

1. Indian Space Research Organization (ISRO)

ISRO stands for Indian Space Research Organization; it is a space agency that comes under the Department of Space (DOS). ISRO is known for conducting economical programs and is responsible for managing space affairs in India. One of the main achievements is conducting a successful landing on Mars on the first attempt also being the least expensive Mars Mission in the world. ISRO is also responsible to carry out communication satellites and is supposed to work with DRDO to watch out for the security of India. Here is a long essay mentioning the history and importance of ISRO to India.

ISRO is also called Bhartiya Antariksh Anusandhan Sangathan in Hindi. It is directly seen by the Prime Minister of India. The current chairman, Dr. Kailasavadi Sivan also known as K Sivan is also an executive member of the Department of Space (DOS). ISRO holds the record for being one of the agencies with Full Launch capabilities, the ability to launch extraterrestrial missions and can operate a big cortege of artificial satellites.

ISRO boasts 5 launch vehicles namely Satellite Launch Vehicle (SLV), Augmented Satellite Launch Vehicle (ASLV), Polar Satellite Launch Vehicle (PSLV), Geosynchronous Launch Vehicle (GSLV) and Geosynchronous Launch Vehicle Mark III (GSLV-MK III). Among those, 3 are operational launch vehicles which are mentioned below-

1. **PSLV** - Stands for Polar Satellite Launch Vehicle, it is a third generation launch vehicle and was first launched in the year 1994. Till 2017, it has launched 257 satellites in which 48 are Indian satellites and 209 are foreign. It is well known for its successful launch of Mars Orbiter Spacecraft in 2013 and Chandrayan-1 in 2008.
2. **GSLV** - Also known as Geosynchronous Launch Vehicle Mark II (MKII) was launched first on 18th April 2001. Since then it has been in 13 missions and holds the record for having success in 4 missions consecutively.
3. **GSLV-MK III** - Was chosen to launch the Chandrayan II and has the twice the capacity of GSLV MK II and was launched in the year 2014 for the first time.

Earlier scientists like S.K. Mitra, C.V. Raman, and Meghnad Saha used to carry space programs. Later Vikram Sarabhai founded Physical Research Laboratory at Ahmedabad. Homi Bhabha established the Tata Institute of Fundamental Research in 1945.

In 1962, the urge of the Indian National Committee for Space Research (INCOSPAR) was established by PM Jawaharlal Nehru. Later in 1963 sounding rocket was launched from Thumba Equatorial Rocket Launching Station (TERLS). On 15th August 1969 Indian Space Research Organization (ISRO) was established. One of the biggest landmarks was seen when ISRO sent its first satellite 'Aryabhata' with a Soviet Rocket in the year 1975. Later, in the year 1982, Indian National Satellite (INSAT-1A) was launched. ISRO collaborated with the Soviet Union to conduct the first manned mission in 1984 in which Rakesh Sharma was a part of it. In 1994, ISRO conducted the launch of Polar Satellite Launch Vehicle (PSLV), the third generation of launch vehicles. Moving to 2001, ISRO managed to successfully launch GSLV D1. ISRO stepped on the moon in the year 2008 and in 2014 ISRO managed to land on Mars.

India is proud to have ISRO as it has given us many reasons to feel pride. ISRO has always delivered whenever India wanted to do something, ISRO never failed to surprise us. Be it the cheapest landing on Mars or finding water on Moon, ISRO has done many works. Here are some of the Achievements that ISRO must be proud of.

1. **Mars Orbital Mission (MOM)** - The Mars Orbital Mission or Mangalyan is one of the biggest successes for ISRO. ISRO achieved the target of reaching Mars in the most economical way and became the first space agency to reach Mars in the first attempt. The budget was 450 crores which is less than many Hollywood movies making India the 4th country to reach on Mars. There is a movie made to highlight the landing of Mangalyan naming Mission Mangal.
2. **104 satellites in 1 Mission** - ISRO in 2017 created history as it launched 104 satellites in 1 go. ISRO used its Polar Satellite Launch Vehicle to perform this target. Among 104 satellites, 101 were foreign and 3 were Indian.
3. **Water on Moon** - India's Chandrayan I mission was launched on 14th November, 2008. It landed on the south pole of the moon and founded hydroxyl absorption lines on the surface. It was later confirmed by NASA, when M3 sent data on 25th September, 2009.

