Career Launcher IAS

UPSC CURRENT AFFAIRS

OCTOBER 2025 : WEEK-2

Registered / Corporate Office:

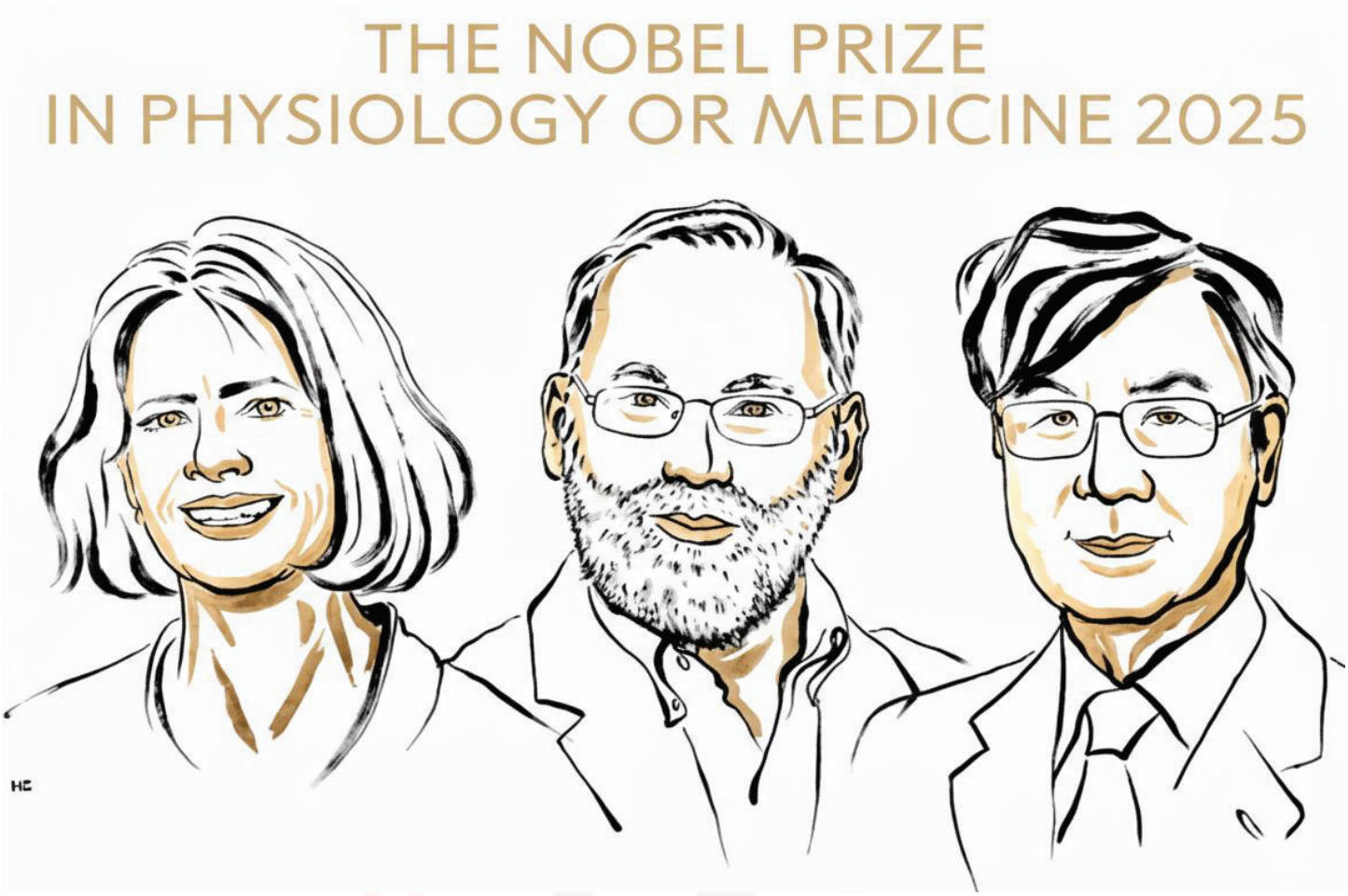
CL Educate Limited, A – 45, Mohan Co-operative Industrial Estate, New Delhi – 110044

Contact No. 011-41280800 / 1100

www.careerlauncher.com www.cleducate.com

Contents

1. Nobel Prize in Medicine



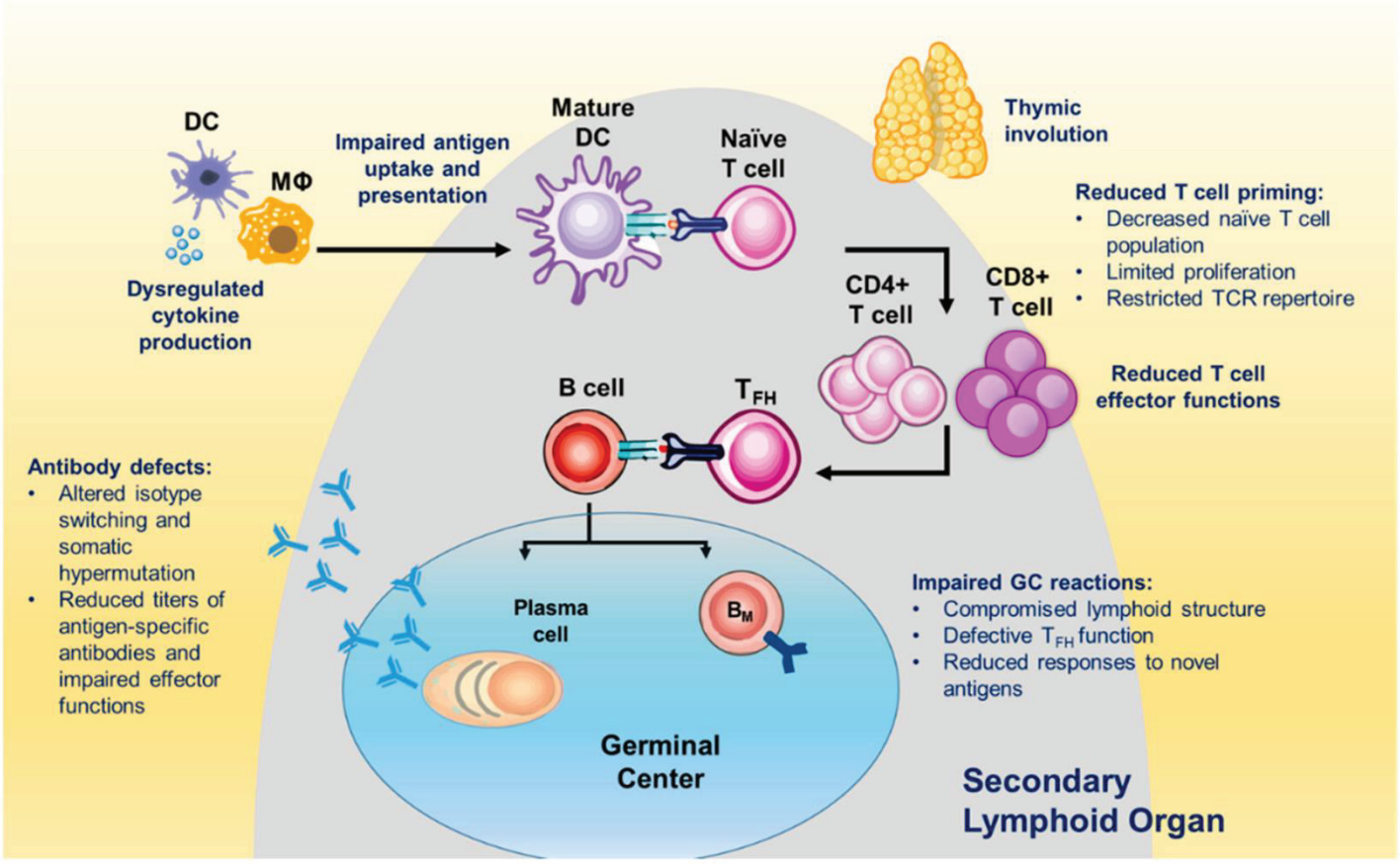
- The first Nobel Prize of this year, the prize for Physiology or Medicine, has been announced. Mary E Brunkow, Fred Ramsdell, and Shimon Sakaguchi have been honoured for their work on the human immune system.
- The Nobel Prizes generally follow the same schedule every year, with the Medicine prize coming first, followed by Physics, Chemistry, Literature, Peace, and Economics.
- Among this year's Medicine winners, Brunkow and Ramsdell are from the USA, while Sakaguchi is from Japan. The research by the two Americans proved to be the second chapter of something Sakaguchi had worked on separately some years ago. After Brunkow and Ramsdell's findings, Sakaguchi and other scientists managed to stitch their work together.

What have the three winners done?

- The human body has a powerful and complex immune system, which not just fights off various bacteria and viruses, but also knows what cells should not be attacked.
- According to the Nobel Prize's official release, "Mary Brunkow, Fred Ramsdell and Shimon Sakaguchi are awarded the Nobel Prize in Physiology or Medicine 2025 for their fundamental discoveries relating to peripheral immune tolerance.
- The laureates identified the immune system's security guards, regulatory T cells, which prevent immune cells from attacking our own body."

First, the basics of the immune system

- The human body's immune system fights off thousands of microbes attempting to invade our bodies every day.
- Microbes vary wildly, and many even have 'camouflages' that mirror human cells.
- Thus the immune system must distinguish what to attack and what to tolerate.
- It should also be able to identify our own healthy cells, so that our body does not turn upon itself.
- When this identification does not happen properly, people develop auto-immune diseases.
- Also, in case of organ or stem cell (or bone marrow) transplants, there is always the danger of the immune system attacking the newly transplanted cells.
- Thus, an understanding of how the immune system works — how the signal to attack or not attack is given and executed — is very important.
- The immune system's work is done by T cells.
- While helper T cells patrol the body and raise an alert when they detect an attack, the killer T cells attack the invader (virus or any other pathogen).
- For a long time, it was believed that the thymus, an organ just behind our sternum, played a central role in how the immune system worked.
- The thymus is specially active in babies and children. The T cells travel to the thymus.



- If they are found attacking our own cells — basically can't tell apart invader from the body's constituents — the thymus does not release them into the blood stream.
- Thus, it was understood that passing through the thymus was a kind of exam T cells had to clear to enter the blood stream and do the job of protecting.

- The three Nobel laureates proved that the picture is more complicated than that, and there is a third category of T cells.
- "The Nobel Prize laureates identified the immune system's security guards, regulatory T cells, thus laying the foundation for a new field of research," the press release says.

Shimon Sakaguchi's key insight

- In the mid-1990s, Shimon Sakaguchi challenged conventional belief by postulating that some specialised T cells act as "security guards" of the immune system, suppressing overly aggressive responses.
- In a series of experiments, he examined mice whose thymus had been removed and matured T cells injected into their bodies later. He identified a class of T cells that basically ask other T cells, which might be attacking the body's own tissues, to calm down. These are called regulatory T cells.
- However, because some related findings had not been found promising, his finding did not get much attention then.

Brunkow, Ramsdell, and the FOXP3 gene

- Far away from Sakaguchi, Brunkow and Ramsdell were examining sick male mice, and through painstaking elimination and identification of genes, had managed to find that the particular mutation making these mice sick was related to a rare autoimmune disease among humans, called IPEX. Both the diseases were caused by mutations in the FOXP3 gene.
- Finally, in another few years, it was established that FOXP3 gene controls the development of regulatory T cells, whose existence Sakaguchi had earlier established. It is this composite work done over decades that has won the Nobel.

