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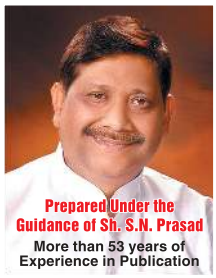

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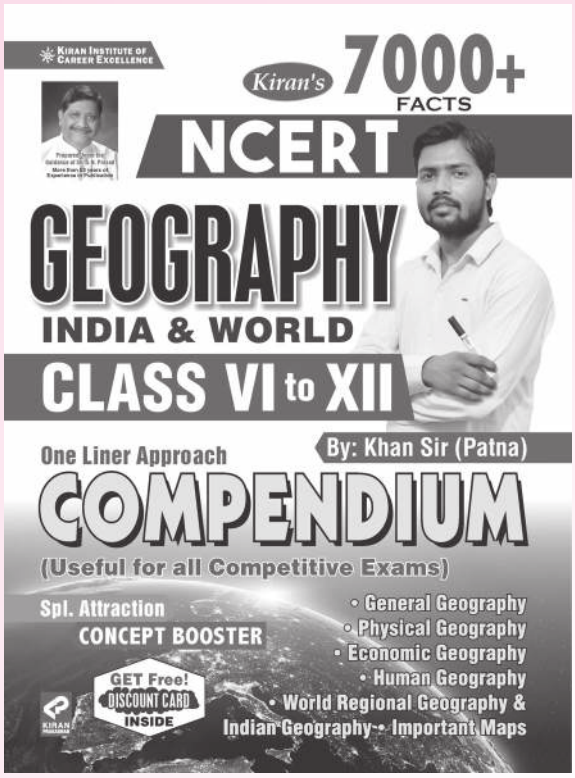

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ABOUT THE BOOK

Dear Readers,

During the preparation of General Studies question paper for all the one-day multiple choice examinations from SSC, Railways to UPSC, and PCS, the first question arises as to which study materials to use and where to start it. Its most accepted answer is - 'NCERT books from class VI to class XII'..

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In 'physical geography', not only the earth, but also the physical form of the universe is studied. Under this, climatology, soil geography, ocean geography, biogeography etc. are studied. By studying all this, natural disasters can be predicted, how the resources can be optimally used can also be found out. Similarly, the theme of 'Geography of the World' is also very important. In the present era of globalization, geography is the mainstay of geopolitics. Middle East is of special importance in global politics, because there are important resources such as a 'mineral oil' available. Similarly, the importance of African continent is significant for abundant mineral and natural resources. Relations between countries and foreign policy are also determined by geography. The controversy over the South China Sea is an updated example of this. Similarly, information about the geographical location of the country, climate, natural resources, geopolitical problems, etc. is also necessary, so that clear policies about the whole country or region can be made and their smooth implementation becomes possible. In view of the importance of the subject 'Geography', a good number of questions are asked from this section in various examinations.

A series of books enriched with updated facts and materials has been published by Kiran Prakashan to reduce the various complications faced by the candidates and to assist them in their preparation. Another important book in this series 'NCERT GEOGRAPHY-ONE LINER APPROACH' is now in your hands. It has a total of 24 chapters, in which general geography, physical geography, economic, social and regional geography of the world and the geography of India have been presented in point-wise question-answer style. In almost all the preliminary examinations conducted during the last several years, the questions asked from the geography of the world and India have been presented in point-wise and question-wise form. Also, all the chapters of this booklet, especially the chapters related to economic geography, have been updated and also enriched with contemporary facts.

Materials related to all its chapters have been collected from all the books of NCERT in one place. While formulating the questions, an effort has been made so that the readers can get as much information as possible from them. While solving the questions, there are many concepts that are necessary to understand at the same time. For this, related vocabulary and facts have been compiled on each page. This book has been composed in simple, easy to understand and sensible language, so that the facts are easy to grasp. As a result, these books will prove very useful for all new and old candidates.

Be sure to let us know your feedback. If you want to give any suggestion, we are glad to welcome it and assure that we will definitely implement your proper suggestions.

With the best wishes,

Publisher

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CONTENT

CHAPTER

1

WHAT IS GEOGRAPHY ?

- The word Geography is derived from two Greek words mainly *Geo* (means- Earth) &*Graphos* (means-description) which collectively means "Description of the Earth". Which Greek scholar was the first to use the term Geography? –CyrineEratosthenes(276-194 B.C.)

Note :

Hindi word Geography is made up of Geo and Spherical which means Spherical Earth.

- Who is called "The Father of Geography"? –CyrineEratosthenes(276-194 B.C.)

Note :

Some people regard Hiketius as the Father of Geography. H.F.Tazar also regarded Hiketius (500B.C.) as the Father of Geography.He described the land portion surrounded by seas and gave knowledge of two mainland.

- Which was the most famous book of Eratosthenes? – Geographica
- Earth is always viewed as the home for Human Beings, and in context to this how do geography scholars define geography? – Description of earth as home for Human Beings
- Geography is concerned with the study of nature and the interaction of man as a whole unit.What are the types of geographical facts, both physical and human? – Not static, but dynamic
- History attempts periodic synthesis.Geography is an analytical subject, what kind of synthesis does it attempt? – Territorial synthesis
- Which technology helped European countries colonize many Asian and African nations, including India, as they gained access through the sea? – Navigation technique
- The approach to thematic or sequential geography is that of general geography,this approach was introduced by which German geographer? – Alexander von Humboldt

Note :

The study of specific natural and human facts located on the ground that make some spatial pattern or structure is called systematic study.Usually, geography is categorised into 4 branches -Physical geography, Biological and Environmental geography, Human geography and Geographical methods and techniques.

- Regional geography divides the world into different regions and studies all the geographical facts, natural, vegetation, political, per capita income, etc. of a particular state. Regional geography has been developed by which German geographer? –Carl Ritter
- Wladimir KöppenGerman (born in Russia and died in Austria) is a meteorologist and climatologist known for the delimitation and mapping of the world's climatic regions. What is he called? –Father of climate science

CYRINE ERATOSTHENES

Cyrine Eratosthenes was an ancient Greek mathematician, poet & Geographer.He is credited with the first use of the term Geography in the third century BCE. He established geography as a separate discipline of study and used the term "Geographica" for geography. Therefore, he is also called the "Father of systematic geography". He gave birth to geodesy. He is also known as "Father of Geography" for his geographical writings and achievements. He also measured the circumference of the Earth almost accurately. In addition, he invented the system of latitude and longitude and also calculated the distance of the sun from the earth. He is also called the inventor of the leap year.

WHAT IS GEOGRAPHIC INFORMATION SYSTEM ?

Geography is often referred to as the art of map-making and study. Maps give us a more accurate and vivid depiction of the earth's surface than diagrams. Currently, maps can be designed using satellite imagery using the tools of the Geographic Information System. The Geographical Information System integrates computer hardware and software with geographic information and arranges data collection, management, analysis, preservation, and representation for them. Nowadays, geographers, engineers, environmental scientists and others are also using geographical information systems to under-stand the earth better.

- Who is called the Father of Indian Geography? –James Rennel
- World's first known map was made by Anaximander. He was resident of which country? –Greece
- Which two geographers gave the first accurate map of India? –William Lambton & George Everest
- Which is the main institution of map making in India after the Survey of India established on the basis of the British Ordinance Survey? –National Atlas & Thematic Mapping organisation (NATMO)
- Who first introduced the word anticyclone? –Francis Galton
- The study method of geography has been changing. The early scholars were descriptive geographers. Later it developed into analytical geography. Today what else does this subject describe and analyse? –Prediction
- Geography is often referred to as the art of map making and study. Presently, by which mechanism of satellite imaging, map making is performed? –Geographical Information System(GIS)
- In 1962, the first geographical coordinate system was created by the Federal Forest and Rural Development Department of which country? –Cananda
- Which Canadian geographer first imagined and developed GIS for the use of Canada Land Inventory, because of which he is called the father of GIS? –Roger Tomlinson
- Under whose leadership did the regional science movement begin in 1950, which provided a more quantitative and analytical basis to geographical questions in contrast to the qualitative trends of traditional geography? –Walter Isar

THREE MAIN BRANCHES OF GEOGRAPHY

- Different ground phenomena can be taken individually or collectively. They are classified as physical and human phenomena. There are three major branches of Geography - Physical Geography, Human Geography and Regional Geography.
- 1. Physical Geography : Physical geography describes and studies physical phenomena. It is also associated with geology, meteorology, zoology, and chemistry. This topic became very popular in the late 19th century. It has several sub-disciplines to discuss various physical phenomena as-
  1. Astronomical geography
  2. Climatology
  3. Soil geography
  4. Geomorphology
  5. Oceanography
  6. Biological Sciences
- 2. Human Geography : Human geography is a synthesized study of the relationship between Earth's surfaces and human communities. It is closely related to the three components - the spatial analysis of the human population, the ecological analysis of the relationship between the human population and the environment, and the regional synthesis, which combines the first two objects in the regional differentiation of the surface. Following are the main sub-sections of human geography -
  1. Anthropological geography
  2. Economic geography
  3. Historical geography
  4. Population geography
  5. Cultural geography
  6. Political geography
  7. Social geography
  8. Domicile geography
- 3. Regional Geography : The territorial demarcation of the territories and its geographical characteristics are studied under regional geography. Regional geography is also divided into other branches, such as large, medium, and fine. All these subjects are interrelated.

WHAT IS GEOGRAPHY?

- *Geography is the illustrious science that glimpses the earth in heaven. -Ptolemy*
- *The objective of geography is to describe and explain the territorial/regional variation on the ground. - Richard Hartshorne*
- *Geography studies the variation in causally related facts in different parts of the surface. -Alfred Hettner*
- *Geography is the department in which all the characteristics of the geosphere are described in terms of the events and their relation to the Earth independently. Its overall unity appears related to human and human world. -Carl Ritter*
- *Geography gives us knowledge about the land and the creatures living in the oceans, as well as explaining the features of the Earth with different characteristics. -Starvo*
- *Geography is the science of explaining the surface of earth regarding it as the centre of study. Under this, inspection and description of elements like climate, surface characteristics, water and desert, minerals and animals and humans settled on the ground floor. -Varenius*

SOME IMPORTANT BOOKS AND THEIR AUTHORS

- *Geographica:* Eratosthenes
- *Geographia:* Strabo Ptolemy
- *Geographia in relation to nature & the history of mankind:* Carl Ritter
- *The Big Bang theory and the origins of our universe:* Georges Lemaitre
- *On the Revolutions of Heavenly Spheres:* Nicolaus Copernicus
- *The World as I See It:* Albert Einstein
- *Relativity-The special & General theory:* Albert Einstein
- *The Realm of the Nebulae:* Edwin Powell Hubble
- *The Sidereal messenger:* Galileo Galilei
- *The Harmonies of the World:* Johannes Kepler
- *A Big History of Time:* For the Big Bang to black hole (1988): Stephen Hawking

CHAPTER

2

GALAXY RELATED FACTS & THEORIES

- The combined form of matter and energy is called universe. What is the shape of the universe? –Oval
- What is the whole universe except for small clusters of matter and energy? –Almost Empty
- The universe has neither a centre nor an initial edge because according to Albert Einstein's special theory of relativity, how is all space and time tied to gravity? –As an endless curve
- A large number of hypotheses were put forth by different philosophers and scientists regarding the origin of the earth. One of the earlier and popular arguments was by German philosopher Immanuel Kant. Mathematician Laplace revised it in 1796.What is the name of the modified text? –Nebular Hypothesis
- Which is the most reliable and publicly accepted theory about the origin of the universe? –Big Bang Theory
- According to the Big Bang theory, the universe is believed to have originated 15 billion years ago, but according to the latest NASA discoveries, how many years ago the universe is believed to have originated? –13.8billion years ago
- According to the Big Bang theory, there was initially a superhot particle smaller than the atom, which later cooled to the shape of a football. What happened in it suddenly, after which the universe originated? –Big Bang
- Which of the two fundamental forces was responsible for The Big Bang? –Gravitational force and electromagnetic force
- The Big Bang theory is also known as which hypothesis? –Expanding Universe Hypothesis
- According to the Big Bang theory, the observable universe began to expand with the explosion of a particle at a given time. Who first gave this idea in 1927, which is accepted by almost all astronomers today? –Georges Lemaitre (Belgium)
- In 1929, who gave evidence that the universe is expanding and that the galaxies are getting away from each other with the passage of time? –Edwin Powell Hubble
- The expansion of the universe means the expansion in the distance between galaxies. On contrary to this, who presented the 'steady state concept'? –Hoyle
- According to the steady state concept, the universe has remained the same at any time. But as of now what theory is the scientific community in favour of, after getting many evidences of the expansion of the universe? –Expanding Universe Theory
- Initially atoms did not exist, but which were the most microscopic particles, whose fusion resulted in the creation of the smallest atom 'hydrogen'? –Quark
- Which gas was formed due to fusion of hydrogen atom? –Helium Gas
- Due to which process, excreted energy is the source of energy of sun and other stars? –Fusion

WHAT IS NEBULAR HYPOTHESIS?

