



HYPERLOOP 2018

**MATERIAL SCIENCE, GK & ETHICS ETC
CONSOLIDATED PRELIMS CURRENT AFFAIRS**

1. MATERIAL SCIENCE.....	4
1.1 NANOTECHNOLOGY.....	4
1.1.1 Carbon nanotubes in water treatment.....	4
1.1.2 IISc team fabricates nanomaterial to treat Parkinson’s disease.....	4
1.1.3 Hydrogen fuel from seawater.....	5
1.2 Biomaterials.....	5
1.2.1 Novel compounds destroy biofilm-forming bacteria.....	5
1.2.2 Flexible bio-glue for wound heal.....	5
1.3 Technologies.....	6
1.3.1 Plastic waste treatment.....	6
1.3.2 Applications of Perovskites.....	6
1.3.3 Unconventional superconductors.....	6
1.3.4 Smart windows.....	7
1.3.5 New earthquake-resistant concrete to be tested in India.....	8
1.3.6 Commercial use of smart acrylic polymer.....	8
2. ETHICS.....	9
2.1 Combating Corruption.....	9
2.2 Corporate Ethics.....	9
2.3 Corporate Governance.....	10
2.4 Uday Kotak committee proposes corporate governance reforms.....	11
3. SAFETY.....	12
3.1 Utkal Express derailment: yawning gaps in communication and track safety.....	12
3.2 Rail Safety – Anil Kakodkar Committee and after.....	13
3.3 India’s roads to be safer.....	13
3.4 Mumbai’s Elphinstone bridge stampede.....	14
3.5 NTPC boiler accident.....	14
4. GENERAL KNOWLEDGE.....	16
4.1 SCIENCE AND TECHNOLOGY.....	16
4.1.1 Hyperloop One.....	16
4.1.2 Sharpest laser can help test Einstein’s theory.....	16
4.1.3 Nightside of Venus.....	16

4.1.4 Planet Nine does exist in our solar system: NASA	17
4.1.5 Observations confirm neutron star merger	17
4.1.6 Narrow rings of comets spotted forming planets.....	17
4.1.7 India's Space mission to Moon 'Chandrayaan- II' in 2018	17
4.1.8 China unveils Asia's largest cutting-edge dredger	18
4.1.9 Uber, Nasa to develop flying taxis	18
4.2 ARMS AND AMMUNITIONS.....	18
4.2.1 Astra Missile	18
4.2.2 Artillery gun sets new record in range.....	19
4.2.3 A bigger nuclear submarine	19
4.2.4 India successfully tests glide bomb.....	19
4.2.5 NIRBHAY' Sub-Sonic Cruise Missile	20
4.2.6 Brahmos	21
4.2.7 First private sector anti-tank guided missile project	22
4.2.8 Yudh Abhyas 2017.....	22
4.2.9 Exercise INDRA - 2017: Indo-Russia Joint Exercise	22
4.2.10 India, Kazakh armies begin joint exercise in Himachal	22
4.3. NOBEL PRIZES, 2017	23
4.3.1 Nobel prize in Medicine 2017	23
4.3.2 The Nobel Prize in Physics 2017.....	23
4.3.3 Nobel prize in Chemistry 2017.....	23
4.3.4 Nobel Prize in Peace 2017.....	24
4.3.5 Nobel Prize in Economics 2017	24
4.3.6 Man Booker prize 2017.....	24
4.4. MEDICINE AND HEALTH	25
4.4.1 Experimental vaccine against HIV.....	25
4.4.2 Gene Tool.....	25
4.4.3 New dengue virus confirmed in India	25
4.4.4 The superbug of Hyderabad.....	25
4.4.5 Japanese Encephalitis in Gorakhpur	26
4.4.6 Scientists gene-edit piglets	26

4.4.7 Engineering babies 26

4.4.8 Designer babies 26

4.4.9 Three Parent babies 27

4.5.MISCELLANEOUS 27

4.5.1 Pacific shadow-zone 27

4.5.2 GI for Rosogolla 27

4.5.3 State Tree for Goa 27

4.5.4 NOTA 27

4.5.5 Voter Verifiable Paper Audit Trail (VVPAT) 28

4.5.6 National Agri-Food Biotechnology Institute 28

4.5.7 Article 35A 28

IES



GS

1. MATERIAL SCIENCE

1.1 NANOTECHNOLOGY

1.1.1 Carbon nanotubes in water treatment

Scientists have developed carbon nanotubes over 50,000 times thinner than a human hair which can separate salt from seawater.

Purifying mechanism:

- Membranes with specialised pores mimic highly efficient and water selective biological proteins.
- The super smooth inner surface of the nanotube is responsible for their remarkably high water permeability, while the tiny pore size blocks larger salt ions.
- The narrow hydrophobic channel forces water to translocate in a single-file arrangement

Low power water filter

The water filter developed by Indian Institute of Technology (IIT) Bombay has a high desalination rate and capacity

- The researchers used a novel way to produce the electrodes
- Carbon nanotubes were synthesised and cellulose thread was dip coated with these nanotubes. The dried carbon nanotube thread was then closely wound across flat copper plates to produce the electrodes
- Carbon nanotubes are hydrophobic in nature, cellulose thread is highly water-loving (hydrophilic).
- Carbon nanotubes thread is hydrophilic and mesoporous.