2. Defence Research and Development Organisation (DRDO)

DRDO works under the administrative control of Ministry of Defence, Government of India. It is working to establish world class science and technology base for India and provides our Defence Services decisive edge by equipping them with internationally competitive systems and solutions.

DRDO was established in 1958 after combining Technical Development Establishment (TDEs) of the Indian Army and the Directorate of Technical Development & Production (DTDP) with the Defence Science Organisation (DSO).

Starting with 10 laboratories, DRDO has now grown to a network of 52 laboratories which are deeply engaged in developing defence technologies covering various disciplines, like aeronautics, armaments, electronics, combat vehicles, engineering systems, instrumentation, missiles, advanced computing and simulation, special materials, naval systems, life sciences, training, information systems and agriculture.

Presently, the Organisation is backed by over 5000 scientists and about 25,000 other scientific, technical and supporting personnel.

Several major projects for the development of missiles, armaments, light combat aircrafts, radars, electronic warfare systems etc. are on hand and significant achievements have already been made in several such technologies.

Mission

- Design, develop and lead to production state-of-the-art sensors, weapon systems, platforms and allied equipment for our Defence Services.
- Provide technological solutions to the Services to optimise combat effectiveness and to promote well-being of the troops.
- Develop infrastructure and committed quality manpower and build strong indigenous technology base.

Integrated Guided Missile Development Programme (IGMDP)

- IGMDP was brain child of renowned scientist Dr. APJ Abdul Kalam.
- It was intended to attain self-sufficiency in the field of missile technology.
- After keeping in mind the requirements of various types of missiles by the defense forces, the program recognized the need to develop five missile systems.
- The IGMDP formally got the approval of Indian government on July 26, 1983.
- It brought together the country's scientific community, academic institutions, R&D laboratories, industries and the three defence services in giving shape to the strategic, indigenous missile systems.

The missiles developed under IGMDP are:

1. Short-range surface-to-surface ballistic missile – **Prithvi**
2. Intermediate-range surface-to-surface ballistic missile – **Agni**
3. Short-range low-level surface-to-air missile – **Trishul**
4. Medium-range surface-to-air missile – **Akash**
5. Third generation anti-tank missile – **Nag**

The Agni, which was initially conceived as a technology demonstrator project in the form of a re-entry vehicle, was later upgraded to a ballistic missile with different ranges. Dr. Kalam played a major role in the development and operationalisation of Agni and Prithvi missiles.

After achieving the goal of making India self-reliant in missile technology, DRDO on January 8, 2008, formally announced successful completion of IGMDP.

3. Milky Way

The Milky Way is a unique galaxy in a sense that it houses a solar system that contains life. Our Earth and the solar system are a very tiny part of the Milky Way. You can see the beauty of our galaxy in the night time by watching twinkling stars during a clear sky.

The Milky Way is a galaxy among the billions of other galaxies in our Universe. It is a cluster of stars and other cosmic objects. It houses at least 250 billion stars excluding the other galactic objects. Most of the stars in the Milky Way also have their own solar system in which many planets and asteroids orbit around a star.

We, humans, are living inside the Milky Way galaxy which makes it harder to find its structure. Astronomers have used various tricks and methods to find out how our galaxy looks like. With the use of powerful telescopes, astronomers have found regions of younger stars and older stars. They have used this data along with computer simulation to find the structure of the Milky Way. The result of all the work indicated that our Milky Way is barred-spiral in shape.

Furthermore, the Milky Way has 2 major arms and 2 minor arms that start from a bar shape at its center. Most of the stars are found in the major arms, while the minor arms mostly have dust which is a suitable place for the formation of new stars.

Our galaxy has an overwhelming number of objects that are distributed across its center and arms. The exact number of objects is very difficult to find, but scientists have given a rough number of several objects which are:

- 250 billion stars
- 100 billion planets
- 10 billion white dwarfs
- 1 billion neutron stars
- 100 million black holes

Other than these objects, the Milky Way is full of dust and gas clouds that are distributed in the empty spaces between the objects. The cloud of dust and gas is estimated to be a few hundred light-years in the thickness.

