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From
20th July to 25th July 2026

INDEX

1. POLITY & GOVERNANCE	1
1.1. National Road Safety Board	1
1.2. Supreme Court Suggests Raising Retirement Age of Judicial Officers to 61	2
1.3. Right to Protest and Limits on Police Powers	4
2. ECONOMY	6
2.1. Indian Tea Industry: Production, Varieties and Global Significance	6
2.2. RBI Mobilises Foreign Currency Through Swap Facility	8
2.3. India Updates the Index of Core Industries (ICI) Series	10
2.4. Bharat Aatmanirbhar Vigyan Yojana (Bhavya) – Chemical Parks Scheme	12
3. ENVIRONMENT & GEOGRAPHY	14
3.1. Flash Floods & Hydro-Geomorphologic Vulnerability in J & K	14
3.2. Toxic Methane Gas Leak in Sikkim Tunnel	16
3.3. Environmentalists Flag Digital Bias Against Rural Communities	17
3.4. Sc Permits TTZ Authority to Process MSME Applications	19
3.5. Himachal Farmers Pioneer Sustainable Cultivation of KUTKI	20
3.6. Mangrove Restoration in Sundarbans	22
4. SCIENCE & TECHNOLOGY	24
4.1. India Approves its First Indigenous Dengue Vaccine (QDENGVA)	24
4.2. The Science of Maglev Trains	25
4.3. Pellet Guns in Focus: Understanding Technology and its use	27
5. HISTORY & CULTURE	30
5.1. Taj Mahal: India's Iconic Heritage Monument Back in Focus	30

POLITY & GOVERNANCE

1.1. NATIONAL ROAD SAFETY BOARD

Context

- The Centre has constituted the **National Road Safety Board**, an advisory statutory body, amid record **road fatalities of 1,77,175 in 2024** (per the latest report of the **Ministry of Road Transport and Highways**).



Objectives of the National Road Safety Board

- The National Road Safety Board was set up under the **Motor Vehicles Act, 1988. Section 215B** of this Act legally requires the government to set up this Board.
- Formulating **comprehensive guidelines for highway architecture and construction to minimize transit hazards**.
- Recommending the use of cutting-edge tech solutions to streamline vehicular flow and proactively prevent crashes.
- Spearheading nationwide outreach campaigns to foster a culture of responsible driving and commuter awareness.
- Partnering with state-level authorities to guarantee that traffic laws and safety protocols are strictly and consistently applied across the country.

India's International Commitments to Road Safety

- India formally committed to the **United Nations' Decade of Action for Road Safety** (spanning 2011 to 2020), a global pact designed to drastically lower the number of transit-related casualties worldwide.
- To shape its domestic policies, India draws inspiration from premier international models like Sweden's **"Vision Zero"** approach.

Legislative Background

- Idea traces to the **Sundar Committee's 2007 report**, which proposed a board with powers to **prescribe standards, monitor compliance, conduct safety audits, and coordinate action** across agencies.
- First introduced in Parliament via the **National Road Safety and Traffic Management Board Bill, 2010**, largely confined to **highways and mechanised vehicles**.
- Parliamentary Standing Committee on Transport (July 2010 report)** noted several proposed functions were already discharged by existing institutions.

Statutory Timeline

- Statutory provision came into force with rules notified in **September 2021**; the **board itself remained unconstituted** until now.
- As recently as **May 2026**, the **Supreme Court** pressed the Centre to operationalise the board, acting as a parallel force driving road safety reforms via **PIL S. Rajasekaran v. Union of India** (pending since **2012**).

Q. With reference to the National Road Safety Board, consider the following statements:

- I. It has been constituted under Section 215B of the Motor Vehicles Act.
- II. It has been granted binding regulatory powers over both Union and State governments on road safety matters.
- III. Road safety is a subject on which both the Union and the States have legislative competence.

Which of the statements given above is/are correct?

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

Answer: (b) I and III only

Explanation:

- **Statement I is Correct:** The board was constituted on **29 June** under **Section 215B of the Motor Vehicles Act**.
- **Statement II is Incorrect:** The board is only an **advisory body**; it has **no binding regulatory powers** over the Centre or States.
- **Statement III is Correct:** Road safety involves **shared legislative competence** between the **Union and State governments**.

1.2. SUPREME COURT SUGGESTS RAISING RETIREMENT AGE OF JUDICIAL OFFICERS TO 61

Context

- The Supreme Court, hearing the *All India Judges Association* case, directed all States and UTs to consider raising the retirement age of subordinate judicial officers from 60 to 61 years, pending its final decision on a uniform retirement age of 62 years.



Why the Suggestion Was Made

- **Career stagnation and Pay disparities** owing to limited promotional avenues among judicial officers.
- Loss of **experienced judges** at a time of rising case pendency and the need for **uniformity in service conditions** nationwide.

About the Subordinate Judiciary

- Comprises courts functioning below the **High Courts**: District & Sessions Courts, Civil Judges (Senior/Junior Division), Judicial Magistrates, Metropolitan Magistrates, and specialised courts such as Family and Commercial Courts.
- Governed constitutionally by **Articles 233–237** under **Part VI**.

Appointment and Control

- **District Judges** are appointed under **Article 233** by the **Governor**, in consultation with the **High Court**; eligibility requires at least **7 years as an advocate/pleader**, or promotion within the judicial service.

- **Article 235** vests **control over subordinate courts** — posting, promotion, leave, and discipline — in the **High Court**, safeguarding judicial independence from the executive.

Retirement Age

- Retirement Age Currently stands at **60 years**, though it varies by State service rules while the Court's suggestion of **61 years** is a **recommendation, not a mandate** — States must amend their own service rules to give effect to it.

Implications

- **Advantages:** Retains experienced judges, reduces vacancies, speeds up case disposal, ensures uniform service conditions, and boosts morale.
- **Concerns:** May delay junior officers' promotions, increase States' salary/pension burden, and requires State service-rule amendments.

All India Judges Association Case

- **AJIA v. Union of India:** Landmark case driving reforms in subordinate judiciary through directions on uniform pay, service conditions, infrastructure, and career progression.

Constitutional Provisions

- **Article 233A:** Validates certain past District Judge appointments/promotions made despite procedural irregularities under Articles 233/235.
- **Article 234:** Governor recruits judicial officers (other than District Judges) as per rules framed after consulting the State PSC and High Court.
- **Article 236:** Defines "District Judge" and "judicial service."
- **Article 237:** Extends these provisions to specified classes of Magistrates.
- **Seventh Schedule (List III, Entry 11A):** Administration of justice and organisation of subordinate courts fall under the Concurrent List, hence implementation rests with States/UTs.

Q. With reference to the subordinate judiciary in India, consider the following statements:

- Articles 233–237 of the Constitution deal with subordinate courts.
 - District Judges are appointed by the President of India.
 - The High Court exercises administrative control over subordinate courts.
 - The retirement age of subordinate judicial officers is uniformly fixed by the Constitution.
- Which of the statements given above is/are correct?

- I and II only
- I and III only
- II, III and IV only
- I, II, III and IV

Answer: (b) I and III only

Explanation:

- **Statement I is Correct:** Articles 233–237 deal specifically with **Subordinate Courts**.
- **Statement II is Incorrect:** District Judges are appointed by the **Governor**, not the President, under **Article 233**.
- **Statement III is Correct:** Administrative control over subordinate courts vests in the **High Court** under **Article 235**.
- **Statement IV is Incorrect:** The Constitution prescribes **no uniform retirement age** for subordinate judicial officers; it is governed by individual **State service rules**.

1.3. RIGHT TO PROTEST AND LIMITS ON POLICE POWERS

Context

- A recent protest that escalated into clashes between demonstrators and the police has brought renewed attention to the constitutional right to protest, the limits of police powers, and the legal provisions governing public demonstrations in India.



