ForumIAS

# Science & Tech.

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## 1) SPACE

### a) Space Debris

**News:**

A new device named Space Harpoon that captures junk has been tested successfully.

**Facts:**

- It is part of the Remove DEBRIS project, a multi-organization European effort.
- The Remove Debris satellite platform has four methods for release, capture and deorbit of space debris Net capture, Harpoon Capture, Vision-based navigation and De-orbiting process.
- The Space Harpoon is meant for larger targets, for example full-size satellites that have malfunctioned and are drifting from their orbit.

**Other facts:**

- Space debris encompasses both natural (meteoroid) and artificial (man-made) particles.
- The term Kessler syndrome is associated with Space Debris, which is used to describe a self-sustaining cascading collision of space debris in Low Earth Orbit (LEO).

### b) PSLV-C44

**News:**

India's Polar Satellite Launch Vehicle (PSLV-C44) successfully injected Microsat-R and Kalamsat-V2 satellites into their designated orbits.

**Facts:**

- It was lifted off on January, 2019 from the First Launch Pad at Satish Dhawan Space Centre, Sriharikota.
- It was PSLV's 46th flight.
- Microsat-R, a military imaging satellite, whereas Kalamsat is the payload developed by students and Chennai based Space Kidz India.
- PS4, the fourth stage of this vehicle would be moved to higher circular orbit so as to establish an orbital platform for carrying out experiments.
- The Kalamsat will be the first to use the rocket`s fourth stage as an orbital platform.

**Other facts:**

- Klamsat-V2 will be the world's lightest satellite.

- PSLV is a four-stage launch vehicle with alternating solid and liquid stages.
- Last year, ISRO successfully injected India's earth observation satellite HysIS onboard PSLV C43 into its designated orbit.

**c) Ultima Thule**

**News:**

NASA's New Horizons spacecraft recently flew past a distant object Ultima Thule.

**Facts:**

- It is a Kuiper Belt object and the farthest object ever explored.
- The object is officially named 2014 MU69.
- It is contact binary that is single object with two lobes attached gently.
- NASA dubbed the larger lobe as Ultima and three times smaller lobe as Thule.
- It gives the scientists an unprecedented opportunity to investigate the surface, as well as the origin and evolution.

**Other facts:**

- The Kuiper belt occasionally called the Edgeworth–Kuiper belt, is a circumstellar disc in the outer Solar System, extending from the orbit of Neptune (at 30 AU) to approximately 50 AU from the Sun.
- It consists of icy objects, which are remnants from the formation of the solar system.
- Pluto is also a part of the Kuiper Belt.
- New Horizons is the first mission to explore the Kuiper belt.

**d) SPHEREX**

**News:** NASA has announced the launch of a new telescope Spectro-Photometer for the History of the Universe, Epoch of Reionization and Ices Explorer (SPHEREX) in 2023.

**Facts:**

- It is part of NASA's Explorer Program.
- It has a twofold aim: to understand the evolution of the universe and to explore how common the ingredients for life are in our galaxy.
- It will survey the entire sky every 6 months in optical as well as near-infrared light, creating the first spectral all-sky survey at infrared wavelengths.
- It will be placed in a Low-Earth polar orbit, also known as a Sun-synchronous orbit.

**e) HIPPOCAMP**

**News:**

The International Astronomical Union (IAU) has assigned the name Hippocamp to Neptune's smallest moon S/2004 N1 discovered in 2013.

**Facts:**

- "Hippocamp" is a horse-headed, fish-tailed creature in Greek mythology.
- Except Earth, all of the planets in our solar system have names derived from Greek or Roman mythology.
- Natural satellites are also named after greek or roman mythology but Uranus here is an exception.

**Other facts:**

- IAU is an International Association of Professional astronomers active in professional research and education in astronomy.

**f) X-Calibur**

**News:**

X-Calibur, a telescope, which was recently launched from Antarctica.

**Facts:**

- The telescope aims at analyzing X-rays arriving from distant neutron stars, black holes and other exotic celestial bodies.
- The telescope was launched by Washington University in the US from the McMurdo Station in Antarctica.
- It was carried on a helium balloon intended to reach an altitude of 130,000 feet.
- Its prime observation target will be Vela X-1, a neutron star in binary orbit with a supergiant star.
- The telescope will test two most important theories of modern physics: Quantum Electrodynamics and General Relativity.

**Other facts:**

- Neutron stars are objects of very small radius (typically 30 km) and very high density, composed predominantly of closely packed neutrons.

- It is formed by the gravitational collapse of the remnant of a massive star after a supernova explosion.

**g) UNNATI**

**News:**

ISRO launched a capacity building programme on Nanosatellite development named UNNATI (UNispace Nanosatellite Assembly and Training by ISRO).

**Facts:**

- The programme will commemorate the 50th anniversary of the first UN conference on the exploration and peaceful use of outer space (UNSPACE+50).
- It will enable participating developing countries to strengthen assembling, integrating and testing of Nano satellite.
- The programme is scheduled to be conducted in three batches.

**Other facts:**

- Nano satellites are satellites in the mass range of 1-10 kg.
- These satellites can reduce the cost of launching satellites.

**h) EMISAT**

- ISRO's Polar Satellite Launch Vehicle (PSLV), in its 47th mission (PSLV-C45) has launched EMISAT, from Satish Dhawan Space Centre, Sriharikota in coastal Andhra Pradesh. EMISAT is India's first electronic surveillance satellite.
- EMISAT is a satellite built around ISRO's Mini Satellite-2 bus weighing about 436 kg. It has been jointly developed by ISRO and Defence Research and Development Organization (DRDO). It has been developed under DRDO's Project Kautilya which aims to boost India's space surveillance capacity.
- The satellite is intended for electromagnetic spectrum measurement. It will provide location and information of hostile radars and sensors deployed along the Indian borders. It will also help in knowing exact topography of enemy areas and detect communication devices active in an area.
- Space-based electronic intelligence or ELINT from the EMISAT is an addition to India's current land or aircraft-based ELINT, and will help India's intelligence agencies better monitor hostile activities in border areas.
- The PSLV-C45 mission has marked several "firsts" for ISRO. For the first time, ISRO has placed the satellites and payloads in three different orbits.



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1) Automatic Identification System (AIS) from ISRO-AIS is intended for Maritime satellite applications which would capture messages transmitted from ships.
2) Automatic Packet Repeating System (APRS) from AMSAT (Radio Amateur Satellite Corporation)- ARIS would study the structural and composition studies of ionosphere.
3) Advanced Retarding Potential Analyzer for Ionospheric Studies (ARIS) from Indian Institute of Space Science and Technology (IIST). -AMSAT is intended to assist amateur radio operators in tracking and monitoring position data.