The hypothesis considered that the planets were formed out of a cloud of material associated with a youthful sun, which was slowly rotating. Later in 1900, Chamberlainand Moulton considered that a wandering star approached the sun. As a result, a cigar-shaped extension of material was separated from the solar surface. As the passing star moved away, the material separated from the solar surface continued to revolve around the sun and it slowly condensed into planets. Sir James Jeans and later Sir Harold Jeffrey supported this argument. At a later date, the arguments considered of a companion to the sun to have been coexisting. These arguments are called binary theories. In 1950, Otto Schmidt in Russia and Carl Weizascar in Germany somewhat revised the 'nebular hypothesis', though differing in details. They considered that the sun was surrounded by solar nebula containing mostly the hydrogen and helium along with what may be termed as dust. The friction and collision of particles led to formation of a disk-shaped cloud and the planets were formed through the process of accretion.

WHAT IS A LIGHT YEAR?

A light year is a measure of distance and not of time. Light travels at a speed of 300,000 km/second. Considering this, the distances the light will travel in one year is taken to be one light year. This equals to 9.461 × 1012 km. The mean

- The universe began to expand after origin. As the sky progressed, its radiation temperature began to fall. Its temperature was about 10 billion degrees Kelvin 1 second after the big bang. What was the temperature around 100 seconds later? –1-billion-degree Kelvin (10^9 K)
- Initially there were mainly photons, electrons, neutrinos and antimatter in the universe, which of these is extremely light? –Neutrinos
- Proton and neutron particles do not have enough energy at a billion-degree Kelvin temperature to break the attraction of the powerful nuclear force. As a result, they formed the nucleus of the deuterium. By what other name is the deuterium also known? –Heavy Hydrogen
- Helium nuclei were formed from heavy hydrogen. Which two relatively heavy elements later originated? –Lithium and Beryllium
- Within 300,000 years from the Big Bang, temperature dropped to 4,500 K and gave rise to atomic matter. How was the universe at that time? -Transparent
- The construction of helium and other elements stopped within a few hours of the great explosion. How long after the Big Bang was the first atom formed? - Within First three minutes
- In parts whose density was slightly above average, diffusion slowed down due to the extra gravitational force, they began to shrink and the rotational motion of the material outside them caused them to rotate. As the size of those regions decreased, their rotation speed increased. Which of the following Patch shaped objects were born after this? –Rotating Galaxies
- The distribution of energy and matter was not the same in the early universe. The initial variation in density led to variations in gravitational forces, which resulted in the accumulation of matter. This gathering became the basis of whose development? –Evolution of galaxies
- A cluster of innumerable stars is called a galaxy. Which way is the galaxy flowing from? –North to South
- The galaxies expand so much that their distances are measured in thousands of light years. What is the diameter of a single galaxy? –Between 80,000 and 1 lakh 50 thousand light years
- The formation of a galaxy begins with the accumulation of a massive cloud made of hydrogen gas, what is it called? –Nebula

Note :
The nebula is a highly luminous celestial body consisting of particles of gas and dust.

- Eventually, growing nebula develops localised clumps of gas. These clumps continue to grow into even denser gaseous bodies, giving rise to formation of which kind of heavenly bodies? –Stars

Note :
It is believed that the stars were made about 5 to 6 billion years ago.

- Which nebula is the group of coldest and brightest stars in our galaxy? –Orion Nebula
- What is the unit for measuring distances between stars? –Light Year
- What do the colours of stars indicate? –Their Temperature
- In which two cycles do the stars get most of the energy in the initial state when hydrogen is abundant? –Hydrogen cycle or (proton-proton) cycle and carbon cycle
- What is the limit beyond which stars are struck by early death? –Chandrashekhar Limit
- The last million years of the stars are very quiet. When many stars throw out most of their mass as solar wind, only a small core remains. What does it become if its mass is less than the Chandrasekhar limit? –White dwarf star

distance between the sun and the earth is 149,598,000 km. In terms of light years, it is 8.311 minutes of a year.

WHY DO STARS SHINE?

The stars have a life cycle. They are born from gas clouds i.e. nebulae. These clouds mainly contain hydrogen gas. The stars are always born in Galaxy. It is estimated that our Sun was born about 5 billion years ago. When the gas contractions, heat is generated and nuclear fusion begins. Hydrogen atoms combine to form the atoms of helium. Heat is also produced in this reaction. With this heat, the temperature of the inner part of the stars reaches millions of degrees Kelvin and the stars start shining. The sun and other stars shine for billions of years. Fusion of hydrogen atoms in relatively large stars occurs rapidly. So, despite their high brightness, they have a life span of few lakh years.

WHAT IS CHANDRASHEKHAR LIMIT?

The theoretically maximum possible mass of a temporary white dwarf star is called the Chandrasekhar limit. The current value of the Chandrasekhar limit is 1.4 solar masses indicating that the mass of a white dwarf star cannot exceed 1.4 times the mass of the Sun. When the mass exceeds this mass then electron degeneracy pressure does not remain at such a level that it can prevent the star from being converted into a neutron star or black hole. The range is named after Indian-American scientist Subramanian Chandrasekhar. He discovered this limit in 1930 at just 19 years of age. He was awarded the 1983 Nobel Prize for his theoretical study of physical reactions important for the structure and evolution of stars.

HOW IS QUASAR FORMED?

Several hypotheses have been presented by astronomers

- If the mass of the core exceeds the Chandrasekhar limit, what does it shrink and become? –Neutron Star or Black Hole
- What is the current value of the Chandrasekhar limit of a solar mass? –Only 1.4 times
- In which year Subramanian Chandrasekhar was awarded the Nobel Prize in Physics for the theoretical study of physical reactions important for the structure and evolution of stars? –1983
- After about 5 billion years of more shining, the sun will start lacking hydrogen. It will then grow to about 250 times the current size. What will this situation be called? –Red Demon
- In the process of becoming a red demon, the Sun will absorb Mercury, Venus and Earth. After that, its size will start decreasing again and gradually its size will be reduced to equal to the Earth. What is this state called? –White dwarf
- After sometime the white dwarf stops shining and eventually turns dead or into whom? –Black Dwarf
- In stars whose mass is much larger than that of the Sun, it can explode like a supernova, 90% of such stars are scattered in space. The remaining portion forms a high-density central region. What is this called? –Neutron Star
- If the central region left after the supernova is large, it may become more compressed to become a neutron star. Into what does it get converted later? –Black Hole
- The gravitational force of black hole is so high that any substance falling in it can never come out. Can rays of light come out of it? –No
- Black hole can never be seen directly. How is it identified –By the effect of its gravity on neighbouring stars
- Which two American physicists detected the background brightness of the Big Bang as a microwave description when testing a highly sensitive microwave detector in 1965? –Arno Penzias and Robert Wilson

Note :

The temperature of this microwave radiation was 3 degrees Kelvin. This discovery justifies the theory of the Great Explosion concerning the origin of the universe.

- The massive cluster of stars is called the Galaxy. There are about 19 billion galaxies in space and each galaxy has 100 billion stars. What is the name of our galaxy? –Milky Way
- The Andromeda Galaxy, also known as Messier 31, M31 or NGC 224 and originally the Andromeda Nebula, is a forbidden spiral galaxy and the closestmajor galaxy to Milky way. How far is it located from the earth? –Nearly 2.5 million light years
- How long does the sun take to revolve around the centre of our galaxy? –25 crore years
- Other than stars, gas and dust are also found in the galaxy. The expansion of a galaxy is 100,000 light years. What is its thickness? –1000 light years
- The group of stars is called the constellation. They have been named on the basis of their special shapes. As the shape of the Saptarishi constellation resembles that of a bear. So, what is it named? –Great Bear or Ursa Major
- Which is the brightest constellation among alpha, beta, gamma, etc. regions of a constellation? –Alpha Star
- Which constellation stars point towards the pole? –Great Bear
- Of the total 89 constellations identified so far, which one is the largest? –Hydra
- Energy is constantly released from the stars. They are formed from gas clouds in the galaxy. Pole stars in space are found in pairs, what are they called? –Twin stars

regarding the formation of quasars. Some speculate that the quasar is formed by the release of substances in the accelerating plate by the black hole. As the velocity of a substance increases in the accelerating plate, its temperature also increases. The mutual collision of particles of matter produces energy in forms other than light and X-rays. Scientists estimate that any black hole swallows a substance equal to the mass of our Sun each year. When matter loses its existence in a black hole, it transforms into an infinite amount of energy and rapidly exits the northern and southern poles of the black hole. Astronomers call it the cosmic fountain. But some astronomers do not agree with the above hypothesis regarding the origin of quasar. According to them, quasar is actually a type of nascent galaxy because very little is known about the origin and development process of Galaxy, so it is possible that quasar represents the infancy of a galaxy. It means that the energy emitted from the quasar which is visible to us, is emitted from the core of a new born and active galaxy. Some other scientists have presented a third hypothesis regarding the origin of quasar, according to which quasar is the point in distant space where new matter is entering our universe. From this point of view, the quasar is considered to be exactly opposite to the black hole. But there is no scientific basis behind this hypothesis.

WHAT IS PULSAR?

Neutron stars are extremely dense forms of dead stars, which are made up of only neutrons. A subclass of neutron stars is called pulsar. They are called pulsars because they emit a pulse of electromagnetic radiation. The pulsar emits high-energy waves in space that are dense near its magnetic axis. This magnetic force is 10 trillion times

- What are those celestial bodies found in the universe, which are the brightest and the most distant from us (millions or billions light-year distance)? –Quasar
- In the early 1960s, quasars were found to be the most powerful sources of radio waves, so what were they called at that time? - Radio star
- QUASARs is an abbreviation of which of 4 English words? –Quasi Stellar Radio Objects
- Many astrophysicists have also called quasars as QSOs. What is the full form of QSO? –Quasi Stellar objects

Note :

Recent studies by the developed variety of radio telescopes and optical telescopes have shown that quasars are not real stars, but they look like stars. They also emit radio waves, X-rays and light waves.

