

CURRENT AFFAIRS

THE BEST MAGAZINE FOR GEOGRAPHY, ENVIRONMENT AND SCIENCE CURRENT AFFAIRS

GES REPORTER



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Contents

Olive ridley	5
About Olive ridley	5
Solomon Island	6
About Solomon island.....	6
Hybrid immunity	7
What is hybrid immunity?.....	7
Adaptive plasticity.....	7
Helium 3.....	8
Horseshoe bat.....	9
Horseshoe bats	9
Climate change and its impact	10
Ithaca.....	10
Groundwater	10
Extraction value	11
Changing approach	11
Noise pollution	12
Why are measurements of noise important?	12
What is India doing about noise pollution?.....	13
NFC	13
Why are measurements of noise important?	13
What is India doing about noise pollution?.....	14
What is NFC and how does it work?	14
What are the other applications of NFC technology?	15
Types of vaccines	15
Different types of vaccines.....	16
Vector vaccine	16
Protein subunit vaccine	16
CUET.....	17
Recombination of variants.....	18
How are variants created?.....	18
What is a recombinant variant?	18
How many recombinant viruses have been detected?	19
Are recombinant variants more deadly?	19

Although recombination has been detected in SARS-CoV-2, it has not yet impacted public health in a unique way.	19
Open source software	19
What is Open source software?	20
Indigenization list	20
H-60R Multi-Role Helicopters (MRH)	21
ALSORA	22
About Alrosa.....	22
Double mutant in India	22
Micro Swimmer	23
Drug delivery.....	24
Graph grammar and designer molecule.....	24
W boson.....	25
Bones of Spinosaurus.....	26
Ozone and climate Ozone	26
Indigotin	26
The list includes.....	27
HOPS and Healthcare.....	27
Some challenges.....	28
HOPS.....	28
IRMS.....	28
Card skimming.....	30
What is card skimming?	30
Understanding software copyright	30
Gestational diabetes.....	32
Solar policy	32
What are the reasons for rooftop solar adoption not meeting targets?.....	33
How critical is solar power to India's commitment to mitigate climate change?.....	33
EL NINO and Indian monsoon	34
EL NINO.....	34
Pollution control and role of states	35
Stick Shaker.....	36
Warm vaccine	36
S 400 missile system	37
S400.....	37
How important is S-400 missile system to India's defence arsenal?	38

Omicron in animals	38
Fish communication	39
Thermophotovoltaic	39
Thermophotovoltaic (TPV).....	39
Role of climate and migration.....	40
Role of climate.....	40
Ailao Mountains	40
Moire patterns.....	41
Moire patterns	41
InspectOR.....	42
Nutrition and TB.....	42
What Is Tuberculosis?	43
Can tuberculosis be cured?	43
Tuberculosis Types	43
National cybersecurity strategy	44
Why does India need a cybersecurity strategy?.....	44
What is the National Cyber Security Strategy?	45
What steps does the report suggest?	45
UAVs along the border.....	47
Cryptocurrency and RBI.....	47
Education –Centre vs State.....	48
Six airbags in vehicles.....	49
Cartelization.....	49
Kuril island dispute.....	50
Palk bay dispute.....	51
Plankton and eccentricity of Earth’s orbit.....	52
Earth's orbital eccentricity	53
GM mosquitoes.....	53
GM mosquitoes	54
Hydrogen as a source of energy	54
Biomass as a source.....	55
Benefits of biochar.....	56
Yamanaka factor.....	56
The Yamanaka factors	56
mRNA technology	57
Blue straggler’	58

Why a blue straggler is more massive, and energetic?	58
(cVDPV3).....	59
Strontium attack.....	60
What is Strontium?	60
How does it attack networks?	61
Netflix.....	61
Why has there been a fall in paid subscriptions?	61
Splinternet.....	62
H3N8	63
H3N8.....	63
India green hydrogen policy	64
Hydrogen: a game-changer.....	64
Five-step strategy	65
On the supply side too, a five-step strategy should be devised.....	65
Indonesian palm oil export ban	66
The story so far:	66
Why are the prices of edible oils rising?.....	67
How bad is Indonesia's palm oil crisis?.....	67
How will it impact India?	68
Human and Heatwaves.....	68
Subunit vaccines and adjuvants.....	69
About Corbevax and subunit vaccine.....	69

Olive ridley

As a record number of 4.92 lakh Olive Ridley turtles have crawled to the Rushikulya coast in Odisha.

Arribada is a Spanish word meaning “arrival by sea” and refers to the mass nesting behaviour exhibited by Kemp’s Ridley and Olive Ridley sea turtles.

About Olive ridley

- The olive ridley sea turtle (*Lepidochelys olivacea*), also known commonly as the Pacific ridley sea turtle, is a species of turtle in the family Cheloniidae.
- The species is the second-smallest and most abundant of all sea turtles found in the world. *L. olivacea* is found in warm and tropical waters, primarily in the Pacific and Indian Oceans, but also in the warm waters of the Atlantic Ocean.
- This turtle and the related Kemp's ridley turtle are best known for their unique synchronized mass nestings called *arribadas*, where thousands of females come together on the same beach to lay eggs
- The olive ridley turtle has a circumtropical distribution, living in tropical and warm waters of the Pacific and Indian Oceans from India, Arabia, Japan, and Micronesia south to southern Africa, Australia, and New Zealand.
- In the Atlantic Ocean, it has been observed off the western coast of Africa and the coasts of northern Brazil, Suriname, Guyana, French Guiana, and Venezuela. Additionally, the olive ridley has been recorded in the Caribbean Sea as far north as Puerto Rico.
- Olive ridley turtles exhibit two different nesting behaviour, the most prevalent solitary nesting, but also the behaviour they are best known for, the synchronized mass nesting, termed *arribadas*.
- Females return to the same beach from where they hatched, to lay their eggs. They lay their eggs in conical nests about 1.5 ft deep, which they laboriously dig with their hind flippers.



Solomon Island

- Solomon Islands Prime Minister Manasseh Sogavare said on Friday his government would not allow a Chinese military base to be built in his country “under its watch” as he defended a pending security agreement with Beijing.



About Solomon island

- Solomon Islands is a sovereign country consisting of six major islands and over 900 smaller islands in Oceania, to the east of Papua New Guinea and northwest of Vanuatu. It has a land area of 28,400 square kilometres (11,000 sq mi), and a population of 652,858.
- Its capital, Honiara, is located on the largest island, Guadalcanal.
- The country takes its name from the Solomon Islands archipelago, which is a

collection of Melanesian islands that also includes the North Solomon Islands (a part of Papua New Guinea), but excludes outlying islands, such as the Santa Cruz Islands and Rennell and Bellona.

- The islands have been settled since at least some time between 30,000 and 28,800 BCE, with later waves of migrants, notably the Lapita people, mixing and producing the modern indigenous Solomon Islanders population. In 1568, the Spanish navigator Álvaro de Mendaña was the first European to visit them, naming them the *Islas Salomón*.

Hybrid immunity

- A retrospective study undertaken in Sweden has once again found irrefutable evidence in support of vaccination, even among people who have been previously infected.
- The study also found that people who have been infected and subsequently vaccinated with one or two doses of a vaccine, which is called hybrid immunity, had far greater protection from infection and hospitalization.

What is hybrid immunity?

- Also known as 'superhuman immunity', hybrid immunity refers to a combination of immunity gained from a natural infection as well as from vaccines.
- People who have recovered from COVID-19 develop hybrid immunity when they get vaccinated, given that they now have both natural and vaccine-induced immunity.

Adaptive plasticity

- We now have evidence that the change is actually happening faster than we ever thought and that not all evolution happens due to habitat destruction, invasion or pollution.

- It establishes that evolutionary changes happen quickly and researchers can track these in real time within a single seasonal turn in a year
- Adaptive plasticity allows organisms to cope with environmental change, thereby increasing the population's long-term fitness.
- However, individual selection can only compare the fitness of individuals within each generation: if the environment changes more slowly than the generation time (i.e., a coarse-grained environment) a population will not experience selection for plasticity even if it is adaptive in the long-term.
- One explanation is that, if competing alleles conferring different degrees of plasticity persist across multiple environments, natural selection between genetic lineages could select for adaptive plasticity (lineage selection).
- Organisms respond to different environments by changing how they act, look or function. When these responses improve the chances of survival, we call them adaptive plasticity.

Helium 3

- Helium-3 has been measured at Earth's surface in relatively small quantities. But scientists did not know how much was leaking from the Earth's core, as opposed to its middle layers.
- The new study (Geochemistry, Geophysics, and Geosystems) pins down the core as a major source of helium-3 for the Earth.
- Some natural processes can generate helium-3, such as the radioactive decay of tritium, but helium-3 is made primarily in solar nebulae massive, spinning clouds of gas and dust like the one that gave rise to our Solar System.
- Because helium is one of the earliest elements produced in the universe, most helium-3 can be traced back to the Big Bang.
- As a planet grows, it accumulates material from its surroundings, so its composition reflects the environment in which it formed.
- To get high concentrations of helium-3 deep in the core, Earth would have had to

form inside a thriving solar nebula.

- The new research adds further clues to the mystery surrounding Earth's formation
-

Horseshoe bat

- A genomic analysis suggests that there are probably dozens of unknown species of horseshoe bats in Southeast Asia.
- Researchers examined hundreds of bats representing 11 species.
- The Rhinolophidae family of bats are considered to be the reservoir of many viruses that can jump from animals to people, including close relatives of SARS-CoV-2.

Horseshoe bats

- Horseshoe bats are considered small or medium-sized microbats, weighing 4–28 g (0.14–0.99 oz), with forearm lengths of 30–75 mm (1.2–3.0 in) and combined lengths of head and body of 35–110 mm (1.4–4.3 in).
- The fur, long and smooth in most species, can be reddish-brown, blackish, or bright orange-red. They get their common name from their large nose-leafs, which are shaped like horseshoes.
- The nose-leafs aid in echolocation; horseshoe bats have highly sophisticated echolocation, using constant frequency calls at high duty cycles to detect prey in areas of high environmental clutters.
- Horseshoe bats are relevant to humans in some regions as a source of disease, as food, and for traditional medicine.
- Several species are the natural reservoirs of various SARS-related coronaviruses, and data strongly suggests they are a reservoir of SARS-CoV, though humans may face more exposure risk from intermediate hosts such as masked palm civets.
- They are hunted for food in several regions, particularly sub-Saharan Africa, but also Southeast Asia. Some species or their guano are used in traditional medicine in Nepal, India, Vietnam, and Senegal.

Climate change and its impact

- Climate change could make landslides more likely to happen, by creating more extreme rain events, more powerful wildfires and rising sea levels.
- Rain reduces the strength of soil to a point where it fails and slides away.
- Wildfires can destroy stabilizing vegetation. Rising sea levels can destabilize slopes.

Ithaca

- An artificial intelligence (AI) called Ithaca is able to predict missing text in ancient
- Greek inscriptions and estimate the time frame and geographical origin of ancient inscriptions.
- Ithaca is trained on thousands of existing inscriptions to suggest text to fill the gaps in fragmented writing.
- Its suggestions tend to match those previously made by academics.

Groundwater

- The theme of this year's World Water Day (March 22) was 'Groundwater: Making the Invisible Visible'.
- The primary focus is to draw attention to the role of groundwater in water and sanitation systems, agriculture, industry, ecosystems, and climate change adaptation.
- Groundwater helps reduce the risk of temporary water shortage and caters to the needs of arid and semiarid regions
- While dependence on groundwater is increasing everywhere, there are serious issues of depletion of stored groundwater and deterioration of quality. High temperatures and drought threaten water security.
- Due to its high storage capacity, groundwater is more resilient to the effects of

climate change than surface water.

