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AI and cyber, the double helix of today's security threats

Prelims : General Studies Paper I

Current events of national and international importance

Mains: General Studies 3

Awareness in the fields of IT, Space, Computers, robotics, nano-technology, bio-technology and issues relating to intellectual property rights.

Why in Focus?

- The rapid advancement of **Artificial Intelligence (AI)** is transforming the global **cybersecurity** and **national security** landscape.
- The growing use of **Agentic AI** and AI-powered cyber tools has raised concerns over **cyber attacks**, **autonomous warfare**, and the need for stronger AI governance.

Agentic AI is an AI system that can perform specific tasks autonomously with minimal human supervision. It consists of AI agents-machine learning models that imitate human decision-making to solve problems in real time.

Generative AI is a type of artificial intelligence (AI) that can create original content such as text, images, videos, audio, and software code in response to a user's prompt or request.

Zero Trust is a cybersecurity model based on the principle of "never trust, always verify." It continuously verifies the **user**, **device**, and **risk level** before granting or maintaining access.

Key Highlights

- **AI-powered malware** can adapt to changing environments, making cyber attacks more difficult to detect and prevent.
- **Large Language Models (LLMs)** and **Agentic AI** are increasingly being used across businesses, defence, and cybersecurity.
- **Agentic AI** can perform tasks **autonomously**, making it more powerful and potentially riskier than **Generative AI**.
- AI has transformed modern warfare by improving **missile detection**, **target tracking**, **intelligence gathering**, and **autonomous weapon systems**.
- Advanced AI systems could enable **non-state actors** and **rogue groups** to carry out sophisticated cyber attacks once possible only for nation states.
- AI systems can produce **hallucinations**, **biased decisions**, and **algorithmic radicalisation**, raising concerns over excessive reliance on AI.
- The article stresses the need to keep **human oversight** over AI systems, especially in **defence** and **national security**.



Challenges / Issues

- Increasingly sophisticated **AI-powered cyber attacks** are becoming harder to detect and counter.
- Existing **cybersecurity frameworks** and **Zero Trust protocols** may become inadequate against advanced AI threats.
- Lack of comprehensive **global rules** and **governance frameworks** for advanced AI.
- Risks arising from **AI bias, hallucinations, and autonomous decision-making** in critical sectors.
- Intensifying **AI competition** between major powers such as the **United States** and **China**.

Way Forward

- Develop robust **AI governance** and **international regulatory frameworks**.
- Strengthen **cybersecurity systems** to counter AI-enabled threats.
- Ensure **human oversight** in defence, national security, and other critical AI applications.
- Promote **responsible, transparent, and ethical** development and deployment of AI.
- Enhance international cooperation to address emerging **AI** and **cybersecurity** challenges.

Mains Question

“Artificial Intelligence has emerged as both a force multiplier and a security challenge in cyberspace. Discuss the opportunities and risks associated with AI-enabled cybersecurity and the need for effective AI governance.” (250 Words)

Critical minerals, the foundation of strategic power

Prelims: General Studies Paper 1

Current events of national and international importance

Mains: General Studies 2

Distribution of key natural resources across the world (including South Asia and the Indian subcontinent)

Why in Focus?

- The editorial **highlights that critical minerals have become central to economic security, clean energy transition, and industrial strategy.**
- It argues that **India must move beyond resource availability and build robust processing, refining, and supply chain capabilities** to reduce strategic dependence.

