

# TARGET PT 2020 in IGG DAYS

CONCEPT | CURRENT AFFAIR | TEST | SNIPPETS

# GS SCORE

An Institute for Civil Services



[www.iasscore.in](http://www.iasscore.in)



SCIENCE  
& TECHNOLOGY

TRENDING TOPICS



# GS SCORE

An Institute for Civil Services

## IAS 2021 LIVE & INTERACTIVE CLASSES

### IAS 2021-22 GS FOUNDATION

BATCH STARTS

**28**  
MAY, 2020

OPTIONAL  
FOUNDATION

**POL. SCIENCE  
FOUNDATION**

by: Dr. Piyush Choubey

BATCH STARTS

**15**  
JUNE

**PUB. ADMN.  
FOUNDATION**

by: Ashutosh Pandey

BATCH STARTS

**29**  
JUNE

**HISTORY  
FOUNDATION**

By: Piyush Kumar

BATCH STARTS

**29**  
JUNE

IAS 2021

**MAINS  
ADVANCE**

BATCH STARTS

**19** JULY  
2020

IAS 2021

**INTEGRATED  
TEST SERIES**  
PRELIMS CUM MAINS

BATCH STARTS

**25** JULY  
2020

IAS 2021

**PRELIMS  
TEST SERIES**

BATCH STARTS

**2** AUGUST  
2020

IAS 2021

MAINS TEST SERIES  
**GS MAINS  
Q&A**

BATCH STARTS

**8** AUGUST  
2020

📍 1B, 2<sup>nd</sup> Floor, Pusa Road Karol Bagh, New Delhi-110005,  
(Adjacent to Karol Bagh Metro Gate No. 8)

✉ [info@iasscore.in](mailto:info@iasscore.in) 📱 [/iasscore](https://www.facebook.com/iasscore)

Visit: [www.iasscore.in](http://www.iasscore.in)

☎ **8448496262**

# CONTENT

---

## ■ Day 61 .....01-03

- The significance of the ..... 01  
Kolkata Port
- Northeast Gas Grid Project ..... 02
- 'eBkay' - online auction ..... 03  
platform for assets attached  
by banks

---

## ■ Day 62 .....04-07

- Rare Diseases Day ..... 4
- SUTRA PIC ..... 5
- "Spike Protein" of 2019-nCoV ..... 6

---

## ■ Day 63 .....08-11

- Rare Diseases Day ..... 8
- Scientists discover animal ..... 9  
that doesn't breathe oxygen
- Mars Insight Mission ..... 11

---

## ■ Day 64 .....12-16

- ISRO to launch an ..... 12  
unprecedented 10 earth  
imaging satellites
- Aditya - L1 Mission ..... 13
- GISAT-1 Mission ..... 14

---

## ■ Day 65 .....17-20

- Betelgeuse Supernova ..... 17
- SyRI (System Risk Indicator) ..... 18
- Genome India Project ..... 19

---

## ■ Day 66 .....21-23

- Arsenic-resistant rice ..... 21
- Voyager 2 ..... 22
- National Mission on Quantum ..... 22  
Technologies & Applications  
(NM-QTA)

---

## ■ Day 67 .....24-28

- Vaccine to control classical ..... 24  
swine fever
- NASA's Spitzer Space Telescope ... 25
- Polycrack Technology ..... 27

---

## ■ Day 68 .....29-32

- Dhanush, India's first ..... 29  
indigenous long-range  
artillery gun
- Biorock or mineral accretion ..... 30  
Technology
- Accretion Burst Event ..... 31

\*\*\*\*\*



An Institute for Civil Services

# IAS 2021-22

## LIVE & INTERACTIVE CLASSES

### LEARNING NEVER STOPS!

Due to the current situation of  
CORONA Pandemic, we continue to  
put our efforts for  
**IAS Aspirants**  
exclusively through  
**Online Live  
& Interactive Classes**

For:

**IAS Foundation**

**Optional Subjects**

**Mains Courses**

**Test Series.**



Visit:  [www.iasscore.in](http://www.iasscore.in)

📍 1B, 2<sup>nd</sup> Floor, Pusa Road Karol Bagh, New Delhi-110005, (Adjacent to Karol Bagh Metro Gate No. 8)

☎ 91 8448496262 ✉ [info@iasscore.in](mailto:info@iasscore.in) 📺 [/iasscore](https://www.facebook.com/iasscore)



## 1. 'THE SIGNIFICANCE OF THE KOLKATA PORT'

### Context

In a recent development, Prime Minister Narendra Modi renamed the **Kolkata Port Trust** after Bharatiya Jana Sangh (BJS) founder **Dr. Syama Prasad Mookerjee**, at an event to mark its 150th anniversary.

### About Kolkata Port:

- Kolkata Port is the only riverine Major Port in India, situated 232 kilometers upstream from the Sandheads, having arguably the longest navigational channel amongst Major Ports of India and its navigational channel is one of the longest in the world.
- KoPT is India's oldest operational port and the first among the 12 major ports (government-owned) of India. Kolkata Port System includes three ports:
  - ▶ Kolkata
  - ▶ Haldia
  - ▶ Sagar Island
- The port facility has aided in industrialization, employment generation and major economic activity in the region while serving a vast hinterland as well as landlocked neighboring countries such as Bhutan and Nepal.
- The river Hooghly, on which it is located, has many sharp bends and is considered a difficult navigational channel.
- Throughout the year, dredging activities have to be carried out to keep the channel open.
- The **Farakka Barrage**, built-in 1975, reduced some of the port's woes as Ganga waters were diverted into the **Bhagirathi-Hooghly system**.