- The international conference on ‘Groundwater, Key to the Sustainable Development Goals’ (May 2022) and the UN-Water Summit on Groundwater (December 2022) are part of global initiatives to highlight the significance of groundwater in sustainable development.
- With an annual groundwater extraction of 248.69 billion cubic meters (2017), India is among the largest users of groundwater in the world.
- Almost 89% of the groundwater extracted is used for irrigation and the rest for domestic and industrial use (9% and 2%)

Extraction value

- According to the Central Ground Water Board, the annual groundwater withdrawal is considered to be safe when the extraction rate is limited to below 70% of the annual replenishable recharge.
- Available data indicate that the level of extraction for the country in 2017 was 63%, from 58% in 2004.
- However, the level varied across regions. Punjab, Rajasthan, Haryana, Delhi, Chandigarh, Himachal Pradesh, Tamil Nadu, and Puducherry have crossed the 70% mark
- Fluoride, iron, salinity, nitrate, and arsenic contamination are major problems
- A high level of nitrate affects human health.
- Source of nitrates are mainly anthropogenic and depend on local actions.

Changing approach

- As the Mihir Shah Committee (2016) proposed, the Central Water Commission and the Central Ground Water Board could be united and a national water framework with an integrated perspective developed.
- There is also a need to work out local-level plans covering water resources in all

its forms: rainwater, surface water, soil water and groundwater and the resource use sectors.

- Groundwater, surface water and the intervening landscape form part of a matrix, and together with the vegetation system they constitute the Critical Zone, where most terrestrial life resides.
- Re-establishing connections between surface and groundwater systems, both for governance and management, entails a local area approach that will involve revisiting the present groundwater estimations process, large-scale aquifer mapping, linking aquifers with river basin/watershed boundaries, hydro geomorphology analysis, and factoring land uses and human-induced changes in the water system.
- Linking cropping patterns and crop intensity with groundwater availability, aquifer type, and the present state of groundwater extraction at the farm level is imperative.
- At present, there is an energy subsidy for groundwater extraction with little regulation. This encourages farmers to withdraw water at their will

Noise pollution

The story so far

- A February report commissioned by the United Nations Environment Programme on the environmental challenges posed by noise, wildfires and the disruption of biological rhythms of plants, animals and ecological cycles became controversial on account of the mention of a single city, Moradabad

Why are measurements of noise important?

- The latest 2018 World Health Organization (WHO) guidelines established a health-protective recommendation for road traffic noise levels of 53 dB.
- The Frontiers report compiled a host of evidence, including the adverse effects of

noise on public health, which range from mild and temporary distress to severe and chronic physical impairment.

- Night-time noise disturbs sleep and affects well-being the following day. Estimates suggest that in Europe 22 million and 6.5 million people suffer from chronic noise annoyance and sleep disturbance, respectively.
- The elderly, pregnant women and shift workers are among those at risk of noise-induced sleep disturbance.
- Noise-induced awakenings can trigger a range of physiological and psychological stress responses because sleep is necessary for hormonal regulation and cardiovascular functioning.

What is India doing about noise pollution?

- The Central Pollution Control Board (CPCB) is mandated to track noise levels, set standards as well as ensure, via their State units, that sources of excessive noise are controlled.
- The agency has a manual monitoring system where sensors are installed in major cities and few cities have the facility to track noise levels in real time.

NFC

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The story so far

- Google Pay has recently launched a new feature in India, 'Tap to pay for UPI', in collaboration with Pine Labs.
- The feature makes use of Near Field Communication (NFC) technology

What is NFC and how does it work?

- NFC is a short-range wireless connectivity technology that allows NFC-enabled devices to communicate with each other and transfer information quickly and

easily with a single touch whether to pay bills, exchange business cards, download coupons, or share a document.

- NFC transmits data through electromagnetic radio fields, to enable communication between two devices.
- Both devices must contain NFC chips, as transactions take place within a very short distance.
- NFC-enabled devices must be either physically touching or within a few centimeters from each other for data transfer to occur

What are the other applications of NFC technology?

- NFC tech has a wide range of applications besides driving payment services like Google Wallet and Apple Pay.
- It is used in contactless banking cards to perform money transactions or to generate contact-less tickets for public transport.
- Contactless cards and readers use NFC in several applications from securing networks and buildings to monitoring inventory and sales, preventing auto theft, keeping tabs on library books, and running unmanned toll booths, according to Investopedia.
- NFC is behind the cards that we wave over card readers in subway turnstiles and on buses to check tickets.
- It is present in speakers, household appliances, and other electronic devices that we monitor and control through our smartphones. With just a touch, NFC can also set up Wi-Fi and Bluetooth devices in our homes, Investopedia noted.

Types of vaccines

- Vaccine maker Biological E has been selected to receive mRNA technology from the World Health Organization technology transfer hub.
- After examining a number of proposals from India, the WHO's Advisory

Committee on Vaccine Product Development has selected Biological E as a recipient

- The WHO's technology transfer hub has the potential to expand manufacturing capacity for other products as well, including treatments, and target other priorities such as malaria, HIV and cancer.
- The WHO and partners will work with the Indian government and Biological E to put in place training and support for the company to start producing mRNA vaccines,

Different types of vaccines

- Messenger RNA (mRNA) vaccine. This type of vaccine uses genetically engineered mRNA to give your cells instructions for how to make the S protein found on the surface of the COVID-19 virus. After vaccination, your muscle cells begin making the S protein pieces and displaying them on cell surfaces. This causes your body to create antibodies

Vector vaccine

- In this type of vaccine, genetic material from the COVID-19 virus is placed in a modified version of a different virus (viral vector).
- When the viral vector gets into your cells, it delivers genetic material from the COVID-19 virus that gives your cells instructions to make copies of the S protein.
- Once your cells display the S proteins on their surfaces, your immune system responds by creating antibodies and defensive white blood cells

Protein subunit vaccine

- Subunit vaccines include only the parts of a virus that best stimulate your immune system. This type of COVID-19 vaccine contains harmless S proteins.
- Once your immune system recognizes the S proteins, it creates antibodies and defensive white blood cells.
- If you later become infected with the COVID-19 virus, the antibodies will fight

the virus.

CUET

- Central universities may have been caught unawares when the University Grants Commission, or UGC (which looks into the ‘coordination, determination and maintenance of standards of university education in India’), made it mandatory from this year for them to admit students in their undergraduate programmes solely on the basis and merit of scores in the Central University Entrance Test (CUET).
- Central universities, apparently, have no option but to follow the mandate
- The CUET may find favour with students for it might widen their academic choices and save them the cost, the hassle and the inconvenience of attempting many different test
- Concerns about the quality of the tests arising on account of the autonomy, competence, credibility and expertise of the NTA.
- Instead, respecting the idea of academic autonomy, they grant their faculty the freedom to evolve holistic criteria for admission. The NEP 2020 too while mentioning the need for ‘a common principle for entrance examination’ had emphasized the point that it should be done ‘with due regard to the diversity and university autonomy’.
- Further, the policy mentions in no uncertain terms that ‘it would be left to the individual universities and colleges to use NTA assessments for their admissions.
- Besides, higher education being in the concurrent list and, thus, a joint responsibility of the Union and State governments warrants that the States are taken into confidence before their institutions are subjected to a single common entrance test.
- Finally, regulatory reforms, in particular the establishment of the Higher Education Commission of India (HECI), as prescribed by the NEP 2020, need to be expedited, as there is a built-in consultative mechanism in the form of the

General Education Council (GEC), for the speedy and thoughtful implementation of the NEP.

Recombination of variants

The story so far:

- The World Health Organization (WHO) has flagged the emergence of a new variant of the SARS-CoV-2 virus the XE recombinant.
- The WHO further added that the recombinant virus was detected in the U.K. on January 19 and over 600 sequences have been reported and confirmed since.

How are variants created?

- SARS-CoV-2, the virus that causes COVID-19, is an RNA virus which evolves by accumulating genetic errors in its genome.
- These errors are produced when the virus infects a person and makes copies of itself inside the host's cells.
- These errors (otherwise called mutations) are therefore a by-product of replication of SARS-CoV-2 inside the cell and may be carried forward as the virus continues to infect people.
- When viruses having a specific set of errors or mutations infect a number of people, this forms a cluster of infections descending from a common parental virus genome and is known as a lineage or a variant of the virus.

The PANGO network, an open global consortium of researchers from across the world, provides a system for naming different lineages of SARS-CoV-2.

What is a recombinant variant?

- Apart from the errors in the virus genome, another process through which a virus increases its genetic diversity is recombination.

- Recombination occurs when, in extremely rare situations, two different lineages of the virus co-infect the same cell in the host and exchange fragments of their individual genomes which generates a descendent variant having mutations that occurred in both the original lineages of the virus
- Such recombination events occur typically in situations where two or more lineages of SARS-CoV-2 may be co-circulating in a certain region during the same time period.
- This co-circulation of lineages provides an opportunity for recombination to occur between these two lineages of SARS-CoV-2

How many recombinant viruses have been detected?

- While recombination events are not frequently observed for the SARS-CoV-2 virus, multiple recombinant lineages have been designated during the pandemic.
- The recombinant lineages are annotated by PANGO with an 'X' followed by an alphabet which indicates the order of discovery.
- Some previously detected and designated lineages include XA, a recombinant of B.1.1.7 (Alpha) and B.1.177 detected in the U.K., lineage XB detected in the U.S., and lineage XC detected in Japan, which is a recombinant of B.1.1.7 (Alpha) and AY.29 sublineage of Delta.
- While lineage XE is a combination of Omicron lineages BA.1 and BA.2. Lineage XD, which has the Spike gene of Omicron inserted into a Delta genome,

Are recombinant variants more deadly?

Although recombination has been detected in SARS-CoV-2, it has not yet impacted public health in a unique way.

Open source software

- Some experts note that making social media algorithms open source could weed

out misinformation and hatred from these platforms.

- Having an idea of what a platform prioritizes over another will help users to be more informed, and keep bad actors from manipulating the system.
- But others point out that the codes that run these platforms are part of the corporation's trade secret.
- Balancing disclosure and corporate secrecy will be a tough act to follow as most tech firms may not even have a team that has a full view of how their algorithm works.
- It continues to be a black box that few have complete access to.

What is Open source software?

- Open source software (OSS) is software that is distributed with its source code, making it available for use, modification, and distribution with its original rights.
- Source code is the part of software that most computer users don't ever see; it's the code computer programmers manipulate to control how a program or application behaves.
- Programmers who have access to source code can change a program by adding to it, changing it, or fixing parts of it that aren't working properly.
- OSS typically includes a license that allows programmers to modify the software to best fit their needs and control how the software can be distributed.

Indigenization list

- Self-reliance did not mean working in isolation from the rest of the world, but working in the country itself with their active participation and support
- Rajnath Singh formally releasing the third positive indigenization list of 101 pieces of equipment and platforms, which the Services can procure only from the domestic industry.
- The list includes naval utility helicopters, light tanks, small unmanned aerial vehicles and anti-ship missiles.

- “The release of this list shows the fast pace of our self-reliance in the defence sector. This list is planned to be implemented from December 2022 till December 2027,”
- The DRDO stated that so far it had entered into more than 1430 ToT (transfer of technology) agreements with industries all over the country
- One of the big-ticket items on the list is naval utility helicopters, the procurement of which was to be processed through the Strategic Partnership route and has been hanging fire for over a couple of years now. This is now expected to go to Hindustan Aeronautics Ltd. (HAL)
- Other big systems on the list include sensors, weapons and ammunitions, rockets, patrol vessels, anti-ship missile, anti-radiation missile and several others which would fulfil the requirements of the armed forces.
- Like in the two earlier lists, special focus has been given to import substitution for ammunition in the third list
- The first batch of Indian Navy aircrew successfully completed its training on the MH-60R Multi-Role Helicopters (MRH) at the U.S. Naval Air Station, North Island in San Diego.