1.1.2 IISc team fabricates nanomaterial to treat Parkinson's disease

A metal oxide nanomaterial that is capable of mimicking all three major cellular antioxidant enzymes

- Controls the level of reactive oxygen species (ROS) inside cells.
- Promising against oxidative stress-induced neurological disorders, particularly Parkinson's
- Excess of ROS generated is usually controlled by the action of three antioxidant enzymes (superoxide dismutase, catalase and glutathione peroxidase).

The nanomaterial

- The manganese oxide nanomaterial was able to control the level of ROS inside the cells.
- It is not toxic up to a few microgram.

1.1.3 Hydrogen fuel from seawater

A new nanomaterial uses solar energy to generate hydrogen from seawater.

- The advance may lead to a new source of hydrogen fuel and ease demand for fossil fuels
- The new catalyst stand up to the harsh conditions found in seawater.
- By controlling the density of sulphur vacancy within the nanoflakes, they can produce energy from ultraviolet-visible to near-infrared light wavelengths, making it at least twice as efficient as current photocatalysts.

1.2 BIOMATERIALS**1.2.1 Novel compounds destroy biofilm-forming bacteria**

Two new molecules capable of destroying bio-film forming bacteria have been developed by scientists at the Bengaluru-based Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR).

What are biofilms?

- Biofilms are communities of microorganisms that attach to each other and to surfaces and are able to act as barriers to antibiotics.

1.2.2 Flexible bio-glue for wound heal

Scientists have developed a super strong, flexible adhesive material inspired by the glue secreted by slugs that sticks to biological tissues – even when wet – without causing toxicity.

About the new bio-glue

The new material is a double- layered hydrogel consisting of an alginate-polyacrylamide matrix supporting an adhesive layer that has positively- charged polymers protruding from its surface.

- The polymers bond to biological tissues via three mechanisms – electrostatic attraction to negatively charged cell surfaces, covalent bonds between neighbouring atoms, and physical interpenetration – making the adhesive extremely strong.
- It has the combination of a very strong adhesive force the “tough adhesive” is biocompatible without causes tissue damage.

1.3 TECHNOLOGIES

1.3.1 Plastic waste treatment

- CSIR-Indian Institute of Chemical Technology (IICT) and GAIL has developed a catalyst that can be used for conversion of waste plastics to fuel oils.
- One kilogram of waste polyethylene and polypropylene can be converted to either about 600-650 ml of petrol or 700-750 ml of diesel along with LPG.

1.3.2 Applications of Perovskites

Technically, a perovskite is a type of mineral that was first found in the Ural Mountains and named after Lev Perovski .

- True perovskite (the mineral) is composed of calcium, titanium and oxygen in the form CaTiO_3 .
- Meanwhile, a perovskite structure is anything that has the generic form ABX_3 and the same crystallographic structure as perovskite (the mineral).

Depending on which atoms/molecules are used in the structure, perovskites can have an impressive array of interesting properties including superconductivity, giant magnetoresistance, spin-dependent transport (spintronics) and catalytic properties.

- In the case of perovskite solar cells, the most efficient devices so far have been produced with the following combination of materials in the usual perovskite form ABX_3 :
 - A = An organic cation - methylammonium (CH_3NH_3)⁺
 - B = A big inorganic cation - usually lead(II) (Pb_2^+)
 - X_3 = A slightly smaller halogen anion – usually chloride (Cl^-) or iodide (I^-)

1.3.3 Unconventional superconductors

Researchers from the Los Alamos National Laboratory in the U.S. showed that among superconducting materials in high magnetic fields, the phenomenon of electronic symmetry breaking is common.

- Heavy fermion superconductor CeRhIn_5 revealed a state in which the material's electrons aligned in such a way to apparently reduce the symmetry of the original crystal

Unconventional superconductivity

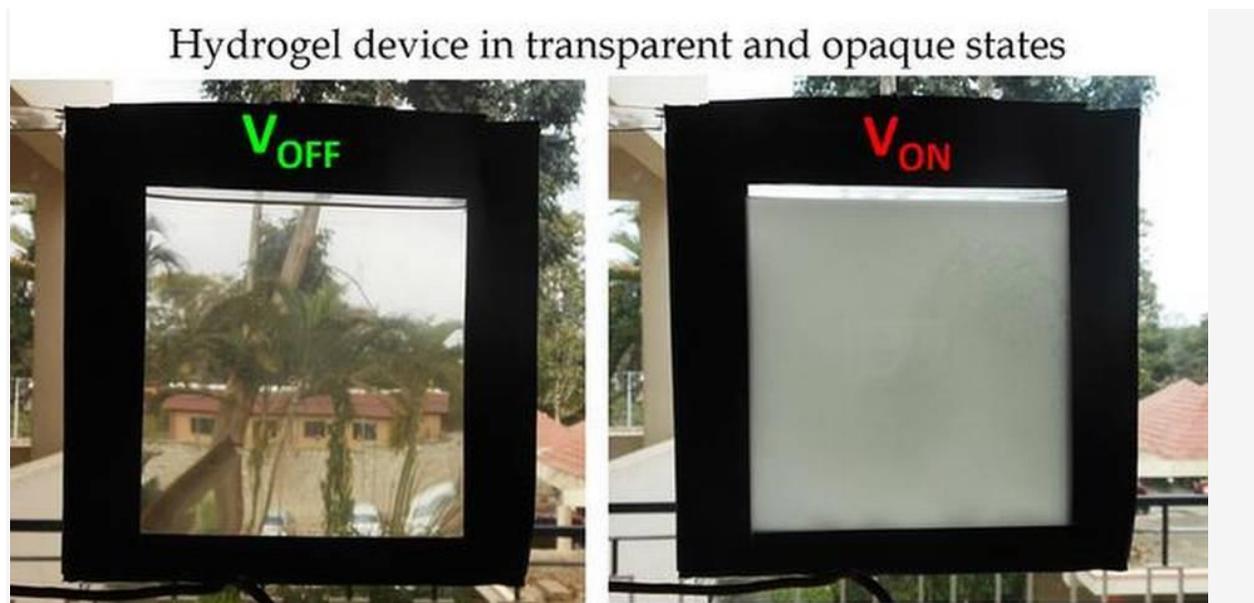
- The unconventional superconductivity develops near a phase boundary separating magnetically ordered and magnetically disordered phases of a material

