ASPIRE with RAM IAS

Guiding Dreams, Empowering Future

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4TH WEEK | Feb-2026

EXCLUSIVE CURRENT AFFAIRS BULLETIN

AI Impact Summit 2026 : India

Why in News

- India hosts the 4th AI Impact Summit 2026 from February 16–20 at Bharat Mandapam, New Delhi.
- Prime Minister inaugurates the India AI Impact Expo 2026 with participation from global tech leaders and representatives of nearly 100 countries.
- First time a Global South country is hosting the summit.
- Previous editions were held in the United Kingdom, South Korea, and France.

AI IMPACT SUMMIT भारत 2026 INDIA

- Highlights India's growing leadership role in global AI governance and policy discussions.

Overview of the Summit

- Edition: 4th AI Impact Summit.
- Venue: Bharat Mandapam, New Delhi (also hosted the G20 Leaders' Summit 2023).
- Theme Structure organized around three thematic chakras: People, Planet, and Progress.
- Participation of global tech CEOs such as Sundar Pichai, Sam Altman, Demis Hassabis, Dario Amodei, and Brad Smith.
- Global leaders including Emmanuel Macron, Luiz Inácio Lula da Silva, and António Guterres attended.
- Bilateral meetings conducted alongside the summit.
- Dedicated all-women hackathon promoting inclusive innovation.
- Events include Leaders' Summit and Tech CEO Roundtable discussions.

Why AI is Important in the Current Scenario

- Driver of economic growth through automation, productivity enhancement, and innovation.
- Critical for governance reforms including digital public infrastructure, smart governance, and predictive policymaking.
- Enhances healthcare diagnostics, agriculture forecasting, climate modelling, and disaster management.
- Supports Industry 4.0 through robotics, IoT integration, and intelligent manufacturing.
- Strategic technology shaping geopolitical influence and technological sovereignty.

AI in Education & Healthcare

■ AI in Education

- Personalized learning systems use AI to adapt educational content based on individual student needs, reducing learning time by nearly 20% through application of cognitive load theory.
- Predictive analytics identifies at-risk students early with nearly 92% accuracy using machine learning models such as random forests, enabling timely academic interventions.
- Automated grading and administrative tools reduce teacher workload; handwriting recognition systems achieve nearly 95% accuracy and enable smart scheduling.
- Inference engines construct knowledge models using Bayesian networks to predict student performance and recommend targeted revisions.

■ Challenges in AI-driven Education

- Digital divide restricts equitable access; India's higher education Gross Enrolment Ratio (GER) stands at 28.4%, and uneven AI access may deepen educational inequality.
- Over-reliance on AI risks weakening critical thinking and independent learning

abilities among students.
- Ethical concerns include data privacy risks and increased possibilities of academic dishonesty.
- Infrastructure shortages, low AI literacy among educators and learners, and unclear regulatory frameworks slow large-scale adoption.

AI in Healthcare

- AI enhances diagnostic accuracy and early disease detection through medical imaging, Electronic Medical Record (EMR) analysis, and predictive tools for outbreak forecasting.
- Personalized medicine uses AI to tailor treatments, reduce healthcare costs, accelerate drug discovery, and optimize clinical trials and dosage planning.
- Resource optimization systems predict patient admissions, allocate hospital beds and staff efficiently, and reduce operational waste.
- Wearable technologies powered by AI monitor more than 300 biomarkers, enabling proactive disease prevention and continuous health monitoring.

Challenges in AI-driven Healthcare

- Sensitive health data raises major privacy and cybersecurity concerns.
- Algorithmic bias due to underrepresented datasets may widen healthcare inequalities.
- Infrastructure limitations in resource-poor regions restrict equitable AI deployment.
- Regulatory gaps hinder ethical, transparent, and inclusive AI implementation.
- Overburdened healthcare systems require improved AI literacy to prevent over-reliance on automated decision-making.

Challenges in the AI Era

- Ethical concerns such as bias, discrimination, and lack of algorithmic transparency.
- Data privacy and cybersecurity vulnerabilities.
- High energy consumption and environmental costs of large AI models.
- Digital divide between developed and developing nations.
- Regulatory gaps and absence of universally accepted AI governance frameworks.

Impact on Jobs & Software Industry

- Automation of repetitive coding and testing tasks through generative AI tools.
- Shift from traditional coding roles to AI supervision, prompt engineering, and system design.
- Creation of new job categories in AI safety, data science, robotics & AI ethics.
- Need for large-scale reskilling and upskilling of workforce.
- Increased productivity but potential short-term job displacement in routine IT services.

AI and National Defence Mechanisms

- AI-enabled surveillance, intelligence analysis, and real-time threat detection.
- Autonomous drones and unmanned combat systems.
- Cyber defence and predictive threat modelling.
- Decision-support systems for military strategy and logistics optimization.
- Integration of AI with space and satellite monitoring systems.

