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1. HISTORY, ART & CULTURE

1.1 Ranenglao Bob Khathing

Defence Minister recently inaugurated the Major Ralengnao 'Bob' Khathing Museum of Valour at Tawang in Arunachal Pradesh.

- Ranenglao 'Bob' Khathing was born on February 28, 1912, in ***Manipur's Ukhrul district***.
- He was a ***Tangkhul Naga.***
- He studied at Sir Johnstone High School in Imphal and did his matriculation from Shillong before joining Cotton College in Guwahati.
- He joined Ukhrul High School as its Head Master. He also founded a school at Harasingha in Assam's Darrang district.
- **Awards -** Bob Khathing was given
    - The coveted award of Member of British Empire (MBE) for his role in galvanising Naga support against the Japanese in Burma and India and
    - Military Cross (MC) for his acts of bravery above and beyond the call of duty.
- In 1939, after the Second World War broke out, Khathing joined the Indian Army and got an Emergency Commission as an officer.
- During the Second World War, he was part of a guerrilla outfit called ***Victor Force***, raised by the British to combat the Japanese on the Burma-India road.
- Later, another force known as ***SANCOL*** was formed in June 1944 under command of Major John Saunders, and Bob Khathing was appointed Advisor to this force.
- At the end of the Second World War, he joined the interim government of ***Maharaja Kumar Priyabrata Singh of Manipur*** as minister in charge of the hill areas.
- In 1949, when Manipur merged with India, the interim government was dissolved and he joined the Assam Rifles.
- In 1951, he joined the Indian Frontier Administrative Service as an assistant political officer.
- In 1951, he was tasked by the Governor of Assam, Jairamdas Daulatram, to occupy Tawang in Arunachal Pradesh.
- Bob Khathing started the expedition for Tawang in 1951, from the Lokhra Camp near Assam's Charduar with troops of Assam Rifles.
- Once they arrived in Tawang, Khathing held parleys with the locals, winning over their trust.
- He officially took Tawang under Indian administration by hoisting the Indian flag on February 14, **1951**.
- Thereafter, Khathing started the process of establishing an administrative set-up in the area around Tawang.
- He appointed ***Gaon Buras (village elders)*** in each village for that purpose, in keeping with the traditional practice of one Gaon Bura for groups of three to ten villages.
- Then he went on to serve as Deputy Commissioner of Mokokchung (in Nagaland), Development Commissioner in Sikkim, and Chief Secretary of Nagaland.
- His career ended as ambassador to Burma in 1975 making him possibly the ***first person of tribal origin to be appointed ambassador*** in independent India.
- He died in Imphal on January 12, 1990.

1.2 Yanadi tribe

3 children of Yanadi tribe who went missing from their homes at Kalekhanpeta in Machilipatnam were traced recently.

- The Yanadi are a scheduled tribe in ***Andhra Pradesh***.
- **Name** - The name may come from the Sanskrit word anadi, which means "of unknown origin".
- **Language** - Their mother tongue is Telugu.
- **Lifestyle** - They are nomadic and live in symbiosis with non-tribals.
- **Occupation** - They traditionally hunted, gathered, and farmed.
- **Health** - They have traditional knowledge of herbal remedies for a variety of ailments.
- **Religion** - They celebrate Hindu festivals and worship their household deities in houses called ***"Devuru Indlu".***
- **Dance** - They perform the ***Dhimsa Dance*** during festivals and special occasions.
- **Groups** – There are 4 endogamous groups like
    - Manchi Yanadis or Reddi Yanadis (Cultivators and servants)
    - Adivi Yanadis (those living in forests)
    - Paki Yanadis (Scavengers) and
    - Challa Yanadis (those who collect left out food from leaf plates in the dust bins).
- **Vulnerability** - They are among the most vulnerable tribal groups in India, living in extreme poverty and social exclusion.
- In 2001, an Integrated Tribal Development Agency (IITD) was established in Nellore to help with the socio-economic development of the Yanadi people.

1.3 Jagannath Temple

Odisha's law minister recently clarified that there was no secret chamber inside the treasury of the Jagannath Temple in Puri.

- The circular temple is situated in Puri, Odisha.
- It is the only circular temple in India.
- It is a revered temple where ***Lord Krishna*** is worshipped as Lord Jagannath.
- Lord Jagannath is present in this temple along with elder brother Lord Balbhadra and younger sister Goddess Subhadra.
- **Built by -** King ***Anatavarman Chodaganga Deva*** of the Kachchhapaghata Dynasty (Eastern Ganga Dynasty) in the 12th century.
- **Architecture-**The temple is known for its Kalinga style architecture, which features intricate carvings and curvilinear towers.
- **Features -** ***Sandstone and laterite*** construction, intricate carvings of Hindu mythology, main shrine built in the 10th century
- The circular structure of the temple is believed to have inspired the design of the Indian Parliament building.

Char Dham refers to the 4 holy sites or 4 abodes of God in the 4 directions of India likely Puri in the East, Rameshwaram in the South, Dwarka in the West, and Badrinath in the North.

- The temple is also known as the ***"White Pagoda"*** and is one of the 4 great ***"Char Dham" pilgrimage*** sites.
- It is famous for its Annual Rath yatra, or chariot festival.

1.4 Maori Haka

Hana-Rawhiti Maipi-Clarke, the young New Zealand parliamentarian performed the famous 'Ka Mate' haka in Parliament amid a discussion on the bill.

- **Maori** - Maori are a ***Polynesian people*** and are the first peoples of their homeland, New Zealand.

- They called New Zealand as 'Aotearoa' or 'land of the long white cloud'.
- **Maori haka** – It is a ceremonial war dance and a sign of cultural pride, strength, and unity for the Maori people of New Zealand.
- It is a group performance that involves chanting, hand movements, facial gestures, and stamping.
- The haka is usually performed in a uniform manner and ***requires strict discipline.***
- The haka varies by tribal region, and many haka tell the story of significant events in a tribe's history.
- **Purpose -** The Haka is performed for a variety of reasons, including Welcoming guests, Acknowledging achievements, occasions, or funerals, Expressing solidarity or support for a person or group, Symbolizing dedication to people and their values.
- The most famous haka is "Ka Mate," which was composed around 1820 by the Māori chief Te Rauparaha.
- It became well known when it was incorporated into the pregame ritual of the All Blacks, New Zealand's national rugby union team.
- Haka may be performed by both men and women, and several varieties of the dance fulfill social functions within Maori culture.
- Now, haka is used as a sign of respect and is performed on important occasions, such as sporting events, weddings, funerals, and Pōwhiri (a traditional welcome).
- The traditional Maori performance of haka is a source of pride for all New Zealanders.

1.5 Reang tribe

Recently, Tripura's Reang community has demanded the government to grant recognition to their language and declare a holiday on Hojagiri Day.

- **Reang** – They are the ***2nd largest numerous sub-tribe*** of Tripuris after the old Tripuri clan.
- The Reangs are found in Tripura, Mizoram, and Assam.
- **Origin -** They come first from the Shan State of upper Burma (now Myanmar) in different waves to the Chittagong Hill Tracts and then to the Southern part of Tripura.
- They belong to ***Indo-Mongoloid racial*** stock and are still a nomadic tribe.
- **2 Major Clans -**
    - **Meska -** It is divided into 7 subgroups or Dofa.
    - **Molsoi –** It is subdivided into 6 groups.
- **Language –** It has an affinity of Austro-Asiatic groups under the Tibeto-Burman family.
- It is known as ***"Kaubru"*** which has a tonal effect of the Kuki language though broadly it is the Kok-Borok dialect.
- **Cultivation –** They are primarily an agriculturist tribe and maintain their livelihood involving Hilltop Jhum Cultivation.
- Food gathering activities like collection of jungle fruits, leaf, plants, fishing in stagnant water in hill slopes, hunting of wild animals and birds.
- **Religious belief -** Hindus and most of their deities are akin to gods and goddesses of Hindu faith.
- They are also *followers of Vaishnavism* and believe in spirits and existence of soul.
- They have faith in different deities like Buraha, Bonirao, Songragma, Jampira, Lampra and female deities like Mwtaikotorma, Tuibuma, Mailoma, and Ganga.
- **Marriage system -** Traditionally are endogamous and *do not marry outside their community.*
- The village council chief is known as "RAI" permits Divorce and Widow Marriage.
- **Dance -** ***Hozagiri dance*** is performed during the Hojagiri Festival, which is celebrated to worship the ***goddess Lampra*** for a good harvest.
- It is performed exclusively by young women, with melodious tune of flute which is most attractive throughout the country and abroad.

- **Death -** They cremate their dead bedside a river or chara.
- It is done in 2 stages - Broksakami and Kothainami.
- They are considered the ***only Particularly Vulnerable Tribal Group (PVTG)*** in the state of Tripura.

Hojagiri Festival is celebrated on 18-19 October.

1.6 Kanhirapoil Megalithic Site

Recently, the Archaeologist discovered prehistoric rock-cut footprints and a human figure at Kanhirapoil in Kerala's Kasaragod.

- A megalithic site is a location where large stone structures are found.
- **Megalith -** It means a large/big stone used to construct a monument or a structure.
- It has been constructed either alone or together with other stones.
- Megaliths were used as monuments and burial sites by ancient communities from the Late Neolithic to the Iron Age.
- Megaliths are often oriented to the solstices and equinoxes.
- **Period -** Lasted from 2500 BC to AD 200.

Recent Findings

- **Location** - Kanhirapoil in Madikkai panchayat, Kerala.
- The findings include 24 pairs of prehistoric footprints and a human figure carved into rock on private property.
- These carvings date back to the ***Megalithic period*** and are made with iron tools.
- Footprints vary from 6 to 10 inches.
- At the end of the footprints, a human figure has been intricately etched, accompanied by 4 circular pits around it.
- This represents both children and adults, and souls of dead people have been carved out to honor them.
- All the footprints are pointing towards the west. The local people believe these footmarks to be a goddesses.
- It is similar to prehistoric rock art found in ***Avalakki Pera in Udupi district in Karnataka.***
- These carvings and artefacts indicating a shared cultural heritage in prehistoric north Kerala.

1.7 Jarawa Tribe

Recently, the Jarawa Tribe of 19 members in Andaman and Nicobar Islands was included in the electoral process for the first time, done under systematic Voters' Education & Electoral Participation program.

- The Jarawa are a Paleolithic tribe of hunter-gatherers who live in the ***Andaman and Nicobar Islands*** in the Indian Ocean.
- **Location** - They live in the western region and coastal belt of South Andaman and Middle Andaman Islands.
- The 1st friendly contact with the tribe was made in 1974.
- **Division -** It has 3 socially discernable territorial divisions viz.
    - **Northern Group -** Occupies Western part of Middle Andaman Island – known as Tanmad and 'Kadamtala Jarawa' among non-tribals.
    - **Southern Group** – Occupies Western part of South Andaman Island – known as Boiab among Jarawas and nonJarawas call them as 'Tirur Jarawas'.
    - **Central Group** - Occupies Western part of South Andaman Island - Thidong among the Jarawa and among non-Jarawas it is known as 'R. K. Nallah Jarawas'.
- **Habitat -** They live in groups of *chaddhas*, which called as their homes.
- **Lifestyle -** They live a nomadic lifestyle, subsisting on hunting, fishing, and gathering.
- **Diet -**Their traditional food includes boar, turtles, crabs, wild pigs, fruits, and honey.

- **Dress** – They do not use any apparel to cover their bodies, in recent times some of them use clothes occasionally.
- They rename their children ***during or after the adolescent ceremony***.
- **Marriage System** - The girls generally get married by 15 years of age.
- Widowhood does not affect the childbearing of females in this society.
- Widows/Widowers are allowed to remarry.
- **Belief** - They consider the sun, moon, sky, star and cloud as the important phenomena for their living and survival.
- **Music** – The singing is related to their activities like making floral ornaments, baskets, wooden buckets, or fetching water.
- **Population -** The Jarawa population has been drastically reduced by interaction with foreigners and the introduction of diseases.
- Recent surveys estimate that only ***250 to 450*** Jarawa people still live in the Andaman Islands.

2. GEOGRAPHY

2.1 DANA, Weather pattern

Millions have been affected in southern and eastern Spain due to torrential rain, which began recently because of the annual weather pattern, cold drop.

- It is an ***annual weather phenomenon*** known as a "gota fria," or cold drop.
- It is also sometimes called a DANA, Depresion Aislada en Niveles Altos or isolated depression at high altitudes.
- **Formation** - DANA or cold drop takes place when cold air descends over the warm waters of the ***Mediterranean Sea.***
- This results in atmospheric instability, causing hotter, moist air on the surface of the sea to rise quickly, leading to the formation of dense, towering ***cumulonimbus clouds*** in a matter of hours.
- These clouds then dump heavy rain.
- Its occurrence is related to the polar jet stream, a fast-moving wind current at high levels of the troposphere which circulates from west to east and separates the cold polar air from the warm tropical air.
- Often, a pocket of cold air gets separated from the polar jet stream and collides with the warmer air over the Mediterranean Sea, which results in DANA.
- The phenomenon and usually coincides with the onset of autumn and spring in the western Mediterranean.
- It can occur in Spain, Portugal, France, Italy, and other Mediterranean countries.
- However, experts suggest that cold drops have become more frequent and intense in recent years. Also, the phenomenon has also become more geographically spread.
- This is happening partly because of soaring global temperatures warmer air can retain more moisture which, in turn, results in more intense rainfall.
- The rise in sea surface temperatures of the Mediterranean Sea has also exacerbated the situation.

2.2 Mount Lewotobi Laki-Laki volcano

Indonesia's Mount Lewotobi Laki-Laki volcano continues to erupt, spewing ash clouds and causing widespread disruption.

- Mount Lewotobi Laki-Laki is an active volcano located on Flores Island in Indonesia's East Nusa Tenggara province.
- It is one of the two main peaks of the twin volcano Lewotobi.
- **Twin Volcanoes -** Lewotobi Lakilaki (man) and Lewotobi Perempuan (woman).

- It is known for its ***stratovolcano structure*** and is situated close to its counterpart, Lewotobi Perempuan (Female Lewotobi).
- It is Part of the ***Pacific "Ring of Fire".***

Volcanoes

- Volcanoes are openings, or vents where lava, tephra (small rocks), and steam erupt onto the Earth's surface.
- **Occurrence –** It can be on land and in the Ocean in Earth.
- **Types –** According to the British Geological Survey, the type of volcano depends
  - On the viscosity of the magma
  - On the amount of gas in the magma
  - On the composition of the magma
  - On the way the magma reaches the surface
  - On basis of their activity – Active, dormant and extinct

Pacific Ring of Fire is a horseshoe-shaped region around the Pacific Ocean that is known for its high levels of seismic and volcanic activity, home to more than 75% of the world's volcanoes and 90% of its earthquakes.

- Shield Volcanoes, Cinder cones, Composite Volcanoes (Stratovolcanoes), Caldera, Flood Basalt Provinces, Mid-Ocean Ridge Volcanoes, Active volcano.

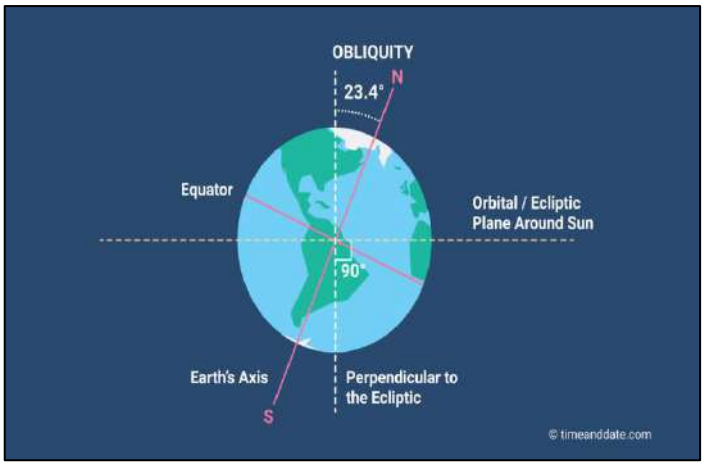
Strato volcanoes

- They are characterized by a steep, conical shape formed from alternating layers of lava flows, volcanic ash, and other volcanic debris.
- This layered structure contributes to their towering height.
- **Eruption Style -** Stratovolcanoes typically exhibit explosive eruptions due to the thick, viscous nature of their magma, which is often rich in silica.
- This viscosity can trap gases, leading to pressure buildup and explosive eruptions, as opposed to the more gentle eruptions seen in shield volcanoes.
- **Lava Composition -** The lava produced is usually ***andesitic to rhyolitic*** in composition, meaning it has a moderate to high silica content, contributing to its viscous nature.
- **Activity -** Stratovolcanoes can have long periods of dormancy between eruptions, but when they do erupt, it can be highly explosive. This can create pyroclastic flows, ashfall, and lava domes.
- **Geographic Distribution -** They are commonly found at ***convergent plate boundaries,*** where an oceanic plate subducts beneath a continental plate, leading to magma generation.
- Many well-known volcanoes, like Mount St. Helens and Mount Fuji, are stratovolcanoes.

2.3 Changes in Tilt of Earth's Axis

Researchers recently discovered that Earth's axis has tilted by 31.5 inches due to excessive groundwater extraction.

- **Axial tilt –** It is the ***angle between the planet's rotational axis and its orbital axis.***
- A planet's orbital axis is perpendicular to the ecliptic or orbital plane, the thin disk surrounding the sun and extending to the edge of the solar system.
- **Earth's axial tilt –** It is about ***23.5 degrees.***
- Due to this axial tilt, the sun shines on different latitudes at different angles throughout the year which causes the seasons.
- It is also known as the ***obliquity of the ecliptic.***



- **Axial Precession**- Its axis appears stable but wobbles very slowly, like a spinning top.

- It takes *Earth's axis about 26,000 years to complete a circular "wobble."*
- It is also known as axial precession which is influenced by the distribution of mass across the planet.

Recent Findings

- **Groundwater extraction -** The study reveals that excessive groundwater extraction has caused a significant shift in Earth's rotational pole.
- It is estimated that humans have *pumped out around 2,150 gigatons of groundwater* largely for irrigation and for their use.
- Between 1993 and 2010, the Earth's pole drifted approximately 80 centimeters eastward due to groundwater depletion.
- It has contributed to a sea level rise of about 0.24 inches and altered the distribution of Earth's mass, leading to the drift of the rotational pole at a rate of 4.36 centimeters per year.
- The redistribution of groundwater from aquifers to oceans has affected the polar motion.
- It has a larger impact on polar drift than climate-related factors such as ice sheet melting.
- **Regional Impact -** Western North America and northwestern India have significant groundwater extraction.
- These mid-latitude areas influence polar drift due to their geographical location and the volume of water extracted.
- **Current Shift -** Earth's tilt is *not enough to affect weather patterns or seasons immediately.*
- The continued groundwater depletion could have long-term climatic impacts.

Polar Motion is the movement of Earth's rotational axis relative to its crust. When Earth rotates on its spin axis an imaginary line that passes through the North and South Poles, it drifts and wobbles.

2.4 Pennaiyar River

Recently, the Supreme Court directed the Union government to submit the report on Tamil Nadu and Karnataka's dispute between Pennaiyar river water.

- It is the ***2nd largest interstate East flowing river*** basin among the 12 basins lying between Pennar and Cauvery basins.
- It is also known as *Thenpennai, Ponnaiyar, or Dakshina Pinakini.*
- **Origin** – It originates on the ***eastern slope of Nandi Hills*** in Karnataka and flows through Tamil Nadu into the Bay of Bengal.
- **Area -** It covers a large area in the State of Tamil Nadu besides the areas covered in the states of Karnataka and Andhra Pradesh, **77%** of the drainage basin lies in ***Tamil Nadu.***
- **Length** - 497 km.
- **Bounded by -** Velikonda, Nagari, Javadu, Shevaroy, Chitteri, and Kalrayan hills of the Eastern Ghats.
- **Tributaries -** Chinnar West, Chinnar East, Markandanadhi, Kambainallur, Pambar, Vaniyar, Kottaipatti, Kallar, Valayar Odai, Ramakkal, Pambanar, Aliyar, Musukundanadhi and Thurinjalar.
- It *flows in monsoon seasons, and dry in remaining parts of the year*.
- The river is mentioned in sangam literature.
- **Irrigation** – It is extensively dammed for irrigation, especially in Tamil Nadu.
- It's rich in abundance of soil such as non-calcareous red & brown and calcareous black soil, Red sandy loam and clay loam, and got coastal alluvium soil.

2.5 Baltic Sea

Recently, the Baltic Sea is at a high risk zone after a suspected sabotage attack on undersea cables.

- It is the 15th largest sea of Atlantic Ocean and ***one of the world's largest brackish waters***.
- **Location -** It is a ***semi-enclosed inland*** sea of water in ***Northern Europe*.**

- It is the arm of the North Atlantic Ocean and connects it through the Danish Straits.
- **Origin -** It originated in the Scandinavian mountains.
- It is the ***youngest sea on Earth***, emerging some 10,000-15,000 years ago as the glaciers retreated at the end of the last Ice Age.
- **Bordering Countries** - Denmark, Estonia, Finland, Germany, Latvia, Lithuania, Poland, Russia, and Sweden.
- Danish Straits connects it to the Atlantic Ocean.
- **Catchment**– It has a catchment area 4 times larger than the sea.
- The Baltic Sea is connected to the White Sea via the White Sea Canal and to the North Sea's German Bight via Kiel Canal.
- **Rivers** - Neva is the largest river that drains into the Baltic Sea. Its longest rivers are the Vistula and the Oder.
- The highest salinity is recorded in the western Baltic.
- **Major Gulfs -** The Gulf of Bothnia to the north, the Gulf of Finland to the east, and the Gulf of Riga slightly to the south.
- **Islands -** Gotland, located off the coast of Sweden, is the largest island in the Baltic Sea.
- It is often cited as the *world's largest brackish inland water body.*
- It is characterized by a fluctuating size, salinity, and connection to nearby oceans due to glacial influences and drowned rivers emptying into its main bays.

World Wide Fund for Nature (WWF) doing a Baltic Programme with an aim at marine protected areas covering 30% of the sea, with 10% of the strictly protected area by 2030.

3. POLITY

3.1 Recent judgment on the Right to property

Supreme Court (SC) recently said that the government cannot acquire and redistribute all privately owned properties.

- **Article 39(b) -** State shall direct its policy towards securing that the ownership and control of the material resources of the community are so distributed as best to sub serve the common good.
- SC clarifies that Article 39(b) includes privately-owned resources but not every resource owned by the individual can be considered as a material resource.
- Further it says that the term "distribution" has a wide connotation, and the court must determine whether distribution of resources in a given case sub serves common good.
- **Right to property -** SC says that the interpretation of all private property is 'material resource of community' is incompatible with the right to property.
- The right to property under ***Article 300A*** is a constitutional right.
- Article 39(b), both as a pre-cursor to the protection of Article 31C and as an aspirational Directive Principle, cannot run counter to the constitutional recognition of private property.
- To hold that all private property is "material resources of the community" and that the ultimate aim is state control of private resources would be incompatible with the constitutional protection.
- The reference to the Constitution Bench was based on petitions filed by parties including the Property Owners Association (POA).
- Private properties cannot be taken over by the state under the garb of constitutional schemes of ***Articles 39 (b) and 31 C*** of the Constitution.

3.2 Constitution Day

Recently, the Constitution Day of India, or Samvidhan Divas is celebrated on 26th November to commemorate the adoption of the Constitution of India.

- On November 26, 1949, the Constituent Assembly adopted the Constitution of India.
- The Constitution finally took effect on January 26, 1950, when India became a republic.
- **Notified by -** Ministry of Social Justice and Empowerment.
- **Notified on** – 19th November 2015, the year that marked the 125th ***birth anniversary of Dr BR Ambedkar.***
- President will address the Members of both Houses of Parliament in the Central Hall on the occasion of 'Samvidhan Diwas'.
- **Historical Background -** The Constituent Assembly met for the first time in New Delhi on December 9, 1946 in the Central Hall of the old Parliament House building.
- Dr. Rajendra Prasad, the first President of India, as its chairman.
- The Assembly had 389 members, including prominent leaders like Dr BR Ambedkar, Jawaharlal Nehru, and Sardar Patel.
- Ambedkar presented the draft in the Constituent Assembly in 1948. The draft was adopted, after being deliberated across eleven sessions and for more than two years, on November 26, 1949, with a few amendments.
- The Constitution of India finally came into effect on January 26, 1950, which is observed as Republic Day.

The Constitution of India is the largest written constitution in the world, with 1,17,360 words (in the English version) and it had 395 Articles and 8 Schedules.

- The Preamble of the Constitution of India declares the country as a sovereign, socialist, secular and democratic republic and aims to secure justice, liberty, and equality for all citizens
- Celebrating Constitution Day is primarily to honor Dr BR Ambedkar and promote awareness of constitutional values, rights, and duties.
- **Dr Ambedkar** – He chaired the Drafting Committee of the Constitution.
- He is known as the *Father of the Indian Constitution*.
- The day was previously observed as ***National Law Day*** as he was also the first Law Minister of India.

4. GOVERNMENT INTERVENTIONS & SCHEMES

4.1 PM-Vidyalaxmi scheme

The Union Cabinet, chaired by Prime Minister Shri Narendra Modi, has approved PM Vidyalaxmi Scheme recently.

- It is a ***Central Sector scheme*** to provide financial support to meritorious students through various measures in both public and private Higher Education Institutions (HEIs).
- It is a key initiative of National Education Policy, 2020.
- **Eligibility -** Any student who gets admission in quality Higher Education Institution (QHEIs) will be eligible.
- The scheme will be applicable to the top quality higher educational institutions of the nation, as determined by the NIRF rankings.
- It includes
    - All HEIs, government and private, that are ranked within the ***top 100*** in NIRF in overall, category-specific and domain specific rankings;
    - State government HEIs ranked in ***101-200*** in NIRF and all central government governed institutions.
- The scheme will be administered through a simple, transparent and student-friendly system that will be inter-operable and entirely digital.

- **Funding –** A special loan product will offer ***collateral free, guarantor free*** loan from banks and financial institutions to cover ***full amount*** of tuition fees and other expenses related to the course.
- For loan amount up to ₹ 7.5 lakhs, the student will also be eligible for a credit guarantee of 75% of outstanding default.
- This will give support to banks in making education loans available to students under the scheme.
- In addition to the above, for students
    - Having an annual family income of up to ₹ 8 lakhs, and
    - Not eligible for benefits under any other government scholarship or interest subvention schemes, 3% interest subvention for loan up to Rs.10 lakhs will also be provided during moratorium period.
- The interest subvention support will be given to one lakh students every year.
- Payment of interest subvention will be made through e-vouchers and Central Bank Digital Currency (CBDC) wallets.
- Preference will be given to students who are from government institutions and have opted for technical/ professional courses.
- **Portal** - The Department of Higher Education will have a unified portal "PM-Vidyalaxmi".
- The portal has been developed and being maintained by NSDL e-Governance Infrastructure Limited.
- Students will be able to apply for the education loan as well as interest subvention, through a simplified application process to be used by all banks.

4.2 Animal Health Security Strengthening in India for Pandemic Preparedness and Response initiative

The central government recently launched a project called 'Animal Health Security Strengthening in India for Pandemic Preparedness and Response' initiative.

