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Magnetosphere

- It is the region around a planet dominated by the planet's magnetic field.
- Other planets in our solar system have magnetospheres, but Earth has the strongest one of all the rocky planets.
- The magnetosphere shields earth from solar and cosmic particle radiation, as well as erosion of the atmosphere by the solar wind – the constant flow of charged particles streaming off the sun.

Regions of the Earth's Magnetosphere

- **Bow shock** - It occurs when the magnetosphere of an Earth interacts with the nearby flowing ambient plasma such as the solar wind.
- **Magneto sheath -** It is the region of space between the magnetopause and the bow shock of a planet's magnetosphere.
- **Magnetopause -** It is the boundary between the planet's magnetic field and the solar wind.
- **Magnetotail** - The sun-facing side, or dayside, extends a distance of about six to 10 times the radius of the Earth.
- The side of the magnetosphere facing away from the sun, the night side stretches out into an immense magneto tail, which fluctuates in length and its exact length is not known, this extension of the magnetosphere.
- **Northern tail lobe -** The magnetosphere of the earth contains two lobes, referred to as the northern and southern tail lobes. Magnetic field lines in the northern tail lobe point towards the earth.
- **Southern tail lobe -** The magnetic field lines in the southern tail lobes point away from the earth. Usually, the tail lobes are almost empty, with few charged particles opposing the flow of the solar wind.
- **Plasma sphere -** The plasma sphere, or inner magnetosphere, is a region of the Earth's magnetosphere consisting of low energy (cool) plasma.
- **Solar winds -** It is a stream of charged particles released from the upper atmosphere of the Sun, called the corona.

Formation of Earth's Magnetosphere

- Sun is the major source of plasma deposition in space around the Earth.
- Thus, the Sun forces some of its plasma towards the earth in the form of the solar wind.
- Plasma is the most common state of matter in the universe as a whole.It consists of a gas of ions and free electrons.
- The speed of solar wind varies between 300 to 1500 km/s, which carries with it a solar magnetic field, called the Interplanetary Magnetic Field (IMF).
- The interaction of the IMF with the earth's magnetic field creates the magnetosphere of the earth.

Van Allen Radiation belt

- A Van Allen radiation belt is a zone of energetic charged particles, most of which originate from the solar wind, that are captured by and held around a planet by that planet's magnetic field.
- Earth has two such belts and sometimes others may be temporarily created.
- The discovery of the belts is credited to James Van Allen, and as a result, Earth's belts are known as the Van Allen belts.
- Earth's two main belts extend from an altitude of about 640 to 58,000 km (400 to 36,040 mi) above the surface in which region radiation levels vary.
- Notable feature of Van Allen Radiation Belts are

1. Most of the particles that form the belts are thought to come from solar wind and other particles by cosmic rays.
2. By trapping the solar wind, the magnetic field deflects those energetic particles and protects the atmosphere from destruction.
3. The belts are located in the inner region of Earth's magnetosphere.
4. The belts trap energetic electrons and protons.
5. Other nuclei, such as alpha particles, are less prevalent.
6. The belts endanger satellites, which must have their sensitive components protected with adequate shielding if they spend significant time near that zone.

Simulation Code for Magnetosphere

- Scientists at the Indian Institute of Geomagnetism (IIG) have developed a generalized one-dimensional fluid simulation code capable of studying a wide spectrum of coherent electric field structures in near-earth plasma environments or earth's magnetosphere.
- The developed simulation code is expected to help in planning of future

space missions.
- The study will also lead to control fusion experiments to fulfill ever-expanding energy demands of humanity.
- The plasma processes have the ability to hamper the working of a number of satellites that have been placed in orbit in the magnetospheric region.
- However, the morphology of these plasma processes changes over space and time.
- These changes can be ideally deciphered only through computer simulations.
- The study will help advance the knowledge of plasma waves, instabilities, and coherent effects associated with wave-particle interactions that are useful in planning future space missions.
- It can also lead to precisely controlled fusion laboratory experiments for ever-expanding energy needs of humanity.

Indian Institute of Geomagnetism

- Indian Institute of Geomagnetism (IIG) is an autonomous institution functioning directly under the Department of Science and Technology.
- It has its main Campus at Navi Mumbai (Maharashtra).
- It conducts basic and applied research in Geomagnetism (study of dynamics of earth's magnetic field) and allied fields like Solid Earth Geomagnetism/Geophysics, Magnetosphere, Space and Atmospheric Sciences.
- The Institute also supports a World Data Centre for Geomagnetism (WDC, Mumbai), which is the only International center for Geomagnetic data in South Asia and caters to the needs of Space and Earth Scientists and researchers from various universities and research institutions.

Minor Forest Produce (MFP)

- MFP includes all non-timber forest produce of plant origin and includes bamboo, canes, fodder, leaves, gums, waxes, dyes, resins and many forms of food including nuts, wild fruits, honey, lac, tusser etc.
- It provides both subsistence and cash income for people who live in or near forests.
- They form a major portion of their food, fruits, medicines and other consumption items and also provide cash income through sales.
- Recently, Union government has revised the Minimum Support Price (MSP) for Minor Forest Produce (MFP).
- The MSP is the rate at which the government buys produce from farmers

and tribal.
- The idea of MSP is to counter price volatility of commodities due to the factors like variation in their supply, lack of market integration and information asymmetry.
- The increased Minimum support price (MSP) ranges from 16% to 66%.
- MSP for MFPs is revised once every three years by the Pricing Cell constituted under the Ministry of Tribal Affairs.
- However, the authorities have revised the MSP much earlier than 3 years.
- This will offer much-needed support to tribal gatherers in view of the "exceptional and very difficult" circumstances prevailing in the country due to the Covid-19 pandemic.