H-60R Multi-Role Helicopters (MRH)

\$2.2 billion deal

- India had signed a \$2.2 billion deal for MH-60R helicopters built by Lockheed Martin during the visit of then U.S. President Donald Trump in February 2020.
- Deliveries are expected to be completed by 2025.
- The Navy is facing an acute shortage of helicopters on its frontline warships but procurement of new ones has been repeatedly delayed.
 - The MH-60Rs are a replacement of the Sea King 42/42A helicopters

already decommissioned in the 1990s, and are envisaged to operate from the frontline ships and aircraft carriers providing them the critical attributes of flexibility of operation, enhanced surveillance and attacking capability.



ALSORA

The United States' decision to impose stricter sanctions on Alrosa of Russia, a major player in India's gems and jewellery

About Alrosa

- Alrosa is a Russian group of diamond mining companies that specialize in exploration, mining, manufacture, and sale of diamonds.
- The company leads the world in diamond mining by volume
- Mining takes place in Western Yakutia, the Arkhangelsk region, and Africa. Alrosa is Russia's leading diamond mining and Distribution Company, accounting for 95% of Russian diamond production and 27% of global diamond extraction.
- The company's headquarters are located in Mirny (Sakha Republic) and Moscow.

Double mutant in India

- The “double mutant” virus that scientists had flagged last month as having a bearing on the spread of the pandemic in India, has a formal scientific classification: B.1.617.

- Couple of defining mutations, E484Q and L425R that enable it to become more infectious and evade antibodies.
- Certain variants of the coronavirus, for instance, B.1.1.7 and B.1.351 have been termed the “United Kingdom” and “South Africa” variant, respectively.

Micro Swimmer

- Made from the two-dimensional compound poly (heptazine imide) carbon nitride (aka PHI carbon nitride), these microbots are nothing like the miniaturized humans.
- They range from 1- 10 micrometer (a micrometer is one-millionth of a meter) in size, and can selfpropel when energized by shining light. How they swim
- The PHI carbon nitride micro particles are photocatalytic.
- “Like in a solar cell, the incident light is converted into electrons and holes. These charges drive reactions in the surrounding liquid
- Electrons and holes are produced on the surface of the swimmers, which in turn react to form ions and an electric field around the swimmer.
- These ions move around the particle and cause fluid to flow around the particle.
- So this fluid flow causes the micro-swimmers to move,”
- As photo catalysis is light-driven, it occurs only on the brightened hemisphere.
- As the ions move from the bright side to the dark side, micro-swimmers march towards the direction of the light source.
- The body fluids and blood contain dissolved salts.
- When salts are present, the salt ions stop the reaction ions from moving freely as they will just bind or recombine with them and stop them.
- So all the chemically propelled swimmers can’t swim in solutions containing salts.”

- To overcome this challenge, the researchers examined various materials such as titanium dioxide and cobalt monoxide and finally zeroed on polyheptazine imide (PHI) carbon nitride.
- While carbon nitride is an excellent photo-catalyst, the two-dimensional PHI has a sponge-like structure full of pores and voids and charge storage properties.

Drug delivery

- In addition to transporting salt ions from the fluid, the voids and pores on the micro particles worked as cargo bays and could soak up large amounts of drug.
- The researchers found that Doxorubicin, a drug used to treat cancer, was readily absorbed.
- By changing the pH of the solution or by triggering it with light, the researchers showed the drug release could be activated

Graph grammar and designer molecule

- We can now have “designer molecules,” where we formulate a wish list of properties for material (say, desired tensile strength as well as flexibility) and seek to not merely discover, but also “construct,” molecules that exhibit such properties.
- Generating molecules computationally involves the use of Artificial Intelligence (AI) and machine learning algorithms that require large datasets to train on.
- Moreover, the molecules thus designed may be hard to synthesize. So, the challenge is to circumvent these shortfalls.
- Now, researchers from Massachusetts Institute of Technology (MIT) and International Business Machines (IBM) have together devised a method to generate molecules computationally which combines the power of machine learning with what are called graph grammars.

- This approach requires much smaller datasets (for example, about 100 datasets in the place of 81,000, as the researchers mention) and builds up the molecules in a bottom-up approach
- What mathematicians call graphs are networks or webs with nodes and edges between them?
- In this approach, a molecule is represented as a graph where the nodes are strings of atoms and edges are chemical bonds. A grammar for such structures tells us how to replace a string in a node with a whole molecular structure.

W boson

- The difference in mass from what the prevailing theory of the universe predicts is too big to be a rounding error or anything that could be easily explained away, according to the study by a team of 400 scientists from around the world published in the journal Science.
- If confirmed by other experiments, it would present one of the biggest problems yet with the standard model of particle physics.
- The standard model says a W boson should measure 8,03,57,000 electron volts, plus or minus six. “We found it slightly more than that
- In particle physics, the W and Z bosons are vector bosons that are together known as the weak bosons or more generally as the intermediate vector bosons. In particle physics, a vector boson is a boson whose spin equals one.
- These elementary particles mediate the weak interaction; the respective symbols are W^+ , W^- , and Z^0
- The W^\pm bosons have either a positive or negative electric charge of 1 elementary charge and are each other's antiparticles. The Z^0 boson is electrically neutral and is its own antiparticle. The three particles each have a spin of 1.
- All three of these particles are very short-lived, with a half-life of about 3×10^{-25}

s.

- The W bosons had already been named, and the Z bosons were named for having zero electric charge.

Bones of Spinosaurus

- Bones of Spinosaurus and its kin had dense bone walls similar to a penguin suggesting that it spent lots of time in the water and hunted in it.
- Researchers compared the bones of spinosaurids with those from an array of living and extinct marine mammals, aquatic reptiles and water-loving birds.
- They found that Spinosaurus could swim underwater.

Ozone and climate Ozone

- Ozone, climate change Ozone has been found to have a major impact on climate change.
- A study published in Nature Climate Change showed that the levels of ozone in the upper and the lower atmosphere were responsible for nearly one-third of the warming of waters, which borders Antarctica in the twentieth century.

Indigotin

- The ancient Greeks called the plant dye indigo by a name which is pronounced as indikón and means Indian.
- Leaves of these plants contain upto 0.5% of Indican which when exposed to oxygen produces the blue substance Indigotin.
- Cakes of this were a major item of trade from India
- The environmental impact of natural dyes is much lesser than that of synthetic equivalents.
- The search for better and better techniques and procedures for using natural dyes

from other commonly available herbs, shrubs and trees continue

- Identified and sometimes successfully recreated dye-extraction and dyeing methods for several plant species.

The list includes

- (a) Nepal barberry (*Mahonia napaulensis*, Daaruhaldi in Hindi; Mullumanjanathi in Tamil): The Apatani tribe of Arunachal Pradesh has for long used this plant for colouring their weaves.
- (b) Wild canna (*Canna indica* Sarvajjaya in Hindi; Kalvazhai in Tamil).
- The flowers of this ornamental plant are bright red, from an alcohol-soluble dye that can be easily fixed on to cotton and stands fast.
- (c) Flame of the forest (*Butea monosperma*, Palash in Hindi) is a native of our subcontinent and has an eye-catching flower from which is derived a traditional color of the Holi festival
- Environmental costs meanwhile, biotechnologists look to bypass the environmental costs of chemical methods.
- This has been proved in concept by engineering bacteria to produce the indigo precursor, indican.
- The conversion of this to the dye is performed by enzymes on the surface of wet denim, thus eliminating several toxic effluents.

HOPS and Healthcare

- The basic idea of UHC is that no one should be deprived of quality health care for the lack of ability to pay.
- In concrete terms, UHC typically relies on one or both of two basic approaches: public service and social insurance.
- In the first approach, health care is provided as a free public service.

- The second approach allows private as well as public provision of health care, but the costs are mostly borne by the social insurance fund(s), not the patient, so the result is similar: everyone has access to quality health care.

Some challenges

- Even in a system based on social insurance, public service plays an essential role.
- In the absence of public health centres, dedicated not only to primary health care but also to preventive work, there is a danger of patients rushing to expensive hospitals every other day
- Another challenge with social insurance is to regulate private health-care providers.

Today, most countries with UHC rely on a combination of public service and social insurance

HOPS

- “Healthcare as an optional public service” (HOPS).
- The idea is that everyone would have a legal right to receive free, quality health care in a public institution if they wish.
- It would not prevent anyone from seeking health care from the private sector at their own expense.
- But the public sector would guarantee decent health services to everyone as a matter of right, free of cost.

IRMS

- A recent Gazette notification regarding the creation of the Indian Railway Management Service (IRMS) marks a paradigm shift in the management of one of the world’s largest rail networks.
- Eight out of 10 Group-A Indian Railway services have been merged to create the

IRMS.

- Besides removing silos, this restructuring also aims at rationalizing the top-heavy bureaucracy of the Indian Railways.
- Training the future leaders of India's public transporter in the rapidly evolving logistics sector of the country is the most important task ahead.
- The fact remains that even after the creation of the IRMS, the 8,000 strong (already serving) officers of the Indian Railways will need to work in coordination and not in silos, as they will be serving in the organization for decades to come.
- Though the UPSC will recruit a few hundred IRMS officers each year from now, they will remain much less in number when compared to already serving officers for a long time to come.
- The task of training such a dynamic talent pool assumes importance in view of India's aspirations of becoming a \$5 trillion economy and an economic powerhouse in the near future.
- The Indian Railways will play a very crucial role in achieving key objectives with its prestigious projects such as a network of dedicated freight corridors, high speed rail corridors, station re-development projects, the induction of Vande Bharat trains on a large scale, and other projects of strategic importance
- The merger of services provides an opportunity to redesign the training for newly recruited IRMS officers to make them future ready.
- The IRMS training needs to be a design based on competencies required for different leadership roles. Mission Karma yogi of the Government of India provides for competencies based postings of officers.
- The Integrated Government Online Training (iGOT) programme of the Government of India will be instrumental in shaping the career progression of IRMS officers.

Card skimming

- RBI has announced Cardless cash withdrawals at ATMs across the country. These withdrawals are to be authenticated via UPI.
- Cardless cash withdrawals will enhance security of cash withdrawal transactions. It would also help prevent frauds like card skimming and card cloning.
- However, while the security vulnerability of a card is minimized through Cardless withdrawals, the risk will soon transfer to mobile-enabled features.

What is card skimming?

- Criminals steal data from credit/ debit cards by tracking a card swiped at ATMs.
- They pick this information from using a skimming device that reads the card's magnetic strip.
- These devices are surreptitiously installed on ATMs. Once the device picks up the data, it can be used to gain unauthorized access to the user's banking records.
- The stolen information can be coded onto a new card, a process called cloning, and be used to make payments and transact with other bank accounts.
- Problematic ATMs that function intermittently, and the ones located in isolated areas are often used to install such skimming devices.
- Fraudsters also install scanning devices on point-of-sale machines.
- These devices stealthily scan a card before it is swiped at the payment counter at a departmental store.
- These are especially tough to spot if the billing counter is not in the line of sight of the card owner.

Understanding software copyright

- Software licensing: A copyright gives a creator the legal right to own, distribute and profit from his or her creative work.
- Software, like any other technology has all shades of licences facilitating its use.
- On one end of the spectrum, there is proprietary software which is to be

purchased as a one-time transaction or as yearly licences.