What is the impact of the discoveries on medical treatment?

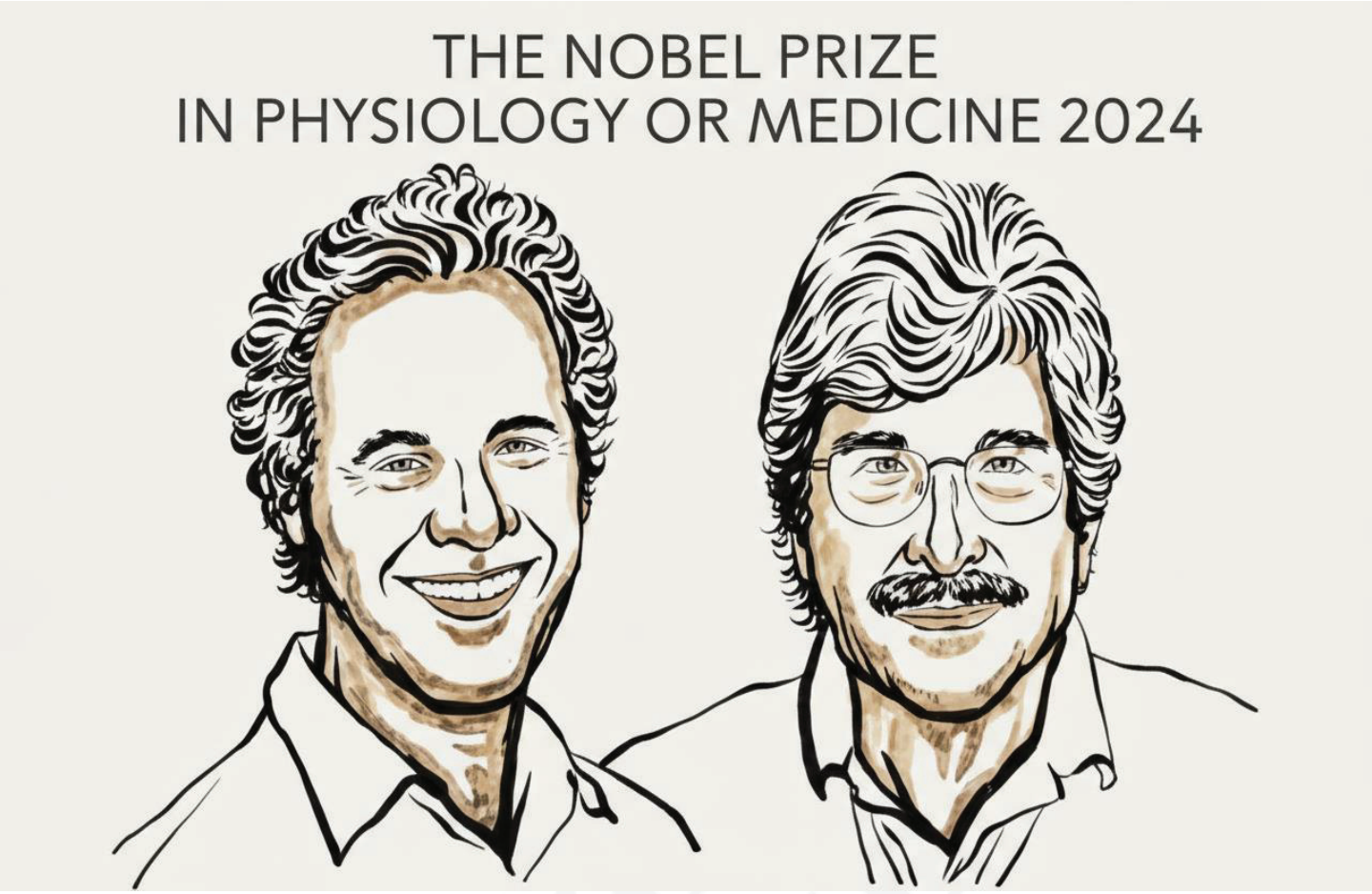
- The discoveries of regulatory T cells and the FOXP3 gene have launched a new field of immune-regulation research, with significant implications for human health.
- In cancer, tumours are often surrounded by many regulatory T cells, which protect them from immune attack. Researchers are investigating how to dismantle this "protective wall" so that the immune system can better reach and destroy cancerous cells.
- Conversely, in autoimmune diseases, strategies aim to boost regulatory T cells, so that they can stop the attacking cells from destroying the body.
- Better understanding of the immune system can also help in making sure the body does not reject transplanted organs.

Where do the three scientists work?

- Mary Brunkow, born in 1961, works at the Institute for Systems Biology, Seattle, USA.
- Frederick Ramsdell, born in 1960, works at Sonoma Biotherapeutics, San Francisco, USA.
- Shimon Sakaguchi, born in 1951, works at Osaka University, Japan.

2024 Nobel Prize in Physiology or Medicine

- Victor Ambros and Gary Ruvkun are American scientists who were jointly awarded the 2024 Nobel Prize in Physiology or Medicine for their discovery of microRNA (miRNA) and its role in post-transcriptional gene regulation.
- Working with the roundworm C. elegans, they identified tiny RNA molecules that bind to messenger RNA (mRNA) and control which genes are expressed as proteins, revealing a critical new layer of genetic control.



Their Discovery of MicroRNA

- **What it is:** MicroRNAs are a class of small, non-coding RNA molecules that regulate gene expression after transcription.
- **How it works:** After their discovery, scientists learned that miRNAs attach to specific messenger RNAs, blocking them from being translated into proteins. This process effectively shuts down certain genes, offering a new understanding of how cells control their activities.
- **Why it matters:** This fundamental discovery changed the understanding of the central dogma of molecular biology and showed that gene regulation is much more complex than previously understood.

QUESTIONS

1. With reference to the 2025 Nobel Prize in Physiology or Medicine, consider the following statements:

1. Mary Brunkow, Fred Ramsdell, and Shimon Sakaguchi were awarded for discoveries in microRNA regulation.
2. The laureates identified regulatory T cells which prevent the immune system from attacking the body's own cells.
3. The FOXP3 gene is crucial for the development of regulatory T cells.

Which of the statements given above is/are correct?

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

2. Which of the following is a correct role of regulatory T cells discovered by Sakaguchi, Brunkow, and Ramsdell?

A. Directly killing invading viruses

B. Acting as "security guards" to suppress overly aggressive immune responses

C. Transporting oxygen to tissues

D. Producing antibodies against pathogens

3. Consider the following statements about the thymus:

1. T cells mature in the thymus and are tested for their ability to distinguish self from non-self.
2. Only regulatory T cells develop outside the thymus.
3. A failure of this process can lead to autoimmune diseases.

Which of the statements given above is/are correct?

A. 1 and 3 only

B. 2 only

C. 1 and 2 only

D. 1, 2 and 3

4. Which of the following is a potential application of the discoveries of regulatory T cells and the FOXP3 gene?

1. Enhancing immune attacks against cancer cells by modulating T cell activity
2. Reducing organ transplant rejection
3. Designing strategies to boost T cell regulation in autoimmune diseases
4. Directly generating stem cells from regulatory T cells

Select the correct answer using the code given below:

A. 1, 2, and 3 only

B. 2 and 4 only

C. 1 and 4 only

D. 1, 2, 3, and 4

5. Which one of the following statements best describes the role of B cells and T cells in the human body?

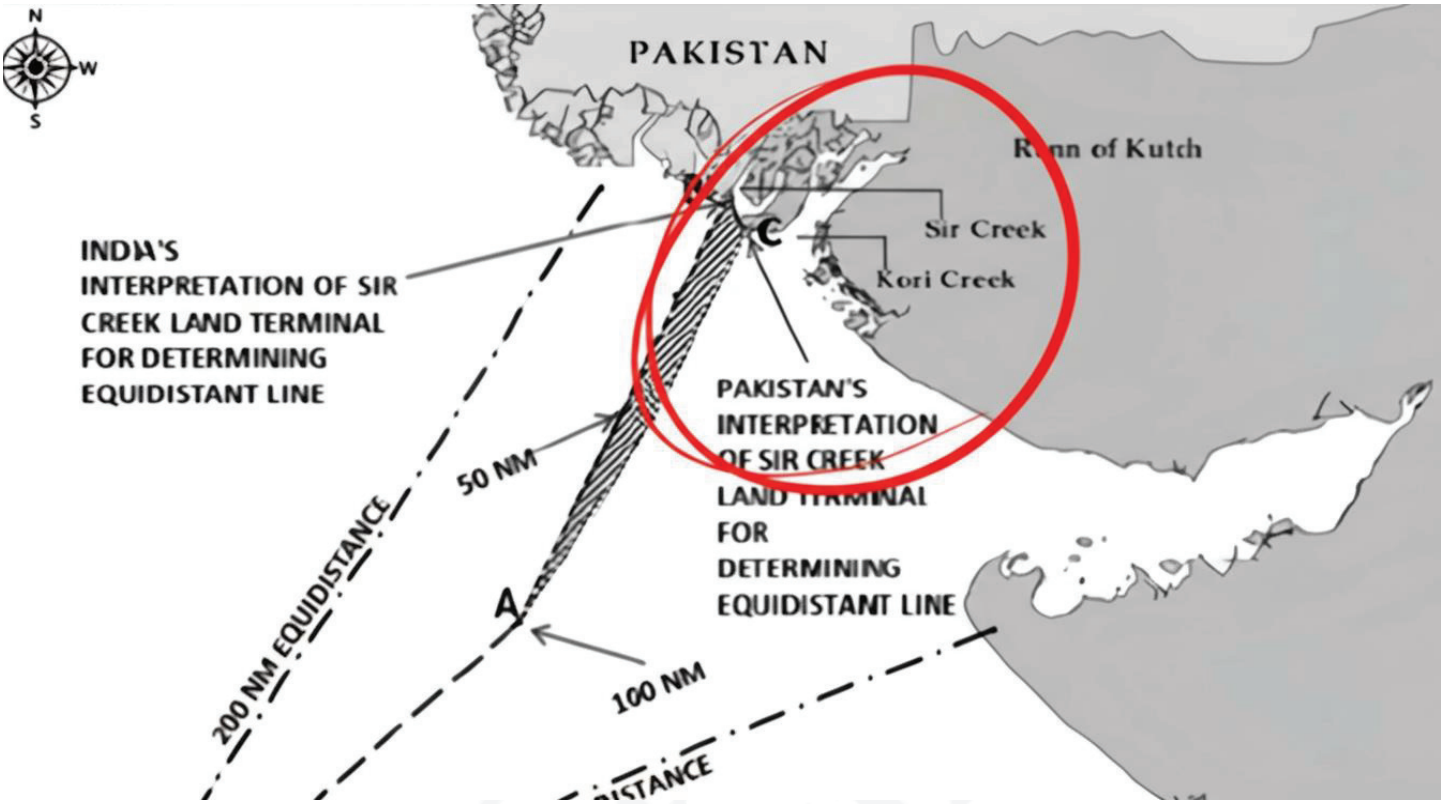
A. They protect the body from environmental allergens.

