You & Technology July-2020

ASPIRE IAS
The Name Associated with Excellence

GOOD MORNING TIMES S&T (JULY-2020)

You & Technology July-2020

General Studies Paper-3 – S&T – July 2020

.

1) NANO TECHNOLOGY IN AGRICULTURE

Recently centre has released 'Guidelines for Evaluation of Nano-based Agri-input and food products' in India. **Nanotechnology in Agriculture**

• Nanotechnology refers to a field of applied science and technology whose unifying theme is the control of matter on the molecular level in scales smaller than 1 micrometre, normally 1 to 100 nanometres, and the fabrication of devices within that size range.

• Benefits of Nanotechnology in agriculture

o Reduce nutrient run off: Compared to bulk form of chemical inputs in crops, use of nano-nutrients can reduce nutrient run-off into ground water and thus can reduce environmental pollution.

o Increase productivity: It helps to increase plant productivity and better crop protection for meeting requirements of providing food to growing population.

o Increase soil fertility: In the agri-food areas pertinent applications of nanotubes, fullerenes, biosensors, controlled delivery systems, nanofiltration, etc. proved to be as good in resources management of agricultural field, drug delivery mechanisms in plants and helps to maintain the soils fertility.

o Sustainable agriculture: Nano-based Agri-input and food products in India' will pave the way for significant benefits for our mission on Doubling Farming Income by 2022 and National Mission on Sustainable Agriculture.

• Nano-biotechnology has been an important area for the government of India which had launched a National Nano Mission in 2007.

o The mission looks at the uses of nanotechnology for safe drinking water, materials development, sensors development, drug delivery, etc.

o Department of Science and Technology (DST) is the nodal agency for implementing the nano mission. Highlights of the guidelines

• Guidelines apply to Nano-Agri-Input Products (NAIPs), Nano-Agri Products (NAPs) and nano composites, sensors made from Nanomaterials that require direct contact with crops, food and feed for data acquisitions.

o They do not apply to the conventional products or formulations with incidental presence of natural nanomaterials.

• **Objectives**

o To help researchers in development of products for agriculture and human consumption.

o To help regulators to assess quality and safety of nano based agriculture and food products.

o To encourage Indian innovators and industries to develop new nano-based formulations and products in these sectors.

• Guideline provides for regulation of NAIPs and NAPs.

o Safety, efficacy, functionality, toxicity and other quality data for proposed NAIPs and NAPs should be conducted under:

▪ Fertiliser (Control) Order, 1985, the Essential Commodities Act, 1955, Insecticides Act 1968,

▪ Food and Drug Administration guidelines, Food Safety and Standards Act, 2006,

▪ Cattle Feed (Regulation of Manufacture and Sale) Order, 2009

▪ Food Safety and Standards Authority of India (FSSAI). o Implementation of standards should be conducted as per Bureau of Indian Standards (BIS).

▪ BIS is a national standards body working under the aegis of Ministry of Consumer Affairs, Food & Public Distribution

Concerns regarding Nanotechnology in Agriculture

• Phytotoxicity and reactivity of nanomaterials in environment and possible adverse effect on exposed workers.

o Concerns of fabrication and validation of nano sensors as well as environmental and health consequences of nanomaterial released from devices.

• Concerns of Cytotoxic and genotoxic effects of cellular nanomaterials on Nano Agri Products.

o Risk of nanoparticles toxicity is higher in plants due to their miniscule size that can easily translocate within plant body.

• Concerns regarding high aspect ratio, stiffness and bio durability of nano cellulose.

• Insufficient economic interest, regulatory issues and public opinion in relation to nanotechnology in agricultural sector.

• Lack of knowledge and developmental methods for risk and life-cycle assessment of nanotechnology in agriculture.

• It reduces important bacterial diversity with declining taxa of Rhizobiales, Bradyrhizobiaceae, and Bradyrhizobium (related to nitrogen fixation) in response to these nanoparticles treatment.

Definitions given in Guidelines

• Nanomaterial (NM): These are material that ranges in size from 1 to 100 nm at least in one dimension or any materials that possess improved properties or phenomena because of the effect of dimension(s), even if these dimension(s) fall outside the nanoscale range, up to 1000 nm.