- A popular example is Microsoft Windows which is purchased along with the computer or Microsoft Office which typically has a yearly licence that has to be renewed upon payment
- On the other hand, there are different kinds of software licences that allow free use of software.
- There is the Creative Commons licence (CC) which is public domain: any software or work that is in CC can be used and distributed free of cost. For example, Wikipedia is under CC
- Another form of free software licence is Permissive Software licence which is popular in the software developer community and in the commercial world. This licence allows free use and modification of software.
- There are further specific licences under this category, like the Apache licence and MIT licence.
- The Apache licence is maintained by the Apache Software Foundation which is a non-profit entity.
- Many popular and powerful softwares like Spark (used in Big Data) have been developed under Apache licence.
- MIT licence is maintained by the Massachusetts Institute of Technology and it covers hundreds of software packages including GitLab and Dot NET.
- Open source software packages are developed and maintained by programmers from around the world.
- open source could create sophisticated solutions because of access to top programmers around the world
- The core of the internet itself is free: it is free to use ideas like linking contents on the internet, transferring them with a network software protocol and adopting the associated standards like maintaining the website address (Uniform Resource Locator-URL).
- The core software packages that implement these ideas are made available to

everyone for free, thanks to the foresight of Sir Tim Bernes-Lee who conceived of the key concepts behind the internet between 1989 and 1991 (the first web page was launched in 1990) and was one among the internet pioneers.

Gestational diabetes

- In the year 2021, the prevalence of diabetes was estimated by the International Diabetes Federation (IDF) to be 537 million people.
- On extrapolating the data to the year 2045, it is safe to say that almost 783 million
- While several reasons can be ascribed for this rising trend these include an aging population, urbanization, genetic predisposition, nutrition and lifestyle transition there is one factor that has not yet received due attention, namely, diabetes that occurs during pregnancy.
- Pregnancy-related diabetes encompasses both newly detected diabetes during pregnancy (or ‘gestational diabetes’) as well as women with pre-existing diabetes (or ‘pre-gestational diabetes’)
- The pancreas of the foetus (which secretes the hormone insulin), is able to respond to the maternal blood-sugars present in the blood that go to the foetus.
- In case the blood sugar levels are increased, the fetal pancreas secrete excessive insulin, which in turn deposits fat in the growing foetus, sometimes even resulting in a ‘big baby’.
- When this adversely programmed child grows up, he is faced with an unhealthy environment of high caloric foods, lesser physical activity and stress.

Solar policy

What is India’s solar policy?

- Since 2011, India’s solar sector has grown at a compounded annual growth rate (CAGR) of around 59% from 0.5GW in 2011 to 55GW in 2021.
- The Jawaharlal Nehru National Solar Mission (JNNSM), also known as the

National Solar Mission (NSM), which commenced in January 2010, marked the first time the government focused on promoting and developing solar power in India.

- Under the scheme, the total installed capacity target was set as 20 GW by 2022. In 2015, the target was revised to 100GW and in August 2021, the government set a solar target of 300 GW by 2030.
- India currently ranks fifth after China, U.S., Japan and Germany in terms of installed solar power capacity.
- As of December 2021, the cumulative solar installed capacity of India is 55GW, which is roughly half the renewable energy (RE) capacity (excluding large hydro power) and 14% of the overall power generation capacity of India.

What are the reasons for rooftop solar adoption not meeting targets?

- In its early years, India's rooftop solar market struggled to grow, held back by lack of consumer awareness, inconsistent policy frameworks of the Centre/ State governments and financing.
- Recently, however, there has been a sharp rise in rooftop solar installations thanks to falling technology costs, increasing grid tariffs, rising consumer awareness and the growing need for cutting energy cost

How critical is solar power to India's commitment to mitigate climate change?

- Solar power is a major prong of India's commitment to address global warming according to the terms of the Paris Agreement, as well as achieving net zero, or no net carbon emissions, by 2070.
- To boost the renewable energy installation drive in the long term, the Centre in 2020 set a target of 450GW of RE-based installed capacity to be achieved by 2030, within which the target for solar was 300GW.

EL NINO and Indian monsoon

- The India Meteorological Department (IMD), while forecasting a “normal” southwest monsoon for this year also, revised downwards the definition of what constitutes average rainfall.
- The agency said India would get 99% of the long period average (LPA) rainfall changed from 89 cm to 88 cm in 2018, and in the periodic update in 2022, again revised to 87 cm.
- A monsoon is considered “normal” when rainfall falls between 96% and 104% of the LPA.
- The IMD does not expect an El Nino, a phenomenon associated with a warming of the Central Pacific and drying up of the rains over northwest India, the coming monsoon.
- “Currently La Nina conditions are prevailing over equatorial Pacific.
- Definition of the LPA was meant to be updated every decade.
- The 89-cm average was computed based on a 50- year average from 1951 to 2000; the 88 cm based on average for the period from 1961 to 2010; and the latest is based on the average for the period from 1971 to 2020.
- Over a century, the average rainfall changes every decade with roughly 30 years of a declining trend followed by 30 years of an upswing,
- “Currently, India is at the end of a dry epoch and we seem to be entering a wet epoch. The next update will be after a decade

EL NINO

- El Niño means Little Boy, or Christ Child in Spanish. South American fishermen first noticed periods of unusually warm water in the Pacific Ocean in the 1600s.
- The full name they used was El Niño de Navidad, because El Niño typically peaks around December.
- El Niño can affect our weather significantly.

- The warmer waters cause the Pacific jet stream to move south of its neutral position. With this shift, areas in the northern U.S. and Canada are dryer and warmer than usual.
- But in the U.S. Gulf Coast and Southeast, these periods are wetter than usual and have increased flooding.
- El Niño also has a strong effect on marine life off the Pacific coast.
- During normal conditions, upwelling brings water from the depths to the surface; this water is cold and nutrient rich. During El Niño, upwelling weakens or stops altogether.
- Without the nutrients from the deep, there are fewer phytoplankton off the coast.
- This affects fish that eat phytoplankton and, in turn, affects everything that eats fish.
- The warmer waters can also bring tropical species, like yellowtail and albacore tuna, into areas that are normally too cold.

Pollution control and role of states

- First, those in charge of the two States must talk. Setting aside their disagreements on the contribution of stubble burning to Delhi's air pollution, the States should arrive at a common understanding of sources polluting the region
- Second, create platforms for knowledge exchange. A common knowledge centre should be set up to facilitate cross-learning on possible solutions to developmental challenges in both States
- Third, collaborate to execute proven solutions. The two States could co-design solutions that would improve air quality. They could jointly institutionalise a task force comprising experts from State-run institutions to pilot these
- Fourth, create a market for diversified crop products. The persistence of stubble burning in Punjab and its contribution to toxic winter pollution in Delhi cannot be denied. Shifting away from the 'paddy-wheat cycle' through crop

diversification is a sure shot solution to stubble burning

- Finally, both State governments should assert the need for extending inter-State cooperation to other States in the Indo-Gangetic plains in different inter-State forums.
- One such forum is the Northern Zonal Council which has representation from Chandigarh, Delhi, Punjab, Haryana, Rajasthan, Himachal Pradesh, Jammu and Kashmir and Ladakh. Both Delhi and Punjab must use this platform to highlight the need for coordination with neighbouring States to alleviate the pollution crisis.

Stick Shaker

- Pilots cannot be trained to fly Boeing 737 MAXs safely if the stick shaker in a simulator is faulty, the plane manufacturer has informed the Director-General of Civil Aviation, which barred 90 SpiceJet pilots from flying these planes following an inspection of a training facility of the airline.

Warm vaccine

- A prospective vaccine against SARS-CoV-2 being developed in India, that doesn't need to be stored in refrigerators or a cold-chain storage, generated a significant number of antibodies in mouse trials against prevalent variants of the virus.
- The 'warm' vaccine, developed by the Bengaluru based Mynvax Private Limited, a company incubated at the Indian Institute of Science, Bengaluru, is unique among existing vaccines in that it can be stored at 37 degree Celsius for four weeks and at 100 degree Celsius for up to 90 minutes. Most other vaccines require to be stored in refrigerators and can be kept at room temperature for no more than a few hours.
- The COVID-19 vaccine candidate contains a part of the spike protein of the novel

coronavirus called the receptor binding domain (RBD) the region that helps the virus stick to the host's cell and is being developed.

S 400 missile system

- There is a delay in the delivery of the second regiment of S-400 from Russia due to the ongoing war in Ukraine. However, some training equipment and simulators arrived in India
- With the threat of U.S. sanctions under CAATSA (Countering America's Adversaries through Sanctions Act), New Delhi and Moscow had worked out payments through rupee-rouble exchange for this deal.
- The two sides are now exploring the same payment route for larger bilateral trade.
- Terminal High Altitude Area Defense (THAAD)
- Unlike S-400, THE THAAD has a single layer defence to counter intermediate range and intercontinental ballistic missile systems, it defence misses another missile system like the Patriot missiles need to be fired.
- Moreover, the S-400 can fire different types of missiles but the THAAD can fire only one type making it a one-dimensional missile system. The range of S-400 too is wider with an estimated range of 400 kms against 150-200 of the American system.

S400

- The S-400, successor to the S-200 and the S-300 missile system, is often labelled by various defence journals and military experts as "one of the most advanced defence systems in the world".
- The S-400 first came into service in 2007 with the First Air Defense Corps to protect Moscow.
- The S-400 has four different types of missiles and having ranges between 40 km, 100 km, 200 km and 400 km.
- The S-400 is capable of taking down multiple aerial targets including stealth

fighter jets, bombers, cruise and ballistic missiles, and even unmanned aerial vehicles (UAVs).

How important is S-400 missile system to India's defence arsenal?

- At a time when China is increasingly threatening India's border, especially in Ladakh, the S-400 missile system is a strong defence, military experts opine.
- The S-400 also acts as an extra layer of protection to India's western borders, particularly from Pakistan and its militant insurgency threats.
- Over the years, senior Indian Air Force officials have also expressed positively on the capability of the S-400.



Omicron in animals

- One reason why dogs and cats show less susceptibility to the Omicron variant could be the low binding ability of the virus with cells.
- As per a study published in the Journal of Genetics and Genomics, the Omicron variant might have emerged in mice and then spread to humans.
- The authors from the Chinese Academy of Sciences in Beijing do cite three possible scenarios under which the Omicron variant could have emerged.
- The first hypothesis is the evolution and spread in a small population that was neither vaccinated nor tested and genomes sequenced.

- The second hypothesis is an immunocompromised individual providing a perfect environment for the virus to persist in the host and undergo numerous mutations.
- The third is the possible origin in mice before jumping to humans.

Fish communication

- In the underground caves of north-eastern Mexico, groups of blind fish that communicate using clicks seem to be developing cave-specific accents.
- Researchers noticed significant differences: clicks were high-pitched in one cave, and deep and booming in another.
- The linguistic split could contribute to ongoing speciation among the fish.

Thermophotovoltaic

- Thermal batteries Researchers have achieved a nearly 30% jump in the efficiency of a thermophotovoltaic (TPV), which converts photons emitted by a heat source to electricity.
- The idea is to feed surplus wind or solar electricity to a heating element, and then use TVPs to convert the heat into electricity

Thermophotovoltaic (TPV)

- Thermophotovoltaic (TPV) energy conversion is a direct conversion process from heat to electricity via photons.
- A basic thermophotovoltaic system consists of a thermal emitter and a photovoltaic diode cell.
- The temperature of thermal emitters varies from about 900 °C to about 1300 °C, although in principle TPV devices can extract energy from any emitter with a temperature elevated above that of the photovoltaic device (forming an optical heat engine).

