

Factly Weekly

Compilation

2024

**For UPSC CSE Prelims
Exam**



2nd Week

October 2024

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UPSC Syllabus: World geography

Mount Adams

Why in news?

Recently, Mount Adams has shown an increase in seismic activity after being dormant for thousands of years.

About Mount Adams

1. About: It is a stratovolcano, although it is currently dormant. The last significant eruption occurred about 1,000 years ago.
2. Location: Mount Adams is located in the Cascade Range in Washington, USA. It is approximately 31 miles (50 km) east of Mount St. Helens and 55 miles (89 km) north of the Columbia River.
3. Elevation: It is standing at 12,281 feet (3,743 meters). Mount Adams is the second-highest peak in Washington State, after Mount Rainier.
4. Geological Composition: Mount Adams is primarily composed of andesite and basaltic andesite lava flows, making it one of the largest stratovolcanoes in the Cascades by volume.
5. Glaciers: The mountain has several glaciers, including the Adams Glacier on the north side, which is the largest. Other glaciers include the White Salmon Glacier, Avalanche Glacier, and Klickitat Glacier.
6. Flora and Fauna: The area surrounding Mount Adams is part of the Gifford Pinchot National Forest and supports diverse wildlife, including deer, elk, black bears, and various bird species. The forest also features a mix of subalpine and alpine vegetation.
7. Climate: The climate around Mount Adams varies with elevation. The lower slopes have a more temperate climate, while the higher altitudes experience heavy snowfall in winter and cooler temperatures year-round.
8. Cultural Significance: Mount Adams is known as Pahto or Klickitat by local Native American tribes, who regard it as a sacred mountain. It holds cultural and spiritual significance for tribes such as the Yakama Nation.

Hurricane Milton

Why in news?

Hurricane Milton has intensified rapidly in the Gulf of Mexico.

About Hurricane Milton

1. It was initially formed as a tropical depression in the Gulf of Mexico.
2. Milton swiftly transformed from a Category 1 hurricane to a powerful Category 5 within just 12 hours on October 7.
3. This explosive growth was largely attributed to unusually warm sea surface temperatures, which provided ample energy for the storm's intensification.
4. By October 8, Milton had reached a peak wind speed of 290 km/hr (180 mph) and recorded a minimum central pressure of 897 millibars, marking it as the third strongest hurricane in Atlantic history.

5. The storm has since undergone an eyewall replacement cycle, leading to a slight decrease in wind speed to 240 km/hr (150 mph), categorizing it as a formidable Category 4 hurricane.

6. The National Hurricane Center (NHC) has issued storm surge warnings, predicting surges up to 15 feet in certain areas, especially along Florida's western coast, and rainfall forecasts indicate potential accumulations of up to 460 mm in some regions.

About Hurricane

1. Hurricanes, also known as tropical cyclones or typhoons in different regions, are intense tropical storms with sustained winds of at least 119 km/hr (74 mph).

2. They form over warm ocean waters near the equator, which serve as the primary energy source.

3. Warm, moist air rises and cools, leading to the formation of clouds and the release of latent heat, which fuels the storm. This cycle continues, causing the system to grow and intensify.

4. Hurricanes are classified into five categories based on the Saffir-Simpson Hurricane Wind Scale:

Categories	Classification description
Category 1	Wind speeds of 119-153 km/hr (74-95 mph)
Category 2	Wind speeds of 154-177 km/hr (96-110 mph)
Category 3	Wind speeds of 178-208 km/hr (111-129 mph) - considered a major hurricane
Category 4	Wind speeds of 209-251 km/hr (130-156 mph) - major hurricane with catastrophic damage potential
Category 5	Wind speeds exceeding 252 km/hr (157 mph) - extremely dangerous with catastrophic impact

5. Hurricanes bring multiple hazards, including high winds, heavy rainfall, storm surges, and even tornadoes. They can lead to widespread destruction, especially in coastal areas, with flooding often being the most devastating consequence.

6. Their behavior and trajectory are influenced by various factors, including sea surface temperatures, atmospheric moisture, and wind shear.

Status of Renewable energy in India

Why in news?

Recently, India has achieved a significant milestone in its renewable energy journey, as the country's total renewable energy capacity surpassed the 200 GW (gigawatt).