• Nano-Agri-Input Products (NAIPs): They are agricultural input preparation containing NMs in any of the three dimensions i.e. zero, one or two on the nanoscale or with an internal or surface structure, intended for applications on crop for the purpose of farming through soil, seed, foliar and drip and other means.

• Nano-Agri Products (NAPs): They are agricultural preparation containing NMs in any of the three dimensions i.e. zero, one or two on the nanoscale or with an internal or surface structure, intended for consumption or application in food/feed and their supplements as well as nutraceutical delivery.

2) What is Raman Spectroscopy?

Raman Spectroscopy is a non-destructive chemical analysis technique which 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 Scatter: It 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.

Why in News?

Researchers have turned to Raman Spectroscopy to detect RNA viruses present in saliva samples.

• It has been reported that novel coronavirus is found in sufficient numbers in human saliva.

How was it carried out?

For the study, the researchers spiked saliva samples with non-infectious RNA viruses and analysed it with Raman Spectroscopy. They analysed the raw Raman Spectroscopy data and compared the signals with both viral positive and negative samples.

• Statistical analysis of all the 1,400 spectra obtained for each sample, showed a set of 65 Raman spectral features was adequate to identify the viral positive signal.

Significance: This conceptual framework to detect RNA viruses in saliva could form the basis for field application of Raman Spectroscopy in managing viral outbreaks, such as the ongoing COVID-19 pandemic.

• However, in case of COVID 19 pandemic, it can be used only for screening. Because, the RNA virus detected could be a common cold virus as well or any other RNA virus such as HIV. It doesn't look for COVID19 viral-specific signature. But, the main benefit here is that this whole process of data acquisition and analysis can be performed within a minute. Since no additional reagent is needed there is no recurring cost.

• A portable (benchtop or handheld) Raman spectrophotometer installed at the port of entry such as airports or any point of care (in the field) can quickly screen passengers within minutes.

3) National Biopharma Mission (NBM)

BIRAC has announced that ZyCoV-D, the plasmid DNA vaccine designed and developed by Zydus and partially funded by the Department of Biotechnology (DBT) has initiated Phase I/Phase II clinical trials in healthy subjects, making it the first indigenously developed vaccine for COVID-19 to be administered in humans in India.

• DBT has partnered with Zydus to address rapid development of an indigenous vaccine for COVID-19 under the National Biopharma Mission.

About National Biopharma Mission (NBM): It is an industry-academia collaborative mission for accelerating biopharmaceutical development in the country. It was launched in 2017 at a total cost of Rs 1500 crore and is 50% co-funded by World Bank loan. It is being implemented by the Biotechnology Industry Research Assistance Council (BIRAC).

• Under this Mission, the Government has launched Innovate in India (i3) programme to create an enabling ecosystem to promote entrepreneurship and indigenous manufacturing in the biopharma sector. It has a focus on following four verticals:

1. Development of product leads for Vaccines , Biosimilars and Medical Devices that are

relevant to the public health need by focussing on managed partnerships.

2. Upgradation of shared infrastructure facilities and establishing them as centres of product discovery/discovery validations and manufacturing.

3. Developing human capital by providing specific training.

4. Developing technology transfer offices to help enhance industry academia inter-linkages.

4) Kakrapar Atomic Plant achieves Criticality

Third unit at Kakrapar Atomic Power Plant in Gujarat achieves criticality.

• The first Pressurised Heavy Water Reactor (PHWR) of 220 MWe was commissioned on May 6, 1993, while the second unit of similar capacity was commissioned on September 1, 1995. These two units were based on Canadian technology.

• The third reactor at Kakrapar is the front runner in a series of 16 indigenous 700 MWe PHWRs which are under various stages of development.

• Four units of the 700MWe reactor are currently being built at Kakrapar (KAPP-3 and 4) and Rawatbhata (RAPS-7 and 8).

• Currently, nuclear power capacity constitutes less than 2% of the total installed capacity of 3,68,690 MW (end-January 2020).

What is criticality or when a rector is said to be critical?

A reactor is said to be critical when the nuclear fuel inside a reactor sustains a fission chain reaction, where each fission event releases a sufficient number of neutrons to sustain a series of reactions. Criticality is first step towards power production.