-
- The quasar was discovered in the Virgo constellations in 1960 by a scientist named T. Mathew and A.Sandage. What was the name given to the astronomer by these astronomers? –3C273
- Which astronomer identified the pattern of emission lines of 3C273 in 1963 and reported that emission lines coming from this luminous quasar appear to be coming from hydrogen atoms with a redshift of 0.158? –Marten Schmidt
- The quasar farthest from Earth is named ULASJ1120 + 0641. How far is it located from us? –About 29 billion light years
- By what name is the nearest identified quasar known, which is 730 million light years away from us? –IC 2497
- The quasar is believed to be a compact region found in the central part of a massive galaxy, and this central region is actually around the supermassive black hole that is situated at the very centre of the galaxy. How much is the mass in a supermassive black hole? –Similar to a billion solar masses (about 100 million stars as heavy)
- Radio-Loud Quasars are accompanied by powerful jets which are a powerful source of radio wave radiation. How many such types of quasars are found? –Only 10%
- The universe consists of about 90% of the quiet radio quasars, from which radio emissions are relatively weak. Do such quasars have radio emitting jets? –No
- Quasars also emit jets in their central regions, which can be much larger than the host galaxy. What are these called? –Quasar jet
- The collision of quasar jets with the space medium produces hotspots on a large-scale. What are these hotspots called? –Double Radio Source Active Galactic Nucleus (DRAGN)

Note :

A DRAGN can extend a distance of 1.5 million light years or more from one end to the other.

- What do we call a neutron star that emits a pulse of electromagnetic radiation? –Pulsar
- Who discovered the first Pulsar in 1967? –Jocelyn Bell and Antony Hewish
- The largest star in the universe is Spinal oregi, which is the brightest star in the sky? –Sirius (Dog star)
- Who first predicted the existence of a black hole in 1916 with his general theory of relativity? –Albert Einstein

more powerful than the Earth's magnetic force. These waves are usually of material derived from a companion star, in which the speed of particles is accelerated to 20% of the speed of light. Pulsars do a fairly fast rotation. The fastest pulsar performs 642 rotations in 1 second and the slowest one in 4.308 seconds. This speed is under the law of conservation of angular momentum. According to this rule, if a body is rotating at a speed, and the size of that body decreases, but the mass remains unchanged then its rotational speed increases. After the rotation stops, the pulsar becomes a simple neutron star.

STEPHEN HAWKING'S DISCOVERY RELATED TO THE BLACK HOLE

According to the discovery of Stephen Hawking, one day the black hole disappears completely due to Hawking radiation. When you reach inside a black hole, it is infinitely curved at the centre. Both time and space lose their meaning on going there and no law of physics works. No one knows what will happen after arriving there. Will another universe come or will you forget everything and reach the new World? It is still a mystery. When you fall into a black hole, you will discover the secret of nature and will fall into the black hole without any shock. Or it will be like freefall which Einstein called 'Happiest Thought'.

WHY IS IT CALLED A BLACK HOLE?

It is called a black hole because it absorbs all the light falling on it and does not reflect anything. According to Stephen Hawking's theory, black holes are not completely black, but actually emit particles. Hawking published a paper titled 'Black hole ain't not so black' in the year 1974. In this paper, he demonstrated on the basis of general relativity theory and quantum physics theories that black holes are not completely black, but rather emit small amounts of radiation.

- The term black hole was first coined in 1967 by which American astronomer? –Ohn Wheeler
- For decades, black holes have only been known as theoretical objects, in which year was the first physical black hole discovered? –In the year 1971
- According to Stephen Hawking, on falling into a black hole, you will discover the secrets of nature and fall into it without any shock, which will be like a freefall. What did Einstein call it? –Happiest Thought

UNIVERSE EXPLORATION AND TELESCOPE

- Telescope consists of the Greek words tele (far) and scope (to look or see). Who invented far seeing binoculars i.e. telescope, in 1608? –Hans Lippershey, Holland
- Who made the correct use of the telescope discovered by Hans Lippershey for the first sighting of astronomical events in 1609 by making some changes in it? –Galileo Galilei, Italy
- What type of telescope was Galileo's telescope, in which lenses were used? –A refractive telescope
- With the help of this telescope, Galileo found out about the crater on the moon, the four satellites and solar spots of the planet Jupiter and in 1610 which book did he write based on his great discoveries? –The Starry Messenger
- The Hubble Space Telescope is an astronomical telescope located in space as an artificial satellite. It was placed in orbit on 25 April 1990 with the help of which American spacecraft? –Discovery
- The Hubble Telescope, created by the US Space Agency (NASA) in collaboration with the European Space Agency, is named after which American astronomer? –EdwinPowellHubble
- With the help of Hubble, astronomers have discovered a group of stars, considered to be 1000 light years away, moving towards an energy-less state. What is the age of the universe based on the speed at which these stars are extinguished? –Between 13 to 14 billion years
- Researchers have used the Hubble Space Telescope to detect a dwarf galaxy in the neighbourhood of the universe that is smaller and foggier. What is this dwarf galaxy named? –Bedin-1

Note :

Bedin-1 is the most isolated small dwarf galaxy ever discovered. Dwarf galaxies are defined by their small size, foggy, dust loss, etc. These contain old stars. Such 36 galaxies are already known at present in the local group of galaxies, 22 of which are satellite galaxies of our Milky Way.

- With the help of the Hubble Telescope, NASA has discovered the planetary-looking gaseous nebula 'NGC 6326', which looks like a colourful bright object. For this reason, which other name is also given to it? –Holiday Ornament in space
- Which NASA telescope was placed in solar orbit on 25 August 2003, which completed 15 years in space in September 2018? –Spitzer space telescope
- In addition to providing information about the oldest galaxies in the universe, Spitzer has also revealed a new ring around Saturn. In addition, it assisted the discovery of other planets beyond the solar system, including 7 Earth-sized planets. What are these planets revolving around? –TRRAPIST-1
- Spitzer first discovered buckyballs in concrete form in space in 2010. It is three-dimensional spherical structures made up of how many carbon atoms in space? –From 60 carbon atoms

BLACK HOLE THREE TYPES

1. Stellar Black Hole - When a star burns with the last parts of its fuel, it can collapse or fall on its own. For smaller stars up to about 3 times the mass of the Sun, the new core would be a neutron star or a white dwarf. But when a big star collapses, it compresses and creates a stellar black hole. They are small, but relatively dense and deadly.

2. Supermassive Black Hole: Supermassive black holes are millions or billions of times larger than the Sun. Such black holes are thought to be located at the centre of every galaxy. Scientists are not sure how these big black holes are formed. Once formed, they collect masses of dust and gas around them.

3. Intermediate Black Holes: Scientists once thought that black holes only come in small and large sizes but recent research has revealed the possibility of existence of a mid-size or intermediate black hole. Such bodies can form when stars collide in a cluster in a chain reaction. Many of these, formed in the same region, may eventually collapse together into the centre of a galaxy and form a supermassive black hole. When a giant star reaches its end, it starts collapsing within itself and gradually it becomes a huge black hole and starts to encapsulate everything.

WHAT IS EVENT HORIZON?

A state of continuously shrinking stars comes when particles of light stop coming from it due to its intense gravity. We can see the state just before that, can feel it from outside, it is called event horizon. You can understand this as the 'last sight'. The events beyond that cannot affect us and we cannot see them. In fact, event horizon is a limit in space-time beyond which events do not affect the outside universe, nor can any spectator sitting outside this limit know what is happening

- When was Spitzer, the space observatory that played a key role in space exploration for over 16 years, closed by NASA?
  –31 January 2020
- When was the Compton Gamma Ray Observatory, designed by NASA to identify sources of celestial gamma rays launched from the Atlantis spacecraft? –5 April 1991
- After whom was the Compton Gamma Ray Observatory named?
  –Arthur Holley Compton
- The Chandra X-ray Observatory is a space-based observatory that was launched by NASA on July 23, 1999 to study black holes, supernovas and other sources of high energy. By what name was it previously known? –Advanced X-Ray Astrophysics facility
- Chandra X-ray Observatory was named after which Indian-American astronomer? -Subrahmanyan Chandrasekhar
- Which telescope has been constructed for the purpose of exploring the first stars formed after the Big Bang, and to study the surroundings of the planets around the stars, which will be installed in the year 2021? –James Webb Space Telescope
- The James Webb Space Telescope, also known as the 'Webb' or NGST, will be the world's most advanced space observatory and the largest telescope ever sent into space. It is named after which NASA scientist? –James Webb
- The JWST will be installed 1.5 million kilometres from Earth. What is this condition called? - Lagrange point2

Note :

The telescope at the Lagrange points will be operated at temperatures below -390 degrees Fahrenheit. If there are any faults in the telescope in this situation, there is no way to reach this place and stabilize or repair it.

- Which telescope with NASA's 300-megapixel wide field instrument has been developed, which is capable of taking pictures 100 times larger and clearer than the Hubble Telescope?
  –Wide field infrared survey telescope (WFIRST)
- WFIRST was first to be launched by mid-2020, but when will it be launched now? –In the year 2025
- Which telescope is being built since the year 2015 in collaboration with countries like UK, France, Spain, Mexico, which is a very powerful spectrograph which will be installed at the end of 2020 and it will study the waves of spectrum, which will make it easy for the astronomers to solve many mysteries of the universe?
  –Dark energy spectroscopic instrument (DESI)
- With the help of old data from Chile's Atacama Large Millimetre / Submilli Meter array, astronomers have discovered which galaxy which is 12.4 billion light years away from Earth?
  –SPT-SJ041839-4751-9 or SPT0418-47
- Which telescope saw and released the first picture of a black hole in the centre of the galaxy Messier 87 (M87) in 2019?
  –Event Horizon Telescope

Note :

In this picture of M87, it is said that this black hole is 3 million times larger than the Earth and more than 650 million times heavier than the Sun in weight. It has been considered as the largest black hole in the universe.

- Preparations are being made to send extremely light Nano crafts to 'Alpha Centauri', the star closest to the solar system. What is this project named? – Starshot
- With the help of which observatory, gravitational waves were first discovered in September 2015, which was announced in early 2016?
  –Laser Interferometer Gravitational Web Observatory

beyond this horizon. The Gravity exceeds this limit so much that nothing, not even light, can pass out. Astronomers are trying to get a picture of this event horizon by the Event Horizon Project.

EVENT HORIZON TELESCOPE

The Event Horizon Telescope is a large telescope series group consisting of global networks of radio telescopes. The EHT project combines data from very long baseline interferometry or VLBIs around the Earth that is sufficient to observe the shape of the event horizon of a supermassive black hole with angular resolution. The observation goals of this project include two black holes with largest angular diameter that are visible from the earth namely superglant elliptical galaxy Messier87 and the Milky Way situated at the centre of Sagittarius-A . It is an international collaboration project which was started in 2009. It has used 8 major radio telescopes of the world to collect black holes. With this technique, called Very Long Baseline Interferometry, or VLBI, the size of this virtual telescope became the size of the Earth. A black hole becomes a point or even smaller object, but its event horizon can be a few kilometres in size. It is a very short length in terms of astronomy. Finding or measuring it is as if we are trying to find a coin that has been accidentally fallen on the surface of the moon by a telescope sitting on the earth. This huge data received from each telescope is collected and analysed with the help of a supercomputer. The overall picture of the black hole has been prepared from this data.

