
Prelims Exam Topics

INTEGRATED FERTILIZER MANAGEMENT SYSTEM (IFMS)

Context

The **Department of Fertilizers** is integrating the **Integrated Fertilizer Management System (iFMS)** with **state land records, Meri Fasal Mera Byora (MFMB) and AgriStack** to improve fertilizer monitoring and subsidy management.

About iFMS

- **Nature:** A national **digital system for end-to-end fertilizer tracking**, covering production, imports, transportation, retail sales and subsidy settlement.
- **Nodal Department:** **Department of Fertilizers, Ministry of Chemicals and Fertilizers.**
- **Objective:** Ensure **transparent fertilizer distribution**, reduce diversion and link subsidies to actual retail sales.

Key Features

- **Supply-Chain Tracking:** Monitors fertilizer from **domestic production and ports to districts and retail outlets.**
- **Land-Record Integration:** Links farmer and transaction data with **land records, AgriStack and crop information** to assess fertilizer requirements.
- **Digital Pre-Booking:** Under the **Framework for Fertilizer Sale (FFS)**, farmers can pre-book fertilizer using a **dynamic QR code**, which is verified at PoS outlets.
- **Transport Monitoring: Vehicle Location Tracking System (VLTS)** uses GPS-based tracking to monitor fertilizer movement and detect route deviations.
- **Digital Subsidy Settlement:** Integration with **PFMS and e-Bill** supports automated and risk-based processing of **DBT subsidy claims.**

LEGAL METROLOGY (INDIAN STANDARD TIME) RULES, 2026

Context

The Union Government has notified the **Legal Metrology (Indian Standard Time) Rules, 2026**, making **Indian Standard Time (IST)** the single reference for legal, administrative, commercial and official purposes.

About the Rules

- **Nodal Ministry:** Ministry of Consumer Affairs, Food and Public Distribution.
- **Technical Institutions:** CSIR-National Physical Laboratory (NPL), ISRO and Legal Metrology laboratories.
- **Objective:** Establish a **secure, accurate and nationally synchronised time system** for India.
- **Single Time Standard:** IST becomes the common reference for official and commercial activities.
- **Transition Period:** A **180-day period** is provided for organisations to update and synchronise systems.
- **Indigenous Sources:** Allows **NavIC and other approved Indian systems** for secure time dissemination.
- **High-Precision Synchronisation:** **White Rabbit technology** can enable highly accurate time transfer across critical digital networks.
- **Domestic Time Network:** Indian institutions and Legal Metrology laboratories will support nationwide time dissemination.
- **Significance:** A common and indigenous time standard can improve **transaction accuracy, infrastructure synchronisation and resilience of critical digital systems**, while reducing dependence on foreign timing services.

PERMANENT COURT OF ARBITRATION (PCA)

Context

The **Permanent Court of Arbitration (PCA)** has ruled that the **Indus Waters Treaty (IWT)** remains in force and restricted certain works on the **Ratle Hydroelectric Project**. India rejected the ruling, calling the arbitration illegally constituted.

About PCA

- **Nature:** An **intergovernmental organisation** that facilitates international **arbitration, conciliation and fact-finding**.
- **Establishment:** Created in **1899** under the **Hague Convention for the Pacific Settlement of International Disputes**. The convention was revised in **1907**.
- **Headquarters:** Peace Palace, The Hague, Netherlands.
- **India and Pakistan:** Both have been **Contracting Parties since 1950**.

Key Features

- **Institutional Nature:** Despite its name, the PCA is not a permanent court with a fixed panel of judges. It provides **administrative and procedural support to tribunals constituted for specific disputes**.
- **Dispute Resolution:** Handles disputes involving **States, State entities, international organisations and private parties**.
- **Ad-hoc Tribunals:** Provides administrative support, procedural rules and registry services for **arbitral tribunals**.
- **Appointing Authority:** The **PCA Secretary-General** can appoint arbitrators when parties fail to agree on tribunal composition.
- **Fact-Finding & Conciliation:** Also supports **inquiries and non-binding conciliation proceedings**.

PCA and Indus Waters Treaty

- **IWT Framework:** The **1960 World Bank-brokered treaty** allocates the **Ravi, Beas and Sutlej** to India and the **Indus, Jhelum and Chenab** primarily to Pakistan, while allowing India limited use of the western rivers.
- **Recent Ruling:** The PCA held that the treaty **continues to remain binding** and cannot be unilaterally suspended.
- **Ratle Project:** It restricted specified works on the **850 MW Ratle Hydroelectric Project on the Chenab**, pending proceedings before the Neutral Expert.

DISTINGUISHED JURIST PROVISION

Context

Article 124(3)(c) of the Constitution allows a **distinguished jurist** to be appointed as a **Judge of the Supreme Court**. Justice Ujjal Bhuyan recently highlighted that this provision has **never been used** since the Constitution came into force.