- A century back in 1920, astronomers believed that all stars in the universe are held by the Milky Way. But later it was discovered that the Milky Way is just a galaxy among billions of other galaxies in the Universe.
- The diameter of the Milky Way is around 100,000 light-years and the total estimated mass is 1.5 trillion times the mass of our Sun.
 - The mass of dark matter in the Milky Way which is also responsible for shaping the Milky Way is found to be 5 times more than the mass of visible matter.

4. Mars

- Mass: 6.39×10^{23} kg
- Diameter: 6,779 km
- Year: 687 days
- Moons: 2
- Gravity: 3.71 m/s^2
- Distance from Sun: 227.9 million km
- Speed around Sun: 24 km/sec (15 miles/sec)

Mars, also known as "red planet" due to its reddish color. It is the fourth closest planet to the Sun and a terrestrial planet means its surface is rocky like our Earth. Mars is smaller in size than the Earth, if the Earth is the basketball then Mars would be the size of a softball. Mars has two moons one is "Deimos" and other is "Phobos". Phobos is the closest moon to the Mars that orbits at 5,954 Km (3,700 miles). It is closer than any other moon that around their parent planet. Mars surface is dry so it has huge dust storms and high-speed winds, it sends dust miles into the atmosphere. Mars atmosphere is much thinner than the Earth, so it can't block enough heat coming from the Sun. The average temperature on the Mars during winter is -82°C (-125°F) and -5°C (23°F) during the summer.

Mars landforms are similar to those found on our Earth, it has mountains, volcanoes, valleys, polar ice caps and deserts. The surface of Mars is made of rocks and a thick layer of dusty iron oxide, which is responsible for its reddish color. Mars has three layers crust, Mantle and the core. Martian core doesn't move, therefore no magnetic field is present to protect the Mars from the Sun's radiations.

Today, Mars don't have flowing water, but Martian features show that liquid water was once flowing on its surface. The temperature on the Mars is too cold for the water to remain in the liquid state, so water exists on Mars in form of ice.

5. Microscope

The word "microscope" is originated from Greek language words "micro" means small, and "skopion" means to see. In other words, a microscope allows a person to see something too small that can't be observed with naked eyes. In the scientific world, the instrument of the microscope has brought a revolution that was invented by Zacharias Janssen. Moreover, the discovery of the cell (a basic block of life) by Robert Hook in 1665 with the help of a microscope was extraordinary. The Microscope is a scientific instrument that helps us to see very tiny things (e.g. bacteria) larger and clearer. Moreover, the microscope also helps in measuring dimensions (i.e. length) of microscopic things. Furthermore, microscopes are only helpful in viewing small things (viruses, cells, and crystals) that kept closer to the microscope's objective lens. They can't be used to observe something far away.

There are many types of microscopes that are in use around the world for various purposes. Some microscopes are useful for cell study while others are good for soil study. Some of the most important and famous types of microscopes are:

- Simple Microscope – Microscopes that have only one lense are categorized as simple microscopes. In general, magnifying glasses are considered as simple microscopes. These microscopes can have a maximum magnification of 300x. Nowadays, simple microscopes are not used anymore other than magnifying glasses.
- Compound microscope – Compound microscope is better than a simple microscope and consists of more than one lenses. The magnification of these microscopes reaches 1000x to 2000x and gives a much clear view. These microscopes are normally used in biology labs of schools and pathological labs.
 - Stereo microscope – Stereo microscope gives a 3D view of the sample under observation. It can also observe objects which are opaque, such as crystals, stones, metals, and jewelry. However, the magnification of these microscopes is very limited. It magnifies objects in a 3D view up to 300 times.
 - Confocal microscope – It uses laser light to focus on the sample for increased resolution and sharper image.
 - Scanning electron microscope (SEM) – SEM is the modern and one of the most advanced microscopes that magnifies a specimen million times. SEMs don't require light to focus on the sample. Instead, it uses beams of electrons to get the image of the sample. SEMs are very useful in the field of biology, chemistry, and physics.