Van Dhan Vikas Kendra

- Van Dhan Vikas Kendras have been set up under the program 'Van Dhan Yojana' which was launched in 2018, in Chhattisgarh.
- The Van Dhan Vikas Kendra caters to ten Self Help Groups of thirty tribal gatherers each.
- The selection of the tribal beneficiaries and formation of the SHGs has been undertaken by the Tribal Cooperative Marketing Development Federation of India (TRIFED).
- The Van Dhan Vikas Kendras boost the economic development of tribals involved in the collection of Minor Forest Produce (MFP) and provide a sustainable MFP-based livelihood in MFP-rich districts.
- Union government has also created an online monitoring dashboard, called the Van Dhan Dashboard, for reporting the procurement activities undertaken at the state level.
- The dashboard is a part of the "TRIFED E- Sampark Setu" that aims to facilitate exchange of information to and from every Panchayat and Van Dhan Kendra, either through email or mobile phone.
- States have appointed the Van Dhan Kendras as their primary procurement agents for MFP procurements from local bazaars.

Year of Awareness on Science & Health (YASH)

- National Council for Science & Technology Communication (NCSTC), Department of Science & Technology (DST) has launched a programme on health and risk communication 'Year of Awareness on Science & Health (YASH)' with focus on Covid-19.
- The programme is a comprehensive and effective science and health communication effort for promoting grass-root level appreciation and

response on health.

- It aims to reduce the fear of risks and build confidence with necessary understanding for adopting sustainable healthy lifestyles and nurturing scientific culture among masses and societies.
- The programme is aimed at minimizing risks at all levels with the help of public communication and outreach activities, promoting public understanding of common minimum science for community care and health safety measures like:

1. Personal sanitation and hygiene,
2. Physical distancing,
3. Maintaining desired collective behavior and so on.

Hypoxia

- Recently medical practitioners have reported a condition called silent or happy hypoxia, in which Covid-19 patients have extremely low blood oxygen levels, yet they do not show signs of breathlessness.
- It is a condition wherein there is not enough oxygen available to the blood and body tissues.
- Hypoxia can either be generalized, affecting the whole body, or local, affecting a region of the body.
- Normal arterial oxygen is approximately 75 to 100 millimeters of mercury (mm Hg) and normal pulse oximeter readings usually range from 95 to 100%, Values under 90% are considered low.
- When levels fall below 90%, patients could begin experiencing lethargy, confusion or mental disruptions because of insufficient quantities of oxygen reaching the brain.
- Levels below 80% can result in damage to vital organs.
- Silent Hypoxia is a form of oxygen deprivation that is harder to detect than regular hypoxia because patients appear to be less in distress.
- In many cases, Covid-19 patients with silent hypoxia did not exhibit symptoms such as shortness of breath or coughing until their oxygen fell to acutely low levels, at which point there was a risk of acute respiratory distress (ARDS) and organ failure.
- The reason why people are left feeling breathless is not because of the fall in oxygen levels itself but due to the rise in carbon dioxide levels that occur at the same time, when lungs are not able to expel this gas efficiently.
- A medical device called a pulse oximeter can be used in the early detection of silent hypoxia.

Pulse Oximeter

- It is a test used to measure the oxygen level (oxygen saturation) of the blood.
- The device measures the saturation of oxygen in red blood cells (RBCs) and can be attached to a person's fingers, toes, nose, feet, ears or forehead.
- The method is easy and painless and the device can be reused or disposed of after use.
- It is generally used to check the health of patients with known conditions that affect blood oxygen levels like heart and lung conditions.
- Active Covid-19 or suspected cases can check their oxygen levels early on by using the device.
- A fall in oxygen levels can serve as a signal for seeking additional treatment immediately.

Covid-19 Pneumonia

- It is a potentially deadly condition in Covid-19 patients which affects the lungs' ability to transfer oxygen and causes breathing difficulties.
- When a person cannot inhale enough oxygen and exhale enough carbon dioxide, the pneumonia can lead to death.
- Covid-19 pneumonia is especially severe because it is viral and it completely affects the lungs instead of small parts.
- Other kinds of pneumonia which are caused mainly by bacteria and can be treated using antibiotics are less severe than Covid pneumonia.
- Patients are required to be put on ventilator support in such severe cases to ensure adequate circulation of oxygen in the body.

UV Blaster

- Recently, the Defence Research and Development Organization (DRDO) has developed an Ultra Violet (UV) Disinfection Tower for rapid and chemical free disinfection of high infection prone areas.
- The equipment named "UV blaster" is designed and developed by Laser Science & Technology Centre (LASTEC), a premier laboratory of DRDO.
- The UV blaster is a UV based area sanitizer useful for high tech surfaces like electronic equipment, computers and other gadgets in laboratories and offices that are not suitable for disinfection with chemical methods.
- The product is also effective for areas with large flow of people such as airports, shopping malls, metros, hotels, factories, offices, etc.
- The UV based area sanitizer may be used by remote operation through

laptop/mobile phone using Wi-Fi link.

- The sanitizer switches off on accidental opening of room or human intervention.
- It is also being considered as the key to arm operation.

Source: Indian Express, PIB, News on Air

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