B. They alleviate the body's pain and inflammation.

C. They act as immunosuppressants in the body.

D. They protect the body from the diseases caused by pathogens.

2. Importance of Sir Creek



- Defence Minister Rajnath Singh warned Pakistan that "any misadventure in the Sir Creek sector will invite a decisive response".
- "Pakistan must remember that the road to Karachi passes through the Creek," Singh said while performing shastra puja on Vijaya Dashami at the Bhuj Military Station in Gujarat.
- Singh also pointed to the "recent expansion" of Pakistan's military infrastructure in the areas adjacent to Sir Creek.

Why Sir Creek matters

- Sir Creek, originally Ban Ganga, is a fluctuating 96-km tidal estuary along the India-Pakistan border. To its east lies the Rann of Kutch in Gujarat, and to its west, the province of Sindh in Pakistan.
- The marshy area around Sir Creek teems with venomous Russel's vipers and scorpions; every monsoon, the creek floods its banks, enveloping surrounding salt flats. As such, the region is sparsely populated and difficult to police.
- Yet it has long been at the centre of an unresolved border dispute between India and Pakistan.
- This is because it is strategically and economically important for both countries.

STRATEGIC IMPORTANCE:

- Sir Creek is crucial to Pakistan's defence of Karachi, Sindh's capital and Pakistan's economic hub and largest city.
- Post Operation Sindoor, Pakistan has built bunkers, radars, and forward bases in the disputed area, capable of launching drone attacks and infantry operations. India too has maintained a strong military presence to deter any Pakistani misadventure.

- Indian concerns, however, aren't merely limited to the Pakistan military.
- Sir Creek could be used as a launchpad for terror attacks on Indian soil.
- During the November 2008 Mumbai terror attacks, Pakistani terrorists had come to Mumbai by boat.

ECONOMIC IMPORTANCE:

- Beyond strategic concerns, it is perhaps the economic importance of Sir Creek that has precluded the resolution of the decades-long border dispute.
- The region is said to hold untapped oil and gas reserves which are potentially vital to both countries' interests.
- For New Delhi, which has long sought to diversify its oil imports, and which is currently searching for newer sources of cheaper oil beyond Russia, this is particularly important.
- The creek also supports vital fishing grounds, crucial for the livelihoods of local fishermen in both Gujarat and Sindh.
- The absence of a clear boundary results in frequent arrests of fishermen who inadvertently cross into the other country's waters, disrupting livelihoods and ruining lives.
- The definition of international boundary at Sir Creek has a direct impact on the delimitation of both country's Exclusive Economic Zones (EEZs) in the Arabian Sea.
- EEZs extending upto 200 nautical miles (370.4 km) beyond a nation's territorial waters, within which it has jurisdiction over both living and non-living resources.

The boundary dispute

- Pakistan claims the entirety of Sir Creek, while India sets the boundary along the middle of the navigable channel.
- This disagreement stems from a larger disagreement on whether the creek falls under the 'Thalweg' principle of boundary demarcation, which provides for making the mid-channel of a given watercourse a boundary. India argues that while fluctuating, the creek falls under the Thalweg principle because it remains navigable and is frequented by fishermen. Pakistan rejects this argument, claiming instead that the creek is not navigable, meaning the principle does not apply.
- The dispute actually traces its origins to the early 20th century, when an argument ensued between the rulers of Kutch and Sindh over ownership of a pile of firewood lying on the banks of a creek situated between the two principalities.
- Post-Independence, it came to the fore after the India-Pakistan War of 1965, following which Pakistan claimed jurisdiction of over half of the Rann of Kutch. While this dispute was settled by a tribunal in 1968 — India was granted 90% of the Rann and Pakistani claims were largely rejected — Sir Creek was not included in this resolution.
- The tribunal had noted, "the question concerning the Sir Creek part of the boundary is left out of consideration." The dispute has festered since.

Discussions but no resolution

- India and Pakistan have thus far held several rounds of bilateral discussions on the dispute.
- During the first round of talks held in Islamabad on 2 June 1989, the two sides managed to discuss the fundamental aspects of the dispute, but without any concrete results.
- The second and third rounds of talks in 1990 and 1991 concluded without any progress.
- A fourth round of talks were held in Rawalpindi in 1991, while the fifth round of talks on this dispute were held in New Delhi the next year, in the presence of technical experts from the Indian Navy.

- After six years, India and Pakistan agreed to form a separate working group on the issue.
- The talks of the Sir Creek working group were held in 1998 in New Delhi, wherein India objected to Pakistan's bid to internationalise the dispute, reiterating that all differences, after the Simla Accord, had to be resolved bilaterally.

Simla Accord

- The Simla Accord (also spelled Shimla Agreement) was a peace agreement signed between India and Pakistan on July 2, 1972, in Simla (now Shimla), India, following the Indo-Pakistani War of 1971, which led to the creation of Bangladesh.

Signed by:

- Indira Gandhi (Prime Minister of India)
- Zulfikar Ali Bhutto (President of Pakistan at the time)

Objectives of the Simla Accord:

Peaceful Resolution of Disputes:

- Both countries agreed to resolve their differences bilaterally through peaceful means and without the use of force.

Respect for Line of Control (LoC):

- The ceasefire line in Jammu and Kashmir, which resulted from the 1971 war, was converted into the Line of Control (LoC).
- Neither side would attempt to alter the LoC unilaterally.

Normalization of Relations:

- The agreement aimed to normalize diplomatic relations, including restoration of communications, trade, and travel.

Return of Prisoners of War (POWs):

- Pakistan agreed to take back its prisoners of war captured by India during the 1971 conflict.
- India also agreed to return captured Pakistani territory.

Significance:

- The Simla Accord was a cornerstone of India-Pakistan relations post-1971 and set the framework for how both nations would engage going forward.
- It emphasized bilateralism, meaning disputes—especially Kashmir—were to be resolved without third-party mediation.
- This clause has often been cited by India to reject international involvement, such as from the UN or other countries, in the Kashmir issue.

QUESTIONS

6. Which of the following statements is/are true regarding the Sir Creek dispute?

1. The dispute stems from the differing interpretations of the 'Thalweg' principle between India and Pakistan.
2. Sir Creek is primarily a strategic area for both countries due to its role in defining the boundary for Exclusive Economic Zones (EEZs).

3. Pakistan claims full control of Sir Creek, while India argues that the boundary should be defined along the mid-channel.

Select the correct answer using the code given below:

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

7. Which of the following was excluded from the 1968 tribunal decision regarding the Rann of Kutch?

1. Sir Creek dispute
2. The Thalweg principle for boundary demarcation
3. Territorial claims of Pakistan over the Rann of Kutch

Select the correct answer using the code given below:

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

8. Which of the following is true regarding the Simla Accord (1972)?

1. The Simla Accord established that the Jammu and Kashmir issue would be resolved through bilateral negotiations without the use of force.
2. The ceasefire line in Jammu and Kashmir was converted into the Line of Control (LoC).

Select the correct answer using the code given below:

A. 1 only
C. Both 1 and 2
B. 2 only
D. Neither 1 nor 2

9. Which of the following statements are true regarding India's engagement with Pakistan on the Sir Creek issue?

1. India and Pakistan have held several rounds of talks on the Sir Creek issue, with no concrete solutions reached.
2. The Simla Accord called for the resolution of Sir Creek through bilateral talks.
3. Pakistan has proposed internationalizing the Sir Creek dispute, which India has consistently opposed.

Select the correct answer using the code given below:

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

10. Which of the following statements about the Sir Creek area is/are correct?

1. Sir Creek is located along the India-Pakistan border and is a tidal estuary.
2. The dispute over Sir Creek arises from differing interpretations of the Thalweg principle between India and Pakistan.

3. Sir Creek's resolution is important to both countries due to its economic importance, particularly for oil and gas reserves.

Select the correct answer using the code below:

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

3. Philippines pioneers coral larvae cryobank to protect threatened reefs

The Coral Triangle: The Ocean's Amazon

- The Coral Triangle, spanning 5.7 million sq. km across Indonesia, Malaysia, the Philippines, Papua New Guinea, Solomon Islands, and Timor-Leste, is the world's most biodiverse marine ecosystem. Often called the "Amazon of the seas," this region hosts:
  - Over 75% of the world's coral species
  - One-third of global reef fish species
  - Vast mangrove forests
  - Six of the seven known marine turtle species
- Crucially, it supports the food security and livelihoods of more than 120 million people.

Mounting Threats to a Marine Treasure

- Despite its richness, the Coral Triangle is under severe threat. A combination of climate change, pollution, and unsustainable human activity is driving coral bleaching, habitat loss, and species decline. These dangers include:
  - Rising carbon emissions
  - Ocean warming and acidification
  - Destructive fishing practices

Pollution from land and sea

- According to the Status of Coral Reefs of the World 2020 report, 14% of the world's corals were lost between 2009 and 2018.
- Even under the most ambitious climate goals, the UN Environment Programme warns that ocean temperatures may take decades to stabilise, leaving coral ecosystems highly vulnerable.
- Scientists now estimate that if global temperatures rise beyond 1.5ºC, we may lose 70-90% of live coral cover by 2050.

A Cryogenic Lifeline: Coral Larvae Cryobanking

- As a proactive response to this looming crisis, the Philippines is launching Southeast Asia's first coral larvae cryobank — a cutting-edge initiative led by the University of the Philippines Marine Science Institute.

- This facility will freeze and preserve coral larvae — the free-swimming reproductive forms of corals — at ultra-low temperatures using a method called vitrification. These frozen "seeds" can be used in the future for:
    - Reef restoration
    - Genetic conservation
    - Scientific researc

A Regional Network of Hope

- This cryobank is part of a broader regional project involving institutions from Taiwan, Indonesia, Malaysia, Thailand, and the Philippines, under the leadership of Dr. Chiahsin Lin from Taiwan's National Museum of Marine Biology and Aquarium and National Dong Hwa University. Supported by the Coral Research & Development Accelerator Platform, the aim is to build a network of cryobanks across the Coral Triangle to safeguard marine biodiversity.

Breakthrough Science: Vitrification and Laser Warming

- The cryopreservation process hinges on the vitrification technique, where coral larvae are:

Exposed to cryoprotective solutions

- Rapidly frozen in liquid nitrogen at –196ºC, avoiding the formation of destructive ice crystals
- Laser-thawed in a fraction of a second to prevent damage during warming
- Once revived, the larvae are rehydrated and monitored for life signs like swimming and settling. Successfully thawed larvae are transferred to tanks for further growth and potential reef reintroduction.
- This method represents a major breakthrough in coral conservation by enabling long-term storage of genetic material.

More Than Just Endangered Species

- While many cryopreservation projects focus on endangered species, Dr. Lin emphasizes a broader strategy. He states, "All coral species are endangered" given current trends and believes conservation must include a range of species, not just those already listed as threatened.
- The project begins with 'model' coral species like Pocillopora, Acropora, and Galaxsia due to their accessibility and reproductive traits, with the goal of applying refined techniques to rarer species.

Challenges in the Field

- In Thailand, Dr. Preeyanuch Thongpoo is leading efforts to cryopreserve coral symbionts — microscopic algae vital to coral survival. Her team is working with cauliflower corals (Pocillopora sp.), but technical issues in coral husbandry have hindered larval collection.

Challenges include:

- Larvae with high lipid content
- Sensitivity to cold
- Presence of algae that complicate cryopreservation
- However, teams remain optimistic, refining protocols to overcome these hurdles.