Status of Renewable energy in India

1. Total renewable energy capacity surpassed 200 GW. Current renewable capacity stands at 201.45 GW.

2. **Proportion of Renewable Energy:** Renewable energy constitutes 46.3% of India's total electricity generation capacity, which is 452.69 GW.

3. Sources of Renewable Energy:

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Sources of Renewable Energy	Capacity
Solar Power	90.76 GW (largest contributor)
Wind Power	47.36 GW
Hydropower	a) Large Hydro: 46.92 GW b) Small Hydro: 5.07 GW c) Biopower: 11.32 GW

4. Leading States in Renewable Capacity:

Rajasthan: 29.98 GW

Gujarat: 29.52 GW

Tamil Nadu: 23.70 GW

Karnataka: 22.37 GW

5. Government Initiatives: Target of 500 GW from non-fossil sources by 2030. Key programs include National Green Hydrogen Mission, PM-KUSUM, PM Surya Ghar and Production-Linked Incentive (PLI)** schemes for solar PV modules.

6. Investment and Infrastructure: 100% Foreign Direct Investment allowed under the automatic route. Waiver of Inter-State Transmission System charges for specific projects until designated deadlines. Establishment of Ultra Mega Renewable Energy Parks for large-scale projects.

7. Regulatory Framework: Issued Electricity (Rights of Consumers) Rules, 2020 for net metering. Also, launched Green Energy Open Access Rules 2022 to promote renewable energy. Standard Bidding Guidelines for tariff-based competitive bidding.

UPSC Syllabus: Schemes and programmes

Prime Minister Early Career Research Grant (PMECRG)

Why in news?

The Anusandhan National Research Foundation (ANRF) has launched two initial initiatives: the Prime Minister Early Career Research Grant (PMECRG) and the Mission for Advancement in High-Impact Areas – Electric Vehicle (MAHA-EV) Mission.

These initiatives aim to enhance India's scientific research capabilities and promote advancements in the Electric Vehicle (EV) sector.

Aspects	Description
About	1. This grant is designed to support early career researchers in advancing India's scientific excellence and innovation. 2. It encourages young researchers to participate in India's transformative research landscape.

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	<p>3. The PM Early Career Research Grant (PMECRG) reflects ANRF's commitment to nurturing young researchers by: Investing in early-career researchers to seed and grow a strong research culture and fostering a robust ecosystem of research and innovation throughout India.</p> <p>4. ANRF acknowledges the critical role of early-career researchers in advancing India's position as a global leader in S&T by: Empowering researchers to excel and support groundbreaking discoveries and building a vibrant research environment that prioritizes excellence.</p>
Aim	<p>It aims to foster high-quality, innovative research that:</p> <p>Expands knowledge boundaries.</p> <p>Drives technological progress.</p> <p>Contributes to positioning India as a global leader in Science and Technology (S&T).</p>

About Prime Minister Early Career Research Grant (PMECRG)

About Mission for Advancement in High-Impact Areas – Electric Vehicle (MAHA-EV) Mission

Aspects	Description
About	The MAHA-EV Mission is an initiative under the Advancement in High-Impact Areas (MAHA) Scheme by the ANRF.
Aim	It is aimed at advancing Electric Vehicle (EV) technologies to reduce import dependency, foster domestic innovation, and establish India as a global leader in EVs.
Focus area	<p>1. Concentration on three major technology verticals:</p> <ul style="list-style-type: none">i) Tropical EV Batteries and Battery Cellsii) Power Electronics, Machines, and Drives (PEMD)iii) Electric Vehicle Charging Infrastructure <p>2. Enhances domestic capabilities in the design and development of crucial EV components.</p>
Mission Goals	<p>1. It supports India's vision of Atmanirbhar Bharat by fostering self-reliance in EV component development.</p> <p>2. It is designed to facilitate collaboration across multiple institutions and disciplines to address critical scientific challenges.</p> <p>3. It aligns with the government's sustainable growth objectives and aims to establish India as a global EV component hub.</p>

UPSC Syllabus: Science and technology

Terminal High Altitude Area Defense (THAAD)

Why in news?

The United States has deployed 100 troops and the Terminal High Altitude Area Defense (THAAD) to Israel.

