

ONE STOP DESTINATION

CIVIL SERVICE EXAM PREPARATION

An Initiative by
Vetri IAS Study Circle

EXPERT GUIDANCE

ONLINE
TEST
SERIES

RESOURCE
MATERIALS

DAILY
CURRENT AFFAIRS



SCIENCE & TECHNOLOGY CURRENT AFFAIRS 2018 - 2019

INDEX

1. SPACE

✚ Gaganyaan Mission	4
✚ Japan to test Mini 'SPACE ELEVATOR'	5
✚ Kepler Space Telescope	5
✚ NASA'S Orion Spacecraft	6
✚ HAYABUSA 2	7
✚ Remove Debris	7
✚ ISRO Is Planning to Design Launch Vehicles for Small Satellites	8
✚ Hyperspectral Imaging Satellite (HYSIS)	9
✚ GSAT-19	10
✚ Beidou Goes Global	11
✚ Hongyun Project	12
✚ Digital Sky Platform launched	13
✚ Exseed Sat-1	14
✚ GSAT-7A	15
✚ Chang'e-4 Moon Mission	15
✚ Parker Solar Probe	17
✚ BEPI COLOMBO	19
✚ Samwad with Students	20
✚ MICROSAT	21
✚ Hyperion Super-galaxy	21
✚ YUTU-2	23
✚ LOFAR Telescope	23
✚ Transiting Exoplanet Survey Satellite (TESS)	24
✚ GSAT-31	25
✚ Mission Sakthi	25

2. INFORMATION AND TECHNOLOGY

✚ 'Vision Document' for a digital North East	27
✚ AGMARK Online System	28
✚ 'Innovation cell' at AICTE	29
✚ Model International Center for Transformative Artificial Intelligence (ICTAI)	30
✚ Integrated Health Information Platform (IHIP)	30

 India To Launch Public DNS Server	31
--	-----------

3. DEFENSE

 India's First Missile Tracking Ship is Ready for Sea Trials	32
 India's First Indigenous Anti-Nuclear Medical Kit	32
 'Prahar' Missile	33
 'NIRBHAY'	34
 Air Launched Brahmos Missile Test Fired	34
 Integrated Quarter Master Package (IQMP)	35
 Drone Olympics	35
 QRSAM	36

4. BIOTECHNOLOGY

 Scientists Grow Human Oesophagus in Lab	37
 Carnivorous Plants Use Co2 To Lure Prey	38
 ZIKA VIRUS	38
 World TB Report 2018	39
 Bisphenol A (BPA)	40
 Wolbachia Bacteria	40
 Indian Human Microbiome Initiative Project	41
 Horizon – 2020	43

5. ENERGY

 Hydrogen Powered Train	43
 Cyclone – 30	44
 Apsara – U Research Reactor	45
 Floating Nuclear Power Plant	46
 Three Mission Centres Inaugurated at IIT Madras	47
 District Cooling System	47

6. NEW INVENTION & ROBOTICS

✚ WAYU- Air Pollution Mitigation Device	48
✚ Air Quality Index	48
✚ Delhi to get Cleaner Euro Vi Fuel	49
✚ Definition of KG	49
✚ New Detection Kit for Testing milk easy and fast	50
✚ Ultima Thule	52
✚ Eyerov Tuna	52

7. SCHEMES

✚ 'IMPRINT-2' Scheme	53
✚ Academia Alliance Program	54
✚ Earth Bio-Genome Project	55
✚ National Children's Science Congress (NCSC)	56
✚ SPARC Scheme	57
✚ UNNATI- programme	58
✚ Young Scientist Programme	59

8. GOVERNANCE

✚ Steering Committee on 5G	59
✚ Regulations for Civil Use of Remotely Piloted Aircraft System (RPAS)	60
✚ PM-STIAC	62
✚ NGT ON India-based Neutrino Observatory	62
✚ Two Time zones	64
✚ International Year of The Periodic Table	66
✚ Indian Science Congress	67
✚ DNA Technology (Use and Application) Regulation Bill, 2018	68
✚ Company Under Department of Space	69
✚ IPRISM	70

9. INDEXES

✚ Global Talent Competitive Index	71
✚ International Intellectual Property (IP) Index	72

SPACE

GAGANYAAN MISSION

- Recently the Prime Minister in his Independence Day speech announced that ISRO will be sending its first human spaceflight mission into the space by 2022.

Background:

- In 2004, the manned space mission was first endorsed by the ISRO Policy Planning Committee with the target initially set was in 2015, preparations have been going on since then.

INDIA'S TRYST WITH ITS MAN IN SPACE	
<p>April 2, 1984: Rakesh Sharma becomes the first and only Indian citizen to travel in space</p> <p>2007 - First proposals for ISRO's manned space mission</p> <p>2008 - India and Russia sign MoU for manned space mission; plan abandoned in 2010</p> <p>Dec 2014 - Experimental flight of the manned mission launcher - GSLV Mk-III - tested</p>	<p>2016 - Then director of Vikram Sarabhai Space Centre, K Sivan announced 'Pad abort' test for the mission capsule</p> <p>2017 - Initial estimates of the successful manned space mission</p> <p>July 2018 - Pad abort test conducted successfully in Sriharikota</p> <p>2022 - PM Narendra Modi's new target for manned space mission</p>



- ISRO has successfully demonstrated some of the technologies required for the mission such as Space Capsule Recovery Experiment (SRE-2007), Crew module Atmospheric Re-entry Experiment (CARE-2014), GSLV Mk-III (2014), Reusable Launch Vehicle- Technology Demonstrator (RLV-TD), Crew Escape System (July 2018) and Pad Abort Test (2018). ISRO also recently unveiled a space capsule (crew module) and Space suit prototype.
- ISRO has also finalized the layout and design of Environmental Control & Life Support System (ECLSS) which maintains a steady cabin pressure and air composition, removes carbon dioxide and other harmful gases, controls temperature and humidity, and manages parameters like fire detection and suppression, food and water management, and emergency support.

Specifications:

- GSLV Mk-III launch vehicle will be used to launch Gaganyaan. Two unmanned Gaganyaan missions will be undertaken prior to sending humans, with first unmanned flight within 30 months.
- The total programme is expected to be completed before 2022 and cost is expected to be less than Rs. 10,000 Crores.
- The mission will aim to send a three-member crew to space for a period of five to seven days.
- The spacecraft will be placed in a low earth orbit of 300-400km.
- This will be the first human mission indigenously developed by ISRO, though to accelerate the programme, ISRO may consider collaborations with space agencies from friendly countries.
- It will comprise of a crew module and service module that constitute an orbital module. The crew will do microgravity experiment during the mission.

JAPAN TO TEST MINI 'SPACE ELEVATOR'

- A Japanese team has developed a space elevator and will conduct a first trial this month, blasting off a miniature version on satellites to test the technology.

About:

- The test equipment will hitch a ride on an H-2B rocket being launched by Japan's space agency.
- The test involves a miniature elevator stand-in a box just 6 cm long, 3 cm wide, and 3 cm high. The mini elevator will travel along the cable from a container in one of the satellites.
- If all goes well, it will provide proof of concept by moving along a 10-metre cable suspended in space between two mini satellites that will keep it taut.



Background:

- 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. But technical barriers have always kept plans stuck at the conceptual stage

KEPLER SPACE TELESCOPE

- NASA's planet hunting Kepler space telescope — which has led to the discovery of over 2,300 planets so far — has woken up from sleep mode and has restarted its scientific operations. NASA has been closely monitoring the probe since it is expected to run out of fuel soon.
- The Kepler team is planning to collect as much science data as possible in its remaining time and beam it back to Earth before the loss of the fuel-powered thrusters that would make it difficult to aim the spacecraft for data transfer.

Background:

- The space telescope, originally launched in March 2009, has had a tumultuous year. The team placed Kepler into hibernation in July, as their new planet-hunter, the Transiting Exoplanet Survey Satellite (TESS), began testing for its own mission.
- The hibernation-like state was to ensure that the data from Kepler's 18th mission, stored onboard the spacecraft, would be able to make its way back to Earth.
- In total, the Kepler mission has confirmed the existence of 2,652 exoplanets and 30 of those exist within the Small Habitable Zone, the area of space surrounding a star where a planet could theoretically support a surface of liquid water (and potentially extra-terrestrial life).

Kepler Mission:

- Launched in 2009, the Kepler mission is specifically designed to survey our region of the Milky Way galaxy to discover hundreds of Earth-sized and smaller planets in or near the

habitable zone and determine the fraction of the hundreds of billions of stars in our galaxy that might have such planets.

TESS Mission:

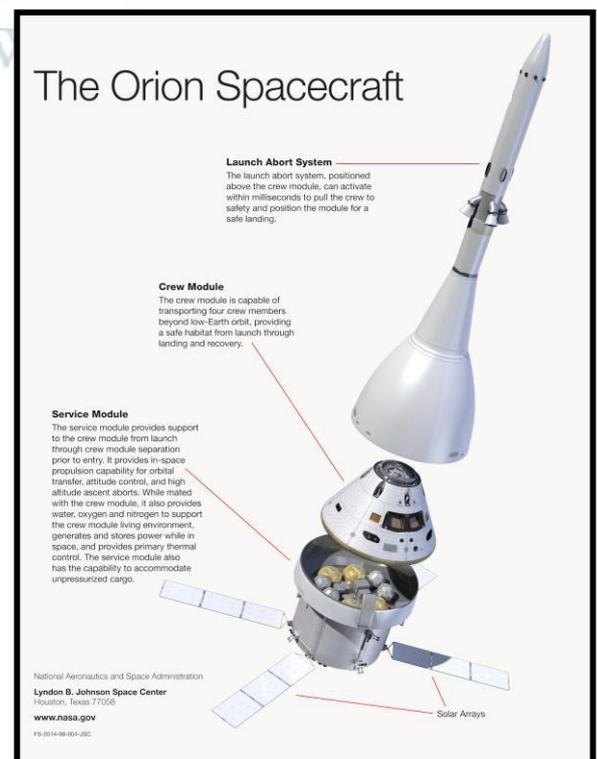
- ✚ The Transiting Exoplanet Survey Satellite (TESS) is a NASA mission that will look for planets orbiting the brightest stars in Earth's sky. It was led by the Massachusetts Institute of Technology with seed funding from Google.
- ✚ **Mission:** The mission will monitor at least 200,000 stars for signs of exoplanets, ranging from Earth-sized rocky worlds to huge gas giant planets. TESS, however, will focus on stars that are 30 to 100 times brighter than those Kepler examined. This will help astronomers better understand the structure of solar systems outside of our Earth, and provide insights into how our own solar system formed.
- ✚ **Orbit:** TESS will occupy a never-before-used orbit high above Earth. The elliptical orbit, called P/2, is exactly half of the moon's orbital period; this means that TESS will orbit Earth every 13.7 days. Its closest point to Earth (67,000 miles or 108,000 kilometres) is about triple the distance of geosynchronous orbit, where most communications satellites operate

NASA'S ORION SPACECRAFT

- ✚ NASA has successfully completed the final test to qualify Orion's space capsule's parachute system for flights with astronauts, ahead of its mission to send humans to the Moon and beyond. The parachute system is the only system that must assemble itself in mid-air and must be able to keep the crew safe in several failure scenarios, such as mortar failures that prevent a single parachute type to deploy, or conditions that cause some of the parachute textile components to fail.

About Orion:

- ✚ NASA's Orion spacecraft is built to take humans farther than they've ever gone before. Orion will serve as the exploration vehicle that will carry the crew to space, provide emergency abort capability, sustain the crew during the space travel, and provide safe re-entry from deep space return velocities. Orion will launch on NASA's new heavy-lift rocket, the Space Launch System.



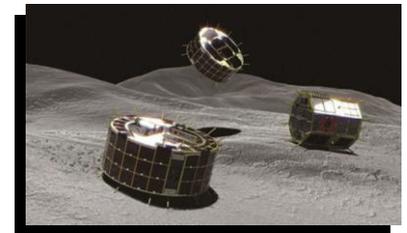
- ✚ Orion will first fly with astronauts aboard during Exploration Mission-2, a mission that will venture near the Moon and farther from Earth than ever before, launching atop NASA's Space Launch System rocket — which will be the world's most powerful rocket.

HAYABUSA 2

- ✚ Hayabusa2, a Japanese space probe has released a pair of exploring rovers towards an egg-shaped asteroid- the Ryugu asteroid, to collect mineral samples that may shed light on the origin of the solar system.

The Mission:

- ✚ If the mission is successful, the rovers will conduct the world's first moving, robotic observation of an asteroid surface.
- ✚ Taking advantage of the asteroid's low gravity, they will jump around on the surface — soaring as high as 15 metres and staying in the air for as long as 15 minutes — to survey the asteroid's physical features with cameras and sensors.



About Hayabusa 2:

- ✚ Hayabusa 2 is an unmanned explorer. It was launched in 2014 aboard Japan's main H-IIA rocket from Tanegashima Space Centre for its six-year mission to bring back mineral samples from the asteroid. The probe will also release a French-German landing vehicle named Mobile Asteroid Surface Scout (MASCOT) for surface observation.
- ✚ Hayabusa2, about the size of a large fridge and equipped with solar panels, is the successor to JAXA's first asteroid explorer, Hayabusa — Japanese for falcon.
- ✚ If all goes well, soil samples will be returned to Earth in late 2020.

REMOVEDEBRIS

- ✚ RemoveDebris system has successfully completed its capture test.

Background:

- ✚ Back in June, the RemoveDEBRIS system was deployed from the International Space Station. On September 16th, the group began to proceed with in-space testing.
- ✚ Operating over 186 miles (300 km) above the Earth, the RemoveDEBRIS system set out to capture a tiny satellite known as a CubeSat. With a net shooting off at around 44 MPH (20 meters per second) and a vision-based navigation including cameras and LiDAR, the net was able to quickly capture the runaway CubeSat.

About:

- ✚ RemoveDebris is an EU (European Union) research project to develop and fly a low cost in-orbit demonstrator mission that aims to de-risk and verify technologies needed for future ADR (Active Debris Removal) missions.
- ✚ RemoveDebris is aimed at performing key ADR technology demonstrations (e.g., capture, deorbiting) representative of an operational scenario during a low-cost mission using novel key technologies for ADR. The project is based on and aimed at contributing to global/European ADR roadmaps.

How it works:

- ✚ A microsatellite called here RemoveSAT, will release, capture and deorbit two space debris targets, called DebrisSats, in sequence using various rendezvous, capture and deorbiting technologies thus demonstrating in orbit, key ADR technologies for future missions in what promises to be the first ADR technology mission internationally.

Background:

- ✚ Space junk is an ever-growing problem with more than 7,500 tonnes of redundant hardware now thought to be circling the Earth. Ranging from old rocket bodies and defunct spacecraft through to screws and even flecks of paint – this material poses a collision hazard to operational missions.
- ✚ The rising population of space debris increases the potential danger to all space vehicles, but especially to the International Space Station (ISS), space shuttles, satellites and other spacecraft.

ISRO IS PLANNING TO DESIGN LAUNCH VEHICLES FOR SMALL SATELLITES

- ✚ ISRO is developing a PSLV launch vehicle exclusively for small satellites that is slated to be launched in early 2019.

About:

- ✚ With the huge number of small satellites outpacing the available launchers, many small satellites have to remain grounded as they don't find a launcher due to large queue and waiting time. In the UK this year, 50 small satellites could not find a launcher. This is a big obstacle in the path of realizing the full potential of space technology and enabling civilians to build small satellites for an array of purposes ranging from educational to monitoring to observation. The lack of launch facilities or higher costs incurred also impedes the mission of evangelizing satellite technology in the public for greater digitalization.

Benefits of small launch vehicles:

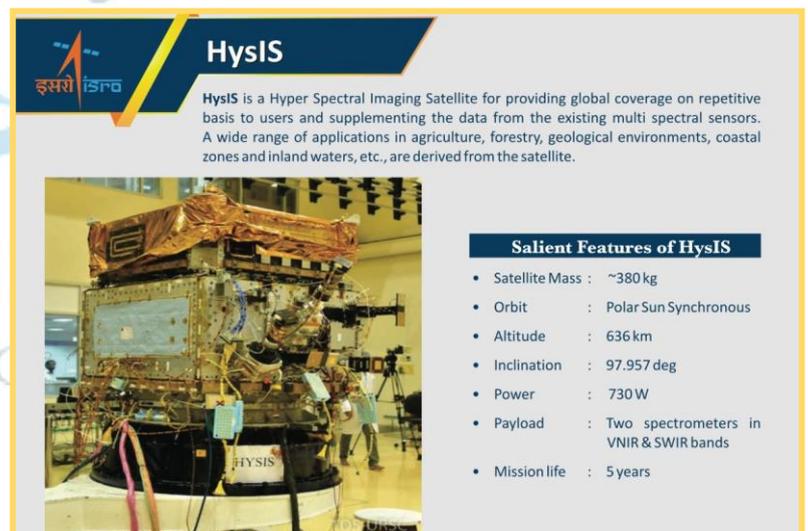
- ✚ The small launch vehicle is expected to cost one-tenth of a normal PSLV rocket which costs anywhere between INR 1,500 million and 5,000 million. It will be capable of carrying a payload of 700 kg.
- ✚ Small rocket can be manufactured in about three days, against 40 days required for a regular PSLV rocket, is also expected to escalate the pace of launches.

HYPERSPECTRAL IMAGING SATELLITE (HYSIS)

- ✚ The Indian Space Research Organisation (ISRO) is planning to launch a full-fledged earth observation satellite with the help of a critical chip it has developed.
- ✚ This new Hyperspectral Imaging Satellite will help Indian satellites to be able to distinct identification of objects from space.

About:

- ✚ It will enable distinct identification of objects on earth by reading the spectrum of each pixel of a scene from the space.
- ✚ The chip developed by IRO plays a key role, with which, the satellite can identify 55 spectral/ color bands from 630 kms above ground. It could read 1000×66 pixels.
- ✚ The optical imaging detector chip is developed by ISROS centres i.e. Space Application Centre (SAC), Ahmedabad and ISRO's electronic arm, Semi-Conductor Laboratory (SCL), Chandigarh.
- ✚ The chip has been developed according to the Indian requirements.
- ✚ ISRO tried out Hyperspex for the first time in 2008 in IMS-1 and Chandrayaan-1.



