December

FSSAI launches awareness drive on Trans fats

- The Food Safety and Standards Authority of India (FSSAI) 30 launched a new mass media campaign in order to create awareness about Trans fats and eliminate them in India by 2022.
- The campaign will warn citizens about the health hazards of consuming trans fats and offer strategies to avoid them through healthier alternatives.
- Studies have recently shown that 60,000 deaths occur every year due to cardiovascular diseases, which in turn are caused due to high consumption of trans fats.
- Swasth Bharat Yatra, an initiative started under the "Eat Right" campaign which started will also seek to create awareness among citizens about trans fats.

Related Information

Trans fat

- Trans fat is also called unsaturated fatty acids or trans fatty acids, are a type of unsaturated fat that occur in small amounts in nature.
- It has widely produced industrially from vegetable fats starting in the 1950s for use in margarine, snack food, packaged baked goods, and for frying fast food.
- Fats contain long hydrocarbon chains, which can be either unsaturated, i.e., have double bonds, or saturated, i.e., have no double bonds.
- Consuming trans fats has been shown to increase the risk of coronary artery disease in part by raising levels of low-density lipoprotein (LDL, often termed "bad cholesterol"), lowering levels of high-density lipoprotein (HDL, often termed "good cholesterol"), increasing triglycerides in the bloodstream and promoting systemic inflammation.

GSAT-11 - Part of ISRO's new satellite fleet for high-speed Internet services

- The GSAT-11 satellite launched by ISRO which will ride on European launch vehicle Ariane 5 ECA, numbered VA246.
- The 5,854-kg satellite almost doubles the biggest one built or launched by ISRO to date.
- Its co-passenger is South Korea's GEO-KOMPSAT-2A, a meteorology satellite.
- GSAT-11 is part of ISRO's new family of high-throughput communication satellite (HTS).
- This satellite will help to drive the country's Internet broadband from space to untouched areas.

Related Information

- ISRO already has launched two HTSs — GSAT-29 and GSAT-19 which will provide high-speed Internet data services at the rate of 100 Gbps (Gigabits per second) to Indian users.
- The HTSs will also be the backbone of pan-India digital or easy Internet-based programmes and services — such as Digital India, BharathNet for rural e-governance, and commercial and public sector VSAT Net service providers.

Digital Sky: Govt starts online portal for drone registration

- Civil Aviation Ministry announced the registration process for drone operators in the country, to be done through a portal called 'Digital Sky'.

- Digital Sky Platform, a first of its kind that implements 'no permission, no take-off' (NPNT) – a novel system of software-based self-enforcement to minimize deviations from the Civil Aviation Regulations.
- The digital platform has begun accepting registrations of users, and payments for Unmanned Aerial Operator's Permit (UAOP) and Unique Identification Numbers (UIN) will be accepted through the Bharat Kosh portal (bharatkosh.gov.in).

Related Information

- Remotely Piloted Aerial Systems (RPAS), popularly referred to as drones, are a technology platform with wide-ranging applications.
- In August 2018, India had announced the release of its Civil Aviation Regulations (CAR) to enable safe flying of RPAS in India.
- The CAR detailed the obligations of operators, remote pilots/ users and manufacturers/ OEM for safe operations of RPAS and co-operative use of airspace.
- For drones of micro size and above categories, operators are required to register on the Digital Sky portal.

Unmanned Aerial Vehicle

- An unmanned aerial vehicle (UAV), commonly known as a drone, is an aircraft without a human pilot aboard.
- The flight of UAVs may operate with various degrees of autonomy by either under remote control by a human operator or autonomously by onboard computers.
- These drones are used mostly in military applications but their use is rapidly expanding to commercial, scientific, recreational, agricultural, and other applications.

Train 18

- Train 18 which India's first engine-less train-breached the 180 kmph speed threshold during a test run in the Kota-Sawai Madhopur section, becoming the country's fastest train.
- It is indigenously built train.
- It is a high-tech, energy-efficient, self-propelled (engine-less) train.
  It features aerodynamically designed driver cabins at both ends for quicker turn-around at destinations.

Country's largest Floating solar plant to set up in reservoir Rihand dam

- A 50 Mega Watt floating solar plant will be set up in the country's largest reservoir Rihand dam in Sonbhadra district of Uttar Pradesh.

What are Floating solar plants?

- Floating solar plant involves setting up solar panels on floats placed on dams, lakes and similar water bodies.
- They are considered an alternative to tackle land availability issues.

Related Information

Rihand Dam

- Rihand Dam, also known as Govind Ballabh Pant Sagar, is the country's largest reservoir by volume and largest artificial lake, located on the Rihand River.
- It's catchment area spread over Uttar Pradesh, Madhya Pradesh and Chhattisgarh
- The largest floating solar plant to date is a 2MW one in Vishakhapatnam.
- Another is a 500-kWh plant built by the Kerala State Electricity Board at the Banasura Sagar Dam.

New 'chemputer' system may revolutionize drug production

- Scientists have developed a new method to produce drug molecules which use downloadable blueprints to easily and reliably synthesize organic chemicals via a programmable 'chemputer'.
- This the first time scientists are able to a synthesis of important drug molecules which can be achieved in an affordable and modular chemical-robot system called chemputer.

- The objective of this program is to develop a general abstraction for chemistry that can be made universal, practical, and driven by a computer programme.

Related Information

- Chempiler is the chemical recipes, run on a computer programme which instructs the computer how to produce molecules on-demand, more affordable and safely than ever possible before.
- The researchers claim the ability to use a universal code will allow chemists all around the world to convert their recipe into a digital code.
- This approach is a key step in the digitization of chemistry and will allow the universal assembly of complex molecules on demand, democratizing the ability to discover and make new molecules using a simple software app and a modular chemputer.

NASA's OSIRIS-REx spacecraft reached asteroid Bennu

- NASA's Origins, Spectral Interpretation, Resource Identification, Security-Regolith Explorer (OSIRIS-REx) spacecraft completed its journey to arrive at the asteroid Bennu on 3 December 2018.
- The primary goals of this survey are to refine estimates of Bennu's mass and spin rate and to generate a more precise model of its shape.
- The mission will help scientists investigate how planets formed and how life began, as well as improve our understanding of asteroids that could impact Earth.

Colistin ban a step in the right direction: CSE

- Centre for Science and Environment (CSE) said that a ban on the use of the antibiotic colistin would be a step in the right direction.
- India’s highest drug advisory body, the Drug Technical Advisory Board had recommended a stoppage on the use of colistin by poultry farmers.
- Colistin is a last resort antibiotic which is administered to human beings when most other antibiotics fail to function.
- However, it is indiscriminately used by the poultry industry to promote growth and prevent the occurrence of infections in chicken.
- Increasing evidence has linked this to the development of resistance against colistin in humans.

IISER Kolkata team develops a method to simulate, predict solar activity over ten years

- A team of researchers from IISER Kolkata have developed a way of predicting the intensity of sunspot activity in the next solar cycle (approximately from 2020 to 2031) using data spread over the last 100 years.
- Astronomers have observed sunspots on the surface of the sun for nearly 400 years.
- It is known that sunspots follow a cyclic pattern of growing in number and disappearing in approximately 11 years, known as the sunspot cycle or the sun’s activity cycle.
- We are currently in the 24th sunspot cycle since the observation began in 1755.

India plans deep dive for seabed minerals

- India is going full steam ahead in anticipation of the International Seabed Authority (ISA) — a U.N. body that oversees mining on the high seas — giving the green light for commercial exploitation.

- Over the next decade, the Indian government plans to pump in more than $1 billion to develop and test deep-sea technologies like underwater crawling machines and human-piloted submarines
- If it works, the equipment will be able to reach depths of up to 6 km, where metals can be 15 times more concentrated than inland deposits.
- The ISA allows India to explore an area in the Indian Ocean of 75,000 square kilometres.
- China provides about 90% of rare earth, which are used in aviation and defence manufacturing.
- India is most interested in copper, nickel and cobalt, as it ramps up clean power generation.

ISRO and ROSCOSMOS have signed a MoU in on 'Joint Activities in the field of Human Spaceflight Programme'

Related Information

Roscosmos

- The Roscosmos State Corporation for Space Activities commonly known as Roscosmos is a state corporation responsible for the space flight and cosmonautics program for the Russian Federation.
- The headquarters of Roscosmos are located in Moscow, capital of Russia.

Indian Human Spaceflight Programme

- The Indian Human Spaceflight Programme was created by the Indian Space Research Organisation (ISRO) to develop the technology needed to launch crewed orbital spacecraft into low Earth orbit.
- The first crewed flight is planned with a spacecraft called Gaganyaan for December 2021 on a home-grown GSLV-III rocket.

Voyager 2 Mission

- NASA's Voyager 2 spacecraft has exited the heliosphere which is the protective bubble of particles and magnetic fields created by the Sun.
- It has become the second human-made object in voyager series in history to reach the edge of our solar system.
- Earlier Voyager 1 crossed the space boundary in 2012.

Related Information

Heliosphere

- It is a bubble around the sun created by the outward flow of the solar wind from the sun and the opposing inward flow of the interstellar wind.
- It is the region influenced by the dynamic properties of the sun that are carried in the solar wind such as magnetic fields, energetic particles, and solar wind plasma.
- The solar system boundary is called the 'Heliopause'.
- It is the place where the tenuous, hot solar wind meets the cold, dense interstellar medium.
- The heliopause marks the end of the heliosphere and the beginning of interstellar space.

What is Heliophysics?

- The study of the sun and its interaction with Earth and the solar system is called Heliophysics.
- It requires viewing the sun, heliosphere & planetary environments as elements of a single interconnected system - one that contains dynamic space weather, and that evolves in response to solar, planetary and interstellar conditions.

New online portal "Collect Earth" developed to track land-use on Earth's surface

- The UN food agency has announced, launching a new online portal developed in collaboration with the United States Space Agency, NASA.