- A new variant of the rocket, PSLV-QL, with four strap-on boosters has been used for the launch for the first time.
- It is also the first time PSLV fourth stage (PS4) used solar panels to support payloads hosted on it.
- It is also the first time that ISRO invited common people to view the launch.
- EMISAT will have the following characteristics (a)they help monitor the activities of enemy radars and sensors deployed along the border (b) know the exact topography of enemy areas (c)find out how many communication devices are active in an area and (d)will help India's intelligence agencies monitor hostile countries in its neighbourhood.
- The PSLV is a four-stage engine expendable rocket with alternating solid and liquid fuel. In its normal configuration, the rocket will have six strap-on motors hugging the rocket's first stage. ISRO selects the kind of rocket to be used based on the weight of the satellites it carries.

**i) Mission Shakti**

- Defence sources have said that debris from anti-satellite missile test are expected to disintegrate in 45 days. India has assured that that there will be no space debris left as the test was conducted in the lower atmosphere. Being in the Low Earth Orbit, the debris would fall towards earth and burn up as soon as they enter the atmosphere.
- Recently, India has successfully demonstrated Mission Shakti, an anti-Satellite (ASAT) missile test. The Mission was carried out by shooting down Microsat-R with a modified exo-atmospheric missile of the ballistic missile defence at an altitude of 300 km. Microsat-R is an imaging satellite which was launched by ISRO using a Polar Satellite Launch Vehicle (PSLV) in January 2019.
- North American Aerospace Defence Command (NORAD) has said that the satellite had disintegrated into at least 270 pieces and have reported to have been tracking the space debris.

- Space debris are artificial material that is orbiting Earth but is no longer functional. They consist of dead satellites, spent rocket motors, nuts and bolts etc. Space debris is a threat to active satellites and spaceships as they pose risk of collisions.
- In the backdrop of the success of Mission Shakti, an ASAT missile testing, the USA has said that India and USA would continue to pursue shared interests in space and scientific and technical cooperation. In 2016, USA had designated India uniquely as Major Defense Partner'.
- The USA has also raised concerns over space debris and reported to have been tracking space debris from Mission Shakti. However, India has assured that that there will be no space debris left and the debris would die down in 45 days. This is because the test was conducted in the lower atmosphere. A low-orbit satellite was shot down using anti-satellite (ASAT) missile.
- Low earth orbit refers to an altitude up to 2,000 km. A satellite in LEO can monitor activities on the ground and water surfaces. Such a satellite can be used for espionage and pose a serious threat to the country's security in the instances of war. The anti-satellite missile that was fired by DRDO can incapacitate or completely destroy the satellite in the LEO range.
- Mission Shakti was significant because (a)It brings India in the select league of nations that claim to have anti-satellite weapons. Only the United States, China and Russia have demonstrated this capability till now. Israel is also said to possess this capability though it has not carried out a test so far and (b)The satellite is entirely Made in India by the Defence Research & Development Organisation (DRDO).
- According to the database from the Union of Concerned Scientists, a non-government organisation based in the United States, says that there are at least five known Indian satellites in LEO which are India PiSat, Resourcesat 2, Radar Imaging Satellites 1 and 2 and SRMsat.
- No country has used an A-SAT against another nation till date. In all the instances, the nation's testing anti-satellite missiles have targeted one of their defunct satellites to showcase their space warfare capabilities.

**j) Hayabusa2 spacecraft**

- The Japan Aerospace Exploration Agency has said that its Hayabusa2 spacecraft will drop an explosive on the asteroid Ryugu to make a crater. It would do so collect underground samples for possible clues to the origin of the solar system.
- In February, the Hayabusa2 spacecraft had successfully touched down on the boulder-rich asteroid Ryugu. It had then collected some surface fragments.

- Hayabusa 2 is a Japanese spacecraft launched in December 2014 on a six-year mission. It seeks to study the asteroid Ryugu and to collect samples to bring to Earth for analysis. It will bring the asteroid sample to Earth in 2020.
- Asteroid Ryugu is a near-Earth object and a potentially hazardous asteroid of the Apollo group. A near-Earth object (NEO) is any small Solar System body whose orbit brings it to proximity with Earth. A potentially hazardous object is a NEO (asteroid or a comet) with an orbit that can make exceptionally close approaches to the Earth. It is large enough to cause significant regional damage in the event of impact. The Apollo asteroids are a group of near-Earth asteroids named after 1862 Apollo. 1862 Apollo is an asteroid discovered by German astronomer Karl Reinmuth in 1930s.
- The Hayabusa2 mission is a follow-up to Japan's original Hayabusa mission which took samples from asteroid Itokawa. It was the first spacecraft to take samples from an asteroid and also the first mission to successfully land and take off from an asteroid. It returned the samples from asteroid to Earth in 2010.

**k) SpaceX's Crew Dragon capsule**

- SpaceX successfully launched a new astronaut capsule to the International Space Station(ISS). It is a key step towards resuming manned space flights from U.S after an eight-year break. The only occupant on board of SpaceX's Crew Dragon capsule was a dummy named Riple.
- This mission is called as Demonstration Mission-1 or DM-1 where Crew Dragon test capsule is scheduled to take off in falcon 9 rocket to the ISS.
- The International Space Station (ISS) is a space station, or a habitable artificial satellite, in low Earth orbit. The ISS programme is a joint project among five participating space agencies: NASA(USA), Roscosmos (Russia), JAXA(Japan), ESA (European Union) and CSA (Canada).
- SpaceX is a space technologies company founded by Elon Musk. It has developed the Falcon 1 and Falcon 9 launch vehicles, both designed to be reusable, thus reducing the cost of launch.
- Falcon 9 is a two-stage rocket model designed to allow the transportation of satellites and cargo into orbit. The Dragon Spacecraft module – a free flying spacecraft which holds the cargo – is attached to the top of the Falcon 9.

## 2) IT AND COMPUTER

**a) Param Shivay**

**News:**



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PARAM Shivay, the first super computer designed & built under the National Supercomputing Mission by C-DAC (Center for Development of Advanced Computing).

**Facts:**

- It was launched at IIT-BHU.
- The National Supercomputing Mission, launched in 2015, envisages empowering our national academic and R&D institutions of the country by installing a grid comprising of more than 70 high-performance computing facilities.
- The Mission would be implemented jointly by the Department of Science and Technology (DST) and Department of Electronics and Information Technology (DeitY) for over a period of seven years, through the C-DAC and Indian Institute of Science (IISc), Bengaluru.
- Applications: Climate Modelling, Computational Biology, Atomic Energy Simulations, National Security/ Defence Applications, Disaster Simulations and Management, Computational Material Science and Nanomaterials, Cyber Physical Systems, Big Data Analytics etc.
- The Mission also includes development of highly professional High Performance Computing (HPC) aware human resource to be able to operate the supercomputer facility. PARAM Shavak is one such machine that has been deployed to provide training.