Humanoid AI Robots: Future Applications

- Healthcare assistance and elderly care support.
- Industrial automation in hazardous environments.
- Disaster response and rescue operations.
- Customer service, education and hospitality sectors.
- Space exploration and extreme-environment missions.

India's Vision on AI

- AI for All – inclusive and responsible AI development.
- Focus on Digital Public Infrastructure and open innovation ecosystem.
- Promotion of AI research through national AI missions, innovation labs, and startups.
- Strengthening semiconductor and computing infrastructure.
- Balancing innovation with ethical governance and global cooperation.

Conclusion

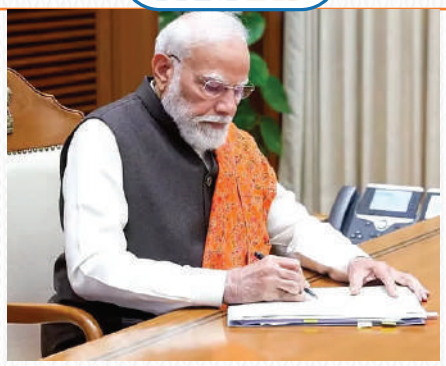
The AI Impact Summit 2026 reinforces India's emergence as a key global player in shaping responsible and inclusive artificial intelligence governance. For UPSC preparation, the summit connects international relations, technology governance, economic transformation, and national security, making it highly relevant for Prelims and GS-II/GS-III Mains perspectives.

PYQ - 2025

Q. Consider the following statements regarding AI Action Summit held in Grand Palais, Paris in February 2025
1. I. Co-chaired with India, the event builds on advances made at the Bletchley Park Summit (2023) and Seoul Summit (2024).
2. II. Along with other countries, the US and UK also signed the declaration on inclusive and sustainable AI.

Correct Answer: (a) I only

PM RAHAT Scheme



Overview

•Launched by the Union Government as a major governance initiative for road safety and emergency healthcare.
• Announced on 17 February 2026 after relocation of the government functioning to Seva Teerth.
• Presented in concise policy format aimed at improving accident response systems.

About PM RAHAT Scheme

• Implemented by the Ministry of Road Transport and Highways (MoRTH).
• Objective: Provide immediate, cashless medical treatment to road accident victims.
• Addresses high mortality due to delayed treatment; nearly 50% of deaths are preventable with timely care.
• Focuses on Golden Hour management — the first hour after serious injury when treatment is most effective.

Cashless Treatment & Coverage

• Cashless treatment up to ₹1.5 lakh per victim.
• Applicable on all categories of roads: national highways, state highways, and urban roads.
• Coverage valid for the first 7 days of treatment following the accident.

Emergency Response

• Stabilization care guaranteed up to 24 hours in non-life-threatening cases.
• Up to 48 hours stabilization care in life-threatening cases, subject to police authentication.

Implementation & Access Mechanism

• Technology-driven digital framework ensures seamless claim processing.
• Integration of Electronic Detailed Accident Report (eDAR) platform of MoRTH.
• Linked with Transaction Management System (TMS 2.0) of the National Health Authority.
• Ensures real-time coordination between police, hospitals, insurers, and government systems.

Funding Mechanism

• Hospitals reimbursed through the Motor Vehicle Accident Fund (MVAF).
• If the offending vehicle is insured, payments are made through contributions from General Insurance Companies.
• Uninsured and hit-and-run cases funded through Government of India budgetary allocation.

Integration

• Integrated with Emergency Response Support System (ERSS) via Dial 112.
• Victims or Good Samaritans can request ambulance services.
• System helps locate the nearest designated hospital for immediate treatment.

Grievance Redressal Mechanism

• District-level Grievance Redressal Officer appointed by the District Road Safety Committee.
• Committee chaired by District Collector/District Magistrate/Deputy Commissioner.
• Ensures accountability and addresses complaints of victims and families.

Previous Year Question

Q. With reference to the 'Golden Hour' in road safety management, consider the following statements:
1. It refers to the first hour after a traumatic injury during which medical treatment is most effective.
2. Timely treatment during this period significantly reduces mortality in road accident cases.
3. The concept is unrelated to emergency medical response systems.
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

Bharat VISTAAR

LAUNCH OF Bharat Vistaar

About Scheme :

• Announced by Finance Minister Nirmala Sitharaman in the Union Budget 2026–27 on 1 February 2026.

• Full Form: Virtually Integrated System to Access Agricultural Resources (VISTAAR).

• Officially launched on 17 February 2026 in Jaipur by Union Agriculture Minister Shivraj Singh Chouhan.

• Allocated budget of ₹150 crore for FY 2026–27.

• Designed as a 24/7 AI-based digital farming expert accessible to farmers across India.

Main Features

• AI-powered multilingual assistant 'Bharati' provides real-time advisory services.