### Historical background:

- In the early 16th century, the Portuguese first used the present location of the port to anchor their ships, since they found the upper reaches of the Hooghly river, beyond Kolkata, unsafe for navigation.
- **Job Charnock**, an employee, and administrator of the **East India Company** is believed to have founded a trading post at the site in 1690. Since the area was situated on the river with jungle on three sides, it was considered safe from enemy invasion.
- After the abolition of slavery in the British Empire in 1833, this port was used to ship lakhs of Indians as 'indentured laborers' to far-flung territories throughout the Empire.
- As Kolkata grew in size and importance, merchants in the city demanded the setting up of a port trust in 1863.
- The colonial government formed a **River Trust in 1866**, but it soon failed, and administration was again taken up by the government.



- Finally, in 1870, the **Calcutta Port Act (Act V of 1870)** was passed, creating the offices of Calcutta Port Commissioners.
- In 1869 and 1870, eight jetties were built on the Strand. A wet dock was set up at Khidirpur in 1892. The Khidirpur Dock II was completed in 1902.
- As cargo traffic at the port grew, so did the requirement of more kerosene, leading to the building of a petroleum wharf at Budge Budge in 1896.
- In 1925, the Garden Reach jetty was added to accommodate greater cargo traffic. A new dock, named King George's Dock, was commissioned in 1928 (it was renamed Netaji Subhash Dock in 1973).
- During World War II, the port was bombed by Japanese forces.
- After Independence, the Kolkata Port lost its preeminent position in cargo traffic to ports at Mumbai, Kandla, Chennai, and Visakhapatnam.
- In 1975, the Commissioners of the port ceased to control it after the Major Port Trusts Act, 1963, came into force.

### Who was Dr. Shyama Prasad Mookerjee?

- Shyama Prasad Mookerjee was born in Calcutta on 6<sup>th</sup> July 1901. He was the youngest (33) ever Vice-Chancellor of Calcutta University and Independent India's first Minister of Industry and Supply.
- After India's independence, Prime Minister Jawaharlal Nehru made Dr. Shyama Prasad Mookerjee Ministry for Industry and Supply in the interim Central Government.
- However, he resigned from the Cabinet in 1950 as he was against the 'Nehru-Liaquat Ali Pact'.
- After he formed Bhartiya Jana Sangh on 21<sup>st</sup> October 1951 and became its first President.

## 2. NORTHEAST GAS GRID PROJECT

### Context

Recently, the Cabinet Committee on Economic Affairs, chaired by Prime Minister Narendra Modi, has given its approval for viability Gap Funding/ Capital Grant of 60% of the estimated cost of Rs. 9,265 crore for the Northeast Gas Grid project to Indradhanush Gas Grid Limited (IGGL) who implements it.

### About

- The Northeast Gas Grid Project will connect **Guwahati to the major Northeast cities and major load centers. It is 1,656 km long.**
- The project is being implemented under an ambitious **Urja Ganga Gas Pipeline Project.**
- Besides connecting all the state capitals in the region, the pipeline will also connect with the National Gas Grid through Barauni-Guwahati Gas Pipeline, which is being laid by GAIL.

### Pradhan Mantri Urja Ganga project:

- The gas pipeline project aims to provide piped cooking gas to residents of Varanasi and later to millions of people in states like Bihar, Jharkhand, West Bengal, and Odisha.
  - From Varanasi's perspective, an **800-km long MDPI pipeline** will be laid and 50,000 households and 20,000 vehicles will get PNG and CNG gas respectively. The government estimates that around 5 lakh gas cylinders will be sent in rural areas annually.
  - According to GAIL, with the Urja Ganga project, **20 lakh households will get PNG connections.** The project is said to be a major step towards collective growth and development of the Eastern region of India.
  - GAIL has built a network of trunk pipelines covering the length of around 11,000 km. With the Urja Ganga project, this number will further increase by 2540 km.

- The pipeline will enable the supply of piped cooking gas to households and CNG to automobiles, besides fuel to industry.
- **Implementing Agency:** The North-East pipeline grid is to be implemented by Indradhanush Gas Grid, a joint venture of state-owned GAIL India, Indian Oil Corp (IOC), Oil and Natural Gas Corp (ONGC), Oil India Ltd (OIL) and Numaligarh Refinery Ltd (NRL).

### Objectives of National Gas Grid

- To remove regional imbalance within the country concerning access for natural gas and provide clean and green fuel throughout the country.
- To connect gas sources to major demand centers and ensure the availability of gas to consumers in various sectors.
- Development of City Gas Distribution Networks in various cities for the supply of CNG and PNG.

## 3. 'EBKRAY' - ONLINE AUCTION PLATFORM FOR ASSETS ATTACHED BY BANKS

### Context

- **eBkray is an e-auction platform to enable online auction of attached assets by banks.**
- Buyers can use the **IBAPI portal** to search and get properties details and participate in the auction process. Presently 21 banks are onboard on this portal
- Currently, there are 2,457 residential, 576 commercial, 333 industrial and 18 agricultural properties are available on eBkray platform among others.
- PSBs have attached assets worth over Rs 2.3 lakh crore in the last three fiscal years.