• In simple terms, the power plant reached the normal operating condition of a reactor. It indicates that the plant is now set to generate power. Why is this achievement significant? This is a landmark event in India's domestic civilian nuclear programme given that KAPP-3 is the country's first 700 MWe (megawatt electric) unit, and the biggest indigenously developed variant of the Pressurised Heavy Water Reactor (PHWR). Pressurized Heavy Water Reactor: A PHWR is a nuclear power reactor, commonly using unenriched natural uranium as its fuel, that uses heavy water (deuterium oxide D2O) as its coolant and moderator.

• The heavy water coolant is kept under pressure, allowing it to be heated to higher temperatures without boiling, much as in a typical pressurized water reactor.

• While heavy water is significantly more expensive than ordinary light water, it yields greatly enhanced neutron economy, allowing the reactor to operate without fuel enrichment facilities (mitigating the additional capital cost of the heavy water) and generally enhancing the ability of the reactor to efficiently make use of alternate fuel cycles.

5) NASA research says the Moon is more metallic than thought before

NASA's Lunar Reconnaissance Orbiter (LRO) spacecraft has found evidence that the Moon's subsurface might have greater quantities of metals such as iron and titanium than thought before.

• The metallic distribution was observed by the Miniature Radio Frequency (Mini-RF) instrument aboard the LRO.

The Mini-RF findings were backed by metal oxide maps from the LRO Wide-Angle Camera, Japan's Kaguya mission and NASA's Lunar Prospector spacecraft, which showed that larger craters with their increased dielectric material were also richer in metals.

How was it discovered?

LRO's Mini-RF instrument was measuring an electrical property within lunar soil in crater floors in the Moon's northern hemisphere. The property, known as the dielectric constant, is the ratio of the electric permeability of a material to the electric permeability of a vacuum. Dielectric properties are directly linked to the concentration of these metal minerals.

• Level of this property increased as they surveyed larger craters, and kept rising in crater sizes up to 5 km in diameter. Beyond that size, the value of the dielectric constant leveled off. The findings raise the possibility that the dielectric constant increased in larger craters because the meteors that created them dug up dust containing iron and titanium oxides from beneath the Moon's surface. How was moon created? The most popular theory about the Moon's creation is that a Mars-sized protoplanet collided with newly formed Earth around 4.5 billion years ago, breaking off a piece of our planet that went on to become its satellite.

• The hypothesis is also backed by substantial evidence, such as the close resemblance between the Moon's bulk chemical composition with that of Earth. Implications of latest findings: It is known that Earth's crust has lesser amounts of iron oxide than the Moon– a finding that scientists have been trying to explain.

• Now, the new discovery of even greater quantities of metal on the Moon makes their job even more difficult. It really raises the question of what this means for our previous formation hypotheses. A possible reason could be that the Moon was created from a material much deeper beneath Earth's surface than was believed before, or that the newly found metal presence could be the result of molten lunar surface cooling down gradually.

About Lunar Reconnaissance Orbiter (LRO): It is a NASA mission to the moon within the Lunar Precursor and Robotic Program (LPRP) in preparation for future manned missions to the moon and beyond (Mars). LRO is the first mission of NASA's `New Vision for Space Exploration'. The objectives of LRO are to:

1. Identify potential lunar resources.
2. Gather detailed maps of the lunar surface.
3. Collect data on the moon's radiation levels.
4. Study the moons polar regions for resources that could be used in future manned missions or robotic sample return missions.

6) Production of lithium in stars

A forty-year-old puzzle regarding the production of lithium in stars has been solved by Indian researchers.

What was the puzzle all about?

Stars, as per known mechanisms of evolution, actually destroy lithium as they evolve into red giants. Planets were known to have more lithium than their stars — as is the case with the Earth-Sun pair. However, leading to a

contradiction, some stars were found that were lithium-rich.

• This posed a puzzle — if stars do not produce lithium, how do some stars develop to become lithium rich?

So far, the planet engulfment theory was quite popular. For example, Earth-like planets may increase the star's lithium content when they plunge into their star's atmosphere when the latter become Red Giants. Latest findings: When stars grow beyond their Red Giant stage into what is known as the Red Clump stage, they produce lithium in what is known as a Helium Flash and this is what enriches them with lithium. The study also challenges the present understanding of nucleosynthesis in stars.

What is the big bang nucleosynthesis (BBN)?

The Big Bang Nucleosynthesis theory predicts that roughly 25% the mass of the Universe consists of Helium. It also predicts about 0.01% deuterium, and even smaller quantities of lithium.