• Offers guidance on crop planning, scientific farming practices, pest management, weather forecasts, and market prices.

• Provides real-time inputs on soil health, fertilizers, irrigation, and localized farm conditions.

• Delivers personalized recommendations based on farmer location and crop profile.

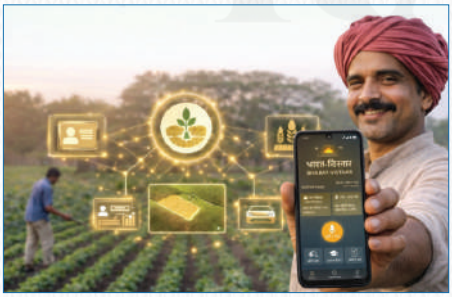
▸▸ Continued on P4

From P3

- Covers key government schemes including PM-KISAN, PM Fasal Bima Yojana, Soil Health Card Scheme, Per Drop More Crop, Kisan Credit Card, and others.
- Provides eligibility details, application assistance, and scheme tracking services.
- Accessible through voice or text without requiring mobile app installation.
- Uses Bhashini language platform enabling regional language access such as Hindi, Telugu, English, with additional languages planned.

Technology and Integration

- Integrates AgriStack, India's digital public infrastructure for agriculture.
- Combines Indian Council of Agricultural Research (ICAR) knowledge systems with AI analytics.
- Connected with Kisan Call Centres, weather APIs, and government scheme portals for seamless advisory delivery.
- Open innovation platform allowing start-ups, NGOs, and India AI Mission participants to build additional services.



- Future capabilities include pest image recognition and advanced crop diagnostics.
- Builds upon pilot AI chatbot programs in states like Bihar and Madhya Pradesh serving over 4,000 agricultural extension workers.

Access Mechanism

- Farmers can access Bharat VISTAAR by dialing 155261.
- Provides multilingual interaction through voice and text interfaces.
- Designed for inclusivity to support farmers without smartphones or advanced digital literacy.

Goals and Benefits

- Enhances decision-making through real-time agricultural intelligence.
- Reduces crop risks by providing timely advisories on pests, weather, and markets.
- Aims to improve productivity for India's agricultural workforce, which constitutes nearly 50% of the population.
- Strengthens last-mile agricultural extension services.
- Improves scheme delivery, monitoring, and transparency.
- Promotes sustainable agriculture through data-driven inputs on sowing patterns, irrigation, and pest control.

Governance and Digital Agriculture Context

- Represents integration of Artificial Intelligence with Digital Public Infrastructure (DPI) in agriculture.
- Supports India's broader Digital Agriculture Mission objectives.
- Enhances convergence between policy delivery, research institutions and farmer-level implementation.

Conclusion

Bharat VISTAAR represents a major step in AI-driven agricultural governance by combining AgriStack data, ICAR expertise, and multilingual AI assistance to provide real-time advisory support, improve productivity, and strengthen sustainable farming practices across India.

Previous Year Question (2024)

Q. With reference to 'AgriStack', consider the following statements:

1. It aims to create a comprehensive digital identity for farmers.

2. It includes Farmer's Registry, Geo-referenced Soil Profiles, and Digital Crop Surveys.

3. It was announced in Budget 2020–21.

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.

80 Years of RIN Revolt (1946)

WHY IN NEWS...?

- 18 February 2026 marks the 80th anniversary of the Royal Indian Navy (RIN) Revolt.
- The event represents militant anti-colonial resistance and rare Hindu–Muslim unity during the final phase of British rule in India.

Summary of the RIN Revolt

- RIN Revolt (1946) was a large-scale armed uprising involving nearly 20,000 naval ratings.
- Triggered by racial discrimination, poor service conditions, and political anger over INA trials.
- Demonstrated rare Hindu–Muslim unity with protesters jointly displaying Congress, Muslim League, and Communist Party flags.
- Though suppressed, it accelerated British withdrawal from India.
- Led to important political concessions and reinforced civilian supremacy over the military.

What was the RIN Revolt (1946)?

Continued on P5

From P4

- A large-scale naval insurrection involving over 20,000 ratings.
- Included participation of 78 ships and 20 shore establishments such as HMIS Talwar in Bombay.
- Spread across naval bases in Karachi, Madras, Cochin, Vishakhapatnam, Calcutta, and the Andaman Islands.
- Inspired sympathetic strikes in Royal Indian Air Force units at Bombay, Poona, Calcutta, Jessore, and Ambala.

Immediate Triggers & Grievances

- Poor food quality, low wages, and racial discrimination faced by Indian ratings.
- Abusive behaviour by British superior officers.
- Arrest of a rating for writing 'Quit India' on HMIS Talwar.
- Growing nationalist sentiment among armed forces personnel.