- Transmission electron microscope (TEM) – Transmission electron microscope works on the same principals of SEM. TEM differs from SEM only in detection methods of electrons to form an image of the sample. Furthermore, TEM gives a sharper image than SEM but it can observe a much smaller area than the SEM.
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- Galileo Galilei made a better version of the microscope in 1609 along with the development of telescopes.
- Human eyes are capable of seeing objects that are 0.1 mm (100 micrometers) in size under good conditions.
- Sometimes the sample under observation is very transparent and its structure can't be seen. In this case, the sample is first stained with a color to make its structures visible

6. Cancer

Cancer is not a single disease, but it is the group of diseases that cause abnormal and uncontrolled growth of cells in the body. These abnormal cells are called cancerous cells and have the ability to spread to other healthy parts of the body. Also, the lifespan of these cells increases as compared to healthy cells. This results in the replacement of healthy cells of the body with the abnormal cells, and make a person sick.

There are around 200 different types of cancer that are related to different parts of the body. These types of cancer are named after the part of the body in which they happen and grow. For example, cancer in the breast is called breast cancer.

The most common types of cancer throughout the world are:

- Lung Cancer – This type of cancer happens in the lungs and is mostly caused by smoking. However, there are also other causes of lung cancer, such as polluted air.
- Breast Cancer – This type of cancer is very common in women as compared to men, and mostly happens in glands which are responsible for making milk.
 - Colon Cancer – This type of cancer happens in the large intestine which is the last part of the digestive
 - Leukemia – It is the type of cancer that directly affects the bone marrow and red blood cells.
 - Lymphoma – It happens in white blood cells, called lymphocytes, which fight with foreign harmful microbes. Lymphocytes are also found in lymph nodes, thymus, bone marrow, and spleen. So, this type of cancer is spread to these parts and some other parts of the body.
 - Melanoma – This type of cancer happens in the cells that carry melanin pigment. These cells give color to our skin and are also found in eyes, mouth, and hair. The common cause of melanoma is long term exposure to sunlight or radiations on the skin.

- Thyroid Cancer – Thyroid is a gland which is located in the front of the neck. This type of cancer happens in thyroid and results in disturbance of metabolism and production of certain hormones.

Here are the common factors that play a part in all types of cancer:

- Overweight of the body
- Alcohol Consumption
- Smoking and air pollution
- Lack of necessary nutrition in the body
- Lack of physical activities, such as exercise.

7. DNA

DNA stands for deoxyribonucleic acid, which is a molecule that contains the code of an entire organism. DNA defines the purpose, structure, development, and function of an organism. DNA is found in every cell of an organism and is copied from parent cells to child cells. You can consider the DNA similar to a program of a computer and the body of a cell as hardware on which program is executed. The cell constantly gets instructions from DNA to perform various function throughout its life.

DNA is a very long molecule which is very thin and has a double helix ladder shape. The structure of DNA can be divided into two parts; the backbone and the bases. Backbones are the twisted pair structures which are located at sides of the double helix shape and are responsible for holding the bases of DNA together. Bases are the actual fundamental blocks which form the DNA code.

Bases are represented by four letters; A, T, C, and G. These four letters are actually the representation of the nucleotides which are adenine, thymine, cytosine, and guanine. These nucleotides are connected between backbones in such a way that only two particular nucleotides can connect together to form a pair; Nucleotide A will only connect to T, and C will only connect G.

The molecule of DNA is so long that it can't be fit into a cell without a packaging. To pack large molecules of DNA in a cell, there are structures in cells which are called chromosomes. These chromosomes are the tightly packed and coiled molecules of DNA; one chromosome accounts for the single DNA molecule. In the cells of the human body, there are 23 pairs of chromosomes which are located in the nucleus of each cell.

- There are sets of instructions in each string of DNA which are called genes. You can consider the genes as the language which cells can understand. The genes instruct the cells about making specific proteins. These proteins are responsible for the functionality, survival, and growth of a cell. There are 3 billion bases in human DNA and 99.9% of these bases are identical in every people on the Earth. It is only 0.1% of these bases that makes every human being different from others.