- **Aim –** The project aims to enhance the country's capacity to ***"prevent, detect, and respond to animal health threats."***
- It is to better monitor animal health for prevention of future pandemics.
- **Approved by -** The Pandemic Fund, created by G20 countries under Indonesian presidency in 2022.
- The basic purpose of the fund is to assist low-and middle-income countries in strengthening their capacities to identify, report and contain future pandemics.
- **Funding -** In its first investment round, the fund mobilized $2 billion.
- From India, the proposal by the Union animal husbandry department made it to the final list to receive a funding of $25 million.
- **Implementing Agencies** - The project will work with the help of 3 implementing agencies
    - Asian development bank (adb),
    - The world bank, and
    - The food and agriculture organisation (fao).
- **Duration -** It is expected to be completed by August 2026.
- **Key outputs expected –**
    - Augmentation of laboratory systems and vaccine manufacturing facilities;
    - Strengthening of surveillance and early warning systems;
    - Development of human resources capacity and competency;
    - Strengthening of data systems, analytics, risk analysis, and risk communication; and
    - Addressing cross-cutting institutional capacity gaps at national and regional levels.

WHO has declared 6 public health emergencies of international concern and 5 of these have had animal origin. About two-thirds of infectious diseases affecting humans originate from animals.

- India, with 536 million livestock and other animals, requires measures to prevent and manage infection outbreaks.

4.3 EV as a Service' Programme

Recently Union Minister of Power and Housing & Urban launched 'EV as a Service' programme.

- **EV as a Service** – It is a subscription-based access to electric vehicles, eliminating the high upfront costs of purchasing an EV.
- **Aim** - To boost e-mobility in government offices to deploy 5,000 E-Cars in government departments over the next two years.
- Advancing the adoption of electric cars in Central and State Government ministries/departments, CPSE's and institutions.
- **Nodal Agency** - Convergence Energy Services Limited (CESL), a subsidiary of Energy Efficiency Services Limited (EESL).
- **Flexible procurement model** - Govt. offices can choose E-Cars that best align with their operational requirements.
- **Benefits**
  - Supports the government's environmental sustainability vision.
  - Aligns with India's ambitious goal of achieving net zero emissions by 2070.
  - Cuts carbon emissions
  - Reduces reliance on fossil fuels
  - Bolsters India's energy security

Convergence Energy Services Limited (CESL)

- **Convergence** – It is a green energy focused subsidiary venture of Energy Efficiency Services Limited (EESL).
- **Functions** - It offers interventions to solve multiple gap areas in the energy ecosystem by amalgamating independent sectors such as electricity, transport, home appliances.
- It introduces models for adaptation at scale through government partnerships and innovative financing such as carbon markets.

- CESL has already deployed nearly 2000 nos. of E-Cars across India and is also facilitating the deployment of approx. 17,000 E-Buses.

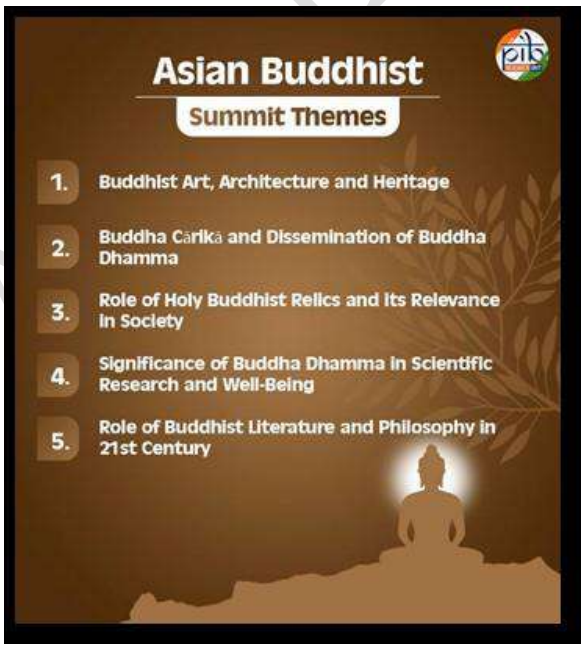
PM Electric Drive Revolution in Innovative Vehicle Enhancement (PM E-DRIVE)

- **Aim**- To accelerate EV adoption and establish essential charging infrastructure across the country, promoting cleaner and more sustainable transportation.
- **Financial outlay** – Rs. 10,900 crore over a period of 2 years.
- **Nodal Ministry** - Ministry of Heavy Industries (MHI)
- **E-Vouchers** – It facilitates accessing incentives by consumers, providing a seamless experience for both consumers and manufacturers.
- The scheme portal will generate an e-KYC Aadhaar FACE authenticated e-Voucher for the customer at the time of purchase.
- A link to download the e-Voucher shall be sent on the registered mobile number of the customer.
- **Eligible EV Categories under the scheme**
  - e-2 Wheelers (e-2Ws)
  - e-3 Wheelers (e-3Ws) including registered e-rickshaws & e-carts and L5
  - e-Ambulances
  - e-Trucks
  - e-Buses
  - Charging infra
  - Upgradation of Testing Agencies

4.4 First Asian Buddhist Summit, 2024

Recently, the Ministry of Culture and the International Buddhist Confederation (IBC), organized the First Asian Buddhist Summit.

- **Theme -** *'Role of Buddha Dhamma in Strengthening Asia'.*
- **Participants-** 32 countries with over 160 international participants of 'Sangha' leaders, scholars, experts and practitioners from various traditions across Asia.
- **The Delhi Declaration** – The summit adopted the declaration at the conclusion of the event.
    - Strengthening bonds between Asian countries based on the principles of Buddha Dhamma.
    - Working upon Buddhist literature, especially Pali.
    - Fostering and sharing the historical journey of Buddhist art and heritage (including architecture).
    - Connect Asian Buddhist Circuit through Buddhist Pilgrimage and Living Heritage.
    - Recognize the relevance of scientific and medical aspects of Buddha Dhamma (religion).
- **Significance of Buddhist Summit-** Focuses on the foundational teachings of the Buddha and their modern-day applications.
- Explores the ways in which Buddhist principles can contribute to sustainable development, social harmony, and international cooperation.
- Mainly concerned with the religious aspects and its associated discourse.
- Threw up many innovative ideas emanating from the ancient philosophy and science of Dhamma.
- Dhamma as a guiding framework for ethical governance compassionate action, and sustainable development.
- Aligns with India's Act East Policy and Neighborhood First Policy, focusing on collective, inclusive, and spiritual development in Asia.



International Buddhist Confederation

- It is a Buddhist umbrella body with its base in New Delhi.
- It serves as a common platform for Buddhists worldwide.
- It was established under the patronage of the supreme Buddhist religious hierarchy.
- **Membership -** More than 320 organizations, both monastic and lay, in 39 countries.

4.5 Mobility Arrangement for Talented Early-professionals Scheme (MATES)

Australia has recently come up with a new scheme that allows talented young people from India to work in the country for some time.

- MATES gives ***Indian university graduates and early career professionals*** a chance to work in Australia for ***2 years.***
- This scheme will open for professionals from December this year.
- MATES has been established under the ***Migration and Mobility Partnership Arrangement (MMPA).***
- **Eligibility –** It is open to Indian nationals who are aged ***30 or younger*** at the time of application
    - Have not previously participated in MATES
    - Have proficient English language skills (overall IELTS or equivalent score of at least 6, with a minimum score of 5 for each of the four modules)

- Have graduated within 2 years from an eligible educational institution at the time of application
- And hold a qualification (Bachelor's degree or higher) in one of the following;
- Renewable energy, mining, engineering, Information Communications Technology (ICT), artificial intelligence (AI), financial technology (fintech) and agricultural technology.

- Graduates from the ***top 100 universities of India*** as per the National Institutional Ranking Framework (NIRF) ranking 2024 will be eligible for this scheme.
- There is ***no requirement for sponsorship*** by an Australian employer to avail this scheme.
- Visa holders can enter Australia for the first time within 12 months, and they may stay in the country for up to 24 months after that. Multiple entry into Australia are permitted with the visa.
- Participants may extend their period of stay by applying for another visa permitting temporary or permanent residence, provided they meet all eligibility requirements for the visa.

Migration and Mobility Partnership Arrangement (MMPA)

- Australia and India entered into a Migration and Mobility Partnership Arrangement (MMPA) in 2023.
- It is a bilateral framework that supports and promotes two-way migration and mobility between the two countries, while addressing issues pertaining to illegal and irregular migration.

4.6 'Know Your Medicine (KYM)' app

Union Minister for Youth Affairs & Sports has recently launched a nationwide appeal, 'Know Your Medicine (KYM)' app.

- **Aim-** To empower athletes with critical information, helping them ***avoid inadvertent doping*** and maintain fair play.
- KYM app helps to eliminate inadvertent doping and contribute to a fair and transparent sporting culture.
- The KYM app is part of ***National Anti-Doping Agency*** to raise anti-doping awareness and education, equipping athletes with essential information to stay clean.
- The app allows users to easily verify whether a specific medicine or its ingredients contain any substances listed as prohibited by the ***World Anti-Doping Agency (WADA).***
- By offering this quick and seamless verification, the KYM app helps athletes to stay informed and uphold integrity of sport, fostering a culture of fair and ethical sportsmanship.
- Its unique features includes image and audio search, enables user to select their sport category and search specific sport related information.

WADA was established in 1999 as an international independent agency to lead a collaborative worldwide movement for doping-free sport.

National Anti-Doping Agency (NADA)

- It is an autonomous body under the Ministry of Youth Affairs & Sports.
- It implements the anti-doping programme in India, in line with the World Anti-doping Code 2021.
- It works in close collaboration with the sport ecosystem to create a dope-free sporting environment in the country.
- NADA India collaborates other national anti-doping organizations to strengthen clean sporting practices, contribute to evolving the guidelines and ensure athletes can compete on a level playing field across the world.

4.7 Bodoland Mohotsav

Recently 1st Bodoland Mohotsav has been celebrated in New Delhi.

- **Bodoland Mahotsav** - The 2-day Mahotsav is a mega event on language, literature, and culture to sustain peace and build a Vibrant Bodo Society.
- **Aim** – To integrate the indigenous Bodo people residing in Bodoland and other parts of Assam, West Bengal, Nepal, and international border areas of the Northeast.
- Capitalise on the richness of cultural and linguistic heritage, ecological biodiversity, and touristic potential of Bodoland.

- **Theme** - Peace and Harmony for Prosperous Bharat
- **Bodos** - The Boro , also called Bodo, are an ethnolinguistic group native to the state of Assam in India.
- **Bodo Kachari** - They are a part of the greater Bodo-Kachari family of ethnolinguistic groups and are spread across northeastern India.
- They are concentrated mainly in the Bodoland Territorial Region of Assam, though Boros inhabit all other districts of Assam and Meghalaya.
- **Scheduled Tribes** - Boros were listed under both "Boro" and "Borokachari" in The Constitution (Scheduled Tribes) Order, 1950.
- **Bodoland** – It is officially the Bodoland Territorial Region, is an autonomous region in Assam, Northeast India.
- Bodoland is named after Bodo, an alternative spelling of the Boro people who live primarily in the Dooars regions of Goalpara and Kamrup districts.
- It is predominantly inhabited by the Bodo people and other indigenous communities of Assam.
- **Bodo Movement** - All Bodo Students' Union launched the Bodo Movement in 1987 with the demand for a separate state to be called Bodoland, ending with the Bodo Accord of 1993 with the formation of Bodoland Autonomous Council.
- **Bodo Peace Accord in 2020**- It was signed between the Government of India and the Government of Assam on one side and the National Democratic Front of Bodoland, (NDFB) the All Bodo Students' Union and United Bodo People's Organisation on the other.

- Under the terms of this agreement, a Bodoland Territorial Region was formed with enhanced executive and legislative powers.
- **Districts** - It is made up of four districts on the north bank of the Brahmaputra river below the foothills of Bhutan and Arunachal Pradesh.
- **Bodoland Territorial Council** - Bodoland is administered by an elected body known as the Bodoland Territorial Council which came into existence under the terms of a peace agreement signed in February 2003.
- **Bodo Culture**
  - **Religion -** Bathouism
  - **Dance –** Bagurumba, Kherai Group Dance
  - **Jou Gishi** - Rice beer is produced by the Boros from different kinds of rice varieties.
- **Festival** – Bwisagu.

4.8 Digital Life Certificates (DLCs)

The Department of Pension & Pensioners' Welfare data show that as of March this year, there were 64.88 crore central government pensioners and 1.47 crore certificates were generated during DLC campaign.

- Jeevan Pramaan is a biometric-enabled, Aadhaar based digital service that allows ***pensioners to generate a Digital Life Certificate (DLC)*** for themselves.
- **Introduced by -** The Department of Pension & Pensioners' Welfare (DoPPW) in 2014.
- It is officially recognized under the ***Information Technology Act.***
- It can be generated ***online anywhere,*** and is made available directly to the relevant pension-disbursing authority.
- It eliminates the need to be physically present at the pension disbursing agency or certification authority including banks and post offices.
- **Eligiblity –** Pensioners of Central Government, State Government or any other Government

The largest number of DLCs have been generated in Maharashtra so far, followed by Tamil Nadu, West Bengal, Uttar Pradesh, and Karnataka.

organization such as Defence services, Railways, public sector undertakings, and many higher education institutions, etc can take benefit of this facility.

- **Distribution –** It is disbursed by the various government bodies forms the basis for their income and sustainability.
- From 2021 onward, face authentication has been added as an option.
- **Jeevan Pramaan version 3.0 -** UIDAI has introduced new Aadhaar Authentication Framework version (ver. 3.0) of Jeevan Pramaan Application to support the scheme.
- Every November, retirees have to submit a "life certificate" to continue to receive their pensions for ***another year.***

4.9 Partnerships for Accelerated Innovation and Research (PAIR)

Recently, the Partnerships for Accelerated Innovation and Research (PAIR) initiative was launched to enhance research capabilities of universities, particularly central and state public institutions.

- It is designed to foster collaboration between research and teaching institutions.
- **Launched by** – Anusandhan National Research Foundation (ANRF).
- **Objectives** – To *stimulate scientific innovation* in institutions with limited research, in a ***mentorship mode*** by leveraging the knowledge and expertise of top-ranking institutions.
- Support internationally competitive research and foster successful *collaborative networks* between diverse institutions.
- **Hub-and-spoke model of implementation**
  - **Hub** – Well established institutions
  - **Spoke** – Emerging institutions

Category I	• It includes central and state public universities ranked *within the top 200 overall NIRF* rankings, top 100 NIRF university rankings, or top 100 NIRF state public university rankings, excluding those eligible as hubs.
Category II	• It includes *NITs and IIITs* as per the approved list.
Category III	• It includes any central or state public university not in the 1st two categories but demonstrating potential in specific research areas.

- **PAIR network** – It will consist of a central hub institution and between 3 to 7 spoke institutions.
- A hub institution can submit only 1 proposal and each institution can participate *as a spoke in only 1 network*.
- *At least 2 state public universities* must be included in each PAIR network, and to ensure regional diversity, at least 1 spoke institution must be located outside the state of the hub institution.
- **Funding for PAIR network** – It will vary based on factors such as the research theme, the number of spoke institutions, and the involvement of multiple departments and faculty members.
  - **Maximum funding** – Rs.100 crore
  - **Budget distribution between the hub and spoke** - 30:70 ratio
- **First phase** – It will target institutions that are ranked within
  - Top 25 in NIRF overall rankings over the past 2 years
  - Between the rank 26 and 50 in Institutions of National Importance
- **Eligibility for the spoke institutions** – It has been divided into 3 categories.
- **Significance** – It is a key component of the National Education Policy 2020 (NEP 2020) and will play a crucial role in fostering a robust research culture across India's higher education institutions.

4.10 One Day One Genome

Recently, One Day One Genome initiative was launched to harness the microbial potential of India on the 1st foundation day of BRIC held in National Institute of Immunology (NII).

- It will *highlight the unique bacterial species* found in our country and emphasize their critical roles in environment, agriculture and the human health.
- **Introduced by**
  - Department of Biotechnology (DBT)
  - Biotechnology Research and Innovation Council (BRIC).
- **Aim** – To release a *fully annotated bacteriological genome* isolated in the country freely available to the public.
- **Role** – This will be complemented with a *detailed graphical summary*, infographics and genome assembly/annotation details.
- These documents will thus give an idea about the scientific and industrial use of these microbes.
- Consequently, microbial genomics data will become more accessible to the general public, scientific researchers and thereby stimulate discussions; innovations directly benefit the entire community and ecosystem.
- **Significance** – It will lead to the benefit of better protection and management of our environment, development in agriculture and improvement in human health.

Relevance of Microorganisms

- **In environment** – They play an important role in all biogeochemical cycles, soil formation, mineral purification, degradation of organic wastes and toxic pollutants along with methane production.
- Cumulatively they help to maintain the homeostasis in our planet.
- **In agriculture** – They help in nutrient cycling, nitrogen fixation, maintaining soil fertility, controlling pest and weeds and stress responses. In Flora- Microorganisms symbiotically associate with plants and help them in nutrient and water uptake.

Genome sequencing will allow the visualization of the hidden potential of the microbial world to the community at large. Sequencing data can be analyzed to identify the genome encoded capacities for various important enzymes, antimicrobial resistance, bio active compounds etc.

- **In humans** – They outnumber the number of human cells in a human body and are essential for our digestion, immunity and even mental health.
- All infectious diseases are mainly caused by pathogenic microorganisms on the other hand non-pathogenic microorganisms are indispensable for our defense against infectious diseases.

4.11 Bhu-Neer portal

Recently, the Minister of Jal Shakti launched a newly developed Bhu-Neer portal during the concluding ceremony of India Water Week 2024.

- **Bhu-Neer –** It is a ***centralized platform for managing groundwater withdrawal permits.***
- **Developed by** - Central Ground Water Authority (CGWA) in collaboration with the National Informatics Centre (NIC).
- **Ministry** - Ministry of Jal Shakti.
- It is designed to provide comprehensive details regarding the legal framework governing groundwater extraction, regulations at the state and national levels.

No Objection Certificate (NOC) to Abstract Ground Water (NOCAP) is required to abstract groundwater from an existing or proposed bore well at a project site for drinking, domestic, and factory operations by residential, commercial, and industrial units.

- It is to enhance transparency, efficiency and sustainability in groundwater usage across the country.
- It replaces the older NOCAP system with advanced features designed to simplify the permit process and ensure seamless compliance with groundwater regulations.

Central Ground Water Authority (CGWA)

- It has been constituted under *Section 3 (3) of the Environment (Protection) Act, 1986.*
- To regulate and control, management and development of ground water in the country and to issue necessary regulatory directions for the purpose.

- **Key Innovations** – Making the process entirely digital and faceless it includes a

- PAN-based single ID system, a user-friendly interface and
- QR-coded No Objection Certificates (NOCs)

- It provides comprehensive details on groundwater policies, legal frameworks and sustainable practices, serving as a vital resource for project proponents and stakeholders.
- It aligns with the Prime Minister vision of ***Ease of Doing Business*** by making ground water regulation a seamless and faceless exercise.

4.12 National Mission on Natural Farming (NMNF)

Recently, the Union Cabinet has launched a scheme National Mission on Natural Farming (NMNF) under the Ministry of Agriculture & Farmers' Welfare.

- **Aim –** To promote natural farming practices, rooted in traditional agricultural knowledge.
- It is a ***Centrally Sponsored Scheme***.
- **Ministry -** Ministry of Agriculture & Farmers Welfare.
- Farmers will engage in chemical-free farming, utilizing local livestock and diversified crop systems.
- This approach not only aligns with local agro-ecological principles but also encourages the use of location-specific technologies.
- The mission aims to provide safe and nutritious food for all while supporting farmers in reducing the input cost of cultivation and dependency on externally purchased inputs.
- NMNF is launched as a shift to scientifically revive and strengthen agriculture practices towards sustainability, climate resilience and healthy food for farmer families and consumers.
- **Implementation -** It will be implemented in 15,000 clusters across Gram Panchayats that express willingness to participate.

Natural Farming (NF)

- It is a chemical-free farming that involves local livestock integrated natural farming methods, diversified crop systems
- It follows local agroecological principles rooted in local knowledge, location-specific technologies and is evolved as per the local agroecology.
- **Benefits -** Build & maintain healthy soil ecosystems.
- Promote biodiversity and encourage diverse cropping systems.
- Enhance resilience as suitable to the local agroecology.
- **Benefits to farmers -** Reduce input cost of cultivation and dependency on externally purchased inputs.
- Rejuvenating soil health, fertility & quality and building resilience to climate risks like waterlogging, flood, drought, etc.
- Reduce health risks from exposure to fertilisers, pesticides, and provide healthy & nutritious food for the farmers' family.

- The mission aims to ***reach 1 crore farmers*** and initiate natural farming practices on 7.5 lakh hectares of land.
- Special attention will be given to areas where natural farming is already practiced.
- **Bio-input Resource Centres -** To facilitate this transition, the government plans to establish 10,000 Bio-input Resource Centres (BRCs).
- These centers will provide farmers with easy access to ready-to-use natural farming inputs.
- Around 2000 NF Model Demonstration Farms shall be established at Krishi Vigyan Kendras (KVKs), Agricultural Universities (AUs) and farmers' fields.
- It shall be supported by experienced and trained Farmer Master Trainers.
- **Training -** The willing farmers will be trained in Model Demonstration Farms on the natural farming package of practices, and preparation of natural farming inputs.
- Around 18.75 lakh trained and willing farmers will prepare inputs like Jeevamrit, and Beejamrit by using their livestock or procuring from bio-input resource centres.
- They will be provided with a simple certification system and dedicated common branding to provide access to market their natural farming produce.
- Real-time monitoring of progress will be done through an online portal.

4.13 E-Daakhil Portal

Recently, the Centre launched an E-Daakhil portal across all states and the union territories of India.

- **Aim -** It is an innovative online platform ***to streamline the consumer grievance redressal process***.
- **Launched on** – It was ***first launched on 7th September 2020.***
- **Launched by** – National Consumer Dispute Redressal Commission (NSDRC).
- It's operational now in every state and UTs making a truly ***Pan-India Initiative.***
- **Ministry -** Ministry of Consumer Affairs, Food & Public Distribution.
- **Features –** It offers an intuitive and easy-to-navigate interface, allowing consumers to file complaints with minimal effort.
- It allows consumers to file complaints, track their cases' progress, and make payments.
- Its nature ensures a paperless and transparent system for the entire grievance redressal process.
- **Eligibility** - Any consumer or advocate can sign up on the e-Daakhil platform with the required authentication
- **Benefits –** It is an inexpensive, speedy and hassle-free mechanism for filing consumer complaints.
- It is an efficient and convenient way for consumers to approach the relevant consumer forum without their physical presence.
- It is accessible to consumers across all regions, from metropolitan cities to remote areas.
- It empowers consumers and enhances the efficiency of the consumer grievance redressal system.
- It is a game-changer in promoting consumer rights and ensuring timely justice.

> *The government is also moving forward with the launching of e-jagriti, a new initiative designed to further automate consumer cases' filing, tracking, and management.*

National Consumer Dispute Redressal Commission (NSDRC)

- It is a quasi-judicial commission in India which was set up in 1988.
- **Under -** Consumer Protection Act, 1986.
- **Head Quarters** - New Delhi.
- **Headed by -** Sitting or a retired Judge of the Supreme Court or a sitting or a retired Chief Justice of a High Court.
- **Section 21 of the Consumer Protection Act, 1986**
  - It posits that the National Commission shall have jurisdiction to entertain a complaint valued more than 2 crore and
  - It also has Appellate and Revisional jurisdiction from the orders of State Commissions or the District as the case may be.
- **Section 23 of the Consumer Protection Act, 1986**
  - It provides that any person aggrieved by an order of NCDRC, may prefer an Appeal against such order to Supreme Court of India within a period of 30 days.
- **Consumer Protection Act, 2019 –** It is the *first and only act* enabled ordinary consumers to secure less expensive and often speedy redressal for their grievance.

4.14 Gelephu Mindfulness City

The Prime Minister recently inaugurated the International Cooperative Alliance (ICA) with Bhutan for the upcoming Gelephu Mindfulness City project.

- **Gelephu Mindfulness City** – It is an ***innovative urban development project*** that integrates economic growth with mindfulness, holistic living, and sustainability.
- **Located on –** The Indian border, about 30 km to the east of Sarpang in Bhutan.
- It is the *biggest "co-operative project" in Bhutan.*

- It is being developed as a ***"Zero Carbon" city***.
- **Government –** It is a special administrative region in Bhutan, envisioned by the Majesty King Jigme Khesar Namgyel Wangchuck.
- It have its own government and the independence to have its own lawmaking, as well as an independent judiciary.
- **Area –** It is a massive city spread over 2,500 square km.
- **2 protected areas** - National Park and Wildlife Sanctuary.
- Its forests and biological corridors are teeming with wildlife.
- **Land –** It is beautiful and pristine, which is a *biological hot spot* with abundant potential for clean energy.
- **Features** - It is around a series of inhabitable bridges.
    - It is a low-rise city which will have its own university, health care facilities for both western and traditional medicine.
    - Its rivers have the potential to generate 4,000 to 5,000 megawatts of electricity through renewable energy.
    - It plans to build a hydroelectric power project and a hydroponic greenhouse.
- **Benefits –** It is designed to be a hub of knowledge, technology, and finance, grounded in the values of mindfulness, sustainability and harmony.
- It is the place where people can live with harmony with others from all over the world.
- It is to improve the lives of Bhutanese people and take to the next level.

5. INTERNATIONAL RELATIONS

5.1 Balfour Declaration

The 107th anniversary of the Balfour Declaration sees Gaza burning and collusion by Zionist Arab regimes.

- Balfour Declaration was made on November 2, 1917, in a letter from British Foreign Secretary ***Arthur Balfour*** to Lionel Walter Rothschild, a leader of the British Jewish community.
- **Provisions-**Balfour Declaration promised British support in ***establishing a Jewish homeland in Palestine.***
- It stated that the British government would not take any action that would prejudice the civil and religious rights of the non-Jewish communities already living in Palestine.
- The British government would not take any action that would prejudice the rights and political status of Jews in other countries.
- **History -** Palestine then was a part of the Ottoman Empire, and Britain had no legal right to promise it to anyone.
- After World War II the system transferred rule from the territories that were previously controlled by the powers defeated in the war Germany, Austria-Hungary, the Ottoman Empire and Bulgaria to the victors.
- The declared aim of the mandate system was to allow the winners of the war to administer the newly emerging states until they could become independent.
- Upon the start of the mandate, the British began to facilitate the immigration of European Jews to Palestine.
- Between 1922 and 1935, the Jewish population rose from 9% to nearly 27% of the total population.
- Though the Balfour Declaration stated that nothing shall be done against the civil and religious rights of existing non-Jewish communities in Palestine, equip Jews with the tools to establish self-rule, at the expense of the Palestinian Arabs.
- Also, the Declaration in spirit violated the promises made in the McMahon–Hussein correspondence (July 1915 to March 1916).
    - In which the British had promised the Arabs an independent state in return for support against the Ottoman Empire in World War I.

- **The importance of the declaration for British** - Control over Palestine was a strategic imperial interest to keep Egypt and the Suez Canal within Britain's sphere of influence.
- Britain had to side with the Zionists to rally support among Jews in the United States and Russia, hoping they could encourage their governments to stay in the war until victory.

Operation Al-Aqsa Flood, represents a strategic military initiative undertaken by Palestinian forces, aimed at targeting Israeli military bases, particularly in areas near the Gaza Strip.

- Intense Zionist lobbying and strong connections between the Zionist community in Britain and the British government, some of the officials in the government were Zionists themselves.
- Jews were being persecuted in Europe and the British government was sympathetic to their suffering.
- Palestinians and their supporters have long condemned the declaration as a land theft conspiracy.
- This declaration ignored the longstanding Palestinian presence and sovereignty, as Jews made up only 5% of Palestine's population at the time.

