

Today's Prelims Topics

World's first personalised gene therapy treatment

Context

In US, a baby suffering from **carbamoyl phosphate synthetase 1 (CPS1)** deficiency was healed with world's first personalised **CRISPR based gene editing treatment**.

What is Carbamoyl Phosphate Synthetase 1 (CPS1) Deficiency?

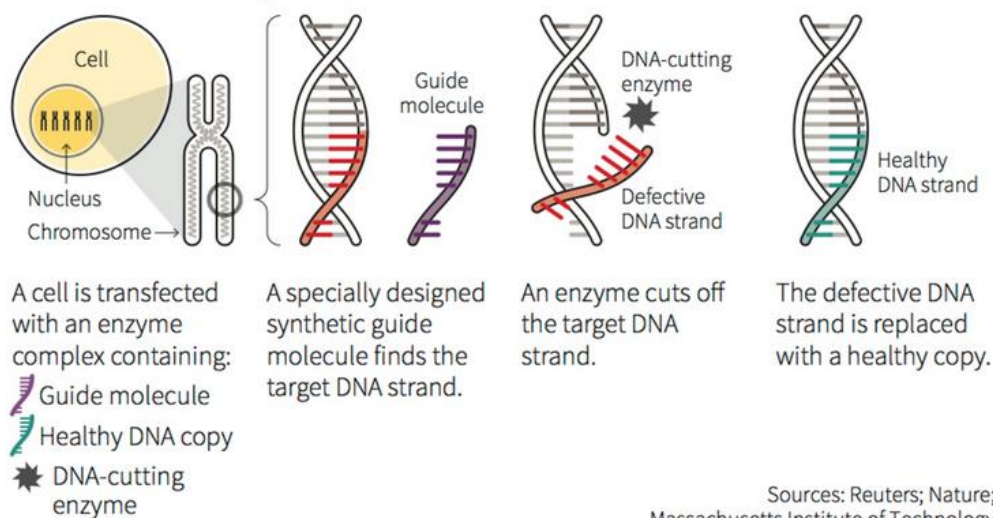
- **CPS1 deficiency** is a **rare genetic metabolic disorder** that affects the **urea cycle**, the process by which the body removes excess nitrogen (ammonia) from the blood.
- **Cause:** A mutation in the **CPS1 gene**, which produces an enzyme needed to break down **ammonia** in the liver.
- **Effect:** Without this enzyme, **ammonia builds up in the bloodstream**, leading to **ammonia toxicity**, which can damage the brain and be life-threatening.
- **Symptoms:** Poor feeding, vomiting, lethargy, seizures, coma, and in severe cases, death—especially during stress, illness, or high protein intake.
- **Incidence:** It is extremely rare, affecting roughly **1 in 1 million** newborns.

What is Gene Editing Treatment?

- It involves **changing an organism's DNA** to correct genetic defects, modify how genes are expressed, or introduce new genetic material.
- It holds promise for treating **difficult-to-manage conditions** such as sickle cell anemia, cystic fibrosis, and certain types of cancer.
- It targets **mutated genes** and changes their DNA sequence so the body can **produce normal, functional proteins**.
- Used especially for **rare or inherited diseases** where conventional drugs cannot address the root genetic cause.

What is CRISPR-Based Gene Editing Treatment?

HOW THE TECHNIQUE WORKS



Sources: Reuters; Nature;
Massachusetts Institute of Technology

- **CRISPR** (Clustered Regularly Interspaced Short Palindromic Repeats) is a **revolutionary gene-editing technology**.

- It acts like **molecular scissors**: guided by a piece of RNA, CRISPR targets a specific sequence in the DNA and **cuts it at a precise location**.
- **Two key components**:
 - **Cas9**, an enzyme acting as '**molecular scissors**' to cut DNA at specific locations.
 - **Guide RNA (gRNA)**, designed to direct Cas9 to a precise genome spot.
 - The gRNA binds to a matching DNA sequence, guiding Cas9 to make strategic cuts.
- This allows scientists to:
 - **Delete** a faulty gene
 - **Insert** a healthy gene
 - Or **correct** a single incorrect "letter" (nucleotide) in the DNA code

In KJ's Case

- Doctors identified the exact **faulty genetic code** causing CPS1 deficiency.
- They used CRISPR to **flip a single incorrect DNA letter** to the correct one.
- This is **customized (bespoke) gene therapy**, offering **potential lifelong correction** of the genetic defect.