HYSIS

HYSIS is a Hyper Spectral Imaging Satellite for providing global coverage on repetitive basis to users and supplementing the data from the existing multi spectral sensors. A wide range of applications in agriculture, forestry, geological environments, coastal zones and inland waters, etc., are derived from the satellite.

Salient Features of HYSIS

- Satellite Mass : ~380 kg
- Orbit : Polar Sun Synchronous
- Altitude : 636 km
- Inclination : 97.957 deg
- Power : 730 W
- Payload : Two spectrometers in VNIR & SWIR bands
- Mission life : 5 years

Hyperspectral Imaging:

- ✚ Hyperspectral imaging combines the power of digital imaging and spectroscopy.
- ✚ For each pixel in an image, a hyperspectral camera acquires the light intensity for a large number of contiguous spectral bands.
- ✚ Every pixel in the image thus contains a continuous spectrum and can be used to characterize the objects in the scene with great precision and detail.

- Hyperspectral images obviously provide much more detailed information about the scene than a normal color camera, which only acquires three different spectral channels corresponding to the visual primary colors red, green and blue.
- Hence, hyperspectral imaging leads to a vastly improved ability to classify the objects in the scene based on their spectral properties.

Application:

- Continuous monitoring of emissions produced by coal and oil-fired power plants, municipal and hazardous waste incinerators, cement plants, as well as many other types of industrial sources. Monitoring the development and health of crops.
- Hyperspectral imaging is particularly useful in military surveillance because of countermeasures that military entities now take to avoid airborne surveillance.
- In the food processing industry, hyperspectral imaging, combined with intelligent software, helps to identify and remove defects and foreign material that are invisible to traditional camera and laser sorters.
- Soldiers can be exposed to a wide variety of chemical hazards. These threats are mostly invisible but detectable by hyperspectral imaging technology.
- Geological samples, such as drill cores, can be rapidly mapped for nearly all minerals of commercial interest with hyperspectral imaging.
- Hyperspectral photography in the diagnosis of retinopathy and macular edema
- In astronomy, hyperspectral imaging is used to determine a spatially-resolved spectral image.

GSAT-19

- GSLV Mk III-D1 launched GSAT-19 from the Satish Dhawan Space Centre SHAR (SDSC SHAR), Sriharikota. The first developmental flight of GSLV Mk III (the GSLV-Mk III-D1) successfully placed GSAT-19 satellite to a Geosynchronous Transfer Orbit (GTO).

About:

- GSLV Mk III is a three-stage heavy lift launch vehicle developed by ISRO.
- It is a three-stage vehicle with two solid motor strap-ons (S200), a liquid propellant core stage (L110) and a cryogenic stage (C25).
- GSLV-Mk III is capable launching 4-ton class of satellites to Geosynchronous Transfer Orbit (GTO).
- GSLV Mk III is designed to carry 4-ton class of satellites into Geosynchronous Transfer Orbit (GTO) or about 10

GSLV MkIII-D1/GSAT-19 Mission



GSLV MkIII-D1 at Second Launch Pad

The Mission

GSLV MkIII-D1/GSAT-19 Mission is the first developmental flight of GSLV MkIII, a heavy lift launch vehicle, capable of lofting payloads up to 4,000 kg into Geosynchronous Transfer Orbit (GTO) and 10,000 kg into Low Earth Orbit (LEO).

GSAT-19, a high throughput communication satellite is identified as the payload in this mission. This will be the heaviest satellite being launched from India till date.

Launch of GSLV MkIII-D1 is planned from the Second Launch Pad at Satish Dhawan Space Centre, Sriharikota.

Mission Specifications	
Orbit	GTO
Perigee	170 km
Apogee	35975 km
Inclination	21.5 degree
Payload Mass	3136 kg

tons to Low Earth Orbit (LEO), which is about twice the capability of GSLV Mk II. **3 stages of GSLV Mk III – The Mechanism**

- ✚ The two strap-on motors of GSLV Mk III are located on either side of its core liquid booster. Designated as ‘S200’, each carries 205 tons of composite solid propellant and their ignition results in vehicle lift-off.
- ✚ S200s function for 140 seconds. During strap-ons functioning phase, the two clustered Vikas liquid Engines of L110 liquid core booster will ignite 114 sec after lift -off to further augment the thrust of the vehicle.
- ✚ These two engines continue to function after the separation of the strap-ons at about 140 seconds after lift -off. GSAT-19 satellite with a lift-off mass of 3136 kg, is the communication satellite of India, configured around the ISRO’s standard I-3K bus.
- ✚ GSAT-19 carries Ka/Ku-band high throughput communication transponders.
- ✚ Besides, it carries a Geostationary Radiation Spectrometer (GRASP) payload to monitor and study the nature of charged particles and the influence of space radiation on satellites and their electronic components.
- ✚ GSAT-19 also features certain advanced spacecraft technologies including miniaturised heat pipe, fibre optic gyro, Micro-Electro-Mechanical Systems (MEMS) accelerometer, Ku-band TTC transponder, as well an indigenous Lithium-ion Battery.
- ✚ GSAT-19 satellite was launched by GSLV Mk III-D1 on June 05, 2017 from the Second Launch Pad (SLP) at Satish Dhawan Space Centre SHAR (SDSC SHAR), Sriharikota.

BEIDOU GOES GLOBAL

- ✚ China’s home-grown satellite navigation system Beidou, has launched its global service ahead of the previous roll-out target of 2020 as the country looks to challenge the dominance of America’s Global Positioning System (GPS).

About:

- ✚ Beidou, the Chinese name for the seven stars that make up the Big Dipper, offers a worldwide location service with an accuracy of 5 metres within the Asia-Pacific region and 10 metres in other parts of the world. Its velocity accuracy is 0.2 metres per second, while its timing accuracy stands at 20 nanoseconds.



- ✚ It started serving China in 2000 and the Asia-Pacific region in 2012, while outside of China, Pakistan is the first country to use the BeiDou system.
- ✚ The US GPS offers accuracy to within centimetres, but concerns over Washington's ability to shut off service during wartime, prompted China, Russia and other nations to develop their own system.
- ✚ Similar to the origins of GPS, Beidou started in 1994 as an air defence system with the goal of boosting the country's space programme, while freeing up the People's Liberation Army from its reliance on the American-built system.
- ✚ By the end of 2018, there were a total of 33 BDS satellites operating in orbit for BeiDou. This included 15 BDS-2 satellites and 18 BDS-3 satellites.
- ✚ The navigation system now serves not only China's civil aviation and maritime needs, but is also used in global search and rescue, telecommunications and mass consumer applications for navigation.
- ✚ China plans to launch another 11 BDS-3 satellites and one BDS-2 satellite in the coming two years to form a complete global network, which will further enhance the global service performance.

HONGYUN PROJECT

- ✚ China has successfully launched the first satellite of its Hongyun project, which seeks to create a network of communication satellites on the low Earth orbit in order to provide stable internet connection to the country's remote regions.

About:

- ✚ The satellite was launched from a Long March 11 carrier rocket from the Jiuquan Satellite Launch Centre in north-western China.
- ✚ The mission of the satellite is to verify low-orbit broadband communication technologies to be used on the Hongyun satellite constellation.
- ✚ Weighing 247 kilograms, the satellite works in a sun-synchronous orbit about 1,100 kilometres above earth. It is powered by solar arrays and has a design life of one year, but is expected to operate longer.



- ✚ Announced by China Aerospace Science and Industry Corp. (CASIC) in September 2016, the Hongyun project has the goal of building a space-based communications network of 156 communications satellites into low Earth orbit, at an altitude of 160 to 2,000 km. Each satellite of the network will be able to transmit 500 megabytes of data per second. It will become operational in 2022.
- ✚ The concept of running a low-cost, high-performance satellite network to provide space-based communications and internet services has become popular globally among industry players. Currently, many tech companies, including Google, SpaceX, OneWeb and Telesat, have already launched plans to use satellites to provide free internet access
- ✚ When the Hongyun project is complete, it will cover the whole world and offer round-the-clock communication services to users in polar regions, who now have difficulties accessing telecommunication and internet services, even from on board an aircraft or a ship or in a remote area.
- ✚ The Hongyun system will feature lower production and operational costs and fewer occurrences of data transmission delays compared with existing communication satellite networks.
- ✚ It will achieve global coverage with communications, navigation, remote sensing and other functions, supplying application demands, including sensor data acquisition, industrial Internet of Things, and remote control of unmanned vehicles.

DIGITAL SKY PLATFORM LAUNCHED

- ✚ The Civil Aviation Ministry has started the registration process for drone operators in the country, to be done through a portal called Digital Sky.

About:

- ✚ The government, in August, had put in place regulations for operations of remotely piloted aircraft, to come into effect from December 1.
- ✚ Under these norms, drone users will be required to do one-time registration of their drones.
- ✚ They will also need to register the pilots of drones as well as their owners.
- ✚ For drones of micro size and above categories, operators are required to register on the Digital Sky portal whereas Nano drones can start flying legally from the day of the announcement.
- ✚ To get the permission to fly, RPAS (remotely piloted aerial system) or drone operators or remote pilots will have to file a flight plan.



- ✚ Flying in the green zones will require only intimation of the time and location of the flights via the portal or the app. Permissions will be required for flying in yellow zones and flights will not be allowed in the red zones.
- ✚ The location of these zones will be announced soon and permission will be made available digitally on the portal.
- ✚ To prevent unauthorised flights and ensure public safety, any drone without a digital permit will not be able to take off.
- ✚ The drone industry is an industry of the future. With the development of this platform, India will be taking lead in this sector and will be working with countries around the world to develop common, scalable standards. It has a large potential for Make in India and also to export drones and services from India.

EXSEED SAT-1

- ✚ India's first privately built satellite Exseed Sat-1 was recently launched into polar orbit by SpaceX's Falcon 9 rocket.

About:

- ✚ With this launch, Mumbai-based Exseed Space has become the first private commercial organisation in India to have a satellite in space.
- ✚ It develops small satellite platforms with primary focus on assembly, integration, testing and operation of satellites with the ultimate goal to democratise space exploration.
- ✚ The company is working toward setting up India's first contract satellite manufacturing facility. Once operational, the facility will cater to the growing global demands of manufacturing Cubesats, Nanosats & Micro-sats.
- ✚ ISRO has been encouraging private players to form a small consortium to undertake satellite and rocket manufacturing work so that it can focus on R&D.
- ✚ Costing Rs 2 crore, it was built in just 18 months by a team of eight scientists. It weighs only one kilo, and has dimensions that are no bigger than a tissue box. However, it will play a large role in India's communication systems. It is expected to have a life of two years, depending upon how long the battery lasts and when the satellite de-orbits naturally. It is an amateur (ham) radio, the kind of communication system that functions perfectly irrespective of the terrestrial systems. An amateur radio operator or Ham is someone who uses equipment at an amateur radio station to engage in a two-way personal communication with other amateur operators on radio frequencies assigned to the amateur radio service. It looks to serve the amateur radio community, and will help in coordinating messages among them and help the country in time of emergencies and natural disasters. At the same time, it will be used for commercial purposes, agricultural solutions and communication.

GSAT-7A

- ISRO has recently launched its military communication satellite GSAT-7A from Sriharikota, Andhra.

About:

- Second in the family of military satellites (GSAT-7 was for the Indian Navy) weighing 2250 kg, GSAT-7A has a mission life of eight years.
- It has been built to provide communication capability to the Indian Air Force in the Ku-band, over the Indian region.
- The GSLV-F11 space vehicle will release it to an eventual geostationary orbit of 36,000 km from Earth. However, it will become fully functional after a month of testing payloads.
- GSLV F-11 with indigenous cryogenic upper stage has a total of three stages.
- The satellite is expected to add a new space-based dimension to the way IAF interlinks, operates and communicates with its aircraft as they fly and with command centres on ground.
- The IAF has several platforms (aircrafts) which have capabilities of communication through satellite. The communication to the platform through the satellite will be made possible with this launch.
- It is designed to expand the communication capabilities of the Indian Air Force by connecting many of the ground radar stations, airbases and aircrafts operated by the IAF, and is also expected to boost some of their network dependant warfare and drone capabilities.
- It will be a major booster and force multiplier for the IAF as such systems will help achieve full network centrality in a network centric warfare.

Eye in the sky

GSAT-7A - a communication satellite designed specifically for military operations - will be launched from Satish Dhawan Space Centre, Sriharikota on December 19. Some facts about the launch:



- This is the 13th flight of the Geosynchronous Satellite Launch Vehicle (GSLV)
- The satellite GSAT-7A is the 35th Indian communication satellite. It weighs 2,250 kg.
- The satellite is built to provide communication capability to users in the Ku-band over the Indian region
- Ku-band will enable superl- or real time aircraft-to-aircraft communication

CHANG'E-4 MOON MISSION

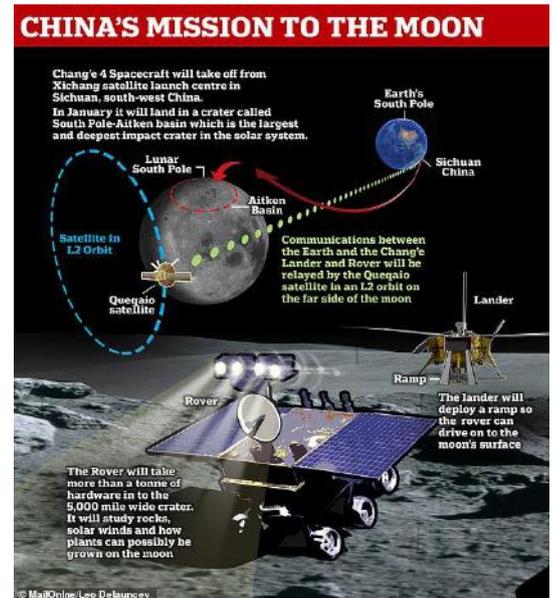
- China has launched the Chang'e-4 moon mission (named after an ancient lunar goddess), successfully sending it into a lunar transfer orbit to make the first ever attempt at a landing on the far side of the Moon.

About:

- The vast majority of the far side of the Moon never faces the Earth due to tidal locking, and humanity's first glimpse of that hemisphere did not come until the Soviet Luna 3 mission sent back images in 1959.



- ✚ The topography of the far side is far more rugged and variable than the near side, which is marked with vast, smooth basaltic seas or mare, which can be seen from Earth with the naked eye. The far side contains few such maria and the Chang'e-4 mission may bring insight into this mystery.
- ✚ The mission will target an area within the South Pole-Aitken Basin (SPA), a huge, ancient and scientifically significant impact crater on the far side of the Moon. It has a diameter of around 2,500 kilometres and could contain exposed material from the Moon's mantle.
- ✚ A lunar far side landing is unprecedented, hence innovative solutions are needed to facilitate communications for sending commands to the spacecraft and aiding landing, and receiving telemetry and the all-important science data.



Objectives:

- ✚ With the Moon shielding the spacecraft from Earth's interference, Chang'e-4 will be able to carry out unprecedented radio observations at low frequencies not possible on Earth due to its atmosphere.
- ✚ The imaging spectrometer will allow an analysis of the composition of the lunar surface, while the radar will be capable of bringing insights into the layers, and therefore the history, and other geological features below the surface.
- ✚ The ASAN instrument will tell scientists about how the solar wind interacts with the Moon, and the German LND payload will help in understanding processes on the lunar surface mixing processes while also being sensitive to possible lunar water. Meanwhile, the cameras will return clear, high-resolution images from the lunar far side, comparable to those from Chang'e-3 on the near side.
- ✚ Investigation of the composition of areas of the SPA could reveal clues to the history of the moon and development of the wider solar system.
- ✚ Furthermore, China is also developing the capabilities required for putting astronauts on the lunar surface, including massive launch vehicles and new generation crewed spacecraft.

PARKER SOLAR PROBE

- ✚ NASA has launched Parker Solar Probe, a historic mission to touch the sun.
- ✚ The car-sized spacecraft will travel directly into the Sun's atmosphere, about four million miles from its surface and more than seven times closer than any spacecraft has come before.



About:

- ✚ US space agency NASA on August 12, 2018 launched Parker Solar Probe, a historic mission to touch the sun. The main aim of the mission is to send a satellite closer to the Sun than any before. The rocket carrying the solar probe lifted off from Space Launch Complex 37 at Cape Canaveral Air Force Station in Florida, US. The launch happened after a failed attempt on the previous day, when a last-minute alarm caused the agency to miss its 65-minute weather window.

Significance:

- ✚ The mission is named after astrophysicist Eugene Parker, 91, the physicist who first theorised the existence of the solar wind in 1958. It is the first space craft to be named after a living person. A plaque dedicating the mission to Parker was attached to the spacecraft in May. It includes a quote from the renowned physicist – “Let’s see what lies ahead.” It also holds a memory card containing more than 1.1 million names submitted by the public to travel with the spacecraft to the Sun.

About the Mission:

- ✚ Parker Solar Probe, is the world’s first-ever mission to touch the Sun. It will perform the closest-ever observations of a star when it travels through the Sun's outer atmosphere - called the corona.
- ✚ The car-sized spacecraft will travel directly into the Sun's atmosphere, about four million miles from its surface and more than seven times closer than any spacecraft has come before. The mission is expected to unlock the mysteries of the star's fiery outer atmosphere and its effects on space weather during its seven-year long journey.
- ✚ The overall cost of the mission is expected to be around 1.5 billion US dollars.

Key Highlights

- ✚ The solar probe was launched aboard United Launch Alliance Delta IV Heavy rocket.
- ✚ Just under an hour after the launch, NASA confirmed that the spacecraft had successfully separated and the probe had been released into space.

- ✚ The spacecraft is expected to fly past Venus in six weeks and make the first contact with the Sun six weeks after that.
- ✚ In its seven-year mission, Parker Solar Probe will make six more Venus flybys and 24 total passes by the Sun, journeying steadily closer to the Sun until it makes its closest approach at 3.8 million miles.
- ✚ At this point, the probe will be moving at roughly 430,000 miles per hour, setting the record of being the fastest human-made object ever.
- ✚ The probe will dip inside the tenuous atmosphere, sampling conditions and getting to just 6.16 million km from the Sun's broiling surface.
- ✚ It is expected to transmit its first science observations in December 2018.

How will the findings help?

- ✚ The mission's findings will help researchers improve their forecasts of space weather events, which have the potential to damage satellites and harm astronauts on orbit, disrupt radio communications and, at their most severe, overwhelm power grids.

