



IAS PARLIAMENT

Information is a Blessing

A Shankar IAS Academy Initiative

SCIENCE MONTHLY

FEBRUARY 2020

Shankar IAS Academy™

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

www.shankariasacademy.com | www.iasparliament.com



SCIENCE & TECHNOLOGY

FEBRUARY 2020

S.No.	Title	Page No.
1.	SPACE	3
1.1	<i>Cryogenic Quantum Control Chip</i>	3
1.2	<i>Sun's Polar Regions.....</i>	4
1.3	<i>InSight Lander.....</i>	5
1.4	<i>Jupiter's Atmosphere</i>	5
1.5	<i>Nanosatellites</i>	6
1.6	<i>NAVIC.....</i>	6
1.7	<i>New Mini-Moon.....</i>	7
1.8	<i>Spitzer Space Telescope</i>	7
2.	ENVIRONMENT.....	9
2.1	<i>Incineration</i>	9
2.2	<i>Bacteria to Fight Climate Change.....</i>	10
2.3	<i>Padma Shri for Organic Farming.....</i>	11
2.4	<i>Panel to Study Ulsoor Lake Pollution</i>	11
2.5	<i>Pollinators.....</i>	12
2.6	<i>Sunderbans' Moonsoon.....</i>	12
2.7	<i>Urban Heat Island</i>	13
2.8	<i>No for Plastic bags</i>	14
3.	INNOVATION	15
3.1	<i>5G.....</i>	15
3.2	<i>Augmented Reality to Spread Love</i>	15
3.3	<i>CERN</i>	16
3.4	<i>Diesel Engine</i>	16
3.5	<i>Draft to Regulate RO.....</i>	17
3.6	<i>National Science Day</i>	17
3.7	<i>New Lithium Reserve</i>	18
3.8	<i>Swarm Robots</i>	19
4.	BIO-TECHNOLOGY.....	19
4.1	<i>Corona Outbreak hits Markets.....</i>	19
4.2	<i>Enhancing Cold-blooded Species Extinction.....</i>	20
4.3	<i>In Vitro Fertilization</i>	21
4.4	<i>Lassa fever</i>	21
4.5	<i>Public Health Emergency</i>	21
4.6	<i>Swine Flu.....</i>	22

SCIENCE & TECHNOLOGY

FEBRUARY 2020

1. SPACE

1.1 Cryogenic Quantum Control Chip

Why in News?

Intel Labs, has unveiled details about its first cryogenic quantum control chip called 'Horse Ridge.'

What are cryogenics?

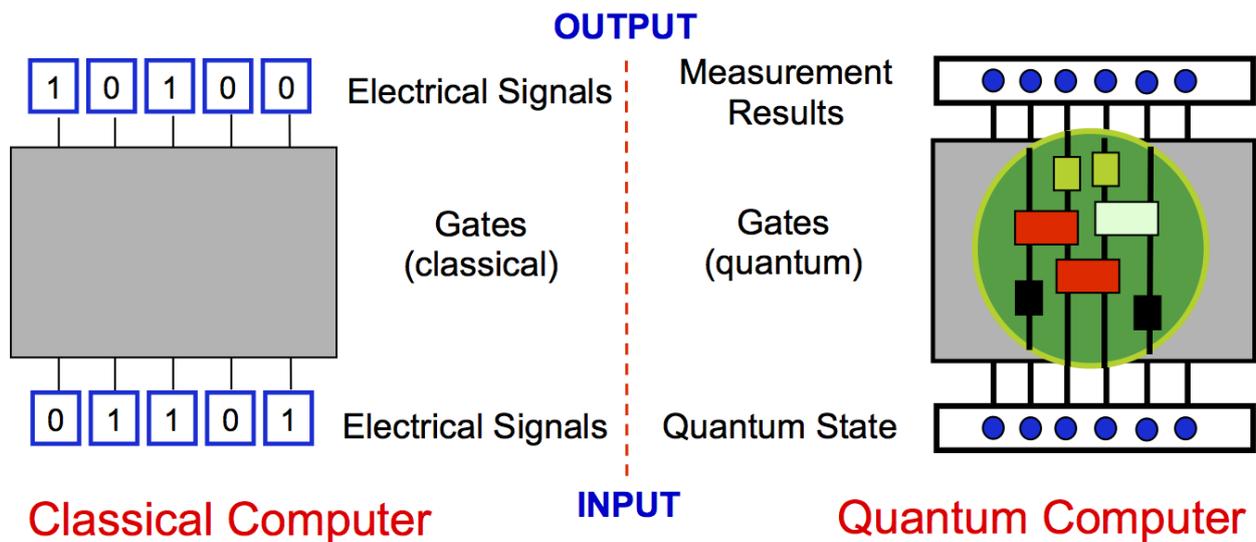
- Cryogenics describes the science that deals with the production, effects, and uses of a wide variety of materials at very low temperatures.
- Cryogenic temperatures range from -150°C to -273°C .
- At -273°C or 0 Kelvin (K) is known as absolute zero, the movement of molecules ceases, thereby resulting in molecules to be at their lowest energy state.
- At such low temperatures, gases undergo a phase transition from its gaseous state to a liquid state.

What are the applications of cryogenics?

- Storage and Transportation of Gases
- Food Preservation
- Electronics
- Aerospace Industry
- Surgery
- Cryopreservation
- Cryonics

What is quantum computing?

- It takes advantage of the strange ability of subatomic particles to exist in more than one state at any time.
- Due to behaviour of the tiniest particles, operations can be done much more quickly and use less energy than classical computers.
- In classical computing, a bit is a single piece of information that can exist in two states – 1 or 0.
- In quantum computing, a qubit (short for "quantum bit") is a unit of quantum information.
- Qubits have special properties that help them solve complex problems much faster than classical bits.
- One of these properties is superposition.
- That is instead of holding one binary value ("0" or "1") like a classical bit, a qubit can hold a combination of "0" and "1" simultaneously.
- When multiple qubits interact coherently, they can explore multiple options and process information in a fraction of the time it would take even the fastest non-quantum systems.
- Unlike a usual bit, they can also store much more information than just 1 or 0, because they can exist in any superposition of these values.