HUBBLE'S LAW

Edwin Hubble made an important discovery in 1929, in which he found that the farther away the galaxy is from us, the faster it is moving away from us. This rule is called the Law of Hubble. But this law was first discovered by George Lemaitre, so it is also called

- LEGO detectors located in Livingstone, Louisiana and Hanford, Washington (USA) are considered the world's most sophisticated detectors. When was it started? –On 23 August 2002
- A group of astrophysicists is also conducting research in India on the exploration of the Laser Interferometer Gravitational Web Observatory (LEGO), which aims to obtain information about gravitational waves. For this, which organization was formed in India in 2009? –Indian Initiative in Gravitational Wave Observation (INDIGO)
- Apart from India, UK, Germany and Australia also have participation in LEGO. Like Indigo in India, VIRGO in Italy and KAGRA in Japan are working. By what other name is Indigo also being known? –LEGO India - Project in Asia-Pacific
- The Central Government gave its approval on 17 February 2016 for the establishment of LEGO in India. Where is LEGO manufactured in India? –Hingoli, Maharashtra
- Who was awarded the 2017 Nobel Prize in Physics for the creation of the Lego Observatory and its discovery of gravitational waves? – Kip Thorne
- Which astronomer in his famous paper 'The internal structure of stars' speculated that the source of energy of stars is nuclear fusion, and proposed the theory of stellar evolution? –Arthur Eddington
- Meghanath Saha was the first astrophysicist to relate the star's spectrum to its temperature. In 1920, he gave the derivation of which equation is used to study the atmosphere of stars? –Saha's ionisation equation
- Who invented a device to measure the load and pressure of solar rays? –Meghnath Saha, India
- Saha's ionization equation or theory shows that the energy of electrons in a star's atmosphere and ionization of atoms in reality depend on temperature and pressure in addition to the structure of stars. This equation laid the foundation for a new branch of astronomy.What is the name of that branch? - Stellar Spectroscopy
- Which American physicist first discovered the radio waves coming from the centre of the Milky Way galaxy and laid the foundation of radio astronomy? –Karl Jansky
- The unit of power of the radio source is named in honour of Karl Jansky. Also, on which satellite is a crater named 'Jansky'? –Moon
- Stephen Hawking (8 January 1942 – 15 March 2018) was one of the well-known astrophysicists of the twentieth century, studying the general theory of relativity and quantum mechanics to explain the universe. What was his theory called? –Grand unified theory
- Stephen Hawking along with Roger Penrose demonstrated which theorem that stated that 'The origin of time must have been at a point with infinite density and infinite curvature of space time? –Gravitational singularity theorem

Note :

The universe originated from a condition in which all its matter and energy were in one place at extremely hot temperatures and densities. This condition is called gravitational singularity.

- One of Hawking's most famous works is the black hole entropy formula according to which the entropy of a black hole is proportional to the area of its event horizon. By what other name is this formula also known? –Bekenstein Hawking formula
- Hawking was suffering from a motor neuron disease called Amyotrophic lateral sclerosis (ALS), he died on 15 March 2018 at the age of 76. Which formula is engraved on his grave? –Black hole entropy formula

Hubble-Lemaitre rule. This rule was the first to prove that the universe is ever expanding, and this rule is the largest and strongest evidence in support of the Big Bang theory. It was Hubble who said that the universe is not just a galaxy but there is a lot of it outside. The discovery of nebulae outside our galaxy by Hubble paved a new path for future astronomers. He also created a system of classifying galaxies known as Hubble's tuning fork diagram.

HAWKING RADIATION

Stephen Hawking demonstrated that the radiation emitted from a black hole slowly exits due to quantum effects. This effect is known as hawking radiation. Black holes begin to lose their mass gradually due to the Hawking radiation effect, and energy also dissipates (E = MC2). This process eventually results in black hole evaporation after a long period of time.

WHAT IS STARSHOT?

The ambitious project to send ultra-nano craft to Alpha Century, the closest star of the Solar System, has been named 'Star Shot'. It is estimated that a spacecraft will take around 30000 years to reach Alpha Century, but this time will be reduced to 20 years through Ultra Nano Craft, the size of the nanocrafts being talked about in this technology of a normal mobile. This nanocraft will be able to fly at least 20% faster than the speed of light. Many other countries including America and India are also involved in this project. On April 12, 2016, the Russian Internet industrialist Yuri Milner with scientists such as Stephen Hawking started this project of about $ 100 million. Facebook founder Mark Zuckerberg is also associated with the project.

CHAPTER

3

SOLAR SYSTEM

- The solar system and the circle of planets, satellites and other celestial bodies revolving in its circular elliptical orbit are called solar system. Who discovered the solar system? –Copernicus
- Who is considered to be the father of the solar system, whose collapse and formation of the core began about 5 to 5.6 billion years ago and the planets formed about 4.6 to 4.56 billion years ago?–To the nebula
- In our solar system, there are millions of small objects like sun (star), planets, satellites, asteroids, comets and large amounts of dust and gas. What is the number of planets circling the Sun? –Only 8
- The size of the Sun is much larger than that of its family members. It has a diameter of 13, 93,000 kilometres and is 109 times larger than the Earth. Its weight is 2.19×10^{27} tonnes. From this point of view, how heavy is it from the earth? –3 million times
- The planets of the Sun revolve around it. Some small celestial bodies revolve around these planets too. What are they called? –Satellite
- The surface temperature of the Sun is estimated at 6000 degrees Kelvin (5,778 k). What is the temperature of its core? –Around 15.7 million degrees kelvin
- The Sun is 14.96 crore kilometres away from the Earth. How long does it take for sunlight to reach the earth? –8 minutes 18 seconds
- Black spots appear on the surface of the Sun periodically due to the emergence of volcanoes. The number of these black spots is continuously decreasing. How hot are these black spots? –Less than 1500 ° C
- The Sun rotates on its axis, but it does not revolve around other planets and stars. At what rate does the gravitational force present in the sun affect the planets? –At the rate of 12 miles per second
- The planets do not have their own light. Whose light are they illuminated? –Starlight
- The Sun is the major source of energy for all the planets in the Solar System. During atoms of hydrogen in the Sun's core perform the process of fusion to give rise to which element which serves as the major source of energy? –Helium
- The planets of the solar system are divided into two parts - internal and external. Which planets come under the internal part? –Mercury, Venus, Earth and Mars
- The planets of the inner part are small in size and high in density, while the planets of the outer part are large and the density is low. What are the outer planets? –Jupiter, Saturn, Uranus, and Neptune
- Jupiter, Saturn, Uranus and Neptune planets are huge planets made of gas. By what another name are they known? –Jovian planet
- Currents of charged particles come out of the Sun's surface. What are they called? –Solar wind

IMPORTANT FACTS RELATED TO SUN

- *Minimum distance from Earth (perihelion): 147 million kms (3 January)*
- *Maximum distance from Earth (aphelion): 152.1 million kms (4 July)*
- *Average distance from Earth: 149.8 million kms*
- *Diameter: 13 92000 km*
- *Volume: 1.3 million times the volume of the Earth*
- *Mass: 3,32,000th times the Earth*
- *Gravity on surface: 28th times that of Earth*
- *Density in the Centre: 100 grams/ cm3*
- *Temperature of Photosphere: 6000 °C*
- *Temperature at centre: 1500 million degrees Celsius*
- *Energy Dissipation: 1026 Joules/ Second*
- *Pressure at centre: 109 Atm*
- *Rotation time period: 25.38 days (relative to equator), 33 days (relative to pole)*
- *Texture: 71% hydrogen, 26.5% Helium & 2.5% other elements*
- *Age: 5 years approx.*
- *The estimated life of normal stars: 10 billion years approx.*
- *Time taken by light to reach Earth: 8 minutes 18 seconds*
- *1 light year (distance travelled by light in 1 year): 9.461 trillion kilometres*
- *One parsec (largest unit of distance): 3.6 light years*

INNER AND OUTER PLANETS: -

Mercury, Venus, Earth and Mars in the Solar System are called internal or inner planets because

- The nearest star after the Sun is located 4.5 light years away. What is its name? –Proxima Centauri
- Due to the magnetic field of the Sun many events occur on the surface of the Sun, what is formed due to it? –Corona

Note :

Note: This magnetic field is caused by the internal movements of the Sun, and leaves its influence on the outside.

- Which scientist has proved that the path of all four stars around the north of the Sun is elliptical? – Johannes Kepler
- Which scientist proved that every planet has a long path? – Johannes Kepler
- The inner planets of the solar system are primarily made of stone and metal, including the asteroid circle 4 outer gas giant planets made of giant gas, the Kuiper circle and the scatter circle. By what other name are these planets also called? –Terrestrial planets
- The flow of plasma from the Sun, i.e. the solar wind, creates a bubble in the interstellar medium, what is it called? –Heliosphere
- In which direction does the sun rotate on its axis? –East to west
- Why do stars appear more in the west than in the east? –The earth rotates from west to east
- When a planet comes close to the Sun, its weight increases and when that planet moves away from the Sun, it decreases. Why this happens? –Because the regional velocity of each planet is constant
- The place where the planet is closest to the Sun is called Perihelion. What is the place where the planet is farthest from the Sun? –Aphelion
- Which planet in our solar system has the highest gravitational force amongst all the planets? –Jupiter
- What is the distance between the Earth and the Sun known as? –An astronomical distance
- Mercury is the closest planet to the Sun. Which is the most distant planet? –Neptune

Note :

If Mercury is away from the Sun, then its distance is 4,35,00,000 miles and if it is near, then its distance is 2,85,00,000 miles.

- The part of Mercury which is in front of the Sun remains warm, and the part which is opposite, is relatively cool. What is the temperature of the illuminated portion? –Around 400 degree centigrade
- In one part of Mercury there is always light and in one part there is always darkness. When it is near the Sun, does it move faster or slower? –Stays slower
- The lowest orbital speed is from the planet Mercury. It completes one round around the sun in 88 days. Which planet's orbital speed is the highest (59,800) days? – Neptune
- Mercury is the smallest planet in the solar system. Which is the fastest moving planet in the solar system? –Mercury
- According to the distance from the Sun, the correct sequence of planets is Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus and Neptune. What is the correct sequence of planets according to distance from Earth? –Venus, Mars, Mercury and Jupiter
- According to size, the correct order of the planets in the solar system (from the smallest to the largest) is - Mercury Mars, Venus, Earth, Neptune Uranus, Saturn and Jupiter. Which is clearly the largest planet in the Solar System? –Jupiter

it lies between the Sun and the asteroid strip. The other four planets Jupiter, Saturn, Uranus and Neptune are called outer planets. The first four planets are also called terrestrial planets. This means that the planets are made of rocks and metals like the Earth and are relatively high in density. The other four planets are called giant planet or Jovian planet made of gas. Jovian means like Jupiter. Most of these are larger than earthly planets and have a dense atmosphere composed of hydrogen and helium. All the planets were formed about 4.6 billion years ago at the same time.

WHY ARE THE INNER PLANET TERRESTRIAL AND OTHER PLANETS GASEOUS?

