

Weekly **EXPECTED**
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for
IAS EXAMINATION



From
05th Oct *to* **10th Oct 2026**



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1.1. VISA IS NOT A RIGHT TO ENTER INDIA

Context

- Recently, the Delhi High Court held that a valid visa does not guarantee a foreign national the right to enter India; entry remains subject to immigration laws and competent authorities.



Delhi HC on Foreigners' Right to Enter India

- The Delhi High Court held that a valid visa does not create an absolute or legally enforceable right to enter India.
- The court held that visa issuance and entry are separate matters, with entry subject to immigration law and competent authorities' powers.
- The judgment relied on the Immigration and Foreigners Act, 2025 and earlier Supreme Court rulings recognising broad State powers over foreigners' entry and presence.
- Refusal of entry is a sovereign function involving national security, foreign policy and administrative discretion.

Legal Framework

- Union List:** Entries 17 (citizenship, aliens), 19 (admission, emigration, expulsion, passports and visas) and 10 (foreign affairs) are under Parliament's law-making power.
- Immigration and Foreigners Act, 2025:** It governs the legal framework for foreigners in India and has replaced the Foreigners Act, 1946, which is now repealed.
- Section 3 (2025 Act):** A foreigner must hold a valid passport or travel document and a valid visa to enter India.
- Section 7 (2025 Act):** The Central Government can make provisions to prohibit, regulate or restrict the entry of foreigners, their departure, and their presence in India.
- Immigration Officer's power:** The officer at the port of entry can require information and examine the passport, travel document and visa before admitting a foreigner.

Constitutional Scope: Fundamental Rights of Foreign Nationals

- Article 14 (equality before law):** It applies to "any person", including foreigners, but reasonable classification and differences in circumstances are allowed.
- Article 21 (life and personal liberty):** It is available to citizens and non-citizens alike. The court held that it does not cover a right to enter India.
- Article 19(1)(e) (right to reside and settle in India):** It is available only to citizens, not to foreigners.

Supreme Court Precedents

- **Hans Muller of Nuremberg v. Superintendent, Presidency Jail (1955):** The Supreme Court held that statutory immigration laws give the Central Government absolute discretion to restrict or expel foreign nationals.
- **Louis De Raedt v. Union of India (1991):** The Supreme Court reaffirmed that a foreigner's fundamental rights are confined primarily to Article 21, with no absolute right to reside or claim entry into India.

Q. Consider the following statements:

1. Article 14 of the Constitution is available to foreigners as well as citizens.
2. The right to reside and settle in any part of India under Article 19(1)(e) is available only to citizens.
3. Admission into India and expulsion from India are subjects in the Union List.
4. A High Court can issue writs under Article 226 only for the enforcement of Fundamental Rights.

Which of the statements given above are correct?

- (a) 1 and 2 only
- (b) 1, 2 and 3 only
- (c) 2, 3 and 4 only
- (d) 1, 2, 3 and 4

Answer: (b)

Explanation:

- **Statement 1 is correct:** Article 14 uses the term "any person".
- **Statement 2 is correct:** Article 19 rights are for citizens only, as held in *Louis De Raedt* (1991).
- **Statement 3 is correct:** Entry 19 of the Union List covers admission into India and expulsion from India.
- **Statement 4 is incorrect:** Article 226 allows writs for Fundamental Rights and for any other purpose.

1.2. APPOINTMENT OF DGPS AND THE PRAKASH SINGH JUDGMENT

Context

- The Supreme Court of India examined Jharkhand's 2025 law governing the appointment of the Director General of Police (DGP), following a challenge by the Union government over its alleged inconsistency with the Supreme Court's **Prakash Singh v. Union of India (2006)** judgment.



About the Prakash Singh Judgment, 2006

- The Supreme Court issued directions to reform the police system and insulate it from unwarranted political interference.
- **Objective:** To promote police autonomy, operational stability, accountability and professionalism.
- **Key Directions on DGP Appointment**

- **Selection Process:** The State government should select the DGP from a panel of suitable officers prepared by the Union Public Service Commission (UPSC).
- **Eligibility:** The panel should comprise the three senior-most suitable officers, assessed on the basis of seniority, service record and range of experience.
- **Residual Service:** Eligible officers should have **at least six months of service** remaining before normal retirement.
- **Minimum Tenure:** The DGP should have a minimum tenure of **two years**, irrespective of the date of superannuation.

Jharkhand's Counter: Double Standards

- Jharkhand said the Centre showed "**special affection**" for it, while States like **Bihar** have "**worse**" appointment laws.
- Sibal pointed to **West Bengal**, where the DGP was appointed by the **Election Commission of India in March 2026**, even though the officer was due to retire the following month.
- **Seventh Schedule:** Police and Public Order fall under List II (State List) of the Seventh Schedule of the Indian Constitution.

Constitutional and Governance Significance

- **Police Reforms:** Strengthens efforts to reduce political interference in policing.
- **Rule of Law:** Reinforces the binding nature of Supreme Court directions under Article 141 of the Constitution.
- **Cooperative Federalism:** Highlights tensions between Union oversight and State-level police administration.
- **Institutional Accountability:** Encourages transparent, merit-based appointments and uniform compliance with judicial directions.

Q. With reference to the Prakash Singh judgment (2006) and the appointment of Directors General of Police (DGPs) in India, consider the following statements:

1. The Supreme Court directed State governments to select the DGP from a panel of suitable officers prepared by the Union Public Service Commission (UPSC).
2. The selected DGP should have a minimum tenure of two years, irrespective of the date of superannuation.
3. Police and Public Order fall under the Concurrent List of the Seventh Schedule of the Constitution of India.
4. The directions issued by the Supreme Court in the Prakash Singh judgment are binding on State governments under Article 141 of the Constitution.

Which of the statements given above are correct?

- (a) 1 and 2 only
- (b) 1, 2 and 4 only
- (c) 2 and 3 only
- (d) 1, 2, 3 and 4

Answer: (b) 1, 2 and 4 only

Explanation:

- **Statement 1 is Correct:** The judgment directed States to select the DGP from a panel of suitable officers prepared by the UPSC.
- **Statement 2 is Correct:** The DGP should have a minimum tenure of two years, subject to the applicable directions.
- **Statement 3 is Incorrect:** Police and Public Order fall under the State List (List II) of the Seventh Schedule.
- **Statement 4 is Correct:** Article 141 provides that the law declared by the Supreme Court is binding on all courts within India.

