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{S&T – Biotech – 20/03} Stem Cell or Cord Blood Banking

[TH](#) | [TH](#) | GS3 > S&T: Developments and their Applications in Everyday Life | Awareness in the field of Bio-tech.

- Poona Citizen Doctor Forum, a body that promotes ethical medical practice, is making efforts to bust the aggressively promoted concept of **cord blood banking (Stem cell banking)**.

Stem Cells

- The blood collected from the **umbilical cord** of the new-born is a rich source of **stem cells**.
- The stem cells are **unspecialised cells** (they do not have a specific predefined function).

Stem cell banking or Cord blood (umbilical cord blood) Banking

- Cord blood is the blood that remains in the **umbilical cord** and **placenta post-delivery**.
- Cord blood at the time of delivery a **rich source of stem cells** and other cells of the immune system.

- Cord blood banking is the process of collecting the cord blood and extracting and cryogenically freezing its stem cells and other cells of the immune system for potential future medical use.
- In some parts of the world, cord blood banking is more often referred to as **stem cell banking**.
- Cord blood banking is designed to collect the stem cells and not the actual blood cells themselves.

How long can the stem cells be preserved?

- The stem cells are preserved in liquid nitrogen in cord blood banks.
- Technically, there is no expiry date and these stem cells **can be preserved for a lifetime**.
- Scientifically, evidence exists that they can be stored for about 20 years.

Why are stem cells special?

- In some organs, such as the **bone marrow**, stem cells **regularly divide** to repair and replace damaged tissues.
- **Stem cells taken from umbilical cord blood are like those taken from bone marrow, capable of producing all blood cells: red cells, platelets, and immune system cells.**
- That is, they are capable of renewing themselves through **cell division** to give rise to **new stem cells** or **specialized cell types** (bone cells, muscle cells, etc.).

What are the uses of stem cells?

- In a patient, they can be induced to become tissue- or organ-specific cells with special functions.
- Hence, they offer the **possibility** of a **renewable source of replacement cells and tissues** to treat diseases including macular degeneration, spinal cord injury, stroke, burns, heart disease, diabetes, etc.
- The stem cells in theory can treat around 70 blood related disorders and genetic disorders including thalassemia, sickle cell anaemia, leukaemia, and immune related disorders.
- But given the present state of medicine, they are effective only for around a dozen of them.

Are stem cells useful for family members?

- Body's immune system does not accept outside stem cells and other cells of the immune system.
- Cord blood taken from a baby's umbilical cord is always a perfect match for the baby.
- In addition, immediate family members are more likely to also be a match for the banked stem cells.
- Hence, it may sometimes be possible to use the stem cells of the immediate family member to treat certain diseases.

What does Indian Council of Medical Research (ICMR) say about cord blood banking?

- Companies convince parents (emotional marketing) to bank the cells promising future therapeutic use.
- However, the ICMR does not recommend commercial stem cell banking.
- According to ICMR, there is no scientific basis for preservation of cord blood for future self use.
- According to ICMR, cord blood banking is advisable when there is an elder child in the family with a condition treatable with stem cells and the mother is expecting the next baby.

What do experts say?

- Globally, cord blood banking is recommended as a source of **hematopoietic stem cell** (derived **from bone marrow, umbilical cord**) transplantation for **haematological** (diseases related to blood) cancers.
- For all other conditions, the use of cord blood as a source of stem cells is **not yet established**.

{S&T – Indigenization – 20/03} National Supercomputing Mission (NSM)

[PIB](#) | GS3 > Indigenization of Technology and Developing New Technology

- NSM was set up to provide the country with supercomputing infrastructure to meet the increasing computational demands by manufacturing supercomputers indigenously in India.
- The National Super Computing Mission is steered jointly by the **Ministry of Electronics and IT (MeitY)** and **Department of Science and Technology (DST)**.
- It is implemented by the **Centre for Development of Advanced Computing (C-DAC), Pune** and the **Indian Institute of Science (IISc), Bengaluru**.
- The target of the mission was set to establish a network of supercomputers ranging from a few Tera Flops to greater than or equal to 3 Peta Flops (PF) in institutions of National importance across the country by 2022.
- This network of Supercomputers envisaging a total of 15-20 PF was approved in 2015 and was later revised to a total of 45 PF (45000 TFs).
- **Supercomputer PARAM 8000** (made by C-DAC) launched on July 1, 1991 is considered **India's first super-computer**. It was indigenously built in 1991 by C-DAC.
- National Supercomputing Mission's first indigenously build supercomputer is called '**Param Shivay**'
- Param Shivay was followed by **Param Shakti** and **Param Brahma** supercomputers.

Focus of the mission

- The Mission envisages empowering national academic and R&D institutions spread over the country by installing a vast supercomputing grid comprising of more than 70 high-performance computing facilities.

- These supercomputers will also be networked on the National Supercomputing grid over the **National Knowledge Network (NKN)**.
- The NKN is another programme of the government which connects academic institutions and R&D labs over a high speed network.

Significance of supercomputers

- Most of the supercomputers across the world are dedicated for weather and climate research.
- Weather prediction has reached accuracy of forecast as well as real time tracking of natural phenomenon.
- Timely warning of cyclones in the recent past have saved many lives and property.

