

11 Jan 2022: PIB Summary & Analysis

TABLE OF CONTENTS

1. [High Temperature Superconductors](#)
2. [World Hindi Day](#)
3. [Final Deliverable Configuration of MPATGM](#)
4. [AI driven Start-up](#)
5. [India-Korea Bilateral Trade Talks](#)

1. High Temperature Superconductors

Syllabus: GS 3, Achievements of Indians in Science and Technology

Prelims: High-Temperature Superconductors, Superconductivity

Mains: India's progress in the field of science and technology

Context: A [Swarnajayanti fellow](#) from the International Centre for Theoretical Sciences, Bengaluru takes an attempt to explore the frontiers of quantum materials related to high-temperature superconductors.

Aim of the study:

- This study intends to provide a generalised paradigm to understand the novel properties in quantum systems such as the collective behaviour of many interacting electrons, the magnetic properties and other areas of quantum mechanics.

Highlights of the study:

- An unusual phenomenon called **quantum entanglement** has been observed to play a key role in stabilising the electronic phases of matter in the materials that surround us.
- **Quantum Entanglement** - This is a complex phenomenon in the world of quantum mechanics that comes into play when two or more particles interact with each other irrespective of their distances in space resulting in the linkage between their quantum states.
- This phenomenon is considered the root cause for the emergence of newer collective behaviours of the electrons.
- There is a possibility that the property of quantum entanglement can be exploited for the creation of quantum analogues of computing bits.

- This exploratory research is supported by the Swarnajayanti fellowship which is instituted by the Department of Science and Technology to boost the studies related to strange metals and their quantum properties, semi-conductivity and superconductivity.

Significance of the study:

- This research will help to bridge the gap between theory and experiments of the electronic phases providing deep insights into the significance of quantum mechanics in shaping the behaviour of electrons in some strange metals.
- Promoting this study will offer a forward step towards a better understanding of the novel basic properties of nature, strengthening future technologies.

About High-Temperature Superconductors:

- High-temperature superconductors can be defined as the materials that become superconducting at temperatures above 77 Kelvin and can also be sometimes as high as 250K.
- They include materials that have critical temperatures higher than the boiling point of liquid nitrogen (-195.8°C). Recent discoveries have found many superconductors with critical temperatures below 77K.
- These are Type - II superconductors that allow magnetic fields to intrude their quantized units of flux. This means they require higher magnetic fields to suppress superconductivity.
- These superconductors are used in magnets that require a high current for a machine to run. For example, superconductors are used in MRI (Magnetic Resonance Imaging) machines.
- Most superconductors must be cooled to a temperature that is a few kelvins above absolute zero temperature. This is a very expensive procedure.
- The high-temperature superconductors had their first commercial use in electronic filters for cellular phones. Presently, they are used in experimental apparatus, thin films and are researched continuously.
- The Copper Oxide (CuO_2) planes in the materials exhibiting superconductivity contribute to their metallic properties.
- Studies have shown that in the direction perpendicular to the CuO_2 plane, when current is passed, a lower conductivity is shown which increases with temperature.
- **Bismuth strontium calcium copper oxide (BSCCO)** is currently a majorly used high-temperature superconductor.
- The ceramic superconductors can be cooled using liquid nitrogen and liquid helium is required for the cooling of metallic superconductors. Therefore, all high-temperature superconductors require a cooling system and none of them can be cooled using dry ice.
- So far, none of them has operated under room temperature and pressure.

Note:

The temperature at which and below which a material becomes a superconductor with zero resistivity is known as Critical Temperature.

2. World Hindi Day

Syllabus: GS 2, International Relations, Important International Institutions

Prelims: UNESCO, World Hindi Day

Mains: Importance of promoting Indian languages in the global platforms

Context: The permanent delegation of India to [UNESCO](#) announced on World Hindi Day which is celebrated every 10th of January that the World Heritage Centre of UNESCO has agreed to publish Hindi descriptions of [India's World Heritage Sites](#) on its website.

Importance:

- This historic decision of UNESCO has been perceived as a matter of pride and encouragement by India.
- Language acts as a sensitive component towards the establishment of strong and deep relationships with countries across the globe. The recognition offered to the Hindi language at the international level will reflect India's enriching culture and heritage in the midst of the international communities contributing to the togetherness of the Hindi speaking populations of the world.
- This would embolden the cultural aspect of our foreign policy that still entails the age-old practice of people to people contact.

Read more about [World Hindi Day](#) in the linked article.

