



# IAS PARLIAMENT

*Information is a Blessing*

A Shankar IAS Academy Initiative

## SCIENCE MONTHLY

### AUGUST 2019

**Shankar IAS Academy™**

Door No 18, New Plot No 259 /109,  
AL Block, 4th Avenue, Shanthi Colony,  
Annanagar, Chennai - 600040.

[www.shankariasacademy.com](http://www.shankariasacademy.com) | [www.iasparliament.com](http://www.iasparliament.com)



## **I N D E X**

### **SCIENCE MONTHLY AUGUST 2019**

<b>SPACE.....</b>	<b>3</b>
1. <i>FEDOR</i> .....	3
2. <i>Gaganyaan</i> .....	3
3. <i>Gravitational Wave from Neutron Star</i> .....	4
4. <i>Pluto not a Planet</i> .....	5
<b>DEFENCE.....</b>	<b>6</b>
5. <i>Directed Energy Weapons</i> .....	6
<b>ENVIRONMENT.....</b>	<b>7</b>
6. <i>Amazon forest</i> .....	7
7. <i>Coastal Zone Management</i> .....	8
8. <i>Deepor Beel to be Eco-Sensitive Zone</i> .....	9
9. <i>Kerala's first organic panchayat</i> .....	10
10. <i>Kuppai Thiruvizha</i> .....	12
11. <i>Microplastics in drinking water</i> .....	13
12. <i>Overfishing increase methylmercury toxin in fish</i> .....	13
13. <i>Plastic Ban in Nepal</i> .....	14
14. <i>Aquaponics</i> .....	16
<b>INNOVATION .....</b>	<b>17</b>
15. <i>Kumkum dye in Solar Cells</i> .....	17
<b>BIO-TECHNOLOGY.....</b>	<b>17</b>
16. <i>Antibiotic resistance in E. coli</i> .....	17
17. <i>Cancer to be covered under PMJAY</i> .....	18
18. <i>Cholera's growing drug resistance</i> .....	19
19. <i>DNA forensic</i> .....	19
20. <i>Implants from Egg shell</i> .....	20
21. <i>Lymphedema</i> .....	21
22. <i>Indigenous Vaccines</i> .....	21
23. <i>Pink Bollworm Spotted</i> .....	22

## SCIENCE MONTHLY AUGUST 2019

### SPACE

#### 1. FEDOR

##### *Why in news?*

A lifesize Russian robot known as 'Fedor' successfully departed the International Space Station, two weeks after an aborted docking attempt delayed its arrival.

##### *What is Fedor?*

- A Russian Soyuz spacecraft carried a humanoid robot to International Space Station (ISS).
- The FEDOR (Final Experimental Demonstration Object Research) robot was sent on a mission to support the crew and test its skills.
- The Skybot F-850 is the first humanoid robot sent to space by Russia.
- NASA sent a humanoid robot, Robonaut 2, to space in 2011 to work in hazardous environments.
- Japan sent a small robot Kirobo in 2013.

#### 2. GAGANYAAN

##### *Why in news?*

- The inaugural flight of India's Gaganyaan mission is unlikely to have any woman astronaut

##### *What is Gaganyaan?*

- It is India's first manned space mission.
- ISRO and Roscosmos (Russia's federal space agency) have agreed to work together for India's first manned space mission Gaganyaan.
- Under it, India is planning to send three humans (Gaganyatris) into space i.e. in low earth orbit (LEO) by 2022 i.e. by 75th Independence Day for period of five to seven days.
- The mission was announced by Prime Minister Narendra Modi during his 72nd Independence Day speech.
- Under this mission, crew of three astronauts will conduct experiments on microgravity in space.
- This mission will make India fourth nation in the world after USA, Russia and China to launch human spaceflight mission.

### **What are the Objectives of Gaganyaan Mission?**

- To enhance science and technology levels in the country.
- To serve as national project involving several institutes, academia and industry.
- To improve of industrial growth, inspire youth, develop technology for social benefits and
- To improve international collaboration

### **What is special about GSLV Mk III?**

- It is a ISROs Geosynchronous Satellite Launch Vehicle GSLV Mk III.
- It is a three-stage heavy-lift launch vehicle.
- It will be used to launch Gaganyaan as it has the necessary payload capability.
- GSLV Mk III is designed to carry 4 ton class of satellites into Geosynchronous Transfer Orbit (GTO) or about 10 tons to Low Earth Orbit (LEO).
- The powerful cryogenic stage of GSLV Mk III enables it to place heavy payloads into LEO's of 600 km altitude.
- The launcher uses two S200 solid rocket boosters to provide the huge amount of thrust required for lift off.