A Genetic Insurance Policy for the Oceans

- Dr. Thongpoo calls cryobanking a "genetic insurance policy," preserving the building blocks of coral life for future generations.

- Dr. Lin warns that without urgent action, cryobanks could become museums for extinct species.
- Beyond science, both researchers stress the importance of local community involvement. Many reef-dependent communities are unaware of the ecological and economic value of coral ecosystems. Without grassroots support, conservation alone may not be enough.

QUESTIONS

11. Which of the following statements about the Coral Triangle are correct?

1. The Coral Triangle is located across six countries, including the Philippines, Indonesia, and Malaysia.
2. The Coral Triangle hosts over 75% of the world's coral species.
3. The Coral Triangle is immune to threats from climate change and pollution.

Select the correct answer using the code below:

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

12. Which of the following statements about the Coral Larvae Cryobank initiative in the Philippines is/are correct?

1. The cryobank preserves coral larvae at ultra-low temperatures using a process called vitrification.
2. The initiative is part of a broader regional project involving only the Philippines.
3. The primary aim of the cryobank is to help restore coral reefs and conserve coral species.

Select the correct answer using the code below:

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

13. Which of the following are true regarding the significance of the Coral Larvae Cryobank?

1. It is described as a "genetic insurance policy" for coral life.
2. The cryobank aims to only preserve endangered coral species.
3. It helps in preventing the extinction of coral species by storing their genetic material for future use.

Select the correct answer using the code below:

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

14. Which of the following have coral reefs?

1. Andaman and Nicobar Islands
2. Gulf of Kachchh
3. Gulf of Mannar
4. Sunderbans

Select the correct answer using the code given below.

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

15. Consider the following statements:

1. Most of the world's coral reefs are in tropical waters.
2. More than one—third of the world's coral reefs are located in the territories of Australia, Indonesia and Philippines.
3. Coral reefs host far more number of animal phyla than those hosted by tropical rainforests.

Which of the statements given above is/are correct?

A. 1 and 2 only
B. 3 only
C. 1 and 3 only
D. 1, 2 and 3 explain

4. Three U.S. Scientists Win 2025 Nobel Prize in Physics for Quantum Chip Breakthrough

- Three scientists from the United States have won the 2025 Nobel Prize in Physics for groundbreaking experiments that showcased quantum physics in action using a chip.
- Their work has paved the way for advancements in quantum computers, quantum sensors and quantum cryptography.
- The laureates John Clarke, Michel Devoret and John Martinis are affiliated with the University of California and Yale University.
- Their experiments demonstrated quantum mechanical tunnelling and energy quantisation in an electrical circuit large enough to be held by hand.
- This discovery confirms that quantum effects can exist on a macroscopic scale.
- The Royal Swedish Academy of Sciences awarded the trio a prize of 11 million Swedish kronor.
- Experts hailed the achievement as a major step in the ongoing development of quantum technologies that could transform digital systems worldwide.
- This continues a tradition of physics breakthroughs shaping modern technology and deepening scientific understanding.

Nobel Prize in Physics

- The Nobel Prize in Physics is one of the five Nobel Prizes established by Alfred Nobel's will (the others are Chemistry, Medicine, Literature, and Peace).
- It is awarded annually by the Royal Swedish Academy of Sciences.
- The criterion is: for those "who in the preceding year have conferred the greatest benefit to humankind" in the field of physics (or more broadly, whose discoveries are deemed of outstanding value in physics).

History & Facts

- The first Nobel Prize in Physics was awarded in 1901.
- Up to 2024, it has been awarded 118 times to 227 laureates.
- John Bardeen is the only person to have won the Physics Nobel twice (1956 and 1972).
- The prize includes a medal, a diploma, and a cash award (amount depends on the year).

Recent (2025) Nobel Prize in Physics

- The 2025 Nobel Prize in Physics was awarded to John Clarke, Michel H. Devoret, and John M. Martinis.
- Their work was on macroscopic quantum mechanical tunneling and energy quantization in superconducting circuits (*i.e.* showing quantum effects at a scale where they are usually suppressed).
- Their experiments essentially bridged the microscopic quantum world and more "macroscopic" systems, which has implications for quantum technologies (like quantum computing, sensors, etc.).
- The prize money (as of 2025) is shared among the laureates.

2024 Nobel Prize in Physics

- The 2024 Nobel Prize in Physics was awarded jointly to John J. Hopfield and Geoffrey E. Hinton "for foundational discoveries and inventions that enable machine learning with artificial neural networks."
- John J. Hopfield (Princeton University, USA) → half the prize share
- Fisica "Aldo Pontremoli"
- Geoffrey E. Hinton (University of Toronto, Canada) → half the prize share
- They were honoured "for foundational discoveries and inventions that enable machine learning with artificial neural networks."
- The total prize amount was 11 million Swedish kronor, to be shared between them.

Quantum computers, quantum sensors and quantum cryptography

Quantum Computers

- Quantum computers use the principles of quantum mechanics (such as superposition and entanglement) to perform computations that are infeasible for classical computers.
    - **Qubits:** Unlike classical bits (0 or 1), quantum bits (qubits) can be in a superposition of both 0 and 1 at the same time.
    - **Entanglement:** Qubits can be entangled, meaning the state of one qubit depends on the state of another, no matter the distance.
- **Applications:**
    - Solving complex optimization problems
    - Breaking some traditional cryptographic systems (like RSA)
    - Simulating quantum systems in physics and chemistry
    - Accelerating machine learning and data analysis
- **Example:** Google's quantum computer "Sycamore" demonstrated "quantum supremacy" by solving a problem in 200 seconds that would take a supercomputer thousands of years.

Quantum Sensors

- Quantum sensors exploit quantum phenomena (*e.g.* superposition, entanglement, tunneling) to achieve ultra-high sensitivity and precision in measuring physical quantities.

- **Applications:**
  - Precision timekeeping (atomic clocks)
  - Detecting gravitational waves (*e.g.* LIGO)
  - Magnetic field detection (quantum magnetometers for medical imaging like MEG)
  - Navigation systems that don't rely on GPS
  - Geological and subterranean mapping
  - These sensors can outperform their classical counterparts in environments where extreme accuracy is needed.

Quantum Cryptography

- Quantum cryptography uses quantum mechanics to secure communication. The most well-known application is:

→ Quantum Key Distribution (QKD)

- Enables two parties to share a secret encryption key securely, with guaranteed detection of eavesdropping.
- Based on the no-cloning theorem and measurement disturbance: observing a quantum system alters its state.

Protocols: BB84 is the most famous QKD protocol.

- **Advantage:** If an eavesdropper tries to intercept the key, the quantum state will be disturbed, alerting the legitimate users.
- **Limitation:** Requires special infrastructure like fiber optics or satellites.

QUESTIONS

16. Consider the following statements:

1. The 2025 Nobel Prize in Physics was awarded to scientists for their work on quantum mechanical tunneling and energy quantization in superconducting circuits.
2. Quantum computing relies on the principles of classical computing, with a central role for classical bits.
3. Quantum Key Distribution (QKD) guarantees secure communication by detecting eavesdropping attempts.

Which of the above statements are correct?

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

17. Consider the following statements:

1. Quantum computers use qubits that can be both 0 and 1 at the same time (superposition).
2. Quantum entanglement involves qubits that are independent of each other and do not share any information.
3. The Nobel Prize-winning work in 2025 has implications for quantum cryptography, quantum sensors, and quantum computing.

Which of the above statements are correct?

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

18. Consider the following statements:

1. Quantum Key Distribution (QKD) uses the principle that observing a quantum system disturbs its state.
2. Quantum sensors exploit quantum phenomena like superposition and entanglement to measure physical quantities with precision.
3. Quantum computers solve problems by using classical bits, making them faster than classical computers for all types of computations.

Which of the above statements are correct?

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

19. Consider the following statements:

1. The Nobel Prize in Physics 2025 recognized discoveries that bridged the microscopic quantum world with macroscopic systems.
2. Quantum computers are limited to solving problems that are simple and already solvable by classical computers.
3. Quantum cryptography ensures secure communication using quantum mechanics principles like superposition and entanglement.

Which of the above statements are correct?

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

20. Which one of the following is the context in which the term "qubit" is mentioned?

A. Cloud Services
B. Quantum Computing
C. Visible Light Communication Technologies
D. Wireless Communication Technologies

5. DRDO Releases Indian Radio Software Architecture Standard 1.0 to Boost Interoperability in Military Communications

Introduction to IRSA 1.0 Release

- The Defence Research and Development Organisation (DRDO), in collaboration with the Integrated Defence Staff (IDS) and the Tri-Services, has officially launched the Indian Radio Software Architecture (IRSA) Standard 1.0.

- This major milestone was announced at a National Workshop on IRSA held at DRDO Bhawan, New Delhi.
- The unveiling represents a critical advancement towards achieving self-reliance (Atmanirbharta) and interoperability in India's military communication systems.

What is IRSA 1.0?

- IRSA 1.0 is a comprehensive software architecture standard specifically developed for Software Defined Radios (SDRs).
- The standard defines uniform interfaces, application programming interfaces (APIs), execution environments, and waveform portability mechanisms to facilitate seamless communication among the Indian Armed Forces' SDR platforms.
- **It is designed to ensure**:
  - **Waveform Portability:** Allowing the same communication waveforms to operate across different radio hardware without modification.
  - **Interoperability:** Enabling communication systems of various forces and platforms to work cohesively.
  - **Certification and Conformance:** Establishing rigorous standards for quality and compatibility across all SDR implementations.

The main objective of IRSA 1.0 is to:

A Enhance radio broadcasting quality

B Ensure interoperability among Software Defined Radios across services

C Launch a new defence satellite

D Improve radar frequency spectrum

- This architecture framework ensures a unified ecosystem for indigenous SDR development and integration, providing the flexibility to adapt to evolving operational needs.

Strategic Importance and Vision

- The introduction of IRSA is a decisive step towards India's Atmanirbharta in defence communications, reducing reliance on foreign technologies. It sets a strong foundation for integrating next-generation communication technologies and fosters the growth of indigenous innovations.
- IRSA is expected to evolve dynamically alongside emerging operational and technological requirements, ensuring India stays ahead in modern warfare communication capabilities.
- Moreover, IRSA is positioned to become a global benchmark in defence communication architecture, opening avenues for India to export compliant SDR solutions to friendly nations. This will not only enhance India's strategic partnerships but also strengthen international defence cooperation.

National Workshop on IRSA: A Collaborative Platform

- The National Workshop on IRSA provided a platform for in-depth discussions on the journey, technical overview, and ecosystem roles of IRSA. It brought together diverse stakeholders, including representatives from:
  - The Indian Armed Forces
  - Department of Defence Production (DDP)
  - Defence Public Sector Undertakings (DPSUs)
  - Industry players
  - Academia
  - Research institutions
- This inclusive gathering facilitated dialogue on potential pilot projects, adoption strategies, and innovation opportunities within SDR technology, fostering a collaborative environment essential for the ecosystem's growth.

IRSA Development Journey

- The IRSA initiative commenced in 2021, prompted by the growing recognition of the vital role that SDRs play in modern warfare.
- The complexity and criticality of military communication necessitated a national software standard to unify diverse radio systems across the armed forces.

Formation of the Core Technical Team

- In 2022, DRDO formed a core technical team that worked closely with IDS and the tri-services to capture operational and user requirements for the new standard.
- This team undertook extensive stakeholder consultations and multiple technical reviews to ensure the framework would be both practical and future-proof.