- The system known as **Collect Earth Online** is web-based, free of charge and open to all platforms, that will allow users to "systematically inspect" any location on the planet, from glaciers to rainforests with satellite data.
- This innovation allows the collection of up-to-date data about our environment and its changes in a more efficient and participatory manner, using the local experts that know the landscape and the underlying ecology.
- It helps us to obtain and upscale practical inputs at a time when environmental challenges are taking on an urgent and unprecedented importance.
- The next generation geospatial tool also provides access to high-resolution satellite imagery from multiple sources as well as historical imagery and photo mosaics from NASA and European Union satellite networks, making it easier to carry out surveys, collect samples and use crowdsourcing techniques.

Farout: The furthest known object in the Solar

- 2018 VG18 also nicknamed "Farout" was discovered at approximately 120 AU (astronomical units) from the Sun.
- This is slightly farther than the distance that Voyager 2 is now out from the Sun after crossing the heliopause (where the solar atmosphere is pushed back by the interstellar medium) into interstellar space.
- Farout is also the first known Solar System object that has been detected at a distance that is more than 100 times farther than Earth is from the Sun.
- Farout was discovered as part of a search for extremely distant Solar System objects, including the suspected Planet X, which is sometimes also called Planet 9.
- The second-most-distant observed solar system object is Eris, at about 96 AU.

Neutrino Observatory

- Recently, Environmental Clearance has been obtained for India Neutrino Observatory (INO).
- INO has applied for Wildlife Clearance to the Govt. of Tamil Nadu in early 2018, as also building clearances for the Inter-Institutional Centre for High Energy Physics (ICHEP), Madurai and INO, Pottipuram sites.
- Clearance from the Tamil Nadu Pollution Control Board (PCB) has to be applied after obtaining above clearances.

Related Information

India-based Neutrino Observatory (INO)

- It is a particle physics research project under construction to primarily study atmospheric neutrinos in a 1,300 meters deep cave under Ino Peak near Theni, Tamil Nadu, India.
- This project is notable in that it is anticipated to provide a precise measurement of neutrino mixing parameters.
- The project is a multi-institute collaboration and one of the biggest experimental particle physics projects undertaken in India.
- When completed, the main magnetized iron calorimeter (ICAL) experiment will include the world's largest magnet, four times larger than the 12,500-tonne magnet in the Compact Muon Solenoid detector at CERN in Geneva, Switzerland.

November

Shakti: India's first microprocessor

- India's first indigenous microprocessor **Shakti** has been developed and booted by Indian Institute of Technology Madras along with a microchip fabricated Laboratory of Indian Space Research Organisation (Isro) at Chandigarh.
- It will reduce dependency on imported microchips and the risk of cyber attacks making it ideal for communication and defence sectors.
- The microprocessor fabricated in India was in a 180nm facility, while the one in the US was in a 20nm. lab.

Related Information

Microprocessor

- A microprocessor is a computer processor that incorporates the functions of a central processing unit on a single integrated circuit (IC).
- The microprocessor is a multipurpose, clock driven, register-based, digital integrated circuit that accepts binary data as input, processes it according to instructions stored in its memory, and provides results as output.
- Microprocessors operate on numbers and symbols represented in the binary number system.

NASA's historic Dawn mission to asteroid belt comes to the end

- NASA's pioneering Dawn spacecraft which orbited the two largest objects in the asteroid belt has run out of fuel.
- The Dawn mission, launched in 2007 to study the protoplanet Vesta and the dwarf planet Ceres on a journey that put about 6.9 billion kilometres on its odometer.

Related Information

- In 2011, when Dawn arrived at Vesta, the second largest world in the main asteroid belt, the spacecraft became the first to orbit a body in the region between Mars and Jupiter.
- In 2015, when Dawn went into orbit around Ceres, a dwarf planet that is also the largest world in the asteroid belt,
- This mission became the first to visit a dwarf planet and go into orbit around two destinations beyond Earth.
- The spacecraft launched 11 years ago to visit the two largest objects in the main asteroid belt.
- Currently, Dawn, it is in orbit around the dwarf planet Ceres, where it will remain for decades.

Note

NASA also announced that its exoplanet-hunting Kepler Space Telescope had run out of hydrazine fuel, and the craft would be commanded to cease operations.

AI bot 'ClaRAN' can spot radio galaxies

- "ClaRAN" grew out of an open source version of Microsoft and Facebook's object detection software.
- AI bot "ClaRAN" was known for recognising faces on Facebook. (International Centre for Radio Astronomy Research).
- It will use Artificial Intelligence (AI) programme that helps to recognise faces on Facebook to identify galaxies in deep space.
- The AI bot named "ClaRAN" scans images taken by radio telescopes.

- Its job is to spot radio galaxies that emit powerful radio jets from supermassive black holes at their centres.

Related Information

- ClaRAN is the brainchild of big data specialist Dr Chen Wu and astronomer Dr Ivy Wong from The University of Western Australia node of the International Centre for Radio Astronomy Research (ICRAR).

How does it work?

- Black holes are found at the centre of most, if not all, galaxies.
- These supermassive black holes occasionally burp out jets that can be seen with a radio telescope.
- "ClaRAN help out to find the jets which stretch a long way from their host galaxies, making it difficult for traditional computer programmes to figure out where the galaxy is.

The Earth has not one, but three moons.

- A group of Hungarian scientists have confirmed a long-standing astronomical speculation; the Earth has three natural satellites or moons and not one.
- The research published in the Monthly Notices of the Royal Astronomical Society.
- It says that the new moons are entirely made up of extremely tiny dust particles of less than one-millimetre size and reflect light rather faintly.
- This is the reason why they were difficult to observe and study in the first place even when they are located at around the same distance as the Moon from the Earth—400,000 kilometres.

Related Information

- In 1961, Kazimierz Kordylewski, a Polish scientist had observed these moons for the first time and they were later named after him as Kordylewski Dust Clouds (KDCs).
- Kordylewski had discovered the dust clouds close to a special point in space known as L5 which a Lagrange point of the Earth-Moon gravitational system is.
- Lagrange points are places of equilibrium in space where gravitational forces of two large and solid astronomical objects like the Earth and the Moon cancel out the centrifugal forces.
- Many other small celestial objects are often found around Lagrange points.
- For example, there are minor planets close to the Lagrange points of the Sun-Earth gravitational system and the Sun-Jupiter system.
- Such points are also ideal for parking satellites and other space vehicles as the fuel consumption is considerably lower here.
- They will be essential for space exploration projects as transfer stations where space shuttles and stations can stop over on long journeys to other planets and even the Sun.
- There are five such points of stability identified in any such two-body system including the Earth-Moon system.

NASA probe set to visit Jupiter's Trojan asteroids

- NASA's Ralph – a space instrument that has travelled as far as Pluto – is set to explore Jupiter's Trojan asteroids, which are remnants from the early days of the solar system.
- Ralph was first launched aboard the New Horizons spacecraft in 2006m and obtained stunning flyby images of Jupiter and its moons.
- This was followed by a visit to Pluto where Ralph took the first high-definition pictures of the iconic minor planet.
- In 2021, Ralph is set to journey with the Lucy mission to Jupiter's Trojan asteroids.

- The Lucy spacecraft carries a near-twin of Ralph, called L'Ralph, which will investigate Jupiter's Trojan asteroids.
- The L'Ralph instrument suite will study this diverse group of bodies.
- Lucy will fly by six Trojans and one Main Belt asteroid – more than any other previous asteroid mission.
- L'Ralph will detect the Trojan asteroids' chemical fingerprints.

Related Information

- L'Ralph allows scientists to interpret data provided by the Sun's reflected light that are the fingerprints of different elements and compounds.
- These data could provide clues about how organic molecules form in primitive bodies, a process that might also have led to the emergence of life on Earth.

China debuts artificial intelligence (AI) news anchors

- Xinhua news agency launched the world first two virtual news anchors amid a state-directed embrace of advanced technologies such as artificial intelligence (AI).
- AI Synthetic Anchors based on the appearances of two flesh-and-blood Chinese news presenters.
- The computerised avatars read out text that is fed into their system, their mouths moving in tandem with the reports.
- "AI Synthetic Anchors", one for Chinese and one for English news, were developed along with Sogou Inc, a Beijing-based creator of search engines and voice-recognition technology.

Related Information

- The digital anchors offer certain advantages over humans such as being able to work 24 hours a day and to quickly disseminate breaking news.
- "The AI Synthetic Anchor has officially become part of the Xinhua reporting team.
- He will work together with other anchors to bring you authoritative, timely and accurate news and information in Chinese and English.

Novel 'bionic mushrooms can produce electricity

- Scientists, including those of Indian origin, have created a bionic device that generates green power by 3D-printing clusters of cyanobacteria on an ordinary white button mushroom.
- The researchers took an ordinary white button mushroom from a grocery store and made it bionic, supercharging it with clusters of cyanobacteria that create electricity and swirls of graphene nanoribbons that can collect the current.
- It can be created by integrating cyanobacteria that can produce electricity, with nanoscale materials capable of collecting the current.

Related Information

Cyanobacteria

- These are the group of only photosynthetic prokaryotes bacteria able to produce oxygen.
- They live in a wide variety of moist soils and water either freely or in a symbiotic relationship with plants or lichen-forming fungi.
- Cyanobacteria are also called "blue-green algae.

World's largest brain-like supercomputer switched on for the first time

- The world's largest supercomputer designed to work in the same way as the human brain has been switched on for the first time.
- The newly formed million-processor-core **Spiking Neural Network Architecture (SpiNNaker)** machine is capable of completing more than 200 million actions per second.

- The SpiNNaker machine, designed and built in The University of Manchester in the UK.
- It can model more biological neurons in real time than any other machine on the planet.