- The source of the superconductivity of these materials is likely different from the electron-ion interactions that are at the heart of conventional superconductivity

Superconductivity

- Superconductivity is the ability of certain materials to conduct electric current with practically zero resistance
- Superconductors are not only perfect conductors, but also exhibit the so-called Meissner effect, where they expel magnetic fields.
- Superconductivity is extensively used in magnetic resonance imaging (MRI), particle accelerators, magnetic fusion devices, and microwave filters.

1.3.4 Smart windows



- Researchers at the Centre for Nano and Soft Matter Sciences (CeNS) have come up with three different types of windows (thermochromic, hydrocarbon, hydrogel) with different behaviours.
- Windows made of hydrogel change from transparent to opaque when heated and back to transparent when heat is removed.
- Thermochromic and hydrocarbon windows are opaque at room temperature and become translucent and transparent respectively when heated.

Basic component of these optoelectronic devices (electronic devices that operate on both light and electrical currents) is the transparent heater.

- Thermochromic windows have an ordinary glass-based transparent heater coated with commercially available temperature-sensitive pigments.
- By supplying very small (0.2 watts/cm²) current
- The second and third type windows were fabricated by filling in either hydrocarbon (commonly available fatty acid) or a hydrogel (hydroxypropyl methyl cellulose) between a glass mounted with transparent heater and a plain glass.
- The hydrogel windows can restrict infrared radiation thus reducing the indoor temperature.

1.3.5 New earthquake-resistant concrete to be tested in India

Researchers plan to retrofit a school building in quake-prone Uttarakhand with a novel concrete coating that can dramatically enhance the earthquake resistance of seismically vulnerable structures.

EDCC- eco-friendly ductile cementitious composite

- The seismic-resistant, fibre-reinforced concrete developed at the University of British Columbia (UBC) in Canada
- The material is engineered at the molecular scale to be strong, malleable, and ductile, similar to steel - capable of dramatically enhancing the earthquake resistance of a seismically vulnerable structure when applied as a thin coating on the surfaces.
- EDCC combines cement with polymer-based fibres, fly ash and other industrial additives, making it highly sustainable.

This is quite an urgent requirement as one tonne of cement production releases almost a tonne of carbon dioxide into the atmosphere, and the cement industry produces close to seven per cent of global greenhouse gas emissions.

1.3.6 Commercial use of smart acrylic polymer

IIT Kharagpur collaborating with companies for commercial use of smart acrylic polymer.

Highlights:

- Researchers at the Indian Institute of Technology Kharagpur have invented a smart polymeric material that can fix car scratches and dents by simply heating the damaged area if it is coated with this material.
- If the car is coated with this material when it is manufactured, then a scratch on your car may not need a fresh paint anymore but only heating.

- The institute is collaborating with companies such as Asian Paints and Pidilite to make this solution

2. ETHICS

2.1 Combating Corruption

Government Initiatives

- Government has adopted “zero tolerance to corruption” approach
- “minimum government and maximum governance” aims simplification of the governance model
- Special investigation team was constituted to fight black money
- International cooperation in G-20 meetings on ending tax havens
- “making government smarter” is at the forefront of the Nation’s Fight against Corruption.
- The Aadhar Act was promulgated to ensure targeted delivery of financial and other subsidies, benefits and services.
- Government E-Market (GEM) have helped improve the accountability and integrity in public procurement.
- The RTI Act has led to improvements in governance.

2.2 Corporate Ethics

The internal battle between Infosys co-founder N.R. Narayana Murthy and its CEO Vishal Sikka has finally culminated in the latter submitting resignation

The dispute

- The company’s founders expressed concerns over transparency and corporate governance.
- They have questioned the compensation package of Chief Executive Officer (CEO) Vishal Sikka and the severance package to its former chief compliance officer David Kennedy and former CFO Rajiv Bansal
- No adequate explanation given for the package offered
- It is done while giving only 80 per cent variable for employees in the company
- Such payments raise doubts whether the company is using such payments as hush money to hide something.
- It affected the morale of many people have made huge sacrifices to build the company

- Promoters of Infosys had earlier abstained from voting to give an extension to Sikka for another two years
- Has objection towards Vishal Sikka's shift in culture towards a less-people more-software-driven business approach
- Shareholders are raising concern on buyback options
- Infosys losing its image of the transparent organisation

What is Good Corporate governance?