### Objectives of eBkray

- To **enhance user experience** through seamless access to information by the search based on the type and location of the property put up for **e-auction by the banks in India.**
- To **enable online auction of attached assets transparently and cleanly** for the improved realization of value by banks.
- It will **provide navigational links to all Public Sector Banks (PSBs) e-auction sites**, property search feature and will present **single-window access to information on properties up for e-auction**, comparison of similar properties, as well as contains videos and photographs of uploaded properties.
- The platform also helps the buyer to easily navigate to the bank e-auction site after a notified property is selected. It also helps the user to search property using State-wise, District-wise and bank-wise details.

### Indian Banks Auctions Mortgaged Properties Information (IBAPI) portal

- It is an **initiative of the Indian Banks Association** under the policy of the Department of Financial Services, **Ministry of Finance** to provide a platform to provide details of mortgaged properties to be auctioned online by Banks, starting with PSBs.

\*\*\*\*\*



## 1. "RARE DISEASES DAY"

### Context

World Rare Disease Day is observed every year on the last day of February. This year, February 29, the rarest of days, is marked as the International Rare Disease Day.

### About

- Rare Disease Day takes place on **the last day of February each year**. The main objective of Rare Disease Day is to **raise awareness** amongst the general public and decision-makers about **rare diseases and their impact on patients' lives**.
- The first Rare Disease Day was celebrated in 2008 on 29 February, a 'rare' date that happens only once every four years.
- Ever since then, Rare Disease Day has taken place on the last day of February, a month is known for having a 'rare' number of days.

### What is Rare Disease?

- A rare disease also referred to as an orphan disease, is any disease that affects a small percentage of the population.
- Over 300 million people are living with one or more of over 6,000 identified rare diseases around the world.
- Over 6000 rare diseases are characterised by a broad diversity of disorders and symptoms that vary not only from disease to disease but also from patient to patient suffering from the same disease.
- Relatively common symptoms can hide underlying rare diseases leading to misdiagnosis and delaying treatment.
- Quintessentially disabling, the patients quality of life is affected by the lack or loss of autonomy due to the chronic, progressive, degenerative, and frequently life-threatening aspects of the disease.
- Each rare disease may only affect a handful of people, scattered around the world, but taken together with the number of people directly affected is equivalent to the population of the world's third-largest country.

### Items for Box:

- Rare diseases currently affect 3.5% - 5.9% of the worldwide population.
- In India, one in one lakh people suffer from some rare disease.
- 72% of rare diseases are genetic whilst others are the result of infections (bacterial or viral), allergies and environmental causes, or are degenerative and proliferative.
- 70% of those genetic rare diseases start in childhood.



## What causes rare diseases?

- There are many different causes of rare diseases. The majority are thought to be genetic, directly caused by changes in genes or chromosomes.
- In some cases, genetic changes that cause disease are passed from one generation to the next.
- In other cases, they occur randomly in a person who is the first in a family to be diagnosed.
- Many rare diseases, including infections, some rare cancers, and some autoimmune diseases, are not inherited.
- The most common rare diseases identified in India are **Haemophilia, Thalassemia, Sickle-cell Anaemia, Primary Immuno Deficiency, Lysosomal Storage Disorders such as Gaucher Disease, Fabry Disease, Hunter Syndrome and Pompe's Disease.**

## 2. SUTRA PIC

### Context

The government recently unveiled SUTRA PIC programme to research on 'indigenous' cows.

### About:

- **SUTRA PIC:** It stands for **Scientific Utilization Through Research Augmentation-Prime Products from Indigenous Cows.**
- **Funding:** The initiative is led by the **Department of Science and Technology (DST)**. It is to be funded by **multiple scientific ministries.**
- **Partners:** Department of **Biotechnology, CSIR, the Ministry for AYUSH**, Indian Council of Medical Research (**ICMR**), among others.
- **Objective:** The initiative aims to perform **scientific research** on complete characterization of milk and milk **products derived from Indian indigenous cows.**
  - It will implement scientific research on **nutritional and therapeutic properties of curd and ghee** prepared from indigenous breeds of cows by traditional methods.
  - It also aims to **develop standards for traditionally processed dairy products** of Indian-origin cow
- **Themes:**
  - Uniqueness of Indigenous Cows
  - Prime-products from Indigenous Cows for Medicine and Health
  - Prime-products from Indigenous Cows for Agricultural Applications
  - Prime-products from Indigenous Cows for Food and Nutrition
  - Prime-products from indigenous cows-based utility items

### Livestock census

- According to the 20<sup>th</sup> livestock census, **livestock population in India rises 4.6% to nearly 536 million.**
  - The **indigenous cattle has decreased by 8.94%.**
  - The **exotic/crossbred population has increased** by 20.18%.
- **Reasons for decline of indigenous breed:** Cross-breeding with exotic breeds; being economically less viable; losing utility; reduction in herd size; large-scale mechanisation of agricultural operation.
- **Implications of decline in indigenous cattle:**

- ▶ Due to continuous fall in productivity, **indigenous breeds of cattle** have become
- ▶ Farmers **find other animals such as buffaloes, goats and sheep more productive.**
- ▶ Unlike cows, if they become unproductive, **they can be sold and slaughtered** for further processing.
- ▶ Fall in indigenous breeds can have **long term health and environmental impact**; because the **milk of indigenous breed has higher nutritional value** than that of crossbreeds.
- ▶ There is also **danger of losing these indigenous breeds.**
- ▶ This has caused disruption in cattle economy which **may adversely impact farm incomes also.**

### 3. "SPIKE PROTEIN" OF 2019-NCOV

#### Context

Researchers in the United States have unveiled the structure of the "spike protein" of 2019-nCoV, the virus behind the current coronavirus disease outbreak.