5.2 Regional Comprehensive Economic Partnership (RCEP)

The CEO of NITI Aayog recently said that India should join the Regional Comprehensive Economic Partnership (RCEP), a China-backed Asian trade bloc it rejected years ago.

- It is a ***free trade agreement*** of the world's largest trade bloc.
- **Members -** It groups
  - ***15 Asia-Pacific economies***, including Australia, Japan, New Zealand, China, South Korea and
  - The 10 member-states of the ***Association of Southeast Asian Nations (ASEAN).***

Members of ASEAN *were Brunei, Cambodia, Indonesia, Lao PDR, Malaysia, Myanmar, Philippines, Singapore, Thailand, and Vietnam.*

- **Began in -** The RCEP was signed in November 2020 and came into effect on January 1, 2022.
- **Objectives - Trade** -Reduce or eliminate tariffs and non-tariff barriers to trade.
- **Investment** - Increase investment and encourage foreign investment.
- **Supply chains** - Facilitate trade and investment among member nations, and enhance regional supply chains.
- **Economic growth** - Promote economic growth and regional stability.
- **Covering areas -** RCEP will cover trade in goods, trade in services, investment, economic and technical cooperation, intellectual property, competition, dispute settlement and other issues.
- **Trade volume –** It is the world's largest free trade agreement by members' GDP, with the 15 member countries accounting for about ***30% of the world's population and 30% of global GDP***.

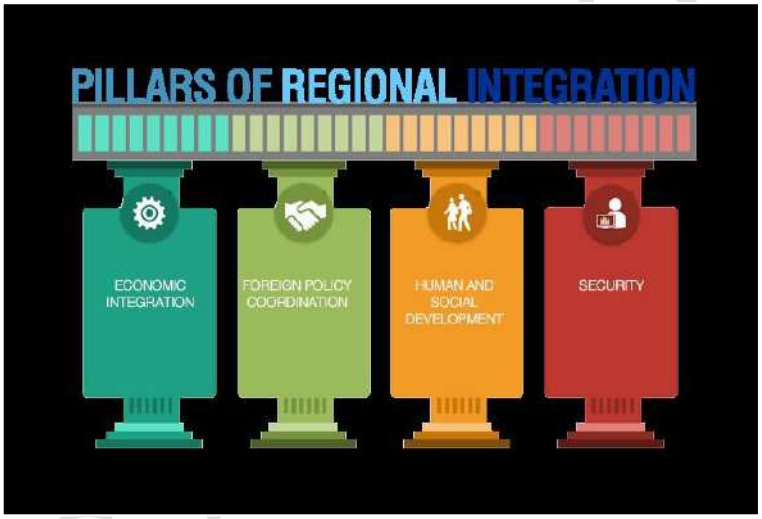
- **India –** India was the ***founding member*** of RCEP.
- In 2019, India decided to not join the bloc, on the grounds that the deal would hurt its farmers, businesses, workers and consumers.
- **Significance for India** - Joining the trade blocs of RCEP and CPTPP will help India boost its manufacturing base and exports by small and medium firms that constitute 40% of the country's exports.
- India's goods exports during April-September 2024 rose by 1.02% from a year earlier to $213.22 billion.

*Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP) is a free trade agreement between **11** countries.*

5.3 Caribbean Community (CARICOM)

The 2nd meeting of the India-CARICOM Joint Commission was held in virtual mode recently.

- The Caribbean Community (CARICOM) is the oldest surviving integration movement in the developing world.
- It is an ***official United Nations General Assembly*** observer.
- **Head Quarters** - Georgetown, Guyana.
- **Established in -** CARICOM came into being on 4 July 1973 with the signing of the ***Treaty of Chaguaramas.***
- It is a grouping of ***21 countries*** (15 member states and 6 Associate Members.
- **Member States -** Antigua and Barbuda, The Bahamas, Barbados, Belize, Dominica, Grenada, Guyana, Haiti, Jamaica, Montserrat, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Suriname, and Trinidad and Tobago.
- **Associate Members -** Anguilla, Bermuda, the British Virgin Islands, the Cayman Islands, and the Turks and Caicos Islands.
- **Observers -** Aruba, Colombia, the Dominican Republic, Mexico, Puerto Rico, and Venezuela.
- **Chairmanship –** It is rotated every 6 months among the member countries' heads.



- **Caribbean Court of Justice (CCJ) -** CARICOM had officially inaugurated the Caribbean Court of Justice (CCJ) in 2007, which replaced the Judicial Committee of the Privy Council in London.
- CCJ serves as the ***final court of appeal for CARICOM members*** and also handles regional trade disputes.
- It is home to approximately 16 million citizens, 60% of whom are under the age of 30, and from the main ethnic groups of Indigenous Peoples, Africans, Indians, Europeans, Chinese, Portuguese and Javanese.
- The Community is multi-lingual with English as the major language complemented by French and Dutch and variations of these, as well as African and Asian expressions.

5.4 International Chess Federation (FIDE)

An Indian prodigy, Anish Sarkar, has become the world's youngest chess player to be ranked by the International Chess Federation all at the age of three.

- The International Chess Federation (FIDE) is the ***governing body for international chess competitions*** and the organization that connects national chess federations.
- FIDE regulates all international chess competitions and is responsible for organizing chess and its championships at the global and continental levels.
- **Founded in -** Paris, France on July 20, 1924.
- Its original name in French is Fédération Internationale des Échecs, which is where the acronym FIDE comes from.
- **Headquarters -** Lausanne.
- **Motto -** FIDE's motto is Gens una sumus, which is Latin for "We are one Family".
- **Member federations** - 201 member federations.
- The ***International Olympic Committee (IOC)*** recognized FIDE as a Global Sporting Organization in 1999.
- FIDE also keeps records of players' ratings.

FIDE Rating system

- According to the FIDE Qualification Commission, players get official ratings by participating in FIDE-rated tournaments.
- The FIDE Rating system is a numerical system in which fractional scores are converted to rating differences and vice versa.
- Its function is to produce measurement information of the best statistical quality.
- **Eligibility -** To become a FIDE-recognized tournament, certain regulations on time limits for a game, a minimum rating for players and other criteria must be met.
- Also, to be included in the rating list, a player must be registered through a national chess federation which is a member of FIDE, unless otherwise approved by FIDE Council.
- The federation must not be temporarily or permanently excluded from membership at the time.
- **Types of rating -** Standard, Rapid and Blitz, which reflect different game lengths.
- In order to get a Standard rating, you will need to play at least 5 games against players who are already rated, and score at least ½ point (a draw) in those games.
- Currently, FIDE awards ***chess's highest honor*** to a player who is able to achieve a FIDE Classical or Standard rating of 2,500, plus 3 Grandmaster norms.
- These norms are defined by a set of complex and rigorous rules regarding tournaments, games, and players, set out in the FIDE Title Regulations.

5.5 Banda Aceh Statement

Recently, the United Nations Educational, Scientific and Cultural Organization (UNESCO) unveiled a roadmap at an international conference in Banda Aceh, Indonesia for global tsunami preparedness.

- **Banda Aceh Statement** – It is a global commitment to improving ***tsunami warning and mitigation systems***.
- It calls on states and civil society to accelerate investments to meet the 2030 goal.
- It recognised new ***Tsunami Ready communities***, including 26 in India and 12 in Indonesia and included real-time drills in 2 villages near Banda Aceh to test community preparedness.
- These exercises reinforced the importance of UNESCO's 3-step warning process
    - **Detection** - Using advanced monitoring systems like deep-ocean tsunami buoys to identify sea-level disturbances.
    - **Warning** - Forecasting wave propagation and potential impacts, followed by immediate alerts.
    - **Dissemination** - Reaching vulnerable populations swiftly through diverse communication channels like sirens, radio and smartphones.
- **Target** – To *achieve 100 per tsunami-ready coastal communities* globally by 2030.
- **Role of UNESCO** – ***UNESCO-IOC Tsunami Ready Recognition Programme (TRRP)*** is an international community-based effort to bolster risk prevention and mitigation across global coastal zones.
- It has expanded its *Indian Ocean Tsunami Warning and Mitigation System* to cover high-risk areas worldwide.
- Its global network includes
    - Tens of thousands of seismometers
    - Over 1,200 active sea-level stations
    - Submarine cable observatories
    - 74 deep-ocean tsunami buoys.

> *Currently, 700 million people live in tsunami-prone coastal areas, a figure projected to reach 1 billion by 2050. Locally damaging tsunamis occur in the Pacific every 1-2 years and UNESCO estimates a near 100% chance of a tsunami in the Mediterranean within the next 30 years.*

- **Beneficiaries** – *More than 30 countries* have already benefited from UNESCO's TRRP to train their populations.

5.6 Global Energy Efficiency Alliance

The United Arab Emirates (UAE) launched the Global Energy Efficiency Alliance at COP29, hosted in Azerbaijan.

- **Aim** - To ***double global energy efficiency rates by 2030*** and contribute to significant emission reductions.
- This initiative builds on the 'UAE Consensus' from COP28.
- It encourages strategic ***public-private partnerships*** and bolsters investments in energy efficiency initiatives.
- The UAE plans to lead the alliance by sharing its expertise in energy efficiency, fostering knowledge transfer, and building effective partnership models with the private sector.
- **Features -** It is designed to support the reduction of carbon emissions and the sustainable use of natural resources through knowledge sharing, capacity building, and standardization efforts.

> *UAE Consensus is a commitment that brings together countries, organizations, and corporations to reduce carbon emissions and promote sustainable resource management.*

- It will focus on compiling and disseminating best practices, with a particular emphasis on *assisting African nations.*
- This support will extend to developing financing options and technological solutions vital for the continent's progress in energy sustainability.

Energy Efficiency Global Alliance (EEGA)

- It is ***an international coalition of*** government, corporate, and NGO leaders that champions faster and deeper implementation of energy efficiency solutions to meet global energy and climate goals
- The International Energy Agency (IEA) estimates that energy efficiency could provide *more than 40% of the emissions abatement required by 2040* to be in line with the Paris Agreement (IEA, 2018).
- It *meets annually at the EE Global Forum* to discuss global energy efficiency needs and opportunities, and to coordinate action.

5.7 Global Alliance against Hunger and Poverty

Recently, the G20 Leaders' Summit launched an initiative Global Alliance against Hunger and Poverty in Rio de Janeiro, Brazil.

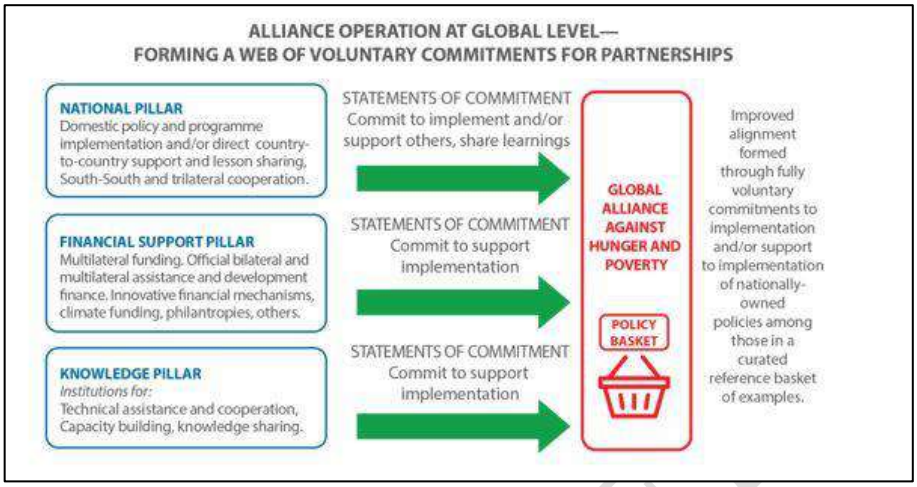
- It is a ***voluntary coalition*** leveraging UN bodies and other organizations for its operations, without having itself a legal personality. The Alliance is conceived as a country-driven initiative.
- **Aim –** To support and accelerate efforts to eradicate hunger and poverty (SDGs 1 and 2) while reducing inequalities (SDG 10) by 2030.

> *622 million people will live below the extreme poverty line of $ 2.15 per day by 2030.*

- **3 Pillars**
  - **National –** Coordination of specific public policies.
  - **Financial –** Large-scale resource mobilization.
  - **Knowledge –** Integration of data and technologies for evidence-based solutions.
- **Need** - In 2015, all 193 UN Member States adopted the '2030 Agenda for Sustainable Development'.
  - **Aim -** To end poverty and hunger, and achieve food security and improved nutrition by 2030.
- **Policy Basket –** It draws from Brazil's experience and other best practices and approaches.
- **Types -** Policies and programs that are included by objective criteria:
  - Well-defined policy instruments, with a clear scope
  - Implemented/implementable by governments
  - Evidence-based
  - Primarily reaching out to people persons experiencing poverty and hunger

- Contributing primarily to reach Sustainable Development Goals 1 and 2.

- **Commitments**
  - 500 million people through income support programs by 2030.
  - Provide school meals to 150 million children in countries with high child hunger rates.
  - Effective Mobilization of billions of dollars through multilateral banks for anti-poverty programs.



- Countries can join the Alliance by submitting ***a Statement of Commitment*** detailing how a state plans to support the initiative.
- **Joined Members - *81 countries (including India)***, 26 international organisations, 9 financial institutions, and 31 philanthropic foundations and non-governmental organisations.
- **Funding -** The $2-3 million required annually for its operations will come from member countries and institutions such as the Food and Agriculture Organization (FAO), UNICEF, and the World Bank.
- The Alliance may be headquartered in Brasilia, or some other Global South country. It will also likely have an office at the FAO headquarters in Rome.

Statements of Commitment is mean to express a robust declaration of intent by the Alliance's members, acting as a catalyst of positive change. They are not legally binding.

5.8 Design Law Treaty (DLT)

India has recently signed the Final Act of the Riyadh Design Law Treaty almost two decades of extensive negotiations.

- **Design Law Treaty (DLT)** – To harmonize procedures and simplify registration processes of ***industrial designs*** in different countries.
- **Adopted by** - World Intellectual Property Organization (WIPO).
  - All 193 contracting parties of the WIPO have enforced the treaty.
- **Goal -** To ensure the streamlined design protection accessible to all stakeholders, with particular emphasis on
  - Small and Medium-Sized Enterprises (SMEs),
  - Startups and
  - Independent designers.
- **Features** – It work towards implementing electronic industrial design systems and facilitating the electronic exchange of priority documents.
- **Benefits –** Its benefiting design applicants, including
  - Relaxed time limits,
  - Reinstatement of lost rights,
  - Option to correct or add priority claims,
  - Simplified procedures for recording assignments and licenses,

India has tripled the domestic filings increasing by 120% in the last 2 years and design applications grew by 25% last year.

World Intellectual Property Organization (WIPO)

- It is the United Nations specialized agency that serves the world's innovators and creators, to protect and promote their intellectual property (IP).
- **Established on** - 14 July 1967.
- **Headquarters -** Geneva, Switzerland.
- **Member states –** 193.
- All member states of the UN are *not obliged, to become members* of this specialized agency.

- Option to file multiple designs in a single application.

- These changes provide greater flexibility for design applicants.
- It reduces administrative burdens, and promoting global creativity in design.
- It empower startups and SMEs by boosting their competitiveness and supporting market growth.
- **India's role –** It reaffirms its commitment to fostering inclusive growth and ensuring equitable access to intellectual property protection.
- It combined with initiatives like the Startup India program and the Startups Intellectual Property Protection (SIPP) scheme.
- The policy integrates design protection with traditional knowledge and cultural expressions.

6. ECONOMY

6.1 Purchasing Managers' Index (PMI)

India's services PMI recovered from its 10-month low in September to reach 58.5 in October supported by strong expansions in output and new business, which in turn boosted job creation.

- The Purchasing Managers' Index (PMI) is an indicator of the prevailing direction of economic trends in the ***manufacturing or service sectors.***
- **Released by** - The ***Institute for Supply Management (ISM)***, a nonprofit supply management organization.
- The indicator is compiled and released ***monthly*** is a survey of supply chain managers across 19 industries, covering both upstream and downstream activity.
- The value of the PMI and its movements can provide useful insight to business decision makers, market analysts, and investors.
- The PMI is a leading indicator of overall economic activity in the U.S.
- **Calculation** - *PMI = (P1 * 1) + (P2 * 0.5) + (P3 * 0),* Where
    - P1 = percentage of answers reporting an improvement
    - P2 = percentage of answers reporting no change
    - P3 = percentage of answers reporting a deterioration
- **Focused areas -** The PMI is based on 5 major survey areas each of which is weighted equally - New orders, Inventory levels, Production, Supplier deliveries, Employment.
- **Headline** - The headline PMI is a number from ***0 to 100.***
    - A PMI above 50 represents an expansion when compared with the previous month.
    - A PMI reading under 50 represents a contraction while a reading at 50 indicates no change.
    - The further away from 50, the greater the level of change.
- The PMI is usually released on a monthly basis, offering up-to-date information about the economic activity in the manufacturing or services sector.
- Changes in the PMI can signal shifts in economic activity before those changes are seen in other indicators like GDP growth or employment numbers.
- The PMI also captures information from various sub-components such as new orders, production, employment, supplier deliveries, and inventories.

6.2 Central Value Added Tax (CENVAT) Credit

Recently, the Supreme Court allowed telecom companies to claim Central Value Added Tax (CENVAT) credit for the installation of mobile towers and shelters.

- It allows a manufacturer to utilize the ***credit of excise duty/additional duty*** paid for the procurement of input services to pay off the excise duty on his/her final product or output services.
- It was introduced as a modification to the previously functioning ***Modified Value Added Tax*** or MODVAT.
- During the course of the manufacture of final products, the raw materials travel through various stages of production, wherein a duty is levied on every value-added at each stage.
- CENVAT, therefore, ***eliminates this double taxation***, thereby simplifying taxation for manufacturers, and consumers at large.
- The CENVAT Credit Rules, 2004 established to implement CENVAT across the country and offer Indian manufacturers of final products certain tax credits on the excise duty payable by them.
- CENVAT credit refers to the set-off available to manufacturers if they utilise some specific inputs for manufacturing their products.

Central Value Added Tax (CENVAT) Credit Rules, 2004

- It exercises the powers conferred by section 37 of the Central Excise Act, 1944, and section 94 of the Finance Act, 1994.
- Rule 2(a)(A) Capital Goods - All goods falling under the First Schedule to the Excise Tariff Act, and
- Pollution control equipment, components, spares and accessories of the goods, moulds and dies, jigs and fixtures, refractories and refractory materials, tubes and pipes and fittings and storage tank used.
- 2(k)Input - All goods, except light diesel oil, high speed diesel oil and motor spirit, commonly known as petrol, used in or in relation to the manufacture of final products whether directly or indirectly and whether contained in the final product or not, or used for providing any output service.

- A manufacturer can claim CENVAT credit on the following cases
  - **Excise duty on a final product -** For manufacturers and producers of final products.
  - **Service tax on output services** - For providers of taxable and exempted services.
  - **Input and capital goods** - If these goods are being partially processed.

7. AGRICULTURE

7.1 Soil Degradation and retrogression

The Minister of Agriculture and Farmers' Welfare raised a concern over soil degradation, which affects 30% of the India's land.

Soil Degradation

- It is the physical, chemical and biological decline in soil quality.
- It is caused by its improper use or poor management, usually for agricultural, industrial or urban purposes.
  - Soil degradation can involve
  - Water erosion, including sheet, rill and gully erosion
  - Wind erosion
  - Salinity, including dryland, irrigation and urban salinity
  - Loss of organic matter
  - Fertility decline
  - Soil acidity or alkalinity
  - Structure decline, including soil compaction and surface sealing
  - Mass movement
  - Soil contamination, including the effects of toxic chemicals and pollutants.

India produces over 330 million tonnes of foodgrains annually and exports agricultural products worth $50 billion.

12 million hectares of agricultural soils are lost globally through soil degradation every year.

- **Influencing Factors** - Excessive fertiliser use, imbalance in nutrient application, unsustainable exploitation of natural resources, and poor soil management practices.
- **Relevant UN convention / multilateral treaty**
    - Land Degradation Assessment in Dryland (LADA) (FAO, 2020b),
    - Global Assessment of Human-Induced Soil Degradation (GLASOD) 1991 (ISRIC, 1991),
    - United Nations Convention to Combat Desertification (UNCCD) (UNCDD, 1994).
- **Soil degradation in India -** 30% of the soil in India is degraded.
- Of this, around 29% is lost to the sea, 61% is transferred from one place to another, and 10% is deposited in reservoirs.
- The worst affected states are Punjab, Haryana, Gujarat, Maharashtra, Andhra Pradesh and Telangana.

Soil Retrogression

- Retrogression is primarily due to soil erosion and corresponds to a phenomenon where succession reverts the land to its natural physical state.
- It is a form of evolution that is distinct from normal evolution and is influenced by the local climate and vegetation.
- It results in reduction in ecosystem productivity band standing plant biomass, declines in the availability of nutrients and shifts in both aboveground and belowground communities.
- It gets dominant by nutrient-stress-tolerant, slow-growing species that are adapted to nutrient poor conditions.

8. ENVIRONMENT

8.1 Ranthambore National Park

In a recent report, officials say that 25 out of 75 tigers were missing last year in Ranthambore National Park.

- The National Park, named after the ***Ranthambore fort***, is situated in Karauli and Swai Madhovpur districts of ***Rajasthan.***
- It is one of the largest tiger habitats in India.
- **Range** - It is located at the junction of ***Aravallis and Vindhyan ranges.***
- **History** - It was established initially as Sawai Madhopur Game Sanctuary in 1955 by the Government of India.
- In 1973, it was declared as one of the ***Project Tiger reserves*** in India.
- In1980, it was declared a national park, while the forests located beside it were named Sawai Man Singh Sanctuary & Keladevi Sanctuary.
- **Rivers** - It is bounded to the north by the Banas river and to the south by the Chambal river.
- **Topography** - It is dry deciduous forests and open grassy meadow.
- **Flora -** There are about 539 species of flowering plants where the Dhok tree is the most common type of tree, apart from it, mango, tamarind, and banyan are amongst the other tree species.
- Ranthambore is also famous for housing one of the largest banyan trees in India at Jogi Mahal.
- **Fauna** – It is popular for being a natural habitat for ***Royal Bengal Tiger.***

- It also has a rich population of leopards, sloth bears, several deer species like chital (spotted deer), marsh crocodile, palm civet, jackal, desert fox, serpent eagle, waterfowl.
- 40 species of mammals, 35 species of reptiles and 320 species of birds found inside the park.

- Birds include serpent eagle, waterfowl, cormorant, painted spurfowl, sarus crane, bronzed-winged jacana, sandpiper, kingfisher, nightjar, painted sandgrouse, and great-horned owl.
- Most of the birds inhabit the areas around the 3 large lakes Padam Talao, Malik Talao and Rajbagh Talao.
- **Significance** - Tiger populations in Ranthambore are smaller, isolated populations.
- This makes them less genetically diverse due to lesser intermixing of different populations.
- **Threats -** Poaching, habitat loss and fragmentation.

8.2 Sukhna Wildlife Sanctuary

The Union ministry of environment, forest and climate change recently issued a notification demarcating an area of 1 km up to 2.035 km around the Sukhna Wildlife Sanctuary on the Haryana side as an ESZ.

> *An eco-sensitive zone (ESZ) is an area surrounding protected areas like national parks and wildlife sanctuaries that require special protection due to their rich environmental resources.*

- The Sukhna Wildlife Sanctuary spread over 25.98 square km in the North-East of Sukhna Lake.
- It is under the administrative control of the ***union territory of Chandigarh.***
- It shares its boundaries with Haryana and Punjab.
- The sanctuary is located in the ***Shivalik foothills,*** which are considered ecologically sensitive and geologically unstable.
- The soil in the Shivaliks is sandy, embedded with pockets of clay which is highly susceptible to erosion by surface run off.
- **Recent Notification -** The prohibited activities include commercial mining, stone quarrying, crushing units, sawmills, industries causing water, air, noise, and soil pollution, commercial use of natural water resources including groundwater, wood-based industry, etc.
- Among the regulated activities, no new commercial hotels and resorts shall be permitted within zone 1 and 2 except for accommodation for temporary occupation of tourists related to eco-tourism activities.
- However, the local residents shall be permitted to undertake construction on the land for their bona fide residential use.
- **Sukhna Lake -** It is a man-made, rainfed lake, constructed in 1958 by damming the Sukhna Choe, a seasonal stream.
- The lake was designed by the creator of the city, Le Corbusier, and the plan was executed by the then Chief Engineer, P L Verma.
- The Lake is declared as a ***National Wetland*** in 1988.

- In sixties & early seventies, the rate of siltation of the lake was very high due to high rate of soil erosion from its catchment area.
- Upto 1988, 66% of the original water holding capacity of the lake was lost due to siltation.
- The lake is home to several species of migratory birds.

8.3 Colors on Birds

New studies advance the understanding of how birds produce their colorful displays and how these traits have evolved.

- Nearly all birds with bright red, orange, and yellow feathers or bills use a group of pigments called ***carotenoids*** to produce their colors.

- However, these animals can't make carotenoids directly. They must acquire them through their diets from the plants they eat.
- Parrots are the exception to this rule, having evolved an entirely new way to make colorful pigments, called psittacofulvins.
- **Recent Findings -** Researchers used recent advances in genetic sequencing to examine which regions of the genome determine natural yellow-to-red colour variation in parrots and finches.
- **Findings in Dusky lory (*Pseudeos fuscata*) –**It is a parrot native to New Guinea with bands of feathers that may be coloured yellow, orange or red.
- The research found that shifts between yellow and red feather colouring were associated with an enzyme called ***ALDH3A2.***
- This enzyme converts red parrot pigments to yellow ones. When developing feathers contain large amounts of the enzyme, they end up yellow; when they have less, they end up red.
- **Findings in long-tailed finch (*Poephila acuticauda*)** – It is a species of songbird native to northern Australia.
- There are two hybridising subspecies with different colored bills. One is yellow-billed while the other is red-billed.
- The bill color in these finches was mostly linked to two genes, ***CYP2J19 and TTC39B.***
- Together, these two genes drive the conversion of yellow dietary carotenoids to red ones.

8.4 Finding of a Large Coral

Recently, the Scientists have discovered the world's largest coral near the Pacific Ocean's Solomon Islands.

- **Corals** –Invertebrate animals belonging to a large group of colourful and fascinating animals called Cnidaria.
- Cnidarians exhibit a wide variety of colours, shapes and sizes.
- Each individual coral animal is called a Polyp, and most live in groups of hundreds to thousands of genetically identical polyps that form a 'colony'.
- The colony is formed by a process called budding, which is where the original polyp literally grows copies of itself.

According to the International Union for the Conservation of Nature, 44% of corals living in warm waters are threatened with extinction.

- **Types**
  - **Hard Corals** – It is around 800 known species, also known as the 'Reef Building' corals.
  - **Soft corals –** It include seas fans, sea feathers and sea whips.
  - It does not have the rock-like calcareous skeleton like the others, instead the y grow wood-like cores for support and fleshy rinds for protection.
- **Coral Reefs -** Hard corals extract abundant calcium from surrounding seawater and use this to create a hardened structure for protection and growth.
- Coral reefs are therefore created by millions of tiny polyps forming large carbonate structures.

Recent Findings

- **Mega Coral –** It is ***not a coral reef*** but is a collection of many connected, tiny creatures that together form one organism rather than a reef.
- It is ***made of nearly one billion little polyps***, pulsing with life and colour.
- It has been growing for 300 years or more.
- **Location -** The coral was discovered at the southeastern tip of the Solomon Islands, in an area known as ***the 3 Sisters.***
- **Size –** It measures about 111 feet wide and 104 feet long.
- It was ***3 times bigger*** than the previous record holder coral, a dubbed Big Momma in American Samoa.

