

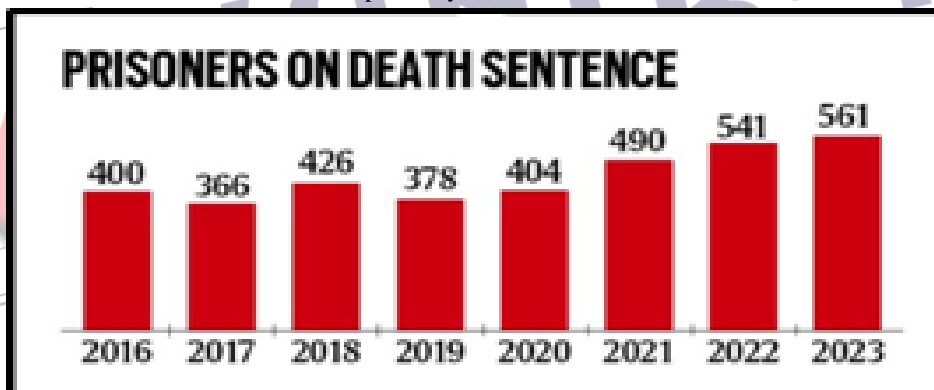
The Annual Death Penalty Report 2023

Why in News?

- According to the Annual Death Penalty Report 2023, appellate Courts in India - SC and all the HCs together - confirmed only one death sentence in 2023 while the rest were either commuted or saw the prisoners acquitted altogether.
- The Report ('Death Penalty in India: Annual Statistics 2023') was prepared by Project 39A, a criminal justice programme linked with the National Law University, Delhi.

Highlights of the Annual Death Penalty Report 2023

- Only one death sentence was confirmed by a High Court (the Karnataka HC in a murder case) in 2023, marking the lowest rate by the appellate courts since 2000.
 - In 2022, HCs confirmed the death sentences of four convicts, five in 2021 and three in 2020.
 - The dip was steep after 2019 when HCs confirmed death sentences of 26 convicts.
- This year (2023) also saw the Supreme Court not confirming any death sentences, the second time since 2021.
- There has been a 15% decrease in the rate of disposal of death penalty confirmation proceedings at the HCs in 2023.
 - 57 death penalty cases were disposed of in 2023, compared with 68 cases in 2022.
- This significant decline in the case disposal rate of death penalties is attributed to the high death row population in the country.
 - There was a 45.71% increase in the number of prisoners under death sentence by the end of December 2023, from that in 2016.
 - With 120 death sentences (167 in 2022) imposed by trial courts and 561 prisoners under the sentence of death by the end of December, 2023 had the highest number of prisoners on death row in nearly two decades.
- Similar to the last five years, the majority of death penalty cases in trial courts involved crimes related to sexual offences.
 - Of the 120 death sentences imposed by trial courts, more than 50% were for homicidal rapes.



Key Takeaways from the Findings of the Annual Death Penalty Report 2023

- Under Section 366 of the Code of Criminal Procedure (CrPC), all death sentences awarded by trial courts are to be confirmed by the concerned HCs.
 - Both the conviction and the quantum of sentence are examined by the first appellate court (HCs).
- Acquittal and remand by the SC and HCs in 2023 indicate significant concerns with the quality of police investigations and appreciation of evidence by lower courts in cases.
 - For example, in acquitting six prisoners in five cases and remanding two cases involving two prisoners, the SC criticised negligence in investigation and trials.
 - In one particularly grievous case, it found that the prisoner had been a minor at the time of the offence, 28 years after his imprisonment.
- The trial courts-imposed death sentences in 86.96% of its cases in the absence of any information relating to the accused, despite the SC's mandate in Manoj v. State of Madhya Pradesh (2022).
 - In this case, SC mandated the Trial Courts to collect psychiatric and psychological evaluation reports of the accused before awarding the death sentence.

Recent Developments with respect to Capital Punishment

- Recently, Ghana (where the Parliament passed a Bill to abolish the death penalty for ordinary crimes) and Malaysia (eliminated the mandatory death penalty for 11 criminal offences) are some of the international developments in death penalty laws.

- However, in India, the passing of the Bharatiya Nyaya Sanhita (BNS) 2023 would increase the number of offences punishable by death from 12 under the Indian Penal Code (1860) to 18 under the Act.