1.3. UNDERSTANDING THE STATES' CONCERNS OVER THE MINING AMENDMENT

Context

- Recently, Parliament passed the Mines and Minerals (Development and Regulation) Amendment Act, 2026, which expands the Centre's regulatory powers over mining and curbs the fiscal powers of States.



Key Changes Under the 2026 Amendment

- **Expanded Central Purview:** Extends the Union Government's regulatory authority beyond mines and mineral development to include **mineral-bearing lands**.
- **Taxation Restrictions:** Prohibits States from imposing fresh levies on mineral rights and mineral-bearing lands except under conditions prescribed by the Centre.
- **Cancellation of Uncollected Dues:** Mineral taxes imposed by States but not fully collected before the Act came into force are cancelled.
- **Centre's Rationale:** Aims to harmonize varied State-level levies, curb escalation in domestic mineral extraction costs, and reduce reliance on mineral imports.

Constitutional provisions: Centre vs. State Powers

Seventh Schedule Entry	Constitutional Power & Scope
Entry 54 (Union List)	Empowers Parliament to regulate mines and mineral development to the extent declared expedient in the public interest .
Entry 23 (State List)	Gives States regulation of mines and mineral development, but expressly subject to the provisions of Entry 54 of the Union List .
Entry 50 (State List)	Taxes on mineral rights , subject to limits imposed by Parliament
Entry 49 (State List)	Exclusive State power to levy taxes on lands and buildings (which the 2024 Supreme Court ruling held cannot be curbed via Entry 54).

The 2024 Supreme Court Verdict vs. 2026 Amendment

- **2024 SC Ruling:** A 9-judge Constitution Bench held that **royalty is not a tax** and affirmed that States have the constitutional power to tax mineral-bearing lands under Entry 49 of the State List, which cannot be restricted by Parliament via Entry 54.
- **2026 Conflict:** The 2026 amendment brings mineral-bearing lands directly under central regulatory conditions, setting up fresh constitutional challenges by several States (Karnataka, Telangana, Kerala, Himachal Pradesh).

Why are States Concerned?

- Mineral-rich States derive substantial revenue from:
 - Mineral royalties
 - Taxes and levies
 - Mining-related economic activity
- Any reduction in State-level taxation powers could therefore affect State finances and fiscal autonomy.

State Fiscal Exposure

- **High-Dependency States:** Mineral receipts constitute **85%** of non-tax revenue in Jharkhand and **80%** in Odisha.
- **Moderate/Low Dependency:** Karnataka (**48%**), Madhya Pradesh (**41%**), Rajasthan (**39%**), Telangana (**11%**), and Chhattisgarh (**6%**).

Q. With reference to the legislative and fiscal powers over mines and minerals under the Constitution of India, consider the following statements:

1. State legislative power under Entry 23 of the State List is subject to parliamentary legislation under Entry 54 of the Union List.
2. Entry 50 of the State List empowers State legislatures to levy taxes on mineral rights, subject to limitations imposed by Parliament.
3. Taxes on lands and buildings under Entry 49 of the State List are expressly subject to laws made by Parliament under the Union List.

Which of the statements given above are correct?

- (a) 1 and 2 only
- (b) 2 and 3 only
- (c) 1 and 3 only
- (d) 1, 2, and 3

Answer: (a) 1 and 2 only

Explanation:

- **Statement 1 is correct:** Entry 23 of List II (State List) provides for the regulation of mines and mineral development, but it is explicitly subject to Entry 54 of List I (Union List).
- **Statement 2 is correct:** Entry 50 of List II grants States the power to tax mineral rights, subject to any limitations enacted by Parliament by law relating to mineral development.
- **Statement 3 is incorrect:** Entry 49 of List II (Taxes on lands and buildings) is an exclusive State power and is not constitutionally subordinated to parliamentary laws under Entry 54 of the Union List.

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2.1. TIGERS RETURN TO BUXA TIGER RESERVE

Context

- Three-year-old tigress **T138** was translocated from Valmiki Tiger Reserve, Bihar to Buxa Tiger Reserve, West Bengal, on 2 October 2026, launching the phased effort to restore a self-sustaining tiger population, supported by **NTCA** and **WII** through telemetry and camera-trap monitoring.



About Buxa Tiger Reserve

Feature	Detail
Location	Alipurduar subdivision of West Bengal (extending across Terai, Bhabar, and sub-Himalayan ecosystems).
Boundaries	Northern boundary runs along the international border with Bhutan ; Eastern boundary touches Assam (demarcated by the Sankosh River).
Contiguous Landscapes	Contiguous with Bhutan's Phibsoo Wildlife Sanctuary to the north and Assam's Manas Tiger Reserve to the east, forming a vital international transboundary wildlife corridor.
Drainage	Drained by trans-boundary rivers originating in Bhutan, notably the Raidak , Sankosh , and Jayanti rivers.
Status Timeline	Declared a Tiger Reserve in 1983 (15th tiger reserve in India) and a National Park in 1992.

Institutional Framework

National Tiger Conservation Authority (NTCA)

- A statutory body under the **Wildlife (Protection) Act, 1972**, established in 2006.
- Provides technical and financial support for tiger conservation.
- Develops protocols and guidelines for tiger reintroduction and translocation.
- Works with State Governments and WII in tiger recovery programmes.

Wildlife Institute of India (WII)

- Provides scientific and technical expertise in wildlife research and conservation.
- Has collaborated with NTCA in developing frameworks and protocols for tiger conservation and reintroduction.

Q. Consider the following statements regarding Buxa Tiger Reserve:

1. Buxa Tiger Reserve was established in 1983.
2. It is located in the Alipurduar district of West Bengal.
3. The recent tiger reintroduction programme involves translocation of a tigress from Valmiki Tiger Reserve in Bihar.
4. The National Tiger Conservation Authority and Wildlife Institute of India are associated with the programme.

Which of the statements given above are correct?