The speed of a supercomputer

- The average computer's processor performance is measured by megahertz (MHz) units to calculate its clock speed.
- Since supercomputers are far more capable, the performance is calculated in **Floating-point operations per second, or FLOPS** which is of a considerably larger scale.
 - ⇒ **1 billion flops = 1 giga flops (10^9)**
 - ⇒ **1000 giga flop = 1 tera flop (10^{12})**
 - ⇒ **1000 tera flop = 1 peta flop (10^{15})**
- Param 8000 supercomputer had a maximum speed of one giga flop.
- PARAM SHIVAY (February 2019) → 833 TFLOPS
- PARAM Brahma (September 2019) → 0.85 PFLOPS
- **Pratyush and Mihir** (fastest supercomputers in India) → 6.8 PetaFlops
- The most advanced supercomputer **Summit (U.S.)** → ~150 PFLOPS

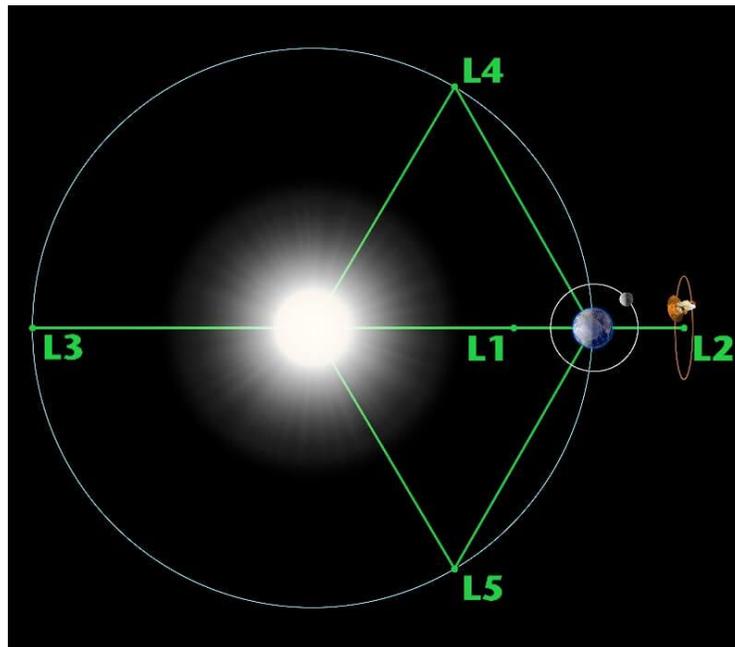
{S&T – ISRO – 20/02} Aditya-L1

[IE](#) | GS3 > Awareness in the fields of Space

- ISRO is preparing to send its first scientific expedition to study the Sun next year.
- Named Aditya-L1, the mission will try to obtain information about Sun's atmosphere and magnetic field.
- Aditya-L1 will be inserted in a halo orbit around L1, which is 1.5 million km from the Earth.
- A Satellite placed in the halo orbit around the Lagrangian Point 1 (L1) of the Sun-Earth system has the major advantage of **continuously viewing the Sun without any eclipses**.

Lagrange Points

- Lagrange Point 1 refers to one of five points in the orbital plane of the Earth-Sun system.
- Lagrange Points are positions in space where the gravitational forces of a two-body system (like the Sun and the Earth) produce enhanced regions of attraction and repulsion.



- These can be used by spacecraft to reduce fuel consumption needed to remain in position.
- The L1 point is home to the **Solar and Heliospheric Observatory Satellite (SOHO)**, an international collaboration project of NASA and the European Space Agency (ESA).

What is the importance of understanding Sun's atmosphere?

- Sun's corona gives rise to solar wind which are hot, energised and charged particles that stream outward from the Sun and fill the solar system.
- These charged particles (solar wind) beaming outwards affects space weather and violent solar wind can hamper satellites and electronics on Earth.

Suggested Reading: [Sun's Internal Structure and Atmosphere, Solar Wind](#)

{S&T – ISRO – 20/03} GISAT-1 or Geo Imaging Satellite-1

TH | GS3 > | Basics: <https://www.pmfias.com/keplers-laws-satellite-orbits-pslv-gslv/>

- The launch of GISAT-1 from Sriharikota, planned for March 05, 2020, is postponed due to technical reasons.
- GSLV-F10 will launch Geo Imaging Satellite (GISAT-1 — 2268 kg) into Geosynchronous Transfer Orbit (**GTO**).
- GISAT-1 is India's **first earth imaging (Earth observatio) satellite in a geostationary orbit**.

- Subsequently, it will reach the final **geostationary orbit (36,000 km)** using its onboard propulsion system.
- A satellite in geostationary orbit has an orbital period equal to earth's rotational period.
- GISATs will image in multi-spectral and hyper-spectral bands to provide near real-time pictures of large areas of the country, under **cloud-free conditions**.
- GISAT-2 (similar to GISAT-1) is scheduled to be launched in August 2020
- The two identical satellites will provide resolution in the range of 42 to 318 m.

Objectives of GISAT-1

- Quick monitoring of natural disasters.
- Keep a constant watch on borders.
- Monitor any changes in the geographical condition of the country.
- Helps to obtain spectral signatures of agriculture, forestry, mineralogy, disaster warning, cloud properties, snow, glaciers and oceanography.

{S&T – ISRO – 20/03} Oceansat

[PIB](#) | GS3 > Indigenization of technology and developing new technology.

- The Indian National Centre for Ocean Information Services (INCOIS) has reported that Oceansat Satellite data are used to prepare the Potential Fishing Zone (PFZ) advisories.
- PFZ are identified using the data on **chlorophyll concentration** obtained from ISRO's Oceansat-2 satellite and the **sea surface temperature** from National Oceanic Atmospheric Administration (NOAA).

