Technology

Indian Science Congress

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

In News

- **106th edition of Indian Science Congress (ISC)-2019** was held from 3rd to 7th January in **Jalandhar, Punjab**.
- ISC with its **theme of FUTURE INDIA – Science and Technology** helped showcase what is being done, what can be done and what would define the future of Science and Technology in India.
- A **Children's Science Congress** targeting 10-17 years of children for carrying forward innovation and research in science to the next level was held.
- A two-day **Science Communicators' Meet** was also held where the main aim was to brainstorm ways of dissemination of scientific information and inculcation of scientific attitude among masses.
- A **Women's Science Congress to showcase the contribution of women in science, technology and society** was also held.
- A time capsule with items representing today's technology and India's scientific prowess was buried to be opened after 100 years.

- The first meeting of the Congress was held from January 15-17, 1914 at the premises of the Asiatic Society, Calcutta, with the Honourable Justice Sir Asutosh Mukherjee, the then Vice-Chancellor of the Calcutta University, as President.
- The science congress owes its origin to the foresight and initiative of two **British Chemists, namely, Professor J. L. Simonsen and Professor P.S. MacMahon**.

Samwad with Students

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

In News

- As part of the enhanced outreach programme of Indian Space Research Organisation (ISRO), a new platform named **Samwad with Students (SwS)** has been launched recently in Bengaluru.
- Through this initiative, ISRO **aims to constantly engage youngsters across India to capture their scientific temperament and draw inspiration and motivation from young India**.
- The new conversation mission will inspire students cutting across schools and colleges.
- The agency will organise guided tours of students thrice in a year, especially during summer and Christmas holidays.
- The students will be taken to ISRO facilities in Thiruvananthapuram and Bengaluru and the launch centre at Sriharikota.

- They will also be taken to space laboratories and will be allowed to make small satellites.
- The programme will be implemented in two months' time, from coming summer holiday.
- It will be open for Class IX to Class XII students from across the country.

Three Mission Centres Inaugurated At IIT Madras

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

In News

- The Department of Science and Technology (DST) has established three mission centres at the Indian Institute of Technology Madras (IIT-M).
- The centres were aimed at research and development in the field of solar and water treatment.
- The three centres are:

1. DST -IITM Solar Energy Harnessing Centre aims to promote **R&D related to silicon solar cells**.
2. 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.
3. 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.

DNA Technology Regulation Bill

Syllabus: Awareness in the fields of bio-tech.

In News

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

About DNA

- Deoxyribonucleic Acid (DNA) is a set of instructions found in a cell. These instructions are used for the growth and development of an organism.
- The DNA of a person is unique, and variation in the sequence of DNA can be used to **match individuals and identify them**. DNA technology, therefore allows for accurate establishment of an individual's identity.
- In addition, DNA-based technology helps in **identification of victims** in the event of terrorist attacks or natural disasters such as earthquakes.
- For example, DNA technology has been used to identify victims of terrorist attacks on the World Trade Centre in 2001, and disasters such as the Asian tsunami in 2004.
- Further, DNA profiling can be used in civil matters, such as **parentage related disputes**.

Highlights Of The Bill

- The Bill regulates DNA testing for identification of persons, in respect of matters listed in the Schedule.
- This **includes offences** under the Indian Penal Code, 1860, as well as offences under other laws such as the Immoral Traffic (Prevention) Act, 1956, the Medical Termination of Pregnancy Act, 1971, the Protection of Civil Rights Act, 1955, and the Motor Vehicles Act, 1988.
- The Schedule also allows for **DNA testing in certain civil matters**. This includes matters such as *parentage disputes, issues related to pedigree, immigration or emigration, assisted reproductive technologies, transplantation of human organs, and for the establishment of individual identity.*
- The central government will **establish a National DNA Data Bank and Regional DNA Data Banks for each state, or two or more states**, as it may deem necessary.
- Every DNA Data Bank is required to maintain the following indices based on DNA testing conducted by a DNA laboratory: (i) crime scene index, (ii) suspects' or undertrials' index, (iii) offenders' index, (iv) missing persons' index, and (v) unknown deceased persons' index.
- All DNA laboratories will share DNA data prepared by them with the National and Regional DNA Data Banks.
- The Bill provides for a D**NA Regulatory Board, which will supervise DNA Data Banks and DNA laboratories**. The **Secretary in the Department of Biotechnology**, will be the **ex-officio Chairperson** of the Board.
- The Board will **make recommendations** to the central government **on privacy protection** in relation to the use and analysis of DNA samples.
- The Board is required to ensure that all information relating to DNA profiles with Data Banks, DNA laboratories, and other persons are kept confidential.
- In case of a person arrested for an offence which carries punishment upto seven years, the authorities are required to obtain his written consent.
- If consent is not given, the authorities may approach a Magistrate who may order the taking of bodily substances from the individual.
- If the offence carries a punishment of more than seven years of imprisonment or death, consent is not required.
- The **penalty for various offences** is imprisonment up to three years and fine of up to one lakh rupees.
- Further, the penalty for intentional tampering or destruction of biological evidence is imprisonment up to five years as well as fine of up to two lakh rupees.