Source: [Sky News: Baby gets world's first personalised gene therapy treatment](#)



Financial Action Task Force

Context

Indian authorities are preparing to inform the Financial Action Task Force (FATF) about new evidence concerning terror bases in Pakistan targeted under Operation Sindoor.

About Financial Action Task Force (FATF)

- It is an inter-governmental body that has developed standards to prevent and combat money laundering and terror financing.
- **Headquarters:** Paris, France.
- **Background:** It was established in **1989** during the G7 Summit in Paris to develop policies against money laundering.
- **Objective:**
 - To establish international standards and to develop and promote policies, both at national and international levels for combating money laundering and terror financing.
- **Members: 40** (38 Countries + 2 Organisations - European Union and Gulf Cooperation Council)
 - Major countries: US, India, China, Saudi Arabia, UK, Germany, France, .
 - India became a member of FATF in **2010**.



FATF Lists

- **Black List:**
 - Includes countries considered safe havens for supporting money laundering and terror funding.
 - Presently **Iran, North Korea, and Myanmar** are currently on the FATF Black List.
- **Grey List:**
 - Includes countries that are considered to have weak anti-money laundering (AML) and counter-terrorism financing (CFT) regimes.
 - This inclusion serves as a warning to the country that it may enter the blacklist.
- **Effects of being on the FATF Blacklist:**
 - No financial help is given to those countries by the International Monetary Fund (IMF), World Bank, Asian Development Bank (ADB) and the European Union (EU).
 - They also face a number of international economic and financial restrictions & sanctions.

Source: [The Hindu: India to apprise FATF of Latest Evidence on terror infrastructure in Pakistan](#)

Pesky Failure Mode in Solid State Li-ion Batteries

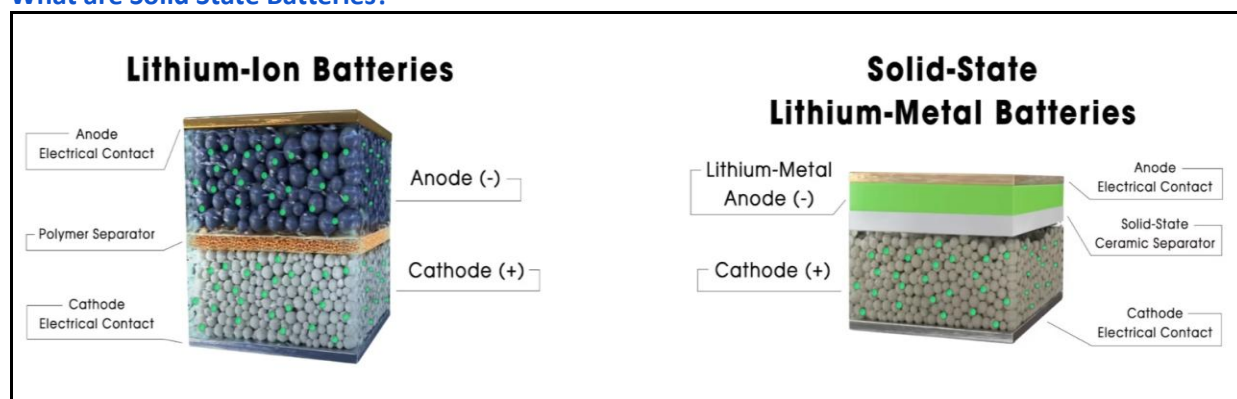
Context

Scientists have reported in *Science* that addressing solid-state battery (SSB) failures might depend on applying well-established mechanical principles.

Pesky Failure in Solid-State Batteries (SSBs)

- The failure was due to **lithium dendrites** forming on the anode and **piercing the solid electrolyte**, which ultimately **short-circuited** the battery.
- **Key contributing factors:**
 - **Metal fatigue** and **mechanical stress** caused by repeated charge-discharge cycles.
 - **Cracks and voids** forming at the anode-electrolyte interface.
 - Even **low charge-discharge rates** caused **structural fatigue**, breaking the electrolyte.

What are Solid State Batteries?



- Solid-state batteries are next-generation batteries that use a **solid electrolyte** instead of the liquid or gel electrolyte found in conventional lithium-ion batteries.
- **Structure and Working Principle:**
 - **Components:**
 - **Anode:** Often made of lithium metal, which allows for higher energy storage.
 - **Cathode:** Made from various materials, similar to those used in lithium-ion batteries (e.g., lithium cobalt oxide, lithium nickel cobalt aluminum oxide).
 - **Solid Electrolyte:** The key differentiator, made from ceramics, glass, sulfides, or solid polymers, separating the anode and cathode and allowing only ions to pass through.
 - **Operation:**
 - During discharge, lithium ions move from the anode to the cathode through the solid electrolyte, while electrons flow through the external circuit, powering the device.
 - During charging, the process reverses: lithium ions travel back from the cathode to the anode.
- **Advantages**
 - **Higher energy density** → Longer range for electric vehicles.
 - **Faster charging** → E.g., 15-minute fast charge capability.
 - **Improved safety** → Eliminates risk of leaks and thermal runaway.
 - **Compact design** → Enables smaller and lighter battery packs.