**Other facts:**

- It is the premier R&D organization of the Ministry of Electronics and Information Technology (MeitY) for carrying out R&D in IT, Electronics etc.
- PARAM 8000, first supercomputer of India, was built by CDAC.
- Top 500 Project: It was started in 1993 and ranks the 500 most powerful non-distributed computers in the world based on the LINPACK benchmark.
- This list of supercomputers is published twice a year.
- Currently, China dominates the list with 229 supercomputers out of 500 while since June 2018, the American "Summit" is the world's most powerful supercomputer.
- India has 4 supercomputers in the Top-500 list of supercomputers with Pratyush and Mihir being the fastest supercomputers in India.

**b) Conference on 30 years of World Wide Web**

- During the conference on 30 years of World wide web,Berners-Lee said that the web is not the web we wanted in every respect.He said that he sees three sources of problems

affecting today's web.These are (a)state-sponsored hacking and attacks (b)criminal behaviour and (c)online harassment.

- Tim Berners-Lee, a British scientist, invented the World Wide Web (WWW) in 1989, while working at CERN, the European Organisation for Nuclear Research. The web was originally conceived and developed to meet the demand for automated information-sharing between scientists in universities and institutes around the world.
- The World Wide Web (WWW) commonly known as the Web, is an information space where documents and other web resources are identified by Uniform Resource Locators(URL). URL's may be interlinked by hypertext, and are accessible via the Internet. URL (Uniform Resource Locator) is a kind of 'address' that is unique to each resource on the web. It could be the address of a webpage or an image file.
- WWW should not be confused with the internet, which is a huge network of computers connected together. On the other hand, World Wide Web is an online application built upon innovations like HTML language, URL addresses and hypertext transfer protocol(HTTP).
- HTML (Hyper Text Markup Language) is the publishing format for the web. It includes the ability to format documents and link to other documents and resources. HTTP (Hypertext Transfer Protocol) allows HTML documents to be requested and transmitted between browsers and web servers via the Internet.

## 3) DEFENCE AND AVIATION

### a) Solid Fuel Ducted Ramjet

**News:**

DRDO successfully flight tested the indigenously developed 'Solid Fuel Ducted Ramjet (SFDR)' propulsion-based missile system.

**Facts:**

- SFDR is an Indo-Russian R&D project which has been established to develop a long-range air-to-air missiles and a surface-to-air missile system.
- The Defence Research Development Laboratory (DRDL), Hyderabad is the leading agency for the collaborative mission project.
- SFDR technology, based on the ramjet propulsion system.
- The solid ramjet fuel is 100% fuel and obtains oxidizer from air, thus providing greater impulse.

- This air breathing ramjet propulsion technology enables missile propulsion at high supersonic speeds (above Mach 2) for engaging targets at long ranges.

**Other facts:**

- Ramjet and Scramjet:
- Ramjet engine does not have any turbojet engines, it achieves compression of intake air just by the forward speed of the air vehicle whereas a Scramjet engine is an improvement over the ramjet engine as it efficiently operates at hypersonic speeds and allows supersonic combustion.
- Thus scramjet is known as Supersonic Combustion Ramjet, or Scramjet.

**b) Landing Craft Utility(LCU) L56**

- Indian Navy has inducted landing craft utility (LCU) L56.It is the sixth indigenously designed and built transport ship. The warship was built and designed by Garden Reach Shipbuilders & Engineers Limited (GRSE), Kolkata.
- The ship can accommodate 216 personnel and is equipped with two indigenous Closed Range Naval(CRN) 91 guns. Further, the ship is fitted with state-of-the-art equipment and advanced systems such as Integrated Bridge System (IBS) and Integrated Platform Management System.
- The Landing Craft Utility ship can help in Amphibious operations capability including transport of troops and equipment will also be enhanced. The ship will be stationed at Andaman and Nicobar Islands,
- Garden Reach Shipbuilders & Engineers Limited(GRSE) has emerged the first Indian shipyard to make and deliver 100 warships to the Indian Navy, Indian Coast Guard and Mauritius Coast Guard.

**c) 'Abhedya'**

- Chief of Naval Staff inaugurated the nuclear, biological and chemical training facility(NBCTF) 'Abhedya' at INS Shivaji in Lonavala, Maharashtra. This facility has been built by Goa Shipyard Limited.
- The word "Abhedya" means 'impenetrable'. It symbolises the protective cover that is provided on naval ships fitted with nuclear, biological and chemical detection and protection systems.
- This training facility will assist Indian Navy in providing realistic simulation of Nuclear, Chemical and Biological (NBC) warfare to its personnel during their NBC damage



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control training. It will train in detecting, monitoring, surveying and decontaminating areas using actual NBC equipment by providing real time NBC scenarios.

- INS Shivaji is a premier Technical Training Establishment of Indian Navy that trains officers and sailors of marine engineering branch and equips them with professional skills and expertise. It is located in Lonavala, Maharashtra.
- INS Shivaji already has two simulators for damage control and fire fighting on board and NBCTF will be the third simulator. Simulators are equipped with advanced sensors, which can detect and measure the exact contamination of NBC components in water and air, and can be used for training on how to nullify ship compartments and operate in case of a nuclear, chemical or biological attack.

**d) CH-47 Chinook**

- The Indian Air Force has inducted four CH-47 Chinook choppers from the United States. The Chinook choppers will be used for various military purposes including deploying of troops and machinery at high-altitude locations along the India-Pakistan border.
- Chinook helicopters are an advanced multi-role, vertical lift military helicopter manufactured by US aerospace company Boeing. It is twin-engined, tandem rotor, heavy-lift helicopter. It is named after Native American Chinook people of modern-day Washington state of US. The helicopter can carry out military operations not only during the day but at night too.
- The features of Chinook helicopter include (a)fully integrated digital cockpit management system (b)capacity to carry maximum payload capacity of 11 tonnes and 45 troops (c)capable of transporting fully-equipped infantry soldiers for specialised operations (d)highly manoeuvrable, which makes it suitable for operating in tough, dense terrain and (e)24X7 all-weather operational capabilities.
- These helicopters are majorly used for (a)airlifting artillery guns (b)battlefield resupply and (c)transportation of troops. These are also used for humanitarian and disaster relief operations such as transportation of relief supplies and mass evacuation of refugees.
- The induction of Chinook is significant as it will not only augment air force's heavy lift capability for military tasks but is a vital addition for the construction of strategic roads and infrastructure projects on the border.

**e) VC 11184**

- The sea trials of India's missile tracking ocean surveillance ship for Indian navy has received great response.



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- The missile tracking ship VC 11184 has been built by Hindustan Shipyard Limited (HSL). It has the capacity to carry 300-strong crew with hi-tech gadgets and communication equipment. It is powered by two diesel engines and a large deck capable of helicopter landing.
- This is the first of its kind ocean surveillance ship being built as part to strengthen the country's strategic weapons programme. After induction of this ship, India will join elite of club of few countries that have such sophisticated ocean surveillance ship. Only four other countries which are US, Russia, China and France are operating similar vessels.

