info@rpmias.com



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By *DR. V. RAM PRASATH MANOHAR, IAS*

EXCLUSIVE CURRENT AFFAIRS BULLETIN

Newsletter | 2nd Week, October 2026



INDEX

1 The Asian Games 2026

2 PM E-DRIVE Scheme

3 India–Switzerland Relations

4 Nobel Prizes 2026: Medicine and Physics

5 India's First 3D-Printed Rural Housing Pilot

6 One Year of PM-SETU

7 The First Female Farmer Worker Conference

8 National Coastal Mission 2.0

9 First Tigress Released in Buxa Tiger Reserve

The Asian Games 2026





Why in News?

October 2026 : India concluded its 20th Asian Games campaign in Aichi-Nagoya, Japan, finishing fourth in the overall medal tally with 85 medals (21 gold, 27 silver, and 37 bronze).

What are the Asian Games?

- Nature: The 20th edition of the Asian Games — Asia's premier multi-sport continental competition.
- Organising body: Organised quadrennially by the Olympic Council of Asia (OCA).
- Host: Co-hosted by Aichi Prefecture and Nagoya, Japan.
- Scale: Featured 46 nations competing across 43 sports and 469 gold medal events.

India's Medal Record and Campaign Overview

Overall Haul

- 85 Medals — 21 Gold, 27 Silver, 37 Bronze.
- Ranking: 4th in the overall medal tally.

Contingent Size

- 495 athletes competing across 36 sporting disciplines.
- This was a 25% smaller squad compared to Hangzhou 2022.

Team vs Individual Dynamics

- 13 of India's 21 gold medals were won in team events — including cricket, field hockey, kabaddi, archery and shooting.
- 19 of India's 27 silver medals came in individual events.
- This highlights a recurring challenge: Indian athletes frequently reach finals but narrowly miss out on the top podium finish.

Funding Efficiency Under Review

- Out of ₹97.84 crore disbursed under TOPS (Target Olympic Podium Scheme) over the Games cycle, approximately 2% (₹2.05 crore) was spent directly on athletes who won gold medals.
- Several major gold winners emerged from outside the core scheme — raising questions about funding efficiency and talent identification.

Key Indian Winners and Notable Performances

Archery (5 Gold, 2 Silver, 2 Bronze)

- Kumkum Mohod (17 years old): Won individual women's recurve gold, becoming India's first-ever individual Asian Games champion in the discipline.
- Women's Recurve Team: Won a historic gold, breaking South Korea's 28-year winning streak.
- Compound Archery: Secured 3 gold medals across team and individual categories.

Boxing (3 Gold, 3 Bronze)

- Gold medallists: Ankush Panghal, Lovlina Borgohain, and Parveen Hooda.
- India emerged as the top-performing nation in boxing, ahead of Uzbekistan, Kazakhstan, and China.
- Bronze medallists: Kapil Pokhariya, Narender, and Priya.

Field Hockey (2 Gold)

- Women's Team: Won gold for the first time in 44 years, defeating defending champion and Olympic silver-medallist China under returning head coach Sjoerd Marijne.
- This directly secured qualification for the 2028 Los Angeles Olympics.
- Men's Team: Defended their gold medal, remaining undefeated throughout the tournament.

Shooting (3 Gold, 8 Silver, 4 Bronze)

- Neeru Dhanda: Won a historic gold in women's trap shooting.
- Suruchi Singh & Kamaljeet Singh: Clinched gold in the 10m air pistol mixed team event.

Wrestling (2 Gold, 2 Silver, 2 Bronze)

- Aman Sehrawat: Clinched gold in men's freestyle wrestling.
- Sujeet Kalkal: Secured gold with standout performances throughout the bracket.

Cricket (2 Gold)

- Both the Indian Men's and Women's teams swept the tournament to claim two gold medals.

Kabaddi (2 Gold)

- Both the Men's and Women's kabaddi squads won gold medals, holding off strong challenges from Iran and Chinese Taipei.

Golf (1 Gold, 1 Silver)

- Pranavi Urs: Became the first Indian woman to win an individual Asian Games golf gold medal.
- She paired with Aditi Ashok and Diksha Dagar to take the women's team silver.



Athletics (1 Gold, 9 Silver, 14 Bronze)

- Total: 24 medals.
- National records broken by Vithya Ramraj, Parul Chaudhary, and Dev Meena.
- Javelin podium finishes from Rohit Yadav and Yash Vir Singh.

Notable Historic and Breakthrough Medals

- Weightlifting: Mirabai Chanu won silver — India's first Asian Games weightlifting medal since 1998.
- Soft Tennis: Jay Meena claimed a bronze — India's first-ever medal in the sport at the Asian Games.
- Table Tennis: Manush Shah and Diya Chitale won a bronze in mixed doubles, defeating the world No. 10 pair from Hong Kong.
- Wushu: Roshibina Devi secured a silver in the women's sanda category.

Analysis & Significance

Strengths

- Historic breakthroughs: First individual recurve gold, first women's hockey gold in 44 years, first golf gold by an Indian woman, first soft tennis medal.
- Team sport dominance: Cricket, kabaddi, and hockey delivered golds consistently.
- Boxing excellence: India topped the boxing medal table ahead of traditional powerhouses.
- Olympic qualification: Women's hockey secured direct qualification for Los Angeles 2028.

Concerns

- Individual event conversion: 19 of 27 silvers in individual events indicate athletes reach finals but fail to convert to gold.
- Smaller contingent: 25% smaller squad than Hangzhou 2022; fewer athletes meant fewer medal opportunities.
- TOPS funding efficiency: Only 2% of TOPS funds went to gold medallists; several gold winners came from outside the scheme.
- Athletics dominance in volume but not gold: 24 medals in athletics but only 1 gold — a conversion challenge.
- Fourth-place finish: India finished behind the top three nations, indicating a gap in overall sporting depth.

Conclusion

India's 2026 Asian Games campaign in Aichi-Nagoya was a landmark yet uneven performance: with 85 medals (21 gold) and a fourth-place finish, it delivered historic breakthroughs in team sports like cricket, kabaddi, and women's hockey
securing direct Olympic qualification for the latter while exposing persistent inefficiencies in converting individual final appearances into golds and a skewed TOPS funding pattern where only 2% supported gold medalists despite a 25% smaller contingent. For civil services aspirants, this underscores the need to move beyond medal-count optimism toward outcome-linked funding, sharper talent identification, and stronger athlete-support systems to turn podium presence into consistent gold-winning capability.

Civil Services Examination Prelims PYQ

Q. With reference to India's performance at the Asian Games 2026, which of the following statements is/are correct?

1. India finished fourth in the overall medal tally with 85 medals.
2. The Indian women's hockey team won gold for the first time in 44 years and directly qualified for the 2028 Los Angeles Olympics.
3. Kumkum Mohod became India's first-ever individual Asian Games champion in women's recurve archery.
4. The Asian Games are organised quadrennially by the Olympic Council of Asia (OCA).

Select the correct answer using the code given below:

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.

Why in News?

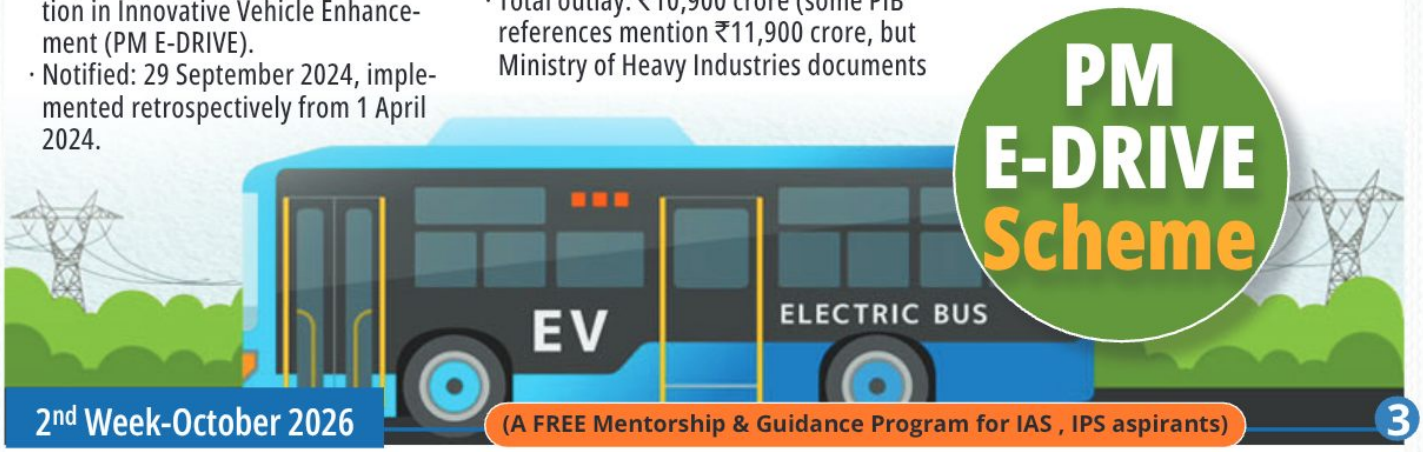
October 2026 : The Government highlighted the progress of the PM E-DRIVE Scheme. As of July 2026, over 23.2 lakh EVs have been incentivised, and ₹689 crore has been approved for deployment of 6,562 EV chargers.