Source: [The Hindu: Cause of pesky failure mode in solid state Li-ion batteries found](#)

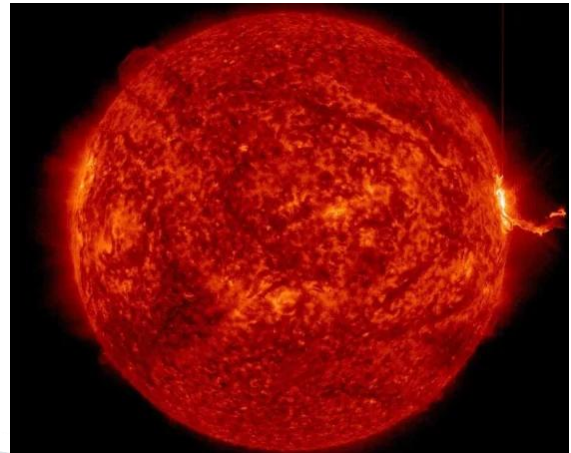
Solar Flares

Context

NASA's satellites have recorded a powerful solar flare.

What are Solar Flares?

- Solar flares are intense bursts of radiation caused by the sudden release of magnetic energy from the Sun. These flares emit high-speed particles and energy into space.
- Solar flares are often linked to **Coronal Mass Ejections (CMEs)**, which are massive eruptions of plasma and magnetic fields from the Sun's outer atmosphere (corona).
- **Classification:** Flares are classified by their strength:
 - **A-class:** Weakest
 - **B, C, M-class:** Moderate
 - **X-class:** Strongest and most intense
- Flares occur more frequently during the **solar maximum**, the peak of the 11-year solar cycle during which the Sun's magnetic poles reverse.
- Solar flares release energy across the **entire electromagnetic spectrum**, including X-rays, gamma rays, ultraviolet, visible light, and radio waves.
- **Impacts of Solar Flares**
 - **Geomagnetic Storms:** Can disrupt Earth's magnetic field, leading to:
 - Radio communication blackouts
 - Power grid disturbances
 - Enhanced auroras (Northern and Southern Lights)
 - **Satellite Vulnerability:** High-energy particles can:
 - Damage satellite electronics
 - Disrupt GPS and communication systems
 - **Human Safety:** Earth's atmosphere and magnetic field protect us from harm.
 - **Astronauts and space missions** are at higher risk due to increased radiation exposure.



Source: [NBC News: Massive solar storm causes communications blackouts](#)

Gyan Bharatam Mission

Context

Prime Minister Narendra Modi will launch the revamped Gyan Bharatam Mission (formerly National Manuscripts Mission) on June 9, 2025.

About National Manuscript Mission

- It is a nationwide initiative focused on documenting, conserving, and digitising India's ancient manuscript heritage.
- **Launched:** February 2003.
- **Parent Organisation:** It functions under the Indira Gandhi National Centre for the Arts (IGNCA), which is part of the Ministry of Culture.
- **Objective:** The main goal is to safeguard India's intellectual legacy and make manuscripts easily accessible to both researchers and the general public.
- **Key Features:**
 - India is estimated to possess over **1 crore (10 million) manuscripts**, written in more than 80 scripts and 60 languages.
 - As of 2025, metadata for **52 lakh (5.2 million) manuscripts has been digitised**, though only around 1.3 lakh (130,000) have been uploaded online.
 - Approximately 80% of these manuscripts are held by private collectors, and the NMM encourages them to share their collections through various incentives.
 - In the past 21 years, the Mission has conserved more than 9 crore (90 million) folios.
 - There is a strong focus on universal access, raising public awareness, and collaborating with international digital platforms such as Google Arts & Culture.

What is a Manuscript?

- A **manuscript** is a **handwritten document** on materials like **palm leaf, cloth, metal, bark, or paper**, and must be **at least 75 years old**.
- Must hold **scientific, historical, or artistic significance**.
- **Printed books or lithographs are not considered manuscripts**.
- Manuscripts can be in **multiple languages** and often in **varied scripts** (e.g., Sanskrit can appear in Devanagari, Grantha, Oriya scripts, etc.).
- Distinct from **epigraphs** or **administrative records** like *farmans* or revenue documents.