About Terminal High Altitude Area Defense (THAAD)

Aspects	Description
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About	<ol style="list-style-type: none">1. THAAD (Terminal High Altitude Area Defense) is an advanced missile defense system designed to counter short, medium, and intermediate-range ballistic missile threats.2. It is the only U.S. missile defense system capable of intercepting missiles both inside and outside the atmosphere (endoatmospheric and exoatmospheric).
Developed by	Lockheed Martin Corporation
Purpose	THAAD is designed to intercept ballistic missiles during the “terminal phase,” or the final stage of the missile’s flight before impact.
Features	<ol style="list-style-type: none">1. A THAAD battery comprises 95 soldiers, six truck-mounted launchers, 48 interceptors, a sophisticated radar surveillance system, and tactical fire control elements.2. THAAD can target short, medium, and intermediate-range ballistic missiles (up to 5,000 km) during their terminal phase of flight, both within and outside the Earth’s atmosphere.3. It employs “hit-to-kill” technology, directly striking threat missiles to neutralize them, which allows it to defend a larger area than older systems like the Patriot.
Components of THAAD	<ol style="list-style-type: none">1. Interceptor: Uses force to destroy incoming missiles.2. Launch Vehicle: Mobile trucks equipped with the interceptors.3. Radar: Detects and tracks missile threats from distances between 870 km to 3,000 km.4. Fire Control System: Coordinates the launch and targeting of interceptors.
Significance of THAAD Deployment in West Asia	<ol style="list-style-type: none">1. Enhanced Defense for Israel: THAAD strengthens Israel’s already robust, multi-layered air defense, adding an advanced layer against potential missile threats from Iran and Iranian-aligned militias.2. Strategic Deterrence: The presence of THAAD could act as a deterrent to further Iranian attacks, potentially stabilizing the tense situation in West Asia.3. Risk to US Troops: The deployment requires US troops to operate the system, which increases the risk to American lives, as Iran has warned the US against deeper involvement in the conflict.

Dragon Drones

Why in the news?

Dragon drones were recently deployed by both Russian and Ukrainian forces.

About Dragon Drones

1. These drones release a substance called thermite, which is a mixture of aluminium and iron oxide. It was initially developed for welding railroad tracks over a century ago.
2. When ignited by an electrical fuse, thermite initiates a self-sustaining reaction that can burn through various materials, including clothes, trees, and even military vehicles.

3. The reaction is intense enough to continue burning underwater and causes severe burns and bone damage on contact with humans.

Tactical Advantages of Dragon Drones

1. Bypassing Defenses: Dragon drones combine thermite with high-precision drone technology, making them highly effective and capable of evading traditional defensive measures.

2. Military Application: Ukrainian forces reportedly used these drones to burn vegetation, exposing Russian troops and their equipment. Russian forces have since adopted similar tactics with their own dragon drones.

Legality and Regulations

1. International Law: While the use of thermite is not outright banned, it is restricted under international law to avoid civilian casualties.

2. Protocol III of the Convention on Certain Conventional Weapons: Incendiary weapons like thermite are limited to military targets due to their indiscriminate nature and the severe burns they cause. Using thermite on civilian targets is prohibited, but its use against military targets remains legal.

X-Band Radar and its application

Why in the news?

In July 2024, devastating floods and landslides in Kerala's Wayanad district claimed more than 200 lives. In response, the Union Ministry of Earth Sciences approved the installation of an X-band radar in the district.

About Radar Technology

1. Radar, short for "radio detection and ranging," is a device that uses radio waves to measure the distance, speed, and other characteristics of objects.
2. It emits a signal toward a target, such as a cloud, and analyses the reflected signals to gather data.