Indian National Army (INA) Trials

- First INA trial held at Red Fort in November 1945.
- Defendants represented major communities: Prem Kumar Sehgal (Hindu), Shah Nawaz Khan (Muslim), Gurbaksh Singh Dhillon (Sikh).
- Congress passed strong resolution supporting INA at Bombay session (September 1945).
- Defence team included Bhulabhai Desai, Tej Bahadur Sapru, Kailash Nath Katju, Jawaharlal Nehru, and Asaf Ali.
- Support extended by Muslim League, Communist Party of India, Unionists, Akalis, Justice Party, Ahrars, RSS, Hindu Mahasabha, Sikh League, and various public groups.

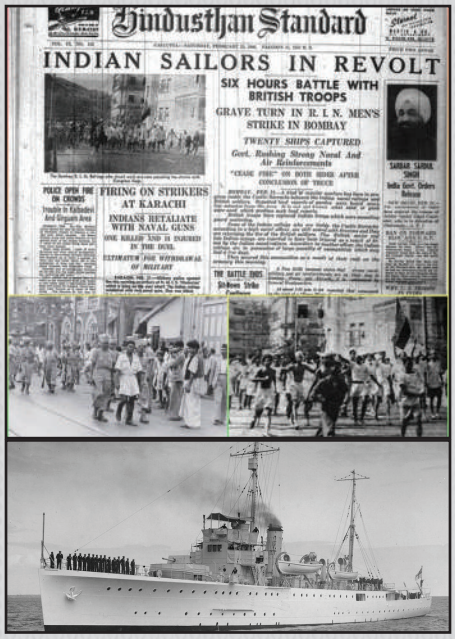
Symbols of Unity During the Revolt

- Naval ratings carried portraits of Subhas Chandra Bose during demonstrations.
- Rebel fleet hoisted flags of Congress, Muslim League, and Communist Party together.
- Displayed strong cross-communal solidarity.

Escalation to Armed Conflict

- Initial peaceful hunger strike turned violent after British forces opened fire.
- Ratings engaged in armed confrontation within barracks.
- Rebel ships manned artillery, raising fears of large-scale military conflict.

Communal Unity and Popular Uprising


Hindusthan Standard

INDIAN SAILORS IN REVOLT

SIX HOURS BATTLE WITH BRITISH TROOPS

GRAVE TURN IN R. I. N. MEN'S STRIKE IN BOMBAY

TWENTY SHIPS CAPTURED

Govt. Rushing Strong Naval And Air Reinforcements

FIRING ON STRIKERS AT KARACHI

INDIANS RETALIATE WITH NAVAL GUNS

- Mass protests erupted in Bombay with joint Hindu–Muslim participation.
- Hartals observed across the city.
- Crowds attacked colonial infrastructure, dug tram tracks, built barricades, and burned vehicles.
- Bombay's mill districts became the epicentre with closure of textile mills, railway workshops, and factories.

Brutal Suppression and Casualties

- British deployed army battalions, armoured vehicles, and machine-gun units.
- Troops fired indiscriminately on crowds to regain control.

End of the Revolt

- Revolt ended on 23 February 1946.
- Sardar Vallabhbhai Patel and Muhammad Ali Jinnah persuaded ratings to surrender.
- National leaders assured protection against victimisation.

Indian National Army (INA): Background

- INA formed during World War II by Indian prisoners of war to fight British rule.
- Initially organised by Mohan Singh with Japanese support, recruiting nearly 40,000 soldiers.
- Rashbehari Bose founded the Indian Independence League in Tokyo (1942).
- Subhas Chandra Bose assumed leadership on 25 August 1943.
- Provisional Government of Free India established in Singapore on 21 October 1943, recognised by nine countries.
- INA launched 'Chalo Delhi' campaign and hoisted flag at Moirang (Manipur).
- Movement collapsed after Japan's surrender on 15 August 1945 and Bose's reported death (18 August 1945).

Significance of the RIN Revolt

- Forced British policy concessions including Cabinet Mission initiative (January 1946).
- Only INA personnel accused of murder or brutality were tried; others received remission by January 1947.
- Indian troops withdrawn from Indo-China and Indonesia by February 1947.
- Revealed declining loyalty of Indian personnel in colonial armed forces.
- Accelerated British decision to transfer power.
- Symbolised communal unity during a period of rising communal tensions.
- Reinforced civilian supremacy as political leadership intervened in military affairs.

Limitations of the Revolt

- Lacked centralised leadership; Naval Central Strike Committee had limited experience.
- Congress and Muslim League leadership opposed continuation and urged surrender.
- Gandhi criticised the revolt for lacking political direction.
- Limited geographical and institutional scope; Indian Army did not join.
- British forces retained overwhelming military superiority.
- Occurred during ongoing negotiations favouring peaceful transfer of power.