- (a) 1 and 2 only
- (b) 1, 2 and 3 only
- (c) 2, 3 and 4 only
- (d) 1, 2, 3 and 4

Answer: (d) 1, 2, 3 and 4

- **Statement 1 is correct:** Buxa was declared a Tiger Reserve in **1983**.
- **Statement 2 is correct:** Buxa Tiger Reserve is located in **Alipurduar district, West Bengal**.
- **Statement 3 is correct:** Tigress **T138** was translocated from **Valmiki Tiger Reserve, Bihar**, to Buxa.
- **Statement 4 is correct:** The programme involves scientific and technical support from the **NTCA and Wildlife Institute of India (WII)**.

2.2. VULTURES RETURN TO THE WAYANAD LANDSCAPE

Context

- Recently, a two-day synchronous vulture survey in the Wayanad Wildlife Sanctuary (WWS), Kerala, recorded 65 vultures, comprising 54 White-rumped Vultures and 11 Red-headed Vultures.

Vulture Species in India

- India is home to 9 species of vultures, belonging mainly to the Accipitridae family:



Species Name (Common & Scientific)	Resident / Migratory	IUCN Red List Status	Key Habitat / Features
White-rumped Vulture	Resident	Critically Endangered (CR)	Plains and open forests; builds nests on tall trees (Banyan, Peepal).
Indian Vulture / Long-billed Vulture	Resident	Critically Endangered (CR)	Prominent in hilly areas and peninsular cliffs; nests on rocky ledges.
Slender-billed Vulture	Resident	Critically Endangered (CR)	Found north of the Ganges, Sub-Himalayan belt, and Northeast India.

Red-headed Vulture / King Vulture	Resident	Critically Endangered (CR)	Distinctive bare red head and neck; solitary or paired feeder.
Egyptian Vulture	Resident & Migratory	Endangered (EN)	Small size, yellow face, white plumage; known for tool use (breaking eggs with stones).
Cinereous Vulture	Winter Migrant	Near Threatened (NT)	Massive wingspan; migrates from Eurasia to northern and western India.
Himalayan Griffon	Resident / High-altitude	Near Threatened (NT)	Trans-Himalayan and high-altitude regions; winters in northern plains.
Eurasian Griffon	Winter Migrant	Least Concern (LC)	Migrates from Europe/Central Asia to northern India during winter.
Bearded Vulture / Lammergeier	Resident (Himalayas)	Near Threatened (NT)	High Himalayas; unique diet consisting primarily of bone marrow.

Why Are Vultures Important?

- **Obligate scavengers** that rapidly consume animal carcasses.
- Remove carcasses, **recycle nutrients**, and maintain ecosystem sanitation.
- Their decline can increase carcass accumulation, feral scavenger populations, and **disease-transmission risks**.

OVERVIEW OF WAYANAD WILDLIFE SANCTUARY

DIPLOMATIC & ESTABLISHMENT:
Established: Formed in 1973; under Project Elephant 1991-92.

LOCATION & GEOGRAPHY:
Located in Western Ghats, Kerala. Important link with Karnataka and Tamil Nadu forests. Part of Nilgiri Biosphere Reserve.

CONTIGUOUS LANDSCAPE:
Connected with: Bandipur NP, Nagarhole NP (Rajiv Gandhi NP), and Mudumalai protected areas.

VEGETATION:
Blend of South Indian moist deciduous forests, semi-evergreen patches, and teak, rosewood, and eucalyptus plantations.

MAMMALS & BIRDS:
Home to: Asian elephants, Indian gaurs (bison), Bengal tigers, leopards, sloth bears, sambar deer. Supports over 200 bird species.

KEY PROTECTED AREAS: MYSORE-NILGIRI COMPLEX

Q. Consider the following statements regarding vultures in India:

1. White-rumped Vulture is classified as **Critically Endangered** in the IUCN Red List.
2. Red-headed Vulture is also classified as **Critically Endangered**.
3. Wayanad Wildlife Sanctuary forms part of the **Nilgiri Biosphere Reserve**.
4. Diclofenac was one of the major causes of the decline of South Asian *Gyps* vultures.

Which of the statements given above are correct?

- A. 1, 2 and 3 only
- B. 1, 3 and 4 only
- C. 1, 2, 3 and 4
- D. 2 and 4 only

Explanation:

- **Statement 1 is Correct:** White-rumped Vulture (*Gyps bengalensis*) is **Critically Endangered**.
- **Statement 2 is Correct:** Red-headed Vulture (*Sarcogyps calvus*) is also **Critically Endangered**.
- **Statement 3 is Correct:** Wayanad Wildlife Sanctuary is part of the **Nilgiri Biosphere Reserve**.
- **Statement 4 is Correct:** Veterinary **diclofenac** caused widespread mortality among *Gyps* vultures, contributing significantly to their population collapse.

2.3. VEERANGANA DURGAVATI TIGER RESERVE BECOMES INDIA'S THIRD CHEETAH HABITAT

Context

- Recently, Madhya Pradesh has established its third cheetah habitat at Veerangana **Durgavati Tiger Reserve** with the release of Vyom (male) and Neera (female), complementing **Kuno National Park** and **Gandhi Sagar Wildlife Sanctuary** and strengthening the spatial diversification of India's cheetah reintroduction programme.



About Veerangana Durgavati Tiger Reserve (VDTR)

- **Location:** Madhya Pradesh; spans Sagar, Damoh and Narsinghpur districts.
- **Established:** Notified as Madhya Pradesh's 7th Tiger Reserve in 2023.
- **Landscape:** Part of the Central Indian highlands, providing connectivity between important wildlife habitats.
- **River Systems:** The Narmada, Sonar and Kopra river systems influence the reserve's landscape.
- **Key Fauna:** Tiger, leopard, sloth bear, gaur, sambar, chital and wild dog.
- **Conservation Significance:** Strengthens tiger conservation, habitat connectivity and landscape-level wildlife management in Central India.

About Kuno National Park

- **Location:** Sheopur district, Madhya Pradesh, within the Kuno River landscape.
- **Established:** Declared a National Park in 2018; earlier notified as a wildlife sanctuary in 1981.
- **Habitat:** Predominantly dry deciduous forests, grasslands and riverine ecosystems.

- **Key Fauna:** Leopard, chital, sambar, nilgai, wild boar and Indian wolf.
- **Cheetah Significance:** India's primary cheetah reintroduction site under Project Cheetah, receiving cheetahs from Namibia and South Africa since 2022.

