Technology

Drone Olympics

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

In News

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

District Cooling System

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

In News

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

Company Under Department of Space

Syllabus: Awareness in the fields of Space

In News

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

LOFAR Telescope

Syllabus: Awareness in the fields of Space

In News

- A new map of the night sky has been published and hundreds of thousands of previously undiscovered galaxies are on it.
- The **300,000 new galaxies** were discovered as part of a study involving 200 scientists from 18 countries, using a **Low-Frequency Array (LOFAR) telescope** in the Netherlands.
- The discovery is shedding new light on some of the Universe's deepest secrets, including the physics of black holes and how clusters of galaxies evolve.

How It works

- The study **used radio astronomy** to look at a segment of sky over the northern hemisphere.
- Radio astronomy allows scientists to **detect radiation produced when massive celestial objects interact**. It helps to detect radiation from the tenuous medium that exists between galaxies.

Importance Of The Study

- The discovery of the new light sources may also help scientists to better understand the behaviour of one of space's most enigmatic phenomena.
- Black holes — which have a gravitational pull so strong that no matter can escape them — emit radiation when they engulf other high-mass objects such as stars and gas clouds.
- It would allow astronomers to compare black holes over time to see how they form and develop.
- If one observes an active black hole, the jets (of radiation) disappear after millions of years, and one won't be able to see them at a higher frequency (of light).
- But at a lower frequency they continue to emit these jets for hundreds of millions of years, which leads to visibility of far older electrons.

LOFAR

- The LOFAR telescope is made up of a **network of radio antenna across seven countries**, forming the equivalent of a 1,300-km diameter satellite dish.
- The telescope works by pick up traces, or "jets," of ancient radiation produced when galaxies merge. These jets can extend over millions of light years.
- LOFAR has a remarkable sensitivity and that allows to see that these jets are present in all of the most massive galaxies, which means that their black holes never stop eating.
- It has helped scientists to chart just 2 percent of the sky so far. The team plans to create high-resolution images of the entire northern sky, which according to them will reveal up to 15 million previously undetected radio sources.

GSAT-31 Launched

Syllabus: Awareness in the fields of Space

In News

- India's latest communication satellite, GSAT-31 has been launched successfully by European launch services provider- Arianespace's rocket from French Guiana.
- The satellite derives its heritage from ISRO's earlier INSAT/GSAT satellite series.
- GSAT-31 is a high power satellite, which 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.
- It has a unique configuration of providing flexible frequency segments and flexible coverage and will provide communication services to Indian mainland and islands.
- With a mission life of around 15 years, it will provide DTH Television Services, connectivity to VSATs for ATM, stock-exchange, Digital Satellite News Gathering (DSNG), television uplinks, cellular backhaul connectivity and e-governance applications.
- It will be used for bulk data transfer for a host of emerging telecommunication applications.
- It will also provide wide beam coverage to facilitate communication over large oceanic region, comprising large parts of Arabian Sea, Bay of Bengal and Indian Ocean using a wide band transponder.

Induced Pluripotent Stem Cells

Syllabus: Awareness in the fields of Biotechnology

In News

- The Japanese government's health ministry has given the go-ahead for a trial of **human induced pluripotent stem cells** to treat **spinal cord injury.**
- An upcoming trial will mark **the first time** that induced pluripotent stem (iPS) cells have been used to **treat spinal-cord injuries.**

Approach

- The team's intervention involves removing differentiated cells from patients and reprogramming them via human induced pluripotent stem cells (iPSCs) into neural cells.
- Clinicians will then inject about 2 million of these cells into the patient's site of injury.
- The approach has been successfully tested in a monkey, which recovered the ability to walk after paralysis.

Not The First Time

- It is **not the first time** Japan has approved the use of iPSCs in clinical trials.
- Last year, researchers at Kyoto University launched a trial using the **cells to treat Parkinson's disease**.
- And in 2014, a team at the RIKEN Center for Developmental Biology led the **first transplant of retina cells** grown from iPSCs to treat a patient's eye disease.

Stem Cells

- The body is made up of many different types of cells. Most cells are specialised to perform particular functions, such as red blood cells that carry oxygen around our bodies in the blood, but they are unable to divide.