Conclusion

The RIN Revolt demonstrated the erosion of British military authority, showcased rare communal unity, and accelerated the British decision to leave India, making it a crucial event in the final phase of the freedom struggle.

PYQ 2021 :

Q. In the context of Colonial India, Shah Nawaz Khan, Prem Kumar Sehgal and Gurbaksh Singh Dhillon are remembered as
(a) Leaders of Swadeshi and Boycott Movement
(b) Members of the Interim Government in 1946
(c) Members of the Drafting Committee in the Constituent Assembly
(d) Officers of the Indian National Army

Answer: (d) Officers of the Indian National Army

NATIONAL SONG GUIDELINES

Why in News

- The Ministry of Home Affairs (MHA) has reiterated guidelines regarding the playing and singing of the National Song 'Vande Mataram'.
- Guidelines include procedural aspects such as drum roll before band performance and protocols for mass singing.

Special Orders Issued by Government of India

- The Government of India, through the Ministry of Home Affairs, has issued executive instructions regulating the manner in which the National Song 'Vande Mataram' may be played and sung on official and significant occasions.
- These are executive guidelines issued under Article 73 of the Constitution.
- They are not issued under any specific Act of Parliament.

Provisions of the Guidelines :

1.Playing by Band

- When played by a band, the National Song should be preceded by a roll of drums to alert the audience, unless another clear indication is provided.

2. Official Version

- Only the officially approved version should be used.
- It should be accompanied by mass singing during occasions such as:
- Unfurling of the National Flag.

- Cultural or ceremonial functions other than parades.
- A trained choir may coordinate with the band.
- Adequate public address systems should be ensured.
- Printed lyrics may be circulated wherever necessary.

3. Other Significant Occasions

- The National Song may be sung during occasions invested with significance due to the presence of Ministers or dignitaries.
- There is no exhaustive list of such occasions.
- Respect and proper decorum must always be maintained.

4. In Schools

- The school day may begin with community singing of the National Song.
- School authorities should promote respect for the National Song, National Anthem, National Flag, and constitutional values.

Constitutional & Legal Position

- The National Song is not mentioned in the Constitution of India.
- There is no law mandating compulsory singing of the National Song.
- It does not enjoy statutory protection similar to the National Anthem under the Prevention of Insults to National Honour Act, 1971.

PYQ 2023 :

Q. Consider the following statements in respect of the National Flag of India according to the Flag Code of India, 2002:

3. Statement-I: One of the standard sizes of the National Flag of India is 600 mm × 400 mm.

4. Statement-II: The ratio of the length to the height (width) of the Flag shall be 3 : 2.

Which one of the following is correct?

(a) Both Statement-I and Statement-II are correct and Statement-II is the correct explanation for Statement-I

(b) Both Statement-I and Statement-II are correct and Statement-II is not the correct explanation for Statement-I

(c) Statement-I is correct but Statement-II is incorrect

(d) Statement-I is incorrect but Statement-II is correct

Correct Answer: (d)

Bio-based Chemicals & Enzymes

Why in News...?

- The Biotechnology for Economy, Employment and Environment (BioE3) Policy has prioritised bio-based chemicals and enzymes as strategic sectors.
- Bio-based chemicals and enzymes use renewable biological feedstocks and reduce dependence on fossil-based industrial inputs.
- The sector is important for India to reduce petrochemical imports (e.g., $479.8 million acetic acid imports in 2023), strengthen energy security, and support climate goals.

What are Bio-based Chemicals and Enzymes?

- Bio-based chemicals are industrial chemicals produced using biological feedstocks such as sugarcane, corn, starch, or biomass residues.
- Production generally occurs through fermentation or enzymatic processes.

Continued on P7

From P6

- Examples include organic acids (such as lactic acid), bio-alcohols, solvents, surfactants, and intermediates used in plastics, cosmetics, and pharmaceuticals.
- Enzymes are biological catalysts widely used in detergents, food processing, pharmaceuticals, textiles, pulp and paper industries, and increasingly in biomanufacturing.
- Enzymes function at lower temperatures and pressures, reducing energy consumption and industrial emissions.

Alignment with India's Energy Security & Industrial Policy Objectives

- Import Substitution: Reduces dependence on petrochemical imports such as acetic acid valued at $479.8 million in 2023.
- Feedstock Utilisation: Uses agricultural residues, sugarcane, and starch-based raw materials to build industrial value chains.
- Manufacturing Expansion: Strengthens domestic production capacity in sustainable chemical manufacturing.
- Energy Efficiency: Enables lower temperature and pressure processing, reducing industrial energy consumption.
- Strategic Autonomy: Diversifies raw material sources beyond fossil fuels.

How the BioE3 Policy Institutionalises Bio-manufacturing as a Governance Priority

- Policy Prioritisation: Bio-based chemicals and enzymes are included under the Department of Biotechnology's BioE3 framework.
- Economic Integration: Links biotechnology development with employment generation and environmental sustainability.
- Sectoral Coordination: Aligns industrial biotechnology with manufacturing sector expansion.
- Innovation Ecosystem: Encourages microbial strategy development for chemical production.