About X-Band Radar



Source: PressReader

Aspects	Description
About	X-band radar is a radar that operates within a specific range of frequencies in the electromagnetic spectrum, typically from 8.0 to 12.0 GHz.
Key Characteristics of X-band Radar	<ol style="list-style-type: none"> The X-band operates in the microwave segment of the spectrum, with wavelengths between 2.5 to 3.75 cm. Its short wavelength allows for precise imaging and higher resolution, which is ideal for detecting small targets and providing detailed information.
Applications	<ol style="list-style-type: none"> Weather Radar: X-band radars are commonly used in meteorology for short-range weather observations. They can detect rainfall intensity, storm patterns, and precipitation types, which is crucial for forecasting and severe weather warnings. Maritime Navigation: The high resolution makes it ideal for identifying small objects at sea, such as buoys, ships, and obstacles, which enhances navigation safety. Military and Surveillance: Due to their ability to detect small and fast-moving targets, X-band radars are employed in missile guidance systems, air defense, and border surveillance. Air Traffic Control: These radars help manage aircraft movements, especially at airports, by detecting and tracking planes accurately.
Advantages	<ol style="list-style-type: none"> High Resolution: X-band radar's shorter wavelength enables it to capture finer details, making it suitable for applications that require high-precision data. Portability: X-band radar systems are often smaller and lighter than other radar types, making them more portable and easier to deploy. Weather Penetration: While X-band radars may be susceptible to attenuation in heavy precipitation, they can still effectively detect and analyze moderate weather conditions, providing crucial data for short-range forecasting.

About Doppler Radar and Its Applications

- In meteorology, Doppler radar is commonly used to observe weather patterns, as it can measure how fast an object is moving and in which direction, based on frequency shifts due to the Doppler effect.
- Doppler radar operates by emitting radio waves in pulses, tracking how often they return after reflecting off objects.

Haber-Bosch Process

Why in news?

The Haber-Bosch process now removes one hundred million tonnes of nitrogen from the atmosphere and converts it into fertilizer, adding 165 million tonnes of reactive nitrogen to the soil.

About Haber-Bosch Process

- The Haber-Bosch Process is a method used for synthesizing ammonia (NH₃) from nitrogen (N₂) and hydrogen (H₂) gases.
- It was developed by Fritz Haber in the early 20th century and later industrialized by Carl Bosch.
- The process is a critical component of the modern agricultural industry, as ammonia serves as a key ingredient in fertilizers.

4. This process has had a transformative impact on food production worldwide, enabling the large-scale manufacture of ammonia and thereby contributing significantly to global crop yields.

What is the process?

1. The Haber-Bosch Process operates under high pressure (150-200 atmospheres) and high temperature (400-500 °C).
2. The reaction takes place in the presence of an iron catalyst, which is crucial for improving the reaction rate and making the process feasible on an industrial scale.
3. The balanced chemical equation for the reaction is: $N_2 + 3H_2 \rightarrow 2NH_3$

Key Steps in the Process

- 1. Gas Preparation:** Nitrogen is typically obtained from the air, which contains about 78% nitrogen. Hydrogen can be derived from natural gas, coal, or water electrolysis.
- 2. Mixing and Compression:** The nitrogen and hydrogen gases are purified, mixed in a 1:3 ratio, and then compressed to the required pressure.
- 3. Catalytic Reaction:** The gas mixture is heated and passed over an iron catalyst bed. This promotes the conversion of nitrogen and hydrogen into ammonia.
- 4. Cooling and Ammonia Separation:** After passing over the catalyst, the gas mixture is cooled. Ammonia, being a condensable gas, liquefies and is separated from the unreacted gases.
- 5. Recycling of Unreacted Gases:** The leftover nitrogen and hydrogen gases are recycled back into the reactor to maximize efficiency and reduce waste.

Industrial Importance

The Haber-Bosch Process is essential for producing ammonia on an industrial scale. Ammonia is a precursor for various nitrogen-based fertilizers, which are vital for crop growth.

Environmental Impact

1. Despite its benefits, the Haber-Bosch Process is energy-intensive and contributes to greenhouse gas emissions due to the use of fossil fuels in hydrogen production.
2. Efforts are underway to make the process more sustainable, including research into alternative hydrogen sources (such as renewable-powered electrolysis) and improved catalysts that could operate at lower temperatures and pressures.

Major Atmospheric Cherenkov Experiment (MACE) Observatory

Why in news?

Recently, Secretary of the Department of Atomic Energy (DAE) and Chairman of the Atomic Energy Commission inaugurated the MACE Observatory at Hanle, Ladakh.

About Major Atmospheric Cherenkov Experiment (MACE) Observatory

- 1. Location:** It is located at Hanle, Ladakh.
- 2. Significance of MACE:** The observatory features the largest imaging Cherenkov telescope in Asia, located at an altitude of approximately 4,300 meters, making it the highest observatory of its kind globally.