**f) Boeing 737 MAX 8**

- Experts have raised questions on the design of Boeing 737 MAX 8. The questions have been raised as the entire global fleet of Boeing 737 Max 8 planes has been grounded.
- The decision on grounding of planes comes in the backdrop of the recent Ethopian Airlines crash. On 10 March 2019, A 737 MAX 8 aircraft operated by Ethiopian Airlines had crashed near Addis Ababa killing 157 people.
- Experts have said that problem is with the installed MACS on the new Boeing 737 MAX. The Maneuvering Characteristics Augmentation System (MCAS) is an automated safety feature on the plane designed to prevent the plane from entering into a stall, or losing lift.
- Angle of attack sensors on the aircraft tell the MCAS to automatically point the nose of the plane down if it is in danger of going into a stall.The pilots of the Ethiopian Airlines struggled to control the aircraft as the automated MCAS system repeatedly pushed the plane's nose down following takeoff.
- The Boeing 737 MAX is an American narrow-body aircraft series designed and produced by Boeing Commercial Airplanes

**g) PINAKA guided WEAPON rocket system**

- Defence Research and Development Organisation(DRDO) successfully test fired the PINAKA guided WEAPON rocket system from Pokhran range in Rajasthan.
- Pinaka rocket systems was named after Pinaka, the bow of Lord Shiva.
- Pinaka Mark I is an indigenous multi-barrel unguided rocket launch system for firing of multiple warheads. It was used in the 1999 Kargil conflict. It has a range of 40 km.
- Pinaka Mark I was later transformed in to a short-range precision guided missile and thus renamed as Guided Pinaka – Mark II. It has high accuracy and equipped with a navigation, guidance and control system with a range of 70 to 80 km.

- The weapon system is equipped with state-of-the-art guidance kit comprising of an advanced navigation and control system. The unique feature of the Pinaka versions tested is the integrated avionics system. It consists of an (a)on-board mission computer (b)miniaturised navigation system and (c)telemetry.

**h) Sukhois (Su-30)**

- According to a report, Sukhois (Su-30) couldn't be stationed in forward areas near Line of Control(LOC) during Aerial Combat between India and Pakistan. It was because of bureaucratic delay in constructing 'hard shelter's also known as 'blast pens'.
- Blast pens are shelter to house fighter-type aircraft and provide protection to the aircraft from attack by conventional weapons or damage from high winds or other elemental hazards. It is also called as an aircraft shelter and a hardened aircraft shelter.
- The Indian Air force(IAF) got the first batch of Su-30s from Russia in 1996 and has since contracted 272 aircraft, of which 240 have been inducted. But the construction of blast pens was not included in the original deal with Russia.
- The Sukhoi Su-30 is a twin-engine, two-seat supermaneuverable fighter aircraft developed by Russia's Sukhoi Aviation Corporation. It is a multirole fighter for all-weather, air-to-air and air-to-surface deep interdiction missions.
- The Sukhoi Su-30MKI is a variant of the Sukhoi Su-30 twinjet multirole air superiority fighter developed by Russia's Sukhoi and built under licence by India's Hindustan Aeronautics Limited (HAL) for the Indian Air Force (IAF).

**i) Akula-class nuclear-powered submarine**

- India has signed a $ 3.3 billion deal with Russia to take third Akula-class nuclear-powered submarine on lease for 10 years. The submarine is expected to join the Indian Navy by 2025.It will be fitted with Indian systems to validate them for the indigenous submarines.
- The submarine will be called Chakra-3 and will replace Chakra-2, whose 10 years lease is set to expire by 2022.However, the lease of Chakra-2 is expected to be extended for another five years to have sufficient time for the Chakra-3 to come on board.
- Akula-class nuclear powered Submarine(SSNs) are a part of the navy's combat fleet. They are propelled by a nuclear reactor, but do not carry nuclear weapons. These vessels can remain underwater for months, making them almost impossible to detect and are a big deterrence for enemy vessels in the region. Their weapons load consists of land attack and anti-ship missiles, and torpedoes to sink enemy shipping.

- India has also indigenously designed and built a nuclear-propelled, nuclear ballistic missile submarine (SSBN), called INS Arihant. They are armed with nuclear-tipped ballistic missiles that are the underwater leg of nuclear Triad. Nuclear triad means the capability of delivering nuclear weapons by aircraft, land based ballistic missiles and submarine launched missiles.

**j) Maritime surveillance centre in India**

- The French space agency, National Centre for Space Studies (CNES), has signed an agreement with the Indian Space Research Organisation (ISRO) to set up a maritime surveillance centre in India.
- The two nations will initially share data from their present space systems and develop new algorithms to analyse them. They will then build a constellation of low earth orbiting satellites for maritime surveillance intended to identify and track ships in the Indian Ocean.
- This development comes a year after French President and Indian Prime Minister signed a 'Joint Vision for Space Cooperation'. Besides France, India had also signed an agreement with Russia for India's human space mission project 'Gaganyaan'. This project aims to send three Indians to space by 2022.
- India and France had earlier formed a working group to explore ways to cooperate on the Gaganyaan project. The scope of the cooperation includes giving ISRO the access to space hospital facilities in France and combining the expertise of the two countries in the field of (a)space medicine (b)astronaut health monitoring (c)life support radiation protection and (d)space debris. Further, experts from ISRO will receive training for the 'Gaganyaan' project at the Toulouse Space Centre in France.
- The next phase of the programme will be based on orbital infrastructure to be jointly operated by two countries. The two agencies have already put up two climate and ocean weather monitoring satellites Megha-Tropiques (of 2011) and SARAL-AltiKa (2013). These satellites will be supplemented with the launch of Oceansat-3-Argos mission in 2020 and a future joint infrared Earth-observation satellite.

**k) Mirage-2000 fighter jets**

- India with its Mirage-2000 fighter jets and other weapons has decimated multiple terror camps across the Line of Control in Pakistan.
- A dozen of Mirage-2000 were used, accompanied by four Sukhoi Su-30 aircraft. Sukhoi which is Russian origin aircraft acted as protective sheets were meant to provide cover if the Mirages were intercepted.

- The Israeli Phalcon Airborne Warning and Control System (AWACS) and the indigenous Netra Airborne Early Warning and Control System Aircraft (AEW&C) aircraft were deployed to monitor the mission to show that no aircraft was within 100 km while the operation was carried out.
- The Mirage-2000 which were armed with SPICE-2000 and Crystal Maze Mark2, also known as AGM 142 Popeye missile.
- The Israeli-built Popeye is a medium-range conventional missile which can be fired from a stand-off distance of around 90 km, i.e., the aircraft doesn't need to be vertically above the target to hit it.
- The SPICE (Smart Precise Impact and Cost Effective guidance kit)-2000 is a forward and tail kit evolved by Israel from the Popeye missile, mounted on a standard 2000-pound Mk 84 unguided bomb. This converts it into smart guided air-to-surface munition that can be dropped from a stand-off distance of up to 60 km. It is a "fire and forget" weapon that automatically goes to its target once launched relying only on its navigation/seeker system.
- The Heron Unmanned Aerial vehicle (UAV) was used for monitoring and assessment of the target. Two IL-78 mid-air refuelling tankers were also used during the operations by the Mirage-2000 and Sukhoi Su-30 aircraft after the target was hit to return to various separate air bases.

