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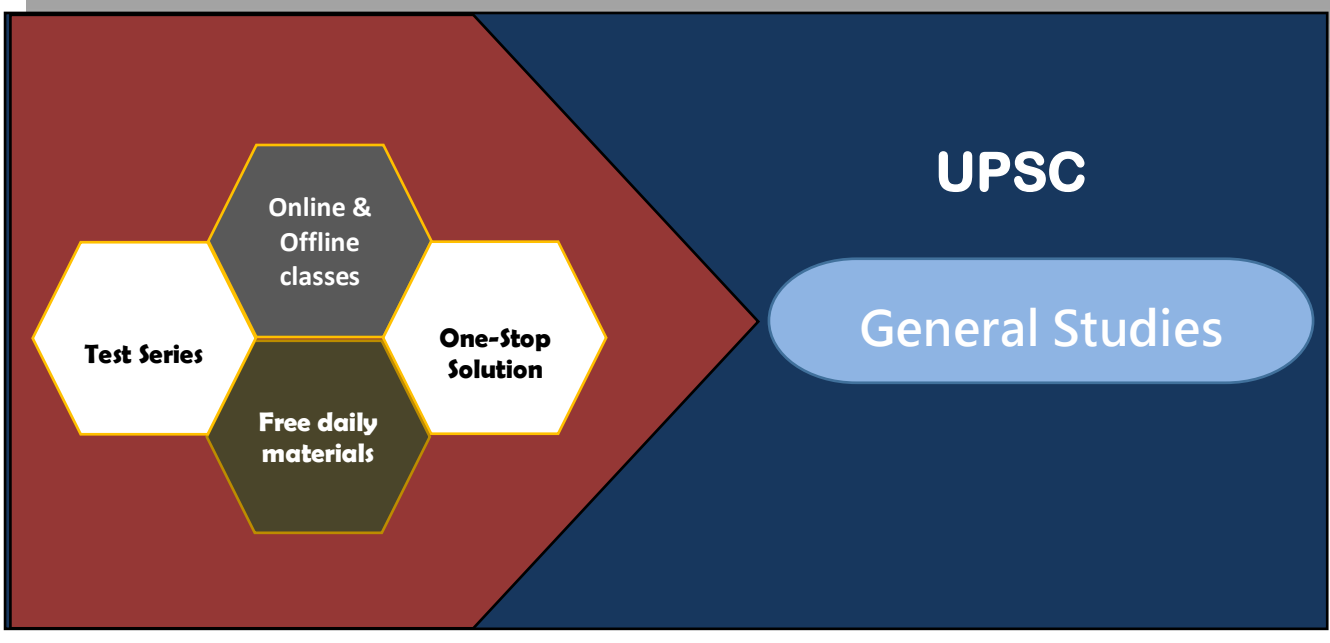
Articles of the day
THE HINDU & INDIAN EXPRESS



THE HINDU

GS 2 : Polity, Governance, International Relations

1. Rare earth metals at the heart of China-U.S. rivalry

Context:

- Recently, the U.S. Senate passed the **U.S. Innovation and Competition Act**, aimed at countering China's technological ambitions.
    - Among many other interventions, the bill also **aimed at improving American competitiveness in the rare earth metals market.** The bill includes several provisions to help improve critical minerals supply chains.

Background:

Rare earth metals:

- Rare earth metals are a **group of 17 elements** – lanthanum, cerium, praseodymium, neodymium, promethium, samarium, europium, gadolinium, terbium, dysprosium, holmium, erbium, thulium, ytterbium, lutetium, scandium, yttrium – that appear in low concentrations in the ground. They are lustrous silvery-white soft heavy metals.
- Although they are more abundant than their name implies, **they are difficult and costly to mine and process cleanly.**

Use of rare earth metals:

- Rare earths **find application in a wide range of products** including rechargeable batteries for electric and hybrid cars, advanced ceramics, computers, DVD players, wind turbines, catalysts in cars and oil refineries, monitors, televisions, lighting, lasers, fiber optics, superconductors, mobiles and glass polishing as well as **military jet engines, satellites and lasers**.
- Lanthanum is needed to manufacture night vision devices.
- These rare minerals **are essential to the manufacture of electric vehicles, wind turbines and drones** considered very important sectors in the coming future.
    - Rare earth minerals like neodymium, praseodymium and dysprosium, are crucial to the manufacture of magnets used in wind turbines and

electric cars. Hence **the transition to green energy is dependent on the availability of these critical rare earth metals.**

China's dominance in rare earth metals:

- The rare earth metals are **largely extracted and refined in China**.
  - Most of the rare earth metal reserves are located within China. After China, the major rare earth countries based on reserve volume are Vietnam, Brazil, and Russia.
  - China hosts most of the world's processing capacity and in 2017, **China accounted for 81% of the world's rare earth production.**
- In 2019, the U.S. imported 80% of its rare earth minerals from China, while the EU gets 98% of its supply from China.

Details:

- **Rising tensions between the United States and China** have sparked concerns over China's dominant position as a supplier of rare earths.
- China's dominance in the critical rare earth metals, key to the future of manufacturing, is a cause of concern for the U.S., given that **China could as well use its dominance in the sector to cut off supplies to the west in case of a geopolitical friction.**
  - Example – Japan accused China of halting rare earth supplies for political reasons (in the aftermath of a diplomatic dispute between China and Japan in 2010), sparking recognition worldwide of the risks of dependence on one supplier.
- Recognizing the fact that the failure to expand its semiconductor production, or reroute rare earths supply chains, could leave the U.S. at a strategic disadvantage in the years ahead, the act makes several recommendations in this regard.
  - The U.S. aims to **boost domestic production and processing of rare earths and lithium**, another key mineral component, while working with allies to **increase sustainable global supply and reduce reliance on competitors like China.**
  - **Recycling** has also emerged as a potential source for rare earth minerals. Scaling up recycling could help meet a substantial proportion of the demand for rare earth metals.