Other Details:

- ✚ During the first week of its journey, the spacecraft will deploy its high-gain antenna and magnetometer boom. It will also perform the first of a two-part deployment of its electric field antennas. Instrument testing will begin in early September and last approximately four weeks, after which the probe will begin its science operations.
- ✚ The probe carries four instrument suites designed to study magnetic fields, plasma and energetic particles and capture images of the solar wind.

Background:

- ✚ Parker Solar Probe is part of NASA's 'Living with a Star' program to explore aspects of the Sun-Earth system that directly affect life and society.
- ✚ The 'Living with a Star' program is managed by the agency's Goddard Space Flight Center in Greenbelt, Maryland, for NASA's Science Mission Directorate in Washington.
- ✚ The spacecraft has been designed and built by APL, which also operates it.
- ✚ The University of California, Berkeley, US Naval Research Laboratory in Washington, University of Michigan in Ann Arbor, and Princeton University in New Jersey lead the investigations.

BEPICOLOMBO

- European Space Agency (ESA) is all set to launch its first mission to Mercury- BepiColombo.
- The four-tonne spacecraft will be launched into orbit by ESA's rocket Ariane 5 from the European spaceport at Kourou, French Guiana.
- The spacecraft will then make a 5.2bn mile (8.5bn km) journey over seven years to reach its destination by 2025.



About:

- BepiColombo is a planned European-Japanese mission to Mercury. It is a joint mission between ESA and the Japan Aerospace Exploration Agency (JAXA) and will be executed under ESA leadership.
- The mission includes a carrier spacecraft called the Mercury Transfer Module (MTM) – which supplies electrical power during interplanetary cruise – and two separate orbiters. The European Space Agency's spacecraft is the Mercury Planet Orbiter (MPO) and the Japanese Aerospace Exploration Agency's spacecraft is the Mercury Magnetospheric Orbiter (MMO). The MPO will study the surface and internal composition of the planet and the MMO will study Mercury's magnetosphere i.e. the region of space around the planet that is influenced by its magnetic field.
- The spacecraft will take about seven years to get to Mercury, using several gravity assists from other planets along the way. It will fly by Earth and Venus in 2020, Venus in 2021 and Mercury itself between 2021 and 2025. These flybys will slow down the spacecraft enough to be captured by Mercury's gravity in December 2025.
- Europe's space scientists have identified the mission as one of the most challenging long-term planetary projects, because Mercury's proximity to the Sun makes it difficult for a spacecraft to reach the planet and to survive in the harsh environment found there.

Significance:

- ESA noted that going to Mercury would help scientists not only understand how the planet had formed, but also give more information generally about the solar system's formation.

BepiColombo's Objectives include:

- Investigate the origin and evolution of a planet close to the parent star.
- Study Mercury as a planet: its form, interior structure, geology, composition and craters.
- Examine Mercury's vestigial atmosphere (exosphere): its composition and dynamics.

- ✚ Probe Mercury's magnetized envelope (magnetosphere): its structure and dynamics.
- ✚ Determine the origin of Mercury's magnetic field.
- ✚ Investigate polar deposits: their composition and origin.
- ✚ Perform a test of Einstein's theory of general relativity.
- ✚ Mercury is a poorly explored planet. So far, only two spacecraft have visited the planet: NASA's Mariner 10, which flew past three times in 1974–5 and returned the first close-up images of the planet, and NASA's MESSENGER spacecraft, which performed three flybys (two in 2008 and one in 2009) before entering orbit around the planet in March 2011.
- ✚ The information obtained when BepiColombo arrives will throw light not only on the composition and history of Mercury, but also on the history and formation of the inner planets in general, including Earth.
- ✚ The scientific interest in going to Mercury lies in the valuable information that such a mission can provide to enhance our understanding of the planet itself as well as the formation of our Solar System; information which cannot be obtained with observations made from Earth.

SAMWAD WITH STUDENTS

- ✚ As part of the enhanced outreach programme of ISRO, a new platform named “Samwad with Students” (SwS) was launched in Bengaluru.

Samwad with Students (SwS) Initiative:

About:

- ✚ Through the initiative, ISRO aims to constantly engage youngsters across India to capture their scientific temperament. The new conversation mission will inspire students cutting across schools and colleges.
- ✚ During the Samwad, the students are briefed about Indian space programme and their benefits to the common man.
- ✚ The Q&A session was followed on a series of topics ranging from rockets, satellites, Chandrayaan, Gaganyaan and various space applications.



MICROSAT

- ✚ ISRO's first mission of 2019 will put into space a 130-kg military imaging satellite, Microsat-R.C-44 will be launched from the older First Launch Pad at the Satish Dhawan Space Centre, Sriharikota.

Details of Launch:

- ✚ The satellite would be placed within 15 minutes after take-off in a polar orbit 274 km away from Earth.
- ✚ This is much lower than any of its civil Earth observation spacecraft, which fly pole to pole over the globe at between 400 km and 700 km.

Payload Details

Microsat-R

- ✚ Microsat-R and its payload come assembled from a handful of laboratories of the Defence Research and Development Organisation (DRDO).
- ✚ It is meant for military use.
- ✚ The satellite was assembled outside and ISRO only interfaced it" with its own systems and the launch vehicle, just as it treats any customer satellite.

Kalamsat:

- ✚ Kalamsat is a communication satellite with a life span of two months.
- ✚ The nanosatellite is a 10cm cube weighing 1.2 kg.
- ✚ The satellite cost was about Rs 12 lakh Kalamsat will be the first to use the rocket's fourth stage as an orbital platform.
- ✚ The fourth stage will be moved to higher circular orbit so as to establish an orbital platform for carrying out experiments.
- ✚ It is named after former Indian president Dr APJ Abdul Kalam and was built by an Indian high school student team, led by Rifath Sharook, an 18-year-old from the Tamil Nadu town of Pallapatti.
- ✚ It is the world's lightest and first ever 3D-printed satellite.
- ✚

HYPERION SUPER-GALAXY

- ✚ A team of scientists at the European Southern Observatory (ESO) peering billions of light years into space have detected the largest.
- ✚ It is the most extensive collection of galaxies ever registered in the early days of the universe, a proto-supercluster, which they nicknamed 'Hyperion.'
- ✚ In Ancient Greek mythology, Hyperion was a colossal titan who fathered Helios, the Sun.

What are superclusters?

- ✚ The largest known system of galaxies.
- ✚ Galaxies are not spread out in the universe at random but packed together in groups based on where in the universe they started to form.
- ✚ One of the largest known superclusters in the universe is called the Sloan Great Wall.

Hyperion:

- ✚ Hyperion has a calculated mass more than one million billion times that of the Sun, making it the largest and most massive structure to be found so early in the formation of the universe.
- ✚ It is like 5,000 galaxies of the Milky Way, said astronomer Steffen Miefke, the chief of operations for the European Southern Observatory.
- ✚ Hyperion is an adolescent in astronomy terms. Its distance from earth means astronomers are viewing it as it was created just over two billion years after the Big Bang, which gave rise to the universe about 13.8 billion years ago.
- ✚ Hyperion is a sixth of the age of the universe

How was Hyperion detected:

- ✚ Hyperion was detected using the Visible Multi-Object Spectrograph (VIMOS), which according to its handlers acts as a time machine in the middle of a desert, showing how the universe looked when it was just a third of its current age.
- ✚ The VIMOS instrument can measure the distance to hundreds of galaxies at the same time. Making it possible to map the position of galaxies within the forming supercluster in three dimensions. The spectrograph is hosted by the Chile-based Very Large Telescope.
- ✚ The discovery was made by a team led by Olga Cucciati of the National Institute of Astrophysics in Bologna, Italy. This is the first time that such a large structure has been identified at such a high redshift, just over two billion years after the Big Bang,” Cucciati explained in the discovery paper. The telescope sits in the Chilean desert 760 miles north of the capital Santiago.

Other information:

- ✚ Superclusters closer to Earth tend to (appear as) a much more concentrated distribution of mass with clear structural features. But in Hyperion, the mass is distributed much more uniformly in a series of connected blobs, populated by loose associations of galaxies.
- ✚ The research, entitled ‘The Progeny of a Cosmic Titan’ was featured in the journal ‘Astronomy & Astrophysics.’ Given its size so early in the history of the universe, Hyperion is expected to evolve into something similar to the immense structures in the local universe such as the superclusters making up the Sloan Great Wall or the Virgo Supercluster that contains our own galaxy, the Milky Way.

YUTU-2

- ✚ China lunar rover, successfully deployed to carry out a string of experiments on the far side of the moon, as 'Yutu-2'.

Impotent Facts:

- ✚ The rover's touchdown is part of China Chang'e-4 lunar probe.
- ✚ China's lunar probe is part of its 'Made in China-2025' project, which focuses on advanced technology, including space applications.
- ✚ The rover has been programmed to launch ground penetration radar that would help map the moon's inner structures. It would also analyse soil and rock samples for minerals, apart from activating a radio telescope to search for possible signals from deep space.
- ✚ The payload also carried a canister filled with air, soil, water, bacterium, silkworm eggs, the seeds of a small flowering plant and a potato.

Why is this Moon landing so significant?

- ✚ Previous Moon missions have landed on the Earth-facing side, but this is the first attempt to explore the rugged far side from the surface.
- ✚ Landing on the far side isn't fundamentally different to landing on the near side of the Moon.
- ✚ But it presents a communications challenge because there's no direct line of sight to Earth.

LOFAR TELESCOPE

- ✚ A new map of the night sky published recently charts hundreds of thousands of previously unknown galaxies discovered using LOFAR telescope that can detect light sources optical instruments cannot see. The discovery literally shed new light on some of the Universe's deepest secrets, including the physics of black holes and how clusters of galaxies evolve.

About:

- ✚ The Low-Frequency Array or LOFAR, is a large radio telescope network located mainly in the Netherlands, completed in 2012 by ASTRON, the Netherlands Institute for Radio Astronomy and its international partners. LOFAR consists of a vast array of omnidirectional antennas using a new concept in which the signals from the separate antennas are not combined in real time as they are in most array antennas. The electronic signals from the antennas are digitized, transported to a central digital processor, and combined in software to emulate a conventional antenna. The project is based on an interferometric array of radio telescopes using about 20,000 small antennas concentrated in at least 48 stations. The mission of LOFAR is to map the Universe at radio frequencies from ~10–240 MHz with greater resolution and greater sensitivity than previous surveys, such as the 7C and 8C surveys, and surveys by the Very Large Array (VLA) and Giant Meterwave Radio Telescope (GMRT).

TRANSITING EXOPLANET SURVEY SATELLITE (TESS)

- Nasa which launched Transiting Exoplanet Survey Satellite (Tess) for searching exoplanets in April, 2018 has discovered a third small planet outside our solar system.

The New Planet:

- The new planet is named HD 21749b. The newly discovered planet orbits a bright and nearby star which is about 53 light years away in the constellation Reticulum.
- HD 21749b appears to have the longest orbital period of the three planets so far identified by Tess. The surface of the new planet is hotter than 100 degrees Celsius.



About TESS Mission:

- The Transiting Exoplanet Survey Satellite (TESS) is a NASA mission that will look for planets orbiting the brightest stars in Earth's sky. It was led by the Massachusetts Institute of Technology with seed funding from Google.
- Mission: The mission will monitor at least 200,000 stars for signs of exoplanets, ranging from Earth-sized rocky worlds to huge gas giant planets. TESS, however, will focus on stars that are 30 to 100 times brighter than those Kepler examined. This will help astronomers better understand the structure of solar systems outside of our Earth, and provide insights into how our own solar system formed. Orbit: TESS will occupy a never-before-used orbit high above Earth. The elliptical orbit, called P/2, is exactly half of the moon's orbital period; this means that TESS will orbit Earth every 13.7 days. Its closest point to Earth (67,000 miles or 108,000 kilometers) is about triple the distance of geosynchronous orbit, where most communications satellites operate.

Working:

- It will use transit method to detect exoplanets. It watches distant stars for small dips in brightness, which can indicate that planet has passed in front of them.
- Repeated dips will indicate planet passing in front of its star. This data has to be validated by repeated observations and verified by scientists.

Significance:

- TESS is designed to build on the work of its predecessor, the Kepler space telescope, which discovered the bulk of some 3,700 exoplanets documented during the past 20 years and is running out of fuel.

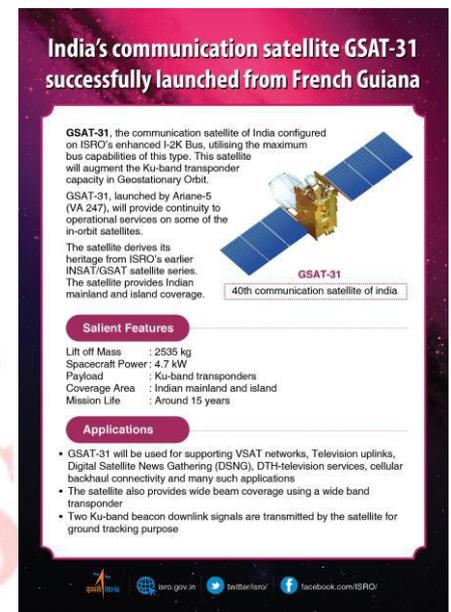
- Nasa expects to pinpoint thousands more previously unknown worlds, perhaps hundreds of them Earth sized or “super-Earth” sized – no larger than twice as big as our home planet.
- Those are believed the most likely to feature rocky surfaces or oceans and are thus considered the best candidates for life to evolve.
- Scientists have said they hope TESS will ultimately help catalog at least 100 more rocky exoplanets for further study in what has become one of astronomy’s newest fields of exploration.

GSAT-31

- India’s latest communication satellite, GSAT-31 was successfully launched from the Spaceport in French Guiana.
- The launch vehicle Ariane 5 VA-247 lifted off from Kourou Launch Base, French Guiana carrying India’s GSAT-31 and Saudi Geostationary Satellite 1/Hellas Sat 4 satellites.

GSAT-31:

- It was launched in an elliptical Geosynchronous Transfer Orbit with a perigee (nearest point to Earth) of 250 km and an apogee (farthest point to Earth) of 35,850 km, inclined at an angle of 3.0 degree to the equator.
- With a lift-off mass of 2536 kg, GSAT-31 will augment the Ku-band transponder capacity in Geostationary Orbit.
- The satellite will provide continuity to operational services on some of the in-orbit satellites. GSAT-31 will provide DTH Television Services, connectivity to VSATs for ATM, Stock-exchange, Digital Satellite News Gathering (DSNG) and e-governance applications.
- The satellite will also be used for bulk data transfer for a host of emerging telecommunication applications.
- It is the India’s 40th communication satellite which is configured on ISRO’s enhanced ‘I-2K Bus’, utilising the maximum “bus capabilities” of this type.



India's communication satellite GSAT-31 successfully launched from French Guiana

GSAT-31, the communication satellite of India configured on ISRO's enhanced I-2K Bus, utilising the maximum bus capabilities of this type. This satellite will augment the Ku-band transponder capacity in Geostationary Orbit.

GSAT-31, launched by Ariane-5 (VA 247), will provide continuity to operational services on some of the in-orbit satellites.

The satellite derives its heritage from ISRO's earlier INSAT/GSAT satellite series. The satellite provides Indian mainland and island coverage.

40th communication satellite of India

Salient Features

- Lift off Mass : 2536 kg
- Spacecraft Power : 4.7 kW
- Payload : Ku-band transponders
- Coverage Area : Indian mainland and island
- Mission Life : Around 15 years

Applications

- GSAT-31 will be used for supporting VSAT networks, Television uplinks, Digital Satellite News Gathering (DSNG), DTH-television services, cellular backhaul connectivity and many such applications
- The satellite also provides wide beam coverage using a wide band transponder
- Two Ku-band beacon downlink signals are transmitted by the satellite for ground tracking purpose

isro.gov.in | twitter/isro | facebook.com/ISRO

MISSION SHAKTI

- India has tested the Anti-Satellite System(A-SAT) from Dr A. P. J. Abdul Kalam Island, formerly known as Wheeler Island, an island off the coast of Odisha. The test was named as Mission Shakti.
- It has successfully destroyed a live satellite in the Low Earth Orbit (an altitude of 300 km).



Mission Shakti

WHAT
Obsolete satellite destroyed by DRDO-developed ballistic missile interceptor missile

Satellite was at height of 300 km, was tracked with sensors that confirmed the kill | **Demonstrates India's ability to detect, target and destroy space objects**

DRDO had capability to develop system in 2012; made presentations, but was not given go-ahead

WHERE
Ground-based interceptor missile units based in Balasore testing range

WHEN
Preparations started in 2016, tests carried out in 2017 and in February this year

- ✚ With this test India is now in the league of three countries after the U.S., Russia, and China to have such technology.

Anti-satellite (ASAT) System

- ✚ It is missile-based system to attack moving satellites.
- ✚ It is of 2 kinds— based on launching from the ground or from planes.
- ✚ Defence Research and Development Organisation (DRDO) has developed Anti-satellite (ASAT) completely indigenously.

Significance:

- ✚ A large number of crucial applications are now satellite-based. These include navigation systems, communication networks, broadcasting, banking systems, stock markets, weather forecasting, disaster management, land and ocean mapping and monitoring tools, and military applications. Destroying a satellite would render these applications useless. It can cripple enemy infrastructure, and without causing any threat to human lives. It was aimed at strengthening the capability to safeguard space assets and India's overall security.

International Reactions on ASAT Test:

- ✚ China has said that it hopes that all countries would uphold peace and tranquillity in the outer-space.
- ✚ Pakistan has said that Space is the common heritage of mankind and every nation has the responsibility to avoid actions which can lead to the militarization of this arena.
- ✚ US has said that it will continue to pursue shared interests in space and scientific and technical cooperation with India, including collaboration on safety and security in space. However, it expressed concern over the issue of space debris.

India's Stand:

- ✚ Ministry of External Affairs has stated that India is against the weaponization of Outer Space and supports international efforts to reinforce the safety and security of space-based assets.
- ✚ India has always maintained that space must be used only for peaceful purposes.