• It is the production of nuclei other than those of the lightest isotope of hydrogen during the early phases of the Universe. Primordial nucleosynthesis is believed by most cosmologists to have taken place in the interval from roughly 10 seconds to 20 minutes after the Big Bang.

Origin of Lithium: It was first produced in the Big Bang, around 13.7 billion years ago when the universe came into being, along with other elements. While the abundance of other elements grew millions of times, the present abundance of lithium in the universe is only four times the original [Big Bang] value. It is actually destroyed in the stars.

• The Sun, for instance, has about a factor of 100 lower amount of lithium than the Earth.

7) NEOWISE- a comet

The recently discovered comet called C/2020 F3, also known as NEOWISE after the NASA telescope that discovered it, will make its closest approach to the Earth on July 22.

• On the day, the comet, which takes 6,800 years to complete one lap around its orbit, will be at a distance of 64 million miles or 103 million kilometers while crossing Earth's outside orbit.

What is Coma?

On July 3, the comet was closest to the sun at 43 million km. On this day, the comet cruised inside Mercury's orbit and, due to its proximity to the sun, its outer layer was released creating an atmosphere – referred to as coma – of gas and dust from its icy surface.

• This atmosphere sometimes leads to formation of a bright tail of debris that can extend for thousands or millions of kilometres.

What Are The Differences Between An Asteroid, Comet, Meteoroid, Meteor and Meteorite?

1. Asteroid: A relatively small, inactive, rocky body orbiting the Sun.
2. Comet: A relatively small, at times active, object whose ices can vaporize in sunlight forming an atmosphere (coma) of dust and gas and, sometimes, a tail of dust and/or gas.
3. Meteoroid: A small particle from a comet or asteroid orbiting the Sun.
4. Meteor: The light phenomena which results when a meteoroid enters the Earth's atmosphere and vaporizes; a shooting star.

5. Meteorite: A meteoroid that survives its passage through the Earth's atmosphere and lands upon the Earth's surface.

NASA's NEOWISE: Launched in December 2009 as the Wide-Field Infrared Survey Explorer, or WISE, the space telescope was originally designed to survey the sky in infrared, detecting asteroids, stars and some of the faintest galaxies in space. It did so successfully until completing its primary mission in February 2011.

• In December 2013, it was re-purposed for the NEOWISE project as an instrument to study near-Earth objects, or NEOs, as well as more distant asteroids and comets.

8) Hope: UAE's first mission to Mars

The launch of the United Arab Emirates' (UAE) first mission to Mars is scheduled for July 16 launch. It will take off from its launch site, Tanegashima Space Center, in Japan.

Why July launch matters?

• The spacecraft must blast off from the Earth during a brief launch window in July, since Earth and Mars orbit the Sun at different rates and are aligned at their closest points only once every two years.

About the Hope mission:

Announced in 2015 with the aim of creating mankind's first integrated model of the Red planet's atmosphere. The Hope mission is a Mars orbiter spacecraft, which will study the thin atmosphere of Mars.

• The mission is officially named the Emirates Mars Mission (EMM) and the orbiter has been named Hope or 'Al Amal'. If successful, the Hope orbiter will join six others in studying Mars, from the US, Europe and India. The Hope orbiter: The Hope probe has a mission life of one Martian year, which is almost two Earth years. The three main objectives of the Hope probe are:

1. to understand the climate dynamics and global weather map of Mars by studying the lower atmosphere of Mars.
2. to explain how the weather of Mars affects the escape of hydrogen and oxygen, by correlating conditions in the lower and upper atmosphere.
3. to understand the presence and variability of hydrogen and oxygen in the upper atmosphere, and why Mars is losing these gases to space.

Significance of the mission:

• It is a known fact that the Red Planet was once habitable, from signatures of flowing water and organic material that point to a past that could have supported living things.

• An understanding of Mars' past could help scientists understand the future of Earth.

9) What is Compulsory Licensing?

A compulsory licence is a licence or authorisation issued by the government to an applicant for making, using and selling a patented product or employing a patented process without the consent of the patentee. Chapter XVI of the Indian Patents Act 1970 and the Agreement on Trade-Related Aspects of Intellectual Property Rights discuss compulsory licensing.

