DAILY CURRENT AFFAIRS ANALYSIS

25 JANUARY 2025

1 - Atmospheric Waves Experiment:

GS III

Science and Technology

- **What is the weather like in space?**

- Similar to how weather exists on Earth, the Sun's actions always have an impact on the environment surrounding Earth and the other planets.
- solar flares and emissions, as well as the types of material that are most prevalent in the space environment.
- Extreme weather can occur in space.
- These directly affect crucial facilities on Earth, such as radio and satellite communication systems, as well as space-based aircraft orbits and stations.
- It has an impact on how well electrical grids, navigation systems, and GPS work together.
- In addition to the effects of solar radiation, terrestrial weather also has an impact on space weather.

- **A gravity wave: what is it?**

- There are many different types of waves in the atmosphere that move in both horizontal and vertical directions.
- Among these vertical waves are Atmospheric Gravity Waves (AWS).
- The majority of the time, they are produced by abrupt disturbances or extreme weather events that cause stable air to be displaced vertically.
- AGWs and other periodic waves can be released into the lower atmosphere by natural occurrences like as thunderstorms, hurricanes, tornadoes, and regional orography, among others.
- The air is pushed back to its initial location when the atmosphere is stable due to the force created by the temperature differential between the ascending air and the atmosphere.
- The air will continually rise and fall, forming a pattern like waves.
- AGWs are waves that travel across stable atmospheric layers, with the upward-moving section of the wave being the most conducive to the development of cloud streaks or patterns.
- AGWs are still present in space, where they influence the weather there.

- **The Experiment on Atmospheric Waves (AWE)?**

- NASA's AWE experiment is a first-of-its-kind attempt to investigate the relationships between space weather and terrestrial weather.
- Under NASA's Heliophysics Explorers Programme, it is planned.
- It will investigate the connections between the waves in the lower atmosphere and the upper atmosphere, and consequently, space weather.

- The International Space Station (ISS), which is circling the Earth, will host AWE after it is launched and installed.
- It will observe Earth from the vantage position and capture the bands of colourful light, also called airglow.
- The goal of the new NASA mission is to comprehend the interplay of forces influencing the upper atmosphere's space weather.
- At the mesopause, which is located between 85 and 87 km above Earth's surface and is where the temperature of the atmosphere drops to minus 100 degrees Celsius, AWE will monitor the airglow.
- The modest airglow in the infrared bandwidth, which appears the brightest and is easiest to identify, can be captured at this altitude.

- **How will AWE at NASA proceed?**

- AWE will map the Earth's atmosphere's vivid airglows with precision.
- An Advanced Mesospheric Temperature Mapper (ATMT), a device that scans or maps the mesopause—the space between the thermosphere and mesosphere—is aboard AWE.
- By utilising the four identical telescopes that make up an image radiometer, researchers intend to measure the wavelength-specific brightness of light.
- After that, this data can be transformed into a temperature map, which may show the migration of the airglow and finally provide hints about its function in the upper atmosphere and space weather.

- ***Source → The Hindu***

2 – Tantalum:

GS III

Science and Technology

- **What are the characteristics of tantalum?**

- Because tantalum is widely utilised in electronics and semiconductors, its presence is important for Punjab and all of India.
- Tantalum, with an atomic number of 73, is a rare metal.
- The number of protons in one atom of an element is its atomic number.
- It's one of the hardest, most durable, heaviest, and grey metals in use today. It also resists corrosion well.
- It has a great resistance to corrosion because, even in the presence of strong and hot acid conditions, it generates an oxide layer in the presence of air that is very difficult to remove.

- Tantalum is ductile when pure, which means it won't break when stretched, tugged, or twisted into a thin wire or thread.
- At temperatures below 150°C, it is nearly impervious to chemical attack; the only substances that can harm it are hydrofluoric acid, acidic solutions containing fluoride ions, and free sulphur trioxide.
- Only tungsten and rhenium have a melting point higher than that of tantalum.

- **The Tantalum Discovery:**

- Swedish chemist Anders Gustaf Ekenberg made the discovery of tantalum in 1802.
- The rich but evil monarch of a hamlet above Mount Sipylus in Anatolia, Tantalus, is a Greek legendary person who inspired the name of this rare metal.

- **Tantalum applications:**

- **Sector of electronics:**

- The electronic industry is one that uses tantalum most frequently.
- Compared to other capacitor types, tantalum capacitors have the highest capacity to store electricity in smaller packages with minimal leakage.
- They are hence perfect for use in portable electronics like digital cameras, computers, and cellphones.

- **Alternative to platinum:**

- Tantalum is commonly used in place of more costly platinum because of its high melting point.
- used in a variety of parts and apparatuses:
- In addition, parts for chemical and nuclear power plants, aeroplanes, and missiles are made with the uncommon metal.
- Tantalum is used to produce surgical instruments and implants, such as prosthetic joints, because it does not react with body fluids.