3. Indigenous Development: Built indigenously by Bhabha Atomic Research Centre (BARC) with support from Electronics Corporation of India Limited (ECIL) and other Indian industry partners, MACE represents a major achievement in Indian scientific and engineering capabilities.

4. Purpose: To advance cosmic-ray research and observe high-energy gamma rays, aiding the understanding of universe phenomena like supernovae, black holes, and gamma-ray bursts.

5. Inspiration for Future Generations: The MACE Observatory aims to inspire future generations of Indian scientists by fostering advancements in cosmic-ray research, multimessenger astronomy, and international scientific collaboration.

World Wide Fund (WWF) report on global wildlife populations

Why in the News?

The latest report by the Worldwide Fund (WWF) for Nature highlights a severe decline in global wildlife populations.

Findings of the report

1. From 1970 to 2020, the average size of monitored wildlife populations has decreased by 73%. In the 2022 report, the recorded decline was 69%, indicating an ongoing trend of population loss.

2. The report emphasizes that addressing the dual crises of climate change and nature loss requires urgent, coordinated action over the next five years. Data compiled by the Zoological Society of London (ZSL) included 35,000 population trends across 5,495 species, covering the years 1970 to 2020.

3. Ecosystems at Risk: The report showed that freshwater Ecosystems has witnessed the sharpest decline at 85%, with freshwater habitats experiencing significant losses. It also showed a 69% decline, reflecting extensive impacts on land-based wildlife. It declined by 56%, highlighting issues within ocean and coastal habitats.

4. Key Drivers of Decline: Habitat Loss and Degradation are predominantly caused by agriculture and food consumption practices worldwide. Other Threats include over-exploitation, invasive species, and diseases are also contributing to the rapid decline of wildlife populations.

5. Implications for Global Ecosystems: The declining wildlife populations serve as a critical indicator of escalating extinction risks and potential ecosystem degradation.

UPSC Syllabus: Environment

Extension of Free Fortified Rice Supply

Why in news?

The Union Cabinet has recently approved the continuation of free fortified rice distribution under various government schemes from July 2024 until December 2028. This includes the Pradhan Mantri Garib Kalyan Anna Yojana (PMGKAY) and other welfare programs.

About the initiative

1. The initiative will operate as a central sector scheme, fully funded by the Government of India. It will ensure a streamlined institutional framework to distribute fortified rice through all relevant schemes.

2. Alignment with Nutritional Security Goals: The fortified rice initiative supports the government's Anaemia Mukht Bharat strategy. This step contributes towards achieving nutritional security nationwide by addressing anaemia and micronutrient deficiencies.

3. Nationwide Coverage: The initiative includes supply of fortified rice under the Targeted Public Distribution System (TPDS), Integrated Child Development Service (ICDS), and PM POSHAN in all States and Union Territories. This broad coverage aims to improve nutrition for vulnerable populations across India.

4. Completion of Phases and Universal Coverage: As of March 2024, the three-phase implementation plan of fortified rice distribution was completed, achieving universal coverage across all targeted government schemes.

5. The National Family Health Survey (NFHS-5) from 2019-2021 underscores the widespread prevalence of anaemia and other nutrient deficiencies in India. Fortified rice, enriched with iron, folic acid, and vitamin B12, helps tackle these issues.

6. Significance of Rice Fortification: Fortified rice serves as an effective method for delivering essential nutrients, particularly in India, where 65% of the population consumes rice as a staple.

The process involves blending Fortified Rice Kernels (FRK) with standard rice, meeting standards set by the Food Safety and Standards Authority of India (FSSAI).

UPSC Syllabus: Schemes and programmes

Unified Genomic Chip

Why in news?

Recently, Prime Minister Narendra Modi launched the 'Unified Genomic Chip'.

About 'Unified Genomic Chip'

1. About: The **Unified Genomic Chip** is an initiative aimed at improving livestock breeding in India, specifically targeting cattle and buffalo.

2. Purpose: To help farmers identify high-quality cattle early and improve dairy farming efficiency in India.

3. Versions of the Chip: The chip comes in two versions: the 'Gau Chip' for cattle and the 'Mahish Chip' for buffalo. Both versions are tailored specifically for Indian cattle breeds.

4. Developed by: The chip was developed by the Department of Animal Husbandry and Dairying (DAHD) under the Ministry of Fisheries, Animal Husbandry, and Dairying.