#### About:

- Coronaviruses are a family of viruses that cause illnesses ranging from the common cold to more severe diseases such as **severe acute respiratory syndrome (SARS)** and the **Middle East respiratory syndrome (MERS)**.
- The World Health Organization (WHO) has declared the virus a global health emergency. Also, the WHO announced an official name for the disease- coronavirus disease 2019, abbreviated as **COVID-19**.
  - ▶ In COVID-19, 'CO' stands for 'corona,' 'VI' for 'virus,' and 'D' for the disease. Formerly, this disease was referred to as "2019 novel coronavirus" or "2019-nCoV."

#### What is a spike protein?

- A viral spike protein is like a key that "unlocks the door" to gain access to the cells of a specific host — humans, in this case.
- The researchers defined the structure of 2019-nCoV's spike protein using a technique called **cryogenic electron microscopy**, or "**Cryo-EM**".
- This involves cooling the protein to below -150 degree Celsius so that it crystallises and then its structure can be determined with near-atomic resolution.

#### Another discovery:

- They also identified the "keyhole", the host cell receptor: it is a human protein called angiotensin-converting enzyme 2 (ACE2).
- This is the same human receptor protein targeted by the earlier SARS coronavirus.
- But, disturbingly, the researchers found that 2019-nCoV binds to ACE2 with much higher affinity (10-20 times higher!) than SARS.

#### So what about a vaccine?

- Both viruses attack the same protein on human cells, and the already available antibodies against SARS-CoV would work against 2019-nCoV.
- This means a stronger solution to this problem is still far away.
- Globally, the competition is heating up to hunt for the best anti-2019-nCoV vaccine.
- The earliest clinical trials to test a suitable vaccine will not be available until several months or even a year after a candidate vaccine is identified, and the global coronavirus outbreak may well be controlled by then.

**Significance of the discovery:**

- Knowing the structure of the virus's spike protein gives us crucial information about exactly how the virus infects host cells.
- The discovery of the 2019-nCoV spike protein structure, therefore, represents both good news and bad.
  - ▶ The good news is now we know what it looks like, it will be easier to find the most suitable weapon against the virus.
  - ▶ The bad news is the enemy is much stronger than we thought, and our current ammunition depot doesn't have anything efficient against it.

\*\*\*\*\*



## 1. "RARE DISEASES DAY"

### Context

World Rare Disease Day is observed every year on the last day of February. This year, February 29, the rarest of days, is marked as the International Rare Disease Day.

### About

- Rare Disease Day takes place on **the last day of February each year**. The main objective of Rare Disease Day is to **raise awareness** amongst the general public and decision-makers about **rare diseases and their impact on patients' lives**.
- The first Rare Disease Day was celebrated in 2008 on 29 February, a 'rare' date that happens only once every four years.
- Ever since then, Rare Disease Day has taken place on the last day of February, a month is known for having a 'rare' number of days.

### What is Rare Disease?

- A rare disease also referred to as an orphan disease, is any disease that affects a small percentage of the population.
- Over 300 million people are living with one or more of over 6,000 identified rare diseases around the world.
- Over 6000 rare diseases are characterised by a broad diversity of disorders and symptoms that vary not only from disease to disease but also from patient to patient suffering from the same disease.
- Relatively common symptoms can hide underlying rare diseases leading to misdiagnosis and delaying treatment.
- Quintessentially disabling, the patients quality of life is affected by the lack or loss of autonomy due to the chronic, progressive, degenerative, and frequently life-threatening aspects of the disease.
- Each rare disease may only affect a handful of people, scattered around the world, but taken together with the number of people directly affected is equivalent to the population of the world's third-largest country.

### Items for Box:

- Rare diseases currently affect 3.5% - 5.9% of the worldwide population.
- In India, one in one lakh people suffer from some rare disease.
- 72% of rare diseases are genetic whilst others are the result of infections (bacterial or viral), allergies and environmental causes, or are degenerative and proliferative.
- 70% of those genetic rare diseases start in childhood.

### What causes rare diseases?

- There are many different causes of rare diseases. The majority are thought to be genetic, directly caused by changes in genes or chromosomes.
- In some cases, genetic changes that cause disease are passed from one generation to the next.
- In other cases, they occur randomly in a person who is the first in a family to be diagnosed.
- Many rare diseases, including infections, some rare cancers, and some autoimmune diseases, are not inherited.
- The most common rare diseases identified in India are **Haemophilia, Thalassemia, Sickle-cell Anaemia, Primary Immuno Deficiency, Lysosomal Storage Disorders such as Gaucher Disease, Fabry Disease, Hunter Syndrome and Pompe's Disease.**

### Challenges:

- **Lack of knowledge:** The lack of scientific knowledge and quality information on the disease often results in a delay in diagnosis.
- **Misdiagnosis:** As mentioned, due to the broad diversity of disorders and relatively common symptoms which can hide underlying rare diseases, initial misdiagnosis is common. In addition, symptoms differ not only from disease to disease but also from patient to patient suffering from the same disease.
- **Social and financial burden:** Also the need for appropriate quality health care engenders inequalities and difficulties in access to treatment and care. This often results in heavy social and financial burdens on patients.
- Building awareness of rare diseases is so important because 1 in 20 people will live with a rare disease at some point in their life. Rare Disease Day improves knowledge amongst the general public of rare diseases while encouraging researchers and decision-makers to address the needs of those living with rare diseases.