- The emitter can be a piece of solid material or an engineered structure. Thermal emission is the spontaneous emission of photons due to thermal motion of charges in the material.
- At TPV temperatures, this radiation is mostly at near infrared and infrared frequencies. The photovoltaic diode absorbs some of these radiated photons and converts them into electricity.

Role of climate and migration

Role of climate

- A record-breaking simulation of the past two million years of Earth's climate provides evidence that temperature and other planetary conditions influenced early human migration and possibly contributed to the emergence of the modern-day human species around 3,00,000 years ago.
- This might be another proof to support the role of climate in shaping human ancestry.

Ailao Mountains

Tracking wildlife

- DNA extracted from blood ingested by leeches has been used to track wildlife in China's Ailaoshan Nature Reserve. Researchers extracted DNA from the leeches' blood and detected 86 different species, from endangered Yunnan spiny frogs to Asiatic black bears and humans.
- Biodiversity was highest in the high-altitude interior of the reserve
- The Ailao Mountains are located in Yunnan, China.

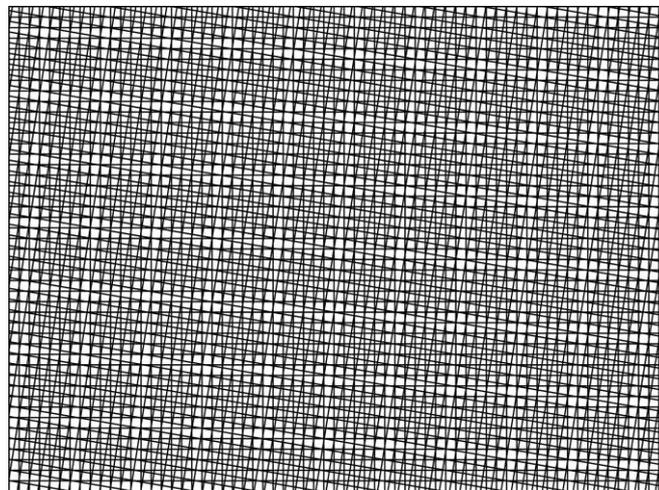
- The Ailao Mountain Nature Reserve is located in the Ailao Mountains, is about 503.60 square kilometres and was created in 1986.

Moire patterns

- Graphene is a two-dimensional material comprising a single layer of carbon atoms arranged in a hexagonal lattice.
- Stacks of graphene layers can make up graphite.
- Graphene possesses several interesting properties by itself, and, moreover, it can be combined with other materials to form useful devices.
- One such material is twisted bilayer graphene.
- This is made by placing two layers of graphene on top of each other such that they are aligned well, and then twisting one layer, so that it makes a well-calibrated, known angle with respect to the former.

Moire patterns

- When such a twist is given, the lattice shows what are called moire patterns.
- Moire patterns are wavy fringelike patterns that we see, for example, when two layers of synthetic fabric overlap and move with respect to each other



InspectOR

- The Food and Drug Administration has issued an emergency use authorisation for what it said is the first device that can detect COVID-19 in breath samples of humans.
- The InspectOR COVID-19 Breathalyzer is about the size of a piece of carry-on luggage, the FDA said, and can be used in doctor's offices, hospitals and mobile testing sites.

Nutrition and TB

- There were no drugs for TB till the discovery of streptomycin in 1943.
- With improved wages, better living standards and the accompanying higher purchasing power for food, the TB mortality rate came down from 300 people per 1,00,000 population to 60 in England and Wales
- Not patient-centric With more drug arsenals such as rifampicin, ethambutol, pyrazinamide, the fight against TB bacteria continued, which became multidrug resistant
- The nutrition of the individual, is the most vital factor in the prevention in tuberculous disease
- “It is most unlikely that drugs alone, or drugs supplemented by vaccination, can control TB in the underprivileged countries of the world as long as their nutritional status has not been raised to a reasonable level.
- The fact is that 90% of Indians exposed to TB remain dormant if their nutritional status and thereby the immune system, is good.
- India has around 2.8 million active cases. It is a disease of the poor. And the poor are three times less likely to go for treatment and four times less likely to complete their treatment for TB, according to WHO, in 2002
- Chhattisgarh also initiated the supply of groundnut, moong dhal and soya oil,

and from April 2018, under the Nikshay Poshan Yojana of the National Health Mission, all States began extending cash support of ₹500 per month to TB patients to buy food

- “undernutrition and TB” are “syndemics”, and the intake of adequate balanced food, especially by the poor, can work as a vaccine to prevent TB
- A syndemic or synergistic epidemic is the aggregation of two or more concurrent or sequential epidemics or disease clusters in a population with biological interactions, which exacerbate the prognosis and burden of disease. The term was developed by Merrill Singer in the mid-1990s
- The food vaccine is a guaranteed right for life under the Constitution for all citizens, more so for TB patients.
- Thus, the goals of reducing the incidence of TB in India and of reducing TB mortality cannot be reached without addressing undernutrition

What Is Tuberculosis?

- Tuberculosis (TB) is a contagious infection that usually attacks your lungs. It can also spread to other parts of your body, like your brain and spine. A type of bacteria called *Mycobacterium tuberculosis* causes it.

Can tuberculosis be cured?

- In the 20th century, TB was a leading cause of death in the United States. Today, most cases are cured with antibiotics. But it takes a long time. You have to take medications for at least 6 to 9 months.

Tuberculosis Types

A TB infection doesn't always mean you'll get sick.

There are two forms of the disease:

- Latent TB. You have the germs in your body, but your immune system keeps them from spreading. You don't have any symptoms, and you're not contagious. But the infection is still alive and can one day become active. If you're at high risk for re-activation for instance, if you have HIV, you had an infection in the past 2 years, your chest X-ray is unusual, or your immune system is weakened your doctor will give you medications to prevent active TB.
- Active TB. The germs multiply and make you sick. You can spread the disease to others. Ninety percent of active cases in adults come from a latent TB infection.
- A latent or active TB infection can also be drug-resistant, meaning certain medications don't work against the bacteria.

National cybersecurity strategy

Why does India need a cybersecurity strategy?

- As per American cybersecurity firm Palo Alto Networks' 2021 report, Maharashtra was the most targeted State in India facing 42% of all ransomware attacks.
- The report stated that India is among the more economically profitable regions for hacker groups and hence these hackers ask Indian firms to pay a ransom, usually using cryptocurrencies, in order to regain access to the data.
- One in four Indian organizations suffered a ransomware attack in 2021. Indian organizations witnessed a 218% increase in ransomware higher than the global average of 21%.
- Software and services (26%), capital goods (14%) and the public sector (9%) were among the most targeted sectors.
- Increase in such attacks has brought to light the urgent need for strengthening India's cybersecurity.

What is the National Cyber Security Strategy?

- Conceptualized by the Data Security Council of India (DSCI), the 22-page report focuses on 21 areas to ensure a safe, secure, trusted, resilient, and vibrant cyberspace for India. The main sectors of focus of the report are:-
- Large scale digitization of public services: There needs to be a focus on security in the early stages of design in all digitization initiatives and for developing institutional capability for assessment, evaluation, certification, and rating of core devices
- Supply chain security: There should be robust monitoring and mapping of the supply chain of the Integrated circuits (ICT) and electronics products. Product testing and certification needs to be scaled up, and the country's semiconductor design capabilities must be leveraged globally.
- Critical information infrastructure protection: The supervisory control and data acquisition (SCADA) security should be integrated with enterprise security. A repository of vulnerabilities should also be maintained.
- Digital payments: There should be mapping and modelling of devices and platforms deployed, transacting entities, payment flows, interfaces and data exchange as well as threat research and sharing of threat intelligence.
- State-level cyber security: State-level cybersecurity policies and guidelines for security architecture, operations, and governance need to be developed.

What steps does the report suggest?

- To implement cybersecurity in the above-listed focus areas, the report lists the following recommendations:
- Budgetary provisions: A minimum allocation of 0.25% of the annual budget, which can be raised up to 1% has been recommended to be set aside for cyber security. In terms of separate ministries and agencies, 15-20% of the IT/technology expenditure should be earmarked for cybersecurity. The report

also suggests setting up a Fund of Funds for cybersecurity and to provide central funding to States to build capabilities in the same field.

- Research, innovation, skill-building and technology development: The report suggests investing in modernization and digitization of ICTs, setting up a short and long term agenda for cyber security via outcome-based programs and providing investments in deep-tech cyber security innovation.
- Furthermore, a national framework should be devised in collaboration with institutions like the National Skill Development Corporation (NSDC) and ISEA (Information Security Education and Awareness) to provide global professional certifications in security.
- The DSCI further recommends creating a ‘cyber security services’ with cadre chosen from the Indian Engineering Services.
- **Crisis management:** For adequate preparation to handle crisis, the DSCI recommends holding cybersecurity drills which include real-life scenarios with their ramifications.
- In critical sectors, simulation exercises for cross-border scenarios must be held on an inter-country basis.
- **Cyber insurance:** Cyber insurance being a yet to be researched field, must have an actuarial science to address cybersecurity risks in business and technology scenarios as well as calculate threat exposures. The DSCI recommends developing cyber insurance products for critical information infrastructure and to quantify the risks involving them.
- **Cyber diplomacy:** Cyber diplomacy plays a huge role in shaping India’s global relations. To further better diplomacy, the government should promote brand India as a responsible player in cyber security and also create ‘cyber envoys’ for the key countries/regions.
- **Cybercrime investigation:** With the increase in cybercrime across the world, the report recommends unburdening the judicial system by creating laws to resolve

spamming and fake news. It also suggests charting a five-year roadmap factoring possible technology transformation, setting up exclusive courts to deal with cybercrimes and remove backlog of cybercrimes by increasing centres providing opinion related to digital evidence under section 79A of the IT act.

- Moreover, the DSCI suggests advanced forensic training for agencies to keep up in the age of AI/ML, blockchain, IoT, cloud, automation. Law enforcement and other agencies should partner with their counterparts abroad to seek information of service providers overseas.

UAVs along the border

- China continues to expand its unmanned aerial vehicle (UAV) network and use in areas close to the Line of Actual Control (LAC).
- There is a significant increase in their use for a variety of tasks from intelligence, surveillance and target acquisition and reconnaissance (ISTAR) capabilities and logistics support, official sources said citing intelligence inputs.
- This follows an increasing trend in UAV deployment by the People's Liberation Army (PLA) in Tibet and along the LAC since the stand-off began in eastern Ladakh in May 2020
- This is part of the massive expansion of infrastructure and runways, construction of habitat and support facilities which has continued in the last two years, even while the two sides were engaged in senior military commander talks for disengagement and de-escalation in eastern Ladakh to end the stand-off.

Cryptocurrency and RBI

- Cryptocurrency will be discouraged via taxation and capital gains provisions.
- The Governor of the Reserve Bank of India, in February, highlighted two things.
- First, “private cryptocurrencies are a big threat to our financial and

macroeconomic stability”.

- Second, “these cryptocurrencies have no underlying (asset)
- Clearly, statements from the RBI indicate a growing worry since the proliferation of Cryptos threatens the RBI’s place in the economy’s financial system.
- This threat emerges from the decentralised character of Cryptos based on blockchain technology which central banks cannot regulate and which enables enterprising private entities (such as Satoshi Nakamoto who initiated Bitcoins in 2009) to float Cryptos which can function as assets and money.
- Cryptos which operate via the net can be banned only if all nations come together.
- Even then, tax havens may allow Cryptos to function, defying the global agreement
- Cryptos acquire value and can be transacted via the net. This enables them to function as money.
- A centralized CBDC will require the RBI to validate each transaction something it does not do presently.
- Once a currency note is issued, the RBI does not keep track of its use in transactions.
- Keeping track will be horrendously complex which could make a crypto such as the CBDC unusable unless new secure protocols are designed.