**l) INS Kadmatt:**

- INS Kadmatt is participating in Langkawi International Maritime and Aerospace Exhibition (LIMA)-19 which was held in Langkawi, Malaysia.
- INS Kadmatt is an indigenous stealth anti-submarine warfare corvette. It was commissioned into the Indian Navy in January 2016.It is named after one of the large islands amongst the Lakshadweep group of Islands off the west coast of India.
- The ship is fitted with state-of-the-art weapons, sensors and machinery and is also designed to embark the Seaking anti-submarine helicopter. INS Kalvari and INS Kandheri are two other Anti-Submarine Warfare corvette of Indian Navy.
- Langkawi International Maritime and Aerospace Exhibition (LIMA) is a maritime and aerospace exhibition that takes place once every two years in Langkawi, Malaysia. The event is one of the largest maritime and aerospace exhibitions in the Asia-Pacific. It is focused mainly on the defence industry, but also supports civilian industries.
- Anti-submarine warfare (ASW) is a branch of underwater warfare that uses surface warships, aircraft or other submarines to find, track, and deter, damage, or destroy



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enemy submarines. Successful anti-submarine warfare depends on a mix of sensor and weapon technology, training and experience.

**m) Scorpene Submarine:**

- Indian Navy is ready to induct INS Khanderi. It is the second of six planned Scorpene-class submarines. INS Khanderi is named after Maratha king Chhatrapati Shivaji's island fort Khanderi.
- Scorpene class submarines is a class of diesel-electric submarine being built under Project-75 by Mazgaon Docks Limited (MDL) with technology transfer from France. It features diesel-electric propulsion and an additional air-independent propulsion (AIP) system. It will have both anti-surface and anti-submarine warfare.
- Conventional diesel-electric submarines have to come to surface every few days to get oxygen to recharge their batteries. With AIP systems, they can stay submerged for much longer periods.
- A submarine is a watercraft capable of independent operation underwater. A submarine is the quietest military platform and extremely tough to detect. Their main cover is their ability to move stealthily under water and keep an eye on enemy movement of vessels.
- Indian Navy currently operates four German HDW class submarines and nine Russian Kilo class submarines.

**n) LCA Tejas fighter aircraft:**

- Langkawi International Maritime Aero Expo (LIMA-2019) is being held in Langkawi, Malaysia. The Indian Air Force is participating in the Maritime Aero Expo for the first time during which it will showcase its indigenously developed LCA Tejas fighter aircraft.
- Langkawi International Maritime and Aerospace Exhibition (LIMA) is a maritime and aerospace exhibition that takes place once every two years in Langkawi, Malaysia. The event is one of the largest maritime and aerospace exhibitions in the Asia-Pacific. It is focused mainly on the defence industry, but also supports civilian industries.
- The LCA Tejas is an Indian single-seat, single-jet engine, multi-role light fighter. Its design is highly manoeuvrable, with a tailless, compound delta wing configuration.
- It came from the Light Combat Aircraft (LCA) programme, which began in the 1980s to replace India's ageing MiG-21 fighters. It is the smallest and lightest in its class of contemporary supersonic combat aircraft.
- It is designed by the Aeronautical Development Agency (ADA) and developed by Hindustan Aeronautics Limited (HAL) for the Indian Air Force and Navy.

**o) SPICE 2000:**

- The one among the various weapons used by the Indian Air Force at its target in Balakot, Pakistan were Israeli-developed SPICE-2000.
- SPICE stands for Smart, Precise Impact, Cost Effective. The bomb comes from a family of standoff air-to-ground weapon systems.
- SPICE is basically an electro-optical/GPS guidance kit to convert air dropped unguided bombs into precision guided 'Smart' bombs.
- Each bombs computer memory can be pre-fed with scores of different targets with mix of satellite images and geographical coordinates for drop and target capability. SPICE has an all-weather day and night capability based on its advanced electro optical and infra-red seekers as well as digital scene matching area correlators(DSMAC).
- Once a pilot releases SPICE outside the threatened area, the bomb automatically performs midcourse navigation using its GPS and accurately homes in on the exact target. During the himing phase, the weapon locates the target using 'scene-matching technology' and then uses the tracker to hit it.

## 4) BIOTECHNOLOGY

**a) Generic Drugs**

- The government has planned to colour code generic drugs. This would enable consumers to differentiate between generic drugs and other medicines and take an informed decision while purchasing medicines. The government is also considering use of symbols to make generic drugs easily identifiable.
- Nearly all drugs have three types of names: a) the International Union of Pure and Applied Chemistry (IUPAC), b) the non-proprietary or generic (commonly INN) and c) the brand name. Some countries, such as the U.S., Britain and Japan, have their own generic names or approved names. The International Non-proprietary Name (INN) is an official generic and non-proprietary name given to a pharmaceutical drug or an active ingredient
- United States Food and Drug Administration (USFDA) describes a generic drug "as identical-or bioequivalent-to a brand name drug in dosage form, safety, strength, route of administration, quality, performance characteristics and intended use. Once patents have expired, companies other than the original manufacturer can produce and sell the drug. This usually results in significant reduction in costs. These off-patent drugs are called generics internationally. However, in India, medicines marketed exclusively with INN names are called generics or generic medicine.



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- The Indian Health Ministry has taken several initiatives to promote sale of generic medicines over branded ones. These include a) it has made it mandatory for pharmacies to have separate shelves for displaying generic drugs, b) asked doctors to prescribe generic drugs in legible handwriting, c) asked companies to print generic names on their labels in a font 2 times larger than the brand name, d) Pradhan Mantri Bhartiya Janaushadhi Pariyojana (PMBJP): It is a campaign launched by the Department of Pharmaceuticals to provide quality medicines at affordable prices to the masses. Jan Aushadi stores have been set up to provide generic drugs.

## 5) HEALTH AND DISEASES

### a) Measles-Rubella

**News:**

Global Measles and Rubella Update stated that India had 56,399 confirmed measles cases and 1,066 confirmed rubella cases in 2018.

**Facts:**

- Measles and Rubella are highly contagious viral diseases.
- They spread by contact with an infected person through coughing and sneezing.
- Measles weakens the immune system and opens the door to secondary health problems.
- Measles virus is an exclusive human pathogen and has no animal reservoirs or vectors.
- Rubella, also known as German Measles.
- It is a mild disease but can have serious consequences for pregnant women and their children as it may cause congenital rubella syndrome in the foetus.
- Measles-rubella (MR) vaccine is given at 9-12 months and 16-24 months of age for preventing both measles and rubella diseases in the child as no specific treatment is available for the disease.

### b) National Action Plan for Viral Hepatitis Control

**News:**

Ministry of Health and Family Welfare launched National Action Plan for Viral Hepatitis.