Key Highlights

- Critical minerals such as **lithium, cobalt, nickel, graphite, copper, and rare earth elements** are essential for electric vehicles, renewable energy, semiconductors, defence, AI, and advanced manufacturing.
 - Global mineral supply chains are highly concentrated, with the top three refining countries** controlling about 86% of major critical mineral refining, while **China leads in 19 of 20 strategic minerals.**
 - Rising demand from clean energy and digitalisation, coupled with geopolitical developments** such as China's 2025 rare earth export controls, has made mineral security a major strategic concern.
 - India's demand for critical minerals is projected to rise sharply**, with cumulative demand reaching around 169 million tonnes by 2070.
 - India possesses significant reserves of graphite, copper, nickel, cobalt, and rare earth-bearing monazite**, but remains import-dependent for several key minerals.
 - The National Critical Mineral Mission (NCMM) aims to strengthen the value chain through 1,200 exploration projects, production of at least 15 critical minerals, and acquisition of 50 overseas mining assets by 2030–31.**
- National Critical Mineral Mission (NCMM):** Launched in January 2025, the NCMM aims to strengthen India's critical minerals value chain through exploration, mining, processing, recycling, and overseas asset acquisition to ensure long-term mineral security
- India has also strengthened **international cooperation through the Khanij Bidesh India**



Limited (KABIL) lithium project in Argentina, the proposed rare earth corridors, and the India–U.S. Critical Minerals and Rare Earths Framework (2026).

India–U.S. Critical Minerals and Rare Earths Framework (2026): A bilateral framework aimed at strengthening cooperation in critical minerals through secure supply chains, investment, technology collaboration, and diversification of rare earth processing.

Implications

- **Heavy dependence on China for processing** exposes India to supply chain risks.
- **Limited exploration, slow approvals, weak processing capacity, and low private investment** hinder domestic production.
- **Recycling cannot meet near-term demand** due to limited feedstock and technology.
- **Strengthening refining, strategic stockpiles, overseas sourcing, and R&D** is vital for India's mineral security.

Way Forward

- **Expand domestic processing and refining through incentives** and technology support.
- **Accelerate exploration and mining with faster approvals** and greater private participation.
- **Build strategic stockpiles** to reduce supply risks.
- Diversify overseas mineral sourcing through global partnerships.
- **Strengthen R&D and advanced processing** for high-purity mineral production.
- **Scale up recycling** and integrate it into supply planning.
- **Adopt a comprehensive critical minerals strategy** with clear targets and coordinated implementation.

Mains Question

“Critical minerals are emerging as strategic assets in the global clean energy transition. Discuss the challenges facing India's critical mineral security and examine the measures required to build resilient and diversified supply chains.” (250 Words)

Why has PoK erupted in protests?

Prelims: General Paper 1

Current events of national and international importance.

Mains: General studies 2

India and its neighborhood- relations.

Why in Focus?

- Protests in Pakistan-occupied Kashmir (PoK) during ongoing elections have turned violent, leading to deaths and raising concerns about governance, representation, and human rights.
- The issue is important due to its **impact on regional stability and India-Pakistan relations**.

Key Highlights:

- A mass protest movement led by the **Jammu Kashmir Joint Awami Action Committee (JKJAAC)** is ongoing against rising inflation, lack of accountability, and alleged **rigging of elections**.
- Elections are being held in three phases (July 27-August 11) for a **53-member legislature (45 elected + 8 nominated)**.
- A key issue is that **12 out of 45 elected seats are reserved** for refugees from Jammu & Kashmir (post-1947), whose voters live outside PoK; this reduces **local representation** and increases Islamabad's influence.
- The movement began after the **COVID-19 pandemic** over price rise and gradually expanded into a broader demand for **political rights, fair governance, and representation**.
- Security forces responded with **heavy force**, including firing on protesters; several people were killed, and the death of activist **Osama Jaleel** further intensified the protests.
- There is long-standing resentment that **Pakistan's central leadership (Islamabad)** has failed to address development needs and has maintained tight control over PoK.
- India's **Ministry of External Affairs (MEA)** criticized the crackdown, while **Amnesty International** called for restoring communication and allowing independent observers.



Amnesty International is a global non-governmental organization (NGO) founded in **1961** by **Peter Benenson** in London, working to promote and protect **human rights worldwide**.