Oceansat

- OceanSat-1 (1999) was the first Indian satellite built specifically for Ocean applications.
- It was a part of the **Indian Remote Sensing satellite series**.
- The satellite carried an Ocean Colour Monitor and a Microwave Radiometer.
- Ocean Colour Monitor is a camera designed to monitor the colour of the ocean.
- It is used for detecting chlorophyll concentration, phytoplankton blooms, aerosols, and particulate matter.
- Microwave Radiometer offers information regarding sea surface temperature, cloud water content, etc.
- Oceansat-1 completed its mission in 2010.
- Oceansat-1 was retired in 2010 and Oceansat-2 was designed to provide service continuity.

Indian National Centre for Ocean Information Services (INCOIS)

- INCOIS was established as an autonomous body in 1999 under the **Ministry of Earth Sciences (MoES)**.
- It is located in **Hyderabad (not Chennai)**.
- INCOIS provides ocean information and advisory services to society, industry, government agencies, etc.

Activities of INCOIS

- INCOIS provides warning services for the coastal population on tsunamis, storm surges, high waves, etc. through the in-house **Indian Tsunami Early Warning Centre (ITEWC)**.
- The Intergovernmental Oceanographic Commission (IOC) of UNESCO designated ITEWC as a **Regional Tsunami Service Provider** (RTSP) to provide tsunami warnings to countries on the Indian Ocean Rim.
- Provides daily Potential Fishing Zone advisories to fisher folk.
- Short term (3-7 days) Ocean State Forecasts (waves, currents, sea surface temperature, etc.) are issued daily.
- Established a VSAT aided Emergency Communication System (VECS) to provide tsunami warnings with the least possible time delay even when there is a failure in conventional communication systems.

Suggested Reading: {S&T – Space – 19/10/09} GAGAN, GEMINI

{S&T – Persons of Interest – 20/02} Dr. Vikram Sarabhai

[TOI](#) | [Source](#) | Achievements of Indians in Science & Technology

- ISRO and Department of Atomic Energy (DAE) are conducting various year long events at national level to commemorate the 100th birth anniversary of Dr. Vikram Sarabhai.

About Vikram Sarabhai

- Vikram Sarabhai was born in 1919.
- Sarabhai was instrumental in forming India's future in astronomy.
- Sarabhai founded the Physical Research Laboratory in Ahmedabad in the year 1947.
- Its first topic of research was cosmic rays.
- The most significant contribution of Sarabhai was his role in setting up the country's space research facilities.
- He persuaded GOI to set up the Indian National Committee for Space Research (INCOSPAR) in 1962.
- Sarabhai was the first chairman of the committee.
- The INCOSPAR was restructured and renamed as **ISRO in 1969**.
- He also set up India's first rocket launch site in **Thumba**, a small village near Thiruvananthapuram.
- Vikram Sarabhai was also responsible for bringing cable television to India.

- His constant contact with NASA paved a way for the establishment of Satellite Instructional Television Experiment (SITE) in 1975.
- Sarabhai was the mastermind behind building India's first satellite, **Aryabhata**.
- He was one of the founding members of the Indian Institute of Management, Ahmedabad (**IIMA**).
- Vikram Sarabhai received the Padma Bhushan in 1966.
- He was also awarded the Padma Vibhushan in 1972, posthumously.

{S&T – Technologies – 20/02} Quantum computing gets funds

[D2E](#) | Science and Technology: Developments and their Applications, Awareness in the fields of Computers

- Union Budget for 2020-21 proposed Rs 8,000 crore over five years for National Mission on Quantum Technologies and Applications.
- Quantum technologies comprise quantum computing, quantum communication, quantum optics, quantum information processing, quantum internet and quantum artificial intelligence.

Need for special attention

- The excitement about quantum computer is because of its power to dabble with complex calculations involved in fields like cyber-security which digital computers now deal with.
- Quantum communications can enhance (cyber) security, provide unique fingerprints and also increase available bandwidth for internet networks.

Suggested Reading: {S&T – 19/09/29} Quantum supremacy

{S&T – Technologies – 20/02} Reverse osmosis (RO)

[TH](#) | [TH](#) | [TH](#) | GS3 > Science and Technology: Developments and their Applications and Effects in Everyday Life.

- NGT has recently passed an order prohibiting the use of reverse osmosis (RO) purifiers where total dissolved solids (TDS) in the supplied water are **below 500 mg per litre**.
- The NGT had ordered the ban on the grounds that RO filters often deprived drinking water of essential salts (affecting the nutritional security) and were also wasting a lot of water and power.
- Current BIS regulations consider 500 mg/litre to 1,200 mg/litre of total dissolved solids, which consist of salts and some organic matter, as acceptable.

- MoEF has recently issued a draft notification that seeks to regulate membrane-based RO water filtration systems in areas where the source of water meets drinking water norms of the Bureau of Indian Standards.