### **3. GRAVITATIONAL WAVE FROM NEUTRON STAR**

#### **Why in news?**

Gravitational wave emanating from a possible collision with a neutron star detected

#### **What are Gravitational waves?**

- Gravitational waves are 'ripples' in space-time caused by some of the most violent and energetic processes in the Universe.
- Albert Einstein predicted the existence of gravitational waves in 1916 in his general theory of relativity
- They travel outward from the source that created them.
- Like water waves, sound waves, and electromagnetic waves, Gravitational waves carry energy, momentum, and angular momentum and by doing so they carry those away from the source.

#### **What are the events that create gravitational waves?**

- The most powerful gravitational waves are created when objects move at very high speeds.
- Some examples of events that could cause a gravitational wave are:



- when a star explodes asymmetrically (called a supernova)
- when two big stars orbit each other
- when two black holes orbit each other and merge
- The strongest gravitational waves are produced by catastrophic events such as
  - Colliding black holes
  - The collapse of stellar cores (supernovae)
  - Coalescing neutron stars or white dwarf stars
  - The slightly wobbly rotation of neutron stars that are not perfect spheres, and
  - even the remnants of gravitational radiation created by the birth of the Universe itself.

#### **What is LIGO?**

- LIGO is the world's largest gravitational wave observatory.
- It comprises of two enormous laser interferometers located thousands of kilometers apart.
- LIGO exploits the physical properties of light and of space itself to detect and

understand the origins of gravitational waves.

- **How are gravitational waves detected?**
- When a gravitational wave passes by Earth, it squeezes and stretches space.
- LIGO can detect this squeezing and stretching.
- Each LIGO observatory has two “arms” that are each more than 2 miles (4 kilometers) long.
- A passing gravitational wave causes the length of the arms to change slightly.
- The observatory uses lasers, mirrors, and extremely sensitive instruments to detect these tiny changes.

#### **4. PLUTO NOT A PLANET**

##### **Why in news?**

On August 24, 2006, the solar system witnessed an astronomical change when the number of planets in it was cut down from nine to eight i.e. Pluto has been downgraded to dwarf planet.

##### **What is a Dwarf Planet?**

- A “dwarf planet,” as defined by the IAU, is a celestial body in direct orbit of the Sun that is massive enough that its shape is controlled by gravitational forces rather than mechanical forces

(and is thus ellipsoid in shape), but *has not cleared its neighboring region of other objects.*

### **What are the criteria for a planet?**

- Three criteria of the IAU for a full-sized planet are:
  1. It is in orbit around the Sun.
  2. It has sufficient mass to assume hydrostatic equilibrium (a nearly round shape).
  3. It has "cleared the neighborhood" around its orbit.
- Pluto meets only two of these criteria, losing out on the third.

## **DEFENCE**

### **5. DIRECTED ENERGY WEAPONS**

#### **Why in news?**

Directed energy weapons or DEWs are among the next bunch of military technologies that the Defence Research and Development Organisation (DRDO) is working on

#### **What is Directed Energy?**

- DE is an umbrella term covering technologies that produce a beam of concentrated Electromagnetic energy or atomic or subatomic particles.
- A DE weapon is a system using DE primarily as a direct means to damage

or destroy adversary equipment, facilities, and personnel.

- The two basic types of DEWs include *lasers* and *microwaves*.
- Microwaves and lasers are both part of the electromagnetic spectrum.
- They're made of the same electromagnetic energy which consists of light and radio waves.



- DEWs offer the following capabilities:
  1. They have pinpoint accuracy.
  2. They offer a low cost per use and maintenance.
  3. They have a virtually unlimited magazine capacity.
  4. They are simple to track, aim and shoot with sophisticated sensors.
  5. They are less lethal if tuned properly.
  6. They can operate in all weather conditions.
  7. They can engage multiple targets.
  8. They limit collateral damage.

9. Their energy travels at the speed of light.
10. Their energy can pass through walls at distances of hundreds of meters or even miles.
11. They are silent and offer plausible deniability of their use.

## ENVIRONMENT

### 6. AMAZON FOREST

#### *Why in news?*

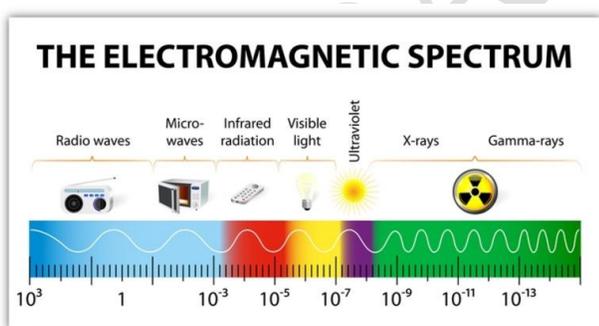
- The dramatic scale of this year's fires in Amazon is the result of a significant acceleration of deforestation for the lumber industry, for agriculture or for other human activities.