SCIENCE & TECHNOLOGY**Nod for spectrum auction****Why in News?**

- The Cabinet has approved telecom spectrum auction across multiple bands at a base price of Rs 96,317.65 crore.
- The Cabinet also approved the proposal, which entails granting Indian Railways 5 Megahertz of wireless spectrum, largely free of cost, for real-time data to enhance passenger safety.

Airwaves/Spectrum

- Airwaves are radio frequencies within the electromagnetic spectrum that can carry information wirelessly for a range of services including telecommunications.
- The government manages and allocates airwaves to companies or sectors for their use.
- The government auctions a fixed amount of spectrum within specified band/s to be utilised by operators for providing communication services to consumers.

Types of spectrum band

- Spectrum can be divided into bands ranging from low frequency to high frequency, which determines their usage and is useful in allocation.
- Low band spectrum
 - Less than 1 GHz (600 MHz, 700 MHz, 800 MHz, 900 MHz)
 - Offers blanket coverage suitable to serve thousands of customers over long distances with fewer towers.
 - Ideal for wide and in-building coverage.
 - When bundled with high-spectrum bands, it can be used for commercial mobile and broadcasting services.
- The mid-band spectrum
 - Ranges from 1 GHz to 6 GHz (1800 MHz, 2100 MHz, and 2300 MHz).
 - Provides coverage as well as the capacity to carry more data while traveling significant distances.
- The high band spectrum
 - Ranges from 24 GHz to 40 GHz and are also known as the millimetre wave spectrum.
 - Ideal for speedy networks over short ranges.
 - However, this range is subject to interference from dense objects.

What spectrum do telecom companies require?

- According to the GSM Association, for telecom purposes, spectrum in the 400 MHz to 4 GHz range is the most optimum.
- Operators can provide 2G, 3G, 4G, and 5G services using one frequency band if they have enough spectrum.
- For mobile technology in India:
 - 2G services use the 900 MHz and 1800 MHz bands,
 - 3G uses 900 MHz and 2100 MHz,
 - 4G uses 850 MHz, 1800 MHz, 2300 MHz, and 2500 MHz, and
 - 5G uses 3.5MHz and 700 MHz bands.
- The 900 MHz band is a superior commercial ecosystem with better-developed technology standards.
 - It is also suitable for offering GSM-based voice calls as well as 4G broadband services.
- After 900 MHz, the band suitable for GSM is 1800 MHz, which is also the core band used globally for LTE (long-term evolution), a 4G mobile communications standard.
- 5G spectrum bands can be clubbed into low, mid and high spectrum buckets.

News Summary

- The Union Cabinet approved an auction of telecom spectrum this year for airwaves amounting to a cumulative reserve price of ₹96,317.65 crore.
 - The reserve pricing is the minimum telecom companies will have to pay for acquiring this spectrum.
 - This is because, these companies will have to bid with the reserve pricing as the minimum price.

Key highlights

- Bands to be auctioned
 - The spectrum will be in the 800, 900, 1,800, 2,100, 2,300, 2,500 and 3,300 megahertz (MHz), as well as in the 26 gigahertz (GHz) bands.
 - If sold, the spectrum will be valid for a 20-year period.
- Expiring airwaves of some companies will also be auctioned

- Expiring airwaves that belong to certain companies undergoing insolvency will also be auctioned.
- Approved spectrum requirements of railways
 - Spectrum has also been approved for use by the railways for the deployment of Kavach.
 - Kavach is the automatic train protection (ATP) system used for preventing accidents in the rail network.
 - This 5 MHz band in the 700MHz band will be assigned to multiple regional and urban rail-based transit systems.
 - The Indian Railways had sought additional 5 Mhz of paired spectrum, free of cost, in the 700 MHz band in July 2023.
 - This was a month after the Balasore incident that left 296 persons dead and nearly 1,200 injured.
- Committee formed to decide on the issue of refarming spectrum
 - The government has also set up a Cabinet Secretary-chaired committee to decide on the issue of refarming spectrum.
 - Spectrum refarming is the process of repurposing radio frequency bands for different uses.
 - This allows different generations of cellular networks to operate in the same radio spectrum.
 - In other words, it is the process of transitioning a specific radio frequency band from one technology to another.

