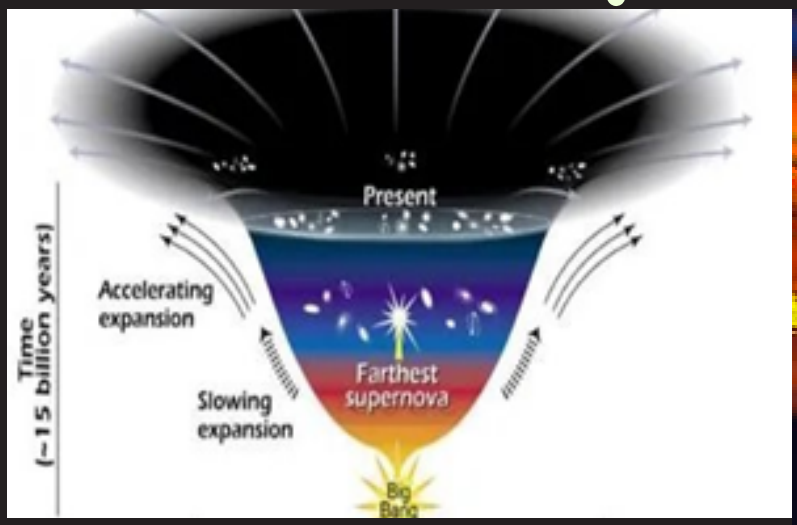
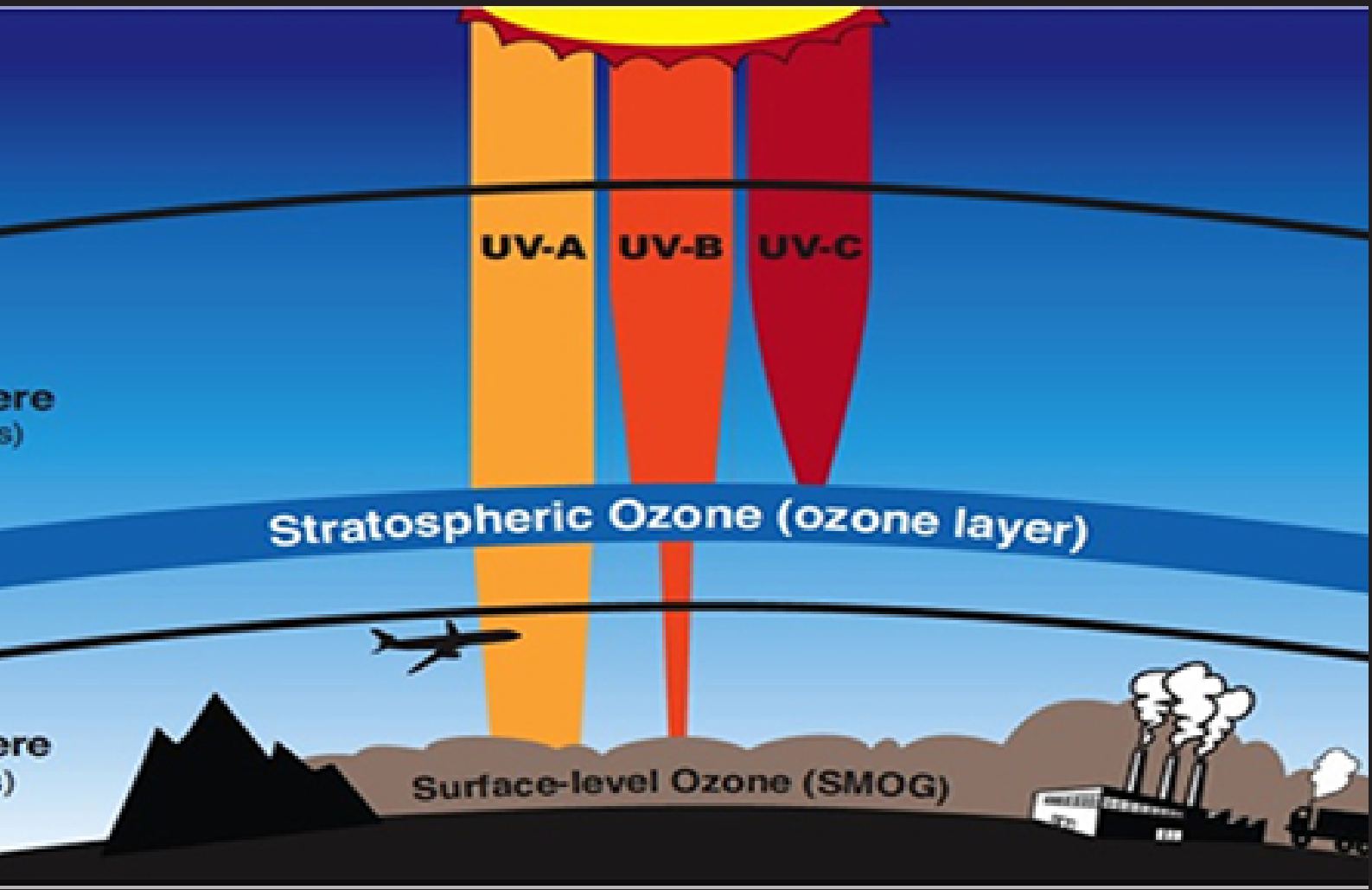
November 2023
GES Reporter

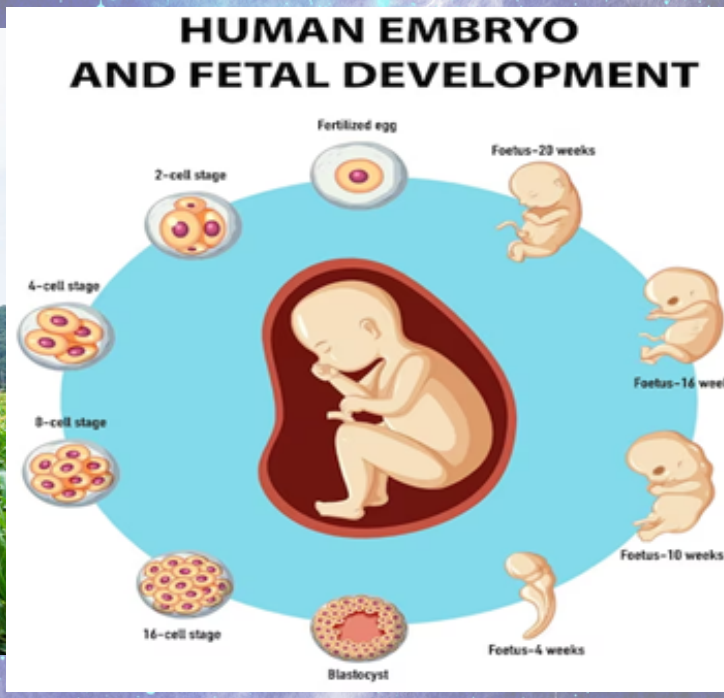
SAURABH PANDEY
CSE
(CIVIL SERVICES EXAMINATION)
FROM BASICS TO UPSC BRILLIANCE

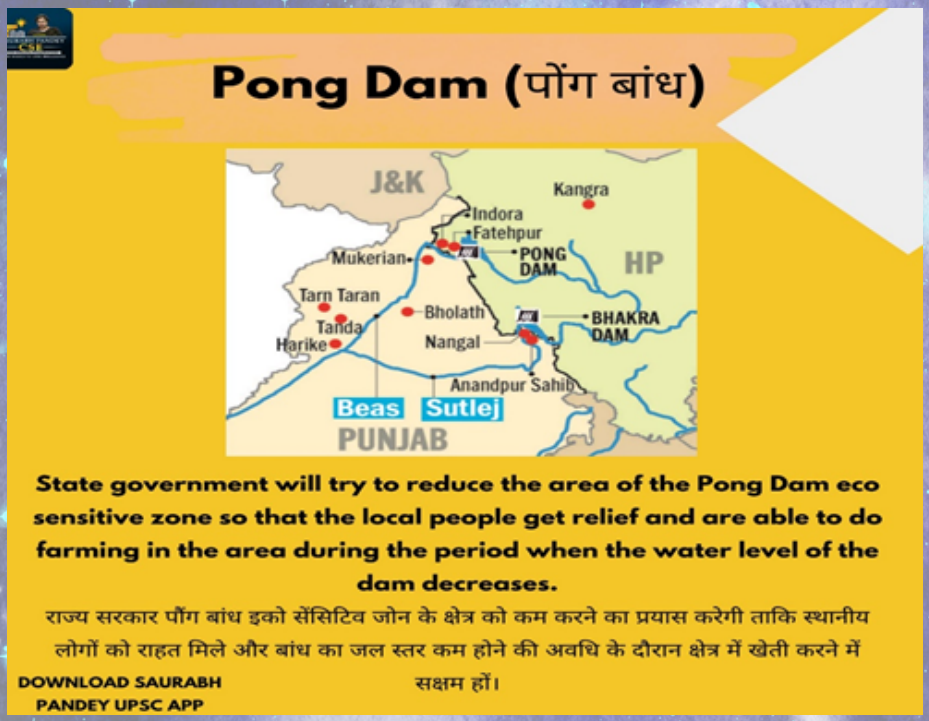


IAS / civil service exam
Covers Geography,science, Environment



November Month 2023





Saurabh Pandey — **Mentor**

Vishali Sharma — **Editor**

CURRENT AFFAIRS PLUS

2 YRS COVERAGE

50 TEST
RS ~~999~~

Target UPSC Prelims 2024

PRELIMS TEST SERIES ON ADVANCED CURRENT AFFAIRS

BY Saurabh pandey sir

DAILY ANSWER REVIEW

Target Mains 2024/25

आकलन Series

Daily answer checked

weekly Mains mock

सत्यमेव जयते
Goverment Of India

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Notes Booklets Included

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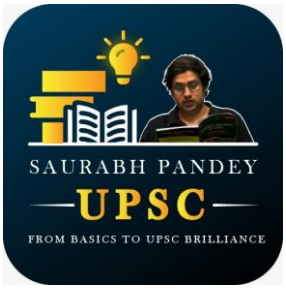
Starting 10 th Jan 2024

About Author

Saurabh Pandey established Saurabh Pandey CSE Channel an online learning platform. He has 8 years of experience in teaching for the UPSC/IAS exam in various renowned institutes like Vision IAS, Study IQ, and Unacademy. He qualified for many exams like NET JRF. He appeared for a UPSC interview and wrote 3 civil services mains exams. He is MA in public administration. He did B.Tech in biotechnology.

Best Sources for UPSC CSE

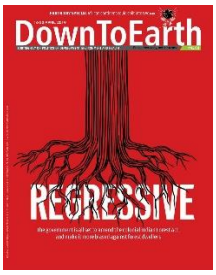
The Hindu



The Indian Express

PIB

Down to Earth



Physics.org

Upcoming Courses

1. Agriculture Optional

   Join Agriculture optional for UPSC civil services/Indian Forest Services (IoFS)

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3. 2nd ARC report
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5. Also access free magazine and attempt daily /weekly current affairs mock
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SAURABH PANDEY
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FROM BASICS TO UPSC BRILLIANCE

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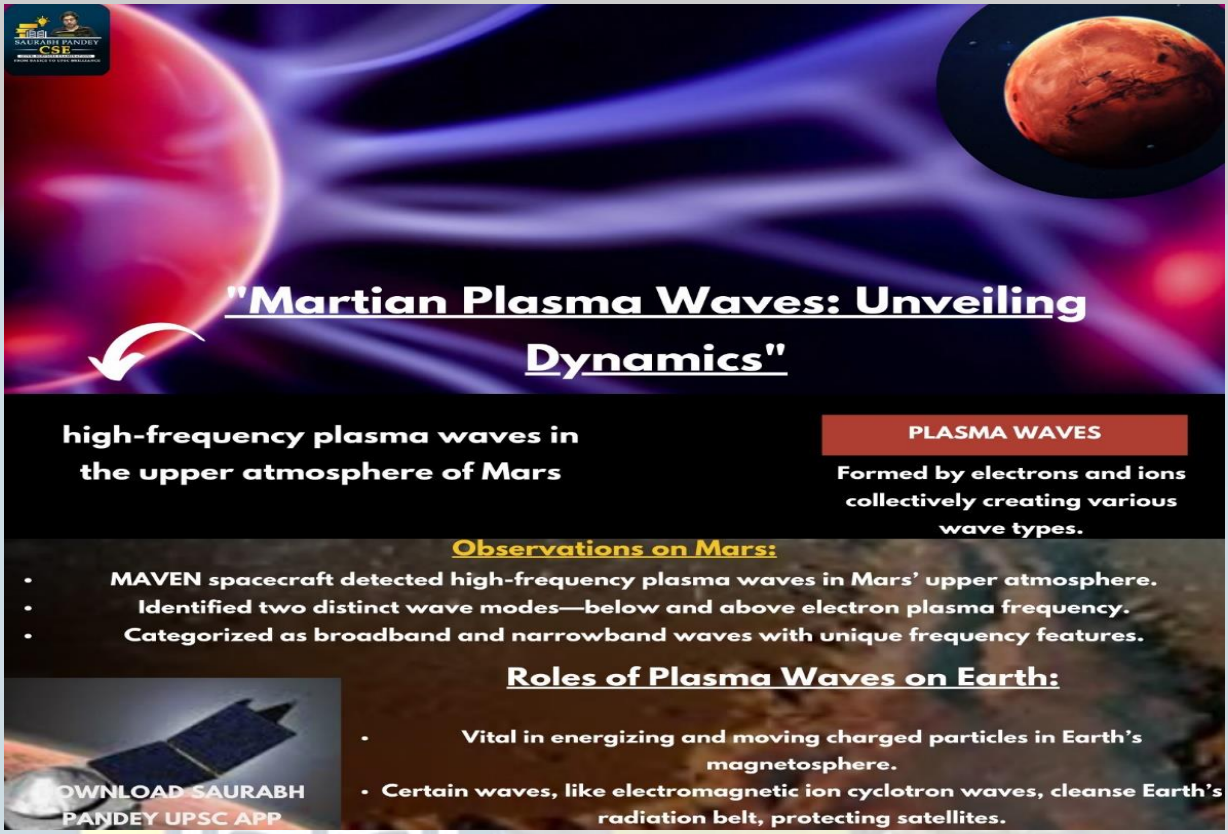
"Martian Plasma Waves: Unveiling Dynamics"
high-frequency plasma waves in the upper atmosphere of Mars
PLASMA WAVES
Formed by electrons and ions collectively creating various wave types.
Observations on Mars:
MAVEN spacecraft detected high-frequency plasma waves in Mars' upper atmosphere.
Identified two distinct wave modes—below and above electron plasma frequency.
Categorized as broadband and narrowband waves with unique frequency features.
Roles of Plasma Waves on Earth:
Vital in energizing and moving charged particles in Earth's magnetosphere.
Certain waves, like electromagnetic ion cyclotron waves, cleanse Earth's radiation belt, protecting satellites.
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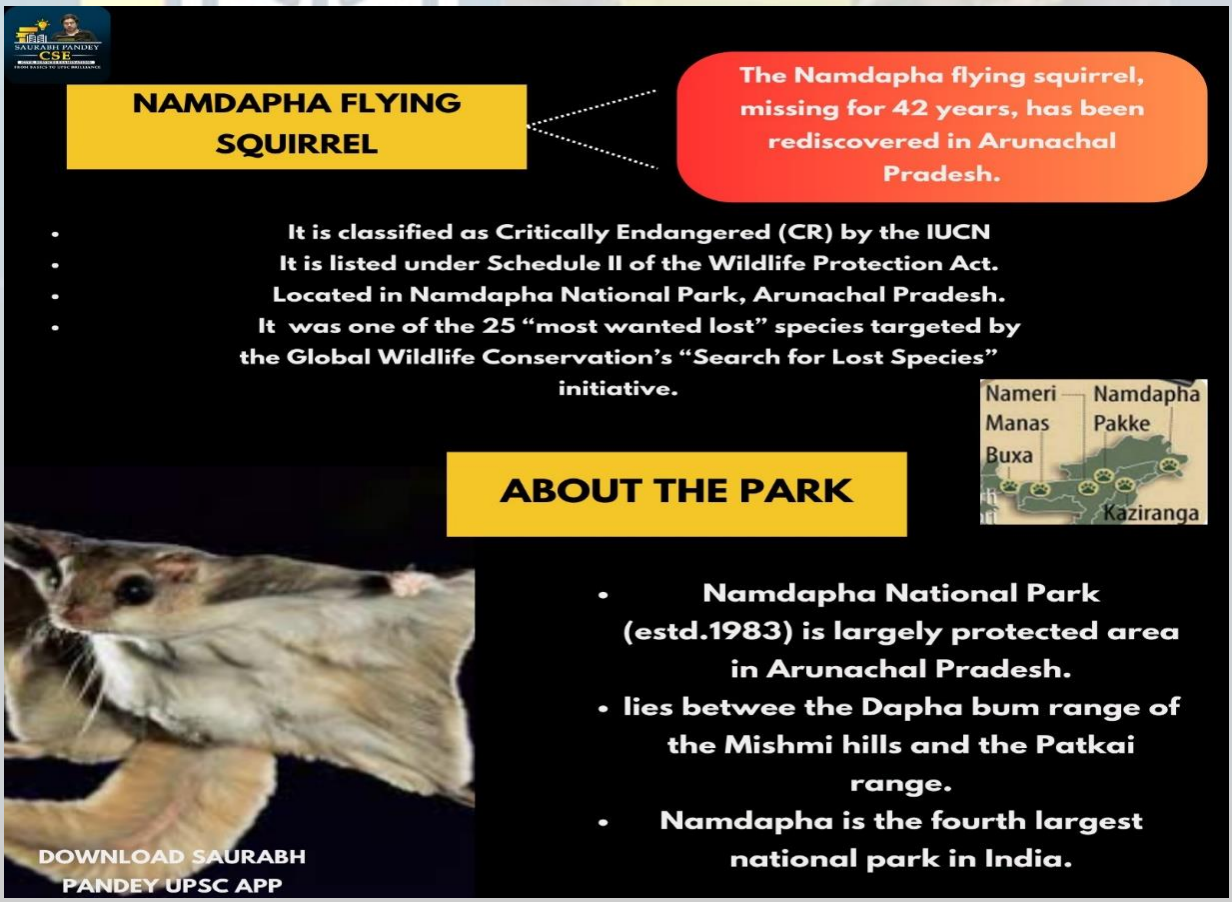
NAMDAPHA FLYING SQUIRREL
The Namdapha flying squirrel, missing for 42 years, has been rediscovered in Arunachal Pradesh.
It is classified as Critically Endangered (CR) by the IUCN
It is listed under Schedule II of the Wildlife Protection Act.
Located in Namdapha National Park, Arunachal Pradesh.
It was one of the 25 "most wanted lost" species targeted by the Global Wildlife Conservation's "Search for Lost Species" initiative.
Nameri
Namdapha
Manas
Pakke
Buxa
Kaziranga
ABOUT THE PARK
Namdapha National Park (estd.1983) is largely protected area in Arunachal Pradesh.
lies betwee the Dapha bum range of the Mishmi hills and the Patkai range.
Namdapha is the fourth largest national park in India.
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Exercise Desert Cyclone

The Joint Military Exercise 'Desert Cyclone 2024' between India and UAE will be held from January 2 to January 15 in Rajasthan.

- It is the inaugural edition of joint military exercise "Desert Cyclone 2024"between India and the United Arab Emirates (UAE).
- Earlier this year, two ships of the Indian Navy, INS Visakhapatnam, and INS Trikand participated in bilateral exercise 'Zayed Talwar' with the UAE to enhance interoperability and synergy between the two navies.

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About Free Movement Regime:

Under the FMR, all the hill tribes, whether they are citizens of India or Myanmar, can travel within 16 km on either side of the Indo-Myanmar Border (IMB).

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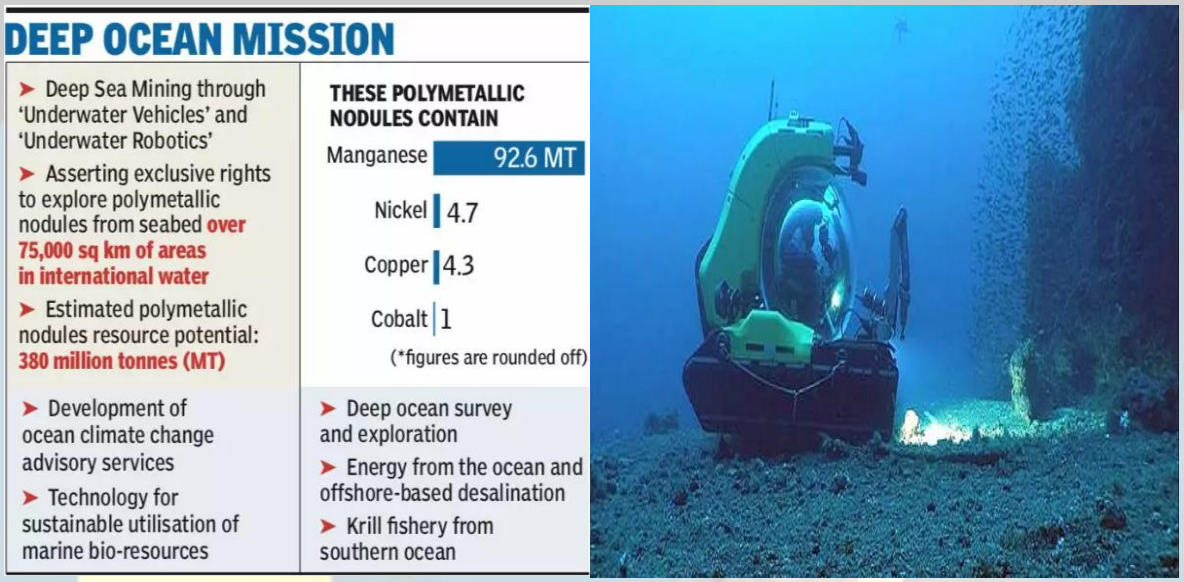
Deep ocean mission



- **The Deep Ocean Mission (DOM) is India's ambitious quest to explore and harness the depths of the ocean.**
- **With DOM, India will, for the first time, embark on a journey to a depth of 6,000 metres in the ocean using an indigenously developed submersible with a three- member crew**
- **DOM is India's ambitious programme for underwater exploration, chiefly implemented by the MoES.**

The mission has six pillars:

- **(i) Development of technologies for deep-sea mining and a manned submersible to carry three people to a depth of 6,000 metres in the ocean**
- **(ii) Development of ocean climate change advisory services, involving an array of ocean observations and models to understand and provide future climate projections;**
- **(iii) Technological innovations for the exploration and conservation of deep-sea biodiversity;**
- **(iv) Deep-ocean survey and exploration aimed at identifying potential sites of multi-metal hydrothermal sulphides mineralisation along the Indian**

Ocean mid-oceanic ridges;

- **(v) Harnessing energy and freshwater from the ocean; and**
- **(vi) Establishing an advanced Marine Station for Ocean Biology, as a hub for nurturing talent and driving new opportunities in ocean biology and blue biotechnology**
- **The 'New India 2030' document outlines a blue economy as the sixth core objective for India's growth.**
- **The years 2021-2030 have been designated by the United Nations as the 'Decade of Ocean Science'. DOM is one of nine missions under the Prime Minister's Science, Technology, and Innovation Advisory Council (PMSTIAC).**
- **It is imperative that DOM supports the blue- economy priority area, blue trade, and blue manufacturing in India. MoES institutes, especially the Centre for Marine Living Resources and Ecology, Indian National Centre for Ocean Information Services, National Centre for Coastal Research, National Centre for Polar and Ocean Research and National Institute of Ocean Technology (NIOT) will collaborate with national institutes and academia to achieve objectives outlined in DOM, albeit with well- segregated responsibilities**
- **As a part of DOM, India's flagship deep ocean mission, 'Samudrayaan', was initiated in 2021 by the Minister of Earth Sciences. In 'Samudrayaan', India is embarking on a groundbreaking crewed expedition to reach the ocean bed at a depth of 6,000 m in the central Indian Ocean.**
- **The Ministry is also working on an integrated system to mine polymetallic nodules of precious minerals from the central Indian Ocean bed. The minerals we can mine from the ocean bed in the central Indian Ocean region, allocated to us by the United Nations International Seabed Authority (ISA), include copper, manganese, nickel, and cobalt**

- **Polymetallic nodules, which contain precious metals like copper, manganese, nickel, iron, and cobalt, are found approximately 5,000 m deep, and polymetallic sulphides occur at around 3,000 m in the central Indian Ocean.**

SPACE VS OCEAN EXPLORATION

- **electronics and instruments find it simpler to function in a vacuum or in space. Conversely, inside the water, poorly designed objects collapse or implode.**
- **Landing on the ocean bed also presents challenges due to its incredibly soft and muddy surface.**
- **extracting materials requires them to be pumped to the surface, an undertaking that demands a large amount of power and energy.**
- **Unlike controlling rovers on distant planets, remotely operated vehicles prove ineffective in the deep oceans due to the absence of electromagnetic wave propagation in this medium.**
- **Visibility also poses a significant hurdle as natural light can penetrate only a few tens of metres beneath the surface, whereas space observations are facilitated through telescopes.**
- **All these intricate challenges are further compounded by factors like variations in temperature, corrosion, salinity, etc., all of which must also be dealt with.**

The Matsya6000

- **The Matsya6000 is India's flagship deep- ocean human submersible that aims to reach the ocean bed at a depth of 6,000 m.**
- **Accompanied by three crew members, the submersible carries a suite of scientific tools and equipment designed to facilitate observations, sample collection, basic video and audio recording, and experimentation.**
- **The primary mission of Matsya6000 is exploration.**

- **The U.S.A., Russia, China, France, and Japan have already achieved successful deep-ocean crewed missions.**
- **India is poised to join the ranks of these nations. Our focus remains on developing these technologies indigenously, aligned with the vision of 'Atmanirbhar Bharat'**

Features

- **Matsya6000 is designed to accommodate three humans travelling within a specialised sphere of diameter 2.1 m.**
- **The sphere will weigh approximately 28 tonnes and have a short- sleeved environment with life support, where oxygen is supplied and carbon dioxide is removed.**
- **Constructed from a titanium alloy, the sphere is engineered to withstand pressures of up to 6,000 bar**.
- **It is equipped with propellers enabling movement in all six directions and features three viewports that allow the crew to observe its surroundings.**
- **There will be about 12 cameras and 16 lights powered by lithium polymer batteries with an energy budget of 1 kWh.**
- **Communication will be through an acoustic phone and modem. The navigation and positioning systems are state-of-the-art, too.**

Climate finance

- **Climate finance has a crucial role in retaining the trust of the developing countries in future climate change negotiations.**
- **Under Article 9 of the Paris Agreement on Climate Change, it is also mandatory for the developed countries to provide in their Biennial Update Reports (BUR), information relating to the financial resources which they have provided and, also, the projected levels of public financial resources to be provided to developing country parties.**

- **At the Copenhagen Change Conference in 2009, the developed countries made the commitment to mobilise $100 billion per year by 2020.**
- **Further, the developed countries are required, in accordance with the decision accompanying the Paris Agreement, to collectively mobilise $100 billion through 2025, before a new collective quantified goal (NCQG) 'from a floor of $100 billion per year is to be set at the end of 2024'.**
- **At the 26th United Nations Climate Change conference in Glasgow in 2021, the developed countries noted, with deep regret, of being able to mobilise only a total of $79.6 billion.**
- **The Paris Agreement is based on the self- determined efforts of all the parties inscribed in the nationally determined contributions (NDCs), which contain the mitigation efforts to be made by a party for the next five years.**
- **Entire NDCs put together project a picture of overshooting the 1.5° C temperature goal. Going by the needs of countries in the Global South expressed in their NDCs, the amount quantified for the first time touches close to $6 trillion until 2030.**
- **For India, its third BUR says that its financial needs derived from its NDCs for adaptation and mitigation purposes for 2015-30 are $206 billion and $834 billion, respectively.**
- **Most of the financial needs are required in transitioning towards low -carbon, cleaner energy systems from traditional systems, which will not be funded by the designated financial mechanisms of the United Nations Framework Convention on Climate Change (UNFCCC).**
- **Additionally, India has reiterated its demand for a just transition at COP27 as '3.6 million people in 159 districts in India are entrenched in the fossil fuel economy through direct or indirect jobs related to the coal mining and power sector**
- **There is no agreed approach among developed countries to share the burden of this goal.**

- **One analysis suggests that the United States provided just 5% of its fair share in 2020.The Global Environment Facility, a UNFCCC-designated funding agency providing grant and concessional loan to developing countries, is replenished every four years.**
- **A similar approach has been borrowed into the Green Climate Fund (GCF) by the developed countries to mobilise finance.**
- **The GCF, set up to administer a portion of the $100 billion for developing country parties to switch over to low -emissions and climate resilient development path, had its second replenishment on October 5, 2023.**

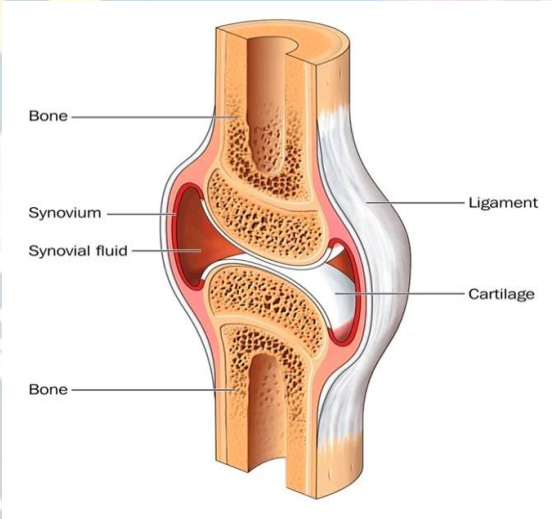
North Dakota

- **It was, to put it mildly, a bad day on the earth when an asteroid smacked Mexico's Yucatan Peninsula 66 million years ago, causing a global calamity that erased three- quarters of the world's species and ended the age of dinosaurs.**
- **The immediate effects included wildfires, quakes, a massive shockwave in the air, and huge standing waves in the seas.**
- **But the coup de grâce for many species may have been the climate catastrophe that unfolded in the following years as the skies were darkened by clouds of debris and temperatures plunged.**
- **Researchers on October 30 revealed the potent role that dust from pulverised rock ejected into the atmosphere from the impact site may have played in driving**

North Dakota

- **Paleontology in North Dakota refers to paleontological research occurring within or conducted by people from the U.S. state of North Dakota.**

Hb and chondrocyte



- **Haemoglobin is found in the red blood cells (RBCs), in that it makes blood red, carries oxygen, and is essential for our survival.**
- **A new and serendipitous discovery has revealed that haemoglobin isn't used by RBCs alone.**
- **In a study published in Nature, scientists from China have reported that chondrocytes cells that make cartilage, the connecting tissue between bones also make haemoglobin and seem to depend on it for their survival.**
- **In a developing growth plate, where oxygen is limited due to a lack of blood**

supply to the region, the chondrocytes still manage to thrive.

