

**GS Paper 3  
Technology – Oct'18**

**Oneer**

*Science and Technology- developments and their applications and effects in everyday life*

**In News**

- **Council of Scientific and Industrial Research, Indian Institute of Toxicology Research (CSIR-IITR)**, Lucknow has developed an innovative technology for Drinking Water Disinfection System with trade name **Oneer**.
- It is useful for continuous treatment of water and eliminates all disease causing pathogens such as virus, bacteria, fungi, protozoa and cyst to provide safe drinking water to domestic and communities with settings as per National and International standards prescribed for potable water.
- According to the World Health Organization, access to safe drinking-water is essential to health, a basic human right and a component of effective policy for health protection.
- Currently, a large proportion of India's rural community is consuming water that does not meet the WHO drinking water quality standards.
- Infection through drinking water results in an increase in morbidity and mortality particularly amongst children and Oneer will provide access to safe and clean drinking water at a cost of just 2 paise / Ltr.
- The smaller unit of Oneer is particularly suitable for homes, street food vendors, and small establishments. And the Community level model is of 450 LPH capacity which can be scaled up to 5000 to 1 lakh L/day and is also maintenance and membrane free.
- The technology will be helpful especially for rural people since it can be solar powered and also this development is in line with the Make in India Mission.

**India's First Engine-less train**

*Syllabus: Indigenization of technology and developing new technology.*

**In News**

- A 16-coach prototype known as **Train 18 or T18, Indian Railways' first engine-less train**, made its inaugural trial run recently.
- Capable of running at a speed of up to 160 kmph, it is being referred to as a successor to the 30-year-old Shatabdi Express.
- The fully air-conditioned semi-high speed train, which will cut travel time by 15 per cent as compared to the Shatabdi, has been **manufactured by the Integral Coach Factory (ICF) in Chennai** and completed in a record 18 months.
- Train 18, a **100 per cent Make in India project**, will cost nearly Rs 100 crore to build the prototype and subsequent production will bring down the cost.
- Driven by a self-propulsion module sans a separate locomotive, the train comes with technical features for enhanced quick acceleration.

**AskDisha Chatbot**

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

### **In News**

- The Indian Railway Catering and Tourism Corporation Limited (IRCTC) has recently launched a chatbot, **Ask Disha**. This Artificial Intelligence (AI) powered chatbot is aimed at **improving the accessibility and customer services** of the passengers.
- IRCTC becomes the **first and only government corporation in India to launch a chat-enabled helpdesk service program**.
- It has been **jointly developed by IRCTC and CoRover Private Limited**, which is a Bengaluru-based startup that develops AI and machine learning based chatbots pertaining to travel and tourism.
- It will support several regional languages, will be voice-enabled and will soon be integrated with the IRCTC Android app.
- The essential features of AskDisha include ability to quickly answer customer queries, ability to multitask, ability to provide round-the-clock customer support, zero waiting time for the query to be answered, and overall an ability to provide customers with a stress-free experience and overall customer satisfaction.
- A chatbot is a conjuncture of chat and robot. It is a computer program based on artificial intelligence which conducts a conversation through text or audio messages. Such programs are often designed to depict exactly how a human would talk or answer as a conversational partner.

### **Nobel Prize**

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

### **In News**

- Nobel Prize is awarded annually from a fund bequeathed by the Swedish inventor and industrialist **Alfred Nobel**. The prize is widely regarded as the most prestigious award given for intellectual achievement in the world.
- The prize is awarded for **Physics, Chemistry, Physiology or Medicine, Literature, and Peace**. The first distribution of the prize took place in **1901**. An additional award in **Economic Sciences** was established in 1968 and was first awarded in 1969. Although not technically a Nobel Prize, it is identified with the award.
- The **Royal Swedish Academy of Sciences** confers the prizes for physics, chemistry, and economics.
- The **Karolinska Institute** confers the prize for physiology or medicine and the **Swedish Academy** confers the prize for literature.
- The **Norwegian Nobel Committee** based in Oslo confers the prize for peace.

### **Nobel in Physiology/Medicine**

- The 2018 Nobel Prize in Physiology or Medicine has been jointly awarded to **James P. Allison and Tasuku Honjo**.
- The two immunologists were awarded the Prize for their discovery of **cancer therapy by inhibition of negative immune regulation**.
- By stimulating the inherent ability of our immune system to attack tumor cells, this year's Nobel Laureates have established an entirely new principle for cancer therapy.
- Allison, professor at the University of Texas MD Anderson Cancer Center, worked on a protein known as CTLA-4 and realised that if this could be blocked, a brake would be released, unleashing immune cells to attack tumours.
- Honjo, professor at Kyoto University separately discovered a second protein called PD-1 and found that it too acted as an immune system brake, but with a different mechanism.
- Therapies based on his discovery have proved to be strikingly effective in the fight against cancer