Spectrum allocation to railways

- Past precedents
 - In the past, the Railways had received spectrum grants, for which they only needed to pay an annual royalty without bidding for the airwaves like telecom operators.
 - However, the data transfer capacity was not sufficient to allow trains to continuously upload video footage for safety purposes.
 - The video feeds were instead dumped at railway stations with a WiFi connection.
- Demand of spectrum from railways
 - The Railways was only granted 5 Mhz of its original demand for 15 MHz in discussions post the Balasore tragedy.
 - As a result, Railways had again asked for an additional 5 MHz of paired spectrum in the 700 MHz band.
 - Railways wants additional spectrum for implementing several safety features such as:
 - the Modern Train Control System,
 - Train Collision Avoidance System,
 - signal aspect in loco cabs, and
 - emergency mobile communications.
 - Other advantages that the spectrum allocation could bring, include:
 - increased speed,
 - augmenting train's running capacity,
 - passenger security,
 - CCTV network-like live feed at security control centres,
 - video surveillance, video analytics, asset reliability, etc.
- Opposition from Cellular Operators Association of India (COAI)
 - COAI had in the past opposed free handouts in the 700 MHz band, from which this spectrum has been set aside for the Railways.
 - That band is used for commercial telecom operations around the world, and a significant chunk of it had already been assigned to the Ministry of Defence.
 - Further assignment to non-telecom use cases would leave the spectrum availability for technologies like 5G grossly inadequate.

PRELIM FACTS

1. Right Issues

- Indiabulls Housing Finance plans to raise ₹3,693 crore through rights issue.

About Rights Issue:

- A rights issue is an offering of rights to the existing shareholders of a company that gives them an opportunity to buy additional shares directly from the company at a discounted price rather than buying them in the secondary market.
- It gives preferential treatment to existing shareholders, where they are given the right (not obligation) to purchase shares at a lower price on or before a specified date.
- The number of additional shares that can be bought depends on the existing holdings of the shareowners.
- Until the date at which the new shares can be purchased, shareholders may trade the rights on the market the same way that they would trade ordinary shares.

- Existing shareholders can also choose to ignore the rights; however, if they do not purchase additional shares, then their existing shareholding will be diluted post-issue of additional shares.
- Dilution occurs because a rights offering spreads a company's net profit over a larger number of shares. Thus, the company's earnings per share, or EPS, decreases as the allocated earnings result in share dilution.

Why issue a Rights Offering?

- Companies most commonly issue a rights offering to raise additional capital. A company may need extra capital to meet its current financial obligations.
- Troubled companies typically use rights issues to pay down debt, especially when they are unable to borrow more money.

2. India's first Hypervelocity Expansion Tunnel Test Facility

- The Indian Institute of Technology Kanpur (IIT-K) has successfully established and tested India's first Hypervelocity Expansion Tunnel Test Facility recently.

About India's first Hypervelocity Expansion Tunnel Test Facility:

- The S2, nicknamed 'Jigarthanda', is a 24-meter-long facility located at IIT Kanpur's Hypersonic Experimental Aerodynamics Laboratory (HEAL) within the Department of Aerospace Engineering.
- It is India's first Hypervelocity Expansion Tunnel Test Facility.
- It was indigenously designed and developed over three years with funding and support from the Aeronautical Research and Development Board (ARDB), the Department of Science and Technology (DST), and IIT Kanpur.
- It is capable of generating flight speeds between 3-10 km/s, simulating the hypersonic conditions encountered during the atmospheric entry of vehicles, asteroid entry, scramjet flights, and ballistic missiles.
- It will be a critical asset for the Indian Space Research Organisation (ISRO) and the Defence Research and Development Organisation (DRDO).
- It will serve as a testing ground for ongoing missions of ISRO and DRDO like Gaganyaan, Reusable Launch Vehicles (RLV), and hypersonic cruise missiles, enabling the development of more advanced and reliable aerospace technologies.

3. Altermagnets

- In a new study, scientists have investigated the newly discovered class of altermagnetic materials for their thermal properties, offering insights into the distinctive nature of altermagnets for spin-caloritronic applications.