- **Based on the scientists' findings, it's the haemoglobin molecules that manage to bring them the oxygen they need to survive.**

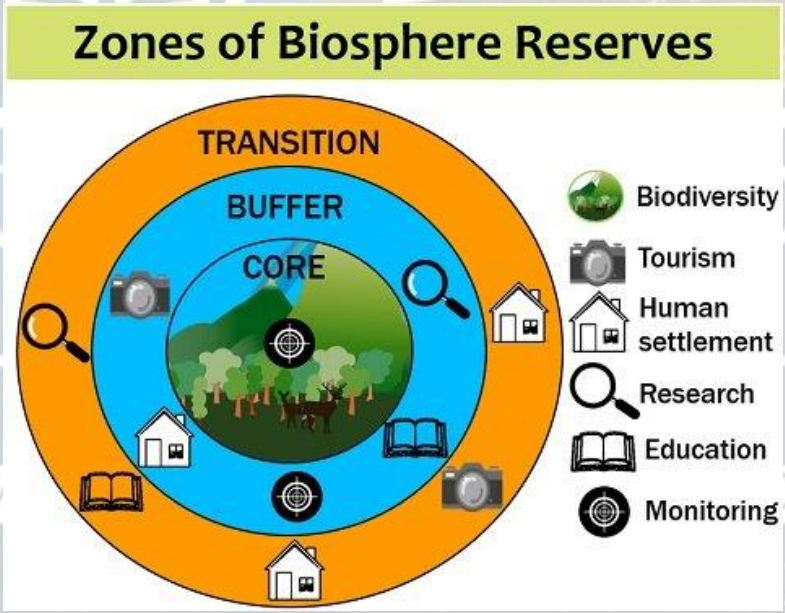
AI regulation

- **The Executive Order in the United States, issued by the Biden administration on October 30, on 'Safe, Secure, and Trustworthy Artificial Intelligence (AI)', illustrates the changing attitude of global leaders towards AI regulation.**
- **Implementation and the use of AI without the necessary safeguards can have enormous implications for the future of humanity, and the changes in regulatory approaches are a welcome development**
- **Ownership and enforcement One of the many areas wherein AI has raised tough questions is ownership and enforcement of intellectual property (IP) rights.**
- **For example, while generative AI tools such as ChatGPT and Midjourney allow people with minimal creative skills to produce reasonably beautiful outputs with the help of a couple of text prompts, their use has raised a number of copy right -related questions.**

- **After reviewing the relevant statutory provisions, case laws, and theoretical justifications for copyright protection, the US District court concluded that human creativity was essential to copyright protection.**
- **Fundamentally, the term 'author,' used in both the Constitution and the Copyright Act, excludes nonhumans".**
- **The office also clarified that copyright applicants had a duty to disclose the inclusion of AI- generated content in any application, followed by detailed guidelines on doing so in registration forms**
- **While India has not effected any legislative changes in the Copyright Act 1957, the Copyright Office ignored the human authorship requirement in Indian copyright law when granting registration with an AI system as a co-author.**
- **When the matter became controversial, the office sent a notice to the human co-author in the application declaring its intent to withdraw the registration.**
- **But the data from the Indian Copyright Office website suggests that the work concerned continues to remain registered**
- **Department- Related Parliamentary Standing Committee on Commerce entitled 'Review of the Intellectual Property Rights Regime in India' (July 2021).**
- **The report had suggested reviewing the Copyright Act 1957 and the Patent Act 1970 to "incorporate the emerging technologies of AI and AI-related inventions in their ambit".**
- **A careful reading of the report suggests some of its recommendations aim to relax the standards for securing copyright and patents.**
- **But these recommendations do not appear to be informed by any study of**

IP- related challenges and needs of the AI innovation ecosystem in India. The committee did not consider the potential adverse implications of such an approach for the startup ecosystem in India.

Single use plastic/ biosphere reserve



- **Our consumption of single- use plastic, in particular plastic water bottles, will also significantly increase. With 80% of all tourism taking place in coastal areas.**

- **In the Island of Principe Biosphere Reserve, Sao Tome and Principe in Africa, schoolchildren have been equipped with stainless steel bottles for drinking water, so the daily production and consumption of single use plastic**

bottles can be completely avoided.

- **Acting as pockets of hope in the face of the climate crisis, the United Nations Educational, Scientific and Cultural Organisation (UNESCO) biosphere reserves are hidden oases, protecting biodiversity, reducing pollution, and enhancing climate resilience.**
- **They are living jewels of land, coastal and marine ecosystems, scattered across the globe, where nature and humans come together creating a symphony of life.**

Biosphere Reserve

- **World Biosphere Reserve Day is celebrated on November 3 each year to raise awareness of the importance of biosphere reserves and to promote their conservation and sustainable use.**
- **In the heart of each biosphere reserve lies the strictly protected core zone, providing habitat for flora and fauna, and protecting water, soil, air, and biota as a whole ecosystem.**
- **There is a buffer zone surrounding the core zone, where people live and work in harmony with nature; a zone that also functions as a laboratory for scientists to study nature, and for training and education.**
- **The outermost edge is the transition zone where communities practice sociocultural and ecologically sustainable human activities.**
- **Designated by UNESCO to promote the conservation of biodiversity, sustainable development, and research, biosphere reserves are also supported by other United Nations agencies**
- **According to UNESCO, there are currently 748 biosphere reserves across 134 countries, including 22 transboundary sites, enhancing the friendly**

cooperation between neighbouring countries.

- **They impact the lives of more than 250 million people in 134 countries; 12 sites can be found in India alone. Biosphere reserves are vital for the future of our planet.**
- **They are a living testament to the resilience of nature, that even amidst human activity, finds a way to flourish.**
- **They are home to a wide variety of ecosystems from tropical rainforests to alpine deserts, and thereby provide home to countless unique and endangered plants and animals species.**
- **In addition to playing a vital role in the protection of biodiversity and ensuring the sustainable use of natural resources, they also provide opportunities for sustainable economic development.**
- **In recent years, biosphere reserves have become crucial in our fight against climate change, as these areas are home to many of the world's carbon sinks helping to absorb carbon dioxide from the atmosphere.**

At the local level

- **There have been significant advancements in the conservation of biosphere reserves on the local level. For example, in the Sundarban Biosphere Reserve in India, local communities are working together to manage mangrove forests and protect the biodiversity of the region.**
- **In the Gulf of Mannar Biosphere Reserve in India, local communities, including women, are contributing towards conservation efforts by forming self-- help groups, while the youth are getting engaged in eco-tourism.**
- **Recently recognised with the UNESCO Michel Batisse Award for Biosphere Reserve Management 2023, the Gulf of Mannar Biosphere Reserve Trust has also introduced the concept of 'plastic checkpoints'.**

- **Community members check all vehicles and tourists for plastic waste, which is collected, recycled and used for the construction of roads.**

- **In times of global challenges such as climate change, biodiversity loss and sustainable development, the role of biosphere reserves becomes even more important.**

- **Despite these sites being the most vital ecosystems protecting nature, these oases are not without threats such as deforestation, invasive species and land use changes such as mining. With increasing urbanisation and constant growth of the world population, exploitation by humans is ever increasing**

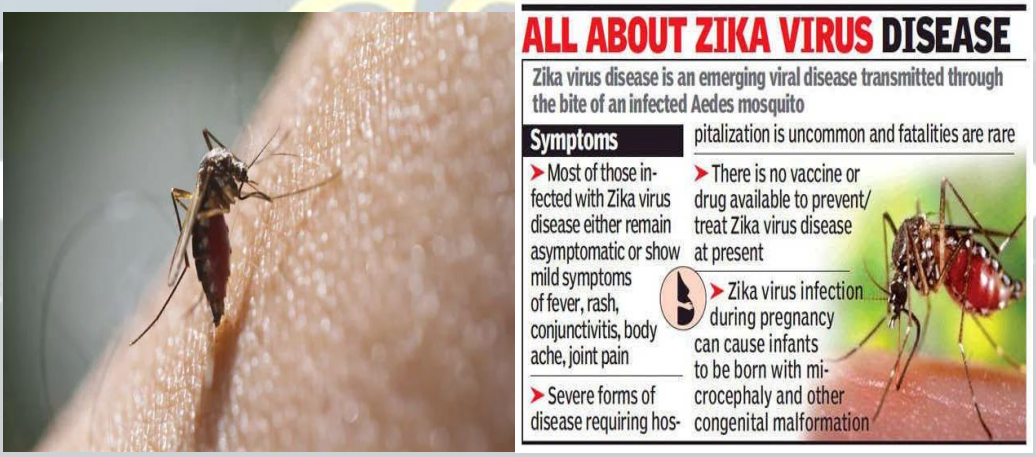
- **In this context, UNESCO in partnership with the Ministry of Environment, Forests and Climate Change and the National Centre for Sustainable Coastal Management, concluded the 10th South and Central Asian Biosphere Reserve Network Meeting (SACAM) in Chennai, India (November 1-3).**

- **With the theme "Ridge to Reef," the SACAM provided a platform for exchanging knowledge and fostering collaborations in the realm of sustainable environmental practices in the South and Central Asia Region. The UNESCO Man and the Biosphere (MAB) programme enhances the human -environment relationship through combining natural and social sciences to improve livelihoods, safeguard ecosystems, and promote sustainable economic development.**

DASH DIET

In the last 50 years in the United States, clinicians have seen a rise in diseases, including hypertension, diabetes, obesity, and coronary artery disease. An estimated 2000 people die of heart disease every day in the United States. Around 30% of US adults are hypertensive. The risk factors of hypertension are fortunately can be controlled to an extent by utilizing the DASH diet.

Zika virus



- **Zika virus is transmitted primarily by Aedes mosquitoes, which bite mostly during the day. Most people with Zika virus infection do not develop symptoms; those who do typically have symptoms including rash, fever, conjunctivitis, muscle and joint pain, malaise and headache that last for 2–7**

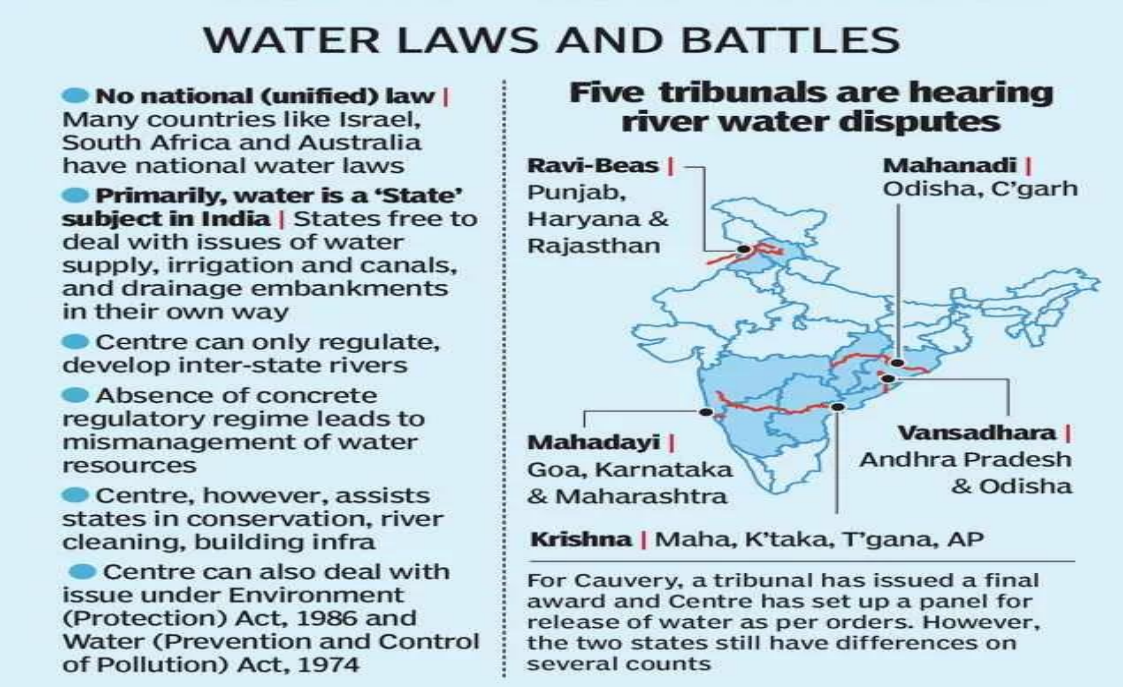
days.

- **Zika virus infection during pregnancy can cause infants to be born with microcephaly and other congenital malformations as well as preterm birth and miscarriage. Zika virus infection is associated with Guillain-Barre syndrome, neuropathy and myelitis in adults and children.**

- **In February 2016, WHO declared Zika-related microcephaly a Public Health Emergency of International Concern (PHEIC), and the causal link between the Zika virus and congenital malformations was confirmed.**

- **Zika virus is a mosquito-borne virus first identified in Uganda in 1947 in a Rhesus macaque monkey followed by evidence of infection and disease in humans in other African countries in the 1950s.**

Water dispute /mekedatu projects



What is the project?

- **Originally mooted in 1948, Mekedatu (which translates as Goat's crossing)**

is a drinking water cum power generation project across river Cauvery.

- **The ₹9,000 crore balancing reservoir at Mekedatu on the Karnataka-Tamil Nadu border envisages an impounding of 67.15 tmc (thousand million cubic) ft. of water.**
- **The project, which will involve submergence of nearly 5,100 hectares of forest in Cauvery wildlife sanctuary hosting rich flora and fauna, will help the state in utilising the additional 4.75 tmc ft. of water allocated by Supreme Court in 2018 for consumptive use for drinking purpose for Bengaluru and neighbouring areas**

How will it benefit Karnataka?

- **The water from Mekedatu is to be pumped to quench the thirst of the burgeoning population of Bengaluru which is estimated to be around 1.3 crore. Besides, there are also plans to generate 400 MW of power.**
- **The revenue earned from power generation is expected to compensate the Government its investment on the project within a few years**

Why is Tamil Nadu opposed to it?

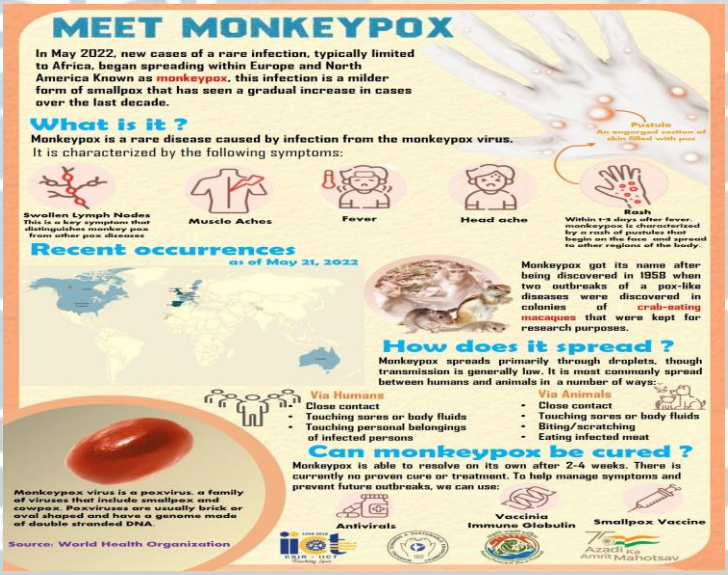
- **Tamil Nadu feels that Karnataka, through the project, will impound and divert flows from "uncontrolled catchments" to it, a component which was taken into account by the Tribunal in the 2007 order while arriving at the water allocation plan for the State.**
- **As per an estimate, around 80 tmc ft of water flows annually to Tamil Nadu, thanks to the catchments including the area between Kabini dam in Karnataka and Billigundulu gauging site on the inter-State border, and the area between Krishnaraja Sagar dam in Karnataka and the gauging site.**
- **As the upper riparian State has adequate infrastructure even now to address**

the water needs of Bengaluru, there is no need for the Mekedatu project, according to Tamil Nadu. Mekedatu also does not find mention in the Tribunal's final order or the Supreme Court judgement.

M POX

- **A new analysis shows that the monkey pox, or mpox, virus is rapidly diverging into several lineages characterised by mutations resulting from continued interaction with the human immune system, suggesting that the virus has been circulating in humans since 2016.**

- **The sustained transmission among people marks a fundamental shift in monkey pox epidemiology as a zoonosis, "highlight the need for revising public health messaging around monkey pox and outbreak management and control**



Mpox (monkey pox) is an infectious disease caused by the monkey pox virus. It can cause a painful rash, enlarged lymph nodes and fever. Most people fully recover, but some get very sick.

Anyone can get mpox. It spreads from contact with infected:

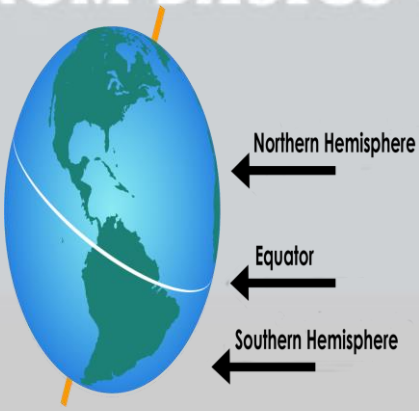
- **Persons, through touch, kissing, or sex**
- **Animals, when hunting, skinning, or cooking them**

- **materials, such as contaminated sheets, clothes or needles**
- **pregnant persons, who may pass the virus on to their unborn baby.**

Herbivory

- **Excluding herbivores or reintroducing their predators may increase vegetation abundance by an average of 93 and 158% at natural regeneration and planted restoration sites, and introducing predators increased abundance by 138 and 372% at natural regeneration and planted restoration sites.**
- **The meta- analysis looked at more than 600 global studies. Herbivory on restoration sites had an overall negative effect on plant abundance and diversity, particularly at sites where restoration was actively promoted.**

Decline in water



Driven in part by large-scale atmospheric climate modes, the Southern hemisphere accounts for more than 95% of the recent decline in global water availability, according to a new study.

- **Global land water availability has varied due to climate change and increased human water use.**
- **The water availability across the Southern hemisphere decreased across the study period. In the Northern hemisphere, there is negligible change in land water availability.**

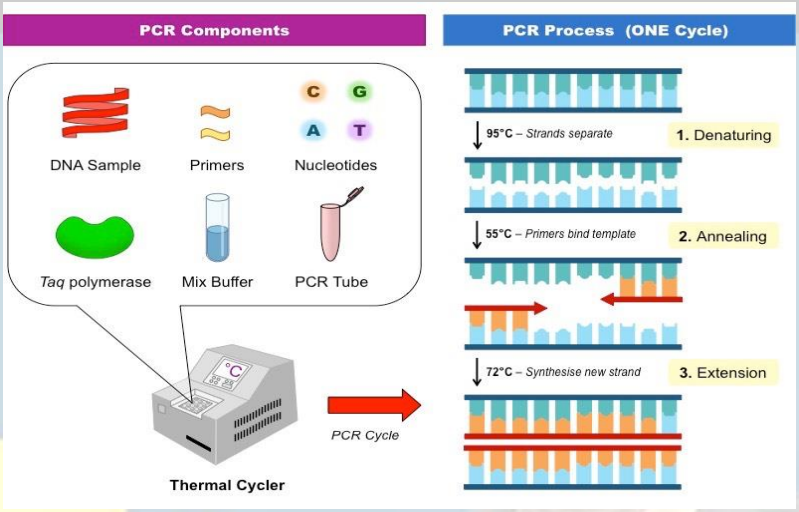
Water evaporation

- **Researchers have been puzzled upon finding that water in their experiments, which was held in a sponge-like material known as a hydrogel, was evaporating at a higher rate than could be explained by the amount of heat, or thermal energy, that the water was receiving.**
- **At the interface where water meets air, light can directly bring about evaporation without the need for heat, and it actually does so even more efficiently than heat.**
- **In this, the water was held in a hydrogel material, but the researchers suggest that the phenomenon may occur under other conditions as well.**
- **The phenomenon might play a role in the formation and evolution of fog and clouds, and thus would be important to incorporate into climate models to improve their accuracy, the researchers say.**

PCR and (H. pylori) bacteria

- **PCR based assay of a small region of the Helicobacter pylori (H. pylori) bacteria can help detect H. pylori infection and also identify clarithromyc in-resistant bacteria and those which are drug -sensitive in six-seven hours has**

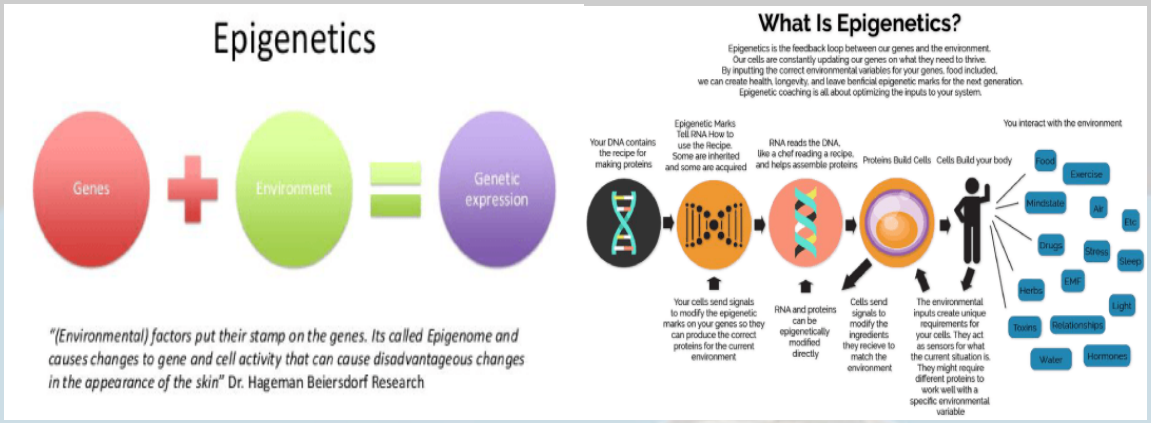
been developed by a team of researchers from the National Institute of Cholera and Enteric Diseases (ICMR-NICED), Kolkata.

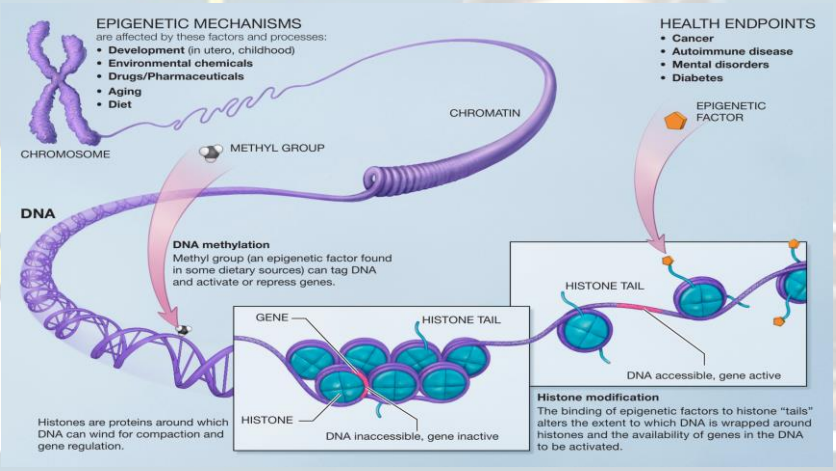


- **Since H. pylori bacteria grow slowly, it takes about a week to culture the bacteria and a couple of more weeks to test for drug- sensitivity, which the new diagnostic assay bypasses.**
- **The molecular- based assay has been found to have 100% sensitivity and specificity. There is an increasing trend of clarithromyc in -resistant H. pylori bacteria in India leading to a decreasing success rate in treating the infection.**

Epigenetic changes

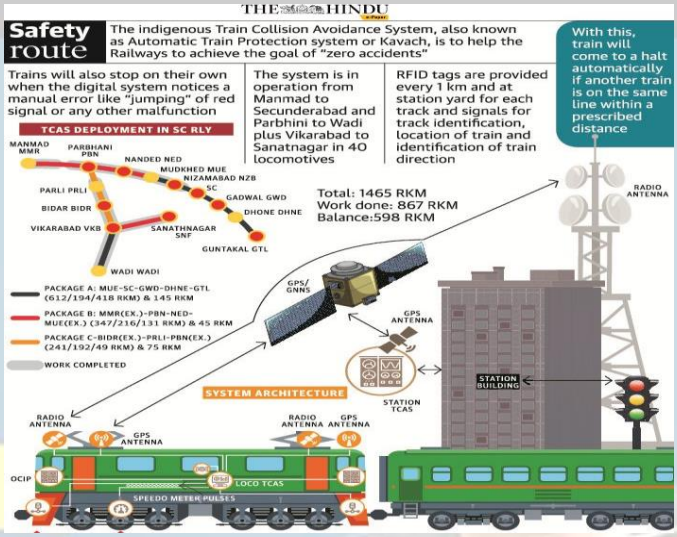
- **While human height is strongly influenced by fixed genetic and variable environmental factors, the authors of the study noted that the contribution of modifiable epigenetic factors is under-explored.**
- **Epigenetic factors are external influences, including lifestyle, nutrition and environment that affect the way genes work.**
- **Epigenetic changes affect gene regulation and alter gene expression but not the DNA sequence.**

- 



- **Many environmental factors, including socio economic status, nutrition and infection load are believed to influence childhood growth which plays a critical role in determining one's height. Quoting the World Health Organization, 2021 estimates indicated that a large proportion of stunted children reside in LMIC, particularly in South Asia and sub-Saharan Africa where undernutrition and associated comorbidities are more prevalent compared to high-income countries (HICs).**

Indian Railways Research Designs and Standards Organisation



What is TCAS - Kavach?

- **Kavach is a cab signaling train control system with anti-collision features. Simply put, it plays the role of a watchdog over the existing signaling system.**
- **It was developed over a period of 10 years, starting in 2012, by the Indian Railways Research Designs and Standards Organisation (RDSO).**
- **Kavach is designed to give out warnings to the loco pilot in case he does not notice the 'red signal,' and instead of stopping, is going to overshoot the signal.**

How is the Kavach system deployed?

- **In the Kavach set- up, the railway stations along the route where this tech is sanctioned to be deployed are provided with three components.**
- **First is Radio Frequency Identification (RFID) technology in the tracks. RFID tech uses radio waves to identify people or objects. It uses electromagnetic fields to automatically identify and read information contained in a wireless device from a distance without making physical contact or requiring a line of sight.**
- **Secondly, the locomotive, which is the driver's cabin, is provided with RFID**

readers, computer, and brake interface equipment. And finally, radio infrastructure which are towers and modems are installed at railway stations.

Zika virus/ DENV Infection

- **The Zika virus is a mosquito -borne flavivirus. Most infections in humans are asymptomatic or with mild symptoms, including fever, rash, and joint pain.**
- **The Zika virus became notorious during the 2015-2018 outbreak that swept through the Americas. The outbreak was characterised by an alarming increase in the number of microcephaly cases in newborns, prompting the World Health Organisation to declare it a public health emergency of international concern in early 2016.**
- **Researchers isolated the virus in 1947 from monkeys from the Zika forest in Uganda. The first human cases were detected in 1952 in Uganda and Tanzania.**
- **There have since been multiple outbreaks around the world, but largely confined to the tropics. It has more than 10,000 bases of single- stranded RNA. 6The genome is also peculiar: it encodes for a large polyprotein, which is further cleaved into capsid, membrane precursor (prM), envelope, and seven non-structural proteins.**
- **The Zika virus has an RNA genome, and thus a very high potential to accumulate mutations.**
- **Genomic studies have suggested that the Zika virus has two lineages: African and Asian researchers had suggested that a mutation in one of the precursor membrane proteins, called prM, of the Zika virus was associated with**

microcephaly.

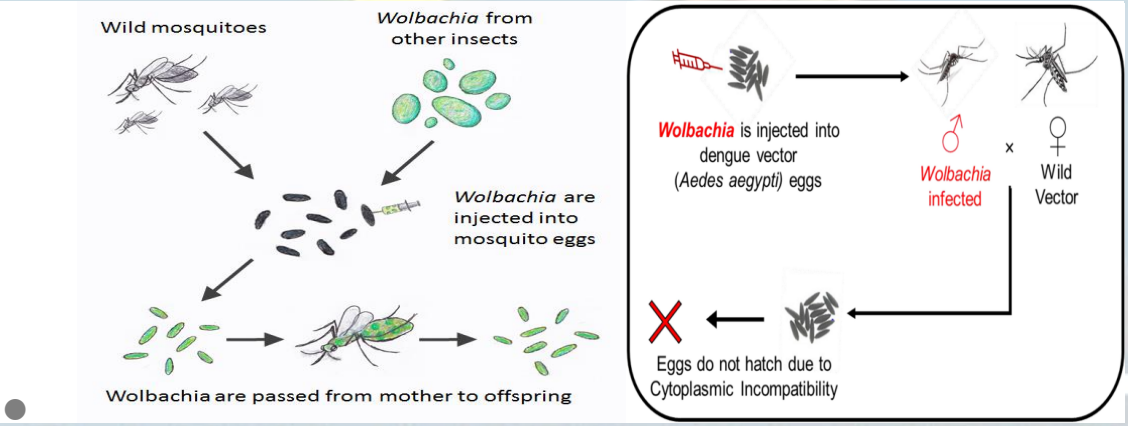
- **Researchers also suspected that this mutation originated during the outbreak in French Polynesia in 2013 before breaking out in South America, causing microcephaly.**
- **Researchers in Tsinghua University, suggested in a recent study in Cell that infections of two viruses in primates encourage specific microbes to grow on the skin by suppressing an antimicrobial peptide, RELM, on the skin.**
- **These microbes produce acetophenones, which are volatile molecules that could provide a chemical cue to mosquitoes, attracting them towards the individual and supporting forward transmission of the viruses.**
- **Zika virus and DENV interactions have also been an interesting area of research. A significant body of evidence suggests that a Zika virus infection can significantly increase the risk for severe dengue.**

DENV Infection

- **Dengue is a viral infection caused by the dengue virus (DENV), transmitted to humans through the bite of infected mosquitoes.**
- **About half of the world's population is now at risk of dengue with an estimated 100–400 million infections occurring each year.**
- **Dengue is found in tropical and sub-tropical climates worldwide, mostly in urban and semi-urban areas.**
- **The virus is transmitted to humans through the bites of infected female mosquitoes, primarily the *Aedes aegypti* mosquito.**
- **Other species within the Aedes genus can also act as vectors, but their contribution is secondary to *Aedes aegypti*.**

Wolbachia

- **Wolbachia is a genus of bacteria that has evolved complex relationships with the many insects that can host it.**
- **It is named for the American pathologist Simeon Burt Wolbach, who identified it along with Marshall Hertig in 1924.**
- **In 1971, researchers discovered that when male Culex mosquitoes infected by Wolbachia bacteria fertilised healthy eggs from a female, the eggs died.**



- **The bacteria modified the male's sperm cells in a way that only the bacteria could reverse.**
- **So if the female mosquito was uninfected, her egg cells would be damaged.**
- **But if the female was infected by Wolbachia, the eggs would be viable if the male was uninfected or infected by the same strain of Wolbachia.**
- **This means infected female mosquitoes gain a reproductive advantage over time as the amount of Wolbachia in the population increases.**
- **Wolbachia can also reduce the rate at which chikungunya and yellow fever viruses multiply in infected mosquitoes.**

Evros region

BIG SHOT

This aerial view shows a burnt forest in the Evros region, near the village of Dadia in Greece, on October 26, 2023. The European Union has said that the Dadia fire was the largest in Europe's recorded history, ravaging more than 900 sq. km of land in three days, including a large chunk of a biodiverse ecosystem, and destroyed swathes of pasture land. AFP

- **Evros is one of the regional units of Greece. It is part of the region of East Macedonia and Thrace. Its name is derived from the river Evros. Evros is the northernmost regional unit. It borders Turkey to the east, across the river Evros, and it borders Bulgaria to the north and the northwest.**

Sikkim floods

- **The South Lhonak lake in the Himalayan state of Sikkim breached on the night of October 3, resulting in a glacial lake outburst flood (GLOF).**
- **The South Lhonak lake is located in North Sikkim, at an altitude of 5,200 m.**
- **According to scientists, the current interpretation of the flood which relies heavily on satellite data suggests that on October 3 night, a slope failure occurred along the lateral moraine (a mass of debris and rocks) on the lake's left bank.**
- **The lake is one of the largest and fastest growing glacial lakes in Sikkim, and has been a potential hazard for several years now.**
- **"While the lake level was lowered due to the flood, it did not drain completely. A lot of water still remains in the lake, making it a potential hazard.**

What caused the GLOF?