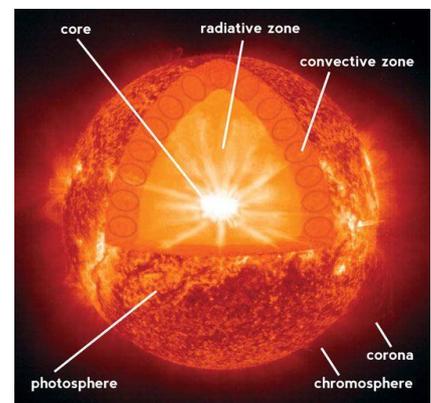
1.2 Sun's Polar Regions

Why in News?

A new spacecraft built jointly by U.S. and European space agencies is ready for a blazing journey to the sun to capture an unprecedented view of its two poles, an angle that could help researchers understand how the stars vast bubble of magnetic energy affects Earth.

What is solar dynamo?

- The generation of the solar magnetic field is generally ascribed to dynamo processes in the convection zone.
- Most solar physicists believe that the solar dynamo is located either at the bottom of the convection zone or in a thin region called the overshoot zone.
- The overshoot zone is located between the convection zone and the radiative zone.
- It is widely believed that the Sun's magnetic field is generated by a magnetic dynamo within the Sun.
- The Sun's magnetic field changes dramatically over the course of just a few years.
- Also, it changes in a cyclical manner indicates that the magnetic field continues to be generated within the Sun.
- A successful model for the solar dynamo must explain several observations:
 - 1) The 11-year period of the sunspot cycle
 - 2) The equator-ward drift of the active latitude as seen in the butterfly diagram
 - 3) Hale's polarity law and the 22-year magnetic cycle
 - 4) Joy's law for the observed tilt of sunspot groups and
 - 5) The reversal of the polar magnetic fields near the time of cycle maximum as seen in the magnetic butterfly diagram.



What is Solar Cycle?

- A cycle in which the amount of magnetic flux that rises up to the Sun's surface varies with time is called the solar cycle.
- This cycle lasts 11 years on average.

- This cycle is also referred to as the sunspot cycle.
- Near the minimum of the solar cycle (i.e. Solar minimum), it is rare to see sunspots on the Sun.
- Even the spots that do appear are very small and short-lived.
- During "solar maximum", there will be sunspots visible on the Sun almost all the time (more than 100 spots visible at a time).
- Some of those spots will be very large (up to 50,000 km in diameter) and last several weeks.

What are sun spots?

- Sunspots are regions where the solar magnetic field is very strong.
- In visible light, sunspots appear darker than their surroundings because they are a few thousand degrees cooler than their surroundings.
- Most of the visible surface of the Sun has a temperature of about 5400 degrees C.
- But in a big sunspot the temperature can drop to about 4000 degrees C.
- Sunspots come in sizes between about 2500 km and about 50,000 km.
- So while they are quite large, they are still much smaller than the Sun itself, which has a diameter of 1,392,000 km.
- Most sunspots are roughly circular in shape.
- Sunspots have two distinct parts: the umbra and the penumbra.

1.3 InSight Lander

Why in News?

InSight lander successfully managed to use a robot arm to place a seismometer on ground clear of landing platform, then cover it with a wind & thermal shield.

What is InSight?

Mission type	Mars lander
---------------------	-------------

- InSight - Interior Exploration using Seismic Investigations, Geodesy and Heat Transport.
- It is a Mars lander designed to give the Red Planet its first thorough checkup.
- It is the first outer space robotic explorer to study in-depth the "inner space" of Mars: its crust, mantle, and core.
- Studying Mars' interior structure answers key questions about the early formation of rocky planets in our inner solar system
- The InSight mission seeks to uncover how a rocky body forms and evolves to become a planet by investigating the interior structure and composition of Mars.
- The mission will also determine the rate of Martian tectonic activity and meteorite impacts.

1.4 Jupiter’s Atmosphere

Why in News?

Water makes up about 0.25% of the molecules in Jupiter’s atmosphere along its equator — almost three times that of the Sun, according to a study based on data from NASA’s Juno mission launched in 2011.

What is Juno?

- Juno: NASA
- The Juno mission is the second spacecraft designed under NASA's New Frontiers Program.

- Juno will improve our understanding of the solar system's beginnings by revealing the origin and evolution of Jupiter.
- Determine how much water is in Jupiter's atmosphere.
- This helps determine which planet formation theory is correct (or if new theories are needed)
- Look deep into Jupiter's atmosphere to measure composition, temperature, cloud motions and other properties
- Map Jupiter's magnetic and gravity fields, revealing the planet's deep structure
- Explore and study Jupiter's magnetosphere near the planet's poles, especially the auroras.
- Provide new insights about how the planet's enormous magnetic force field affects its atmosphere.

1.5 Nanosatellites

Why in News?

Two senior school pupils from Aranthangi Taluk hope to help farmers with their nano satellite.

What is a nanosatellite?

- A nanosatellite is any satellite with mass from 1 kg to 10kg.
- This includes all CubeSats, PocketQubes, TubeSats, SunCubes, ThinSats and non-standard picosatellites.

How Satellites are classified based on mass?