Related Information

- SpiNNaker is unique because, unlike traditional computers, it does not communicate by sending large amounts of information from point A to B via a standard network.
- SpiNNaker has been used to simulate high-level real-time processing in a range of isolated brain networks.
- This includes an 80,000 neuron model of a segment of the cortex, the outer layer of the brain that receives and processes information from the senses.
- It also has simulated a region of the brain called the Basal Ganglia – an area affected in Parkinson's disease, meaning it has massive potential for neurological breakthroughs in science such as pharmaceutical testing.
- The power of SpiNNaker has even recently been harnessed to control a robot, the SpOmnibot.
- This robot uses the SpiNNaker system to interpret real-time visual information and navigate certain objects while ignoring others.
- Neuroscientists can now use SpiNNaker to help unlock some of the secrets of how the human brain works by running unprecedentedly large-scale simulations.
- It also works as a real-time neural simulator that allows roboticists to design large-scale neural networks into mobile robots so they can walk, talk and move with flexibility and low power.
- Biological neurons are basic brain cells present in the nervous system that communicate primarily by emitting 'spikes' of pure electro-chemical energy.
- Neuromorphic computing uses large-scale computer systems containing electronic circuits to mimic these spikes in a machine.

NASA to send organs-on-chips to space

- NASA is planning to send small devices containing human cells in a 3D matrix — known as tissue chips or organs-on-chips — to the International Space Station (ISS).
- The US space agency is planning the investigations in collaboration with CASIS and the National Center for Advancing Translational Sciences (NCATS) at the National Institutes for Health (NIH).
- This will help to test how they respond to stress, drugs and genetic changes.
- Chips are made of flexible plastic and having ports and channels to provide nutrients and oxygen to the cells inside them.
- The "Tissue Chips in Space" initiative seeks to better understand the role of microgravity on human health and disease and to translate that understanding to improved human health on Earth.

Related Information

- This first phase of Tissue Chips in Space includes five investigations.
- An investigation of immune system ageing is planned for launch on the SpaceX CRS-16 flight.
- The other four, scheduled to launch on SpaceX CRS-17 or subsequent flights, include lung host defence, the blood-brain barrier, musculoskeletal disease and kidney function.

Definition of kilogram set to change

- The International General Conference on Weights and Measures will meet in Versailles, France, to vote on whether to redefine the kilogram.
- Since 1879, the kilogram has been defined as the weight of "Le Grand K", a cylinder of platinum and iridium weighing a little over 2 pounds and kept in a locked vault in Paris.

- Different countries have their own "prototype kilograms" that serve as national standards and are calibrated to the Le Grand K, founded by 17 nations in 1875.
- Now though, scientists say, the system needs to change since over time, the prototype has lost atoms and therefore mass because it is "susceptible to damage and environmental factors".
- Scientists are proposing to calculate the kilogram based on the Planck's constant, which is measured by an instrument called the Kibble Balance, first developed at London's National Physical Laboratory by British scientist Bryan Kibble.
- The change will have applications in computing, manufacturing, pharmaceuticals, climate change studies and other disciplines which require very precise measurements.

Related Information

- Scientists say that the redefinition of the kilogram using a constant will ensure it remains reliable, and enable far more accurate mass measurements in the future.
- The value of the kilogram will not change.
- The kilogram is the last unit from 1875 which has not yet changed.
- The standard for other basic units like the metre for length, the second for time, the ampere for electric current, the Kelvin for temperature, the mole for the amount of a substance and the candela for luminous intensity have all been improved upon.
- For instance, the metre is defined as the length that light travels in a vacuum in 1/299,792,458th of a second rather than a metal bar.

General Conference on Weights & Measures

- The General Conference on Weights and Measures is the supreme authority of the International Bureau of Weights and Measures.
- The International Bureau of Weights and Measures is an organization that is based in Sèvres near Paris in France.
- It is an inter-governmental organization established in 1875 under the terms of the Metre Convention through which Member States act together on matters related to measurement science and measurement standards.

'Super-Earth' found orbiting Sun's nearest single star

- Astronomers have discovered a frozen planet with a mass over three times that of the Earth, orbiting the closest solitary star to the Sun.
- The potentially rocky planet, known as Barnard's star b, is a 'super-Earth' and orbits around its host star once every 233 days.
- The planet lies in a distant region from the star known as the 'snow line'.
- This is well beyond the habitable zone in which liquid water, and possibly life, could exist.
- The planet's surface temperature is estimated to be around -170°C.

Related Information

- Barnard's star is an infamous object among astronomers and exoplanet scientists, as it was one of the first stars where planets were initially claimed but later proven to be incorrect.
- Barnard's star b is the second closest known exoplanet to our Sun after "Proxima Centauri b".
- Barnard's star is the next closest star to the Sun after the Alpha Centauri triple system.
- It is a type of faint, low-mass star called a red dwarf.
- Red dwarfs are considered to be the best places to look for exoplanet candidates, which are planets outside our solar system.
- The researchers used the radial velocity method during the observations that led to the discovery of Barnard's star b.
- This technique detects wobbles in a star which are likely to be caused by the gravitational pull of an orbiting planet.
- These wobbles affect the light coming from the star.

China's build 'Artificial Sun'

- China's "artificial sun" has reached a temperature of 180 million ºF with a heating power of 10 megawatts.
- This temperature makes it six times hotter than the core of the burning star, which peaks at around 27 million F (15 million C).
- The device the **Experimental Advanced Superconducting Tokamak (EAST)** is built to harness the energy of nuclear fusion, the same process that powers stars.
- The experiment is conducted by Institute of Plasma Physics.

Related Information

Nuclear fission and Fusion

- Nuclear fission takes place when a large, somewhat unstable isotope (atoms with the same number of protons but a different number of neutrons) is bombarded by high-speed particles, usually neutrons.
- These neutrons are accelerated and then slammed into the unstable isotope, causing it to fission, or break into smaller particles.
- During the process, a neutron is accelerated and strikes the target nucleus, which in the majority of nuclear power reactors today is Uranium-235.
- This splits the target nucleus and breaks it down into two smaller isotopes (the fission products), three high-speed neutrons, and a large amount of energy.
- This resulting energy is then used to heat water in nuclear reactors and ultimately produces electricity.
- The high-speed neutrons that are ejected become projectiles that initiate other fission reactions, or chain reactions.

Nuclear Fusion

- Nuclear fusion refers to the "union of atomic nuclei to form heavier nuclei resulting in the release of enormous amounts of energy.
- For a fusion reaction to occur, two atomic nuclei merge under extremely high pressures and temperatures topping 270 million ºF.
- Fusion takes place when two low-mass isotopes, typically isotope of hydrogen, unite under conditions of extreme pressure and temperature.
- Fusion is what powers the sun.
- Atoms of Tritium and Deuterium (isotopes of hydrogen, Hydrogen-3 and Hydrogen-2, respectively) unite under extreme pressure and temperature to produce a neutron and a helium isotope.
- Along with this, an enormous amount of energy is released, which is several times the amount produced from fission.

GROWTH-India telescope's first science observation

- The GROWTH-India telescope at the Indian Astronomical Observatory located in Hanle, Ladakh.
- It has made its first science observation which is a follow-up study of a nova explosion.
- The GROWTH-India telescope is part of the Global Relay of Observatories Watching Transients Happen.
- Its goals are threefold:
  (a) Search for explosions in the optical regime whenever LIGO group detects a Binary Neutron Star merger
  (b) Study nearby young supernova explosions.
  (c) Study nearby asteroids.

Related Information

Nova

- Nova is explosive events involving violent eruptions on the surface of white dwarf stars, leading to a temporary increase in brightness of the star.
- This recurrent nova, named M31N-2008, has been observed to erupt several times.

Nova v/s Supernova

- Nova and supernova are two features of the universe.
- A nova is defined as "A star that suddenly becomes much brighter and then gradually returns to its original brightness over a period of weeks to years Supernova is "a rare celestial phenomenon involving the explosion of most of the material in a star,
- resulting in an extremely bright, short-lived object that emits vast amounts of energy"
- The major difference between a nova and a supernova is that in a supernova a lot of the object's mass is ejected with the explosion.

Human microbiome

- Pune hosted an international conference on microbiome research, a field of study that is still in its infancy in India.
- In this conference, they would study and map the human microbiome across the country.

Related Information

- The human body carries diverse communities of microorganisms, which are mainly bacterial are referred to as "human microbiome".
- These organisms play a key role in many aspects of host physiology, ranging from metabolism of otherwise complex indigestible carbohydrates and fats to producing essential vitamins, maintaining immune systems and acting as the first line of defence against pathogens.
- Research on the human microbiome has thrown light on various aspects like
  (a) How different parts of the human body are occupied by characteristic microbial communities, and how various factors contribute to shaping the composition of the microbiome.
  (b) It also includes the study of genetics, dietary habits, age, geographic location and ethnicity.
- The project will include the collection of saliva, stool and skin swabs of 20,000 Indians across various ethnic groups from different geographical regions.
- India provides for a wide range of research with more than 4,500 ethnic groups and presence of two global biodiversity hotspots (Himalayan range and the Western Ghats).

A smart 'Vaccine for Goat plague

- Researchers from the UK and India, including a team from the Tamil Nadu Veterinary and Animal Sciences University, have jointly developed a 'smart' vaccine which has the potential to help eradicate goat plague.
- The major contribution from British scientists were providing a template for developing a smart vaccine, which is also called **DIVA vaccine**.
- It is one of the first smart Peste des petits ruminants (PPR) vaccines that help distinguish between animals which are vaccinated and infected, which is impossible with conventional live or killed virus vaccines.
- These vaccines induce the immune response which is different from that induced by natural infection.

Related Information

- Goat plague or Peste des petits ruminants (PPR), is a highly contagious viral disease that afflicts goats and sheep in many parts of the country.
- The disease kills small ruminants in large numbers unless they are vaccinated.

- Apart from India, goat plague is prevalent in many African countries, West Asia, China and Mongolia.

ISRO's PSLV-C43 successfully places HysIS, 30 foreign satellites in respective orbits.