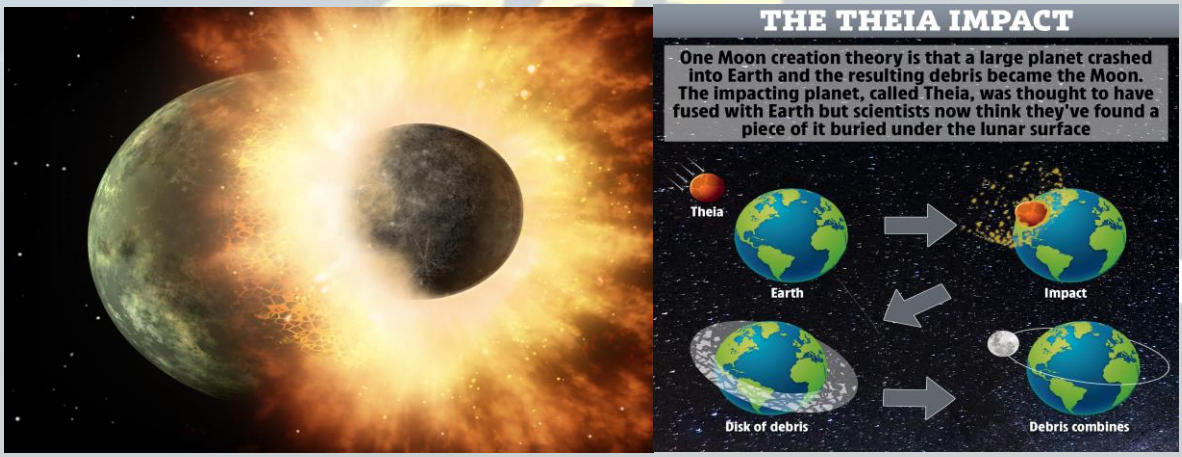
- **The Sikkim government has been claiming that the GLOF was triggered by a cloudburst.**
- **In fact, Sikkim State Disaster Management Authority's daily reports on deaths and damages continue to call the flood "cloudburst induced"**
- **While the reservoir's gross storage capacity was 5.08 million cubic metres, the volume of water stored in it at the time of the disaster is currently not known.**
- **Further downstream of the Teesta-III dam, two more hydropower projects were damaged: the 510-MW Teesta-V and the 500-MW Teesta-VI that is under construction**

What is the role of climate change?

- **In the South Lhonak glacier, the signs of climate change emerged decades ago and became stronger as the rate at which the glacier melted increased, resulting in a rapidly growing lake that was bound to breach – as several research studies stated.**
- **GLOFs are natural, but the rapid increase in the lake's size as a result of the glacier's accelerated melting is tied closely to anthropogenic climate warming.**

Theia

- **Seismologists have recognised since the 1970s that two mysterious continent-sized blobs reside in the deepest part of the earth's mantle, one under Africa and the other under the South Pacific region.**
- **These blobs may be relics from a cataclysm early in our planet's history hypothesised to have spawned the moon - the collision between primordial earth and a Mars-sized object called Theia, researchers have said.**



- **This impact, which recent research determined occurred more than 4.46 billion years ago, blasted molten rock into space that orbited the earth and coalesced into the moon.**
- **But chunks of Theia may have remained inside the earth, sinking to a**

location just above our planet's super-hot core of iron and nickel.

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Telecos vs OTT

- **Telecom companies have seen revenue from traditional streams such as voice calls and Short Message Service (SMS) come under pressure, as competing OTT services are often free.**
- **At the same time, they have had to invest heavily in upgrading their infrastructure to handle increased data traffic, without necessarily seeing an equivalent rise in revenue.**
- **It is also their lament that OTT services are not subject to the same level of taxation and licensing fees, leading to an uneven playing field**
- **The OTT consultation has renewed the clamour from the telecom companies that content providers such as Netflix, Amazon Prime, and Disney+ Hotstar be asked to share in the costs of bandwidth.**
- **They argue that streaming platforms are free riders, benefiting from the infrastructure built and maintained by the telecom companies.**
- **By offering services that consumers desire, OTT platforms generate demand for Internet access.**
- **They also pay for the content delivery networks (CDNs) to create pathways that substantially augment the capacity of the internet to deliver their content.**

- **Telecom companies capitalise on this demand (and the availability of OTT content) by providing connectivity to the Internet and charging subscribers for it**
- **OTT services compete in their own market on the basis of variety and quality of content, the quality of streaming (such as, support for HD or better resolution or 5.1 surround sound), ease in navigation and discovery of content, and its availability on multiple devices.**
- **The consumers pay the price for these benefits as compared to the alternatives. Similarly, in the marketplace for Internet access, the consumers are free to choose the provider that offers them the highest bandwidth, data volume, and reliability at an affordable price.**
- **Net neutrality is the principle that Internet access providers must treat all traffic originating from and terminating to the Internet in the same way.**
- **Net neutrality formed the basis of TRAI's regulation on the prohibition of discriminatory tariffs for data services brought out on February 8, 2016.**

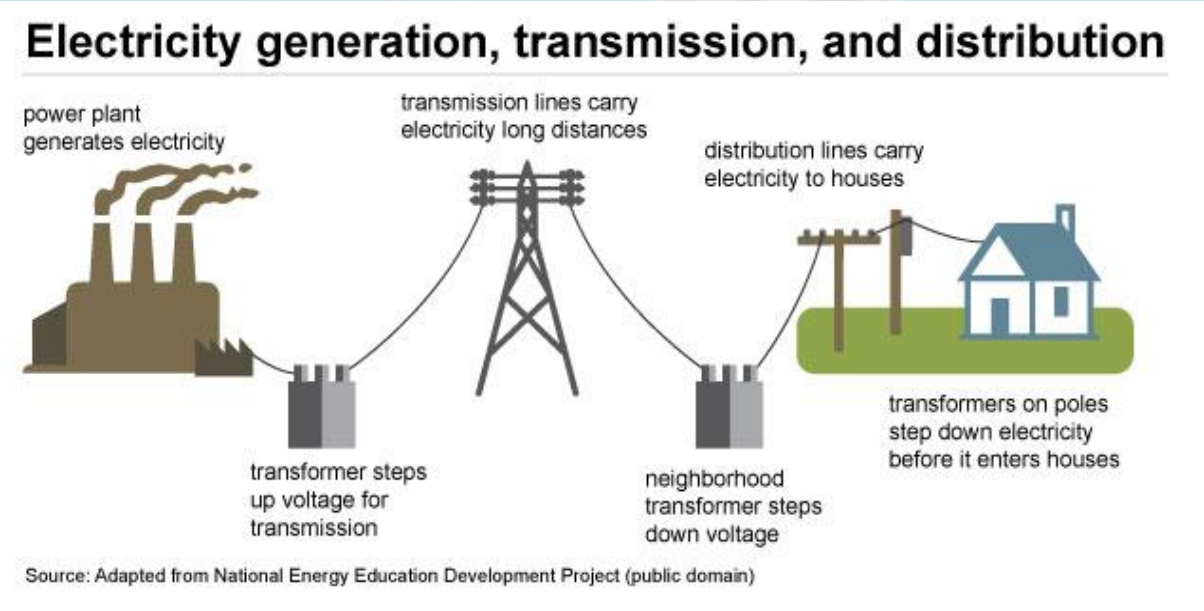
MIG 21 Replacement

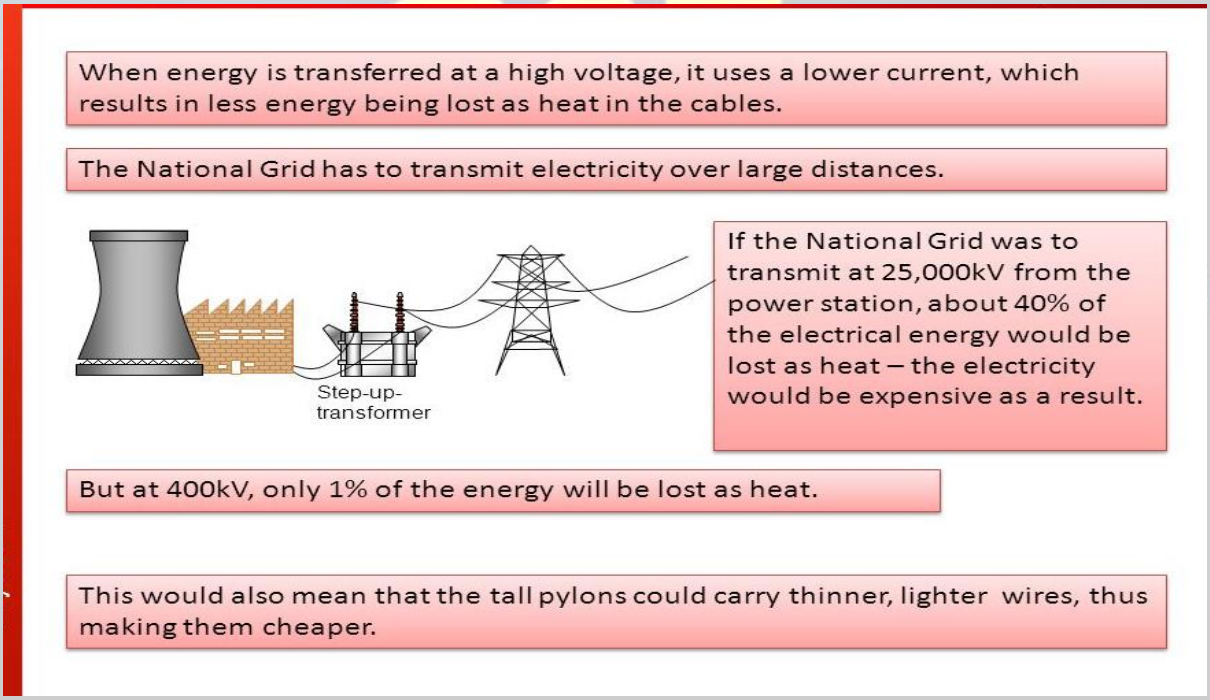
- **On October 31, 2023 MiG-21 fighter jets of the No. 4 squadron 'OORIALS' of the Indian Air Force (IAF) flew one last time over Uttarlai in Rajasthan.**
- **Last year, the No. 51 squadron 'swordarms' based in Srinagar was phased out.**
- **It was the same squadron of which Gp Capt (then Wg Cdr) Abhinandan Varthaman was part of and saw action in February 2019, a day after the Balakot air strike.**
- **The MiG-21 was the first supersonic fighter in service of the IAF and was inducted in 1963 and has participated in all major conflicts since.**
- **will replace the MiG-21 squadron with the indigenous Light Combat**

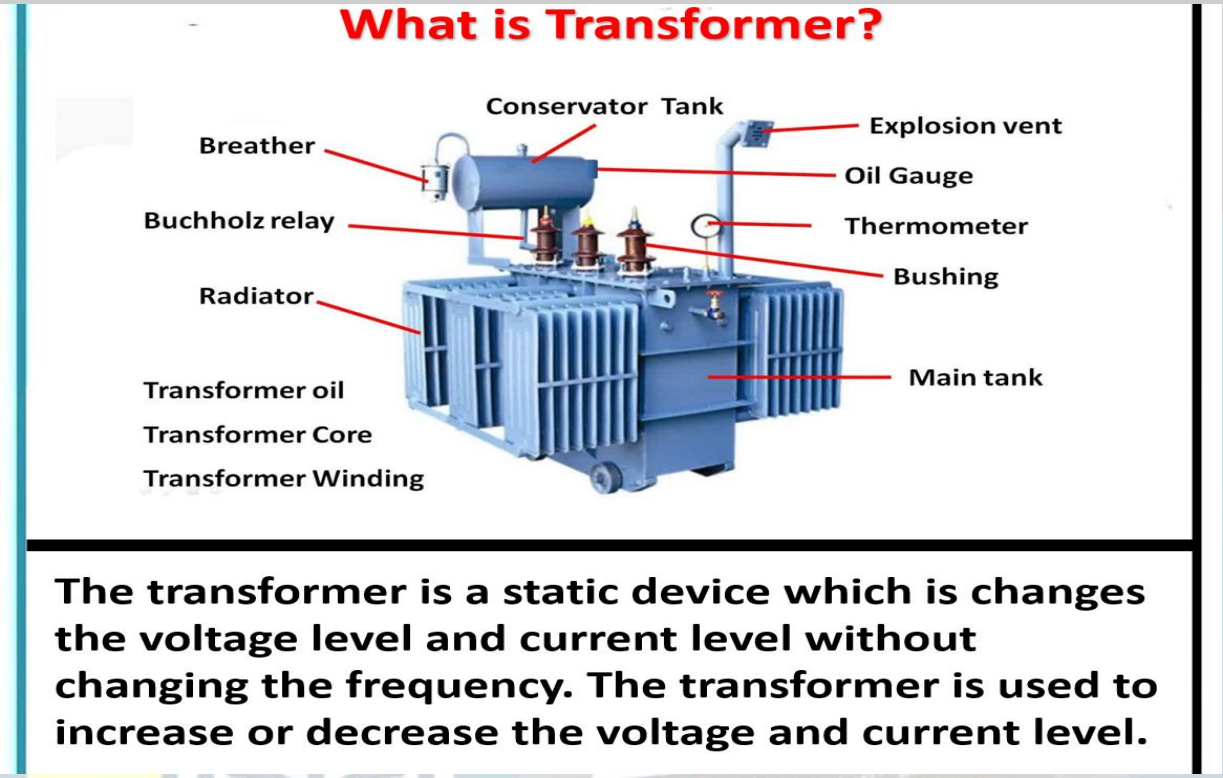
Aircraft (LCA)-Mk1A… The induction of the LCA Mark-1A will fill the gap of these MiG-21s

- **In the last few years, the IAF has inducted two squadrons of the indigenous LCA Tejas and two squadrons of Rafale fighter jets procured from France which pushed the squadron strength to over 30.**

AC & DC and Transformer

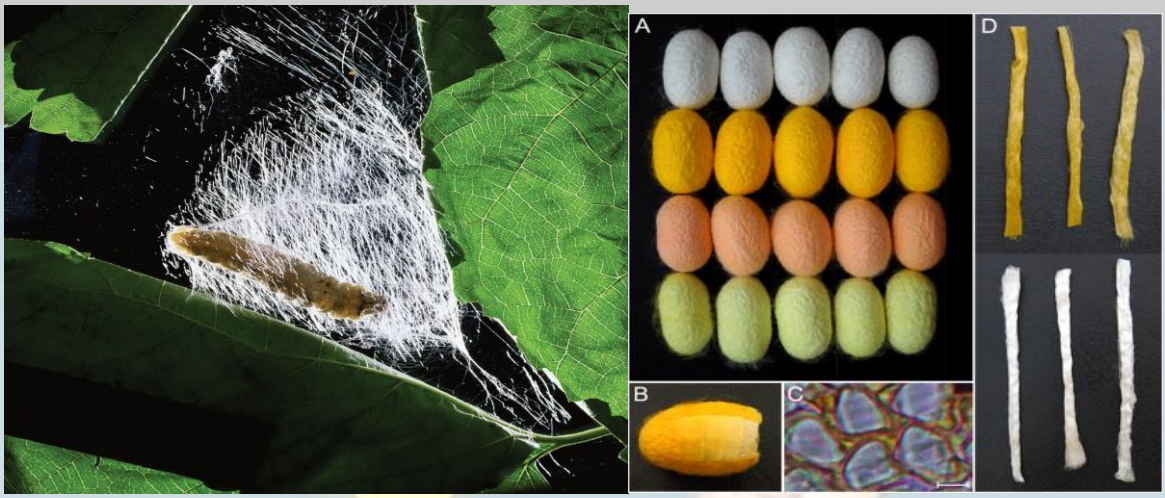


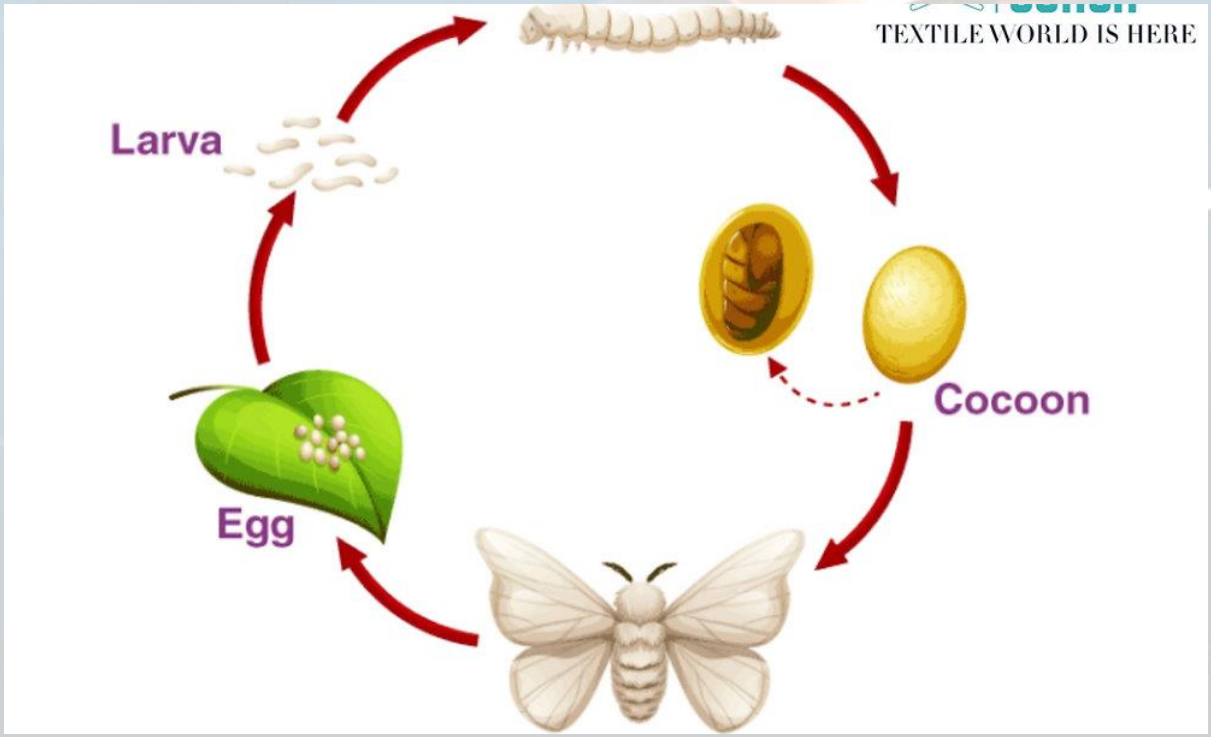




Alternating Current	Direct Current
AC is safe to transfer longer distance even between two cities, and maintain the electric power.	DC cannot travel for a very long distance. It loses electric power.
The rotating magnets cause the change in direction of electric flow.	The steady magnetism makes DC flow in a single direction.
The frequency of AC is depended upon the country. But, generally, the frequency is 50 Hz or 60 Hz.	DC has no frequency of zero frequency.
In AC the flow of current changes its direction backwards periodically.	It flows in a single direction steadily.
Electrons in AC keep changing its directions – backward and forward	Electrons only move in one direction – that is forward.

Silkworm cocoon different colours





Caterpillars, also known as silkworms, of both these species feed exclusively on leaves of mulberry plants (genus Morus).

Carotenoids and flavonoids

- **'Wild' silks which include the muga, tasar, and eri silks – are obtained from other moth species: namely, Antheraea assama, Antheraea mylitta, and Samia cynthia ricini.**

- **These moths survive relatively independently of human care, and their caterpillars forage on a wider variety of trees.**
- **Non--mulberry silks comprise about 30% of all silk produced in India. The ancestral mulberry moth makes (boringly uniform) brown- yellow cocoons.**
- **In contrast, domesticated silk moth cocoons come in an eye-catching palette of yellow- red, gold, flesh, pink, pale green, deep green or white**
- **Cocoon's pigments are derived from chemical compounds called carotenoids and flavonoids, which are made by the mulberry leaves.**
- **Silkworms feed voraciously on the leaves, absorb the chemicals in their midgut, transport them via the hemolymph – arthropods' analogue of blood to the silk glands, where they are taken up and bound to the silk protein.**
- **Mature caterpillars then spin out the silk proteins and associated pigment into a single fibre. The caterpillar wraps the fibre around itself to build the cocoon**
- **Differently coloured cocoons arise from mutations in genes responsible for uptake, transport, and modification of carotenoids and flavonoids.**
- **The mutant strains have become a valuable resource for scientists to study the molecular basis of how, in a relatively short span of 5,000 years, artificial selection generated such spectacular diversity**
- **A yellow -red cocoon requires the Y gene, which encodes a protein that transports carotenoids from midgut to the silk glands.**
- **Other genes encode proteins that selectively absorb specific carotenoids.**
- **Mutations in one or more of these genes produce the yellow, flesh-coloured, rusty, and pink cocoons. The gene called apontic-like Domesticated and ancestral mulberry silk moths can be interbred to produce hybrid offspring.**
- **Last year, researchers in the University of Tokyo and Columbia University in New York created such hybrid moths and then specifically mutated either**

their B. mori- or B. mandarina -derived copy of a gene called apontic- like.

Colours in tube light

- **Q: Why are fluorescent lamps marked 6500 K (tube light)?**
- **A: The value 6,500K marked on fluorescent lamps represents a parameter called correlated colour temperature.**
- **It means that the spectral, or light, colour distribution from that lamp is similar to that of a black body at that temperature.**
- **Any black body when heated emits different colours at different temperatures: at 2,000K it emits red light; at 4,000K it is yellowish white; at 2,700K, it provides warm light; and at 6,500K, it gives the impression of cool daylight, according to illumination engineers.**
- **Based on colour appearance, fluorescent tubes are classified into three types: daylight white (above 5,000K), neutral white (4,000K), and warm white (below 3,300K). The colour of light depends on the fluorescent coating inside the tube. Three types of coatings are generally given: tri-phosphor, standard phosphor, and multi- phosphor.**
- **Standard phosphor is used in ordinary tube lights. Tri-phosphor coated lamps, like incandescent lamps, emit yellow light similar to sunlight. Standard tube lights render a colour similar to daylight**

- **The Klyuchevskoy volcano, one of the highest active volcanoes in the world, erupts in Russia's northern Kamchatka Peninsula on October 28, 2023.**

- **Klyuchevskaya Sopka is a stratovolcano, the highest mountain of Siberia and the highest active volcano of Eurasia. Its steep, symmetrical cone towers about 100 kilometres from the Bering Sea. The volcano is part of the natural Volcanoes of Kamchatka UNESCO World Heritage Site.**

The Klyuchevskoy volcano,

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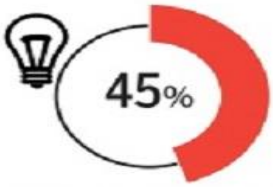
Stubble burning

EFFICIENT USE OF ENERGY

An IIT-Delhi team is providing technical support to a power plant in Fazilka, Punjab, which uses paddy straw to generate energy



of **energy available in biomass** is harnessed as thermal energy by this plant; most other processes harness only **15-20% energy**

If not burnt, paddy straw in the northern Indian states can be utilised to yield **2.2 million tonnes** of oil equivalent to **25,365 gigaWatt per year**

STEP BY STEP

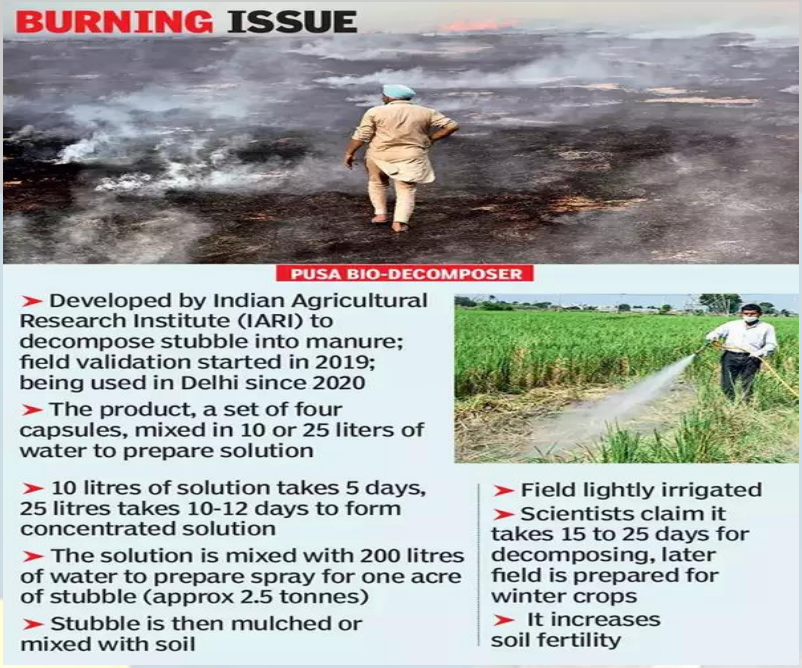
- Size to paddy straw reduced my mechanical pulverization
- 10 parts straw is then added with 90 parts water
- The material is kept in the plant for 30 days to produce biogas
- **Removal of hydrogen sulfide:** In order to use biogas, in electrical generator it necessary to lower hydrogen sulfide concentration to avoid damage of engine
- Gas is supplied to the engine for power generation

SURGE IN CASES

- According to Punjab Remote Sensing Centre, a total of **52,942 incidents** of paddy stubble burning have been reported from September 23 to November 26 up from **50,590 in 2018**
- The state government had registered over **1,700 FIRs** against farmers and imposed fines for burning stubble, impounded combine harvesters and made red entries in land records

SUGGESTIONS FROM FARM ACTIVISTS

- Provide compensation for crop residue management (CRM) to those having up to 10 acres of land
- Give machinery for management as proposed by the National Green Tribunal
- Drop the practice of imposing fines
- Prepare ground for pulling farmers out of paddy by setting up strong marketing network with assurance purchase of crops
- Stop seeing farmers as villains and stop making red entries into land records of those burning stubble



Early warning system for earthquake

- **The Android Earthquake Early Warning system supplements the government's efforts on earthquake alerts and aims to provide people with advance notice that can help them stay safe.**
- **Earthquake alerts did go out immediately in many areas around the India Nepal border, where the shaking was strongest, pointing to screenshots posted online by social media users in this region.**
- **The company says it warns users only if the shaking in their area can expect to cross a value of 3.5 on the Modified Mercalli Intensity (MMI) Scale, a measurement of shaking during earthquakes that serves as an alternative to the Richter scale.**

Amphotericin B (AmB)

- **A structurally modified antifungal agent has shown reduced toxicity in mice and in human kidney cells while retaining its antimicrobial properties, according to a paper published in Nature.**
- **Amphotericin B (AmB) is an antifungal agent produced by bacteria and has**

been used as a last line of defence against severe fungal infections for many decades.

- **It achieves this by forming sponge- like aggregates that bind to a molecule known as ergosterol (which is found in bacterial and fungal cells and performs a similar function to mammalian cholesterol).**

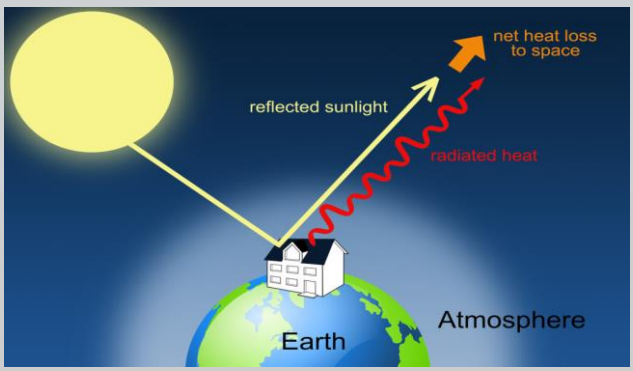
- **This binding results in the extraction of ergosterol from the membrane, which leads to fungal cell death. Despite being effective, AmB is highly toxic in humans particularly in renal cells.**

Passive radiative cooling

- **Two recent studies provide evidence that passive radiative cooling materials work. Passive radiative cooling approaches that use glass- and ceramic-based materials are more versatile, making them more attractive for a wide range of outdoor passive cooling applications.**

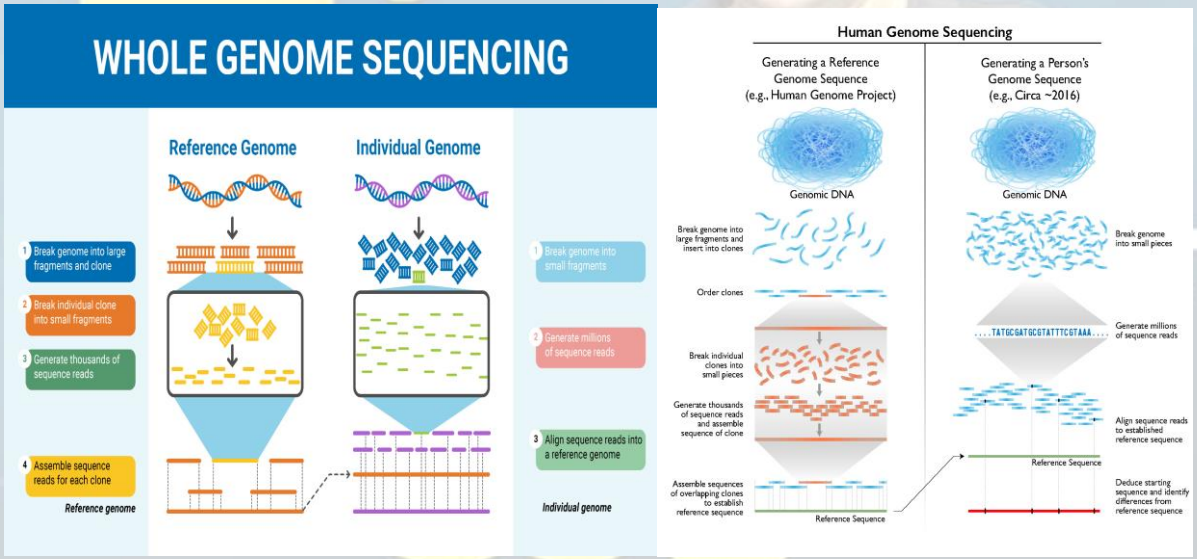
- **The microporous glass coating enables a temperature drop of about 3.5-4 degrees Celsius during daytime and night-time, respectively. The ceramic composite can produce highly efficient light scattering and high thermal emission.**

- **Passive daytime radiative cooling (PDRC) is a zero-energy building cooling method proposed as a solution to reduce air conditioning, lower the urban heat island effect, cool human body temperatures in extreme heat, move toward carbon neutrality, and control global warming by enhancing terrestrial heat flow to outer space through the installation of thermally-emissive surfaces on Earth that require zero energy consumption or pollution**



Genome sequencing

- **Researchers in Nepal are carrying out environmental surveys and genomic sequencing to determine the cause of an eye infection that can cause children to lose their vision within days.**
- **Symptoms begin with a painless reddening and loss of pressure in one eye. Cases of seasonal hyper acute panuveitis seem to spike every two years, baffling scientists.**
- **Now researchers are racing to examine a possible link with white moths of the genus Gazalina, which swarm through Nepal at the end of the monsoon season.**



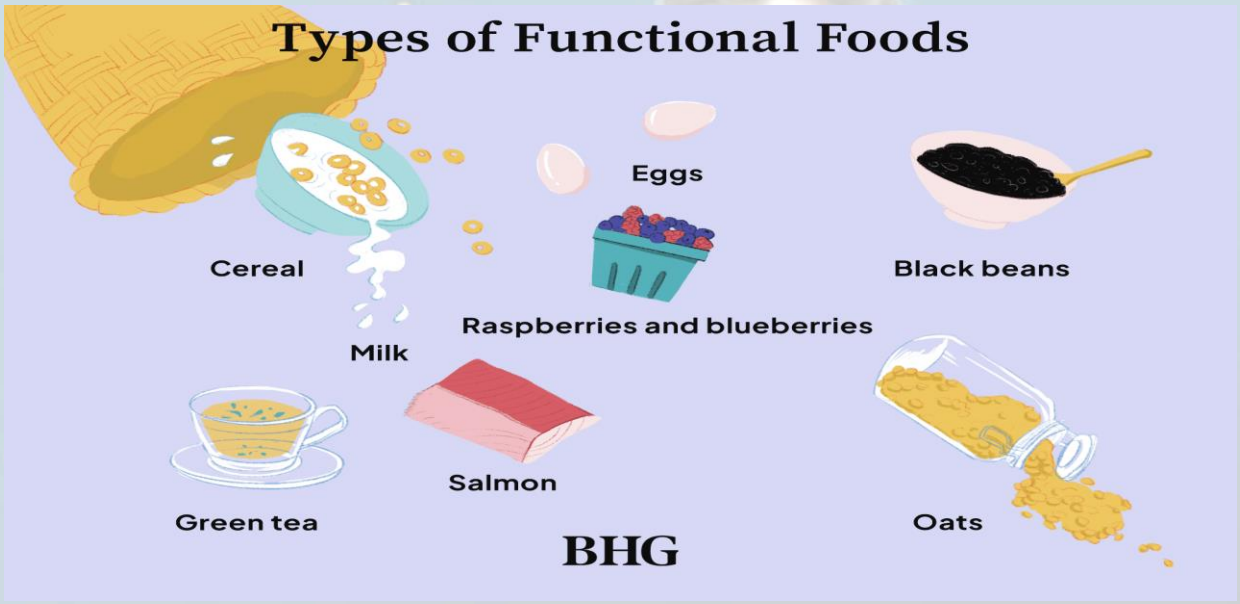
Cytoplasmic lattices

- **Cytoplasmic lattices seem to be storage sites for many proteins that are essential for the development of the early embryo.**
- **They enrich maternally provided proteins to prevent their premature degradation and cellular activity. The discovery could explain why people whose eggs lack the fibers entirely are infertile.**
- **Cytoplasmic lattices are important regulators of oocyte maturation. An oocyte or ovocyte is a female gametocyte or germ cell involved in**

reproduction. In other words, it is an immature ovum, or egg cell.