**Facts:**

- The Plan provides a strategic framework, based on which National Viral Hepatitis Control Program was launched in 2018 under National Health Mission.



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- It is an inflammation of the liver often caused by viruses.
- There are 5 main hepatitis viruses: A, B, C, D and E.
- Viral hepatitis types B and C can cause chronic hepatitis while Hepatitis A and E usually cause acute hepatitis.
- Hepatitis A and E are typically caused by ingestion of contaminated food or water while Hepatitis B, C and D usually occur as a result of contact with infected body fluids.
- There are vaccines to prevent hepatitis A, B and E. However, there is no vaccine for hepatitis C.
- Other facts:
- National Viral Hepatitis Control Program aims to end viral hepatitis as a public health threat in the country by 2030.
- It aims to reduce morbidity and mortality due to viral hepatitis.

**c) Lymphatic Filariasis**

**News:**

Triple Drug Therapy, lymphatic filariasis drug, was launched in Nagpur.

**Facts:**

- Triple Drug Therapy is a combination of Ivermectin, Diethylcarbamazine Citrate and Albendazole (IDA).
- The World Health Organization (WHO) recommended the three-drug treatment to accelerate the global elimination of lymphatic filariasis.
- Other Facts:
- Lymphatic filariasis - a disabling and disfiguring, neglected tropical disease.
- Parasitic worms living in the lymphatic system cause it.
- The larval stages of this parasite (microfilaria) circulate in the blood and are transmitted from person to person by mosquitoes.
- The manifestation of the disease takes time and results into abnormal enlargement of the body parts like arms, breasts and genitals leading to severe disability.

**d) Leprosy**

**News:**

Initial reports of Leprosy Case Detection Campaign of the National Leprosy Eradication Programme (NLEP) indicated an all-time high of nearly 50,000 new leprosy cases in Bihar.

**Facts:**

- India was officially declared to have eliminated leprosy in 2005 when new cases fell to less than 1 per 10,000.
- In recent years, along with other countries, India in 2016 repealed Lepers Act that discriminates against persons affected by leprosy and in January 2019 Lok Sabha passed a bill seeking to remove leprosy as a ground for divorce.

**Other facts:**

- Leprosy, also known as Hansen's disease, is a chronic infectious disease caused by Mycobacterium leprae.
- The bacteria has a long incubation period. Once a person is infected, it can take 6-10 years or even 20 years for the first symptoms to surface.
- Leprosy is known to occur at all ages ranging from early infancy to very old age.
- The disease mainly affects the skin, the peripheral nerves, the mucosa of the upper respiratory tract and the eyes.
- Mycobacterium Indicus Pranii (MIP) is an indigenous vaccine for leprosy developed by the National Institute of Immunology, now being introduced into the National Leprosy Elimination Programme (NLEP).

**e) U.S. modifies Zika advisory**

- The US government's Centre for Disease Control and Prevention (CDC) has modified its advisory against travelling to India. In 2018, CDC had issued the advisory after zika cases were reported in Rajasthan and Madhya Pradesh.
- The travel advisory stated that India has an ongoing outbreak of the disease in Rajasthan and its surrounding states. It also cautioned pregnant women and women who are planning for pregnancy not to travel to areas with ongoing zika outbreaks.
- The status of India in the Zika virus alert for travellers has been changed from "ongoing outbreak" to "current or past transmission but no current outbreak". The modification comes after Union Health Ministry, in January, had urged the US government to change or modify the travel advisory.
- Zika virus disease is caused by a virus transmitted primarily by Aedes mosquitoes. Additionally, infected people can transmit Zika through transfer of body fluids including sexual intercourse.
- Zika virus infection during pregnancy is a cause of microcephaly (a condition in which babies are born with small and underdeveloped brains) and other congenital abnormalities in the developing fetus and new-borns.

- Zika virus was first identified in Uganda in 1947 in monkeys. It was later identified in humans in 1952 in Uganda and the United Republic of Tanzania.
- The first confirmed Indian case of Zika occurred in 2016 in Gujarat. The Zika strain was found to be close to a Malaysian Zika strain, isolated in 1966. In 2018, there had been Zika outbreaks in Rajasthan and Madhya Pradesh

**f) Bird flu outbreak in Cuttack**

- Authorities in Cuttack, Odisha have begun mass culling of poultry after an outbreak of bird flu in the city. Samples collected from a state-run duck breeding centre had tested positive of avian influenza (Bird flu)
- Bird flu is a highly infectious, severe respiratory disease in birds. It is caused by H5N1 virus, a subtype of the influenza A virus. Human infections with avian influenza occur through infected bird-to-human contact or contact with surfaces and objects contaminated by their droppings.
- Human-human transmission is limited. H5N1 infection in humans can cause severe disease and has a high mortality rate.

**g) Nipah Virus**

- Tripura Health Department has issued a Nipah Virus alert after the death of five persons in a few villages of Bangladesh close to the Indo-Bangla international border. It has asked the district chief medical officers to stay sensitized and alert on any impending Nipah virus outbreak in the state.
- According to World Health Organization(WHO), the Nipah virus infection is a newly emerging zoonosis, that is, a disease transmitted from animals to humans. The virus belongs to a new genus termed Henipavirus (subfamily Paramyxovirinae).
- The natural host of the virus are fruit bats belonging to the family Pteropodidae.In 2004, humans were affected after eating the date palm contaminated by infected fruit bats. Pigs can also act as intermediate hosts. The virus was first identified in 1998 at Kampung Sungai Nipah village, Malaysia. The virus is named after this village.
- The symptoms of Nipah virus are (a) fever (b) muscle pain (c) respiratory problems and (d)Inflammation of the brain. Late onset of Encephalitis can also occur. Sometimes a person can also have an asymptomatic infection that can be a carrier of Nipah and not show any symptoms.

**h) West Nile fever**

- A boy from Malappuram district, Kerala has been diagnosed with West Nile fever. The West Nile fever is a zoonotic diseases. Zoonotic diseases are those that are naturally transmissible from vertebrate animals to humans.
- West Nile fever is caused by the West Nile Virus. Birds are the natural hosts of West Nile virus (WNV).
- According to world Health Organization (WHO) West Nile virus transmits to humans through bites from infected Culex mosquitoes. Mosquitoes become infected when they feed on infected birds.
- Horses and humans are "dead-end" hosts. It implies that while they become infected, they do not spread the infection. According to WHO, no human-to—human transmission from casual contact has not been documented.
- Symptoms of White Nile fever include fever, headache, tiredness, and body aches, nausea, vomiting. It can cause fatal neurological disease in humans.
- West Nile Virus was first isolated in a woman in the West Nile district of Uganda in 1937. An epidemic of WNV was reported in humans in Israel in 1951.
- West Nile Virus is commonly found in Africa, Europe, Middle East, West Asia and North Ame

**i) HIV**

- An HIV-positive man in Britain has become the second known adult worldwide to be cleared of the HIV virus. He had received a bone marrow transplant from an HIV resistant donor. The donor had a genetic mutation known as 'CCR5 delta 32', which confers resistance to HIV.
- The first person to be cleared of HIV virus was a patient in Germany who underwent a similar treatment in 2007.
- HIV stands for human immunodeficiency virus. It is the virus that can lead to acquired immunodeficiency syndrome (AIDS), if not treated. There are two main types of the virus: HIV-1 and HIV-2. HIV-2. At present there is no effective cure for HIV, but HIV can be controlled. The medicine used to treat HIV is called antiretroviral therapy or ART.