- ISRO's PSLV-C43 successfully placed HysIS and 30 foreign satellites soared in a trajectory crossing the path of the Sun.
- The 30 satellites are one each from Australia, Canada, Colombia, Finland, Malaysia, Netherlands and Spain, and 23 from the USA.

Related Information

Hyper Spectral Imaging Satellite (HysIS)

- HysIS Satellite or dubbed 'Sharp Eye is India's first hyperspectral imaging satellite for advanced Earth observation, it was launched with the help of PSLV-C43 launcher.
- HysIS will study the Earth's surface in visible, near-infrared and shortwave infrared regions of the electromagnetic spectrum, with a mission life of about 5 years.
- It has a hyperspectral imaging camera in space can provide well-defined images that can help to identify objects on Earth far more clearly than regular optical or remote sensing cameras.
- The technology will be an added advantage of watching over India from space for a variety of purposes such as defence, agriculture, land use, coastal zones, among others.

November

Shakti: India's first microprocessor

- India's first indigenous microprocessor **Shakti** has been developed and booted by Indian Institute of Technology Madras along with a microchip fabricated Laboratory of Indian Space Research Organisation (Isro) at Chandigarh.
- It will reduce dependency on imported microchips and the risk of cyber attacks making it ideal for communication and defence sectors.
- The microprocessor fabricated in India was in a 180nm facility, while the one in the US was in a 20nm. lab.

Related Information

Microprocessor

- A microprocessor is a computer processor that incorporates the functions of a central processing unit on a single integrated circuit (IC).
- The microprocessor is a multipurpose, clock driven, register-based, digital integrated circuit that accepts binary data as input, processes it according to instructions stored in its memory, and provides results as output.
- Microprocessors operate on numbers and symbols represented in the binary number system.

NASA's historic Dawn mission to asteroid belt comes to the end

- NASA's pioneering Dawn spacecraft which orbited the two largest objects in the asteroid belt has run out of fuel.
- The Dawn mission, launched in 2007 to study the protoplanet Vesta and the dwarf planet Ceres on a journey that put about 6.9 billion kilometres on its odometer.

Related Information

- In 2011, when Dawn arrived at Vesta, the second largest world in the main asteroid belt, the spacecraft became the first to orbit a body in the region between Mars and Jupiter.
- In 2015, when Dawn went into orbit around Ceres, a dwarf planet that is also the largest world in the asteroid belt,
- This mission became the first to visit a dwarf planet and go into orbit around two destinations beyond Earth.
- The spacecraft launched 11 years ago to visit the two largest objects in the main asteroid belt.
- Currently, Dawn, it is in orbit around the dwarf planet Ceres, where it will remain for decades.

Note

NASA also announced that its exoplanet-hunting Kepler Space Telescope had run out of hydrazine fuel, and the craft would be commanded to cease operations.

AI bot 'ClaRAN' can spot radio galaxies

- "ClaRAN" grew out of an open source version of Microsoft and Facebook's object detection software.
- AI bot "ClaRAN" was known for recognising faces on Facebook. (International Centre for Radio Astronomy Research).
- It will use Artificial Intelligence (AI) programme that helps to recognise faces on Facebook to identify galaxies in deep space.
- The AI bot named "ClaRAN" scans images taken by radio telescopes.
- Its job is to spot radio galaxies that emit powerful radio jets from supermassive black holes at their centres.

Related Information

- ClaRAN is the brainchild of big data specialist Dr Chen Wu and astronomer Dr Ivy Wong from The University of Western Australia node of the International Centre for Radio Astronomy Research (ICRAR).

How does it work?

- Black holes are found at the centre of most, if not all, galaxies.
- These supermassive black holes occasionally burp out jets that can be seen with a radio telescope.
- "ClaRAN help out to find the jets which stretch a long way from their host galaxies, making it difficult for traditional computer programmes to figure out where the galaxy is.

The Earth has not one, but three moons.

- A group of Hungarian scientists have confirmed a long-standing astronomical speculation; the Earth has three natural satellites or moons and not one.
- The research published in the Monthly Notices of the Royal Astronomical Society.
- It says that the new moons are entirely made up of extremely tiny dust particles of less than one-millimetre size and reflect light rather faintly.
- This is the reason why they were difficult to observe and study in the first place even when they are located at around the same distance as the Moon from the Earth—400,000 kilometres.

Related Information

- In 1961, Kazimierz Kordylewski, a Polish scientist had observed these moons for the first time and they were later named after him as Kordylewski Dust Clouds (KDCs).

- Kordylewski had discovered the dust clouds close to a special point in space known as L5 which a Lagrange point of the Earth-Moon gravitational system is.
- Lagrange points are places of equilibrium in space where gravitational forces of two large and solid astronomical objects like the Earth and the Moon cancel out the centrifugal forces.
- Many other small celestial objects are often found around Lagrange points.
- For example, there are minor planets close to the Lagrange points of the Sun-Earth gravitational system and the Sun-Jupiter system.
- Such points are also ideal for parking satellites and other space vehicles as the fuel consumption is considerably lower here.
- They will be essential for space exploration projects as transfer stations where space shuttles and stations can stop over on long journeys to other planets and even the Sun.
- There are five such points of stability identified in any such two-body system including the Earth-Moon system.

NASA probe set to visit Jupiter's Trojan asteroids

- NASA's Ralph – a space instrument that has travelled as far as Pluto – is set to explore Jupiter's Trojan asteroids, which are remnants from the early days of the solar system.
- Ralph was first launched aboard the New Horizons spacecraft in 2006m and obtained stunning flyby images of Jupiter and its moons.
- This was followed by a visit to Pluto where Ralph took the first high-definition pictures of the iconic minor planet.
- In 2021, Ralph is set to journey with the Lucy mission to Jupiter's Trojan asteroids.
- The Lucy spacecraft carries a near-twin of Ralph, called L'Ralph, which will investigate Jupiter's Trojan asteroids.
- The L'Ralph instrument suite will study this diverse group of bodies.
- Lucy will fly by six Trojans and one Main Belt asteroid – more than any other previous asteroid mission.
- L'Ralph will detect the Trojan asteroids' chemical fingerprints.

Related Information

- L'Ralph allows scientists to interpret data provided by the Sun's reflected light that are the fingerprints of different elements and compounds.
- These data could provide clues about how organic molecules form in primitive bodies, a process that might also have led to the emergence of life on Earth.

China debuts artificial intelligence (AI) news anchors

- Xinhua news agency launched the world first two virtual news anchors amid a state-directed embrace of advanced technologies such as artificial intelligence (AI).
- AI Synthetic Anchors based on the appearances of two flesh-and-blood Chinese news presenters.
- The computerised avatars read out text that is fed into their system, their mouths moving in tandem with the reports.
- "AI Synthetic Anchors", one for Chinese and one for English news, were developed along with Sogou Inc, a Beijing-based creator of search engines and voice-recognition technology.

Related Information

- The digital anchors offer certain advantages over humans such as being able to work 24 hours a day and to quickly disseminate breaking news.
- "The AI Synthetic Anchor has officially become part of the Xinhua reporting team.

- He will work together with other anchors to bring you authoritative, timely and accurate news and information in Chinese and English.

Novel 'bionic mushrooms can produce electricity

- Scientists, including those of Indian origin, have created a bionic device that generates green power by 3D-printing clusters of cyanobacteria on an ordinary white button mushroom.
- The researchers took an ordinary white button mushroom from a grocery store and made it bionic, supercharging it with clusters of cyanobacteria that create electricity and swirls of graphene nanoribbons that can collect the current.
- It can be created by integrating cyanobacteria that can produce electricity, with nanoscale materials capable of collecting the current.

Related Information

Cyanobacteria

- These are the group of only photosynthetic prokaryotes bacteria able to produce oxygen.
- They live in a wide variety of moist soils and water either freely or in a symbiotic relationship with plants or lichen-forming fungi.
- Cyanobacteria are also called "blue-green algae.

World's largest brain-like supercomputer switched on for the first time

- The world's largest supercomputer designed to work in the same way as the human brain has been switched on for the first time.
- The newly formed million-processor-core **Spiking Neural Network Architecture (SpiNNaker)** machine is capable of completing more than 200 million actions per second.
- The SpiNNaker machine, designed and built in The University of Manchester in the UK.
- It can model more biological neurons in real time than any other machine on the planet.

Related Information

- SpiNNaker is unique because, unlike traditional computers, it does not communicate by sending large amounts of information from point A to B via a standard network.
- SpiNNaker has been used to simulate high-level real-time processing in a range of isolated brain networks.
- This includes an 80,000 neuron model of a segment of the cortex, the outer layer of the brain that receives and processes information from the senses.
- It also has simulated a region of the brain called the Basal Ganglia – an area affected in Parkinson's disease, meaning it has massive potential for neurological breakthroughs in science such as pharmaceutical testing.
- The power of SpiNNaker has even recently been harnessed to control a robot, the SpOmnibot.
- This robot uses the SpiNNaker system to interpret real-time visual information and navigate certain objects while ignoring others.
- Neuroscientists can now use SpiNNaker to help unlock some of the secrets of how the human brain works by running unprecedentedly large-scale simulations.
- It also works as a real-time neural simulator that allows roboticists to design large-scale neural networks into mobile robots so they can walk, talk and move with flexibility and low power.
- Biological neurons are basic brain cells present in the nervous system that communicate primarily by emitting 'spikes' of pure electro-chemical energy.
- Neuromorphic computing uses large-scale computer systems containing electronic circuits to mimic these spikes in a machine.

NASA to send organs-on-chips to space

- NASA is planning to send small devices containing human cells in a 3D matrix — known as tissue chips or organs-on-chips — to the International Space Station (ISS).
- The US space agency is planning the investigations in collaboration with CASIS and the National Center for Advancing Translational Sciences (NCATS) at the National Institutes for Health (NIH).
- This will help to test how they respond to stress, drugs and genetic changes.
- Chips are made of flexible plastic and having ports and channels to provide nutrients and oxygen to the cells inside them.
- The "Tissue Chips in Space" initiative seeks to better understand the role of microgravity on human health and disease and to translate that understanding to improved human health on Earth.