#### *What are electromagnetic waves?*

- It is defined as a wave produced by the interaction of time-alternating electric and magnetic fields.
- Electromagnetic waves form when an electric field merges with a magnetic field.
- In directional form, magnetic and electric fields of an electromagnetic wave are perpendicular to one another and to the direction of the wave.

#### *Where Amazon forest is located?*

- The Amazon rainforest is located in South America and covers 2.1 million square miles of land.
- It is bounded by the Guiana Highlands to the north, the Andes Mountains to the west, the Brazilian central plateau to the south, and the Atlantic Ocean to the east
- Brazil has 60%, Peru has 13%, and Colombia has 10% while other countries have very small parts of the rainforest within their borders.
- Altogether there are nine nations that enjoy all that the Amazon rainforest has to offer.
- The Amazon rainforest has existed for at least 55 million years.
- The Amazon rainforest is home to a very diverse range of species, many of



which are not found elsewhere in the world.



### **What are the important facts about Amazon forest?**

- The Amazon rainforest is a moist, broadleaf forest.
- It covers most of the Amazon Basin in South America. The basin is 2.7 million square miles while the Amazon covers 2.1 million square miles of it. If the Amazon rainforest was a country, it would rank 9th in size.
- The nine nations that have the Amazon rainforest in their borders are: Brazil, Peru, Colombia, Venezuela, Ecuador, Bolivia, Guyana, Suriname and French Guiana.
- The Amazon rainforest accounts for more than half of the entire world's remaining rainforests.
- The Amazon rainforest is home to 10% of the known species in the world.

- The Amazon rainforest is home to more than 1500 of the bird species in the world.
- There are over 40,000 different plant species and approximately 2.5 million insect species in the Amazon rainforest.

## **7. COASTAL ZONE MANAGEMENT**

### **Why in news?**

The Environment Ministry has unveiled a draft plan that will dictate how prospective infrastructure projects situated along the coast ought to be assessed before they can apply for clearance.

### **What is Coastal zone?**

- The coastal zone is a transition area between marine and territorial zones.
- It includes shore ecosystems, wetland ecosystems, mangrove ecosystems, mudflat ecosystems, sea grass ecosystems, salt marsh ecosystems and seaweed ecosystems.

### **What is Coastal Regulation Zone (CRZ) notification?**

- It was issued in 1991 under the Environmental Protection Act, 1986, by the Ministry of Environment and Forest to regulate activities in coastal areas of India.



- CRZ consists of coastal land up to 500 metres from the High Tide Line (HTL) and a stage of 100 metres along the banks of creeks, estuaries, backwater and rivers where tidal fluctuations occur.
- The coastal areas have been classified into four categories—CRZ-I, CRZ-II, CRZ-III and CRZ-IV—in the 1991 notification, which aimed at restricting establishment of industries in these areas.
- The ecologically sensitive areas that lie between high and low tide line, and are very much essential for maintaining the ecosystems, are covered under CRZ-I.
- Natural gas exploration and salt extraction are permitted in this zone.
- The areas up to the shoreline of the coast are notified under CRZ-II. Unauthorised structures are not allowed here.
- Rural and urban areas which fall outside CRZ-I and CRZ-II are covered under CRZ-III.
- Only agriculture-related activities and public facilities are permitted in this zone.
- Aquatic areas up to territorial limits are notified under CRZ-IV.

### ***What is coastal zone management?***

- Coastal zone management involves managing coastal areas to balance environmental, economic, human health, and human activities.
- The concept of coastal zone management is a relatively new one, emerging less than four decades ago from the need to tackle an array of interconnected problems associated with population growth and development along our nation's coasts.

## **8. DEEPOP BEEL TO BE ECO-SENSITIVE ZONE**

### ***Why in news?***

National Green Tribunal seeks eco-sensitive zone tag for Assam wetland Deepor Beel

### ***What is Eco-sensitive zone/Eco-sensitive Area?***

- ESAs are defined as those areas 'that are ecologically and economically important, but vulnerable even to mild disturbances, and hence demand careful management'.
- Therefore 'ecologically and economically important' areas are those areas that are biologically and ecologically 'rich', 'valuable' and or 'unique', and are largely irreplaceable if destroyed.

