R	S	A	C	Y
A	F	H	G	E	R	E	D	O	L	D	I	A	I	U	M	G
B	C	E	C	L	I	P	S	E	Y	K	D	I	M	J	N	O
E	D	O	P	S	T	Y	P	J	G	H	E	I	A	A	M	I
S	J	K	L	R	T	U	Y	B	V	C	W	K	L	L	U	Y

Solar winds

Chandrayaan

Eclipse

unar

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Spring tid

Planetesim

Sun spots

Neap tide