About the Provision

- **Constitutional Basis:** Under **Article 124(3)(c)**, a person who is a **citizen of India** and, in the President's opinion, a **distinguished jurist** is eligible for appointment as a Supreme Court judge.
- **Meaning:** It provides a route for eminent **legal scholars, academics and jurists** without requiring prior experience as a High Court judge or practising advocate.

- **Apex Court Only:** The provision applies to **Supreme Court appointments**. A similar provision for High Courts was introduced by the **42nd Amendment (1976)** but removed by the **44th Amendment (1978)**.
- **Exclusive to Supreme Court:** The provision is available only for **Supreme Court judges**, not High Court judges.

MISSION RANGEEN MACHHLI 2031

Context

The **Government of India** released the **Mission Rangeen Machhli 2031 Strategic Action Plan** to promote the development of India's **ornamental fisheries sector**.

About Mission Rangeen Machhli 2031

- **Nodal Ministry:** **Ministry of Fisheries, Animal Husbandry & Dairying**, through the Department of Fisheries.
- **Objective:** Develop the ornamental fisheries sector into a **regulated, organised and globally competitive industry**.
- **Focus Area:** Promotes **breeding, rearing and trade of ornamental fish** for aquariums and commercial displays.

Key Features

- **Standardised Practices:** Develops SOPs for **broodstock management, breeding, hatchery operations, disease prevention and live-fish transport**.
- **Biosecurity:** Promotes **quarantine, fish-health surveillance and quality standards** to control diseases and invasive pathogens.
- **Traceability:** Tracks the origin of ornamental fish to encourage **captive breeding** and reduce illegal collection from natural ecosystems.
- **Cluster Development:** Supports production, logistics and market infrastructure in convergence with **Pradhan Mantri Matsya Sampada Yojana (PMMSY)**.
- **Livelihoods:** Supports **fishers, youth and women-led SHGs** through training in small-scale ornamental fish rearing.

EXERCISE SUPER GARUDA SHIELD

Context

The **United States and Indonesia** have begun the annual **Exercise Super Garuda Shield**, being conducted across multiple regions of Indonesia.

About Exercise Super Garuda Shield

- **Nature:** A major **multilateral joint military exercise** hosted by the **Indonesian National Armed Forces (TNI)** and co-led by **US Indo-Pacific Command (USINDOPACOM)**.
- **Participants:** **Indonesia and the United States**, along with additional partner and observer countries including **Japan, South Korea, Australia, Canada, the UK, France and Singapore**.
- **Domains:** Covers **land, air, maritime and cyber operations**.
- **Aim:** Strengthen **military interoperability, tactical readiness, joint operations and crisis-response capabilities**, including **territorial defence and HADR**.

GHEPAN LAKE

Context

The **Lahaul-Spiti district administration** has strengthened monitoring and precautionary measures for **Ghepan Lake** following recent glacial flood events in the Himalayan region.

About Ghepan Lake

- **Location:** A high-altitude **glacial lake in the Lahaul region of Himachal Pradesh**.
- **Features:** Known for its **turquoise-blue waters** and surrounding glacial landscape.
- **Glacier-fed:** Fed by **three hanging glaciers**, a distinctive feature at this altitude.

Why Is Ghepan Lake a Risk?

- **Lake Expansion:** Rapid **glacier melting over recent decades** has increased the lake's size.
- **GLOF Risk:** A sudden collapse or breach could release large volumes of **water, rocks and debris**, causing a **Glacial Lake Outburst Flood (GLOF)**.
- **Downstream Threat:** Such a flood can endanger **settlements and infrastructure downstream**.

ROTENONE

Context

Biologists in **Southcentral Alaska, United States** used **rotenone** to remove an invasive population of **northern pike** from a lake as part of an ecosystem restoration effort.

About Rotenone

- **Nature:** A naturally occurring compound obtained from the roots of plants belonging to the genera **Derris, Lonchocarpus and Tephrosia**.
- **Uses:** Used as an **insecticide, pesticide and piscicide** in fisheries management.
- **Fisheries Management:** Applied in controlled concentrations to remove **unwanted or invasive fish** from lakes and streams.

How Does Rotenone Work?

- **Mode of Action:** Rotenone interferes with **cellular respiration**, reducing the ability of fish to use oxygen effectively.
- **Effect on Fish:** It primarily acts through the **gills**, leading to oxygen deprivation and death.
- **Environmental Behaviour:** It breaks down relatively quickly when exposed to **sunlight and warm water**, reducing its persistence.

