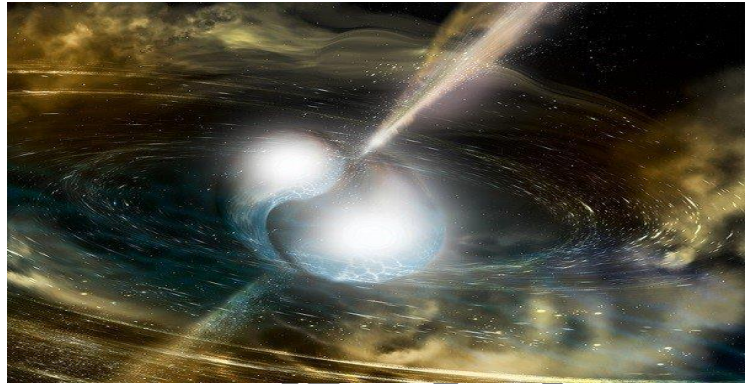# 1. Nucleosynthesis

Why in News?

- **Stellar nucleosynthesis** is the process by which stars forge elements inside their cores.
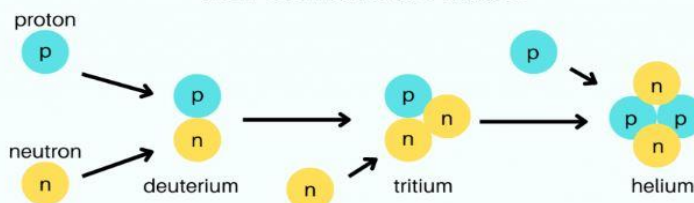
About

- Nucleosynthesis is the **process** by which elements are formed within **stars or during cosmic events like supernovae.**
  o Nucleosynthesis first occurred within a few minutes of the Big Bang.
- It's **crucial for understanding the origin** of elements in the universe.
- There are several types of nucleosynthesis:
  o **Big Bang Nucleosynthesis (BBN):** This occurred in the first few minutes after the Big Bang when the universe was hot and dense enough for nuclear reactions to occur. During BBN, light elements like hydrogen, helium, and a small amount of lithium were formed.
  o **Stellar Nucleosynthesis:** This occurs within stars through nuclear fusion reactions. Hydrogen fuses into helium in the core of stars like our Sun. More massive stars can continue this process, creating heavier elements up to iron through successive fusion reactions in their cores.
  o **Supernova Nucleosynthesis:** It refers to the process by which elements heavier than iron are formed during the explosive death throes of massive stars known as supernovae.
    ▪ When a massive star exhausts its nuclear fuel and undergoes a core collapse, or in the case of a white dwarf accreting material from a companion star and reaching the Chandrasekhar limit, a supernova explosion occurs.
  o **Cosmic Ray Spallation:** High-energy cosmic rays can collide with atomic nuclei in interstellar space, breaking them apart and creating new, lighter elements.

2. New Caledonia

Why in News?
French security forces are stepping up efforts to regain control of New Caledonia amid ongoing and deadly unrest.

About New Caledonia:

- It is a **French overseas collectivity** with **significant autonomy under** the terms of the **1998 Nouméa Accord.**
- It is located in the **southwestern Pacific Ocean**, about 900 miles (1,500 km) **east of Australia.**
- Unlike many Pacific islands that are of relatively recent volcanic origin, New Caledonia is an **ancient fragment of the Gondwana supercontinent**.
- It **comprises** the **main island of Grande Terre**, the **four Loyalty Islands** (Ouvéa, Lifou, Tiga, and Maré), the **Belep archipelago**, the **Isle of Pines,** and some **remote islands.**
- **Capital: Nouméa** (located on Grande Terre)
- **Population**:
  o Just over 270,000 people live in New Caledonia (2019). Approximately **39 percent are indigenous ('Kanak').**
  o The remainder are Caledonians of European, Polynesian, and other (including Vietnamese, Indonesian, and Algerian) origins.
- New Caledonians are **French and European citizens** with the **right to live anywhere inFrance**. They are **entitled to vote in** territorial and **French national elections**.
- The **President of the French** Republic **is New Caledonia's Head of State** and is **represented** in New Caledonia **by a High Commissioner.**
- It is **one of** the **European Union's (EU) Overseas Countries and Territories** (OCTs), but is **not part of the EU**, the **Euro, or Schengen zones**.
- The **Nouméa Accord(1998)** and **consequent Organic Law** (March 1999) **provide** the **constitutional framework** under which New Caledonia is governed. The Accord also **defines New Caledonia's relations with France** and

sets out a timetable for New Caledonia to assume responsibility for most areas of government.

New Caledonia is the **seat of the Secretariat of the Pacific Community**, formed by Australia, France, the Netherlands, New Zealand, the United Kingdom, and the United States in 1947 to promote economic and social stability in the countries of the South Pacific.

3. Generalized System of Preferences (GSP)

Why in News?

It is accepted wisdom that GSP renewal would offer an avenue for wide-ranging U.S.-India trade negotiations that can help in vaulting the bilateral trade relationship.