Additional information:

- The **Mountain Pass mine** is located in California, U.S.
  - The Mountain Pass Mine is an open-pit mine of rare-earth elements. In 2020 the mine supplied 15.8% of the world's rare-earth production.

2. Fight against authoritarianism, extremism, says PM at G7 meet

Context:

- India's participation in the special outreach sessions for guest countries at the G7 summit.

Major highlights:

- The Indian Prime Minister has stated that India being the world's largest democracy, qualifies as a **natural ally of the G7** to fight against threats of authoritarianism.
- India has also called for joint efforts in the **fight against terrorism and violent extremism, disinformation and infodemics and economic coercion.**
- The Indian administration has stated that it will study U.S. President Joseph Biden's proposal for a **"Build Back Better World" (B3W) initiative**, keeping in mind the principles of "transparency and inclusion".
- India has supported the call for a timely, transparent, expert-led, and science-based WHO-convened Phase 2 **COVID-19 Origins study**.
- India also sought **support from the G7 countries for the joint India-South Africa proposal for a TRIPS (Intellectual Property Rights) waiver** for coronavirus-related medicines and vaccines.
    - **The G7 has committed to donating a billion vaccines to poorer countries.**
- The Indian administration has stopped short of direct references to China as against the main 25-page G7 communique, which contained negative references to China on the issue of its aggression in the East and South China Sea, and human rights issues in Xinjiang.

GS 3 : Economy, Science and Technology,Environment

3. Planning for a biosecure future

Context:

- The article analyzes the **biosecurity concerns of synthetic biology**.

Synthetic biology:

- Synthetic biology is a field of science where **new organisms, biological parts and devices can be created and existing natural life forms can be redesigned.**
- Synthetic biology encompasses a broad range of methodologies from various disciplines, such as biotechnology, genetic engineering, molecular biology, molecular engineering, systems biology, membrane science, biophysics, chemical and biological engineering, electrical and computer engineering, control engineering and evolutionary biology.
- Due to more powerful genetic engineering capabilities and decreased DNA synthesis and sequencing costs, the **field of synthetic biology is rapidly growing**. There has been a rapid rise in synthetic biology in the last two decades.

Significance of synthetic biology:

- Genetic engineering is finding increasing application in the area of **medical treatment** by re-engineering cells. Genetic engineering is being used to modify plants to improve resistance to pests in crops and to induce desirable qualities like resistance to droughts, waterlogging and developing faster-growing dwarf varieties. This can help ensure **food security.**

Threat posed by synthetic biology:

- While synthetic biology can be used for human betterment, there are many risks associated with the technology which must be addressed before it becomes widely accessible.
    - Much is still to be understood of the possible **long term implications of genetic engineering.**
    - Insufficiently trained staff, inadequately safeguarded facilities, and lack of proper protocols can also lead to **accidental leaks of experimental pathogens**.
    - There is also the **possibility of deliberate misuse**. A planned attack using highly infectious pathogens synthetically engineered in a lab could have a devastating impact on the target country.

Lacunae in current approach to biosecurity:

Lack of focus on biosecurity:

- As against the focus on the threat posed by weapons of mass destruction like nuclear and chemical weapons, there has been **very little focus on threats emanating from biological sources**.
- Nuclear weapons, facilities and material are tightly controlled through strong treaties and institutional arrangements. Unlike this, the fields of biology or

synthetic biology are not regulated internationally despite growing military interest in synthetic biology applications and their potential misuse.

Ineffectiveness of the BTWC:

- There is the **Biological and Toxin Weapons Convention (BTWC) of 1972** which regulates bio-weapons, however, it suffers from the following shortcomings.
    - There is **no implementing body** to oversee this convention which almost renders the convention ineffective.
    - The BTWC also **does not have a verification clause**, **nor does it have clearly laid down rules and procedures to guide research** in the concerned field.
        - The BTWC while bans bio-weapons, **research for medical and bio-defence purposes are allowed.** This is liable for misuse since bio-defence research routinely uses pathogens and toxins for experimental purposes, processes, know-how and outcomes of bio-defence research could potentially be used to create bio-weapons.
    - Initiatives to enhance the transparency of treaty-relevant biological facilities and activities to help deter violations of the BTWC have not been accepted by the member states.

India's vulnerability:

- India remains grossly underprepared in the domain of biosecurity.
    - There is **poor disease surveillance** to detect any threat in its early stages.
    - **Insufficient coordination among various government departments** dealing with biosecurity issues.
        - Implementation of biosafety guidelines is the responsibility of the Science and Technology Ministry and the Environment Ministry. However, labs dealing with biological research are set up under the Indian Council of Medical Research and the Indian Council of Agricultural Research, which are under the Ministries of Health and Agriculture, respectively.
    - The **bad state of the healthcare system** renders India ineffective in tackling any possible outcomes of a bio attack.
    - India, with its **porous borders and ill-trained border control institutions**, is ill-prepared for defending against pathogens or dangerous biological organisms or agents arriving from abroad.

Conclusion:

- The COVID-19 pandemic and its devastating impact have challenged the traditional imagination of national security with even the most developed and rich countries crumbling under the impact of the pandemic.
- The COVID-19 pandemic should serve as a wake-up call to recognize the **biosecurity concerns of synthetic biology** and the national security studies henceforth will have to consider the threat posed by synthetic biology.
- COVID-19 pandemic is an indication of the potential impact of bio-weapons that can come from labs.
- In fact, all exponential technologies such as synthetic biology, artificial intelligence and nanotechnology have to be understood and regulated to counter any unforeseen national and global security implications.
    - Exponential technologies can be defined as those technologies that allow change at an accelerated speed.
- The **upcoming November 2021 BTWC review conference** must take stock of the advances in the field of synthetic biology, address the thinning line between biotechnology research and bio-weapons research, and consider international measures for monitoring and verification.