India's Institutional and Market Capacity to Scale Bio-based Production

- Corporate Leadership: Praj Industries and Godrej Industries lead bio-chemical initiatives in India.
- Refinery Innovation: Godavari Biorefineries produces acetyls and intermediates such as acetic anhydride (ethyl acetate).
- Enzyme Market Consolidation: Top players account for over 75% of market share.
- Key Industry Actors operating in India include Novozymes India, DuPont, DSM, Advanced Enzyme Technologies, BASF SE, and Ultreze Enzymes Private Limited.
- Fermentation Expertise: India's strong pharmaceutical and vaccine manufacturing ecosystem supports scaling of bio-based production.

Governance and Regulatory Challenges

- Capital Intensity: Bio-refineries require high initial investment.
- Feedstock Volatility: Agricultural raw material supply fluctuates seasonally.
- Technology Dependence: Advanced microbial engineering requires continued global collaboration.
- Regulatory Clearances: Multi-layer approvals delay commercial scaling.
- Market Competitiveness: Petrochemical alternatives remain cost-competitive due to existing infrastructure advantages.

Global Policy Context Shaping India's Strategy

- EU Bioeconomy Strategy integrates bio-based chemicals into circular economy and climate transition frameworks.
- USDA BioPreferred Program provides federal procurement preference for bio-based products.
- Industrial decarbonisation strategies globally link manufacturing transition with bio-manufacturing.
- Waste Reduction Policies promote conversion of biomass residues into industrial chemicals.
- Global competition positions bio-based chemicals as an emerging industrial frontier.

Conclusion

Bio-based chemicals and enzymes integrate industrial growth with environmental sustainability. India's agricultural base, fermentation expertise, and BioE3 policy provide structural advantages. Scaling the sector requires regulatory reforms, technology advancement, and feedstock security. The sector offers strong potential for import substitution, green growth, and strategic industrial positioning.

PYQ Mains 2023 :

Q. Discuss several ways in which microorganisms can help in meeting the current fuel shortage.

SARVAM AI - INDIA

Sarvam AI Models : Overview

- Sarvam Vision is a 3-billion-parameter vision-language model designed for document intelligence and visual understanding.
- Performs image captioning, scene text recognition, chart interpretation, and complex table parsing.
- Focuses on digitization of Indian records such as manuscripts, government files, financial tables, and historical texts.
- Moves beyond traditional OCR by extracting meaning and knowledge instead of only text.
- Understands document structure including headings, captions, layouts, and reading order.
- Trained across all 22 official Indian languages and handles mixed-script documents.
- Scored 84.3% on olmOCR-Bench, outperforming major global OCR systems.
- Achieved 93.28% accuracy on Omni-DocBench v1.5 for complex real-world document parsing.

Bulbul V3 (Text-to-Speech Model)

- Advanced text-to-speech AI optimized for India's multilingual ecosystem.
- Supports 35+ professional voices across 11 Indian languages, expanding toward all 22 Scheduled Languages.
- Captures prosody such as tone, pauses, and emphasis for natural speech generation.
- Handles code-switching, abbreviations, regional accents, and emotional expression.
- Enables voice-based digital access for linguistically diverse populations.

Concept of Sovereign AI

- Refers to a nation's ability to build, deploy, and regulate AI using domestic infrastructure, data, talent, and laws.
- Ensures strategic autonomy and reduces dependence on foreign technology ecosystems.
- Protects critical digital infrastructure from geopolitical risks and corporate control.

Significance for India

- Data Security: Sensitive datasets like Aadhaar or financial records remain within national borders.
- Cultural Alignment: Reduces Western-centric bias and improves India-specific contextual understanding.
- Frugal Innovation: Efficient smaller models reduce energy and computational costs.
- Digital Inclusion: Voice AI enables participation of non-literate and vernacular users.

Challenges in Building Sovereign AI

- Linguistic data scarcity and token inequality across Indian languages.
- Risk of caste, gender, and religious bias from uncurated training data.
- Limited patient capital for deep-tech AI research compared to consumer startups.
- Government data often unstructured or siloed, reducing usability for AI training.
- Dependence on foreign hardware such as GPUs and AI accelerators.
- Global tech giants may close performance gaps by fine-tuning on Indic datasets.

Measures to Strengthen India's AI Ecosystem

- Integrate AI development with India Semiconductor Mission for domestic compute capability.
- Promote indigenous processors like Shakti and Vega microprocessors.
- Adopt Frugal AI and Small Language Models suitable for edge devices.
- Use GPAI leadership to promote Global South-focused AI governance.
- Implement DPDP Act, 2023 to enforce data residency and local processing.
- Mandate indigenous AI adoption in public procurement.
- Establish an AI Safety Institute for testing bias and safety risks.