About Gandhi Sagar Wildlife Sanctuary

- **Location:** Mandsaur and Neemuch districts, Madhya Pradesh, along the Chambal River.
- **Established:** 1974; forms part of the Gandhi Sagar-Kuno landscape for wildlife conservation.
- **Habitat:** Predominantly dry deciduous forests, grasslands, ravines and riverine ecosystems.
- **Key Fauna:** Chinkara, leopard, sloth bear, striped hyena, crocodile and various migratory birds.
- **Cheetah Significance:** Selected as the second cheetah reintroduction site in Madhya Pradesh, complementing Kuno National Park and supporting the expansion of Project Cheetah.

Project Cheetah

- **Launched:** September 2022, to reintroduce cheetahs in India after their extinction in 1952.
- **Nodal Ministry:** Ministry of Environment, Forest and Climate Change (MoEFCC).
- **Objective:** Establish a viable, self-sustaining cheetah population through phased reintroduction.
- **Sources:** Cheetahs are being translocated primarily from Namibia and South Africa.
- **Key Habitats in Madhya Pradesh:** Kuno National Park, Gandhi Sagar Wildlife Sanctuary and Veerangana Durgavati Tiger Reserve.
- **Significance:** Aims to restore a lost apex predator, enhance ecosystem functioning and promote grassland and open-forest conservation.

Q. Consider the following statements regarding Project Cheetah in India:

1. **Kuno National Park** was the first site selected for the reintroduction of cheetahs in India.
2. **Gandhi Sagar Wildlife Sanctuary** is the second cheetah introduction site in Madhya Pradesh.
3. **Veerangana Durgavati Tiger Reserve** is located in the Bundelkhand region of Madhya Pradesh and is the third cheetah conservation site in the state.
4. All three sites have the same protected-area status.

Which of the statements given above are correct?

- (a) 1, 2 and 3 only
- (b) 1 and 3 only
- (c) 2 and 4 only
- (d) 1, 2, 3 and 4

Answer: (a) 1, 2 and 3 only

- **Statement 1 is correct:** Kuno National Park was the first site under Project Cheetah.
- **Statement 2 is correct:** Gandhi Sagar Wildlife Sanctuary became the second cheetah introduction site.

- **Statement 3 is correct:** Veerangana Durgavati Tiger Reserve, in the Bundelkhand region, is the third site.
- **Statement 4 is incorrect:** Their protected-area categories differ—Kuno is a National Park, Gandhi Sagar is a Wildlife Sanctuary, and Veerangana Durgavati is a Tiger Reserve.

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3.1. INDIAN PAYLOADS ON SPACEX'S TRANSPORTER

Context

- Recently, multiple Indian payloads were launched on SpaceX's Falcon 9 from Vandenberg Space Force Base, California, as part of the Transporter-18 rideshare mission. Dhruva Space's LEAP-2 mission was among them, hosting multiple in-orbit demonstration (IOD) payloads.



About the Transporter-18 Mission

- Type:** A rideshare mission, meaning multiple customers share the same rocket.
- Vehicle:** Falcon 9, SpaceX's reusable two-stage rocket.
- Launch site:** Space Launch Complex 4E, Vandenberg Space Force Base, California.
- Scale:** About 130 payloads were carried.
- Orbit:** A dedicated smallsat rideshare to Sun-synchronous orbit (SSO).

About LEAP (Launching Expeditions for Aspiring Payloads)

- Full form:** Launching Expeditions for Aspiring Payloads.
- Developer:** Dhruva Space, a private Indian space company.
- Concept:** A hosted-payload model. Instead of building a whole satellite for one instrument, a customer fits it onto Dhruva's ready-made satellite bus, called P-30.
- Services:** Dhruva also handles launch integration, ground station support and mission management.
- Earlier missions:**
 - LEAP-TD** (technology demonstrator) flew on ISRO's **PSLV-C58** in 2024.
 - LEAP-1**, Dhruva's first commercial mission, flew on a Falcon 9 in **August 2025**.
- LEAP-2:** Carries four payloads, including a star tracker from France's **Sodern**.

Other Indian Payloads on the Mission

- TAPAS-1 (SatLeo Labs):** A thermal-imaging payload that flew aboard LEAP-2. It is described as India's first commercial CubeSat thermal payload.
- MOI-1A (TakeMe2Space):** A satellite designed to process Earth observation data in orbit using AI. It carried EON Space Labs' MIRA multi-spectral imaging system.
- Background:** TakeMe2Space's first satellite, MOI-1, was lost on ISRO's PSLV-C62 in January 2026.
- Regulator:** All three Indian missions were authorised by IN-SPACe.



Q. With reference to the recent Transporter-18 mission, consider the following statements:

- I. It was a rideshare mission in which multiple customers shared a single Falcon 9 launch.
- II. Dhruva Space's LEAP platform allows smaller payloads to be hosted on a single satellite for in-orbit demonstration.
- III. IN-SPACe is the commercial arm of ISRO that markets ISRO's products and services.

Which of the statements given above is/are correct?

- (a) I and II only
- (b) II and III only
- (c) I and III only
- (d) I, II and III

Answer: (a)

Explanation

- **Statement I is correct:** Transporter-18 was a rideshare mission with about 130 payloads from multiple customers on one rocket.
- **Statement II is correct:** LEAP (Launching Expeditions for Aspiring Payloads) hosts several small payloads on one P-30 bus for IOD.
- **Statement III is incorrect:** The commercial arm of ISRO is **NewSpace India Limited (NSIL)**. IN-SPACe is the autonomous regulator and promoter of private space activity under the Department of Space.

3.2. NOBEL PRIZE IN PHYSICS 2026: ICECUBE NEUTRINO OBSERVATORY

Context

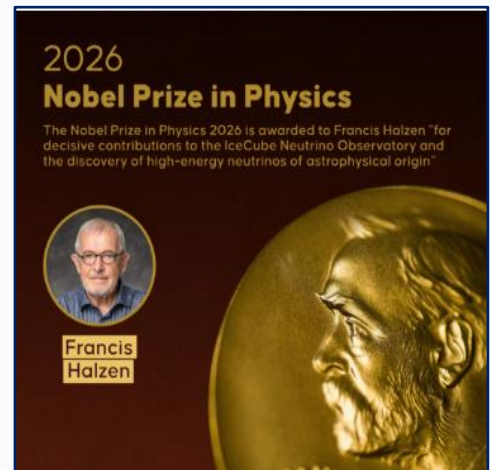
- The **2026 Nobel Prize in Physics** is being awarded to **Francis Halzen** for his pioneering contributions to the **IceCube Neutrino Observatory** and the discovery of **high-energy neutrinos of astrophysical origin**.