- James Watson and Francis Crick in 1953 became the first to discover the double helix ladder-shaped of DNA.
 - Friedrich Meischer in 1869 become the first person to isolate the DNA from a cell.

8.Fossils

Fossils are the remains of living creatures including animals, plants, and microbes that have died and buried a very long time ago. The remains of living creatures may be their whole body, parts of body, impressions, and traces. In impression and trace fossils, the body parts of an organism are not present but only its mold, cast, or track of the body's outline are present. Remains of any living creature can be considered as a fossil but according to standard definition, "any remains of a living organism is considered as a fossil if it is more than 10,000 years old". There are various processes in which fossils are formed which include permineralization, casts and molds, carbonization, amber, and freezing. Let's discuss in detail about some important processes.

Fossils by the process of permineralization start to form when an organism is buried in the land. The organism that is buried has many empty spaces in its body which are filled with mineral-rich water of ground. When the groundwater somehow evaporates and new groundwater comes in, the minerals in the water starts to precipitate. Mineral precipitation fills the spaces completely and the organism is converted into a fossil. This process of fossilization produces very detailed fossils of organisms.

Sometimes the remains of organisms are completely destroyed or dissolved in water, leaving behind a mold in the rock. The mold formed in rock is then filled with minerals and is called a cast. The mold itself and the cast, both are fossils of the original organism.

Many smaller organisms such as insects and microbes somehow get covered with tree sap. The tree sap when dries becomes hard and is called amber. The organism in the amber is preserved for millions of years. This process of fossilization most of the time preserves the whole organism in very good condition.

Freezing also the process of fossilization in which most of the time the whole organism gets preserved. The organism is preserved until the ice doesn't melt or gets broke. Most of the fossils found frozen have been formed in the last ice age. Paleontologists have discovered many large organisms with their whole bodies frozen in the ice, such as woolly mammoths (large species elephants) from arctic glaciers.

The most common method of dating a fossil is by carbon dating. It is done by measuring the amount of carbon-13 (radioactive isotope) in the remains of an organism. The other method is to find the age of substance in which fossil is found. For example, if a fossil of the trilobite is

found in a rock which is formed about 500 million years ago, then the age of trilobite fossil will be 500 million years.

9. Hydropower

Hydropower is the energy from the flowing water. Flowing water has kinetic energy due to the motion, which is achieved as a result of falling from the heights. Humans have known about the power of flowing water from centuries. They have been using this power to drive water mills for grinding, rolling and hammering.

Hydropower is a type of renewable energy source because the water is not consumed in the process of generating power. Flowing water is provided by the nature in the rivers free of cost, and also renewed by nature itself in the process of evaporation and raining.

Scientists have found a way to generate electricity from the flowing water in the late 1800s. Which resulted in the development of power plants known as a hydroelectric power plant to generate electricity from the hydropower.

There are various methods to generate electricity from the hydropower. But, the basic principle always remains same. Which is, the flowing water is allowed to fall on the blades of a turbine to generate electricity. A turbine is a machine which converts the fluid energy (in this case, water) into mechanical energy. Turbine is connected to a generator through a shaft or a gear. When blades of the turbine rotate due to the flow of water, they also rotate the generator through the shaft. As a result, electricity is generated.

Run-of-the-river (Directly using the river):
It the easiest way to make the electricity from the water of the river. In this method river's natural flow is directly used to turn the blades of the turbine. This method provides a lot of advantages over other two methods. The main advantage is its simplicity, which reduces the cost of the whole system. There no need to make any dam, which reduces the impact on the surrounding regions. But, this method is only useful for the rivers that are continuous and flowing all the year.

Water Storage method:
In this method, the water coming from the river is stored in a dam. Then, this stored water is released from the dam at a height, which falls on the blades of a turbine and forces them to rotate to drive generators. Using this method also provides the control over the flow of water, and continuous electricity can be produced. World's largest dam "Three Gorges Dam" is located in china. Its electricity generating capacity is 22,500 MW. The disadvantage of this method is the cost of the dam, which is very high. This method is useful where we need both controls over the flow of water and generation of electricity.