- Good governance is about doing what is fair in a transparent manner with full accountability accepted by senior leaders and board members for their actions.
- Good governance results from following – when in doubt, disclose. ie maintaining transparency in all actions.
- Good corporate governance is about enhancing shareholder value on a sustainable basis while ensuring fairness, transparency and accountability in every action vis-à-vis every stakeholder – customers, employees, investors, vendor-partners, government of the land and society.
- Corporate governance is about maximizing shareholder value legally, ethically and on a sustainable basis.
- Sound corporate governance is critical in enhancing and retaining investor trust.
- It includes
 - Making a clear distinction between personal convenience and corporate resources
 - Communicating externally in a truthful manner about how the company is run internally
 - Complying with the laws in all the countries in which the company operates

2.3 Corporate Governance

SEBI(Securities and Exchange Board of India), the capital markets regulator, is empowered to protect the interest of investors.

- As India is moving towards internationally accepted norms of corporate governance, conflicts happens between modern, free-market capitalism on the one side and the forces of 'compassionate capitalism' on the other
- A three-tier governing system for companies is suggested where

- a supervisory board is constituted and should lay down the framework for the functioning of the board of directors
- It will monitor performance as well as the value system for the company
- The board of directors, in turn, oversees the functioning of the executive management
- Multinationals like Google and Microsoft are governed in this manner

SEBI had constituted a committee on corporate governance under the chairmanship of Uday Kotak in June.

Uday Kotak Committee

To advise SEBI on issues relating to corporate governance in Indian firms, including issues such as

1. Ensuring independence in spirit of Independent Directors and their active participation in functioning of the company
2. Improving safeguards and disclosures pertaining to Related Party Transactions
3. Issues in accounting and auditing practices by listed companies
4. Improving effectiveness of Board Evaluation practices
5. Addressing issues faced by investors on voting and participation in general meetings
6. Disclosure and transparency related issues
7. Any other matter, as the Committee deems fit pertaining to corporate
8. panel on corporate governance reforms has suggested more powers governance in India.

2.4 Uday Kotak committee proposes corporate governance reforms

Uday Kotak-led Sebi for independent directors, greater transparency.

The recommendations span areas such as the composition of the board, the makeup of board committees, treatment of subsidiaries, information sharing with promoters and related-party transactions, audit evaluations, and conduct of annual general meetings.

Some of the suggestions are :

- Chairman of the board can not be managing director or CEO of company
- Boards to have at least one independent women director.
- Boards to have minimum of 6 directors.

- Independent directors to constitute 50% of the board.
- Sebi to have power to grant immunity to whistle- blower.
- Sebi to penalize auditors if lapses are found.

3.SAFETY

3.1 Utkal Express derailment: yawning gaps in communication and track safety

The Puri-Haridwar Utkal Express derailed in Khatauli in Uttar Pradesh's Muzaffarnagar district with 14 coaches of the train jumped off the track

- Railways admits to lapse by Engineering department as prima facie cause of accident
- Railways has taken action against eight officials over the accident. Four railway officials have been suspended over the train accident(Senior Divisional Engineer, Assistant Engineer, Senior Section Engineer and a Junior Engineer) .
- These officers are from The Civil Engineering department of Indian Railways is managed by IRSE(Indian Railways Service of Engineers) cadre . These officers are responsible for maintenance of all fixed assets of Indian Railways, i.e. Track, Bridges, Buildings, Roads, Water supply,land etc.
- Recruitment to service this is done through "Engineering Services" examination

As the accident that appeared to have been caused due to negligence, shows how important is 'safety' in operations. Safe operating practices are very important while in service, especially when the officers are responsible for safety of people. The officers have moral responsibility to ensure safety, is a part of both professional and personal ethics

- Instead of engaging in relief operations, after the accident, employees of different railway wings in the Khatauli-Muzaffarnagar area have started a blame game
- Derailment could have been caused by the ongoing repair work on the rail line; station master insists he was not informed about any maintenance
- The repairs cannot happen without prior permission for blockage of traffic. The Engineering Department has to inform the Station Manager and also get the go-ahead for the blocking from senior officials

3.2 Rail Safety – Anil Kakodkar Committee and after

The safety review committee headed by Dr Anil Kakodkar in 2012 noted that there has been massive underinvestment in track renewal and signalling systems for long

- Rail minister Suresh Prabhu had announced earlier this year that the Railways would allocate about Rs 10,000 crore for renewal of tracks and adopt the latest technology to detect rail fracture.
- The Railways is also reportedly setting up a Rs 1,00,000 crore safety fund, as recommended by the Kakodkar committee.
- There is a need for a statutory and empowered Railway Safety Authority as called for by the Kakodkar panel, for vetting routine rail safety and maintenance.

Other steps taken for safety

- Railways has decided to stop the production of ICF coaches, which are deemed unsafe. These coaches don't have anti-climbing and anti-capsizing features, which causes an increase in the number of casualties.
- All new coaches that are being manufactured are the safer LHB coaches with German design
- Indian Railways to hire close to 200,000 workers over the next few years aimed at strengthening its safety and ground patrolling divisions.

3.3 India's roads to be safer

National Highways Authority of India (NHAI) set to roll out an 'incident management system'.

- Ambulances will be stationed every 50 kilometres to be able to respond to any mishap within 15 minutes of it being reported on a national accident helpline.
- A larger four-bedded ambulance with medical recovery systems that can save lives within the 'golden hour'(the first hour after an accident) will be placed every 100 km of highway lengths in seven States to begin with: Tamil Nadu, Delhi, Rajasthan, Uttar Pradesh, Haryana, Gujarat and Maharashtra.

The NH authority has also proposed the creation of a new highways operations division to focus on aspects related to roadside amenities, highway safety and security, and smooth transition of vehicles at toll gates.