- Large satellites: >1000 kg
- Medium satellites: 500 to 1000 kg
- Small satellites: < 500 kg
 - Minisatellites: 100 to 500 kg
 - Microsatellites: 10 to 100 kg
 - Nanosatellites: 1 to 10 kg
 - Picosatellites: 100 g – 1 kg
 - Femtosatellites: 10 g – 100 g
 - Attosatellites: 1 g – 10 g
 - Zeptosatellites: 0.1 g – 1 g
- CubeSat sizes:
 - From 0.25U to 27U
 - From ~0.2 kg to ~40 kg
- Small satellite (smallsat) is any satellite below 500 kg.
- This term should be used rarely, there can be large differences between sizes and capabilities.

1.6 NAVIC

Why in News?

Xiaomi announced that it would bring ISRO's Indian Regional Navigation Satellite System NavIC technology to its smartphones.

What is NAVIC?

- IRNSS is an independent regional navigation satellite system being developed by India.
- It is designed to provide accurate position information service to users in India as well as the region extending up to 1500 km from its boundary, which is its primary service area.
- An Extended Service Area lies between primary service area and area enclosed by the rectangle from Latitude 30 deg South to 50 deg North, Longitude 30 deg East to 130 deg East.

- Navic is the operational name of the Indian Regional Navigation Satellite System (IRNSS) developed by ISRO
- IRNSS will provide two types of services, namely,
 - Standard Positioning Service (SPS) which is provided to all the users and
 - Restricted Service (RS), which is an encrypted service provided only to the authorised users.
- The IRNSS System is expected to provide a position accuracy of better than 20 m in the primary service area.

What are Some applications of IRNSS?

- Terrestrial, Aerial and Marine Navigation
- Disaster Management
- Vehicle tracking and fleet management
- Integration with mobile phones
- Precise Timing
- Mapping and Geodetic data capture
- Terrestrial navigation aid for hikers and travellers
- Visual and voice navigation for drivers

1.7 New Mini-Moon

Why in News?

Earth has a new temporarily captured object/Possible mini-moon called 2020 CD3, likely to be a C-type asteroid.

What is a natural satellite?

- A natural satellite is an object that orbits a planet or other body larger than itself and which is not man-made.
- Such objects are often called moons.
- The term is normally used to identify non-artificial satellites of planets, dwarf planets, or minor planets.
- There are 240 known moons within the solar system, including 163 orbiting the planets, four orbiting dwarf planets, and dozens more orbiting small solar system bodies.
- The large gas giants have extensive systems of natural satellites, including half a dozen comparable in size to the Earth's moon.
- Of the inner planets, Mercury and Venus have no moon at all;
- Earth has one large moon (the Moon); and
- Mars has two tiny moons: Phobos and Deimos.
- Among the dwarf planets,
 - Ceres has no moons (though many objects in the asteroid belt do)
 - Eris has one: Dysnomia, and
 - Pluto has three known satellites: Nix, Hydra, and a large companion called Charon.
- The Pluto-Charon system is unusual in that the center of mass lies in open space between the two, a characteristic of a double planet system.

1.8 Spitzer Space Telescope

Why in News?

NASA has decommissioned the Spitzer Space Telescope, one of its greatest observatories which has studied the universe by detecting cosmic infrared radiation for more than 16 years

What is Spitzer?

- Goal: Provide a unique, infrared view of the universe and allow us to peer into regions of space that are hidden from optical telescopes.
- The Spitzer Space Telescope is the final mission in NASA's Great Observatories Program.
- It is a family of four space-based observatories, each observing the Universe in a different kind of light.
- The other missions in the program include the visible-light Hubble Space Telescope (HST), Compton Gamma-Ray Observatory (CGRO), and the Chandra X-Ray Observatory (CXO).
- Spitzer is designed to detect infrared radiation, which is primarily heat radiation.

What are the other important space telescopes?

- Hubble Space Telescope:
 - Space agency: NASA, ESA
 - Year: 1990
 - Spectrum: Visible, UV, Near-IR
 - To study: Deep Space Objects
- Chandra X-ray Observatory:
 - Space agency: NASA
 - Year: 1999
 - Spectrum: X-Ray
 - To study: strangest objects, including quasars, immense clouds of gas and dust etc.
- Spitzer Space Telescope :
 - Space agency: NASA
 - Year: 2003
 - Spectrum: IR
 - To study: Distant and Nearby Objects
- Herschel Space Observatory:
 - Space agency: ESA & NASA
 - Year: 2009
 - Spectrum: Far-IR
 - To study: to look for water, both in nearby comets and faraway dust clouds
- Planck Observatory:
 - Space agency: ESA
 - Year: 2009
 - Spectrum: Microwave
 - To study: Cosmic Microwave Background
- Kepler Mission:
 - Space agency: NASA
 - Year: 2009
 - Spectrum: Visible
 - To study: Extrasolar planets
- Fermi Gamma-ray Space Telescope:
 - Space agency: NASA
 - Year: 2008
 - Spectrum: Gamma ray
 - To study: Various

- Swift Gamma Ray Burst Explorer:
 - Space agency: NASA
 - Year: 2004
 - Spectrum: X-ray, UV, Visible
 - To study: Various
- INTEGRAL (International Gamma-Ray Astrophysics Laboratory):
 - Space agency: ESA
 - Year: 2002
 - Spectrum: Gamma ray, X-ray, Visible
 - To study: Various
- XMM-Newton (X-ray Multi-Mirror Mission):
 - Space agency: ESA
 - Year: 1999
 - Spectrum: X-ray
 - To study: Various
- GALEX (Galaxy Evolution Explorer):
 - Space agency: NASA
 - Year: 2003
 - Spectrum: UV
 - To study: Galaxies
- COROT (Convection Rotation and planetary Transits):
 - Space agency: CNES & ESA
 - Year: 2006
 - Spectrum: Visible
 - To study: Extrasolar planets
- Solar & Heliospheric Observatory:
 - Space agency: NASA & ESA
 - Year: 1995
 - Spectrum: Optical-UV, Magnetic
 - To study: Sun and Solar Wind
- STEREO (Solar Terrestrial Relations Observatory):
 - Space agency: NASA
 - Year: 2006
 - Spectrum: Visible, UV, Radio
 - To study: Sun and Coronal Mass Ejections

2. ENVIRONMENT

2.1 Incineration

What is incineration?