## 2. "SCIENTISTS DISCOVER ANIMAL THAT DOESN'T BREATHE OXYGEN"

### Context

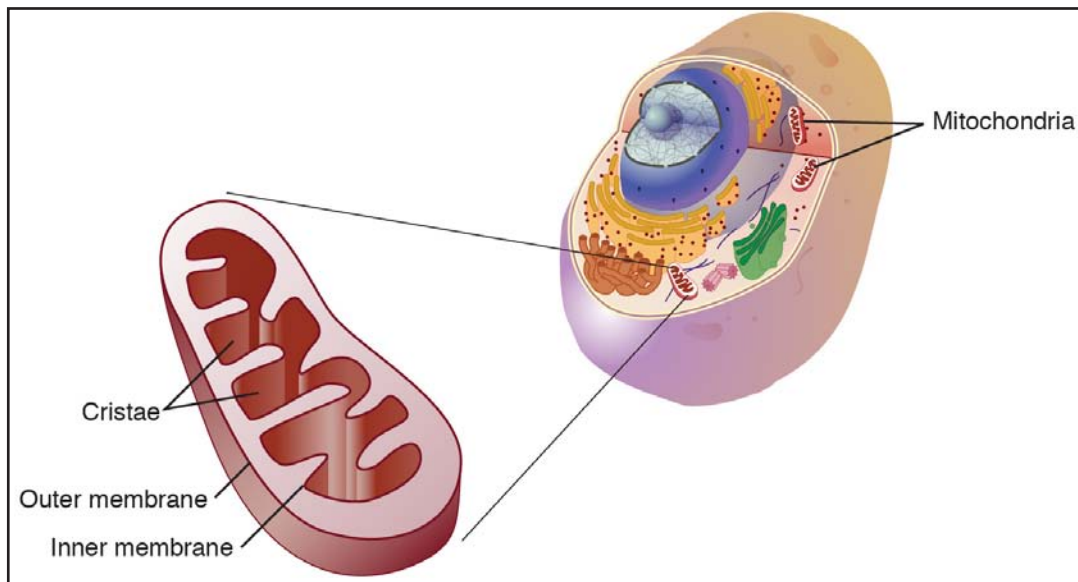
Scientists at Tel Aviv University have discovered a jellyfish-like parasite that doesn't need oxygen because it doesn't breathe. Its life is entirely free of dependency on oxygen.

### About

- The discovery was made by accident as the team was sequencing the genome of a common salmon parasite called **Henneguya salminicola**.
- When they searched for a **mitochondrial genome**, they didn't find anything.
- The discovery has enormous ramifications for not just one's understanding of life on Earth, but also for astrobiology and one's search for non-oxygen dependent life forms on other astronomical objects, possibly within the solar system.

### What is Mitochondria?

- **Mitochondria are organelles that trap oxygen and help to break it down to provide energy for the cell.**
- Mitochondria are membrane-bound cell organelles (mitochondrion, singular) that generate metabolic energy in eukaryotic cells needed to power the cell's biochemical reactions.
- Chemical energy produced by the mitochondria is stored in a small molecule called **adenosine triphosphate (ATP)**.
- Mitochondria contain their small chromosomes. Generally, mitochondria, and therefore mitochondrial DNA, are inherited only from the mother.



### What if, mitochondria are not present?

- The presence of mitochondria helps in harnessing oxygen and breaking it down for energy. Then, life took a dramatic turn and erupted.
- Unlike bacteria, all eukaryotic cells have mitochondria.
- Every cell in every plant or animal contains mitochondria, which generates fuel for the cell to burn and obtain energy.
- The lack of mitochondria implies that the animal does not use oxygen to function, as no other organelle or process in a cell is capable of breaking it down.
- It is not entirely known how the creature (parasite) obtains energy. It may be possible that it does so by absorbing molecules from the salmon that already produces energy.
- There are known organisms who have adapted to thrive in a low oxygen environment but until this study, whether there have been animals that don't use oxygen has been a question that hadn't been answered.

### Aerobic respiration:

- Aerobic respiration is a chemical reaction that transfers energy to cells.
- Plants and animals transport glucose and oxygen to tiny structures in their cells, called mitochondria.
- Here, glucose and oxygen take part in a chemical reaction.
- The reaction is called **aerobic respiration**, and it produces energy which transfers to the cells.
- The waste products of aerobic respiration are carbon dioxide and water.

### The parasite

- **Henneguyasalminicola** is a **myxozoan cnidarian** — a type of animal-related to jellyfish and coral.
- It consists of less than 10 cells in its being. It lives inside salmon's muscles and leeches energy off its host. But it is not a harmful parasite, it can live the fish's entire life inside it.
- The environment inside its host is almost entirely free of oxygen. This meant that it didn't need the mitochondria anymore once it found another way to adapt. So it dropped its mitochondrial genome entirely, so as to save energy and not copy genes for multiplication. It gave up breathing.