The National Geographic Pristine Seas program works to restore the health and productivity of the ocean and improve the livelihoods of coastal communities by protecting the ocean from overfishing.

- It is longer than a blue whale and thought to be so colossal that it could be seen from space.

- It was spotted during a scientific expedition launched by the National Geographic Pristine Seas Program.

8.5 Fossilisation

Fossils provide snapshots of ancient life and environment when they existed in living form, offering invaluable insights into the history and evolution of nature.

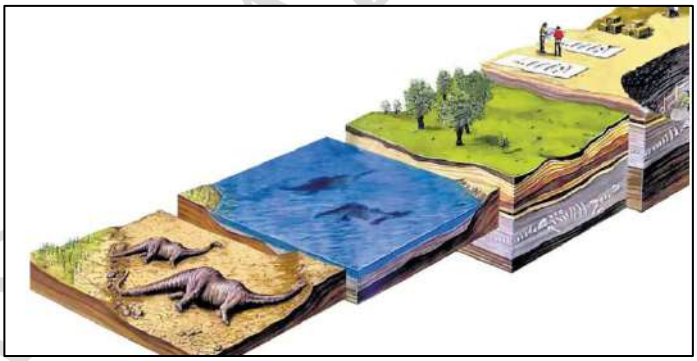
- **Fossilisation** – It is the process by which *organic materials* like plants, animals, and other life forms, are preserved in the Earth's crust over geological time.
- **Formation** – It is a rare occurrence in natural form as most organisms decay before they can become fossilised.
- It can take anywhere from ***thousands to millions of years.***
- **Conditions for formation** – The organism *must be buried quickly after death* as scavengers, bacteria, and environmental factors like weathering and decay, will break it down.

Ideal Conditions to Preserve the Body

- **Ideal place** – It is any place with *deep water, tar pits, or areas with rapid sediment deposition*, where the remains may be preserved before the decomposition process can fully set in.
- **Near immediate burial** – It *isolates the remains from environmental factors* that would otherwise decompose the organism.

Stages of Fossilisation

- **Death** – *Fossilisation begins* the moment when it dies.
- **Burial** - Once an organism dies, it often ends up in a place where it is covered in sediments such as sand, mud, or volcanic ash.
- Over time, layers of sediment accumulate over the buried remains, increasing pressure on them, which causes compaction, squeezing out remaining water in the tissues.



- The type of sediment in which an organism is buried can significantly affect the type of fossil.

Aquatic organisms usually end up being buried in fine mud and silt, which are more likely to preserve structures like shells or bones, while organisms buried under volcanic ash, can result in very detailed fossils.

- **Permineralisation** – The minerals in the surrounding sediment replace the organic materials in the hard parts of the organism.
- It occurs when *mineral rich water seeps into the pores and cavities of the hard parts* and it crystallise within these spaces, preserving the original structure.
    - Harder parts includes bones, teeth, shells, and wood.
    - Softer parts includes muscles, skin, and organs decays rapidly.

In rare cases, under exceptional conditions like extreme freezing, mummification, or entrapment in amber, soft tissues can also be preserved.

- **Mineralisation** – It converts the remains into a rock-like substance, like *calcium carbonate or silica* can replace the original material, turning the bones or shells into fossilised forms.

8.6 56th Tiger Reserve of India

Recently, Union Minister for Environment, Forest and Climate Change notified the 56th Tiger Reserve in Chhattisgarh.

- **Guru Ghasidas-Tamor Pingla Tiger Reserve** – It is the 56th Tiger Reserve of India located in Chhattisgarh.
- The National Tiger Conservation Authority (NTCA) had accorded final approval for notifying it in 2021.
- **Geographical features** – It is *nestled in the Chota Nagpur plateau and partly in Baghelkhand plateau* thus comprises varied terrains, dense forests, streams and rivers.
- These conditions are favourable for harbouring a rich faunal diversity and contains critical habitats for the tiger.
- **Area** – It is spread over 2,829 square km.

- *Core/critical tiger habitat* spans about 2049.2 square kms comprising the
  - Guru Ghasidas National Park
  - Tamor Pingla Wildlife Sanctuary
- Buffer zone spans around 780.15 square kms.

*Guru Ghasidas-Tamor Pingla Tiger Reserve becomes the **3rd largest tiger reserve** in the country after Nagarjunasagar-Srisailam Tiger Reserve in Andhra Pradesh and Manas Tiger Reserve in Assam.*

- **Landscape complex** – This reserve is *in line with landscape approach* as envisaged in India's National Wildlife Plan.
- It is *contiguous with the Sanjay Dubri Tiger Reserve* in Madhya Pradesh forming a landscape complex of nearly 4500 sq.kms.
  - **Connection in west** - Bandhavgarh Tiger Reserve, Madhya Pradesh
  - **Connection in east** – Palamau Tiger Reserve, Jharkhand

4 Tiger Reserves in Chhattisgarh

- Indravati Tiger Reserve
- Udanti-Sitanadi Tiger Reserve
- Achanakmar Tiger Reserve
- Guru Ghasidas-Tamor Pingla Tiger Reserve

- **Biodiversity** - A total of 753 species, including 365 invertebrates and 388 vertebrates, have been documented here by the Zoological Survey of India.
- The invertebrate fauna is represented mostly by the class insecta.
- The vertebrate fauna includes 230 species of birds and 55 species of mammals.

8.7 Uttarakhand Bird Census

Recently, the two-day bird census has been organised in Uttarakhand.

- It is the ***1st ever bird count in Uttarakhand***.
- **Organised By** - The *E-Bird Organization* in collaboration with the forest department and various other groups.
- **Goal** - To establish a dedicated annual bird count for Uttarakhand, bringing communities together to celebrate the state's rich birdlife.

E-Bird Organization India

- It is a *collaborative project managed by Bird Count India*.
- It is designed for the use of birders.

- **Time** - *Mid-November* is an interesting time for birds count in this region as the *altitudinal migrants descend to lower elevations* and long-distance migrants arrive from far-off lands, joining resident species who are adapting to the presence of this region.

Key findings of the Survey

- **Avian diversity** – It had concluded with ***729 bird species*** across 13 districts.
- **Leading District** – They are in the order as follows
  - **Nainital** - 251 species
  - **Dehradun** - 230 species
  - **Pauri Garhwal**
- **Highest birds count** – It includes the species *Ruddy Shelducks, Indian Spot-billed Ducks, and Eurasian Coots*.

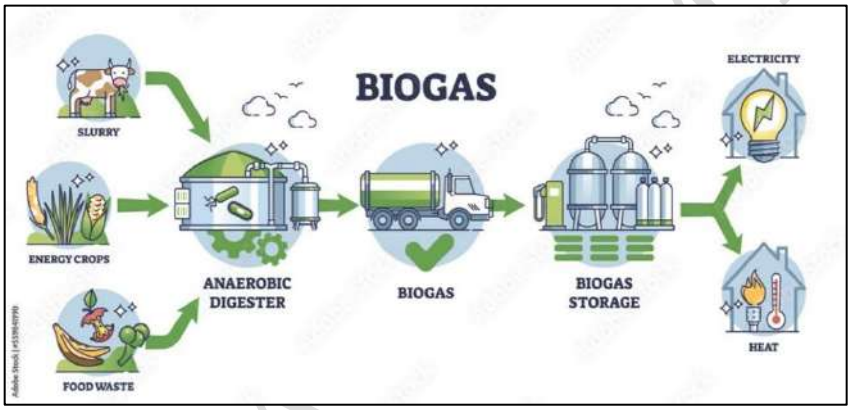
***Bird Count India** is a partnership of a large number of organizations and groups working to increase our collective understanding of the distribution, abundance, and population trends of Indian birds.*

- **Endangered species** - The *17 species classified as endangered* which includes the Pied Avocet, Red-wattled Lapwing, Spotted Dove, Rose-ringed Parakeet, Greater Coucal, and White-throated Kingfisher.
- **Significance** – It primarily focused on identifying the species location to gain a better understanding of the diversity of birds in these regions.
- It helps to understand which bird species are declining in the hills, plains, or wetlands.
- It is crucial for bird conservation efforts in future.

8.8 Compressed Biogas (CBG) Plant

Recently, the Prime Minister inaugurated new 100 tons per day cattle dung based Compressed Bio-Gas (CBG) plant in Gwalior.

- **Compressed Biogas (CBG) -** It is produced by ***anaerobic digestion of biomass and waste sources*** like agricultural residue, cattle dung, sugarcane press mud, municipal solid waste, sewage treatment plant waste, etc.
- **Consists -** Mainly methane more than 90% and other gasses like carbon dioxide less than 4%.
- **Compressed Biogas (CBG) Plant -** It is India's first modern, self-sufficient gaushala that houses a state-of-the-art Compressed Biogas (CBG) plant.
- It is the ***first CBG plant in Madhya Pradesh***.
- **Vision -** Waste to Wealth initiative.
- **Ministry -** Ministry of Housing & Urban Affairs
- **Location -** Adarsh Gaushala, Laltipara, Gwalior.
- It is the *Gwalior's largest cowshed over 10,000 cattle live here*.
- **Operated by -** Gwalior Municipal Corporation.



- **Plant Mechanism –** The biogas will be prepared from cattle dung and garbage such as vegetable and fruit waste materials collected from mandis and homes.
- It transforms cow dung, an often-underutilized resource, into Bio CNG and organic manure.
- It will generate 2 tons of compressed Biogas daily from 100 tons of cattle dung.
- It produces 10-15 tons of dry bio-manure daily, a valuable by-product for organic farming and also produces 2-3 tons of Bio-CNG daily.
- It promoting sustainable practices while reducing carbon emissions.
- **Significance –** It providing a cleaner, eco-friendly alternative to fossil fuels and helping reduce carbon emissions.
- It helps curb carbon emissions, a potent greenhouse gas, making a valuable contribution to climate change mitigation.
- It also creates employment opportunities for locals, boosting the economy while promoting skills in green energy and sustainable practices.

8.9 Phytoplankton Bloom

The researchers found drought in southern Africa's drylands had caused the strongest phytoplankton bloom in about 27 years in the South East of Madagascar.

- **Phytoplankton –** It is a ***microalgae similar to terrestrial plants*** which contain chlorophyll and require sunlight in order to live and grow.
- Its growth depends on the availability of carbon dioxide, sunlight, and nutrients.
- It require inorganic nutrients such as nitrates, phosphates, and sulphur which they convert into proteins, fats, and carbohydrates.
- It float in the upper part of the ocean, where sunlight penetrates the water.
- **Factors** - Influence phytoplankton growth rates, including water temperature and salinity, water depth, wind, and kinds of predators are grazing on them.
- **Main classifications**
    - **Dinoflagellates –** It use a whip-like tail, or flagella, to move through the water and their bodies are covered with complex shells.

- **Diatoms –** It have shells and their structure is rigid, made of interlocking parts, rely on ocean currents to travel through the water.

- It provide food for a wide range of sea creatures like zooplankton, shrimp, snails, jellyfish, and small fish to whales.
- **Phytoplankton Bloom** – Its takes place when a species of phytoplankton ***reproduces at a rapid rate, multiplying quickly in a short amount of time.***
- It also form Harmful Algal Blooms (HABs).
- High concentrations of bloom in the water column can cause the water to appear blue-green, green, brown or even red, depending upon the pigments found in the species experiencing the bloom.

HABs can produce extremely toxic compounds that have harmful effects on fish, shellfish, mammals, birds, and even people.

- It may cover hundreds of square kilometers in the ocean and are easily visible in satellite images.

Recent Findings

- The researchers found that bloom was caused by ***nutrient rich dust like iron, nitrogen, and phosphorus*** that blew from drought drylands in the western parts of southern Africa.
- Major suppliers of dust to the Southern Ocean and its outer edges are
  - Etosha and Makgadikgadi salt pans in Namibia and Botswana,
  - Pans and ephemeral rivers in the coastal Namibian desert, and
  - South-western Kalahari pan belt
- It carried over long distances by wind and deposited into the nutrient limited surface waters through intense rainfall events.
- Blooms of this magnitude are ***rare*** but rising air temperatures, increasing dryness, and higher dust emissions cause such events.
- This abundant food supply could have potentially boosted populations of zooplankton and fish species in the Madagascar region.
- The oceans absorbing carbon dioxide from the atmosphere, making them essential for climate regulation.
- The region acted as a significant carbon sink because of the high rates of photosynthesis occurred.

SPECIES IN NEWS

8.10 Alstonia Scholaris

Cyclone Dana's heavy showers led to Chhatim trees (Alstonia Scholaris) shedding the flowers that have a strong fragrance recently.

- **Family Name** - Apocynaceae.
- **Synonyms** - Echites scholaris, Alstonia kurzii, Tabernaemontana alternifolia, Acokanthera scholaris, Echites pala.
- **Common Name -** Indian Pulai, White Cheesewood, Devil Tree, Blackboard Tree, Milkwood Pine, Dita Bark, Bitter Bark.
- **Size -** It is a medium-sized evergreen tree, usually 12–18 m high, sometimes up to 27 m high, with close-set canopy.
- **Appearance** - Bark is rough, greyish white, yellowish inside, and exudes bitter latex when injured.
- Leaves are 4 to 7 in a whorl, and are thick, oblong, with a blunt tip. They are dark green on the top, and pale and covered with brownish pubescence on the dorsal surface.
- **Floral characteristics -** Flowers are ***fragrant,*** greenish-white or greyish-yellow in umbrella-shaped cymes.
- Follicles (fruits) are narrowly cylindrical, 30 cm × 3 cm, fascicled, with seeds possessing brown hair.

- **Climate** - The species can be grown in a variety of climatic conditions in India, ranging from ***dry tropical to sub-temperate.***
- However, it thrives well in areas where annual rainfall is about 100–150 cm, as it prefers a fairly moist habitat.
- The species grows well in the ***red alluvial soil*** having proper aeration. It can thrive in black cotton soils as well, but the growth is slow due to prevailing moist soil conditions during rainy season.
- **Therapeutic uses -** It is used as a substitute for cinchona and quinine for the treatment of intermittent periodic fever.
- An infusion of bark is given in fever, dyspepsia, skin diseases, liver complaints, chronic diarrhoea, and dysentery.

8.11 Common Cat Snake

Rare 'Cat Snake' recently spotted in Valmiki Tiger Reserve, only Tiger reserve in Bihar.

- **Scientific Name** - Boiga trigonata.
- The common cat snake is far ***less venomous*** than other snake species and is also considered ***extremely rare.***
- **Morphology -** It is a ***medium-sized*** snake that is usually found in 70-100cm range.

- Its body is slender, thin and bears a thin tail. Its upper body colour is grey-brown, with cream coloured irregular markings, margined with black colour.
- Its underside is yellow-white or yellow-brown, with most of the ventral scales having dark spots.
- Its head is large, triangular-shaped and distinctly broader than the neck. Its eyes are large and bear vertical pupils.
- Unlike other Cat Snakes of its range, this species bears characteristic “gamma” or “Y” shaped marking that helps in its quick identification on the field.
- **Behavior -** These snakes are ***nocturnal***, meaning they become active and hunt as darkness falls.
- During the day, their pupils shrink to narrow vertical slits, but as night approaches, the pupils dilate and become almost round.
- **Habitats -** It can be found in almost all types of forests and at a wide range of elevations.
- It hides in tree holes, crevices, and dense vegetation at low to moderate heights.
- **Distribution -** Sri Lanka, India, Pakistan, Nepal, Bangladesh, Afghanistan, southern Turkmenistan, southern Uzbekistan, southeastern Tajikistan, and Iran.
- It is found all around India, excluding north-east states after Sikkim.
- **Conservation status** - **IUCN –** Least Concern.
- It is posing no life-threatening risk to humans, does have an impact on small animals.
- Its venom can be dangerous to creatures such as lizards, frogs, rats, and birds, which the snake typically preys on.
- This natural behavior helps maintain balance within its ecosystem.

8.12 Haast's eagle

The Haast’s eagle gone extinct 500 years ago stands as the largest eagle ever existed.

- **Scientific Name -** Hieraaetus moorei.
- **Native -** It is native to the South Island of New Zealand.
- It is the ***largest eagle to ever exist***, Weighing about 10-18 kilos (22-40 pounds).

- It was much bigger in weight and length than the largest vultures that are still alive, such as the black vulture or the Andean condor.
- **Appearance** - For its size, its wingspan was rather short. The Haast's eagle has a pale head, large, black-and-white birds with a crimson crown and wings that were tinted with yellow-green.

- **Behavior -** It is a raptorial bird and an apex predator.
- Like other forest-dwelling raptors like goshawks or harpy eagles, Haast's eagles most likely hunted in New Zealand's deep woods and shrublands.
- **Prey** - The moa was one of the huge, flightless bird species that the Haast's eagle preyed on most, which finally caused the species to go extinct.
- Moa was up to ***15 times the weight of its predator***, the Haast's eagle, whose enormous beak could potentially tear into its prey's internal organs, causing blood loss that would have led to death.
- The moa, its prey, had a maximum weight of 200 kg (440 lb).
- A Haast's eagle could have easily monopolised a single enormous kill over several days because there were no other large predators or kleptoparasites around.
- **Extinction -** The species vanished around 1445 due to loss of prey.

8.13 Okinawicius Tekdi

A post-graduate student from Maharashtra has discovered a new jumping spider species, Okinawicius tekdi from a hill located in the heart of Pune city.

- **Genus** - Okinawicius Proszynski, first described from India in 2016.
- **Nomenclature** - Tekdi in Marathi translates to 'hill' and the species was named as a tribute to the geographical origin of the animal.

Male Palp is a pair of sensory appendages that arise from the mouthparts of crustaceans and insects.

- **Appearance -** The spider is distinguished by its morphological characteristics, especially in the female genitalia.

- A notable identification feature is the ***membranous coils*** of the copulatory ducts, which lie parallel to the surface.
- The male O. tekdi sp. nov. resembles O. tokarensis discovered in 1987.
- But it also shares similarities in ***male palp*** with species from the Afraflacilla genus, such as A. kurichiadensis and A. avadavathurensis, both described from India in 2022.
- This similarity underscores the importance of examining the female counterparts of the Afraflacilla genus, as ***only one female*** has been described among the 6 known species from India.
- The species was later found on confluence of rivers Ram and Mula, near the Baner hills.
- It has been seen on plumeria, Ficus and Morinda trees, but its habitat is still unknown.

8.14 Amorphophallus Titanum

People in Geelong city have beelined to witness an unusual event, the blooming of the Amorphophallus Titanum.

- Amorphophallus Titanum (called Titan Arum in short) is a rare species, blooms once in a decade.
- It is also called the ***'corpse flower'.***
- **Size** - It is one of the largest in the world, growing over 10 ft. in height.
- It was first described by Italian botanist ***Odoardo Beccari*** in 1878.
- **Native -** It is native to western Sumatra, Indonesia.
- **Fragrance -** The flower smells like putrid dead bodies, only release this smell for 24-48 hours.

- It mimics the stench of rotting flesh to attract its pollinators, carnivorous bees and flies that feed on corpses (tactic called 'sapromyophily').
- **Features –**The massive inflorescence of the titan arum consists of an inner flower spike, known as a spadix, surrounded by a petal-like collar known as a spathe.
- The large furrowed spathe is green to cream-colored on the outside and tightly encloses the spadix before opening to reveal its deep crimson to purple interior.
- The upper, visible half of the spadix is smooth and yellowish to brown in color, and the entire spadix can reach more than 3 meters in height.
- At the base of the phallic structure is the 'corm', an underground structure that stores energy over the decade that it takes for it to bloom and the 6 more months it needs to fruit.

- This corm can weigh around 45 kilograms, the heaviest in the plant kingdom.
- Just one green shoot (that grows to be as tall as a tree) appears every year till the flower blooms to gather energy for it to survive.
- Each Titan Arum produces around 400 reddish-orange fruits containing two seeds each.
- **Habitat -** It blossoms on limestone hills in the rainforests of western Sumatra, Indonesia, where it is called *bunga bangkai* (*bunga* means flower and *bangkai* means corpse).
- Titan Arum *doesn't bloom* in the wild in Australia.
- **Conservation status –** IUCN- Endangered
- **Other similar species**
    - **Rafflesia arnoldi -** The largest individual flower in the world.
    - **Dracunculus vulgaris, Stapelia gigantea, Hydnora africana and Helicodiceros muscivorus**, as well as varieties of the Titan Arum, also emit a strong smell of decaying flesh to attract pollinators.

8.15 Comb jellies

Researchers recently discover new species of marine creatures that can age in reverse.

- Comb jellies are also known as ***ctenophore Mnemiopsis leidyi.***
- The comb jelly is an ***oval-shaped animal*** with 8 rows of tiny comb-like plates that it beats to move itself through the water.
- As it swims, the comb rows break up (diffract) light to produce a shimmering rainbow effect.
- Voracious predators of other jellies, some comb jellies can expand their stomachs to hold prey nearly half their own size.
- **Habitat -** Open waters
- **Diet -** Other ctenophores, some salps and siphonophores.
- **Research Findings -** It is a ***new species of marine invertebrate*** that breaks the traditional cycle of birth, ageing, and death to which most animals are bound.
- It can defy age and revert to younger versions of themselves, could be one of the first animals to have existed in the world as their presence goes back 700 million years.

- The adult comb jelly can regress and reach a larval stage if they are subjected to extreme stress.
- Over several weeks, the species not only reshaped their morphological features, but also had a completely different feeding behaviour, typical of a cydippid larva.
- ***Turritopsis dohrnii,*** known as the immortal jellyfish, have been observed to undergo reverse biological development too.

8.16 Agasthyamalai Bambootail

Recently, researchers have discovered a new species of damselfly in the Western Ghats of Kerala, near the Peppara Wildlife Sanctuary.

- The damselfly is a ***rare species*** belonging to the group of bambootails.
- **Scientific name** – Melanoneura agasthyamalaica.
- **Genus -** Melanoneura
    - It is ***only the second known species*** in the Melanoneura genus.
    - The other known species is Malabar Bambootail (Melanoneura Bilineata), closely related to the newly discovered species.

- Genetic analysis revealed over 7% variation in the ***mitochondrial cytochrome oxidase-I gene*** between the new species and its closest relative.
- The structural differences in its prothorax, anal appendages, and secondary genitalia further set it apart.
- **Unqiue Feature -** It has long black body with brilliant blue markings.
- **Appearance** – It has long cylindrical abdomen resembling a bamboo stalk, which inspired its common name.
- **Habitat –** The species was first observed in streams of the Karamana River, outside the reserved forest area.
- **Distribution –** It has also been recorded in Ponmudi Hills and Bonacaud within the Agasthyamalai landscape.

8.17 Crinum andhricum

Botanists have discovered a new species of flowering plant, 'Crinum andhricum' in the Eastern Ghats of Andhra Pradesh.

- **Family –** Amaryllidaceae.
- It is the latest addition to India's Crinum species, bringing the total to ***16.***
- **Nomenclature -** The species was named after Andhra Pradesh in recognition of the State where it was first found.
- **Genus –** Crinum, several being endemic to India.
    - It has unique characteristics that set it apart from other known species in the 'Crinum' genus.
    - The plant is closely related to two species, Crinum amoenum and Crinum stracheyi but differs in key ways.

- **Uniqueness -** Crinum andhricum has distinct features, including
    - Wider, ***oblanceolate perianth lobes*** (the outer part of the flower) and
    - A greater number of flowers per cluster-producing between ***12 and 38*** flowers in each.
- It also noted that the plant's pedicelled flowers (with a stalk-like structure) make it unique among species in the region.
- **Habitat -** It was found growing in the ***dry, rocky forests*** of the Sapparla hills.
- **Appearance -** The flowers of Crinum andhricum are waxy white, blooming between April and June.
- The tall stem that reaches up to 100 cm. The leaves are large, elliptic, and have smooth, entire margins, features.
- **Conservation status -** The researchers have given Crinum andhricum a preliminary status of ***'Data Deficient'*** under the International Union for Conservation of Nature (IUCN) guidelines.
- **Threats -** Forest fires and grazing.

8.18 Lesser mealworm Larvae

A new plastic-eating insect, lesser mealworm larvae discovered recently in Kenya.

- Mealworm larvae are ***plastic-eaters*** that are capable of consuming polystyrene.
- **Scientific Name -** Alphitobius diaperinus.
- It is also known as litter beetle.
- It is a small group of insects and is found ***native to Africa,*** can be found in many countries around the world.

Polystyrene, commonly known as styrofoam, is a plastic material that's widely used in food, electronic and industrial packaging.

- It is the first insect species capable of breaking the polluting plastic down.
- The lesser mealworm is the larval form of the Alphitobius darkling beetle.
- The larval period lasts between 8 and 10 weeks.
- It is mostly found in poultry rearing houses which are warm and can offer a constant food supply, ideal conditions for them to grow and reproduce.
- **Recent Findings -** The insects could be eating the polystyrene because it is mostly made up of carbon and hydrogen, which may provide them an energy source.
- The microbes and enzymes produced by lesser mealworms can be used in factories, landfills and cleanup sites for waste management.

8.19 Red-Headed Vulture

A rare Red-Headed Vulture recently spotted for the first time in Kasaragod, Kerala.

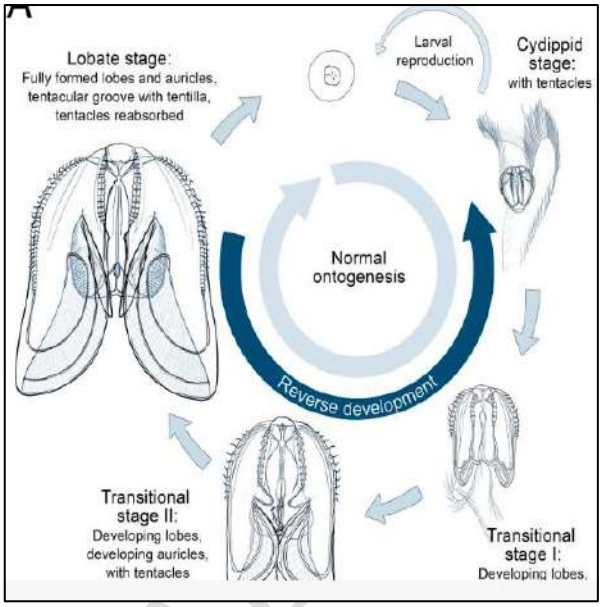
- **Scientific Name -** Sarcogyps calvus.
- **Family –** Accipitridae.
- It is also known as the ***Asian King Vulture.***
- **Appearance –** It is a dark, medium-sized vulture with a bare reddish head and loose flaps on the side of the neck.
- It distinguished by its scarlet crown and black body.
- **Wingspan -** Up to 2.5 m.
- **Weight -** Around 5 kg and averaging over 80 cm in length.
- **Habitats -** Inhabits ***dry forests*** and adjacent areas.
- **Distribution -** It is typically found in Central India, Nepal, Myanmar, Thailand, Vietnam, and parts of Kerala, Karnataka, and Tamil Nadu.
- **Behavior** - The vulture is ***primarily solitary,*** often seen alone or with a mate.
- **Breeding -** Breeding typically takes place between November and January.
- **Conservation status**
  - **Wild Life Protection Act, 1972 -** Schedule-I.
  - **IUCN -** Critically endangered
- **Threats -** Habitat loss, food scarcity, and, most notably, the use of diclofenac, a drug given to cattle that proved fatal to vultures feeding on carcasses.