- It is a waste treatment technology.
- It includes the combustion of waste for recovering energy.
- Incineration coupled with high temperature waste treatments are recognized as thermal treatments.
- During the process of incineration, the waste material that is treated is converted in to IBM, gases, particles and heat.

- These products are later used for generation of electricity.
- The gases, flue gases are first treated for eradication of pollutants before going in to atmosphere.

What is Gasification?

- Gasification is an Advanced Thermal Treatment technology that is characterised by the partial oxidation of the feed stock.
- Oxygen is added, but not in sufficient quantities to allow the substance to be completely oxidised and full combustion to occur.
- The partial combustion results in the production of 'Syngas' which can be used to substitute natural gas, chemicals, fertilisers, transportation fuels and hydrogen.

What is Pyrolysis?

- Pyrolysis is a thermochemical treatment.
- It can be applied to any organic (carbon-based) product.
- It can be done on pure products as well as mixtures.
- In this treatment, material is exposed to high temperature, and in the absence of oxygen goes through chemical and physical separation into different molecules.
- The decomposition takes place thanks to the limited thermal stability of chemical bonds of materials, which allows them to be disintegrated by using the heat.

What are the byproducts of Incineration?

- Pavers bricks
- Fly Ash with Carbon
- Activated Carbon

2.2 Bacteria to Fight Climate Change

Why in News?

Researchers have found a new species of soil bacteria that is particularly adept at breaking down organic matter, including cancer-causing chemicals that are released when coal, gas, oil and refuse are burnt.

What is biodegradation?

- A process by which microbial organisms transform or alter (through metabolic or enzymatic action) the structure of chemicals introduced into the environment.
- Basically, organic (carbon-based) material is changed through chemical processes from complex molecules into simpler molecules, eventually returning the molecules into the environment.

What is Bioremediation?

- Bioremediation is the application of a biological treatment, mainly microbes, to the cleanup hazardous contaminants in soil and surface or subsurface waters.
- These microorganisms can be used to transform them to less harmful forms. The bacteria feed on the contamination, deriving nutrition for growth and for reproduction.
- The microbes will survive and consume their contaminant food source until the unwanted pollutant is remediated.

What is Bioaugmentation?

- Bioaugmentation is a process where selected, standardized bacteria (microbes) are added to an area that has been contaminated with an unwanted substance.

- These bacteria break down the contaminants.
- Scientific advances have enabled us to isolate and mass-produce standardized pro-biotic bacteria and fungi into industrial concentrated inoculum's.
- These selected formulations, of multiple strains of bacteria, can be targeted to address specific contaminants.

2.3 Padma Shri for Organic Farming

Why in News?

Radha Mohan and *Sabarmatee*, a father-daughter duo from Odisha, have been conferred with India's fourth highest civilian honour - the Padma Shri - for their work in agriculture (Organic Farming).

What is organic farming?

- Organic farming is a method of farming system which primarily aimed at cultivating the land and raising crops in such a way, as to keep the soil alive and in good health.
- Using organic wastes (crop, animal and farm wastes, aquatic wastes) and other biological materials along with beneficial microbes (biofertilizers) to release nutrients to crops increase sustainable production in an eco friendly pollution free environment.
- According to FAO: "Organic agriculture is a unique production management system which promotes and enhances agro-ecosystem health, including biodiversity, biological cycles and soil biological activity, and this is accomplished by using on-farm agronomic, biological and mechanical methods in exclusion of all synthetic off-farm inputs".

What are the key characteristics of organic farming?

- Protecting the long term fertility of soils by maintaining organic matter levels, encouraging soil biological activity, and careful mechanical intervention
- Providing crop nutrients indirectly using relatively insoluble nutrient sources which are made available to the plant by the action of soil micro-organisms
- Nitrogen self-sufficiency through the use of legumes and biological nitrogen fixation, as well as effective recycling of organic materials including crop residues and livestock manures
- Weed, disease and pest control relying primarily on crop rotations, natural predators, diversity, organic manuring, resistant varieties and limited (preferably minimal) thermal, biological and chemical intervention
- The extensive management of livestock, paying full regard to their evolutionary adaptations, behavioural needs and animal welfare issues with respect to nutrition, housing, health, breeding and rearing
- Careful attention to the impact of the farming system on the wider environment and the conservation of wildlife and natural habitats.

2.4 Panel to Study Ulsoor Lake Pollution

Why in News?

The National Green Tribunal (NGT) has directed the constitution of a joint committee to take samples of water from Bengaluru's Ulsoor lake and neighbouring areas to ascertain whether the lake is being polluted

What is Chemical Oxygen Demand (COD)?

- The amount of oxygen that is required for the chemical oxidation of the organic and inorganic chemicals present in the wastewater by utilising oxidising agents like Potassium permanganate, Potassium dichromate etc. is called as chemical oxygen demand (COD).
- The presence of COD facilitates rapid chemical oxidation of organic matter without any additional equipment.
- This is the only method that enables to determine the organic load in heavy toxic sewage.

What is Biological Oxygen Demand (BOD)?

- BOD is defined as the amount of oxygen demanded by the micro-organisms in the sewage for the decomposition of bio-degradable matter under aerobic condition.
- This is the most commonly used parameter to determine the strength of municipal or organic quality of the water.

What are the difference between COD and BOD?

BOD	COD
BOD is a biological oxidation process	COD is a chemical oxidation process
BOD is performed by aerobic organisms	COD is performed by chemical reagents
BOD value is lower than COD	COD value is always greater than BOD
BOD is used to oxidize the natural organic matter and organic waste in the water	COD is capable of degrading the industrial sewage. COD does not measure the amount of oxygen consumed by acetates present in the water sample

2.5 Pollinators

Why in News?