### 3. MARS INSIGHT MISSION

#### Context

NASA's Mars Lander InSight has recorded its first 'Marsquake.' It has recorded a quake of 2 or 2.5 magnitude which is hard to predict on Earth's surface.

#### About

- InSight is part of NASA's Discovery Program, managed by the agency's Marshall Space Flight Center in Huntsville, Alabama.
- It will be the first mission to peer deep beneath the Martian surface, studying the planet's interior by measuring its heat output and listening for marsquakes, which are seismic events similar to earthquakes on Earth.
- It will use the seismic waves generated by marsquakes to develop a map of the planet's deep interior.

#### Significance of the mission:

- The findings of Mars' formation will help better understand how other **rocky planets, including Earth, were and are created. But InSight is more than a Mars mission – it is a terrestrial planet** explorer that would address one of the most fundamental issues of planetary and solar system science – understanding the processes that shaped the rocky planets of the inner solar system (including Earth) more than four billion years ago.
- **InSight would delve deep beneath the surface of Mars, detecting the fingerprints of the processes of terrestrial planet formation, as well as measuring the planet's "vital signs":** Its "pulse" (seismology), "temperature" (heat flow probe), and "reflexes" (precision tracking).
- InSight seeks to answer one of science's most fundamental questions: How did the terrestrial planets form?
- Previous missions to Mars have investigated the surface history of the Red Planet by examining features like canyons, volcanoes, rocks and soil. However, signatures of the planet's formation can only be found by sensing and studying its "vital signs" far below the surface.
- In comparison to the other terrestrial planets, Mars is neither too big nor too small. This means that it preserves the record of its formation and can give us insight into how the terrestrial planets formed. It is the perfect laboratory from which to study the formation and evolution of rocky planets. Scientists know that Mars has low levels of geological activity. But a lander like InSight can also reveal just how active Mars really is.

\*\*\*\*\*



## 1. ISRO TO LAUNCH AN UNPRECEDENTED 10 EARTH IMAGING SATELLITES

### Context

The country will send up an unusually large number of 10 earth observation (EO) satellites during 2020-21, according to the latest annual report of the Indian Space Research Organisation for 2019-20.

### About

- It includes new categories such as the first Geo Imaging Satellite, GISAT-1.
- In comparison, only three communication satellites — which is another major category in space infrastructure — and two navigation satellites are planned for the coming financial year starting April.
- The annual plan mentions 36 missions, another high for a year: these include both satellites and their launchers.
- The high number also stands out amidst the immediate two years before and after the plan.
- ISRO says 19 national EO satellites, 18 communication satellites and eight navigation satellites are in service, driving uses from broadcasting, telephony, Internet services, weather and agriculture-related forecasting, security, disaster-time rescue and relief and location-based services.
- Three of the communication satellites are dedicated to military communication and networking.
- The EO sats are ostensibly for benign uses such as land and agriculture watch.
- But their images also have a very important use for the military, for keeping an eye on the borders.
- The satellites such as RISATs, which carry synthetic aperture radar on them, provide all-weather, 24-hour information to security agencies.
- The upcoming EO satellites include radar imaging satellites RISAT-2BR2, RISAT- 1A and 2A; Oceansat-3 and Resourcesat-3/3S.

### 10 earth observation (EO) satellites

- **GISAT-1:** It is a Geo Imaging Satellite in Geostationary orbit with a high temporal resolution. is primarily meant for near real-time imaging of natural resources and disaster management.
- **RISAT-2BR2:** It is a high agility X-Band Synthetic Aperture Radar-based satellite. It will provide all-weather, day/night imaging services from space.
- **OCEANSAT-3:** It will provide continuity of ocean colour data with improvements to continue and enhance operational services like potential fishery zone and primary productivity.
- **RISAT-1A and 2A:** They will provide continuity of service for RISAT-1 and RISAT-2 respectively.
- **HRSAT:** It will have a constellation of three satellites. Applications include large scale and cadastral level mapping, urban and rural planning, infrastructure development & monitoring, précising agriculture, disaster management, etc.

- **RESOURCESAT-3/3A:** The mission is envisaged to provide continuity of data service on an operational basis in the area of Land and Water resources management.
- **RESOURCESAT-3S/3SA:** These are planned to provide data services for earth resource monitoring with improved resolution and a wide swath.
- **INSAT-3DS:** It is designed for enhanced meteorological observations, monitoring of land and ocean surfaces, generating a vertical profile of the atmosphere for weather forecasting and disaster warning.
- **Microsat-2A:** It will meet demands for cartographic applications at cadastral level, urban and rural management, coastal land use and regulation, utility mapping, development and various other GIS applications.
- **NISAR:** It is being jointly developed by NASA & ISRO. The primary mission goals are: Global coverage of the earth's biomass, cryosphere, for surface dynamics and coastal studies over a period of 3-5 years, Systematic coverage of global environment with 12 days repeat the cycle.

## 2. ADITYA – L1 MISSION

### Context

The **Indian Space Research Organization (ISRO)** is preparing for its first scientific expedition to study the Sun, **Aditya-L1**.