4. G7 agrees to boost climate finance, calls on others to join

Context:

- **Climate action deliberations in the ongoing G7 summit.**

Background:

Green Climate Fund:

- The Green Climate Fund (GCF) is a fund established within the **framework of the UNFCCC** as an **operating entity of the Financial Mechanism** to assist developing countries.
    - **The Copenhagen Accord**, established during the 2009 United Nations Climate Change Conference (COP-15) in Copenhagen first considered the idea of a Green Climate Fund.
    - GCF was formally established under the **Cancun Agreements in 2010** during the 2010 United Nations Climate Change Conference in Cancun.
- The objective of the Green Climate Fund is to **support projects, programmes, policies and other activities in developing country parties to help them in adaptation and mitigation practices** to counter climate change.
- The Fund has set itself a goal of **raising $100 billion a year by 2020.**
- The GCF is based in Incheon, South Korea.

Significance of Green Climate Fund:

Climate finance needed:

- **The World Economic Forum projects that by 2020, about $5.7 trillion will need to be invested annually in green infrastructure to meet the Paris agreement targets**. The poor and developing countries are not in a position to mobilize funds to this extent and therein lies the need for a dedicated funding mechanism like the Green Climate Fund.
- Climate finance will help the developing and underdeveloped countries cut carbon emissions and cope with global warming by enabling their shift to renewable and sustainable technology while also helping them adapt to climate change.

Higher per capita emission:

- **The G7 countries account for 20% of global carbon emissions while supporting a smaller proportion of the overall global population**. This necessitates the need for the G7 nations to reduce their GHG emissions and reduce their carbon footprint.

Legacy emission of the developed world:

- Also, given that the G7 nations consisting of some of the **richest economies have had the advantage of early development based on high carbon usage**, these nations need to shoulder some responsibility for their historical GHG emissions. This would be in line with the principle of **Common but Differentiated Responsibilities and Respective Capabilities (CBDR–RC).**
    - Common but Differentiated Responsibilities and Respective Capabilities (CBDR–RC) is a principle within the United Nations Framework Convention on Climate Change (UNFCCC) that acknowledges the different capabilities and differing responsibilities of individual countries in addressing climate change.

Disproportionate impact on the poor and developing countries:

- Also despite being the smallest contributors to the overall GHG emissions, **the poor and developing world continue to remain the most affected countries by climate change**. Their fragile economic and social conditions make them very vulnerable to the impacts of climate change. This necessitates the need for greater focus on these vulnerable countries and hence the need to provide financial assistance to them through climate finance. This would be in line with the **principle of climate justice.**

- Climate justice acknowledges the fact that climate change can have differing social, economic, public health, and other adverse impacts on underprivileged populations. Climate justice requires that these inequities be addressed through long-term mitigation and adaptation strategies. Climate justice examines concepts such as equality, human rights, collective rights, and the historical responsibilities for climate change.

Details:

- G7 leaders have pledged to **meet the climate finance target**.
  - The seven nations including the U.S., Britain, Canada, France, Germany, Italy and Japan have reaffirmed their commitment to jointly **mobilize $100 billion per year from public and private sources, through to 2025**.
- They have also agreed to **raise their contribution** to meet the overdue spending pledge and have also called upon other developed countries to join and enhance their contributions too.
  - Under the Paris Agreement in 2015, developed countries had agreed that prior to 2025 a new collective quantified goal from a floor of USD 100 billion per year shall be set.

Concerns:

- The **Climate finances pledges made so far remain substantially lower than the targeted amount**.
- Also, the pledges of cash promises lack specifics and hence cannot be counted as concrete commitments on climate finance.
- Some green groups were unimpressed with the climate pledges and have reiterated the demand on the rich economies to consider new and additional climate finance.

5. Cyberattacks reveal vulnerabilities in critical infrastructures

Civilian targets of cyberattacks

- Several high-profile cyberattacks were reported from the United States during the past several months.
- These attacks were all **primarily on civilian targets,** though each one was of critical importance.
- Obviously cyber, which is often referred to as **the fifth domain/dimension of warfare**, is now largely being employed against civilian targets.

- Most nations have been concentrating till date mainly on erecting cyber defences **to protect military and strategic targets,** but this will now need to change.

Challenges

- Defending civilian targets, and more so **critical infrastructure,** against cyberattacks such a**s ransomware and phishing** is almost certain to stretch the capability and resources of governments across the globe.
- The **distinction between military and civilian targets** is increasingly getting erased and the consequences of this could be indeterminate.
- In the civilian domain, two key manifestations of the 'cat and mouse game' of cyber warfare today, are **ransomware and phishing,** including spear phishing.
- **Banking and financial services** were most prone to ransomware attacks till date, but **oil, electricity grids, and lately, health care**, have begun to figure prominently.
- Ransomware attacks have skyrocketed, with demands and payments going into **multi-millions of dollars.**
- India figures prominently in this list, being one of the most affected.
- **Compromised 'health information'** is proving to be a vital commodity for use by cybercriminals.
- All indications are that cybercriminals are increasingly targeting a **nation's health-care system** and trying to gain access to patients' data.
- The available data aggravates the risk not only to the individual but also to entire communities.
- Cybercriminals are becoming more sophisticated, and are now engaged in **stealing sensitive data** in targeted computers before **launching a ransomware attack.**
- Also, today's cybercriminals, specially those specialising in **ransomware and similar attacks,** are different from the ordinary criminals.
- Many are known to practise 'reverse engineering' and employ **'penetration testers'** to probe high secure networks.

Way forward

- The need **to be aware of the nature of the cyber threat** to their businesses and take adequate precautionary measures, has become extremely vital.
- **Cybersecurity** essentially hinges on **data protection.**
- As data becomes the world's most precious commodity, **attacks on data and data systems are bound to intensify.**
- With mobile and cloud computing expanding rapidly cybersecurity professionals are now engaged in building a **'Zero Trust Based**

Environment', *viz.*, zero trust on end point devices, zero trust on identity, and zero trust on the network **to protect all sensitive data.**

- Building **deep technology in cyber** is essential.
- New technologies such as **artificial intelligence, Machine learning and quantum computing,** also present new opportunities.
- Pressure also needs to be put on officials in the public domain, as also company boards, to carry out regular **vulnerability assessments** and create necessary **awareness of the growing cyber threat.**

Conclusion

The threat posed by the cyberattacks highlights the need for improved defences against actual, and potential, cyberattacks by all countries across continents.