Education –Centre vs State

- Education being in the concurrent list since 1976, is a joint and shared responsibility of the Union and the State governments.
- Coordination and maintenance of standards may vest in the Union government, but it applies to higher education only.
- Education policy, on the other hand, deals with all levels of education.
- Many a change in the education system, particularly in higher education,

introduced before and after the policy may have alarmed the States.

- The given impression that the common university entrance test (CUET) is the first step towards a 'one nation, one examination' system as envisaged by the policy even though the text of the policy clearly declared that it should be up to the individual universities to use CUET scores or not, is the latest example.
- Making the undergraduate national eligibility test (NEET UG) mandatory for admission to all medical colleges is yet another example.
- States like Tamil Nadu feel that the centralized admission test caused monetary burden and inconvenience for students.
- Data lends credence to their concerns that the national level tests favour students coming from the Central Board of Secondary Education (CBSE).

Six airbags in vehicles

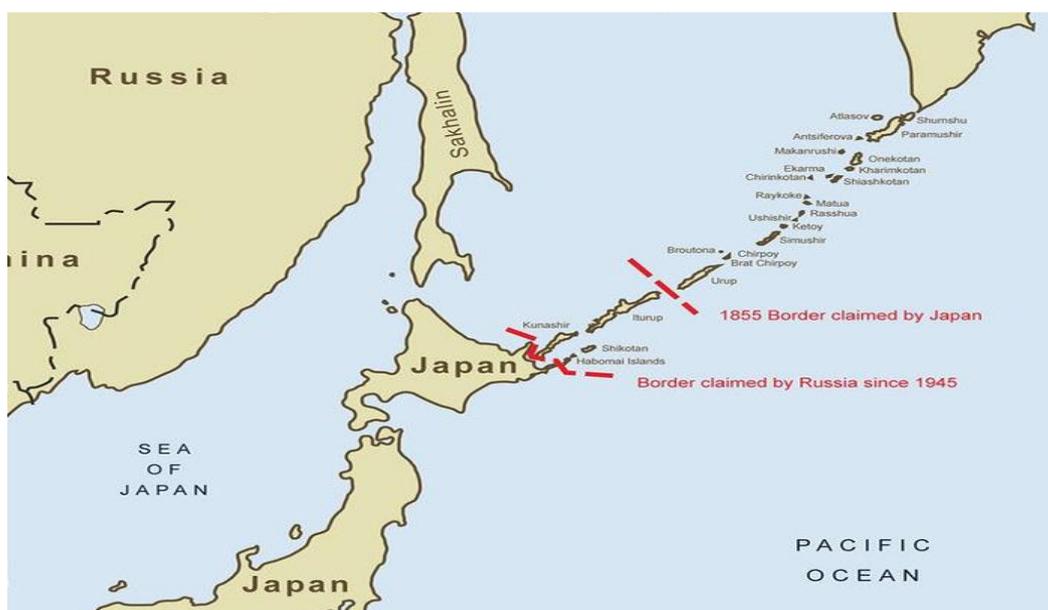
- The government has proposed the installation of six airbags in all passenger vehicles (M1 category) to enhance safety for vehicle occupants.
- The Ministry of Road Transport and Highways explained that these airbags would be deployed to the seats or on the sides at the stipulated position inside the vehicle.
- The deployment of the inflatable airbag in the mentioned position would help mitigate injuries in the torso region or ejection of the occupant from the vehicle.
- Automobile market analyst JATO Dynamics stated that installing four additional airbags in vehicles would increase its cost by ₹17,600.

Cartelization

- A cartel is a group of independent market participants who collude with each other in order to improve their profits and dominate the market. Cartels are usually associations in the same sphere of business, and thus an alliance of rivals.

- Most jurisdictions consider it anti-competitive behavior and have outlawed such practices.
- Cartel behavior includes price fixing, bid rigging, and reductions in output.
- The doctrine in economics that analyzes cartels is cartel theory.
- Cartels are distinguished from other forms of collusion or anti-competitive organization such as corporate mergers.

Kuril island dispute



- Japan described four islands whose ownership it disputes with Moscow as “illegally occupied by Russia” in the latest version of an annual diplomatic report released
- Japan, which is struggling to improve ties with Moscow to regain control of the Kurils, which Tokyo calls the Northern Territories, had previously described the dispute in a softer tone.
- “The Northern Territories are a group of islands Japan has sovereignty over and an integral part of Japan’s territory, but currently they are illegally occupied by Russia,”

Palk bay dispute

- Apart from poaching in the territorial waters of Sri Lanka, the use of mechanized bottom trawlers is another issue that has become a bone of contention between the fishermen of the two countries; the dispute is not just between the two states.
- This method of fishing, which was once promoted by the authorities in India, is now seen as being extremely adverse to the marine ecology, and has been acknowledged so by India.



- At the same time, the fishermen of Tamil Nadu experience a genuine problem the lack of fishing areas consequent to the demarcation of the IMBL in June 1974.
- If they confine themselves to Indian waters, they find the area available for fishing full of rocks and coral reefs besides being shallow.
- The distance between Dhanushkodi (Tamil Nadu) and the IMBL is nine nautical miles (NM) while the maximum distance Devipattinam and the IMBL is 34 NM.
- Under the Tamil Nadu Marine Fishing Regulation Act 1983, mechanized fishing boats can fish only beyond 3 NM from the coast.
- This explains the trend of the fishermen having to cross the IMBL frequently.

- Another factor is that the people of the two countries in general and fisher folk in particular have common threads of language, culture and religion, all of which can be used purposefully to resolve any dispute
- The present situation, which is otherwise very stressful for Sri Lanka in view of the economic crisis, can be utilized to bring the fishermen of the two countries to the negotiating table.
- In the meantime, India will have to modify its scheme on deep sea fishing to accommodate the concerns of its fishermen, especially those from Ramanathapuram district, so that they take to deep sea fishing without any reservation.
- Also, there is a compelling need for the Central and State governments to implement in Tamil Nadu the Pradhan Mantri Matsya Sampada Yojana in a proactive manner.
- The scheme, which was flagged off two years ago, covers alternative livelihood measures too including seaweed cultivation, open sea cage cultivation, and sea/ocean ranching
- Simultaneously, the two countries should explore the possibility of establishing a permanent multistakeholder institutional mechanism to regulate fishing activity in the region.
- At the same time, Sri Lanka should take a lenient view of the situation and refrain from adopting a rigid and narrow legal view of matters concerning the release of 16 fishermen or impounded fishing boats (around 90 in number).

Plankton and eccentricity of Earth's orbit

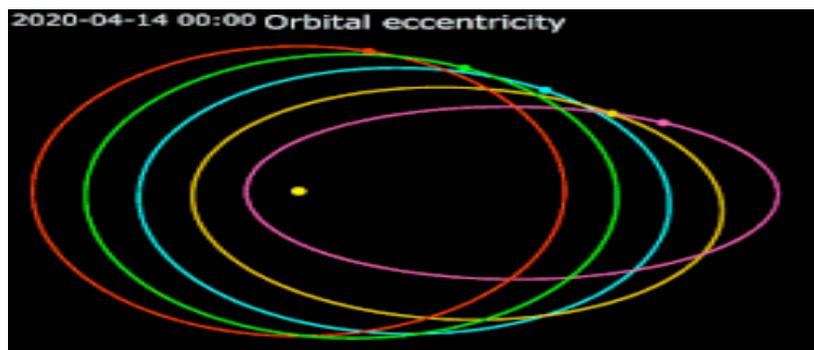
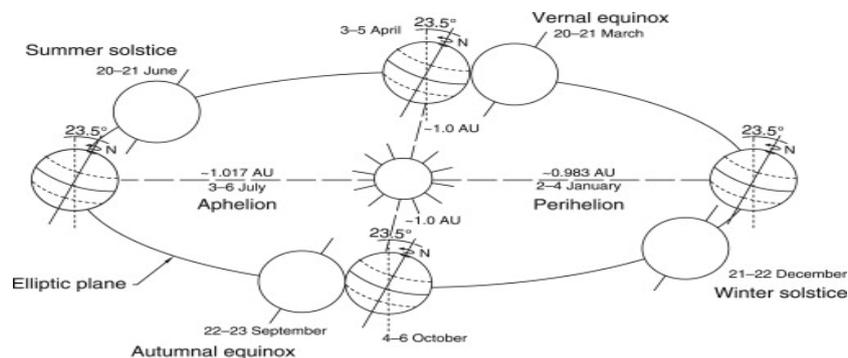
- Plankton evolution Variations in Earth's orbit might help to determine the evolution of marine phytoplankton.
- Researchers analyzed fossils of coccolithophores that lived in the Pleistocene

period alongside deviations in the circularity of Earth's annual orbit.

- The diversity of plankton species increased during periods of high eccentricity of Earth's orbit.

Earth's orbital eccentricity

- Earth's orbital eccentricity e quantifies the deviation of Earth's orbital path from the shape of a circle.
- It is the only orbital parameter that controls the total amount of solar radiation received by Earth, averaged over the course of 1 year. The present eccentricity of Earth is $e \approx 0.01671$



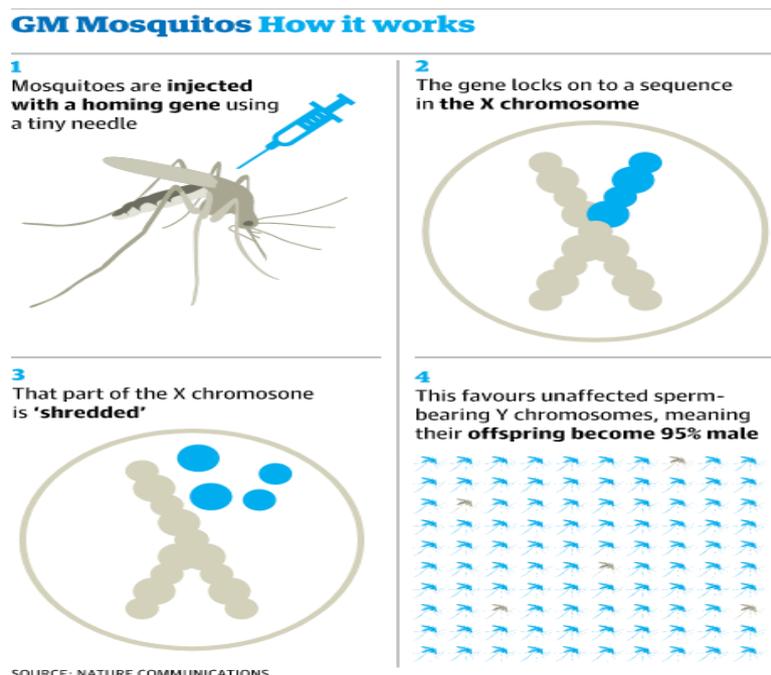
GM mosquitoes

- GM mosquito trial: The results are from the first open-air study of genetically engineered mosquitoes in the United States.
- The bioengineered male *Aedes aegypti* mosquitoes hatched, spread and mated with the wild population.
- All the females that inherited a deadly gene from a bioengineered dad died before

they reached adulthood.

GM mosquitoes

- GM mosquitoes are mass-produced in a laboratory to carry two types of genes: A self-limiting gene that prevents female mosquito offspring from surviving to adulthood.
- A fluorescent marker gene that glows under a special red light. This allows researchers to identify GM mosquitoes in the wild.