8.20 Reverse Development in Jellyfish

Recently, scientists in Norway have discovered that comb jellies from the species Mnemiopsis leidyi reverse from a mature "lobate", or adult with lobes, to an early larval-state when stressed by starvation.

Brain plasticity *refers to the capacity of the nervous system to change its structure and ultimately its function over a lifetime.*

- **Reverse development in Jellyfish** – A process where an adult comb jelly reverses their development and ***become larva again when stressed by starvation.***
- It helps them survive because *larva eat less than the adults*.
- When *Mnemiopsis leidyi* regress, they *grow a new "structure" tentacles*, which the adult doesn't have and the tentacles need a specific nervous system to function.
- This reverse development is just like the "immortal" ***Turritopsis dohrnii,*** a jellyfish that was discovered in 1980's.
- **Survival strategy** – Once they are back at the larval, or cydippid stage, if they are provided with enough food, they can *grow back to an adult.*
- And this cycle could *theoretically repeat again and again*.
- Though it doesn't necessarily mean that they live forever as they could get eaten by a predator, for example.



- **Ecological impact** – These species are highly ***invasive***.
- **Significance** – Reverse development can occur also in non-cnidarians.
- **Future prospects** – If a genetic switch exists in them for this process, then we might try to see if it works also in human cells.
- The rejuvenation of humans, though, is highly unfeasible due to our low brain plasticity.

	Turritopsis dohrnii	Mnemiopsis leidyi
Group	Cnidarians	Ctenophores
Reverse development	Each individual reverses into a colony of individuals, rather than a single larva.	Each individual can reverse to a single larva.

8.21 Genus Koima

A team of researchers have discovered Koima, a new genus of freshwater fish endemic to the Western Ghats.

- **Genus Koima** – The generic name, Koima is *derived from Malayalam* and is the vernacular word used for loaches.
- It now encompasses 2 known species that were *previously misclassified* under the genus Nemacheilus as Mesonoemacheilus remadevii and Nemacheilus monilis.

*The **family Nemacheilidae** includes a diverse group of freshwater fish found mostly in tropical Asia & Europe and many species are valued both as a food source for local communities and as popular ornamental fish.*

- **Unique features** – It has a unique colour pattern which comprises of
  - Yellowish-brown ground colour
  - A single row of black spots on lateral line
  - All fins hyaline
  - Absence of a uniform banding pattern on dorsal side

- **Habitat** – Kunthi, Bhavani, Moyar, Kabini, and Pambar rivers in the Western Ghats.

Koima Remadevii

- **Habitat** – *Swift-flowing riparian streams with substrates* comprising rocks, boulders, and gravel, with sand and silt patches scattered throughout.
- **Microhabitats** – These substrates produce a variety of microhabitats like gaps under boulders, and clefts between rocks that provide protection from powerful currents.

- **Observation** – Currently, it is only known from its type locality in the *Kunthi River inside Silent Valley National Park.*

Koima monilis

- **Microhabitats** – It ranges from *large rivers to small, fast-flowing streams* at elevations between 350 and 800 m.
- **Observations** – In various *tributaries of the Cauvery River*.

- **Significance of discovery** – It highlights the importance of Western Ghats as a biodiversity hotspot and a centre of endemism, it also underscores the need for a comprehensive taxonomic revision of many freshwater fish groups including nemacheilid loaches.

8.22 Dicliptera srisailamica

Recently, a team of botanists from the Botanical Survey of India (BSI) had discovered a new flowering plant species in the Nagarjunasagar Srisailam Tiger Reserve.

- It is a *flowering plant found in the Eastern Ghats* of Andhra Pradesh & Telangana.
- It is named after the temple town of Srisailam
- **Taxonomy**
  - **Family** – Acanthaceae
  - **Genus** – Dicliptera (*tropical and subtropical* presence worldwide)
- **Habitat –** They were found in *rare patches along stream banks and rocky edges.*
- **Features** – It is an ***erect herb, reaching up to 90 cm***, with 4-angled stems covered in fine, deflexed hairs when young.
- Its leaves are ovate, with prominent veins and smooth margins.
- It blooms with small, *pink, bi-lipped flowers* arranged in clusters, commonly seen from October to January.
- **Threat** – It is susceptible to environmental disturbances.
- **Conservation status –** It has not yet been evaluated.

*In India, the **Dicliptera genus** includes 27 species, 8 of which are endemic to the country. Andhra Pradesh alone is home to 7 recorded species, contributing significantly to the flora of the Eastern Ghats.*

Dicliptera srisailamica differs from Dicliptera beddomei in several ways, such as having short, downturned hairs on the stem and distinctive bracts around the flowers.

8.23 Cicadas

Recently, scientists have found that 3 groups of cicadas emerged together for the first time in North America after 1,547 years.

- **Cicadas** – They are ***medium to large insects*** and
- **Family -** Cicadoidea, consists of more than 3,000 species of sound-producing insects.
- **Scientific Name** – Cicadoidea.
- **Appearance** - They have short antennae, 2 pairs of transparent membranous wings, prominent compound eyes, and three simple eyes that form a triangle between the compound eyes.
- **Size** - Ranging from *2 to 5 cm* (0.8 to 2 inches).
- **Types**
- **Annual cicadas –** They emerge from the ground at different times each summer.
  - **Appearance** – They are usually dark with greenish markings.
  - **Life Cycle** - Span 2–5 years.
  - **Distribution -** Annual cicadas can be found throughout the world.

- **Periodical cicadas -** Even periodical cicadas occur most years in different geographic regions as they are split among 15 brood cycles, each lasting 13 or 17 years.
  - **Appearance -** They have black backs, orange bellies, and red eyes.
  - **Life cycle** - Emerge in spring only every 13 or 17 years.
  - **Distribution -** Periodicals are unique to North America.
  - **2 specific broods** - Brood XIX - Southeastern United States, and Brood XIII – Midwest United States have emerged together.
  - Periodical broods emerge in synchrony depending on the year and soil temperature.
  - They wait for the right conditions for breeding, which are when the ground thaws to ***65°F (18°C)*** in a brood's designated year.
- **Sounds – *Males produce this species-specific noise*** with vibrating membranes on their abdomens.
- It uses different sounds to express alarm or attract mates.
  - **3 distinct sound responses -** a congregational song, a courtship song, and a disturbance squawk.
- **Habitat -** Forests, Tropical jungles, Grasslands, Deserts, Chaparral, and Scrub forests.
- **Distribution -** They are found in ***tropical and temperate areas*** worldwide.
- **Diet –** *Drink plant sap* from the xylem of various species of trees, including oak, cypress, willow, ash, and maple using their sucking mouthparts.
- **Life cycle –3 stages** - Egg, Nymph, and Adult.

The largest cicadas in the world are found in Asia.

Recent Findings of Life Cycle

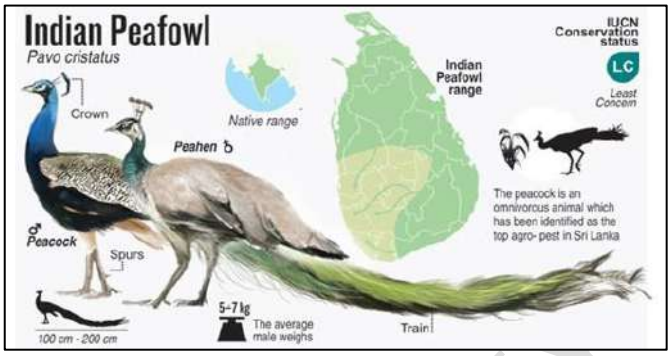
- For the first time in more than 200 years, two specific broods of the 13- and 17-year cicadas have emerged together - Brood XIX, in the southeastern United States, and Brood XIII, found in the country's Midwest.
- It coincides with the emergence of a big batch of Australian greengrocer cicadas, which have a 7-year life cycle.
- North American periodical cicadas span life cycles for ***prime numbers of years (13-17 years)*** and Australian cicadas with their 7-year cycle.
- Its way of survival is to emerge from the ground when its predators are lying dormant.
- It will help them avoid emerging simultaneously as their predators.
- It turns out to be the best way to avoid periodical predators.
- It will also help them to avoid interbreeding with other broods.

8.24 Indian Peafowl

Recently, scientists from the Salim Ali Centre for Ornithology and Natural History (SACON) indicated an exponential rise in the population of peafowl in Tamil Nadu.

- Indian peafowl are a species in a group of birds called ***pheasants.***
- **Scientific Name** – Pavo cristatus.
- **Family -**Phasianidae.
- It is known as the ***common peafowl or blue peafowl***.
- **Sex – Male -** It is a Peacock.
  - **Appearance** – Blue-coloured head with a fan-shaped crest and is best known for its long train.
  - **Size –** Tail length of 100–230 cm to the end of a fully grown train.
- **Female -** It is a Peahen.
  - **Appearance -** Brown in color, with a white face and iridescent green lower neck, and ***lacks the elaborate train.***
  - **Size –** Tail length around 38 cm.
- Together, they are peafowl.

- **Habitat -** Scrub forests and forest edges, which prefer moist, dry deciduous and semi-arid habitats.
- **Distribution –** Indian peafowl are native to India and Sri Lanka, in South Asia.
- **Diet –** It is ***omnivorous*** and feeds on grass, seeds, flower buds, fruits, insects, small reptiles and snakes, and on a wide range of crops in cultivated areas.
- **Breeding -** It spread out over the entire year and is more common during the monsoon months of June to August.



- **Conservation Status**
  - **Wildlife Protection Act, 1972 -** Schedule-I.
  - **CITES -** Appendix III.
  - **IUCN –** Least Concern.
- **Threats -** Pesticide poisoning, electrocution, and vehicular accidents were the top causes of peafowl mortality.

8.25 Raorchestes asakgrensis

Recently, scientists from the Salim Ali Centre for Ornithology and Natural History (SACON) discovered a new frog species, Raorchestes asakgrensis.

- It is a newly discovered frog species in ***Meghalaya.***
- **Family** – Rhacophoridae.
- It is also known as ***Asakgre bush frog***.
- **Nomenclature -** It is named after the *Eman Asakgre Community Reserve*, where it was discovered.
- It is a *nocturnal individual of bush frogs*, which are most active at night.
- **Features -** Found at an elevation of 174 meters in Eman Asakgre, this small arboreal frog is distinctive for its pointed snout and ***visible tympanum.***
- **Size – Male** – It measures about 20.49 mm in snout-vent length.
  - **Female –** It slightly has a larger snout at 22.8 mm.
- **Calls -** Males call from shrubs at dusk, perched 1.5 meters or higher, with calling activity peaking after the first monsoon rains.
- **Distribution -** Found at the sites of Garo Hills and Khasi Hills of Meghalaya, New Delhi and Bangladesh.
- **Other species - Raorchestes garo –** Found in Daribokgre Community Reserve, Meghalaya.
  - **Appearance -** It has orange-hued hind limbs and externally visible tympanum
- **Raorchestes kempiae -** Found in Mikadogre Community Reserve, Meghalaya.
  - **Appearance –** It has concealed tympanum and yellow-spotted ventral colour.
- **Conservation Status –** It has not yet been concluded.

Salim Ali Centre for Ornithology and Natural History (SACON)

- **Location** – Anaikatti in the Western Ghats, Coimbatore.
- **Established by** - The Ministry of Environment and Forest and Bombay Natural History Society.
- It is an ideal place for researchers to study more about the multiple ecosystems in this area.
- It has 402 species of flowering plants, 177 species of birds and 107 species of butterflies.

8.26 Saiga Antelope

Recently, the International Union for Conservation of Nature (IUCN) Red List updated the status for the Saiga Antelope from critically endangered to near threatened category.

- It is an ancient species with a ***distinctive oversized nose.***
- **Scientific name -** Saiga tatarica.
- It is a medium-sized ***hoofed mammal*** that lives in herds in treeless steppe country.
- **Unique Feature** - Swollen snout with *downward-directed nostrils.*
- This peculiar bulbous nose helps it endure the harsh conditions and extreme seasonal temperature fluctuations of its native habitat.
- It act as air filters, keeping out dust while cooling the blood during the scorching, dry summers.
- It also functions like radiators, warming the frigid air before reaches the lungs during winter.
- The saiga also adapts to the seasons with a dense winter coat, which it sheds as the temperatures rise.
- **Native -** Steppes and semi-arid regions of Central Asia, has roamed the Earth since the Ice Age.
- **Distribution -** Kazakhstan, Mongolia, the Russian Federation, Turkmenistan, and Uzbekistan.
- **Diet -** Graze in semi-deserts, steppes, grasslands, and possibly open woodlands, eating several species of plants, including some that are poisonous to other animals.
- **Breeding -** Females give birth in late April and May.
- **Conservation Status**
  - **IUCN –** Near Threatened.
  - **CITES -** Appendix II.
- **Threats –** Climatic variability, Hunting, poaching and blood diseases.

8.27 Tuna fish

The Department of Fisheries has notified the Development of Tuna Cluster in the Andaman and Nicobar Islands under the Pradhan Mantri Matsya Sampada Yojana (PMMSY).

Andaman and Nicobar Islands offers 6.0 lakh square km of Exclusive Economic Zone (EEZ) rich in under-exploited sea resources, particularly Tuna and Tuna like high valued species, estimated at 60,000 metric tons.

- It is a saltwater fish that belongs to the ***tribe Thunnini.***
- It comprises 15 species. Of those, 8 are considered "true tunas', 5 species of bluefins and 3 species of yellowfins, all which belong to the genus Thunnus.
- **Scientific name –** Thunnus.
- **Family –** Scombridae.
- **Size -** Ranging from moderate (1.6 ft) to very large in size (15 ft).
- **Appearance -** Tunas are known for their sleek, ***torpedo-shaped*** bodies designed for speed and endurance.
- Tunas have crescent moon-shaped tails and two dorsal fins on their backs, one of which can be flattened to reduce resistance in the water.
- **Unique feature –** They're among the only ***partially warm-blooded fish*** on Earth.
- It has a well-developed network of ***blood vessels below the skin***.

Pradhan Mantri Matsya Sampada Yojana (PMMSY)

- **PMMSY -** It is a flagship scheme for focused and sustainable development of fisheries sector.
- **Aim -** To double the income of fish farmers and fishers in the country and to bring about Blue Revolution.
- **Launched in** - 2020.
- The PMMSY is an umbrella scheme with 2 separate Components namely
- Central Sector Scheme (CS) and
- Centrally Sponsored Scheme (CSS).
- PMMSY is implemented in all the States and Union Territories for a period of ***5 years*** from 2020-21 to 2024-25.

- This vascular system maintain the temperature of their bodies above that of the surrounding water.
- **Habitat -** Tunas are pelagic fish, meaning they live beyond the continental shelf in the open sea, not near coral reefs, the sea floor, or shoreline.

The Atlantic bluefin tuna can swim up to 43 miles per hour and the yellowfin can swim even faster.

- **Distribution –** Found in tropical, temperate, even some cooler waters and worldwide.
- **Diet -** Tunas are ***apex predators***, feed on fishes, squid, shellfish, and a variety of planktonic organisms.
- **Breeding –** Female lay eggs in the open sea over very large areas.
- **Conservation Status – IUCN** - Least Concern.
- **Threats –** Overfishing for both commercial and great value as food.

World Tuna Day is observed every year on 2nd of May.

8.28 Dunlin

Recently, the International Union for Conservation of Nature (IUCN) of Red list has updated the status of Dunlin from Least Concern to Near Threatened species spotted during Kerala Bird Race.

- It is a fully migratory circumpolar breeder found along the coast.
- **Scientific name** - Calidris alpine.
- It is a ***small, plump shorebird*** with droopy bill.
- It is often in *large flocks on mudflats and beaches*, sometimes mixing with other shorebirds.
- A group of Dunlin are known as a *flight, fling, or trip.*
- **Appearance –** Medium sized sandpiper with a slightly down curved black bill, long black legs and feet, and a black beak that droops slightly at the end, and a dull brown-gray color.
- **Unique Feature -** Summer breeding season have a large black belly spot and orange feathers on their back.
- Winter and nonbreeding season all are white with a gray back and head.
- **Size -** 16 to 22 cm with a wingspan of 33 to 40 cm.
- **Habitat –** Breeding season live in ***coastal tundra areas***, and in winter live along mudflats, estuaries, marshes and coastlines.
- **Distribution –** It is a migratory species that nests around the world's arctic regions.
- Dunlin nest in subarctic and arctic tundra, usually in wet areas with slight ridges and ponds.
- **Diet -** Feed in wet marshes and mudflats and eat mainly invertebrates, including insects, snails, worms, and crustaceans.
- It uses its wide, slightly downturned beak to hunt for food in the mud.
- **Breeding –** Summer breeding in the arctic and subarctic regions, and winter along both coasts of the United States and Mexico.
- **Conservation Status – IUCN** - Near Threatened.
- **Threats –** Habitat loss caused by Wetland draining, Global warming, Invasive plants particularly at migration staging and wintering areas, and Vulnerable to Avian Influenza.

8.29 Palpares contrarius

Recently, the Researchers discovered a new antlion species, palpares contrarius for the first time in Tamil Nadu.

- It is a ***large-sized adult antlion species*** that resembles a dragonfly.
- **Order –** Neuroptera, traps ants and other small insects in pits dug into the ground.
- **Taxonomy - Family –** Myrmeleontidae
    - It is the largest group in Neuroptera and is popularly called the Antlions.
    - Over 2,000 species around the world.

- **Appearance –** The antenna is black, the thorax with 3 dark stripes, forewings undulating in the borders, mostly pale in colour, median band crosses the wing, stigma spot projects towards the median.
- No spot at the fork of the cubitus in the hind wing but has dark bands or spots spread across the hind wing.
- The margin of the forewing is sinuate, tips of the hind wings do not falcate. The abdomen is darker towards the apex.
- **Unique Feature -** Curved or clubbed antenna, fluttering flight and fly with their wings flapping vertically.

- **Wingspan –** More than 110 mm in length.
- **Life Cycle -** As a larva inside the soil and debris survives more than a year.
- The adult stage is relatively for a short period with an average lifespan ranging from 20 to 25 days.
- It is very difficult to spot them during the day and can be spotted at night near illuminated spot.
- **Distribution –** Found mostly in Africa, Myanmar, Thailand, and Sri Lanka and
    - Seen in isolated parts of India like Odisha, Maharashtra, Karnataka, Mizoram, Uttarakhand, and Madhya Pradesh.
- **Diet -** The larvae of the antlion form pits in the sand to trap ants.
- **Conservation Status –** It has not yet been concluded.

8.30 Black thrips

The dreaded black thrips recently attacked the chilli crop-growing regions of Karnataka, Andhra Pradesh, and Haryana.

- It is an invasive pest species belonging to the order Thysanoptera.
- **Scientific Name** - Thrips parvispinus.
- It was 1st reported in India in 2015 on papaya in Karnataka.
- **Unique feature -** Wings are long and narrow, with fringe-like edges.
- **Size -** Typically about 1–4 mm long.

- **Feeds on –** It is a polyphagous species and an invasive sucking pest infesting beans, eggplant, papaya, chilli, pepper, potato, shallot and strawberry.
- Found feeding on agriculture, horticulture and ornamental crops.
- **Habitat -** It is a cosmopolitan pest species which have been reported from Thailand, Australia and Europe.
- **Distribution -** France, Greece, Hawaii, Mauritius, Reunion, Spain, Tanzania, Netherlands, besides India and worldwide.
- It widely distributed across Andhra Pradesh, Assam, Chhattisgarh, Gujarat, Karnataka, Kerala, Maharashtra, Odisha and Tamil Nadu.

Polyphagous species are those that feed on or utilize many different types of food.

- **Nature of Damage** - Adults mainly colonize on flowers and underside of leaves whereas larvae suck sap from undersurface of the leaves.
- It harm the crops indirectly by transmitting plant viruses.
- Its infestation increased during heavy rainfall of North East monsoon in contrast to other thrips species.

Crop Protection Business had reported that around 60-70% of the cropped area has been infested with black thrips in Ballari, Karnataka.

- The infestation is more in the black soil regions.
- It was reported in chilli growing areas of Andhra Pradesh, Telangana, and Karnataka for the first time in Rabi 2021- 22.
- **Preventive sprays -** Use of bioagents and bio consortia to deal with the pest.

8.31 Red-Breasted Flycatcher

Recently, the Red-Breasted Flycatcher bird migrated from Eastern Europe to Ameenpur Lake in Hyderabad.

- **Scientific name** - Ficedula parva.
- **Family** – Muscicapidae.
- It is a *small bird* in the Old World flycatcher family.
- This is a ***scarce migrant*** from central and eastern Europe, that is commoner in autumn than spring.
- **Size –** It measures 12 cm.
- **Appearance**
    - **Males** – Brownish on top, faces are bluish-grey, chin and throat are orangish, underparts are otherwise buffish white, and eye is dark and big, and has a pale ring around it.
    - Distinctiveness is the ***plumage of male*** that shows a clear patch of bright colour from the neck below.
    - **Females** - Brown overall on back and whitish overall underneath on the sides of breast and flushed with brownish buff.
- **Unique Feature -** Whitesides to their blackish tail and their tendency to frequently 'cock' it.
- **Song -** Its song is a series of bland and repetitive but sweet whistles, often with a few fuzzy notes.
- **Call –** It frequently calls while flicking its tail, possibly to defend winter territories from conspecifics. It is detected by a rattling sound like "trrrrr".
- **Distribution –** A migratory bird escapes from the harsh winter and enjoys the moderate temperatures in South Asia.
- Found in ***peninsular India*** during the winter season from October to March.
- **Diet –** Feed mostly on invertebrates such as flies, beetles, ants and spiders.
- **Breeding –** West of Central Asia and winters largely in the Indian Subcontinent except in the northeastern part.
- **Conservation Status - IUCN –** Least Concern.
- **Other Similar Species** - Taiga Flycatcher and Kashmir Flycatcher.

8.32 Bar-Tailed Godwits

Recently, the naturalist spotted a 5 bar-tailed godwits at Pulicat lake in Andhar Pradesh.

- **Scientific Name –** Limosa lapponica.
- It is a small bird with long, sharp beaks.
- **Appearance –** It is a large long-legged wader, predominantly brown above, pale below, with a long tapering and slightly upturned bi-coloured bill, pink at the base and black towards the tip.
- **Size –** Males are smaller with shorter bills than females.
    - **Male –** 39 cm
    - **Female –** 41 cm
- **Wingspan –** 70-80cm.
- **Call –** It is onomatopoeic, which means it sounds similar to their name going 'godwit, godwit'.
- **Habitat –** Marine and Intertidal, Wetland, Grassland, Mudflats, shores, tundra.
- **Distribution –** Widespread in summer across northern Europe and Asia.
- **Diet –** Mainly shellfish, marine snails and worms and shrimps.
- **Breeding** – It is in the Arctic of Scandinavia and Siberia.
- **Conservation Status – IUCN** – Near Threatened.

- **Other Similar species** - Hudsonian godwit, Marbled Godwit, Whimbrel and Terek Sandpiper.

9. SCIENCE AND TECHNOLOGY

PHYSICAL SCIENCE

9.1 1GeV Particle Accelerator

The Department of Atomic Energy plans to build a 1 giga-electron volt (GeV) particle accelerator.

- **Particle Accelerator** – It is a machine that uses electromagnetic fields to propel charged particles like electrons, protons and neutrons to very high speeds and energies to contain them in well-defined beams.
- **Function** - Subatomic particles are shoot on to target or made to collide with each other.
- **Applications**
  - Fundamental research in particle physics
  - Used as synchrotron light sources for the study of condensed matter physics.
  - Particle therapy for oncological purposes.
  - Radioisotope production for medical diagnostics.
  - Ion implanters for the manufacture of semiconductors.
  - Accelerator mass spectrometers for measurements of rare isotopes such as radiocarbon.
- India has many particle accelerators (cyclotrons and synchrotrons) in the range of upto 30 MeV but none are in the GeV range.

Accelerators in India		
Accelerators	**Location**	**Applications**
10 MeV electron RF LINAC	• Bhabha Atomic Research Centre, Mumbai	• Photo-fission • Nuclear data
3 MeV electron DC Accelerator	• Bhabha Atomic Research Centre, Mumbai	• Food processing • Industrial applications
6 MeV electron RF LINAC	• Bhabha Atomic Research Centre, Mumbai	• Cargo Scanning
16.5 Medical cyclotron	• Bhabha Atomic Research Centre, Mumbai	• Isotope Production and PET
Variable energy cyclotron	• Variable Energy Cyclotron Centre, Kolakata	• Research in basic and applied nuclear sciences
Synchrotron Radiation Source INDUS-I & II	• Raja Ramanna Centre for Advanced Technology, Indore	• Research Studies
Microtron Accelerator (8MeV)	• Mangalore University	• Photo-fission • Neutron source
Low energy cyclotron (2-3MeV proton)	• Panjab University, Chandigarh	• Research Studies

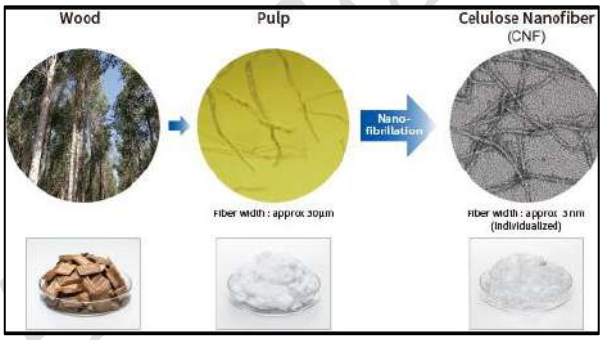
- **1 GeV particle accelerator** — It is a continuous wave, high-intensity proton accelerator that will help convert thorium, abundantly available in India, into uranium-233 nuclear fuel.
- **Other Methods of Leveraging Thorium**
  - **Fast-breeder Reactor** - Breeding uranium-233 by irradiating thorium in a nuclear reactor.
  - **Burn up Configuration** - Using thorium along with uranium in in a reactor to derive surplus energy from thorium **through in situ fission of generated uranium-233.**

In a fast-breeder reactor, one can produce more fissile material than what is consumed.

9.2 Cellulose Nanofibers

A recent study has aimed to create hydrophobic paper by exploiting the mechanical properties and water resistance of cellulose nanofibers.

- **Cellulose nanofibers (CNFs)** – They are tiny elements of cellulosic material with diameters of the order of 15–20 nm.
- They are extracted from agricultural resources such as soy, wheat, corn, beet and biomass.
- **Appearance** - It exist in the form of bundles of cellulose microfibrils, a main component of plant and wood pulp fibers.
- **Properties**
  - Large surface area-to-volume ratio
  - High strength and versatility
  - Good mechanical properties
  - Very low coefficient of thermal expansion
  - Not soluble in aqueous solutions
  - High level of crystallinity



Cellulose is the most abundant renewable organic compound that is structural component of the cell walls of natural plant bodies.

- **Applications** - Cellulose nanofibers have a broad range of applications in areas as food industries, medicine and so forth.
  - Uses in tissue engineering, wound healing, medical implants and delivery of bioactive molecules.
  - Freeze-dried nanocellulose as aerogels are employed in napkins with sanitation purposes, diapers and wound dressing.
  - Composite coating agent in cosmetics
  - Tablets for treating intestinal disorders
  - Used as low-calorie replacements for carbohydrate additives
  - Reinforcing elements in plastics and polymer nanocomposites.

Crystallinity refers to the degree to which a material or substance is composed of ordered, i.e. repeating arrangements of atoms or molecules in a crystalline lattice structure.

9.3 Microplastics

Recently, the researchers founded that microplastics could be affecting weather and climate by producing clouds.

