02nd February 2026: DSC

Solar Cycles

Category: Science and Technology

Context

Researchers at **IIT Kanpur** have developed a new methodology to improve the **prediction of solar cycles**, enhancing understanding of long-term solar activity patterns.

Key Features of Solar Cycles

- A **solar cycle** refers to the roughly **11-year periodic variation** in the Sun's activity levels.

- This cycle is driven by the **solar dynamo mechanism**, wherein the movement of electrically charged plasma inside the Sun generates intense magnetic fields.

- Solar activity is measured primarily through the **number and intensity of sunspots**, which are darker, cooler regions with strong magnetic fields on the solar surface.

- Approximately every **11 years**, the Sun undergoes a **magnetic polarity reversal**, with its north and south poles swapping positions.

- A complete return to the original magnetic polarity takes about **22 years**, known as the **Hale Cycle**.

Phases of the Solar Cycle

- **Solar Minimum:** Period of least solar activity and minimal sunspots.

- **Solar Maximum:** Peak phase marked by maximum sunspot activity, solar flares, and eruptions.

Why It Matters

Solar cycles influence Earth through variations in **solar radiation, cosmic ray intensity, and atmospheric ozone distribution**, thereby affecting space weather and potentially long-term climatic patterns.

Source: *The Hindu*

Pechora Missile System

Category: Defence and Security

Context

Bengaluru-based **Alpha Design Technologies Ltd (ADTL)** has successfully completed a major upgrade of the **Indian Air Force's Pechora air defence system**.

About the Pechora System

- Officially known as the **S-125 Neva/Pechora**, it is a **Soviet-origin medium-range surface-to-air missile (SAM)** system.

- It has been part of India's air defence architecture since the **1970s**.

- The system includes a **radar-guided missile launcher**, fire-control unit, and typically deploys the **V-600 missile**.

Technical Capabilities

- Equipped with the **4R90 Yatagan radar**, featuring five parabolic antennas for detection, tracking, and target locking.

- Can detect aerial threats up to **100 km**, providing early warning.

- Effective against **low-flying and slow-moving targets**, including drones and cruise missiles.

- Operates independently or within an **integrated air defence network**, even under heavy electronic jamming.

- **Range:** Up to **30–35.4 km**

- **Altitude engagement:** From **20 metres to 20–25 km**

- **Kill probability:** Around **92%**, with capability to engage two targets simultaneously at speeds up to **900 m/s**

Source: *The Times of India*

PAIMANA Portal

Category: Government Schemes

Context

The **Ministry of Statistics and Programme Implementation (MoSPI)** has launched the **PAIMANA portal** for mandatory monitoring of **Central Sector Infrastructure Projects worth ₹150 crore and above**.

Key Features

- **PAIMANA** stands for **Project Assessment, Infrastructure Monitoring & Analytics for Nation-building**.

- Acts as a **centralised national repository** for infrastructure projects.

- Integrated with **DPIIT's Integrated Project Monitoring Portal (IPMP/IIG-PMG)** through APIs.

- Provides a **single-window digital interface** for ministries and implementing agencies.

- Offers **real-time dashboards**, drill-down analytics, role-based access, and reporting modules.

Significance

The platform enhances **data accuracy, operational efficiency, transparency**, and evidence-based decision-making in large infrastructure projects.

National Legal Services Authority (NALSA)

Category: Polity and Governance

Context

The Union Ministry of Law and Justice recently informed the Rajya Sabha about the establishment and functioning of **district legal services clinics** under the **National Legal Services Authority (NALSA)**.

About NALSA

- NALSA was constituted under the **Legal Services Authorities Act, 1987** to institutionalise free legal aid in India.

- Its primary mandate is to ensure **free and competent legal services** to economically and socially disadvantaged sections, including **Scheduled Castes and Scheduled Tribes**.

- It gives operational effect to **Article 39A** of the Constitution, which directs the State to promote justice on the basis of equal opportunity.

- Its work is reinforced by **Article 14 (equality before law)** and **Article 22(1) (right to legal representation upon arrest)**.

Institutional Structure

- **Patron-in-Chief:** Chief Justice of India

- **Executive Chairman:** Second senior-most Judge of the Supreme Court

- **State Level:** State Legal Services Authority headed by the Chief Justice of the High Court

- **District Level:** District Legal Services Authority chaired by the District Judge

Key Functions

- Organisation of **Lok Adalats** for amicable dispute resolution.

- Awards passed by Lok Adalats are treated as **civil court decrees**, are **final**, and **non-appealable**.

Scope of Free Legal Services

Includes payment of court and process fees, provision of legal representation, supply of certified documents, and preparation of appeals, paper books, and translations.

Eligibility for Legal Aid

Covers women, children, SC/ST members, industrial workers, disaster victims, persons with disabilities, persons in custody, victims of human trafficking, and individuals below prescribed income thresholds.