Source: [The Hindu: Manuscript Mission to be launched by PM on June 9](#)

SCO Summit

Context

The Sangh Parivar-backed trade union Bharatiya Mazdoor Sangh (BMS) has **boycotted the first meeting of the trade union leaders of the Shanghai Cooperation Organisation (SCO)** member countries held in Beijing.

About Shanghai Cooperation Organisation (SCO)

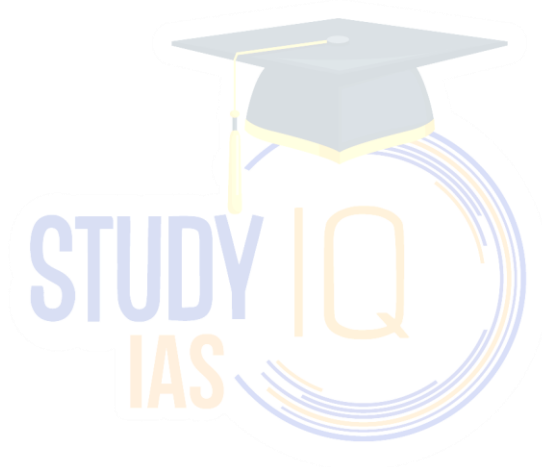


- **Formed:** June 15, 2001 (Successor to Shanghai Five group)
- **Founding Members:** Kazakhstan, China, Kyrgyzstan, Russia, Tajikistan, Uzbekistan
- **SCO Countries:**
 - **9 Member States:** India, Iran, Kazakhstan, China, Kyrgyzstan, Pakistan, Russia, Tajikistan, Uzbekistan.
 - **3 Observer states:** Afghanistan, Belarus, Mongolia.
 - In 2022, at the Samarkand SCO Summit, the process of raising the status of the Republic of Belarus within the Organization to the level of a member state has begun.
 - **14 Dialogue Partners:** Azerbaijan, Armenia, Bahrain, Egypt, Cambodia, Qatar, Kuwait, Maldives, Myanmar, Nepal, United Arab Emirates, Saudi Arabia, Turkey, Sri Lanka.
- **Headquarters:** Beijing, China
- **Official Languages:** Russian, Chinese
- **Goals:**
 - Strengthen regional security and good neighbourliness
 - Promote economic cooperation among members
 - Foster cultural and educational exchange
 - Create a stable and peaceful region
- **Principles:**
 - **Internally:** "Shanghai Spirit" (mutual trust, benefit, equality, consultation, respect for diversity)
 - **Externally:** Non-alignment, openness
- **Decision-Making:**
 - **Council of Heads of States (CHS):** Meets annually, decides major issues
 - **Council of Heads of Government (CHG):** Meets annually, sets economic strategy
- **Other Mechanisms:**
 - Regular meetings on various topics (foreign affairs, defence, culture, etc.)
 - Council of National Coordinators - Coordination body.

India and the SCO

- India's relations with SCO member states stretch back centuries, enriched by shared cultural and spiritual heritage.
- India was granted observer status in the SCO in 2005 and became a full member in 2017.
- As a member, India has hosted important SCO meetings, including the Council of Heads of Government in 2020.
- India's involvement in the SCO aids in regional trade access and enhances its global stature, while also addressing regional security concerns and fostering economic collaboration.

Source: [The Hindu: Sangh Parivar-backed BMS has boycotted the first meeting of SCO](#)