Approval and Finalization

- After rigorous evaluation and refinement, IRSA Version 1.0 received formal approval from the High-Level Advisory Committee (HLAC) in 2025, marking a significant achievement in India's defence R&D landscape.

Technical Features and Benefits of IRSA

- **Uniform Interfaces and APIs:** IRSA standardizes how software interacts with hardware, streamlining development and reducing integration complexities.
- **Execution Environments:** It defines controlled environments where waveforms and communication protocols can run reliably.
- **Waveform Portability:** Ensures that waveforms can be transferred and run across different radio platforms without redesign.
- **Interoperability:** Enables various defence platforms to communicate seamlessly, enhancing joint operations.
- **Certification and Conformance:** Provides testing and certification processes that guarantee performance and security standards.
- These technical features enable armed forces to deploy SDRs with greater efficiency, flexibility, and security.

Broader Impact and Future Outlook

Strengthening Indigenous Defence Ecosystem

- IRSA's implementation will foster a robust ecosystem for indigenous SDR development, encouraging innovation among Indian defence manufacturers and research institutions.
- It aligns with the government's push for self-reliance by reducing dependence on imported communication systems.

Enabling International Defence Cooperation

- With IRSA as a globally recognized standard, India is poised to become a leader in exporting advanced, secure, and interoperable SDR solutions to allied nations.
- This development will contribute to strategic defence collaborations and enhance India's standing in the global defence technology market.

Path Ahead

- The IRSA framework is designed to evolve with advancements in communication technology and operational demands.

- Future versions will likely incorporate cutting-edge features, further solidifying India's technological edge in defence communications.

QUESTIONS

21. Consider the following statements regarding the Indian Radio Software Architecture (IRSA) Standard 1.0:

1. It was developed by the Defence Research and Development Organisation (DRDO) to standardize Software Defined Radios (SDRs) in the Indian Armed Forces.
2. The IRSA Standard 1.0 aims to provide uniform interfaces, APIs, and execution environments for seamless communication between military communication systems.
3. The framework only focuses on reducing India's dependence on foreign SDR technologies and does not address interoperability issues.

Which of the statements given above are correct?

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

22. Consider the following statements about the IRSA 1.0 Standard:

1. IRSA 1.0 is designed to work with multiple military platforms, enhancing interoperability across different services of the Indian Armed Forces.
2. The primary objective of IRSA 1.0 is to replace all communication systems in the Indian Armed Forces.
3. IRSA 1.0 provides a robust platform for the integration of next-generation technologies like AI and 5G into military communication systems.

Which of the statements above are correct?

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

23. Consider the following statements regarding the IRSA Standard:

1. The IRSA Standard was developed under Project Atmanirbharta to make India self-reliant in the development of military communication systems.
2. The standard ensures waveform portability, which allows the same communication waveforms to operate across different radio hardware without modification.
3. IRSA 1.0 provides guidelines for military communication systems but does not address cybersecurity or secure communication.

Which of the statements above is/are correct?

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

24. Consider the following statements about the IRSA 1.0 Standard:

1. IRSA 1.0 is a comprehensive architecture for Software Defined Radios (SDRs) with uniform interfaces and APIs for interoperability.
2. The standard was developed only for the Indian Army and does not apply to the Air Force or Navy.
3. The implementation of IRSA 1.0 is expected to enhance the growth of indigenous SDR solutions and reduce dependence on foreign technologies.

Which of the above statements is/are correct?

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

25. Which of the following is/are correctly matched in terms of equivalent rank in the three services of Indian Defence forces?

	Army	**Air force**	**Navy**
1.	Brigadier	Air Commodore	Commander
2.	Major General	Air Vice Marshal	Vice Admiral
3.	Major	Squadron Leader	Lieutenant Commander
4.	Lieutenant Colonel	Group Captain	Captain

Select the correct answer using the code given below:

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

6. Wildlife Week 2025: Bhupender Yadav Launches Five National Projects On Species Conservation

- Union Minister for Environment, Forest and Climate Change Bhupender Yadav presided over the Wildlife Week 2025 celebrations held at the historic Hari Singh Auditorium, Indira Gandhi National Forest Academy (IGNFA), Forest Research Institute (FRI) Campus, Dehradun.
- The event, themed "Human–Wildlife Coexistence," brought together senior government officials, forest officers, conservation experts, scientists, students, and representatives from various environmental institutions.
- Organized by the Ministry of Environment, Forest and Climate Change (MoEFCC) in collaboration with the Wildlife Institute of India (WII), Indian Council of Forestry Research and Education (ICFRE), IGNFA, and FRI, the celebrations underscored a collaborative, inter-institutional approach to conservation and sustainable wildlife management.

- Yadav highlighted the growing importance of fostering harmony between humans and wildlife, reflecting the Prime Minister's vision outlined during the 7th National Board for Wildlife (NBWL) meeting.
- He emphasized that "Wildlife protection is not just a duty, but a shared responsibility for ensuring harmony between nature and people."
- The Minister called for community-driven and technology-enabled conservation models, urging all stakeholders to move from "conflict to coexistence" through innovation, awareness, and collective participation.
- Marking a milestone in India's wildlife management efforts, the Minister launched five national projects designed to strengthen species conservation and address human-wildlife conflict:
    - **Project Dolphin (Phase II):** To enhance protection and monitoring of river and marine cetaceans across India.
    - **Project Sloth Bear:** Introduction of a national implementation framework for the conservation of sloth bears.
    - **Project Gharial:** Launch of an implementation plan for gharial conservation.
    - **Centre of Excellence for Human–Wildlife Conflict Management**

(CoE–HWC): To be established at SACON, this centre will lead policy support, research, and field-based mitigation strategies.

- **Tigers Outside Tiger Reserves Initiative:** To address tiger-human conflicts in non-protected landscapes through community participation, technological interventions, and landscape-level planning.

- The Minister also unveiled four national-level population estimation and monitoring programmes:
  - * Second Cycle of River Dolphin and Cetacean Estimation, including the release of a new field guide.
  - * All India Tiger Estimation Cycle–6, with field guides published in eight regional languages.
  - * Action Plan for the Second Cycle of Snow Leopard Estimation.
  - * Progress Report on the Population Estimation of Great Indian Bustard and Lesser Florican.
- Additionally, Yadav inaugurated online the SFS Officers' Mess at CASFoS, Coimbatore, symbolizing ongoing capacity-building efforts in forestry training.
  - A key highlight of the event was the National Hackathon on Human–Wildlife Conflict (HWC) Coexistence, which brought together 420 participants from 75 institutions across 20 States and UTs.
  - The hackathon showcased AI-based tools, spatial analytics, and community engagement models for real-time conflict mitigation.
  - Six finalist teams presented their innovations before the Minister and an expert jury.
  - The top three winners received cash awards and certificates, while others were felicitated with appreciation prizes.
  - Yadav also presented awards to the winners of the IGNFA wildlife quiz competition.
  - In his concluding remarks, the Minister reiterated the government's unwavering commitment to biodiversity conservation, inclusive development, and community participation.

- He urged youth, researchers, and local communities to act as ambassadors of coexistence, embodying the vision of a "Viksit Bharat in harmony with nature."
- The Wildlife Week 2025 celebrations in Dehradun reaffirmed India's leadership in sustainable wildlife management and its commitment to balancing ecological protection with human well-being.

QUESTIONS

26. Consider the following statements regarding Wildlife Week 2025 in India:

1. The theme for Wildlife Week 2025 was "Human–Wildlife Coexistence."
2. The event was organized solely by the Ministry of Environment, Forest and Climate Change (MoEFCC).
3. Union Minister Bhupender Yadav launched five national projects to strengthen species conservation.

Which of the statements given above is/are correct?

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

27. Consider the following statements regarding the national projects launched during Wildlife Week 2025:

1. Project Dolphin Phase II focuses on the protection and monitoring of river and marine cetaceans.
2. Project Gharial aims to conserve gharials and their habitat.
3. Tigers Outside Tiger Reserves Initiative addresses tiger-human conflicts in non-protected landscapes.

Which of the statements given above is/are correct?

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

28. Consider the following statements regarding the National Hackathon on Human–Wildlife Conflict (HWC) Coexistence:

1. The hackathon included participants from over 70 institutions across 20 States and Union Territories.
2. Participants presented AI-based solutions for real-time conflict mitigation.
3. Only three teams were recognized, with others receiving no recognition.

Which of the statements given above is/are correct?

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

29. Consider the following statements regarding the national-level population estimation and monitoring programmes launched in Wildlife Week 2025:

1. The All India Tiger Estimation Cycle–6 was published in eight regional languages.
2. A progress report was released on the population estimation of the Great Indian Bustard and Lesser Florican.
3. The first cycle of River Dolphin Estimation was completed in Wildlife Week 2025.

Which of the statements given above is/are correct?

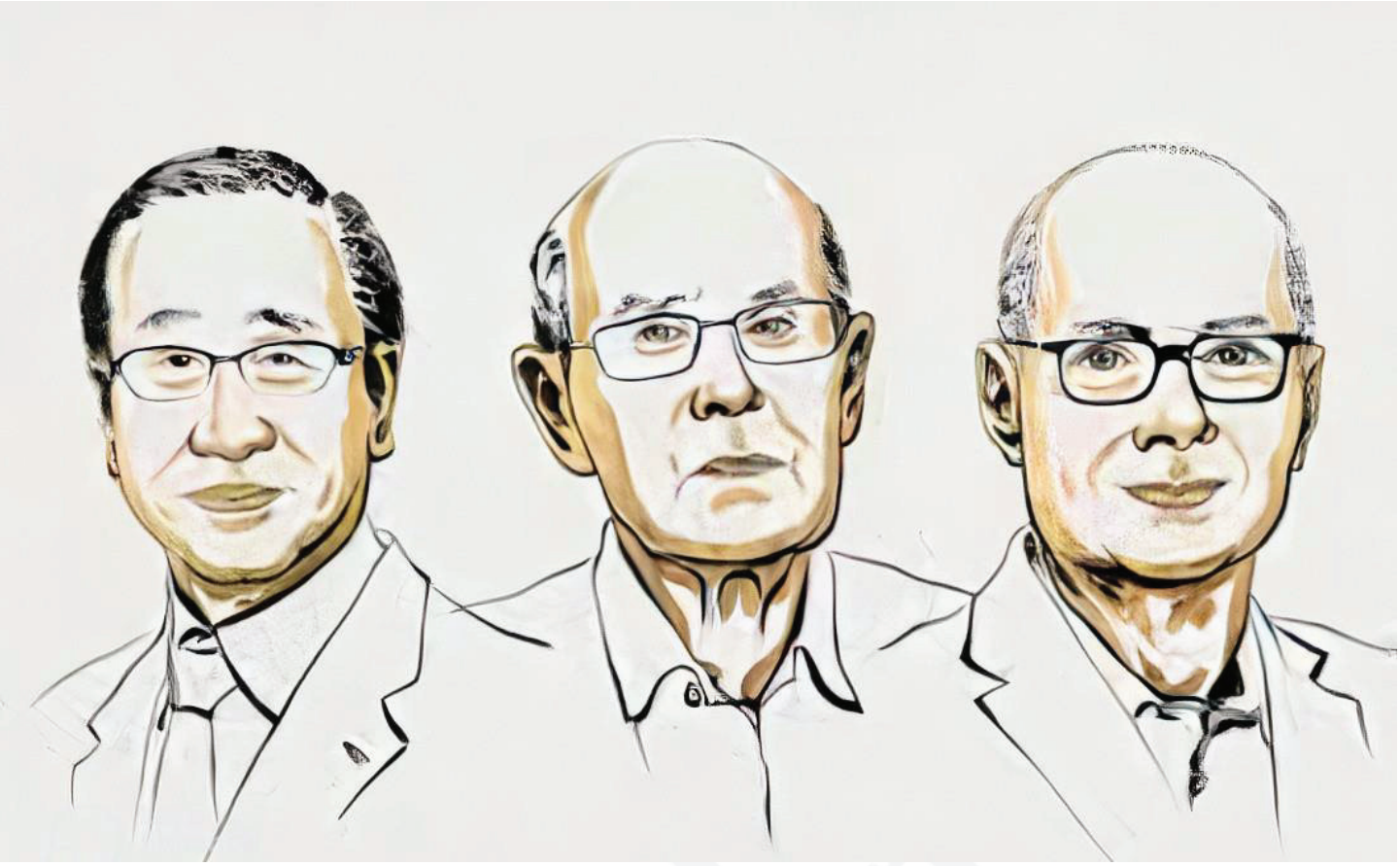
A. 1 and 2 only
C. 1 and 3 only
B. 2 and 3 only
D. 1, 2 and 3