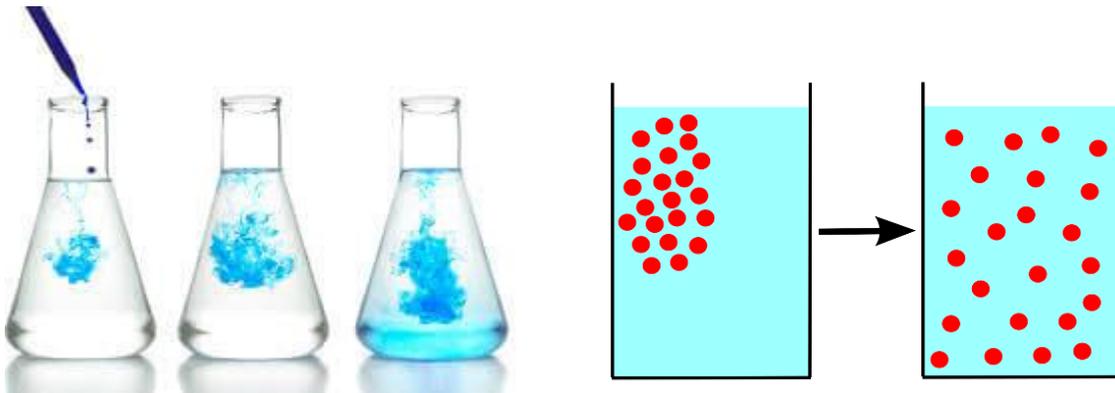
Basics

Solution

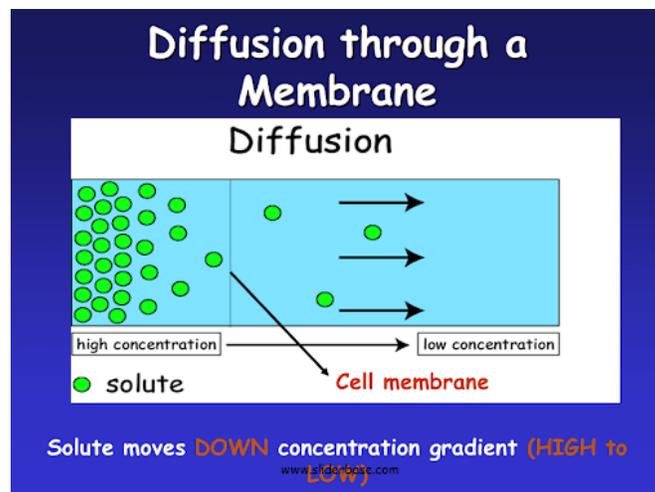
- In chemistry, a solution is homogeneous mixture composed of two or more substances.
- In such a mixture, a **solute is a substance dissolved in another substance, known as a solvent.**
- For example, in salt water, salt is the solute and water is the solvent.

Diffusion

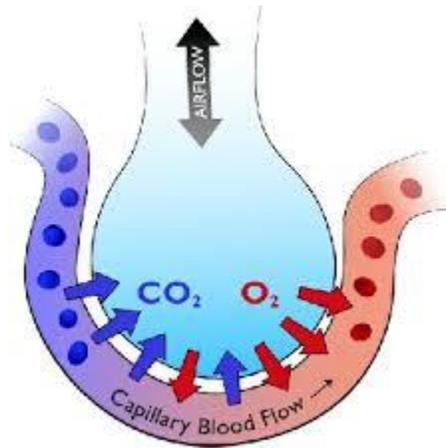
- Diffusion is a spontaneous movement of a substance from an area of high concentration to an area of low concentration.



- Diffusion through a permeable membrane moves a substance (solute) from a region of **high solute concentration (hypertonic solution)** to a region where its **concentration is low (hypotonic solution).**



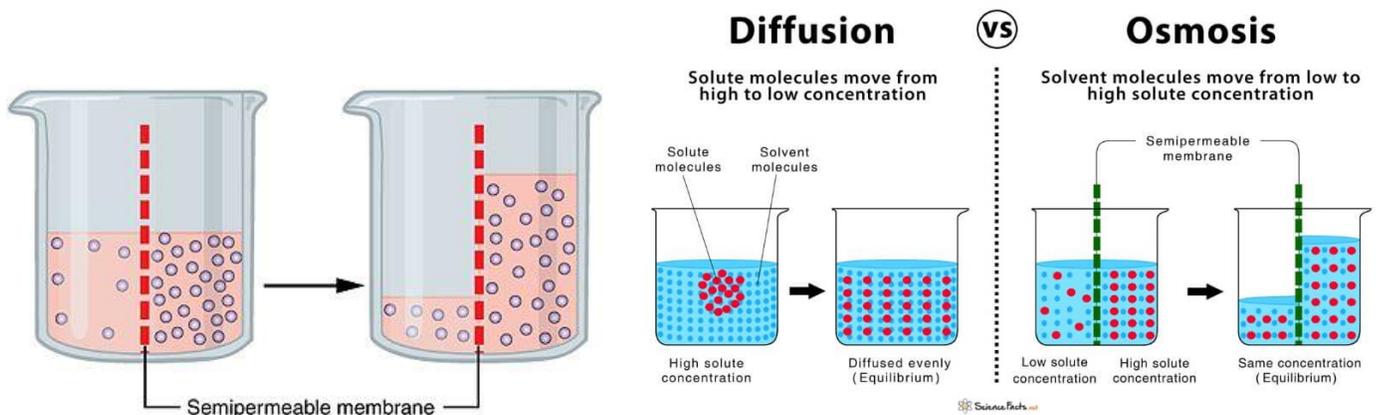
- In living organisms, diffusion plays an important role in **gaseous exchange between the cells** as well as the cell and its external environment.
- Exchange of **O₂ & CO₂ in alveoli** (millions of tiny, balloon-shaped air sacs in lungs) is an example of diffusion.



- In a person suffering from **pneumonia**, the air sacs may fill with fluid or pus. This prevents diffusion of O₂ & CO₂ in alveoli (**breathing issues in Coronavirus patients**).

Osmosis

- Water obeys the law of diffusion.
- Osmosis is the **passage of water (diffusion of molecules of a solvent)** from a **region of low solute concentration (hypotonic) through a semi-permeable membrane to a region of high solute concentration (hypertonic)**.
- **Semi permeable** means that the membrane will allow small molecules and ions to pass through it but acts as a barrier to larger molecules or dissolved substances.