About Altermagnets:

- Altermagnets exhibit a unique blend of magnetic characteristics, setting them apart from conventional magnetic materials like ferromagnets and antiferromagnets.
- Properties
 - These materials exhibit properties observed in both ferromagnets and antiferromagnets, making their study enticing.
 - Altermagnets defy conventional norms by embodying a dual nature—resembling antiferromagnets with zero net magnetization and ferromagnets with non-relativistic spin splitting.
 - This unique behavior emerges from the intricate interplay of atoms within the crystal structure.
 - Additionally, altermagnets exhibit a unique spin polarization. The term "spin polarization" means that a preponderance of electron spins tends to align in a particular direction.
 - The spin polarization is noteworthy in altermagnets because it occurs in the physical arrangement of atoms (real space) and in the momentum space, where the distribution of electron spins in the material is considered.
 - The researchers believe that altermagnets could have a pivotal role in spin caloritronics, a field of research that explores the interplay between spin and heat flow, which are not achievable with ferromagnets or antiferromagnets.
 - This field has potential applications in developing new technologies for information processing and storage.
 - The researchers focused on studying the emergence of crystal Nernst and crystal thermal Hall effects in rubidium dioxide (RuO₂), chosen as a showcase representative of altermagnetism.
 - The crystal Nernst effect (CNE) observed in altermagnets is a result of their distinctive magnetic nature.
 - In simple terms, as the material experiences a temperature difference across its dimensions, it leads to the emergence of a voltage perpendicular to both the temperature gradient and the magnetic field.
 - This phenomenon reveals that the material's magnetic properties influence its response to temperature changes, providing insights into the intricate connection between thermal and magnetic behaviors in altermagnets.

4. Vaccine safety Net

- The Healthy Indian Project (THIP), a health information platform in India, is included as a member of the World Health Organization's Vaccine Safety Net (VSN).

About Vaccine Safety Net:

- It is a global network of websites, established by the World Health Organization that provides reliable information on vaccine safety.
- It is a network of a diverse group of digital information resources (websites and social media), VSN members, located in countries around the world and providing scientifically based information on vaccine safety in various languages.
- A key player in the Project is the Global Advisory Committee on Vaccine Safety (GACVS), established by WHO in 1999, to respond promptly, efficiently, and with scientific rigour to vaccine safety issues of potential global importance.
- At the outset of the Project, GACVS developed three categories of criteria for good information practices - regarding credibility, content, accessibility and design to which digital resources providing information on vaccine safety should adhere.
- WHO evaluates those electronic resources for their adherence to these criteria.
- It is continuously expanding and till date 110 websites from 45 countries provide vaccine safety information in 43 languages.

5. Vidyanjali scholarship programme

- Union Minister of Education and Skill Development & Entrepreneurship recently launched the EdCILVidyanjali Scholarship Programme.

About Vidyanjali Scholarship Programme:

- This initiative guarantees access to high-quality learning systems by facilitating a seamless transition from secondary to higher education and extending financial support for the meritorious Navodaya Vidyalaya students who lack means.
- It symbolises a whole-of-society approach to empowerment through access to and opportunities for education, particularly to students belonging to economically disadvantaged sections.
- The Vidyanjali programme intends to garner assistance and funding from nongovernment partners and private sources such as CSR grants, national and international donors, and impact investors.
- The beneficiaries of the Vidyanjali programme in its initial phase will be students of grades XI and XII studying in NavodayaVidyalayas across the country.
- A fintech platform has been specifically curated under Vidyanjali, and the sponsorship will be disbursed to students through this platform as Direct Benefit Transfer (DBT).
- This platform will be instrumental in capturing data, receiving, hosting, and viewing student applications, tracking student progress, tracking grant disbursement, monitoring fund utilisation, generating impact reports towards SDG realisation, individual mentions of notable student achievement, and publicly acknowledging the support of the funders, among other platform utilities.

What is EdCIL?

- Educational Consultants India Limited (EdCIL) is the only Public Sector Undertaking under the Ministry of Education, Government of India.
- It was incorporated under the Companies Act, 1956, on June 17, 1981.
- It is categorized as a 'Mini Ratna Organisation' by the Government of India.
- It offers consultancy and technical services in different areas of Education and Human Resource Development not only within the country but also on a global basis.
- Clients of EdCIL include most State and Central Govt. Departments including MHRD, PSUs, and autonomous bodies including IITs, IIMs, IIITs, KendriyaVidyalaya, and NavodayaVidyalaya.