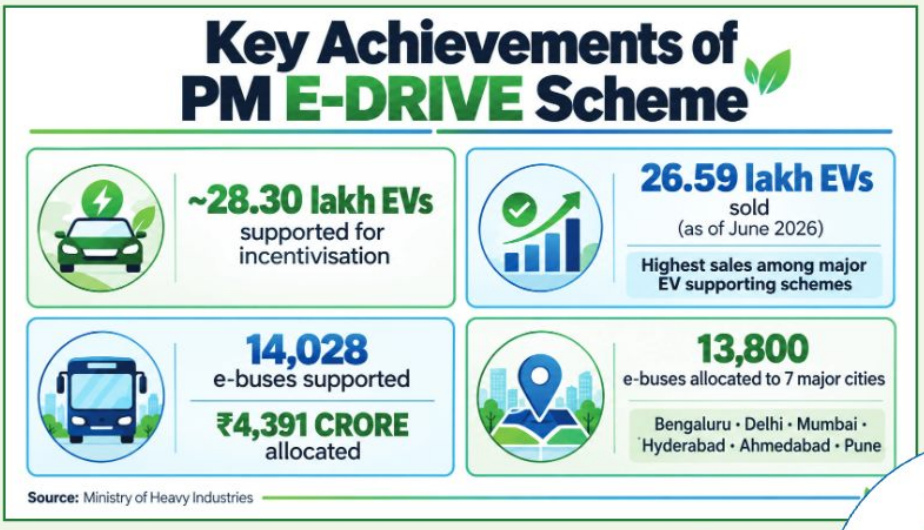
Basic Facts About the Scheme

- Full form: PM Electric Drive Revolution in Innovative Vehicle Enhancement (PM E-DRIVE).
- Notified: 29 September 2024, implemented retrospectively from 1 April 2024.
- Duration: Initially two years (till 31 March 2026), later extended to 31 March 2028; total expenditure ceiling remains unchanged.
- Nodal Ministry: Ministry of Heavy Industries.
- Nature: Subsumes the Electric Mobility Promotion Scheme (EMPS) 2024; continues the policy chain of FAME-I (2015) and FAME-II (2019).

Budget and Allocation

- Total outlay: ₹10,900 crore (some PIB references mention ₹11,900 crore, but Ministry of Heavy Industries documents and Parliamentary replies confirm ₹10,900 crore).
- Demand incentives: about ₹2,767 crore for electric two-wheelers (e-2W).
- Electric buses: ₹4,391 crore for deployment of 14,028 e-buses.
- Charging infrastructure: ₹2,000 crore for public charging stations (EV PCS).
- Testing agencies: ₹780 crore for upgrading test facilities.
- Electric ambulances: ₹500 crore.





Vehicle Categories and Incentives

Electric Two-Wheelers (e-2W)

- Incentive: ₹2,500/kWh, capped at ₹5,000/vehicle (was ₹5,000/kWh, cap ₹10,000 in 2024-25).
- Price cap: ex-factory price not exceeding ₹1.5 lakh.
- Total cap: over 4.579 lakh units.
- Incentive window closed: 31 July 2026.

Electric Three-Wheelers (e-3W) — Registered e-rickshaws and e-carts

- Incentive: ₹2,500/kWh, capped at ₹12,500/vehicle.
- Valid till: March 2028.

Electric Three-Wheelers (L5 category)

- Status: Target achieved on 26 December 2025; category closed.

Electric Trucks (e-trucks)

- Incentive: ₹5,000/kWh, capped at 10% of ex-factory price, with further limits based on Gross Vehicle Weight (GVW).

Electric Ambulances

- Incentive: ₹30,000/kWh, capped at 35% of ex-factory price.

Electric Buses (e-buses)

- Incentive: ₹10,000/kWh, capped at 20% of vehicle cost, with further limits by bus length (below 6 m, 6–10 m, 10–12 m).

Charging Infrastructure

- Target: 72,300 public fast chargers in selected cities and along selected highways.
- Approved: As of July 2026, 6,562 chargers approved involving ₹689 crore.
- Key fact: As of the August 2026 Parliamentary reply, not a single charger had been physically installed.
- Super App: BHEL is developing a digital "Super App" for users to book, pay, and check charger availability.



Domestic Manufacturing (PMP)

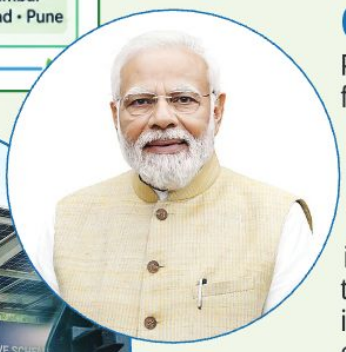
- Domestic manufacturing strengthened through the Phased Manufacturing Programme (PMP).
- e-buses and e-trucks (M2/M3, N2/N3): From 1 September 2026, higher localisation required for traction motors, motor controllers and powertrain components.
- From 1 April 2027, localisation extends to traction motor controllers (including inverters), covering domestic assembly of electronic components on PCBs.

Battery Recycling

- Regulatory framework: Battery Waste Management Rules, 2022, notified by the Ministry of Environment, Forest and Climate Change, provide the legal basis for environmentally sound battery waste management and recycling.

Significance

- Decarbonisation: Supports shift from fossil-fuel-based transport to cleaner mobility.
- Energy Security: Reduces dependence on imported fossil fuels.
- Industrial Development: Encourages domestic EV and battery manufacturing.
- Urban Mobility: Promotes deployment of electric buses and public charging infrastructure.
- Employment: Creates opportunities across EV manufacturing, charging, maintenance, and battery recycling.
- Circular Economy: Strengthens battery recycling and resource recovery.



Conclusion

PM E-DRIVE is the flagship driver of India's electric mobility ecosystem. With a financial outlay of ₹10,900 crore, it pulls demand through purchase incentives for e-2Ws, e-3Ws, e-buses, and e-trucks, while building the supply side through charging infrastructure and phased localisation requirements. The extension of the scheme to 2028 signals sustained government commitment, but the reality of "many chargers approved, none installed" exposes execution bottlenecks. Overall, the scheme is a key policy tool for India's Net Zero by 2070 target and the Viksit Bharat 2047 vision.

Civil Services Examination Prelims PYQ

Q. With reference to the PM E-DRIVE Scheme, which of the following statements is/are correct?

1. **The scheme is implemented by the Ministry of Power.**
2. **The total outlay of the scheme is ₹10,900 crore.**
3. **The scheme was initially for two years and was later extended to 31 March 2028.**
4. **The scheme completely replaced the FAME-II scheme.**

Select the correct answer using the code given below:

A) 1 and 2 only
B) 2 and 3 only
C) 1, 2 and 3 only
D) 1, 2, 3 and 4

Answer: B) 2 and 3 only.

India–Switzerland Relations



Why in News?

October 2026 : The President of the Swiss Confederation held comprehensive bilateral talks with the Indian Prime Minister in New Delhi. The State Visit marked the first anniversary of the entry into force of the Trade and Economic Partnership Agreement (TEPA) between India and the European Free Trade Association (EFTA).

During the visit, both countries agreed to deepen cooperation in trade, investment, defence, nuclear energy, and infrastructure.