International treaties Regarding Outer Space:

- ✚ UN Outer Space Treaty 1967: It prohibits only weapons of mass destruction in outer space, not ordinary weapons. India ratified it in 1982.
- ✚ UN Transparency and Confidence Building Measures (TCBMs)-It includes registering space objects with the UN register, pre-launch notifications etc. India is sharing these details with UN. Inter-Agency Space Debris Coordination Committee (IADC) is an international governmental forum for the worldwide coordination of activities related to the issues of man-made and natural debris in space.

- India participates in IADC-activities with regard to space debris management, undertaking SOPA (Space Object Proximity Awareness and COLA (Collision Avoidance) Analysis.
- India has supported UN resolution on No First Placement of Weapons on Outer Space.

INFORMATION AND TECHNOLOGY

VISION DOCUMENT' FOR A DIGITAL NORTH EAST

- Union IT Minister released the 'Vision Document' for a digital North East by 2022 that aims to enhance peoples' lives by capacity building of government staff and doubling BPO (business process outsourcing) strength in the region

About:

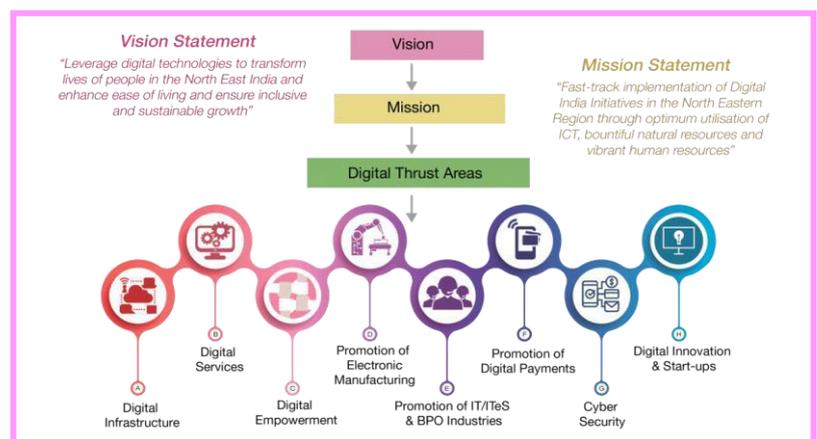
- The Vision Document aims to empower the people of the North Eastern region and state-wise roadmaps have been developed for implementing digital initiatives.

Particulars of Vision Document:

- The document emphasises leveraging digital technologies to transform lives of people of the North East and enhance the ease of living
- A cloud hub for NE will be created in Guwahati and capacity building for 50,000 government staff will be taken up in using digital technologies, including Goods and Services Tax and payment platforms.
- The number of seats planned for BPOs in the NE states will be doubled to 10,000 from 5,000, while the network of common service centres will be expanded to cover all villages.
- High-speed broadband connectivity in all the uncovered villages in the NE region shall be provided.

Focus on 8 thrust Areas:

- The document identifies eight digital thrust areas
- Digital infrastructure
- Digital services
- Digital empowerment
- Promotion of electronics manufacturing
- Promotion of it and it-enabled services including bpos
- Digital payments
- Innovation & start-up's, and Cybersecurity



State-wise Roadmaps:

- ✚ Foundation stone was laid for four NIELIT (National Institute of Electronics & Information Technology) permanent centres in Guwahati, Shillong, Lunglei and Gangtok.
- ✚ Simultaneously, a foundation was laid for the Common Facilitation Centre and Smart Meter Manufacturing facility in Electronics Manufacturing Cluster (EMC) in Tech City, Bongara Village in Assam for promotion of electronics manufacturing in the North East.
- ✚ NIC (National Informatics Centre) is launching the Secure, Scalable and Sugamya Website as a Service (SwaaS) websites for Arunachal Pradesh and Tripura.
- ✚ To take participative governance to last mile citizen, State MyGov portals are being launched for Arunachal Pradesh, Manipur and Tripura.
- ✚ STPI (Software Technology Park of India) incubation facility is being inaugurated in Agartala, Aizawl and Shillong.
- ✚ A BPO centre under the North East BPO Promotion Scheme (NEBPS) is being inaugurated in Majuli, Assam.
- ✚ Manipur State Data Centre is being migrated to the Cloud Platform. ERNET (National Research and Education Network) India is enabling virtual classroom facility in Tripura.
- ✚ Digital Locker is being integrated with Secondary Education Board Assam and with Nagaland e-District.
- ✚ A comprehensive GIS-based Decision Support System for North East States and North Eastern District Resource Plan Geo-Portal is also being launched.
- ✚ Six medical college including Gauhati Medical College, Dibrugarh Medical College will get the benefits of e-class.
- ✚ This vision will play the role of a catalyst to energise the communication of North East with the ASEAN and BBN countries in the face of Act East Policy.

AGMARK ONLINE SYSTEM

- ✚ The government has launched an online platform for processing applications related to quality certification mark 'Agmark' for agricultural products.

About:

- ✚ It is being implemented across the country to conduct quality control functions.
- ✚ It will be available 24×7.
- ✚ It will make process of application is simple, quick, transparent.
- ✚ Through this online system, certificate of authorisation (domestic), permission of laboratories (domestic), permission of printing press and services related to laboratory information management system will be provided online.

Significance:

- ✚ The online system will make processes easy, reliable and cost effective. It also has provisions for online receipt of fees from the applicants as payments can be received in digital mode through bharatkosh.gov.in website.

Agmark:

- ✚ Agmark is certification mark that assures conformity to set of standards approved by Government agency Directorate of Marketing and Inspection.
- ✚ It is legally enforced by Agricultural Produce (Grading and Marking) Act of 1937 (and ammended in 1986). The present AGMARK standards cover quality guidelines for 205 different commodities spanning variety of cereals, pulses, vegetable oils, essential oils, fruits & vegetables, and semi-processed products like vermicelli.

'INNOVATION CELL' AT AICTE

- ✚ The HRD Ministry has established an 'Innovation cell' at AICTE to systematically foster the culture of Innovation in all Higher Education Institutions (HEIs) across the country.

About:

- ✚ The main purpose behind the formation of the network of Institution's Innovation Councils (IICs) is to encourage, inspire and nurture young students by exposing them to new ideas and processes resulting in innovative activities in their formative years.

Key Highlights:

- ✚ More than 1000 Higher Education Institutions (HEIs) have already formed IICs in their campuses and enrolled for the IIC network managed by MHRD's Innovation cell to promote innovation through multitudinous modes leading to an innovation promotion eco-system in their campuses.
- ✚ In most developed countries, Universities are the main research centers and because of their research, the nation's get top ranks in the global innovation ranking.
- ✚ Now, Indian universities are also setting up research centers through the Institution's Innovation Council programme.
- ✚ Through this initiative, India hopes to get a good rank in global innovation ranking in the next 2-3 years.

MODEL INTERNATIONAL CENTER FOR TRANSFORMATIVE ARTIFICIAL INTELLIGENCE (ICTAI)

- ✚ NITI Aayog, Intel, and Tata Institute of Fundamental Research (TIFR) are collaborating to set up a Model International Center for Transformative Artificial Intelligence (ICTAI) towards developing and deploying AI-led application-based research projects.
- ✚ This initiative is part of NITI Aayog's 'National Strategy for Artificial Intelligence' Discussion Paper that focuses on establishing ICTAI in the country through private sector collaboration.

ICTAI:

- ✚ Based in Bengaluru, the Model ICTAI aims to conduct advanced research to incubate AI-led solutions in three important areas – healthcare, agriculture and smart mobility – by bringing together the expertise of Intel and TIFR. It aims to experiment, discover and establish best practices in the domains of ICTAI governance, fundamental research, physical infrastructure, compute and service infrastructure needs, and talent acquisition.

Goals and objectives:

- ✚ Through this collaborative effort, the model ICTAI is chartered to develop AI foundational frameworks, tools and assets, including curated datasets and unique AI algorithms. The intent is to develop standards and support policy development related to information technology such as data-storage, information security, privacy, and ethics for data capture and use. The model Centre also plans to develop AI foundational technologies to promote applied research that can scale for national impact and will lead to the creation of a vibrant and self-sustaining ecosystem. Another key area of its focus will be collaboration with industry leaders, start-up's, and AI services and product companies to productize technologies and IP that are developed at the model ICTAI. And finally, the goal is to support skilling and talent development for world-class AI talent. The learning and best practices developed through this model ICTAI will be used by NITI Aayog to set up the future ICTAIs across country.

INTEGRATED HEALTH INFORMATION PLATFORM (IHIP)

- ✚ The Union Health Ministry did soft-launch of the Integrated Disease Surveillance Programme (IDSP) segment of Integrated Health Information Platform (IHIP) in seven states.

About:

- ✚ IHIP is real time, village-wise, case based electronic health information system with GIS tagging which will help in prompt prevention and control of epidemic prone diseases. The initiative will provide near-real-time data to policy makers for detecting outbreaks, reducing the morbidity and mortality and lessening disease burden in the populations and better health systems.

- ✚ The primary objective of IHIP is to enable the creation of standards compliant Electronic Health Records (EHRs) of the citizens on a pan-India basis.
- ✚ The EHRs aims to build a comprehensive Health Information Exchange (HIE) as part of this centralized accessible platform.
- ✚ The success of this platform will depend primarily on the quality of data shared by the states.
- ✚ For effective implementation of the platform, 32,000 people at the block level, 13,000 at the district level and 900 at the state level have been trained

India To Launch Public DNS Server

- ✚ The Ministry of electronics and IT (MeitY) has announced that the government will soon roll out a public Domain Name Server for India.

About:

- ✚ It will be aimed at providing a faster and more secure browsing experience for Internet users in the country, while ensuring that citizens' data is stored locally.
- ✚ A DNS is a like a directory for the Internet, it helps to convert domain names that are easy for people to remember into IP addresses, which are used by computers/machines to communicate.
- ✚ If the DNS is either slow or fails to work, users will not be able to locate web addresses.
- ✚ The roll-out, will be executed by the National Informatics Centre – the technology arm of the government. NIC is already using the public DNS within the government network.
- ✚ The new platform is an upgraded version with enhanced in-built security features compared to the earlier created by the National Informatics Centre (NIC).
- ✚ It has a capability to host as many as 5 million users that can be scaled up further if needed.
- ✚ It is developed in the wake of critical digital services being delivered online requiring enhanced security to discourage cyber-attacks and a quicker site loading time.
- ✚ It will be placed across the country to minimise outage and would be available round the clock. If a user inadvertently accesses a malicious or phishing site, the new public system would immediately open up a page or popup to alert the user of such potential threat so that the suspicious resource could be avoided.
- ✚ It will also ensure availability, particularly for smaller Internet Service Providers (ISPs) who do not have a credible DNS, the bigger ones usually have their own DNS.
- ✚ The users will be free to choose any DNS of their choice and will not be required to compulsorily shift to the public DNS.

DEFENSE

INDIA'S FIRST MISSILE TRACKING SHIP IS READYING FOR SEA TRIALS

- Hindustan Shipyard Limited (HSL) is gearing up to undertake sea trials of India's first missile tracking ship

About:

- This will be the first of its kind ocean surveillance ship being built as part of the efforts to strengthen the country's strategic weapons programme.
- Its induction will put India in the elite of club of a few countries that have such sophisticated ocean surveillance ship.
- It has the capacity to carry 300-strong crew with hi-tech gadgets and communication equipment, powered by two diesel engines, and a large deck capable of helicopter landing.



INDIA'S FIRST INDIGENOUS ANTI-NUCLEAR MEDICAL KIT

- In a major shot in the arm for paramilitary and police forces, scientists at Institute of Nuclear Medicine and Allied Sciences (INMAS) claim to have developed India's first indigenous medical kit that may ensure protection from serious injuries and faster healing of wounds resulting from nuclear warfare or radioactive leakage.

About:

- The kit has been developed for the armed, paramilitary and police forces only as they are the first ones likely to get exposed to radiation — be it during nuclear, chemical and biomedical (NCB) warfare or a rescue operation after a nuclear accident.
- The kit has over 25 items, including radio-protectors that provide 80-90% protection against radiation and nerve gas agents, bandages that absorb radiation as well as tablets and ointments.
- Developed in India for the first time, it's a potent alternative to similar kits that were till now being procured from strategically advanced nations such as the US and Russia at much higher prices.
- The contents include an advanced form of Prussian blue tablets, highly effective in incorporating Radio Cesium (Cs-137) and Radio Thallium, among the most feared radioisotopes in nuclear bombs that destroy human body cells.

- ✚ The kit also has an Ethylenediaminetetraacetic acid (EDTA) injection that traps uranium in the guts and blood of victims during a nuclear accident or warfare. When EDTA is injected into the veins, it “grabs” heavy metals and minerals and removes them from the body.
- ✚ The kit also has Ca-EDTA Respiratory Fluid, which is the inhalation formula for chelation, or grabbing, of heavy metals and radioactive elements deposited in lungs through inhalation at nuclear accident sites.
- ✚ The kit also has a radioactive urine/biofluid collector which is cost-effective, easy to store and can safely dispose of the urine of a person affected by radiation. The collector has silk at its base, more than enough to jellify 500 millilitre of urine, which could be disposed of safely. The kit has anti-gamma ray skin ointment that protects and heals the radiation damage on the skin.
- ✚ Also part of the kit is the amifostine injection, a US Food and Drug Administration (FDA) approved conventional radiopharmaceutical that limits damage from gamma radiation. Another medicine in the form of a tablet is Indranil 150 mg. It is being introduced as a reserve emergency drug for services, rescue workers and places where high acute exposures are expected and lives will be at stake.

Significance:

- ✚ During radioactive accidents thousands of patients may be rushed to hospitals. In several cases, if not most, they will also have traumatic, orthopaedic, surgical injuries or burns.
- ✚ The blood of such patients will have radioactive elements and will require wound dressing with significantly higher absorption capacity so that nothing leaks and infects others. Such highly absorptive dressings and gauze also make it safer for the medical staff to handle radioactive patients as the chance of their own contamination is reduced. The kit is a potential alternative to those being procured from nations such as the US and Russia at much higher prices. Such medicines will help everyone and not just soldiers. This will also help the victims affected in terrorist attacks.

‘PRAHAR’ MISSILE

- ✚ DRDO successfully flight tested the indigenously developed surface-to-surface tactical missile ‘Prahara’, from Launch Complex-III, ITR, Balasore.

About:

- ✚ Prahara (“Strike”) is an Indian solid-fuel road-mobile tactical ballistic missile developed by DRDO. Prahara is expected to replace the Prithvi-I short-range ballistic missile in Indian service. The missile is equipped with state-of-the-art navigation, guidance and electromechanical actuation systems with advanced on-board computer.

- It is a quick-reaction, all-weather, all-terrain, highly accurate battlefield support tactical weapon system. The missile fills the short-range tactical battlefield missile role as required by the Indian Army to take out strategic and tactical targets.
- 'Prahar' is a contemporary weapon system capable of carrying multiple types of warheads and neutralizing a wide variety of targets.

'NIRBHAY'

- India has successfully conducted a flight test of its state-of-the-art sleek cruise missile 'Nirbhay', which is capable of carrying warheads of up to 300 kg. About Nirbhay It is a Sub-sonic cruise missile.

About Nirbhay:

- 'Nirbhay', a two-stage missile, is 6-metre long, 0.52-metre-wide and with a wingspan of 2.7 metre. It can carry the designated warhead at a speed of 0.6-0.7 Mach. Its launch weight is about 1500 kg. With an operational range of 1,000 km, the missile is fueled by a solid rocket motor booster developed by the Advanced Systems Laboratory (ASL).
- The missile is guided by a highly-advanced inertial navigation system which is also indigenously designed and developed by the Research Centre Imarat (RCI).

AIR LAUNCHED BRAHMOS MISSILE TEST FIRED

- The world's fastest supersonic cruise missile, BrahMos, was successfully flight-tested for the first time from the Indian Air Force's frontline fighter, Sukhoi-30MKI. It is now capable of being launched from land, sea and air.

Basic features of BrahMos:

- Supersonic cruise missile, BrahMos, is being developed with Russia as a private joint venture.
- BrahMos is a multi-platform cruise missile enabling it to strike from various types of land, sea and air-based platforms.
- It is among the fastest supersonic cruise missiles in the world with speeds ranging between Mach 2.5 - 2.8. BrahMos is a 'fire and forget' weapon, requiring no further guidance from the control centre once the target has been assigned and it is launched. BrahMos is a two-stage missile with a solid propellant booster engine as its first stage which brings it to supersonic speed and then gets separated.



BrahMos Cruise Missile

Air-launched variant tested

BrahMos, the world's fastest supersonic cruise missile, successfully flight-tested for the first time from a Sukhoi-30MKI fighter of the Indian Air Force against a sea based target in Bay of Bengal. The missile is now capable of being launched from land, sea and air, completing the tactical cruise missile triad for India.

Technical Specifications	
Maximum range	400+ km
Velocity	Mach 2.8
Weight	2.5 tonnes
Warhead mass	200-300 kg
Altitude	15 km
Terminal	10-15 metre

Special Features

- Universal for multiple platforms
- "Fire and Forget" principle of operation
- High supersonic speed all through the flight
- Long flight range with varieties of flight trajectories
- Low radar signature
- Shorter flight times leading to lower target dispersion and quicker engagement
- Pin point accuracy with high lethal power aided by large kinetic energy on impact

Compared to existing state-of-the-art subsonic cruise missiles, BrahMos has

- 3 times more velocity
- 2.5 to 3 times more flight range
- 3 to 4 times more seeker range
- 9 times more kinetic energy



- ✚ The liquid ramjet or the second stage then takes the missile closer to Mach 3 speed in cruise phase. Stealth technology and guidance system with advanced embedded software provide the missile with special features. The missile has flight range of up to 290-km with supersonic speed all through the flight, leading to shorter flight time, consequently ensuring lower dispersion of targets, quicker engagement time and non-interception by any known weapon system in the world. Its destructive power is enhanced due to large kinetic energy on impact. Its cruising altitude could be up to 15 km and terminal altitude is as low as 10 meters.
- ✚ It carries a conventional warhead weighing 200 to 300 kg.

Significance:

- ✚ The supersonic cruise missile that provides a major strategic deterrence against China and Pakistan can be utilised in ‘multi-mission’ roles, including precision strikes on terror camps across the LoC, against highvalue naval targets, including aircraft carriers and nuclear bunkers. This will act as a significant capability development for the IAF, which will have the combination of Su-30 fighters having a range of 3,000 km and the BrahMos with 290 km.