About the IceCube Neutrino Observatory

- **IceCube** is a giant **neutrino detector located at the South Pole** in Antarctica.
- It is designed primarily to detect **high-energy astrophysical neutrinos** originating from distant and energetic cosmic events.
- The observatory occupies nearly **1 cubic kilometre of Antarctic ice**.
- It contains around **5,160 optical sensors** embedded deep in the ice.
- IceCube was **completed in 2010**.

Why Neutrinos are Important?

- **Neutrinos** are extremely elusive **subatomic particles** with very weak interactions with matter.
- They can travel enormous cosmic distances without being significantly deflected or absorbed.



- High-energy neutrinos can therefore provide information about **violent astrophysical environments** that cannot be studied adequately through conventional electromagnetic astronomy.

Why is Ice Used to Detect Neutrinos?

- **Antarctic ice** offers a vast and exceptionally **transparent medium** for detecting the faint flashes of light produced by neutrino interactions.
- When a **neutrino interacts with matter in the ice**, it can produce charged particles that emit **Cherenkov light**.
- **Light sensors embedded deep in the ice** detect these faint flashes.
- By analysing these signals, scientists can determine the **energy and direction** of the neutrino and trace its **cosmic origin**.

About Cherenkov Radiation

- **Cherenkov light** is the characteristic blue light produced when a **charged particle travels through a transparent medium faster than light can travel through that medium**.
- It does **not** mean that the particle travels faster than light in vacuum.
- IceCube uses this light to reconstruct the **direction and energy of neutrino interactions**.

Q. With reference to the IceCube Neutrino Observatory, consider the following statements:

1. It is located in the Arctic region.
2. It detects Cherenkov light produced by neutrino interactions in ice.
3. Its main focus is on high-energy astrophysical neutrinos.

Which of the statements given above are correct?

- (a) 1 and 2 only
- (b) 2 and 3 only
- (c) 1 and 3 only
- (d) 1, 2 and 3

Answer: B

- **Statement 1 is incorrect.** IceCube is at the **South Pole, in Antarctica**, not the Arctic.
- **Statement 2 is correct.** Its **5,160 optical sensors** detect **Cherenkov light**, the pale blue flash produced when charged particles from a neutrino collision travel through the ice faster than light does in that medium.
- **Statement 3 is correct.** Its principal scientific focus is **high-energy astrophysical (cosmic) neutrinos**, such as the ones first reported in 2013 and the one traced to a blazar in 2018.

3.3. CARBON CAPTURE, UTILISATION AND STORAGE (CCUS)

Context

- Recently, Iceland has expressed interest in collaborating with India in **geothermal energy, Carbon Capture, Utilisation and Storage (CCUS)** and **carbon-to-stone technologies**.

Iceland and Geothermal Energy

- Iceland has abundant **geothermal resources** due to its location on the **Mid-Atlantic Ridge**, where tectonic plates are diverging.
- Around **70% of Iceland's electricity** comes from **hydropower** and about **30% from geothermal energy**.
- Geothermal energy is also widely used for **space heating and hot water**.
- Iceland has significant expertise in **geothermal exploration, power generation and direct heat utilisation**.



India's Geothermal Potential

- India has an estimated **geothermal potential of about 10.6 GW**, according to government estimates.
- Major geothermal regions in India include:
 - **Himalayan region**
 - **Western India**
 - **Deccan region**
 - **Andaman & Nicobar Islands**
- Geothermal energy is a **renewable and relatively continuous source of energy**, unlike solar and wind, which are weather-dependent.

About CCUS (Carbon Capture, Utilisation and Storage)

- **CCUS** is a technology that **captures CO₂ emissions** from industrial sources or directly from the atmosphere.
- The captured CO₂ is either **utilised** in products/processes or **transported and stored permanently** in geological formations.
- It can help **decarbonise hard-to-abate sectors** such as cement, steel, chemicals and refining.

About Carbon-to-Stone Technology

- **Carbon-to-Stone** is a carbon-removal technology that converts **captured CO₂ into stable carbonate minerals (rock)** through **mineralisation**.
- CO₂ reacts with **calcium- or magnesium-rich minerals**, forming solid carbonates that can store carbon for **thousands to millions of years**.
- **Example:** Heirloom Carbon Technologies uses captured CO₂ to accelerate its reaction with limestone-derived materials, permanently storing carbon as solid calcium carbonate.
- **Another example:** Carbfix injects dissolved CO₂ into basaltic rocks, where it mineralises into stable carbonates.
- **Significance:** Provides long-term carbon storage and can support net-zero and carbon-removal efforts.

Q. Consider the following statements regarding CCUS and Carbon-to-Stone Technology:

1. **CCUS** involves capturing CO₂ and either utilising it or storing it in suitable geological formations.
2. In **Carbon-to-Stone technology**, CO₂ is dissolved in water and injected into basaltic rocks.
3. The injected CO₂ reacts with minerals in basalt to form **stable carbonate minerals**.

Which of the statements given above is/are correct?

- (a) 1 and 2 only
- (b) 2 and 3 only
- (c) 1 and 3 only
- (d) 1, 2 and 3

Answer: (d) 1, 2 and 3

Explanation:

- **Statement 1 – Correct:** CCUS captures CO₂ and either **utilises it** in industrial processes or **stores it** in suitable geological formations.
- **Statement 2 – Correct:** In the **Carbon-to-Stone** approach, CO₂ is dissolved in water and injected into **basaltic rock formations**.
- **Statement 3 – Correct:** CO₂ reacts with minerals present in basalt and gets converted into **stable carbonate minerals**, enabling long-term storage as rock.