Related Information

- This first phase of Tissue Chips in Space includes five investigations.
- An investigation of immune system ageing is planned for launch on the SpaceX CRS-16 flight.
- The other four, scheduled to launch on SpaceX CRS-17 or subsequent flights, include lung host defence, the blood-brain barrier, musculoskeletal disease and kidney function.

Definition of kilogram set to change

- The International General Conference on Weights and Measures will meet in Versailles, France, to vote on whether to redefine the kilogram.
- Since 1879, the kilogram has been defined as the weight of "Le Grand K", a cylinder of platinum and iridium weighing a little over 2 pounds and kept in a locked vault in Paris.
- Different countries have their own "prototype kilograms" that serve as national standards and are calibrated to the Le Grand K, founded by 17 nations in 1875.
- Now though, scientists say, the system needs to change since over time, the prototype has lost atoms and therefore mass because it is "susceptible to damage and environmental factors".
- Scientists are proposing to calculate the kilogram based on the Planck's constant, which is measured by an instrument called the Kibble Balance, first developed at London's National Physical Laboratory by British scientist Bryan Kibble.
- The change will have applications in computing, manufacturing, pharmaceuticals, climate change studies and other disciplines which require very precise measurements.

Related Information

- Scientists say that the redefinition of the kilogram using a constant will ensure it remains reliable, and enable far more accurate mass measurements in the future.
- The value of the kilogram will not change.
- The kilogram is the last unit from 1875 which has not yet changed.
- The standard for other basic units like the metre for length, the second for time, the ampere for electric current, the Kelvin for temperature, the mole for the amount of a substance and the candela for luminous intensity have all been improved upon.
- For instance, the metre is defined as the length that light travels in a vacuum in 1/299,792,458th of a second rather than a metal bar.

General Conference on Weights & Measures

- The General Conference on Weights and Measures is the supreme authority of the International Bureau of Weights and Measures.
- The International Bureau of Weights and Measures is an organization that is based in Sèvres near Paris in France.
- It is an inter-governmental organization established in 1875 under the terms of the Metre Convention through which Member States act together on matters related to measurement science and measurement standards.

'Super-Earth' found orbiting Sun's nearest single star

- Astronomers have discovered a frozen planet with a mass over three times that of the Earth, orbiting the closest solitary star to the Sun.
- The potentially rocky planet, known as Barnard's star b, is a 'super-Earth' and orbits around its host star once every 233 days.
- The planet lies in a distant region from the star known as the 'snow line'.
- This is well beyond the habitable zone in which liquid water, and possibly life, could exist.
- The planet's surface temperature is estimated to be around -170°C.

Related Information

- Barnard's star is an infamous object among astronomers and exoplanet scientists, as it was one of the first stars where planets were initially claimed but later proven to be incorrect.
- Barnard's star b is the second closest known exoplanet to our Sun after "Proxima Centauri b".
- Barnard's star is the next closest star to the Sun after the Alpha Centauri triple system.
- It is a type of faint, low-mass star called a red dwarf.
- Red dwarfs are considered to be the best places to look for exoplanet candidates, which are planets outside our solar system.
- The researchers used the radial velocity method during the observations that led to the discovery of Barnard's star b.
- This technique detects wobbles in a star which are likely to be caused by the gravitational pull of an orbiting planet.
- These wobbles affect the light coming from the star.

China's build 'Artificial Sun'

- China's "artificial sun" has reached a temperature of 180 million ºF with a heating power of 10 megawatts.
- This temperature makes it six times hotter than the core of the burning star, which peaks at around 27 million F (15 million C).
- The device the **Experimental Advanced Superconducting Tokamak (EAST)** is built to harness the energy of nuclear fusion, the same process that powers stars.
- The experiment is conducted by Institute of Plasma Physics.

Related Information

Nuclear fission and Fusion

- Nuclear fission takes place when a large, somewhat unstable isotope (atoms with the same number of protons but a different number of neutrons) is bombarded by high-speed particles, usually neutrons.
- These neutrons are accelerated and then slammed into the unstable isotope, causing it to fission, or break into smaller particles.
- During the process, a neutron is accelerated and strikes the target nucleus, which in the majority of nuclear power reactors today is Uranium-235.
- This splits the target nucleus and breaks it down into two smaller isotopes (the fission products), three high-speed neutrons, and a large amount of energy.
- This resulting energy is then used to heat water in nuclear reactors and ultimately produces electricity.
- The high-speed neutrons that are ejected become projectiles that initiate other fission reactions, or chain reactions.

Nuclear Fusion

- Nuclear fusion refers to the "union of atomic nuclei to form heavier nuclei resulting in the release of enormous amounts of energy.
- For a fusion reaction to occur, two atomic nuclei merge under extremely high pressures and temperatures topping 270 million ºF.
- Fusion takes place when two low-mass isotopes, typically isotope of hydrogen, unite under conditions of extreme pressure and temperature.
- Fusion is what powers the sun.
- Atoms of Tritium and Deuterium (isotopes of hydrogen, Hydrogen-3 and Hydrogen-2, respectively) unite under extreme pressure and temperature to produce a neutron and a helium isotope.
- Along with this, an enormous amount of energy is released, which is several times the amount produced from fission.

GROWTH-India telescope's first science observation

- The GROWTH-India telescope at the Indian Astronomical Observatory located in Hanle, Ladakh.
- It has made its first science observation which is a follow-up study of a nova explosion.
- The GROWTH-India telescope is part of the Global Relay of Observatories Watching Transients Happen.
- Its goals are threefold:
  (a) Search for explosions in the optical regime whenever LIGO group detects a Binary Neutron Star merger
  (b) Study nearby young supernova explosions.
  (c) Study nearby asteroids.

Related Information
Nova

- Nova is explosive events involving violent eruptions on the surface of white dwarf stars, leading to a temporary increase in brightness of the star.
- This recurrent nova, named M31N-2008, has been observed to erupt several times.

Nova v/s Supernova

- Nova and supernova are two features of the universe.
- A nova is defined as "A star that suddenly becomes much brighter and then gradually returns to its original brightness over a period of weeks to years Supernova is "a rare celestial phenomenon involving the explosion of most of the material in a star,
- resulting in an extremely bright, short-lived object that emits vast amounts of energy"
- The major difference between a nova and a supernova is that in a supernova a lot of the object's mass is ejected with the explosion.

Human microbiome

- Pune hosted an international conference on microbiome research, a field of study that is still in its infancy in India.
- In this conference, they would study and map the human microbiome across the country.

Related Information

- The human body carries diverse communities of microorganisms, which are mainly bacterial are referred to as "human microbiome".
- These organisms play a key role in many aspects of host physiology, ranging from metabolism of otherwise complex indigestible carbohydrates and fats to producing essential vitamins, maintaining immune systems and acting as the first line of defence against pathogens.

- Research on the human microbiome has thrown light on various aspects like
  (a) How different parts of the human body are occupied by characteristic microbial communities, and how various factors contribute to shaping the composition of the microbiome.
  (b) It also includes the study of genetics, dietary habits, age, geographic location and ethnicity.
- The project will include the collection of saliva, stool and skin swabs of 20,000 Indians across various ethnic groups from different geographical regions.
- India provides for a wide range of research with more than 4,500 ethnic groups and presence of two global biodiversity hotspots (Himalayan range and the Western Ghats).

A smart `Vaccine for Goat plague

- Researchers from the UK and India, including a team from the Tamil Nadu Veterinary and Animal Sciences University, have jointly developed a 'smart' vaccine which has the potential to help eradicate goat plague.
- The major contribution from British scientists were providing a template for developing a smart vaccine, which is also called **DIVA vaccine**.
- It is one of the first smart Peste des petits ruminants (PPR) vaccines that help distinguish between animals which are vaccinated and infected, which is impossible with conventional live or killed virus vaccines.
- These vaccines induce the immune response which is different from that induced by natural infection.

Related Information

- Goat plague or Peste des petits ruminants (PPR), is a highly contagious viral disease that afflicts goats and sheep in many parts of the country.
- The disease kills small ruminants in large numbers unless they are vaccinated.
- Apart from India, goat plague is prevalent in many African countries, West Asia, China and Mongolia.

ISRO's PSLV-C43 successfully places HysIS, 30 foreign satellites in respective orbits.

- ISRO's PSLV-C43 successfully placed HysIS and 30 foreign satellites soared in a trajectory crossing the path of the Sun.
- The 30 satellites are one each from Australia, Canada, Colombia, Finland, Malaysia, Netherlands and Spain, and 23 from the USA.

Related Information

Hyper Spectral Imaging Satellite (HysIS)

- HysIS Satellite or dubbed 'Sharp Eye is India's first hyperspectral imaging satellite for advanced Earth observation, it was launched with the help of PSLV-C43 launcher.
- HysIS will study the Earth's surface in visible, near-infrared and shortwave infrared regions of the electromagnetic spectrum, with a mission life of about 5 years.
- It has a hyperspectral imaging camera in space can provide well-defined images that can help to identify objects on Earth far more clearly than regular optical or remote sensing cameras.
- The technology will be an added advantage of watching over India from space for a variety of purposes such as defence, agriculture, land use, coastal zones, among others.

October

Fall Armyworm: Nipping a problem in the bud

- India has to effectively deal with this new insect pest that can devastate maize and a host of other crops.
- This pest has been seen in the Americas for several decades.
- Fall Armyworm (FAW) scientifically known as Spodoptera frugiperda) has been recently reported in Karnataka and also parts of Andhra Pradesh, Telangana, Tamil Nadu, Maharashtra, and Gujarat.
- It has been detected mainly in maize fields.