- **They store components of the protein synthesis machinery including ribosomes and, among others, they are involved in the regulation of microtubule dynamics in both mouse and human.**

Functional food



The growing body of clinical evidence suggests that almond, which can be

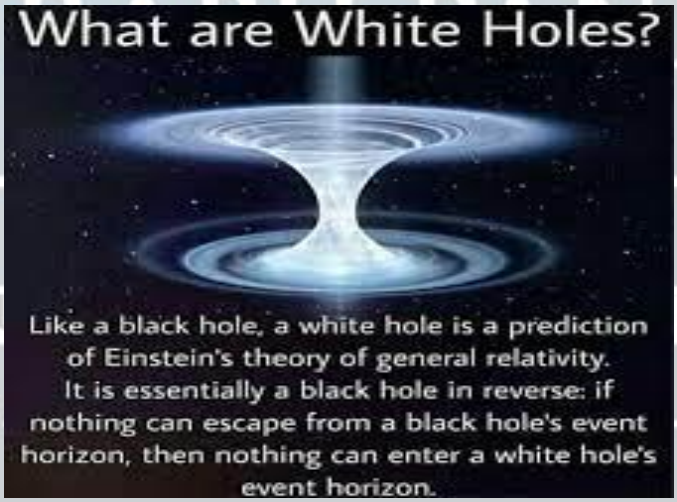
bought in any dry fruits shop, consumption is associated with several health benefits.

- **Other dry fruits that also offer health benefits are cashew nuts, raisins, walnuts, dates, apricots and pistachio. Besides dry fruits, 'wet fruits' such as bananas, grapes, guavas, oranges and mangoes offer health benefits, as Charaka pointed out.**

- **Such healthy foods are also called 'functional foods', since they offer health benefits beyond their nutritional value. Some examples are oats, and millets like bajra, ragi, jowar, and soya proteins, besides the fruits.**

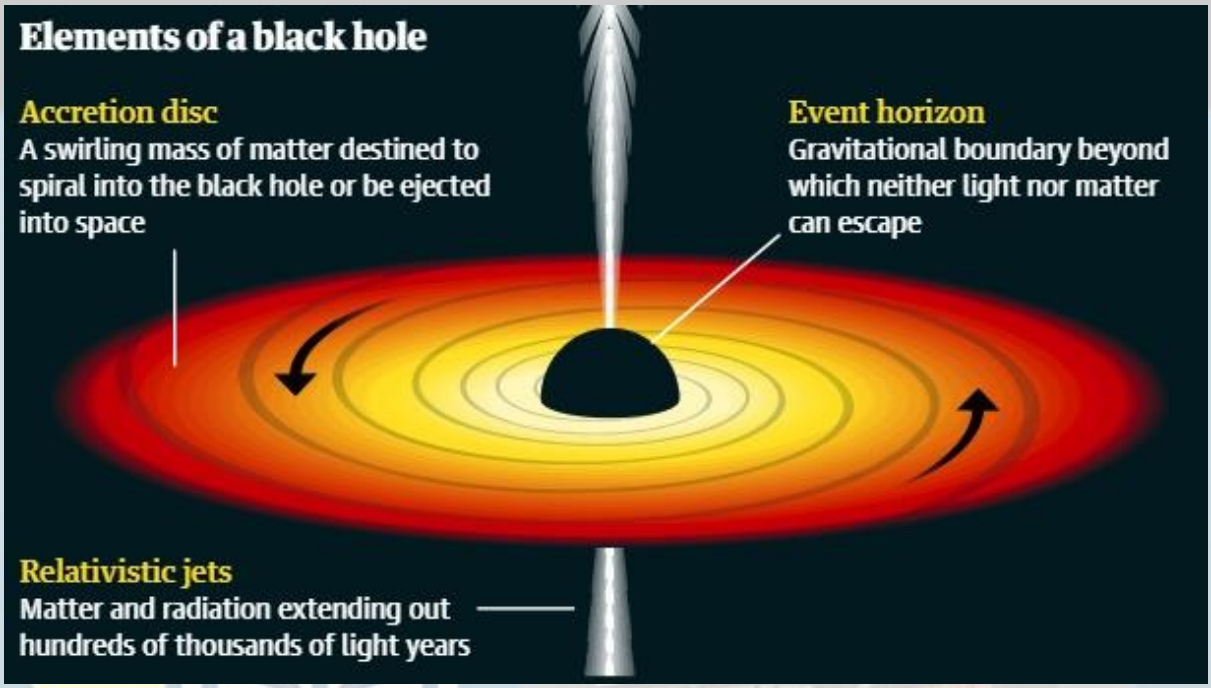
- **Functional foods are defined broadly as foods that provide more than simple nutrition; they supply additional physiological benefit to the consumer. Functional foods have ingredients that offer health benefits which extend beyond their nutritional value. Some types contain supplements or other additional ingredients designed to improve health.**

White Hole vs Black hole

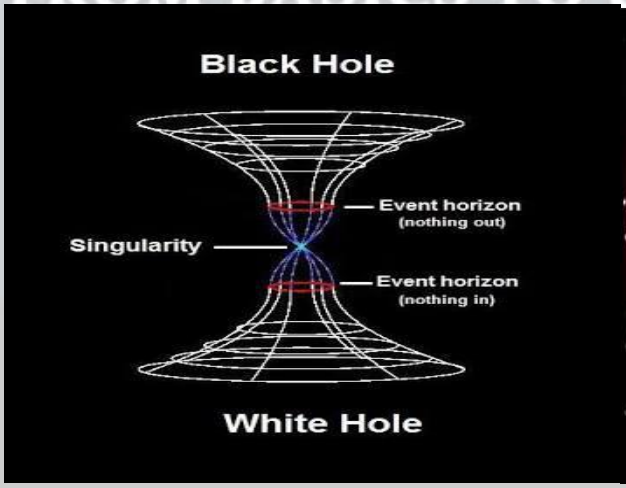


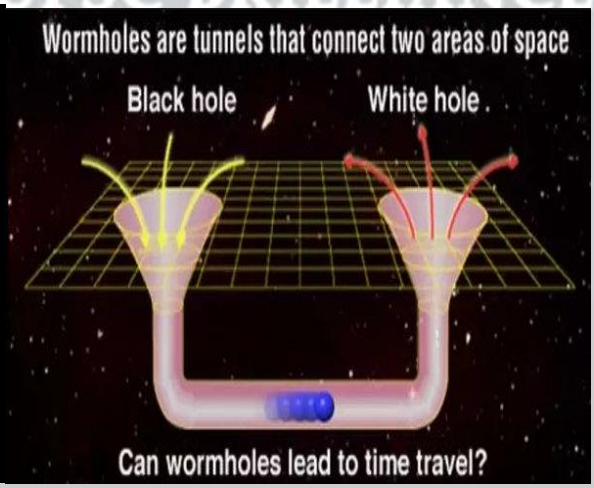
- **A white hole is a time-reversed black hole a region of space-time where matter spontaneously appears and explodes outwards, rather than implodes and disappears as with a black hole. White holes are essentially the opposite of black holes, in that they spit out light and matter, rather than trapping it. So far, white holes they are purely hypothetical objects, but astronomers are**

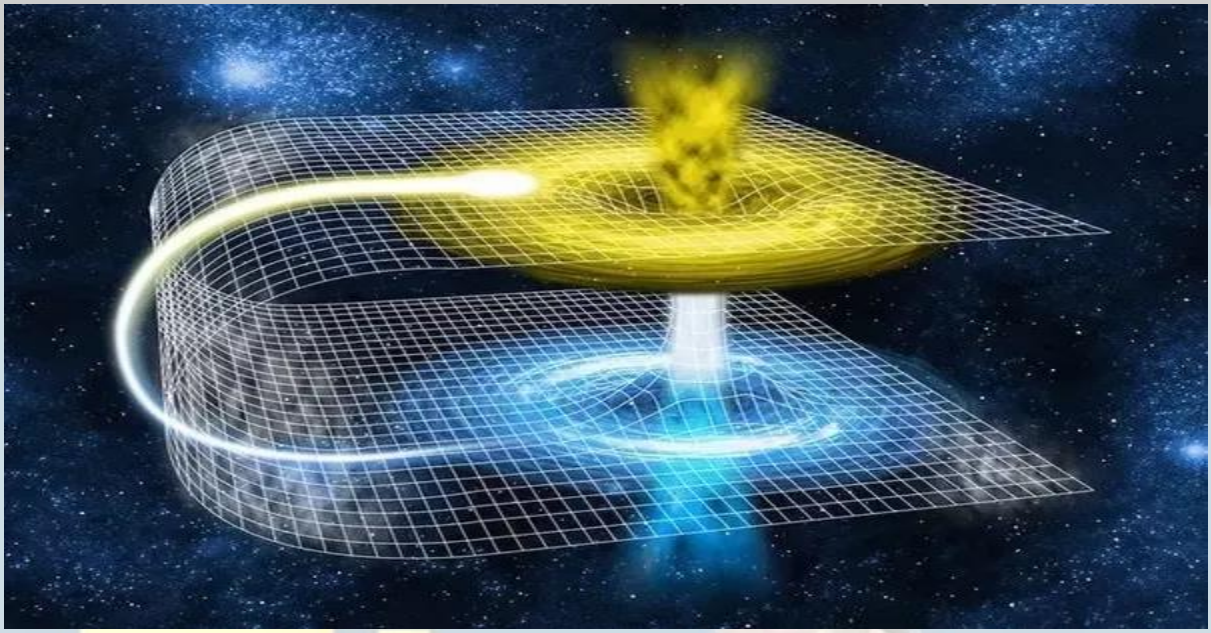
contemplating how they could form in reality.



- **A black hole forms when a massive star at the end of its life shrinks catastrophically under its own gravity down to an infinitesimally small point, or singularity.**
- **All that is left behind from the stellar collapse is a grossly warped region of space. One possibility is that it explodes into another universe as a white hole**
- **For matter to pass between universes, the black hole and the white hole must be connected by a wormhole a tunnel through space-time.**







Amendment in forest conservation act

- **The Forest Conservation Amendment Act of 2023 has received limited attention and little discussion about its impact on forests and its inhabitants.**

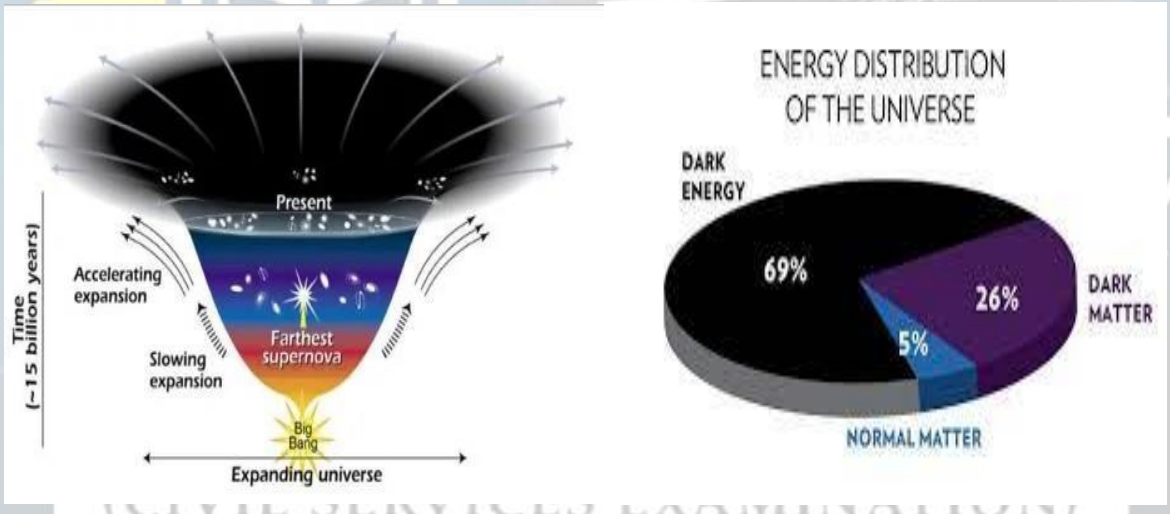
What is the new amendment?

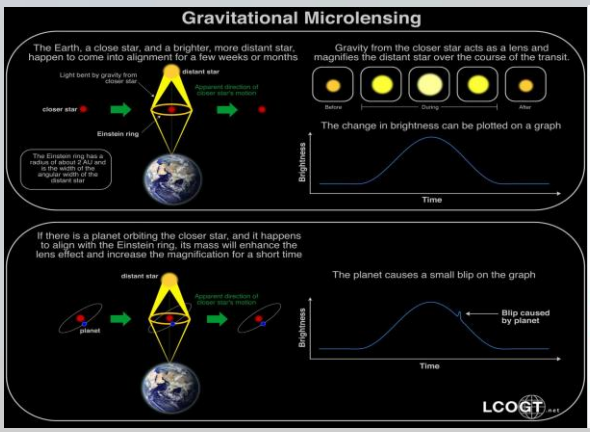
- **At first glance, the amendment primarily aims to tackle the critical issues of climate change and deforestation adverse effects, focusing on effective management and afforestation**
- **The law further aims to determine how forests can be utilized for economic gain, and the manner in which it seeks to achieve this goal is outlined in the legislation.**
- **The primary method used to achieve this objective involves removing forests from the law's jurisdiction, thereby facilitating various forms of economic exploitation.**
- **As per the amendment, the forest law will now apply exclusively to areas categorized under the 1927 Forest Act and those designated as such on or after October 25, 1980.**
- **The Act will not be applicable to forests that were converted for non -forest**

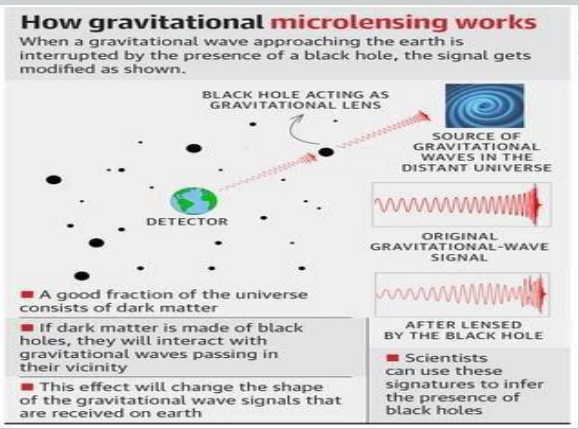
use on or after December 12, 1996 and land which falls under 100 kilometres from the China and Pakistan border where the central government can build linear projects.

- **To establish security infrastructure and facilities for surveillance, the central government is authorised to construct security measures in areas up to ten hectares. This provision also applies to areas (up to five hectares) which are designated as vulnerable.**
- **Within these regions, the government, with the necessary approvals, can implement security protocols as described above. Initiatives like ecotourism, safari, environmental entertainment, and more may be implemented in these areas.**

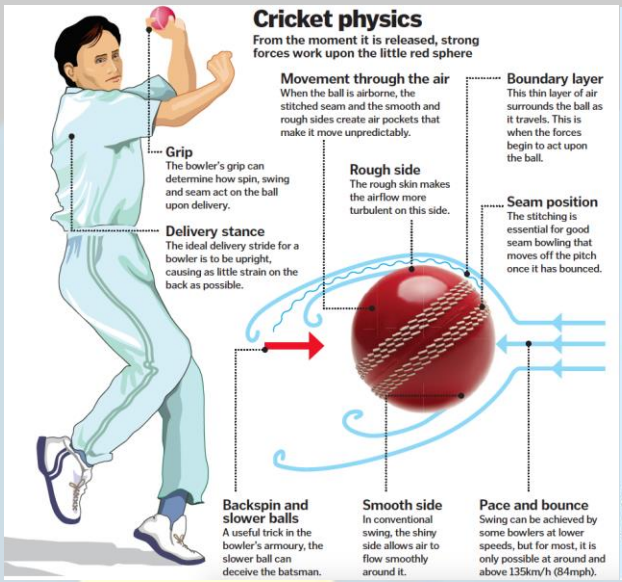
Dark Energy

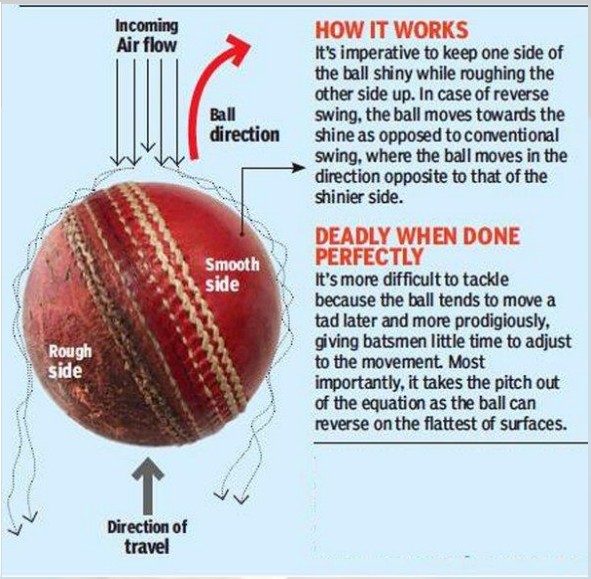




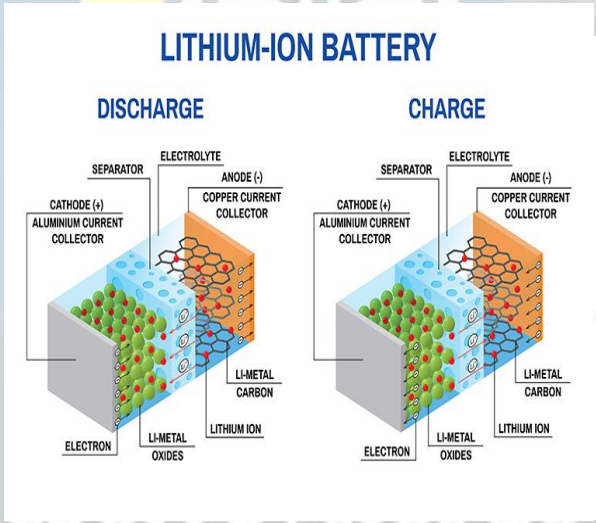


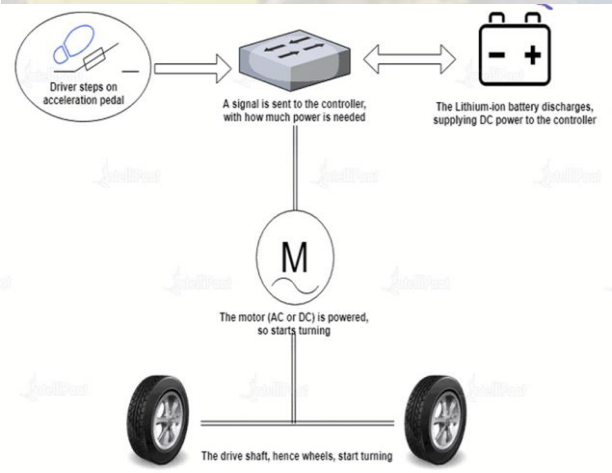
Science of swing

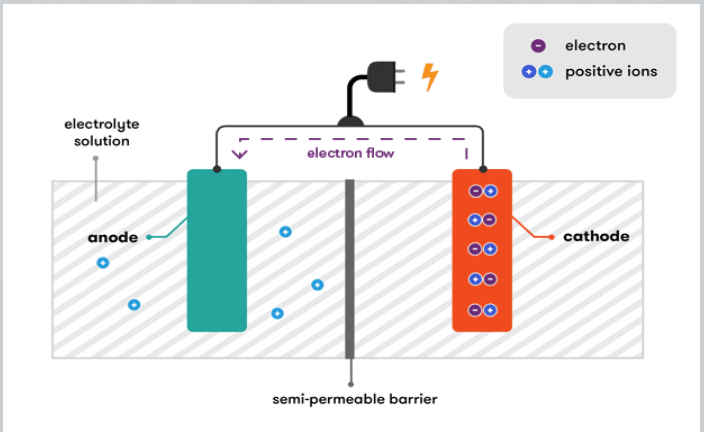




Electric battery and Lithium ion battery







- **A well-known problem that degrades the performance of electrochemical cells is corrosion.**
- **For example, in humid conditions, water droplets can condense on the electrodes. If atmospheric carbon dioxide levels are high, the water can combine with the gas to produce carbonic acid, which can corrode the electrode.**
- **Another source is galvanic corrosion, whereby one of the electrodes in a cell dissolves faster into the electrolyte over time because it is more reactive, before the less reactive electrode starts to erode.**
- **For example, in a (non-rechargeable) carbon-zinc battery, zinc erodes preferentially as the battery is used**

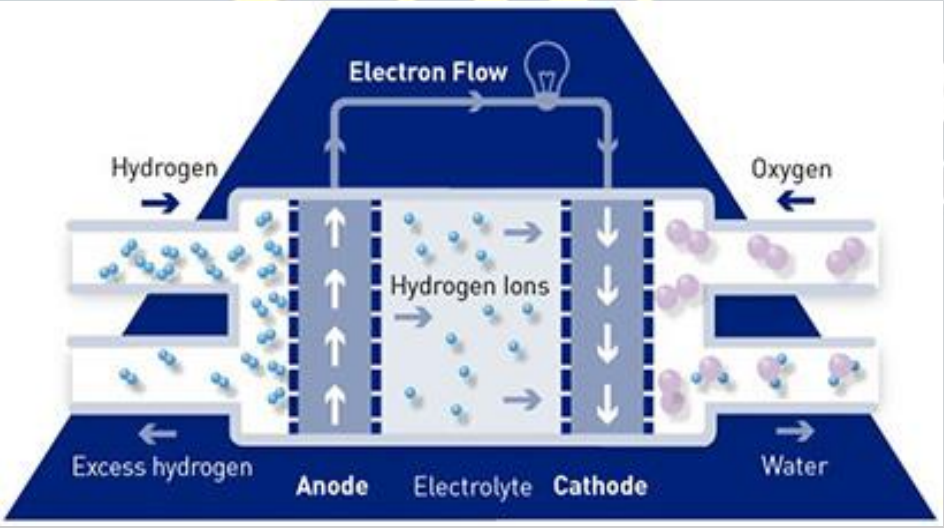
What are the types of batteries?

- **Two batteries that are often on the news these days are the lithium ion (Li-ion) battery and the batteries used in Electric Vehicles (EVs).**
- **The Li-ion battery won the developers of its foundational principles the Nobel Prize for chemistry in 2019**
- **This battery is a voltaic as well as an electrolytic cell.**
- **A voltaic cell converts chemical energy to electrical energy. An electrolytic cell converts electrical energy to chemical energy.**
- **A battery that can do both is thus rechargeable. In a Li-ion polymer cell, used in smartphones, a lithium metal oxide is the cathode and graphite is the anode.**
- **The electrolyte is a semisolid polymer gel. Microporous polyethylene is used to separate the two half- cells. The basics are as follows: in the voltaic phase, lithium oxidizes to Li+ in the anode and releases an electron.**
- **The electron moves via the external circuit to the cathode whereas the Li+ moves via the electrolyte to the cathode.**

- **There, the ion slips between the layers of carbon sheets that graphite is made of in a process called intercalation.**
- **In the electrolytic phase, an over-voltage is applied to the cell so that it charges and the Li+ moves from the graphite to intercalate in the metal oxide, getting ready for the next discharge**

Hydrogen Fuel cells

- **Hydrogen fuel cells are also of great interest today. At the anode, a catalyst separates hydrogen into protons and electrons.**
- **The electrons flow through an external circuit and the protons through the electrolyte both to the cathode.**
- **At the cathode, the particles react with oxygen from the air to create heat and water.**
- **A cell like this will work as long as hydrogen is supplied, and is expected to be a key component of the hydrogen economy**



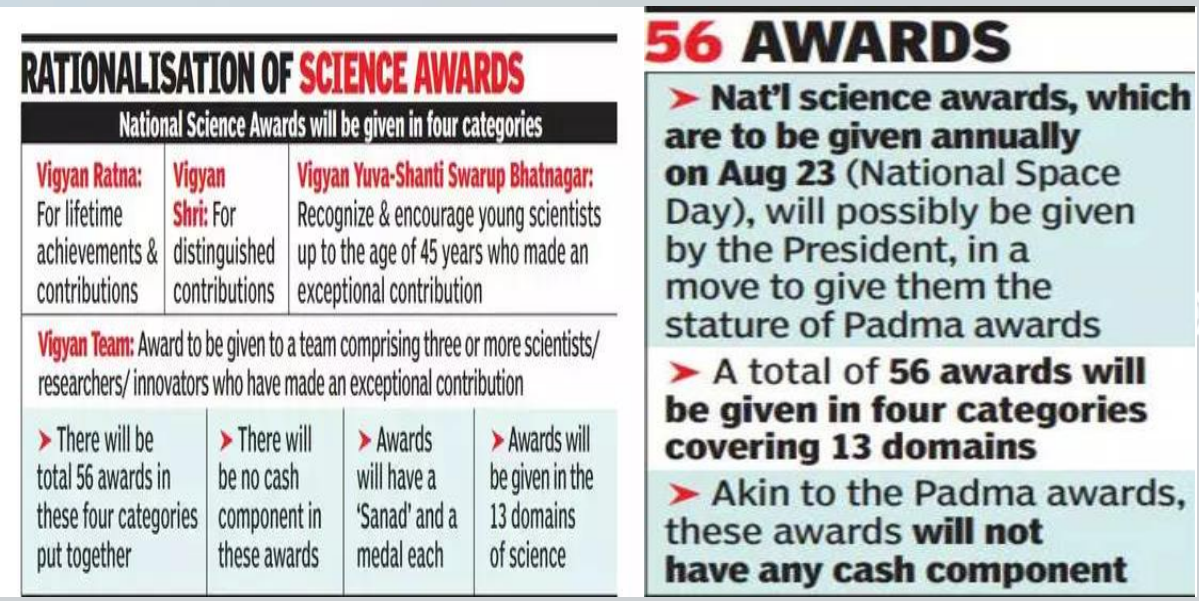
Rashtriya vigyan purashkar

- **The Government of India has come out with a new set of National Awards in the field of Science, Technology and Innovation known as "Rashtriya Vigyan Puraskar''.**

- **The objective of the Rashtriya Vigyan Puraskar (RVP) is to recognize the notable and inspiring contribution made by the scientists, technologists, and innovators individually or in teams in various fields of science, technology, and technology- led innovation.**

- **The Rashtriya Vigyan Puraskar shall be one of the highest recognitions in the field of science, technology, and innovation in India.**

- **Scientists/ technologists/innovators working in government, private sector organizations, or any individual working outside any organization, who have made distinguished contributions in terms of path-breaking research or innovation or discovery in any field of science, technology, or technology-led innovation shall be eligible for the awards**



- **The Rashtriya Vigyan Puraskar shall be given in the 13 domains, namely Physics, Chemistry, Biological Sciences, Mathematics & Computer Science,**

Earth Science, Medicine, Engineering Sciences, Agricultural Science, Environmental Science, Technology & Innovation, Atomic Energy, Space Science and Technology, and Others. The representation from each domain/field, including gender parity will be ensured.

- **All nominations received for the Rashtriya Vigyan Puraskar awards shall be placed before the Rashtriya Vigyan Puraskar Committee (RVPC) to be headed by the Principal Scientific Adviser (PSA) to Government of India and comprising Secretaries of Science Departments, members of Science and Engineering Academies and some distinguished scientists and technologists from different fields of science and technology.**

- **The nominations for this bouquet of awards will be invited every year on 14th January which would remain open till 28th February (National Science Day) every year. These awards shall be announced on 11th May (National Technology Day) every year. The Award Ceremony for all categories of awards will be held on 23rd August (National Space Day). All Awards will have a Sanad& a medal.**

Report on GHG

- **Greenhouse gas concentrations in the atmosphere hit new record highs in 2022, with no end in sight to the rising trend, the United Nations warned on Wednesday.**

- **The UN's World Meteorological Organization said levels of the three main greenhouse gases the climate- warming carbon dioxide, methane and nitrous oxide all broke records last year.**

- **'Wrong direction' Such levels of heat- trapping gases will mean further temperature increases, more extreme weather and higher sea levels, the WMO said in its 19th annual Greenhouse Gas Bulletin**

NISAR

- **The NASA -ISRO Synthetic Aperture Radar (NISAR) is set to be launched in the first quarter of 2024.**

- **NASA-ISRO SAR (NISAR) is a Low Earth Orbit (LEO) observatory being jointly developed by NASA and ISRO.**

- **NISAR will map the entire globe in 12 days and provide spatially and temporally consistent data for understanding changes in Earth's ecosystems, ice mass, vegetation biomass, sea level rise, ground water and natural hazards including earthquakes, tsunamis, volcanoes and landslides. NISAR.**

- **NISAR will reveal the dynamics of carbon storage and uptake in wooded, agricultural, wetland, and permafrost ecosystems and the response of ice sheets to climate change, and the interaction of sea ice and climate.**

Vaccine chikungunya

- **On November 9, the world's first vaccine for chikungunya was approved by the Food and Drug Administration (FDA) in the U.S.**

- **The vaccine has been developed by European vaccine manufacturer Valneva and will be available under the brand Ixchiq, and has been approved for administration in people who are 18 years or older, and are at increased risk of exposure to the virus.**

- **It was approved using the Accelerated Approval pathway, which allows the FDA to clear certain products for serious or life- threatening conditions based on evidence of a product's effectiveness that is likely to provide clinical benefit.**

What is chikungunya?