Summary of the Relationship

- India–Switzerland ties are expanding beyond trade into defence, nuclear energy, infrastructure, science, technology, and AI governance.
- The India–EFTA TEPA provides the major economic framework for this deepening engagement.
- Key challenges include trade imbalance, absence of a Bilateral Investment Treaty, IPR concerns under Section 3(d), and implementation of the USD 100 billion TEPA investment commitment.

Key Outcomes of the 2026 State Visit

Migration & Mobility Partnership (MMP) Agreement

- Facilitates legal movement of talent while curbing irregular migration and trafficking.
- Provides multiple-entry visas valid up to 5 years (stays up to 6 months per visit).
- Includes renewable 1-year student permits.

Exchange of Young Professionals (YPS) Agreement

- Enables annual exchange of 300 young professionals (scalable to 500) for temporary employment and skill enhancement.
- Backed by a strict 30/90-day verification timeline.

Transport and Infrastructure MoU

- Formalises collaboration between India's Ministry of Road Transport and Highways (MoRTH) and Switzerland's Federal Department of Economic Affairs, Education and Research (EAER).
- Focus areas: sustainable mobility, electric vehicles (EVs), ropeways, circular economy, and alpine tunnelling technologies.

Science and Research Framework

- Letter of Intent (LoI) between India's Department of Science and Technology (DST) and the Swiss National Science Foundation (SNSF) to support joint, long-term scientific and exploratory research.

Startup and Technology Transfer (AIT India)

- Agreement between DST and Zurich University of Applied Sciences to roll out the Indo–Swiss Academia–Industry Training programme supporting early-stage science and deep-tech startups.

Strategic Expansion

- Both nations agreed to open new frontiers in defence equipment manufacturing, military exchanges, civilian nuclear energy, and ethical Artificial Intelligence (AI) governance.

Historical & Diplomatic Ties

- Diplomatic ties established through the Treaty of Friendship signed in New Delhi in 1948 — one of independent India's first such treaties.
- Relations have traditionally been cordial, stable, and economically driven.

Bilateral Trade

- Switzerland was India's 15th-largest trading partner in FY 2024–25, with total trade of USD 23.27 billion.
- India's Exports: Organic chemicals, jewellery, metals, textiles, electrical equipment, pharmaceuticals, agricultural products, and machinery.
- Swiss Exports: Gold bullion, chemicals, pharmaceuticals, machinery, transport equipment, precision instruments, and watches.

Economic & Commercial Engagements

India–EFTA TEPA

- Implemented in October 2025.
- Carries a commitment from EFTA states to mobilise USD 100 billion in Foreign Direct Investment (FDI) and generate 1 million direct jobs in India over 15 years.

FDI and Corporate Presence

- Switzerland ranks among the top European investors in India.

· Switzerland invested USD 10.87 billion in India between April 2000 and June 2025.
· Switzerland is India's 12th-largest source of FDI globally.

Science, Technology, and Education

· Bilateral research driven by the Indo-Swiss Joint Research Programme (ISJRP).
· India is an Associate Member State at CERN (European Organization for Nuclear Research) in Geneva — symbolised by the iconic Nataraja statue gifted by India installed at CERN.

European Free Trade Association (EFTA)

· About: EFTA is an intergovernmental organisation set up in 1960 under the Stockholm Convention for the promotion of free trade and economic integration.
· Members: Iceland, Liechtenstein, Norway, and Switzerland.
· Relation to EU: EFTA is not a customs union. Each member sets its own external tariffs, and none are EU members.



· Iceland, Liechtenstein, and Norway are part of the EU single market via the European Economic Area (EEA); Switzerland relies on separate bilateral agreements with the EU.
· India–EFTA Desk: Launched by Invest India as a single-window investment facilitation mechanism to strengthen economic ties and support EFTA investments under TEPA.
· India is EFTA's 5th-largest trading partner, with USD 24.4 billion in two-way trade in 2024–25; Switzerland is India's largest EFTA trading partner.

Key Challenges in India–Switzerland Relations

Lack of Bilateral Investment Treaty (BIT)

· Swiss investors currently lack explicit treaty protection in India, as India terminated its older bilateral investment treaties in 2017.
· Switzerland is pushing for a quick conclusion of a new investment protection pact.

Intellectual Property Rights (IPR) and Pharmaceutical Patents

· Swiss multinational pharmaceutical corporations have long raised concerns over Indian patent laws, particularly Section 3(d) of the Patents Act, 1970 (which prevents "evergreening").
· Switzerland seeks stricter data exclusivity and patent term extensions, which conflicts with India's role as the "pharmacy of the world" supplying affordable generic drugs.

Structural Trade Deficit

· India faces a persistent trade deficit with Switzerland, heavily skewed by significant imports of Swiss gold bullion, high-end precision machinery, and pharmaceuticals.

Realising the USD 100 Billion TEPA Pledge

· The EFTA bloc's USD 100 billion investment commitment is not backed by government guarantees; it depends entirely on whether private European companies choose to invest.
· The real operational challenge for India is maintaining a competitive business climate to secure these phased targets: USD 50 billion over the first 10 years, and the remaining USD 50 billion across the following 5 years.

Divergent Geopolitical Approaches

· Switzerland maintains its traditional neutrality and hosts Western-led initiatives like the Ukraine Peace Summit.
· India prioritises strategic autonomy, avoids bloc sanctions, and maintains multi-aligned ties — resulting in contrasting diplomatic approaches to global conflict resolution.

Way Forward

· Operationalise TEPA Investment Channels: Under the India–EFTA Investment Desk, fast-track joint monitoring mechanisms to direct Swiss capital into priority sectors under India's Production Linked Incentive (PLI) schemes — especially precision engineering, renewable energy, and medical devices.
· Collaborative Pharmaceutical Models: Shift the IPR discourse from litigation to co-development. Encourage Swiss pharma firms to set up clinical research, API manufacturing, and R&D centres in India through joint ventures.
· Harness Swiss Engineering for Indian Infrastructure: Integrate Swiss alpine tunnelling, avalanche protection, and ropeway engineering into India's complex border road networks and Himalayan connectivity projects (e.g., Char Dham route, urban ropeways).
· Deepen High-Tech and Green Hydrogen Synergy: Leverage Swiss research leadership in green hydrogen, carbon capture, and quantum technology to support India's climate targets under the National Green Hydrogen Mission.

Conclusion

India–Switzerland relations are evolving from trade-focused ties towards a broader strategic partnership covering technology, defence, nuclear energy, and investment. The 2026 State Visit and the first anniversary of TEPA mark a significant deepening of engagement, with new agreements on migration, mobility, young professionals, infrastructure, and science. However, the relationship still faces structural challenges, the absence of a Bilateral Investment Treaty, IPR friction over Section 3(d), a persistent gold-driven trade deficit, and the uncertain realisation of the USD 100 billion investment pledge. Strengthening TEPA implementation, resolving patent and investment-protection issues, and expanding cooperation into defence, nuclear, and AI governance will be key to transforming this relationship into a genuinely multidimensional strategic partnership.

Civil Services Examination Prelims PYQ

Q. Consider the following statements regarding India–Switzerland relations:

1. India and Switzerland established diplomatic ties through a Treaty of Friendship signed in 1948.
2. Switzerland is a member of the European Union as well as the European Free Trade Association (EFTA).
3. India terminated its older bilateral investment treaties with Switzerland in 2017.
4. Section 3(d) of India's Patents Act, 1970 prevents "evergreening" of pharmaceutical patents.

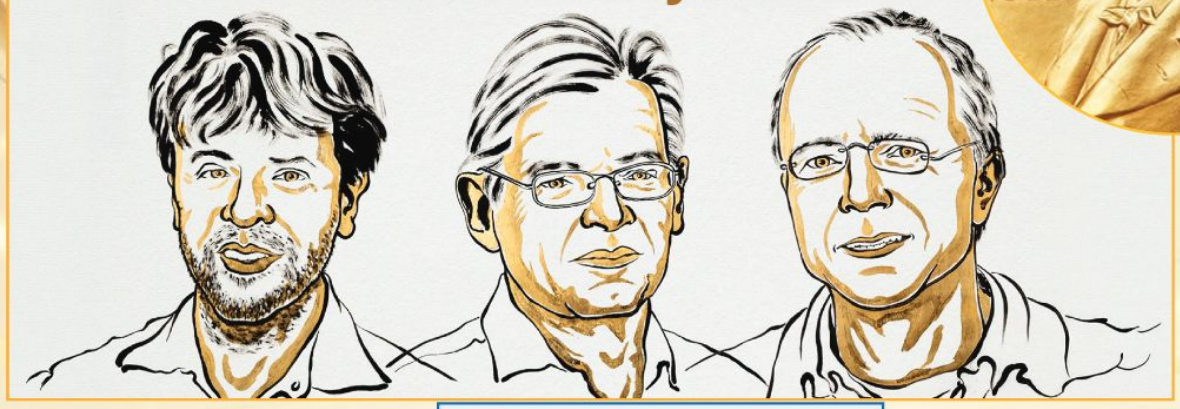
Which of the statements given above are correct?