5. Benefits for Farmers:

i) It helps farmers make informed decisions regarding animal selection by identifying high-quality bulls at an early age.

ii) It aims to improve cattle quality and enhance dairy productivity, contributing to farmers' economic growth.

6. Alignment with 'Make in India': This initiative supports the 'Make in India' program by focusing on indigenous technological advancements.

7. Impact on Dairy Farming: The use of this genomic chip is expected to boost the quality and productivity of the dairy farming sector in India, benefiting the overall agricultural landscape.

UPSC Syllabus: Defence exercises

MALABAR Exercise 2024

Why in news?

Recently, the Opening Ceremony of MALABAR 2024 under the aegis of Eastern Naval Command was held onboard Indian Naval Ship *Satpura* at Visakhapatnam.

About MALABAR maritime exercise

Aspects	Description
About	<ol style="list-style-type: none">1. This is the 28th edition of the MALABAR maritime exercise.2. It was initiated in 1992 as a bilateral exercise between India and the United States. Japan and Australia later joined, making it a multi-national maritime engagement.3. It supports India's vision of Security and Growth for All in the Region (SAGAR).4. It also reflects India's growing engagement with like-minded nations to strengthen regional security.
Duration	The exercise started on October 8, 2024, and will continue until October 18, 2024.
Attendee	Crew and planning staff from participating nations' ships, aircraft, and Special Forces.
Objective	Enhance understanding, collaboration, and engagement to address common maritime challenges.
Key features	It would be conducted two Phases, both at the harbor and at sea. Key Drills includes live weapon firings, complex surface, anti-air, and anti-submarine warfare drills, and joint maneuvers. Asset Participation involves destroyers, frigates, corvettes, fleet support ships, long-range maritime patrol aircraft, jet aircraft, helicopters, and submarines.

How dispute regarding the symbol is resolved between the two factions

Why in news?

The Nationalist Congress Party (NCP) recently split into two factions. One is led by Sharad Pawar himself, and the other by Ajit Pawar. Sharad Pawar has filed a petition in the Supreme Court to prevent the Ajit Pawar faction from using the NCP's original symbol, the 'clock,' in upcoming Maharashtra assembly elections.

About the political symbols

Importance of Political Symbols in India: In India, a large part of the population is still illiterate. Therefore, political symbols are crucial for helping voters identify parties on ballots.

How are Symbols Allotted: The Election Commission of India (ECI) assigns unique symbols to nationally or state-recognized parties. These symbols are reserved, ensuring that no other party or candidate uses them in elections.

What Does the Law Say on Previous Cases of Symbol Disputes?

When a recognized party splits, the ECI has the authority to decide which faction is the rightful party and who can use the party symbol. Sometimes, ECI has also “frozen” symbols until the dispute is settled.

Criteria for Recognizing a Faction

As per the Supreme Court Guidelines (1971), in the Sadiq Ali vs. ECI case, the Supreme Court outlined a 3-test formula:

- i) Party’s Aims and Objectives:** To determine which faction aligns more closely with the party’s goals.
- ii) Party Constitution and Inner Democracy:** To check how closely each faction follows the party’s constitution and democratic procedures.
- iii) Legislative and Organizational Majority:** To assess which faction has the majority in the legislative and organizational wings.

UPSC Syllabus: Polity and nation

Nobel Prize in Economics 2024

Why in news?

Recently, The Nobel Prize in Economics was awarded to economists Daron Acemoglu, Simon Johnson, and James A. Robinson for their research on how societal institutions shape economic prosperity.

What are the core findings?

- 1. Their work explains why some nations prosper while others do not, emphasising that countries with inclusive institutions characterised by democracy, rule of law, and property rights tend to experience sustained growth.
- 2. In contrast, nations with extractive institutions, where power is centralized and the rule of law is weak, fail to achieve similar outcomes.

3. Inclusive vs. Extractive Institutions

Inclusive Institutions: These promote economic growth by ensuring rights, legal protections, and democratic governance. They create an environment where individuals feel secure to invest in their future.

Extractive Institutions: These hinder growth by concentrating power, exploiting resources, and lacking protections for individuals’ rights. Extractive institutions deter long-term economic planning and foster inequality.