Key Facts about Northern Pike

- **Distribution:** Native to **North America, Europe and Asia**, particularly circumpolar northern regions.
- **Habitat:** Found mainly in **freshwater lakes and rivers**, and also in the brackish waters of the Baltic Sea.
- **Invasive Potential:** Outside its native range, it can become invasive by preying heavily on native fish such as **trout, perch and bass**.
- **Features:** Has an **elongated body, flattened snout, large mouth and sharp teeth**, adapted for ambush predation.
- **IUCN Status:** **Least Concern**.

ATTUNLI HYDROELECTRIC PROJECT

Context

The Expert Appraisal Committee (EAC) has recommended **environmental clearance** for the **680 MW Attunli Hydroelectric Project** in **Dibang Valley, Arunachal Pradesh**.

About Attunli Hydroelectric Project

- **Type:** A run-of-river hydropower project on the **Tangon (Talo) River**.
- **Location:** Dibang Valley district, Arunachal Pradesh.

RAMON MAGSAYSAY AWARD

Context

Singaporean diplomat **Tommy Koh**, Myanmar activist **Bo Kyi** and Bangladeshi social worker **Runa Khan** have been named recipients of the **2026 Ramon Magsaysay Award**.

About Ramon Magsaysay Award

- **Nature:** Regarded as a major **Asian award for transformative leadership and public service**.
- **Established:** First awarded in **1958** and named after **Ramon Magsaysay**, former President of the Philippines.
- **Award Ceremony:** Presented annually in **Manila, Philippines**, on **31 August**.
- **Selection:** Recipients are selected by the **Ramon Magsaysay Award Foundation (RMAF) Board of Trustees**.
- **Award:** Each recipient receives a **certificate and a medallion** bearing the profile of Ramon Magsaysay.

Award Categories

From **1958 to 2008**, the award was presented under six broad categories:

1. **Government Service**
2. **Public Service**
3. **Community Leadership**
4. **Journalism, Literature and Creative Communication Arts**
5. **Peace and International Understanding**
6. **Emergent Leadership**

Changes in Categories

- **Emergent Leadership:** Introduced in **2000** for individuals aged **40 years or below** working on social change at the community level.
- **From 2009:** The award discontinued fixed categories, except for **Emergent Leadership**.

ASTRORAD VEST

Context

Researchers have found that the **AstroRad radiation-protection vest** could significantly reduce astronauts' exposure to radiation during major **solar storms**, supporting future missions to the Moon and Mars.

About AstroRad

- **Nature:** A wearable **radiation-protection vest** developed by **StemRad, an Israeli company, in collaboration with Lockheed Martin**.
- **Purpose:** Protects astronauts from **solar particle radiation** during spaceflight.
- **Design:** Provides greater shielding to the **chest, abdomen and pelvis**, where vital organs and large amounts of bone marrow are located.

How Does It Work?

- **Hydrogen-Rich Material:** Uses **hydrogen-rich polymers** that can slow energetic particles through collisions.
- **Targeted Shielding:** Concentrates protection around **radiation-sensitive organs and bone marrow** instead of adding heavy shielding throughout the spacecraft.
- **Weight Advantage:** Provides a **lighter shielding approach** compared with relying only on additional spacecraft shielding.
- **Limitation:** AstroRad is designed mainly for **solar particle events** and is less effective against **galactic cosmic rays** originating outside the Solar System.

CORAL BLEACHING

Context

A new global assessment by the **Global Coral Reef Monitoring Network (GCRMN)** found that coral bleaching is becoming more frequent, leaving reefs **less time to recover from heat stress**.

About Coral Bleaching

- **Meaning:** Coral bleaching occurs when environmental stress causes corals to **expel their symbiotic algae (zooxanthellae)**, making them appear pale or white.
- **Causes:** It can be triggered by **rising ocean temperatures, pollution, ocean acidification, excessive sunlight and extremely low tides.**
- **Major Trigger:** **Marine heatwaves and rising sea-surface temperatures** are the leading global drivers.
- **Recovery:** Corals may recover when stress conditions ease, but prolonged or repeated bleaching can cause **coral death.**

Process of Coral Bleaching

- **Stress Response:** Under stress, zooxanthellae inside coral polyps produce excess **reactive oxygen species (ROS).**
- **Algal Expulsion:** Corals expel the **colour-producing zooxanthellae** to reduce the harmful effects.
- **White Appearance:** Loss of zooxanthellae exposes the coral's **pale calcium carbonate skeleton**, producing the bleached appearance.
- **Symbiosis Disruption:** The loss of zooxanthellae reduces the coral's major source of **food and nutrients from photosynthesis**, weakening the coral.

What Are Corals?

- **Nature:** Corals are **marine invertebrates.** An individual coral is called a **polyp.**
- **Colony Formation:** Large coral colonies form when numerous polyps **multiply and live together.**
- **Symbiotic Relationship:** Coral polyps host single-celled algae called **zooxanthellae.**
- **Role of Algae:** Zooxanthellae provide **food and nutrients through photosynthesis**, while corals provide the algae with **shelter and nutrients.**
- **Colour:** Zooxanthellae contribute to the **characteristic colours of healthy corals.**

Why Are Coral Reefs Important?