**j) H1NI:**

- Recently, there has been a sharp rise in cases and deaths from H1N1 influenza. The data on H1N1 cases has been collected by Integrated Disease Surveillance Programme, National Centre of Disease Control, Delhi.
- Influenza is an infectious disease caused by an influenza virus belonging to the family Orthomyxoviridae. Influenza viruses are divided into three broad categories A, B and C

on the basis of their core proteins. Only types A and B cause human disease of any concern. H1N1 flu is a variety of influenza A.

- H1N1 virus had caused the 2009 pandemic (swine flu pandemic). It has become a regular human flu virus and continues to circulate seasonally worldwide.
- The Integrated Disease Surveillance Program (IDSP) is a disease surveillance programme under the Ministry of Health and Family Affairs. It was launched in 2004. It aims at early detection and response to disease outbreaks. It seeks to maintain decentralized laboratory based IT enabled disease surveillance system for epidemic prone diseases.
- The National Centre for Disease Control (NCDC) is an institute under the Directorate General of Health Services, Ministry of Health and Family Welfare.
- The functions of NCDC are: a) undertaking investigations of disease outbreaks across India, b) investigating and recommending control measures for the outbreak of various communicable diseases in the States/UTs in India. It also investigates and recommends measures to some neighbouring countries in the South East Asia Region. c) Providing referral diagnostic services to individuals, community, medical colleges, research institutions and state health directorates.
- Swine flu cases has been on a rise in Gujarat. Of late, nearly 100 new cases are reported from across the state per day.
- Swine flu is a highly contagious acute respiratory disease of pigs caused by type A influenza virus. Swine flu viruses do not normally infect humans. However, sporadic human infections with swine flu have occurred. Most commonly, these cases occur in people with direct exposure to pigs. However, there have been cases of human-to-human spread of swine flu.
- H1N1 virus is spread from person to person, similar to seasonal influenza viruses. It is transmitted to other people by exposure to infected droplets expelled by coughing or sneezing, or through contact to contaminate hands or surfaces.
- Swine origin influenza (H1N1) among humans was first recognized in the border area of Mexico and United States in April 2009 and soon spread to other places. The WHO declared H1N1 swine flu a pandemic in June 2009 when swine flu cases were identified in 74 countries. It lasted till 2010. H1N1 has continued to circulate as a seasonal virus.
- A pandemic is the worldwide spread of a new disease. An influenza pandemic occurs when a new influenza virus emerges and spreads around the world, and most people do not have immunity.

## 6) ENCOURAGING DEVELOPMENT OF SCIENCE AND TECHNOLOGY

**a) Young Scientist Programme**

**News:**

ISRO recently launched the Young Scientist Programme for school students.

**Facts:**

- "YUva VIgyani KAryakram" (YUVIKA) from this year, will be in tune with the Government's vision of "Jai Vigyan, Jai Anusandhan".
- The program is thus aimed at creating awareness amongst the youngsters who are the future building blocks of our Nation.
- The programme will be of around two weeks' duration during summer holidays and the schedule will include invited talks, experience sharing by the eminent scientists, facility and lab visits, exclusive sessions for discussions etc.
- It is proposed to select 3 students from each State/ Union Territory to participate in this programme every year covering CBSE, ICSE and State syllabus.
- Students who have finished 8th standard and currently studying in 9th standard will be eligible for the programme.
- All expenses of travelling and boarding will be funded entirely by ISRO.
- Under the programme 6 incubation centers will be established in the country: North, South, East, West, Center and North East.
- First of these centers has been established in Agartala, Tripura.

**b) 106th Indian Science Congress**

**News:**

106th Indian Science Congress will be held at Lovely Professional University, Phagwara, Jalandhar, Punjab from 3-7th January, 2019.

**Facts:**

- Theme: FUTURE INDIA – Science and Technology.
- The Indian Science Congress Association (ISCA), Department of Science and Technology organized it.
- On the 2nd day of ISC, Children's Science Congress was inaugurated targeting 10-17 years of children for carrying forward innovation and research in science to a next level.
- Other facts:
- The first ISC session was held at Kolkata in 1914 under the presidentship of Ashutosh Mukherjee.

- 105th Indian Science Congress to be hosted by Manipur Central University, Imphal on March 2018.
- 107th Indian Science Congress will be held at the University of Agricultural Sciences, GKVK Campus, Bangalore, Karnataka from 3-7th January 2020.

**c) Five year's extension of Biomedical Research Career Programme**

- The Union Cabinet has approved the continuation of the Biomedical Research Career Programme (BRCP), and Wellcome Trust (WT) / DBT India Alliance. The extension is beyond the initial term (2008-09 to 2018-29) and will have a new five-year phase (2019-20 to 2023-24).
- BRCP seeks to build and nurture talent of highest global standards in cutting-edge biomedical research in India. It is implemented by Department of Biotechnology (DBT) and Wellcome Trust. Wellcome Trust is a UK based biomedical research charity.
- Wellcome Trust/DBT India Alliance is an initiative funded equally by the Wellcome Trust, UK and Department of Biotechnology, India. The aim of the initiative is to build excellence in the Indian biomedical scientific community through funding and engagement. In the new five-year phase, the DBT has increased its financial commitment by two times in comparison to Wellcome trust.
- The Department of Biotechnology under the Ministry of Science and Technology was formed in 1986. It works towards the development of the field of modern biology and biotechnology in India.

## 7) ALTERNATIVE ENERGY/CLIMATE CHANGE TECHNOLOGIES

**a) India's first District Cooling System**

**News:**

A UAE-based international cooling provider has entered into a 30-year concession with Andhra Pradesh government to build, own, operate and transfer India's first district cooling system.

**Facts:**

- This district will be in the state's newly built capital Amravati.
- District cooling systems produce chilled water, steam or hot water at a central plant and then pipe that energy out (either underground or over rooftops) to buildings for air conditioning, space heating and water heating.
- This system reduces carbon emissions and generate less noise as compared to traditional air conditioning systems.

**c) Super-efficient Air Conditioning Programme**

**News:**

Recently, a Super-Efficient Air Conditioning Programme was launched for residential and institutional customers.