- **Microplastics -** They are fragments of any type of plastic less than 5 mm (0.20 in) in length.
- They can originate from larger plastic waste as it breaks down, Resin pellets, Microbeads, Tires, Synthetic clothing.
- The problem with microplastics is that like plastic items of any size they do not readily break down into harmless molecules.
- On beaches, microplastics are visible as tiny multicolored plastic bits in sand.
- In the oceans, microplastic pollution is often consumed by marine animals.
- **Types of Microplastics -** Primary microplastics and Secondary microplastics.

- **Primary microplastics -** Any plastic fragments that are already 5.0 mm in size or less.
- **Secondary microplastics** – They are arise from the degradation (breakdown) of larger plastic products through natural weathering processes.

- **Research findings –** They act as ice-nucleating particles that produce clouds in conditions where they would not form.
- They are suspended in small droplets of water and slowly cooling these droplets to observe how the microplastics affected ice formation.
- The average temperature at which the droplets froze was 5-10 degrees warmer than droplets without microplastics.
- They are insoluble as a defect into a droplet, it can nucleate ice at warmer temperatures.

The world is producing 57 million tons of plastic pollution per year.

- They are interacting with the climate system and the process of cloud formation is triggered by microplastics.
- **Clouds effect on weather and climate** – If microplastics are present, they could cause ice crystals to form, potentially increasing rain or snowfall.
- They reflect incoming sunlight away from the Earth's surface, which has a cooling effect.
- They absorb some radiation that is emitted from Earth's surface, which has a warming effect.
- If microplastics increase the presence of ice particles in clouds compared with liquid water droplets, this shifting ratio could change clouds' effect on Earth's energy balance.

SPACE

9.4 Black hole triple system

A new study says scientists have discovered a "black hole triple" in space for the first time.

- The system comprises a black hole at its centre, currently in the process of consuming a small star spiralling very close to it.
- There is also a second star, which appears to be circling the black hole but is actually far away.
- **Distance** - It is located about 8,000 light years away from Earth.
- **Constellation** - It is situated in the ***constellation of Cygnus.***
- The system features one of the oldest known black holes, the V404 Cygni, which is ***9 times as big as the Sun*** in our solar system.
- **Black Hole** - A black hole is a region in space where the pull of gravity is so strong that no matter or light can escape it.
- Astronomers believe most black holes are formed after massive stars explode at the end of their lives known as a supernova. However, the triple system suggests a gentler process.
- Many black holes discovered until now have been part of binary systems, consisting of a black hole and a secondary object (such as a star or another black hole).

1 light year is the distance light travels in a year, 9.5 trillion kilometer.

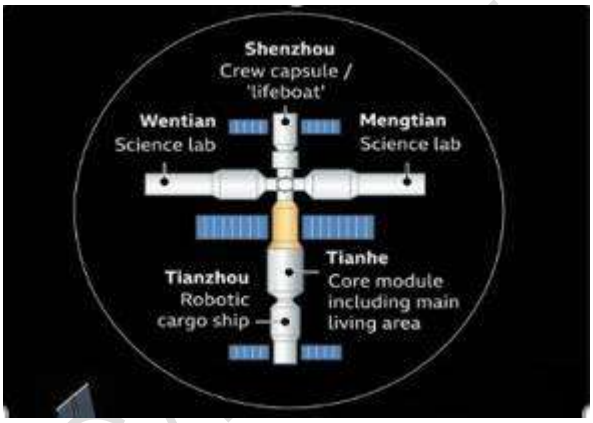
- **The black hole Triplet** – The black hole triple not only has one star which orbits the black hole about every 6.5 days, but also a more far-off star which orbits it every 70,000 years.
- **Formation -** V404 Cygni has 2 stars around it as the black hole did not arise from a supernova, which typically kicks away outer stars in the explosion.
- It was formed through another process called ***"direct collapse",*** where the star caves in after expending all its fuel, but does not explode.
- These events are called as a 'failed supernova'.
- However, the black hole triple will not have 3 members forever, as V404 Cygni is consuming the nearer star.
- This suggests that some already discovered binary systems could have been triple systems at some point, with the black hole later devouring one of its members.

9.5 Shenzhou-19

A Chinese spaceship, Shenzhou-19 carrying a 3-person crew docked with its orbiting space station recently.

- It is a ***Chinese spacecraft*** carrying a 3-member crew to the ***Tiangong space station.***
- **Aim -** To focus on scientific research, technological innovation, and crew safety.
- It was China's 14th crewed spaceflight and the 19th flight of the Shenzhou program.
- **Agency -** China Manned Space Agency.
- **Areas of study** - Space life science, microgravity physics, and space material science.
- **Launching Rocket** - It is launched using Long March-2F rocket.
- **Orbit** - Low-Earth orbit.
- **Duration** – The crew remained on the station until April or May 2025.

*China launched its first crewed mission in 2003, becoming only the **3rd** nation to do so after the former Soviet Union and the United States.*



Tiangong space station

- It is a ***permanently crewed space station in T-shape*** constructed by China and operated by China Manned Space Agency.
- It is the ***first space station of China***.
- It is expected to be operational until 2028.
- It is a 3-module space station in low-Earth orbit.
    - The core module Tianhe launched in April 2021, followed by the Wentian and Mengtian experiment modules in 2022.
- The station typically hosts 3 astronauts at a time for six-month stays. It can support 6 astronauts at a time during crew handovers.
- It is significantly smaller and lighter compared to International Space Station (ISS).

ISS is a large space station assembled and maintained in low Earth orbit by a collaboration of 5 space agencies and their contractors - NASA (United States), Roscosmos (Russia), JAXA (Japan), ESA (Europe), and CSA (Canada).

9.6 TOI-6651b, a new planet

An international team of scientists led by the Physical Research Laboratory (PRL), Ahmedabad, has discovered an exoplanet outside our solar system.

- It is a ***sub-Saturn class planet***, 5 times bigger and 60 times heavier than the Earth.
- **Discovered using** - The 2nd ***PRL Advanced Radial Velocity Abu Sky Search (PARAS-2)***, a high-end spectroscope mounted on PRL's 2.5m telescope at Mount Abu in Rajasthan.
- **Distance** - Located 690 light years away from the Sun.
- It is the ***3rd most dense sub-Saturn class*** located at the edge of the ***Neptunian desert*** (4th exoplanet found within the rare Neptunian desert).
- **Orbit -** TOI-6651b orbits around its host star, a Sun-like star, in just ***5 days.***
- As the planet is revolving dangerously close to its parent star, this area receives strong irradiation from the star itself.
    - It means that the close-by planets will be unable to retain their gaseous atmosphere for long as they evaporate, leaving behind a rocky core, as in this case.
- The core of the exoplanet is massive (nearly 87%) composed of rich ***metals like iron*** and was found to be rocky whereas the rest mass consisted of a low-density envelope of ***hydrogen and helium.***

Sub-Saturn class planets have a size in between that of Neptune and Saturn.

Neptune desert is a region of the known exoplanet population, where planets rotating close to the stars are rare.

- **Temperature -** 1,500 degrees Kelvin (about 1,200 degrees Celsius), thus ***ruling out TOI-6651b from being habitable***.

9.7 Lignosat

Recently, the world's first wood-panelled satellite was launched into space by the Japanese spacecraft.

- **Aim -** To test the durability of wood in extreme temperatures.
- To test the reliability of timber as a renewable building material for future space travel.
- **Developed by -** Kyoto University and logging firm Sumitomo Forestry.
- **Duration -** It will be released into orbit above the Earth, and will remain in orbit for six months.

- **Properties**
  - It is a small, palm-sized satellite.
  - It measures just 4 inches (10 centimeters) on each side, and weighs 900 grams.
  - It is made from ***Honoki Wood***, a type of magnolia tree native to Japan.
  - It is *not entirely made of wood*
  - Aluminium structures and electronic components are also used in a wood panel casing.
  - **Launched by -** Space X's Falcon 9 Block 5 rocket.
  - **Tests to be conducted**
    - Durability of wood in the extreme environment of space where temperatures fluctuate from 100 to 100 degrees Celsius every 45 minutes.
    - Timber's ability to reduce the impact of space radiation on semiconductors.
    - Changes in the wood's structure, integrity, and resilience.
  - **Benefits of Wooden Satellite**
    - Wood is more durable in space than on Earth because there's no water or oxygen that would rot or inflame it.
    - Wooden made satellite is a renewable solution for a long-term.
    - It wouldn't introduce any damaging pollutants like aluminum oxides into the atmosphere when it falls back to Earth.
    - It will be minimising the risk to active satellites, space stations, and astronauts.

9.8 Magnetic understanding of Uranus

Recently, the Scientists had uncovered a magnetic misunderstanding about Uranus.

- **Uranus –** It is a ***3rd largest planet*** in our solar system.
- **Discovered by** - British astronomer William Herschel in 1781, the first planet discovered with the aid of a telescope.
- **Colour -** It is ***blue-green in colour due to the methane*** contained in the atmosphere comprised mostly of hydrogen and helium.
- **Orbit -** Its unusual tilt makes Uranus appear to orbit the sun like a rolling ball.
- **Size -** It has a ***diameter of about 31,500 miles*** (50,700 km).
- It has 28 known moons and two sets of rings.
- **2 largest moons - *Titania and Oberon***.
- **Voyager 2 –** It is a space probe launched by NASA on August 20, 1977, as a part of the Voyager program.

Interstellar space is the region outside the heliopause, or the bubble of energetic particles and magnetic fields from the Sun.

Solar Wind is a high-speed flow of charged particles emanating from the sun.

- Voyager 2 is the only spacecraft to visit Uranus and Neptune and the probe is now in interstellar space, almost 13 billion miles (21 billion kilometers) from Earth.
- **Voyager 2 flyby of Uranus -** When NASA's Voyager 2 spacecraft flew by Uranus in 1986, it provided scientists' first — and, so far, only — close glimpse of this strange, sideways-rotating outer planet.
- **Misreading of Voyager -** The Voyager 2 observations had suggested that Uranus has
    - Small magnetosphere
    - No plasma in the atmosphere
    - Intense radiation belts
    - Its two largest moons - Titania and Oberon - orbit outside the magnetosphere.

- **Recent Findings –** Uranus has
    - Large magnetosphere
    - Plasma in the magnetosphere
    - Weak radiation belts
    - Titania and Oberon orbit within the magnetosphere
- **Reason for the misreading** – Voyager 2 had visited the Uranus after the planet was hit by a strong solar storm which had striped its magnetosphere.

9.9 Solar Activity

Recently, 3 tiny Australian satellites from Curtin University's Binar Space Program burned up in Earth's atmosphere due to high solar activity.

- **Solar activity** – The sun is a ***magnetic variable star*** that fluctuates on times scales ranging from a fraction of a second to billions of years.
- It includes phenomena such as sunspots, solar flares and solar wind, the stream of charged particles that flows toward Earth.
- This activity is a product of the Sun's ever-changing magnetic field, and approximately ***every 11 years***, it completely flips.
- At the midpoint of this cycle, solar activity is at its highest.
- **High solar activity -** It means more solar flares and stronger solar wind, resulting in a ***higher flux of charged particles*** that can damage or disrupt electrical components on satellites.
- The most obvious is the presence of auroras which are far more intensely and closer to the equator than in the last two decades.
- It is a direct result of the increased solar activity.
- It also increase in ionising radiation, resulting in a higher dose for astronauts and pilots, and potential disruptions to long-distance radio communications.
- **Impact on Satellites –** The satellite orbiting in Lower Earth Orbit at an altitudes up to 2,000 km, experiences orbital decay, eventually re-entering and burning up in the atmosphere.
- The increase in solar activity accelerate this process, particularly affecting smaller satellites that lack altitude control systems.

Binar Space Program

- It is a satellite research program operating out of Curtin University.
- Binar (BIN-ah) is the Noongar word for "fireball".
- **Aim** - To advance our understanding of the Solar System and lower the barrier for operating in space.
- **Program Missions - Binar-1 -** First satellite mission, launched to the International Space Station (ISS) on August 29, 2021.
- It was deployed into its own orbit and operated in orbit for almost a year in space.
- It was intact and powered up, included beacon messages and some data about the spacecraft's systems.
- **Follow-Up Mission -** Binar-2, 3, & 4, launched on August 4, 2024.
- They comprised 3 1U CubeSats hosting scientific experiments, in-house developed technology validation and industry payloads.
- They were deployed into a naturally decaying orbit below the ISS at an altitude of 400km above sea-level, and circled Earth every 90 minutes for just 2 months.
- They were expected to last approximately 6 months but managed only 2 months due to unexpected high solar activity.

9.10 WOH G64

European Southern Observatory's Very Large Telescope Interferometer (ESO's VLTI) recently observed WOH G64, which revealed some crucial details about its activity and surrounding layers.

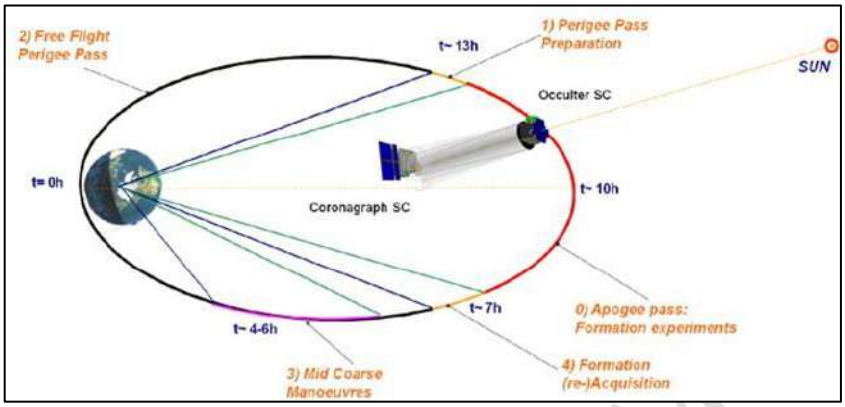
- The WOH 64 is a giant star that dwells in the Large Magellanic Cloud, a dwarf or satellite galaxy that orbits Milky Way.
- **Discovered by -** Bengt Westerlunds, Olander, and Hedin in the 1970s.
- Incidentally, the WOH in its name is the acronym for the names of its three discoverers.
- The star is believed to be around ***1,60,000 light years away*** from Earth.
- **Size -** The star is classified as a ***red supergiant*** owing to its size, which is roughly 2,000 times that of the Sun.
- In 2005 and 2007, the team reportedly used European Southern Observatory's Very Large Telescope Interferometer (ESO's VLTI) in the Atacama Desert of Chile to ascertain the features of the star.
- To get an accurate image, the team had to wait for the development of GRAVITY, a set of VLTI's second-generation instruments.
- Red super-giants like WOH G64 shed their outer layers, which are mainly gas and dust, in the final stages of their lifecycles.
- This process can continue for thousands of years.
- This star is one of the most extreme of its kind, and any drastic change may bring it closer to an explosive end.
- According to the team, the materials that are being shed could be responsible for the dimming of the star and the unusual shape of the dust cocoon around it.

9.11 Proba-3 Mission

The Indian Space Research Organisation ***(ISRO) is all set to launch the European Space Agency's Proba-3 mission*** *from Sriharikota, Andhra Pradesh.*

- **Proba-3 –** It is the ***world's 1st precision formation flying mission***.
- Proba-3 will be the first mission to launch from India.
- **Aim -** To *observe the Sun's corona* through an innovative satellite formation flight.
- **Mission life –** 2 years.
- **Launch vehicle -** Polar Satellite Launch Vehicle (PSLV) XL rocket.
- **Orbit -** It will be launched into a ***highly elliptical orbit*** measuring around 600 x 60,530 km.
- **Orbital period -** 19.7 hours.

- The core objective is to create an ***artificial eclipse*** by precisely coordinating two independent satellites.
- The 2 satellites will be launched together, and maintain a fixed configuration in space.



- **2 satellites**
  - Coronagraph spacecraft (CSC) - 200 kg.
  - Occulter spacecraft (OSC) - 340 kg.
- **Working -** The two spacecraft will fly in formation, maintaining a distance of about 150 meters for 6 hours at a time.
- The OSC will cast its shadow onto the CSC's telescope, blocking the sun's direct light.
- This will allow the CSC to image the sun's corona in visible, ultraviolet, and polarized light.
- The CSC's coronagraph instrument will take images of the sun's corona. The mission will study the sun's corona.

The Sun's corona is the outermost part of the Sun's atmosphere, made up of hot, ionized gas called plasma. The corona is usually hidden by the bright light of the Sun's surface.

- **Instruments**
  - **The Association of Spacecraft for Polarimetric and Imaging Investigation of the Corona of the Sun (ASPIICS) or the Coronagraph** - Its field of view is between the Sun's outer and inner corona, a circular belt normally observable during solar eclipse events.
  - **The Digital Absolute Radiometer (DARA) -** Maintain a continuous measurement of the Sun's total energy output, known as the total solar irradiance.
  - **The 3D Energetic Electron Spectrometer (3DEES) -** Measure electron fluxes as it passes through Earth's radiation belts, providing data for space weather studies.

DEFENCE

9.12 Pinaka Multi-Barrel Rocket Launcher

France is considering India's Pinaka Multi-Barrel Rocket Launch (MBRL) system for its requirements.

- **Pinaka Multi Barrel Rocket Launcher (MBRL)** – It is a battle-proven an all-weather, indirect area fire Artillery Weapon System.
- **Designed by** - Defence Research and Development Organisation
- **Characteristics**

  - **Maximum Range**
    - Mark-I Enhance - 45 km
    - Mark-II ER version - 90
  - Shoot & Scoot Capability with Auto Levelling / Stabilisation
  - Salvo of 12 Rockets in 44 Seconds
  - Position accuracy of one milliradian for AZ and EL
  - Programming all 12 Rockets in max. 20 seconds
  - Onboard Inertial Navigation System for Accurate and Speedy Laying
  - It can fire a variety of ammunition
- The Indian Army has four Pinaka regiments in service and six more are on order.
- Armenia became the first export customer for the indigenously developed Pinaka.

9.13 Antariksha Abhyas, 2024

Antariksha Abhyas, 2024, a tri-service three day Exercise hosted by Defence Space Agency begins in New Delhi.

- It is the ***1st Ever Space Exercise*** to help secure national strategic objectives in space.
- It is a first of its kind exercise being conducted and is expected to integrate India's space capability in military operations.
- **Aim -** To war-game the growing threats from and to Space Based Assets and Services.
- **Conducted by -** The Defence Space Agency of Headquarters Integrated Defence Staff.
- **Participants -** Specialist branches under Headquarters Integrated Defence Staff namely Defence Cyber Agency, Defence Intelligence Agency and Strategic Forces Command.
- In addition, the exercise intends to identify vulnerabilities in conduct of operations in the event of denial or disruptions of space-based services.

9.14 Pinaka multi-barrel rocket launcher (MBRL) system

A senior French Army officer recently revealed that France is evaluating India's indigenous Pinaka multi-barrel rocket launcher (MBRL) system for potential use by its military.

- It is a ***long-range artillery system*** capable of striking targets upto 75kms away.
- **Developed by –** Defence Research and Development Organisation (DRDO).
- The system has multiple variants, which offer flexibility in terms of payload, firepower, and range.
- **Features -** It provides a unique capability to accurately deliver a devastatingly lethal and responsive fire against a variety of area targets such as
    - Exposed enemy troops,
    - Armoured and soft skin vehicles,
    - Communication centres,
    - Air terminal complexes,
    - Fuel and ammunition dumps.
- The system consists of Rocket, Multi Barrel Rocket launcher, Battery Command Post, Loader cum Replenishment Vehicle, Replenishment Vehicle and Digicora MET Radar.
- It is capable of firing in ***salvo mode*** within 48 sec neutralizing the area of 700 x 500 m.
- This versatility makes it suitable for different types of military engagements, such as counter-terrorism, border defence, and conventional warfare.
- ***Armenia*** has placed orders for the system earlier.

HEALTH

9.15 Vaccine-derived poliovirus

A recent report says that World Health Organization's database on polio, like wild poliovirus and vaccine-derived poliovirus cases hides more than it reveals.

- VDPV stands for vaccine-derived poliovirus, a ***rare and weakened strain of poliovirus*** used in the oral polio vaccine (OPV) mutates and regains the ability to cause paralysis.
- OPV contains a live, attenuated virus that is used for immunization against the disease.
- This weakened virus triggers an immune response when administered, thus protecting people from the disease.
- **Transmission** - The attenuated virus replicates in the intestines for a limited period and is excreted in the stool.
- In rare cases, the virus can mutate enough to cause the disease again, and circulate in areas where
    - Either immunization is low, or

- Where immunocompromised persons reside, or
- Regions with poor sanitation and hygiene.

India was declared polio-free in 2014 by the World Health Organization (WHO).

- If it spreads in populations that aren't immunized or in people with compromised immune systems.
- **Symptoms** - VDPV causes acute flaccid paralysis (AFP), which includes muscle pain, loss of muscle reflexes, and floppy limbs.
- **Risk** - VDPV poses a similar risk to the community as wild poliovirus, and can spread to others who aren't vaccinated.
- **Detection** - If VDPV is detected in at least two different sources that are genetically linked, it's considered "circulating".
- **Prevention** - The inactivated poliovirus vaccine (IPV) protects against VDPV and is given as an injection in the arm or leg. The United States has used IPV exclusively since 2000.

9.16 Lassa fever

Lassa fever has come into prominence after a recent case in Iowa, United States, involving the death of a traveler from West Africa.

- **Caused by -** The Lassa virus causes Lassa fever, a ***zoonotic disease*** that is part of the Arenaviridae family, with the ***Mastomys rat*** as its primary reservoir.
- **Identified in -** The disease was first identified in the town of Lassa in Nigeria in 1969
- **Symptoms -** Gradual onset of fever, general weakness, and malaise, followed after a few days by
  - More severe manifestations such as headache, sore throat, muscle and chest pain, nausea, vomiting, diarrhoea, cough, and abdominal pain.
- While approximately ***80% of infections are asymptomatic*** or mild, severe cases can present with high fever, severe headaches, and haemorrhage, potentially leading to organ failure.
- **Human Transmission** - Humans usually contract the virus through contact with food or items contaminated by the the Mastomys rat's urine or faeces.
- Secondary human-to-human transmission occurs through exposure to bodily fluids, raising significant risks, particularly in healthcare settings.
- **Vulnerable population -** Lassa fever poses particularly severe risks for pregnant women and infants.
- Infected pregnant women, especially those in their 3rd trimester, face an increased maternal mortality rate of over 30%.
- The disease's impact on the foetus is devastating, with a foetal death rate ***exceeding 85%.***
- For children up to 2 years old, Lassa fever can manifest as "swollen baby syndrome, "characterized by extensive swelling and associated with a higher fatality rate than that of adults.
- Vertical transmission has been reported from the mother to the foetus in the transmission of Lassa fever.
- **Prevention** - Minimising rat-to-human transmission is vital to controlling Lassa fever.
- **Fatality -** Lassa fever has a case fatality rate (CFR) of approximately 1% overall.
- However, the CFR can escalate to as high as 15-20% among hospitalised patients.
- Notable sequelae include varying degrees of deafness in nearly 25-50% of patients one to three months after recovery.
- Estimated 1,00,000 to 3,00,000 individuals annually, with around 5,000 deaths each year.
- **Cases in India -** India's Ministry of Health and Family Welfare, has classified Lassa fever as a disease of international significance.
- India has ***not recorded any documented cases*** until now (officially, no case reported till 2022).

9.17 Orphan drugs

Orphan drugs have increasingly gained attention in India following the implementation of the National Policy for Rare Diseases (NPRD) in 2021.

- Orphan drugs are critical in ***treating rare (orphan) diseases.***
- A disease is considered rare if it affects fewer than 200,000 people in the U.S. and fewer than 1 in 10,000 people in the European Union.
- There is ***no formal prevalence-based*** definition in India, the NPRD of 2021 outlines a framework for diagnosing and treating rare diseases, with a low prevalence threshold expected.
- **Category** - Under India's NPRD, rare diseases are classified into 3 categories to facilitate treatment approaches.
    - Group 1 includes disorders that are curable through one-time interventions, such as Lysosomal Storage Disorders (LSDs) requiring Hematopoietic Stem Cell Transplantation (HSCT).
    - Group 2 encompasses diseases that need long-term or lifelong management but have relatively lower treatment costs, such as Phenylketonuria (PKU) and Maple Syrup Urine Disease (MSUD).
    - Group 3 covers conditions like Gaucher Disease and Pompe Disease, where treatment is available but complicated by high costs and the necessity for lifelong care.

Orphanet is a resource that allows users to search for orphan drugs by disease name or substance name.

- Orphan drugs are categorized ***based on the types of diseases*** they target and their regulatory status.
- Diseases such as genetic disorders, rare cancers, metabolic disorders, and autoimmune conditions frequently fall under the orphan disease category.
- **Examples** - Ivacaftor for cystic fibrosis, Alglucerase for Gaucher disease, Coagulation factor IX for hemophilia B, Imatinib for leukemia, and Rucaparib for ovarian cancer.
- **Criteria** - For a drug to receive orphan drug designation, it must meet certain criteria that vary across countries. Typically, the disease in question must have a ***low prevalence.***
- Additionally, the condition must lack approved treatments, or the orphan drug must provide significant benefits over current treatment options.
- **Approval** - Developers of orphan drugs must also provide scientific evidence that the drug has the potential to treat or alleviate the condition.
- This evidence can be presented at any stage of drug development, from preclinical research to late-phase clinical trials.
- **Incentives -** Once designated, it receive several incentives to encourage their development, including market exclusivity, tax credits for research and development expenses, and fee waivers for regulatory applications.

9.18 Snakebite Envenomation

The Tamil Nadu government has officially declared snakebite envenomation as a notifiable disease.

- It is a ***life-threatening medical condition*** caused by venomous snake bites.
- It can cause severe paralysis that may prevent breathing, cause bleeding disorders that can lead to fatal haemorrhage, irreversible kidney failure and severe local tissue destruction.
- The most effective treatment for snakebite envenomation is high-quality snake anti venom, which can prevent or reverse many of the toxic effects of the venom.
- Often preventable, it poses a risk to vulnerable populations, including agricultural workers, children, and those living in tropical and subtropical areas.
- It is a major health concern in rural and snake-endemic regions.

An estimated 5.4 million people worldwide are bitten by snakes each year with 1.8 to 2.7 million cases of envenomings.

- **WHO response -** World Health Organization has recognized snakebite as a global public health issue and launched a strategy to reduce snakebite-induced deaths and disabilities worldwide.
- **In India -** India has more than ***310 species of snakes***, mostly non-Venomous.

- However, there are 66 species that are labelled as venomous or mildly venomous and majority of the snakebites result from 4 species, collectively named as "Big 4" species namely

- **Action plan in India -** National Action Plan for Prevention and Control of Snakebite Envenoming, which was published by the Ministry of Health and Family Welfare earlier this year.
- The plan aims to ***halve snakebite deaths by 2030*** through a 'One Health' approach, integrating human, animal, and environmental health interventions.
- **Tamil Nadu's Plan -** It is declared as a notifiable disease under the Tamil Nadu Public Health Act, 1939.
- To improve the collection of vital data, strengthen clinical infrastructure, and ensure the efficient distribution of anti-snake venom.
- This move is expected to lead to better prevention strategies, reduce mortality rates, and enhance treatment facilities across the state.
- Authorities have noted that there has been a significant underreporting of snakebite cases and deaths in existing data, and the new system is designed to bridge this gap.
- Under the new directive, both government and private hospitals are now required to report cases of snakebites and related fatalities to the government.
- This mandatory reporting system will be integrated with the State's Integrated Health Information Platform under the Integrated Disease Surveillance Program.