Misuse of pesticides to blame for disappearance of pollinators

What are pollinators?

- Pollinators are animals that move pollen from male structures (anthers) of flowers to the female structure (stigma) of the same plant species.
- Movement of pollen (analogous to sperm) to a flower’s stigma results in fertilization of the flower’s eggs.
- An adequately fertilized flower will produce seeds and the fruit surrounding seeds, ensuring that a new generation of plants can be grown.
- Pollination is mutually beneficial to plants and to pollinators.
- Pollination results in the production of seeds and is necessary for many plants to reproduce.
- Meanwhile, pollinators receive nectar and/or pollen rewards from the flowers that they visit.
- Sugary nectar provides pollinators with carbohydrates while pollen offers proteins, fats, vitamins, minerals, and necessary phytochemicals.
- Examples: Honey bee, other bee species, butterflies, beetles, flies, some birds and some bats are pollinators.

Why pollinators so important?

- Not every species of plant requires animal-mediated pollination services.
- For example, wheat is wind-pollinated.
- However, the majority of crops that we like most to eat and provide most of our nutrition (fruits, vegetables, and nuts) use animal-mediated pollination.
- Without pollinators, our diets would be severely limited, and it would be more difficult to acquire the variety of vitamins and minerals that we need to stay healthy.

2.6 Sunderbans’ Moonsoon

Why in News?

The monsoon in Sunderbans is likely to last longer and get more intense, according to a fact sheet titled The Sunderbans and Climate Change

What is Sunderbans?

- The Sunderbans is a cluster of low-lying islands in the Bay of Bengal, spread across India and Bangladesh, famous for its unique mangrove forests.
- This active delta region is among the largest in the world, measuring about 40,000 sq km.
- The Sunderbans forest is about 10,000 sq km across India and Bangladesh, of which 40% lies in India.
- It is home to many rare and globally threatened wildlife species such as the
 - Estuarine crocodile (*Crocodilus porosus*),
 - Royal Bengal tiger (*Panthera tigris*),
 - Water monitor lizard (*Varanus salvator*),
 - Gangetic dolphin (*Platinista gangetica*), and
 - Olive ridley turtle (*Lepidochelys olivacea*).

What are mangroves?

- Mangrove trees grow in areas with low-oxygen soil, where slow-moving waters allow fine sediments to accumulate.
- Mangrove forests only grow at tropical and subtropical latitudes near the equator.
- Because they cannot withstand freezing temperatures.
- Many mangrove forests can be recognized by their dense tangle of prop roots.
- This tangle of roots allows the trees to handle the daily rise and fall of tides, which means that most mangroves get flooded at least twice per day.
- The roots also slow the movement of tidal waters, causing sediments to settle out of the water and build up the muddy bottom.
- Mangrove forests stabilize the coastline, reducing erosion from storm surges, currents, waves, and tides.
- The intricate root system of mangroves also makes these forests attractive to fish and other organisms seeking food and shelter from predators.
- The root systems of mangroves that grow in tidal mudflats are characterized by the presence of “breathing roots” known as pneumatophores.

What are the States/Union Territories in India with mangrove cover?

- West Bengal
- Orissa
- Andhra Pradesh
- Andaman & Nicobar
- Tamil Nadu
- Kerala
- Karnataka
- Goa
- Maharashtra

2.7 Urban Heat Island

Why in News?

A team of researchers has found that most cities in the country are turning into “urban heat islands” in all seasons during both day and night.

What is urban heat island?

- An urban heat island (UHI) is a metropolitan area which is significantly warmer than its surroundings.
- This temperature difference usually is larger at night than during the day.
- This temperature difference is Larger in winter than in summer.
- It is most apparent when winds are weak.
- The main causes are changes in the land surface by urban development along with waste heat generated by energy use.
- As population centers grow, they tend to change greater areas of land which then undergo a corresponding increase in average temperature.

How Do Heat Islands Form?

- Heat islands form as vegetation is replaced by asphalt and concrete for roads, buildings, and other structures necessary to accommodate growing populations.
- These surfaces absorb—rather than reflect—the sun's heat, causing surface temperatures and overall ambient temperatures to rise.
- Displacing trees and vegetation minimizes the natural cooling effects of shading and evaporation of water from soil and leaves (evapotranspiration).
- Tall buildings and narrow streets can heat air trapped between them and reduce air flow.
- Waste heat from vehicles, factories, and air conditioners may add warmth to their surroundings, further exacerbating the heat island effect.
- Heat islands can occur year-round during the day or night.
- Urban-rural temperature differences are often largest during calm, clear evenings.
- This is because rural areas cool off faster at night than cities, which retain much of the heat stored in roads, buildings, and other structures.
- As a result, the largest urban-rural temperature difference, or maximum heat island effect, is often three to five hours after sunset.

2.8 No for Plastic bags

Why in News?

No polythene bags for saplings in nurseries. Instead, Forest Advisory Committee calls for use of biodegradable bags

What is Polythene?

- Polythene is a short form name of polyethylene (PE).
- Polyethylene is a thermoplastic, and as such, plays a distinct role in the manufacturing of plastic products.
- A thermoplastic is any polymer that can be shaped and molded as a liquid and remain in that shape as a solid.
- The two most common types of polyethylene compounds are high density polyethylene (HDPE) and low density polyethylene (LDPE).
- Both compounds have very different physical properties.
- For example, while LDPE compounds have a melting point of 115° C, HDPE compounds melt at 135° C.
- LDPE is more flexible than HDPE, but when it comes to strength, HDPE is the winner.

3. INNOVATION

3.1 5G

Why in News?

Huawei Consumer Business Group (CBG) announced its refreshed line up of 5G products and its strategy that showcase the full capabilities of its all-scenario ecosystem at a virtual launch here.