**Facts:**

- It was launched by the Energy Efficiency Services Limited (EESL).
- Implementation for the programme for 12 months will be done jointly by EESL and private discom - BSES Rajdhani Delhi.
- Super-Efficient Air Conditioners are distributed under the programme, which are 40% more efficient and cost effective.
- It will reduce energy consumption, phase out Hydrofluorocarbons and reduce refrigerant demand as per India Cooling Action Plan (ICAP).
- EESL investment is partially supported by a grant from the Global Environment Facility (GEF), partially by Asian Development Bank (ADB) grants and loans and technical assistance from United Nations Environment (UNEP).

**d) Gas Hydrates**

**News:**

Researchers at IIT Madras has shown that methane and carbon dioxide can exist as gas hydrates.



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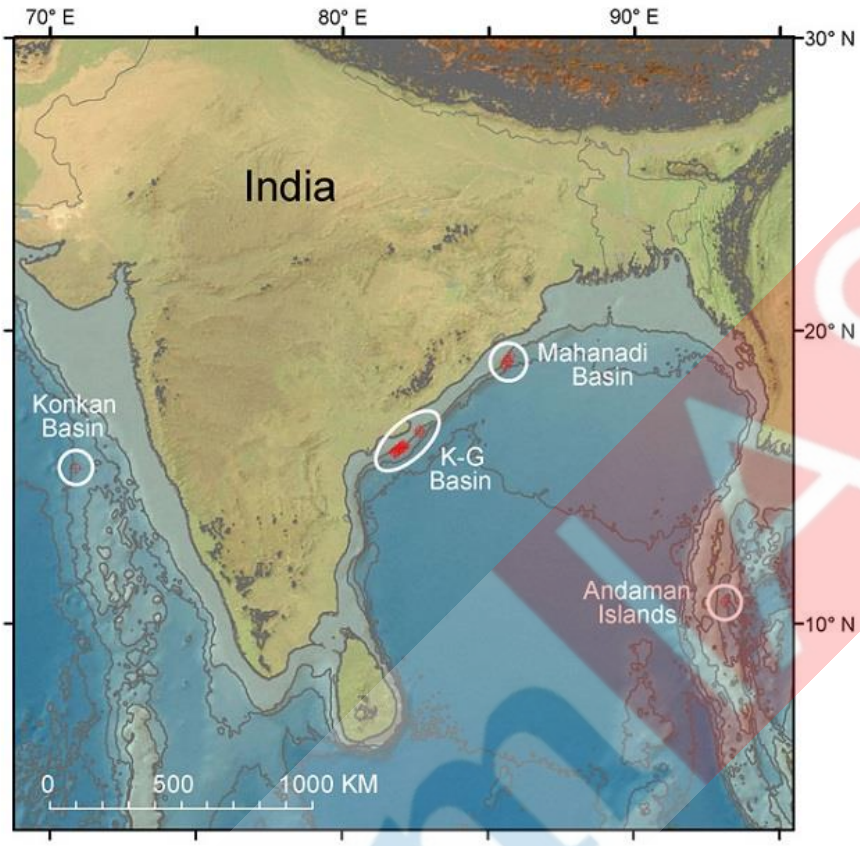


Locations of Gas Hydrates in India

**Facts:**

- The carbon dioxide hydrate produced in the lab by the IIT team raises the possibility of sequestering or storing carbon dioxide as hydrates under the sea bed.

**Other facts:**

- Gas hydrate is a solid ice-like form of water that contains gas molecules in its molecular cavities.
- Natural gas hydrates occur on continental margins and shelves worldwide from Polar Regions to the tropics.
- It is estimated that the total amount of carbon in the form of methane hydrates, far exceeds the carbon content in all the fossil fuel reserves put together and hence these are supposed to be the future potential energy resource.

**e) Cloud Seeding**

- The Rural Development and Panchayat Raj Department of Karnataka has called tenders for cloud seeding operations to enhance rainfall during the monsoons of 2019 and

2020. This decision for cloud seeding comes in the backdrop of deficient rainfall in 2018-19 and consequent drought in 176 taluks of Karnataka.

- Cloud seeding is a type of weather modification procedure. It is an artificial way to induce moisture in the clouds so as to cause a rainfall. In this process, silver iodide, potassium chloride and sodium chloride is sprayed on the clouds by using an aircraft. The chemicals condense smaller particles into larger rain droplets.
- Karnataka had previously used cloud seeding in 2003, 2009 and 2017. In 2017, the Karnataka government had successfully carried out a cloud seeding exercise called Project Varshadhare. An independent evaluation committee had estimated that the project led to rainfall enhancement of 27.9%.
- Cloud seeding operations in India requires multiple approvals from different government departments, viz. Ministry of Defence (MoD), the Indian Air Force, Intelligence Bureau and Directorate General of Civil Aviation (DGCA) – the regulatory body in field of Civil Aviation.

## 8) MISCELLANEOUS

### a) Shifting of North Magnetic Pole

**News:**

Earth's north magnetic pole has been drifting at about 55 kilometers a year, and is leaving the Canadian Arctic on its way to Siberia.

**Facts:**

- Scientists periodically update the World Magnetic Mode to map this process.
- The last version was updated in 2015, intended to last till 2020, however the drift is too fast to be on the verge of exceeding the acceptable limit for navigation errors.
- This requires the scientist to do an early update on the magnetic model to help ships, airplanes and submarines navigate.

**Other facts:**

- North Magnetic pole: The North Magnetic Pole is the wandering point on the surface of Earth's Northern Hemisphere on which the planet's magnetic field points vertically downwards.

### b) International year of the Periodic Table

**News:**

The United Nations General Assembly during its 74th Plenary Meeting proclaimed 2019 as the International Year of the Periodic Table of Chemical Elements.



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**Facts:**

- It will commemorate the 150th anniversary since Dmitry Mendeleev discovered the Periodic System.
- The initiative for IYPT2019 is supported by IUPAC in partnership with the International Union of Pure and Applied Physics (IUPAP), European Association for Chemical and Molecular Science (EuCheMS), the International Council for Science (ICSU), the International Astronomical Union (IAU), and the International Union of History and Philosophy of Science and Technology (IUHPS).
- UNESCO and 1001 Inventions Organization will launch a new educational initiative in 2019 International Year of the Periodic Table of Chemical Elements, to raise awareness of chemistry and its applications for sustainable development.

**Other facts:**

- Dmitry Mendeleev organized all the chemical elements by their atomic mass.
- The modern periodic table managed by the International Union for Pure and Applied Chemistry (IUPAC), arranged the elements on the basis of atomic number.

**c) Abel Prize for Maths**

- Karen Uhlenbeck of the U.S. has been awarded the Abel Prize 2019. She is the first woman to receive the award. She has been awarded the prise for her works on partial differential equations.
- The Abel Prizes is one of the world's most prestigious math's awards. The prize was established by the Norwegian government in 2002 on the occasion of the 200th birth anniversary of Norwegian mathematician Niels Henrik Abel. The Norwegian Academy of Science and Letters awards the Abel Prize.
- Another prestigious award in the field of math's id the Fields Medal. It is awarded every four years on the occasion of International Congress of the International Mathematical Union (IMU).