6. 498 crore for iDEX challenge

iDEX:

- The **Innovations for Defence Excellence (iDEX)** framework aims at the creation of an ecosystem to foster innovation and technology development in Defence and Aerospace by engaging industries including MSMEs, start-ups, individual innovators, R&D institutes & academia. It **provides them grants/funding and other support to carry out R&D** which has good potential for future adoption for Indian defence and aerospace needs.
- **iDEX will be funded and managed by the 'Defence Innovation Organization (DIO)'** which has been formed as a 'not for profit' company as per Section 8 of the Companies Act 2013.
- iDEX will function as the executive arm of DIO, carrying out all the required activities while DIO will provide high-level policy guidance to iDEX.
- The iDEX framework and establishment of the DIO by the Department of Defence Production (DDP) is aimed at **promoting innovation and indigenization in the aerospace and defence sector at the start-up level.**

Context:

- Defence Minister Rajnath Singh has approved the budgetary support of ₹498.8 crore to the Innovations for Defence Excellence (iDEX) challenge under the Defence Innovation Organisation (DIO) for the next five years.

7. The world is hardly wired for cyber resilience

Background:

- There have been a **series of high profile cyber attacks in recent months**.
  - The end of 2020 witnessed the **'SolarWinds' cyberattack** involving data breaches across critical wings of the U.S. government like defence, energy and state.
  - Early 2021 witnessed a **cyberattack by a Chinese group called Hafnium**. Thousands of U.S. organizations were hacked and remote control was gained over the affected systems.
  - Then there was the **ransomware attack on Colonial Pipeline** (which is the main supplier of oil to the U.S. East Coast) by Russia/East Europe-based cybercriminals, styled DarkSide. Colonial Pipeline had to pay out several million dollars as ransom to unlock its computers and release its files.
  - **A Russia-backed group, Nobellium, had launched a phishing attack** on 3,000 e-mail accounts, targeting USAID and several other organisations.
  - Recently **JBS SA**, the U.S. subsidiary of a Brazilian meat processing company, was the target of a **ransomware attack.**

Challenges:

Targeting critical civilian targets:

- Unlike the traditional approach to cyber warfare, **cyber attacks are now being employed against civilian targets of critical importance.** The fact that most nations have been concentrating mainly on cyber defences to protect military and strategic targets has left civilian targets vulnerable to attacks.
- Unlike previously where the banking and financial services were most prone to ransomware attacks, recently even oil, electricity grids, and health care are being increasingly targeted.
- Defending critical civilian targets against cyberattacks is almost certain to stretch the capability and resources of governments across the globe.

Increasing sophistication of the cybercriminals:

- The technical competence of cybercriminals has only increased. They have been employing advanced methods like '**penetration testers**' to probe high secure networks.
- **Zero day software vulnerabilities** are being increasingly used for cyber attacks such as **ransomware, phishing and spear phishing**.

- **A zero-day is a computer-software vulnerability** unknown to those who should be interested in its mitigation. Until the vulnerability is mitigated, hackers can exploit it to adversely affect programs, data, additional computers or a network.
- Ransomware is malware that employs encryption to hold a victim's information at ransom. A user or organization's critical data is encrypted so that they cannot access files, databases, or applications. A ransom is then demanded to provide access.
- Phishing is a type of social engineering attack often used to steal user data, including login credentials and credit card numbers or to deploy malicious software on the victim's infrastructure like ransomware. It occurs when an attacker, masquerading as a trusted entity, dupes a victim into opening an email, instant message, or text message.
- Spear phishing is the fraudulent practice of sending emails ostensibly from a known or trusted sender in order to induce targeted individuals to reveal confidential information.

- Cybercriminals are becoming more sophisticated in their modus operandi. They first steal sensitive data in targeted computers before launching a ransomware attack thus resulting in a kind of **'double jeopardy' for the targeted victim.**

Diversification of motivation for the attacks:

- The motivation for cyberattacks has also diversified beyond just **geopolitical and profits**, with **'insider threats'** due to discontent with the management or personal reasons also emerging as a possible threat.

Targeting of high value and vulnerable sectors:

- Notably, the number of **cyberattacks on healthcare systems has increased** and cybercriminals are increasingly trying to gain access to patients' data. The available data aggravates the risk not only to the individual but also to entire communities.

Challenges associated with data protection:

- With **data becoming valuable** in an increasingly digitized world, attacks on data and data systems are bound to intensify.
- More than three quintillion bytes of data are generated every day and several billion devices are interconnected to billions of endpoint devices and are exchanging petabytes of sensitive data, on the network. This is only bound to grow. **Ensuring data protection of this huge quantity of data is going to be a herculean task.**

Way forward:

Improve awareness and preparedness:

- Businesses need to be aware of the nature of the cyber threat to their businesses and take **adequate precautionary measures**.
- Officials in the public domain and also company boards need to carry out **regular vulnerability assessments and create necessary awareness of the growing cyber threat**.
- There is the need for improved defences against actual, and potential, cyberattacks by all countries across continents.

Zero trust-based environment:

- Cybersecurity professionals are now engaged in building a 'Zero Trust Based Environment', viz., zero trust on end point devices, zero trust on identity, and zero trust on the network to protect all sensitive data.
- Zero Trust Based environment technologies employ: software-defined solutions for **agile perimeter security, secure gateways, cloud access security, privileged access management, threat intelligence platforms, static and dynamic data masking**, etc.

Adopting deep technology:

- Building deep technology in cyberspace is essential. New technologies such as **artificial intelligence, machine learning and quantum computing** present new opportunities which need to be harnessed.

8. Tree of coffee family discovered in Andaman and Nicobar

Context:

- **A new species belonging to the genus of the coffee family** has recently been discovered from the Andaman Islands.