- Important categories of attributes that need to be considered in defining the ecological sensitive areas are:
  - a. abiotic attributes,
  - b. biotic attributes and
  - c. anthropological or socio-cultural attributes.

### ***What are the objectives of ESAs?***

- In order to manage and regulate the activities around Wildlife Sanctuaries, National Parks and Protected Areas.
- They serve as 'shock absorbers'
- To provide for a transition zone between the highly protected and relatively less protected areas
- To give effect to Section 3(2)(v) of the Environment Protection Act, 1986 which restricts the operation of industries or processes to be carried out in certain areas or to maintain certain safeguards to operate industries.
- In order to make it a mandate on the states.

## **9. KERALA'S FIRST ORGANIC PANCHAYAT**

### ***Why in news?***

Kanjikuzhi became Kerala's first chemical-free, vegetable-sufficient panchayat

### ***What is Soil Reclamation?***

- It is the process of reclaiming the soil's quality like lost fertility, minerals, nutrients and moisture to make it fit for use again.
- The reclamation of soil, its nutrients and fertility are done with an objective to increase yield.
- This process in combination with Land reclamation is being employed widely for the creation of national parks and wildlife sanctuaries for enhancing wilderness and forest life by a combined process called Pedogenesis.
- Pedogenesis, also known as soil development, soil evolution, soil formation, and soil genesis.
- It is the process of soil formation as regulated by the effects of place, environment, and history.

### ***What are the most popular methods used for soil reclamation?***

- **Phytoremediation** - In this method, higher plants are used for the degradation and removal of different contaminants (both organic and inorganic) from the soil.
- **Phytostabilization** - This process is based on the ability of roots to immobilize pollutants.



- The process takes place on the surface of roots as an adsorption effect.
- Contaminants are absorbed into roots and precipitated in the roots' area.
- **Phytoextraction/Photodegradation** - In this method, contaminants are picked up by the roots of plants and transported to their overground parts, and then removed together with the crops.
- **Bioremediation** - This method is based on microorganisms' activity, which is commonly used for the reclamation of soils polluted by organic compounds.
- **Electroremediation** - This method is based on the phenomenon of pollutant migration in an electric field.
- Migrating particles have to have a permanent electric charge or have to be polarized, so the technique is used to remove heavy metals or polar compounds.
- Electrodes are inserted into the ground on opposite sites of the contaminated area.
- Contaminants under the influence of an electromagnetic field migrate through the soil.
- **Biofiltration** - Biological filters and bioreactors are based on the biological activity of microorganisms.
- During the first stage of the process, the contaminated soil is mixed with water and as a suspension is moved into a reaction chamber.
- Here a selected group of microorganisms removes the contaminants as a result of sorption and/or transformation.
- **Surface Insulation** - This is a physical method based on covering the contaminated soil to prevent toxic migration to the environment as a result of rainwater or wind erosion.
- The layers are comprised of a combined material such as synthetic fiber, clay, and concrete.
- **Hydraulic method (Soil washing)** - This method is used for removing inorganic contamination, such as heavy metals, radionuclides, toxic anions and others.
- In some cases, it can be applied to organic contamination.
- This method uses a wide spectrum of leaching solutions from water to strong inorganic acids.
- **Air Sparging** - This is a subsurface contaminant remediation technique



that involves the injection of pressurized air into the contaminated groundwater causing hydrocarbons to change state from dissolved to vapor state.

- The air is then sent to the vacuum extraction systems to remove the contaminants.
- **Composting** - Contaminated soil is explored and stored in a pile or a thin layer distributed over a larger area, for the degradation of contaminants.
- This process enables some organic contaminants to be removed from the soil, by way of biological degradation.
- The process is carried out by aerobic organisms, which mineralize organic compounds to simple compounds such as CO<sub>2</sub>, H<sub>2</sub>O, and others.

## **10. KUPPAI THIRUVIZHA**

### ***Why in news?***

Through kuppai thiruvizha awareness on zero waste management is created by residents of Anna nagar.

### ***What is waste management?***

- Waste management is the precise name for the collection, transportation, disposal or recycling and monitoring of waste.

- This term is assigned to the material, waste material that is produced through human being activity.
- This material is managed to avoid its adverse effect over human health and environment.
- Most of the time, waste is managed to get resources from it.
- The waste to be managed includes all forms of matter i.e. gaseous, liquid, solid and radioactive matter.