3.4 Mumbai's Elphinstone bridge stampede

This tragedy unfolded during morning rush hour at a narrow foot overbridge connecting the busy Elphinstone Road and Parel train stations in Mumbai. A large crowd poured into the bridge – already bursting with people taking shelter from a sudden, heavy downpour – when four trains rolled in at the same time

Scenario of other places in the city

- Similar scenes unfold every day at rush hour in other stations like Dadar, Lower Parel and Currey Road etc
- Elphinstone Road and Parel, between them, see around 3 lakh passengers a day.
- The Foot Over Bridges, however, have not been widened for decades, and comprehensive renovation are long overdue.

Crowd Management problem in India

India with huge population, Stampedes are becoming more and more frequent, especially at busy places and also in religious congregations. There is an urgent need of chalking out a detailed plan to manage crowd, by identifying all choking points. People also should be sensitized to follow queues especially in such congested places

3.5 NTPC boiler accident

The explosion at NTPC's 1,550 MW power plant at Unchahar, close to Lucknow, has claimed 32 lives, injured scores and shut down one of the plant's six units

- NTPC is one of India's better run companies, where employee morale is generally high, the habit of shirking responsibility absent.
- Yet an accident took place that should not have.

Basis

- High pressure boilers are hazardous pieces of equipment, which are strictly regulated with special laws.
- the Indian Boilers Act, 1923 is to ensure the safety of life and protection of property by mandating uniform standards in the quality and upkeep of these units.
- boilers are designed to provide warnings as soon as dangerous pressure builds up and trigger automatic safety devices at a critical point.
- They should undergo periodic inspections to ensure that all these features are working and intact

Lessons

- Safety is a function of engineering, quality procurement of equipment, standard operating procedure, including maintenance, a culture of adherence to rules and work discipline.
- The immediate cause of the explosion, reportedly, was the build-up of ash in a pipeline and the resultant buildup of pressure.
- The blocking of an outlet for waste gases by ash, unusual in a fairly new boiler, calls for an inquiry into the quality of the equipment and the fuel used
- An inquiry will establish whether it was a mistake to not have shut down the unit, instead of merely running it to a lower capacity.

Questions

- Was the coal used supplied with a misleading grade classification?
- Does NTPC not beneficiate coal to specified levels at its own plants, instead of relying on slipshod classification by coal suppliers?
- Is Coal India pushing up output by shipping out ever lower grades of coal with very high ash content?
- Does the company that insures the plant against industrial accidents of the kind that has taken place have any independent assessment of risk and quality norms that it seeks enforced?
- Does the security officer of the plant focus on law-and-order variety of threats, neglecting operational safety?
- In automated, continuous process plants, computers guide operations. Are the SCADA systems deployed for this purpose secure against cyber sabotage?
- Is Industrial regulation viewed as a barrier to ease of doing business in India?
- Is self-certification and third-party certification of facilities enough to ensure safety?

4. GENERAL KNOWLEDGE

4.1 SCIENCE AND TECHNOLOGY

4.1.1 Hyperloop One

- High-speed transportation system Hyperloop. One has successfully tested its prototype passenger pod 'XP-1', reaching a speed of up to 310 km per hour.
- Passengers and cargo are loaded into a pod, and accelerate gradually via electric propulsion through a low-pressure tube.
- The pod then lifts above the track using magnetic levitation and glides at airline speeds for long distances due to ultra-low aerodynamic drag.

4.1.2 Sharpest laser can help test Einstein's theory

- Scientists have developed the world's sharpest laser with record-breaking precision that can help make optical atomic clocks more precise as well as test Einstein's theory of relativity.
- Researchers have now developed a laser with a linewidth of only 10 milliHertz (mHz) — closer to the ideal laser than ever before

Significance of this discovery:

This precision is useful for various applications such as optical atomic clocks, precision spectroscopy, and radio astronomy and for testing the theory of relativity.

4.1.3 Nightside of Venus

The night side exhibits unexpected and previously-unseen cloud types, morphologies, and dynamics — some of which appear to be connected to features on the planet's surface.

Findings:

- Venus' atmosphere is dominated by strong winds that whirl around the planet far faster than Venus itself rotates.
- This phenomenon, known as 'super-rotation', sees Venusian winds rotating up to 60 times faster than the planet below, pushing and dragging along clouds within the atmosphere as they go.
- The team used European Space Agency's (ESA) Venus Express spacecraft to observe the clouds in the infrared.

4.1.4 Planet Nine does exist in our solar system: NASA

May be 10 times the mass of the Earth and 20 times away from the Sun than Neptune

Super earth - planet 9

- Super Earth is a planet with a mass higher than the Earth's, but substantially lower than the masses of ice giants Uranus and Neptune.
- The signs so far are indirect, mainly its gravitational footprints

4.1.5 Observations confirm neutron star merger

The neutron star merger is detected on August 17 by the LIGO-VIRGO collaboration of gravitational wave detectors.

Observation

- Above observation has been reinforced by the observation of short gamma ray (light waves) bursts almost simultaneously by other space and earth-based observatories.
- Gamma ray bursts were observed by several telescopes including the Giant Metrewave Radio Telescope (GMRT), the Himalayan Chandra Telescope (HCT) and AstroSat.
- The sensitive CZTI(The Cadmium Zinc Telluride Imager) on AstroSat helped narrow down the location of the gamma-ray flashes.