Right to Protest: Constitutional Position

- The **Right to Protest** is **not a Fundamental Right by itself**, but is derived from:
 - **Article 19(1)(a)** – Freedom of Speech and Expression.
 - **Article 19(1)(b)** – Right to Assemble Peaceably and Without Arms.
 - **Article 19(1)(c)** – Right to Form Associations or Unions.
- However, these rights are **not absolute** and are subject to **reasonable restrictions** under:
 - **Article 19(2)** – Restrictions on free speech.
 - **Article 19(3)** – Restrictions on peaceful assembly.

Grounds for Reasonable Restrictions

- Under **Articles 19(2) and 19(3)**, the State may impose **reasonable restrictions** on the right to protest in the interests of the **sovereignty and integrity of India, security of the State, friendly relations with foreign States, public order, decency or morality, contempt of court, defamation, and incitement to an offence.**

When Can a Protest Become Unlawful?

Under the **Bharatiya Nyaya Sanhita (BNS), 2023**:

- It may become unlawful if it:
 - Use criminal force or violence.
 - Obstructs the execution of law.
 - Compels a person through force or intimidation.
 - Disturbs public order or threatens public safety.

Police Powers to Regulate Protests

Police may regulate demonstrations to:

- Maintain **public order**.
- Prevent violence and damage to property.
- Ensure public safety.
- Manage traffic and essential services.

Prohibitory Orders under BNSS, 2023

- **Section 163** empowers the Executive Magistrate to issue orders restricting assemblies, marches or demonstrations in urgent situations to prevent:
 - Public nuisance
 - Danger to human life
 - Rioting or affray

- Such orders are preventive in nature and are generally issued for a limited period.

Prohibitory Orders under BNSS, 2023

- **Section 163 of the Bharatiya Nagarik Suraksha Sanhita (BNSS), 2023** empowers an Executive Magistrate to temporarily prohibit assemblies, marches, or demonstrations to prevent **public nuisance, danger to human life, rioting, or affray**.
- These orders are **preventive** and are generally issued for a **limited period**.

Use of Force by Police

- The police may use force **only when necessary** and in accordance with the principles of **legality, necessity, proportionality, and minimum force**.
- Force should be **used gradually, only as a last resort after peaceful measures fail**, and **remain subject to judicial scrutiny**.

Important Supreme Court Judgements

Mazdoor Kisan Shakti Sangathan (MKSS) v. Union of India (2018)

- The Supreme Court held that the **right to protest is a constitutional right**, but it must be balanced with the rights of other citizens.

Amit Sahni v. Commissioner of Police (Shaheen Bagh Case), 2020

- Public roads and public spaces cannot be occupied indefinitely in the name of protest.
- The right to protest must be exercised without causing disproportionate inconvenience to the public.

Q. With reference to the Right to Protest in India, consider the following statements:

1. The Right to Protest is explicitly mentioned as a separate Fundamental Right under the Constitution.
2. The right to assemble peacefully without arms is guaranteed under Article 19(1)(b).
3. The State may impose reasonable restrictions on public assemblies in the interest of public order.
4. Section 163 of the Bharatiya Nagarik Suraksha Sanhita (BNSS), 2023 empowers authorities to regulate assemblies in certain situations.

Which of the statements given above are correct?

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

Answer: A

Explanation

- **Statement 1:** Incorrect. The Constitution does not explicitly mention a separate "Right to Protest"; it is derived from Article 19.
- **Statement 2:** Correct. Article 19(1)(b) guarantees the right to assemble peacefully and without arms.
- **Statement 3:** Correct. Reasonable restrictions may be imposed under Article 19(3) in the interest of public order and other constitutional grounds.
- **Statement 4:** Correct. Section 163 of the BNSS, 2023 empowers authorities to regulate assemblies to maintain public order.

2.1. INDIAN TEA INDUSTRY: PRODUCTION, VARIETIES AND GLOBAL SIGNIFICANCE

Context

- Recently, the Indian tea industry reported record achievements in **production, exports, auction prices, and domestic consumption**, reaffirming India's position as one of the world's leading tea-producing nations.



About Indian Tea Industry

Tea is one of India's most important **plantation crops** and a major agricultural export. The sector employs millions of people, particularly women, and plays a significant role in the rural economy.

Key Facts

- India is the **second-largest tea producer** in the world after China.
- Produces around **1.5 billion kg** of tea annually.
- Contributes nearly **20% of global tea production**.
- Nearly **80% of India's tea production is consumed domestically**.

Climatic Conditions for Tea Cultivation

Tea is a **climate-sensitive crop** that thrives in tropical and subtropical regions. Even minor weather changes can affect both the yield and quality of tea.

Ideal Conditions

- Temperature:** 15°C–23°C
- Rainfall:** 150–300 cm annually.
- Climate:** Warm, humid with at least 5 hours of sunlight daily.
- Soil:** Slightly acidic, calcium-free, well-drained soil.
- Relief:** Sloping terrain for proper drainage.

Major Tea-Growing Regions

- The major tea-growing areas include **Assam** (the largest producer), **West Bengal** (Darjeeling and Dooars), **Tamil Nadu** (Nilgiris), **Kerala**, **Himachal Pradesh** (Kangra Valley), **Tripura**, and **Arunachal Pradesh**.

Types of Tea Produced in India

India produces over **1,000 varieties** of tea. Climatic conditions, altitude and processing techniques give Indian teas their unique flavour and aroma.

Tea Type	Key Feature
Black Tea	Most produced and exported variety

CTC Tea	Crush–Tear–Curl process; widely consumed in India
Orthodox Tea	Premium quality; mainly exported
Green Tea	Rich in antioxidants
White Tea	Rare; produced from young buds
Oolong Tea	Partially oxidized; niche market
Darjeeling Tea	GI-tagged; famous for muscatel flavour
Assam Tea	Strong, bright and malty
Nilgiri Tea	Aromatic flavour from Western Ghats

About Tea Board of India

The **Tea Board of India** is the apex statutory body responsible for regulating and promoting the tea industry.

About

- **Established:** 1953 (Tea Act, 1953)
- **Operational since:** 1954
- **Headquarters:** Kolkata
- **Ministry:** Ministry of Commerce & Industry
- **Overseas Offices:** Dubai and Moscow
- Reconstituted every **three years**.

Conclusion

India's tea industry combines **favourable agro-climatic conditions, diverse tea varieties, strong institutional support, and targeted government initiatives**, making it one of the country's most important plantation sectors and a significant contributor to agricultural exports.

Q. With reference to the **Indian Tea Industry**, consider the following statements:

1. The **Tea Board of India** was established under the **Tea Act, 1953**.
2. **Darjeeling Tea** is the first **GI-tagged agricultural product** of India.
3. Tea cultivation is best suited to regions receiving **less than 100 cm of annual rainfall**.

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: a. 1 and 2 only

Explanation

- **Statement 1 is correct.** The **Tea Board of India** was established under the **Tea Act, 1953**.
- **Statement 2 is Correct.** **Darjeeling Tea** is India's **first GI-tagged agricultural product**.
- **Statement 3 is Incorrect.** Tea requires **150–300 cm of well-distributed annual rainfall**, along with a warm, humid climate and well-drained acidic soil.

2.2. RBI MOBILISES FOREIGN CURRENCY THROUGH SWAP FACILITY

Context

- The **RBI** has operationalised a **Special Foreign Currency Swap Facility** to mobilise foreign exchange through **FCNR(B) deposits, ECBs, and OFCBs**.
- The facility has attracted **over US\$20 billion**, boosting **India's forex reserves** and external sector stability.



What is RBI's Special Swap Facility?