3.4. 2026 NOBEL PRIZE IN CHEMISTRY

Context

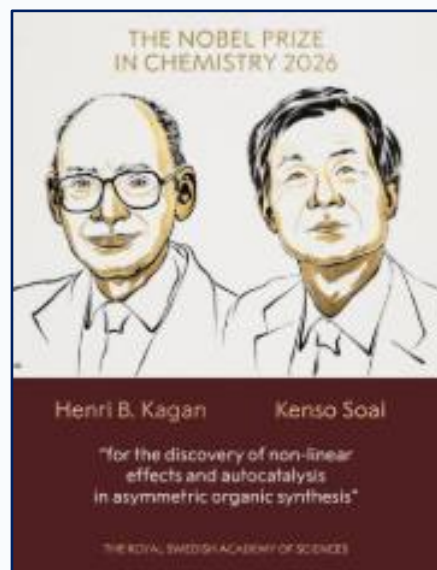
- Henri B. Kagan (France) and Kenso Soai (Japan) received the 2026 Nobel Prize in Chemistry for discovering non-linear effects and autocatalysis in asymmetric organic synthesis, helping explain **homochirality**—why life predominantly uses one mirror-image form of certain molecules.

What is Chirality?

- **Chirality** refers to the property of an object or molecule that is **not identical to its mirror image**.
- The two mirror-image forms of a chiral molecule are called **enantiomers**.
- A simple example is the **left and right hand**—they are mirror images but cannot be perfectly superimposed.
- Many biologically important molecules, including **amino acids**, are chiral.
- Biological systems often preferentially use **one specific enantiomer**.
- This molecular “handedness” is known as **homochirality** when one form predominates in a biological system.

Why is Chirality Important?

- Chirality is important because biological systems are completely asymmetrical, meaning two mirror-image molecules will fit into body receptors differently—like a left hand trying to fit into a right-handed glove.
- This is particularly important in **pharmaceuticals**, where one molecular form may produce the desired therapeutic effect while another may have a different or undesirable effect.
- Therefore, controlling which enantiomer is produced is crucial for **drug development and manufacturing**.
- Chirality is also important in the production of **flavours, fragrances and advanced materials**.



Advanced Chemical Principles & Innovations

- **Asymmetric Amplification (Kagan's Discovery - 1986):**
 - Demonstrates that even a slight initial imbalance in the handedness of a chiral catalyst can disproportionately bias the final chemical reaction to yield a specific desired form.
 - Enables high-efficiency production of specific enantiomers for pharmaceuticals, agrochemicals, and fragrances.
- **Asymmetric Autocatalysis (Soai Reaction - 1990s):**
 - Occurs when a chiral molecule serves as its own catalyst, accelerating the formation of identical chiral forms.
 - Helps explain the evolutionary origins of why life prefers single-handed molecular forms.

Significance of the Discovery

- **Pharmaceuticals:** Enables greater control over the production of desired enantiomers.
- **Organic synthesis:** Provides methods to selectively produce **chiral molecules**.
- **Origin of life:** Offers insights into the emergence of **homochirality**.
- **Chemical catalysis:** Demonstrates how molecular asymmetry can be **amplified through catalytic processes**.
- **Materials and technology:** Chiral molecules are increasingly relevant in the development of **new materials and technological applications**.

Q. With reference to 'Chirality' and chemical reactions, consider the following statements:

1. Chiral molecules are mirror-image forms of each other that interact identically with human cell receptors.
2. In asymmetric catalysis, a minor structural imbalance in a catalyst can disproportionately determine the end product's optical form.
3. The majority of proteins in the human body are made of amino acids displaying a specific hand-like orientation.

Which of the statements given above is/are correct?

- (a) 1 only
- (b) 2 and 3 only
- (c) 1 and 3 only
- (d) 1, 2 and 3

Answer: (b) 2 and 3 only

- **Statement 1 is incorrect:** Chiral molecules are mirror-image forms of each other (enantiomers) that interact **differently** with chiral receptors and enzymes in human cells. Because cell receptors and enzymes are chiral, two mirror-image forms of a molecule can trigger distinct biological responses.
- **Statement 2 is correct:** In asymmetric catalysis, a minor initial imbalance or asymmetry in the catalyst can disproportionately bias the reaction, determining the optical form/handedness of the end product.

- **Statement 3 is correct:** Living organisms display homochirality; specifically, the majority of proteins in the human body are composed of amino acids with a specific hand-like orientation.

3.5. NOBEL PRIZE 2026 AND THE BREAKTHROUGH IN OPTOGENETICS

Context

- The 2026 Nobel Prize in Physiology or Medicine was awarded to Peter Hegemann, Karl Deisseroth and Georg Nagel for pioneering optogenetics, which uses light to control specific neurons and study brain functions.

What is Optogenetics?

- Optogenetics combines genetic engineering and light to selectively activate or inhibit specific neurons, helping scientists study their roles in brain functions and behaviour.



Why is Optogenetics Important?

- **High Precision:** Targets specific neurons with millisecond-level control.
- **Circuit Analysis:** Reveals the roles of specific neural pathways.
- **Causal Links:** Connects neural activity with specific behaviours.
- **Brain Research:** Helps study memory, movement, emotions, attention and sleep.

Scientific Mechanism: From Algae to Neuroscience

- **Discovery:** Peter Hegemann and Georg Nagel studied light-sensitive proteins called channelrhodopsins in green algae.
- **Breakthrough (2005):** Karl Deisseroth introduced the algal gene into mammalian neurons, making them responsive to blue light.
- **Neural Control:** Fibre-optic light selectively switches neurons on or off, helping researchers study brain circuits and behaviour in live animals.

Significance & Applications

- **Understandings:** Establishes direct links between specific neural circuits and behaviour.
- **Disease Research:** Helps investigate Alzheimer's, Parkinson's, schizophrenia and depression.
- **Vision Restoration:** Shows potential for treating retinal disorders like retinitis pigmentosa.
- **Hearing Restoration:** Explores potential approaches to recovering hearing.

Q. Consider the following statements regarding 'Optogenetics', which was recently in the news:

1. It is a technique that combines genetic engineering and optical methods to monitor and control the activities of individual neurons in living tissue.
2. The foundational components of this technology were originally discovered by studying light-sensitive proteins in microscopic algae.

3. It relies exclusively on external chemical drugs to activate targeted neural circuits without the use of light.

Which of the statements given above is/are correct?