Details:

- The new species has been named ***Pyrostria laljii*.**
- The new species has been reported from the **Wandoor forest in South Andaman.**

  - The other places in the Andaman and Nicobar Islands where the tree could be located are the Tirur forest near the **Jarawa Reserve Forest and the Chidia Tapu (Munda Pahar) forest.**
- It is also the **first record of the genus Pyrostria in India.**
  - Plants belonging to the genus Pyrostria are usually found in Madagascar.
  - While the genus Pyrostria is not found in India, there are several genera from the family Rubiaceae that are common in India. These plants include cinchona, coffee, adina, hamelia, ixora, galium, gardenia, mussaenda, rubia, morinda.
- *Pyrostria laljii* has been **assessed as 'Critically Endangered'** based on the International Union for Conservation of Nature's (IUCN) Red List criteria.

THE INDIAN EXPRESS

GS 2 : Polity, Governance, International Relations

1. 47th G7 Summit

Why in News

Recently, the Indian Prime Minister addressed the **47th G7 Summit 2021** through video conferencing.

- Earlier, the Finance Ministers from the G7 nations reached a landmark accord setting a **Global Minimum Corporate Tax Rate (GMCTR).**
- Apart from **India, Australia and South Korea** were also invited to participate in the proceedings of the summit as **"guest countries".**
- This year's summit was **hosted by the UK.** The **last G-7 summit was in France in 2019,** with last year's event in the US canceled due to the **pandemic.**

Group of Seven (G7)

- It is an **intergovernmental organisation** that was formed in **1975.**
- The bloc **meets annually** to discuss issues of **common interest like global economic governance, international security and energy policy.**

- The G7 countries are the **UK, Canada, France, Germany, Italy, Japan and the US.**
  - **All the G7 countries and India are a part of G20.**
- The G7 **does not have a formal constitution or a fixed headquarters.** The decisions taken by leaders during annual summits are non-binding.

Key Points

- **Build Back Better for the World Project:**
  - It is aimed squarely at **competing with China's** trillion-dollar **Belt and Road infrastructure initiative,** which has been widely **criticised for saddling small countries with unmanageable debt** but has **included even G7 member Italy** since launching in 2013.
  - It will collectively catalyse hundreds of billions of infrastructure investment for low- and middle-income countries (in Asia and Africa) and offer a **values-driven, high-standard and transparent partnership with G7.**
- **Democracies 11:**
  - Signed off on a joint statement (Democracies 11) by G-7 and guest countries on "open societies" that **reaffirm and encourage the values of freedom of expression,** both online and offline, as a freedom that safeguards democracy and helps people live free from fear and oppression.
    - The statement also refers to **politically motivated internet shutdowns** as one of the threats to freedom and democracy.
    - While the statement is **directed at China and Russia, India has been under scrutiny** over **Internet curbs in Jammu and Kashmir** even as the Government is locked in a face-off over its **New IT rules 2021** with tech giants.
  - Democracies 11 is facing **threats to freedom and democracy** from rising authoritarianism, electoral interference, corruption, economic coercion, manipulation of information, including disinformation, online harms and cyber attacks, politically motivated internet shutdowns, human rights violations and abuses, terrorism and violent extremism.
- **Carbis Bay Declaration:**
  - The G7 signed the **Carbis Bay Declaration.** It is aimed at **preventing future pandemics.**
  - The G7 also **pledged over 1 billion coronavirus vaccine doses for poorer nations** with half of that coming from the United States and 100 million from Britain.
    - 11 billion doses are needed to vaccinate at least 70% of the world's population by mid-2022.

- The doses would come both directly and through the international **COVAX program**.

- **Climate Change:**
  - Renewed a pledge to **raise their contributions to meet an overdue spending pledge of USD 100 billion a year** to help poorer countries cut carbon emissions.
  - Promised **to halt and reverse biodiversity loss by 2030.**
  - Pledged to reach **net zero carbon emissions by 2050.**
- **Against China:**
  - The G-7 statement which was **not signed by India** and other outreach countries **hit out at China on "human rights and fundamental freedoms"** in **Xinjiang (Uyghur Muslims) and Hong Kong,** and the unilateral attempts to change the status quo in the **South China Sea.**
  - It also called for a transparent and timely **World Health Organization's Covid origins study in China.**
    - India had also called for the same in a **statement during the World Health Assembly.**
- **India's Stand:**
  - India is a **natural ally for the G7** countries in **defending the shared values** from a host of threats stemming from authoritarianism, terrorism and violent extremism, disinformation and economic coercion.
  - Expressed concerns that **open societies are particularly vulnerable to disinformation and cyber-attacks.**
  - It sought the support of the grouping to **lift patent protections for Covid-19 vaccines.**
  - Planet's atmosphere, biodiversity and oceans cannot be protected by countries acting in silos, and **called for collective action on climate change.**
    - India is the only G-20 country on track to meet its Paris commitments.
  - Developing countries need better access to climate finance, and **called for a holistic approach towards climate change** that covers mitigation, adaptation, technology transfer, climate financing, equity, climate justice and lifestyle change.
  - Highlighted the **revolutionary impact of digital technologies** on social inclusion and empowerment in India through applications such as **Aadhaar**, **Direct Benefit Transfer (DBT)** and **JAM (Jan Dhan-Aadhaar- Mobile) trinity.**

2. National AI Portal

Why in News

The **'National AI Portal',** celebrated its **first anniversary on 28th May, 2021.**