A) 1 and 2 only
B) 1, 3 and 4 only
C) 2 and 4 only
D) 1, 2, 3 and 4

Answer: B) 1, 3 and 4 only.

Nobel Prizes 2026: Physiology or Medicine and Physics







Part I : Nobel Prize in Physiology or Medicine 2026: Optogenetics

Why in News?

October 2026: The 2026 Nobel Prize in Physiology or Medicine was jointly awarded to three scientists:

- Karl Deisseroth (USA)
- Peter Hegemann (Germany)
- Georg Nagel (Germany)

They were honoured for their revolutionary discoveries concerning "light-gated ion channels and optogenetics" a breakthrough technology that allows scientists to control specific brain cells (neurons) using light.

What is Optogenetics?

- Meaning: The word "optogenetics" comes from "opto" (light) and "genetics". It is a biological technique that uses light to control the electrical activity of specific nerve cells in living tissues.
- Core Concept: The human brain has around 90 billion nerve cells intertwined in complex circuits.
- Traditional methods to study the brain (like electrodes or drugs) act bluntly, stimulating broad areas of the brain indiscriminately.
- Optogenetics solves this by allowing scientists to switch individual neural circuits on or off with millisecond precision using flashes of light.
- Historical Context: In the 1970s, Nobel Laureate Francis Crick speculated that since nerve signals travel extremely fast, light would be the ideal, instantaneous tool to control them. This trio of scientists turned Crick's "far-fetched" vision into reality.

Key Facts About the 2026 Nobel Prize

Peter Hegemann and Georg Nagel (The Microbiologists)

- Hegemann (Humboldt University of Berlin, Germany) and Nagel (University of Würzburg, Germany) discovered channelrhodopsin, a light-sensitive protein found in algae.
- They identified that when channelrhodopsin is exposed to blue light, it acts as a physical gate (an ion channel) that opens up, allowing positive ions to flow and generate an electrical impulse.

Karl Deisseroth (The Neuroscientist)

- Deisseroth (Stanford University and HHMI Investigator, USA) inserted the algal channelrhodopsin gene into mammalian (rat) neurons.
- He used tiny optical fibres to deliver blue light into the brains of living mice.
- When activated by blue light, channelrhodopsin opened ion channels and triggered electrical impulses, enabling scientists to precisely control specific neural circuits and behaviours.
- The key breakthrough: The protein itself combines light detection and ion-channel activity, effectively acting as a molecular light switch for electrically active cells.

Significance of Optogenetics

Unprecedented Brain Mapping

- By selectively turning specific neurons on or off, optogenetics allows scientists to map neural circuits responsible for memory, emotions, and movement.
- It helps establish cause-and-effect relationships between neural activity and behaviour.
- This overcomes limitations of older brain-mapping methods.

Understanding Neurological Disorders

- Optogenetics may allow more precise stimulation of the auditory nerve than current electrical cochlear implants.
- By isolating malfunctioning neural circuits, researchers can gain deep insights into psychiatric and neurological disorders such as:
- Parkinson's disease
- Alzheimer's disease
- Schizophrenia
- Depression
- Epilepsy

Improved Neural Interfaces

- Researchers hope optogenetics could improve technologies such as cochlear implants by enabling more precise stimulation of the auditory nerve.

Beyond the Brain

- The technique is now being used to study how the nervous system interacts with other organs, including the heart and the gut (Enteric Nervous System).
- Optogenetics may help restore vision in patients with retinal disorders such as

retinitis pigmentosa.

Challenges and Human Application Gene Therapy Requirement

- It requires genetically modifying brain cells to express the light-sensitive protein, which carries clinical risks.

Light Penetration

- The human skull and scalp block visible light.
- Getting light deep into the brain currently requires surgically implanting fibre-optic cables.

Other Challenges

- Safety risks associated with genetic modification.
- Long-term effects of introducing foreign proteins into human neurons are not fully understood.
- Ethical concerns regarding manipulation of brain activity and behaviour.

Part II - Nobel Prize in Physics 2026: IceCube Neutrino Observatory

Why in News?

October 2026: The Royal Swedish Academy of Sciences awarded the Nobel Prize in Physics 2026 to Francis Halzen, a Belgian-American scientist. He was recognised for his decisive contributions to the conception and realisation of the IceCube Neutrino Observatory at the South Pole, and the discovery of high-energy neutrinos of astrophysical origin.

Summary

- The 2026 Nobel Prize in Physics recognised Francis Halzen for pioneering IceCube and advancing neutrino astronomy through the detection of high-energy astrophysical neutrinos.
- The proposed India-based Neutrino Observatory (INO) aims to study neutrinos using the 50,000-tonne ICAL detector, but remains stalled due to environmental and wildlife concerns.

Key Facts About the 2026 Nobel Prize in Physics

The Laureate

- Francis Halzen, a prominent professor and researcher at the University of Wisconsin–Madison.
- He conceptualised turning massive blocks of Antarctic glacial ice into a scientific detector for elusive cosmic particles.

The Genesis

- Halzen first proposed using the deep Antarctic ice at the South Pole to detect high-energy neutrinos in 1988.
- Subsequent experimental work, including AMANDA (Antarctic Muon And Neutrino Detector Array), demonstrated that Antarctic ice could successfully be used for neutrino detection.
- This paved the way for IceCube, which was completed in December 2010.

The IceCube Neutrino Observatory

Location and Scale

- Situated at the Amundsen-Scott South Pole Station in Antarctica.
- It is the world's largest particle detector — a device used to detect and measure subatomic particles.
- It utilises a full cubic kilometre of incredibly pure, deep glacial ice.
- IceCube contains 5,160 optical sensors embedded in about one cubic kilometre of Antarctic ice.
- The South Pole is particularly suitable because its deep ice is clear, stable, dark, and relatively free from interference.

Detection Mechanism

- When a high-energy neutrino occasionally collides with an atomic nucleus in the ice, it produces charged particles that generate faint flashes of blue light.
- The embedded sensors capture this light, allowing scientists to reconstruct the energy and exact cosmic origin of the neutrino.

Significance of IceCube

Pioneering a "New Kind of | Astronomy"

- For centuries, scientists relied on the electromagnetic spectrum (visible light, radio waves, X-rays, gamma rays) to observe the cosmos.
- Halzen's successful deployment of IceCube established a revolutionary observational paradigm known as neutrino astronomy.
- This allows humanity to study the universe using elusive subatomic particles rather than conventional light.

Decoding Uncorrupted Cosmic Messengers

- Traditional observation methods have major limitations:
- High-energy protons (cosmic rays) are charged and get deflected by interstellar magnetic fields.
- Gamma radiation is often absorbed by cosmic dust.
- Neutrinos carry no electrical charge and interact very weakly with matter.
- They travel across billions of light-years in perfectly straight lines, undisturbed by magnetic fields or dense physical obstructions.
- This unique property allows physicists to trace them directly back to their exact cosmic origins.

Mapping the Universe's Environments

- The continuous capture of high-energy astrophysical neutrinos allows astrophysicists to probe the internal mechanics of the most extreme and energy-rich environments in the distant cosmos.
- This provides unprecedented insights into previously obscured phenomena like:
- Supermassive black holes
- Active galactic nuclei (such as galaxy NGC 1068)
- Massive exploding stars (supernovae)

Solving the Mystery of Cosmic Accelerators

- High-energy neutrinos help scientists trace the origin of ultra-high-energy cosmic rays.
- They help identify the universe's powerful natural particle accelerators.

6. What are Neutrinos?

About

- Neutrinos are fundamental, elementary subatomic particles belonging to the lepton family.
- Because they rarely interact with normal matter, scientists often call them "ghost particles".
- Despite their elusive nature, they are the second most abundant particles in the universe, outnumbered only by photons (light particles).
- Every second, around 65 billion solar neutrinos pass through every square centimetre of Earth and the human body, almost entirely undetected.