INTEGRATED QUARTER MASTER PACKAGE (IQMP)

- ✚ Integrated Quarter Master Package (IQMP) software application was formally released to the Indian Army.

About:

- ✚ The software has been developed with the aim of bringing speed, accuracy and transparency in handling logistics aspects in the unit. It will help in effective logistics management and decision making, thereby assisting Army units to be battle ready all the time. It will also play an important role in achieving automation of Indian Army and prove to be a significant milestone towards ‘Digital Army’ in consonance with the ‘Digital India initiative’ of the government. The application can be dynamically configured to meet the specific requirements of various types of Army units and is capable of sharing information and data with other software applications in the domain of logistics management.

DRONE OLYMPICS

- ✚ The Drone Olympics was recently held at the 12th edition of Aero India, wherein national and international players demonstrated their potential.

About:

- ✚ The Aero India exhibition, with the theme - ‘The Runway to a Billion Opportunities’ is designed to bolster business in the international aviation sector and provide a platform to showcase India’s aeronautical advancements.
- ✚ The ‘Drone Olympics’ has been organized by Ministry of Defence.

- It aims to encourage the UAV industry to connect with potential buyers and business partners in the country and also provide an opportunity to the Armed Forces to assess the capabilities of UAVs. The role of UAVs are ever-increasing in the defence sectors, making them the ideal platform for intelligence, surveillance, reconnaissance, electronic warfare and strike missions.
- The competition was held in three categories: surveillance challenge to determine the surveillance capacities of unmanned aerial vehicles (UAV); supply drop challenge to assess the weight dropping capacity of the UAVs; and the formation flying challenge to demonstrate different shapes with group of UAVs. During the award ceremony, Atal Tinkering Lab (ATL) of Atal Innovation Mission (AIM), NITI Aayog launched 'ATL Drone Module – Get Set Fly!' created in collaboration with the blooming drone industry in India.
- The goal of the ATL Drone module is to introduce the young minds of India to the technology and help them to identify and solve community issues using drones as a tool.



Market Opportunity

- Indian UAV market is projected to grow at a CAGR of 18 per cent during 2017-23.
- By 2021, the Indian UAV market is expected to reach \$885.7 million, while the global market size will touch \$21.47 billion, according to a study by BIS Research.
- UAV demand is mainly derived from military-end user application, followed by law enforcement, precision agricultural, inspection and monitoring.
- According to the Stockholm International Peace Research Institute (SIPRI), India tops the list of drone-importing nations with 22.5 percent of the world's UAV imports.
- Drone-related firms like the ones which participated in the Aero India can help reduce India's dependence on foreign UAVs.

QRSAM

- India has successfully test-fired two indigenously developed Quick Reaction Surface-to-Air missiles (QRSAM) from a test range off the Odisha coast.



About QRSAM:

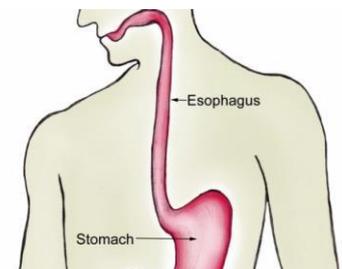
- It has been developed to replace the 'Akash' missile defence system, and has 360-degree coverage.
- It is capable of hitting the low flying objects.

- ✚ The QR-SAM was jointly developed by the Defence Research Development Organisation (DRDO) and Bharat Electronics Limited.
- ✚ Reports suggest that this missile system has the potential to engage multiple targets within a range of approximate 30 kilometres, with the configuration of two vehicles for area air defence.
- ✚ It is equipped for quick reaction and the system is all weather enabled, a network-centric one, which is also capable of search-on-the-move.
- ✚ It is a truck-mounted missile and is 360 degree rotatable, electronic-mechanically operated, turret-based launch unit.
- ✚ The missile, which is a highly mobile air defence system, can also deceive enemy radars making it to be detected.
- ✚ It can also be used as an anti-sea skimmer from a ship against low flying attacking missiles. It employs dual thrust propulsion stage using high-energy solid propellant.

BIOTECHNOLOGY

SCIENTISTS GROW HUMAN OESOPHAGUS IN LAB

- ✚ In a first, scientists have successfully grown oesophageal organoids – miniature, functional versions of the human food pipe – using stem cells, paving the way for new ways to study and test drugs against gut disorders.
- ✚ The human oesophageal tissue was grown entirely from pluripotent stem cells (PSCs), which can form any tissue type in the body.



Significance:

- ✚ The research may lead to personalised diagnostic methods and focused in part on developing regenerative tissue therapies to treat or cure GI disorders.
- ✚ In addition to being a new model to study birth defects like esophageal atresia, the organoids can be used to study diseases like eosinophilic esophagitis and Barrett's metaplasia, or to bioengineer genetically matched esophageal tissue for individual patients.

Oesophagus:

- ✚ The oesophagus is a muscular tube that actively passes food from the mouth to the stomach. It is also called as gastro-intestinal tract (GI tract or gullet or food pipe).
- ✚ There are a number of lymph nodes close to the oesophagus.

CARNIVOROUS PLANTS USE CO₂ TO LURE PREY

- ✚ Carnivorous plants are predatory flowering plants that kill animals in order to derive nutrition from their bodies. They share three attributes that operate together and separate them from other plants.

Carnivorous plants:

- ✚ Capture and kill prey.
- ✚ Have a mechanism to facilitate digestion of the prey.
- ✚ Derive a significant benefit from nutrients assimilated from the prey.
- ✚ Carnivorous plants have been known to employ a variety of techniques like nectar, smell, colour and ultraviolet florescence to lure and capture prey. But now, scientists at the Jawaharlal Nehru Tropical Botanic Gardens and Research Institute here have come up with evidence that some carnivorous plants use carbon dioxide (CO₂) to attract insects and ants to their prey traps.

ZIKA VIRUS

About:

- ✚ The Indian Council of Medical Research (ICMR) recently announced that the Zika virus strains causing the outbreak in Jaipur, Rajasthan, cannot cause microcephaly
- ✚ Epidemiological, clinical, and experimental data have indicated that microcephaly and a range of other birth defects (such as miscarriages and ocular disease) could be caused by the Zika virus passing from a pregnant woman to her foetus
- ✚ There is not a specific Zika virus strain — or mutation — linked to microcephaly
- ✚ All Zika virus strains could possibly cause birth defects

Why ICMR announcement is flawed?

- ✚ This conclusion was based on a genetic sequencing of viruses isolated from the outbreak
- ✚ The problem with this conclusion is that the research was based on infection in mouse brains — not humans — and contains no epidemiological or clinical support
- ✚ Numerous other studies suggest that all Zika virus strains may have the capacity to infect fetuses and cause neurological disease

Support for ICMR claim:

- ✚ According to the Centers for Disease Control and Prevention in the U.S., only 5-10% of Zika virus infections during pregnancies lead to Zika-associated birth defects, and the rates of microcephaly are much lower.

Other associated risks:

- ✚ It is also difficult to determine how extensive Zika virus outbreaks will be in India
- ✚ If the Zika virus has been silently spreading in the country, as it did throughout most of Asia for the last 50 years, then enough people may be immune to the virus to prevent large outbreaks

Precautionary measures:

- ✚ Pregnant women and their families, including those planning to get pregnant, should take great caution to avoid mosquitoes. Those infected should be isolated in order to contain the spreading of the virus.

Way forward:

- ✚ Zika-associated birth defects could be a serious public health crisis in India
- ✚ Despite the recent announcement suggesting that the Jaipur Zika virus strains cannot cause foetal microcephaly, all possible measures to control transmission and monitor pregnancies should be taken.

WORLD TB REPORT 2018

- ✚ Recently, World Health Organisation (WHO) released World TB Report 2018, with collaboration of UN's first high-level meeting (HLM) on TB. Additionally, WHO released a Roadmap toward Ending TB in Children and Adolescent.

Findings of the World TB report 2018:

- ✚ TB is the 10th leading cause of death worldwide, and since 2011. It has been the leading cause of death from a single infectious agent, ranking above HIV/AIDS.
- ✚ Overall, TB deaths have decreased over the past year. However, underreporting and under-diagnosis of TB cases remains a major challenge.

Triple-Billion Goals:

- ✚ It is associated with WHO General Programme of Work 2019-2023 linked to SGDs health goals. This stressed the need of
- ✚ 1 billion more people are benefiting from Universal Health Coverage.
- ✚ 1 billion more people are better protected from health emergencies,
- ✚ 1 billion more people are enjoying better health and well-being.

Catastrophic total costs due to TB:

- ✚ It is TB-specific indicator incorporates not only direct medical payments for diagnosis and treatment, but also direct non-medical payments (e.g. for transportation and lodging) and indirect costs (e.g. lost income).

Observations in World TB Report 2018 for India:

- ✚ India accounted for 27% of the total new infections of TB in 2017, which is the highest among the top 30 high TB burden countries in the world.
- ✚ India also led in cases of Multi-Drug Resistant TB (MDR-TB).
- ✚ Nearly a quarter of the world's MDR-TB cases are in India (24 per cent).
- ✚ Roadmap toward ending TB in Children and Adolescent It is systematic pathway which will guide the stakeholders to contains the prevalence of Child and Adolescent.

Observations in Roadmap:

- ✚ Young children are at increased risk of developing severe forms of TB disease (e.g. disseminated TB, TB meningitis) with increased risk of death (especially children <2 years).
- ✚ Adolescent (10-19 years) TB patients faces unique challenges due to peer-pressure and fear of stigma, increasing prevalence of co-morbidities such as HIV, and risk behaviours such as alcohol, substance and tobacco use.
- ✚ Many of the policies and tools needed to break down the continuous cycle of transmission of disease and policy action need to be prioritised, strengthened and fully implemented to move us closer to ending TB.

BISPHENOL A (BPA)

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

Bisphenol A (BPA):

- ✚ 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.

Concerns:

- ✚ While BPA that seeps into food and drink is considered safe in low doses, prolonged exposure is suspected of affecting the health of children and contributing to high blood pressure. 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.

WOLBACHIA BACTERIA

- ✚ Recently successful experiments were conducted in Australia, which demonstrated the positive correlation between presence of Wolbachia bacteria in mosquitoes and reduced spread of diseases such as Malaria and Dengue.

About:

- Wolbachia is a tiny bacterium that is present in up to 60% of all species of insects, including several mosquito species. But it is usually not present in the *Aedes aegypti* mosquito, the primary species responsible for transmitting dengue, chikungunya and Zika. Wolbachia is one of the world's most common parasitic microbes and possibly the most common reproductive parasite in the biosphere. When present in the mosquito, the viruses cannot replicate and hence small numbers of wolbachia-carrying mosquitoes are released in target areas. The World Mosquito Program introduces Wolbachia into *Aedes aegypti* mosquitoes. Once Wolbachia carrying mosquitoes are released, they breed with wild mosquitoes and over time, the majority of mosquitoes carry Wolbachia. This new method provides bio-control approach to handle these diseases. In 2017, there were 1.9 lakh dengue cases and 325 deaths in the country. Until July this year, there have been 15,000 cases and 38 deaths. This method may help reduce such incidences of these diseases.

INDIAN HUMAN MICROBIOME INITIATIVE PROJECT

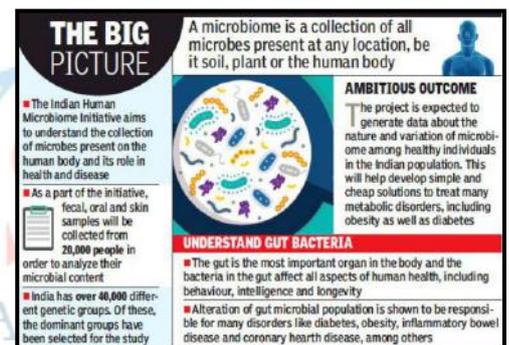
- Indian Human Microbiome Initiative Project, led by The National Centre for Microbial Resource (NCMR) – National Centre for Cell Science (NCCS) has been put up for approval.

Microbiome:

- The collective genome of all micro-organisms contained within the human body, residing inside tissues & bio-fluids is called Human Microbiome. It includes bacteria, archaea, fungi, protists and viruses.
- Most of them have either commensal (co-exist without harming humans) or mutualistic (each benefit from the other).
- Different parts of human body including the skin, mammary glands, placenta, uterus, ovarian follicles, lungs, saliva, oral mucosa, conjunctiva, biliary and gastrointestinal tracts, are occupied by characteristic microbial populations.
- The composition of microbiome is shaped by factors such as genetics, dietary habits, age, geographic location and ethnicity. Human microbiome makes up around 2% of the body mass of the adult.

Importance of the Human Microbiome:

- Microbial communities play a key role in many aspects of host physiology:
- Metabolism of otherwise complex indigestible carbohydrates and fats
- Production of essential vitamins



- ✚ Maintaining immune systems
- ✚ Acting as a first line of defense against pathogens
- ✚ Influence the susceptibility to certain infectious diseases, as well as contribute to disorders such as obesity and diabetes
- ✚ Determines how one responds to a particular drug treatment
- ✚ The diversity of microbes that make up human microbiome could lead to novel therapies e.g. an infection caused by a ‘bad’ bacterial species can be treated by promoting the growth of ‘good’ bacteria.

About Human Microbiome Project (HMP):

- ✚ Human Microbiome Project is a research initiative of US’s National Institute of Health with the mission to generate the resources and expertise needed to characterize the human microbiome and analyze its role in health and disease.
- ✚ Launched in 2007, it is focused on identifying and characterizing human microbial fauna and elucidating their roles in health and diseases.
- ✚ Some methodologies used in HMP are:
- ✚ Metagenomics as a culture-independent method of broad microbial community characterization
- ✚ Whole Genome Sequencing (WGS) to provide a “deep” genetic perspective on aspects of a given microbial community, i.e. individual bacterial species

Human Microbiome Research in India:

- ✚ India doesn’t have a dedicated national human microbiome project. But, the proposed Indian Human Microbiome Initiative holds a lot of potential.
- ✚ The project will include 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 Western Ghats).
- ✚ Scientists have found that Indian population, particularly tribals, have distinct gut microbiota than individuals from other parts of the world. Such tribal populations largely unaffected by “modern” diet and have lower prevalence of lifestyle diseases and their study would shed some light on mutualism between gut microbiota and the host.

HORIZON 2020

India and the European Union have gone and collaborated on a research programme called the Horizon 2020. This programme will be used to develop the next generation of Influenza vaccine that will help in protecting people around the world. India's Department of Biotechnology (DBT) and EU have committed to 15 million Euros i.e. Rs. 240 crores for this research programme.

The Three Pillars of Horizon 2020

Excellent Science	Industrial Leadership	Societal Challenges
<ul style="list-style-type: none"> European Research Council Future and Emerging Technologies Marie Curie actions Research Infrastructures 	<ul style="list-style-type: none"> Leadership in Enabling and Industrial Technologies Access to risk finance Innovation in SMEs 	<ul style="list-style-type: none"> Health, demographic change and wellbeing Food security, sustainable agriculture, marine and maritime research & the bio-economy Secure, clean and efficient energy Smart, green and integrated transport Climate action, resource efficiency and raw materials Inclusive societies Secure societies

Horizon 2020 research project:

- This project will focus on a cost-effective and affordable influenza vaccine that will be developed with the aims of advancing the efficacy, safety, duration of immunity, and reactivity against influenza strains.
- There have been an approximate Rs. 240 crore funds, which has been designated for research and innovation efforts under this project. The vaccine will be developed by EU-India consortia.
- This effort will help at bringing together multi-disciplinary stakeholders who represent any part of the chain from lab to market and will comprise a minimum of three applicants from Europe or countries associated to EU programme Horizon 2020 and three applicants from India, where in other countries too are free to join these EU-India consortia.

Significance:

- This project will help in contributing to the achievement of a sustainable development goal 3 (SDG-3).
- It will ensure the health and well-being for all and also help the international community to prepare better in the event of an influenza pandemic.

ENERGY

HYDROGEN POWERED TRAIN

- Germany rolled out world's first hydrogen powered trains as an initiative for eco-friendly technology.

About:

- The CoradiaiLint trains can run for around 1,000km on a single tank of hydrogen, similar to the range of diesel trains.
- The main aim is to replace the polluting diesel trains in this region.
- The trains are built by French TGV-maker

- These trains will cater to the transportation needs of towns and cities of northern Germany, running 100km route through Cuxhaven, Bremerhaven, Bremervoerde and Buxtehude in northern Germany.

Working:

- Hydrogen trains are equipped with fuel cells that produce electricity through a combination of hydrogen and oxygen, a process that leaves steam and water as the only emissions.
- Excess energy is stored in ion lithium batteries on board the train.
- Hydrogen powered vehicles convert the chemical energy of hydrogen to mechanical energy.
- The process of conversion takes place either by burning hydrogen in hydrogen internal combustion engine vehicle, or by reacting hydrogen with oxygen in a fuel cell to run electric motors. Widespread use of hydrogen for fuelling rail transportation is an important element of proposed fuel economy.

CYCLONE-30

- India's biggest cyclotron facility named Cyclone-30 became operational at Kolkata-based Variable Energy Cyclotron Centre (VECC), which comes under Department of Atomic Energy (DAE).



About:

- Cyclone-30 will produce radioisotopes vital for diagnosis and treatment of cancer.
- It will be first and only cyclotron facility in country to produce Germanium-68 radioisotopes, which is used in diagnosis of breast cancer.
- It will also produce Palladium 103 isotopes, which is used for the treatment of prostate cancer. In its future stages, it will also produce Iodine 123 isotopes, which can help detect thyroid cancer. Cyclone-30 started working for first time when 30 MeV beam reached Faraday Cup (a metal cup designed to catch charged particles in vacuum). The beam from this facility was used to produce fluorine-18 isotope for preparation of radiopharmaceutical fluoro-de-oxy-glucose (FDG), which is used for diagnose various types of cancer.
- It will start regular production by mid-2019 after supporting nuclear systems and regulatory clearances are commissioned.

Significance:

- The high-energy and high-yielding Cyclone-30 machine will provide for affordable radio isotopes and related radiopharmaceuticals for entire country, especially for eastern states like

- West Bengal. It will also help in bringing down imports, while raising possibility of exporting radioisotopes in the future.
- It also has export potential for germanium-68 and gallium-68 generator for in-situ production of gallium-68 and palladium-103 isotopes, which are used for breast cancer diagnosis and prostate cancer treatment, respectively.
- It can also be used for research in the fields of material science and nuclear physics.