30. Among the following Tiger Reserves, which one has the largest area under "Critical Tiger Habitat"?

A. Corbett
C. Nagariunsagar-Srigailam
B. Ranthambore
D. Sunderbang

7. Susumu Kitagawa, Richard Robson And Omar Yaghi Win 2025 Nobel Prize In Chemistry For Developing Metal–Organic Frameworks

- Scientists Susumu Kitagawa, Richard Robson and Omar Yaghi won the 2025 Nobel Prize in Chemistry "for the development of metal–organic frameworks".
- The more than a century-old prize is awarded by the Royal Swedish Academy of Sciences and the winners share 11 million Swedish crowns ($1.2 million), as well as the fame of winning arguably the world's most prestigious science award.



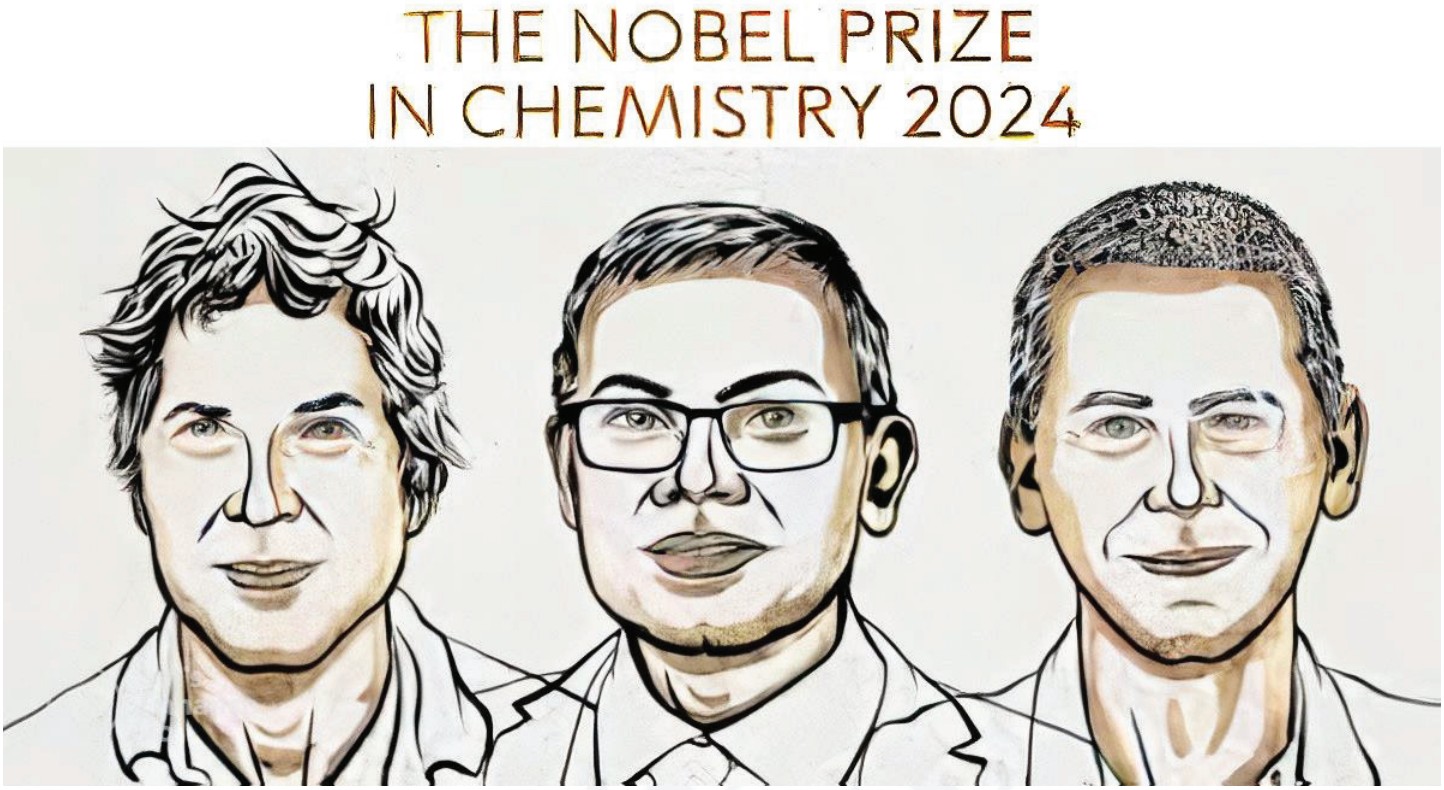
- "Through the development of metal-organic frameworks, the laureates have provided chemists with new opportunities for solving some of the challenges we face,".
- The Chemistry Nobel was the third prize announced in this year's crop of awards, in keeping with tradition, following those for medicine and physics announced.
- Established in the will of Swedish inventor and businessman Alfred Nobel, the prizes for achievements in science, literature and peace have been awarded since 1901, with a few interruptions mostly due to the world wars.
- Nobel was himself a chemist and his developments in that field helped underpin the wealth he amassed from his invention of dynamite in the 19th century.
- Sometimes overshadowed by more famous laureates in the fields of physics, literature and peace, the chemistry awards have still recognised many influential discoveries such as nuclear fission, DNA sequencing techniques, and yeast.

Nobel Prize in Chemistry

- The Nobel Prize in Chemistry is one of the five Nobel Prizes established in the will of Alfred Nobel (the inventor of dynamite).
- It is awarded annually by the Royal Swedish Academy of Sciences "to those who, during the preceding year, shall have made the most important chemical discovery or improvement."
- First awarded in 1901.
- Recipients are chosen by the Royal Swedish Academy of Sciences.
- The prize can be shared by up to three individuals.
- The award includes a monetary reward (for example, recent prizes have been ~11 million Swedish kronor) plus the prestige.

2024 Nobel Prize in Chemistry

- The 2024 Nobel Prize in Chemistry was awarded to three scientists for their groundbreaking contributions to understanding and manipulating proteins, the essential molecular machines of life.



Laureates and Their Contributions

- **David Baker (USA):** Recognized for his pioneering work in computational protein design, Baker developed the Rosetta software suite, which enables the design of novel protein structures. His team's creation of Top7 in 2003 marked the first synthetic protein fold not found in nature, opening new avenues in biotechnology and medicine.
- **Demis Hassabis and John M. Jumper (UK & USA):** Awarded for their development of AlphaFold2, an artificial intelligence model capable of predicting the 3D structures of proteins with remarkable accuracy. This model has revolutionized structural biology by providing insights into the function of proteins and accelerating drug discovery.

Global Impact

- The advancements in protein science have profound implications across various fields:
  - **Medicine:** Facilitating the development of targeted therapies and vaccines.
  - **Biotechnology:** Enabling the design of enzymes for industrial applications.
  - **Environmental Science:** Contributing to the creation of proteins that can degrade pollutants.
- These achievements underscore the transformative potential of combining computational methods with biological research.

Metal–Organic Frameworks

- Metal–Organic Frameworks (MOFs) are a fascinating class of materials made up of metal ions or clusters coordinated to organic ligands to form one-, two-, or three-dimensional structures. They're known for their highly porous nature and large surface areas, which make them incredibly useful in various applications like gas storage, separation, catalysis, and sensing.

Key Features of MOFs:

- **Structure:** Composed of metal nodes (ions or clusters) connected by organic linkers.
- **Porosity:** Extremely high porosity, meaning they have lots of tiny, tunable pores.
- **Surface Area:** Very large surface areas, often exceeding those of traditional porous materials like zeolites or activated carbons.
- **Tunability:** Both the metal centers and the organic linkers can be modified to customize properties.
- **Crystallinity:** They typically form highly crystalline structures, which makes characterization easier.

Applications:

- **Gas Storage:** Such as hydrogen or methane storage for fuel applications.
- **Gas Separation:** Filtering and separating gases like CO_2 capture from air or industrial emissions.
- **Catalysis:** Acting as catalysts or catalyst supports for chemical reactions.
- **Sensing:** Detecting chemicals or changes in the environment.
- **Drug Delivery:** Due to their porous nature and biocompatibility in some cases.

QUESTIONS

31. Consider the following statements regarding the 2025 Nobel Prize in Chemistry:

1. It was awarded to Susumu Kitagawa, Richard Robson, and Omar Yaghi.
2. The prize was given for discoveries related to protein folding.
3. The Royal Swedish Academy of Sciences awards the Nobel Prize in Chemistry.

Which of the statements given above is/are correct?

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

32. Consider the following features of Metal–Organic Frameworks (MOFs):

1. MOFs are made of metal ions or clusters coordinated to organic linkers.
2. They have extremely high porosity and large surface area.
3. MOFs are primarily used for designing synthetic proteins.

Which of the statements given above is/are correct?

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

33. Which of the following applications are correctly associated with Metal–Organic Frameworks (MOFs)?

1. Hydrogen storage for fuel applications.
2. Carbon dioxide capture and gas separation.
3. Prediction of 3D structures of proteins.

Select the correct answer using the code given below:

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

34. Consider the following statements about the Nobel Prizes:

1. They were established in the will of Alfred Nobel.
2. The Nobel Prize in Chemistry can be awarded to up to three individuals.
3. The Nobel Prize in Chemistry has been awarded since 1910.

Which of the statements given above is/are correct?

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

35. The 2025 Nobel Prize in Chemistry highlighted MOFs as a breakthrough. Which of the following statements regarding MOFs is correct?

A. MOFs are crystalline materials with tunable metal and organic components.
B. MOFs are primarily designed for developing AI models for protein folding.
C. MOFs cannot be used for catalysis or gas separation.
D. MOFs are natural minerals found in coral reefs.

8. How Supreme Court verdict upheld equal inheritance rights for tribal women

Scheduled Tribes and Governing Laws

- The Supreme Court addressed the inheritance rights of women from the Gond community, a Scheduled Tribe under Article 342 of the Indian Constitution.
- Unlike other communities governed by the Hindu Succession Act, 1956, Scheduled Tribes like the Gonds are exempt unless explicitly notified by the Central Government.
- Their personal laws are largely based on customs, which are often unwritten and localized.