ANSWER WRITING

Q. Discuss several ways in which microorganisms can help in meeting the current fuel shortage. (150 words)

Answer: Microorganisms like algae, bacteria etc., can be used to generate several fuels, including ethanol, hydrogen, methane, lipids, and butanol out of raw organic materials, thereby converting the chemical energy in the biomass into chemical energy in the form of fuels.

Microorganism can help in meeting the current fuel shortage

- **Biofuel Production:** Certain microorganisms such as algae and bacteria can be used to produce biofuels like biodiesel and bioethanol. For example, algae can convert sunlight and carbon dioxide into lipids, which can be processed into biodiesel.
- **Biogas Production:** Microbes are used in anaerobic digestion to break down organic waste, such as agriculture residues, sewage etc. to produce biogas.

- **Hydrogen Production:** Several microorganisms can produce hydrogen gas through fermentation processes which can be further used as a clean fuel in various applications, including fuel cells, which can power vehicles.
- **Bioremediation:** Microorganisms can help in cleaning oil spills and contaminated sites by breaking down hydrocarbons which can be used to recover useful hydrocarbons from polluted areas.
- **Carbon Capture and Utilization:** Microorganisms can capture and convert carbon dioxide (CO₂) emissions from industrial processes into biofuels.

Conclusion:

The development of pilot plants for microbial energy fuel production is necessary to mitigate the fuel shortage and not only can it reduce the higher crude prices but also can serve the environment in a sustainable way.

MCQs

- Which of the following provisions of the Constitution of India have a bearing on Education?
 - Directive Principles of State Policy
 - Rural and Urban Local Bodies
 - Fifth Schedule
 - Sixth Schedule
 - Seventh Schedule
 Select the correct answer using the codes given below:
 - 1 and 2 only
 - 3, 4 and 5 only
 - 1, 2 and 5 only
 - 1, 2, 3, 4 and 5**
- Under which Schedule of the Constitution of India can the transfer of tribal land to private parties for mining be declared null and void?
 - Third Schedule
 - Fifth Schedule**
 - Ninth Schedule
 - Twelfth Schedule
- Consider the following statements:
 - The Food Safety and Standards Act, 2006 replaced the Prevention of Food Adulteration Act, 1954.
 - The Food Safety and Standards Authority of India (FSSAI) is under the charge of Director General of Health Services in the Union Ministry of Health and Family Welfare.
 Which of the statements given above is/are correct?
 - 1 only**
 - 2 only
 - Both 1 and 2
 - Neither 1 nor 2
- The term 'West Texas Intermediate', sometimes found in news, refers to a grade of
 - Crude oil**
 - Bullion
 - Rare earth elements
 - Uranium
- In the 'Index of Eight Core Industries', which one of the following is given the highest weight?
 - Coal production
 - Electricity generation**
 - Fertiliser production
 - Steel production
- Consider the following statements with reference to the Olive ridley turtles:
 - Arribada is their unique nesting process where thousands of females come together on the same beach to lay eggs.
 - They are listed as vulnerable in the IUCN red list.
 Which of the statements given above are correct?
 - 1 only
 - 2 only
 - Both 1 and 2**
 - Neither 1 nor 2
- Consider the following statements about DhokraShilpkala:
 - It utilises the lost-wax technique, or cireperdue, for metal casting.
 - The theme of the art form is nature, mythology, and daily life.
 Which of the statements given above are incorrect?
 - 1 only
 - 2 only
 - Both 1 and 2
 - Neither 1 nor 2**
- NASA's PACE mission has recently been in the news, its objective is
 - To observe the photosphere, chromosphere, and Sun's outermost layers.
 - To observe the universe in the Infrared spectrum.
 - To measure surface soil moisture and freeze-thaw state.
 - To monitor aerosols in the atmosphere and plankton on the ocean's surface.**
- NASA has started a series of marathon flights in Asia with DC-8 to
 - To keep eye on China's activities.
 - Study and map the areas prone to wildfire.
 - Improve the accuracy of the Global Positioning System (GPS).
 - Improve the models that help forecast and fight air pollution.**
- Project "UNNATI" was launched for
 - Upgrading the skill base of the MGNREGS workers.**
 - Detecting debris and other hazards to Indian satellites in space.
 - Rebuilding cultural connections with countries bordering Indian Ocean.
 - Monitoring high-value transactions and detecting tax evaders.