4.1.6 Narrow rings of comets spotted forming planets

Scientists using NASA telescopes have spotted narrow dense rings of comets coming together to form massive planets on the outskirts of at least three distant solar systems. NASA observatories involved are the Infrared Telescope Facility in Hawaii and the Spitzer Space Telescope

4.1.7 India's Space mission to Moon 'Chandrayaan- II' in 2018

- India's second lunar exploration mission after Chandrayaan-1.
- It includes a lunar orbiter, lander and rover, all developed by India
- This mission will use and test various new technologies and conduct new experiments.
- The wheeled rover will move on the lunar surface and will perform on-site chemical analysis.

4.1.8 China unveils Asia's largest cutting-edge dredger

China has floated out a giant island-building vessel, which has been called “a magic island-maker” by its designer and is considered the most powerful vessel of its type in Asia.

- The launch comes amid ongoing territorial disputes in the South China Sea.
- The vessel ‘Tiankun’, has a deck as long as five basketball courts, can smash underwater rocks and then suck out sand, water, and mud, and transfer the substance up to 15 kilometers away.

4.1.9 Uber, Nasa to develop flying taxis

Uber on Wednesday unveiled a partnership with NASA that will see it develop flying taxis priced competitively with standard Uber journeys.

It also announced Los Angeles will join two other previously revealed “UberAIR” pilot schemes in Dallas Fort-Worth, Texas, and Dubai.

Main Points

- Uber’s participation in NASA’s UTM (Unmanned Traffic Management) Project will help the company’s goal of starting demonstration flights of uberAIR in select U.S. cities by 2020,
- The first demonstration flights are expected in 2020, moving into commercial operations by 2023
- The vehicles will take off, land and recharge upon a network of “vertiports” installed on top of parking garages, on existing helipads or on unused land around road interchanges.

4.2 ARMS AND AMMUNITIONS

4.2.1 Astra Missile

The final Development Flight Trials of Astra – Beyond Visual Range Air to Air Missile (BVRAAM) was conducted recently over the Bay of Bengal, Off the Coast of Chandipur, Odisha. The trials were successful.

- It is one of the smallest weapon system developed by DRDO
- It possesses high Single Shot Kill Probability (SSKP) making it highly reliable.
- It has advanced on-board electronic counter-measures that jam radar signals from enemy radar, making tracking of the missile difficult.

4.2.2 Artillery gun sets new record in range

- An indigenous artillery gun, Advanced Towed Artillery Gun System (ATAGS), being jointly developed by the Defence Research and Development Organisation (DRDO)
- The private sector has set a new world record in range by hitting targets at a distance of 48 km

Features

- The record was achieved with special ammunition, “high explosive – base bleed” (HE – BB) by the ATAGS variant developed by Kalyani Group.
- The development is being done through a consortium based model, similar to that adopted for the Pinaka multi-barrel rocket launch system.

4.2.3 A bigger nuclear submarine

Strategic nuclear submarine Aridhaman

- It will have a stronger weapons configuration integrated into an extra compartment that would be added to Arihant’s original design.
- It is the indigenously built second nuclear submarine
- Will carry several new pieces of equipment including new-generation sensors and periscope, compared to the first ship.

4.2.4 India successfully tests glide bomb

The ‘smart anti-airfield weapon’ (SAAW)

- Indigenously-developed by the Defence Research and Development Organisation’s Research Centre Imarat (RCI), other labs and the Indian Air Force
- The project was sanctioned in September 2013
- Is a lightweight(120 kg) ‘glide bomb’
- Is a smart weapon, which is capable of engaging targets with high precision up to a range of 100 km.
- will allow the IAF to easily hit targets across the border without putting the pilot and aircraft at risk

Test Particulars

- Tested at Chandipur in Odisha.
- The guided bomb released from the airforce aircraft and guided through precision navigation system, reached the targets at greater than 70 km range, with high accuracies
- This was the third test

- Three tests of the SAAW with different release conditions and ranges were conducted and all were successful
- first test from an IAF Jaguar aircraft in Bengaluru. The second test was conducted from a Su-30MKI fighter
- SAAW will soon be inducted into the armed forces

4.2.5 NIRBHAY' Sub-Sonic Cruise Missile



Defence Research and Development Organisation (DRDO) achieved yet another feat today with the successful test flight of 'NIRBHAY' - India's first indigenously designed

Significance of the missile

- The missile has the capability to loiter and cruise at 0.7 Mach, at altitudes as low as 100 m.
- Developed Long Range Sub-Sonic Cruise Missile which can be deployed from multiple platforms.
- This successful trial would take India to the select League of Nations for possessing this complex technology and sub-sonic cruise missile capability.

4.2.6 Brahmos

BrahMos missile tested from Sukhoi fighter jet

- A lighter BrahMos missile - weighing 2.4-tonne instead of the original 2.9-tonne
- Will upgrade India's precision-strike weapon into a deep surgical-strike one.
- BrahMos supersonic cruise missile flies almost three times the speed of sound at Mach 2.8
- Sukhoi-30MKI fighter jet has a cruising range of 3,200-km
- The air-to-ground BrahMos missiles can conceivably be used for pinpoint strikes
- The armed forces have already inducted the 290-km range land and warship-based versions of the BrahMos missiles
- the armed forces are also testing an extended range BrahMos that can hit targets 450-km
- initial work has also begun on developing a hypersonic version of the BrahMos, capable of flying at a speed of over Mach 5



- It is described as the world's fastest supersonic cruise missile, from land, sea and air.
- With this India completing the tactical cruise missile triad for the country.
- The defence ministry said the missile hit a sea-based target in the Bay of Bengal from the combat jet.