4. Colonial Influence on Institutional Development: The laureates’ research highlights how European colonial powers chose different institutional frameworks based on their goals. Where they aimed to extract resources, they established exploitative systems. In colonies where Europeans settled long-term, they set up inclusive institutions that fostered economic growth.

Under British rule, India's economic structure shifted from thriving industrial activity to serving colonial extractive needs, leading to a decline in prosperity. This legacy underscores the lasting impact of institutional frameworks on national development.

5. Future Considerations for Democracies: According to Acemoglu, global democracies are experiencing a decline in institutional strength and public trust. There is a need to restore democratic institutions' credibility by improving governance and ensuring they serve broader societal interests.

UPSC Syllabus: Miscellaneous

Nobel Prize in Chemistry 2024

Why in news?

The 2024 Nobel Prize in Chemistry was awarded to David Baker, Demis Hassabis, and John Jumper. Baker was recognised for advancements in computational protein design. Hassabis and Jumper were honoured for breakthroughs in protein structure prediction.

What is their contribution?

1. David Baker's Contribution: Baker's team at the University of Washington developed methods for designing new proteins in 2003. David Baker developed computational methods to design entirely new proteins that do not exist in nature.

2. Baker's synthetic proteins can be engineered to perform specific functions, such as breaking down non-biodegradable plastics or tackling disease-causing proteins.

3. This approach offers a more efficient alternative to natural evolutionary processes, which require multiple mutations and extensive time.

4. Demis Hassabis and John Jumper's Contribution: Hassabis and Jumper were recognised for developing AlphaFold 2, an AI model that predicts protein structures.

About AlphaFold

1. AlphaFold relies on databases of known protein structures and amino acid sequences, using this data to train and improve predictive accuracy.

2. This tool marks a significant shift from traditional methods like x-ray crystallography, which are time-consuming and labor-intensive.

About Protein Structure

1. Proteins are essential molecules that play crucial roles in biological functions across all living organisms

2. It is composed of 20 amino acids. Proteins functions are determined by their specific sequences and folded structures.

3. Previous research demonstrated that amino acid sequences dictate protein structures, which in turn define their functions.

Han Kang Wins 2024 Nobel Prize in Literature

Why in the News?

The Swedish Academy awarded South Korean writer Han Kang the 2024 Nobel Prize in Literature for her “intense poetic prose” that addresses historical traumas and highlights human fragility.

Themes and Literary Contributions

Exploration of Human Condition and Trauma: Han Kang’s works delve into themes like patriarchy, violence, grief, and historical injustices. Her poetic style brings these universal human struggles to the forefront.

Impact and Legacy

Bridging Literature and History: Han Kang’s work often draws on Korean history, using precise imagery to connect past and present. Her narratives seek to transform trauma into art, revealing hidden chapters of Korea’s history.

Global Influence and Cultural Impact: Han’s Booker win boosted global interest in Korean literature, alongside the rise of Korean cinema and pop music. This has spurred a surge in translations of Korean literary works, broadening their reach.

Innovator in Contemporary Prose: Known for her unique exploration of the connection between body and soul, Han Kang’s experimental style and depth have positioned her as a significant figure in modern literature, using her prose to “speak the truth.”

Nobel Prize in Physics 2024

Why in news?

The Royal Swedish Academy of Sciences announced that John Hopfield and Geoffrey Hinton have been awarded the 2024 Nobel Prize in Physics for their foundational discoveries and inventions that enable machine learning with artificial neural networks.

About Nobel Prize in Physics 2024

1. John J. Hopfield and Geoffrey E. Hinton were awarded the prize for their foundational contributions to artificial neural networks and machine learning.
2. John Hopfield developed the Hopfield Network, a recurrent neural network based on Hebbian learning principles.
3. Hopfield’s work drew inspiration from physics, likening neural networks to magnetic atom interactions, facilitating tasks like pattern completion and image denoising. His 1982 research linked neural networks to statistical physics, bridging biological concepts with computational techniques.
4. Geoffrey Hinton advanced the Boltzmann Machine, contributing to the development of Restricted Boltzmann Machines (RBMs). Hinton’s work on RBMs enabled the progression of deep learning in artificial neural networks, leading to breakthroughs across various fields.
4. The duo’s contributions have influenced machine learning’s integration into everyday applications, such as AI chatbots like ChatGPT.