- **Chikungunya, is characterised by severe joint pain and impaired mobility, and comes with fever.**

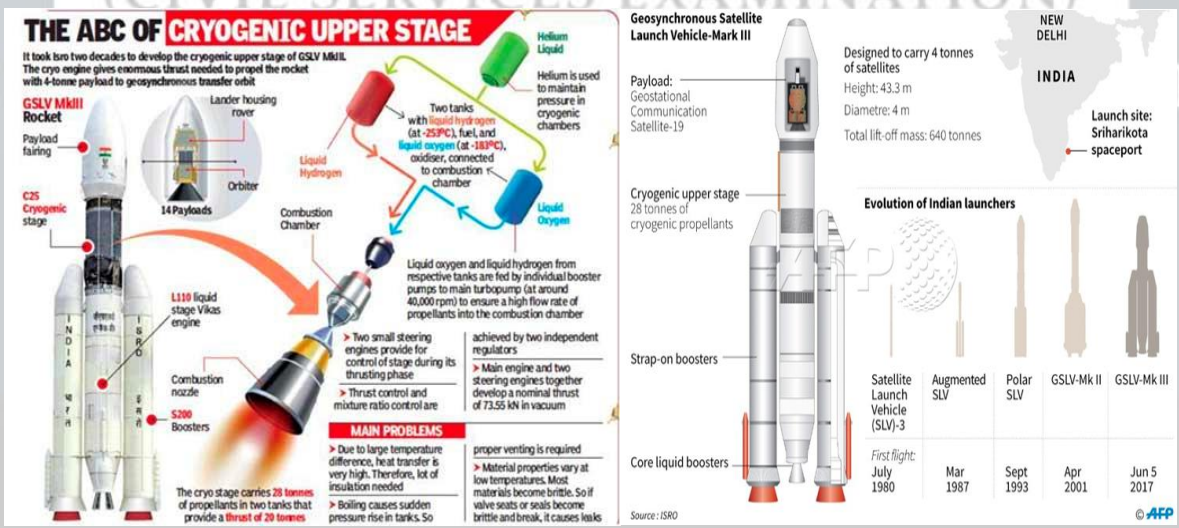
- **It is a viral infection (CHIKV) transmitted primarily by the Aedes aegypti and Aedes albopictus mosquitoes and has been described as "an emerging global health threat."**
- **The WHO fact sheet says Chikungunya is prevalent in Africa, Asia, and the Americas; but sporadic outbreaks have been reported in other regions.**

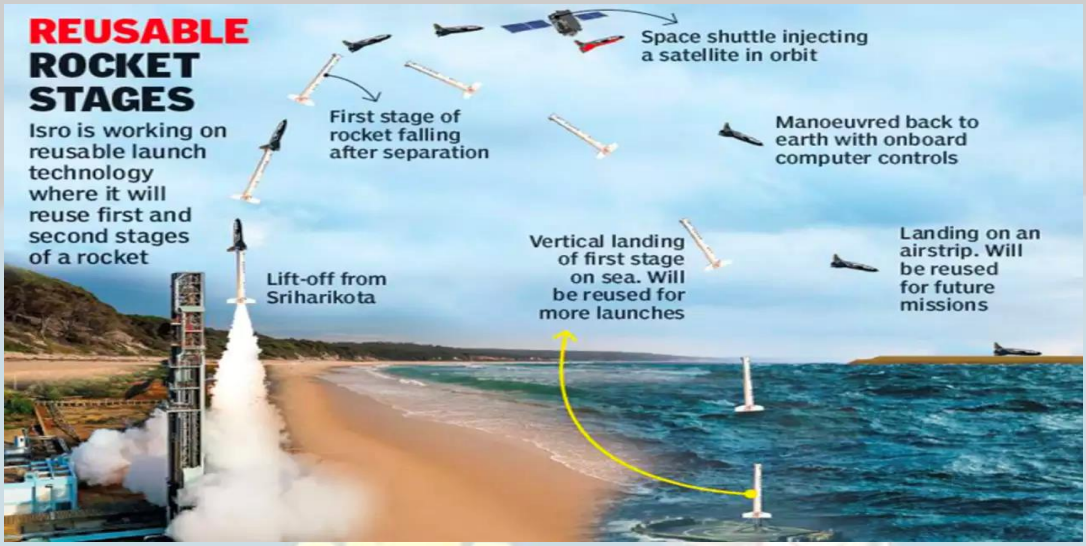
What is the vaccine composition?

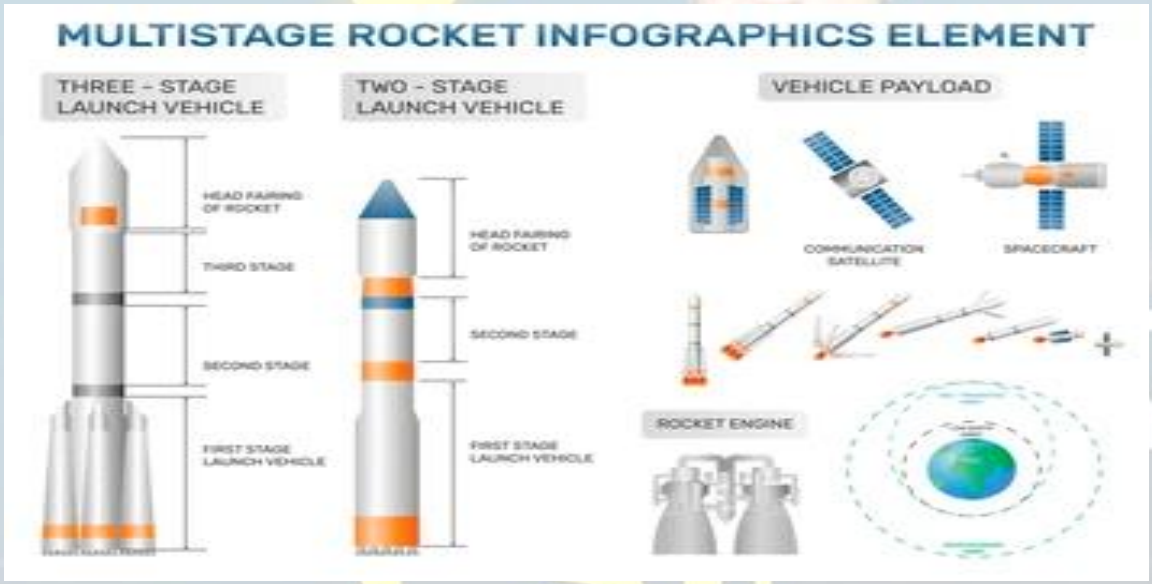
- **Ixchiq is administered as a single dose by injection into the muscle.**
- **It contains a live, weakened version of the chikungunya virus and may cause symptoms in the vaccine recipient similar to those experienced by people who have the disease.**

Cryogenic stage

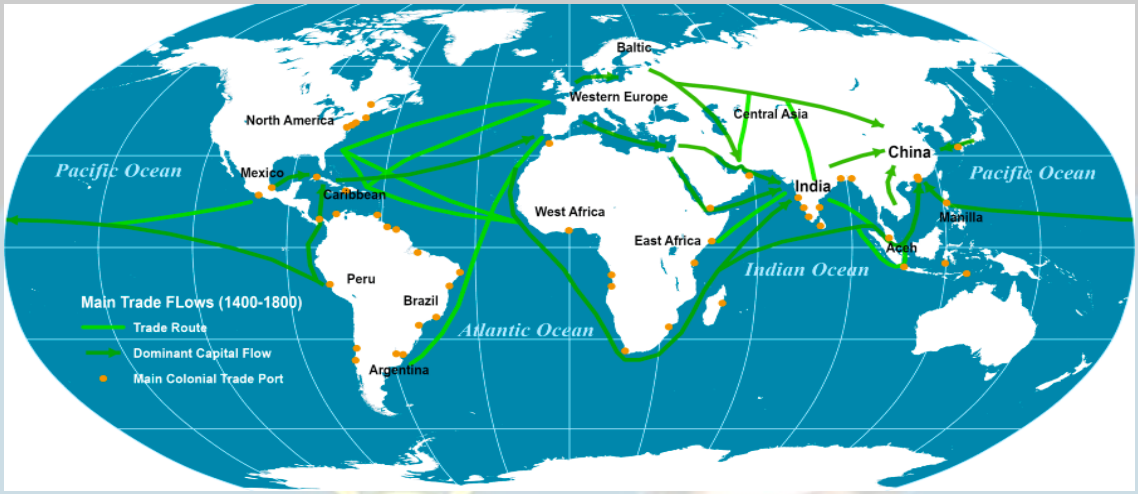
- **The Indian Space Research Organisation (ISRO) has said that the cryogenic upper stage of the LVM3 M4 launch vehicle which launched India's Chandrayaan- 3 moon mission has made an uncontrolled re-entry into the earth's atmosphere on November 15.**
- **The agency added that the final ground track did not pass over India.**
- **"This rocket body (NORAD id 57321) was part of the vehicle that successfully injected the Chandrayaan- 3 spacecraft into the intended orbit**







Gulf of Guinea

- 

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- **The Indian Navy has completed its second anti-piracy patrol in the Gulf of Guinea (GoG) in the Atlantic Ocean. The offshore patrol vessel INS Sumedha, which is on an extended range operational deployment and is currently operating in the Atlantic Ocean along the west coast of Africa, undertook a 31-day anti-piracy patrol,**

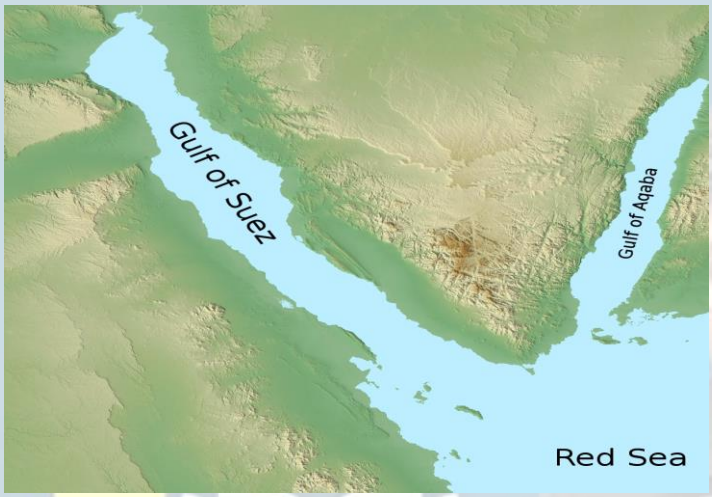
- **The maiden Gulf of Guinea anti-piracy patrol was undertaken by INS Tarkash in September- October 2022**

- **INS Sumedha's deployment also ensured enhancing Navy -to -Navy connect with regional Navies, including Senegal, Ghana, Togo, Nigeria, Angola and Namibia.**

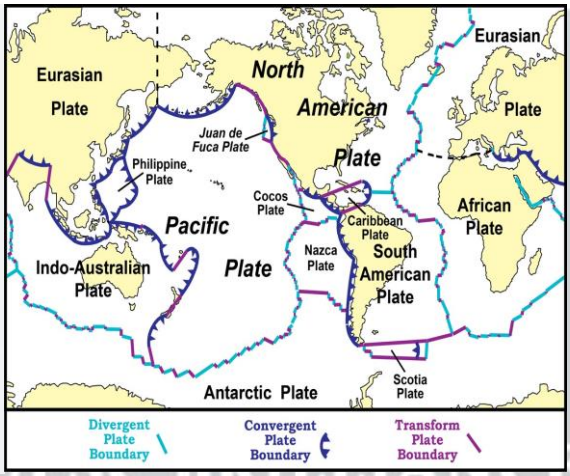
- **Another highlight of the deployment was the ship's participation in the maiden India- EU Joint Exercise.**

What is GULF?

- **A gulf is a large inlet from the ocean into the landmass, typically with a narrower opening than a bay, but that is not observable in all geographic areas so named.**



Earthquake in Philippines



Varicella

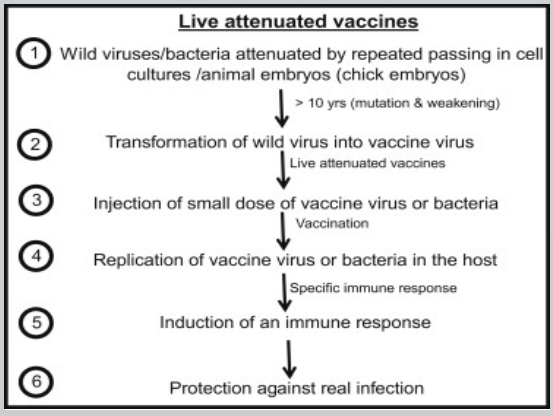
- **Varicella (chickenpox) is an acute, highly contagious disease caused by varicella-zoster virus (VZV), a member of the herpesvirus family. Only one serotype of VZV is known, and humans are the only reservoir.**

- **VZV transmission occurs via droplets, aerosols, or direct contact with respiratory secretions, and almost always produces clinical disease in susceptible individuals. While mostly a mild disorder in childhood, varicella tends to be more severe in adults**

Varicella Vaccines

- **Current varicella vaccines are attenuated vaccines based on the Oka VZV strain that has been modified through sequential propagation in different cell cultures.**

- **The attenuated strain is grown in cell culture, purified, and lyophilized. Reconstituted vaccine is injected subcutaneously. Varicella vaccine has also been included in a combination vaccine with measles mumps rubella (MMRV). A vaccine which contains higher level of the virus has also been developed for the prevention of shingles in the elderly. Live attenuated vaccines contain a version of the living virus that has been weakened so that it does not cause serious disease in people with healthy immune systems.**



Oxygen producing material

- **Oxygen -producing materials made from meteorites found on Mars have been produced using a robotic artificial intelligence (AI) chemist.**
- **The research, published in Nature Synthesis, provides a proof- of concept for generating oxygen and may have implications for future manned missions to Mars.**
- **Potential future manned missions to Mars will require oxygen as it is essential to human activity on the planet, being used in rocket propellants and life support systems.**
- **One of the ways to make these potential missions more cost -effective in the long term and less complex would be to use resources already present on the planet to create oxygen, rather than transport materials from Earth.**
- **Recent evidence of water on Mars and analysis of the elemental composition of meteorites found on the planet could provide an opportunity to make catalysts using Martian resources.**
- **China and others developed a robotic AI- chemist that is able to create catalysts that can be used to produce oxygen from Martian materials without human intervention.**

Biosensor for studying neuropeptide

A new sensor toolkit for studying neuropeptides

- **New biosensors have helped reveal the activity of neuropeptides in the brain, researchers report, providing novel tools for studying the release, function, and regulation of these crucial signalling molecules in vivo.**
- **According to a study, the approach has the potential to address questions regarding neuropeptides and their roles in health and disease.**
- **In the brain, neuropeptides are signalling molecules in the body that regulate many physiological functions, including digestion, metabolism, and sleep.**

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Mussels

- **The same bundle of non-living filaments that mussels use to anchor themselves within their environment can also be jettisoned on demand. Mussels create this quick -release interface by way of a neuro chemically -mediated junction, where billions of motile cilia hold fast to interlinked biopolymer sheets. The ability to produce stable and strong connections between living tissues and non-living surfaces is crucial for a wide range of advanced biomaterials applications.**
- **Mussel is the common name used for members of several families of bivalve molluscs, from saltwater and freshwater habitats. These groups have in common a shell whose outline is elongated and asymmetrical compared with other edible clams, which are often more or less rounded or oval.**

Draft broadcasting bill

- **The draft Bill provides for a consolidated framework to regulate the broadcasting services in the country and seeks to replace the existing Cable Television Networks (Regulation) Act, 1995 and other Policy Guidelines currently governing the broadcasting sector in the country.**

- **The Bill streamlines regulatory processes, extends its purview to cover the Over-the-Top(OTT) content and digital news, and introduces contemporary definitions and provisions for emerging technologies.**

- **It seeks to provide for Content Evaluation Committees and a Broadcast Advisory Council for self-regulation, different program and advertisement code for different Broadcasting Network Operators, Accessibility measures for persons with disabilities, and statutory penalties, etc.**

- **The Bill comprises of Six Chapters, 48 Sections and three Schedules.**

Key Highlights

- **1. Consolidation and Modernization: It addresses a long standing need of consolidating and updating the regulatory provisions for various broadcasting services under a single legislative framework. This move streamlines the regulatory process, making it more efficient and contemporary.**

- **It extends its regulatory purview to encompass broadcasting over-the-top (OTT) content and digital news and current affairs currently regulated through IT Act, 2000 and regulations made there under.**

- **2. Contemporary Definitions and Future-Ready Provisions: To keep pace with the evolving technologies and services, the bill introduces comprehensive definitions for contemporary broadcasting terms and incorporates provisions for emerging broadcasting technologies.**

- **3. Strengthens the Self-Regulation Regime: It enhances self-regulation with the introduction of 'Content evaluation committees' and evolves the existing Inter-Departmental Committee into a more participative and broader**

'Broadcast Advisory Council'.

- **4. Differentiated Programme Code and Advertisement Code: It allows for a differentiated approach to Programme and Advertisement Codes across various services and require self-classification by broadcasters and robust access control measures for restricted content.**

- **5. Accessibility for Persons with Disabilities: The bill addresses the specific needs of persons with disabilities by providing for enabling provisions for issue of comprehensive accessibility guidelines.**

  6. Statutory Penalties and Fines: The draft Bill introduces statutory penalties such as: advisory, warning, censure, or monetary penalties, for operators and broadcasters. Provision for imprisonment and/or fines remains, but only for very serious offenses, ensuring a balanced approach to regulation.

- **7. Equitable Penalties: Monetary penalties and fines are linked to the financial capacity of the entity, taking into account their investment and turnover to ensure fairness and equity.**

- **8. Infrastructure Sharing, Platform Services and Right of Way: The bill also includes provisions for infrastructure sharing among broadcasting network operators and carriage of platform services. Further, it streamlines the Right of Way section to address relocation and alterations more efficiently, and establishes a structured dispute resolution mechanism.**

- **The right of way is the total land area acquired for the construction of the roadway. Its width should be enough to accommodate all the elements of the roadway cross section, any future widening of the road and any public utility facilities that will be installed along the roadway.**

Chimaeras

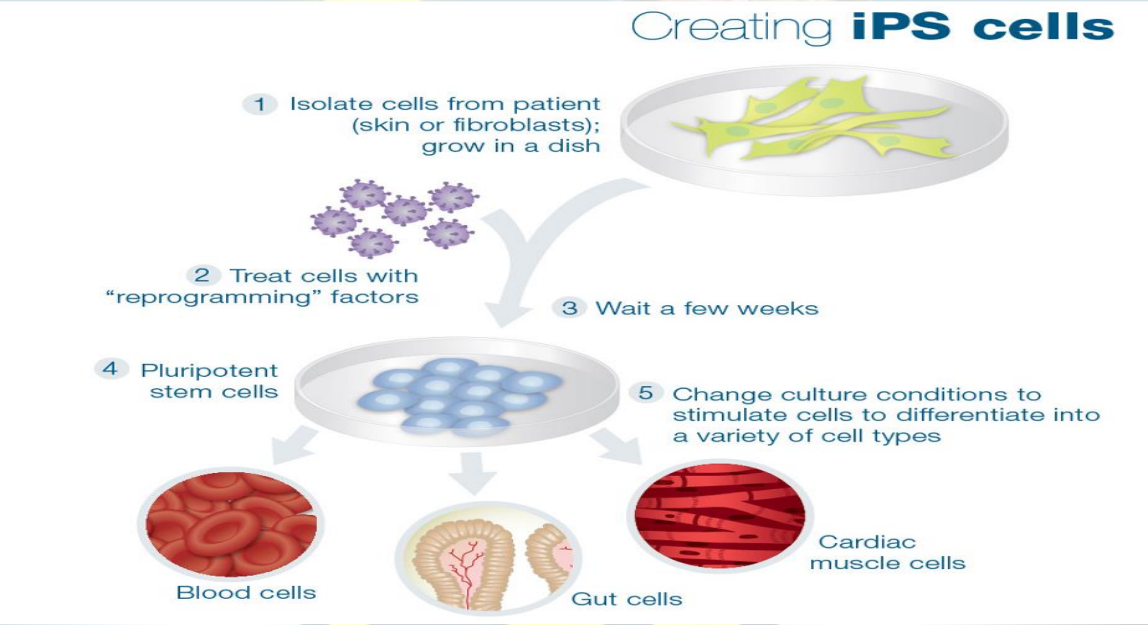
- **A genetic chimaera is a single organism composed of cells of more than one distinct genotype (or genetic makeup). The animal kingdom has several examples of varying degrees of chimerism.**

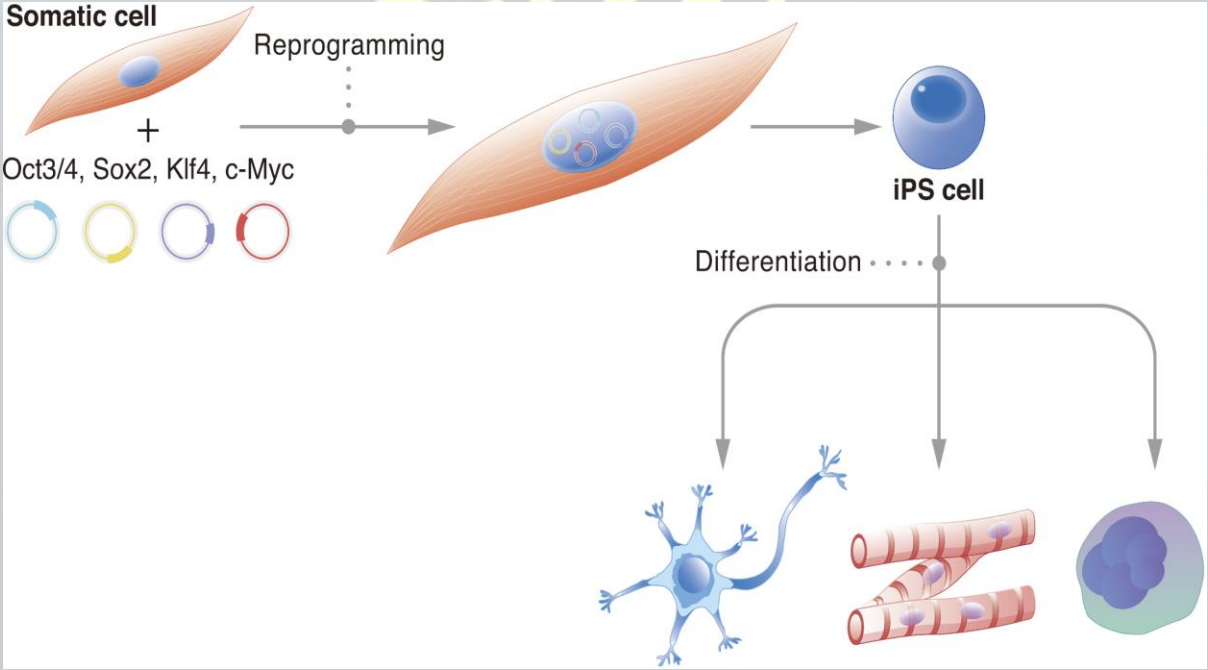
- **The half - sider budgerigar, a type of common parakeet widely adopted as pets, has different colors on either side of its body due to chimerism.**
- **The anglerfish displays an extreme degree of symbiotic chimerism in which the male fish fuses with and is eventually absorbed into the female fish, mixing their genetic makeups into a single animal.**
- **Marine sponges are known to have up to four distinct genotypes in a single organism. The fusion of two fertilized zygotes early in the embryonic stage can also lead to a condition in which two genetic makeups coexist in a single individual.**
- **Chimerism can also result from twin or multiple pregnancies evolving into a single foetus or a twin foetus being absorbed into a singleton.**
- **Researchers have also documented individuals living with two blood types. In fact, blood- group chimerism during multiple births is relatively common**
- **During bone marrow transplants patients have their marrow replaced. The donor's marrow contains stem cells which will produce blood cells that will repopulate the recipient's blood -cell repertoire.**
- **The recipient will develop blood cells that resemble the donor's and will differ from the genetic makeup of the recipient's other tissues – resulting in a chimeric individual**
- **In a study published in Cell, scientists reported the successful generation of a live chimaera in non-human primates species evolutionarily close to humans.**
- **This is the first time scientists have succeeded in producing a live infant chimeric monkey.**

- **iPSC are derived from skin or blood cells that have been reprogrammed back into an embryonic-like pluripotent state that enables the development of an unlimited source of any type of human cell needed for therapeutic purposes**

- **A pluripotent cell is able to develop into several different types of cell:**

- ***Embryonic stem cells are said to be more pluripotent than adult stem cells.***





Induced pluripotent stem cells (iPSCs) technology

- **Freemartins are sterile female cattle that result from the twinning of a male and a female within the same uterus.**
- **This phenomenon occurs in approximately 90% of such twin pregnancies in cattle. The key reason is the exchange of blood between the male and the female foetuses during gestation.**
- **Genetically, free martinism is attributed to the sharing of cells carrying the Y chromosome from the male twin with the female twin.**
- **This chromosome triggers the development of male reproductive organs in the male foetus, while the female foetus, affected by the presence of male hormones, experiences incomplete development of its reproductive system.**
- **The end result is that the freemartin has an underdeveloped or non-functional reproductive tract.**

Langlands program

- **In representation theory and algebraic number theory, the Langlands program is a web of far-reaching and consequential conjectures about connections between number theory and geometry.**
- **Proposed by Robert Langlands (1967, 1970), it seeks to relate Galois groups in algebraic number theory to automorphic forms and representation theory of algebraic groups over local fields and adeles.**
- **Widely seen as the single biggest project in modern mathematical research, the Langlands program has been described by Edward Frenkel as "a kind of grand unified theory of mathematics."**

- **The Langlands program consists of some very complicated theoretical abstractions, which can be difficult even for specialist mathematicians to grasp.**

- **To oversimplify, the fundamental lemma of the project posits a direct connection between the generalized fundamental representation of a finite field with its group extension to the automorphic forms under which it is invariant.**

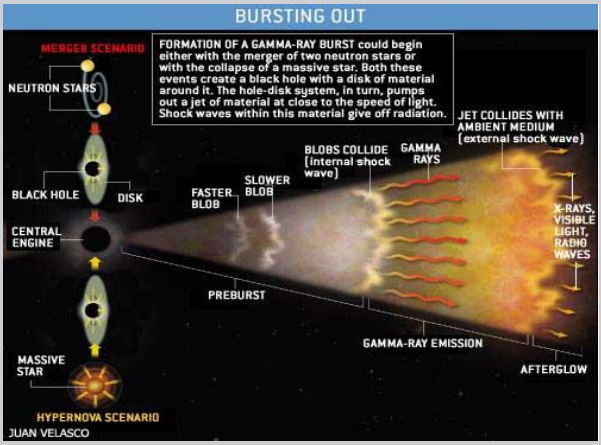
- **In mathematics, a conjecture is a conclusion or a proposition that is proffered on a tentative basis without proof. In mathematics, in the area of abstract algebra known as Galois theory, the Galois group of a certain type of field extension is a specific group associated with the field extension.**

- **In harmonic analysis and number theory, an automorphic form is a well-behaved function from a topological group *G* to the complex numbers.**

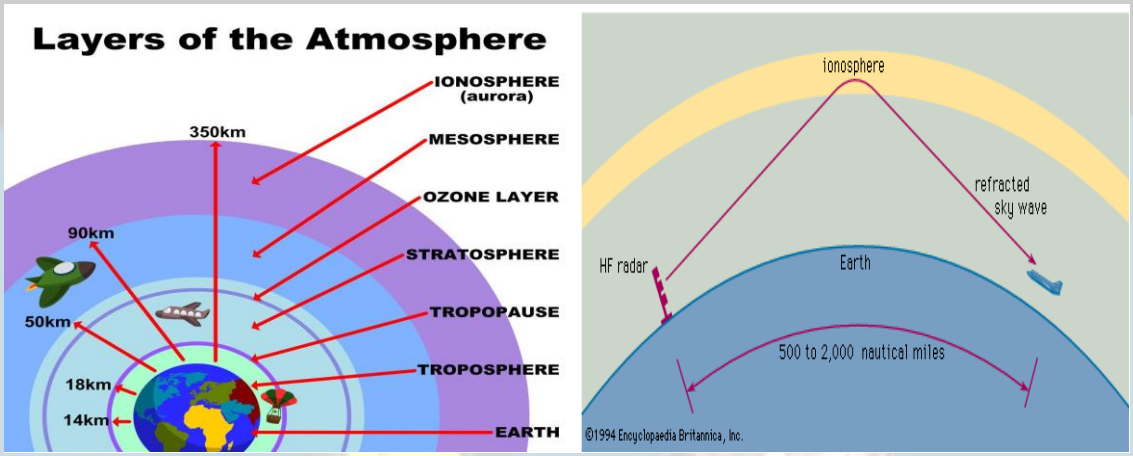
Gamma-ray bursts & Ionosphere

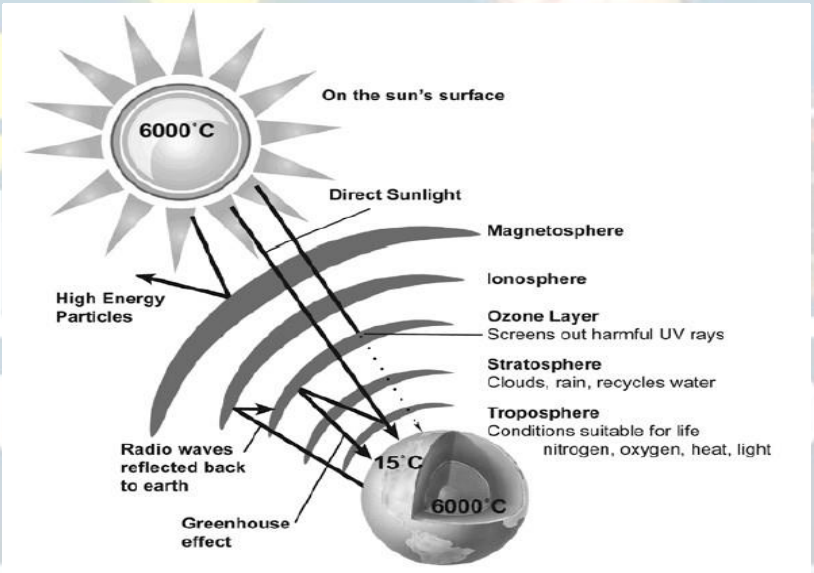
What is gamma-ray bursts?