The inner planets are terrestrial while the other planets are mostly gaseous. Terrestrial planets were formed very close to the parent star where gas could not condense due to extreme temperatures. Jovian planets were formed at a relatively greater distance. The second reason is that the solar wind was more powerful near the Sun. Therefore, large quantities of gas and dust were blown away from the terrestrial planets. Jovian planets could not remove gases from them due to solar wind not being so powerful there. Apart from this, due to the smaller size of terrestrial planets, their gravitational power was also reduced, as a result of which the gas released from them could not stay on them.

KEPLER'S LAWS OF PLANETARY MOTION

German astronomer scientist Johannes Kepler in astronomy has given three laws of planetary motion. He presented the first two rules in 1609 and the third rule in 1618. These three rules are as follows: -

- *According to Kepler's first law, the orbit of every planet is an ellipse around the sun with sun at one of the two foci of ellipse*
- *According to Kepler's Second Law, the line that joins a planet to the sun sweeps out equal areas in*

- What are the two planets in the solar system that do not have a satellite? –Mercury and Venus
- What is the name of the planet called "The twin sister of the Earth" due to its almost equal size? –Venus
- Venus is the brightest star of the solar system. By which other name is it known as? –Morning and evening star
- Venus, the brightest planet in the solar system, is also known by what another name? –morning and evening star
- With which gas is the atmosphere of Venus? –From dense carbon dioxide
- The Venus core is solid like the Earth's core. Day temperature on the surface of Venus is up to 430 degree centigrade. What is the night temperature here? –Around 80 degree centigrade
- In how many days does Venus complete the sun's rotation? –In 225 days
- The earth is flat on the pole and bulges outward in the middle, the maximum radius of the earth is 6380 kilometres. What is its minimum radius? –6170 km
- The volume of the Earth is 6 X 10^{21} tons and the average density is 5.52 cubic centimetres. What is its total surface area?–504 lakh sq. km
- 70.8 percent of the Earth is covered with water, consequently it appears blue from space, which is why it is also known as? –Water planets and Blue planets
- What distance does the Earth travel per minute? –About 49 kilometres
- How much (in degree) is the Earth tilted on its axis? –23.5 degrees
- When is Earth and Sun at maximum distance? –On 4 July
- Scientists believe that the origin of the moon as the Earth's satellite is the result of a major collision. what is this called? –The big splat
- Which celestial body is called 'Earth son'? –Moon
- How many degrees of inclination is there in between the orbiting axes of the Earth and Moon? –5 degrees
- How far away from Earth is the Earth's only natural satellite Moon? –384400 km
- The Moon is about a quarter of the size of the Earth. What is its gravity relative to that of Earth's gravity? –Only 17%
- So far 24 astronauts have visited the moon. How many of these have moonwalked? –Only 12
- The Moon has a very small atmosphere (almost nil), what is it called? –Exosphere
- Due to the scarcity of which force, the Moon lacks atmosphere? –Gravitational force
- The maximum temperature of the day on the moon is 127 degrees Celsius. How much does it become at night? –Minus 173 ° C
- The mass of the Moon is 100 times less than the Earth. What is the average density of this? –Just 3.4 cubic centimetres
- Which is the fifth largest natural satellite of the solar system? –Moon
- The surface of the Moon, about 384265 km from Earth, is uneven and has a diameter of 3476 km. What is its mass as compared to the mass of the Earth? –Around 1/8th
- Like the Earth, its rotation path is also long circular. How long does the moon complete one revolution of the earth (period of revolution)? –27 hours 7 minutes three seconds

equal intervals of time (i.e. the line connecting the Sun and the planets determines the same area in the same time interval, i.e., the areal speed of each planet is always fixed.)

- *According to Kepler's third law,the square of time period of a planet is directly proportional to the cube of the semi-major axis of its orbit i.e. the square of the orbital period of a planet is proportional to the cube of the semi-prime distance of its orbit. It refers to the relationship between the distance of the planets from the Sun and their orbital period. The effect of this is that the rotation period of the planet farther from the sun is also longer and the planet around the sun has a shorter rotation period.*

HOW IS THE ATMOSPHERE OF THE MOON?

The atmosphere of the moon is very calm but there are huge fluctuations in temperature here. Dust of the moon hovers at sunrise and sunset. One reason for this may be the electrically charged molecules. It only happens in the direction of the Sun. The dust here is sticky due to which the equipment of the scientists deteriorates. If an astronaut goes there, the dust will quickly stick to his clothes and then it is difficult to remove. On the other hand, the dust field of the back of the moon is called Silent sea(Shantisagar) which is in darkness, that is why only one part of the moon is always visible.

WHAT IS THE REASON OF STAR TWINKLING?

The stars appear to be flickering due to atmospheric refraction. Due to the stars being very far away from the earth, they appear to be similar to the point source of light. The rays of light coming from the stars face uneven refraction many

Note :

The moon completes a rotation on its axis in 27 hours 7 minutes 83 seconds

- How long does it take for the moon's light to come to Earth, reflected from the sun? –Just 1.3 seconds
- There is a thin layer of gas around the moon. It is so thin that atoms of gas collide with each other very rarely. What is this rare layer of gas called? –Lunar Exosphere
- Which is one of the main components of the lunar outer atmosphere, which is an isotope of the noble gas argon? –Argon 40
- The largest mountain of the Moon is situated at the South Pole which is 35000 feet (10668 m) high. What is its name? – Leibnitz mountain
- Only one part of the moon is always visible, because it is dark due to dust. What is this dust field of the moon's back called? –Shanti Sagar (Regolith)
- The gravitational power of the Moon is less than the Earth, so how much does the weight of human their decrease compared to the Earth? –About 16.5%
- The Moon is becoming 3.78 centimetres away from the Earth every year. How many days will the moon take to orbit the earth at a certain distance instead of 27.3 days? –47 days
- If the moon goes farther in the same way, then by moving away from the Earth's gravitational power and orbit, space can be lost somewhere. In this case, how many hours will the day remain on the earth? –Only for 6 hours
- From the earth, we see the sky blue and white, but what does the sky look like most of the time on the moon? –Black
- Only 57% of the Moon can be seen from the Earth. What does the Earth look like from the Moon? –About 45 times brighter and blue than the full moon
- Dark and light patterns are seen in more than 100 parts of the moon's surface. What is this pattern called? –Lunar swirls
- What is the science that studies the surface of the Moon and its inner surface? –Selenology
- The axis of the Moon makes an angle of 58. 48 degrees with the Earth's axis. The Moon is almost parallel to the Earth's axis. Moon is also known as which planet? –Fossil planet
- The rocks brought by Apollo astronauts from the moon showed that the moon is as old as the Earth (about 460 million years). Whose quantity is found in excess in its rocks? –Of titanium
- Which spacecraft was the first manned expedition to the moon? –Apollo 11
- The Apollo 11 vehicle launched on 16 July 1969 was visited by Commander Neil Armstrong, control vehicle driver Michael Colling and lunar module pilotEdwin Aldrin. Who first stepped on the moon on 20 July 1969? –Neil Armstrong
- Where is 'sea of tranquillity'? –On the moon
- Mars is the fourth planet from the Sun in the solar system. Its aura from the earth is seen as Reddish, due to this what another name is given to this planet? –Red Planet
- The highest mountain in the Solar System is located on Mars. what is its name? –Nix Olympia (Olympus mons)
- On which planet is the largest canyon Valles Marineris located? –On mars

times in the atmosphere in order to reach the Earth. Due to the uneven refraction of the rays of light coming from the stars, its path changes continuously, due to which the virtual position of the stars also changes. Since the virtual position of the stars keeps on distracting and the amount of light entering the eyes keeps shimmering, due to which a star sometimes appears bright or sometimes blurred and the stars seem to flicker to us.

WHY DOES THE SKY LOOK BLUE?

The molecules of air and other fine particles in the atmosphere have size smaller than the wavelength of visible light. These are more effective in scattering light of shorter wavelengths at the blue end than light of longer wavelengths at the red end. The red light has a wavelength about 1.8 times greater than blue light. Thus, when sunlight passes through the atmosphere, the fine particles in air scatter the blue colour (shorter wavelengths) more strongly than red. The scattered blue light enters our eyes.

AND HENCE THE SKY APPEARS BLUE TO US WHY DOES THE SKY LOOK BLACK IN SPACE?

There is no atmosphere of any kind in space, the rays of the sun are not divided into different colours, so the sky appears black in space. In fact, the sky will appear black at all places in space due to the absence of scattering sunlight over the Earth's atmosphere. This is confirmed by the spacecraft going out of the atmosphere. There is also a lack of atmosphere on the moon, so the colour of the sky also appears black from there.

IMPORTANT FACTS RELATED TO EARTH

It is the fifth largest planet in the Solar System in size and is the only

- Like Earth, Mars is also a terrestrial surface planet. In addition to geographic features, both Mars' rotation period and seasonal cycle are similar to Earth's. Which gas has dominance in its atmosphere? –Carbon dioxide
- Mars has two moons or satellites which are small and irregular in shape. What is the name of these satellites? –Phobos and Deimos
- Mars is composed of silicon and oxygen-rich minerals, metals and other elements, which usually make up the upper rock. What is Mars and mainly made of? –Tholeiitic basalt (which is more silica-rich than typical basalt)
- Mars is much smaller than Earth in size. Whose density is 3.95 cubic centimetres And what is its radius? – 3376 .33 km
- Mars has flat from both sides. In how many days does it revolve around the sun? –687 days
- Apart from the European Space Agency, NASA of America and Russia's Roscosmos, which is the fourth organization to send a spacecraft to Mars? – ISRO, India
- India launched its first Mars Arbiter Mission (MOM) from Sriharikota on 5 November 2013 through the polar satellite launch vehicle PSLV C-25. What is it named? –Mangalyaan
- The world's first Mars mission in 1960 was Russia's Koralb, which was destroyed. Which was the first successful mission? –Mariner-4, America, 1965
- In 1971, the Mars-3 orbiter or lander was the first spacecraft to land on the Red Planet. Which country launched it? –Russia (Soviet Union)
- On which planet was the spacecraft Mangalyaan sent? –Mars

Note :

Mars Global Surveyor, Mars Express Rosetta, (Rover Spirit and Opportunity), Curiosity Rover etc. related to Mars Campaign.

- Jupiter is the largest and heaviest planet in the solar system in size. How many times is it larger than the Earth? –13 hundred times

Note :

Jupiter's weight is more than 2 times the combined weight of all the planets in the solar system.

- Three boxes are found on the surface of Jupiter which extends from 70000 to 100000 miles in width. What is its surface temperature? – Minus 150 degrees centigrade
- There is a feeling of accumulation of snow and clouds in the boxes of the planet Jupiter. What is it mainly made of? –Hydrogen and Helium

Note :

Hydrogen of its core has become solid and converted into metal.

- According to the recent discovery how many satellites (moons) of Jupiter are there? –Total 79

Note :

According to NASA's website 53 out of 79 satellites have been named while the remaining 26 satellites are yet to be named officially.

- Jupiter's 4 satellites were first discovered by Galileo Galilei in 1610, which is why these four are called "Galilean satellites". What is the name of these four planets? –IO, Europa, Ganymede and Callisto
- Which is the second largest planet in the solar system after Jupiter? –Saturn

planet that has life. It lies between Venus and Mars. It rotates west to east on its axis and is tilted 23.5 degrees on its axis. It makes a complete round on its axis in 23 hours 56 minutes and 4 seconds.