About Generalized System of Preferences (GSP):

- It was instituted in 1971 under the **aegis of the** United Nations Conference on Trade and Development. (UNCTAD)

- It is a **voluntary trade measure** implemented **by developed countries** that **provides an advantageous**, or **"preferential"**, **tariff treatment to imports from developing countries**.

- The preferences are in **the form of** either **elimination or reduction in customs duty** when the list of eligible products from the beneficiary developing country (BDC) is exported to the developed country.

- However, **an exporter** under the GSP **is required to fulfil the rules of origin** under the GSP scheme. The rules of origin are the criteria required to ensure that the product exported originates from the country of export and is not being diverted from another country.

- The GSP is a **unilateral customs duty preference scheme** i.e. there is **no need for** India or other **BDCs to provide reciprocal customs duty preferences** for the developed country.

- The **major countries who grant GSP** preferences to developing countries are Armenia, Australia, Azerbaijan, Belarus, **Canada**, **European Union (EU), Japan,** Kazakhstan, Kyrgyz Republic, New Zealand, Norway, **Russian** Federation, **Switzerland**, Tajikistan, Turkmenistan, Turkey, **United Kingdom (UK), United States (US),** and Uzbekistan.

- **Each** of these developed countries **has its own regulatory frame work under which it provides the GSP** tariff preferences.

- The GSP provided **also varies in terms of the product**s on which preferences are provided **and the developing countries exports to** which the tariff preferences are granted.

- In terms of trade volumes, the **GSPs** granted **by the EU and the US** are the **most comprehensive** and, hence, the most important for developing countries.
- **Some of the GSP** schemes **also provide additional tariff preferences to a** specified **class of developing countries,** with most providing the largest coverage of GSP customs duty preferences to exports from **Least Developed Countries (LDCs).**

India is one of the **primary beneficiaries** in terms of export volume realized under the GSP. **Around 40% of India's exports to the EU** are **under the EU GSP, while prior to the USGSP withdrawal**, around **10% of India's total exports to the US** were under the GSP.

4. MPLADS Scheme

Why In News?

- In the last 10 years, Delhi's MPs have not utilised the funds under the Members of Parliament Local Area Development (MPLAD) scheme.

What is MPLAD Scheme?

- **Introduced in:** September 1993.
- **Funded by:** Central Sector Scheme (Wholly Government of India).
- **Annual Entitlement:** 5 Crores.
- **Objective:** Enable the MPs to suggest and execute developmental works of capital nature.

Members of Parliament Local Area Development Scheme (MPLADS)

- **Funds Utilisation:** LS members can recommend works **within their Constituencies.**
  - o **Elected Members of RS** can recommend works **within the State of Election.**
  - o **Nominated Members** of both the houses can recommend works **anywhere in the country.**
- **Administration:** Ministry of Statistics and Programme Implementation.
- **Implementing Authority:** District Authority under DC/DM/Commissioner (Municipal)
- **Areas inhabited by Scheduled Caste and Scheduled Tribe:** At least 15 percent of the MPLADS entitlement for the year for SC & 7.5 per cent for areas for STs
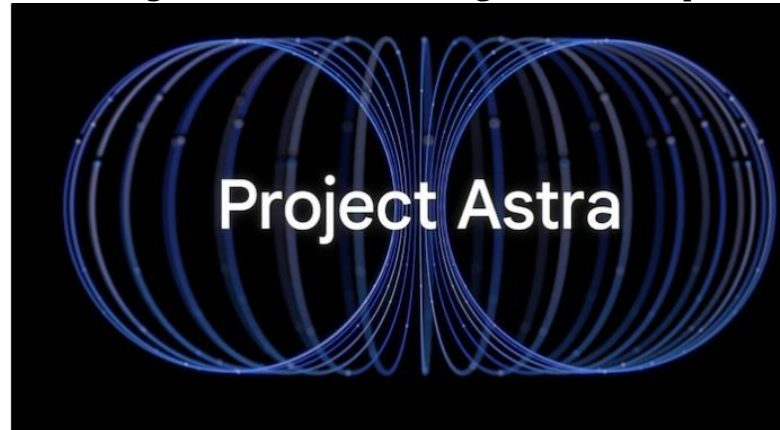
5. Project Astra

Why in News?

Recently, Google at the company's annual developer conference, presented an early version of Project Astra.

About Project Astra:

- It is a new **multimodal AI agent** developed by **Google.**

- It is capable of answering **real-time questions** fed to it through text, video, images, and speech by pulling up the relevant information.
- It can see the world, remember where one has left a thing and even answer if a computer code is correct by looking at it through the phone's camera.
- It even answers if a **computer code** is correct by looking at it through the phone's camera.
- It is more straight-forward, there is no range of emotional diversity in its voice.
- It is **not limited to smartphones**. Google also showed it being used with a pair of smart glasses.
- Project Astra can learn about the world, making it as close as possible to a human-assistant-like experience.

What is multimodal model AI?

- A multimodal model is a Machine Learning (ML) model that is **capable of processing information from different modalities**, including images, videos, and text.
  - For example, Google's multimodal model, Gemini, can receive a photo of a plate of cookies and generate a written recipe as a response and vice versa.
- This model expands on generative capabilities, processing information from multiple modalities, including images, videos, and text. Multimodality can be thought of as giving AI the ability to process and understand **different sensory modes.**