### ***What is the zero-waste movement?***

- The zero-waste movement is a lifestyle where people aim to eliminate their trash output completely.
- This means no plastic, no wrappers, no garbage.

### ***What are the types of waste management?***

- Ocean Dumping
- Sanitary Landfill
- Incineration
- Composting
- Waste separation, recycling and recovery
- Mechanical and biological waste treatment
- Mechanical sorting of wastes



## **11. MICROPLASTICS IN DRINKING WATER**

### ***Why in news?***

The World Health Organization (WHO) said that the level of microplastics in drinking water is not yet dangerous for humans but called for more research into potential future risk.

### ***What are microplastics?***

- Microplastics generally refer to plastic particles between 0.33 mm and 5 mm in size.
- These smaller plastic particles can be ingested by aquatic organisms.

### ***Where do they come from?***

- Deterioration of larger plastic fragments, cordage and films over time, with or without assistance from UV radiation, mechanical forces in the seaborne through biological activity.
- Direct release of micro particles into waterways (e.g. scrubs and abrasives in household and personal care products) and via urban wastewater treatment.
- Accidental loss of industrial raw materials during transport or trans-shipment, at sea or into surface waterways;

- Discharge of macerated wastes, e.g. sewage sludge

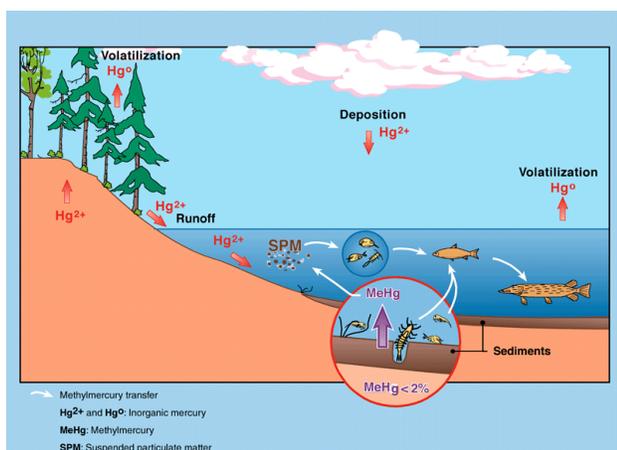
## **12. OVERFISHING INCREASE METHYLMERCURY TOXIN IN FISH**

### ***Why in news?***

The researchers warn that human exposure to the methyl mercury toxin through fish consumption is bound to increase as a result of climate change.

### ***What are the sources of mercury pollution?***

- About 30% of mercury in the atmosphere comes from natural sources such as volcanoes or forest fires.
- But 70% of the mercury is a result of human activities,
  1. the mining of mercury ores
  2. the use of this mercury in products and manufacturing, and
  3. the incidental release of trace concentrations of mercury naturally present in limestone, coal, crude oil, and metal ores such as taconite.

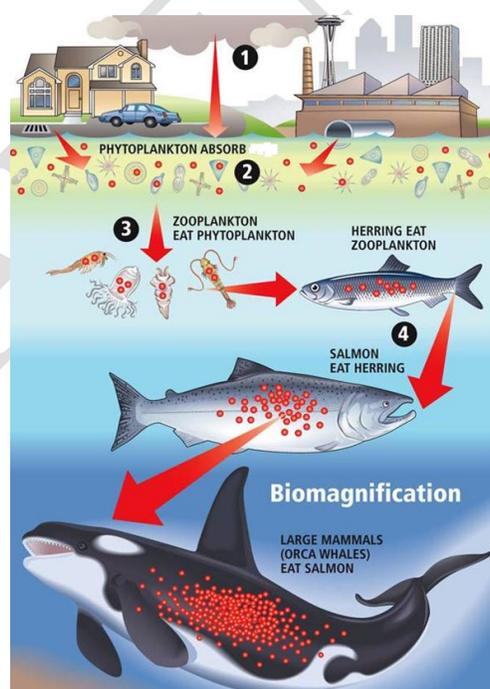


### What are the effects of mercury pollution?

- Exposure to mercury – even small amounts – may cause serious health problems.
- It is a threat to the development of the child in utero and early in life.
- Mercury may have toxic effects on the nervous, digestive and immune systems, and on lungs, kidneys, skin and eyes.
- Mercury is considered by WHO as one of the top ten chemicals or groups of chemicals of major public health concern.
- People are mainly exposed to methylmercury, an organic compound, when they eat fish and shellfish that contain the compound.