### About

- Aditya-L1 is planned to be launched by the end of 2020. It would be placed into a point in space known as the L1 Lagrange point.
- Aditya L1 will be ISRO's 2nd space-based astronomy mission after AstroSat, which was launched in 2015.
- Aditya 1 was renamed as Aditya-L1. The Aditya 1 was meant to observe only the solar corona.
- **Launch Vehicle:** Aditya L1 will be launched using the **Polar Satellite Launch Vehicle (PSLV) XL with 7 payloads** (instruments) on board.
- **Objective:** Aditya L1 will study the:
  - **Sun's corona (Visible and Near-infrared rays)**
  - **Sun's photosphere (soft and hard X-ray)**
  - **chromosphere (Ultra Violet )**
  - **solar emissions, solar winds and flares**
  - **Coronal Mass Ejections (CMEs)**
- **Moreover, it will carry out round-the-clock imaging of the Sun.**

### Challenges:

- **Huge distance:** The distance of the Sun from Earth (approximately 15 crore km on average, compared to the only 3.84 lakh km to the Moon). This huge distance poses a scientific challenge.
- **Moving payloads:** Due to the risks involved, payloads in earlier ISRO missions have largely remained stationary in space; however, Aditya L1 will have some moving components which increase the risks of collision.
- **Others:** Other issues are the super-hot temperatures and radiation in the solar atmosphere. However, Aditya L1 will stay much farther away, and the heat is not expected to be a major concern for the instruments onboard.

### Significance of the Mission

- Evolution of every planet, including Earth and the exoplanets beyond the Solar System, is governed by its parent star i.e the Sun in our case. **Solar weather and environment affect the weather of the entire system.** Therefore, it is important to study the Sun.
- **Effects of Variation in Solar Weather System:** Variations in this weather can change the orbits of satellites or shorten their lives, interfere with or damage onboard electronics, and cause power blackouts and other disturbances on Earth.
- Knowledge of solar events is key to understanding space weather.
- To learn about and track Earth-directed storms, and to predict their impact, continuous solar observations are needed.
- Many of the instruments and their components for this mission are being manufactured for the first time in the country.

## 3. "GISAT-1 MISSION"

### Context

An ISRO GSLV-II rocket will launch the GISAT-1 mission.

### About:

- GISAT-1 is an Indian earth observation satellite to be launched in geostationary orbit. It is tasked with continuous observation of Indian sub-continent and quick monitoring of natural hazards and disaster.
- GISAT carries an imaging payload consisting of multi-spectral, multi-resolution from 50 m to 1.5 km.
- It will operate in geostationary orbit above the Southern India region after being launched from Sriharikota, India.
- The rocket consists of three stages and four liquid engine strap-on rocket motors that use UDMH and N<sub>2</sub>O<sub>4</sub>.
  - ▶ **First Stage:** The solid propellant first stage uses Hydroxyl-terminated polybutadiene (HTBP) and has a burn time of around 100 seconds.
  - ▶ It is important to keep in mind that once a solid motor is ignited, there is no shutting it off.
  - ▶ **Second Stage:** Also used by the second stage, Unsymmetrical dimethylhydrazine (UDMH) is the fuel of choice which has been used since the 1950s by many rocket companies, and Nitrogen tetroxide (N<sub>2</sub>O<sub>4</sub>) is the oxidizer of choice.
  - ▶ **Third Stage:** Finally, the third stage uses more familiar and frequently used propellants, Liquid Oxygen (LOX) as the oxidizer and Liquid Hydrogen (LH<sub>2</sub>) as the fuel.
- Using all the energy from these stages combined, ISRO can launch up to 2500 kg to Geostationary Transfer Orbit (GTO).

### What is GSLV Mk II?

- Geosynchronous Satellite Launch Vehicle Mark-II (GSLV Mk II) is the largest launch vehicle developed by India, which is currently in operation.
- This fourth-generation launch vehicle is a three-stage vehicle with four liquid strap-ons.
- The indigenously developed cryogenic Upper Stage (CUS), which is flight-proven, forms the third stage of GSLV Mk II.
- From January 2014, the vehicle has achieved four consecutive successes.

**Significance of the mission:**

- **Informative pictures:** It will provide pictures of the area of interest on a near real-time basis including border areas.
  - GISAT will provide near real-time pictures of large areas of the country, under cloud-free conditions, at frequent intervals.
  - That is, selected Sector-wise image every 5 minutes and entire Indian landmass image every 30 minutes at 50 m spatial resolution.
- **Security:** With GISAT-1, the government can keep a constant watch on borders.
- **Monitoring geographic changes:** Furthermore, it can monitor any change in the geographical condition of the country.

\*\*\*\*\*



An Institute for Civil Services

# IAS MAINS 2020

## LIVE & INTERACTIVE CLASSES

### MAINS 2020 CLASSES

- 1 GS MAINS QIP
- 2 ETHICS CLASSES
- 3 ESSAY CLASSES
- 4 POL. SC. ADVANCE
- 5 PUB AD. ADVANCE

### MAINS 2020 TEST SERIES

- 1 GS MAINS TEST SERIES
- 2 ETHICS & ESSAY TEST SERIES
- 3 POL. SC. TEST SERIES
- 4 PUB. ADM. TEST SERIES
- 5 HISTORY TEST SERIES

**Courses will be conducted according to UPSC Prelims Examination Date Announcements**

📍 1B, 2<sup>nd</sup> Floor, Pusa Road Karol Bagh, New Delhi-110005,  
(Adjacent to Karol Bagh Metro Gate No. 8)

✉ [info@iasscore.in](mailto:info@iasscore.in) 📱 [f/iasscore](https://www.facebook.com/iasscore)



[www.iasscore.in](http://www.iasscore.in)



8448496262





## 1. "BETELGEUSE SUPERNOVA"

### Context

Betelgeuse, the red supergiant star that marks the armpit of Orion the Hunter, has been dramatically and mysteriously dimming for the last six months.