Implications:

- The situation reflects a **democratic deficit**, where limited autonomy and unfair representation weaken trust in the political system.
- Reports of **human rights violations** such as excessive force, deaths, and communication blackout raise serious concerns.
- Continued unrest may lead to **long-term instability or radicalization**, similar to other conflict-prone regions.
- The region's location near the **Line of Control (LoC)** makes it strategically sensitive and may increase tensions between India and Pakistan.
- Lack of development and governance failures are creating **deep public dissatisfaction and alienation**.
- Competing narratives by India and Pakistan may lead to **international attention and diplomatic complications**.

Way Forward:

- Conduct **free, fair, and transparent elections**, and review the reservation of refugee seats to improve local representation.
- Start **inclusive dialogue** with protest groups, civil society, and political stakeholders to address grievances.
- Ensure **protection of human rights** by reducing use of force, restoring internet and communication, and allowing media access.
- Focus on **economic development**, including controlling inflation, improving infrastructure, and creating employment opportunities.
- Promote **confidence-building measures (CBMs)** and peaceful engagement to reduce tensions in the region.

Mains Question:

"The ongoing protests in Pakistan-occupied Kashmir are rooted in issues of governance, representation, and human rights. Discuss the causes of the unrest and examine its implications for regional stability and India-Pakistan relations."(15 mark, 250 words)

Why lab-grown diamonds are sustainable alternative to mined stones

Prelims: General Studies Paper 1

Current events of national and international importance

Mains: General Studies 2

Distribution of key natural resources across the world (including South Asia and the Indian subcontinent)

Why in Focus?

- The **editorial highlights the growing importance of lab-grown diamonds (LGDs) as a sustainable, ethical, and economically viable alternative** to mined diamonds amid declining natural reserves and rising environmental concerns.

Lab-Grown Diamonds (LGDs): Diamonds created in laboratories using High Pressure High Temperature (HPHT) or Chemical Vapour Deposition (CVD) processes, which are chemically, physically, and optically identical to natural diamonds.



Key Highlights

- Natural diamond reserves are depleting, with many major mines nearing exhaustion and most existing mines expected to last less than 50 years.
- **Diamond mining causes deforestation, soil erosion, water pollution, biodiversity loss,**



and high energy and water consumption.

- **Blood diamonds (conflict diamonds) continue to fund armed conflicts** despite the Kimberley Process, due to regulatory loopholes and illegal trade.

Blood Diamonds (Conflict Diamonds): Diamonds mined and sold illegally to finance armed conflicts, rebel groups, or military activities, often involving forced labour and human rights abuses.

Kimberley Process (KP): An international certification initiative, launched in 2003, that prevents the trade in conflict (blood) diamonds by certifying shipments of rough diamonds as conflict-free.

- Falling production costs have made LGDs more affordable, traceable, and increasingly preferred by consumers seeking ethical and sustainable products.
- India is **promoting LGDs through Budget 2023–24 support and the India Centre for Lab-Grown Diamond (InCent-LGD) at IIT Madras**, established with a ₹243 crore grant.
- LGDs **produced using renewable energy have a significantly lower carbon footprint and support the UN Sustainable Development Goals (SDGs)** and circular economy principles.

Implications

- **Depletion of natural diamond reserves.**
- **Environmental damage from mining**, including deforestation and water pollution.
- **Health risks and poor working conditions** for mine workers.
- **High carbon emissions from LGDs** produced using fossil fuel-based energy.
- **Need for wider adoption of renewable energy** in lab-grown diamond production.

Way Forward

- **Promote renewable energy-powered Lab-Grown Diamond (LGD) production.**
- **Strengthen R&D in High Pressure High Temperature (HPHT) and Chemical Vapour Deposition (CVD) technologies.**
- **Expand domestic manufacturing** and develop a skilled workforce.
- **Improve traceability and certification systems.**
- **Encourage sustainable industrial applications** of LGDs.
- Position India as a global hub for ethical diamond production.