Primary Sources

- Stars



- Cosmic rays
- Supernovae
- Radioactive decay
- Nuclear reactors
- Particle accelerators

Key Properties

- Charge: Neutrinos are completely electrically neutral (zero charge). This means they are not affected by magnetic or electromagnetic fields in space.
- Interaction: They interact only via the weak nuclear force and gravity. They do not interact with the strong nuclear force or electromagnetic force, allowing them to penetrate vast amounts of matter effortlessly.
- Mass: For decades, physicists believed neutrinos were completely massless. However, the 2015 Nobel Prize in Physics (awarded to Takaaki Kajita and Arthur B. McDonald) confirmed that they do have a tiny, nearly zero mass.

Three Types (Flavours) of Neutrinos

- Electron neutrino: Produced during the radioactive beta decay of atomic nuclei, primarily originating from the massive nuclear fusion reactions in the core of the Sun.
- Muon neutrino: Created when high-energy cosmic rays (mainly protons) slam into the Earth's upper atmosphere, producing particles that decay into muons and muon neutrinos.
- Tau neutrino: The rarest flavour, associated with the much heavier tau lepton. It was experimentally confirmed in 2000.

India-based Neutrino Observatory (INO) Project

About

- The INO was included by the Planning Commission as a Mega Science Project under the 11th Five-Year Plan.
- It is a proposed underground facility at Bodi West Hills, Theni district, Tamil Nadu.
- Aim: To study the fundamental properties of neutrinos, particularly atmospheric neutrinos.
- Its deep underground location, with over 1 km of rock cover, helps shield detectors from background cosmic radiation.

Structure

- The project involves excavating a 2,100-metre-long access tunnel leading to a massive underground cavern designed to house the primary detector.

ICAL Detector

- The Iron Calorimeter (ICAL) is the core detector of the INO project.
- It will use 50,000 tonnes of magnetised iron.
- It is designed to distinguish neutrinos from antineutrinos.
- When a neutrino very rarely collides with an iron nucleus, it produces a charged particle (a muon).
- Because the iron is magnetised, the path of the resulting muon will curve.
- The direction of this curve allows ICAL to uniquely distinguish between neutrinos and anti-neutrinos — a major scientific advantage over other global observatories.

India's Neutrino Legacy

- During 1964–65, an international collaboration installed detectors about 2.3 km underground in the Kolar Gold Fields in Karnataka.
- They recorded atmospheric neutrinos in 1965, making India one of the earliest centres of experimental neutrino research.

Current Status

- The INO project is stalled due to:
- Environmental concerns
- Its location in a tiger corridor
- Pending wildlife clearance
- Local opposition stemming from misconceptions about radioactivity, though neutrino research is non-radioactive.

Conclusion

The 2026 Nobel Prize in Physics awarded to Francis Halzen recognises a profound shift in how humanity observes the universe. By transforming a cubic kilometre of Antarctic ice into the world's largest particle detector, IceCube has established neutrino astronomy as a new window into the cosmos. Unlike light or cosmic rays, neutrinos travel billions of light-years in straight lines, unaffected by magnetic fields or cosmic dust, allowing scientists to trace them back to their exact origins, supermassive black holes, active galactic nuclei, and supernovae. This opens unprecedented insights into the universe's most extreme environments and the mysterious cosmic accelerators that produce ultra-high-energy particles. Meanwhile, India's own neutrino research ambitions, rooted in the pioneering Kolar Gold Fields experiments of the 1960s, remain stalled through the INO project due to environmental and wildlife concerns. The IceCube breakthrough underscores the importance of long-term scientific mega-projects and basic research, and serves as a reminder of the potential that India's stalled neutrino programme holds for fundamental physics.

Civil Services Examination Prelims PYQ

Q. Consider the following statements about neutrinos:

1. **Neutrinos are electrically neutral particles that interact only through the weak nuclear force and gravity.**
2. **The 2015 Nobel Prize in Physics confirmed that neutrinos have a tiny, non-zero mass.**
3. **The India-based Neutrino Observatory (INO) is proposed to be located in the Bodi West Hills of Tamil Nadu.**
4. **The ICAL detector at INO is designed to distinguish between neutrinos and antineutrinos using magnetised iron.**

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



India's First 3D-Printed Rural Housing Pilot

Why in News?

India's first national-level pilot project for constructing rural houses using 3D Concrete Printing (3DCP) under the Pradhan Mantri Awas Yojana-Gramin (PMAY-G) was launched in Andhra Pradesh.

Key Facts About the Pilot Project

- Objective: To construct 177 houses at a cost of approximately ₹14 crore.
- Completion target: Within six months.
- Implementing framework: Under PMAY-G, the flagship rural housing scheme of the Government of India.
- Significance: This is India's first national-level pilot for 3D-printed rural housing, marking a shift from experimental demonstrations to field-level application.

What is 3D Concrete Printing (3DCP)?

- Definition: It is a form of construction-scale additive manufacturing in which a computer-controlled robotic printer converts digital Building Information Modelling (BIM) designs into physical structures by depositing specially formulated concrete in successive layers.
- Working principle: Instead of traditional moulds and formwork, the robotic printer lays down concrete layer by layer, following a digital design, until the structure is built.
- Nature of the technology: It combines material science and automation.

Material Requirements and Automation

3DCP requires concrete mixtures with specific properties:

- Extrudability: The concrete must flow smoothly through the printer nozzle.
- Buildability: Each successive layer must retain its shape without collapsing under the weight of layers above it.
- Rapid-setting properties: The concrete must set quickly enough to support the next layer.
- Automation: The process relies on computer-controlled robotic systems, reducing manual intervention.

Significance of 3DCP

- Reduced construction time: Structures can be built much faster than conventional methods.
- Lower material waste: Precise deposition reduces excess use of concrete.
- Reduced labour requirements: Automation decreases dependence on manual labour.
- Less dependence on conventional formwork: Eliminates the need for traditional moulds and shuttering.
- Faster, cost-effective, and standardised affordable housing: Enables quicker delivery of uniform-quality houses.

Wider Applications

Beyond rural housing, 3DCP can support:

- Disaster-relief shelters: Rapid construction of temporary or permanent shelters after disasters.
- Remote-area housing: Construction in difficult terrain or locations with limited access.
- Defence fortifications: Quick construction of military structures and bunkers.
- Rapidly deployable public infrastructure: Schools, clinics, and other public facilities in urgent need.

Challenges

- Hybrid dependence: 3DCP still relies on conventional or hybrid construction methods for components such as:
- Foundations
- Structural reinforcement
- Roofing
- Electrical systems
- Plumbing
- Material limitations: Developing concrete mixes with the right extrudability, buildability, and rapid-setting properties remains technically demanding.
- Skilled workforce: Requires trained operators and engineers familiar with robotic printing and BIM design.

- Regulatory and standards gaps: Building codes and safety standards for 3D-printed structures are still evolving.
- Scalability: Moving from pilot projects to mass-scale rural housing requires cost reduction and supply-chain development.

India's Journey in 3D-Printed Construction

- 2021: India's adoption of construction-scale 3D printing gained momentum when IIT Madras and startup Tvasta unveiled the country's first 3D-printed single-storey house on the IIT Madras campus.
- 2026: The launch of the PMAY-G pilot in Andhra Pradesh marks the first national-level application of this technology for rural housing.

Global Evolution

- Construction-scale 3D printing has evolved from experimental applications to commercial use across regions such as:
- United States
- China
- Europe
- West Asia
- Dubai has emerged as a major hub for large-scale construction 3D printing.

Conclusion

India's first 3D-printed rural housing pilot in Andhra Pradesh represents a significant step in integrating construction-scale additive manufacturing into the country's affordable housing mission. By using robotic printers and specially formulated concrete, 3DCP promises faster construction, reduced material waste, lower labour dependence, and standardised quality, all critical for meeting rural housing targets under PMAY-G. The technology's potential extends beyond housing to disaster-relief shelters, defence fortifications, and remote infrastructure. However, challenges remain: dependence on conventional methods for foundations, roofing, and utilities, the need for skilled operators, and evolving regulatory standards. The success of this pilot will determine whether 3DCP can be scaled up as a mainstream solution for India's massive rural housing needs, making it a technology worth watching in the civil services examination context.