- Stem cells provide new cells for the body as it grows, and replace specialised cells that are damaged or lost.
- The **unique property that enables them to do this is the ability to divide over and over again to produce new cells**.
- As they divide, **they can change into the other types of cell that make up the body**.
- Three main types of stem cells are **embryonic stem cells**, **adult stem cells** and **induced pluripotent stem cells.**
- **Embryonic stem cells** supply new cells for an embryo as it grows and develops into a baby. These stem cells are said to be pluripotent, which means they can change into any cell in the body.
- **Adult stem cells** supply new cells as an organism grows and to **replace cells that get damaged**.
- They are **said to be multipotent, which means they can only change into some cells in the body, not any cell**.
- For example, blood (or 'haematopoietic') stem cells can only replace the various types of cells in the blood.
- **Induced pluripotent stem cells**, or 'iPS cells', are stem cells that scientists make in the laboratory.
- 'Induced' means **that they are made in the lab by taking normal adult cells**, like skin or blood cells, and reprogramming them to become stem cells.
- Just **like embryonic stem cells**, they are **pluripotent** so they can develop into any cell type.
- Further, because embryonic stem cells can only be derived from embryos, it has so far not been feasible to create patient-matched embryonic stem cell lines.
- Currently, damaged organs can be replaced by obtaining healthy organs from a donor, however donated organs may be 'rejected' by the body as the immune system sees it as something that is foreign.
- Since iPSCs can be derived directly from adult tissues, they not only bypass the need for embryos, but can be made in a patient-matched manner, which means that each individual **could have their own pluripotent stem** cell line.
- These unlimited supplies of autologous cells could be used to generate transplants without the risk of immune rejection.

IPrism

Syllabus: Issues relating to IPR.

In News

- 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'.
- It is an Intellectual Property (IP) competition for students of schools, polytechnic institutes, colleges and universities.

- 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.
- This year, entries are invited on **IP in Daily Life** in two categories – film making and comic book making.

Need For Such Event

- 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.

International IP Index 2019

Syllabus: Issues relating to IPR.

In News

- The U.S. Chamber of Commerce's Global Innovation Policy Center (GIPC) has released its International IP Index, "**Inspiring Tomorrow**".
- This index assesses the intellectual property (IP) environments of 50 world economies.

About The Index

- The index covers over 90 per cent of global gross domestic product.
- It provides both an IP report card for the world and a blueprint for policymakers in countries like India, that wish to bolster economic growth and jobs, innovation and creativity.
- It is based on **45 indicators** that are critical to an **innovation-led economy** supported by robust patent, trademark, copyright, and trade secrets protection.

Key Highlights

- This year, the index included **four new indicators** on commercialisation of IP assets and market access that shed light on factors that either disrupt or facilitate technology transfer in global markets.
- These are - *barriers to technology transfer*, *registration and disclosure requirements of licensing deals*, *direct government intervention in setting licensing terms* and *tax incentives for the creation of IP assets*.
- US, UK, Sweden, France and Germany remained the **top five economies** on the intellectual property index in 2019 retaining their spots from the last year.

India Specific Observations

- **India has jumped eight places to 36th (from previous 44) position on the index**.
- The eight-point jump is the highest increase among 50 nations mapped by the index. For the second year in a row, India's score represents the **largest gain of any country** measured on the Index.
- India's overall score has also increased substantially from **30.07 per cent** (12.03 out of 40) in the previous edition to **36.04 per cent** (16.22 out of 45) in the present edition.
- The improvement reflects important reforms implemented by Indian policy-makers towards building and sustaining an innovation ecosystem for domestic entrepreneurs and foreign investors alike and the country's efforts to align and incorporate the IP environment with the international IP environment.
- The increase is a result of specific reforms, including its **accession to the WIPO Internet Treaties, the agreement to initiate a Patent Prosecution Highway (PPH) with international offices, a dedicated set of IP incentives for small business and administrative reforms to address the patent backlog**.
- **Among the weaknesses**, the index has cited barriers to licensing and technology transfer, including strict registration norms, limited framework for the protection **of** biopharmaceutical IP rights, patentability rules outside international standards, lengthy pre-grant opposition proceedings and previously used compulsory licensing for commercial and non-emergency situations as key hurdles.

Intellectual Property

- Intellectual property (IP) refers to creations of the mind, such as inventions; literary and artistic works; designs; and symbols, names and images used in commerce.
- IP is protected in law by, for example, patents, copyright and trademarks, which enable people to earn recognition or financial benefit from what they invent or create.

National IPR policy 2016:

- The Union Cabinet has approved the National Intellectual Property Rights (IPR) Policy in May 2016 that shall lay the future roadmap for IPRs in India.
- The policy recognises the abundance of creative and innovative energies that flow in India and the need to tap into and channelize these energies towards a better and brighter future for all.
- The policy lays down the following seven objectives:
    1. **IPR Awareness**: Outreach and Promotion- Generation of IPRs: To create public awareness about the economic, social and cultural benefits of IPRs among all

sections of society;

2. **Generation of IPRs**- To stimulate the generation of IPRs;
3. **Legal and Legislative Framework**: To have strong and effective IPR laws, which balance the interests of rights owners with larger public interest;
4. **Administration and Management**: To modernize and strengthen service-oriented IPR administration;
5. **Commercialization of IPR**: Get value for IPRs through commercialization;
6. **Enforcement and Adjudication**: To strengthen the enforcement and adjudicatory mechanisms for combating IPR infringements;
7. **Human Capital Development**: To strengthen and expand human resources, institutions and capacities for teaching, training, research and skill building in IPRs;

- The department of industrial policy and promotion (DIPP) will be the nodal agency for all IPR issues. Copyrights related issues will also come under DIPP's ambit from that of the Human Resource Development (HRD) Ministry.