- It is a **temporary liquidity window** introduced by the RBI to encourage banks to raise foreign currency from overseas.
- Banks mobilise foreign currency through specified sources and swap it with the RBI for rupees at a concessional swap rate.

Objective

- Increase foreign exchange inflows, strengthen forex reserves, improve balance of payments (BoP), and stabilise the rupee during periods of external uncertainty.

Sources of Foreign Currency under the Swap Facility

1. FCNR(B) Deposits (Foreign Currency Non-Resident Bank Deposits)

- **Who can open?** Non-Resident Indians (NRIs) with authorised Indian banks.
- **Deposit Currency:** Maintained in designated foreign currencies (e.g., US Dollar, Euro, Pound Sterling, Japanese Yen).
- **Exchange Rate Protection:** Both the principal and interest are repaid in the same foreign currency, protecting depositors from exchange rate fluctuations.
- **Repatriation:** Both principal and interest are fully repatriable, allowing NRIs to transfer funds abroad without restrictions.

2. External Commercial Borrowings (ECBs)

- **Meaning:** Foreign currency loans raised by eligible Indian companies from overseas lenders.
- **Purpose:** Used for capital expenditure, infrastructure projects, manufacturing, and business expansion, subject to RBI guidelines.
- **Lenders:** International banks, foreign financial institutions, export credit agencies, and other recognised overseas lenders.
- **Regulation:** Governed by the RBI's External Commercial Borrowing (ECB) Framework.

3. Overseas Foreign Currency Borrowings (OFCBs)

- **Meaning:** Foreign currency borrowings raised by Indian banks from overseas financial markets.
- **Purpose:** Helps banks mobilise additional foreign currency resources to meet domestic funding requirements.

- **Significance:** Increases the availability of foreign exchange in the banking system and supports the RBI's efforts to strengthen forex reserves and liquidity under the special swap facility.

About Foreign Currency Swap

A **currency swap** is an agreement in which two parties exchange one currency for another and agree to reverse the transaction at a future date at predetermined terms.

In this case:

- Banks bring foreign currency (e.g., US dollars) to RBI.
- RBI provides equivalent rupee liquidity.
- At maturity, the transaction is reversed as per agreed conditions.

FCNR(B) vs NRE vs NRO Accounts

Feature	FCNR(B) Foreign (Currency Non-Resident (Bank) Account)	NRE (Non-Resident External Account)	NRO (Non-Resident Ordinary Account)
Who can open?	NRIs/PIOs	NRIs/PIOs	NRIs/PIOs
Deposit Currency	Foreign Currency	Indian Rupee (INR)	Indian Rupee (INR)
Source of Funds	Foreign earnings remitted from abroad	Foreign earnings remitted from abroad	Income earned in India (rent, pension, dividend, etc.) and foreign remittances
Exchange Rate Risk	No (Deposit and repayment in same foreign currency)	Yes	Yes
Repatriation	Fully repatriable	Fully repatriable	Repatriation is restricted (subject to RBI rules and limits)
Interest	Paid in foreign currency	Paid in INR	Paid in INR
Used For	Holding savings in foreign currency without exchange rate risk	Maintaining overseas income in India	Managing income generated in India

Q. With reference to the Foreign Currency Non-Resident (Bank) [FCNR(B)] Account, consider the following statements:

1. FCNR(B) deposits are maintained in Indian Rupees and are repaid in Indian Rupees.
2. Both the principal and interest are repaid in the same foreign currency, protecting the depositor from exchange rate risk.
3. FCNR(B) accounts can be opened by any resident Indian citizen.

Which of the statements given above is/are correct?

- (a) 1 only
(b) 2 only

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

Answer: (b) 2 only

Explanation

- **Statement 1 is Incorrect.** FCNR(B) deposits are maintained in designated foreign currencies, not in Indian Rupees.
- **Statement 2 is Correct.** The principal and interest are repaid in the same foreign currency, eliminating exchange rate risk for the depositor.
- **Statement 3 is Incorrect.** FCNR(B) accounts can be opened only by Non-Resident Indians (NRIs)/Persons of Indian Origin (PIOs) (as per eligibility rules), not by resident Indian citizens.

2.3. INDIA UPDATES THE INDEX OF CORE INDUSTRIES (ICI) SERIES

Context

- The Union Government has released a revised Index of Core Industries (ICI) series with a new base year (2022–23), expanded sectoral coverage, updated methodology, and revised sectoral weights.
- The revision aims to better reflect the current industrial structure and align the ICI with updated macroeconomic indicators such as **Gross Domestic Product (GDP)** and **Gross Value Added (GVA)** and **IIP**.



What is the Index of Core Industries (ICI)?

- The **Index of Core Industries (ICI)** measures the performance of India's **core industrial sectors**, which serve as the backbone of industrial production.
- It acts as a **leading indicator of industrial growth** and significantly influences the **Index of Industrial Production (IIP)**.
- **Released by:** Office of the Economic Adviser (OEA), **Department for Promotion of Industry and Internal Trade (DPIIT)**, Ministry of Commerce & Industry.
- **Frequency:** Monthly.

Major Changes in the Revised ICI Series

1. Base Year Revised

- The base year has been revised from 2011–12 to 2022–23. This makes the Index of Core Industries (ICI) more representative of the current structure of the Indian economy and provides a more accurate measure of industrial activity.

2. Expansion of Sectoral Coverage

- The number of core industries has increased from 8 to 9 with the inclusion of Iron Ore as a separate core industry due to its growing importance.
- The revised ICI now covers **Coal, Crude Oil, Natural Gas, Refinery Products, Fertilizers, Steel, Cement, Electricity, and Iron Ore**.

3. Changes in Methodology

Steel

- Steel production is now measured on a **Gross Output** basis instead of the earlier **Net Output** basis.
- This brings the ICI methodology in line with the **Index of Industrial Production (IIP)**.

Coal

- The revised series measures **only raw coal production**.
- **Middling coal and washed coal** have been excluded to eliminate **double counting**, as both are produced from raw coal.

4. Revision in Sectoral Weights

- The inclusion of Iron Ore and the increase in the number of sectors have led to a redistribution of weights.
- The Government has also revised the weights of existing sectors to maintain consistency with the updated IIP series.

Major Changes in Weights

Sector	Change in Weight
Electricity	19.85% → 30.93% (Highest Increase)
Iron Ore	Newly Added – 4.905%
Fertilizers	2.63% → 2.731%
Coal	10.33% → 5.596%
Natural Gas	6.88% → 3.841%
Refinery Products	28.04% → 22.572%

Why Were These Changes Made?

- **To reflect the current economy:** The revised series better represents India's present industrial structure and production pattern.
- **To ensure consistency:** It aligns the ICI with the revised IIP and National Accounts for better comparability.
- **To improve accuracy:** Methodological changes remove issues like double counting, making industrial growth estimates more reliable.

About Index of Industrial Production (IIP)

The **Index of Industrial Production (IIP)** is a **monthly indicator** that measures the **growth in industrial output** in India.

- It covers **three sectors: Mining, Manufacturing, and Electricity**.
- **Released by:** National Statistics Office (NSO), Ministry of Statistics and Programme Implementation (MoSPI).
- **Base Year: 2022–23.**
- It is one of the most important indicators used to assess the **performance of the industrial sector** and overall economic activity.

Q. With reference to the recently revised Index of Core Industries (ICI), consider the following statements:

1. The base year of the Index of Core Industries has been revised from **2011–12 to 2022–23**.
2. Iron Ore has been included as a new core industry in the revised series.
3. Steel production in the revised series is measured on a **Gross Output** basis instead of a Net Output basis.
4. The revised series continues to include washed coal and middling coal in coal production.

Which of the statements given above are correct?