Civil Services Examination Prelims PYQ

Q. With reference to 3D Concrete Printing (3DCP), which of the following statements is/are correct?

1. It is a form of construction-scale additive manufacturing that uses a computer-controlled robotic printer.
2. The technology requires concrete mixtures with properties such as extrudability, buildability, and rapid-setting.
3. 3DCP completely eliminates the need for conventional construction methods for foundations, roofing, and plumbing.
4. India's first 3D-printed single-storey house was unveiled by IIT Madras and startup Tvasta in 2021.

Select the correct answer using the code given below:

A) 1 and 2 only
B) 1, 2 and 4 only
C) 2, 3 and 4 only
D) 1, 2, 3 and 4

Answer: B) 1, 2 and 4 only.

One Year of PM-SETU

Why in News?

PM-SETU came into focus as it completed one year of implementation, with 850 Industrial Training Institutes (ITIs) identified and 14 ITI clusters approved under its Hub-and-Spoke model.

Key Facts About PM-SETU

About

- Full name: Pradhan Mantri Skilling and Employability Transformation through Upgraded ITIs (PM-SETU).
- Launched: 4 October 2025.
- Aim: To modernise Government ITIs and make vocational training more industry-aligned and demand-driven.
- Outlay:₹60,000 crore vocational education and training upgradation scheme.
- Centre: ₹30,000 crore
- States: ₹20,000 crore
- Industry: ₹10,000 crore
- Approach: Promotes industry-led skilling by involving companies in curriculum design, training delivery, infrastructure development and institutional governance.

Hub-and-Spoke Model (Component I)

- Covers 1,000 Government ITIs, comprising 200 Hub ITIs and 800 Spoke ITIs.
- Each Hub is connected to an average of four Spoke ITIs.
- Enables shared access to:
- Modern infrastructure
- Advanced training facilities
- Digital learning systems
- Incubation facilities

- Hub ITIs have innovation centres, training-of-trainers facilities, production units, and placement services.
- Spoke ITIs expand access to these resources.
- Upgradation includes smart classrooms, modern laboratories, digital content, and industry-aligned courses.

Strengthening NSTIs (Component II)

- Focuses on capacity augmentation of five National Skill Training Institutes (NSTIs) at:
- Bhubaneswar
- Chennai
- Hyderabad
- Kanpur
- Ludhiana
- Includes sector-specific National Centres of Excellence.
- Includes advanced training of trainers through global partnerships.

Governance Structure

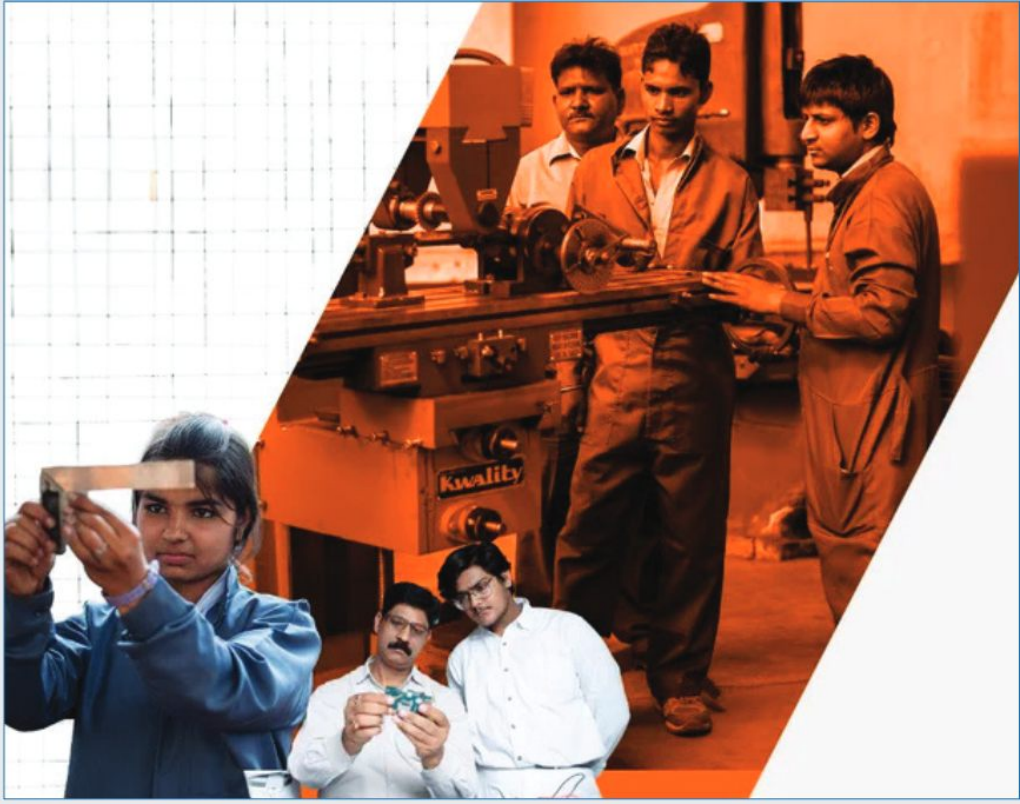
State–Industry–Centre Coordination

- States and UTs lead the selection of ITIs in consultation with industry.
- They submit upgradation proposals with industry partners based on emerging skill requirements and regional industrial potential.
- At the national level, the National Steering Committee (NSC), chaired by the Secretary, MSDE, provides:
- Policy direction
- Finalises guidelines
- Monitors implementation
- Undertakes course correction

Industry-Led Governance

- PM-SETU establishes Special Purpose Vehicles (SPVs) for upgraded ITI clusters.
- Ownership structure:
- Anchor Industry Partner: 51%
- Centre: 24.5%
- State Governments: 24.5%
- SPVs drive cluster development and operations based on local industry needs.
- Interventions include curriculum, training delivery, infrastructure, and industry exposure.
- Prospective industry partners must submit a Strategic Investment Plan (SIP).

How is PM-SETU Transforming ITIs? Implementation Progress



(First Year)

- 850 Government ITIs identified:
- 172 Hub ITIs
- 678 Spoke ITIs
- 36 States/UTs have identified clusters and created dedicated State budget heads.
- 35 States/UTs have constituted State Steering Committees.
- 26 States/UTs have initiated the process of inviting industry participation.

Nationwide Rollout

- The National Steering Committee (NSC) has approved the transition from the pilot phase to nationwide rollout across 200 ITI clusters.
- Rollout based on industry readiness and implementation capacity.

Industry Investment

- 14 Strategic Investment Plans (SIPs) approved, covering 8 States and 1 UT.
- Total investment: ₹3,446 crore.
- Sectors covered:
- Steel
- Manufacturing
- Healthcare
- Pharmaceuticals
- Infrastructure
- Automotive
- Defence electronics

32 New-Age Courses

- Directorate General of Training (DGT) introduced 32 new-age courses under the Craftsmen Training Scheme (CTS).
- Courses cover:
- AI
- Cyber Security
- Additive Manufacturing
- EVs
- Semiconductor Technology
- Robotics
- Green Hydrogen
- Drones
- IoT
- Solar Energy
- 5G

International Partnerships

- Singapore: MoU for NSTI Chennai.
- France: MoU for NSTI Kanpur.
- Australia: MoU for NSTI Bhubaneswar.
- Germany: Joint Declaration of Intent for NSTI Hyderabad.

How are ITIs Building the Foundation for a Skilled Workforce?

Vocational Training

- ITIs provide practical vocational training to equip youth with skills required for employment and industry.
- Under the Craftsmen Training Scheme (CTS), training is offered in engineering and non-engineering trades through Government and Private ITIs.

Course Duration

- ITI courses range from six months to two years, depending on the trade.

National-Level Coordination

- The Directorate General of Training (DGT), under the Ministry of Skill Development and Entrepreneurship (MSDE), is the apex organisation responsible for:
- Policy formulation
- Framing norms and standards
- Curriculum development
- Affiliation

· Instructor training
· Trade testing

Administrative Control

· ITIs function under the administrative and financial control of State Governments and Union Territory Administrations.

Expansion of ITI Network

· Number of Government and Private ITIs increased from 9,776 in 2014 to 13,888 in 2026 — a 42% increase.

Rising Enrolment

· ITI enrolment increased from 9.51 lakh in 2014–15 to 14.70 lakh in 2025–26 — a 54% increase.