Key Points

- **About the National AI Portal:**
  - It is **a joint initiative by the Ministry of Electronics and IT (MeitY), National e-Governance Division (NeGD) and NASSCOM.**
    - **NeGD:** In 2009, NeGD was created as an Independent Business **Division under the Digital India Corporation** (a not-for-profit company set up by MeitY).
    - **NASSCOM:** A **not-for-profit industry association**, is the **apex body for the IT and IT enabled products and services sector** in India.
  - It serves as **a central hub for Artificial Intelligence (AI) related news, learning, articles, events and activities etc.**, in India and beyond.
- **About Artificial Intelligence (AI):**
  - It describes the **action of machines accomplishing tasks** that have historically required human intelligence.
  - It includes technologies like **machine learning, pattern recognition, big data, neural networks, self algorithms etc.**
  - AI involves complex things such as **feeding a particular data into the machine and making it react as per the different situations.**
  - AI is being **used across different industries** including finance and healthcare.
  - As per a report by PwC, India reported **a 45% increase in the use of AI**, the highest among all countries, following the outbreak of the virus.
- **Recent Examples of Use of AI in India:**
  - **For the Covid-19 Response:** An **AI-enabled Chatbot**was used by **MyGov** for ensuring communications.
  - **In Judicial System:** An AI based **portal 'SUPACE'** is aimed at assisting judges with legal research.
  - **In Agriculture:** ICRISAT has developed an **AI-power sowing app**, which utilises weather models and data on local crop yield and rainfall to more accurately predict and advise local farmers on when they should plant their seeds.
  - **In Disaster Management**: An **AI-based flood forecasting model** that has been **implemented in Bihar** is now being expanded to cover the whole of India to ensure that around 200 million people get alerts and warnings 48 hours earlier about impending floods.

- **In Banking & Financial Services Industry:** Few banks in India have adopted AI **to increase digitisation to improve customer experience and use algorithms in risk** management (for example, fraud detection).

- **Initiatives Taken to Boost Use of AI:**
  - The **National Strategy for Artificial Intelligence** (NITI Aayog, June 2018) which is focused on inclusive AI (AI for all), and the **New Education Policy** (NEP, 2020) which addresses the need to inculcate AI in the curriculum are the right strategic steps to encourage core and applied research.
  - The **Ministry of Tribal Affairs (MTA)** has inked a **MoU with Microsoft** to support the **digital transformation of schools such as Eklavya Model Residential Schools (EMRS)** and Ashram Schools, among others under the Ministry.
  - **US India Artificial Intelligence (USIAI) initiative** has been launched to scale up the science and technology relationship between India and the United States.
  - In 2020, India joined the **'Global Partnership on Artificial Intelligence (GPAI)'** as a founding member to support the responsible and human-centric development and use of AI.
  - **'RAISE 2020 - Responsible AI for Social Empowerment 2020'**, a mega virtual summit, was jointly organised by the NITI Aayog and the MeitY.
  - The larger aim of the program **"Responsible AI for Youth"** is to provide an equal opportunity to all Indian youths - in urban, rural and remote corners of India - to become human-centric designers who can create real AI solutions to solve economic and social impact issues of India.
- **Barriers to Adoption of AI:**
  - **Limited understanding of AI**: Many Indian companies may have not yet understood the full benefits of leveraging AI in their companies.
  - **Low Investments and Less Evolved Startup Ecosystem:** Startup/investment funding ecosystem in India is yet to scale up in terms of AI startups and service providers.
  - **Limited Availability of AI Trained Talent:** There is limited infrastructure to 'democratise' and scale-up important AI skills such as deep learning and neural networks.

Way Forward

- **Global Lessons:** Countries like China, USA and Israel currently lead the way in terms of AI adoption. India can consider a few learnings from these countries to further scale-up its AI ecosystem while keeping in mind the overall social development and inclusiveness agenda.

- **Clear Central Strategy and Policy Framework:** AI adoption in India can be accelerated through the formulation of more focused policies related to innovation, for example, patent control and security. **Malicious use of AI** should be managed as well.
- **Collaboration among Government, Corporates and Academia:** These three critical stakeholders need to work synergistically to undertake actions like nurturing entrepreneurship, promoting re-skilling, encouraging research and development, and driving the policies on the ground.

GS 3 : Economy, Science and Technology,Environment

3. Polar-Areas Stellar-Imaging in Polarisation High-Accuracy Experiment (PASIPHAE)

The development of a vital instrument PASIPHAE, which will be used in upcoming sky surveys to study stars, is being led by an Indian astronomer.

What is PASIPHAE?

- PASIPHAE stands for Polar-Areas Stellar-Imaging in Polarisation High-Accuracy Experiment.
- It is an international collaborative sky surveying project. Scientists aim to study the polarisation in the light coming from millions of stars.
- The name is inspired by Pasiphae, the daughter of Greek Sun God Helios.
- The survey will use two high-tech optical polarimeters to observe the northern and southern skies, simultaneously.
- It will focus on capturing starlight polarisation of very faint stars that are so far away that polarisation signals from there have not been systematically studied.
- By combining the data, astronomers will perform a maiden magnetic field tomography mapping of the interstellar medium of very large areas of the sky using a novel polarimeter instrument known as WALOP.

Why is PASIPHAE important?

- Since its birth about 14 billion years ago, the universe has been constantly expanding, as evidenced by the presence of Cosmic Microwave Background (CMB) radiation which fills the universe.
- Immediately after its birth, the universe went through a short inflationary phase during which it expanded at a very high rate before it slowed down and reached the current rate.
- However, so far, there have only been theories and indirect evidence of expansion associated with the early universe.
- A definitive consequence of the inflationary phase is that a tiny fraction of the CMB radiation should have its imprints in the form of a specific kind of polarisation (known scientifically as a B-mode signal).
- All previous attempts to detect this signal met with failure mainly due to the difficulty posed by our galaxy, the Milky Way, which emits copious amounts of polarized radiation.
- Besides, it contains a lot of dust clouds that are present in the form of clusters. When starlight passes through these dust clouds, they get scattered and polarized.

What will PASIPHAE do?

- The PASIPHAE survey will measure starlight polarisation over large areas of the sky.
- This data along with distances to the stars will help create a 3-Dimensional model of the distribution of the dust and magnetic field structure of the galaxy.
- Such data can help remove the galactic polarized foreground light and enable astronomers to look for the elusive B-mode signal.

What is WALOP?