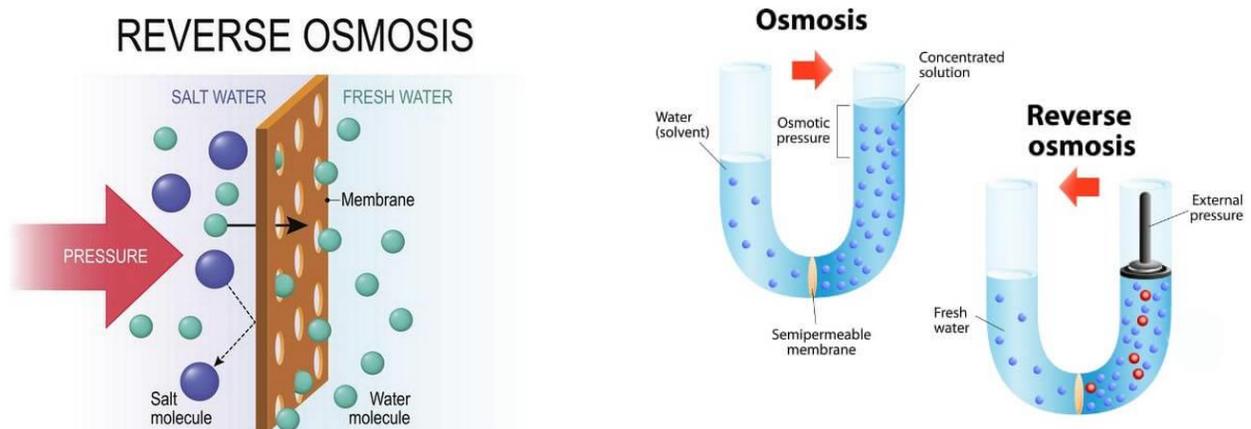


- Thus, osmosis is a special case of **diffusion through a selectively permeable membrane**.
- Unicellular freshwater organisms and most plant cells tend to gain water through osmosis.

- **Absorption of water by plant roots** is also an example of osmosis.

Reverse Osmosis (RO)

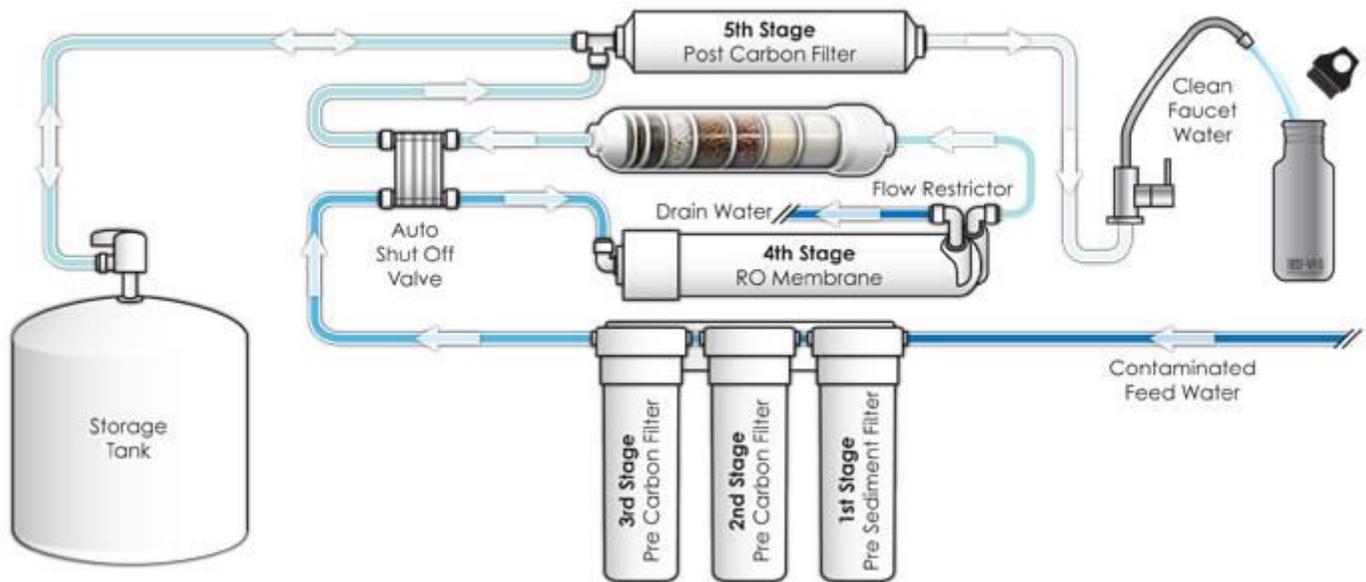
- Reverse osmosis (RO) is a **water purification technology** that uses a semipermeable membrane to remove larger particles from drinking water.
- In reverse osmosis, an **applied pressure** is used to **overcome osmotic pressure** so that **pure water flows from a region of high solute concentration (hypertonic) through a semi-permeable membrane to a region of low solute concentration (hypotonic)**.



Note: In NCERT Biology Compilation, I have given a wrong explanation for both Osmosis and Reverse Osmosis. What I have given here is the correct explanation.

Application of Reverse Osmosis (RO)

- RO was originally a technology devised in the late 1950s to desalinate sea water.
- At present, it is possible to deploy a wide array of membranes and multiple stages of filters to filter a wide variety of solutes — **arsenic, fluoride, hexavalent chromium, nitrates, bacteria**.
- This has led to an industry of home-RO systems for drinking water.
- To create external pressure, RO relies on a pump and electric motors.
- It uses "**activated carbon**" components, such as **charcoal and carbon black** that **can filter out contaminants as well as organic substances such as bacteria** (UV light is also used to kill bacteria).
- It all depends on the filtering material and the number of filters that incoming tap water must pass through.