Conclusion

PM-SETU represents a fundamental shift from conventional vocational training towards a modern, industry-led, and technology-oriented skilling ecosystem. In its first year, the scheme has identified 850 ITIs, approved 14 ITI clusters with ₹3,446 crore in industry investment, introduced 32 new-age courses, and forged international partnerships with Singapore, France, Australia, and Germany. Its Hub-and-Spoke model, industry-led SPVs with majority industry ownership, Strategic Investment Plans, and focus on emerging sectors like AI, semiconductors, green hydrogen, and EVs seek to make ITIs more responsive to changing labour-market requirements. By connecting skills, industry, and employment, PM-SETU can strengthen India's human capital and support the creation of a skilled workforce capable of contributing to emerging sectors and the broader objective of Viksit Bharat.

Civil Services Examination Prelims PYQ

Q. With reference to PM-SETU (Pradhan Mantri Skilling and Employability Transformation through Upgraded ITIs), which of the following statements is/are correct?

1. It aims to modernise Government ITIs and make vocational training more industry-aligned and demand-driven.
2. Under its Hub-and-Spoke model, 200 Hub ITIs and 800 Spoke ITIs are covered.
3. The ownership structure of Special Purpose Vehicles (SPVs) gives 51% to the Anchor Industry Partner, with the Centre and States holding 24.5% each.
4. The scheme has a total outlay of ₹60,000 crore, with contributions from the Centre, States, and industry.

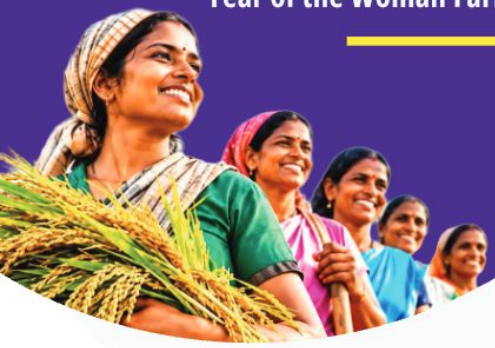
Select the correct answer using the code given below:

A) 1 and 2 only
B) 1, 2 and 4 only
C) 2, 3 and 4 only
D) 1, 2, 3 and 4

Answer: D) 1, 2, 3 and 4.

The First Female Farmer Worker Conference

Context: India's first Female Farmer Worker Conference was held in New Delhi to recognise women's contributions to agriculture and rural livelihoods, coinciding with the UN-designated International Year of the Woman Farmer 2026.



AboutThe First Female Farmer Worker Conference:

What it is?

A national-level convention dedicated to celebrating, networking, and addressing structural challenges faced by women farmers, agricultural laborers, and pastoralists across India.

Organisation: Organised by the Bharatiya Kisan Sangh (BKS).
Aim: To establish the formal social and legal identity of women as legitimate "farmers" (Kisan) rather than unpaid family helpers, facilitate their access to institutional land rights and credit, and promote sustainable agrarian models.

Key Features:

Alignment with UN IYWF 2026: Anchored around the global observance of the UN International Year of the Woman Farmer 2026, highlighting systemic gender gaps in global and domestic agrifood systems.
Multi-Domain National Awards: Conferred national honors upon female farmers demonstrating outstanding achievements in cow-based organic/natural farming, indigenous seed conservation, animal husbandry, and food processing.
Focus on Traditional Agro-Ecological Knowledge: Celebrated rural women as the primary custodians of indigenous seed preservation, local biodiversity mapping, and household nutritional security.
Platform forStructural Reform Deliberations: Deliberated on policy solutions for critical roadblocks including lack of land titles (joint pattas), institutional credit blockades, inadequate drudgery-reducing farm tools, and market linkage deficits.
Emphasis on Agrarian Leadership & Collectivization: Highlighted the scaling of women-led Farmer Producer Organizations (FPOs) and Self-Help Groups (SHGs) transitioning from subsistence wage-earning to agribusiness management.

Significance:

Despite contributing 60–80% of manual farm work, fewer than 14% of women own land, limiting access to credit and benefits.
Empowering women can promote natural and regenerative farming, improve soil health and food security, and diversify rural livelihoods.



NATIONAL COASTAL MISSION 2.0

Why in News?

The Union Environment Minister launched the implementation guidelines for National Coastal Mission 2.0 in New Delhi. This mission is a Central Sector Scheme with an approved outlay of ₹767 crore to be implemented from 2025-26 to 2030-31 across nine coastal States and four Union Territories .

Basic Facts About NCM 2.0

- Full name: National Coastal Mission 2.0.
- Nodal Ministry: Ministry of Environment, Forest and Climate Change (MoEFCC) .
- Type: 100% Central Sector Scheme (entirely funded by the Union Government; no external funding like multilateral loans or grants is envisaged) .
- Outlay: ₹767 crore for the period 2025-26 to 2030-31, aligned with the Finance Commission award period .
- Duration: Till 2030-31 (six operational years) .
- Legal Status: It subsumes the earlier National Coastal Mission (NCM 1.0) from 16 May 2025. NCM 1.0 was implemented from 2021-22 to 2025-26 with an outlay of ₹87 crore .

Background and Policy Continuum

- Blue Economy Vision 2047: Builds on India's Blue Economy vision, positioning the mission as a key institutional vehicle for environmentally sustainable coastal development .
- ICZMP Pilot: Draws from the World Bank-assisted Integrated Coastal Zone Management Project (ICZMP) .
- Mangroves & Coral Reefs Scheme: Builds on the earlier Conservation and Management of Mangroves and Coral Reefs scheme .
- Union Budget 2024-25: Announced a scheme for restoration and adaptation measures, coastal aquaculture and mariculture under Blue Economy 2.0 with an integrated multi-sectoral approach .
- NITI Aayog Report (October 2025): Situated sustainable utilisation of coastal and marine resources within Blue Economy Vision 2047, in consonance with Viksit Bharat goals .
- ENCORE Proposal: NCM 1.0 was an interim arrangement pending approval of the larger Enhancing Coastal and Ocean Resource Efficiency (ENCORE) proposal .

Vision & Objectives

Vision

To conserve and protect India's coastal and marine ecosystems while promoting sustainable and inclusive development, enhancing climate resilience, and unlocking the potential of the Blue Economy for socio-economic development and prosperity of coastal regions and communities .

Mission Objectives

- Promote adaptation and mitigation measures to address climate change impacts on coastal communities and ecosystems .
- Conserve, protect, and manage fragile coastal and marine ecosystems including mangroves, brackish water wetlands, coral reefs .
- Develop Integrated Coastal Zone Management Plans (ICZMPs) and Coastal Marine Spatial Plans (CMSPs) for environmentally sound, climate-resilient Blue Economy development .
- Support diversified and resilient livelihood options for coastal communities .
- Prevent, abate, and control pollution of coastal and territorial marine waters .
- Strengthen capacity and awareness among stakeholders on climate change challenges .
- Promote objectives of Atmanirbhar Bharat and fulfil international treaty obligations related to ocean and coastal environmental management .
- Unlock Blue Economy potential for socio-economic development of coastal regions .

Five Components (Thematic Categories)

a. Climate Resilient Blue Economic Growth

Promotes ecosystem conservation, pollution management, and climate-resilient development to enhance sustainability, resilience, and Blue Economy potential of coastal and marine regions .

b. Coastal Vulnerability and Risk Reduction

Supports scientific assessment of coastal vulnerabilities and risks, integrated planning through ICZMPs and CMSPs, and development of climate-resilient approaches to reduce coastal risks .

c. Climate Change Adaptation with Mitigation Co-benefits

Supports ecosystem-based and nature-positive interventions that enhance resilience of coastal ecosystems



and communities while generating mitigation co-benefits through conservation and restoration .

d. Capacity Building and Outreach
Training programmes, manuals, guidelines development, and awareness generation for stakeholders and coastal communities.

e. Committed Liabilities and Project Management
Administrative and operational expenses, monitoring, evaluation, third-party assessments, and project management consultants .

Geographical Coverage

Covers nine coastal States and four Union Territories:
States: Gujarat, Maharashtra, Goa, Karnataka, Kerala, Tamil Nadu, Andhra Pradesh, Odisha, West Bengal .
UTs: Dadra and Nagar Haveli and Daman & Diu, Andaman & Nicobar Islands, Puducherry, Lakshadweep .
India's coastline: Approximately 7,516.6 km (mainland) and 11,098.81 km including islands .