Source: *PIB*

Sunabeda Wildlife Sanctuary

Category: Environment and Ecology

Context

Forest officials have reported that **Sunabeda Wildlife Sanctuary in Odisha** is emerging as a stronghold for **leopards**, with an estimated population exceeding **70 individuals**.

Key Features

- Located in **Nuapada district, Odisha** and notified as a sanctuary in **1983**.

- Has received **in-principle approval from the NTCA** for declaration as a **Tiger Reserve**.

- Falls within the **Deccan Peninsula biogeographic zone**.

Landscape and Connectivity

- Functions as an important **wildlife corridor**, linking **Satkosia Gorge Wildlife Sanctuary (Odisha)** with **Sitanadi and Udanti Sanctuaries (Chhattisgarh)**.

- Terrain includes **plateaus, canyons, and 11 waterfalls**, supporting diverse habitats.

Hydrology and Vegetation

- Forms part of the catchment of the **Jonk River**, a tributary of the **Mahanadi**, over which a dam has been constructed for irrigation.

- Dominated by **dry deciduous tropical forests** with species such as teak, bija, asan, sisoo, sandalwood, and mahul.

Biodiversity

- Faunal diversity includes tigers, leopards, barasingha, gaur, sambar, sloth bear, hyena, chital, barking deer, and hill myna.

- The region is inhabited by tribal communities such as the **Gond and Paharia**.

Source: *The Times of India*

Green Steel: The Missing Link in India's Climate and Industrial Transition

GS III – Environment, Climate Change

Context

At **COP30 (Belém, 2025)**, India committed to submitting a more ambitious **Nationally Determined Contribution (NDC)**, placing pressure on hard-to-abate sectors—especially **steel**—to decarbonise rapidly.

Why Steel Is Central

- India produces around **125 million tonnes of steel annually**, projected to exceed **400 million tonnes** by mid-century.

- The sector contributes nearly **12% of India's total carbon emissions**, largely due to coal-based blast furnace processes.

Core Argument

Green steel is not a discretionary climate choice but a **strategic economic necessity**. Delay risks carbon lock-in, export penalties, and stranded assets.

Key Challenges

- **Carbon lock-in:** Steel plants operate for 30–40 years.

- **High capital costs:** Green steel technologies require 30–50% higher investment.

- **Input bottlenecks:** Limited green hydrogen supply, scrap availability, renewable power, and natural gas.

- **Policy gaps:** Despite a Green Steel Taxonomy, Hydrogen Mission, and Carbon Credit Trading Scheme, coal-intensive routes remain dominant.

Global Pressures

- The **EU Carbon Border Adjustment Mechanism (CBAM)** penalises carbon-intensive steel imports.

- High carbon prices in Europe make low-carbon steel economically competitive.

Way Forward

- Introduce credible **carbon pricing signals**.

- Scale pilot projects into commercial operations.

- Use **public procurement** to create assured demand.

- Develop shared infrastructure for hydrogen, renewables, and CO_2 transport.

- Ensure a **just transition** for MSMEs and workers.

Core Insight

Green steel represents India's next climate frontier, demanding coordinated industrial policy, market incentives, and early investment signals.

India's Manufacturing Leap: From Volume Expansion to Strategic Value Creation

GS III – Indian Economy

Context

As global supply chains reconfigure, India's manufacturing strategy must evolve beyond scale towards **strategic relevance** in global value chains.

Core Idea

The future of Indian manufacturing lies in **what is produced and how indispensable it becomes**, not merely in output volumes.

Key Arguments

- Sectors like **electronics and pharmaceuticals** show strong gains in exports, value addition, and technology absorption.

- Traditional cluster-led industrialisation faces limits due to fragmentation and low productivity.
- **Tier-2 and Tier-3 cities** offer cost advantages but require high-quality infrastructure and logistics.

Infrastructure and Logistics

- Logistics costs have declined to about **14% of GDP**, aided by PM Gati Shakti and the National Logistics Policy.
- However, weak multimodal integration and road freight dominance continue to constrain efficiency.

Role of Standards and MSMEs

- Quality Control Orders and global standards enhance export credibility but require phased implementation.
- MSMEs remain the backbone of manufacturing but face credit, skill, and technology adoption constraints.

Way Forward

- Prioritise technology-intensive and strategic sectors.
- Build integrated industrial ecosystems rather than fragmented clusters.
- Improve regulatory predictability and fast-track approvals.
- Deepen MSME integration into global value chains.

Core Insight

Manufacturing competitiveness today depends on **ecosystem depth, infrastructure quality, and strategic integration**, not just scale.

02nd February 20261: Daily MCQs

1. With reference to the National Legal Services Authority (NALSA), consider the following statements:

1. NALSA derives its constitutional mandate directly from Article 21 of the Constitution.
2. Awards passed by Lok Adalats organised under NALSA have the same force as decrees of civil courts.
3. Income eligibility limits for free legal aid are uniform across all courts in India.