Legal Challenge: Custom vs. Constitutional Equality

- The plaintiffs, children of a Gond woman, claimed their mother's right to inherit ancestral property.
- Lower courts dismissed the claim due to lack of evidence proving a Gond custom that allowed women inheritance rights equal to men.
- The High Court upheld this patriarchal presumption, reinforcing male-only inheritance customs.

Supreme Court's Key Observations

- **Reversal of Burden of Proof:** The Court rejected the assumption that women are excluded from inheritance unless proven otherwise. Instead, it held that inclusion should be the default, and any exclusion must be clearly demonstrated.

- **Patriarchal Bias Rejected:** The court identified the exclusionary presumption as stemming from Hindu law, which should not apply to tribal customs.
- **Constitutional Principles Override Unproven Custom:** The Court invoked Articles 14 (equality before law), 15(1) (prohibition of gender discrimination), 38 (state's duty to eliminate inequality), and 46 (protection of weaker sections) to support its stance.

Constitutional Morality and Gender Equality

- Drawing from the 2005 Hindu Succession (Amendment) Act's Statement of Objects and Reasons, the Court emphasized that gender-based exclusion in property rights is unconstitutional.
- While not applying Hindu law directly, the Court used this to highlight the constitutional ethos that equality must prevail in the absence of clear customs.

Impact of the Judgment

- **Shift in Legal Approach:** Courts must now presume equality in tribal inheritance unless exclusion is proven.
- **Balancing Autonomy and Equality:** The judgment attempts to reconcile tribal self-governance with constitutional guarantees against discrimination.
- **Revisiting Past Precedents:** This ruling departs from the 1996 Madhu Kishwar judgment that upheld exclusionary customs, signaling a move towards greater gender justice within tribal laws.

Article 342 of the Indian Constitution

Article 342: Scheduled Tribes

President's Power to Specify Scheduled Tribes

- The President of India has the authority to specify the tribes or tribal communities or parts of or groups within tribes or tribal communities that shall be deemed to be Scheduled Tribes for the purposes of the Constitution.

Parliamentary Approval

- The specification made by the President is subject to modification or repealed by Parliament through law.

Key Points:

- **The list of Scheduled Tribes is prepared by the President.**
- **Parliament can change or amend the list.**
    - This article lays the constitutional basis for identifying Scheduled Tribes who are entitled to special protections and benefits under the Constitution, like reservation in education, employment, and political representation.

Hindu Succession (Amendment) Act, 2005

- The Hindu Succession (Amendment) Act, 2005 is a landmark piece of legislation in India that brought gender equality in the inheritance rights of Hindu women. It amended the Hindu Succession Act, 1956, which governs intestate succession (*i.e.*, inheritance when someone dies without a will) among Hindus, Buddhists, Jains, and Sikhs.

Key Highlights of the 2005 Amendment

Equal Rights for Daughters in Coparcenary Property:

- Before 2005, only male members (sons) were considered coparceners in a Hindu Undivided Family (HUF).
- After the amendment, daughters were also recognized as coparceners by birth, just like sons.
- This meant they had equal rights, duties, and liabilities in the HUF property.

Daughters Can Demand Partition:

- Daughters can now seek partition of ancestral property, just like sons.
- They can also become the Karta (manager) of the HUF if they are the senior-most coparcener.

Applies Retrospectively (With Conditions):

- The law applies to daughters born before or after the amendment.
- However, the father must have been alive on 9th September 2005 (the date the amendment came into effect) for the daughter to claim rights as a coparcener. This was clarified by the Supreme Court in later judgments.

Removes Gender Discrimination:

- Previously, the law favored male heirs in succession.
- The amendment removed discriminatory provisions that prevented women from inheriting equally.

Important Supreme Court Judgments

Prakash v. Phulavati (2016):

- Held that the father must be alive on the date of the amendment (9 Sept 2005) for the daughter to claim coparcenary rights.

Danamma v. Amar (2018):

- Contradicted Prakash, giving daughters coparcenary rights even though the father had died before 2005.

Vineeta Sharma v. Rakesh Sharma (2020):

- **Resolved the conflict.**
  - Held that daughters have equal rights by birth, irrespective of whether the father was alive or not on 9 Sept 2005.
  - This judgment made the 2005 Amendment fully retrospective in effect.

QUESTIONS

36. Consider the following statements regarding the Supreme Court verdict on inheritance rights for tribal women:

1. The Court held that tribal women should be presumed to have equal inheritance rights unless exclusion is clearly proven.
2. The Court applied Hindu Succession Act, 1956 directly to Scheduled Tribes.
3. The Court relied on Articles 14, 15(1), 38, and 46 of the Indian Constitution to support gender equality.

Which of the statements given above is/are correct?

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

37. Which of the following articles of the Indian Constitution empower the State to protect Scheduled Tribes and eliminate inequality?

1. Article 342

2. Article 46
3. Article 15(1)

Select the correct answer using the code given below:

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

38. Which of the following statements about the Hindu Succession (Amendment) Act, 2005 are correct?

1. It gave daughters equal coparcenary rights by birth in Hindu Undivided Family property.
2. It applies retrospectively even if the father was deceased before 9th September 2005.
3. Daughters can become the Karta of a HUF if they are the senior-most coparcener.

Select the correct answer using the code given below:

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

39. Which of the following Supreme Court judgments clarified the retrospective application of the 2005 Hindu Succession (Amendment) Act?

1. Prakash v. Phulavati (2016)
2. Danamma v. Amar (2018)
3. Vineeta Sharma v. Rakesh Sharma (2020)

Select the correct answer using the code given below:

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

40. Which of the following statements correctly describe Article 342 and its role in the context of Scheduled Tribes?

1. The President of India specifies the list of Scheduled Tribes.
2. Parliament can modify or repeal the list specified under Article 342.
3. Article 342 gives STs automatic inheritance rights in ancestral property.

Select the correct answer using the code given below:

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

ANSWER KEY AND EXPLANATION

1. B 2 and 3 only

Statement 1 is incorrect because the 2025 Nobel Prize was awarded for **peripheral immune tolerance and regulatory T cells**, not for microRNA (that was the 2024 prize). Statements 2 and 3 are correct. Regulatory T cells prevent autoimmunity, and the FOXP3 gene controls their development.

2. B Acting as "security guards" to suppress overly aggressive immune responses

Regulatory T cells do not attack pathogens directly; instead, they **moderate the immune system**, preventing it from attacking the body's own cells and reducing the risk of autoimmune diseases.

3. A 1 and 3 only

Statement 1 is correct; T cells mature in the thymus to learn self-tolerance. Statement 3 is correct; failures in this process can cause autoimmunity. Statement 2 is incorrect; **regulatory T cells also develop in the thymus**, although Sakaguchi's work highlighted additional regulatory functions.

4. A 1, 2, and 3 only

Regulatory T cells discoveries help **modulate immune responses**, enhancing cancer therapy, reducing transplant rejection, and controlling autoimmune disorders. Statement 4 is incorrect; regulatory T cells **cannot directly generate stem cells**.

5. D They protect the body from the diseases caused by pathogens.

- **B cells** and **T cells** are central components of the **adaptive immune system**.
- **B cells** produce antibodies that specifically target pathogens like bacteria and viruses.
- **T cells** include:
  - **Helper T cells**: activate other immune cells, including B cells.
  - **Killer (Cytotoxic) T cells**: destroy infected or abnormal cells.
  - **Regulatory T cells**: modulate immune responses to prevent attacking the body's own cells.
- Together, they **recognize and neutralize pathogens**, protecting the body from infectious diseases.

Why other options are incorrect:

(a) Allergens: While the immune system reacts to allergens, B and T cells primarily defend against **pathogens**, not allergens.

(b) Pain and inflammation: These are mediated by nervous and inflammatory systems, not B/T cells.

(c) Immunosuppressants: Only **regulatory T cells** have an immunosuppressive role, but B and T cells overall are **immune defenders**.

6. C 1, 2, and 3

All three statements are correct. India and Pakistan disagree over the 'Thalweg' principle in defining the boundary, with Pakistan claiming full control while India argues for the mid-channel boundary. The creek's role in defining EEZs further emphasizes its strategic importance.

7. C 1 only

The 1968 tribunal decision resolved the Rann of Kutch dispute, with India receiving 90% of the region. However, the Sir Creek issue was excluded from the tribunal's decision, and it remains unresolved.

8. C Both 1 and 2

The Simla Accord focused on resolving differences between India and Pakistan through peaceful means. It also converted the ceasefire line into the Line of Control (LoC), but India did not agree to hand over Jammu and Kashmir to Pakistan.

9. C 1, 2, and 3

India and Pakistan have engaged in several rounds of talks about the Sir Creek dispute without reaching a resolution. The Simla Accord emphasized bilateral resolution, and Pakistan's attempts to internationalize the dispute have been rejected by India, which maintains that all issues.

10. C 1, 2, and 3

- **Statement 1 is correct:** Sir Creek is a tidal estuary located along the India-Pakistan border.
- **Statement 2 is correct:** The dispute arises from differing interpretations of the Thalweg principle, which defines the boundary in the middle of the navigable channel.
- **Statement 3 is correct:** The area is important for its potential oil and gas reserves and its role in both countries' Exclusive Economic Zones.

11. A 1 and 2 only

- **Statement 1 is correct:** The Coral Triangle spans six countries, including the Philippines, Indonesia, Malaysia, and others.
- **Statement 2 is correct:** The Coral Triangle is home to over 75% of the world's coral species.
- **Statement 3 is incorrect:** The Coral Triangle is facing severe threats from climate change, pollution, and unsustainable human activity, leading to coral bleaching and species decline.

12. B 1 and 3 only

- **Statement 1 is correct:** The cryobank uses vitrification, a technique that prevents ice crystals from forming, to preserve coral larvae.
- **Statement 2 is incorrect:** The initiative is part of a regional project involving multiple countries, including Taiwan, Indonesia, Malaysia, and Thailand.
- **Statement 3 is correct:** The primary purpose of the cryobank is reef restoration and conservation of coral species.

13. A 1 and 3 only

- **Statement 1 is correct:** The cryobank is referred to as a "genetic insurance policy" to protect coral species from extinction.
- **Statement 2 is incorrect:** The cryobank is not limited to preserving endangered species but aims to preserve all coral species.
- **Statement 3 is correct:** The cryobank is designed to store genetic material for future use, thus helping in preventing the extinction of corals.

14. A 1, 2 and 3 only

- **Andaman and Nicobar Islands:** These islands are home to some of the most diverse and well-preserved coral reefs in India, making them an important coral reef area.
- **Gulf of Kachchh (Gulf of Kutch):** This region also features coral reefs, specifically fringing reefs and other types of reefs.
- **Gulf of Mannar:** The Gulf of Mannar, located between India and Sri Lanka, is another region in India known for its rich coral reef ecosystems, including both fringing and barrier reefs.

- **Sunderbans:** The Sunderbans region, known for its mangrove forests, does not have coral reefs. It is primarily characterized by its unique estuarine ecosystem, home to the Bengal tiger and various mangrove species, but not coral reefs. Thus, the correct answer is **[A] 1, 2 and 3 only**.