3. Final Deliverable Configuration of MPATGM

Syllabus: GS 3, Indigenisation of Technology

Prelims: DRDO, Features of MPATGM

Context: The indigenous Man-Portable Anti-tank Guided Missile (MPATGM) has been successfully flight-tested by [DRDO](#).

Important Facts:

- The missile was launched from a man-portable launcher integrated with a thermal site. The test was successfully completed with precision and has been validated for the minimum range prior to which the maximum range testing has been completed.
- The missile system possesses a state-of-the-art miniaturised infrared imaging seeker along with advanced avionics.
- The MPATGM has been launched using a tripod offering a maximum range of 2.5 km with a launch weight of less than 15 kg.
- It is a low weight “fire and forget” missile.
- The missile impacted the target and destroyed it.

Read more about [Anti Tank Missiles](#) in the linked article.

4. AI driven Start-up

Syllabus: GS 3, Science and Technology- developments and their applications and effects in everyday life

Prelims: Artificial Intelligence, IoT

Mains: Role of technology in the achievement of developmental goals

Context: An Artificial Intelligence-driven start-up was launched by an IIT alumnus in order to provide clean drinking water at a reasonable price. This start-up ensures to deliver innovative technology towards water purification.

Key Highlights:

- An MoU has been signed between Technology Development Board (TDB) and Swajal Water Private Limited (the start-up).
- It has been emphasised that cooperation from the private sector is a requisite to fulfilling the target of providing 14 crore households with clean water access.
- The company intends to make reliable clean drinking water available to the communities at an affordable rate.

- This is for their project on [IoT](#) (Internet of Things) enabled point of use Solar Water Purification Unit for slums, villages and high utility areas.
- The start-up will be facilitated with financial support by the TDB which is a statutory body under the Government of India that aims to promote and commercialise indigenous technology.
- This initiative is in line with the ambitious target of achieving clean drinking water for all by 2024.
- A massive boost will be experienced by the [Jal Jeevan Mission](#) under which half a crore families started getting tap water. This also expands the effectiveness of the “Har Ghar Nal Se Jal” mission.

Use of Artificial Intelligence:

- The start-up uses a 'clairvoyant' system which is patented to optimise purification systems and predict future breakdowns by using artificial intelligence.
- Remote management, update and repair of the purification system will be ensured along with real-time monitoring.
- It has been proposed that solar energy will be used to pump water from rivers, wells, ponds or groundwater depending on the location.

Read more about [Artificial Intelligence](#) in the linked article.

5. India-Korea Bilateral Trade Talks

Syllabus: GS 2, International Relations, Bilateral agreements involving India's interests

Prelims: CEPA

Mains: Significance of the bilateral talks in improving India's trade deficits

Context: India and South Korea held bilateral trade talks involving the Ministry of Trade and Commerce of both countries.

Area of focus:

- The trade talk intended to focus on key challenges like trade deficit, market access issues and non-tariff barriers faced by Indian exporters along with investment-related issues.
- The bilateral talks envisaged to strengthen the trade ties between the countries and make the bilateral relationship equitable and balanced to the mutual advantage.

Elements of the talk:

- The issue of stringent regulatory norms in Korea that obstruct market access has been raised as a major concern by certain industry groups.
- There are difficulties in market access in Korea for products such as bovine meat, grapes, pomegranate, okra and eggplants.
- Attempts have been made to provide concessions from both sides to establish an easy and flexible trading ecosystem.
- India also sought investments from Korean companies in sectors like semiconductors, chemical batteries for e-vehicles and technical textiles.
- The introduction of a tariff-rate quota (TRQ) arrangement for the import of rice in the Korean market has been allocated to importing partners like China, Vietnam, USA, Thailand and Australia. As a result, a very less quantity of rice to be imported is left for countries like India.
- The Indian textile exporters face the challenge of getting the Korean certification mark.
- There is a large barrier that India faces to access the Korean steel market as experts identify that Korean steel companies prefer to do business with firms with which they already have business ties. Over the years, India's share in total steel exports to the Republic of Korea has been extensively low.

The Comprehensive Economic Partnership Agreement (CEPA):

- In the 2008-09 period, the trade deficit between India and Korea stood at USD 5 billion and increased to USD 8 billion in 2020-21.
 - Both the countries decided to implement CEPA which is a free trade pact that was formulated in January 2010.
 - The bilateral trade stood at USD 17.5 billion in 2010-21 with an inclination to the Korean side.
 - Through the recently held talks between the bilateral partners, discussions have been made to upgrade CEPA, revamp the trade issues and promote policies that would benefit both partners.
 - An ambitious target has been set to enhance the India-Korea trade to USD 50 billion before 2030.
-