- Wide Area Linear Optical Polarimeter (WALOP) is an instrument when mounted on two small optical telescopes, that will be used to detect polarized light signals emerging from the stars along high galactic latitudes.
- The images will simultaneously have the finest of details of a star along with its panoramic background.
- WALOP will operate on the principle that at any given time, the data from a portion of the sky under observation will be split into four different channels.
- Depending on the manner in which light passes through the four channels, the polarisation value from the star is obtained.
- That is, each star will have four corresponding images which when stitched together will help calculate the desired polarisation value of a star.

4. Mustard oil blending is now banned

The Food Safety and Standards Authority of India had decided this on March 31. This would end the practice to add other edible oil (like palms, rice bran, etc) to mustard oil.

Why such move?

- This is good news for mustard farmers whose fortunes were adversely hit as up to a fifth of mustard oil volume could earlier be blends of other oils.
- But why did India start the practice in the first place? And how has it affected consumer health?

Why did the blending begin?

- The Union health ministry had allowed blending in edible vegetable oil in a notification in 1990.
- In 1998, Delhi and other north Indian states witnessed the dropsy epidemic — a disease that caused swelling in the body due to the build-up of fluid in tissues.
- At least 60 people died and 3,000 were hospitalized in the national capital.
- Researchers believed the consumption of mustard oil caused the disease.

Adulteration is hazardous

- Upon investigation, it was found to be adulterated with Argemone Mexicana, a kind of weed that grows with yellow flowers.
- The adulteration, however, was highly suspicious: While mustard is a rabi crop that is cultivated in the winters, Argemone Mexicana grows in April-May.
- This meant that the possibility of mixing mustard seeds with that Argemone mexicana was rare.
- The suspicious adulteration stoked fear among the masses. It started a campaign against the consumption of oil.
- Several studies have found mustard oil unsafe for consumption.

The 1990 decision

- Experts have claimed that the blending of mustard oil was not only dangerous to health but also adversely impacted mustard farming.
- Some groups have also flagged the blending of refined oil.

- Following the Union health ministry's 1990 notification allowing for the blending of edible vegetable oil, the FSSAI rolled out regulations in the regard in 2006.
- Producers and other companies involved in blending were regularised through the Agriculture Produce (Grading and Marking) Act (AGMARK).
- It also made it mandatory to write the kind of oil used for blending over the packet.
- The companies involved in blending strongly advocated for the cause, despite reports about its excess and unregulated use. The governments over the years have been tight-lipped about it.

Has blending led to dependence over the import of oil?

- In 1990-91, India was self-reliant in mustard oil production and produced 98 percent of the oil needed.
- Blending mustard oil with other edible oils considered to bolster nutritional profile, taste, and quality.
- Despite the harmful effects, the processing industry took advantage of blending.
- Cheap palm oil would be blended up to 80 percent in mustard oil sometimes.
- As a result, profits of mustard farmers dried up, which discouraged them from cultivating the crop.
- This could be one of the reasons behind India's increasing dependency on oil imports over the last two decades.

5.PASIPHAE: A Sky Surveying Project

Why in news

The **Wide Area Linear Optical Polarimeter (WALOP),** a **vital instrument for the PASIPHAE Project,** is being **developed at Inter-University Centre for Astronomy and Astrophysics (IUCAA), India.**

- **Polar-Areas Stellar-Imaging in Polarisation High-Accuracy Experiment (PASIPHAE)** is **an international collaborative sky surveying project.**

Astronomical Polarimetry

- Polarimetry, **a technique to measure the polarisation of light,** is a powerful tool that allows astronomers to infer information about celestial objects, from passing comets to distant galaxies, that can not be obtained using other techniques.

- **Polarization** is **a property of light that represents the direction that the light wave oscillates.**
- Two decades ago, an Indian astrophysicist Sujan Sengupta, put forth an idea, that the light emitted by a **cloudy brown dwarf**, or reflected off an **extrasolar planet**, will be polarised.

Key Points

- **About the PASIPHAE Survey:**
  - It is an **opto polarimetric survey** aiming to **measure the linear polarization from millions of stars.**
  - The survey **will use two high-tech optical polarimeters to observe the northern and southern skies,** simultaneously.
  - The survey **will be conducted** concurrently from the **South African Astronomical Observatory in Sutherland,** South Africa in the **southern hemisphere,** and the **Skinakas Observatory in Crete, Greece,** in the **north.**
  - It will focus on **capturing starlight polarisation** of very faint stars that are so far away that polarisation signals from there have not been systematically studied.
  - The distances to these stars will be obtained from measurements of the **GAIA satellite.**
    - GAIA is on a **mission to chart a three-dimensional map of our Galaxy,** the Milky Way, in the process revealing the composition, formation and evolution of the Galaxy. It is **a European Space Agency astronomical observatory mission.**
  - Scientists from the University of Crete, Greece, Caltech, USA, **IUCAA, India,** the South African Astronomical Observatory and the University of Oslo, Norway, are involved in this project, steered by the Institute of Astrophysics, Greece.
- **Importance of the Project:**
  - Since its birth about 14 billion years ago, the **universe has been constantly expanding,** as evidenced by the presence of **Cosmic Microwave Background (CMB) radiation** which fills the universe.
    - The **Milky Way Galaxy contains a lot of dust clouds** that are present in the form of clusters. When **starlight passes through these dust clouds,** they **get scattered and polarised.**
  - The PASIPHAE polarimetric map **will be used to perform magnetic tomography of the Milky Way Galaxy.**
    - That is, it will **deduce the 3-dimensional structure of the magnetic field and the dust that resides in our own Galaxy.**

- This map will **provide invaluable information for future CMB B-mode experiments** searching for inflationary **gravitational waves.**
- The **B-mode experiment** was used **to test the theory of cosmic inflation** and distinguish between inflationary models of the very early universe by making precise measurements of the polarization of the Cosmic Microwave Background (CMB).
- According to the **theory of inflation,** the **early Universe expanded exponentially fast for a fraction of a second** after the **Big Bang.**

- Beyond studies of the early Universe, the survey will **lead to leaps forward in some of the most actively pursued areas in Astrophysics,** including high-energy astrophysics, stellar astrophysics, and interstellar medium dynamics.