Related Information

About Fall Armyworm

- The female moth lays eggs and the caterpillars hatching from these eat parts of the host crop plants, before pupating and turning into new moths.
- This highly-destructive and the invasive pest has been seen in the Americas for several decades, but its prevalence outside was noted for the first time in West Africa in early 2016.
- According to the International Maize and Wheat Improvement Center at Mexico also known as CIMMYT damaged more than 1.5 million hectares of Africa's maize crop.

Control measurement

- An effective IPM strategy would need to incorporate host plant resistance (through breeding), biological and cultural control.
- The use of environmentally-safer chemical and biopesticides for crop protection.
- Spraying of chemicals should be avoided unless the pest load has crossed economic threshold levels.
- The eggs laid by the moths are discernible to the naked eye. Farmers can be trained to recognize and destroy the egg masses, so as to prevent the caterpillars from emerging.

World's first Hyperloop passenger capsule unveiled

- World's first Hyperloop passenger capsule, having speed 1200 k/hr. was shown in Spain presented by Hyperloop Transportation Technologies.

Related Information

- Hyperloop is a technology that gained popularity after billionaire Elon Musk touted it in 2013.
- It is a first full-scale passenger capsule, offering the world a peek at the future of travel.
- It envisages moving passengers in capsules at speeds of more than 750 miles (1,200 kilometers) per hour through low-pressure tubes, in order to reduce friction.
- The technology will be able to propel trains faster than existing methods.

Context to India

- In February, Branson signed a preliminary agreement in Mumbai for a broad hyperloop framework
- It helps in mooted a Mumbai-Pune system that would shrink travel time to 25 minutes and save about three hours.

The Goblin: Presumed to be the ninth planet of the Solar System

- A newly discovered dwarf planet nicknamed 'The Goblin' which is charting a lonely orbit far beyond Pluto.
- The Goblin estimated to be 10 times as massive as Earth and its provisional name.

Related Information

2015 TG387

- The Goblin was 80 astronomical units (AU) from the Sun (1 AU is equal to the distance between the Earth and the Sun).
- At its closest, the Goblin is 65 AU from the Sun.
- It orbits the Sun once in 40,000 years.

The first moon outside our solar system discovered

- The newly discovered exomoon and the planet it orbits are both gaseous.

Related Information

- Astronomers have pinpointed the first moon detected outside our solar system.
- It is a large gaseous world the size of Neptune that is unlike any other known moon and orbits a gas planet much more massive than Jupiter.
- The exomoon and its planet orbit Kepler-1625, a star similar in temperature to our sun but about 70% larger.
- The exomoon orbits roughly 3 million km from its planet and its mass is about 1.5% that of its planet.

4th India International Science Festival in Lucknow

- It is organized by the Ministry of Science and Technology, Ministry of Earth Sciences in association with Vijnana Bharati.

Related information

- The 3rd series of IISF was held in Tamil Nadu.
- More than ten thousand scientists and experts, including science teachers and students, will participate in the event.
- The theme of this year's festival is "Science for transformation.

About Vijnana Bharati

- Vijnana Bharati (VIBHA, previously known as Swadeshi Science Movement) is a non- profit organization.
- It will be working for science popularization & implementation of modern technology & ancient sciences in India.
- It was started in the Indian Institute of Science, Bengaluru.

Gujarat acts to save its pride

- The deaths of 23 lions since September 12 in Gir Forest stunned the Gujarat Government.

Related Information

- The central government called international experts to help us control the situation.
- The Indian Council for Medical Research (ICMR) has confirmed that the **Canine Distemper Virus (CDV)** was responsible.
- The scientists of ICMR-NIV (ICMR-National Institute of Virology) have recommended the existing CDV vaccine which should work as a protective intervention for Gir lions.
- Canine Distemper Virus (CDV) and tick-borne Babesiosis is killing the great cats famously known as Gujarat's pride.
- ICMR has also recommended that the animals should be placed in 2-3 different sanctuaries.

About CDV

- CDV causes a highly contagious and life-threatening disease in dogs.
- It also affects different wild carnivore's viz., wolves, foxes, raccoons, red pandas, ferrets, hyenas, tigers, and lions.

Nobel Prize 2018

Field	To Whom	For
1. In Medicine	James Allison of the US and Tasuku Honjo of Japan	Cancer treatment inhibition of negative immune regulation.
2. In Physics	Arthur Ashkin (U.S.), Gerard Mourou (France) & Donna Strickland (Canada)	Optical lasers technique which is now used in corrective eye surgery.
3. In Chemistry	Frances H. Arnold, George P. Smith, and Sir Gregory P. Winter jointly win the Noble prize.	H. Arnold "for the directed evolution of enzymes" George P. Smith and Sir Gregory P. Winter - the phage display of peptides & antibodies.
4. In Peace	Gynecologist Dr. Denis Mukwege & Yazidi human rights activist ' Nadia Murad	Efforts to end the use of sexual violence as a weapon of war & armed conflict.

India's first Manned Space Mission: Gaganyaan 2022

- Indian Space Research Organisation and Russia's Roscosmos State Corporation for Space Activities (ROSCOSMOS) have signed a MoU to work together for Gaganyaan.
- ROSCOSMOS has offered the ride to Indian astronaut short visit to International Space Station (ISS) onboard Soyuz spacecraft for short training mission in 2022.

Related Information

About Gaganyaan:

- It is India's first manned space mission.
- Under it, India is planning to send three humans (Gaganyatris) into space i.e. in low earth orbit (LEO) by 2022 i.e. by 75th Independence Day for the period of five to seven days.
- India plans to build a crew vehicle that can accommodate 2 or 3 astronauts and human rate its GLSV Mk-III launcher.

About Pad Abort

- ISRO recently conducted its first 'pad abort' test that was successful.
- The 'pad abort' test or Crew Escape System is an emergency escape measure that helps pull the crew away from the launch vehicle when a mission has to be aborted.
- The test was conducted at the Satish Dhawan Space Centre, Sriharikota.
- The Pad Abort Test demonstrated the safe recovery of the crew module in case of any exigency at the launch pad

Note: - India will be the fourth nation to do so after the United States, Russia, and China if it launches the Gaganyaan mission.

Tiny spheres to trap water contaminants developed

- Scientists have created tiny spheres that can catch and destroy Bisphenol A (BPA)
- It is a synthetic chemical used to make plastics that often contaminates water.

Related Information

- BPA is commonly used to coat the insides of food cans, bottle tops, and water supply lines, and was once a component of baby bottles.
- BPA that seeps into food and drink is considered safe in low doses.
- The prolonged exposure is suspected of affecting the health of children and contributing to high blood pressure.

How these tiny sphere used in trap BPA

- The micron-sized spheres developed resemble tiny flower-like collections of titanium dioxide petals.
- The supple petals provide plenty of surface area for researchers to anchor cyclodextrin — a benign sugar-based molecule often used in food and drugs.
- It has a two-faced structure, with a hydrophobic (water-avoiding) cavity and a hydrophilic (water-attracting) outer surface.
- BPA is hydrophobic and naturally attracted to the cavity. Once trapped, reactive oxygen species (ROS) produced by the spheres degrade BPA into harmless chemicals.

The first example of a bioelectronic medicine

- Northwestern University and Washington University School of Medicine have developed the first example of a bioelectronic medicine.
- It is an implantable, biodegradable wireless device that speeds nerve regeneration and improves healing of a damaged nerve.

How it's works

- This device delivered pulses of electricity to damaged nerves in rats after a surgical repair process, accelerating the regrowth of nerves and enhancing the recovery of muscle strength and control.
- The device is the size of a dime and the thickness of a sheet of paper. Researchers at an implantable, biodegradable wireless device that speeds nerve regeneration and improves the healing of a damaged nerve.
- The size of a dime and the thickness of a sheet of paper, the wireless device operates for about two weeks before naturally absorbed into the body.
- The research study also showed the device can work as a temporary pacemaker and as an interface to the spinal cord and other stimulation sites across the body.

Power Bat: Harnessing technology to enhance the fan experience

- Spektacom Technologies, the start-up by former India leg-spinner Anil Kumble, Microsoft Corp and broadcast partner Star India introduced the Power Bat.
- This bat (tools) will provide players, coaches, commentators, fans, and viewers a completely new and unique way to engage with cricket and improve their game.

Related Information

- The Power Bat is powered by the Microsoft Azure cloud platform using AI and Internet of Things (IoT) services.
- Power Bat is a unique concept whereby a lightweight, Azure Sphere-powered sticker is stuck on the shoulder of the bat.
- As soon as the batsman hits the ball, data on different parameters (speed, twist and quality of the shot) are captured in a new unit of measurement titled Power Speks.
- Power Bat first used in the TNPL and Star India used it in a recent series to provide real-time statistics and insights straight off the ground.

Mission to sequence genes of Indians

- India is planning a major mission to sequence the genes of a "large" group of Indians.
- The project has involved different countries along with India to sequence the genes of a "large" group of Indians akin to projects in the United Kingdom, China, Japan, and Australia.
- This will be used to improve health as well as the buck a global trend of designing 'personalised medicine.'
- The Ministry of Health and Family Welfare and the Department of Biotechnology would be closely associated with the project.
- India is now one of the six countries to achieve such a feat.

Council of Scientific and Industrial Research

- The Council of Scientific and Industrial Research is an autonomous body established by the Government of India.
- It is the largest research and development organization in India.
- It is mainly funded by the Ministry of Science and Technology and it operates as an autonomous body through the Societies Registration Act, 1860.
- The Council of Scientific and Industrial Research in 2009 announced that it had sequenced the genome of an Indian.

About Gene

- A gene is a region of DNA that encodes function.
- A chromosome consists of a long strand of DNA containing many genes.
- A human chromosome can have up to 500 million base pairs of DNA with thousands of genes.