15. D 1, 2 and 3

- **Most of the world's coral reefs are in tropical waters:** This statement is **correct**. Coral reefs are primarily found in tropical waters, which offer the ideal conditions for coral growth, with warm temperatures (around 18-30°C), clear water, and sunlight.
- **More than one-third of the world's coral reefs are located in the territories of Australia, Indonesia, and Philippines:** This statement is **correct**. The Indo-Pacific region, particularly the areas around Australia, Indonesia, and the Philippines, contains a large proportion of the world's coral reefs. The Great Barrier Reef in Australia is one of the largest and most famous coral reef systems in the world.
- **Coral reefs host far more number of animal phyla than those hosted by tropical rainforests:** This statement is **correct**. Coral reefs are considered the most biodiverse ecosystems on the planet. They host a greater variety of species, including animals from more than 30 animal phyla, far surpassing the number of phyla in tropical rainforests. Coral reefs are home to a wide range of marine life, including fish, mollusks, echinoderms, and others. Thus, all three statements are correct, making the correct answer **[D] 1, 2 and 3**.

16. B 1 and 3 only

- **Statement 1 is correct** as the Nobel Prize in Physics 2025 was awarded for work on macroscopic quantum mechanical tunneling and energy quantization.
- **Statement 2 is incorrect** because quantum computers use qubits, which are fundamentally different from classical bits.
- **Statement 3 is correct;** QKD uses the principles of quantum mechanics to ensure secure communication, where eavesdropping attempts are easily detectable.

17. C 1 and 3 only

- **Statement 1 is correct** as quantum computers use qubits, which can exist in a superposition of states (both 0 and 1).
- **Statement 2 is incorrect** because quantum entanglement refers to qubits that are connected, with the state of one qubit influencing the state of the other, no matter the distance.
- **Statement 3 is correct;** the Nobel-winning work in 2025 has significant implications for quantum technologies, including quantum cryptography, computing, and sensors.

18. A 1 and 2 only

- **Statement 1 is correct;** QKD relies on the principle that measurement of a quantum system disturbs its state, which is a key security feature.
- **Statement 2 is correct;** quantum sensors use quantum phenomena to achieve ultra-high precision in measurements.
- **Statement 3 is incorrect;** quantum computers use qubits, not classical bits, to solve certain types of problems much faster than classical computers, but they are not universally faster for all computations.

19. C 1 and 3 only

- **Statement 1 is correct;** the 2025 Nobel Prize in Physics recognized work that bridged the quantum world with macroscopic systems.

- **Statement 2 is incorrect;** quantum computers excel at solving problems that classical computers cannot easily solve, such as optimization problems and simulating quantum systems.
- **Statement 3 is correct;** quantum cryptography uses quantum mechanics, including superposition and entanglement, to secure communication channels.\

20. B Quantum Computing

A **qubit** (short for "quantum bit") is the fundamental unit of quantum information in quantum computing. Unlike classical bits that can represent either a 0 or a 1, a qubit can represent both 0 and 1 simultaneously due to the phenomenon of **superposition**. This property allows quantum computers to perform many calculations in parallel, offering potential advantages in solving problems that are computationally difficult for classical computers.

21. A 1 and 2 only

- **Statement 1 is correct** as IRSA 1.0 was developed by DRDO to ensure standardization across SDRs used by the Indian military.
- **Statement 2 is also correct** as the standard defines uniform interfaces, APIs, and execution environments to facilitate seamless communication among various defense platforms.
- **Statement 3 is incorrect** because IRSA not only focuses on reducing dependency on foreign technologies but also aims to achieve better interoperability between various communication systems within India's armed forces.

22. A 1 only

- **Statement 1 is correct** as IRSA 1.0 is specifically designed to enhance interoperability among different military platforms and services within the Indian Armed Forces.
- **Statement 2 is incorrect** as IRSA 1.0 is not designed to replace all communication systems but to standardize and unify the communication protocols.
- **Statement 3 is partially correct**, but the primary focus of IRSA 1.0 is not the integration of AI and 5G but to enable seamless communication within SDR platforms. The technology will evolve over time, but it's not the primary objective at present.

23. A 1 and 2 only

- **Statement 1 is correct** as IRSA 1.0 is a part of India's efforts to achieve self-reliance (Atmanirbharta) in defense communication.
- **Statement 2 is also correct** as the standard facilitates waveform portability, making it easier to use the same communication waveforms across various platforms.
- **Statement 3 is incorrect** because IRSA 1.0 also addresses the security and certification of communication systems, ensuring that military communication systems are both secure and efficient.

24. C 1 and 3 only

- **Statement 1 is correct** because IRSA 1.0 provides a unified framework for SDRs across various military platforms.
- **Statement 2 is incorrect** because IRSA 1.0 applies to all branches of the Indian Armed Forces, not just the Army.
- **Statement 3 is correct** as the standard aims to promote indigenous development of SDR solutions, in line with India's Atmanirbharta initiative.

25. D 13 only

Explanation: Here's the breakdown of the equivalency of ranks across the three services of the Indian Defence Forces:

- **Brigadier - Air Commodore - Commander**

  Incorrect. Brigadier (Army) is equivalent to Commodore (Navy), not Commander. So, this pairing is not correct.

- **Major General - Air Vice Marshal - Vice Admiral**

  Incorrect. Major General (Army) is equivalent to Air Vice Marshal (Air Force) and Rear Admiral (Navy), not Vice Admiral. Vice Admiral (Navy) is equivalent to Lieutenant General (Army) or Air Marshal (Air Force).

- **Major - Squadron Leader - Lieutenant Commander**

  Correct. Major (Army) is equivalent to Squadron Leader (Air Force) and Lieutenant Commander (Navy). This is a correct match.

- **Lieutenant Colonel - Group Captain - Captain**

  Incorrect. Lieutenant Colonel (Army) is equivalent to Wing Commander (Air Force), not Group Captain. Captain (Navy) is not equivalent to Lieutenant Colonel, which is a higher rank.

- **Correct Matching:**
  - Brigadier (Army) = Commodore (Navy) = Air Commodore (Air Force)
  - Major General (Army) = Rear Admiral (Navy) = Air Vice Marshal (Air Force)
  - Major (Army) = Squadron Leader (Air Force) = Lieutenant Commander (Navy)
  - Lieutenant Colonel (Army) = Wing Commander (Air Force) = Commander (Navy)

26. B 1 and 3 only

- **Statement 1 is correct.** The official theme of Wildlife Week 2025 was "Human–Wildlife Coexistence."
- **Statement 2 is incorrect** because MoEFCC collaborated with the Wildlife Institute of India (WII), Indian Council of Forestry Research and Education (ICFRE), IGNFA, and FRI.
- **Statement 3 is correct** as the Minister launched five national projects: Project Dolphin Phase II, Project Sloth Bear, Project Gharial, CoE-HWC, and Tigers Outside Tiger Reserves Initiative.

27. D 1, 2 and 3

All three statements are correct. Each project targets specific species or human-wildlife conflict mitigation:

- Project Dolphin Phase II → river and marine cetaceans.
- Project Gharial → gharials.
- Tigers Outside Tiger Reserves → tiger-human conflict in non-protected areas.

28. A 1 and 2 only

- **Statement 1 is correct** (420 participants from 75 institutions across 20 States and UTs).
- **Statement 2 is correct** (AI-based tools, spatial analytics, and community engagement models were presented).
- **Statement 3 is incorrect** because besides the top three winners, other participants were felicitated with appreciation prizes.

29. A 1 and 2 only

- **Statement 1 is correct** (Tiger Estimation Cycle–6 guides in eight regional languages).
- **Statement 2 is correct** (progress report on Great Indian Bustard and Lesser Florican released).
- **Statement 3 is incorrect** because the **second cycle** of River Dolphin and Cetacean Estimation was launched, not the first.

30. C Nagariunsagar-Srigailam

Critical Tiger Habitat (CTH): These are areas identified under the **Wildlife Protection Act, 1972** where tiger conservation is of highest priority. CTH is part of the Tiger Reserve and is legally protected from diversion for non-forest purposes. **Nagarjunsagar-Srisailam Tiger Reserve (Telangana & Andhra Pradesh): Largest tiger reserve in India**. Its CTH area is **3,568 km²**, making it the largest among all tiger reserves.

31. A 1 and 3 only

- **Statement 1 is correct.** Susumu Kitagawa, Richard Robson, and Omar Yaghi won the 2025 Nobel Prize for developing Metal–Organic Frameworks (MOFs).
- **Statement 2 is incorrect.** Protein folding discoveries were recognized in the 2024 Chemistry Nobel (David Baker, Demis Hassabis, John Jumper).
- **Statement 3 is correct.** The Royal Swedish Academy of Sciences awards the Nobel Prize in Chemistry annually.

32. A 1 and 2 only

- MOFs consist of metal ions/clusters connected to organic linkers (Statement 1).
- They are highly porous with very large surface areas, making them useful in catalysis, gas storage, and separation (Statement 2).
- **Statement 3 is incorrect.** MOFs are not used for protein design; that relates to the 2024 Chemistry Nobel.

33. A 1 and 2 only

- MOFs are used in gas storage (like hydrogen, methane) and gas separation, including CO_2 capture (Statements 1 and 2).
- Statement 3 is incorrect. Protein 3D structure prediction is related to AI (AlphaFold) and the 2024 Chemistry Nobel, not MOFs.

34. A 1 and 2 only

- **Statement 1 is correct.** Alfred Nobel established the Nobel Prizes in his will.
- **Statement 2 is correct.** Up to three individuals can share a Nobel Prize in Chemistry.
- **Statement 3 is incorrect.** The first Nobel Prize in Chemistry was awarded in 1901, not 1910.

35. A MOFs are crystalline materials with tunable metal and organic components.

- MOFs are highly crystalline structures where both the metal nodes and organic linkers can be modified to tune their properties (correct).
- **Option B is wrong;** protein folding is unrelated to MOFs.
- **Option C is wrong;** MOFs are widely used in catalysis and gas separation.
- **Option D is wrong;** MOFs are synthetic, not natural minerals.

36. A 1 and 3 only

- **Statement 1 is correct.** The Court reversed the burden of proof, presuming equality in tribal inheritance unless exclusion is proven.
- **Statement 2 is incorrect.** The Court did **not apply Hindu law directly**; it used constitutional principles as guidance.
- **Statement 3 is correct.** Articles 14, 15(1), 38, and 46 were cited to uphold gender equality.

37. B 2 and 3 only

- Article 46 directs the State to promote educational and economic interests of weaker sections, including STs.
- Article 15(1) prohibits discrimination on the basis of sex or other factors.
- Article 342 allows specification of Scheduled Tribes but does not directly provide protection or elimination of inequality.

38. B 1 and 3 only

- Statement 1 is correct; daughters are now coparceners by birth.
- Statement 2 was initially restricted, clarified in later judgments. Full retrospective effect was given by **Vineeta Sharma v. Rakesh Sharma (2020)**.
- Statement 3 is correct; daughters can become Karta if senior-most.

39. C 3 only

- Vineeta Sharma v. Rakesh Sharma (2020) clarified that daughters have equal rights irrespective of whether the father was alive on 9 Sept 2005, making the amendment fully retrospective.
- Prakash and Danamma involved partial clarifications but did not finalize full retrospective effect.

40. A 1 and 2 only

- **Statements 1 and 2 are correct;** the President prepares the ST list and Parliament can amend it.
- **Statement 3 is incorrect;** Article 342 **does not confer inheritance rights**; it provides a constitutional basis for ST identification.