- *Shape:* Oval
- *Pole to Pole distance:* 12714 km
- *Equator diameter:* 12756
- *Polar circumference:* 40008 km
- *Circumference of equator:* 40075 km
- *Mass:* 5.97 ×1024 tons
- *Water:* 71%
- *Land:* 29%
- *Volume:* 10.83 X 1011 cubic kilometres
- *Average relative density:* 5.52 (with respect to density of water)
- *Age (estimated):* 4.6 Billion years
- *Surface area:* 511Million square Km
- *Rotational time on its axis:* 23 hours 56 minutes 4 second Revolving time: 365 days 5 hours 48 minutes 46 seconds
- *Orbit velocity:* 29.8 km/sec
- *Class length:* 960 million km
- *Minimum distance from Sun (perihelion):* 147.9 million km
- *Maximum distance from the Sun (aphelion):* 152.1km
- *Average distance from the sun:* 149.8 km
- *Time taken by light to reach sunlight:* 8 minutes 18 seconds
- *Distance from the moon:* 384000 km
- *Deepest point:* Mariana Trench (11034 m deep from average sea level)
- *Earth's closest star after Sun:* Proxima centauri
- *Satellite:* Moon

IMPORTANT MOON FACTS: -

- *Average distance from Earth:* 384365 km

- How long does it take for the moon's light to come to Earth, reflected from the sun? - Just 1.3 seconds
- Which astronomer was the first to see Saturn? –Galileo Galilei
- What colour star does Saturn look like in sky? – Yellow
- Rings are seen around the planet Saturn, which always revolve around this planet, what are these rings made of? –Small particles of ice and rocks
- All the rings of Saturn are on one plane only. It is divided into 14 main parts of which 12 are rings and two spaces. A, B and C rings can be seen from Earth. What are the spaces between A and B rings? –Cassini Division
- The atmosphere is found on Saturn, except for the complete internal core, the rest is gaseous. Which gas is mainly in them? –Hydrogen (about 96%) and helium (4%)

Note :
Gas like ammonia, acetylene, ethane, phosphine and methane are also found in Saturn's atmosphere

- What is the number of Saturn's satellites according to NASA? –Total 82

Note :
53 out of 82 moons have been confirmed and named and the other 29 moons are yet to be officially named.

- Which is the largest satellite of Saturn whose size is equal to that of Mercury? – Titan
- Which satellite of Saturn orbits in the opposite direction of its orbit? –Phoebe
- The conditions of Saturn are very similar to Jupiter. What is its surface temperature? –Minus 100 degrees centigrade
- The radius of Saturn is 60524.5 kilometres and the density is 0.69 cubic centimetres. How heavy is it from Earth? – 815 times
- Winds on Saturn move 5 times faster than winds on Earth. What is the speed of winds on Saturn? –1800 km/ hour
- How many times the atmosphere pressure on Saturn is higher than that of Earth? –100 times
- How long does Saturn take to make an orbit around the Sun? –29.4 Earth years
- The gravitational force of the surface of Saturn is 10.4 square meters per second and what is the migration velocity of this planet? –129. 924 km / h
- The diameter of the planet Saturn is 120660 kilometres. What is the tilt of its axis? –Just 26.7 degrees
- So far Saturn has been visited by a total of 4 spacecraft. This is - Pioneer-11, Voyager-1, Voyager-2, and Cassini-1. Which vehicle entered Saturn's orbit on July 2004? –Cassini
- In 1781, who discovered the planet Uranus with the help of telescopes, after which the number of real planets in the solar system increased to 7? –By William Herschel
- Uranus' atmosphere is made up of hydrogen and helium. What is the surface temperature of Uranus? –Minus 210 degrees centigrade
- Saturn, Jupiter, Uranus and Neptune are a ringed planet in the solar system. Uranus rings are made up of which coloured material in the solar system? –Darkest material
- Uranus has a radius of 23572.7 kilometres and an average density of 1.7 cubic meters. What makes Uranus blue in colour? –Due to fluid methane

- *Maximum distance from Earth (apogee): 406000 km*
- *Minimum distance from earth(perigee): 364000km*
- *Time revolving around the earth: 27days 7hours 43 minutes 11.47 seconds*
- *Highest mountain: Leibnitz Mountain*
- *Diameter: 3476 km*
- *Atmosphere: No atmosphere of its own*
- *The hidden part of the lunar surface: 0.41(41%)*
- *Mass compared to earth: 1:81.30*

PLANETARY POSITIONS IN DECREASING ORDER

According to size	*According to Mass*
Jupiter	*Jupiter*
Saturn	*Saturn*
Uranus	*Uranus*
Neptune	*Mars*
Earth	*Earth*
Venus	*Venus*
Mars	*Neptune*
Mercury	*Mercury*
Revolution duration	*Revolution Speed*
Neptune	*Mercury*
Uranus	*Venus*
Saturn	*Earth*
Jupiter	*Mars*
Mars	*Jupiter*
Earth	*Saturn*
Venus	*Uranus*

MERCURY NEPTUNE PLANETS ACCORDING TO DENSITY (IN DECREASING ORDER)

1. Saturn	*2. Uranus*
3. Jupiter	*4. Neptune*
5. Mars	*6. Venus*
7. Mercury	*8. Earth*

NUMBER OF NATURAL SATELLITES OF DIFFERENT PLANETS

1. Saturn - 82	*2. Jupiter - 79*
3. Uranus - 27	*4. Neptune - 14*
5. Mars - 2	*6.Earth - 1*
7. Mercury - 0	*8. Venus – 0*

- Uranus is 4 times larger than the Earth. How much heavier is it than the Earth? –14.5 times
- In the summer, the sun shines on Uranus continuously for 20 hours. In which season is it continuously dark for 20 hours? –Winter season
- The satellites of Uranus are named after literary characters, such as Umbriel, Titania, Oberon, Cordelia, Ophelia, Juliet, Margaret, Ferdinand, etc. What is the total number of satellites of Uranus? –Total 27
- How long does Uranus take a revolution around the Sun? –84 years
- Except for which two planets, the rotation direction of all the other planets like Earth is from west to east? –Uranus and Venus
- Which planet was discovered by the Berlin Observatory's Astronomist Johann Galle in September 1846 and the number of planets was then 8? –Neptune

Note :
Neptune was discovered by Joseph Lee Worrier and John Couch Adams by another date.

- The total number of satellites of Neptune is 14. Which of its satellites is considered the coldest place in the solar system? –Titan (temperature minus 236 degrees centigrade)
- Neptune's size is somewhat larger than Earth's size. Its radius is 24846.9 km and average density is 1.6 cubic centimetres. What is its surface temperature? –Minus 210 degrees centigrade
- Neptune is the fourth largest planet in the Solar System by diameter. Which planet is in terms of mass (weight)? – Third largest planet (Jupiter first and second Saturn)
- The daytime values of the planet Neptune and the tilt of its axis are roughly equivalent to the Earth's daylength and inclination. What colour light does it emit? –Green colour
- Which planet takes the maximum time in an orbit around the sun? –Neptune
- The average distance between Neptune and the Sun is 4. 50 billion kilometres (about 30.1au). How many years does Neptune take to do a complete orbit of the Sun? –164.79 years (i.e. one Neptune year equals 164.79 Earth years.)
- In which year did Neptune planet complete a revolution of the Sun after it was discovered in 1846? –In the year 2011
- Neptune was the "god of the sea" in ancient Roman religion, which god has been in the same place in ancient India, due to which the planet has been given that name in Hindi? –Varun
- Neptune's mass is 17 times that of Earth. What colour is the planet Neptune? –Blue like the sea
- Neptune is a massive planet made up of gases or 29% helium made up of layers of 80% hydrogen and traces of methane gas. Is its surface solid? –No
- If the mass of all the satellites of Uranus is added, it will be less than half the mass of Titan. Titan is the seventh largest satellite in the solar system. Which gas is it mainly made of? –Nitrogen
- Neptune has a unique magnetic field. How many times is it more than the Earth? –27 times
- In 1989, when the Voyager-2 vehicle passed near Neptune, a large pit was spotted on it. It was compared to which planet's large red spots? –Jupiter

ERIS / XENA-2003 UB313

Xena-2003 UB313 is the largest known dwarf planet in our solar system. It was discovered on 8 January 2005 by a team based at Palomar Observatory under the leadership of Mike Brown. It was formally named Eris by the International Astronomical Union in September 2006. Eris orbits the Sun. Its diameter is estimated at about 2400 kilometres. It also has a natural satellite called Dysnomia, which is only 250 km in diameter.

CHARON

The Charon was previously accepted as the only satellite of Pluto, but according to the 2006 Prague Conference decision of the International Astronomical Union, it has been classified as a dwarf planet. Its diameter is 1192 kilometre. It was discovered in June 1978 by astronomers James Christy and Robert Harrington. Its size is about half the size of Pluto. The distance between them is 19640 km.

THE SMALLEST DWARF PLANET CERES

Ceres is the smallest dwarf planet. It was earlier known as '1-Ceres' asteroid. Its orbit was believed to be 44.6 million km from the Sun. Its diameter is 950 kilometres which is 1/5 of the diameter of Mercury. Ceres is considered the "Roman god of agriculture". It was discovered by Italian astronomer Giuseppe Piazzi on 1 January 1801. Ceres is in the main asteroid belt located between Mars and Jupiter. It is the largest body in this band. Other large asteroids such as Pallas, Juno and Hygeia are irregularly shaped. Ceres has a rocky nucleus and a 100 km thick ice layer. This is 23-28% of the mass of the Serius area and 50% of its volume. It is more than fresh water on the earth. There is a thin layer of dust outside it.

Makemake: It is a dwarf planet, which was discovered on March 31, 2005 by a team led by Michael E. Brown. Its formal name is

- On 24 August 2006, the Science Association set a new standard for the definition of planets in Prague, the capital of the Czech Republic, which status was given to Pluto by removing them in the category of planets? –Dwarf planet
- Which planet or body was discovered by Clyde Tombaugh, a 24-year-old astronomer from the United States, on 18 February 1930 with the icy surface and the largest distance from the Sun in the Solar System? –Pluto
- Pluto is smaller than our moon. In how many years does it complete one orbit of the sun in a long elliptical orbit at an average distance of 596 million kilometre's? –In about 248 years
- Pluto's orbit is quite strange. All the planets other than Pluto revolve around the Sun in a plane, but how many degrees does the orbit of Pluto make with this plane of planets? –17-degree angle
- When Pluto comes close to the Sun, it reaches within the orbit of Neptune to become the eighth planet in the Solar System and Neptune becomes the ninth planet. Recently Pluto was the eighth planet in the solar system in which period? –From 1979 to 1999
- In 1987, NASA Research Station, USA discovered which planet in the Solar System which is 5 times heavier than Earth and completed the orbiter of the Sun in 700 years? –Carla
- What are the celestial bodies revolving around the Sun in a strip between Mars and Earth? –Asteroid
- Which is the only asteroid we can see with the naked eye? –Vesta
- What are the objects made of celestial dust, gases and glaciers that revolve around the sun in irregular orbit? –Comet or tail stars
- In a normal state, a comet is tailless, but as it approaches the sun, its outer layer melts into a gas due to the heat of the sun and looks like a shiny tail. What is the velocity of some comets when approaching the Sun? –20 lakh kilometres per second
- Comet orbits are very long and most of the time they remain away from the boundary of the solar system. What do comets revolve around? –Sun
- Which comet hit the planet Jupiter in July 1994? –Shoemaker levy 9
- Temple-1, Forbes, Hale bopp, Encke and Kohoutek are some of the other major comets. Which is a recurring comet whose duration is 76 years? –Haley
- Some small celestial bodies made up of dust and gas come towards the Earth due to the gravity of the Earth, then due to the atmospheric friction of the Earth, they start to glow and get burnt. By what name are they known? –Meteor
- What are some meteors that do not completely destroy and fall on the earth as rocks? - Shooting stars
- Relatively large Shooting stars are called meteorites. In which state of the United States was a large crater lake formed by a meteorite that still exists today? –Arizona
- The point at the maximum distance from the Sun is called aphelion. On July 4, the Earth is at its maximum distance from the Sun in its orbit, so what happens on the 4th of July? –Aphelion
- In which layer does the phenomenon in electromagnetic light related to polar light occur? –Ionosphere
- The polar light appears in the high latitudes of both hemispheres. In the Northern Hemisphere it is called Aurora borealis. What is called the polar flame occurring in the Southern Hemisphere? –Aurora australis means southern polar light

'136472 Makemake', maintained by the International Astronomical Union. It is the third largest dwarf planet in the solar system and its average diameter is estimated around 1360 - 1480 kilometres. It has no known satellite. It is about 7.8 billion kilometres away from the Sun. Its orbit is at a degree of 28 degrees from the flat cycle of the solar system and it takes about 301 years to complete one orbit of the Sun. It is extremely cold and has an average temperature of around -232 degrees centigrade due to its thick layer of frozen ice of methane, ethane and perhaps nitrogen gases on its surface. Makemake was a deity from the Polynesia region who was credited with creating mankind. This dwarf planet is named after him.