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

Answer: A

Explanation:

- **Statement 1:** Correct. The base year has been revised from **2011–12 to 2022–23**.
- **Statement 2:** Correct. **Iron Ore** has been added as the **9th core industry**.
- **Statement 3:** Correct. Steel is now measured on a **Gross Output** basis to align with the IIP methodology.
- **Statement 4:** Incorrect. The revised series measures **only raw coal**. **Washed coal and middling coal have been excluded** to avoid double counting.

2.4. BHARAT AATMANIRBHAR VIGYAN YOJANA (BHAVYA) – CHEMICAL PARKS SCHEME

Context

- The Union Cabinet approved the **Bharat Audyogik Vikas Yojana Rasayan (BHAVYA-Rasayan)** with a total outlay of **₹3,030 crore** to establish **three dedicated chemical parks** across the country, aimed at strengthening India's self-reliance in the chemical sector.



What does the scheme entail?

Information & Broadcasting Minister Ashwini Vaishnaw noted that each park has the potential to attract between ₹20,000 crore and ₹50,000 crore in investment, furthering India's push toward self-reliance in the chemicals sector.

Why is it significant?

The scheme is expected to act as a "multiplier," catalysing far larger private investment and positioning India as a competitive, self-reliant hub for chemical manufacturing.

About the Chemicals Sector in India

- Chemicals are a **key input industry**, feeding into pharmaceuticals, agriculture (fertilizers/agrochemicals), textiles, and consumer goods.
- India is among the world's largest producers of chemicals but remains significantly **import-dependent** for speciality and intermediate chemicals.

- The **Department of Chemicals and Petrochemicals**, under the **Ministry of Chemicals and Fertilizers**, is the nodal body for sectoral policy.

Functions of Dedicated Chemical Parks

- Provide **plug-and-play infrastructure** to reduce setup time and cost for chemical manufacturing units.
- Ensure **common effluent treatment and safety infrastructure**, given the hazardous nature of chemical manufacturing.
- Enable **cluster-based development**, improving logistics, raw material access, and ease of doing business.

Economic Benefits of BHAVYA-Rasayan Scheme

- **Value-chain development:** Strengthens the chemical industry across upstream, downstream, and ancillary segments, ensuring efficient resource use and lower logistics costs.
- **Cost competitiveness:** Shared common infrastructure and basic utilities, tailored to industry needs, will enhance cost efficiency and global competitiveness.
- **Global integration:** Enables deeper integration of Indian chemical manufacturers into global value chains, boosting exports and import substitution.
- **Sustainable growth:** Centralized facilities — including Common Effluent Treatment Plants, Treatment Storage and Disposal Facilities, and hazardous waste management infrastructure — will support environmental compliance and eco-friendly industrial development.
- **Broader economic impact:** Growth in the chemicals sector will have a cascading effect on downstream industries, generating employment and driving progress toward the **Viksit Bharat @ 2047** goal.

Q. With reference to the Bharat Audyogik Vikas Yojana Rasayan (BHAVYA-Rasayan), consider the following statements:

I. The scheme provides for the establishment of three dedicated chemical parks.

II. Each chemical park will be spread over at least 2,000 acres.

III. The scheme has a total outlay of ₹30,300 crore.

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) I and II only

Explanation:

- **Statement I is Correct:** The scheme envisages setting up **three dedicated chemical parks**.
- **Statement II is Correct:** Each park will span **at least 2,000 acres**.
- **Statement III is Incorrect:** The total outlay is **₹3,030 crore**, not ₹30,300 crore.

3.1. FLASH FLOODS & HYDRO-GEOMORPHIC VULNERABILITY IN J&K

Context

- Heavy rainfall triggered **flash floods** in the **Poonch and Rajouri districts of Jammu & Kashmir**, resulting in multiple fatalities, injuries, and widespread damage to houses, schools, roads, and other public infrastructure. The incident highlights the increasing vulnerability of the Himalayan region to extreme weather events.



What are Flash Floods?

- Flash floods** are sudden floods that develop **within a few minutes to a few hours** after intense rainfall, cloudbursts, dam failure, or rapid snow/glacier melt.
- They are characterized by:
 - Very rapid rise in water level.
 - High velocity of water flow.
 - Little or no warning time.
 - Severe damage to life and property.

Why is Jammu & Kashmir Vulnerable to Flash Floods?

1. Fragile Himalayan Terrain

- Young fold mountains with unstable slopes.
- Highly prone to landslides and soil erosion.

2. Intense Rainfall & Cloudbursts

- Localized heavy rainfall causes sudden runoff.
- Small mountain streams overflow rapidly.

3. Steep River Gradients

- Rivers descend rapidly from high elevations.
- Water flows with high speed, increasing flood intensity.

4. Unplanned Development

- Construction along riverbanks and floodplains.
- Encroachment of natural drainage channels.

5. Climate Change

- Increasing frequency of extreme rainfall events.
- Rapid glacier melt adds to flood risk.

Major Rivers of Jammu & Kashmir

River	Origin	Important Facts
Jhelum	Verinag Spring	Lifeline of Kashmir Valley; tributary of the Indus
Chenab	Confluence of Chandra & Bhaga rivers	Major hydropower river
Ravi	Himalayas (Himachal Pradesh)	Forms part of J&K's southern drainage
Tawi	Kailash Kund	Flows through Jammu city
Poonch River	Pir Panjal Range	Tributary of the Jhelum

Previous Major Flood Events in Jammu & Kashmir

- **2014 Kashmir Floods** – One of the worst floods in the region; widespread inundation of Srinagar due to overflowing Jhelum River.
- Frequent flash floods and landslides occur during the southwest monsoon and western disturbance-induced rainfall.

Institutional Framework

- **National Disaster Management Authority (NDMA)** – Apex disaster management body.
- **National Disaster Response Force (NDRF)** – Specialized disaster response force.
- **India Meteorological Department (IMD)** – Weather forecasting and early warnings.
- **State Disaster Management Authority (SDMA)** – State-level disaster planning and response.

Q. Consider the following pairs:

River	Major Basin System
1. Poonch River	Jhelum River Basin
2. Ansi River	Chenab River Basin
3. Rajouri Tawi	Ravi River Basin

How many of the above pairs are correctly matched?

- Only one
- Only two
- All three
- None

Answer: (b) Only two

- **Pair 1 is correct:** The Poonch River originates in the Pir Panjal Range and joins the Jhelum River.
- **Pair 2 is correct:** The Ansi River drains parts of the Budhal area in Rajouri and flows into the Chenab basin.
- **Pair 3 is incorrect:** Rajouri Tawi (also called Naushera Tawi) feeds into the Chenab river network, not the Ravi River.

3.2. TOXIC METHANE GAS LEAK IN SIKKIM TUNNEL

Context

- A suspected **methane gas leak** inside the under-construction **Teesta Stage-VI Hydroelectric Project** tunnel in **Namchi district, Sikkim**, led to the death of **12 workers**, while rescue operations continued for trapped workers. The incident highlights the hazards associated with underground tunnelling and gas accumulation.



Why is Methane Dangerous in Tunnels?

- Methane accumulates in **poorly ventilated underground spaces**.
- Concentration of **5–15% in air** forms an explosive mixture.
- A spark, heat source or blasting activity can trigger an explosion.
- Methane can also displace oxygen, causing **asphyxiation (oxygen deficiency)**.
- Explosions often generate **toxic gases** such as carbon monoxide and dense smoke.

Tunnel Safety Measures

- Continuous methane and oxygen monitoring sensors.
- High-capacity ventilation systems.
- Flame-proof electrical equipment.
- Emergency evacuation routes.
- Personal gas detectors for workers.
- Regular geotechnical and geological surveys before excavation.