What is a 5G?

- 5G simply stands for fifth generation and refers to the next and newest mobile wireless standard based on the IEEE 802.11ac standard of broadband technology.
- Formal standard for 5G is yet to be set.
- According to the Next Generation Mobile Network's 5G white paper, 5G connections must be based on 'user experience, system performance, enhanced services, business models and management & operations'.
- And according to the Groupe Speciale Mobile Association (GSMA) to qualify for a 5G a connection should meet most of these eight criteria:
 1. One to 10Gbps connections to end points in the field
 2. One millisecond end-to-end round trip delay
 3. 1000x bandwidth per unit area
 4. 10 to 100x number of connected devices
 5. (Perception of) 99.999 percent availability
 6. (Perception of) 100 percent coverage
 7. 90 percent reduction in network energy usage
 8. Up to ten-year battery life for low power, machine-type devices

3.2 Augmented Reality to Spread Love

Why in News?

Augmented Reality app leverages poetry to spread love.

What is Augmented Reality?

- Augmented reality is the technology that expands our physical world, adding layers of digital information onto it.
- Unlike Virtual Reality (VR), AR does not create the whole artificial environments to replace real with a virtual one.
- AR appears in direct view of an existing environment and adds sounds, videos, graphics to it.
- A view of the physical real-world environment with superimposed computer-generated images, thus changing the perception of reality, is the AR.

What is Virtual Reality?

- Virtual reality (VR) implies a complete immersion experience that shuts out the physical world.
- Using VR devices users can be transported into a number of real-world and imagined environments such as the middle of a squawking penguin colony or even the back of a dragon.

What is Mixed Reality?

- In a Mixed Reality (MR) experience, which combines elements of both AR and VR, real-world and digital objects interact.
- Mixed reality technology is just now starting to take off.

What is Extended Reality?

- Extended Reality (XR) is an umbrella term that covers all of the various technologies that enhance our senses, whether they're providing additional information about the actual world or creating totally unreal, simulated worlds for us to experience.
- It includes Virtual Reality (VR), Augmented Reality (AR) and Mixed Reality (MR) technologies.

3.3 CERN

Why in News?

The European Organisation for Nuclear Research, or CERN, has decided to shun enterprise connectivity platform Workplace by Facebook, citing concerns around the management of user data by the social networking giant.

What is CERN?

- CERN is the world's largest particle physics laboratory.
- Scientists from all over the world work here to advance our knowledge of matter, its fundamental constituents and the forces that link them.
- Founded in 1954, CERN was one of the first European collaborations.
- The number of Member States has now grown to 23.
- CERN is run by 23 Member States, each of which has two official delegates to the CERN Council.
- One represents his or her government's administration; the other represents national scientific interests.
- Each Member State has a single vote and most decisions require a simple majority.

What are the missions of CERN?

- Provide a unique range of particle accelerator facilities that enable research at the forefront of human knowledge.
- Perform world-class research in fundamental physics.
- Unite people from all over the world to push the frontiers of science and technology, for the benefit of all.

3.4 Diesel Engine

Why in News?

Rudolf Diesel was granted the patent "on a principle of operation and construction for internal combustion engines" on February 23, 1893 – (remembering Rudolf Diesel)

What are the differences between petrol and diesel engine?

Diesel Engine	Petrol Engine
Works on the Diesel cycle	Works on the Otto cycle
Diesel is mixed with air inside the cylinder	Air and petrol are mixed in a carburettor
Ignition is achieved with the help of hot & compressed air.	Fuel is ignited with an electric spark
High compression ratio	Relatively low compression ratio
High power production	Comparatively less power produced
These engines work with fuels that have low volatilities	Highly volatile fuels are used in these internal combustion engines
Generally used in heavy vehicles such as trucks and	Used in light vehicles such as motorcycles and cars.

buses	
Relatively low fuel consumption	High fuel consumption.
High initial and maintenance costs	Comparatively low initial cost and maintenance cost

3.5 Draft to Regulate RO

Why in News?

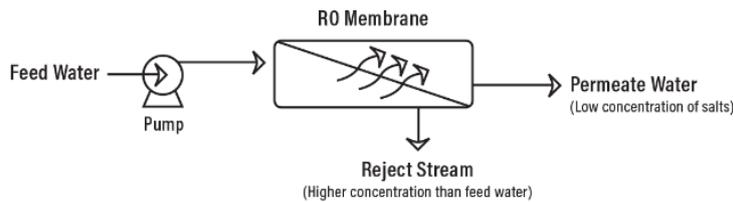
The Ministry has issued a draft notification that seeks to regulate membrane-based water filtration systems.

What is Osmosis?

- Osmosis is the movement of any solvent through a selectively permeable membrane into an area of higher solute concentration.
- Result of this movement will be an equalizing of solute concentration on either side of the membrane.

How does Reverse Osmosis work?

- Reverse Osmosis works by using a high pressure pump to increase the pressure on the salt side of the RO and force the water across the semi-permeable RO membrane.
- This process leaves almost all (around 95% to 99%) of dissolved salts behind in the reject stream.



- The amount of pressure required depends on the salt concentration of the feed water.
- The more concentrated the feed water, the more pressure is required to overcome the osmotic pressure.
- The desalinated water that is demineralized or deionized, is called permeate (or product) water.
- The water stream that carries the concentrated contaminants that did not pass through the RO membrane is called the reject (or concentrate) stream.
- Feed water enters the RO membrane under pressure (enough pressure to overcome osmotic pressure).
- The water molecules pass through the semi-permeable membrane
- The salts and other contaminants are not allowed to pass and are discharged through the reject stream (also known as the concentrate or brine stream).

3.6 National Science Day

Why in News?

On National Science Day, many leading Indian women scientists have stressed on the need for the right kind of support, equality, and gender-fair policies in the field of research.

Why National Science day is celebrated?