WHAT IS ANTIMATTER?

Antimatter is virtually the same as matter, but everything inside its atom is the opposite, the atom usually has a nucleus with positive charge and a revolving electron with negative charge. But the antimatter atom has a negatively charged nucleus and a positive charge electron. According to a theory propounded in 1928 by the British Physicist Paul Dirac, when energy is converted into matter it produces a particle and an anti-particle with opposite electric charge. When particles and anti-particles collide, they destroy each other amidst a spark of energy. If all things were equal at the time of the birth of the universe, matter and anti-matter should have been present in equal amounts, but the universe we are seeing today would never exist because then the particles opposite to each other would have destroyed each other, it would not exist on Earth due to its early destruction, but it is available in large quantities in outer space. Antimatter is very useful as renewable fuel. It is also used in many radiation techniques. It can be used as a fuel in aircraft going to other planets in space.

CHAPTER

4

EARTH AND ITS SATELLITE MOON

Earth's geological history

- Although the age of the Earth is said to be 4.6 billion years, but after examining the radioactive elements in the oldest stone on Earth, how much is its age estimated? –3.9 billion years
- Which scientist made the first attempt to explain the geological history of the Earth? –Comte de Buffon, France
- The Pre-Palaeozoic era is divided into two parts Archean and Pre-Cambrian. In the Archean period, there is a complete lack of fossils in the rocks. Therefore, this age is also known by what another name? –Azoic Era
- In the Archaean period, rocks had a predominance of granite and gneiss, in which gold and iron are found. In which period were the Canadian and Fennoscandian shields built? – In Archaean Period
- At what time did the creatures without spine, mainly those with soft skin, emerge in the warm seas? – Granite and Gneiss
- The Palaeozoic era is divided into six parts - the Cambrian period, the Ordovician period, the Silurian period, the Devonian period, the Carboniferous era, and the Permian era. By what another name is this era known? –Primary era
- The earliest sedimentary rocks were formed in the Cambrian period. Which ranges were formed in India during this period? –Vindhyachal mountain range
- At what time did the first vegetation and spineless creatures on earth and grasses in the sea originated? –In Cambrian era
- Sea flora expanded during the Ordovician period. What kind of sea creatures have arisen in this period? –Creatures that crawl
- The vertebrates first emerged and evolved in the Silurian period. Therefore, this era is known as which another name? –Age of vertebrates
- In which country did leafless plants first appear on the land during the Silurian period? –In Australia
- The mountains of Scandinavia and Scotland were built during the Silurian period. There is also a period of widespread Caledonian mountain movements. In which period did fish originate in the sea? –In Silurian period itself
- Earth's climate in the Devonian period was very favourable for marine animals, especially fishes. Shark fish also emerged during this period. From this point of view, this era is also known as which era? –Fish age
- In what period did the amphibians expand and reptiles emerged on land? –In the Carboniferous period
- 100 feet tall trees were also produced in Carboniferous period, which is why it is also called? –Period of Glossopteris flora
- At what time did the first vegetation and spineless creatures on earth and grasses in the sea originate? –In Cambrian era
- At what time did the rocks of the Gondwana sequence formed due to the suppression of trees in large eruptions, in which extensive deposits of coal are found? –Carboniferous era

HYPOTHESES RELATED TO THE ORIGIN OF THE EARTH

Aerial hypothesis (Gaseous hypothesis): –*E. Kant*
Nebular Hypothesis –*Laplace*
Planetary hypothesis –*Chamberlin & Moulton*
Tidal hypothesis –*James Jean (Modified by Jeffreys)*
Duality hypothesis –*Russell*
Supernova hypothesis –*Hoyle & Littleton*
Interstellar dust hypothesis –*Otto Schmidt*
Interstellar cloud hypothesis –*Alfven*
Jupiter duality hypothesis –*Drobishweski*
Nebular Cloud hypothesis –*Van Waijsecker*
Cepheid Hypothesis –*AC Banerjee*
Cruises and tidal hypothesis –*AC Banerjee*
Planet Origin hypothesis –*Kuiper*
Electromagnetic hypothesis –*Alfvén*
Big bang hypothesis –*George Lemaitre*
Comet hypothesis –*Buffon*
Inflation theory –*Alan Guth*

SOME IMPORTANT FACTS RELATED TO EARTH

- *Total surface area - 51,00,66,100 sq km*
- *Time of Moon's light reaching Earth - 1 minute 3 seconds*
- *Day and night are equal on Earth - 21 March, 23*

GEOLOGICAL TIME SCALE

Eons	Era	Period	Epoch	Age/Years	Life/Major Events
		Quaternary	Holocene Pleistocene	0-10.00 10.000 - 2 million	Modern Man Homo Sapiens
	Cainozoic (From 65 million years to the present times)	Teriary	Pliocene Miocene Oligocene Ecocene Palaeocene	2 - 5 million 5 - 24 million 24 - 37 Ma 37 - 58 Million 57 - 65 Million	Early Human Ancestor Ape: Flowering Plants and Trees Anthropoid Ape Rabbits and Hare Small Mammals : Rats - Mice
	Mesozoic 65 - 245 Million Mammals	Cretacenus Jurassic Triassic		65 - 144 Million 144 - 208 Million 208 - 245 Million	Extinction of Dinosaurs Age of Dinosaurs Frogs and turtles
	Plaeozoic 345 - 570 Million	Permian Carboniferous Devonian Silurian Ordovician Cambrian		245 - 286 Million 286 - 360 Million 260 - 408 Million 408 - 438 Million 438 - 505 Million 505 - 570 Million	Reptile dominate-replace amphibians First Reptiles : Vertebrates : Coal beds Amphibians First trace of life on land: Plants First Fish No terrestrial Life : Marine Invertebrate
Proterozoic Archean Hadean	Pre-Cambrian 570 Million 4,800 Million			570 - 2.500 Million 2,500 - 3,800 Million 3,800 - 4,800 Million	Soft-Bodied arthropods Blue green Algae : Unicellular bacteria Oceans and Continents form - Ocean and Atmosphere are rich in Carbon dioxide
Origin of Stars Supernova Big Bang	5,000 - 13,700 Million			5,000 Million 12,000 Million 13,700 Million	Orgin of the sun Origin of the universe

- In which period, due to the formation of the faults, the mountains like the Black Forest and the Spanish Meseta, Altai, Aplesian mountains were created? –In the Permian period
- Due to the evaporation of internal lakes generated due to corruption, whose deposits on earth were formed? –Potash
- The Mesozoic Era is also known as the 'Secondary Age'. In which three period is it divided? –Triassic, Jurassic and Cretaceous.
- During the Triassic period, large creeping creatures developed at the site. The first side emerged in this period. What was its name? –Archaeopteris
- Archaeopteris is considered to be the link between which two classes of organisms? –Reptiles and Birds
- In what period 'crocodile-like mouth and fish-like body' dinosaur reptiles' expanded and lobster animals continued to grow, along with all three types of creatures such as aquatics, amphibians, aerials? –In the Jurassic period
- In which period did angiosperms plants develop and big turtles emerged? –Cretaceous period

Note :

Temperate autumn forest trees like Magnolia and Poplar developed in the time of Cretaceous. In addition, deposition of alabaster was observed in North Western Alaska, Canada, Mexico, the Dover region of Britain and Australia etc.

- Which period is called the 'Tertiary Age' and is divided into the Paleocene, Eocene, Oligocene, Myosin and Pliocene periods? –Cenozoic Era

Note :

- In the Cenozoic period, all the new folded mountains of the world, the Alps, Himalayas Rocky, Andes etc. originated.

- At what time did Alpine mountainization begin and the first mammals and apes emerged? –Paleocene period
- During the Eocene period, the creatures crawling on the site often went extinct and the ancestors of elephant, horse, rhinoceros and boar emerged. Ancient monkeys and gibbons originated from which country? –Myanmar
- In which period was the main period of the origin of the great Himalayas? –Oligocene period
- In which period, large size shark fish, proconsul (tailless monkey), geese and ducks such as water birds and penguins etc. arose and elephants evolved? – Miocene period
- The Middle or Small Himalayas originated in the Miocene period. Which mountain range originated in the Pliocene period? – Shivalik Mountain Range
- At what time the number of large mammals, horses, sharks were destroyed, the development of human ancestors and the emergence of modern mammals took place? –Paleocene period
- The Neozoic Era is also called the quartile era. This period is divided into two parts? –Pleistocene and Holocene
- At what time did the emergence of birds flying on Earth and the development of humans and other mammals in the present form? –Pleistocene period
- Four Ice Age were seen in Europe during the Pleistocene period. At what time did this ice age begin due to the rise in temperature, which continues even today? –Holocene era
- In which period did agriculture and animal husbandry start in humans? –Holocene period

- *September*
- *Biggest day (long) - 21 June*
- *Shortest day - 22 December*
- *Tilt of the Earth's axis on the orbital plane - 23. 5 degrees*
- *Time taken by Moon to orbit the Earth - 27 days 7 hours*

Highest altitude on earth- 8,848m

The deepest point on earth-11,022 m

MEGHALAYAN AGE: A NEW ERA IN THE HISTORY OF THE EARTH

Geologists have discovered a new era in Earth's history, which began 4200 years ago, and continues to this day. It is named Meghalayan era. The International Geological Sciences Association granted it official recognition in July 2018. After this discovery the Holocene era was divided into three classes. The beginning of the Holocene era is named Greenlandian (11,700 to 8,326 years ago). This was the era when the Earth came out of the ice age. The Middle Holocene era is named Northgrippian (8,326 to 4200 years ago). Meghalaya is the latest era of the Holocene era. According to the discovery made by geologists, the Meghalayan era started with a severe drought that lasted for 200 years. Drought led to the end of agro-based civilizations in Egypt, Greece, Syria, Palestinian, Mesopotamia, the Indus Valley and the Yangtse River Valley. An international team of researchers collected and studied stalagmite lime on the floor by dripping from the roof of a Mawmaluh cave in Meghalaya. This study helped define the smallest climatic event in Earth's history. That is why this era was named Meghalayan era.