Teesta Stage-VI Hydroelectric Project

- River:** Teesta River
- Location:** Samardung, **Namchi District (South Sikkim)**, Sikkim.
- Executing Agency:** NHPC Ltd.
- Type:** Run-of-the-river Hydroelectric Project
- Developed to enhance **renewable energy generation** in the Himalayan region.
- River Basin:** Designed as a **Run-of-River (RoR)** scheme on the **Teesta River**.
 - Source: The Teesta River originates from the **Cho Lamo glacier** in the high Himalayas.
 - Course: It flows southward through Sikkim and West Bengal before emptying into the **Brahmaputra River** (Jamuna) in Bangladesh.

Methane (CH₄)

- Methane (CH₄) is a **colourless, odourless, highly flammable hydrocarbon gas**.
- It is the **main component of natural gas**.
- It is the **second-largest contributor** to global warming after carbon dioxide.
- Over a **20-year period**, methane has nearly **80 times higher warming potential than CO₂**.
- Major Sources**

- Natural wetlands
- Coal mines and underground rock formations
- Oil and natural gas extraction
- Landfills and sewage
- Livestock (enteric fermentation)
- Rice cultivation

Q. Consider the following statements regarding the Teesta River:

1. It is a major tributary of the Brahmaputra River.
2. The river originates from the Cho Lamo glacier.
3. Teesta flows entirely within the borders of India.

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

- **Statement 1 is CORRECT:** The Teesta River is a major right-bank tributary of the Brahmaputra River (known as the Jamuna in Bangladesh). Historically, Teesta used to flow southward to join the Ganga, but after a massive flood in 1787, it altered its course eastward to merge with the Brahmaputra system.
- **Statement 2 is CORRECT:** The river originates from the Tso Lhamo (Cho Lamo) Lake / Glacier complex at an elevation of over 5,300 meters in North Sikkim. This is one of the highest lakes in the world.
- **Statement 3 is INCORRECT:** The Teesta River is an **international/transboundary river**. It flows through Sikkim and West Bengal in India before crossing the international border into Bangladesh, where it finally joins the Brahmaputra. Because it spans multiple nations, it is a subject of long-standing bilateral water-sharing discussions between India and Bangladesh.

3.3. ENVIRONMENTALISTS FLAG DIGITAL BIAS AGAINST RURAL COMMUNITIES

Context

- Recently, the Supreme Court constituted a five-member High-Powered Committee (HPC) to conduct a fresh scientific and ecological review of the definition and delineation of the Aravalli Hill Range after staying the October 2025 MoEFCC report over critical ambiguities. The committee has been directed to submit its report by **August 31, 2026**.



The Core Dispute

- **The 500-Metre Paradox:** The previous report limited the definition of the Aravalli range strictly to areas within a **500-metre gap** between two or more qualifying hills. Experts argue this narrows protected boundaries, opening up intervening gaps to rampant commercial mining.

- **The 100-Metre Elevation Criterion:** The prior assessment claimed only 1,048 of Rajasthan's 12,081 hills satisfied the 100-metre elevation mark. The new HPC will check if this factually excludes lower-elevation formations that act as vital ecological buffers.
- **Contiguity vs. Fragmentation:** The committee is evaluating whether hills above 100 metres form a single, **continuous ecological formation** despite larger physical gaps, warranting absolute regulatory protection.

High-Powered Committee (HPC) Architecture

- **Chairmanship:** Chaired ex-officio by the **Director General of the Indian Council of Forestry Research and Education (ICFRE)** (currently Kanchan Devi).
- **Composition:** Comprises multidisciplinary domain experts from geology, soil science, biodiversity, and scientific geo-mapping (including representatives from the Forest Survey of India and Geological Survey of India).
- **Mandate:** Formed under the exercise of the Supreme Court's jurisdiction (**Articles 32 and 142** of the Constitution) to institutionalize participatory deliberation and deliver a fair, independent ecological review.

Current Governance Bottlenecks

Environmental groups and grassroot activists (such as Adivasi Samanvay Manch Bharat and Ridge Bachao Andolan) have flagged severe flaws in the committee's public consultation process:

- **Digital Exclusion:** The committee invited public feedback exclusively via **emails and Google Forms**. Activists argue this structurally excludes the most affected rural and indigenous communities living deep within the Aravalli belt who lack digital literacy.
- **Inadequate Consultation Window:** A strict **21-day timeline** is deemed entirely insufficient for remote communities to comprehend, process, and meaningfully communicate deep-seated environmental grievances.
- **Regulatory Non-Compliance:** Local networks report that licensed mining leases across **Haryana, Rajasthan, and Gujarat** are blatantly flouting environmental norms, causing irreversible health and livelihood damage.
- **Proposed Alternative:** Activists demand that public notices be published in local languages at *Panchayat Bhawans*, schools, and *Anganwadis*, alongside mandatory physical field visits by the committee members.

Q. With reference to the **Aravali Hill Range**, consider the following statements:

1. The Aravali Range is one of the oldest fold mountain systems in the world.
2. Guru Shikhar, the highest peak of the Aravalis, is located in Haryana.
3. The Aravali Range acts as a natural barrier against the eastward expansion of the Thar Desert.
4. The Aravali Range extends through Delhi, Haryana, Rajasthan, and Gujarat.

Which of the statements given above are correct?

- A. 1, 2 and 3 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

Statement 1 is correct: The **Aravali Range** is among the **oldest fold mountain systems** in the world and has undergone extensive erosion over geological time.

Statement 2 is incorrect: **Guru Shikhar (1,722 m)**, the highest peak of the Aravali Range, is located in **Mount Abu, Rajasthan**, not Haryana.

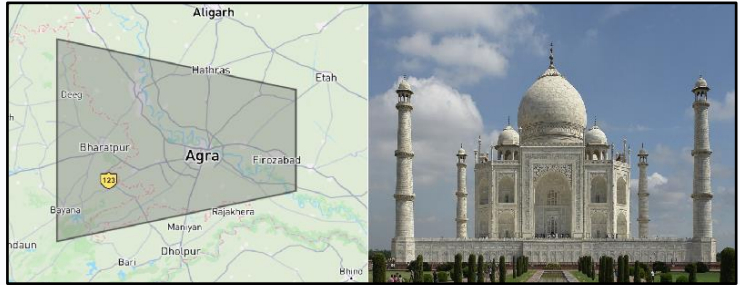
Statement 3 is correct: The Aravalis act as a **natural barrier**, preventing the **eastward spread of the Thar Desert** and reducing desertification.

Statement 4 is correct: The Aravali Range extends for about **700 km** across **Delhi, Haryana, Rajasthan, and Gujarat**.

3.4. SC PERMITS TTZ AUTHORITY TO PROCESS MSME APPLICATIONS

Context

- The Supreme Court permitted the **Taj Trapezium Zone (TTZ) Authority** to process around **400** pending applications for the establishment of non-polluting **Micro, Small and Medium Enterprises (MSMEs)** within the ecologically sensitive area surrounding the **Taj Mahal**.



Why did the moratorium existed in the first place?

The TTZ is an ecologically sensitive zone created to shield the Taj Mahal and 40+ other monuments from industrial pollution. The Supreme Court's October 2024 order froze all new approvals because there wasn't a settled, final definition of what counts as a **"non-polluting industry"**-so the Court didn't want the TTZ Authority making case-by-case calls without oversight.

What changed now?

Rather than lifting the freeze outright, the Court carved out a controlled pathway for the ~400 pending applications (mostly MSMEs seeking to set up, expand, or relocate).

About the Taj Trapezium Zone (TTZ) Authority

- Statutory body** established under the **M.C. Mehta v. Union of India (1996)** Supreme Court judgment to protect the **Taj Mahal** and other monuments within the **10,400 sq. km TTZ**.
- Chaired by the **Commissioner, Agra Division**, assisted by a **Member Secretary (IAS/IFS)**.
- Funded via budgetary provisions from the **State of Uttar Pradesh**.