Water pumping method:

This is the same method as describes above, but with the addition of the pumping system. Pumping system pumps the water back to the dam or any other reservoir. The pumping is done when the consumer side electricity consumption is less. Pumping system may get the electricity from other renewable energy sources (e.g. solar or wind) or from the power grid when there is excessive electricity. The benefit of doing this is that when power demands are high then, this extra water can be released to produce more electricity.

10. Global Warming

There many things powerful enough to disturb the life on the Earth. Earth quakes, Tsunamis, volcanic eruptions, terrorism and nuclear blasts etc. All these forces affect the land, even the continent but their effects are quite localized.

When we turn towards the changes in temperature of earth the whole story changes, it represents the greater threat than anything else humans have faced in recent time.

Global warming is the gradual rise of the earth's average temperature. Its effects on the life are very devastating, forcing many species throughout the globe into extinction, making them harder to survive.

Earth has gone through many temperature changes before and several ice ages. The temperature changes in small amount but the impacts are very large. When earth warmed up, it melted the ice. When its temperature decrease, ice builds up.

These are the few effects of global warming.

- Glaciers melting
- Rise in Ocean level – Melting glaciers rise the level of ocean and cause flooding in coastal regions.
- Animal migration – Which cause the food chain to be disturbed and may cause extinction.
- Ecosystem changes
 - Global warming is mainly caused by greenhouse effect. A greenhouse keeps its inside air hotter than the atmosphere. Earth's atmosphere acts much like the same way because its atmosphere contains greenhouse gases. The Surface of the earth is heated when sun is shining but when sunsets, greenhouses traps heat and keep the atmosphere and surface of earth hotter.
 - Greenhouse effect support the life because it keeps the heat trapped in the atmosphere. Problems occur when the amount of greenhouse gases increase in the atmosphere, which traps more heat than it is necessary and rise the average temperature of earth.

As humans are developing, their consumption of fossil fuel is increasing, which is producing a lot of carbon dioxide gas (a greenhouse gas). Amount of carbon dioxide in the globe has increased to 380 ppm from 280 ppm since industrial time. Another reason is the reduction in the number of trees by human activities. Trees consume carbon dioxide in photosynthesis process to make food.

Now amount of carbon dioxide gas is increasing and number of trees is decreasing, it is definitely increasing the average temperature of earth and putting the life on the earth in danger.

11. Radioactivity

- Radioactivity is a natural phenomenon in which atoms of elements that have unstable nuclei (nuclei = plural of nucleus), disintegrate for getting stability. There are 3 main reasons behind an unstable nucleus in an atom. These reasons are: higher number of protons
- higher number of neutrons
- higher energy of the nucleus

When an element decay, it can change from one element to another for achieving stability. Sometimes when an element decay, it doesn't change from one element to others but simply gets stability by releasing extra energy in the form of gamma rays.

There are around 118 known elements that differ from each other by the number of protons in their atoms. For example, hydrogen has 1 proton and helium has 2 protons. The nucleus also has neutrons which when change in an element, creates a new isotope of that element.

Isotopes of an element have the same chemical properties, but they differ only in weight due to a difference in the number of neutrons. For example, hydrogen has three isotopes; protium, deuterium, tritium. These isotopes differ from each other due to a difference in the number of neutrons, while the number of protons remains the same. Elements from hydrogen to bismuth in the periodic table have at least one stable isotope. But, elements after bismuth have no stable isotope; they are all radioactive.

Radioactive isotopes of elements can emit 3 types of radiations known as alpha rays, beta rays, and gamma rays.

- Alpha rays – Alpha rays are positive charged particles that are composed of two protons and two neutrons (also called nuclei of helium). Alpha rays have a positive charge due to the presence of protons; the positively charged particles.

- Beta rays – Beta rays are the streams of negatively charged particles, e.g. electrons, or positrons.
 - Gamma rays – Gamma rays are neutral and are different from alpha rays and beta rays because they are not made of matter particles. Instead, they are high energy electromagnetic radiations; a form of light that is very energetic and can't be seen with naked eyes.