Conclusion

India's sovereign AI push emphasizes data control, multilingual capability, and frugal innovation to build a self-reliant technology ecosystem. Sarvam AI represents a strategic step toward technological self-reliance by developing indigenous models tailored for Indian languages and contexts. A strong AI ecosystem requires coordinated progress in data infrastructure, hardware development, governance frameworks, and sustained research investment.

PYQ 2020

Q. With the present state of development, Artificial Intelligence can effectively do which of the following?

1. Bring down electricity consumption in industrial units
2. Create meaningful short stories and songs
3. Disease diagnosis
4. Text-to-Speech Conversion
5. Wireless transmission of electrical energy

Select the correct answer using the code given below:

(a) 1, 2, 3 and 5 only
(b) 1, 3 and 4 only
(c) 2, 4 and 5 only
(d) 1, 2, 3, 4 and 5

Ans: (b)

LHS 1903 Four-Planet System

Why in News...?

Astronomers have discovered a unique four-planet system around the red dwarf star LHS 1903 using the European Space Agency's CHEOPS Space Telescope. The discovery was announced on 16 February 2026 and highlights new insights into planetary formation.

About LHS 1903

- Discovery made using ESA's CHEOPS (Characterising Exoplanet Satellite).
- Star system located about 117 light-years away from Earth.
- Host star LHS 1903 is a red dwarf star.
- The system contains four planets.
- Two planets are Super-Earths (rocky planets larger than Earth).
- Two planets are Mini-Neptunes (planets with thick gaseous envelopes).
- The outermost planet is rocky despite being farther from the star.

Planet Classification :

- Super-Earths: Rocky planets with masses 2–10 times that of Earth.
- Mini-Neptunes: Larger than Earth but smaller than Neptune; possess thick gaseous atmospheres.
- Exoplanets: Planets that orbit stars outside our solar system.

Planetary Characteristics

- System contains four planets: rocky super-Earths (b and e) and gaseous mini-Neptunes (c and d).
- Planets b and e are dense and Earth-like, lacking extended gaseous atmospheres.
- Planets c and d possess volatile-rich envelopes indicating gaseous composition.
- Density measurements confirm compositional differences within the same system.

Unusual Planetary Architecture

- Rocky planet e lies beyond gaseous planets c and d — opposite of standard planetary arrangement.
- Represents an 'inside-out' reversal of expected formation patterns.
- Spans the 'radius valley' (gap between rocky super-Earths and gaseous mini-Neptunes).
- Contradicts expectations for thick-disk stars, which usually host only mini-Neptunes.

Discovery History

- Inner three planets initially detected by NASA's TESS mission.
- Outer planet e identified through reanalysis of ESA CHEOPS observations.
- High-resolution spectroscopy used to determine planetary masses.
- Gaia astrometry helped rule out hidden gas-giant companions.

Formation Implications

- Outer rocky planet likely formed after depletion of gas in the protoplanetary disk.
- Supports 'gas-depleted formation' model over photoevaporation theory.
- Simulations rule out large-scale migration or major planetary impacts.
- Suggests sequential planet formation in fading disks, similar to the inner Solar System.

Static Background: Exoplanets

- Exoplanets are planets located outside the Solar System.
- More than 5,500 exoplanets have been confirmed to date.
- Major detection methods include Transit Method, Radial Velocity Method, and Direct Imaging.

Planet Formation Theory (Standard Model)

- Planets form from gas and dust in a protoplanetary disk.
- Inner regions form rocky planets due to high temperatures.
- Outer regions retain hydrogen-helium gas, forming gaseous giants.
- LHS 1903 system deviates from this classical model.

Red Dwarf Stars

- Account for nearly 70–75% of stars in the Milky Way galaxy.
- Smaller, cooler, and longer-lived compared to the Sun.
- LHS 1903 has about 50% of the Sun's mass and ~5% of its luminosity.
- Habitable zones lie much closer to red dwarf stars.

Scientific Significance

- Evidence for sequential planetary formation rather than simultaneous formation.
- Indicates gas depletion occurred before formation of the outermost planet.
- Alternative explanation includes atmospheric loss due to stellar radiation or collisions.

Habitability Perspective

- Estimated surface temperature of planet e is around 60°C.
- Conditions may allow extremophile life depending on atmosphere and water presence.
- Habitability depends on atmosphere, liquid water, and magnetic field protection.
- Red dwarf systems are key targets in search for habitable exoplanets.

Technology & Space Missions

- CHEOPS (launched 2019) is an ESA mission focused on characterising known exoplanets.
- Measures planetary size, density, and orbital properties.
- Complements NASA's TESS and the James Webb Space Telescope.