ISRO to set up center at Jammu University

- ISRO will set up a center, named Satish Dhawan Center for Space Science, at the Central University of Jammu (CUJ) to expand its presence in the northernmost state of India.
- The center will have facilities for geospatial data analysis that will help in for sustainable use of natural resources and planning land-use pattern.
- It will help in ground-based observations for atmospheric studies, the research lab for astrophysics.
- It also provides atmospheric sensing and glacier studies lab for better use of the large quantity of water is stored in the form of seasonal snow, ice and glaciers in the rivers of North India.
- This will help to enhance Jammu and Kashmir economy and human lives which are affected by vegetation cover, forest area, snow, landslides, avalanches, groundwater, cloud cover, which can be monitored from space through remote-sensing.

Chandra X-Ray Observatory

- NASA's Chandra X-ray Observatory has entered protective "safe mode" Mere days after the Hubble Space Telescope entered safe mode following a component failure.
- The Chandra X-Ray Observatory is a NASA spies worked on different objects that include black holes, galaxies, supernovas, high-temperature gases, and quasars.
- The x-ray portion of the electromagnetic spectrum to help us better understands the universe.
- It was previously known as the Advanced X-ray Astrophysics Facility (AXAF).
- The telescope is named after the Nobel Prize-winning Indian-American astrophysicist Subrahmanyan Chandrasekhar.

Related Information

NASA's Great Observatories

(a) Hubble Space Telescope

- The first element of the program - and arguably the best known -- is the Hubble Space Telescope (HST).
- The Hubble telescope was deployed by a NASA Space Shuttle in 1990.

(b) The Compton Gamma Ray Observatory (CGRO)

- It was the second of NASA's Great Observatories.
- This mission collected data on some of the most violent physical processes in the Universe, characterized by their extremely high energies.

(c) Chandra X-ray Observatory

- The third member of the Great Observatory family.
- This observatory is observing such objects as black holes, quasars, and high-temperature gases throughout the x-ray portion of the EM spectrum.

(d) Spitzer Space Telescope

- The Spitzer Space Telescope represents the fourth and final element in NASA's Great Observatory program.
- Spitzer fills in an important gap in wavelength coverage not available from the ground-the thermal infrared.

Bees go silent during the total solar eclipse

- Researchers at the University of Missouri organized a cadre of citizen scientists and elementary school classrooms study that solar eclipse's influence on bee behavior.
- The result published in the Annals of the Entomological Society of America
- Bees stopped flying during the period of total solar eclipse.

Related Information

- For the study of this research 16 monitoring stations were set up in Oregon, Idaho, and Missouri.
- The data showed that bees remained active during the partial-eclipse phases both before and after totality, but they essentially ceased flying during the period of totality.
- Just one buzz was recorded during totality in all of the 16 monitoring locations.
- Bees commonly fly more slowly at dusk and return to their colonies at night, and so the same behavior triggered by solar eclipse offers evidence about how they respond to environmental cues when those cues occur unexpectedly.

Water Disinfection System "OneerTM"

- It is developed by Council of Scientific and Industrial Research, Indian Institute of Toxicology Research (CSIR-IITR) Lucknow.
- "OneerTM" is the trademark of this innovative technology Drinking Water Disinfection System.
- It is useful for the continuous treatment of water and eliminates all disease-causing pathogens such as virus, bacteria, fungi, protozoa, and cyst.
- It provides safe drinking water to domestic and communities settings as per National and International standards prescribed for potable water (BIS, WHO etc.).
- The device will go a long way in meeting the requirements of potable water in rural and urban areas.

Related information

- The technology will be helpful especially for rural people since it can be solar powered and this development is in line with the 'Make in India' Mission"
- According to the World Health Organization, "access to safe drinking water is essential to health, a basic human right and a component of effective policy for health protection".
- The smaller unit of Oneer is particularly suitable for homes, street food vendors, and small establishments.

About CSIR

- The Council of Scientific and Industrial Research was established by the Government of India.
- It is an autonomous body that has emerged as the largest research and development organization in India.
- It is funded by the Ministry of Science and Technology, registration under the Societies Registration Act, 1860.
- The research and development activities of CSIR include aerospace engineering, structural engineering, ocean sciences, life sciences, metallurgy, chemicals, mining, food, petroleum, leather, and environmental science.

C-FLOWS - NCCR develops a system to estimate, predict flooding within Chennai

- The C-FLOWS system which stands for Chennai FLOod Warning System has been developed by the National Centre for Coastal Research (NCCR), Chennai, and IITs.
- It is a flood warning system customized for use in Chennai

- The system has a six-module ensemble which can predict flooding due to heavy rainfall, sea-level rise and increase in water levels of the three rivers, Cooum, Adyar and Kosasthalaiyar that traverse the city.

Related Information

- It is developed after the unprecedented and sudden floods in 2015 paralyzed Chennai with over 18 lakh people being displaced.
- This C-Flows system used data about ward boundaries, population details, and infrastructure available across Tamil Nadu.
- The topography data was obtained from the Indian Remote Sensing programmed.
- The system will provide the prediction for rain 10 days in advance by taking inputs from the India Meteorological Department (IMD) on the forecast and National Centre for Medium Range Weather Forecasting (NCMRWF).

Convergence

- Data from IMD, NCMRWF, INCOIS and Tamil Nadu State government are brought together in an online hub along with the field data and the remote sensing data to observe the situation in real time.
- C-FLOWS will be integrated with TN-SMART, a portal being developed by his department.

Injectable gel may deliver islet cells for type 1 diabetes: study

- Researchers at the Indian Institute of Technology, Guwahati have developed an injectable gel using silk proteins to deliver insulin-producing cells needed to address type1 diabetes.
- Previous studies had suggested hydrogels have potential to deliver islets as they contain high water content and mimic hydrophilic content of extracellular matrix.
- It was not permissible because the use of harsh chemicals in making gels makes them unsuitable to deliver cells or bioactive molecules.
- To address this problem, researchers used a mixture of two silk proteins (mulberry Bombyxmori and non-mulberry Antheraeaassama) which leads to self-gelation. Insulin-producing islet cells were harvested from rats and encapsulated in the hydrogel.
- The hydrogel was loaded with immunosuppressive drugs to prevent immune rejection.
- It was then injected under the skin of rats.

Related Information

Islets Cells

- Islets in the pancreas are surrounded by the extracellular matrix which provides structural and biochemical support to cells.
- The components of this matrix bind to transmembrane proteins on the islet surface to facilitate cell to cell connection, proliferation and insulin secretion.

Type1 diabetes

- Diabetes mellitus type 1, also known as type 1 diabetes is a form of diabetes mellitus in which very little or no insulin is produced by the pancreas.

The classic symptoms are frequent urination, increased thirst, increased hunger, and weight loss

- It also shows other symptoms which may include blurry vision, feeling tired and poor healing.

World's smallest optical gyroscope developed

- Scientists have developed the world's smallest optical gyroscope device.
- This device helps vehicles, drones, and wearable and handheld electronic devices know their orientation in three-dimensional space.

- It is 500 times smaller than the current state-of-the-art device described in the journal Nature Photonics.
- The new gyroscope achieves improved performance by using a new technique called "reciprocal sensitivity enhancement.
- "In this case, "reciprocal" means that it affects both beams of the light inside the gyroscope in the same way.

Related Information

Fibre optic gyroscope

- A fibre optic gyroscope (FOG) senses changes in orientation using the Sagnac effect, thus performing the function of a mechanical gyroscope.
- Its principle of operation is instead based on the interference of light which has passed through a coil of optical fibre which can be as long as 5 km.

Applications

- FOGs are used in Fibre optic gyrocompasses.
- FOGs are used in the inertial navigation systems of some guided missiles.
- FOGs can be a navigation aid in remotely operated vehicles and autonomous underwater vehicles.
- FOGs are used in surveying.

Poly-Oxime gel: Protect farmers from toxic pesticides

- Poly-Oxime gel has been prepared by researchers at the Institute for Stem Cell Science and Regenerative Medicine (InStem) Bengaluru from a nucleophilic polymer.

Why this gel?

- Indian farmers usually do not wear any protective gear while spraying chemicals in fields.
- This exposes them to harmful toxics contained in pesticides, causing severe health impacts and even death in extreme cases.

How it's work?

- The gel can be applied on the skin and can break down toxic chemicals in pesticides, insecticides and fungicides including the most hazardous and widely used organo phosphorous compounds.
- The gel deactivates these chemicals, preventing them from going deep into the skin and organs like the brain and the lungs.

Related Information

- Exposure to chemicals contained in pesticides interferes with an enzyme called acetyl cholinesterase (AChE) which is present in the nervous system and is critical for neuromuscular functions.
- When its functioning is disrupted by chemical pesticides entering the body through the skin, it can cause neurotoxicity, cognitive dysfunction and even death in severe cases.
- When the gel was applied on rats and they were exposed to a lethal dose of pesticide MPT, it did not lead to any change in their AChE level, showing it could prevent penetration of the pesticide into the skin.

CSIR developed Less Polluting Firecrackers named – SWAS, SAFAL and STAR

- CSIR scientists have developed Less Polluting Firecrackers which are not only environment friendly but 15-20 % cheaper than the conventional ones.
- These crackers have been named as safe water releaser (SWAS), safe minimal aluminium (SAFAL) and safe thermite cracker (STAR).
- SWAS crackers eliminate usage of (KNO_3) Potassium nitrate and Sulphur with the consequent reduction in particulate matter (30-35%) SO_2 and NOx.
- STAR eliminates usage of KNO_3 and Sulphur with the consequent reduction in particulate matter (35-40%), SO_2 and NOx.

- SAFAL has minimal usage of aluminium (only in flash powder for initiation) with the consequent significant reduction in particulate matter (35-40 %) compared to commercial crackers.
- Researchers decided to replace aluminium with magnesium on the understanding that it would reduce ignition temperature and subsequently minimise particulate matter coming from the cracker.