12. Minerals

- A mineral is any inorganic solid that occurs naturally; means they are not formed in the labs. Minerals are different from rocks because they have uniform chemical structure. Whereas, rocks are composed of several minerals and don't have the uniform chemical structure. Here are some common characteristics of minerals:
- They are solid at room temperature.
- They occur naturally around the world.
- They are not produced by living things, like plants and animals.
- They have uniform chemical structure and can be represented by the chemical

Properties of Minerals

1. Hardness: Hardness of the minerals is defined in terms of its resistance to scratches. You have mostly seen that plastics are easier to scratch than a glass. The same case is here for the minerals. Some minerals are easier to scratch, like talc and gypsum. While, others are very hard to scratch on, like quartz and diamond. But, Diamond is the hardest known mineral on our Earth. The hardness of any mineral is measured on a scale called, moh's scale. This scale assigns the hardness to minerals from 0 to 10. Diamond having the hardness of 10.
2. Luster: This property defines the shining of the minerals when light reflects on their surface. Some minerals shine like metals and are said to have a metallic While others shine very dull.
3. Streak: It is the color of the mineral in its powdered form. Usually, minerals change their color when powdered. Some minerals turn white when powdered. Streak can be tested with a streak plate or rubbing the with any rough surface.
4. Cleavage: It defines how a mineral will be broken into the pieces. Usually, the structure of the minerals is weaker at some locations than other. These locations are called planes of weakness. When a mineral is breakage occurs along these planes, it is called its cleavage.

5. Specific gravity: It is the ratio of density of a mineral to the density of the water. If the specific gravity of a mineral is more than one, then it will sink in the water. If it is less than one then the mineral will float in water.
6. Color: It is the visible property of a mineral. Minerals come in wide variety of colors.

All the minerals are divided into two main classes, which are silicates and non-silicates.

1. Silicates: In this type of mineral, silicon and oxygen form a group of atoms known as silicate (SiO_4) and bond with other elements to make silicate minerals. This is the most common type of mineral found in the crust of the Earth. Silicate minerals are also divided into subclasses, which includes tectosilicates, phyllosilicates, inosilicates, cyclosilicates, sorosilicates, and orthosilicates.
2. Non-silicates: All the other non-silicate minerals are placed in this category. Non-silicate minerals include sulfides, oxides, halides, carbonates, sulfates, phosphates, and organic minerals.

Minerals are very necessary ingredients of the food. They allow our body to function normally and help in growth and development. You may have heard mineral deficiency in children and adult due to an imbalanced diet, which may cause many problems.

For example, deficiency of calcium in our body weakens the bone and teeth. So, a balanced diet is necessary to avoid any mineral deficiency.

13. Electricity

Electricity is the source of energy that is widely used by the peoples around the world. Today, life can't be imagined without electricity. We use it all the time for lighting our houses, powering smartphones and computer etc. You have to just push a button and you have the electricity powering your appliances. So, what is the electricity itself? First, we have to understand about the atom and its components to understand the electricity.

Atoms are smaller particles of matter, so small that millions of them can fit on the tip of a needle. These atoms are not fundamental particles, but they are made up of even smaller particles known as electrons, protons and neutrons. Protons and neutrons are held together in the center (nucleus) of an atom. Whereas, electrons orbit around the center at very high speeds. Electrons carry a negative charge and protons carry a positive charge, but neutrons are neutral (charge less). Both electrons and protons have the same amount of charge. Also, the number of electrons and protons are equal in an atom, which makes the atoms neutral (charge less).

Because electrons are not bound to a place like protons and neutrons. Instead, they revolve around the center of the atom, so that they can be released from the atom by applying some force. When electrons jump on other atoms in the whole material by some applied force, they generate electricity. So you can consider the flow of electrons as electricity, but electricity can also be stored where electrons do not flow. Therefore, electricity is divided into two types, one is current electricity and the other is static electricity.

Current electricity is the constant flow of electrons between the atoms in a closed path called "electric current". The path followed by the electron is known as the "electric circuit". The electric circuit needs to be closed for the electric current to flow; E.g. When you press the button to power the light bulb, you are actually closing the circuit (completing the path for electrons) through which electrons flow to power your light bulb.