Hydrogen as a source of energy

- Storing large quantities of energy in a modest amount of space is a vital requirement, and hydrogen has an impressive energy storage capacity.
- While classifying fuels in terms of their energy value (also called heating value), the deciding elements are carbon, hydrogen and oxygen.
- Hydrogen has an energy value that is seven times that of carbon. In the burning of wood, carbon and hydrogen are oxidised in a heat-generating reaction, the end products of which are carbon dioxide and water.

- The former is a greenhouse gas, contributing to global warming. Burning of hydrogen gives us only water and heat.
- A smarter way to harness the energy in hydrogen would be to generate electricity with it.
- This is achieved in a proton exchange membrane fuel cell where, in the presence of a metal catalyst, a hydrogen molecule is split into protons and electrons, with the electrons providing the current output.
- The limited popularity of hydrogen as fuel is due to production and distribution restraints.
- It is safer to handle than domestic cooking gas. Industrial-level quantities of Hydrogen gas are used in processes such as the production of ammonia for fertilizers
- Over 90% of the world's hydrogen is produced from fossil fuels.

Biomass as a source

- Biomass is a catch-all term for organic waste material of plant and animal origin. It is a rich source of both hydrogen and carbon our dried banana peel has a hydrogen content of 5%, and 33% is carbon.
- An important goal of all climate change-curbing protocols is to sequester as much carbon as possible.
- The Swiss group uses pyrolysis, wherein organic matter is decomposed using small bursts of intense heat under inert conditions.
- Flashes of irradiation from a xenon lamp provide the heat a total of 15 milliseconds of irradiation are enough to heat the system to 600 degrees Celsius, and decompose a kilogram of banana peel powder liberating 100 liters of hydrogen gas.
- This short burst of photo thermal energy also produces 330 grams of biochar, a solid residue that is rich in carbon.

Benefits of biochar

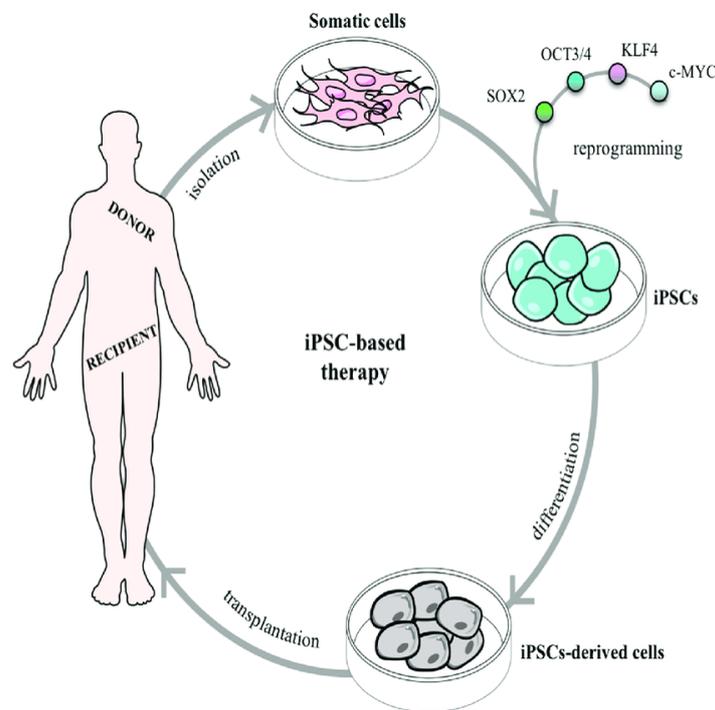
- Biochar has other uses too apart from safekeeping carbon, biochar has several uses in agriculture.
- Agricultural leftovers such as rice husk are a major source of biomass, and the biochar it forms has significant mineral content.
- Adding it to soil enriches plant nutrients.
- The porous nature of biochar makes it suitable for remediation the adsorption of toxic substances in polluted soils - thus reducing the potency of contaminants in the soil.

Yamanaka factor

- Scientists have developed a new technique for rejuvenating skin cells.
- This technique has allowed researchers to rewind the cellular biological clock by around 30 years according to molecular measures.
- The partially rejuvenated cells showed signs of behaving more like youthful cells in experiments simulating a skin wound (eLife).
- This research, although in early stages, could eventually have implications for regenerative medicine.
- The new method overcomes the problem of entirely erasing cell identity by halting reprogramming part of the way through the process.
- The new method, called ‘maturation phase transient reprogramming’, exposes cells to Yamanaka factors for just 13 days.
- At this point, age-related changes are removed and the cells have temporarily lost their identity.

The Yamanaka factors

- The Yamanaka factors (Oct3/4, Sox2, Klf4, c-Myc) are a group of protein transcription factors that play a vital role in the creation of induced pluripotent stem cells (cells that have the ability to become any cell in the body), often called iPSCs.
- They control how DNA is copied for translation into other proteins



mRNA technology

What is mRNA technology?

- Messenger RNA is a type of RNA that is necessary for protein production. In cells, mRNA uses the information in genes to create a blueprint for making proteins.
- Once cells finish making a protein, they quickly break down the mRNA. mRNA from vaccines does not enter the nucleus and does not alter DNA

E.g mRNA vaccines

- mRNA vaccines work by introducing a piece of mRNA that corresponds to a viral protein, usually a small piece of a protein found on the virus's outer membrane.

(Individuals who get an mRNA vaccine are not exposed to the virus, nor can they become infected by the vaccine.)

- Using this mRNA blueprint, cells produce the viral protein.
- As part of a normal immune response, the immune system recognizes that the protein is foreign and produces specialized proteins called antibodies.
- Antibodies help protect the body against infection by recognizing individual viruses or other pathogens, attaching to them, and marking the pathogens for destruction.
- Once produced, antibodies remain in the body, even after the body has rid itself of the pathogen, so that the immune system can quickly respond if exposed again.

Blue straggler'

- Blue stragglers is a class of stars on open or globular clusters that stand out as they are bigger and bluer than the rest of the stars.
- These are unusually hot and bright stars found in the cores of ancient star clusters known as globular.
- A clue to their origin is that they are only found in dense stellar systems, where distances between stars are extremely small (a fraction of a light year).
- Allan Sandage (an astronomer with Carnegie Observatories in Pasadena, California) discovered blue stragglers in the globular cluster M3 in 1952-53.

Why a blue straggler is more massive, and energetic?

- One that these do not belong to the family of stars in the cluster, and hence are not expected to have the group properties. But if they actually belong, the evasive behaviour is due to these stars gaining mass from a binary companion.
- Second, the straggler draws matter from the giant companion and grows more massive, hot and blue, and the red giant ends up as a normal or smaller white

dwarf.

- The third possibility is that the straggler draws matter from a companion star, but that there is a third star that facilitates this process

About UVIT

- Ultra Violet Imaging Telescope on ASTROSAT Satellite mission is a suite of Far Ultra Violet (FUV 130 to 180 nm), Near Ultra Violet (NUV 200 to 300 nm) and Visible band (VIS 320 to 550nm) imagers.
- ASTROSAT is the first multi wavelength mission of INDIA. UVIT will image the selected regions of the sky simultaneously in three channels and observe young stars, galaxies, bright UV Sources
- (Ultra Violet Imaging Telescope) of ASTROSAT, India's first science observatory in space.

(cVDPV3)

- The recent news of wild poliovirus type 1 (WPV1) in Malawi imported from Pakistan and of polio outbreak in Israel caused by 'circulating vaccine-derived poliovirus type 3' (cVDPV3) are visible signs of floundering polio eradication.
- When a virus in oral polio vaccine (OPV) de-attenuates by mutations, acquiring transmission efficiency and neurovirulence, it is called cVDPV.
- Every paediatric textbook warns that on rare occasions, OPV itself may cause vaccine associated paralytic polio (VAPP) in vaccinated children (vaccinated VAPP) and unvaccinated child-contacts (contact VAPP).
- The commonest cause of vaccinated VAPP is type 3 vaccine virus and for contact VAPP, it is type 2.
- These safety problems were known since 1964.
- For avoiding VAPP, rich countries immunize children with the inactivated polio virus vaccine (IPV), which is completely safe
- After WPV-2 was eradicated in 1999, the benefit of type 2 vaccine virus became

defunct.

- The ethical problem of risk without benefit was neglected until cVDPV2 caused several outbreaks, beginning in 2006, forcing the tOPV (trivalent oral polio vaccine) to bOPV switch in 2016.
- WHO experts recommended one dose of IPV at 14 weeks of age to mitigate further risks of cVDPV2 outbreaks.
- But that was too little too late, as more countries continue with cVDPV2 outbreaks than have WPV type 1.
- After wild virus type 3 was globally eradicated in 2012, vaccine virus type 3 had to be removed for avoiding VAPP. No agency has any right to cause VAPP in the name of eradication, especially after WPV-3 has been eradicated.

Strontium attack

The story so far:

- On April 7, Microsoft said it had disrupted cyberattacks from a Russian nation-state hacking group.
- The group called 'Strontium' by the software company targeted Ukrainian firms, media organizations, government bodies, and think tanks in the U.S. and the EU

What is Strontium?

- Strontium, also known as Fancy Bear, Tsar Team, Pawn Storm, Sofacy, Sednit or Advanced Persistent Threat 28 (APT28) group, is a highly active and prolific cyber-espionage group.
- It is one of the most active APT groups and has been operating since at least the mid-2000s, making it one of the world's oldest cyber-spy groups.
- It has access to highly sophisticated tools to conduct spy operations, and has been

attacking targets in the U.S., Europe, Central Asia and West Asia.

- The group is said to be connected to the GRU, the Russian Armed Forces' main military intelligence wing.
- The GRU's cyber units are believed to have been responsible for several cyberattacks over the years and its unit 26165 is identified as Fancy Bear

How does it attack networks?

- The group deploys diverse malware and malicious tools to breach networks. In the past, it has used X-Tunnel, SPLM (or CHOPSTICK and X-Agent), GAMEFISH and Zebrocy to attack targets.
- These tools can be used as hooks in system drivers to access local passwords, and can track keystroke, mouse movements, and control webcam and USB drives.
- They can also search and replace local files and stay connected to the network, according to a report by the U.K. National Cyber Security Centre (NCSC).

Netflix

The story so far:

- Streaming platform Netflix lost two lakh subscribers in the first quarter of its financial year and expects to lose another two million subscribers in the second quarter.
- It attributed the losses to geopolitical tensions in Ukraine, increasing competition and issues pertaining to household penetration referring to the consumption of content from a single account in a household and sharing outside the household

Why has there been a fall in paid subscriptions?

- Netflix stated that the percentage of its paying membership has not changed much over the years. This is because of the complicated dimension of sharing and

‘freeloading’.

- Netflix sharing is complicated. If a family of four views OTT content on the streaming platform estimates that in addition to 222 million paying households, Netflix is being shared with over 100 million additional households.
- While sharing an account within the household is reasonable, Netflix aspires to monetize the additional sharing with people, outside the household

How has the Russia-Ukraine war affected subscriptions?

- Netflix lost 7,00,000 paid subscribers following the suspension of its services in Russia.
- The OTT had suspended its services in Russia following the country’s invasion of Ukraine.
- Its businesses in Central and Eastern Europe the regions nearest to Russia experienced a slowdown each market, Netflix strives to ensure that the product mix incorporates subscription prices and the willingness and ability to pay.
- This is why subscription prices keep fluctuating at a regional level own.