• The application for compulsory license can be made any time after 3 years from date of sealing of a patent. The following conditions should be fulfilled by the applicant:

1. Reasonable requirements of the public with respect to the patented invention have not been satisfied;

2. Patented invention is not available to the public at a reasonably affordable price.
3. Patented invention is not used in India. Additionally, according to Section 92 of the Act, compulsory licenses can also be issued suo motu by the Controller of Patents pursuant to a notification issued by the Central Government if there is either a "national emergency" or "extreme urgency" or in cases of "public non-commercial use".

When was the first license issued?

India's first ever compulsory license was granted by the Patent Office on March 9, 2012, to Hyderabad-based Natco Pharma for the production of generic version of Bayer's Nexavar, an anti-cancer agent used in the treatment of liver and kidney cancer. Global Perspective on Compulsory Licensing: This phenomenon of compulsory licensing is a hugely debated issue. Many developing countries are giving importance to the compulsory licensing because of the unavailability and unaffordability of the medicines, and they are continuously granting more and more compulsory licenses. The developed countries of Europe, USA are opposing this view as it would make innovation difficult for the pharmaceutical companies.

Why compulsory licensing is in News?

Issue compulsory licences for manufacture of an affordable generic version of Remdesivir, CPI(M) tells govt.

• It said the government should invoke Clause 92 of the Patent Act that allows it to issue compulsory licences so that Indian manufacturers can produce a more affordable generic version. Need for: Gilead Sciences' anti-viral drug Remdesivir has shown efficacy in treating COVID-19 patients.

• Media reports indicate that the U.S., which is hoarding all drugs found to be useful in combating the pandemic, has bought the entire stock of Remdesivir from Gilead for the next three months.

• It will therefore not be available for the rest of the world.

Besides, while the cost of manufacturing Remdesivir for a full course — as worked out by experts — is less than $10 or ₹750 in the U.S. And about ₹100 in India. Gilead, by virtue of its patent monopoly, is holding the world to ransom by asking a price that is hundreds of times its cost. Present scenario: Given the uncertainty over access to treatments for COVID-19, several countries have been laying the legislative groundwork to issue compulsory licenses for products that patent holders refuse to make accessible.

10) International Thermonuclear Experimental Reactor (ITER)

The truly massive International Thermonuclear Experimental Reactor (ITER) has entered its years-long assembly phase.

• After 35 years of brainstorming, planning, and preproduction, ITER says assembly will take five years, starting now. What is ITER? It is an international nuclear fusion research and engineering megaproject, which will be the world's largest magnetic confinement plasma physics experiment. It is an experimental tokamak nuclear fusion reactor that is being built in southern France.

• The goal of ITER is to demonstrate the scientific and technological feasibility of

fusion energy for peaceful use. **Significance of ITER:**

1. ITER will be the first fusion device to produce net energy.
2. ITER will be the first fusion device to maintain fusion for long periods of time.
3. ITER will be the first fusion device to test the integrated technologies, materials, and physics regimes necessary for the commercial production of fusion-based electricity. The project is funded and run by seven member entities: The European Union, China, India, Japan, Russia, South Korea and the United States.

What will ITER do?

1. Produce 500 MW of fusion power
2. Demonstrate the integrated operation of technologies for a fusion power plant
3. Achieve a deuterium-tritium plasma in which the reaction is sustained through internal heating
4. Test tritium breeding
5. Demonstrate the safety characteristics of a fusion device.

What is Fusion?

Fusion is the energy source of the Sun and stars. In the tremendous heat and gravity at the core of these stellar bodies, hydrogen nuclei collide, fuse into heavier helium atoms and release tremendous amounts of energy in the process.

How is it achieved in the laboratory?

Most efficient fusion reaction in the laboratory setting is the reaction between two hydrogen isotopes, deuterium (D) and tritium (T). The DT fusion reaction produces the highest energy gain at the "lowest" temperatures. Three conditions must be fulfilled to achieve fusion in a laboratory:

1. Very high temperature (on the order of 150,000,000° Celsius).
2. Sufficient plasma particle density (to increase the likelihood that collisions do occur).
3. Sufficient confinement time (to hold the plasma, which has a propensity to expand, within a defined volume). **What is a Tokamak?**

The tokamak is an experimental machine designed to harness the energy of fusion.