- (a) 1 only
- (b) 1 and 2 only
- (c) 2 and 3 only
- (d) 1, 2 and 3

Correct Answer: (b) 1 and 2 only

Statement 1 is Correct: Fuses gene insertion with light delivery to manipulate targeted cells with millisecond precision.

Statement 2 is Correct: Researchers identified channelrhodopsin proteins in green algae that react to light by triggering electrical signals.

Statement 3 is Incorrect: Uses targeted **light stimulation** (via lasers/LEDs), not chemical drugs, to activate sensitized neural circuits.

3.6. INS SURYA: INDIA'S FIRST INDIGENOUS FLEET SUPPORT SHIP

Context

- Recently, the Defence Minister launched **Fleet Support Ship-1 (FSS-1), named 'Surya'**, at **Hindustan Shipyard Limited (HSL), Visakhapatnam**.

What is a Fleet Support Ship (FSS)?

- A **Fleet Support Ship** is a naval logistics vessel designed to **replenish warships at sea**.
- It can provide **fuel, fresh water, ammunition and stores**, allowing naval vessels to remain deployed for longer without returning to port.
- Thus, FSS strengthens the Navy's **operational endurance, mobility and reach**, particularly during extended operations in the **Indian Ocean Region (IOR)**.



Key Features of FSS-1 'Surya'

- **First of five** Fleet Support Ships being built for the Indian Navy.
- **Designed and built indigenously by HSL.**
- Approximately **43,500 tonnes**.
- Equipped with:
 - First-line maintenance workshops
 - **Helicopter deck** for Multi-Role Helicopter operations
 - Self-defence systems
- The ships are intended to strengthen India's Blue Water Navy capability.

Q. Consider the following statements regarding Fleet Support Ship-1 (FSS-1) 'Surya':

1. It is designed to replenish warships at sea with fuel, fresh water, ammunition and other stores.
2. It is the first of five Fleet Support Ships being built for the Indian Navy.
3. It is being indigenously designed and built by Hindustan Shipyard Limited at Visakhapatnam.
4. Its primary role is to conduct anti-submarine warfare operations in the Indian Ocean Region.

Which of the statements given above are correct?

- (a) 1, 2 and 3 only
(b) 1 and 4 only
(c) 2 and 3 only
(d) 1, 2, 3 and 4

Answer: A

Explanation:

- **Statement 1 is correct:** Fleet Support Ships are replenishment vessels. They supply fuel, fresh water, ammunition, provisions and spares to warships at sea, which lets the fleet stay deployed far from base for longer.
- **Statement 2 is correct:** The Navy ordered **five** FSS under a contract signed in 2023, and FSS-1 is the first of the class.
- **Statement 3 is correct:** The ships are being built by **Hindustan Shipyard Limited (HSL), Visakhapatnam**, under the **Atmanirbhar Bharat / Make in India** push. HSL reportedly worked with a foreign design partner, so "indigenous" here refers to the build and the government's framing, not a fully foreign-free design.
- **Statement 4 is incorrect:** An FSS is a **logistics and replenishment vessel**, not a combat platform. Anti-submarine warfare is done by ASW corvettes, destroyers, frigates and ASW aircraft.

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HISTORY & CULTURE

4.1. RAMAPPA TEMPLE

Context

- Activists have raised concerns over a **proposed open-cast coal mine near Venkatapur** in Mulugu district of Telangana, arguing that mining activity could adversely affect the **Rudreshwara Temple, popularly known as Ramappa Temple**, and the adjoining **Ramappa Lake**.

About Ramappa Temple

- The **Rudreshwara Temple**, popularly known as the **Ramappa Temple**, is located at **Palampet in Mulugu district, Telangana**.
- It was built during the **Kakatiya period** in the **13th century**.
- The temple is dedicated to **Lord Shiva**.
- It is popularly named after **Ramappa**, the chief sculptor associated with its construction.
- The temple is noted for its **intricate sculptures, ornamental carvings and distinctive architectural techniques**.
- The temple complex is located near the **Ramappa Lake**, a historic water-management structure associated with the Kakatiya period.



UNESCO World Heritage Status

- The **Rudreshwara (Ramappa) Temple** was inscribed on the **UNESCO World Heritage List in 2021**.
- It is significant because it represents the architectural and cultural achievements of the **Kakatiya dynasty**.

Kakatiya Architecture: Key Features

- Star-shaped plan:** Temples often have a distinctive stellate (star-shaped) ground plan.
- Material:** Extensive use of locally available granite and sandstone, with highly polished stone surfaces.
- Intricate carvings:** Rich floral, geometric, mythological and figurative sculptures adorn walls and pillars.
- Lathe-turned pillars:** Highly polished, finely carved circular pillars are a prominent feature.
- Raised platforms:** Temples were often built on elevated platforms (jagati).
- Distinctive gateways:** Elaborate entrances and toranas, especially seen at the Warangal Fort.
- Open-pillared halls:** Spacious mandapas with numerous ornate pillars were used for religious gatherings.
- Water architecture:** Kakatiyas developed tanks, reservoirs and stepped wells, reflecting their expertise in water management.
- Notable examples:** Thousand Pillar Temple, Ramappa Temple, and Warangal Fort.

Q. With reference to the Kakatiya Rudreshwara (Ramappa) Temple, consider the following statements:

1. It is built in close proximity to a historic irrigation lake developed by the Kakatiyas.
2. The superstructure of the temple was constructed using porous, lightweight bricks capable of floating on water.
3. The temple utilizes a specialized sandbox foundation technique to absorb seismic vibrations.
4. It was commissioned during the reign of Kakatiya ruler Prataparudra I.

Which of the statements given above are correct?

- (a) 1, 2, and 3 only
- (b) 2 and 4 only
- (c) 1, 3, and 4 only
- (d) 1, 2, 3, and 4

Answer: (a) 1, 2, and 3 only

Explanation:

- **Statements 1, 2, and 3 are correct:** The temple sits adjacent to the Kakatiya-era Ramappa Lake, incorporates floating lightweight bricks in its *vimana*, and relies on a sandbox foundation to buffer against seismic tremors.
- **Statement 4 is incorrect:** It was commissioned in 1213 CE during the reign of Kakatiya King **Ganapati Deva** by his general Recherla Rudra, not Prataparudra I.