- National Science Day: 28 February.
- Celebrated each year to mark the discovery of the Raman effect by Indian physicist Sir C. V. Raman on 28 February 1928.
- For his discovery, Sir C.V. Raman was awarded the Nobel Prize in Physics in 1930.

What is Raman Effect?

- Raman effect is the change in the wavelength of light that occurs when a light beam is deflected by molecules.
- When a beam of light traverses a dust-free, transparent sample of a chemical compound, a small fraction of the light emerges in directions other than that of the incident (incoming) beam.
- Most of this scattered light is of unchanged wavelength.
- A small part, however, has wavelengths different from that of the incident light; its presence is a result of the Raman Effect.

What is Raman Scattering?

- Raman Spectroscopy is a non-destructive chemical analysis technique.
- It provides detailed information about chemical structure, phase and polymorphy, crystallinity and molecular interactions.
- It is based upon the interaction of light with the chemical bonds within a material.
- Raman is a light scattering technique, whereby a molecule scatters incident light from a high intensity laser light source.
- Most of the scattered light is at the same wavelength (or color) as the laser source and does not provide useful information – this is called Rayleigh Scatter.
- However a small amount of light (typically 0.0000001%) is scattered at different wavelengths (or colors), which depend on the chemical structure of the analyte – this is called Raman Scatter.
- A Raman spectrum features a number of peaks, showing the intensity and wavelength position of the Raman scattered light.
- Each peak corresponds to a specific molecular bond vibration, including individual bonds such as C-C, C=C, N-O, C-H etc., and groups of bonds such as benzene ring breathing mode, polymer chain vibrations, lattice modes, etc.

3.7 New Lithium Reserve

Why in News?

Research paper points to lithium reserves in Mandya district

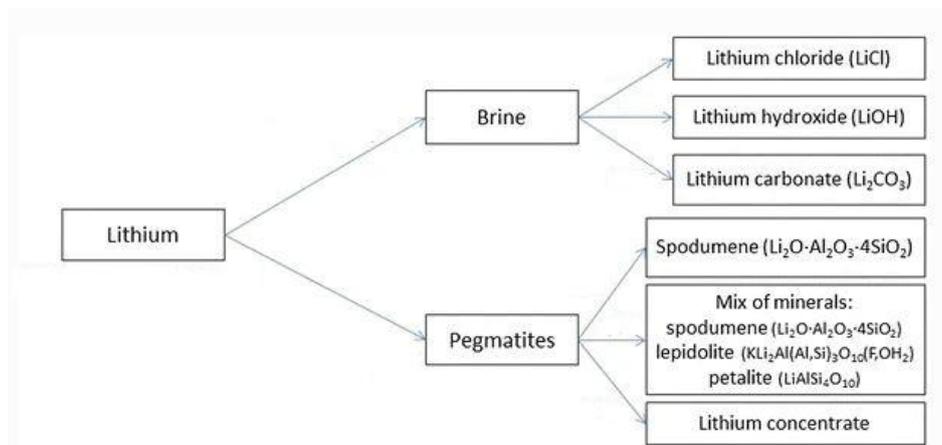
What is Lithium?

- Lithium (Li) belongs to alkali metal group.
- It is the lightest of the solid elements.
- The metal itself is soft, white, and lustrous.
- Lithium is used as a scavenger (remover of impurities) in metallurgy.
- It is used in refining of metals such as iron, nickel, copper, and zinc and their alloys.
- Also a large variety of nonmetallic elements are scavenged by lithium, including oxygen, hydrogen, nitrogen, carbon, sulfur, and the halogens.
- Lithium is utilized to a considerable extent in organic synthesis.
- For instance n-butyllithium, C_4H_9Li is used as an initiator of polymerization, in the production of synthetic rubber.

- It is also extensively used in the production of other organic chemicals, especially pharmaceuticals.
- Because of its light weight and large negative electrochemical potential, lithium metal, either pure or in the presence of other elements, serves as the anode (negative electrode) in many nonrechargeable lithium primary batteries.
- Lightweight lithium-magnesium alloys and tough lithium-aluminum alloys, harder than aluminum alone, have structural applications in the aerospace and other industries.
- Metallic lithium is used in the preparation of compounds such as lithium hydride.

What are the ores of lithium?

- petalite $(\text{LiAl}(\text{Si}_2\text{O}_5)_2)$
- lepidolite $\text{K}(\text{Li},\text{Al})_3(\text{Al},\text{Si},\text{Rb})_4\text{O}_{10}(\text{F},\text{OH})_2$
- spodumene $\text{LiAl}(\text{SiO}_3)_2$ and
- also subsurface brines



3.8 Swarm Robots

Why in News?

To help make self-driving vehicles safer and more flawless, the researchers have developed a decentralised algorithm with a collision-free, deadlock-free guarantee.

What is swarm robotics?

- Swarm robotics is the use of numerous, autonomous robotics to accomplish a task.
- Robot swarms coordinate the behaviours of a large number of relatively simple robots in a decentralised manner.
- Swarm robotics plays an important role in the development of collective artificial intelligence (AI).
- Current uses for robot swarms include search and rescue, precision agriculture, supply chain management (SCM) and military reconnaissance.
- Swarm robotics attempts to draw on the ways social organisms, such as insects, use collaborative behaviors to achieve complex tasks beyond any individual's capability.

4. BIO-TECHNOLOGY

4.1 Corona Outbreak hits Markets

Why in News?

The markets remain worried that coronavirus' economic damage could last not just weeks, but several months or even quarters.

What is Coronavirus?