Mains Question

“Lab-grown diamonds (LGDs) offer an opportunity to balance economic growth with environmental sustainability. Discuss their advantages over natural diamonds and examine their potential in India’s manufacturing and export sector.” (250 Words)



KEYWORDS

Trade Receivables Discounting System (TReDS)

- Trade Receivables Discounting System (TReDS) was **introduced by the Reserve Bank of India (RBI) through guidelines issued in 2014** to facilitate invoice discounting for MSMEs.
- TReDS is an **electronic platform that facilitates the financing and discounting of trade receivables of Micro, Small and Medium Enterprises (MSMEs) through multiple financiers.**
- Only **MSMEs can participate as sellers on TReDS, while corporates, Government Departments, PSUs and other entities can participate as buyers.**
- **Banks and other financial institutions permitted by the RBI can participate as financiers on the TReDS platform.**
- The primary objective of TReDS is to **improve MSMEs' working capital by enabling faster realization of payments against invoices,** and participation is voluntary for buyers, sellers and financiers.

TRAI MyCall App

- **TRAI MyCall** is a **citizen-centric platform** that enables telecom users to provide **real-time feedback** on their **voice call experience.**
- It helps improve the **Quality of Experience (QoE)** and **Quality of Service (QoS)** by providing feedback to **Telecom Service Providers (TSPs)** for **network optimisation.**
- Users can rate calls through a **1–5 star system** and report issues such as **call drops, echo, audio delay, voice breaking,** and **call connection delays.**
- The app provides a **rating history** and **interactive maps** to help users track call quality and network performance.
- It includes a **Coverage Test** feature to assess **mobile signal strength.**

- The Telecom Regulatory Authority of India (TRAI) has **launched a revamped version of the TRAI MyCall application**

TRAI MySpeed App

- **TRAI MySpeed** is an application that measures **internet performance** using a **standardised methodology.**
- It enables users to assess **mobile and Wi-Fi network performance** through **multiple test modes.**
- The app collects **anonymised data** to support **network performance assessment, analysis,** and **transparency initiatives** by TRAI.
- It evaluates **network quality, stability,** and **usability** under **real-world conditions,** going beyond basic **internet speed testing.**

Places in News

Naoero (Nauru)

- **Naoero (Nauru)** is one of the **world's smallest island nations by population** (about **12,000 people**), located in the **Pacific Ocean, northeast of Australia**.
- It is a **low-lying coral limestone atoll**, making it highly vulnerable to **sea-level rise** and **climate change**.
- The island was **annexed by Germany (1888)**, later **administered by Australia**, and became an **independent republic in 1968**.
- **Phosphate mining** once brought great wealth but later caused **economic decline** after the deposits were exhausted.
- The island was first named **"Pleasant Island"** by **British sailor John Fearn in 1798**, while the name **"Nauru"** became official during **German rule**.
- The country has now adopted the **indigenous name "Naoero"** to move away from its **colonial past** and preserve its **endangered native language**.



Species In News

Changthangi goat

- The **Changthangi goat** (also called the **Pashmina goat/Changpa goat**) is frequently in the news due to the **impact of climate change** on its **high-altitude habitat**, affecting **Pashmina wool production** and the **livelihoods of nomadic communities**.
- It is a **rare, indigenous breed of cashmere goat** native to the **high-altitude Changthang region of Ladakh (northern India)**, adapted to **extreme climatic conditions**.
- To survive **severe winters (-20°C or lower)**, the goats develop a **specialized ultra-fine undercoat (12-16 microns)**, which is harvested to produce **authentic Kashmiri Pashmina ("soft gold")**.
- The breed is reared by the **Changpa nomadic pastoralists**, a **Tibetan-origin community**, and is crucial for **traditional livelihoods and pastoral economy**.
- In **2012**, scientists at **SKUAST (Sher-e-Kashmir University of Agricultural Sciences and Technology)** cloned the first **Pashmina goat "Noori"**, marking a **significant milestone in animal biotechnology and breed conservation**.