14. Pacific Ocean

The Pacific Ocean is the largest and deepest among the five Major Oceans of the Earth. The surface area of the Pacific Ocean is so large that it can fit all seven continents. It covers around 30% surface area of the Earth while the remaining 70% is covered with all other oceans and continents. The continents that surround the Pacific Ocean are Asia, Australia, South American, and North America.

The name Pacific is derived from the Portuguese and Spanish word "Mar Pacifico", which means a "peaceful sea". This name was given by Ferdinand Magellan, who is a Portuguese explorer.

Temperature

The temperature gradient of the Pacific Ocean ranges from -1.4°C to 30°C . The surface temperature of the Pacific Ocean depends on the weather and location. The surface temperature is highest in equatorial regions and lowest near Polar Regions.

Salinity

The salinity of the Pacific Ocean is less than the Atlantic Ocean. Salt content is around 3.5% by mass which changes along the latitude. The salt content is lowest in equatorial regions nearly 3.2% by mass due to heavy rainfall.

Water Circulation

In the North Pacific Ocean, water moves in the clockwise direction, and in the South Pacific Ocean, water moves in the anti-clockwise direction.

Ring of Fire, also known as Rim of Fire, is a ring-shaped region in the Pacific Ocean (highlighted in the above image) in which most of the volcanoes are located. These volcanoes are located on islands, along the coast of countries, and submerged in the Ocean. Many

volcanoes in the Ring of Fire are active that is where the name came from. Furthermore, 90% of all Earth Quakes happen alongside the Ring of Fire due to volcanic activities.

Garbage thrown by humans is not only polluting the land, lakes, ponds, and river. But, it is also polluting the oceans. The Pacific Ocean has few patches or regions of floating plastic garbage that cover an area of two times the size of Texas. These garbage patches were first discovered in 1997, since then they have grown rapidly in size.

Garbage patches were formed in the Pacific Ocean due to the system of water currents that gathered plastic from around the Pacific Ocean. The garbage patches are very harmful to marine life, they cause the marine animal to die from suffocation when they tangle in plastics or eat them.

- The Pacific Ocean contains around 25,000 islands and most of them are located in the South Pacific Ocean.
- The Mariana Trench is the deepest place of the planet Earth which is located in the Pacific Ocean at the depth of 11,034 meters.
 - Pacific Ocean islands are divided into three categories; Micronesia, Melanesia, Polynesia.

15. Heat Transfer

Heat transfer is the transfer of thermal energy from one object to another. It occurs between two objects when they are at different temperatures – the heat will transfer from hot object to cold object. In our environment heat transfer occurs all the time. The sun is transferring some of its heat energy towards earth, and we get days hotter than nights. We cook our food on stoves – it is possible due to heat transfer.

There are 3 methods of heat transfer, which are conduction, convection, and radiation. Let's discuss each of them individually.

Conduction

When two objects with different temperatures come in contact with each other, the heat is transferred from the hot object towards the cold object. This happens due to the collision of the molecules at the contact area of two objects.

In solids, molecules of hot objects vibrate more frequently than cold objects. When hot and cold objects come in contact with each other, their molecules collide. As a result, the collisions of molecules transfer the energy from the hot object to cold object. This transfer of thermal energy continues until hot and cold objects reach the same temperature. For example, when you boil water on a gas stove, the heat is conducted to the pot from fire.

Convection

Convection is the heat transfer method that only occurs in fluids (liquid and gases). It is caused by the flow and diffusion of fluids. This flow happens in the closed path – from hot regions of fluids towards cold regions and back again.

For example, when water is boiled on the gas stove, the heat is conducted by metal pot. The temperature of metal pot increase, which increases the temperature of the water that is in contact with it. Hot water rises to the surface and is replaced by cold water. This process continues and causes circular motion. As a result, the heat is distributed towards all the regions of water.

Radiation

In this process, heat is transferred by electromagnetic waves – also known as light. This process doesn't depend on any medium or material to transfer the heat. Instead, the radiations travel through space or air to transfer the heat.

The heat is transferred to objects that absorb the radiation. As a result, their temperature increases. For example, the Sun transfer the heat energy as radiations that heats-up our Earth. Furthermore, the reflecting objects like mirrors can't completely absorb the radiations. So, their temperature doesn't increase.