- **In gamma-ray astronomy, gamma-ray bursts are immensely energetic explosions that have been observed in distant galaxies, described by NASA as "the most powerful class of explosions in the universe". They are the most energetic and luminous electromagnetic events since the Big Bang.**



What is Ionosphere?



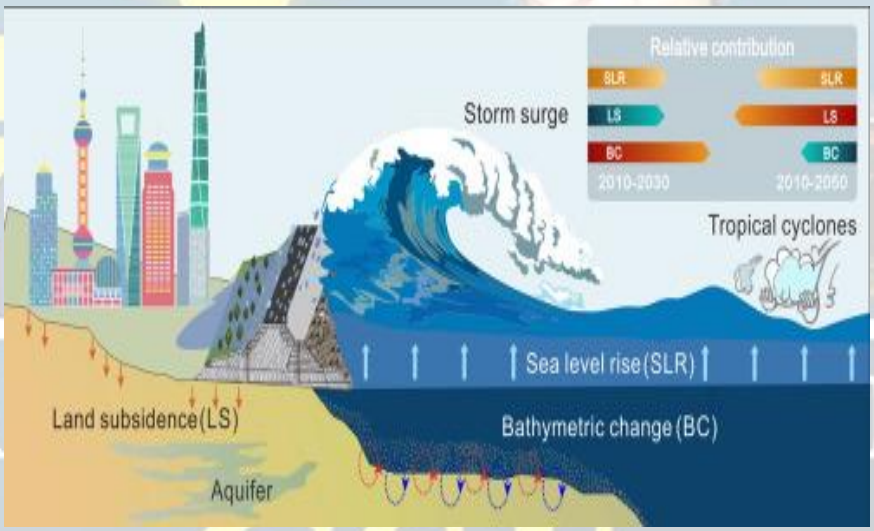


- **The ionosphere is situated about 50-950 km above the earth's surface, stretching to the very edge of space. It helps form the boundary between the vacuum of space and the lower atmosphere inhabited by people.**
- **The gamma rays from the burst impacted the atmosphere for about 13 minutes on October 9, 2022.**
- **They were detected by the European Space Agency's Integral (International Gamma- Ray Astrophysics Laboratory) space observatory and various satellites orbiting close to the earth. The gamma rays caused a strong variation in the ionosphere's electric field,**
- **The ionosphere, which helps protect life on the earth by absorbing harmful**

ultraviolet rays from the sun, is sensitive to changing magnetic and electrical conditions in space, usually connected to solar activity.

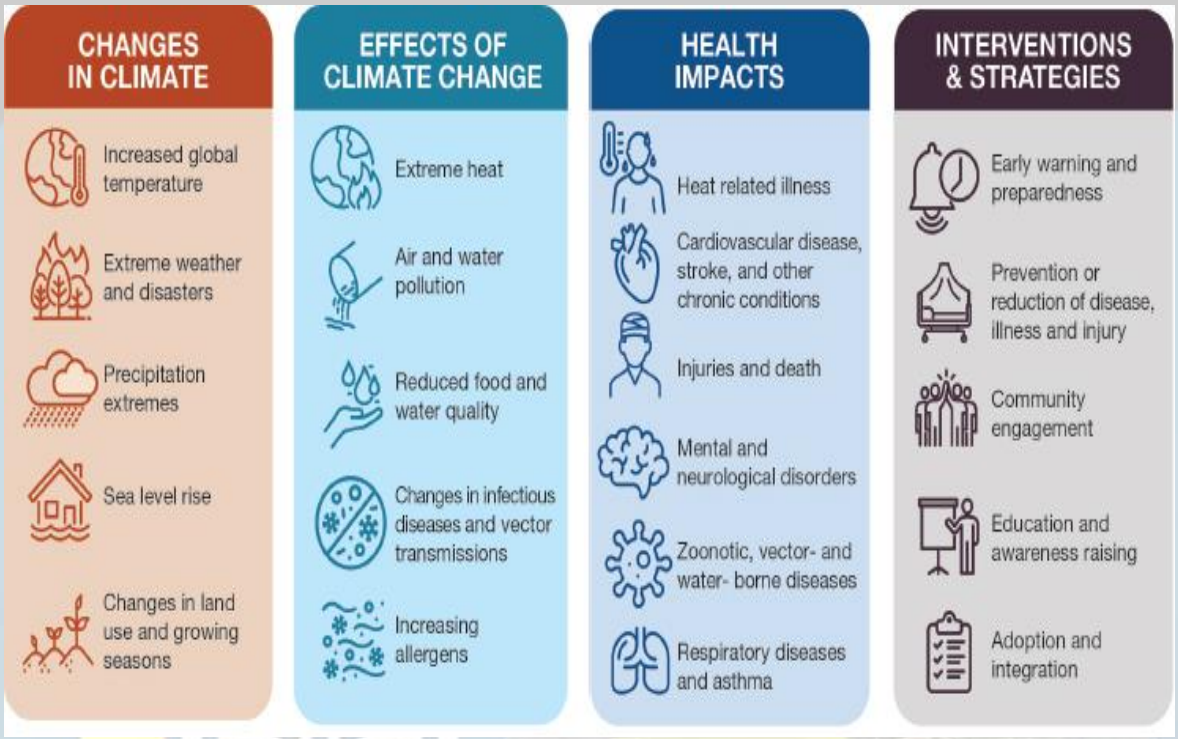
- **While this gamma ray burst did not cause deleterious effects for life on the earth, it has been hypothesised that a strong one originating within the Milky Way and pointed right at us could subject the planet's surface to a flood of harmful ultraviolet radiation.**

Maldives & sea level rise



- **Rising sea levels threaten to swamp the Maldives and the Indian Ocean archipelago is already out of drinking water, but the new President says he has scrapped plans to relocate citizens.**
- **Instead, President Mohamed Muizzu promises the low -lying nation will beat back the waves through ambitious land reclamation and building islands higher.**

Climate change and Health



- **One estimate suggests that if global temperature were to rise by 2°C, many parts of India would become uninhabitable. All nations during the Paris Agreement agreed to cap the rise in temperature at 1.5°C.**
- **The double burden of morbidity that India faces from communicable and non-communicable diseases will be worsened by climate change. It could facilitate the growth of vectors such as mosquitoes, sandflies, ticks, and as yet unknown ones, and change the seasonality of infection through changes in their life cycle.**
- **It could also facilitate the introduction of vectors and pathogens into areas where they did not exist before, such as mosquitoes in the Himalayan States.**
- **Heat also alters the virulence of pathogens.**
- **Reduced availability of food and water and the decrease in nutritional value of food increases vulnerability to diseases.**

- **Epidemics commonly occur after floods, but extended warm periods also promote the proliferation of water and food-borne pathogens and diseases.**
- **Less well recognised is the impact of climate change on non-communicable diseases and mental health, both of which are poorly managed in India.**
- **Heat, physical exertion, and dehydration, a constant state for labourers, could lead to kidney injuries, which are rising in India due to uncontrolled diabetes. Chronic Obstructive Pulmonary Diseases are exacerbated by increased and extended episodes of air pollution.**
- **India has to recognise climate change and its impact on health as a problem that can be and needs to be addressed.**
- **Researchers who work in this area need to come up with policy options for action. National, State, and local governments have to decide to act on the policy options that have been generated by research.**
- **Only when the three streams of problematisation, policy options, and political decision- making come together is meaningful change likely to happen.**

ILO Conventions

- **International labour standards are legal instruments drawn up by the ILO's constituents (governments, employers and workers) and setting out basic principles and rights at work.**
- **They are either Conventions (or Protocols), which are legally binding international treaties that may be ratified by member states, or Recommendations, which serve as non-binding guidelines**
- **Conventions and Recommendations are drawn up by representatives of**

governments, employers and workers and are adopted at the annual International Labour Conference.

- **Once a standard is adopted, member states are required under article 19(6) of the ILO Constitution, to *submit* it to their competent authority (normally Parliament) within a period of twelve months for consideration.**

The eleven fundamental instruments are:

- **Freedom of Association and Protection of the Right to Organize Convention, 1948 (No. 87)**
- **Right to Organize and Collective Bargaining Convention, 1949 (No. 98)**
- **Forced Labour Convention, 1930 (No. 29) (and its 2014 Protocol)**
- **Abolition of Forced Labour Convention, 1957 (No. 105)**
- **Minimum Age Convention, 1973 (No. 138)**
- **Worst Forms of Child Labour Convention, 1999 (No. 182)**
- **Equal Remuneration Convention, 1951 (No. 100)**
- **Discrimination (Employment and Occupation) Convention, 1958 (No. 111)**
- **Occupational Safety and Health Convention, 1981 (No. 155)**
- **Promotional Framework for Occupational Safety and Health Convention, 2006 (No. 187)**

The four governance Conventions are:

- **Labour Inspection Convention, 1947 (No. 81)**
- **Employment Policy Convention, 1964 (No. 122)**
- **Labour Inspection (Agriculture) Convention, 1969 (No. 129)**

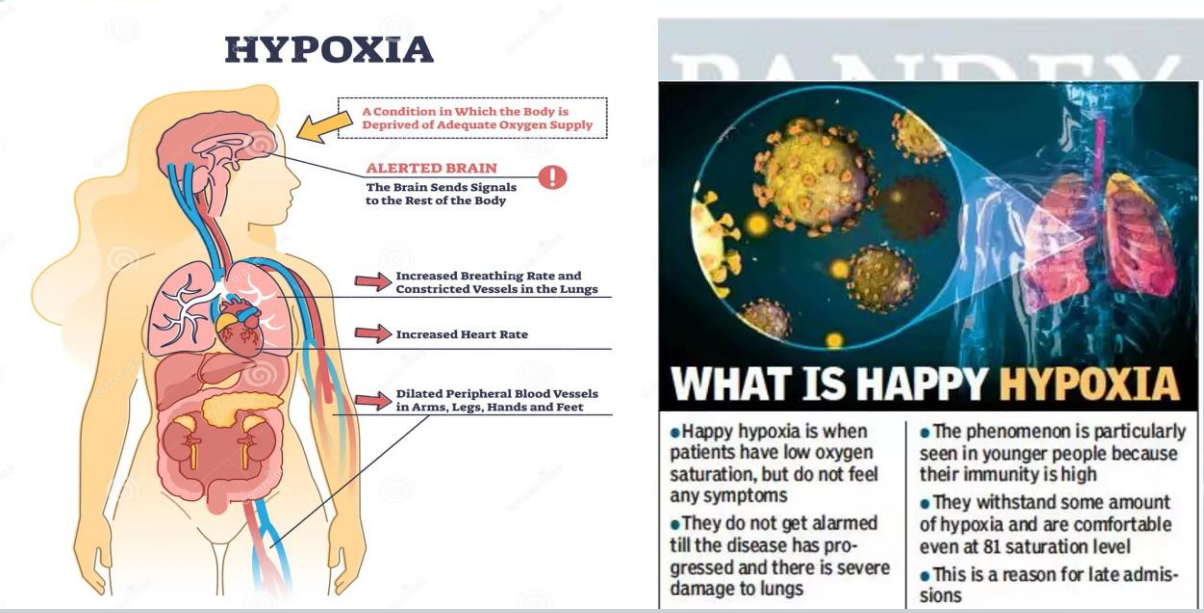
- **Tripartite Consultation (International Labour Standards) Convention, 1976 (No. 144)**

- **ABOUT ILO**

- **It was created in 1919, as part of the Treaty of Versailles that ended World War I, to reflect the belief that universal and lasting peace can be accomplished only if it is based on social justice.**

- **The Constitution of the ILO was drafted in early 1919 by the Labour Commission, chaired by Samuel Gompers, head of the American Federation of Labour (AFL) in the United States. It was composed of representatives from nine countries: Belgium, Cuba, Czechoslovakia, France, Italy, Japan, Poland, the United Kingdom and the United States**

HYPOXIA



Why study hypoxia?

- **The researchers have noted that theirs is the first study to demonstrate that oxygen restriction, or continuous hypoxia, can extend lifespan in an ageing mammal.**

- **Previous reports on oxygen restriction lengthening life span have come from mammalian cells grown in Petri dishes, yeast, and in less complex lab animals such as roundworms and fruit flies.**
- **hypoxia prompted the mice to restrict their diets.**
- **But they found that the hypoxic mice ate slightly more food than those living in normoxia, ruling out dietary restriction as the fundamental underlying mechanism.**

CO2 vs CH4

- **Climate talks often revolve around reducing the most dangerous greenhouse gas, carbon dioxide (CO2). But other powerful heat -trapping emissions, namely methane, are also likely to be in the crosshairs of negotiators at the crucial CoP28**
- **Atmospheric methane (CH4) occurs abundantly in nature as the primary component of natural gas. It is the second largest contributor to climate change, accounting for around 16% of the warming effect.**
- **Methane remains in the atmosphere for only about 10 years, but has a much more powerful warming impact than CO2.**
- **Its warming effect is 28-times greater than CO2 over a 100-year timescale. Agriculture is the biggest culprit, responsible for roughly a quarter of emissions.**
- **Most of that is from livestock (cows and sheep release methane during digestion and in their manure) and rice cultivation, where flooded fields create ideal conditions for methane -emitting bacteria.**
- **The energy sector - coal, oil, and gas - is the second largest source of human caused methane emissions. Methane leaks from energy infrastructure, such as gas pipelines, and from deliberate releases during maintenance.**

- **Discarded household waste also releases large quantities of methane when it decomposes, if left to rot in landfills.**
- **A recent IEA report estimates that rapid cuts in methane emissions linked to the fossil fuel sector could prevent up to 0.1 degrees Celsius of warming by mid-century**
- **For rice fields, changes to water management are the "most promising" way to reduce emissions, according to a FAO report.**

AI Regulation

- **India will evolve norms for regulating artificial intelligence, and the AI regulator could function like financial regulator SEBI.**
- **Stating that the model of self- regulation and bureaucratic regulation is unlikely to work in the AI space**
- **India could think of having a regulator that understands the technology and pays attention to how it is evolving.**
- **"Need to create the equivalent (of SEBI) for the AI system.**
- **Need a regulator who understands the technology.**
- **Have to enforce regular audits**
- **Good protocol on developing AI regulation**

Climate smart agriculture

- **The world's southern continents are reportedly experiencing severe drought due to climate change, which negatively impacts agricultural production and farmers' livelihoods.**
- **Both population expansion and dietary changes are contributing to an**

increase in the demand for food

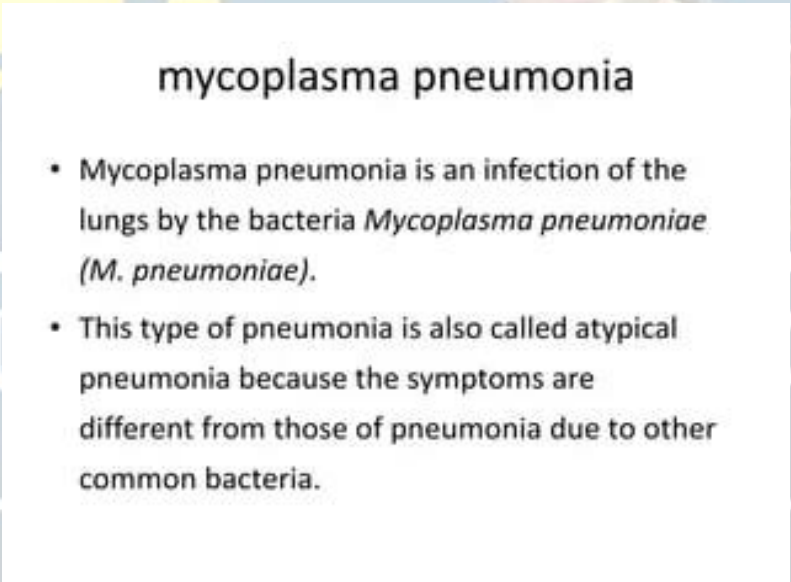
- **As a result of climate change, traditional farming practices are becoming less productive.**
- **Climate change is increasing the dangers faced by farmers, prompting them to re-evaluate their practices.**
- **Climate smart agriculture is an approach for transforming food and agriculture systems to support sustainable development and safeguard food security under climate change.**
- **CSA comprises three pillars or objectives: (1) sustainably increase agricultural productivity and incomes;**
- **(2) adapt and build resilience to climate change; and (3) reduce/remove GHG (greenhouse gases) emissions, where possible."**
- **Dimensions of climate-smart practices include water smart, weather smart, energy smart, and carbon- smart practices.**
- **They improve productivity, deal with land degradation, and improve soil health.**
- **The National Action Plan on Climate Change emphasises the role of climate-resilient agriculture in India's adaptation measures.**
- **Programmes such as the Soil Health Card Scheme use precision nutrient management to optimise agricultural methods.**
- **CSA promotes crop diversification, increases water efficiency, and integrates drought- resistant crop types, all of which help lessen the disruptive effects of climate change.**

- **The importance of CSA lies in its ability to increase agricultural output while maintaining ecological stability.**
- **This correlation is not only a desired consequence but rather essential for long-term food security and sustainable resource usage in a warming planet.**
- **By reducing exposure to climate -related dangers and shocks, CSA increases resilience in the face of longer -term stressors like shorter seasons and erratic weather patterns.**
- **In addition to these benefits, a significant outcome of CSA implementation is the increasing economic autonomy of farmers.**
- **CSA causes a dramatic change in farming communities' economic and social structure by distributing information about and providing access to climate- resilient methods. The increasing popularity of CSA is a promising indicator for the future of biodiversity conservation.**
- **CSA's ecosystem -based approach and different crop varieties help cropland and wild regions coexist together.**
- **The majority of Indian farmers are small or marginal.**
- **Therefore, CSA can play a significant role in helping them increase their profits.**
- **The intersection of climate vulnerability and agricultural importance places India at a unique juncture where CSA adoption is not merely desirable but essential.**
- **The National Adaptation Fund for Climate Change, National Innovation on Climate Resilient Agriculture, Soil Health Mission, Pradhan Mantri Krishi**

Sinchayee Yojana, Paramparagat Krishi Vikas Yojana, Biotech -KISAN, and Climate Smart Village are a few examples of government initiatives in India focusing on CSA.

Mycoplasma pneumoniae

- **On November 23, the details shared with the WHO by China indicated that the spike in cases and hospitalisations among children were due to Mycoplasma pneumoniae pneumonia since May, and RSV, adenovirus and influenza virus since October**



- **Respiratory syncytial) virus, or RSV, is a common respiratory virus that usually causes mild, cold-like symptoms. Most people recover in a week or two, but RSV can be serious.**

- **Adenoviruses are a group of viruses that can cause infections. Adenovirus infections can happen in kids of any age, but are more common in babies and young children.**

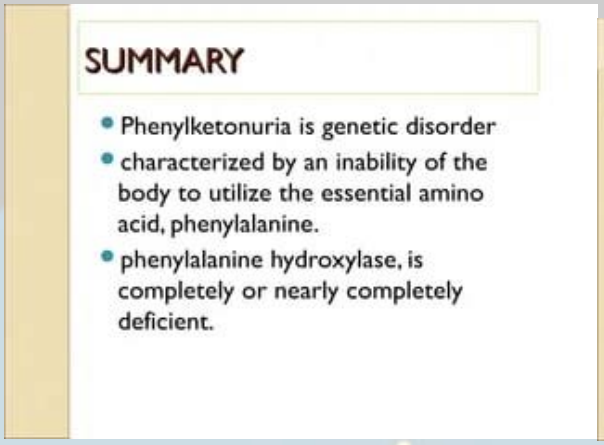
- **Adenoviruses are medium-sized, non-enveloped viruses with an icosahedral nucleocapsid containing a double-stranded DNA genome.**

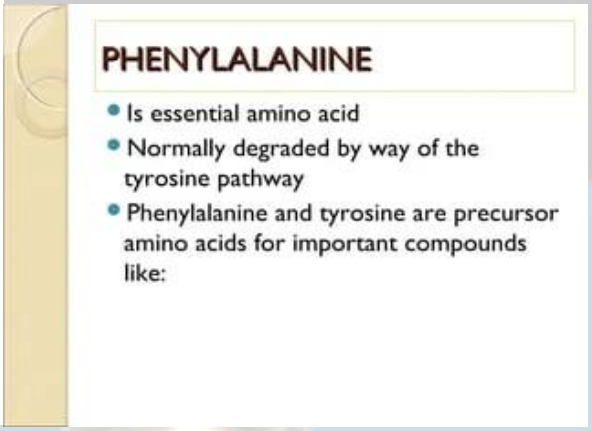
H9N2

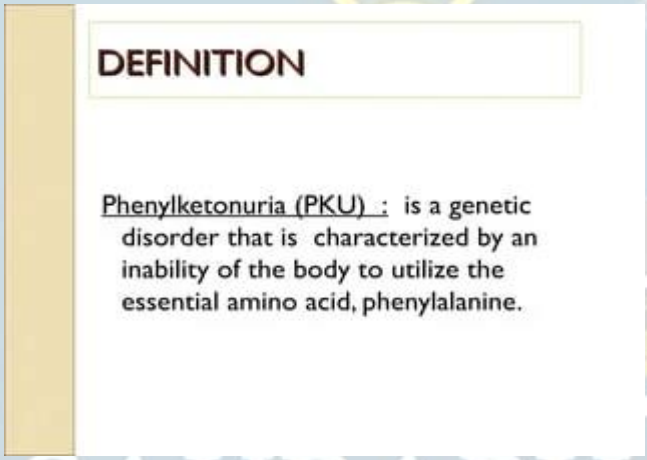
- **The Ministry maintained that it is closely monitoring the reported outbreak of H9N2 cases and clusters of respiratory illness in children in northern China.**
- **It, however, maintained that there is a need for strengthening surveillance among human, animal husbandry and wildlife sectors, and improving coordination. It maintained that India is prepared for any kind of public health exigency**
- **Influenza A virus subtype H9N2 (A/H9N2) is a subtype of the species Influenza A virus (bird flu virus).**
- **H9N2 is the most common subtype of influenza viruses in Chinese chickens and thus causes great economic loss for the poultry industry, even under the long-term vaccination programs.**
- **The H9N2 influenza virus can be transmitted by air droplet, dust, feed, or water. Chickens usually seemed to be healthy after the infection but some of them do show depression and ruffled feathers. The virus replicates itself in the trachea.**
- **Tyrosinemia Type 1, Gaucher's Disease, Wilson's Disease, and the Dravet Lennox Gastaut Syndrome.**
- **Providing relief to patients with rare diseases across India, the Union Health Ministry has made available generic drugs to support the care and treatment of four ailments: Tyrosinemia-Type 1, Gauchers Disease, Wilson's Disease, and the Dravet-Lennox Gastaut Syndrome.**
- **Tyrosinemia type I is a rare autosomal recessive genetic metabolic disorder characterised by lack of the enzyme fumarylacetoacetate hydrolase (FAH),**

which is needed for the final break down of the amino acid tyrosine.

- **Gaucher (go-SHAY) disease is the result of a buildup of certain fatty substances in certain organs, particularly your spleen and liver.**
- **This causes these organs to enlarge and can affect their function.**
- **The fatty substances also can build up in bone tissue, weakening the bone and increasing the risk of fractures.**
- **Wilson disease (hepatolenticular degeneration) is a rare, autosomal recessive disorder caused by abnormal copper accumulation in the body particularly involving the brain, liver, and cornea.**
- **It affects 1 in 30,000 individuals and may present as weakness, abdominal pain, jaundice, personality change, seizures, etc.**
- **Dravet syndrome is a genetic epilepsy. The majority of children are found to have a mutation in the SCN1A gene, or sodium channel gene, whereas Lennox-Gastaut is an epilepsy syndrome with a myriad of etiologies.**
- **Epilepsy is a disorder of the brain characterized by repeated seizures. A seizure is usually defined as a sudden alteration of behavior due to a temporary change in the electrical functioning of the brain**
- **The Ministry is also in the process of making available drugs for more rare diseases, including Phenylketonuria and Hyperammonemia, over the next few months. Phenylketonuria , also called PKU, is a rare inherited disorder that causes an amino acid called phenylalanine to build up in the body.**
- **PKU is caused by a change in the phenylalanine hydroxylase (PAH) gene. This gene helps create the enzyme needed to break down phenylalanine.**







Hyperammonemia is a metabolic condition characterized by the raised levels of ammonia, a nitrogen-containing compound. Normal levels of ammonia in the body vary according to age. Hyperammonemia can result from various congenital and acquired conditions in which it may be the principal toxin.

CERT-IN

- **CERT-In is operational since January 2004. The constituency of CERT-In is the Indian Cyber Community. CERT-In is the national nodal agency for responding to computer security incidents as and when they occur.**

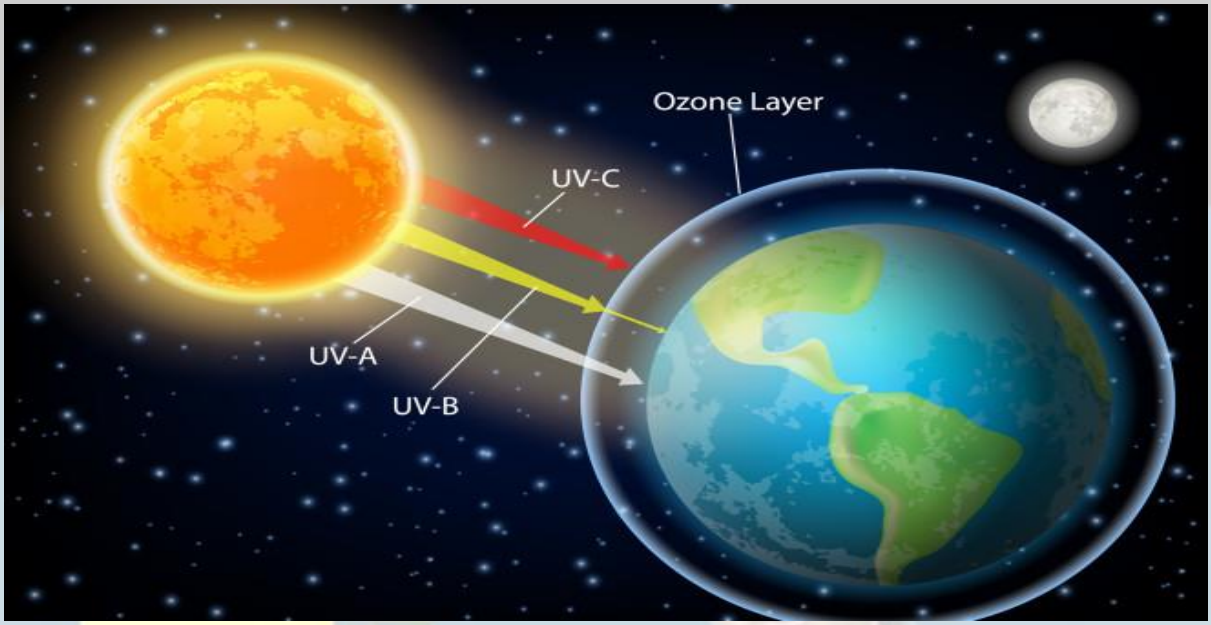
- **CERT-In has been designated to serve as the national agency to perform the following functions in the area of cyber security:**

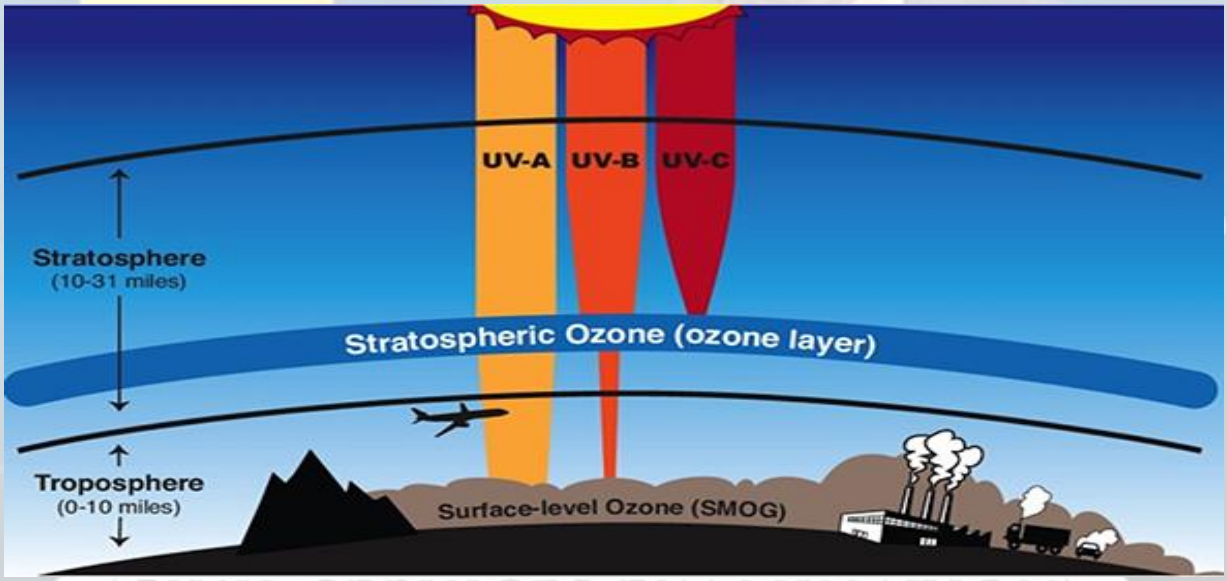
- **Collection, analysis and dissemination of information on cyber incidents.**

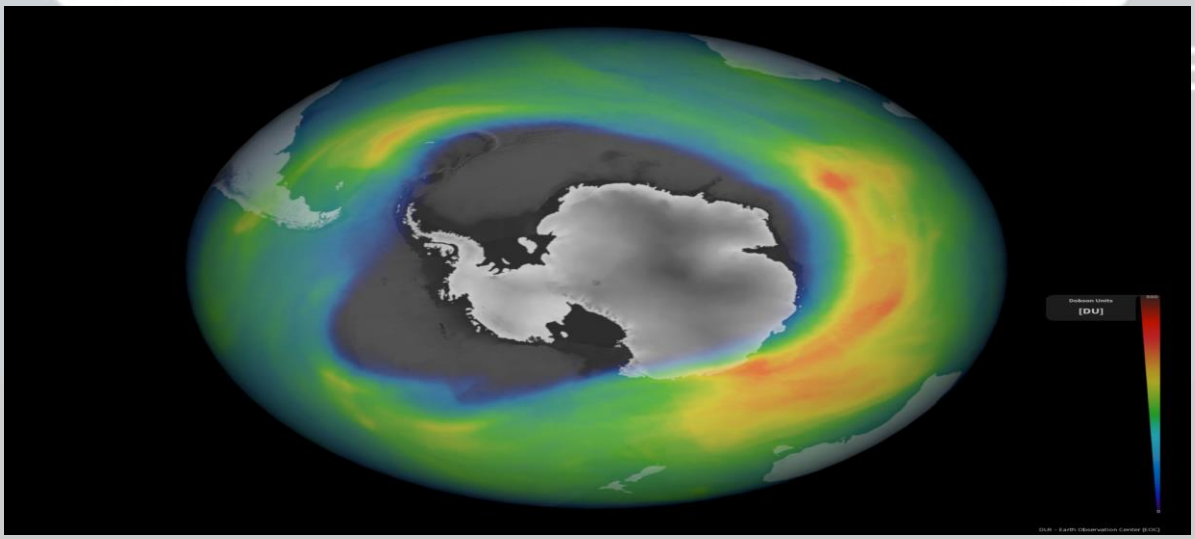
- **Forecast and alerts of cyber security incidents**
- **Emergency measures for handling cyber security incidents**
- **Coordination of cyber incident response activities.**
- **Issue guidelines, advisories, vulnerability notes and whitepapers relating to information security practices, procedures, prevention, response and reporting of cyber incidents.**
- **Such other functions relating to cyber security as may be prescribed.**

Antarctica ozone hole

- **The core (middle stratospheric layer) of the Antarctic ozone in mid -spring (October) has experienced a 26% reduction since 2004, contrary to previously reported recovery trends in total ozone.**
- **The Montreal Protocol designated a list of controlled ozone depleting substances that were banned from future production in 1987 and is widely considered to have been successful for ozone recovery.**







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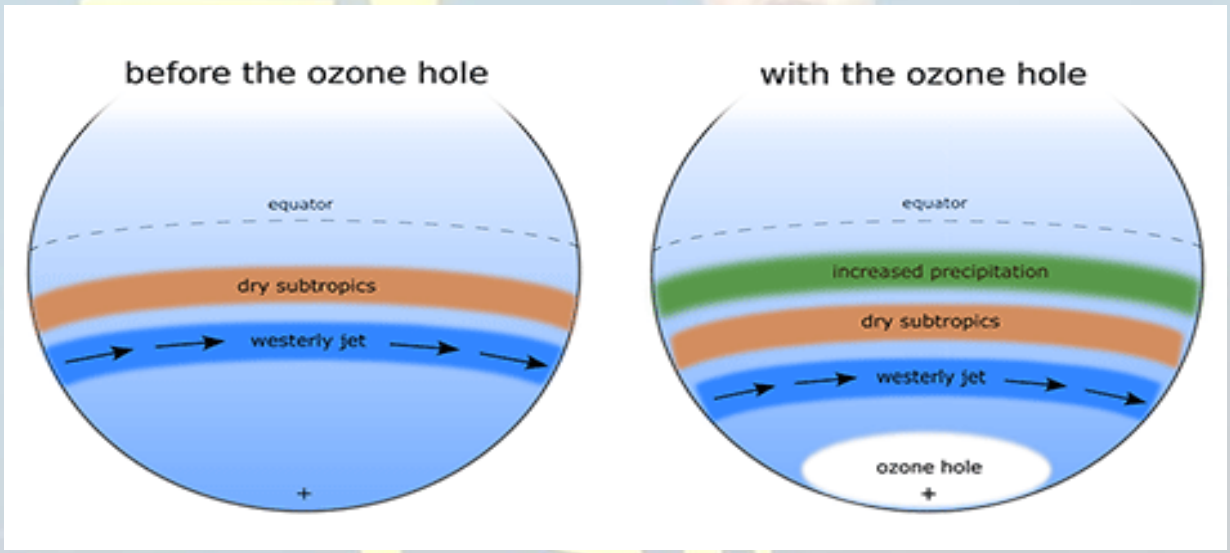
- 

- **However, the past three years (2020-2022) have witnessed the re-emergence of large and long lived ozone holes over Antarctica in mid spring, while early spring.**

- **The middle stratosphere has been dominated by continued, significant ozone reduction since 2004, amounting to 26% loss in the core of the ozone hole.**

- **This reduction is potentially driven by dynamical changes in the mesosphere (the atmospheric layer above the stratosphere and the ozone layer).**

- **The findings suggest that changes in the Southern Hemisphere atmosphere**

are contributing to a persistent Antarctic ozone hole.