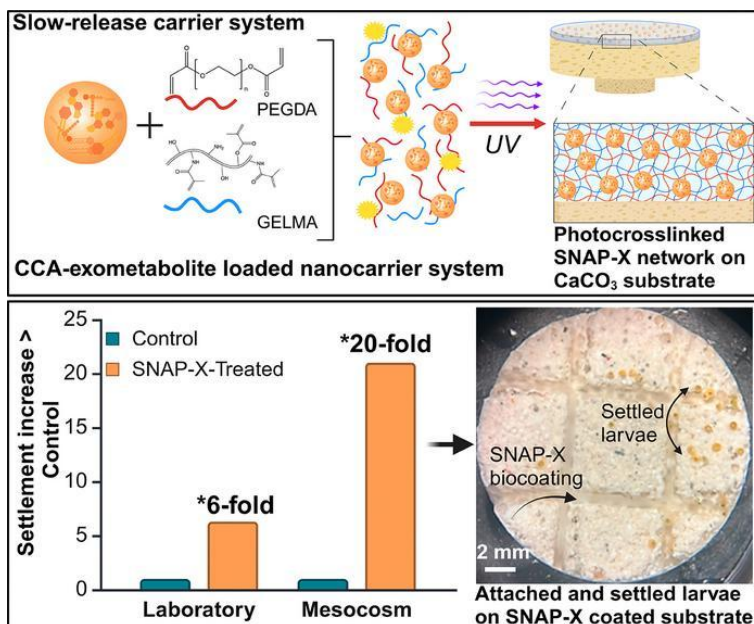


News in Short

SNAP-X

News? Scientists have created an ink called SNAP-X to help corals settle and grow on damaged reefs.

About SNAP-X



- The bio-ink has been engineered to **promote coral larvae settlement** and help restore coral reefs, which are rapidly declining due to climate change.
- **Composition:** The ink is **transparent** and **infused with natural metabolites** derived from **crustose coralline algae (CCA)**.
 - CCA is known to **emit chemical cues** that attract coral larvae and help them settle.

Five-point Call for Global Action to Protect Mountain Ecosystems

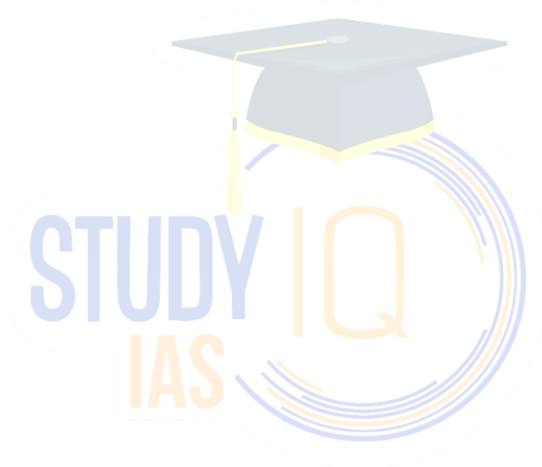
News? Environment Minister of India announced 'Five-point call for Global Action' to Protect Fragile Mountain Ecosystems at the **first Sagarmatha Sambaad** in Kathmandu, themed "**Climate Change, Mountains, and the Future of Humanity**".

Five-Point Agenda

- **Strengthen Scientific Collaboration:** Foster international partnerships in **research, data sharing,** and **monitoring** of key mountain systems like **cryosphere, hydrology,** and **biodiversity**.
- **Promote Climate Resilience in Mountains:** Invest in **early warning systems** (e.g., for Glacial Lake Outburst Floods – GLOFs) and develop **climate-resilient infrastructure** tailored to mountainous terrains.
- **Empower Mountain Communities:** Place **local people at the center** of climate policies.
 - Promote **green jobs, sustainable tourism,** and ensure that community needs and aspirations are addressed.
- **Ensure Access to Climate Finance:** Facilitate **adequate green finance** in line with the **UNFCCC and Paris Agreement** to help mountain nations pursue **adaptation** and **mitigation** strategies.
- **Integrate Mountain Voices in Global Forums:** Recognize the **unique vulnerabilities and ecological contributions** of mountains in **international climate talks** and **sustainable**

development agendas.

Source: [PIB: Union Minister Shri Bhupender Yadav outlines a 'Five-point call for Global Action' to Protect Fragile Mountain Ecosystems at the 1st Sagarmatha Sambaad in Kathmandu, Nepal](#)



Places in News

New Caledonia



News? Political talks led by French Overseas Minister Manuel Valls collapsed over disagreement on sovereignty proposals.

About New Caledonia

- **Location:** Southwestern Pacific Ocean, East of Australia.
- **Major Islets:** Grande Terre, the Loyalty Islands, the Isle of Pines.
- **Capital:** Nouméa
- **Ethnic Groups:** Predominantly Kanaks.
- **Political Status:** It is **not an independent country**—it has a special status within France.
 - **1853** – France seized New Caledonia as a penal colony.
 - **1957** – French citizenship granted to all inhabitants.
 - **1998 – Nouméa Accord** signed, granting autonomy and promising referendums.
 - **2018, 2020, 2021** – Three referendums held; all rejected independence, with the last one boycotted.

Hodeidah and al-Salif



News? The Israeli military launched a targeted attack on ports of Hodeidah and al-Salif.

About Hodeidah and al-Salif

- **Location:** Western Yemen on the coast of Red Sea.