Problem with RO water purifiers

- In making tap water pass through multiple stages of cleaning, RO systems end up wasting a lot of water.
- Anywhere between three-five times more water is wasted by them (high carbon footprint).
- RO system filters out essential micronutrients such as **calcium, zinc, magnesium**. Drinking such water over time could be harmful.
- However, many manufacturers claim to overcome this challenge by “post-treatment” (added minerals).
- RO system only reduces Total Dissolved Solids, ensure water is odourless and has a pH from 6.5-8.5.
- The National Institute of Virology (NIV) claimed that most RO methods did not eliminate Hepatitis E virus.
- However, a combination of filtration systems can eliminate most contaminants (more power consumption).
- RO systems reduce the incentive for public-funded water distribution systems and vast majority of the country can ill-afford such systems.
- In case of sea water desalinization, deposition of brine (highly concentrated salt water) along the shores affects plankton, which is the main food for small fish species.

How is the quality of piped water in the country?

- Under the Jal Jeevan Mission, GOI has committed to provide tap water to the entire country by 2024.
- However, studies show that the existing quality of piped water is deficient in much of India.
- In Delhi, all tap water samples drawn from various places did not comply with the BIS’s requirements.
- The case is the same with a lot of other cities.

What is the quality of water globally?

- Countries with a high development index tend to have good quality tap water.
- Finland, Denmark, Germany, UK have access to freshwater lakes or glacier melt (clean and mineral rich).
- Singapore and Israel rely on extensive recycling and even making sewage water fit for drinking.
- But for much of the world, access to clean piped water from the public supply remains a challenge.

{S&T – Technologies – 20/03} Cyber Physical Systems (CPS)

[IT](#) | [PIB](#) | GS3 > Technologies and their applications in daily life

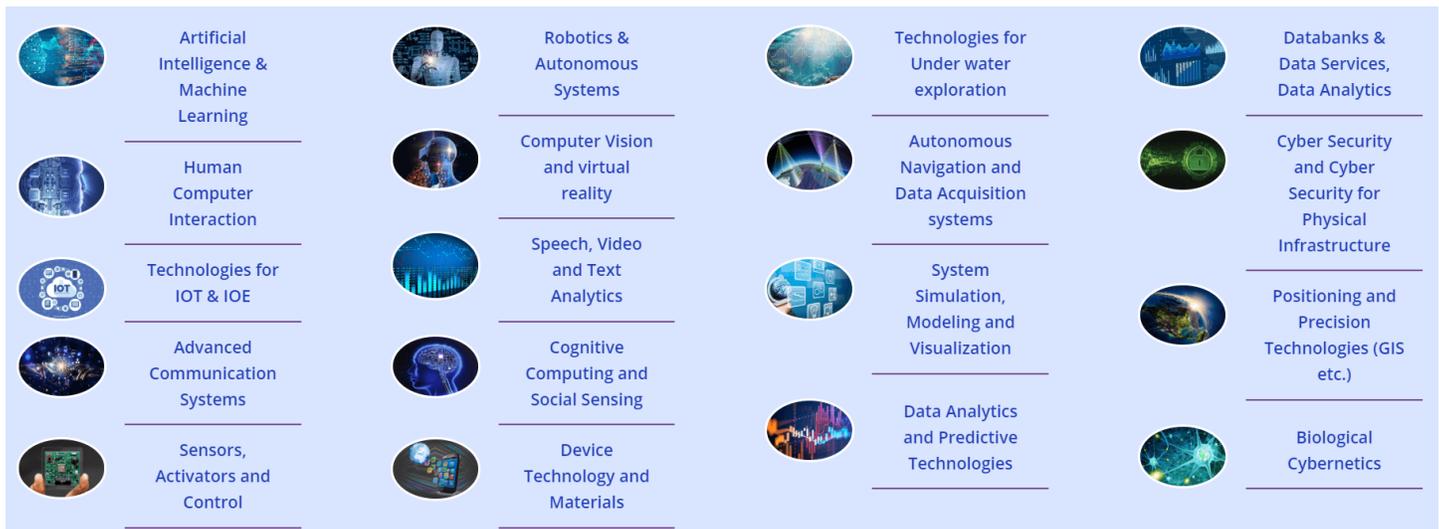
- Department of Science & Technology has sanctioned funds to IIT Mandi to start a Technology Innovation Hub (TIH) in its campus.
- DST has sanctioned the funds under its National Mission on Interdisciplinary Cyber-Physical Systems.

Cyber Physical Systems (CPS)

- CPS **integrates digital elements with physical objects** (e.g. machines, autonomous vehicles) and **data**.
- CPS have the capabilities of communication, data collection & processing, decision making and action.
- In CPS, a complex mechanism is controlled or monitored by computer algorithms.
- CPS is closely associated with technologies like AI, Internet of Things (IoT), Machine Learning (ML), Deep Learning (DP), Big Data Analytics, Robotics, Cybernetics, Mechatronics, Quantum Computing, etc.
- Examples of CPS include **smart grid, autonomous automobile systems**, medical monitoring, industrial control systems, robotics systems, etc.