Which of the statements given above is/are correct?
(a) 2 only
(b) 1 and 2 only
(c) 2 and 3 only
(d) 1, 2 and 3

Answer: (a)

Explanation:

- Statement 1 is incorrect: NALSA operationalises **Article 39A (DPSP)**, supported by Articles 14 and 22, not Article 21 directly.

- Statement 2 is correct: Lok Adalat awards are **final, binding, and equivalent to civil court decrees**.

- Statement 3 is incorrect: Income limits vary (e.g., higher ceiling for Supreme Court Legal Services Committee).

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2. Sunabeda Wildlife Sanctuary is ecologically significant primarily because it:

(a) Lies within the Himalayan biogeographic zone
(b) Serves as a corridor between Eastern Ghats and Western Ghats
(c) Connects tiger landscapes of Odisha and Chhattisgarh
(d) Hosts India's largest population of swamp deer

Answer: (c)

Explanation:
Sunabeda connects **Satkosia Gorge (Odisha)** with **Sitanadi–Udanti (Chhattisgarh)**, forming a **critical inter-state wildlife corridor**. It is in the **Deccan Peninsula**, not the Himalayas.

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3. Consider the following statements regarding Green Steel in India:

1. Green steel production primarily relies on hydrogen-based Direct Reduced Iron (DRI) technology.

2. The Green Steel Taxonomy notified by India is the world's first such classification framework.

3. Decarbonising steel alone is insufficient for achieving India's net-zero targets.

Which of the statements given above is/are correct?
(a) 1 and 2 only
(b) 2 and 3 only
(c) 1 only
(d) 1, 2 and 3

Answer: (a)

Explanation:

- Statement 1 is correct.

- Statement 2 is correct (India was the first to notify a **Green Steel Taxonomy**).

- Statement 3 is incorrect: Steel is a **central hard-to-abate sector**, and without it, net-zero is not achievable.

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4. Which of the following best explains why pumped storage projects (PSPs) are preferred over battery storage for India's energy transition?

(a) Lower land requirement and zero ecological impact
(b) Ability to provide short-duration peak power only
(c) Long-duration storage with grid stability benefits
(d) Complete exemption from environmental clearances

Answer: (c)

Explanation:
PSPs provide **long-duration storage (6–10 hours)**, grid inertia, and frequency regulation—advantages batteries currently lack at scale.

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5. Illegal electric fencing poses a greater threat to big cats than legal solar fencing because illegal fencing:

(a) Uses direct current instead of alternating current
(b) Is often installed inside core protected areas
(c) Carries high-voltage grid electricity
(d) Is designed primarily to trap carnivores

Answer: (c)

Explanation:
Illegal fencing taps **high-voltage AC grid power**, making it lethal, unlike low-voltage solar fencing meant only as a deterrent.

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6. Recognising village commons as a distinct land-use category is expected to primarily help in:

(a) Increasing agricultural land availability
(b) Strengthening Panchayat taxation powers
(c) Preventing encroachment and policy invisibility
(d) Converting commons into private property

Answer: (c)

Explanation:
Formal land-use recognition enables **mapping, monitoring, funding, and legal protection**, preventing misclassification as "wasteland".

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7. Consider the following statements about Solar Cycles:

1. A complete magnetic polarity cycle of the Sun takes approximately 22 years.

2. Solar maximum corresponds to the period of weakest solar magnetic field.

3. Solar cycles are measured primarily using solar irradiance variations.

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

Answer: (a)

Explanation:

- Statement 1 is correct (Hale Cycle).

- Statement 2 is incorrect: solar maximum = **strong magnetic activity**.

- Statement 3 is incorrect: cycles are tracked mainly by **sunspot numbers**.

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8. The Pechora missile system is particularly relevant in modern warfare because it is effective against:

(a) Hypersonic ballistic missiles
(b) High-altitude stealth bombers
(c) Low-flying drones and cruise missiles
(d) Submarine-launched missiles

Answer: (c)

Explanation:
Pechora (S-125) is optimised for **low- to medium-altitude, slow-moving targets**, making it suitable against drones and cruise missiles.

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9. The PAIMANA portal differs from traditional infrastructure monitoring systems mainly because it:

(a) Focuses only on private infrastructure projects
(b) Acts as a real-time, analytics-driven national repository
(c) Is operated jointly by NITI Aayog and RBI
(d) Replaces all existing project monitoring platforms

Answer: (b)

Explanation:
PAIMANA provides **real-time dashboards, analytics, and API integration**, improving monitoring efficiency—not replacing all platforms.

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10. Which of the following best captures the shift in India's manufacturing strategy highlighted in recent policy discourse?

(a) From labour-intensive to agriculture-linked manufacturing
(b) From export-led growth to import substitution
(c) From volume expansion to strategic value creation
(d) From MSME dominance to PSU-led manufacturing

Answer: (c)

Explanation:
India's manufacturing focus is shifting toward **technology depth, ecosystem strength, and strategic indispensability**, not mere output scale.