APSARA-U RESEARCH REACTOR

- India's oldest research reactor 'Apsara', which was shut down permanently in 2009 for repair, was recommissioned with a higher capacity on September 10, 2018 at Bhabha Atomic Research Centre, Trombay
- The refurbished version of the reactor is named as 'Apsara-upgraded' (Apsara-U).

Apsara-U research reactor:

- This swimming pool type research reactor of higher capacity comes nearly 62 years after Apsara came into existence.
- The reactor, made indigenously, uses plate type dispersion fuel elements made of Low Enriched Uranium (LEU). This reactor will increase indigenous production of radio-isotopes for medical application by about 50 percent.
- It would also be extensively used for research in nuclear physics, material science and radiation shielding.
- The development re-emphasises the capability of Indian scientists and Engineers to build complex facilities for health care, science education and research.

APSARA

FIRST REACTOR IN ASIA Built by our own people
Was in operation 2 years before first reactor in China
which was designed and built by USSR

Mar 1955: AEC decides to build Swimming Pool type REACTOR.

July 1955: Team finalizes design and power (1M Wt).

Oct 1955: Agreement signed with UKAEA for supply of enriched U fuel (4.5 kg)

Aug 1956: Reactor achieves criticality ... n-flux ~ 10¹² n/cm²

Jan 1957: Nehru names the reactor "APSARA" in the "dedication" ceremony.

CURRENTLY WORK IN PROGRESS FOR 2MW UPGRADED APSARA

Background:

- As per Dr Homi J. Bhabha, the father of Indian Nuclear programme, "Research reactors are the back bone of Nuclear Programme".
- Considering this, Apsara, the first research reactor of Asia, became operational in Trombay campus of Bhabha Atomic Research Centre in August 1956. Apsara is a light water swimming pool-type reactor with a maximum power output of one megawatt thermal (MWt). The reactor burns enriched uranium in the form of aluminum alloyed curved plates.
- After more than five decades of service, the reactor was shut down in 2009.

FLOATING NUCLEAR POWER PLANT

Russia's state-run Atomic Energy Corporation, ROSATOM has developed the world's first floating nuclear power plant.



About:

- Named after 18th-century Russian scientist Mikhail Lomonosov, it is called Akademik Lomonosov and will primarily be used to power oil rigs as Russia pushes further north into the Arctic to drill for oil and gas.
- The ship holds two reactors with two 35 megawatt nuclear reactors that are similar to those used to power icebreaker ships. It will replace a coal-fired power plant and an aging nuclear power plant Bilibino, supplying over 50,000 people with electricity and reducing carbon footprint in the Arctic by around 50,000 tonnes of carbon dioxide emissions each year. It will also make it possible to supply electricity to hard-to-reach areas, regardless of transport infrastructure, landscape, and cost of fuel delivery.
- For fossil fuel-based electricity generation, up to 40 per cent of the cost is attributed to the price of coal, oil or gas, as well as to the cost of their delivery. This figure is even higher for especially remote locations. The small size, lightweight, and fixed cost of the plant eliminate many such challenges. The small nuclear reactor can operate non-stop without the need for refuelling for three to five years, thereby considerably reducing the cost of electricity generation.
- The reactor has the potential to work particularly well in regions with extended coastlines, power supply shortages and limited access to electrical grids.
- Moreover, no spent nuclear fuel or radioactive waste will be left behind as it will be taken to the special storage facilities.
- Greenpeace has referred to the vessel as Chernobyl on ice and a nuclear Titanic bound for catastrophe.
- The 1986 Chernobyl disaster was a catastrophic nuclear accident that occurred in April 1986, at the Chernobyl Nuclear Power Plant in Ukraine.
- One of the major concerns with the power plant is that it has a flat-bottomed hull that it can get close to the shoreline and it has no self-propulsion, making it more vulnerable to storms. The efforts of Greenpeace compelled Russia to change its plan to stock the power plant in St Petersburg and send it to Pevek.

THREE MISSION CENTRES INAUGURATED AT IIT MADRAS

- The Department of Science and Technology (DST) has established three mission centres at the Indian Institute of Technology Madras (IIT-M).

About:

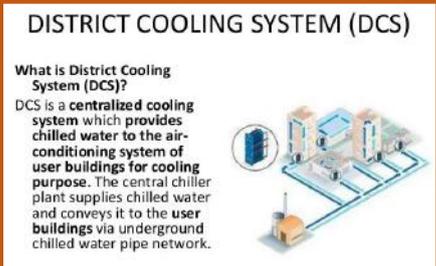
- The centres were aimed at research and development in the field of solar and water treatment.
- The three centres are:
 - DST -IITM Solar Energy Harnessing Centre aims to promote R&D related to silicon solar cells.
 - DST- IITM Centre for Sustainable Treatment, Reuse and Management for Efficient, Affordable and Synergistic Solutions for Water (Water-IC for SUTRAM of EASY WATER) – It aims to on various issues related to waste water management.
 - DST-IITM-KGDS Test-bed on Solar Thermal Desalination Solutions in Narippaiyur, Ramanathapuram District, Tamil Nadu. It aims to deliver customised technological solutions to address prevalent water challenges in the arid coastal village located on the shores of the Bay of Bengal.

DISTRICT COOLING SYSTEM

- The foundation stone of India's biggest district cooling system was recently laid in Amravati by the chief minister of Andhra Pradesh.

About:

- UAE-based cooling solutions utility National Central Cooling Company PJSC (Tabreed) has entered into a 30-year concession with Andhra Pradesh Capital Region Development Authority (APCRDA) to build, own, operate and transfer the cooling system.
- The agreement is for a contracted cooling capacity of 20,000 refrigeration tonnes and this will be the company's first plant outside its Gulf Cooperation Council (GCC) market.
- District cooling was first set up in India at Gujarat International Finance Tec-City (GIFT). The first phase of this system, with a capacity of 10,000 RTs, has been operational since April 2015.
- In addition, and in line with the ambitious plans for the greenfield capital city to be among the most sustainable cities in the world, the system will meet cooling requirements for the State's Assembly, High Court, Secretariat and other government buildings that are currently under construction, for which cooling services will commence from early 2021.
- Touted as a highly efficient, cost-effective form of air conditioning, district cooling uses only 50 per cent of primary energy consumption for cooling urban buildings thereby reducing carbon emissions.



- ✚ The system has associated benefits of improvement in air quality and reduction in general noise levels when compared to other traditional air conditioning systems.
- ✚ The cooling system is a part of the larger vision for Amaravati to create jobs and homes along with a world-class infrastructure, a green city and efficient resource management.

NEW INVENTION

WAYU- AIR POLLUTION MITIGATION DEVICE

- ✚ Air pollution control device WAYU (Wind Augmentation Purifying Unit) for traffic junctions was recently inaugurated in Delhi.

About:

- ✚ WAYU is developed by Council of Scientific and Industrial Research – National Environmental Engineering Research Institute (CSIR-NEERI) as a part of Technology Development Project funded by Department of Science and Technology.
- ✚ The device has the capacity to purify air in an area of 500-meter square. The device consumes only half a unit of electricity for 10 hours of running and has a maintenance cost of only Rs. 1500 per month.

How it works:

- ✚ The device works on two principles mainly Wind generation for dilution of air pollutants and Active Pollutants removal.
- ✚ The device has filters for Particulate Matter removal and activated carbon (charcoal) and UV lamps for poisonous gases removal such as VOCs and Carbon Monoxide.
- ✚ The device has one fan and filter for sucking and removing Particulate Matter. There are two UV lamps and half kg of activated carbon charcoal coated with special chemical Titanium Dioxide.

AIR QUALITY INDEX

- ✚ National Air Quality Index (AQI) has been launched for monitoring the quality of air in major urban centres across the country on a real-time basis and enhancing public awareness for taking mitigative action.

Salient features of the Index:

- ✚ The Index is centred around five chief pollutants: Particulate Matter, Ozone, Nitrogen Dioxide and Carbon Monoxide.
- ✚ The unit of measurement is microgram (or milligram in the case of CO) per cubic meter.
- ✚ The AQI has been developed by the Central Pollution Control Board in consultation with IIT-Kanpur and an expert group comprising medical, air-quality professionals and other stakeholders.

DELHI TO GET CLEANER EURO VI FUEL

- The government has advanced introduction of ultra-clean Euro-VI grade petrol and diesel in the national capital by two years to April 2018 in a bid to fight air pollution that has reached alarming levels.

About:

- Euro VI fuel Euro-VI grade fuel contains 10 parts per million (ppm) of sulphur as against 50 ppm in Euro-IV fuels.
- The aim of Euro 6 is to reduce levels of harmful car and van exhaust emissions, both in petrol and diesel cars.
- This includes nitrogen oxide (NO_x), carbon monoxide (CO), hydrocarbons (THC and NMHC) and particulate matter (PM), which is basically soot from diesel cars.
- The knock-on effect of reducing these pollutants can also mean improved fuel economy and lower CO₂ emissions.
- NO_x is a harmful pollutant that is often blamed for damaging the environment, but has also been proven to have serious health implications.
- Particulate matter, meanwhile, is a local pollutant that has also been linked to health and respiratory problems. The latest Euro 6 regulations set different emissions standards for petrol and diesel cars, but that is a reflection of the different kind of pollutants the two fuels produce.
- For diesels, the permitted level of NO_x emitted has dramatically dropped to a maximum of 80mg/ km, compared to the 180mg/km level that was required for cars that met the previous Euro 5 emissions standard.
- In contrast, the NO_x limit for petrol cars remained unchanged from Euro 5, as it was already low at 60mg/ km

DEFINITION OF KG

- 26th General Conference on Weights and Measures redefines standard definition of Kg
- The 26th CGPM was special and historic, as the members voted for the redefinition of 130-years-old “Le grand K – the SI unit of kg” in terms of the fundamental Planck’s constant (h). The new definitions will come into force on May 20, 2019.

About:

- The CGPM is the highest international body of the world for accurate and precise measurements. The CGPM comprises 60 countries including India and 42 Associate Members. India was represented by Consumer Affairs Secretary Avinash K Srivastava, National Physical Laboratory (NPL) Director D K Aswal and Head of NPL’s Planning, Monitoring & Evaluation TD Senguttuvan.

Key Highlights:

- ✚ The International Bureau of Weights and Measures (BIPM), the main executive body of CGPM has the responsibility of defining the International System of Units (SI).
- ✚ The revision of the SI is the culmination of many years of intensive scientific cooperation between the National Metrology Institutes (The National Physical Laboratory for India) and the BIPM.
- ✚ The dissemination of SI units for the welfare of society and industries in the country is the responsibility of Legal Metrology, Department of Consumer Affairs, Government of India.
- ✚ Out of five draft resolutions, the revision of the International System of Units and the definition of timescales are important.
- ✚ The most important is the resolution on the revision of the International System of Units.
- ✚ The definition of the seven base units namely, second, metre, kilogram, ampere, Kelvin, mole and candela has been changed from being linked to artefacts to being based on the fundamental constants on nature.

Impact:

- ✚ The change in the definitions will result in uniform and worldwide accessible SI system for international trade, high- technology manufacturing, human health and safety, protection of the environment, global climate studies and the basic science underpinning these.
- ✚ The units are expected to be stable in the long term, internally self-consistent and practically realisable being based on the present theoretical description of nature at the highest level.

NEW DETECTION KIT FOR TESTING FRESHNESS OF MILK EASY AND FAST.

- ✚ IIT Guwahati scientists develop a new detection kit that could make testing freshness of milk easy and fast.

About:

- ✚ Scientists at the Indian Institute of Technology (IIT), Guwahati, have developed a simple paper kit that can test freshness of milk and tell how well it has been pasteurised.
- ✚ Aided with a smart phone app, the kit can help ensure that milk is consumed before it turns too sour.

Significance:

- ✚ Being a widely consumed food, the safety of milk is of prime concern to consumers. More so because it's highly perishable and prone to action of enzymes and microorganisms inherently present in it.

- ✚ Although pasteurisation, freezing and preservation using additives are widely used to prevent spoilage, perishability of milk is still a concern. There is no easy way to know if milk is fresh or stale or how effective is the pasteurisation.
- ✚ Tests used in dairies and dairy industries are time consuming and need sophisticated equipment like spectrophotometers. The new detection kit could make testing easy and fast.

Working:

- ✚ A milk enzyme, Alkaline Phosphatase (ALP), is considered to be an indicator of milk quality because its presence even after pasteurisation indicates presence of microbes that may not have been rendered inactive with pasteurization.
- ✚ Researchers used ordinary filter paper to prepare the detector. The filter paper was cut into small discs using office punch and impregnated with chemical probes that preferentially react with ALP. The 'probes' used are antibodies that specifically bind to ALP.
- ✚ When ALP comes into contact with the probe, it turns white paper disc into a coloured one. "When soaked paper discs in 4-carboxybenzene diazonium solution and then chemically treated to expose-COOH groups on the diazonium,"
- ✚ The -COOH groups then attach to NH₂ groups on anti-ALP probe molecules. Thus the anti-ALP probes are fixed on paper. When a drop of milk is poured on the tiny paper disc, the ALP in milk reacts with probes, resulting in change of colour.
- ✚ The colour change on paper discs is then photographed by a smartphone camera and images processed to obtain corresponding colour values. These values are then compared with standard data stored in the phone.
- ✚ Thus, not only the presence of ALP could be detected but the amount of it in milk could also be measured.
- ✚ The team also confirmed that colour is only due to ALP and not due to interference of vitamins, other proteins and minerals in the milk.
- ✚ The sensor works in both qualitative and quantitative modes. "No separate reader is required for qualitative analysis as it works just like pregnancy test strips. While colour change shows ALP's presence, the exact amount of ALP is determined using a smartphone," adds Dr Chandra. The team has prepared a kit by attaching probe discs onto a 2 cm square transparent cellulose acetate film. The probe is then covered with another cellulose acetate film.
- ✚ Colour reaction takes place when milk is injected through a tiny hole in the cover and a smart phone can be used to get the results. It takes just about 15 minutes to detect raw milk from pasteurised one.
- ✚ The kit could come handy in milk bars, large kitchens and at milk collection centres where freshness of milk is a concern.

- It can find other applications too. Since ALP is also tested in various body fluids, the kit can also be utilised in clinics. Fabrication in the laboratory at present costs around Rs 80 to Rs 125 per kit and could come down when mass manufactured, say researchers.

ULTIMA THULE

- On January 1, NASA's New Horizons spacecraft became the first explorer to fly past the mysterious object- Ultima Thule, located some 4 billion miles from Earth. This is a historic flyby of the farthest, and quite possibly the oldest, cosmic body ever explored by humankind.



Key facts- Ultima Thule:

- Ultima Thule is located in the Kuiper belt in the outermost regions of the Solar System, beyond the orbit of Neptune.
- It measures approximately 30 km in diameter, and is irregularly shaped.
- Ultima Thule has a reddish colour, probably caused by exposure of hydrocarbons to sunlight over billions of years.
- Ultima Thule belongs to a class of Kuiper belt objects called the "cold classicals", which have nearly circular orbits with low inclinations to the solar plane.

About New Horizons:

- New Horizons is an interplanetary space probe that was launched as a part of NASA's New Frontiers program.
- The spacecraft was launched in 2006 with the
- Primary mission to perform a flyby study of the Pluto system in 2015,
- Secondary mission to fly by and study one or more other Kuiper belt objects (KBOs) in the decade to follow.
- It is the fifth artificial object to achieve the escape velocity needed to leave the Solar System. New Horizon's core science mission is to map the surfaces of Pluto and Charon, to study Pluto's atmosphere and to take temperature readings

EYEROV TUNA

- India's first underwater robotic drone EyeROV TUNA was recently handed over to Naval Physical and Oceanographic Laboratory (NPOL) of Defence Research and Development Organisation (DRDO).



About:

- It has been designed and developed indigenously by Kochi-based start-up IROV Technologies Pvt Ltd (EyeROV). It is smart micro-ROV (Remotely Operated Vehicle) or underwater drone. This underwater drone will be used. by NPOL for research and development activities which in turn would result in commercial product for defence purposes.
- It is designed to perform visual inspection and surveys of submerged structures up to depth of 100 metres.
- It is also equipped to perform variety of functions, including inspection of ship hulls, undersea cables or bridge moorings, fish farms, dams, port structure and bridge foundations and also in various underwater research operations.
- Its commercial use will eliminate need for costlier and riskier manual inspection by divers.

SCHEMES

'IMPRINT-2' SCHEME

- The Union Government has approved 122 new research project proposals worth Rs 112 crore for funding under its Impacting Research Innovation and Technology 'IMPRINT-2' scheme.

About:

- The proposals were approved on August 4, 2018 at the IMPRINT 2 Apex Committee meeting held in New Delhi. The initiative aims to advance research in energy, healthcare, security and defence domains in the high education institutions.

Key Highlights:

- Among 2145 proposals, 122 best proposals were selected for funding under IMPRINT-2. Of the selected 122 new projects, 81 are sponsored by the industry.
- The selected proposals include 35 (ICT), 18 (Advanced Materials), 17 (Healthcare Technology), 12 (Energy Security), 11 (Security & Defence), 9 (Sustainable Habitat), 7 Water Resource & River Systems, 5 (Environment & Climate), 4 (Manufacturing) and 4 (Nano Technology).
- The implementation of 142 projects under IMPRINT-1 has got underway. These projects have received support from several ministries, councils and departments in addition to the Ministry of Human Resource Development.
- The knowledge portal for monitoring the progress of these research projects and to disseminate findings will be launched in October 2018.

Imprint:

- IMPRINT is the first of its kind government-supported initiative to address the major science and engineering challenges that India must address and champion to enable, empower and embolden the nation for inclusive growth and self-reliance.

The initiative is aimed at:

- Developing new engineering education policy
- Creating a road map to pursue engineering challenges
- It also provides the overarching vision that guides research into areas that are predominantly socially relevant.

ACADEMIA ALLIANCE PROGRAM

- Recently, Start-up India launched Startup Academia Alliance Program.