- The land and warship versions of the missile have already been inducted into the armed forces.

What is Nuclear Triad?

A nuclear triad refers to the nuclear weapons delivery of a strategic nuclear arsenal which consists of three components: land-based intercontinental ballistic missiles (ICBMs), strategic bombers, and submarine-launched ballistic missiles (SLBMs).

4.2.7 First private sector anti-tank guided missile project

Kalyani Rafael Advanced Systems (KRAS), a joint venture between Kalyani Strategic Systems Limited and Israel's Rafael Advanced Defence Systems, opened its facility in Hyderabad

- Besides supplying to the Indian Army, the plan is to export to South East Asian countries
- Formed in line with the 'Make in India' initiative of the Centre and the policy to encourage private sector participation in defence production

4.2.8 Yudh Abhyas 2017

Joint Indo US exercise, Exercise Yudh Abhyas 2017 concluded in September 2017 at Joint Base Lewis McChord (JBLM), Washington, USA. The training was focused on specialised drills and procedures involved in counter insurgency, counter terrorist operations in an urban environment.

4.2.9 Exercise INDRA - 2017: Indo-Russia Joint Exercise

Is the first ever Tri Services Joint Exercise between Indian and Russian Armed Forces conducted in the Eastern Military District of Russia.

- It will provide an opportunity to the armed forces of both countries to train in counter terrorism operations in a multinational scenario in a joint tri service environment

4.2.10 India, Kazakh armies begin joint exercise in Himachal

Indian and Kazakh armies today began a 14-day joint exercise in Himachal Pradesh.

Key facts:

- This is second joint military exercise between the two countries.
- The first edition of "Prabal Dostyk" was held in Kazakhstan in 2016.
- The joint exercise is aimed at enhancing the military ties between the two countries.

- Achieving interoperability between the two armies.

4.3. NOBEL PRIZES, 2017

4.3.1 Nobel prize in Medicine 2017

Jeffrey C. Hall, Michael Rosbash and Michael W. Young

- For their work on finding genetic mechanisms behind circadian rhythms
- Circadian rhythms will help adapt the workings of the body to different phases of the day, influencing sleep, behaviour, hormone levels, body temperature and metabolism.
- Chronic misalignment between our lifestyle and the rhythm of biological clock is associated with increased risk for various diseases

4.3.2 The Nobel Prize in Physics 2017

One half awarded to Rainer Weiss, the other half jointly to Barry C. Barish and Kip S. Thorne

- For decisive contributions to the LIGO detector and the observation of gravitational waves

Gravitational waves

- The discrepancies in Newton's theory were resolved by Einstein's general theory of relativity
- He postulated the existence of gravitational waves and created the mathematical foundation for it.
- US-based Ligo had detected the gravitational waves.
- It provides the evidence of black holes, its size etc

Indian Ligo

- The Indian Ligo ((Laser Interferometer Gravitational-Wave Observatory) will be a replica of the two US observatories, and the three will together to form an array of Ligo facilities
- The Indian Ligo is slated to begin scientific operations in 2024
- The Pune-based Inter-University Centre for Astronomy and Astrophysics is leading the project.

4.3.3 Nobel prize in Chemistry 2017

Jacques Dubochet, Joachim Frank and Richard Henderson

- Developed cryo-electron microscopy for the high-resolution structure determination of biomolecules in solution.

- 'Cryo', short for cryogenic refers to very low temperatures(below minus 150°C)
- The object to be imaged is frozen to such low temperatures to facilitate being studied under the beam of the electron microscope.

4.3.4 Nobel Prize in Peace 2017

International Campaign to Abolish Nuclear Weapons (ICAN), a coalition of non-governmental organisations from over 100 countries around the globe.

Area of work:

- Its work to draw attention to the catastrophic humanitarian consequences of any use of nuclear weapons
- Its ground-breaking efforts to achieve a treaty-based prohibition of such weapons

4.3.5 Nobel Prize in Economics 2017

Richard Thaler, Professor of Economics and Behavioural Science at the University of Chicago.

- Combined economics with insights from psychology to show how heavily economic decisions are influenced by cognitive biases
- Mr Thaler developed a theory of mental accounting, which explains how people making financial decisions look only at the narrow effect of individual decisions rather than the whole effect
- He had supported demonetisation in India as a first step towards cashless economy and fighting corruption.

4.3.6 Man Booker prize 2017

American author George Saunders won the prestigious Man Booker Prize for fiction Lincoln in the Bardo.

- The book juxtaposes events from Lincoln's life and the U.S. Civil War through passages from historians both real and fictional
- In Tibetan Buddhism, the bardo is the transition state between death and rebirth.

4.4. MEDICINE AND HEALTH

4.4.1 Experimental vaccine against HIV

- Obstacle to creating an effective HIV vaccine is the difficulty of getting the immune system to generate antibodies against the sugar shield of multiple HIV strains.
- The new vaccine addresses this problem by designing a vaccine component that mimics a protein-sugar part of this shield.

4.4.2 Gene Tool

- Scientists have created a new gene editing tool that tweaks the individual RNA 'letters' in human cells without making changes to the entire genome, paving the way for therapies that can reverse mutations.
- The tool was developed by scientists from The Broad Institute and Massachusetts Institute of Technology.