- ***Source → The Hindu***

3 - Langlands Program:

GS III

Science and Technology

- **About the Langlands Programme:**

- The Langlands programme is a web of extensive and consequential conjectures about linkages between number theory and geometry in representation theory and algebraic number theory.
- It was proposed by Robert Langlands and aims to connect representation theory of algebraic groups over local fields and adeles with automorphic forms of Galois groups in algebraic number theory.
- The Langlands programme, widely regarded as the largest effort in contemporary mathematics study, has been likened to a grand, cohesive theory of mathematics.

- **The Program's main goal is to establish links between two disparate fields of mathematics:**

- **Theory of numbers:**

- The arithmetic study of numbers and their relationships is known as number theory.
- Pythagoras' theorem, which states that a2 + b2 = c2, is a well-known illustration of such a relationship.

- **Analysis of harmonics:**

- Periodic phenomena are of relevance to harmonic analysis.
- Harmonic analysts work with mathematical objects that are more continuous in nature, such as waves, as opposed to number theorists, who deal with discrete arithmetics (such integers).

- **Goal of the Initiative:**

- The inability to develop a generic formula to discover the roots of polynomial equations whose maximum power is larger than 4 was demonstrated in 1824 by Norwegian mathematician Niels Henrik Abel.
- The quadratic formula, which is used to solve quadratic equations, is an illustration of a general formula.
- The French mathematician Évariste Galois proposed a different approach for mathematicians to take: rather than concentrating on determining the exact roots of such polynomial equations, they should consider symmetry between roots.
- A set of roots symmetries of a polynomial equation is called a Galois group.

- The Langlands Programme aims to provide a bridge between number theory and harmonic analysis by connecting every Galois group with automorphic functions. This will enable mathematicians to use calculus methods to explore polynomial problems.
- Trigonometric and elliptic functions are generalised into automorphic functions.

- ***Source → The Hindu***

4 - 1962 Indo-China War:

GS II

International Issues

- **Important information:**

- India suffered great humiliation from the 1962 battle, which damaged the reputation of Jawaharlal Nehru, the country's first prime minister.
- China had won the war on all fronts, but its gains in territory were disproportionate.
- It did manage to take Aksai Chin in the west, but China withdrew twenty km east of the McMahon Line.
- China attacked India on October 20, 1962, in Ladakh and in the North-East Frontier Agency (then known as the McMahon Line).
- The Indian side made few preparations before the conflict began because they were sure it wouldn't break out.
- Given this thought, China stationed three regiments in the area of combat, whereas India only sent out two divisions.
- Additionally, the Chinese severed Indian phone lines, which prevented the defenders from communicating with their headquarters.
- China's official military history states that the conflict succeeded in achieving China's policy goals of border security in its western region.

- **Factors that fueled the conflict included:**

- **Proactive Strategy:**

- Many have accused Nehru of inciting China with his "Forward Policy."
- The Indian Army established outposts in areas that China disputes as part of the Forward Policy.
- Some have claimed that China's invasion and eventual loss of India were caused by these acts by an ill-equipped and unprepared army.

- **The Dalai Lama's refuge:**

- Others have noted that China's wish to be recognised as the uncontested leader of Asia and India's choice to offer the Dalai Lama asylum after he fled Tibet due to Chinese tyranny were the main causes of the war.

- **Mao Zedong's gains in politics:**

- A successful war was one strategy that was almost certain to restore Mao Zedong's popularity at a time when animosity against his Great Leap Forward policy to forcefully modernise and industrialise the nation was growing in China.

- **How did the conflict come to an end?**

- Barely a month passed during the 1962 conflict.

- **China assaulted India from two directions:**

- in the western part of Ladakh and
- in the Northeast Frontier Agency, which includes sections of modern-day Assam and Arunachal Pradesh, in the east.
- Its wins were quick and decisive on both fronts.
- It succeeded in taking control of the strategically significant Tawang (in what is now Arunachal Pradesh) and continued to advance.
- China issued a cease-fire declaration on November 21.

- **China announced a ceasefire; why?**

- **China's supply networks performed well:**

- As winter was about to arrive, China had managed to overstretch its supply lines through its own quick progress.

- **Indian Army's threat within Indian territory:**

- The Chinese soldiers were now closer to Indian territory, making the Indian Army a significantly more formidable foe.

- **Danger posed by a snowy winter:**

- It would be challenging for China to send supplies and reinforcements over the Himalayas and escape through the mountain routes once they were soon blocked by snow.

- **Foreign assistance to India:**

- Nehru requested assistance from the US and the UK after recognising the seriousness of the situation, and both countries complied.
- A tremendous international effort to assist India was under progress.
- This would have resulted in a battle that escalated beyond China's comfort zone.

- ***Source → The Hindu***