9.19 Helicobacter pylori (H. pylori)

More research is needed to combat the global prevalence of Helicobacter pylori, with India having an infection rate of over 50% of its population.

- It is a ***type of bacteria*** that can cause an infection in the stomach or duodenum (first part of the small intestine).
- People usually get it as children, and it can stay in the body for years without causing problems.
- Even though the stomach has strong acid, H. pylori survives by making a substance that weakens the acid.
- Over time, this bacteria can harm the stomach's protective layer, leading to irritation and sometimes causing painful sores called ulcers.
- **Symptoms -** H. pylori don't have symptoms, but when they do, these may include burning stomach pain, bloating, burping, nausea or vomiting. Some may also lose their appetite and experience weight loss.
- While many are infected in childhood without symptoms, in some cases, symptoms don't appear until the late teens or adulthood, particularly if the infection causes ulcers or digestive problems.
- **Transmission -** H. Pylori from person to person, primarily through saliva, vomit or stool.
- It can also spread by contaminated food, water or poor hygiene especially in areas with crowded living conditions or limited access to clean water and sanitation.
- **Treatment -** Helicobacter pylori (H. pylori) infection is typically treated with a combination of antibiotics and medications to reduce stomach acid.
- **Prevalence** - It is almost ***10 times more prevalent*** than diabetes in the country and is a major cause of chronic gastritis, peptic ulcers and even stomach cancer.
- Helicobacter pylori (H. pylori) infections affect an estimated 50% to 60% of the population in India and constitute a significant public health challenge.
- **Nobel Prize -** Dr. Barry Marshall, along with Robin Warren, was awarded the 2005 Nobel Prize in Physiology or Medicine for discovering that ***H. pylori was the main cause of peptic ulcers.***

9.20 Walking pneumonia

In recent weeks, doctors have sudden increase in reported cases of walking pneumonia.

- Walking pneumonia is most commonly caused by the ***bacteria Mycoplasma pneumonia.***
- Walking pneumonia, also known as atypical pneumonia, is a less severe type of pneumonia.
- It is a mild yet persistent lung infection that can mimic symptoms of a common cold.
- The primary difference between them is that the common cold is usually caused by a viral infection while walking pneumonia is essentially a bacterial infection.
- Unlike typical pneumonia, which can lead to severe lung inflammation and difficulty breathing, walking pneumonia is ***often less intense,*** allowing people to carry on with their daily activities.
- It is also called ***'silent' pneumonia*** because sometimes people don't experience symptoms despite X-rays showing fluid-filled air sacs in the lungs.
- **Symptoms -** Fever, Runny nose, Cough, Sore throat, Headache, Tiredness, Ear pain, and Chest pain from coughing.
- **Transmission** - Though walking pneumonia is typically not as contagious as the flu or a viral cold, it can still spread through respiratory droplets when an infected person coughs or sneezes.
- **Vulnerable** - People who work or live in crowded spaces are at a higher risk of outbreaks.
- **Prevention -** There aren't any vaccines available that prevent walking pneumonia.
- **Treatment -** Walking pneumonia is often manageable with rest, fluids, and, in some cases, antibiotics

9.21 Infectious Disease among Bees

A recent research paper explores the presence of some virus species in wild bee and hoverfly species across different landscapes in Switzerland.

- **Virus in Bees** – Recent study found the presence of ***deformed wing virus and black queen virus*** in 19 wild bee and hoverfly species across different landscapes in Switzerland.
- They found *higher loads of these pathogens in wild pollinators* that used floral resources the honey bees accessed as well.
- **Causes** – *Western honey bees are often viral reservoirs* and can infect wild species when they share habitats.
- **Pathogen spillover** – A process of the transmission of pathogens between managed honey bees and wild pollinators.
- The loads were 10-times higher among the wild pollinators in these shared habitats.
- **Pathogen spillback** – The less virulent virus could *mutate in the wild pollinators and then spill back* to honeybees in a more virulent form, being more detrimental to honeybees.
- **Habitat loss** – It could force pollinators into smaller suitable habitats and increase the risk of disease transmission.
    - A recent estimate showed that 40% of bumblebee species in the Indian Himalaya could lose more than 90% of their habitat by 2050, raising concerns about the competition for resources with western honey bees.

Bees in India

- It hosts *more than 700 bee species*, including ***4 indigenous honey*** bees - Asiatic honey bee (*Apis cerana indica*), Giant rock bee (*Apis dorsata*), Dwarf honey bee (*Apis florea*), Stingless bee (sp. *Trigona*).
- **Introduction of Western honey bees** – They were introduced in India in 1983 to increase the country's honey yield.
- **Infection** - In 1991-1992, a *Thai sacbrood virus* outbreak devastated around 90% of Asiatic honey bee colonies in South India and *reemerged in 2021 in Telangana*.

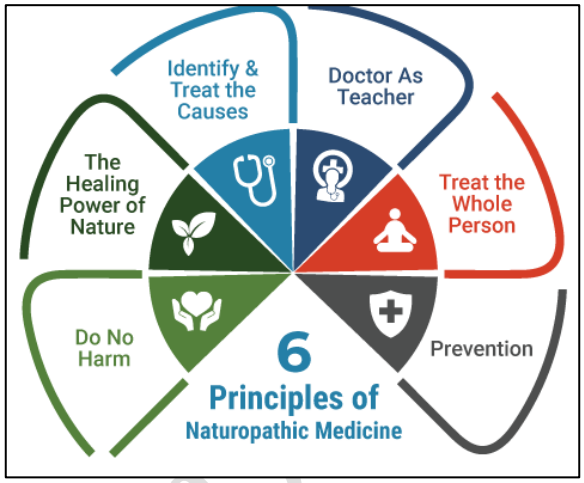
More than 75% of food crops, fruits, and flowering plants need bees, wasps, beetles, flies, moths, and butterflies to yield successful harvests.

- **Control mechanism** – *Diverse pollinator-friendly habitats* with more floral resources lowered the chance pathogen spillover & spillback between wild pollinators and managed western honey bees.
- More research and surveillance are required to monitor emerging diseases in bees and other pollinators.
- **Impact** – It threatens world's economies

9.22 Naturopathy

The 7th Naturopathy Day was celebrated at the Central Research Institute of Yoga and Naturopathy (CRIYN) in Karnataka to promote better mental and physical health through natural, drug-free therapies.

- **Naturopathy** – It is a unique system of medicine that promotes health by aligning with nature.
- It focuses on the ***body's natural ability to heal***, emphasising treatments like diet, exercise, fasting, hydrotherapy, homoeopathy, botanical medicine, detoxification, and lifestyle counselling.
- It teaches us to eat, drink, act, and live in moderation.
- It equips us with the *art of self-management*, enabling us to stay healthy for spiritual pursuits.
- **Origin** – It had its *roots in Germany*.
- **Introduction in India** – It gained prominence with the translation of 'The New Science of Healing' by German nutritionist into Telugu in 1894 and later into Hindi and Urdu in 1904.
- It helped spread the principles of naturopathy across the country.
- States like Andhra Pradesh, Gujarat, Bengal, Maharashtra, and Uttar Pradesh played an essential role in promoting naturopathy.



*The term 'naturopathy' was 1st used by John Schell in 1895. **Benedict Lust** was known as the 'Father of Modern Naturopathy,' popularised it in the U.S.*

***Naturopathy Day** is observed every year in India on 18th November since 2018, the day on which Mahatma Gandhi become a Life Member of the Nature Cure Foundation Trust and signed the deed in 1945.*

***Gandhiji** is considered the founding figure of Naturopathy in India.*

- **Initiatives in India** – *Central Council for Research in Yoga & Naturopathy (CCRYN)*, Ministry of Ayush was inaugurated in Haryana in 2024.
- *National Institute of Naturopathy* (NIN) titled 'NISARG GRAM' was inaugurated in Pune, Maharashtra in 2024.
- India is going to create a chain of research and teaching institutes like *Central Research Institutes in Yoga and Naturopathy (CRIYN)* with 100 to 200 bed hospitals to conduct high-level research across various states.
    - 2 CRIYNs, one at Karnataka, and another in Haryana, are already operational.
- India aims to establish Yoga and Naturopathy Diet Centres (YNDCs) across the nation.

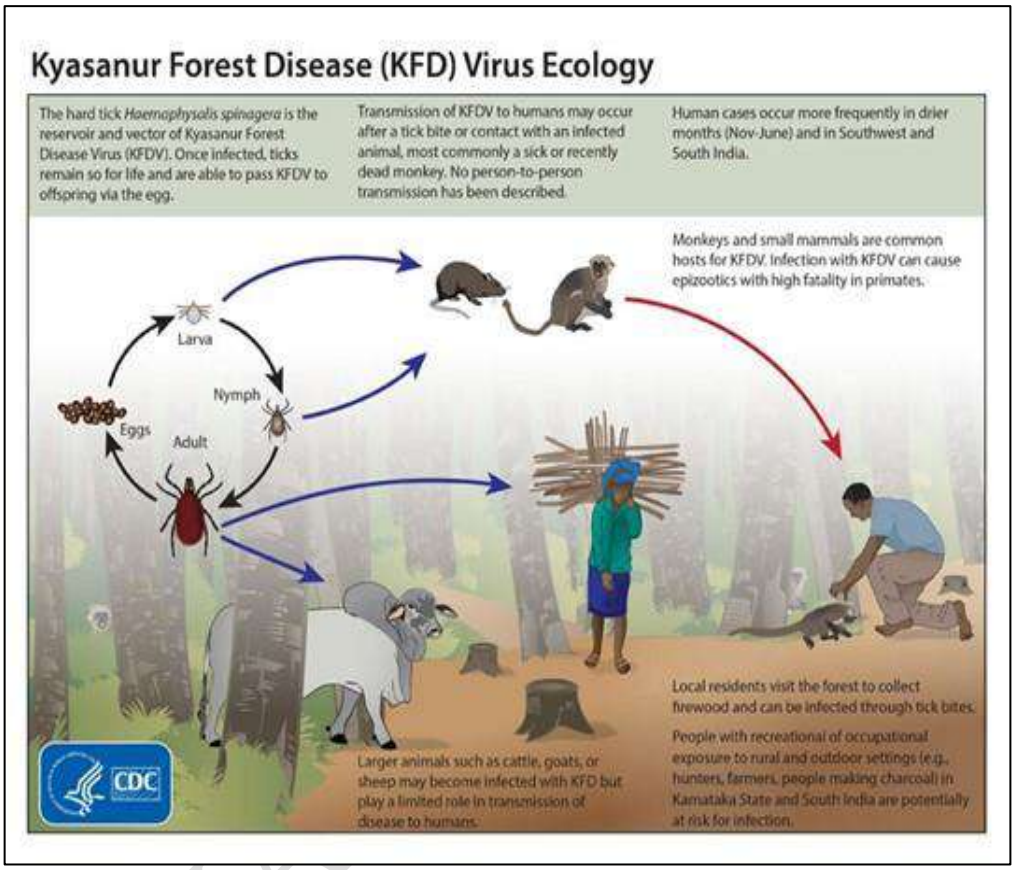
9.23 Kyasanur Forest Disease (KFD)

Recently, Karnataka district health officials have created awareness on high alert to prevent Kyasanur Forest Disease (KFD).

- **KFD** – It is a ***tick-borne haemorrhagic fever*** of humans, caused by Kyasanur Forest Disease Virus (KFDV).
    - KFDV virus is a single-stranded, positive-sense RNA virus belonging to the family Flaviviridae.
- It is also known as ***"monkey fever"*** because monkeys are highly susceptible to the disease.
- KFD was ***first discovered in 1957*** in the Kyasanur forest area of Karnataka.
- Hard ticks (Hemaphysalis spinigera) spread the KFD virus to people and to animals, like monkeys and rodents.
- **Symptoms**
    - **1st Wave -** Sudden onset of chills, high fever, frontal headache, vomiting, diarrhea, coughing, and severe muscle pain, followed by bleeding from the nasal cavity.

- **2nd Wave -** About 10 to 20% of patients experience including severe headache, mental disturbances, tremors, and vision problems.

- **Signs** - 3-8 days after being infected with the virus.
- **Transmission -** To people primarily occurs through tick bites or contact with infected animals.
- It can spread to livestock like cattle, goats, and sheep but livestock rarely spread tick bites to people.
- Human-to-human transmission has ***not been observed***.
- **Mortality rate** - Infected cases are estimated to be 3–10%.
- **Risk factors** - Hunters, herders, forest workers, and farmers in the Karnataka, Tamil Nadu, and Kerala states are at higher risk.
- **Treatment** - There is ***no specific treatment*** available.
- **Prevention**
    - **Vaccination** – It is an inactivated vaccine produced using formalin inactivation of the KFD virus grown in a chick embryo tissue culture.
    - About 70% of people who take this vaccine develop neutralizing antibodies.
    - **Tick bite avoidance -** It is an effective way of being safe when traveling in areas where this disease is transmitted.



9.24 Sjogren's Disease

Recently, the clinical immunologist offered an insight into the conditions prevalence and presentation of the Sjögren's Disease.

- It is a ***chronic long-lasting autoimmune disorder***.
- The immune system attacks the glands that make moisture such as your nose, throat, and skin.
- It also affect other parts of the body, including your joints, lungs, kidneys, blood vessels, digestive organs, and nerves.
- It is also known as ***Sjogren's and Sjogren's syndrome.***
- **Symptoms** – It have cycles of mild and then severe symptoms.

Autoimmune diseases happen when the immune system mistakenly damages the body instead of protecting it.

- **2 main symptoms**
    - **Dry eyes -** Burn or itch or feel like sand in the eyes, the dryness causes blurry vision or sensitivity to bright light, and get irritated, itchy eyelids due to inflammation.
    - **Dry mouth -** Feel chalky, have trouble swallowing, speaking, and tasting, and develop mouth infections such as candidiasis.
- **Other symptoms –** Fatigue, Joint pain, Dry skin, Dry nasal passages and throat, dry cough, Skin rashes, Muscle aches, Vaginal dryness.

- **Causes –** Its inflammation damages the glands, limiting their production of the fluids that normally keep the eyes and mouth moist.
- It also damages other organs and tissues and causing a range of other symptoms.
- **Risk factors**
    - **Age** - It is usually diagnosed in people older than 40.
    - **Sex -** It predominantly affects women.
    - **Rheumatic disease -** It's common for people who have this syndrome to also have a rheumatic disease such as rheumatoid arthritis or lupus.
- **Treatment -** There is ***no cure*** for this syndrome.
- It can be relieved depending on which parts of the body are affected.

9.25 Japanese Encephalitis Virus (JEV)

Recently, a suspected case of Japanese Encephalitis Virus was reported in Bindapur, New Delhi.

- **JEV** – It is a ***mosquito-borne flavivirus*** that belongs to the same genus as dengue, Zika, yellow fever and West Nile viruses.
- It is spread through the bite of an infected mosquito especially a mosquitoes called *Culex tritaeniorhynchus*.
- This virus infection resulted in febrile illness, including meningitis or encephalitis.
- **First case** – Reported on 1871 in Japan.
- **Symptoms** – It doesn't have any symptoms or have only mild symptoms in most of the people.
    - **Initial** – Includes fever, headache, Seizures, gastrointestinal pain and vomiting.
    - **Severe** – High fever, headache, neck stiffness, disorientation, weakness, coma, seizures, spastic paralysis and ultimately death.
- **Signs** – The time from infection until illness onset is ***typically 5–15 days***.
- **Transmission** – It circulates in the environment between mosquitoes and other animals, namely wading birds and pigs.
- Humans infected with the virus when mosquitoes feed on other infected animals and then bite people.
- It is ***not transmitted from person-to-person***, except rarely by blood transfusion.
- **Region** – In temperate areas of Asia, transmitted mainly during the warm season.
- In tropics and subtropics, transmission intensifies during the rainy season.
- **Risk Factors** – Majorly occur to children ***below 15 years of age***.
    - **Less than 1%** - Develop neurologic illness.
    - **20–30%** - Die due to inflammation in the brain.
    - **30%-50%** - Suffer permanent cognitive, behavioural illness such as seizures, hearing or vision loss, speech, language, memory, and communication problems or weakness of the limbs.

24 countries in the World Health Organisation (WHO) South-East Asia and Western Pacific Regions have endemic JEV transmission, exposing more than 3 billion people to risks of infection.

- **Treatment -** There is ***no antiviral treatment***.
- It is focused on relieving severe signs and supporting the patients to overcome the infection.
- **Vaccine** - It is available to prevent disease.
- Rest, fluids, and counter pain medicine relieve some symptoms.

BIO-TECHNOLOGY

9.26 RNA editing

A biotechnology company in Massachusetts in the U.S. named Wave Life Sciences made for becoming the first company to treat a genetic condition by editing RNA at the clinical level.

- **Transcription –** Transcription is the process of making an RNA copy of a gene's DNA sequence.
- This copy, called messenger RNA (mRNA), carries the gene's protein information encoded in DNA.
- **Faulty proteins -** During this process of transcription, the cell may make mistakes in the mRNA's sequence and based on it produce faulty proteins.
- Many of these proteins have been known to cause debilitating disorders.
- **RNA Editing -** RNA editing allows scientists to fix mistakes in the mRNA after the cell has synthesized it but before the cell reads it to make the proteins.
- One technique involves a group of enzymes called ***adenosine deaminase acting on RNA (ADAR).***
- Adenosine is one of the building blocks of RNA.
- ADAR works by converting some of the adenosine blocks in mRNA to another molecule called ***inosine.***
- This is useful because inosine mimics the function of a different RNA building block called guanosine.
- Because guanosine-like function is found where adenosine is supposed to be, the cell detects a mistake and proceeds to correct it, in the process restoring the mRNA's original function.
- And then the cell makes normal proteins.
- Scientists took advantage of ADAR's effects to pair it with a guide RNA (or gRNA), the gRNA guides ADAR to a specific part of the mRNA, where the ADAR works its magic.
- They expect a variety of serious genetic conditions can be treated using such site-specific RNA editing.
- **Recent Finding in RNA editing -** Wave Life Sciences used RNA editing ***to treat α-1 antitrypsin deficiency (AATD),*** an inherited disorder.
- In patients suffering from AATD, levels of the protein α-1 antitrypsin build up and affect the liver and the lungs.
- People with AATD affecting the lungs currently go through weekly intravenous therapy for relief, among people where AATD has affected the liver, a liver transplant is the sole treatment option.
- In its therapy, dubbed WVE-006, the company used a gRNA to lead ADAR enzymes to specific single-point mutations in the mRNA sequence of the SERPINA1 gene.
    - SERPINA1 gene contains the instructions for cells to make α-1 antitrypsin.
- A single-point mutation occurs when a single building block of the mRNA is wrong.
- Once at the target, the ADAR enzymes fix the mRNA and the cells produce α-1 antitrypsin at normal levels.
- Wave Life Sciences is planning to extend its RNA editing technology to treat Huntington's disease, Duchenne muscular dystrophy, and obesity.
- The first two and some forms of obesity are associated with single-point mutations.

DNA editing	RNA editing
• DNA editing makes permanent changes to a person's genome and sometimes this can lead to irreversible errors.	• RNA editing makes temporary changes, allowing the effects of the edits to fade over time.
• CRISPR-Cas9 and other DNA editing tools require proteins acquired from certain bacteria to perform the cutting function, but these proteins can elicit undesirable immune reactions in some cases.	• RNA editing relies on ADAR enzymes, which already occur in the human body and thus present a lower risk of allergic reactions. • This is useful for people who require repeated treatment and/or who have immune sensitivities.

9.27 Bio-derived Foam

Researchers at the Indian Institute of Science (IISc) in Bengaluru have developed an innovative, eco-friendly bio-derived foam recently.

- It is a bio-derived foam that offers a sustainable alternative to plastic materials used in traditional Fast-Moving Consumer Goods (FMCG) packaging.
- The foam is made from bio-based epoxy resins, made from non-edible oils approved by the US Food and Drug Administration (FDA) and hardeners derived from tea leaves.
- It is an alternative to conventional expanded polystyrene (EPS) and polyurethane (PU) foams.
- It disintegrates in landfills ***without contaminating groundwater,*** offering a sustainable alternative to traditional plastic foams.

Each year, around 2.3 million tonnes of plastic foam are produced worldwide, but less than 1% of it is recycled.

- These bio-foams can disintegrate within ***3 hours*** when exposed to eco-friendly solvents at ***80°C.***
- The foams contain chemical bonds that can be broken and reformed in response to external stimuli.
- This allows the material to be mechanically reprocessed or dissolved in eco-friendly solvents within hours.
- It is sustainable packaging solutions, offering industries an environmentally responsible.
- **Significance -** Researchers said the production of 10,000 traditional plastic foam cups results in approximately 308 kg of greenhouse gas emissions.
- The Indian foam market, valued at USD 7.9 billion in 2023, is expected to grow to USD 11.1 billion by 2032, with a compound annual growth rate (CAGR) of 3.85%.

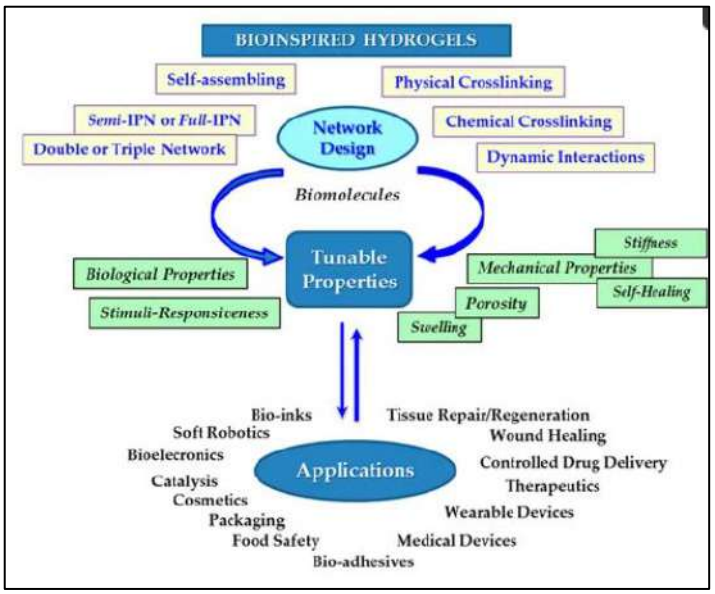
9.28 Bioinspired Hydrogels

Recently, researchers have designed a new type of bioinspired hydrogel that can generate hydrogen and oxygen by splitting water molecules using sunlight.

- **Hydrogels** – They are *soft biomaterials* that can be engineered to mimic many aspects of a tissue structure.
- **Bioinspired hydrogels** – They are ***3-dimensional networks*** composed of *hydrophobic polymers* synthesized by crosslinking water-soluble polymers.

Bioinspired materials *are synthetic materials whose structure, properties or function mimic those of natural materials or living matter.*

Bioinspired Hydrogels for Hydrogen Production



- **Working principle** – The polymer network prevent the molecules from clumping together and help *control the transfer of electrons*, which is crucial for splitting water into hydrogen and oxygen.
- **Working** – It mimics nature by using sunlight directly to split water.
- They are packed with functional molecules, such as *ruthenium complexes and platinum nanoparticles* which work together to simulate the natural process of photosynthesis.
    - Photocatalytic splitting of water, $2\ H_2O \rightarrow 2\ H_2 + O_2$
- **Advantages** – This prevent the functional molecules from aggregating thereby boosting the activity of the water-splitting process and *producing more hydrogen*.
- Molecules organized within the hydrogel made the energy conversion process much more efficient.
- **Significance** – It has major implications for clean energy and could help sustainably reshape energy technologies

Artificial photosynthesis *is a process that seeks to replicate nature's method, using sunlight to drive chemical reactions that generate clean energy.*

Hydrogen as Fuel
• It is seen as a promising fuel for the future as it is clean & renewable • Currently, hydrogen is produced from electrolysis of water by using electrical power. • **Challenges** – It rely on external energy sources.

9.29 Gene HMGB15 – Architect of Pollen and Seed Development

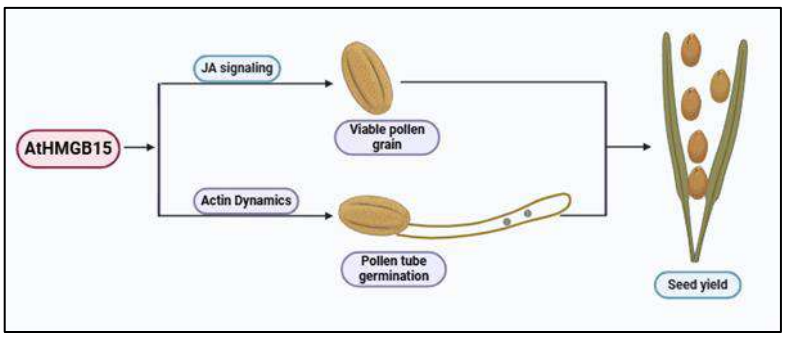
Recently, a novel gene named HMGB15 identified by Bose Institute, Kolkata, an autonomous institution of Department of Science and Technology.

- **HMGB15 –** It is a *non-histone protein* that restructures chromatin.
- It plays a crucial role in the *development of stamens* (male reproductive structure) including *pollen grain and seed formation*, in *Arabidopsis* flowering plants related to cabbage and mustard.

Pollen and Seed Development in Flowering Plants

• It is a very important developmental stage in plant life cycle.
• **Pollen** – It represents the male gametophyte and its role is to deliver the genetic material to the embryo sac.
• **Conditions for seed set** – It involves steps like
  ○ The production & transfer of viable pollen grains to stigma
  ○ Germination of the pollen grains
  ○ Growth of the pollen tubes down the style
  ○ Effective fertilization
• **Factors determining a healthy pollen –** It depends on *Pollen germination speed and Pollen tube growth that* evolved with the evolution in flowering plants (Angiosperms).
• The rapid growth of the pollen tube through the style to reach ovary, is a pre-requisite for fertilization in flowering plants.
• Since many pollen tubes grow through the style, the reproductive success of a pollen grain is determined by its rate of pollen tube elongation.
• *Pollen development, Pollen hydration and Pollen germination* responsible for the formation of a mature viable pollen grains.

- **Mutation in the gene** – It causes significant disruptions like
  - Partial male sterility in plants
  - Low pollen grain viability
  - Defective pollen wall patterning
  - Retarded pollen tube germination rate
  - Shorter filaments that are unable to reach the stigma
  - Reduced seed production



- The abnormalities in the mutants are due to the disruption in gene regulatory networks important for pollen development, maturation and pollen tube germination.
- **Significance** – Understanding the pollen development process opens up new possibilities for *improving crop fertility and seed production.*

9.30 AroTrack

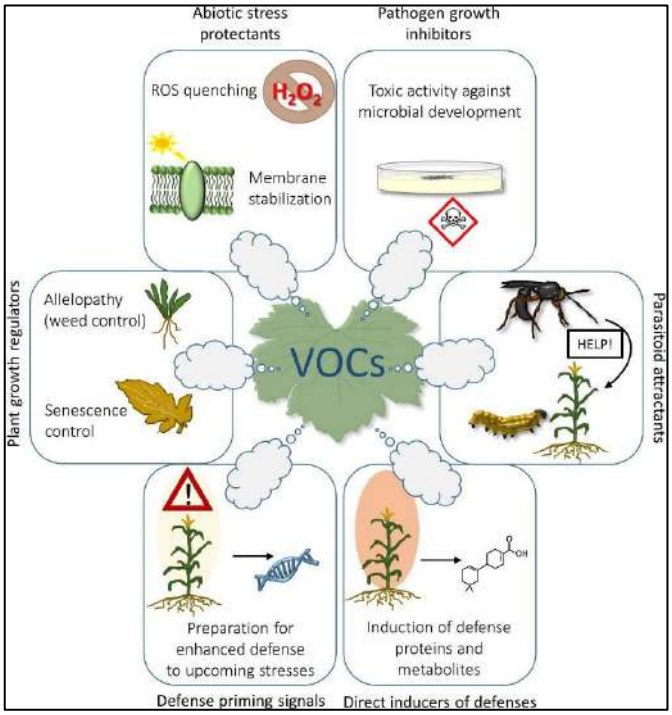
The scientists at the Indian Institute of Technology Bombay (IIT Bombay) have introduced a water-pollutant detecting device AroTrack.