Conclusion

The LHS 1903 planetary system discovery provides critical evidence that planetary formation may occur through multiple evolutionary pathways.

PYQ 2015

Q. The term 'Goldilocks Zone' is often seen in the news in the context of
(a) the limits of habitable zone above the surface of the Earth
(b) the limits of a habitable zone of a star
(c) the solar eclipses
(d) the solar system

Answer: (b)

Eurasian Otter Sighting in Kashmir Valley

Why in News

A Eurasian Otter (Lutra lutra) was sighted on 17 February 2026 along the Sindh Canal in Kashmir Valley. The observation provided the first direct photographic evidence in the region after a long absence, where the species was believed locally extinct in some areas.

Overview:

- Chance sighting recorded along Sindh Canal, Kashmir Valley.
- First confirmed photographic evidence of Eurasian Otter presence after long absence.
- Important biodiversity rediscovery highlighting ecosystem recovery.

Eurasian Otter – Taxonomy & Identification

- Scientific name: Lutra lutra (also called European or Common Otter).
- Genus: Lutra.
- Family: Mustelidae (weasel family).
- Physical features: Streamlined body adapted for swimming.
- Webbed feet and powerful tail aid propulsion in water.
- Sensitive whiskers (vibrissae) help detect prey underwater.
- Males are generally larger than females.

Characteristics

- Eurasian Otters are streamlined carnivores measuring 57–95 cm in body length (excluding a 250–400 mm tail).
- Average weight ranges from 6–12 kg, with males larger than females.
- They possess dense, waterproof fur (up to 500,000 hairs per sq cm) with velvety undersides.
- Strong, webbed feet enable agile swimming and dives up to 1 km in distance.
- Primarily nocturnal or crepuscular in behaviour.
- Territories extend 5–40 km along watercourses and are marked using spraint (feces with fish/musk smell).
- Use holts (dens in riverbanks or trees) and couches (resting sites) for shelter.
- Diet consists mainly of fish (about 80%, including salmonids), supplemented by amphibians, crustaceans, and birds.
- Daily food intake can reach nearly 20% of body weight.

Habitat Preferences

- Prefer clean, fish-rich freshwater ecosystems such as rivers, lakes, streams, marshes, and coastal waters.
- Require unpolluted water with more than 80% water-quality index.
- Depend on riparian vegetation for cover and nearby forests for breeding.
- In India, found in Western Ghats rivers (Periyar, Kabini), Himalayan foothills, and Northeast wetlands.
- Generally avoid regulated canals and heavily urbanised river stretches.
- Home ranges expand during low-food winters, sometimes reaching up to 50 km.
- Can tolerate brackish water but require terrestrial refuges within 100 metres of water bodies.

Major Threats

- Habitat fragmentation caused by dams, infrastructure expansion, and urbanisation.
- Water pollution, especially pesticide contamination leading to bioaccumulation and decline in fish populations.
- Overfishing reduces prey availability.
- Accidental roadkills near waterways.
- Illegal hunting for fur and traditional medicine continues in parts of Asia.
- Climate change alters prey distribution and aquatic ecosystem stability.
- Hydropower projects in regions like the Western Ghats disrupt migration corridors.
- Globally listed as Near Threatened by IUCN, with Endangered status in parts of Europe and Asia.

Conservation Efforts

- Protected under CITES Appendix I, which bans international trade.
- EU Habitats Directive mandates monitoring and conservation measures.
- In India, listed under Schedule I of the Wildlife Protection Act, 1972, providing the highest legal protection.
- Project Otter (2015, WWF-India) focuses on population surveys and habitat restoration.
- Conservation strategies include eco-bridges and connectivity restoration.
- Important conservation sites include Chilika Lake and National Chambal Sanctuary.
- Community-based conservation programs in Kerala promote fish-friendly and sustainable practices.
- European populations have recovered in some regions following pollution control measures such as PCB bans.

Environmental Impact & Ecological Role

- As apex piscivores, otters regulate fish and invertebrate populations.
- Help prevent algal blooms through trophic cascade effects.
- Serve as bioindicators of clean and healthy aquatic ecosystems.
- Population decline reflects broader wetland degradation affecting migratory birds and amphibians.
- Habitat restoration linked to otter recovery can increase fisheries productivity by 20–30%.
- In agroecosystems, they rarely create conflict and indirectly control invasive species.

Other Otter Species in India

- India hosts three otter species.
- Eurasian Otter – Found in Himalayas, Northeast India, and Western Ghats.
- Smooth-coated Otter – Widely distributed across India.
- Small-clawed Otter – Found in Himalayan region and parts of southern India.

PYQ

Q. Consider the following statements about otters in India:

1. India has three species of otters.
2. Smooth-coated otter is widely distributed across India.
3. Eurasian otter is endemic only to Kashmir.

Which of the statements given above are correct?

Ans: 1 and 2 only.