Key Focus Areas (as highlighted by the Minister)

- Coastal vulnerability assessments.
- Ecosystem restoration (mangroves, coral reefs, wetlands).
- Pollution management.
- Biodiversity conservation.
- Sustainable tourism.
- Spatial planning (ICZMPs and CMSPs).
- Research and capacity building.
- Promoting ease of doing business through a clear and streamlined implementation framework .

Expected Outcomes

- ICZMPs and CMSPs for 1,000 km of priority coastline .
- Cumulative vulnerability assessment of India's entire coastline .
- Restoration of coral reefs and mangrove restoration in Andaman & Nicobar Islands .
- Improved coastal water quality.
- Green shoreline infrastructure.
- Eco-friendly tourism.
- Conservation of coastal mammals (including sea water dolphins) .

Financial Framework Funding Pattern

- 100% centrally funded Central Sector Scheme .
- No external funding (multilateral loans/grants) envisaged .
- States/UTs encouraged to leverage own resources and State-level schemes for convergence.

Fund Flow

- Central Nodal Agency (CNA): Central Pollution Control Board (CPCB) .
- Funds routed through PFMS-enabled model (CNA/TSA/TSA-Hybrid) .
- Just-in-Time principle: Fund releases linked to approved activities, milestones, and achievement of Key Performance Indicators .
- First instalment: Up to 25% of approved project cost as advance .
- Subsequent instalments: After utilisation of at least 75% of earlier release with certified Utilisation Certificate .

Administrative Expenses

- ₹30 crore earmarked for Administrative and Operational Expenses (A&OE) over the scheme period .

Implementation Framework Institutional Structure

- Project Steering Committee (PSC): Chaired by Secretary, MoEFCC; provides apex-level oversight .
- Project Management Consultant (PMC): Conducts regular operational reviews and field visits .
- Implementing Agencies (IAs): State/UT departments and designated agencies .
- State Nodal Coordination Officers (SNCOs): Coordinate at State level .

Key Implementation Requirements

- Detailed Project Report (DPR) mandatory for all projects, including Executive Summary, Background & Need, SMART Objectives, Technical Design, Convergence Assessment, KPIs, and O&M plan.
- Memorandum of Understanding (MoU) between MoEFCC and Implementing Agency defining roles, responsibilities, and scope .
- Convergence with ongoing schemes to avoid duplication and optimise resources .

Significance

- Climate Resilience: Reduces coastal vulnerability to erosion, flooding, and salinity ingress .
- Blue Economy: Supports sustainable Blue Economy-led development in line with Blue Economy Vision 2047 and Viksit Bharat @2047 .
- Ecosystem Services: Protects mangroves, coral reefs, dunes, and wetlands that act as natural buffers against storms and erosion .
- Livelihoods: Strengthens institutional capacity and community livelihoods .
- International Obligations: Fulfils obligations under international treaties and conventions related to ocean and coastal environmental management .

Governance Challenges

- Centre-State execution gap: Although 100% Union-funded, States/UTs identify, plan, and implement projects; administrative capacity varies across regions .
- Overlapping jurisdictions: Coastal conservation, fisheries, tourism, urban development, and disaster manage-



ment involve separate departments; weak coordination delays decisions .

- Data fragmentation: Erosion and hazard data from scientific institutions may not be integrated with State-level land-use plans .
- Project selection and delays: Delays in proposal preparation, approval, procurement, and fund utilisation .
- Local participation: Coastal communities may be affected without adequate consultation or alternative livelihood support .
- Financing gap: With under ₹10 crore annually per coastal State/UT, capital-intensive coastal engineering works may require external borrowing or scheme convergence .



Conclusion

National Coastal Mission 2.0 represents a significant consolidating framework for India's climate-resilient coastal management. With a ₹767 crore outlay, it subsumes the earlier NCM and integrates ecosystem restoration, vulnerability assessment, pollution control, and sustainable livelihoods under a whole-of-government approach. The mission's success will depend not merely on guidelines and institutional structures but on effective Centre-State coordination, outcome-linked fund releases, community participation, and convergence with State-level schemes. By positioning itself within the broader Blue Economy Vision 2047 and Viksit Bharat goals, NCM 2.0 is a key policy instrument for balancing ecological protection with economic development along India's vast coastline.

Civil Services Examination Prelims PYQ

Q. With reference to the National Coastal Mission 2.0 (NCM 2.0), which of the following statements is/are correct?

1. NCM 2.0 is a Centrally Sponsored Scheme with shared funding between the Union and State Governments.
2. The mission covers nine coastal States and four Union Territories.
3. The Central Pollution Control Board (CPCB) serves as the Central Nodal Agency for fund flow under NCM 2.0.
4. The mission has an approved outlay of ₹767 crore for the period 2025-26 to 2030-31.
Select the correct answer using the code given below:
A) 1 and 2 only
B) 2, 3 and 4 only
C) 1, 3 and 4 only
D) 1, 2, 3 and 4

Answer: B) 2, 3 and 4 only.



First Tigress Released in Buxa Tiger Reserve

Context: Union Minister for Environment, Forest and Climate Change and West Bengal Chief Minister released the first tigress translocated from Bihar's Valmiki Tiger Reserve—into Buxa Tiger Reserve to mark Wildlife Week 2026.

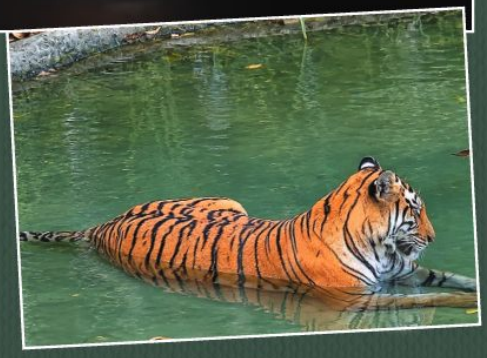
About Buxa Tiger Reserve:

A major protected area and biodiversity hotspot in the Dooars region of West Bengal, covering 760.87 sq km, including 390.58 sq km core and 370.29 sq km buffer.

Background:

Protected Status: Buxa was notified as India's 15th Tiger Reserve in 1983 and subsequently declared a National Park in 1997.

Tiger Population Decline: Once supporting resident tigers, Buxa experienced local decline due to habitat fragmentation, high biotic pressure and depletion of its natural prey base.



Key Features:

Moist TropicalAltitudinal Gradient: Extending from the plains to about 1,750 metres, Buxa supports moist tropical forests with over 350 tree species and 144 orchid species.

Transboundary Corridors: Buxa connects with Bhutan's Phipsoo Wildlife Sanctuary, Jaldapara National Park, Assam's Ripu Reserve Forest and Manas Tiger Reserve, creating an important transboundary wildlife landscape.

Rich Faunal Diversity: The reserve supports Asian elephants, gaur, clouded leopards, leopard cats, marbled cats and dholes, while its hill streams provide habitat for mahseer fish.

High Biotic Pressure: With 37 forest villages and large populations around adjoining tea estates, Eco-Development Committees play an important role in conservation and human-wildlife conflict mitigation.

About Tiger Reintroduction Programme

A scientific conservation programme involving the translocation, acclimatisation, release and monitoring of tigers to restore a self-sustaining breeding population in their historical range.

Institutional Framework:

NTCA Framework: Tiger reintroduction follows guidelines under the Wildlife (Protection) Act, 1972, with the National Tiger Conservation Authority providing the institutional conservation framework.

Buxa Recovery Project: The Tiger Augmentation and Recovery Project began in 2018 through collaboration between the West Bengal Forest Department, NTCA and Wildlife Institute of India (WII).

Aim: It seeks to restore a self-sustaining tiger population by improving prey availability, habitat quality and connectivity while strengthening coexistence with local communities.

Key Features:

Scientific Selection: The programme uses habitat viability assessment and genetic mapping to identify suitable founder tigers, particularly young animals capable of establishing new breeding territories.

Prey & Habitat Restoration: Since 2018, over 800 chital have been released and around 380 hectares of degraded grassland restored to strengthen the reserve's prey base.

Soft Release & Monitoring: Tigers undergo acclimatisation in soft-release enclosures before release and are subsequently monitored through telemetry collars, camera traps and veterinary surveillance.

Community-Centric Governance: JFMCs and Eco-Development Committees support conservation through local employment, livestock-loss compensation and measures to reduce human-tiger conflict.



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