- **AroTrack –** It is a portable device ***accurately detect harmful pollutants such as phenol, benzene and xylenols in water.***
- **Developed by -** Indian Institute of Technology Bombay (IIT Bombay).
- It is a user-friendly, low-cost bio sensing device.
- It uses a ***protein-based biosensor*** which typically found in bacteria living in heavily polluted environments to effectively identify multiple aromatic pollutants in water.
- The protein undergoes a highly selective ATP hydrolysis chemical reaction if an aromatic compound is present in the sample.
- This reaction is expressed with a change in the colour of the protein solution, which it can detect.
- **MopR** – It is a ***biosensing module and a sensitive sensor*** for detecting phenol.
- MopR is both selective and stable and it can *detect pollutants even in complex environments* with a high degree of precision.
- It detect other pollutants from the benzene and xylenol groups by engineering mutations in the bacterial protein.
- The reaction is measured using a light-emitting diode (LED), phototransistor assembly within the device.
- **Features -** It can detect several aromatic contaminants, including phenol, benzene, and 2, 3 dimethyl phenol even when these pollutants are present in low concentrations usually in the 10-200 parts per billion range.
- AroTrack can operates efficiently in water temperatures up to 50°C and it completes analyses within 30 minutes.
- It is highly reliable, offering a degree of accuracy and efficiency on par with modern spectrophotometers, which are currently used for detection.
- It promises to revolutionise water quality monitoring, particularly in rural and resource-limited areas.

9.31 Science of Plant Communication

The Biologists and scientists discovered that plants understand the significance of communication which is better than any other organisms.

- **Plants –** It appear to be the quiet, silent and solitary type of organisms but they have a complex way of communicating.
- They communicate using volatile organic compounds (VOCs), electrical signaling, and common mycorrhizal networks between plants and a host of other organisms.
- **Ways of Communication - Chemical signals -** It release chemicals into the air when in danger, known as VOCs.
- VOCs alerting the neighbouring plants to start producing defensive compounds or toxic substances to keep the herbivores away.
- It release the signals through soil also by when it experience stress by pest attacks or droughts immediately sends out signals to others through their roots.
- **Underground Networking** – It friendly attached with fungi to the roots that helps in extending the plant's root system with fungi's web of filament.



- This wide network helps the plants to share the nutrients received from fungi to other plants in time of distress.
- **Cooperative Behaviour** – When a growing plant know about their struggling neighbour, they share nutrients to support their neighbour's growth.

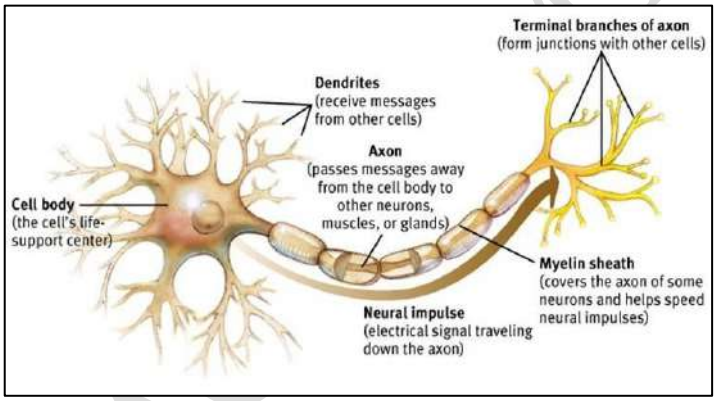
Volatile organic compounds (VOCs) are a group of chemicals that can vaporize into air.

- It is widely noticeable in densely populated forests where there is an intense need for light, water and nutrients.
- **Significance –** It shows their understanding of the surrounding and their prompt response to potential threat or dangers.
- It prioritise their resources to support close and far plants in distress which helps in the overall forest health.
- It shows the resilient and reliable ecosystem by working together.

Biologists and scientists discovered that plants form a symbiotic bond with mycorrhizal fungi that connects roots of different plants and thus named this fungal network 'wood wide web'.

9.32 Dendrites

Recently, the Scientists have first time uncovered a unique type of electrical signal from dendrites in the human brain.



- **Dendrites –** It is ***branch like extensions at the beginning of a neuron*** that help increase the surface area of the cell body.
- **Characteristics –** They are short, narrow and highly branched.
- The length of dendrites is about two µm, and they are usually 5 to 7 in numbers.
- Dendrites comprise various cytoskeletal structures, the Golgi apparatus, ribosomes, and smooth endoplasmic reticulum.
- **Functions –** Its primary job is to *collect signals from other neurons and pass them* to the neuron's main body, called the Soma.
- Dendrites also accumulate all incoming information from axon terminals.
- Dendrites collect messages from other neurons, which are then forwarded to the brain.
- The brain, then, sends back the instructions to various parts of the body so that a reaction can happen.
- Dendrites also have a significant role to play in psychological processes such as ***memory formation.***

Recent Findings

- Researchers examined layer 2/3 (L2/3) pyramidal neurons from human brain tissue, specifically from the ***cerebral cortex***, which plays a key role in advanced thinking and problem-solving.
- **Calcium-Mediated Dendritic Action Potentials (dCaAPs) -** They have uncovered for the 1st time a unique type of electrical signal in the human brain called dCaAPs.
- It showed a "graded" response which means their strength varied depending on the level of stimulation, they *reached their peak at just the right level of input* but became weaker with stronger inputs.
- These dendritic signals allow individual neurons to solve problems that scientists previously thought required entire networks of brain cells.
- Essentially, a single neuron can classify inputs that are traditionally seen as too complex for one cell to handle, redefining our understanding of brain computation.

INFORMATION TECHNOLOGY

9.33 AI Data Bank

The Minister of Science & Technology launched an Artificial Intelligence (AI) Data Bank, at the 7th edition of the ASSOCHAM AI Leadership Meet 2024.

- It is ***India's first practical AI Data Bank.***
- **Aim -** To accelerate *technological growth and innovation* by providing researchers, startups, and developers access to high-quality, diverse datasets.

- It is essential for creating scalable and inclusive AI solutions.
- It *enhances national security* through real-time analytics of satellite, drone, and IoT data.
- This step aligns with India's goal to utilize AI for predictive analytics in disaster management and cyber security.
- **India's AI -** It is guided by a comprehensive approach focused on innovation, ethical governance, and global collaboration.
- It is fostering partnerships between academia, private enterprises, and startups to propel AI applications in critical sectors such as healthcare, agriculture, smart cities, and space exploration.

7th ASSOCHAM AI Leadership Meet 2024

- The Associated Chambers of Commerce & Industry of India (ASSOCHAM) is the country's oldest apex chamber.
- **Vision -** Creating a New India.
- **4 strategic priorities -** Sustainability, Empowerment, Entrepreneurship and Digitisation.
- **Theme -** AI for India: Advancing India's AI Development - Innovation, Ethics, and Governance.
- It served as a platform for leaders, policymakers, and industry experts to exchange insights and chart a responsible path for AI.

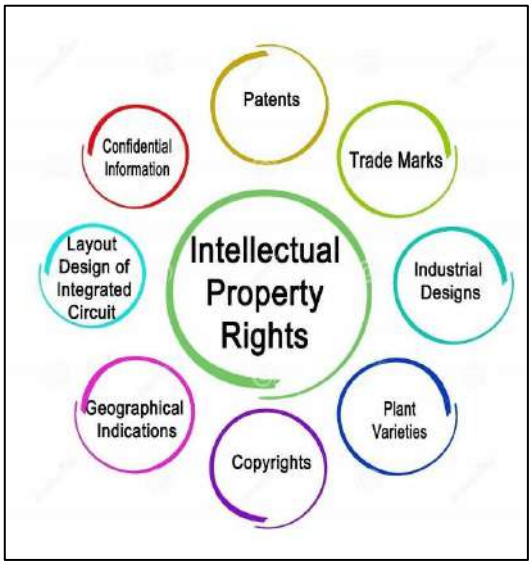
- It focuses to *empower citizens and ensure equitable access* to the benefits of this transformative technology.
- **Significance -** It aligns with India's goal to utilize AI for predictive analytics in disaster management and cyber security.
- It shows India's strategic roadmap for harnessing the transformative potential of AI.
- It addresses pressing challenges such as climate change, public service delivery, and national security.

10. INDEX AND REPORT

10.1 World Intellectual Property Indicators (WIPI), 2024

India secures position in top 10 countries in Patents, Trademarks, and Industrial Designs in the recently released WIPI, 2024.

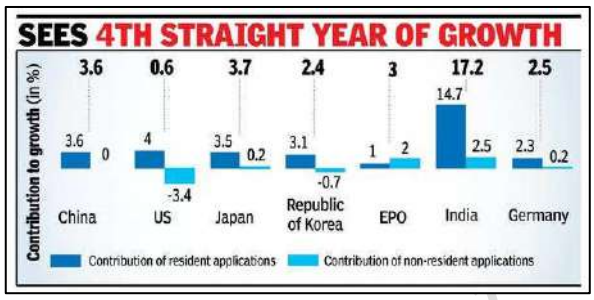
- **WIPI –** It is an ***annual statistical report*** published by the World Intellectual Property Organization (WIPO).
- It underscoring global trends in Intellectual Property (IP) statistics collected from ***the 193 member States of WIPO***.



Report findings

- **India's position -** India has secured a spot for the first time in the ***global top 10*** for all 3 major intellectual property (IP) rights.
- **3 major IP -** Patents, Trademarks, and Industrial designs.
- **Patents** – India ranks ***6th globally*** for patents.
- The patent office also granted 149.4% more patents in 2023 compared to the previous year. It underlining the country's fast-evolving IP ecosystem.
- India recorded the fastest growth in patent (+15.7%) applications in 2023 among the top 20 origins, marking the 5th consecutive year of double-digit growth.
- **Industrial designs (ID) –** India indicates a steady rise (36.4%) in ID which aligns with increasing emphasis on product design, manufacturing, and creative industries.
    - **Top 3 sectors**—Textiles and Accessories, Tools and Machines, and Health and Cosmetics made up almost half of all design in India.
- **Trademarks -** India ranked ***4th globally*** in trademarks.
    - **Key Sectors -** Health (21.9%), Agriculture (15.3%), and Clothing (12.8%) leading the way.
- India's trademark office holds the *second-largest number of active registrations worldwide.*

- It reflecting the country's strong position in global brand protection.
- **Global Findings -** Asia continues to be the top spot for patents, accounting for 68.7%, 66.7% and 69% of global patent, trademark and industrial design filing activity in 2023.
- **Patents -** Global patenting activity reached new heights in 2023 as applications surpassed 3.5 million for the first time.
- It marks the 4th consecutive year of growth despite a challenging macroeconomic environment.



- China (1.64 million), the US (518,364), Japan (414,413), the Republic of Korea (287,954) and Germany (133,053) led global patent filings.
- **Industrial filing -** Global industrial design filing activity also grew in 2023, rising by 2.8% to 1.52 million designs, with 7 of the top 20 countries seeing double digit growth.
- China were the most active in the world in terms of design count in 2023.
- They were followed by applicants from the US (69,076), Germany (64,986), Italy (60,486) and the Republic of Korea (60,120).
- In contrast, Germany (–7.6%) and the Republic of Korea (–3.4%) saw declines.
- **Trademark filing** - Activity totalled 15.23 million classes, reflecting a 2% decline on 2022, though the decrease was much less severe than in the previous year.
- Among the top 5 origins, Italy (+15.7%) had the fastest growth in filings in 2023, followed by China (+5%) and the US (+2.6%).
- **Asia's position -** Offices located in Asia received around 2.44 million applications in 2023, constituting 68.7% of the world total.
- Notably, over the course of a decade, Asia's share of total applications filed globally has increased by 10.3% point from 58.4% in 2013 to 68.7% in 2023.
- Meanwhile, Northern America's share has decreased from 23.6% in 2013 to 17.8% in 2023, while Europe's has fallen by 3.2% points down to 10.3% during the same period.

10.2 World Food and Agriculture Book

According to the recently released 'World Food and Agriculture' yearbook, global hunger continues to worsen, with 152 million more people facing hunger in 2023 compared to pre-pandemic levels in 2019.

- It reveals critical insights on the sustainability of global agriculture, food security, and the importance of agrifood systems in employment
- **Released by** - United Nation's Food and Agriculture Organization (FAO).

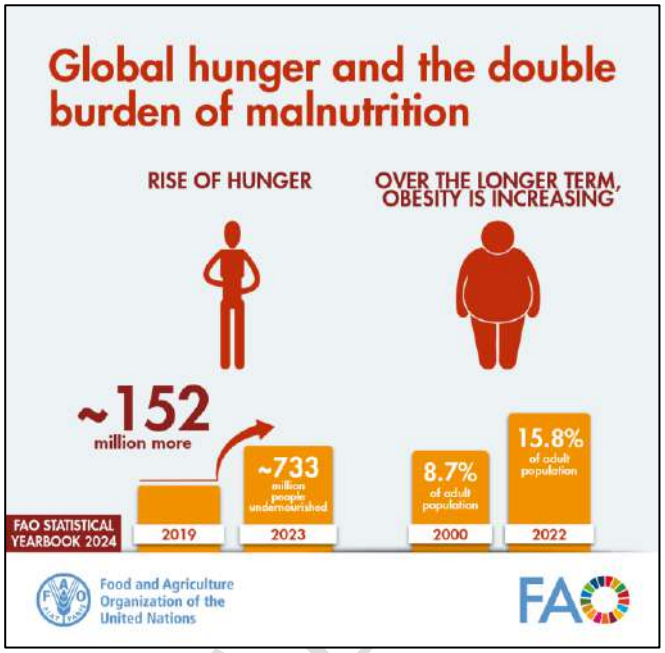
> ***Food and Agriculture Organization (FAO)*** *was founded in 1945 with its headquarters in Rome. It is a specialized agency of the United Nations that leads international efforts to defeat hunger.*

Key highlights from the book

- **Global agricultural value** – It has *increased by 89% in real terms* over the past 2 decades, reaching $3.8 trillion in 2022.
- Despite this growth, agriculture's contribution to global economic output has remained relatively stable, and the proportion of the global *workforce employed in agriculture has decreased*.
- **Food insecurity** – While food production has continued to rise, hunger remains a persistent issue.
    - *Majority of the undernourished people lives in Asia*, though the prevalence of undernourishment is highest in Africa.
- **Obesity rates** – They are also *rising*, particularly in high-income regions.

- Over 25% of adults in the Americas, Europe and Oceania are obese.

- **Global production of primary crops** – It reached 9.6 billion tonnes in 2022, an increase of 56% compared to 2000.
  - Staple crops such as sugar cane, maize, wheat and rice together account for nearly 50% of global crop production.
- **Meat production** – It had increased, with *chicken accounting for the largest share* of this rise.
- **Use of pesticides** – It *increased by 70%* between 2000 and 2022, with the Americas accounting for 50% of the global pesticide use in 2022.
- **Inorganic fertilizers in agriculture** – Its usage increased in 2022, with *58% of this amount being nitrogen.*
- **Production of vegetable oils** – It grew by 133% between 2000 and 2021, largely driven by an *increase in palm oil production*.



- **Greenhouse gas emissions from agrifood systems** – It have risen with livestock contributing to around 54% of Farm-gate emissions.
- **Water scarcity** – It remains a *growing concern in regions such as the Near East and North Africa*, where many countries face extreme water stress, impacting the sustainability of agricultural production.
  - Kuwait, the United Arab Emirates and Saudi Arabia are withdrawing each year 9 to almost 40 times their renewable freshwater resources available.

10.3 State of the World's Children report, 2024

The United Nations International Children's Emergency Fund (UNICEF) published the State of the World's Children Report which determine the future of childhood in a changing world.

Report Findings

- It is a vital statistics on child survival, development and protection across countries and regions worldwide.
- It explore all future indicators and their impact for children.
- **3 Megatrends** - Impact children's lives between now and 2050:
- **Demographic transitions** - Movement and migration can offer benefits and also carries dangers, including increased risk of exploitation and separation from caregivers.
- **Climate and environmental crises** - Children developing brains, lungs and immune systems are affected by pollution, disease and extreme weather.
- **Frontier Technologies** – Its developing and governing will affect the future generations to learn, work, communicate, and also their well-being for years to come.
- **3 Future scenarios** – It shows children depending on rates of progress and on the actions of decision-makers.

UNICEF

- **UNICEF** – It is an agency of the United Nations responsible for *providing humanitarian and developmental aid to children* worldwide.
- It works in *over 190 countries and territories* to protect the rights of every child.
- It provides children to survive, thrive, fulfil their potential, education, health, and nutrition services, and protect them from violence, and abuse and keep them safe from climate change and disease.
- UNICEF is world's largest provider of vaccines, and also runs the world's largest humanitarian warehouse.

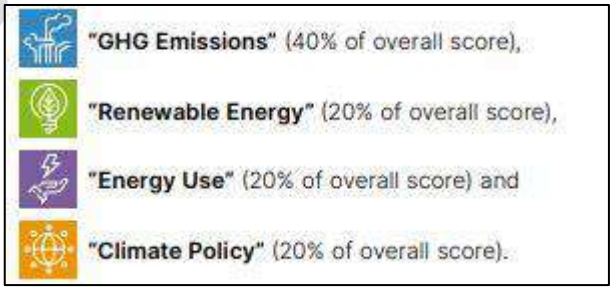
- **Business-as-usual trendlines** - Child populations in low-income and lower-middle-income countries will surge by the 2050s.
- **Accelerated development** – They are exposed to prolonged subnational conflict and heatwaves.

- **Delayed development** – They are still facing extreme gender inequality with 1.1 billion living in gender unequal societies.

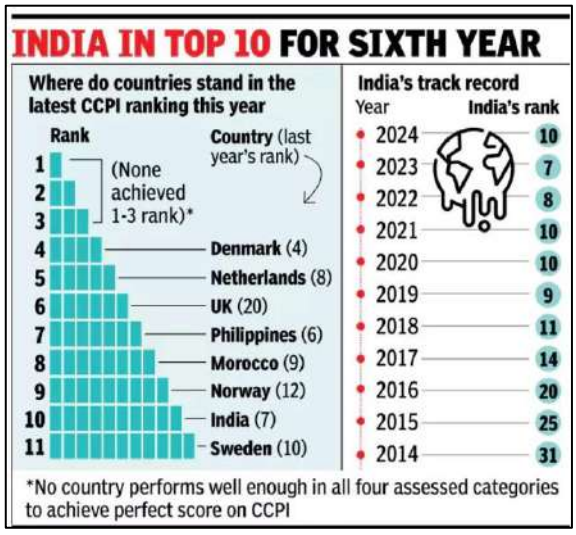
10.4 Climate Change Performance Index (CCPI), 2025

Recently, the United Nations Climate Change Conference (UNCCC) released a report of Climate Change Performance Index (CCPI) 2025 in Baku, Azerbaijan.

- **CCPI -** It is an ***independent monitoring tool*** released ***annually*** for tracking countries climate mitigation performance.
- **Aim -** It increases transparency in national and international climate policy and enables comparison of individual countries climate protection efforts and progress.
- **Published by** - Germanwatch, New Climate Institute, and Climate Action Network International.
- The CCPI was 1st presented at the 11th Meeting of the Conference of the Parties (COP 11) climate change conference in ***Montreal in 2005.***
- **Methodology** – It evaluates and compares the ***climate protection performance of 63 countries and the European Union (EU).***
    - Together, these countries account for more than 90% of global greenhouse gas (GHG) emissions.
    - Other countries with significantly lower emissions therefore are not applicable to the CCPI's methodology.
    - However, in the past years new countries have regularly been included (Nigeria, Pakistan, UAE and Uzbekistan were added in CCPI 2024).
    - It uses ***production-based emissions*** only for its calculation.
- **Indicators -** 14
- **Categories -** 4
- 80% of the assessment is based on quantitative data from internationally recognised institutions.



- **Top Ranking Countries, 2025** - The ***first 3 places empty***, as no country performed well enough across all index categories to achieve an overall "very high" rating.
    - Denmark (4th)
    - Netherland (5th)
    - UK (6th)
- **Low Ranking Countries** - Largest two emitters, China and the U.S., remain very low at 55th and 57th place, respectively.
- Iran (67th), Saudi Arabia (66th), the United Arab Emirates (65th), and Russia (64th).
- Only **22** of the 64 surveyed CCPI countries aligned with the 2015 Paris Agreement goal of keeping global temperature rise within 2 degrees Celsius and make efforts to contain it to 1.5 degrees.



- **Methodology,2025** – It is based on the methodological design introduced in 2017 covering
    - All greenhouse gas (GHG) emissions and
    - Evaluates the 2030 targets and
    - The well-below-2°C compatibility of countries' current levels and targets in the categories
- **India's Rank -** ***India ranks 10th*** out of the 63 countries.
- India drops 2 places but remains among top 10 climate performers.

- India's per capita emissions stand at 2.9 tons of CO_2 equivalent (tCO_2e), far below the global average of 6.6 tCO_2e.
- **Category ranking of India**
  - **High -** GHG Emissions and Energy Use
  - **Medium –** Climate Policy
  - **Low -** Renewable Energy

India has pledged to reach net zero emissions (balancing emissions with removals) by 2070 and aims to achieve 500 gigawatts of renewable energy capacity by 2030.

11. OTHERS

11.1 Booker Prize, 2024

British writer Samantha Harvey recently won the Booker Prize in 2024 for her space station novel Orbital.

- The Booker Prize is open to novels ***originally written in English and published in the U.K. or Ireland.***
- **Founded in** - 1969.
- **Awarded by –** Booker Prize Foundation.
- It has been awarded ***annually.***
- **Nationality -** Any nationality.
- **Publication –** The novel must be published by a registered UK or Irish publication, self-published novels are ***not eligible.***
- **Award -** The winner receives ***50,000 pounds*** as well as the 2,500 pounds awarded to each of the 6 shortlisted authors.
- Both the winner and the shortlisted authors are guaranteed a global readership and can expect a dramatic increase in book sales.
- **Recognition** - Being shortlisted or nominated for the Booker Prize is considered a mark of distinction for authors.
- **Shortlisted candidates -** Held, Creation Lake, Orbital, James, The Safekeep, Stone Yard Devotional.

International Booker Prize

- It is an annual award that recognizes the ***best translated work*** of fiction published in the United Kingdom or Ireland.
- The award honors the best novels and short story collections in translation.
- International Booker Prize began life in 2005 as the Man Booker International Prize.
- It was initially a ***biennial prize*** for a body of work, and there was no stipulation that the work should be written in a language other than English.
- In 2015, after the rules of the original Booker Prize expanded to allow writers of any nationality to enter as long as their books were written in English and published in the UK.
- Since then it has been awarded ***annually*** for a single book, written in another language and translated into English.
- The prize money is divided equally between the author and the translator. The winning title receives a ***£50,000 prize***.

11.2 National Gopal Ratna Award (NGRA) 2024

Recently, National Gopal Ratna Awards (NGRA) awards given on the occasion of National Milk Day celebrations on 26th November 2024.

- **NGRA -** It is one of the highest National Awards in the ***field of livestock and dairy sector*** for the year 2024.
- **Given by -** *Department of Animal Husbandry and Dairying (DAHD).*
- **Ministry -** Ministry of Fisheries, Animal Husbandry & Dairying.
- It has been conferred under the Rashtriya Gokul Mission (RGM) every year.
- **Objective -** To recognize and encourage all individuals like
    - Farmers rearing Indigenous animals,
    - Artificial Insemination (AI) Technicians and
    - Dairy cooperative societies / Milk Producer Company / Dairy farmers Producers Organizations working in the sector of animal husbandry and dairying.
- **3 categories -** It is conferred under these categories:
    - Best Dairy Farmer Rearing Indigenous Cattle/buffalo Breeds.
    - Best Dairy Cooperative Society (DCS)/ Milk producer Company (MPC)/ Dairy Farmer Producer Organization (FPO).
    - Best Artificial Insemination Technician (AIT).
- The Department has incorporated a ***Special award*** for North Eastern Region (NER) States, in all the 3 categories to encourage and boost the dairy development activities in NER.
- **Certificate**
    - Certificate of merit, a memento, and a monetary prize for first 2 categories.
    - Certificate of merit and a memento only – AIT Category.
- **Cash prize based on Ranking**
    - Rs. 5 lakh - 1st rank
    - Rs. 3 lakh - 2nd rank
    - Rs. 2 lakh for 3rd rank and
    - Rs. 2 lakh - Special Award for NER.

Rashtriya Gokul Mission (RGM)

- **Aim -** Conservation and development of indigenous bovine breeds in a scientific and holistic manner.
- **Duration** - From 2021-2022 to 2025-2026.
- **Implemented by** - Department of Animal Husbandry and Dairying
- **Under -** Rashtriya Pashudhan Vikas Yojna from 2021 to 2026.
- **Important -** Enhancing milk production and productivity of bovines to meet the growing demand of milk and making dairying more remunerative to the rural farmers of the country.
- **Benefits -** Women in particular since over 70% of the work involved in livestock farming is undertaken by women.

National Milk Day honors the 103rd birth anniversary of Dr. Verghese Kurien, remembered as the "Father of the White Revolution in India."

11.3 President's Colour Award

The President's Colours were recently awarded to the 4 mechanised infantry battalions by the Army chief during a ceremony in Maharashtra.

- It is ***one of the highest honors*** that can be bestowed upon any military unit such as the Army, Naval, and Air Force.
- **Origin -** The tradition began under colonial rule.
- On 23 November 1950, the 'king's colour' of the erstwhile British Indian regiments were laid to rest in the Chetwode Hall, Dehradun, to make way for the 'colours' of the President of the Republic of India.
- The ***Indian Navy*** was the first to receive the President's Colours in 1951.
- **Presented by -** The colours are presented by ***the President*** or, on her/his behalf, by the Chief of the Army Staff.
- **Presented to -** Units depend upon completing specified meritorious service to recognize their contributions in combat and peacetime operations and their dedication to the nation.

- **Emblem-** The award is also known as ***Nishaan***, an emblem that unit officers wear on the left sleeve of their uniform
- **Colours –** It is a ***ceremonial flag*** consists of a golden border in the middle and bears the unit's sign or mark and motto in the centre.
- The tradition of carrying these colours into the battlefield has stopped but ceremonially awarding and carrying them continues.
- They were also used as banners of the Knights of the Middle Ages.
- **President colours, 2024 -** The President's Colours were recently awarded to the 4 mechanised infantry battalions.
- Mechanised Infantry Arm, since its inception in 1979, has distinguished itself as a modern and professional force within the Indian Army.
- **Key operations -** Op PAWAN, Op VIJAY, Op RAKSHAK, and Op SNOW LEOPARD, as well as in UN peacekeeping missions.
    - Operation Pawan - Sri Lanka
    - Operation Vijay - Kargil
    - Operation Rakshak - Jammu & Kashmir
    - Operation Snow Leopard - Eastern Ladakh
    - United Nations peacekeeping missions.

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