### **Nobel in Chemistry**

- One half of the Nobel Prize in Chemistry 2018 was awarded to Frances H. Arnold "**for the directed evolution of enzymes**" and the other half jointly to George P. Smith and Sir Gregory P. Winter "**for the phage display of peptides and antibodies**."
- The Laureates have been inspired by the power of evolution and used the same principles -- genetic change and selection -- to develop proteins that solve mankind's chemical problems.
- They have applied the principles of Darwin in test tubes and have used the molecular understanding we have of the evolutionary process and recreated the process in their labs.
- In 1993, Frances H. Arnold conducted the first directed evolution of enzymes, which are proteins that catalyse chemical reactions. Since then, she has refined the methods that are now routinely used to develop new catalysts.
- Her method of creating new proteins with desired properties is being used to **convert renewable resources like sugar cane into biofuels**, and to make more **environmentally friendly chemical substances**, improving everyday products such as laundry and dishwashing detergents to enhance their performance in cold temperatures.
- In 1985, George Smith developed an elegant method known as phage display, where a bacteriophage — a virus that infects bacteria — can be used to evolve new proteins.
- Gregory Winter used the method to evolve antibodies, which are disease-fighting proteins in the blood.
- Pharmaceuticals for rheumatoid arthritis, psoriasis and inflammatory bowel diseases have resulted from their research, as well as anti-bodies that can neutralise toxins, counteract autoimmune diseases and cure metastatic cancer.
- Between them, the two groups of winners have taken humanity's project to create more useful lifeforms to a new level.

### **Gaganyaan**

*Syllabus: Awareness in the fields of IT, Space etc*

### **In News**

- A MoU was signed between ISRO and the Federal Space Agency of Russia ROSCOSMOS on joint activities in the field of the human spaceflight programme Gaganyaan.
- The Russian side has offered a ride to Indian astronaut to International Space Station (ISS) on board a Soyuz spacecraft for a short training mission in 2022.
- If successful, India would be the fourth nation to send a human in space after the US, Russia and China.

### **About Gaganyaan**

- Gaganyaan is India's maiden human spaceflight programme scheduled for completion by 2022.
- **GSLV Mk-III** launch vehicle, which has the necessary payload capability for this mission, will be used to launch Gaganyaan.
- 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**.
- For a manned mission, the key distinguishing capabilities would be the **ability to bring the spacecraft back to Earth** after the flight, and to build a spacecraft in which astronauts can live in Earth-like conditions in space.

### **China's Artificial Moon**

*Syllabus: Awareness in the fields of IT, Space etc*

### **In News**

- China has planned to launch an **artificial moon over the city of Chengdu**, in Sichuan province, by 2020. The objective is to provide an **alternative means of street lighting and save on electricity**.
- As per preliminary reports the artificial moon would be a **mirror orbiting Chengdu at a height of 500 km**. It would **reflect the sun's light at night**, and supplement street lighting in Chengdu, which has a population of 1.6 million.
- The moon would illuminate an area of diameter between 10-80 km. If the illuminated, it would save an estimated 1.2 billion yuan (\$170 million) a year in electricity costs for Chengdu.
- The extraterrestrial source of light will also **help rescue efforts in disaster zones during blackouts**.
- The first man-made moon will launch from Xichang Satellite Launch Center in Sichuan, with two more to follow in 2022 if the first test goes well.
- Though the first launch will be experimental, the 2022 satellites will have great civic and commercial potential.
- China is not the first country to try beaming sunlight back to Earth. In the 1990s, Russian scientists reportedly used giant mirrors to reflect light from space in an experimental **project called Znamya or Banner**.

### **Apprehensions**

- At an altitude as low as 500 km, and considering a diameter small enough to be economically viable, accuracy is key. Missing the angle of reflection by even a few degrees would miss Chengdu by miles.
- In order to light up an area with an error of say 10 km, even if it is missed by one 100th of a degree it will have the light pointing at another place.
- There must be sufficient glow, but if this glow covers a large area, it **could potentially affect the daily cycle of animals and plants**, and even affect the human circadian system — the body clock.
- The moon would significantly increase the **night-time brightness** of an already light-polluted city, creating problems for Chengdu's residents who are **unable to screen out** the unwanted light.