### What is Bioaccumulation and Biomagnification?

- **Bioaccumulation** refers to how pollutants enter a food chain;
- **Biomagnification** refers to the tendency of pollutants to concentrate as they move from one trophic level to the next



## 13. PLASTIC BAN IN NEPAL

### Why in news?

Nepal bans single use plastics on Everest region

### What is a Plastic?

- Plastic is any synthetic or semisynthetic organic polymer.
- Along with other elements plastics include carbon and hydrogen.

- Plastics may be made from any organic polymer.
- Most industrial plastic is made from petrochemicals.
- Thermoplastics and thermosetting polymers are the two types of plastic.
- The name "plastic" refers to the property of plasticity, the ability to deform without breaking.
- The polymer used to make a plastic is almost always mixed with additives, including colorants, plasticizers, stabilizers, fillers, and reinforcements.
- These additives affect the chemical composition, chemical properties, and mechanical properties of a plastic, along with its cost.
- Glassy polymers tend to be stiff (e.g., polystyrene). However, thin sheets of these polymers can be used as films (e.g., polyethylene).
- Nearly all plastics display elongation when they are stressed that is not recovered after the stress is removed. This is called "creep."
- Plastics tend to be durable, with a slow rate of degradation.

#### ***What is Bio plastic?***

#### ***What are the properties of plastics?***

- All plastics are polymers, but not all polymers are plastic. Plastic polymers consist of chains of linked subunits, called monomers.
- Plastics are usually solids. They may be amorphous solids, crystalline solids, or semicrystalline solids (crystallites).
- Plastics are usually poor conductors of heat and electricity. Most are insulators with a high dielectric strength.
- A bioplastic is a substance made from organic biomass sources, unlike conventional plastics which are made from petroleum.
- Bioplastics are made through a number of different processes.
- Some use a microorganism to process base materials, such as vegetable oils, cellulose, starches, acids and alcohols.
- Almost all bioplastics produce less carbon dioxide in production than conventional plastics, they are not necessarily completely green.
- The methods by which their base materials are grown and the processing involved both impact their product footprint.

- Many bioplastics also release carbon dioxide or monoxide when biodegrading.
- Their overall environmental impact is typically lower than that of conventional plastics, and as oil costs rise, their cost becomes more and more competitive.
- Some biodegradable bioplastics can break down in 180 days, given the right conditions.
- Others are not biodegradable at all.

## 14. AQUAPONICS

### *Why in news?*

Aquaponics is growing as a sustainable method of agriculture using comparatively less resources.

### *What is Aquaponics?*

- Aquaponics is a form of agriculture that combines raising fish in tanks (recirculating aquaculture) with soilless plant culture (hydroponics).
- In aquaponics, the nutrient-rich water from raising fish provides a natural fertilizer for the plants and the plants help to purify the water for the fish.
- Aquaponics can be used to sustainably raise fresh fish and vegetables for a family, to feed a village or to generate

profit in a commercial farming venture, year 'round, in any climate.

- Aquaponics is a great example of year 'round, indoor farming.
- It can be done anywhere, providing fresh local food that is free of pesticides, herbicides and chemical fertilizers.

### *What are the Benefits of Aquaponics?*

- Use 1/6th of the water to grow 8 times more food per acre compared to traditional agriculture!
- All natural fertilizer source from fish waste.
- No reliance on mined and manufactured fertilizers.
- Efficient, sustainable and highly productive.
- Produce is free of pesticides and herbicides.
- Fish are free of growth hormones and antibiotics.
- Allows continuous production of food.
- Produces both a protein and vegetable crop.
- Integrated system is sustainable and earth-friendly.
- Eliminating soil eliminates soil borne diseases.



- When combined with Controlled Environment Agriculture, you can grow year 'round in any climate.

## INNOVATION

### 15. KUMKUM DYE IN SOLAR CELLS

#### *Why in news?*

Research on how kumkum dye be made integral in developing eco-friendly solar cells

#### *What are solar cells?*

- Solar cells are used to capture solar energy and create electricity in most solar panels.
- The solar panels we most often see use solar cells.
- The cells are flat, dark-colored and shiny.
- Most importantly, each cell contains everything necessary to transform sunlight directly into clean electricity.
- All the other components are used only to increase output and transform the electricity from DC to AC electricity.
- **What is photovoltaic effect?**
- The photovoltaic effect is a process that generates voltage or electric current in a photovoltaic cell when it is exposed to sunlight.

- It is this effect that makes solar panels useful, as it is how the cells within the panel convert sunlight to electrical energy.
- The photovoltaic effect was first discovered in 1839 by Edmond Becquerel.
- The photovoltaic effect occurs in solar cells.
- These solar cells are composed of two different types of semiconductors - a p-type and an n-type - that are joined together to create a p-n junction.