Grey Areas/Concerns

- DNA testing carried out in medical or research laboratories can be used to identify an individual. **It is unclear if the Bill intends to regulate such laboratories**.
- The Bill requires consent of the individual when DNA profiling is used in criminal investigations and identifying missing persons. However, **consent requirements have not been specified in case of DNA profiling for civil matters**.

- It is unclear whether DNA profiles for civil matters will also be stored in the Data Banks. **Storage of these profiles in the Data Banks may violate the right to privacy**.
- The Bill specifies the process by which DNA profiles may be removed from the Data Banks. However, **the Bill does not require DNA laboratories to remove DNA profiles**.
- The Bill **does not provide any mechanism for redressal of grievances in cases where the DNA profile is not removed from the data banks by the Director of the National DNA Data Bank.**
- The Law Commission in its report on the draft Bill of 2017 stated that **only the portion of the DNA which provides information on identity** will be used for profiling. However, this is not specified in the Bill.

Microsat-R

Syllabus: Awareness in the fields of Space

In News

- ISRO's Polar Satellite Launch Vehicle (PSLV-C44) successfully injected **Microsat-R,** and Kalamsat-V2 satellites into their designated orbits.
- Microsat-R is a **military imaging satellite** which was successfully injected into the intended orbit that is much lower than any of its civil Earth observation spacecraft.
- Weighing only 1.26kg, Kalamsat-V2 is the **lightest satellite** to be ever built and launched into orbit.
- It is also the first to be built by a **private Indian firm** and **launched by Isro**.
- PSLV-C44 mission is unique as **it is for the first time ISRO has used the last stage of the rocket (i.e 4th stage) as a platform to perform experiments in space**.
- Kalamsat-V2, a **student payload**, is the first to use PS4 (the fourth stage) as an orbital platform.
- This new low cost technology **will help students to conduct several inspiring experiments in space by attaching their instruments to the last stage of the rocket**.
- The other experiment with the launcher PSLV-C44 vehicle was a new third variant having two strap-on boosters.
- Called the PSLV-DL, D standing for demonstration, it ranges between the older two variants.

UNNATI Programme

Syllabus: Awareness in the fields of Space

In News

- ISRO has come up with a **capacity building programme UNNATI** (UNispace Nanosatellite Assembly & Training by ISRO)**, on nanosatellite development**.
- It is an initiative to commemorate the **50th anniversary of the first United Nations conference on the exploration and peaceful uses of outer space** (UNISPACE-50).
- **U R Rao Satellite Centre (URSC)** being the lead centre of ISRO for satellite building has designed the basic structure of this programme with equal emphasis on theoretical and practical exposure.

- It is planned to be conducted for 3 years by URSC in 3 batches.
- The primary objectives of the programme are:
  - To offer a simplified and increased exposure to satellite fabrication technologies, as part of the UNISPACE initiative.
  - To provide a theoretical course on satellite technology.
  - To provide an intensive course on nanosatellite realisation, covering mission aspects, design, fabrication, assemby, integration & testing.
  - To provide hands-on training to assemble, integrate and test a low cost, modular nanosatellite.

Young Scientist Programme

Syllabus: Awareness in the fields of Space

In News

- **ISRO** has announced the Young Scientist Programme. It has been designed for the young minds to *encourage scientific talent and increase the scientific pool in the country*.
- The initiative is conceptualised on the lines of a similar programme run by NASA.
- ISRO will select over 100 students from across India and give them practical experience of how satellites are built under the programme.
- Mostly class 8 students - three each from 29 states and seven Union territories will be selected for the one month programme.
- Six incubation centres will be established in various parts of the country - North, South, East, West, Centre and North-East, and the **first such centre** has been established in **Agartala in Tripura**.
- The students will be able to use these centres for R&D purposes and will be encouraged to develop scientific payloads that can be launched by ISRO.

Paper Sensor To Detect Freshness Of Milk

Syllabus: Indigenization of technology and developing new technology.

In News

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

Why We Need Such Sensors

- Milk being a widely consumed food, its safety is of prime concern to consumers. More so because it is **highly perishable and prone to action of enzymes and micro organisms inherently present in it**.
- Although pasteurization, 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 pasteurization.

- Tests used in dairies and dairy industries are time consuming and need sophisticated equipment like spectrophotometers. The new detection kit can make testing easy and fast.

How This Sensor Works

- **A milk enzyme, Alkaline Phosphatase or ALP, is considered an indicator of milk quality** because its presence even after pasteurization indicates presence of microbes that may not have been rendered inactive with pasteurization.
- Paper discs were soaked 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 smart phone 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 due only 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 like just like pregnancy test strips.
- Fabrication in the laboratory at present costs around Rs. 80 to Rs 125 per kit and could come down when mass manufactured.
- 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 utilized in clinics.