Related Information

- The new crackers have been developed by scientists of two national labs—Central Electrochemical Research Institute (CECRI) based in Karaikudi, Tamil Nadu and National Environmental Engineering Research Institute (NEERI) in Nagpur.
- The researchers at CECRI have developed green crackers by modifying the chemical formulations for flower pots, 'jiljil' and so-called atom bombs.

About CSIR-NEERI

- The CSIR-National Environmental Engineering Research Institute is a research institute created and funded by Government of India under the Ministry of Science and Technology.
- NEERI is a pioneer laboratory in the field of environmental science and engineering and part of Council of Scientific and Industrial Research.
- It was established in Nagpur in 1958 with a focus on water supply, sewage disposal, communicable diseases and to some extent on industrial pollution and occupational diseases found common in post-independent India.

September

Hope Mars Mission

Related Information

The Hope Mars Mission or Emirates Mars Mission

- It is a space exploration probe mission to Mars.
- Set to be launched by the United Arab Emirates in 2020.
- It will become the first mission to Mars by any Arab or Muslim country upon its launch.
- The mission was announced in July 2014.
- This spacecraft orbiter is a planned uncrewed mission to Mars by the United Arab Emirates to study the Martian atmosphere and climate.
- The mission is being carried out by a team composed solely of Emirati engineers.
- The probe has been named Hope probe or 'Al-Amal' and it is scheduled to reach Mars in 2021.

NOTE

- The Hope probe will be compact and hexagonal in shape and structure, with a mass of approximately 1,500 kg (3,300 lb) including fuel.
- The launch will coincide with the 50th anniversary of the United Arab Emirates' formation.

Japan to test mini 'space elevator'

- This test is the first exploring the movement of a container on a cable in space.
- It's the world's first experiment to test travel between two mini-satellites in space.
- The test equipment will be launched on board of H-2B rocket by Japan's space agency from the southern island of Tanegashima.

- The test involves a miniature elevator stand-in — a box just 6 cm long, 3 cm wide, and 3 cm high.

NOTE

- The idea was first proposed in 1895 by Russian scientist Konstantin Tsiolkovsky after he saw the Eiffel Tower in Paris, and was revisited nearly a century later in a novel by Arthur C. Clarke.

Cyient JV bags Army order for UAV systems

- Cyient Solutions & Systems Pvt. Ltd., a joint venture between IT firm Cyient and BlueBird Aero Systems of Israel, has bagged an order from the Indian Army to supply mini UAV(unmanned aerial vehicle) systems for high altitude aerial surveillance.
- The order is for the SpyLite mini UAV systems.

Related information

SpyLite

- SpyLite is an advanced, combat-proven, electric, mini unmanned aerial system.
- It is fully autonomous.
- From launch to accurate parachute recovery, it delivers enhanced reliability.
- Even in severe weather conditions, assuring long endurance and high operational availability.

NASA-funded Rocket to View Sun with X-Ray Vision

Related information

FOXSI (Focusing Optics X-ray Solar Imager) mission

- FOXSI is a sounding rocket mission.
- FOXSI is a collaboration between NASA and the Japan Aerospace Exploration Agency,
- The sounding rockets make brief 15-minute journeys above Earth's atmosphere for a peek at space before falling back to the ground.
- Smaller, cheaper and faster to develop than large-scale satellite missions.
- FOXSI will travel 190 miles up, above the shield of Earth's atmosphere, to stare directly at the Sun and search for nanoflares using its X-ray vision.
- FOXSI is the first instrument built specially to image high-energy X-rays from the Sun by directly focusing them.
- FOXSI is so far the only instrument to optimize especially for the Sun.

NOTE-

- This will be FOXSI's third flight.
- Its first flight was in 2012, during which it successfully viewed a small solar flare in progress.
- Its second flight was in 2014 when it detected the best evidence at the time of X-ray emission from nanoflares.
- The third mission follows up on this discovery, but this time it includes a new telescope designed for imaging lower-energy, so-called soft X-rays as well.

China launches new marine satellite HY-1C on Long March-2C rocket

NOTE-

China launched:

- HY-1A, in May 2002.
- HY-1B, in April 2007.

Related Information

HaiYang (HY-1C)

- It is a marine remote sensing satellite.

- HY-1C is expected to improve China's ocean remote sensing capability.
- Operated by NSOAS (National Satellite Ocean Application Service).
- HY-1C can detect chlorophyll and suspended sediment concentrations and dissolved organic matter.
- It can affect ocean color, as well as temperatures on the sea surface.

Pluto should be reclassified as a planet

- In 2006, the International Astronomical Union, a global group of astronomy experts, established a definition of a planet.
- The definition agreed upon requires that an object meet three conditions to qualify as a planet:
  1. It must orbit the sun.
  2. It must be massive enough that its gravity pulls it more or less into a spherical shape.
  3. It must clear the neighborhood around its orbit.

Why was Pluto not classified as a planet?

- Since Neptune's gravity influences its neighboring planet Pluto, and Pluto shares its orbit with frozen gases and objects in the Kuiper belt, that meant Pluto was out of planet status.

New Expert Study

- It argued that the third piece of that definition does not match historical usage by scientists and should be revoked.
- Moons such as Saturn's Titan and Jupiter's Europa have been routinely called planets by planetary scientists since the time of Galileo.
- It recommends classifying a planet based on if it is large enough that its gravity allows it to become spherical in shape.

Related Information

The International Astronomical Union (IAU)

- IAU is an international association of professional astronomers.
- At the Ph.D. level and beyond, active in professional research and education in astronomy.
- Formed in 28th July, 1919.
- Headquarters in Paris, France
- It acts as the internationally recognized authority for assigning designations and names to celestial bodies (stars, planets, asteroids, etc.) and any surface features on them.
- The IAU is a member of the International Council for Science (ICSU).
- Its main objective is to promote and safeguard the science of astronomy in all its aspects through international cooperation.

PSLV-C42 Mission

- ISRO's PSLV in its 44th flight put into orbit two UK earth observation satellites in a textbook launch.
- Both the satellites together weighed about 889 kg, and the commercial launch was carried out under an arrangement Surrey Satellite Technologies Limited (SSTL) and ISRO's commercial arm Antrix Corporation Limited.
- NovaSAR is an S-Band Synthetic Aperture Radar (SAR) satellite intended for forest mapping, land use and ice cover monitoring and disaster monitoring while S-14 is a high-resolution Optical Earth Observation Satellite, used for surveying resources, environment monitoring, urban management and for the disaster monitoring.

Related Info

- The PSLV-C42 was only the third launch of PSLV after the rare failure it encountered in August last year due to problems in the heat shield.
- PSLV is a Medium-lift launch vehicle.

- It was developed to allow India to launch its Indian Remote Sensing (IRS) satellites into sun-synchronous orbits, a service that was, until the advent of the PSLV in 1993, commercially available only from Russia.
- PSLV can also launch small size satellites into geostationary transfer orbit (GTO).

Successful Flight Test of Prahar

Defense Research and Development Organisation (DRDO) successfully flight tested the indigenously developed surface-to-surface tactical missile 'Prahar', from Launch Complex-III, ITR, Balasore.

Related Information

Prahar

- 'Prahar' is a contemporary weapon system capable of carrying multiple types of warheads and neutralizing a wide variety of targets.
- It has been indigenously developed by DRDO.
- It is a solid-fuelled short-range missile fitted with the inertial navigation system.
- It is capable of filling the gap between the multi-barrel rocket system 'Pinaka' and medium-range ballistic missile 'Prithvi'.
- It can also engage multiple targets in different directions.
- The missile is equipped with state-of-the-art navigation, guidance, and electromechanical actuation systems with the advanced onboard computer.
- It is a quick-reaction, all-weather, all-terrain, highly accurate battlefield support tactical weapon system.

India is in advanced negotiations with the US to acquire armed Predator-B or weaponised Sea Guardian drones.

Related Information

Predator-B or weaponised Sea Guardian drones.

- They are high-altitude, long-endurance unmanned aerial vehicles (UAVs).
- They can fire 'Hellfire' missiles or 'smart' bombs at enemy targets before returning to their bases to re-arm for the next mission like manned fighter jets.
- Predator and Reaper armed drones were used against Taliban targets in the Afghanistan-Pakistan region.
- They are controlled through satellites and flown by ground-based "pilots and weapon operators" at the Creech Air Force Base in Nevada (US) over 7,500 miles away.

India successfully test fires Prithvi Defence missile

- India successfully conducted a first interceptor missile test off the Odisha coast.
- This made India achieve a major milestone in developing a two-layer Ballistic Missile Defence system.
- The interceptor was launched from Abdul Kalam Island of the Integrated Test Range (ITR).

Related information

Prithvi Defence Vehicle (PDV)

- This Prithvi Defence Vehicle (PDV) mission is for engaging the targets in the exo-atmosphere region at an altitude above 50 km of the earth's atmosphere.
- In an automated operation, radar-based detection and tracking system detected and tracked the enemy's ballistic missile.
- Once the missile crossed the atmosphere, the Heat Shield ejected and the IR Seeker dome opened to look at the target location as designated by the mission computer.

Successful Flight Test of Astra BVR Air-to-Air Missile.

- Astra, the indigenously developed Beyond Visual Range Air-to-Air Missile (BVRAAM), was successfully test fired by the Indian Air Force from Su-30 aircraft, from Air Force Station, Kalaikunda.
- The missile successfully engaged a manoeuvring target with high precision meeting the mission objectives.
- In the series of trials held to date, Astra has been launched in the complete Su-30 flight envelope.

Related information

Astra

- Astra is the best in the class weapon system.
- Astra an all-weather beyond-visual-range air-to-air missile.
- Developed by the Defence Research and Development Organisation.
- It is the first air-to-air missile developed by India.
- It features mid-course inertial guidance with terminal active radar homing.
- Astra is designed to be capable of engaging targets at varying range and altitudes allowing for engagement of both short-range targets at a distance of 20km (12 mi) & long-range targets up to a distance of 80km (50mi).