• Inside a tokamak, the energy produced through the fusion of atoms is absorbed as heat in the walls of the vessel. • Just like a conventional power plant, a fusion power plant will use this heat to produce steam and then electricity by way of turbines and generators. First developed by Soviet research in the late 1960s, the tokamak has been adopted around the world as the most promising configuration of magnetic fusion device. ITER will be the world's largest tokamak—twice the size of the largest machine currently in operation, with ten times the plasma chamber volume.

11) Perseverance- NASA's mission to Mars:

National Aeronautics and Space Administration (NASA) has launched its Mars 2020 Perseverance rover aboard a United Launch Alliance Atlas V.

• The launch took place from Cape Canaveral Air Force Station in Florida. This is the third launch to Mars this month, following the UAE's Hope and China's Tianwen-1 spacecraft.

Key facts:

1. The rover's Mars arrival is set for Feb. 18, 2021.
2. The mission is planned to last for at least one Mars year, which works out to about 687 days on Earth (it takes longer for Mars to go around the sun).
3. Landing site: Jezero crater.
4. Perseverance is loaded with seven instruments chosen to help it achieve its mission objectives.

Why is this mission significant?

1. Perseverance will carry a unique instrument, MOXIE or Mars Oxygen ISRU Experiment: which for the first time will manufacture molecular oxygen on Mars using carbon dioxide from the carbon-dioxide-rich atmosphere (ISRU means In Situ Resource Utilization: or the use of local resources to meet human needs or requirements of the spacecraft).
2. It will carry Ingenuity, the first ever helicopter to fly on Mars. This is the first time NASA will fly a helicopter on another planet or satellite.
3. It is the planned first step to bring back rock samples from Mars for analysis in sophisticated laboratories on Earth: with the goal of looking for biosignatures: or signatures of present or past life.

These are some of the key mission objectives:

1. Look for signs of ancient microbial life.
2. Collect Martian rock and dust samples for later return to Earth.
3. Deliver an experimental helicopter.
4. Study the climate and geology of Mars.
5. Demonstrate technology for future Mars missions.

What is the reason for the near-term interest in Mars?

• Mars is located in the very near backyard (about 200 million km away).
• It is a planet that humans can aspire to visit or to stay for a longer duration.
• Mars had flowing water and an atmosphere in the distant past: and perhaps conditions to support life.
• In the near term, the increase in interest related to Mars is because of Elon Musk's plans for commercial travel.

.

You & Technology July-2020

ASPIRE IAS UPCOMING EXCLUSIVE sessions FOR MAINS-2020 (Online & Offline)

1. Geography OPTIONAL and RRVAP (Rapid round value addition programme with TEST SERIES)

- For the last 5 years favourite programme among students.
- Where you are lacking we are working upon like, Paper-2 in contemporary and geographical manner, Mapping and its application, special emphasis on Thoughts-Regional planning and biogeography.
- Full coverage of geography with writing skill development
- 2013 when the average score was 140 in Geo our students scored 200+ (Isha Dhuna, Nitin Agarwal and Aditya uppal)
- 2014 when average score is 230 our students scored 280-300 (Aditya uppal RANK-19 309 marks)
- Same trend in 2015-18
- Starts after 7 days of PT examination

2. Our best and SUCCESS GRADE course Newspaper analysis and writing skill programme.

** Our TM and most successful programme start 7 days of PT exam with the coverage of last **3 years issues** highly helpful in P-2&3

(Seats are limited). ***FOR FRESHERS AS WELL AS THOSE WHO WANT TO SCORE 450+ IN MAINS 2019***

3. Writing skill development, enhancement and management programme.

- Best developed programme to enhance the writing skills at individual level
- Yield a fantastic result: RANK-22 (Saloni Rai) and Rank 1 Nandani others….

33 sessions with same day discussion, feedback and evaluation of the copies.

4. Special batch for ETHICS and 150 CASE STUDIES. (15 days with the guidance to score 110+ by DIRECTOR sir)

5. Geography for GS MAINS

6. Sociology, political science and Public administration full course and crash course with writing skills.

7. Ncert Foundation btach.

8. GS-FOUNDATION batch for 2021….

All the Best to all my Economics students…

Hope this material will help you.

You & Technology July-2020

God bless...JAI Hind

All the Best

You & Technology July-2020

Jai Hind ☺