Splinternet

- The splinternet (also referred to as cyber-balkanization or internet balkanization) is a characterization of the Internet as splintering and dividing due to various factors, such as technology, commerce, politics, nationalism, religion, and divergent national interests.
- In this internet is controlled by autonomous political blocs or any other controlling power—such as tech or e-commerce companies, or countries with diverging national interests tied to nationalism or religion.
- Clyde Wayne Crews, a researcher at the Cato Institute, coined the term “splinternet” in 2001 to describe "parallel internets that would be run as distinct,

private, and autonomous universes."

- Splinternet is often defined as the balkanization of the net, as nations try to preserve their sovereign identities and economic interests.
 - A fusion of the words "split" and "internet", the splinternet is a fragmented version of the world wide web with national identities.
 - The reasons for this 'split' include global politics, national security, religion and more.
-

H3N8

- China has recorded its first human infection with the H3N8 strain of bird flu, but the risk of its spread among people is low
- The H3N8 variant is common in horses and dogs and has even been found in seals.
- No human cases of H3N8 have been reported.
- Whole genome sequence analyses indicate that the H3N8 virus in this human case is a reassortant, with genes from viruses that have been detected previously in poultry and wild birds

H3N8

- H3N8 is a subtype of the species Influenza A virus that is endemic in birds, horses and dogs.
- It is the main cause of equine influenza and is also known as equine influenza virus.
- In 2011, it was reported to have been found in seals.
- Cats have been experimentally infected with the virus, leading to clinical signs, shedding of the virus and infection of other cats.

India green hydrogen policy

- India's Green Hydrogen Policy released on February 17, 2022 has addressed several critical challenges such as open access, waiver of interstate transmission charges, banking, time-bound clearances, etc., and is expected to further boost India's energy transition.
- India's per capita energy consumption is about one-third of the global average and one-twelfth of the U.S.
- Increasing growth and economic prosperity would significantly increase India's energy appetite furthering import dependence.
- This, coupled with volatility in prices, as seen during the Russia-Ukraine crisis and the roller-coaster ride of energy prices from historic lows in 2020 to record highs in 2021, could pose a serious threat to our energy security
- The new age fuel, hydrogen, is touted as India's gateway to energy independence.
- Hydrogen has a multifaceted role to play in the futuristic energy landscape, be it energy storage, long-haul transport, or decarbonisation of the industrial sector.

Hydrogen: a game-changer

- Hydrogen has a major role to play in the decarbonisation of India's transport sector.
- The advantages of fuel cell vehicles over battery electric vehicles are faster fuelling and long driving range thereby making them ideal for long-haul transportation which is a major constraint with Li Ion batteries.
- India's hydrogen consumption was around 7 Mt in 2020 and according to The Energy and Resources Institute (TERI), it is anticipated to leapfrog to about 28 Mt in 2050.
- Assuming 25% export capacity, we can expect a requirement of 35 Mt by 2050.

- On the basis of this assumption, we can calculate that India would require a tentative capacity in the range of 192 GW to 224 GW of electrolysis by 2050, assuming all of it is green hydrogen
- Apart from the ever-increasing electricity demand, the high cost of hydrogen manufacturing and water scarcity could also pose a challenge.
- Production of 1 kg of hydrogen by electrolysis requires around nine litres of water.
- Therefore, hydrogen project planning should be holistic and targeted in areas that are not water-scarce

Five-step strategy

On the demand side, a five-step strategy should be devised.

- Firstly, to create an initial demand, a mandate should be given to mature industries such as refining and fertilizers, with adequate incentives.
- Secondly, industries manufacturing low emission hydrogen-based products inter alia green steel and green cement need to be incentivized by government policies.
- Thirdly, blending hydrogen with natural gas can act as a big booster shot which can be facilitated by framing blending mandates, regulations and promoting H-CNG stations.
- Further, to promote FCEVs, hydrogen fuel stations may be planned on dedicated corridors where long-distance trucking is widespread.
- Lastly, the concept of carbon tariffs needs to be introduced on the lines of European countries

On the supply side too, a five-step strategy should be devised

- Firstly, investment in R&D should be accelerated to bring its cost at par with fossils.

- Secondly, Sustainable Alternative towards Affordable Transportation (SATAT) scheme with a target to produce 15 MMT of compressed biogas could be leveraged by exploring biogas conversion into hydrogen.
- Thirdly, to commercialize and scale-up nascent technologies, a Viability Gap Funding (VGF) scheme may be introduced for hydrogen based projects.
- Further, to secure affordable financing, electrolyser manufacturing and hydrogen projects need to be brought under Priority Sector Lending (PSL).
- Lastly, since two dominant cost factors for green hydrogen are renewable energy tariffs & electrolyser costs, and India has the advantage of one of the lowest renewable tariffs; the thrust should be on reducing the cost of electrolysers by implementing the Production Linked Incentive (PLI) scheme.
- This could help India become a global hub for electrolyser manufacturing and green hydrogen.
- Hydrogen could completely transform India's energy ecosystem by shifting its trajectory from an energy importer to a dominant exporter over the next few decades.
- India could export to projected future import centres like Japan, South Korea, etc.
- With hydrogen, India could lead the world in achieving Paris Agreement's goal to limit global warming to 2°C compared to pre-industrial level.

Indonesian palm oil export ban

The story so far:

- Indonesia, the world's biggest producer, exporter, and consumer of palm oil, will ban all exports of the commodity and its raw materials from April 28 to reduce domestic shortages of cooking oil and bring down its skyrocketing prices
- The announcement came amid surging global food prices as a consequence of the ongoing Russia-Ukraine conflict.

How important is palm oil to global supply chains?

- Palm oil is the world's most widely used vegetable oil with its global production in crop year 2020 exceeding 73 million tonnes (MT), according to the United States Department of Agriculture (USDA). Output is estimated to be 77 MT for the current year.
- Made from the African oil palm, it is used as cooking oil, and in everything from cosmetics to processed food to cleaning products.
- The oil palm industry has come under criticism for what are reportedly unsustainable production practices leading to deforestation, and exploitative labour practices carried forward from the colonial era
- According to Reuters, palm oil makes up 40% of the global supply of the four most widely used edible oils: palm, soybean, rapeseed (canola), and sunflower oil. Indonesia is responsible for 60% of the global supply of palm oil.

Why are the prices of edible oils rising?

- The prices of palm oil rose this year as demand increased because of the short supply of alternative vegetable oils.
- The production of soybean oil, the second most-produced oil, is expected to take a hit this year due to a poor end soybean season in major producer Argentina.
- The production of canola oil was hit in Canada last year due to drought; and supplies of sunflower oil, 80-90% of which is produced by Russia and Ukraine, has been badly hit due to the ongoing conflict.

How bad is Indonesia's palm oil crisis?

- Indonesia uses palm oil for cooking purposes. The palm oil used for cooking is made by processing crude palm oil (CPO).
- Due to short supply of alternative vegetable oils, lower-than-expected output

from the second-biggest palm oil producer Malaysia due to pandemic-induced labour shortage, the global food inflation linked to the pandemic and the Ukraine crisis, the global prices of CPO had risen significantly since the end of last year.

How will it impact India?

- India is the biggest importer of palm oil which makes up 40% of its vegetable oil consumption, as per the USDA.
- India meets half of its annual need for 8.3 MT of palm oil from Indonesia. Last year, the Centre also unveiled its plan to boost India's domestic palm oil production.
- Already grappling with record-high wholesale inflation, the late January export controls exercised by Indonesia had led to a 38% rise in the landed cost of CPO in India.
- The price of soybean oil, most consumed after palm oil, rose by 29% in the country this year; while sunflower oil, 90% of which India gets from Russia and Ukraine, stopped coming in almost completely.
- Amid this situation, India had requested Indonesia in March to increase palm oil shipments to make up for the short supply and expensive alternatives.
- Despite the rising prices of the commodity, India's palm oil imports jumped 21% in March from the previous month as traders moved to secure alternatives to sunflower oil that could no longer be bought from Ukraine

Human and Heatwaves

- India is gripped in the throes of a long spell of heatwaves and there is compelling evidence that a significant portion of it is due to human-induced climate change.
- the accumulation of greenhouse gases in the atmosphere exacerbated temperatures in the oceans and the land and caused increased glacier melt,

heightened sea level rise and led to changes in the biosphere

- Evidence of warming waters around glaciers and how it was heating even ice sheets, thereby accelerating warming.
- Though global sea-levels were rising only three millimeter a year, it would be a mistake to dismiss it as a minor rise because even those increases were responsible for driving greater numbers of extreme climate events such as flood if carbon emissions were unchecked, half the planet would be in severe drought by the century end.
- There was already a three-fold rise in extreme precipitation events in India, a decrease in rainfall in North India and increase in precipitation in south India,
- Along with carbon dioxide emissions, pollution from biomass burning combined with this and caused 1.5 million deaths annually in India.
- “India could cut its pollution by half just by providing clean cooking fuel to rural household in the Indo-Gangetic plains.
- Societal transformation, mitigating carbon dioxide emissions and adaption were all necessary to buffer against climate change,”

Subunit vaccines and adjuvants

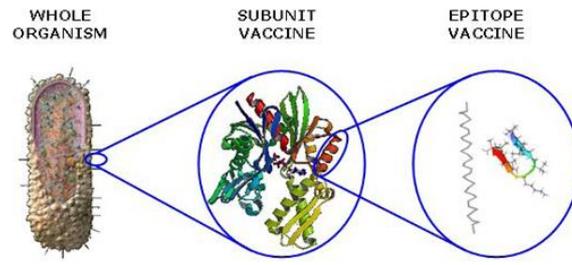
- The government plans to expedite the process of recognition of COVID-19 vaccine Corbevax by other countries while its manufacturer Biological E pursues WHO’s emergency use listing for the jab being administered in India among the 12-14 years age group

About Corbevax and subunit vaccine

- Corbevax is a protein subunit COVID-19 vaccine developed by Texas Children's Hospital Center for Vaccine Development and Baylor College of Medicine in Houston, Texas and Dynavax technologies based in Emeryville, California.
- It is licensed to Indian biopharmaceutical firm Biological E. Limited (BioE) for

development and production

- The vaccine consists of a version of the receptor binding domain (RBD) of the SARS-CoV-2 spike protein, together with the adjuvants aluminium hydroxide gel and CpG 1018.
- The protein is produced by the yeast *Pichia pastoris*; the process is similar to that of existing Hepatitis B vaccines.
- A subunit vaccine is a vaccine that contains purified parts of the pathogen that are antigenic, or necessary to elicit a protective immune response.
- A "subunit" vaccine doesn't contain the whole pathogen, unlike live attenuated or inactivated vaccine, but contains only the antigenic parts such as proteins, polysaccharides or peptides.
- Because the vaccine doesn't contain "live" components of the pathogen, there is no risk of introducing the disease, and is safer and more stable than vaccine containing whole pathogens.
- Other advantages include being well-established technology and being suitable for immunocompromised individuals.
- Disadvantages include being relatively complex to manufacture compared to some vaccines (such as RNA vaccine), possibly requiring adjuvants and booster shots, and requiring time to examine which antigenic combinations may work best.
- In immunology, an adjuvant is a substance that increases or modulates the immune response to a vaccine.
- The word "adjuvant" comes from the Latin word *adiuvare*, meaning to help or aid. "An immunologic adjuvant is defined as any substance that acts to accelerate, prolong, or enhance antigen-specific immune responses when used in combination with specific vaccine antigens."



+ *Delivery Mechanism:*
 recombinant protein,
 viral or bacterial vector,
 naked DNA,
 loaded onto APCs or liposome,
 etc.

+ **Adjuvant**