IMPACT OF EARTH'S ROTATION SPEED

- *The making of day and night.*
- *The tides come twice a day.*

- From the perspective of geological history, the era we are living in is the Holocene era. What is the Middle Holocene era named?
–Northgrippian Age (8,326 - 4200 years ago)
- Recently geologists have discovered which new era in the history of Earth, which is considered to be the latest era of Holocene era?
–Meghalayan Age

Earth and its motions

- The average distance of the Earth from the Sun is about 150 million kilometers. According to the average distance, which planet is it?
– Third (Mercury first and Venus second)
- Earth is not a gaseous planet like Jupiter, but a rocky planet. Which is the largest planet in terms of mass and size among all the 4 inner or solar physical planets? –Earth
- Which of the four solar physics planets Mercury, Venus, Earth and Mars has the highest density, gravity, magnetic field and rotation?
–Earth
- The Earth revolves around the Sun on the elliptical path, due to which the distance varies from 14.7 crore kilometers to 15.3 crore kilometers. When Earth revolves around the elliptical path at maximum distance from the Sun, what is this condition called? –Aphelion
- What is it called when the Earth is at a minimum distance of the Sun? –Perihelion
- On 21 March and 23 September, the Earth's position of Perihelion occurs, causing the sun's rays to fall on both the northern and southern hemispheres equally. What changes does it make in day and night?
–Both day and night are equal
- What is that time of the year when the sun is vertical on the equator in the afternoon, both the hemispheres receive the same light and energy, the day and night on Earth become equal? –Equinox
- What is the same length of day and night all over the world on 23rd September called? –Winter Equinox
- The earth revolves on its axis along the elliptical path around the Sun. What is the elliptical path of orbit called? –Geo orbit
- It takes 365 days for the Earth to revolve around the Sun in its Earth orbit. What is this motion of the Earth called?
–Revolution or annual pace
- The Earth completes the orbit of the Sun i.e. one round 365 days in 5 hours 48 minutes and 45.51 seconds. It is tilted at an angle of 66.5 degrees on its rotation path. Which geographical event is caused by this tilt? –Season change
- Half of the equator continues to receive light at each position, so how much is the difference between day and night at the equator?
–Day and night always remain equal
- The majority of which European country lies within the North Pole circle, where the sun is visible even in the midnight, due to which it is also called the 'Land of the Midnight Sun' ? –Norway
- The maximum length of day is 12 hours at the equator. What is the maximum day length at the pole?
– 6 months
- On which date every year is the summer solstice or Cancer solstice and in the Northern Hemisphere the day is larger than the night, which is also the biggest day of the year? –On 21 June
- At the time of Cancer solstice, the sun shines diagonally in the southern hemisphere at this time, due to which the days here are big and the days are short. What season is there at this time?– Winter season

- *Differences in longitude and time, deviations in winds and currents.*
- *Impact of Earth's Revolution Speed*
- *Season change.*
- *Difference in duration of day and night.*
- *Determination of the duration of the year.*
- *The rays of the sun shine straight and diagonally.*
- *Determination of Cancer and Capricorn.*

DAY AND NIGHT OF SIX MONTHS AT THE POLES

- *Variation in heat distribution on the ground.*
- *Determination of tropics.*
- *The occurrence of solar eclipse and lunar eclipse make it easier to determine latitudes.*

WHAT IS THE EQUINOX?

On both March 21 and September 23, the sun shines vertically on the equator or equator. At this time, half of all the latitude lines remain in light, so that day and night are equal. Due to the similarity between day and night and season in both the hemispheres, these two conditions are called equinox or even night and day. The condition of March 21 is called Spring Equinox and September 23 is called Autumn Equinox. Equinox is derived from the Latin words Aquus (same) and Naqsh (night). Its metaphorical equinox has the same literal meaning, although there are many other factors affecting the length of day and night in an area. The Earth revolves around the Sun tilting 23.5 ° on its axis. Thus, once in a year, the Earth is in this state, when it is inclined towards the Sun and once it is inclined towards the other side of the Sun. Similarly, a situation occurs twice a year when the earth is

- On which date does the winter solstice or Makar Sankranti occur, which makes the night much larger than the day in the Northern Hemisphere? –On 22 December
- In the event of Makar Sankranti, the south pole faces the Sun and the Sun shines vertically on the Capricorn line, which season is here? –Summer season
- The earth always rotates from west to east like a braid on a hypothetical axis. What is this motion of the Earth called ? –Rotation or rotation speed
- The Earth rotates regularly on its axis, which is called rotation or rotation of the Earth. It completes one rotation in 24 hours (23 hours 56 minutes 4 seconds). What geographical phenomenon does this occur? –Day and night
- When the Earth takes a full circle at its distance, then what happens to this speed in a day? –Daily pace
- The axis or axis on which the Earth rotates is an imaginary line that joins the North and South Pole through the centre of the Earth. How many degrees does this axis of the Earth make with its orbital plane? –66 × 2 degrees
- At what angle does earth rotate on its axis? –23 ½ degrees
- The period between two successive passes of a certain constellation above a meridian is called (sidereal day) Nakshatra Divas. How long is a sideral day? –23 hours 56 minutes and 4 seconds
- The time between the successive twists of the meridian sun over a certain meridian is called solar day. How much more is there in Solar Day than Sideral day? –6 minutes and 56 seconds
- The earth is flat on the pole and bulges outward in the middle. The maximum radius of the Earth is 6380 kilometers and the minimum radius is 6170 kilometers. What is its total surface area? –504 lakh sq km
- 70.8% of the Earth is water, due to which the Earth appears blue from space, consequently what planet is Earth known as? –Blue planet and water planet
- Which Greek scientist first officially spoke of the Earth being rounded in 6th century BC? –Pythagoras
- According to modern scientific discoveries, what shape is the Earth instead of round? –Pear Shaped
- By how many degrees does the diameter of the Earth along the equator occupy less space at the poles? –Only 10 degrees
- According to a well-known hypothesis, the Earth originated as a result of the formation of a star. What is this star called? – Nebula

Lines of latitude and longitude etc.

- There are two fixed and stable points at the surface of the earth to determine the position. The baseline is considered the reference point. What are these two fixed points? –North and South Pole
- What is the imaginary circle or line that is drawn on the surface of the earth exactly in the middle of both poles? –Equator, Equatorial circle or Equatorial line
- The equitorial line divides the Earth into two equal parts, the Northern and Southern Hemispheres. By what another name is it known? –Zero-degree latitude line
- What is the largest line drawn on the map of the Earth? – Equator
- What are the circles or lines drawn parallel to the equatorial circle? –Latitude line

neither inclined towards the sun nor the other side of the sun, but in the middle. This condition is called equinox.

WHY IS THERE EXTREME COLD AT THE POLES?

The rays of the sun fall very obliquely on the pole. The oblique rays are much less hot than the perpendicular or straight rays, because they spread over a large area and they have to cross a large part of the atmosphere, which causes them to lose heat. This is why there is severe cold at the poles.

WHAT IS STANDARD TIME?

The meridian of each longitude line is when the longitude line is exactly in front of the Sun. Because of this there is a difference of 4 minutes in the time of each longitude in the same country. If the time of the cities located on that longitude line is counted according to each direction line, then there will be great inconvenience in the work of trains, buses, All India Radio etc. Therefore, the local time of any intermediate longitude line in a country or region is taken to be the time of the entire country or region. Such time is called 'Standard time'. In India, when it is mid-day at 88 2 degrees east longitude, thenit is considered to be mid-day in whole country. In very wide spread countries in east-west direction like USA and Russia etc. there are more than one standard time

INTERNATIONAL DATE LINE

The international date line is an imaginary line drawn from north to south at 180 degrees longitude in the middle of the Pacific Ocean. The beginning of each new day is considered along this line. A day is reduced by crossing this line

Note :
Latitude lines are also called parallel lines. As we look at the globe from the equator to the north pole or south pole, the latitude circles become smaller and at the poles they become equal to zero.

- What is the measurement of the angular distance of a given point north or south of the equator? –Latitude
- The north pole is called 90 degrees latitude and the south pole is called 90 degrees south latitude. What is the value of the equator called? –Zero degree
- All the latitudinal circles between the northern and southern poles are written according to the relative distance of which line? –Equator
- The line drawn at 23°2 degrees parallel to the equator in the Northern Hemisphere is called the Tropic of Cancer. In the Southern Hemisphere, what is the line drawn at a point 23°2 degree parallel to the equator called? –Tropic of Capricorn
- The Arctic Circle is located at 66°2 degree North Latitude, which circle is located at 66°2 degree South Latitude? –Antarctic Circle
- On which circle are the days and nights equal? –Only on the equator
- What is called the area from the Tropic of Cancer to the Tropic of Capricorn on both sides of the equator, where the rays of the sun fall almost straight through the year, causing a lot of heat in this region? –Tropical zone
- What is the area between the Cancer circle and the Arctic circle and the area between the Capricorn circle and the Antarctic circle known as? –Temperate zone

Note :
From the Cancer circle to the North Pole there is a North temperate zone and from the Capricorn circle to the South Pole there is a South temperate zone.

- What is the area between the Arctic and Antarctic circles and poles called? –Frigid Zones

Note :
North Frigid from North Pole Circle to North Pole and South Frigid from South Pole Circle to South Pole.

- Some imaginary lines are drawn joining the North and South Pole which form semicircles. What are they called? –Longitude lines
- The longitude lines cut the equator circle vertically and are in the north-south direction. By what other name do you know the longitude line? –Meridian

Note :
All places located on it have a mid-day or afternoon at the same time.

- Because the Earth rotates from west to east on its imaginary axis, the time east of Greenwich will be ahead of the time here and the time in the west will be behind here. At what degree will eastern and western longitude be the same line? –180 degrees
- The distance between 1-degree latitude is about 111 kilometers. How much does this distance go on becoming from the equator to the poles? –Go on becoming a bit more
- The distance between two longitude lines on the equator is 111.32 kilometers, which reduces to how much at the poles? Zero
- 0 ° longitude is called the 'Greenwich Line'. Where did this line pass through to get its name? –Greenwich near London

from west to east and on crossing from east to west, the day ahead is counted. For example, a traveller who crosses this line from west to east at 5:00 pm on Monday, is considered as 5:00 pm on Sunday and on the other hand, who crosses from east to west on Sunday, the next day is considered Monday. This line has been kept away from the land so that people living in the same country are not inconvenienced i.e. if the international date line had passed through a country, the people on both sides of it would have had to consider two different dates on the same day and thus they would be inconvenienced. That is why the international date line is a zigzag line rather than a straight line.

EARTH'S INNER LAYERS

Layer	*Depth (in km.)*
Earth's crust	*0-35*
Upper crust	*35-60*
Mantle	*35-2890*
Outer core	*2890-5100*
Internal core	*5100-6378*

ACCORDING TO EDUARD SUESS, THE INTERNAL STRUCTURE OF THE EARTH

According to the German Scientist Suess, the relative density of the entire Earth is 5.5. According to him, the inner most rocky layer of the earth is solid and made of high-density metal. On this basis of Suess the rocky layers are divided into three parts. These layers are like a cover on each other, but it is possible that this layer is uneven, the classification of the layers is as follows.

1. *SIAL: This is the topmost layer made of silica and aluminium. Its relative density varies from 2.75 to 2. 90. Its rocks are acidic and have an abundance*