Core Functions

- Enforces **Supreme Court** directives issued in TTZ-related writ petitions and reports regularly to the Court through an **Amicus Curiae**.
- Reviews **ambient air quality** and emissions data submitted by monitoring agencies such as the **Central Pollution Control Board (CPCB)**.
- Regulates the establishment, expansion, and relocation of industrial units within the TTZ to prevent pollution damage to the **Taj Mahal**.

Q. With reference to the Taj Trapezium Zone (TTZ) Authority, consider the following statements:

- I. The TTZ Authority was constituted under the Environment (Protection) Act, 1986.
- II. The Authority is chaired by the Commissioner, Agra Division.
- III. Under the Supreme Court's 2026 directions, an application can be rejected if either the CEC or NEERI expert objects to its "non-polluting" classification.
- IV. The Ministry of Environment, Forest and Climate Change's Red-Orange-Green-White classification is the sole basis for defining "non-polluting industry" in the TTZ.

Which of the statements given above is/are correct?

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

Answer: (a) I, II and III only

Explanation:

- **Statement I is Correct:** The **TTZ Authority** was constituted via a **1998** gazette notification under the **Environment (Protection) Act, 1986**.
- **Statement II is Correct:** The Authority operates through a secretariat chaired by the **Commissioner, Agra Division**.
- **Statement III is Correct:** Under the **2026** vetting mechanism, either the **CEC** or **NEERI** expert's objection blocks approval without **Supreme Court** leave.
- **Statement IV is Incorrect:** The **MoEFCC** classification is only one of **three** frameworks (alongside judicial vetting and the historical fuel-based standard) used to determine "non-polluting" status in the TTZ - not the sole basis.

3.5. HIMACHAL FARMERS PIONEER SUSTAINABLE CULTIVATION OF KUTKI

Context

Farmers in **Mandi district of Himachal Pradesh** have successfully adopted the **scientific cultivation of Kutki (Picrorhiza kurroa)**, a critically important Himalayan medicinal herb that was once threatened due to overharvesting from the wild. The initiative promotes **biodiversity conservation, sustainable livelihoods, and medicinal plant cultivation**.



About Kutki (Picrorhiza kurroa)

Particular	Details
Scientific Name	<i>Picrorhiza kurroa</i>
Family	Plantaginaceae (earlier Scrophulariaceae)
Common Name	Kutki
Habitat	Alpine and sub-alpine Himalayas
Altitude	Approximately 2,700–4,500 m above sea level
Plant Type	Small perennial medicinal herb
Medicinal Part Used	Underground rhizomes (stems)
Major Uses	Liver disorders, digestive ailments, fever, and traditional Ayurvedic medicine

Why is Kutki Important?

- One of the **most valuable medicinal herbs** of the Himalayan region.
- Widely used in **Ayurveda, Siddha, and traditional medicine**.
- Known for its **hepatoprotective (liver-protecting), antioxidant, anti-inflammatory, and immunomodulatory properties**.
- High commercial demand has led to excessive harvesting from forests.

Conservation Status

Organisation	Status
IUCN Red List	Vulnerable (VU)
CITES	International trade regulated to prevent overexploitation (where applicable under national export regulations)
India	Listed among priority medicinal plants under various conservation programmes

Sustainable Cultivation Model

Researchers from the **Himalayan Research Group (HRG)** under the **Department of Science and Technology (DST)** developed a community-based cultivation model.

Key Features

- Shifted farmers from **wild collection** to **scientific cultivation**.
- Propagation through **rhizome (stolon) planting**.
- Farmers harvest only the underground stolons while allowing plants to regenerate.
- Reduces pressure on wild populations.
- Generates an additional source of income for mountain farmers.

Scientific Cultivation Method

- Stolons are planted about **4–5 years** after field establishment.
- Underground stem (stolon) is harvested.
- Upper portion with roots is replanted.
- Enables continuous regeneration of the plant.
- Ensures sustainable production without destroying natural populations.

Q. With reference to Kutki (*Picrorhiza kurroa*), consider the following statements:

1. It is a medicinal herb native to the alpine Himalayan region.
2. The medicinally important part of the plant is its underground rhizome.
3. It is naturally found in tropical coastal forests of India.
4. Scientific cultivation helps reduce pressure on wild populations.

Select the correct answer using the code below:

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

Answer: (b)

- Statement 1 is Correct: Kutki is native to the alpine Himalayas.
- Statement 2 is Correct: Its medicinal value lies mainly in the rhizome (underground stem).
- Statement 3 is Incorrect: It grows in high-altitude Himalayan regions, not coastal forests.
- Statement 4 is Correct: Scientific cultivation reduces dependence on wild harvesting and aids conservation.

3.6. MANGROVE RESTORATION IN SUNDARBANS

Context

- The West Bengal Government has announced that **mangrove forests lost to encroachments, particularly due to shallow fish ponds (bheries), will be restored** in the Sundarbans. The issue gained attention after large-scale mangrove loss was observed in **Kripakhali Island**, where extensive forest areas have been converted into fisheries.



About the Sundarbans

- **Location:** Ganga-Brahmaputra-Meghna Delta across **India and Bangladesh**.
- **Indian Share:** Located in **West Bengal**.
- **Status:**
 - UNESCO World Heritage Site (1987)
 - Ramsar Site
 - Biosphere Reserve
 - Tiger Reserve
- **Largest Mangrove Forest** in the world.

About Mangroves

- Mangroves are **salt-tolerant (halophytic) forests** found in tropical and subtropical coastal regions.
- They grow in **intertidal zones**, estuaries, river deltas, lagoons and sheltered coastlines.
- Possess **stilt roots and pneumatophores (breathing roots)** for survival in waterlogged soils.
- Major Indian mangrove states:
 - **West Bengal (largest share)**
 - Gujarat
 - Andaman & Nicobar Islands
 - Odisha
 - Andhra Pradesh
 - Tamil Nadu

Importance of Mangroves

- **Ecological Importance**
 - Protect coastlines from **cyclones, storm surges and coastal erosion**.

- Act as **natural carbon sinks (Blue Carbon Ecosystems)**.
- Provide breeding and nursery grounds for fish, crabs and shrimps.
- Support rich biodiversity including the **Royal Bengal Tiger**, estuarine crocodile and migratory birds.
- **Economic Importance**
 - Sustain fisheries and coastal livelihoods.
 - Promote ecotourism.
 - Improve water quality by trapping sediments and pollutants.

Threats to Mangroves	Conservation Measures in India
● Conversion into aquaculture (fish/shrimp ponds). ● Illegal encroachments and land reclamation. ● Coastal infrastructure and urbanisation. ● Pollution. ● Sea-level rise and climate change. ● Cyclones and salinity changes.	● National Mangrove and Coral Reef Committee under the Ministry of Environment, Forest and Climate Change (MoEFCC). ● MISHTI (Mangrove Initiative for Shoreline Habitats & Tangible Incomes) launched in Budget 2023–24 for mangrove plantation and restoration. ● Protection through the Coastal Regulation Zone (CRZ) Notification. ● Restoration under CAMPA and State Forest Department initiatives. ● Integration with Ramsar Convention, Blue Carbon and climate adaptation efforts.

Q. With reference to mangrove ecosystems in India, consider the following statements:

1. Mangroves are salt-tolerant plants that grow in intertidal coastal regions.
2. The Sundarbans is the largest mangrove forest in the world.
3. MISHTI is an initiative launched to promote mangrove plantation and restoration.

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

Statement 1 is Correct: Mangroves are **halophytic (salt-tolerant) plants** adapted to grow in **intertidal zones**, estuaries, river deltas and other coastal areas influenced by tides.