Dolomite problem

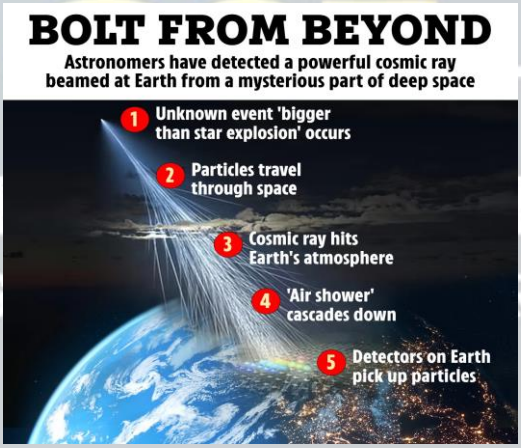
- **Addressing the long-standing "dolomite problem," researchers have found that dolomite crystals require cycling of saturation conditions to grow.**
- **The findings provide new insights into how dolomite is formed and why modern dolomite is primarily found in natural environments with pH or salinity fluctuations.**
- **As per the simulation's predictions, frequent cycling of a solution between supersaturation and undersaturation can speed up dolomite growth by up to 10 million times.**
- **Supersaturation is a state of a solution that contains more of the dissolved material than could be dissolved by the solvent under normal circumstances.**

About Dolomite

- **Dolomite is a type of limestone.**
- **It is rich in magnesium carbonate and calcium carbonate.**
- **It also contains several other minerals.**
- **Dolomite is made of 60% calcium carbonate and 40% magnesium carbonate.**
- **However, it might also contain heavy metals, such as lead**

Extra galactic particles

- **An extremely energetic cosmic ray an extragalactic particle with an energy exceeding about 240 exa-electron volts (EeV) has been detected by the Telescope Array experiment's surface detector.**
- **According to the findings, its arrival direction shows no obvious source. Although low- energy cosmic rays emanate from the sun, the origins of rarer ultra high- energy cosmic rays (UHECRs) are thought to be related to the most energetic phenomena in the Universe, such as those involving black holes.**



- **Extragalactic cosmic rays are very-high-energy particles that flow into the Solar System from beyond the Milky Way galaxy.**
- **While at low energies, the majority of cosmic rays originate within the Galaxy , at high energies the cosmic ray spectrum is dominated by these**

extragalactic cosmic rays.

Dyslexia

- **Dyslexia is a learning disorder that involves difficulty reading due to problems identifying speech sounds and learning how they relate to letters and words (decoding).**
- **Also called a reading disability, dyslexia is a result of individual differences in areas of the brain that process language**

3HP

What is measles?

- **Measles is a contagious disease caused by a virus, which spreads through the air when an infected person coughs or sneezes.**
- **Measles starts with a cough, runny nose, red eyes, and fever.**
- **Then a rash of tiny, red spots break out.**
- **It starts at the head and spreads to the rest of the body.**
- **According to the WHO, measles vaccination averted 56 million deaths between 2000 and 2021.**
- **"Even though a safe and cost -effective vaccine is available, in 2021, there were an estimated 1,28,000 measles deaths globally, mostly among unvaccinated or under vaccinated children under the age of five.**
- **Additionally, in 2022, about 83% of the world's children received one dose of measles vaccine by their first birthday through routine health services the lowest since 2008," it said. Measles can be prevented with the MMR vaccine.**

- **The vaccine protects against three diseases measles, mumps and rubella. Two doses of MMR vaccine are about 97% effective at preventing measles; one dose is about 93% effective.**

- **"This viral disease affecting mainly children causes significant morbidity and mortality. In an unimmunized population, the disease can rapidly break into an epidemic,"**

Himalaya and development

- **The Char Dham Project, all-weather roads, being constructed by the National Highway Authority of India (NHAI) in Uttarakhand, linking the four religious pilgrimages of Gangotri, Yamunotri, Badrinath, and Kedarnath, has brought into focus two major issues in the Indian Himalayan Region (IHR).**

- **The foremost one is about the development model itself and, in concrete terms, what should be the carrying capacity of the IHR.**

- **Also important are the processes in which environment clearances were sought, undermining safety protocols, and a new form of architecture that should be built to construct and monitor infrastructure projects, if at all they are desired, in the region**

- **One of the major problems in this project is in accepting the fact that the Himalayas are the youngest range of mountains and still in the formative stages.**

- **The area is extremely sensitive to earthquakes and frictional shear rocks are present as well.**

- **Constructing in this zone is dangerous. Now, the NHAI has said it is going to conduct a detailed inspection of 29 tunnels in the country for further safety and avoiding accidents**

- **The carrying capacity cannot just be limited to the number of people an ecosystem can sustain; it also has to take into cognisance the total carrying capacity of the IHR from the infrastructure aspect.**
- **The IHR is in a transformative phase and the impetus for this transformation unfortunately comes from the new geographies.**
- **There are spatial and temporal changes that go beyond the scope and spaces of the Himalayan aesthetic, culture, and building typologies.**
- **Sheer integration with the rest is not the way of sustaining them.**
- **A new legislative architecture that allows people to monitor these projects and ensures that geological experts are part of every move is required.**
- **The local communities should be an essential part of these monitoring structures with strict protocols.**
- **Likewise, civil society groups and community -driven organisations should be included.**

Fleet electrification

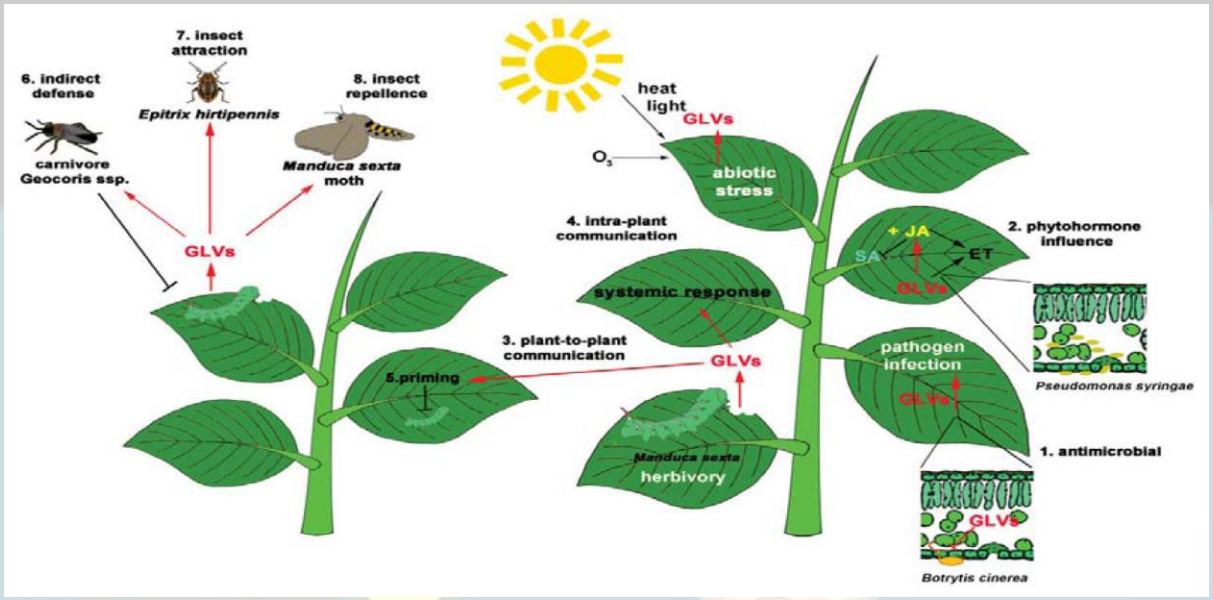
- **About 9 lakh new trucks are added to Indian roads every year to an already running fleet of 70 lakh trucks.**
- **India carries over 2 trillion tonne kilometres freight on trucks, annually.**
- **These trucks consume over one -fourth of Indian oil imports and contribute to over 90% of road transport CO2 emissions.**
- **The rate of increase of truck fleet is expected to keep increasing in a growing network of roads in an emerging economy.**
- **If all these new trucks are powered by diesel-fired internal combustion engines vehicles, as is the case today, our cities will face a greater onslaught**

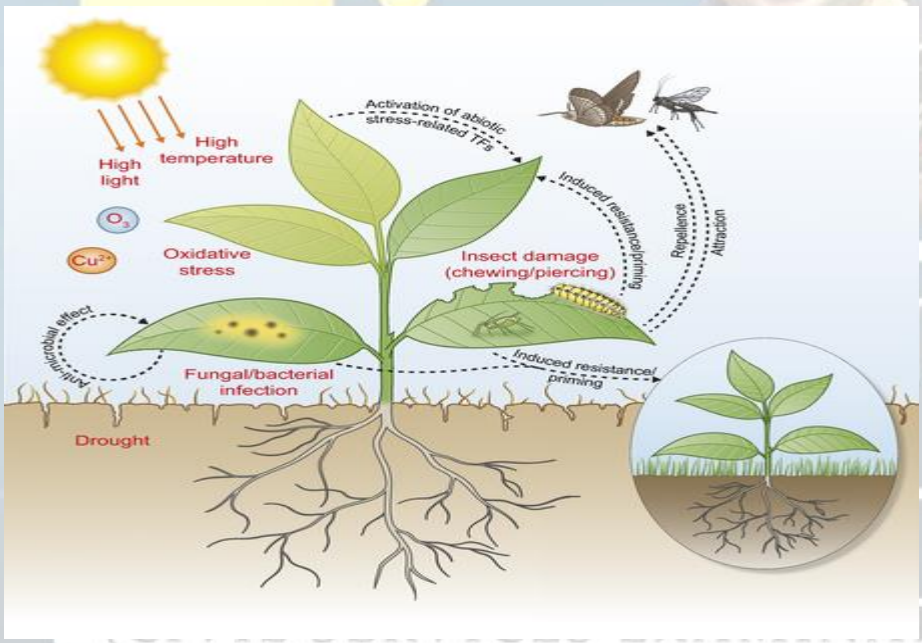
of PM2.5 pollutions.

- **Thankfully, India has already electrified rail freight transportation, but that caters to only about 20% of the freight carried in the country.**
- **On roads, India's electric vehicle penetration rate has crossed the 6% mark, but electric trucks remain a challenge due to upfront costs and charging infrastructure constraints.**
- **It is commendable that the government is aggressively electrifying the bus fleet, and sets electrification targets for bus aggregators. However, the focus must extend to diesel trucks and dust mitigation significant PM sources requiring immediate attention**
- **the Indian truck fleet is likely to reach a figure of 1.7 crore in 2050. Hence, there is a need to push top gear on the pace of transition to e-trucks.**
- **Public funding alone cannot meet the transformational scale required.**
- **Declaring some of the expressways and national highways as green freight corridors will have a demonstration effect in the country.**

Green leaf volatiles (GLV)

- **The study in Nature Communications on October 17, could help unlock long-standing questions in the field of plant defence and pave the way to protect crops without pesticides**
- **The defence mechanism releases GLVs when attacked or damaged. Using this defence response, plants can make themselves less palatable or even indigestible to the insect attackers.**
- **They could also attract predators of the pests**
- **Plants lack brains but obtain information about the world and use it in meaningful ways just like we do**





Green leaf volatiles (GLV)

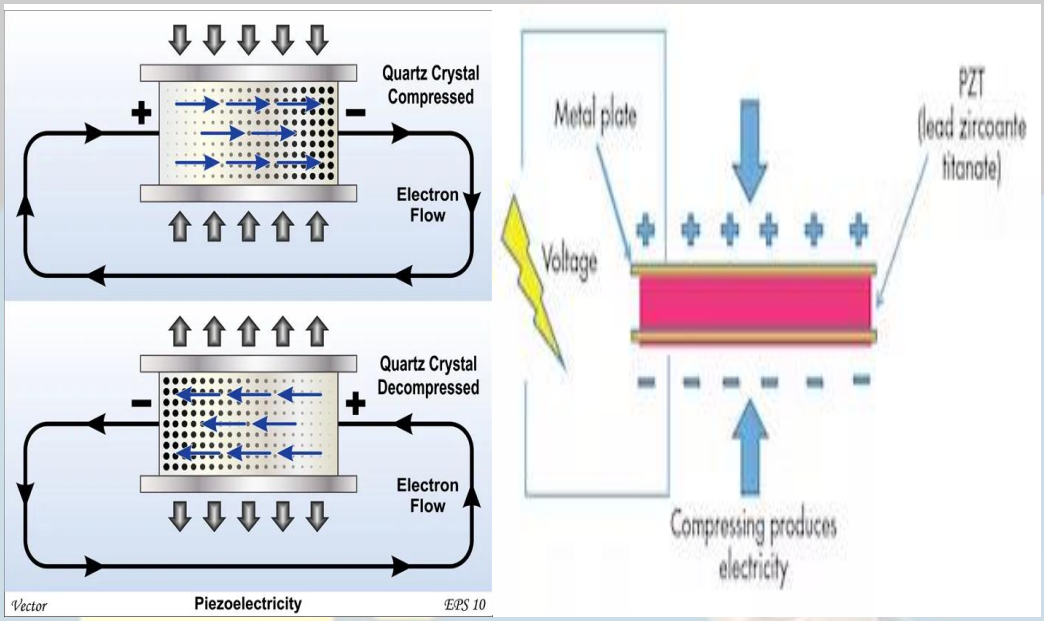
- **Green leaf volatiles (GLV) are organic compounds released by plants.**
- **Some of these chemicals function as signaling compounds between either plants of the same species, of other species, or even different lifeforms like insects.**
- **Green leaf volatiles are involved in patterns of attack and protection between**

species.

- **They have been found to increase the attractive effect of pheromones of cohabiting insect species that protect plants from attacking insect species.**
- **For example, corn plants that are being fed on by caterpillars will release GLVs that attract wasps, who then attack the caterpillars.**
- **GLVs are commonly used as flavors to confer a fresh green odor to vegetable or fruit food products.**
- **This mixture of volatile compounds leads to characteristic plant flavors called the green notes (Ibdah et al., 2010).**
- **These molecules confer freshness and authenticity to food products, thus attracting the interest of the world market of flavors and the food industry.**

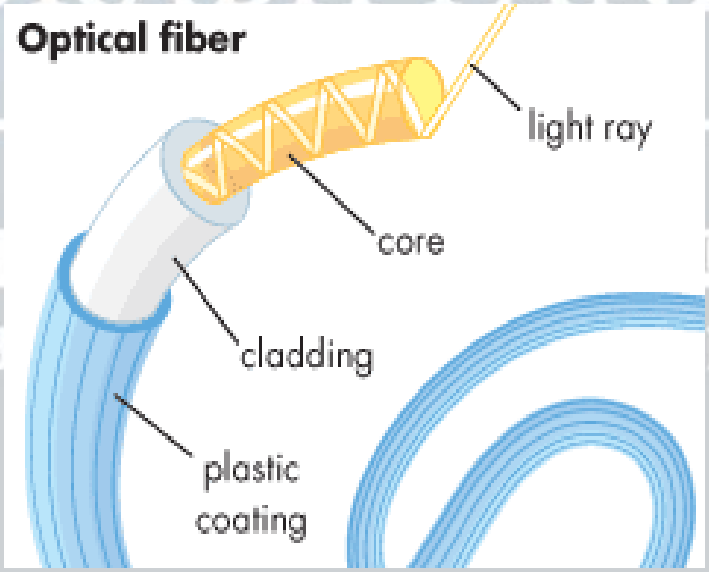
Piezoelectricity

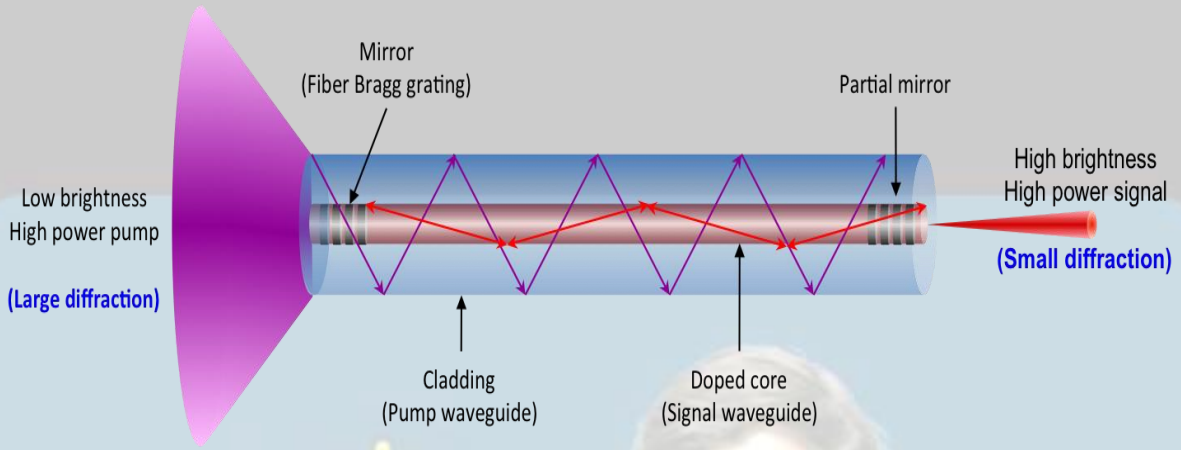
- **Piezoelectricity is a remarkable phenomenon whereby some materials including quartz, ceramics such as lead zirconate titanate (PZT), and even certain biological substances like bone and the tendons can generate an electric charge in response to mechanical stress.**
- **This property is the result of their unusual crystal structures.**



- **Usually, the charges on atoms in the molecules that make them up are symmetric on two sides of an axis. When some stress is applied, the molecule becomes distorted and the asymmetry of charges gives rise to a small electric current**

Optical fibre





What is an optical fibre?

- **Optical fibres are made of thin cylindrical strands of glass. The diameter of a typical fibre is close to the diameter of a human hair.**
- **These fibres can carry information, such as text, images, videos, telephone calls, and anything that can be encoded as digital information, across large distances almost at the speed of light**

How do optical fibres work?

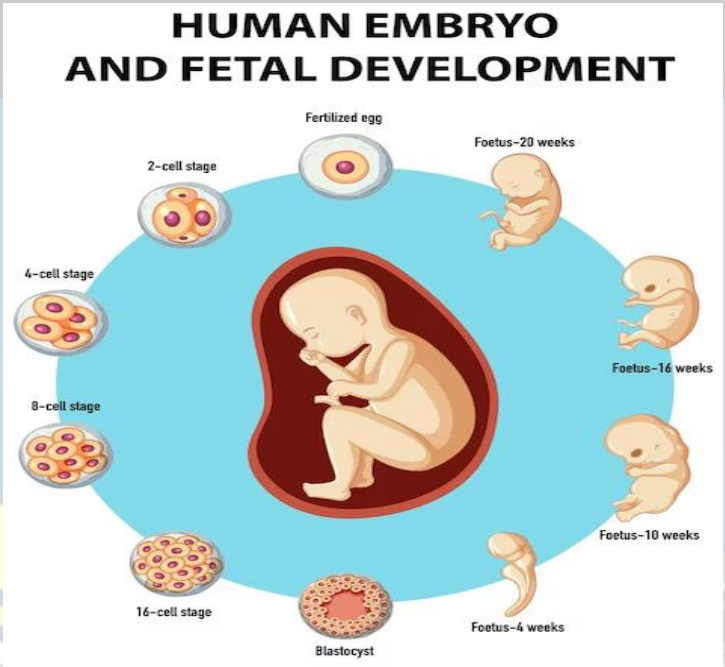
- **Light is an electromagnetic wave with a spectrum of frequencies.**
- **Visible light, X-rays, radio waves, and thermal radiation (heat) all lie on this spectrum. Humans see the world around us via sunlight, but it took us a long time to control and guide light through fibre optic cables or "light pipes" to send coded signals.**
- **When a beam of light falls on a glass surface, it passes through partially while the rest is reflected away. When it passes through, its path bends because the refractive index of glass is different from that of air.**
- **The refractive index is the property of a medium that determines how fast light can travel in it.**
- **When a beam travels in the reverse direction, that is from glass to air, it's**

possible that it won't enter the air.

- **Instead, it will be completely reflected back within the glass.**
- **This phenomenon, known as total internal reflection, is the basis of guiding light across long distances without a significant loss of optical power**
- **A fibre optic communication system consists of three parts a transmitter which encodes information into optical signals (in the form of rapidly blinking light pulses of zeros and ones); an optical fibre that carries the signal to its destination; and a receiver which reproduces the information from the encoded signal.**
- **Optical waves allow a high data- transmission rate, up to several terabits per second in a single fibre.**

National mission on Quantum technologies

Embryo development - Jumping gene

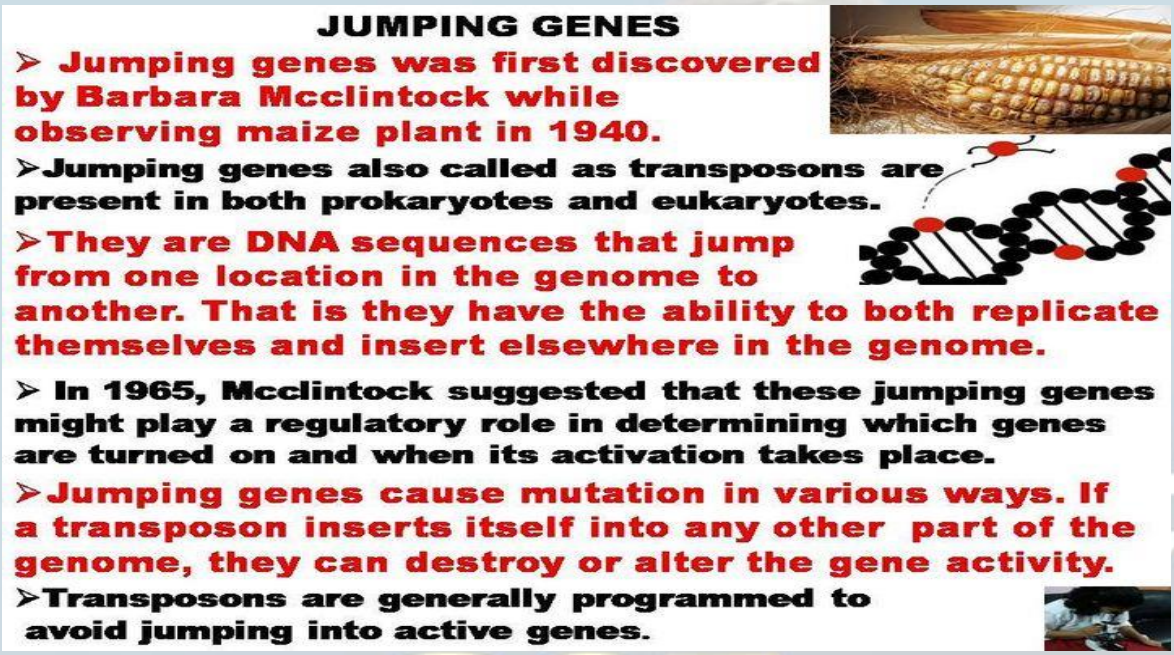


- **In the early stages of the human embryo, before it has implanted in the mother's womb, the cells arrange themselves in a particular way.**
- **A blob of cells gathers towards one side of the embryo and the other cells arrange themselves around this blob.**
- **This blob is called the inner cell mass. It contains cells with the ability to make all the other types of cells in the human body i.e. the cells in this blob are pluripotent.**
- **Since a whole human body takes shape from this blob, scientists are naturally very interested in studying it in detail.**
- **One way that scientists study cells is by looking at the kinds of proteins the genes in the cells can make that human embryonic stem cells express a gene called HERVH, a virus like gene that's important in maintaining pluripotency.**
- **Based on his analysis of the gene expression data in 2016, Dr. Singh found that most of the inner cell mass cells also express HERVH but not the non-committed cells that eventually die.**

What is Jumping Genes?