- **Wide Area Linear Optical Polarimeter (WALOP):**
  - It was **planned in 2013** after the success of the **RoboPol experiment survey during 2012-2017.**
    - WALOP and its predecessor RoboPol **share the photometry (measurement of the brightness of celestial objects) principle.**
    - But the **WALOP will be capable of observing hundreds of stars concurrently** present both in the northern and the southern skies as opposed to RoboPol, which has a much smaller field of view in the sky.
  - **Working Principle:**
    - WALOP will operate on the principle that at any given time, the data from a portion of the sky under observation will be split into four different channels.
    - Depending on the manner in which light passes through the four channels, the polarisation value from the star is obtained.
      - That is, each star will have four corresponding images which when stitched together will help calculate the desired polarisation value of a star.
  - **Installation:**
    - A WALOP each will be mounted on the 1.3-metre Skinakas Observatory, Crete, and on the 1-metre telescope of the South African Astronomical Observatory located in Sutherland.

Prelims Practice Questions

1. Consider the following statements:

1. Seabuckthorn is a shrub found in the cold desert of India.
2. The cold desert of India stretches from Ladakh to Sikkim in the Himalayas.

Which of the statements given above is/are correct?

A 1 only
B 2 only
C Both 1 and 2
D Neither 1 nor 2

Answer : A

Explanation

- **Seabuckthorn** is a **shrub** which produces an orange-yellow coloured edible berry.
  - In India, it is found above the tree line in the Himalayan region, generally in dry areas such as the **cold deserts** of Ladakh and Spiti. **Hence, statement 1 is correct.**
  - A major part is covered by this plant in Himachal Pradesh, Ladakh, Uttarakhand, Sikkim and Arunachal Pradesh.
- **The cold desert of India** is situated in the Himalayas and **stretches from Ladakh** in the north **to Kinnaur** (in the state of **Himachal Pradesh**) in the south. **Hence, statement 2 is not correct.**
  - The region has harsh climatic conditions such as very low rainfall and very high elevation (ranging from 3000–5000m Above Sea Level)] that adds to the coldness in its environment.
  - The soil is not very fertile and the climatic conditions allow very short growing seasons making it a bare landscape

2. "Dustlik", recently seen in the news, is a town in which country?

a. Kazakhstan
b. Iran
c. Uzbekistan
d. Afghanistan

Answer: c

Explanation:

- India-Uzbek joint exercise Dustlik-II commenced at Ranikhet (Uttarakhand).
- It is named after Dustlik, a town in the Jizzakh region of Uzbekistan.
- This is the Second Edition of the annual bilateral joint exercise of both armies.
- The first edition was held in Uzbekistan in 2019.

3. With reference to Bhadar River, consider the following statements:

1. Bhadar river originates from Malwa Plateau region.
2. It flows through the Aravali and finally meets the Arabian sea.

Which of the statements given above is/are correct ?

A 1 only
B 2 only
C Both 1 and 2
D Neither 1 nor 2

Answer : D

Explanation

- The Bhadar is one of the major rivers of Kathiawar (Saurashtra) peninsula in Gujarat.
  - It **originates near Vaddi in Rajkot** district at an elevation of 261 m above mean sea level. **Hence, statement 1 is not correct.**
- It **flows through the Saurashtra region (does not cross the Aravali Range)** and finally confluence with Arabian sea at Naviobandar (Porbandar). **Hence, statement 2 is not correct.**
  - The total length of this river is 198 km. It drains about 1/7th of the area of Saurashtra

4. With respect to the National Population Register (NPR):

1. It is a Register of all the citizens of India only.
2. The NPR was earlier collated in 2010 and 2015.
3. It is mandatory for every usual resident of India to register in the NPR.

Which of the given statement/s is/are INCORRECT?

a. 1 only
b. 2 and 3 only

c. 1 and 3 only
d. 2 only

Answer: a

Explanation:

- National Population Register is a register of usual residents of the country.
- NPR is different from both the decennial census and the National Register of Citizens (NRC).
- The objective of the NPR is to create a comprehensive identity database of every usual resident in the country.
- It is mandatory for every usual resident of India to register in the NPR.
- For the purpose of the NPR, a usual resident is defined as a person who has resided in a local area for six months or more or a person who intends to reside in that area for the next six months or more.
- The NPR earlier collated in 2010 and 2015 has an electronic database of more than 119 crore residents.

5. SIG-716 assault rifles are acquired by India from which country?

a. Russia
b. Israel
c. France
d. United States of America

Answer: d

Explanation:

- SIG-716 assault rifles are American LMG.
- Light Machine Guns (LMGs) are designed to be employed by an individual soldier, with or without an assistant, as an infantry support weapon.

6. Consider the following statements with respect to Singhori Wildlife Sanctuary:

1. It is located in Uttarakhand.
2. Project Tiger was launched in Singhori Wildlife Sanctuary.

Which of the given statement/s is/are correct?

a. 1 only

b. 2 only
c. Both 1 and 2
d. Neither 1 nor 2

Answer: d

Explanation:

- Singhori Wildlife Sanctuary is located in Madhya Pradesh.
- Project Tiger was launched in Jim Corbett National Park of Uttarakhand in 1973.

Mains Practice Questions

1. Describe the procedure of amendment of the Constitution of India under Article 368. Why this amendment procedure has been often criticized? (150 words)

Approach

- Briefly mention the Constitutional provisions regarding amendment of the Constitution
- Explain the procedure of amendment of the Constitution of India under Article 368
- Give reasons as to why this procedure has been criticized often.

2. The linguistic reorganization of states resulted in rationalizing the political map of India without seriously weakening its unity. Examine. (250 words)

Approach:

- Briefly discuss the linguistic reorganisation of states in India.
- Describe how linguistic reorganisation has resulted in administrative efficacy and strengthened Indian unity.
- Discuss a few challenges related to linguistic reorganisation.