Statement 2 is Correct: The **Sundarbans**, spread across **India and Bangladesh**, is the **largest contiguous mangrove ecosystem in the world** and is a UNESCO World Heritage Site.

Statement 3 is Correct: **MISHTI (Mangrove Initiative for Shoreline Habitats & Tangible Incomes)** was announced in the **Union Budget 2023–24** to expand mangrove plantations and restore degraded mangrove ecosystems along India's coastline.

4.1. INDIA APPROVES ITS FIRST INDIGENOUS DENGUE VACCINE (QDENG)

Context

- The **Drugs Controller General of India (DCGI)** has approved **QDENG (TAK-003)**, developed by **Takeda Biopharmaceuticals**, making it **India's first approved dengue vaccine** for individuals aged **4–60 years**.

About QDENG (TAK-003)

- Developed by **Takeda Biopharmaceuticals (Japan)**.
- Live-attenuated tetravalent dengue vaccine**.
- Provides protection against **all four dengue virus serotypes (DENV-1, DENV-2, DENV-3, DENV-4)**.
- Approved for individuals aged **4–60 years**.
- Dosage:** Two-dose schedule, administered **3 months apart**.
- Can be given **regardless of previous dengue infection** (no pre-vaccination screening required).



What is a Tetravalent Vaccine?

- A **tetravalent vaccine** protects against **four different strains (serotypes)** of the same pathogen.
- Example:** QDENG protects against:
 - DENV-1
 - DENV-2
 - DENV-3
 - DENV-4

About Dengue

- Disease Type:** Viral disease.
- Causative Agent:** Dengue Virus (Flavivirus).
- Vector:** Female **Aedes aegypti** mosquito (primary vector); *Aedes albopictus* is also a vector.
- Transmission:** Bite of infected mosquito (not direct person-to-person).
- Incubation Period:** 4–10 days.
- Symptoms**
 - High fever
 - Severe headache
 - Muscle and joint pain ("Breakbone fever")
 - Skin rash
 - Bleeding manifestations in severe cases

About Aedes Mosquito

- Bites mainly during **daytime**.
- Breeds in **clean stagnant water**.
- Common breeding sites:

- Water tanks
- Coolers
- Flower pots
- Tyres
- Coconut shells

About Drugs Controller General of India (DCGI)

- Head of the **Central Drugs Standard Control Organisation (CDSCO)**.
- Functions under the **Ministry of Health & Family Welfare**.
- Responsible for approval of new drugs, vaccines, and clinical trials in India

Q. Consider the following statements regarding QDENG A vaccine:

1. It is a live-attenuated tetravalent dengue vaccine.
2. It protects against all four dengue virus serotypes.
3. Pre-vaccination screening is mandatory before administration.
4. It is administered in a two-dose schedule.

Which of the statements given above are correct?

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

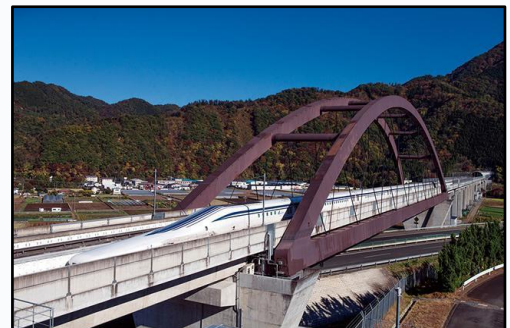
Answer: A. 1, 2 and 4 only

- **Statement 1 is correct:** QDENG A (TAK-003) is a **live-attenuated (weakened virus)** vaccine and is **tetravalent**, meaning it provides protection against **all four serotypes** of the dengue virus (DENV-1, DENV-2, DENV-3, and DENV-4).
- **Statement 2 is correct:** The vaccine is specifically designed to provide immunity against **all four serotypes** of the dengue virus, reducing the risk of severe dengue caused by secondary infection with a different serotype.
- **Statement 3 incorrect.** One of the key advantages of **QDENG A** is that it **does not require pre-vaccination screening**. It can be administered **regardless of whether a person has had a previous dengue infection**, making it easier to implement in public immunisation programmes. **Statement 4 is correct:** QDENG A is administered in **two doses**, with an interval of **three months** between the first and second doses.

4.2. THE SCIENCE OF MAGLEV TRAINS

Context

- Magnetic levitation (maglev) technology is garnering renewed international attention as nations increasingly evaluate high-speed transit systems that utilize magnetic fields for levitation and propulsion, enabling operational speeds in excess of 400 km/hr.



About the Technology

- **Maglev** means "magnetic levitation." These trains float above the track using magnetic force instead of wheels, so there's no rolling friction. This lets them run at speeds over **400 km/hr**. But building and running dedicated magnetic tracks needs precise engineering, making it expensive.

- Two fundamental forces are at play in a maglev system: the **electromagnetic force** and **gravity**; gravity is by far the weaker force, at roughly **10^{39} times weaker** than electromagnetism.

Key Features of Maglev Technology

How is a Train Lifted?

- EMS (Electromagnetic Suspension)**: Electromagnets pull the train up to hover **8–10 mm** above the track; used in **Shanghai Maglev** (~500 km/hr).
- EDS (Electrodynamic Suspension)**: Superconducting magnets induce current in guideway coils, pushing the train up; needs wheels till **100 km/hr**. Japan's **SC Maglev** hit **603 km/hr** in **2015**.

How Does the Train Move Forward?

- Guideway coils carry **AC**, switching poles to pull the train forward and push it from behind.
- Current controls speed; **regenerative braking** slows the train, with **wheels /friction brakes** kept for emergencies.

What are the Downsides of Maglev?

- No rolling friction → high **aerodynamic resistance**, needing costly designs (e.g., bird-beak-shaped front).

Uses of Maglev Technology in Other Sectors

- Turbines/compressors**: magnetic bearings replace mechanical ones, reducing friction.
- Aircraft carriers**: linear motor technology launches aircraft off decks.
- Factory automation**: used in semiconductor manufacturing, CNC machining, and laser/X-ray/DNA-sequencing systems.
- Scientific research**: magnetic fields levitate biological samples, liquids, metals, and small organisms.

Strategic/Scientific Significance

- Reinforces India's interest in **high-speed rail alternatives** amid rising mobility demand, while showcasing **electromagnetic principles'** cross-sector relevance to manufacturing, aerospace, and precision instrumentation.

About Diamagnetic Levitation

- Diamagnetic Levitation**: In **1997**, **Andre Geim** and **Michael Berry** levitated a live frog using a **10-tesla magnetic field**, earning the **Ig Nobel Prize (2000)**; Geim later won the actual **Nobel Prize in Physics** for unrelated work on **graphene**.

Q. With reference to magnetic levitation (maglev) technology, consider the following statements:

- In Electrodynamic Suspension (EDS) systems, the train requires wheels for support until it reaches a minimum speed at which the levitation force overcomes gravity.
- Electromagnetic Suspension (EMS) systems can levitate a train even when it is stationary.
- Andre Geim and Michael Berry were jointly awarded the Nobel Prize in Physics for levitating a frog using a magnetic field.

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) I and II only

Explanation:

- **Statement I is Correct:** EDS systems rely on induced currents generated only once the train is moving, so wheels support the train until roughly **100 km/hr** is reached.
- **Statement II is Correct:** EMS systems use electromagnets that are attracted to the guideway regardless of motion, allowing levitation even at a standstill.
- **Statement III is Incorrect:** Geim and Berry received the **Ig Nobel Prize** (2000) for the frog levitation experiment; **Andre Geim's actual Nobel Prize in Physics** was awarded separately for his work on **graphene**.

4.3. PELLET GUNS IN FOCUS: UNDERSTANDING TECHNOLOGY AND ITS USE

Context

- Pellet guns were recently reported to have been used during a protest for crowd-control purposes. This has once again brought attention to pellet guns, their technology, operational use, and the debate surrounding less-lethal weapons.