### Hyperion Proto-supercluster

*Awareness in the field of space*

#### **In News**

- Astronomers using the VIMOS instrument of **European Southern Observatory's Very Large Telescope** have spotted a gigantic galaxy proto-supercluster in the early Universe.
- Nicknamed Hyperion, the newly-discovered proto-supercluster is the **largest and most massive structure to be found at such a remote time and distance — merely 2 billion years after the Big Bang**.
- The enormous mass of the proto-supercluster is calculated to be **more than one million billion times that of the Sun**.
- Hyperion sits in the constellation Sextans, and is said to have a complex structure that differentiates it from nearby superclusters of similar size. According to researchers, It is home to at least 7 high-density regions connected by filaments of galaxies.
- This is first time that such a large structure has been identified at such a high redshift, just over 2 billion years after the Big Bang. Normally these kinds of structures are known at lower redshifts, which means when the Universe has had much more time to evolve and construct such huge things.
- Superclusters closer to Earth tend to 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.
- This contrast is most likely due to the fact that nearby superclusters have had billions of years for gravity to gather matter together into denser regions — a process that has been acting for far less time in the much younger Hyperion.
- Understanding Hyperion and how it compares to similar recent structures can **give insights into how the Universe developed in the past and will evolve into the future**, and gives the opportunity to challenge some models of supercluster formation. Unearthing this cosmic titan helps uncover the history of these large-scale structures.

## Acinetobacter Junii

*Syllabus: Awareness in the fields of biotech*

### **In News**

- Researchers from the **University of Delhi and Indian Institute of Technology (BHU)**, Varanasi, have successfully degraded toluene into less-toxic byproducts by using a bacteria - **Acinetobacter Junii** isolated from soil and effluents near an oil refinery.
- Toluene is one of the petrochemical wastes that get released without treatment from industries such as refineries, paint, textile, paper and rubber.
- It has been reported to cause serious health problems to aquatic life, and studies point that it has genotoxic and carcinogenic effects on human beings.
- Another interesting find was that when exposed to toluene, these bacteria changed their morphology to escape toxicity. Electron microscopy studies revealed that the cylindrical cells transformed into an ovoid or spherical structure.
- The researchers also examined the pathway by which the bacteria were doing the degradation and found it to be general **aerobic biodegradation** pathway unlike most waste degradation studies that use bacteria that grow in an anaerobic environment.
- The researchers also tested the bacterial strain for the degradation of benzene, phenol, and xylene and they showed effective results towards degradation of these compounds — both individual compounds and their mixtures.
- In laboratory conditions, the bacteria were able to degrade these petrochemical wastes in both soil and water samples. However, more studies are needed to design industrial-scale bioreactors for taking up large-scale degradation of petrochemical waste.

## DigiYatra

*Syllabus: Awareness in the fields of IT, Space etc*

### **In News**

- The Ministry of Civil Aviation has come up with a **DigiYatra platform** to create a digitally unified experience for air travellers.
- It aims to bring together entire industry to develop a digital ecosystem that will deliver customers a seamless, consistent and paperless service experience at every touch point of their journey.
- The platform will be built on 4 key pillars, **Connected Passengers, Connected Airports, Connected Flying and Connected Systems** which will make it possible over a period of time for passengers to:
  - Conveniently navigate through the airport using digital guidance systems, interactive kiosks and augmented reality apps
  - Receive relevant information pertaining to various facilities, protocols, airline timings, queue lengths at airports.
  - Get real time notifications about congestion and delays to have greater visibility on the next step of journey

- Submit grievances, share experiences and provide feedback.

### **India International Science Festival**

*Syllabus: Indigenization of technology and developing new technology.*

#### **In News**

- The 4<sup>th</sup> edition of India International Science Festival, jointly organised by **Ministry of Science and Technology, Ministry of Earth Sciences, and Vijnana Bharati**, was held recently in **Lucknow**.
- Stakeholders assembled to collectively work towards “**Vigyan se Vikas**”- contributing to the **Making of a New India**.
- The 1st IISF was held at Indian Institute of Technology (IIT) New Delhi in 2015.
- IISF is the biggest platform in the country to bring together students, researchers, innovators, artists and general public to celebrate India’s achievements in science and technology.
- It is a medium to encourage the young minds towards the field of science and to promote the networking of stakeholders working towards the propagation of science.
- The festival’s **focal theme** being **Science for Transformation** had many special events.
- The Global Indian Science & Technology Stakeholders Meet (GIST), Industry Academia Meet and Science & Technology for Harnessing Innovations (SATHI) - A National startup entrepreneurship summit and **Student Science Village** being some of the important events.
- The *Science Village program* was linked with the *Pradhan Mantri Sansad Adarsh Gram Yojana* to reach out to the rural masses and propagate science and for seeking scientific solutions to the diverse challenges facing our society, particularly rural India.
- The programme also aspired to develop entrepreneurship and explore new vistas of opportunities in the field of science and technology for women.
- **Nav Bharat Nirman/Creation of new India** a concept focused on the innovative methods and solutions to overcome India’s historical and social disadvantages along with problems created in the 21st century.