## BIO-TECHNOLOGY

### 16. ANTIBIOTIC RESISTANCE IN E. COLI

#### *Why in news?*

Researchers have studied how resistance to the antibiotic rifampicin evolves in E. coli.

#### *What are superbugs?*

- "Superbugs" is a term used to describe strains of bacteria that are resistant to the majority of antibiotics commonly used today.
- Resistant bacteria that cause pneumonia, urinary tract infections and skin infections are just a few of the dangers we now face.



- Antibiotic resistance is a naturally occurring phenomenon that can be slowed, but not stopped.
- Over time, bacteria adapt to the drugs that are designed to kill them and change to ensure their survival.
- This makes previously standard treatments for bacterial infections less effective, and in some cases, ineffective.

### ***What is the difference between Gram negative and Gram positive bacteria?***

- There are two major classes of bacteria, known as Gram positive and Gram negative.
- They take their names from how they respond to the Gram staining test.
- A bacterium is known to be Gram negative or Gram positive based on its reaction to the test.
- Gram positive bacteria stain purple, and Gram negative do not.
- Gram negative bacteria are generally considered the more difficult to treat.

## **17. CANCER TO BE COVERED UNDER PMJAY**

### ***Why in news?***

Cancer treatments will soon be covered under the Ayushman Bharat Yojana- Pradhan Mantri Jan Arogya Yojana (PM-JAY)

### ***What is PMJAY?***

- Government provides health insurance cover of up to Rs. 5,00,000 per family per year.
- More than 10.74 crore poor and vulnerable families (approximately 50 crore beneficiaries) covered across the country.
- All families listed in the SECC database as per defined criteria will be covered.
- No cap on family size and age of members.
- Priority to girl child, women and senior citizens.
- Free treatment available at all public and empaneled private hospitals in times of need.
- Covers secondary and tertiary care hospitalization.
- 1,350 medical packages covering surgery, medical and day care treatments, cost of medicines and diagnostics.
- All pre-existing diseases covered. Hospitals cannot deny treatment.
- Cashless and paperless access to quality health care services.
- Hospitals will not be allowed to charge any additional money from beneficiaries for the treatment.



- Eligible beneficiaries can avail services across India, offering benefit of national portability.
- Can reach out for information, assistance, complaints and grievances to a 24X7 helpline number - 14555

## **18. CHOLERA'S GROWING DRUG RESISTANCE**

### **Why in news?**

The bacteria have become resistant to all commonly used antibiotics. The highest resistance was against sulfamethaxazole.

### **What is Cholera?**

- Cholera is an intestinal infection caused by *Vibrio cholerae* (see the images below).
- The hallmark of the disease is profuse secretory diarrhea.
- Cholera can be endemic, epidemic, or pandemic.
- Although the disease may be asymptomatic (without symptom) or mild, severe cholera can cause dehydration and death within hours of onset.
- Cholera bacteria enter the body through the mouth, often in food or water that has been contaminated with human waste, due to poor sanitation and hygiene.

- They can also enter by eating seafood that is raw or not completely cooked, in particular shellfish native to estuary environments, such as oysters or crabs.
- Poorly cleaned vegetables irrigated by contaminated water sources are another common source of infection.

## **19. DNA FORENSIC**

### **Why in news?**

DNA forensic used in settling a trans boundary poaching dispute

### **What is DNA forensic?**

- The establishment of DNA analysis within the criminal justice system in the mid-1980s revolutionized the field of forensic science.
- Because of the accuracy and reliability of forensic DNA analysis, this evidence has also become an invaluable tool for exonerating individuals who have been wrongfully convicted.

### **What are the principles behind DNA forensic?**

- DNA is sometimes referred to as a “genetic blueprint” because it contains the instructions that govern the development of an organism.

- Characteristics such as hair color, eye color, height and other physical features are all determined by genes that reside in just 2% of human DNA.
- This portion is called the coding region because it provides the instructions for proteins to create these features.
- The other 98% of human DNA is considered non-coding.
- Forensic scientists, however, use this non-coding DNA in criminal investigations.
- Inside this region of DNA are unique repeating patterns that can be used to differentiate one person from another.
- These patterns, known as short-tandem repeats (STRs), can be measured to define the DNA profile of an individual.
- Many implants are prosthetics, intended to replace missing body parts.
- Other implants deliver medication, monitor body functions, or provide support to organs and tissues.
- Some implants are made from skin, bone or other body tissues.
- Others are made from metal, plastic, ceramic or other materials.
- Implants can be placed permanently or they can be removed once they are no longer needed.