4.2. FREEDOM FIGHTER 'SOCIO VASU'

Context

- Veteran freedom fighter **P. Vasu**, popularly known as '**Socio Vasu**', passed away at his residence in Cheruvannur, Kozhikode, at the age of 103.

Role in the Indian Freedom Struggle

- **Quit India Movement (1942):** Actively participated in the movement against British colonial rule.
- **Local Leadership:** Led a prominent protest march from **Kundaithodu to Cheruvannur** in Kozhikode, Kerala.
- **Imprisonment:** Arrested, beaten, and imprisoned by British police for his active role in the Quit India Movement.

Post-Independence Socialist Movement

- **Association with Jayaprakash Narayan:** Joined the Socialist Movement after Independence and received formal party membership directly from **Jayaprakash Narayan** in Kozhikode.



- **Origin of Name:** Earned the moniker '**Socio Vasu**' due to his lifelong commitment and association with the socialist ideology.
- **Rejection of Material Rewards:** In 1951, he turned down 10 acres of land and ₹2,000 offered by the Madras Presidency for freedom fighters, maintaining that he fought for independence rather than material gains.

The Socialist Stream in Indian Politics

Stage	Development
1934	Congress Socialist Party (CSP) formed within the Congress
1948	Socialists left the Congress and formed the Socialist Party
1952	Praja Socialist Party (PSP) formed by merger
1974	JP's " Total Revolution " movement

Q. With reference to the freedom struggle in Kerala, consider the following statements regarding P. Vasu ('Socio Vasu'):

1. He actively participated in the Quit India Movement and led local protest marches in Kozhikode.
2. Post-Independence, he joined the socialist movement under the influence of Jayaprakash Narayan.

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: (C) Both 1 and 2

Statement 1 is correct. He took part in the Quit India Movement and led a protest march from Kundaithodu to Cheruvannur (Kozhikode). The British police imprisoned him for this.

Statement 2 is correct. After Independence he joined the socialist movement and received party membership from Jayaprakash Narayan in Kozhikode. This association is why he came to be called 'Socio Vasu'.

MISCELLANEOUS

5.1. CANADIAN POET ANNE CARSON WINS NOBEL PRIZE IN LITERATURE

Context

- Canadian poet, essayist, and translator **Anne Carson** was awarded the **2026 Nobel Prize in Literature** by the **Swedish Academy**.

About Anne Carson

- Nationality:** Canadian
- Fields:** Poetry, essays and translation
- Literary Style:** Her works blend poetry, prose, essays and fiction, drawing inspiration from ancient Greek and Roman literature.
- Carson is the **19th woman** to receive the Nobel Prize in Literature since its inception in 1901.



Notable Works

- Eros the Bittersweet
- Autobiography of Red
- Men in the Off Hours
- Norma Jeane Baker of Troy
- Glass, Irony, and God
- Nox

About the Nobel Prize System

- Established by:** Alfred Nobel, Swedish chemist, engineer and inventor of dynamite.
- Institutional Origin:** The Nobel Prizes were established through Alfred Nobel's will, signed in 1895.
- First Awards:** The Nobel Prizes were first awarded in 1901.
- Prize Categories:** Physics, Chemistry, Physiology or Medicine, Literature and Peace.
- Economic Sciences:** The Sveriges Riksbank Prize in Economic Sciences in Memory of Alfred Nobel was established in 1968 and first awarded in 1969. It is not one of the original five Nobel Prizes.
- Nobel Prize in Literature:** Awarded by the Swedish Academy.
- Other Awarding Institutions:**
 - Physics and Chemistry — Royal Swedish Academy of Sciences.
 - Physiology or Medicine — Nobel Assembly at Karolinska Institutet.
 - Peace — Norwegian Nobel Committee, appointed by the Norwegian Parliament (Storting).
 - Economic Sciences — Royal Swedish Academy of Sciences.

- **Award Ceremony:** The Nobel Prizes in Physics, Chemistry, Physiology or Medicine, Literature and Economic Sciences are presented in Stockholm, Sweden, while the **Nobel Peace Prize is presented in Oslo, Norway.**
- **Prize Components:** A Nobel Prize consists of a medal, a diploma and a monetary award.

Q. With reference to Anne Carson and the Nobel Prize in Literature, consider the following statements:

1. Anne Carson is a Canadian poet, essayist and translator whose works draw inspiration from ancient Greek and Roman literature.
2. The Swedish Academy is responsible for awarding the Nobel Prize in Literature.
3. Anne Carson is the 29th woman to receive the Nobel Prize in Literature since its inception in 1901.
4. Autobiography of Red and Glass, Irony, and God are among her notable works.

Which of the statements given above are correct?

- (a) 1, 2 and 4 only
(b) 1 and 3 only
(c) 2, 3 and 4 only
(d) 1, 2, 3 and 4

Answer: (a) 1, 2 and 4 only

Explanation:

- **Statement 1 is Correct:** Anne Carson is a Canadian poet, essayist and translator known for blending classical themes with modern literary forms.
- **Statement 2 is Correct:** The Swedish Academy selects the laureate for the Nobel Prize in Literature.
- **Statement 3 is incorrect:** The passage identifies Carson as the 19th woman to receive the award.
- **Statement 4 is Correct:** Both Autobiography of Red and Glass, Irony, and God are among Carson's notable works.

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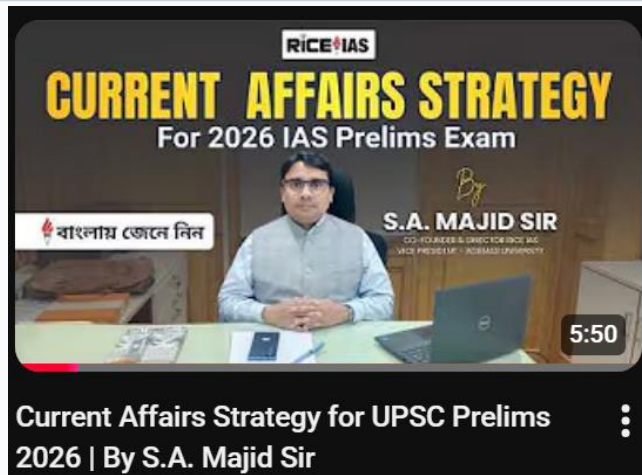
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