Significance

- Increased awareness
- Perception management through legal, administrative and institutional management.
- It will help in reducing the time taken on clearing the backlog of IPR applications from current 5 to 7 years to 18 months by March 2018 as stated by the goals of the policy.
- Reviewing of provisions in every five year will help the Indian IPR-ecosystem to update and improve them or to remove anomalies and inconsistencies.
- It will promote incorporation of globally best practices and will be helpful in promotion of R&D through tax benefits.

Criticism

- It is driven by the agenda of IP maximalism where owner's rights will be maximized at the cost of public interest.
- Intellectual Property rights accelerate innovation in certain sectors/technology but impedes innovation in other sectors. This policy fails to take notice of this and hence lacks integrated approach.
- Criminalising what is essentially a civil wrong is too much, not to mention the potential for abuse at the hands of our police.
- Although the policy seeks to promote & develop the IP field to ensure commercialization and expansion but it does not address the specifics.
- It does not address the present condition of patent filing in the country and how do we improve that, while it does mention that most of the patents in the country are filed by foreign companies/investors.

Conclusion

The policy seems to be a welcoming change but all depends on the way it is enforced. If the all the aspects mentioned in the policy are dealt with in a strict sense, keeping in mind the rights and interests of the indigenous innovators, the policy can change India's stand in the world and foster innovation to a great extent.

National Science Day

Syllabus: Achievements of Indians in science & technology;

In News

- National Science Day is **celebrated on February 28 every year to remember Nobel laureate Sir Chandrasekhara Venkata Raman's contribution to the field of science**.
- For his discovery, Sir CV Raman was **awarded the Nobel Prize in Physics in 1930**.
- In honour of this discovery and as a mark of tribute to the scientist, National Science Day was marked **for the first time on February 28, 1987**.
- He was **also awarded Bharat Ratna in 1954** for his contribution in science especially Physics.
- Science Day is celebrated to spread awareness about the importance of science and its application in the daily life of the people.
- This year the theme for the National Science Day is **Science for people and people for science**.

Raman Effect

- Raman effect is the **inelastic scattering** of a photon by molecules which are excited to **higher vibrational or rotational energy levels**. It is also called **Raman scattering**.
- The Raman effect forms the basis for **Raman spectroscopy** - an instrument developed by him for observing the vibrational, rotational and other low frequency modes - which is used by chemists and physicists to gain information about materials.

QRSAM

Syllabus: Indigenization of technology and developing new technology.

In News

- India has test-fired two **Quick Reaction Surface-to-Air short-range Missiles (QR-SAM)** from the integrated test range (ITR) at Chandipur in Balasore district, off the Odisha coast.
- It has been **jointly developed by Defence Research and Development Organisation (DRDO) and Bharat Electronics (BEL)**.
- The test successfully demonstrated the robust control, aerodynamics, propulsion, structural performance and high manoeuvring capabilities thus proving the design configuration.
- The missile is **an all-weather, all-terrain missile with electronic counter measures against jamming by aircraft radars**. It is also capable of tracking.
- The network-centric missile system can engage multiple threats such as aerial targets, tanks and bunkers within a strike range of 20km to 30km.
- It is equipped with an electronic-mechanically operated, turret-based launch unit and uses a solid fuel propellant.
- It has been **developed to replace the Akash missile defence system**, and has a **360-degree coverage**, lightweight, high mobility and shorter second reaction time as compared to Akash.

Atmospheric Water Generator (AWG)

Syllabus: Indigenization of technology and developing new technology.

In News

- Navratna Defence PSU Bharat Electronics Ltd (BEL) has unveiled a new product, the **Atmospheric Water Generator (AWG)** at Aero India 2019.
- It is **an innovative solution to meet the ever-increasing need for drinking water worldwide.**
- It has been **manufactured by BEL in collaboration with CSIR-IICT and MAITHRI**, a start-up company based in Hyderabad.
- The water generator **employs a novel technology to extract water from the humidity present in the atmosphere and purify it**.
- It **uses heat exchange for condensing the atmospheric moisture** to produce pure, safe and clean potable water.
- It **comes with a Mineralisation Unit, which is used to add minerals** which are required to make the water potable.
- It is configurable in static and mobile (vehicular) versions and is available in 30 litres/day, 100 litres/day, 500 litres/day and 1,000 litres/day capacities. It can provide one litre of drinking water at a cost of less than Rs 1.75 per litre.
- It can be used to provide drinking water in community centres and public places like health care centres, schools, colleges etc.

India To Launch Public DNS Server

Syllabus: Indigenization of technology and developing new technology.

In News

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