### ***What is the difference between implant and transplant?***

- If a biological substance is used to replace tissues, it will be named as TRANSPLANT.
- If a synthetic substance is used it will be named as IMPLANT.

## **20. IMPLANTS FROM EGG SHELL**

### ***Why in news?***

Researchers develop process to get bone implant material from eggshells

### ***What are implants?***

- Medical implants are devices or tissues that are placed inside or on the surface of the body

### ***What is plaster of paris?***

- Plaster of Paris is created by heating gypsum crystals.
- It is a soft mineral made of calcium sulphate dihydrate, to turn them into a dry powder.
- $\text{CaSO}_4 \cdot 2\text{H}_2\text{O} + \text{heat} \rightarrow \text{CaSO}_4 \cdot 0.5\text{H}_2\text{O} + 1.5\text{H}_2\text{O}$  (released as steam).
- When it is mixed with water it reforms into a gypsum paste which is used as



a building material for wall surfacing and fireproofing, or for creating sculptures and other art works.

## **21. LYMPHEDEMA**

### ***Why in news?***

- New treatment plant to be charted out to treat Lymphedema

### ***What is Lymphedema?***

- Lymphedema refers to swelling.
- It generally occurs in one of your arms or legs.
- Sometimes both arms or both legs swell.
- Lymphedema is most commonly caused by the removal of or damage to your lymph nodes as a part of cancer treatment.
- It results from a blockage in your lymphatic system, which is part of your immune system.
- The blockage prevents lymph fluid from draining well, and the fluid buildup leads to swelling.
- There is presently no cure for lymphedema.

### ***What is lymphatic system?***

- It acts as a one-way drainage system transporting fluid from body tissues into the blood circulation

- It contains white blood cells called lymphocytes, which fight infection
- It gets rid of waste products produced by cells.

### ***What is Lymph fluid?***

- This is a colourless fluid that forms in our body and surrounds all our body's tissues.
- Extra fluid that comes from the body's tissues drains into small lymph vessels.
- It flows constantly through the lymph vessels and is filtered through the lymph nodes.
- The fluid then drains back into the bloodstream.

## **22. INDIGENOUS VACCINES**

### ***Why in news?***

Spurred by the success of the rotavirus vaccine, the Department of Biotechnology (DBT) has set its sights on developing more indigenous vaccines that could be included in the national immunisation programme.

### ***What Are Vaccines?***

- A vaccine is a biological substance designed to protect humans from infections caused by bacteria and viruses.

- Vaccines are also called immunizations because they take advantage of our natural immune system's ability to prevent infectious illness.

### **What is Rotavirus?**

- Rotavirus is caused by a virus.
- Rotaviruses are the most common cause of severe diarrhoeal disease in young children throughout the world.
- It mostly affects babies and young children.
- Rotavirus spreads when a person comes in contact with the poop of someone who has rotavirus.

### **What are the differences between antigen and antibody?**

- Antigens are molecules capable of stimulating an immune response.
- Each antigen has distinct surface features, or epitopes, resulting in specific responses.
- Antibodies (immunoglobins) are Y-shaped proteins produced by B cells of the immune system in response to exposure to antigens.
- Each antibody contains a paratope which recognizes a specific epitope on an antigen, acting like a lock and key binding mechanism.

- This binding helps to eliminate antigens from the body, either by direct neutralization or by 'tagging' for other arms of the immune system.

## **23. PINK BOLLWORM SPOTTED**

### **Why in news?**

- The dreaded cotton crop pest, pink bollworm, has made its appearance in some fields in Telengana.

### **What is Pink bollworm?**

- Pink bollworm is an insect known for being a pest in cotton farming.
- The pink bollworm is native to Asia but has become an invasive species in most of the world's cotton-growing regions.
- The female moth lays eggs in a cotton boll and when the larvae emerge from the eggs, they inflict damage through feeding.
- They chew through the cotton lint to feed on the seeds. Since cotton is used for fiber and seed oil, the damage is twofold.
- Their disruption of the protective tissue around the boll is a portal of entry for other insects and fungi.

### **What is Bt cotton?**

- Bt cotton is an insect-resistant transgenic crop designed to combat the bollworm.
- Bt cotton was created by genetically altering the cotton genome to express a microbial protein from the bacterium *Bacillus thuringiensis*.
- In short, the transgene inserted into the plant's genome produces toxin crystals that the plant would not normally produce.
- This toxin when ingested by a certain population of organisms, dissolves the gut lining, leading to the organism's death.