- **Biodiversity:** Provide habitat for a large variety of **marine organisms.**
- **Livelihoods:** Support **fisheries and tourism.**
- **Coastal Protection:** Help reduce **wave energy and coastal erosion.**
- **Ecosystem Services:** Support **food webs and nutrient cycling.**

Mains Exam Topics

SUSHRUTA'S LEGACY

Context

The **Royal College of Surgeons of Edinburgh**, regarded as one of the world's oldest surgical institutions, recently installed a **90-kg bronze statue paying tribute to Sushruta**, the ancient Indian medical figure, drawing attention to his contribution to the history of surgery.

What Did Sushruta's Tradition Contribute to Medical Knowledge?

A. Surgical Innovation

- **Reconstructive Surgery:** The *Sushruta Samhita* described rebuilding a damaged or amputated nose using a **skin flap taken from the patient's cheek**, demonstrating sophisticated reconstructive practice.
- **Specialised Procedures:** It documented **cataract surgery, bladder-stone removal and extraction of arrows from wounds**, indicating knowledge across diverse surgical problems.
- **Procedural Expertise:** Such interventions required considerable **skill and careful observation**, especially in the absence of modern anaesthesia and antiseptics.

B. Empirical Orientation

- **Anatomical Observation:** Sushruta advised students to examine a decomposing body in flowing water so that tissues could be removed and internal structures observed directly.
- **Practice-Based Learning:** Medical knowledge was linked to **direct observation and practical treatment**, rather than depending only on what teachers had previously taught.
- **Naturalistic Explanation:** The *Caraka Samhita* sought to explain heredity through the contributions of the **father's seed and mother's field**, representing an attempt to explain biological processes through natural causes, though not equivalent to modern genetics.

Why Did This Medical Tradition Fail to Sustain Continuous Development?

- **Ritual Impurity:** Physicians regularly dealt with **sickness, blood and death**, contributing to perceptions of ritual impurity.
- **Occupational Suspicion:** Their occupation involved earning money from treating illness, contributing to suspicion toward physicians in parts of the social-religious order.

- **Scriptural Marginalisation:** The *Manusmriti* advised twice-born Brahmins against accepting food from physicians or inviting them to important ritual meals, reflecting their low social standing.
- **Ambiguous Professional Status:** Medicine's association with the *Atharvaveda*, which included healing practices alongside magic and ritual, further complicated the social position of physicians.
- **Limited Cumulative Progress:** Despite earlier achievements, ancient Indian medicine did not develop detailed understanding of the **brain, heart and blood circulation**.

How Did Social Structures Influence the Institutional Development of Medicine in Ancient India?

- **Low Social Status:** Physicians were often seen as socially inferior because their work involved **illness, blood and death**, which were linked with ritual impurity.
 - e.g., The *Manusmriti* advised twice-born Brahmins not to accept food from physicians or invite them to important ritual meals.
- **Occupational Stigma:** Medical practice involved earning money through treatment, which made physicians suspicious in some parts of the social order.
 - e.g., Some texts placed physicians alongside occupations such as **butchers and moneylenders** that were viewed with suspicion.
- **Caste-Based Division of Work:** Social hierarchy affected who performed different kinds of medical work, with **surgery gradually moving into the hands of lower-caste barber communities**.
 - e.g., Surgical skills continued as a practical occupation, but became less connected with the wider scholarly medical tradition.
- **Separation of Practice and Learning:** As surgeons and physicians became socially marginalised, **practical skills and scholarly learning became less closely connected**.
 - e.g., Surgery continued, but deeper study of areas such as the **brain, heart and blood circulation** did not develop to a similar extent.
- **Weakening of Further Research:** The lower status of physicians made it harder for medicine to sustain the **observation, investigation and experimentation** needed for further growth.
 - e.g., This created a gap between the important medical advances of Sushruta and the later development of the medical tradition.

Way Forward

- **Evidence-Based Heritage:** Assess ancient medical achievements through **texts, documented practices and verifiable historical evidence**.
- **Contextual Understanding:** Evaluate traditional knowledge within its historical context without mechanically equating it with **modern scientific concepts**.
- **Dignity of Knowledge Practitioners:** Ensure that **caste, occupational stigma or notions of impurity** do not undermine socially valuable professions.
- **Institutionalise Empiricism:** Encourage **observation, experimentation, documentation and critical verification as foundations of knowledge development**.
- **Ensure Cumulative Continuity:** Connect **practical expertise, formal learning, research and intergenerational transmission** so that knowledge is not merely preserved but continuously improved.