4.4.3 New dengue virus confirmed in India

A new dengue virus has been confirmed for the first time in the country. New virus of an Asian genotype (genetic structure) was a concern as it was associated with severe and extensive epidemics in Singapore in 2005 and Sri Lanka in 2009.

Emergence of the Asian genotype of DENV-1 in South India

- There are four distinct types circulating in India — dengue virus type 1 (DENV-1), DENV-2, DENV-3 and DENV-4
- The Asian genotype of DENV-1 was found in virus isolates drawn from blood samples of dengue-infected patients in southern India.
- DENV-1 was the predominant virus in the 2012 outbreak in TN

A large number of samples should be tested before one can say that the new Asian genotype has become dominant over the African-American genotype in India.

4.4.4 The superbug of Hyderabad

Effluent from pharmaceutical companies contain high concentrations of antibiotics that are turning the city's lake and sewers into breeding grounds of drug-resistant superbugs.

The large doses of man-made antibiotics in pollution hotspots force environment bacteria to evolve by boosting the number of resistance genes.

What is drug resistant superbugs?

Antibiotics are powerful drugs for fighting illness caused by bacteria, when a bacteria strain can no longer be killed by any available antibiotic in known as drug resistant superbug.

Or

Antibiotic resistant bacteria are bacteria that are not controlled or killed by antibiotics. They are able to survive and even multiply in the presence of an antibiotic. Most infection-causing bacteria can become resistant to at least some antibiotics.

4.4.5 Japanese Encephalitis in Gorakhpur

- Japanese Encephalitis (JE) is a mosquito-borne viral infection of the brain
- JE is one kind of encephalitis which falls under a spectrum of diseases called Acute Encephalitis Syndrome (AES).
- JE epidemics are reported from many parts of India however, it is highly endemic in Eastern Uttar Pradesh.

4.4.6 Scientists gene-edit piglets

- Scientists have successfully edited the genetic code of piglets to remove dormant viral infections, a breakthrough that could eventually pave the way for animal-to-human organ transplants.
- The process of grafting or transplanting organs or tissues between members of different species is called Xenotransplantation.

4.4.7 Engineering babies

- Scientists in the United States have repaired a disease-causing mutation in the DNA of early-stage human embryos
- Is the successful use of the CRISPR “gene editing” tool in viable embryos
- With further improvement, the method can potentially be used to prevent transmission of genetic disease to future generations

4.4.8 Designer babies

- Designer baby is a human embryo that has been genetically modified, to produce desirable traits
- This technology is the subject of ethical debate

4.4.9 Three Parent babies

- Egg – with nuclear DNA from the mother and mitochondrial DNA from a donor – fertilized with the father’s sperm.
- Resulting child wouldn’t pass on defective mitochondrial DNA from its mother
- The controversial technique, is legally approved in the UK

4.5.MISCELLANEOUS

4.5.1 Pacific shadow-zone

- The shadow zone is an area of almost stagnant water Between rising currents and geothermal heat sources.This is the oldest water in the ocean in the North Pacific and has remained trapped in a zone around 2 kilometers below the sea surface for over 1,000 years.
- Recently researchers found that the bottom water cannot rise above 2.5km below the surface

4.5.2 GI for Rosogolla

- the Chennai-based Intellectual Property Appellate Board have given GI tag to Bengal, in a fight between Bangal and Odisha
- the crucial factor is geography, not exclusivity, so Odisha can still get a GI
- Other Sweets with GI tag - Mathura peda, Mysore pak and Tirupati laddus have GI stamps, while Tirunelveli halwa and Thootukodi macaroons have applied for it.

4.5.3 State Tree for Goa

- The State Cabinet resolved to declare the coconut tree as the “State tree”.
- The act regulates felling of coconut trees

4.5.4 NOTA

Whether NOTA (None of the above) option should be there on the ballot paper for Rajya Sabha elections?

- The political parties requested to remove this option
- But the Supreme Court refused, saying that the provision has been in place since April 2014 after a direction by the EC

The Rajya Sabha Elections

- Open ballots are used

- Follow a proportional representation system based on the single transferable vote, unlike the general elections to the Lok Sabha, which are conducted with secret ballots (or votes) and based on the first-past-the-post principle
- If an MLA chooses NOTA, the vote is rendered ineffective
- The party high command can issue a whip for a Rajya Sabha candidate, but anti-defection law provisions do not apply, if the MLA does not obey the whip

4.5.5 Voter Verifiable Paper Audit Trail (VVPAT)

- The Election Commission of India to deploy VVPAT Units in all polling booths in the General Elections, 2019
- Is an additional layer of transparency for the satisfaction of voters, allaying any apprehension in the minds of the voters as to the fidelity and integrity of the EVMs
- VVPAT device functions like a printer to be attached to the ballot unit.

4.5.6 National Agri-Food Biotechnology Institute

CIAB is the first institute dedicated to generation of secondary agriculture bioproducts through value addition to unutilized and underutilized biomass.

- Part of agri-food cluster in the Knowledge City, Mohali

4.5.7 Article 35A

The Kashmir and Chenab Valleys on Saturday observed a shutdown over the issue of Article 35A.

- The Article accords special rights and privileges to the natives of J&K, and empower its legislature to frame any law without attracting a challenge on grounds of violating right to equality of people from other states or any other right under the Indian Constitution.
- As per the state legislation gives exclusive rights of locals in J&K over jobs, immovable property and scholarships.