About:

- It is a unique mentorship opportunity between academic scholars and start-ups to promote the spirit of entrepreneurship in the country.
- It aims to reduce the gap between scientific research and its industrial application in order to increase the efficacy of technology and widen its impact.
- It strives to implement the third pillar on which the Start-up India Action Plan is based - Industry Academia Partnerships and Incubation. The other two being Simplification and Handholding & Funding Support and Incentives
- It has been partnered by Regional Centre for Biotechnology, The Energy and Resources Institute (TERI), Council on Energy, Environment and Water, and TERI School of Advanced Studies to provide mentorship and guidance to relevant start-ups in the field of renewable energy, biotechnology, healthcare etc.

REPURPOSE COOKING OIL (RUCO)

- Dehradun-based Indian Institute of Petroleum has successfully finished a pilot test to convert used cooking oil into bio-aviation turbine fuel (Bio-ATF), which can be blended with conventional ATF and used as aircraft fuel.
- The test assumes importance as the Food Safety and Standards Authority of India (FSSAI) has launched the Repurpose Cooking Oil (RUCO) initiative to collect and convert used cooking oil into bio-fuel.

About:

- The Food Safety and Standards Authority of India (FSSAI) had launched RUCO (Repurpose Used Cooking Oil), an initiative that will enable collection and conversion of used cooking oil to bio-diesel.



- Under this initiative, 64 companies at 101 locations have been identified to enable collection of used cooking oil. For instance: McDonald's has already started converting used cooking oil to biodiesel from 100 outlets in Mumbai and Pune.
- FSSAI wants businesses using more than 100 litres of oil for frying, to maintain a stock register and ensure that UCO is handed over to only registered collecting agencies.

Significance:

- FSSAI believes India has the potential to recover 220 crore litres of used cooking oil for the production of biodiesel by 2022 through a co-ordinated action. While biodiesel produced from used cooking oil is currently very small, but a robust ecosystem for conversion and collection is rapidly growing in India and will soon reach a sizable scale.

Background:

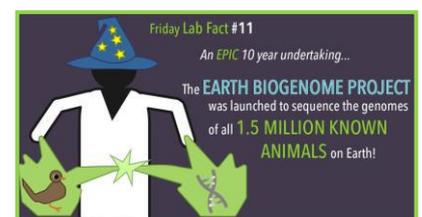
- The initiative has been launched nearly a month after the food safety regulator notified standards for used cooking oil. According to FSSAI regulations, the maximum permissible limits for Total Polar Compounds (TPC) have been set at 25%, beyond which the cooking oil is unsafe for consumption.

Total Polar Compounds (TPC):

- In many countries, TPC is used to measure the quality of oil. The level of TPC increases every time oil is re-heated. Some of the studies show that TPC accumulation in oil without food is slower than that in oil frying with food.
- Higher level of TPC in cooking oil leads to health issues like hypertension, atherosclerosis, Alzheimer's disease and liver disease. One of the studies also noticed high levels of glucose, creatinine and cholesterol with declined levels of protein and albumin in cooking oil.

EARTH BIO-GENOME PROJECT

- The Earth Bio-Genome Project (EBP) is an international consortium of scientists which would undertake the project that aims to sequence, catalog, and characterize the genomes of every eukaryotic biodiversity on Earth, over a period of 10 years.



About:

- It aims to sequence 1.5 million species in three phases. The EBP project will help to create a detailed genetic sequence and reveal evolutionary connections among genus, orders and families that will make up the Digital Library of life.
- Other Partners of EBP – Africa, Australia, Brazil, Canada, China, the European Union and United States, Global Genome Biodiversity Network, the Global Invertebrate Genomics Alliance, the i5K Initiative to sequence 5000 Arthropod Genome and Genome 10K Project.

Vision of the Project:

- ✚ The Earth Bio-Genome Project aims at creating a new foundation for biology, informing a broad range of major issues facing humanity, such as the impact of climate change on biodiversity, the conservation of endangered species and ecosystems, and the preservation and enhancement of ecosystem services. The project could also lead to discovery of more drugs and let researchers find more sources of food as well.

Challenges:

- ✚ Data sharing policies need to be placed to ensure permanent, freely available resources for future scientific discovery while respecting access and benefit sharing guidelines of the Nagoya Protocol.
- ✚ The organisational and scientific challenges are also being highlighted for the execution of the project and require a coordinated global effort just like the Large Hadron Collider at CERN.
- ✚ Collection of samples will be difficult due to remoteness of their natural habitat.
- ✚ The large database thus created would also require a space as large as 200 peta byte.
- ✚ Securing a funding of \$4.7 billion is also a challenge.

NATIONAL CHILDREN'S SCIENCE CONGRESS (NCSC)

- ✚ The 26th National Children's Science Congress (NCSC) was recently held in Odisha with over 700 children from India and 10 ASEAN and five Gulf countries participating in it.

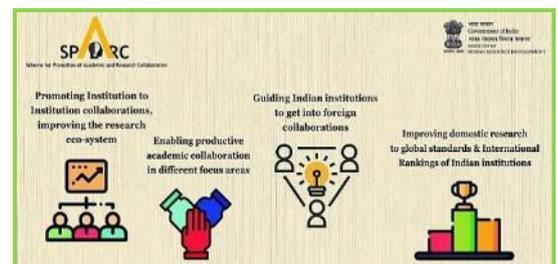
About:

- ✚ NCSC is a nationwide Science Communication programme started in the year 1993. It is a programme of National Council for Science and Technology Communication (NCSTC), Department of Science and Technology, New Delhi.
- ✚ It is a forum for children of the age-group of 10-17 years, both from formal school system as well as from out of school, to exhibit their creativity and innovativeness and more particularly their ability to solve a societal problem experienced locally using by method of science.
- ✚ Around 56% of the participants in the NCSC this year are girls while attempts are being made to bridge the rural-urban gap with 40% of the children hailing from rural areas.
- ✚ The theme for this year's NCSC was Science, Technology and Innovation for a Clean, Green and Healthy Nation, which has been aptly chosen as environment and health have emerged as two major concerns of our times.
- ✚ About National Council for Science and Technology Communication
- ✚ NCSTC is mandated to communicate Science and Technology to masses, stimulate scientific and technological temper and coordinate and orchestrate such efforts throughout the country.

- It is devoted towards societal upliftment through the dissemination of scientific knowledge in an informed manner and builds programmes with the help of different media which percolate down to every nook and corner of the society.
- It focuses on outreach activities, training in Science and Technology communication, development, production & dissemination of S & T software, incentive programmes, and field-based Sci-Com projects, research in S&T communication, international co-operation, motivating students and teachers, environment awareness and programmes with a special component exclusively for women

SPARC SCHEME

- The Government had sanctioned the SPARC scheme with IIT Kharagpur as the National Coordinating Institute to implement the SPARC programme.



About:

- Now the HRD Ministry has launched the web portal of the Scheme for Promotion of Academic and Research Collaboration (SPARC).
- The SPARC scheme aims at improving the research ecosystem of India's higher educational institutions by facilitating academic and research collaborations between Indian Institutions and the best institutions in the world.
- Under this Scheme, 600 joint research proposals will be awarded for 2 years to facilitate strong research collaboration between Indian research groups with the best in class faculty and renowned research groups in the leading universities of the world.
- The collaboration will conduct research in areas that are at the cutting edge of science or with direct social relevance to the mankind, specifically India.

Salient Features:

- This scheme will improve research ecosystem of India's higher educational institutions by facilitating academic and research collaborations/
- The Indian institutions will include those from top-100 or category-wise top-100 in NIRF (including such Private Institutions which are recognized under 12(B) of UGC Act)].
- The foreign institutions will be from top-500 overall and top-200 subject-wise institutions listed in QS World University Ranking) from 28 selected nations.
- As per the criteria mentioned above, 254 top Indian Institutes and 478 top ranked global Institutes have been already identified.

Areas of the Research:

- A set of 5 Thrust Areas has been identified for collaboration under SPARC.

- They are Fundamental Research, Emergent Areas of Impact, Convergence, Action-Oriented Research and Innovation-Driven.
- Each Thrust Area will have a Section Chair. The role of Section Chair of each Thrust Area is to review shortlist and recommend the potential joint-proposals submitted under SPARC scheme. The role of a Nodal Institutions will be to help, handhold and coordinate with willing Participating Indian (PI) Institutions to forge alliance with the Institutions of concerned participating foreign country.

Academic Activities under SPARC:

- SPARC proposes to enable productive academic cooperation by supporting the following critical components that can catalyze impact making research:
- Visits and long-term stay of top international faculty/researchers in Indian institutions to pursue teaching and research, Visits by Indian students for training and experimentation in premier laboratories worldwide, Joint development of niche courses, world-class books and monographs, translatable patents, demonstrable technologies or action-oriented research outcomes and products, Publication, Dissemination and Visibility through a high profile annual international conference in India.

UNNATI- PROGRAMME

- UNNATI- (Unispace Nanosatellite Assembly & Training) programme organized by ISRO was inaugurated recently in Bengaluru.



About:

- Advanced as a capacity building programme on Nanosatellite development, it is an initiative by ISRO to commemorate the 50th anniversary of the first United Nations conference on the exploration and peaceful uses of outer space (UNISPACE-50). The programme provides opportunities to the participating developing countries to strengthen in assembling, integrating and testing of Nanosatellite. The programme aims at capacity building in satellite technology for participants from countries interested in developing space programme by providing hands-on experience in building and testing of Nano satellites. UNNATI programme is planned to be conducted for 3 years by U.R. Rao Satellite Centre of ISRO in 3 batches and will target to benefit officials of 45 countries.

Objectives:

- To offer a simplified and increased exposure to satellite fabrication technologies, as part of the UNISPACE initiative.
- To provide theoretical course on satellite technology

- ✚ To provide intensive course on Nano satellite realisation, covering mission aspects, design, fabrication, assembly, integration & testing.
- ✚ To provide hands-on training to assemble, integrate and test a low cost, modular Nano satellite.

YOUNG SCIENTIST PROGRAMME

- ✚ ISRO has launched a special programme for school children called Yuva Vigyani Karyakram or Young Scientist Programme.

About:

- ✚ The programme aims at imparting basic knowledge on space technology, space science and space applications to the younger ones with the intent of arousing their interest in the emerging areas of space activities. Under the programme, three students each will be selected to participate in it every year from each state and union territory, covering CBSE, ICSE and state syllabus. The eligibility for being chosen for the programme includes those students who have finished 8th standard and are currently studying in the 9th standard. The selection will be based on the academic performance and extracurricular activities of the students, as per the selection criteria already circulated to the chief secretaries of the states and administrators of Union Territories.
- ✚ The students belonging to rural areas have been given special weightage under the selection criteria set by ISRO.

GOVERNANCE STEERING COMMITTEE ON 5G

- ✚ The Steering Committee constituted for identifying the 5G deployment roadmap for India recently submitted report titled 'Making India 5G Ready'.

Key Recommendations:

- ✚ The committee spells out three priority areas for India in 5G:
 - ✚ Deployment – rolling out early, efficient and pervasive 5G networks
 - ✚ Technology – building India's industrial and R&D capacity in 5G
 - ✚ Manufacturing - expanding the manufacturing base in 5G for both semiconductor fabrication as well as assembly & test plants
- ✚ **Spectrum Policy:** India's spectrum allocation for public wireless services should be enhanced significantly. Also, the cost of spectrum relative to per capita GDP is high and should come down.
- ✚ **Regulatory Policy:** Three expert committees on business, security and safety segments to be created to develop clear guidelines on regulatory policy.

- ✚ Education and Awareness Promotion Program: The Committee recommends three initiatives
- ✚ Attract global 5G conference events to India
- ✚ Set up national 5G events and
- ✚ Create a comprehensive skills development program.
- ✚ Setting up applications and Use Case Labs: It can provide multiple functions – interoperability, testing for new applications, fostering innovation, etc. within different economic sectors.
- ✚ Participation in International Standards:
- ✚ Short term initiatives like setting up ‘Standards Project Teams’ to participate in standards activities. Long term initiatives like expert committee should be constituted to recommend a ten-year strategy for Information Technology Standards in India.
- ✚ Technology Demonstration and Major Trials: 5G trials will be an important learning opportunity for our Telecom Service Providers (TSP), academia and industry.
- ✚ Create a 5G Program Office within Department of Telecommunications and an Oversight Committee. New civil infrastructure like highways, roads, canals and utilities (gas, electricity, water) lines should be mandated to provision Common Telecom Infrastructure resources such as ducting and power junction boxes to support 5G infrastructure. Security audits, a prerequisite for importing of equipment before deploying in Indian networks, needs to be simplified.

5G Technology:

- ✚ 5G is a wireless communication technology using radio waves or radio frequency (RF) energy to transmit and receive data. It is the next generation mobile networks technology after 4G LTE networks. 5G technologies will enter services gradually, beginning in 2019 and advance to a full range of services by 2024. The final standard for 5G will be set up by the International Telecommunications Union (ITU).

REGULATIONS FOR CIVIL USE OF REMOTELY PILOTED AIRCRAFT SYSTEM (RPAS)

- ✚ Ministry of Civil Aviation (DGCA) has for the first time released a set of rules regulating the civil use of drones in India which will be effective from 1st December, 2018.



Key features of the Regulations for Civil Use of Remotely Piloted Aircraft System (RPAS)

- ✚ The Digital Sky Platform is the first-of-its-kind national unmanned traffic management (UTM) platform that implements “no permission, no take off” (NPNT).
- ✚ The UTM operates as a traffic regulator in the drone airspace and coordinates closely with the defence and civilian air traffic controllers (ATCs) to ensure that drones remain on the approved flight paths.
- ✚ Before every single flight, drone pilots are required to request permission to fly via a mobile app, which will automatically process the request and grant or reject it.
- ✚ If a drone pilot tries to fly without receiving permission from the Digital Sky Platform, he or she will simply not be able to take-off.
- ✚ Users will be required to do a one-time registration of their drones, pilots and owners. All civil RPA, shall require to obtain Unique Identification Number (UIN) from DGCA.
- ✚ As per the regulation, there are 5 categories of Remotely Piloted Aircraft System (RPAS) categorized by weight, namely
 - ✚ Nano (Less than or equal to 250 grams)
 - ✚ Micro (250 grams to 2kg)
 - ✚ Small (2kg-25kg)
 - ✚ Medium (25kg-150kg) and
 - ✚ Large (Greater than 150kg).
- ✚ Operators of civil drones will need to get a Unmanned Aircraft Operator Permit (UAOP) from the DGCA with certain exceptions such as RPA owned and operated by NTRO, ARC and Central Intelligence Agencies.
- ✚ The DGCA has to issue the UAOP within seven working days and it shall be valid for five years and not Transferrable
- ✚ RPAS shall be flown only by someone over 18 years of age, having passed 10th exam in English, and undergone ground/ practical training as approved by DGCA.
- ✚ DGCA has also clarified that no remote pilot can operate more than one RPA at any time.
- ✚ The basic operating procedure will restrict drone flights to the daytime only and that too within “Visual Line of Sight (VLOS)”.
- ✚ Manned aircraft will be given priority. There can’t be any human or animal payloads, or anything hazardous. It cannot in any manner cause danger to people or property.
- ✚ An insurance will be mandatory to cover third-party damage.
- ✚ Minimum manufacturing standards have been prescribed for RPAS.

Restrictions placed:

- ✚ RPAS cannot be flown within 5km of the perimeters of the airports in Mumbai, Delhi, Chennai, Kolkata, Bengaluru and Hyderabad and within 3km from the perimeter of any other airport.

- ✚ It cannot fly within “permanent or temporary Prohibited, Restricted and Danger Areas” and within 25km from international border which includes the Line of Control (LoC), Line of Actual Control (LAC) and Actual Ground Position Line (AGPL).
- ✚ It cannot fly beyond 500 m into sea from the coast line and within 3 km from perimeter of military installations.

Drones:

- ✚ Drones or unmanned aerial vehicles (UAVs) have been defined as: “Powered, aerial vehicles that do not carry a human operator, use aerodynamic forces to provide vehicle lift, can fly autonomously or be piloted remotely, can be expendable or recoverable, and can carry a lethal or nonlethal payload.”

PM-STIAC

- ✚ Recently Union Government has constituted a new 21-member advisory panel on science, technology and innovation called Prime Minister’s Science, Technology and Innovation Advisory Council (PM-STIAC). It will replace earlier Scientific Advisory Committee to Prime Minister and to Cabinet.

Composition:

- ✚ It will be headed by Principal Scientific Advisor to the government of India. It has nine members, including Chairperson.
- ✚ Apart from nine members, it will also have twelve special invitees — eleven ex officio secretaries 10 central ministries, related to science, technology, energy and education, are special invitees to the panel.

Functions:

- ✚ Advise PM on science, technology, as well as innovation.
- ✚ Coordinate implementation of PMs scientific vision.
- ✚ Aid in formulation and timely implementation of major science and technology missions and evolve interdisciplinary technology development programmes.
- ✚ Advise government on developing ‘Clusters of Excellence’ in science including city-based R&D clusters. Bring together all science and technology partners from academia and institutes to industries near such centres or cities.

NGT ON INDIA-BASED NEUTRINO OBSERVATORY

- ✚ The National Green Tribunal (NGT) has upheld the environmental clearance granted in March 2018 to the India-based Neutrino Observatory (INO) a major scientific research facility that is proposed to be constructed in the Bodi West Hills (Theni district) of Tamil Nadu.

About:

- ✚ However, the project could not be implemented till the approval of the National Board of Wildlife is also received.
- ✚ According to Environmentalists such massive scale of construction underground, and controlled blasts, the vibrations from the explosions will badly affect the ecologically fragile Western Ghats.
- ✚ The site which is near the Kerala-Tamilnadu border is close to the Mathikettan Shola National Park, and a number of hydroelectric projects, which accounts for the majority of the electricity generation in Kerala.

Neutrino:

- ✚ Proton, neutron, and electron are tiny particles that make up atoms. The neutrino is also a tiny elementary particle, but it is not part of the atom. Such particles are also found to exist in nature.
- ✚ Neutrino has a very tiny mass and no charge. It interacts very weakly with other matter particles. So weakly that every second trillion of neutrinos fall on us and pass through our bodies unnoticed. Neutrinos come from the sun (solar neutrinos) and other stars, cosmic rays that come from beyond the solar system, and from the Big Bang from which our Universe originated. They can also be produced in the lab.
- ✚ The INO will study atmospheric neutrinos only. Solar neutrinos have much lower energy than the detector can detect.