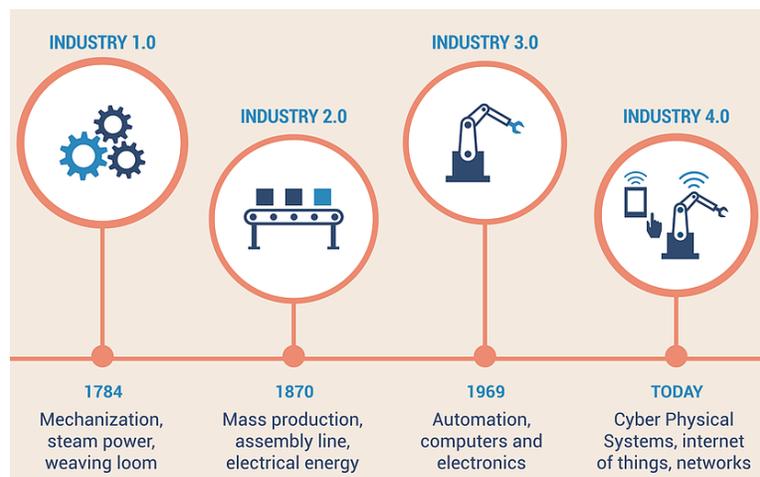
National Mission on Interdisciplinary Cyber Physical Systems (NM-ICPS)

- To harness the potential of **Cyber-Physical Systems (CPS)** and make India a leading player in CPS, the Union Cabinet approved the launch of NM-ICPS in 2018.
- Department of Science & Technology is implementing NM-ICPS since 2018 for a period of five years.
- NM-ICPS aims to create an integrated and overarching National platform to bring convergence among all stakeholders towards CPS technology development and effective implementations.
- The Mission aims at establishment of 15 numbers of **Technology Innovation Hubs (TIH)**, six numbers of **Application Innovation Hubs (AIH)** and four numbers of **Technology Translation Research Parks (TTRP)**.
- Technology Innovation Hubs (TIHs) will be the nodal centres spearheading the activities in a specific domain.
- These Hubs & TTRPs will connect Academics, Industry, Ministries and State Governments in developing solutions in a hub and spoke model.



The mission implementation would develop and bring:

- Cyber Physical Systems (CPS) and associated technologies within reach in the country.
- Adoption of CPS technologies to address India specific National/Regional issues.
- Produce Next Generation skilled manpower in CPS.
- Accelerate entrepreneurship and start-up ecosystem development in CPS.
- Give impetus to advanced research in CPS, Technology development and higher education in Science, Technology and Engineering disciplines.
- Place India at par with other advanced countries and derive several direct and indirect benefits.



I am compiling information related to new age technologies like AI, Internet of Things (IoT), Machine Learning (ML), Deep Learning (DP), Big Data Analytics, Robotics, Cybernetics, Mechatronics, Quantum Computing, etc.

I will be releasing them as one single document in the first week of May (April Current Affairs).

{Sci – GK – 20/02} Kerala bans CFL and filament bulbs from Nov 2020

- Kerala will impose a ban on the sale of CFL and incandescent bulbs starting from November 2020.

Tungsten Lamp or incandescent light bulb

- In an incandescent light bulb, a **wire filament (tungsten)** is heated to a high temperature by passing an electric current through it until it glows with visible light.
- The hot filament is protected from oxidation with a glass or quartz bulb that is filled with **inert gas**.

Why tungsten?

- Pure tungsten has **very high melting point** (3400 °C) (An electric current can heat the filament around 2000-3000 °C, which stays below the melting point of tungsten).
- It has very low vapor pressure, and greatest tensile strength out of all the metals.

CFL

- Compact fluorescent lamp is a fluorescent lamp designed to replace tungsten lamp.
- Compared to incandescent lamps, CFLs are highly energy efficient.
- Like all fluorescent lamps, CFLs contain **toxic mercury**.

Fluorescent lighting

- A fluorescent lamp is a low pressure mercury-vapor gas-discharge lamp.
- Electrons that are bound to mercury atoms are excited to states where they will radiate ultraviolet light as they return to a lower energy level.
- This emitted **ultraviolet light is converted into visible light** as it strikes the **fluorescent coating** on the bulb (**phosphor coating**).

LED lamp

- An LED lamp is a light-emitting diode (LED) product which is assembled into a lamp.
- LED lamps have a lifespan and electrical efficiency which are several times longer than incandescent lamps, and significantly more efficient than most fluorescent lamps.

Light-emitting diode (LED)

- A light-emitting diode (LED) is a two-lead semiconductor light source.

- It is a **p–n junction diode**, which emits light when activated.
- When a suitable voltage is applied to the leads, electrons are able to recombine with electron holes within the device, releasing energy in the form of **photons**.
- This effect is called **electroluminescence**, and the color of the light corresponds to the energy of the photon.

Comparison: LEDs – Incandescent Light Bulbs – CFLs

Type	 Light Emitting Diodes (LEDs)	 Compact Fluorescents (CFLs)	 Incandescent Light Bulbs
Life Span (average)	40X	7.5 X	X
Power consumption	7 watts (X)	14 watts (2X)	60 watts (9X)
Brightness in lumens	600	540	800
Annual Operating Cost	X	2X	10X
Contains TOXIC Mercury	No	Yes	No
CO ₂ Emissions due to power consumption	X	2X	10X
Heat output	Low	Medium	High
Heat sensitive	No	Yes	Yes
Moisture sensitive	No	Yes	Yes

{Sci – In News – 20/02} India develops new vaccine to control classical swine fever

[Source](#) | In News Topic for Prelims | Agri > Animal Rearing > Pork Industry

- The Indian Institute of Veterinary Research (IVRI) of ICAR has developed a new vaccine to control swine fever.
- India currently requires 22 million doses of the CSF (Classical Swine Fever) vaccine every year.
- However, currently, only 1.2 million doses are being produced.
- The reason behind its less production is that only 50 doses can be prepared from the spleen of a rabbit.