- **Transposable elements (TEs), also known as "jumping genes," are DNA sequences that move from one location on the genome to another.**

- **These elements were first identified more than 50 years ago by geneticist Barbara McClintock of Cold Spring Harbor Laboratory in New York. Biologists were initially skeptical of McClintock's discovery**



Teenage galaxies and Webb telescope

- **The galaxies were observed glowing with eight elements hydrogen, helium, oxygen, nitrogen, sulfur, argon, nickel, and silicon.**
- **"Oxygen is noteworthy because it's one of the most important components of 'galaxy DNA,' in terms of tracking past growth.**
- **Incidentally, oxygen is also the third -most abundant element in the universe, teenage galaxies those aged about 2 to 3 billion years after the Big Bang**

James Webb Space Telescope (JWST)

- **The James Webb Space Telescope (JWST) is a space telescope designed primarily to conduct infrared astronomy.**
- **The U.S. National Aeronautics and Space Administration (NASA) led development of the telescope[] in collaboration with the European Space Agency (ESA), and the Canadian Space Agency (CSA).**

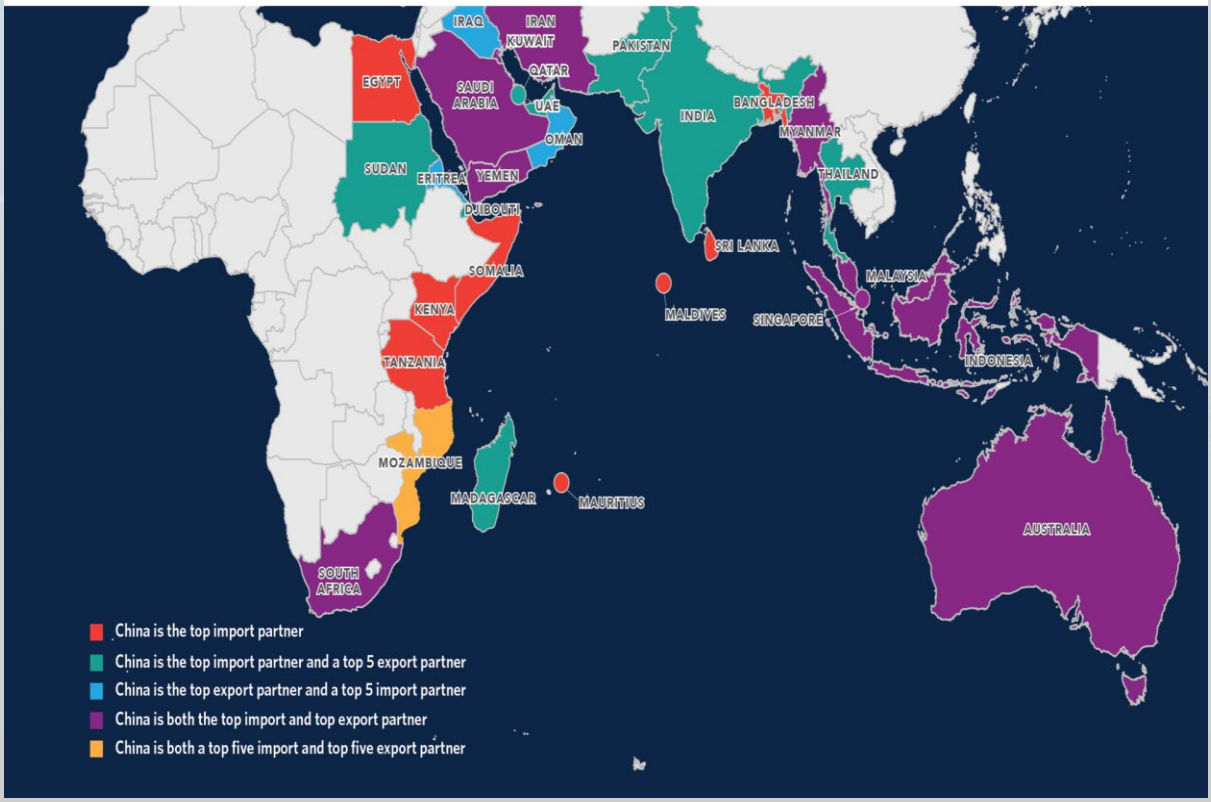
- **The JWST was launched 25 December 2021 on an ESA Ariane 5 rocket from Kourou, French Guianaand is intended to succeed the Hubble Space Telescope as NASA's flagship mission in astrophysics.**

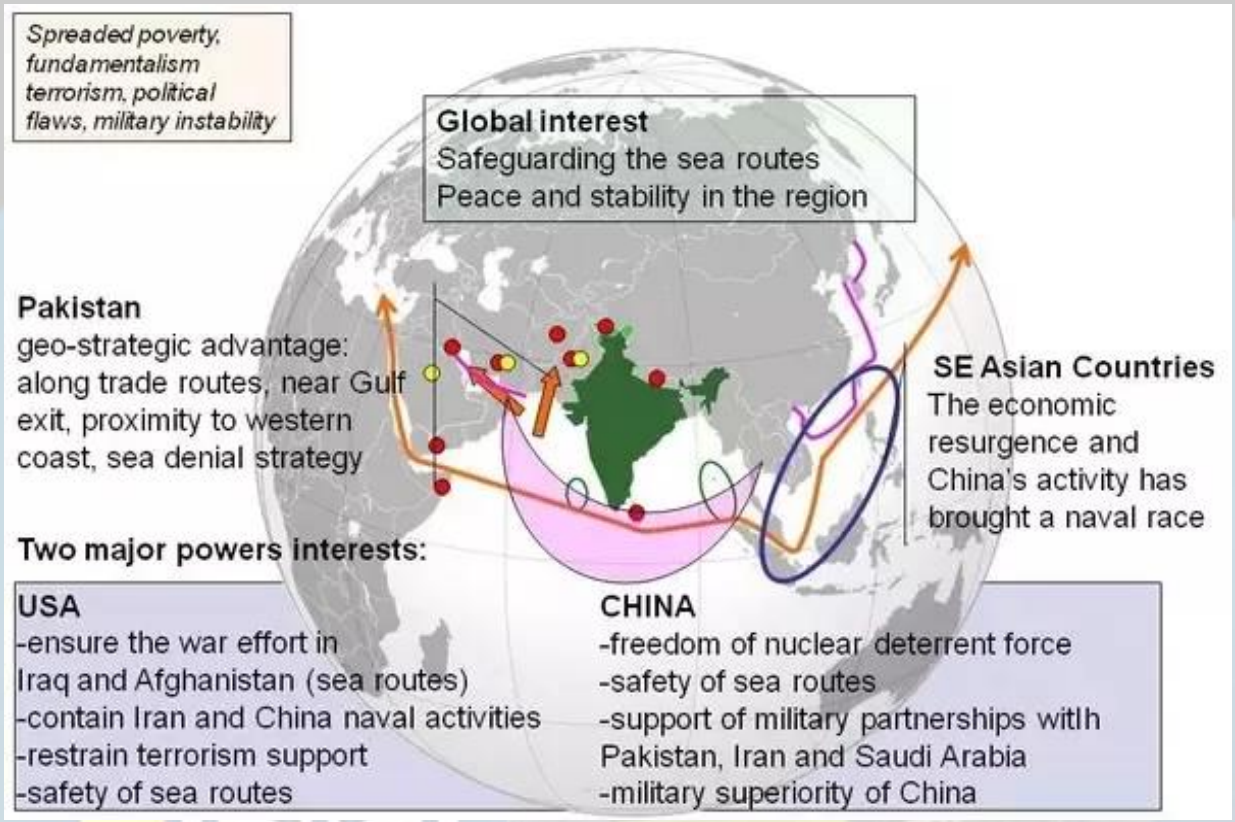
- **The telescope is named after James E. Webb, who was the administrator of NASA from 1961 to 1968 during the Mercury, Gemini, and much of the Apollo programs.**

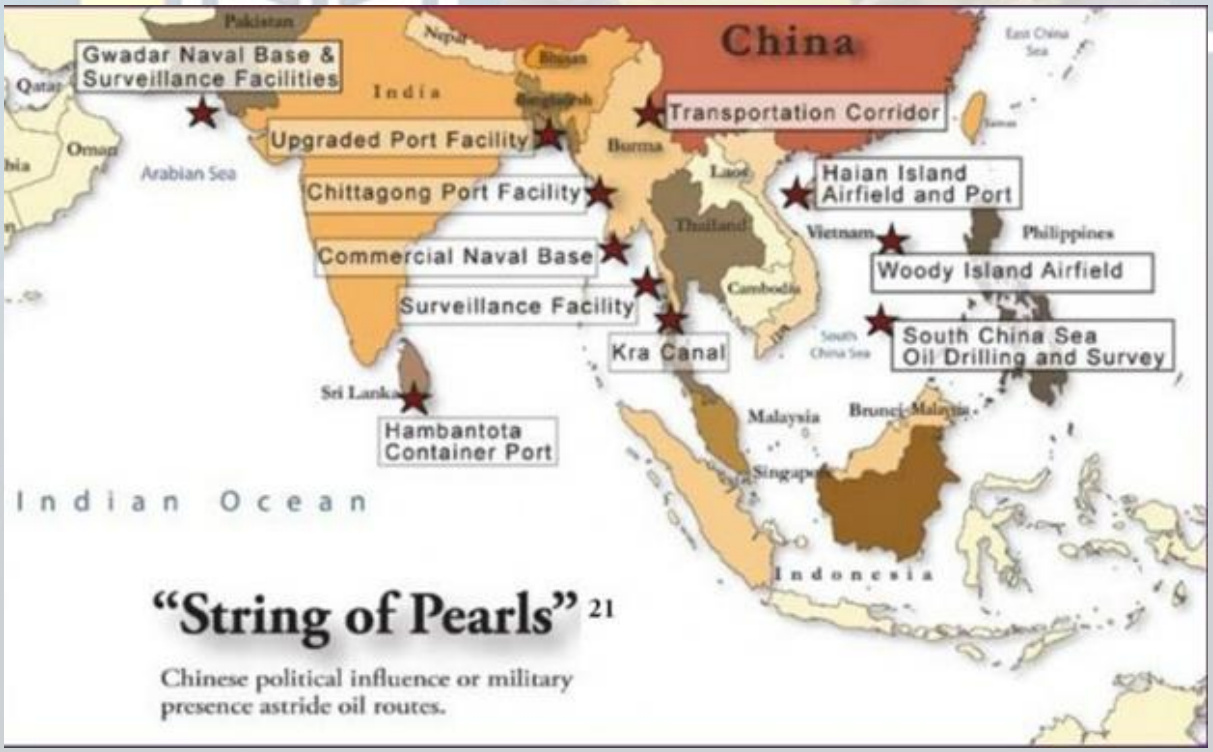
- **It provides improved infrared resolution and sensitivity over Hubble, viewing objects up to 100 times fainter than the faintest detectable by Hubble.**

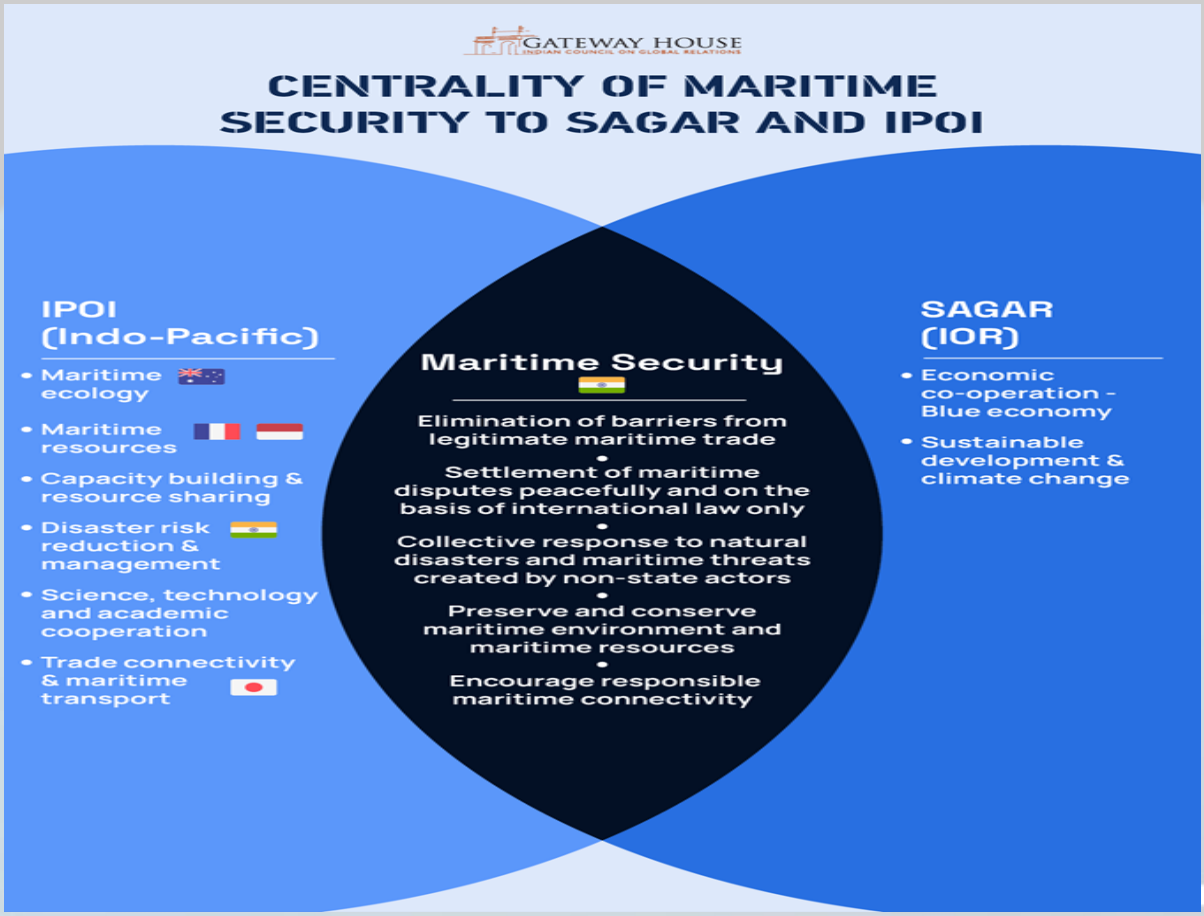
Maritime security and global south

Figure 12. China's Trading Partners in the Indian Ocean Region









- **With Ukraine's growing use of asymmetrical tactics against Russia in the Black Sea or China's deployment of maritime militias in the South China Sea, there is an unmistakable element of improvisation.**
- **The radical new tactics at sea involve the use of grey-zone warfare, land attack missiles, and combat drones.**
- **It is instructive, however, that the bulk of the demand for maritime security in recent years has come from states facing unconventional security threats, such as illegal fishing, natural disasters, marine pollution, human and drug trafficking, and the impact of climate change.**
- **These are difficult to fight using only military means. States must instead be prepared to commit capital, resources, and specialist personnel over prolonged periods to meet security needs.**
- **Throughout its G20 presidency, India has sought to emphasise the concerns of the Global South in discussions to find solutions to the most pressing issues in the maritime domain.**

- **Yet, there is no functioning template to fight non-- traditional threats at sea.**
- **There is a widespread perception in the Global South that the zero -sum competition among powerful nations in the has been to the detriment of the developing world.**
- **The cross- jurisdictional linkages between these diverse areas make them challenging to manage.**
- **Rising sea levels, marine pollution, climate change, and natural disasters have had a disproportionate impact on less developed states, placing them in a position of vulnerability.**
- **Worryingly, littoral states in Asia and Africa have unequal law- enforcement capabilities and lack the security coordination required to jointly combat maritime threats.**
- **Many have varying security priorities and are not always willing to leverage partner capabilities to combat threats such as piracy, armed robbery, and maritime terrorism**

Approach needed

- **Sea power is increasingly about generating prosperity and meeting the aspirations of the people.**
- **India's Maritime Vision 2030 sets out a creative model.**
- **This 10-year blueprint for the maritime sector envisages the development of ports, shipping, and inland waterways as a way of generating growth and livelihoods.**
- **Dhaka's inaugural official document on the Indo-Pacific details guiding principles and objectives that demonstrate a developmental approach to maritime security, focused on the provisioning of goods and services, and the protection of marine resources.**
- **The talk in Africa, too, is about a thriving Blue Economy and a secure**

maritime domain.

- **The sharp uptick in illegal unreported and unregulated fishing has been aided by faulty policies that encourage destructive fishing methods such as bottom trawling and seine fishing.**
- **Environmentalists highlight three specific anomalies: lenient regulations that allow for the misuse of resources; lax implementation of the law by security agencies; and the harmful impact of subsidies that states offer to incentivise smaller fishermen to shift to motorised trawling.**
- **Among the proposals that set out ways to deal with maritime challenges is India's Indo-Pacific Oceans Initiative.**
- **It rests on seven pillars including maritime ecology, marine resources, capacity building, disaster risk reduction, and maritime connectivity. It acknowledges that countries need collective solutions to their common problems, especially since they remain economically interdependent.**
- **Implementing a collaborative strategy is challenging since it requires maritime agencies to improve interoperability, share intelligence, and agree on a regional rule -based order.**
- **States must adapt to an integrated form of maritime security operations and overhaul regulatory frameworks to align domestic regulation with international law an unappealing proposition for many that continue to prioritise sovereignty and strategic independence over collective action.**
- **Unsurprisingly, consensus eludes the Global South.**

Rat hole mining

- **National Green Tribunal (NGT) banned it in April 2014.**

- **Rat hole mining, of two types, is so named as it involves digging tunnels 3-4 feet deep, barely allowing workers to crawl in and out.**
- **They have to squat while extracting coal with pickaxes.**
- **The side cutting type of mining is usually done on hill slopes by following a coal seam dark brown or black-banded coal deposited within layers of rock visible from the outside.**
- **The second type called box -cutting entails digging a circular or squarish pit at least 5 sq. metre in width up to a depth of 400 feet.**
- **Miners who drop down in makeshift cranes or using rope -and- bamboo ladders dig horizontally after finding the coal seam.**

Why is such mining banned?

- **The government has little control over the land in Meghalaya, a Sixth Schedule State where the Coal Mines Nationalisation Act of 1973 does not apply.**
- **The landowners are thus also the owners of the minerals beneath. Coal mining boomed after Meghalaya attained statehood in January 1972.**
- **However, the terrain and expenses involved discouraged mine owners from employing advanced drilling machines.**
- **So, labourers mainly from Assam, Nepal, and adjoining Bangladesh risked the hazards of rat hole mining asphyxiation because of poor ventilation, collapse of mines due to lack of structural support, and flooding.**
- **Apart from issues of safety and health, unregulated mining led to land degradation, deforestation, and water with high concentrations of sulphates, iron, and toxic heavy metals, low dissolved oxygen, and high biochemical oxygen demand.**
- **At least two rivers, Lukha and Myntdu, became too acidic to sustain aquatic life. These factors led to the NGT banning rat hole mining in Meghalaya in**

2014

- **Unlike in Chhattisgarh and Jharkhand, coal seams in Meghalaya are very thin.**
- **This, miners say, makes rat hole mining more economically viable than opencast mining.**

Drones application in agriculture

- **The Centre will provide drones to 15,000 progressive women self-help groups (SHG) to be rented out to farmers for agricultural purposes. The drone services are envisaged to be used by the farmers for nano fertilizer and pesticide applications.**
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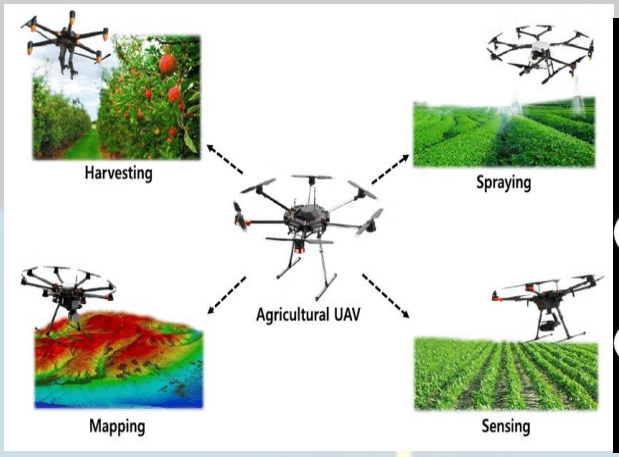
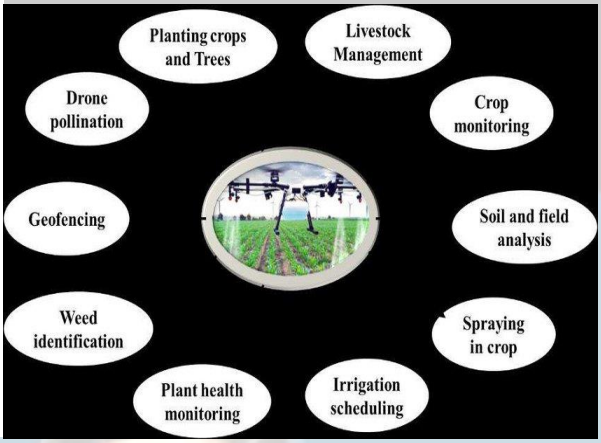
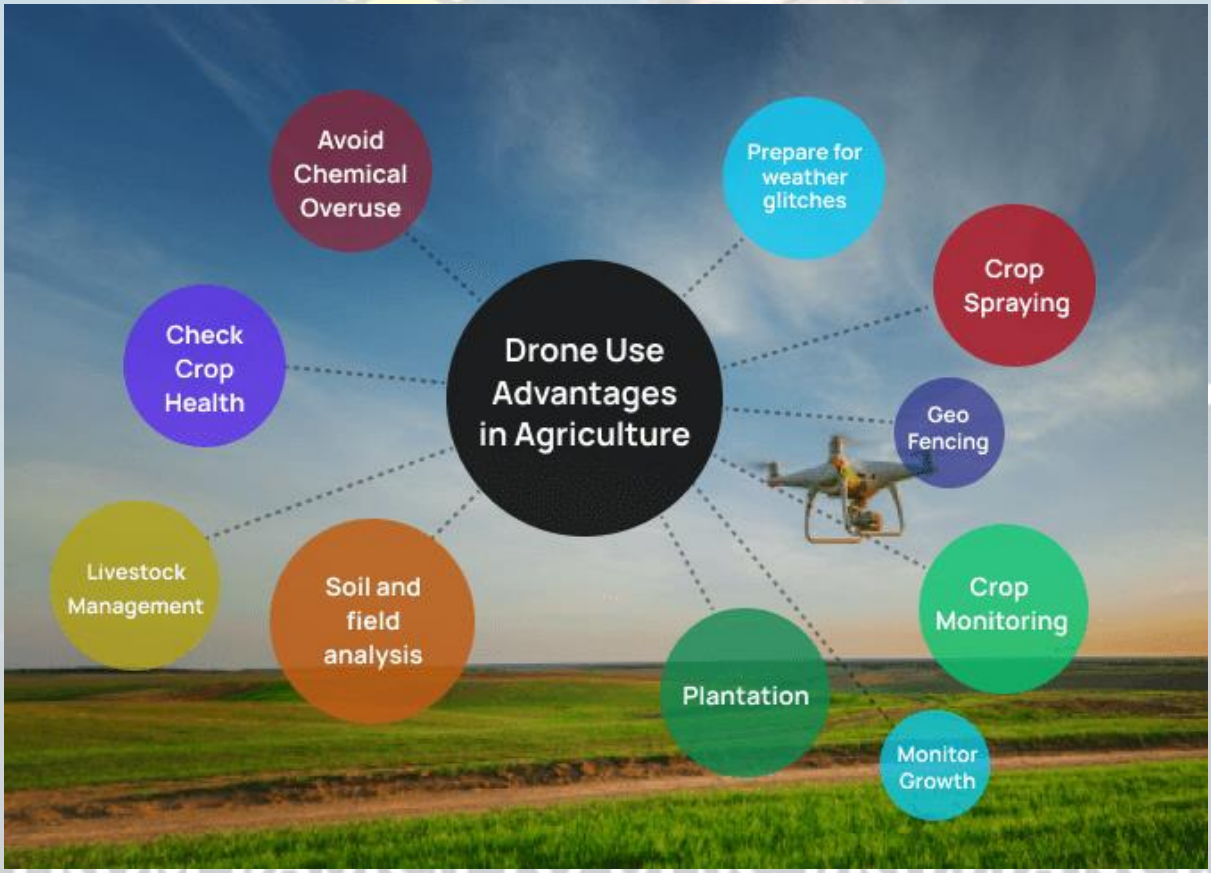




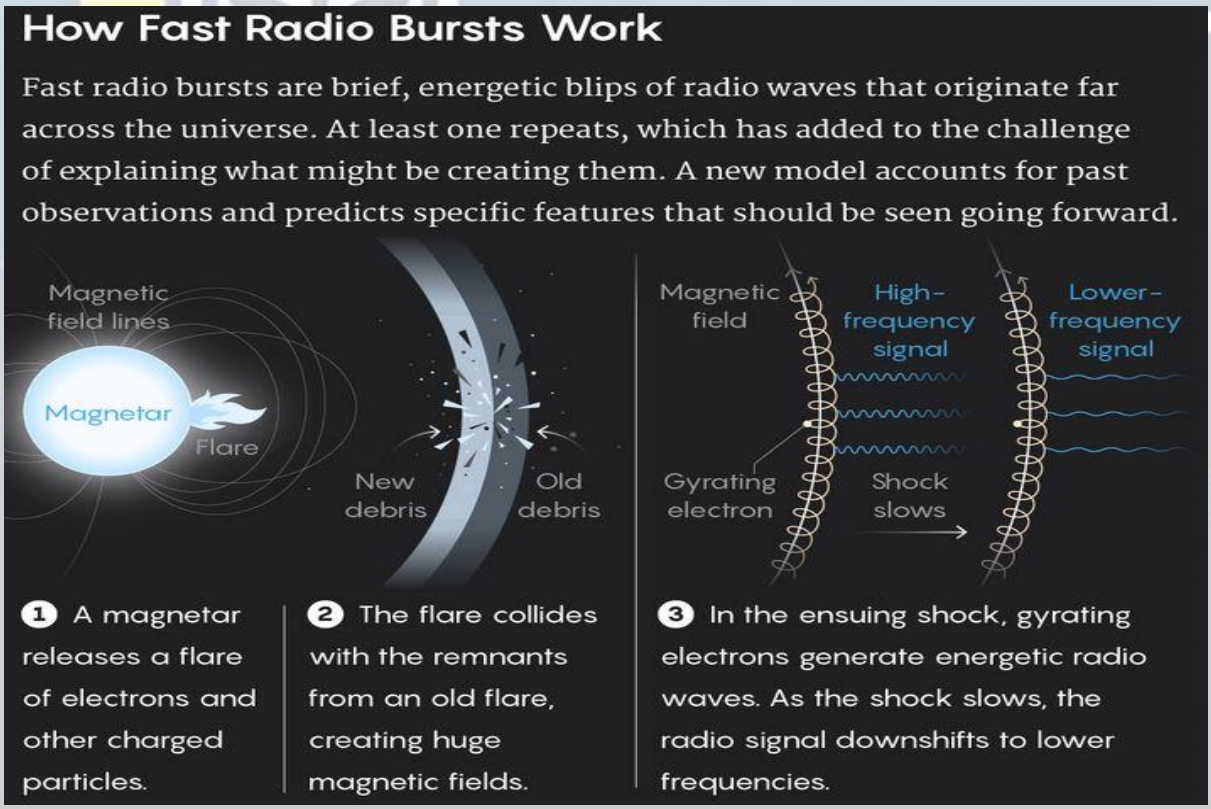


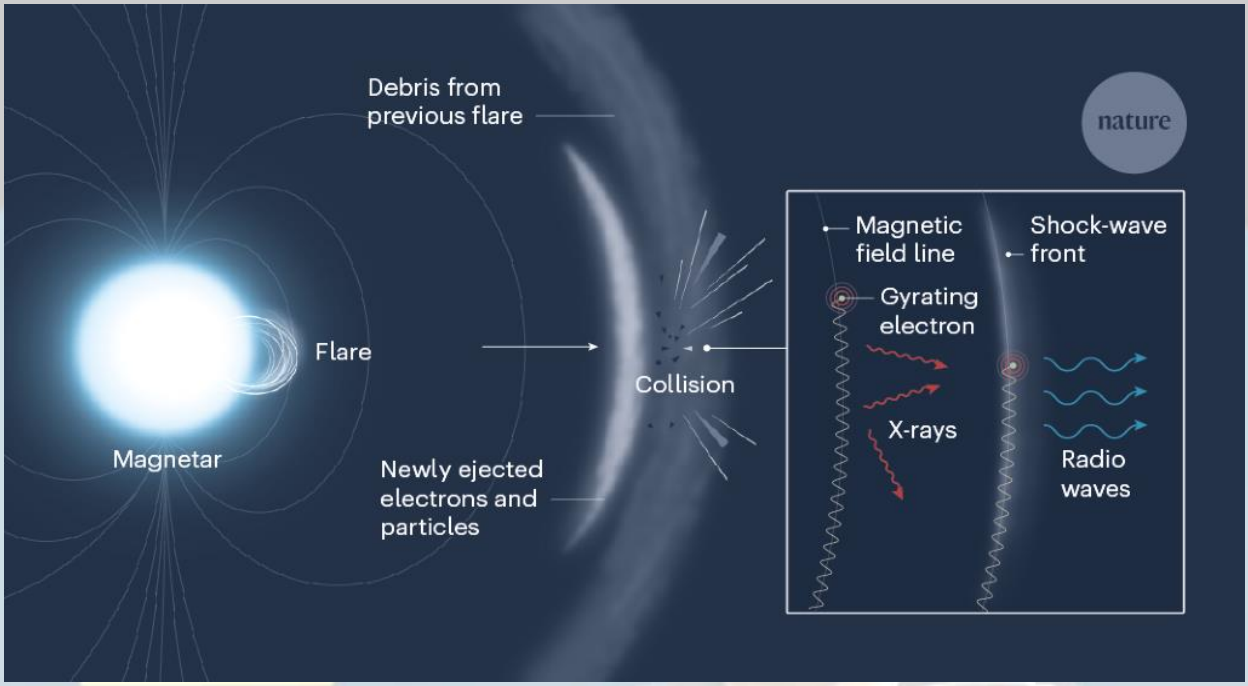
Fast radio burst

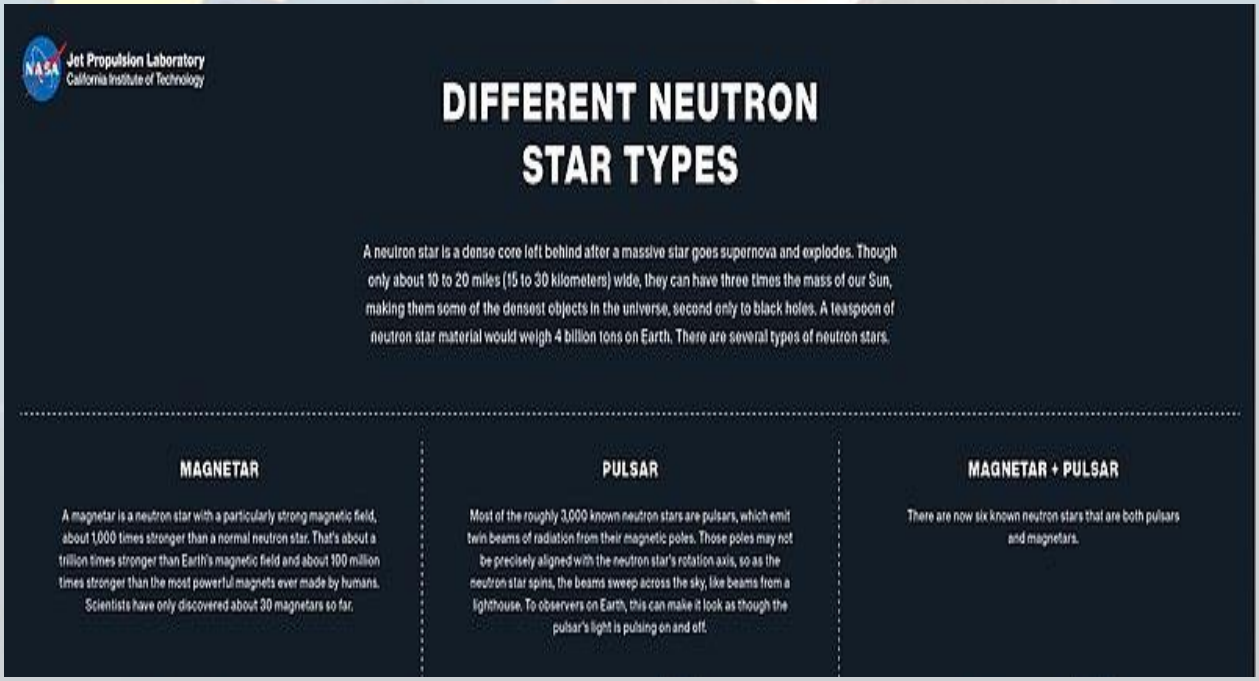
- **In radio astronomy, a fast radio burst (FRB) is a transient radio pulse of length ranging from a fraction of a millisecond to 3 seconds, caused by some high-energy astrophysical process not yet understood.**

- **Astronomers estimate the average FRB releases as much energy in a millisecond as the Sun puts out in three days.**

- **Radio waves are a type of electromagnetic radiation with the longest wavelengths in the electromagnetic spectrum, typically with frequencies of 300 gigahertz (GHz) and below.**







Priorities in cop28

- **Six topics expected to dominate discussions.**
- **1. The global stocktake is a periodic review by countries to contain greenhouse gas (GHG) emissions and transition their fossil- fuel- dependent energy systems to renewable energy sources**

- **2. The COP-28 Presidency and the U.N. Food Systems Coordination Hub announced a new partnership to elevate the role of food systems in achieving targets set in the Paris Agreement.**
- **3. The idea of a 'loss and damage' (L&D) fund is to help developing countries cope with financial losses due to the climate crisis and environmental degradation. At COP-27 in November 2022, representatives of countries party to the United Nations Framework Convention on Climate Change agreed to set up the L&D fund**
- **4. Larger provisions related to climate finance will be at the heart of COP-28, including technology transfer and capacity building to reduce emissions and pivot towards cleaner energy, for which many countries require financial support.**
- **5. Strong language highlighting a commitment to phasing out fossil fuels is expected to be a major point of discussion**
- **6. In June 2023, the EU and the COP-28 Presidency had pledged to seek support to increase renewable energy capacity worldwide and so help countries shift from the unabated use of fossil fuels.**

Pong Dam (पोंग बांध)

State government will try to reduce the area of the Pong Dam eco sensitive zone so that the local people get relief and are able to do farming in the area during the period when the water level of the dam decreases.

राज्य सरकार पौंग बांध इको सेंसिटिव जोन के क्षेत्र को कम करने का प्रयास करेगी ताकि स्थानीय लोगों को राहत मिले और बांध का जल स्तर कम होने की अवधि के दौरान क्षेत्र में खेती करने में सक्षम हों।

Pong Dam (पोंग बांध)

Location: It is situated in the Kangra district of Himachal Pradesh.

- **The main tree species include Acacia, Jamun, Shisham, Mango, Mulberry, Ficus Kachnar, Amla, and Prunus.**
- **It includes animals like Sambhar, Barking Deer, Wild Bear, Nilgai, Clawless Otter, and Leopards**

- **In 1983, the entire reservoir was declared a Wildlife Sanctuary by the Himachal Pradesh government.**
- **Pong Dam Lake was declared a Ramsar Site in November 2002.**

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