What are Pellet Guns?

- A **pellet gun** is a **less-lethal (non-lethal)** weapon designed for **crowd control and riot management**.
- It fires **multiple small metallic pellets** simultaneously through a shotgun cartridge.
- Unlike conventional firearms that fire a single bullet, pellet guns disperse hundreds of pellets over a wide area.
- They are intended to temporarily incapacitate individuals while reducing the need for live ammunition.

How Does a Pellet Gun Work?

- A shotgun cartridge contains numerous small spherical pellets.
- When fired, the cartridge bursts open and the pellets spread in a cone-shaped pattern.
- The spread increases with distance, making the weapon suitable for dispersing crowds rather than targeting a single individual.
- The effectiveness and injury potential depend on factors such as firing distance, pellet material, and impact location.

Key Features

- **Multiple Pellet Discharge:** Fires **hundreds of small pellets** in a single shot.

- **Wide-Area Coverage:** Pellets spread in a **cone-shaped pattern**, covering a broad area instead of a single target.
- **Less-Lethal Weapon:** Designed to reduce reliance on **live ammunition** during crowd-control operations.
- **Effective Range:** Generally used at **short to medium distances** for maximum effectiveness.
- **Specialized Launcher:** Operated using **shotgun-type launchers** specifically designed for pellet cartridges.

Types of Pellets

Depending on operational requirements, pellet cartridges may contain:

- **Lead pellets** – Traditionally used due to their density.
- **Rubber-coated pellets** – Intended to reduce injury severity.
- **Plastic or composite pellets** – Used in some countries as less harmful alternatives.

Why are Pellet Guns Used?

Security forces may deploy pellet guns for:

- Riot control
- Violent crowd dispersal
- Public order management
- Situations where graded use of force is required before considering live ammunition

Advantages

- Pellet guns provide a less-lethal alternative to live ammunition for crowd-control operations.
- Their wide pellet spread makes them useful for dispersing large violent gatherings while supporting the graduated use of force.

Limitations

- Pellet guns have limited accuracy because the pellets disperse over a wide area, making precise targeting difficult.
- This increases the risk of unintended injuries to bystanders and can cause severe harm if used at close range.

Humanitarian Concerns

- Despite being classified as less-lethal weapons, pellet guns can cause serious and sometimes permanent injuries.
- These include eye injuries, vision loss, facial trauma, deep tissue damage, and long-term disability, particularly when vulnerable body parts are struck.

Q. With reference to pellet guns, consider the following statements:

1. Pellet guns are classified as less-lethal weapons used primarily for crowd control.
2. A pellet gun fires a single projectile with high precision.
3. PAVA shells are considered one of the alternatives to pellet guns for riot control.

Which of the statements given above is/are correct?

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

Answer: C. 1 and 3 only

Explanation:

- Statement 1 is correct: Pellet guns are categorized as **less-lethal** crowd-control weapons.
- Statement 2 is incorrect: They fire **multiple small pellets**, not a single projectile.
- Statement 3 is correct: **PAVA (Pelargonic Acid Vanillyl Amide) shells** are considered a comparatively less harmful alternative.

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HISTORY & CULTURE

5.1. TAJ MAHAL: INDIA'S ICONIC HERITAGE MONUMENT BACK IN FOCUS

Context

- The **Taj Mahal**, one of India's most celebrated **UNESCO World Heritage** monuments, is back in the news after the **Allahabad High Court** sought a response from the **Centre** and the **Archaeological Survey of India (ASI)** on a plea concerning the monument, renewing public attention on its heritage status and legal protection framework.



About the Case

- A plea before the **Allahabad High Court** has raised questions relating to the Taj Mahal; the court has issued notices to the **Centre** and the **ASI**, seeking their response.

About the Taj Mahal

- Built between **1632 and 1654** by Mughal Emperor **Shah Jahan** in memory of his wife **Mumtaz Mahal**; located in **Agra, Uttar Pradesh**, on the banks of the **Yamuna River**.
- Chief architect traditionally credited: **Ustad Ahmad Lahori**.
- Declared a **UNESCO World Heritage Site in 1983**, recognised for its architectural and artistic universal value.
- Voted one of the **New 7 Wonders of the World in 2007** through global public polling.
- Built of white **marble**, noted for **pietra dura** (inlay work), calligraphy, and a symmetrical Mughal **Charbagh** garden layout.
- Protected as a **centrally protected monument** by the **Archaeological Survey of India (ASI)**, under the **Ministry of Culture**, per the **AMASR Act, 1958**.

Strategic/Cultural Significance

- Reinforces India's standing in global cultural diplomacy and tourism as custodian of a **world heritage icon**.
- Highlights the **ASI's** role in the scientific conservation and statutory protection of monuments of national importance.
- Underlines the **judicial oversight** mechanisms available for matters concerning protected heritage sites.

About the AMASR Act, 1958

- Governs the protection of **monuments and sites of national importance** declared by the Centre, and establishes the **ASI**, under the **Ministry of Culture**, as India's premier body for archaeological research and heritage protection.
- A **2010 amendment** introduced a **100-metre "prohibited area"** and a further **200-metre "regulated area"** around protected monuments, restricting construction and mining activity.

About UNESCO

- **Overview:** A specialized UN agency founded in 1945 (succeeding the International Committee on Intellectual Cooperation), headquartered in Paris, France. It Runs the **World Heritage Convention (1972)**, protecting sites of "Outstanding Universal Value".
- **Mission:** To strengthen shared humanity and peace through education, science, culture, and communication.
- **Membership:** 194 member countries and 12 associate members.
- **Focus Areas:** Education, Natural Sciences, Social & Human Sciences, Culture, and Communication & Information.
- **Key Functions:** Eradicates illiteracy, promotes free education, and serves as a global hub for knowledge exchange.
- **Network:** Operates as part of the UN Sustainable Development Group, collaborating closely with NGOs and private companies.
- **World Heritage:** Designates and protects global sites of outstanding universal value...
- **India has 44 UNESCO World Heritage Sites** (36 Cultural, 7 Natural, 1 Mixed) — 6th highest globally.
- **Maharashtra** has the maximum UNESCO sites in India.

Q. With reference to the Taj Mahal, consider the following statements:

- I. It was built during the reign of Mughal Emperor Akbar.
- II. It was declared a UNESCO World Heritage Site in 1983.
- III. It was voted one of the New7Wonders of the World in 2007.

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: (b) II and III only

Explanation:

- **Statement I is Incorrect:** The Taj Mahal was built under Emperor **Shah Jahan**, not Akbar.
- **Statement II is Correct:** It was declared a **UNESCO World Heritage Site in 1983**.
- **Statement III is Correct:** It was voted one of the **New7Wonders of the World in 2007**.

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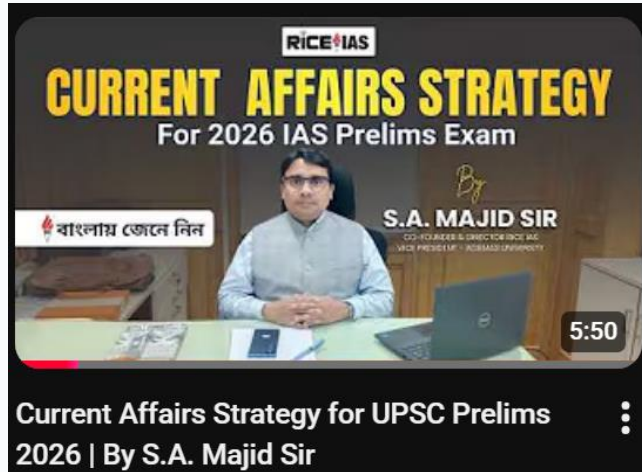
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