About the new vaccine

- The vaccine is a live attenuated CSF cell culture vaccine.

- The indigenously developed vaccine will help in saving rabbits as the currently used vaccine (lapinized CSF vaccine) is produced by sacrificing large numbers of rabbits.
- Besides, the new vaccine gives immunity for two years as compared to 3 to 6 months protection under the currently used vaccines.
- The new vaccine will be a part of the government's One Health Initiative.

What is Classical Swine Fever (CSF)?

- Classical swine fever (CSF) is a contagious viral disease in domestic (pig) and wild swine (Wild boar).
- Although there is no health risk to humans, it is highly transmissible among swine (pigs).
- As per 2019 census, the country's pig population declined to 9.06 million from 11.13 million in 2007.

{Sci – In News – 20/02} Sophisticated Analytical & Technical Help Institutes

[TOI](#) | In News topics for Prelims

- The **Department of Science & Technology (DST)** has launched a scheme called "**Sophisticated Analytical & Technical Help Institutes (SATHI)**".
- SATHI offers shared, professionally managed and strong S&T infrastructure which is readily accessible to academia, start-ups, manufacturing, industry and R&D labs.
- DST has set up three such centres in the country, one each at IIT Kharagpur, IIT Delhi and BHU.
- These Centres are expected to house instruments to provide common services of high-end analytical testing, thus avoiding duplication and reduced dependency on foreign sources.

Objectives of SATHI

- To address the issues of accessibility, maintenance, redundancy and duplication of expensive equipment in the institutions.
- This will also foster a strong culture of collaboration between institutions and across disciplines to take advantage of developments, innovations and expertise in diverse areas.

{Sci – In News – 20/03} COVID-19 National Teleconsultation Centre (CoNTeC)

PIB | In news topic for prelims

- CoNTeC: COVID-19 National Teleconsultation Centre.
- CoNTeC, conceptualised by the Ministry of Health, is being implemented by the AIIMS, New Delhi.

- The CoNTeC is a Telemedicine Hub wherein expert doctors from various clinical domains will be available 24x7 to answer the multifaceted questions from specialists from all over the country.
- It is a multi-modal telecommunications hub through which 2-way audio-video and text communications can be undertaken from any part of the country as well as the world at large.

{Sci – In News – 20/03} RaiDer-X

[PIB](#) | In news topics for prelims

- DRDO & the Indian Institute of Science, Bangalore have developed a bomb detection device called Raider-X.
- RaiDer-X can detect up to 20 explosives from a stand-off distance of two meters.
- It can also discern bulk explosives even if they have been concealed.
- RaiDer-X can also thwart the threat from homemade explosives made from ingredients like petrol.
- The device has various applications including narcotics, for local police, for customs and other detection agencies who need to detect various elements which may be explosive or non-explosive in nature.

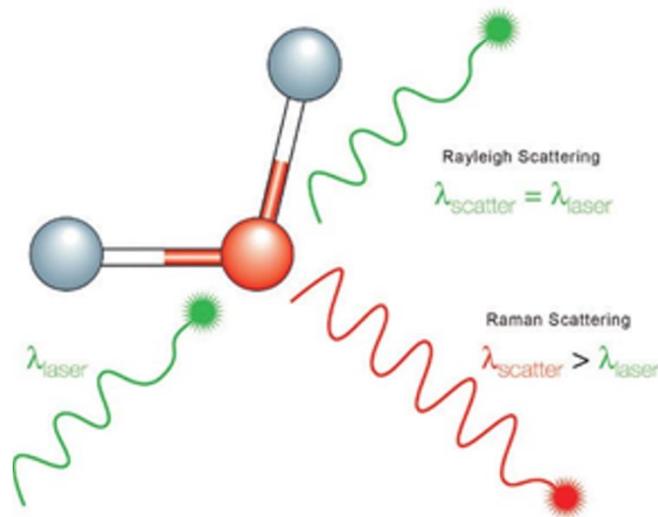
{Sci – Physics – 20/02} National Science Day (NSD)

[PIB](#) | General Science for Prelims

- 28th February is celebrated as National Science Day (NSD) in India.
- NSD is celebrated to commemorate discovery of the '**Raman Effect**' by Sir C.V. Raman
- Sir C.V. Raman won the 1930 Nobel Prize in Physics for his works in the field of light scattering.
- He was the **first Indian to receive Nobel Prize in any branch of science**.
- This year, the theme for National Science Day 2020 is "**Women in Science**", which aims to appreciate the contribution of women in the field of science.

What is Raman Effect?

- It is a phenomenon in **spectroscopy** (study of interaction between matter and electromagnetic radiation) discovered by Sir Chandrasekhara Venkata Raman in 1928.
- Raman Effect is a 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 beam.
- Most of this scattered light is of unchanged wavelength (color) (**Rayleigh scattered light**).
- A small part, however, has **wavelengths (color) different from that of the incident light**.
- In this case, **energy from the light particle is transferred to the molecules in the material** and the remaining energy is emitted as scattered light. This interaction process is known as the **Raman effect**.
- Raman spectroscopy can be used in applications requiring microscopic chemical analysis & imaging.
- One simple example is that the Raman spectroscopy can be used for measuring fat content in milk.

Entire COVID-19 and related topics will be covered in April Current Affairs