- Coronaviruses (CoV) are a large family of viruses.
- There are four known genera in the family, named :
 - *Alphacoronavirus*,
 - *Betacoronavirus*,
 - *Gammacoronavirus*, and
 - *Deltacoronavirus*.
- The first two only infect mammals, including bats, pigs, cats, and humans.
- *Gammacoronavirus* mostly infects birds such as poultry, while *Deltacoronavirus* can infect both birds and mammals.
- It causes illness ranging from the common cold to more severe diseases such as Middle East Respiratory Syndrome (MERS-CoV) and Severe Acute Respiratory Syndrome (SARS-CoV).
- A novel coronavirus (nCoV) is a new strain that has not been previously identified in humans.
- Coronaviruses are zoonotic, meaning they are transmitted between animals and people.
- Detailed investigations found that SARS-CoV was transmitted from civet cats to humans.
- MERS-CoV from dromedary camels to humans.
- Several known coronaviruses are circulating in animals that have not yet infected humans.

What are the differences between DNA and RNA viruses?

- DNA viruses are mostly double-stranded while RNA viruses are single-stranded.
- RNA mutation rate is higher than DNA mutation rate.
- DNA replication takes place in the nucleus while RNA replication takes place in the cytoplasm.
- DNA viruses are stable while RNA viruses are unstable.
- In DNA viruses, viral genetic code is injected in the host DNA for duplication and decoding.
- RNA viruses skip DNA for duplication and decoding.

4.2 Enhancing Cold-blooded Species Extinction

Why in News?

Climate change pushing cold-blooded species faster to extinction.

What are cold blooded animals?

- The source of energy that animals use is the basis on which animals are divided into two groups, namely cold-blooded and warm-blooded animals.
- Cold-blooded animals are also known as ectothermic or poikilothermic animals.
- Their bodies cannot regulate temperatures internally.
- Their temperature is not constant and varies according to their environment.
- In hot environments, their blood can get much warmer than that of warm-blooded animals in the same area.
- To regulate their temperature, cold-blooded animals bask perpendicular to sun rays to get warm, and when they want to cool down they lie parallel to the sun, or keep their mouths open or seek shade.

4.3 In Vitro Fertilization

Why in News?

Two cheetah cubs have been born through in vitro fertilization and embryo transfer to a surrogate mother for the first time in Ohio zoo.

What is Fertilization?

- Fertilization is the union of a sperm nucleus, of paternal origin, with an egg nucleus, of maternal origin, to form the primary nucleus of an embryo.
- In all organisms the essence of fertilization is fusion of the hereditary material of two different sex cells, or gametes,
- Each cell carries half the number of chromosomes typical of the species.
- The most primitive form of fertilization, found in microorganisms and protozoans, consists of an exchange of genetic material between two cells.

What is IVF?

- In vitro fertilization (IVF) is a type of assistive reproductive technology (ART).
- It involves retrieving eggs from a woman's ovaries and fertilizing them with sperm.
- This fertilized egg is known as an embryo.
- The embryo can then be frozen for storage or transferred to a woman's uterus.

Depending on the situation, IVF can use:

- Concerned people's eggs and sperm
- Concerned person's eggs and donor sperm
- donor eggs and Concerned person's sperm
- donor eggs and donor sperm
- donated embryos
- Doctor can also implant embryos in a surrogate, or gestational carrier.

4.4 Lassa fever

Why in News?

The Nigerian Academy of Science has called for the current outbreak of Lassa fever in Africa's most populous nation to be declared a national health emergency because of its severity.

What is Lassa fever?

- Lassa fever is one of the hemorrhagic fever viruses like Ebola virus, Marburg virus, and others.
- It is caused by Lassa virus, a member of the arenavirus family of viruses.
- Unlike Ebola virus, Lassa fever is not as contagious person to person, nor as deadly.
- Lassa virus is typically transmitted by the urine or feces of Mastomys rats to humans.
- Health workers may be infected by direct contact with blood, body fluids, urine, or stool of a patient with Lassa fever.
- Lassa fever occurs primarily in West Africa in areas where these rodents live.

4.5 Public Health Emergency

Why in News?

The World Health Organisation (WHO) declared the novel coronavirus outbreak a Public Health Emergency (PHE) of International Concern.

When was PHE declared last time?

- The last time WHO declared a global health emergency was in 2019 for the Ebola outbreak in eastern Congo that killed more than 2,000 people.
- The agency also declared global emergencies for the 2016 Zika virus, the 2009 H1N1 swine flu, and the 2014 polio and Ebola outbreaks.

What is Public Health Emergency of international concern?

- All countries should be prepared for containment, including active surveillance, early detection, isolation and case management, contact tracing and prevention of onward spread of 2019-nCoV infection, and to share full data with WHO.
- Countries are reminded that they are legally required to share information with WHO under the IHR.
- Any detection of 2019-nCoV in an animal should be reported to the World Organization for Animal Health (OIE) as an emerging disease.
- Countries should place particular emphasis on reducing human infection, prevention of secondary transmission and international spread, and contributing to the international response through multi-sectoral communication and collaboration and active participation in increasing knowledge on the virus and the disease, as well as advancing research.
- The WHO Committee does not recommend any travel or trade restriction based on the current information available.

4.6 Swine Flu

Why in News?

A multinational company has given “work from home” guidance till February 28 to its employees after two of them tested positive for Influenza ‘A’ H1N1.

What is h1n1 or swine flu?

- Swine flu is a respiratory disease caused by influenza viruses.
- H1N1 is a subtype of influenza virus.
- It infects the respiratory tract of pigs and results in a barking cough, decreased appetite, nasal secretions, and listless behavior.
- In a number of instances, people have developed the swine flu infection when they are closely associated with pigs.
- The virus transmitted to humans from pigs hence called so.
- Swine flu viruses may mutate and now are easily transmissible among humans.
- Symptoms of swine flu in humans are similar to most influenza infections: fever (100 F or greater), cough, nasal secretions, fatigue, and headache.
- The incubation period for the disease is about one to four days.
- Vaccination is the best way to prevent or reduce the chances of becoming infected with influenza viruses.