India-based Neutrino Observatory (INO):

- ✚ INO Project is aimed at building a world-class underground laboratory with a rock cover to conduct basic research on neutrino. The Tata Institute of Fundamental Research is the nodal institution. The observatory is to be built jointly with the Department of Atomic Energy and the Department of Science and Technology.
- ✚ The observatory will be located underground so as to provide adequate shielding to the neutrino detector from cosmic background radiation.
- ✚ The operation of INO will have no release of radioactive or toxic substances. It is not a weapons laboratory and will have no strategic or defence applications.

Applications of Neutrino Science:

- ✚ Basic sciences research is needed to understand the properties of particles before they can be applied. 100 years ago, when the electron was discovered, it had no foreseeable uses. Today, a world without electronics cannot be imagined.

- ✚ **Properties of the sun:** The visible light is emitted from the surface of the sun and neutrinos, which travel close to the speed of light, are produced in the core of the sun. Studying these neutrinos can help us understand what goes on in the interior of the sun.
- ✚ **Constituents of the Universe:** Light coming from distant stars can be studied by astronomers, for example, to detect new planets. Likewise, if the properties of neutrinos are understood better, they can be used in astronomy to discover what the universe is made up of.
- ✚ **Probing early Universe:** Neutrinos interact very little with the matter around them, so they travel long distances uninterrupted. The extragalactic (originating outside the Milky Way galaxy) neutrinos we observe may be coming from the distant past. These undamaged messengers can give us a clue about the origin of the universe and the early stages of the infant universe, soon after the Big Bang.
- ✚ **Medical Imaging:** Apart from direct future uses of neutrinos, there are technological applications of the detectors that will be used to study them. For instance, X-ray machines, MRI scans, etc., all came out of research into particle detectors. Hence the INO detectors may have applications in medical imaging.

TWO TIME ZONES

- ✚ A proposal for two time zones has come from the Council of Scientific & Industrial Research National Physical Laboratory (CSIR-NPL).

About:

- ✚ If lines of longitude are drawn exactly a degree apart, they will divide the Earth into 360 zones.
- ✚ As the Earth spins 360° in 24 hours, a longitudinal distance of 15° represents 1 hour.
- ✚ In other words, 1° represents a time separation of 4 minutes.
- ✚ So theoretically, the time zone followed by any place should relate to its longitudinal distance from any other place.
- ✚ Political boundaries mean that time zones are often demarcated by bent lines rather than straight lines of longitude.
- ✚ This is the “legal time”, as defined by a country’s law.
- ✚ The geographic “zero line” runs through Greenwich, London.
- ✚ It identifies the GMT (Greenwich Mean Time), now known as Universal Coordinated Time (UTC).
- ✚ It is maintained by the Bureau of Weights and Measures (BIPM) in France.
- ✚ The United States follows several time zones across its breadth.

In India

- ✚ The Indian Standard Time (IST) is maintained by CSIR-NPL.

- ✚ The Indian Standard Time (IST) is based on a line of longitude that runs through Mirzapur in UP.
- ✚ At $82^{\circ}33'E$, the line is 82.5° east of Greenwich, or 5 hours 30 minutes ahead of UCT.
- ✚ But notably, India extends from $68^{\circ}7'E$ to $97^{\circ}25'E$ (spread of 29°), representing almost two hours from the geographic perspective.
- ✚ Evidently, there is huge difference in daylight times between the country's longitudinal extremes.
- ✚ So the early sunrise in the easternmost parts causes the loss of many daylight hours by the time offices or educational institutions open.
- ✚ Also, the early sunset in the region, leads to higher consumption of electricity and concerns over the costs associated it.
- ✚ Thus, over the years, there have been demands and debates over India having two separate time zones.

Concern:

- ✚ Those against the idea cite the impracticability of having different time zones.
- ✚ Particularly the risk of railway accidents is cited, given the need to reset times at every crossing from one time zone into another.
- ✚ The government has also, in the past, not favoured two time zones citing the complexities involved.

Reason:

- ✚ The “chicken neck”, connecting Northeast to the rest of India, is where the two time zones will be demarcated from each other.
- ✚ Railways - The railway signals have not yet been fully automated in the country.
- ✚ In this line, the border between the two time zones has a very narrow spatial-width with minimum number of train stations.
- ✚ So the train timings, while crossing the border, can be managed manually without any untoward incidents.
- ✚ Energy - The country could potentially save 20 million kWh energy a year if it follows two time zones. Besides, the importance of synchronising office hours as well as biological activities to sunrise and sunset timings was analysed.

INTERNATIONAL YEAR OF THE PERIODIC TABLE

- To celebrate the 150th anniversary of the organisation of the periodic table, UNESCO has launched the International Year of The Periodic Table.



About:

- Russian scientist Dmitry Mendeleev published the first periodic such table in 1869.
- The table organizes all chemical elements by the number of protons in a given atom and other properties.
- There are seven rows, called periods, and 18 columns, called groups, in the table.
- Elements in the same group share similar properties. Those in the same period have the same number of atomic orbitals.
- Most elements on the table are metals divided into six broad categories – alkali metals, alkaline earths, basic metals, transition metals, lanthanides and actinides. They are located on the left, separated from the non-metals on the right by a zig-zag line.
- Lanthanides and actinides, often called “inner transition metals”, are commonly hived off as a separate section under the main table as including all 30 – including Uranium – would make the table too wide.
- The table is a useful tool for people to derive relationships between the different properties of the elements. It can also help predict the properties of new elements that have yet to be discovered or created.

IUPAC:

- The International Union of Pure Applied Chemistry (IUPAC) is responsible for maintaining the periodic table. IUPAC is an international federation of National Adhering Organizations that represents chemists in individual countries. It is a member of the International Council for Science (ICSU). Headquarters of IUPAC is in Zürich, Switzerland.
- Established in 1919 as the successor of the International Congress of Applied Chemistry for the advancement of chemistry.
- Its members, the National Adhering Organizations, can be national chemistry societies, national academies of sciences, or other bodies representing chemists.
- The IUPAC’s Inter-divisional Committee on Nomenclature and Symbols (IUPAC nomenclature) is the recognized world authority in developing standards for the naming of the chemical elements and compounds.

1001 Inventions:

- UNESCO has also launched its educational initiative, 1001 Inventions: Journeys from Alchemy to Chemistry. Consisting of educational material and science experiments to help young people improve their understanding of chemistry and its numerous uses, the initiative will be brought to schools around the world during 2019.

About UNESCO:

- UNESCO is the United Nations Educational, Scientific and Cultural Organization.
- It is a specialized agency of UN.
- It seeks to build peace through international cooperation in Education, the Sciences and Culture.
- It is headquartered at Paris, France.

INDIAN SCIENCE CONGRESS

- World's largest science meet 'Indian Science Congress (ISC)-2019' was held in January 2019, in Jalandhar, Punjab. It was based on the theme 'Future India: Science and Technology'.

About:

- During the five-day long congress, around 100 plus conferences and events of scientific and technology origin were also held, where eminent personalities from DRDO, ISRO, DST, AIIMS, UGC, AICTE, and many elite universities of the USA, UK, India and other countries participated.
- Children's Science Congress was inaugurated with focus on 10-17 years of children for carrying forward innovation and research in science to a next level.
- Science Communicators' Meet- 2019 aimed to brainstorm ways of dissemination of scientific information and inculcation of scientific attitude among masses.
- 'Women's Science Congress' showcased the contribution of women in Science, Technology and the Society. Renowned women scientists and leaders from Government, academia and industry, who are decision-makers delivered lectures and participate in panel discussions for promoting talent among women.
- 'Pride of India' Expo to popularize science amongst the youth to further prepare brilliant scientists and innovators of tomorrow.
- 37 awardees in the categories of Young Scientists, Best Poster presentation and Pride of India- Science Exhibition were honoured.

Indian Science Congress Association:

- The Indian Science Congress Association (ISCA) owes its origin to the foresight and initiative of two British Chemists, namely, Professor J. L. Simonsen and Professor P.S. Mac Mahon.

- It occurred to them that scientific research in India might be stimulated if an annual meeting of research workers somewhat on the lines of the British Association for the Advancement of Science could be arranged.
- The first meeting of the Congress was held in January 1914 at the premises of the Asiatic Society, Calcutta.

Main objectives:

- To advance and promote the cause of science in India
- To hold an annual congress at a suitable place in India
- To publish such proceedings, journals, transactions and other publications as may be considered desirable. To secure and manage funds and endowments for the promotion of Science including the rights of disposing of or selling all or any portion of the properties of the Association.
- To do and perform any or all other acts, matters and things as are conducive to, or incidental to, or necessary for, the above objects.

DNA TECHNOLOGY (USE AND APPLICATION) REGULATION BILL, 2018

- The Lok Sabha has passed the DNA Technology (Use and Application) Regulation Bill, 2018 that allows regulated use of DNA technology to establish the identity of certain defined categories of persons, including offenders, suspects, and undertrials.

Need for the legislation and its significance:

- The utility of DNA based technologies for solving crimes, and to identify missing persons, is well recognized across the world. Therefore, the new bill aims to expand the application of DNA-based forensic technologies to support and strengthen the justice delivery system of the country.

Highlights of the Bill:

- As per the Bill, national and regional DNA data banks will be set up for maintaining a national database for identification of victims, suspects in cases, undertrials, missing persons and unidentified human remains.
- Punishment:** According to it, those leaking the DNA profile information to people or entities who are not entitled to have it, will be punished with a jail term of up to three years and a fine of up to Rs. 1 lakh. Similar, punishment has also been provided for those who seek the information on DNA profiles illegally.
- Usage:** As per the bill, all DNA data, including DNA profiles, DNA samples and records, will only be used for identification of the person and not for “any other purpose”.

- ✚ The bill's provisions will enable the cross-matching between persons who have been reported missing on the one hand and unidentified dead bodies found in various parts of the country on the other, and also for establishing the identity of victims in mass disasters.
- ✚ The Bill establishes a DNA Regulatory Board to accredit the DNA laboratories that analyse DNA samples to establish the identity of an individual.

Benefits of the Bill:

- ✚ By providing for the mandatory accreditation and regulation of DNA laboratories, the Bill seeks to ensure that with the proposed expanded use of this technology in the country.
- ✚ There is also the assurance that the DNA test results are reliable and the data remain protected from misuse or abuse in terms of the privacy rights of our citizens.

DNA technology- significance and concerns:

- ✚ DNA analysis is an extremely useful and accurate technology in ascertaining the identity of a person from his/her DNA sample, or establishing biological relationships between individuals.
- ✚ A hair sample, or even bloodstains from clothes, from a scene of crime, for example, can be matched with that of a suspect, and it can, in most cases, be conclusively established whether the DNA in the sample belongs to the suspected individual.
- ✚ As a result, DNA technology is being increasingly relied upon in investigations of crime, identification of unidentified bodies, or in determining parentage.
- ✚ But information from DNA samples can reveal not just how a person looks, or what their eye colour or skin colour is, but also more intrusive information like their allergies, or susceptibility to diseases.
- ✚ As a result, there is a greater risk of information from DNA analysis getting misused.
- ✚ It is expected that the expanded use of DNA technology would result not only in speedier justice delivery but also in increased conviction rates, which at present is only around 30% (NCRB Statistics for 2016).

COMPANY UNDER DEPARTMENT OF SPACE

- ✚ The Union Cabinet has given its approval to the setting up of a new company under Department of Space (DoS).

About:

- ✚ It will be set up to commercially exploit the research and development work carried out by
- ✚ Indian Space Research Organization (ISRO) Centers and constituent units of DOS.
- ✚ The areas which provide opportunities for commercial exploitation of ISRO programmes are Small satellite technology transfer to the private industry

- ✚ Manufacture of small satellite launch vehicle (SSLV) in collaboration with the private sector, Production of polar satellite launch vehicle (PSLV) through industry,
- ✚ Production and marketing of space-based products and services,
- ✚ Marketing of spin-off technologies and products, both in India and abroad and
- ✚ Transfer of technology developed by ISRO Centers and constituent units of DoS.
- ✚ The cabinet decision will encourage the private sector to indulge more in production of launchers and satellites. In recent years, ISRO has been engaging the private sector in the manufacturing of satellite launchers so that it can focus more on R&D work.
- ✚ Currently, 80-90% of work relating to launch vehicles is being done by the industry, including private and public sector companies. Only, critical components are manufactured by ISRO.

IPRISM

- ✚ The Cell for IPR Promotion and Management (CIPAM), Department for Promotion of Industry and Internal Trade, in collaboration with ASSOCHAM and ERICSSON India, has launched the second edition of 'IPrism', an Intellectual Property (IP) competition for students of schools, polytechnic institutes, colleges and universities.

AIM:

- ✚ Aiming to foster a culture of innovation and creativity in the younger generation, the competition will provide young creators an opportunity to see their creations recognized on a national platform.

About:

- ✚ Cell for IPR Promotion and Management (CIPAM) has been created as a professional body under the aegis of DIPP to take forward the implementation of the National IPR Policy that was approved by the Government in May 2016, with the slogan – “Creative India; Innovative India”.
- ✚ **Functions:** CIPAM is working towards creating public awareness about IPRs in the country, promoting the filing of IPRs through facilitation, providing inventors with a platform to commercialize their IP assets and coordinating the implementation of the National IPR Policy in collaboration with Government Ministries/Departments and other stakeholders.

NEED:

- ✚ Creating IP awareness has become significant in today's knowledge economy where innovations determine the development and success of a nation.
- ✚ Generating awareness will not only inspire students about innovation and its limitless possibilities, but will also aid in building respect for IP rights and deterring counterfeiting and piracy.

- ✚ The National IPR Policy was adopted in May 2016, to create a vibrant IP ecosystem in the country. Creating IPR Awareness through outreach and promotional activities is a key objective of the Policy.

CIPAM:

- ✚ A professional body under the aegis of Department for Promotion of Industry and Internal Trade (DPIIT) which ensures focused action on issues related to IPRs and addresses the 7 identified objectives of the policy.
- ✚ CIPAM assists in simplifying and streamlining of IP processes, apart from undertaking steps for furthering IPR awareness, commercialization and enforcement.
- ✚ CIPAM in partnership with industry associations has conducted IPR awareness programmes in various states.
- ✚ The awareness campaign is being conducted in schools, universities and industries across India.

GLOBAL TALENT COMPETITIVE INDEX

- ✚ INSEAD business school in partnership with Tata Communications and Adecco Group has released Global Talent Competitive Index, 2019.

About:

- ✚ It is a comprehensive annual benchmark measuring how countries and cities grow, attract and retain talent, providing a unique resource for decision makers to understand the global talent competitiveness picture and develop strategies for boosting their competitiveness.
- ✚ The report measures levels of Global Talent Competitiveness by looking at 68 variables.
- ✚ The 2019 index covers 125 national economies and 114 cities (respectively 119 and 90 in 2018) across all groups of income and levels of development.

Highlights of the Report:

- ✚ Switzerland continues to lead the index, while Singapore and the United States come in second and third respectively.
- ✚ The top three is followed by Scandinavian countries, Norway (4th), Denmark (5th), Finland (6th), and Sweden (7th).
- ✚ Yemen has finished at the bottom of this year's index at 125th, just below Congo (124th) and Burundi (123rd).
- ✚ Washington is the top-ranked city followed by Copenhagen, Oslo, Vienna and Zurich. Washington's position can be attributed to its strong performance across four of the five pillars measured in the research, specifically in the "Be Global", "Attract", "Grow" and "Enable" pillars.

◆ The steady economy, dynamic population, outstanding infrastructure and connectivity, highly skilled workforce and world class education are all characteristics which contribute to making the city a talent hub.

- ◆ The report also reveals that cities rather than countries are developing stronger roles as talent hubs and will be crucial to reshaping the global talent scene.
- ◆ This growing importance of cities is due to their greater flexibility and ability to adapt to new trends and patterns – as nimble economic units where policy can be changed more swiftly, cities are thus more attractive for talent, especially entrepreneurial talent.

Main focus

- ◆ This year's report has a special focus on entrepreneurial talent-how it is being encouraged, nurtured and developed throughout the world and how this affects the relative competitiveness of different economies.

The results show that:

- ◆ New approaches are emerging to stimulate entrepreneurial talent and future proof employees – for example, the efforts to develop bottom up innovation and empower employees. The highest-ranking countries and cities tend to be the most open to entrepreneurial talent. Digitalisation and globalisation are increasing the role of entrepreneurial talent.

Overall View:

- ◆ For the first time, the 2019 GTCI provides a longitudinal analysis of talent competitiveness based on the results of all GTCI editions since 2013.
- ◆ The main finding is that the gap separating the talent champions from the rest of the global community has been growing.
- ◆ Talent competitiveness is strengthening in groups of countries where it is already comparatively high and weakening in those where it is relatively low.

India's Rank:

- ◆ At 80th rank, India has moved up one position on index.
- ◆ India's biggest challenge is to improve its ability to attract and retain talent.
- ◆ It further added, there is a need to address its poor level of Internal Openness in particular with respect to weak gender equality and low tolerances towards minorities and immigrants—and it's disappointing showing in lifestyle indicators.

INTERNATIONAL INTELLECTUAL PROPERTY (IP) INDEX

- ◆ India climbed eight places in the 2019 International Intellectual Property (IP) Index, ranking at 36th position among 50 countries. India's overall score has increased from 30.07 percent in 2018 to 36.04 percent in 2019.

About:

- ✚ In 2018 International Intellectual Property Index, India was ranked 44th out of 50 countries.
- ✚ The seventh edition of the International Intellectual Property Index, “Inspiring Tomorrow” was released by the Global Innovation Policy Center (GIPC) of U.S. Chamber of Commerce on February 7, 2019.
- ✚ The Index was topped by the United States with 42.66 points out of 45, followed by the United Kingdom (42.22) at 2nd, Sweden (41.03) at 3rd and Germany (41.00) at 4th.

Background:

- ✚ The International Intellectual Property Index ranks 50 economies based on 45 unique indicators across eight separate categories that are critical to an innovation-led economy supported by robust patent, trademark, copyright, and trade secrets protection.
- ✚ The Global Intellectual Property Centre of the USCC works around the world to examine the Intellectual Property (IP) rights and their role in creating jobs, saving lives, advancing global economic growth, etc.
- ✚ It provides both an IP report card for the world and a blueprint for policymakers in various countries.
- ✚ The Index covers 50 economies, representing 90 percent of global GDP.