### About:

Betelgeuse is a red supergiant star, located an estimated 642 light-years

Location: It's usually the 11th brightest star in the sky, taking its position as the right shoulder of Orion. But in the last few months, it's dimmed down to 38% of its usual brightness, now the 24th brightest star in the sky.

- **Variable star:** Variations are normal for Betelgeuse, and it's known to get dimmer and brighter. It's literally growing and shrinking as the internal temperatures rise and fall pushing the star in and out like a beating heart.
- **Convective cells:** It has **enormous convective cells** on its surface that boil creating brighter and dimmer regions, and it's constantly blowing out dust that can obscure our view for a time.

### What's the reason behind this?

- Astronomers have captured the unprecedented dimming of Betelgeuse Using ESO's Very Large Telescope (VLT).
- The stunning new images of the star's surface show not only the fading red supergiant but also how its apparent shape is changing.
- The red supergiant Betelgeuse has recently dimmed quite dramatically because those two periodic cycles are overlapping at minimal brightness.
- Beginning in October 2019, astronomers noticed that the brightness of Betelgeuse suddenly began to change. The star was dimming.
- Once one of the top 10 brightest stars in the sky, its brightness had fallen to 21st place by the end of December 2019.

### Is it going to explode?

- Astronomers have long suspected that the star might explode sometime in the next million years.
- It's also possible that Betelgeuse has already exploded and we just haven't seen it happen; because the star is 600 light-years away, it takes 600 years after something happens on Betelgeuse for light from that event to reach Earth.
- But if and when astronomers do witness the star's explosion, it will be the most astonishing astronomy event of all time.
- When Betelgeuse explodes, turning into a supernova, it will briefly shine even brighter than the full moon. Then, the star will vanish forever.

### What is The Very Large Telescope array (VLT)?

- The **Very Large Telescope array (VLT)** is the flagship facility for **European ground-based astronomy** at the beginning of the third Millennium.
- It is the **world's most advanced optical instrument**, consisting of four Unit Telescopes with main mirrors of 8.2m diameter and four movable 1.8m diameter Auxiliary Telescopes.
- The telescopes can work together, to form a giant 'interferometer', the ESO Very Large Telescope Interferometer, allowing astronomers to see details up to 25 times finer than with the individual telescopes.
- The light beams are combined in the VLTi using a complex system of mirrors in underground tunnels where the light paths must be kept equal to distances less than 1/1000 mm over a hundred metres.
- With this kind of precision, the VLTi can reconstruct images with an angular resolution of milliarcseconds, equivalent to distinguishing the two headlights of a car at the distance of the Moon.
- The 8.2m diameter Unit Telescopes can also be used individually.
- With one such telescope, images of celestial objects as faint as magnitude 30 can be obtained in a one-hour exposure.
- This corresponds to seeing objects that are four billion (four thousand million) times fainter than what can be seen with the unaided eye.

Over their lifetimes, red supergiants (like Betelgeuse) create and eject vast amounts of material even before they explode as supernovae. Today's modern technology has enabled scientists to study these objects, hundreds of light-years away, in unprecedented detail. It gives the opportunity to unravel the mystery of what triggers their mass loss.

## 2. "SYRI (SYSTEM RISK INDICATOR)"

### Context

In a first anywhere in the world, a court in the Netherlands recently stopped a digital identification scheme for reasons of exclusion. This has a context for similar artificial intelligence systems worldwide, especially at a time when identity, citizenship and privacy are pertinent questions in India.

### What was the scheme?

- SyRI (System Risk Indicator) is an identification mechanism.
- The Dutch Ministry of Social Affairs developed SyRI in 2014 to weed out those who are most likely to commit fraud and receive government benefits.
- Legislation passed by the Dutch Parliament allowed government agencies to share 17 categories of data about welfare recipients such as taxes, land registries, employment records, and vehicle registrations with a private company.
- The company, called "The Intelligence Agency", used an algorithm to analyse data for four cities and calculate risk scores.
- The selective rollout was conducted in low-income and immigrant neighbourhoods, which have a higher number of beneficiaries.
- Elevated risk scores were sent to relevant government arms, which stores these on government databases for a maximum of two years.
- The government, in that time period, could open an investigation on the targeted person.

### The issue:

- Recently, a Dutch district court ruled against SyRI (System Risk Indicator), because of data privacy and human rights concerns.

- While the Hague district court found using new technology to control fraud was acceptable, it held SyRI was too invasive and violative of the privacy guarantees given by European Human Rights Law as well as the EU's General Data Protection Regulation.
- Legal criticism alleged that the algorithm would begin associating poverty and immigrant statuses with fraud risk.
- The court found that opaque algorithmic decision-making puts citizens at a disadvantage to challenge the resulting risk scores. The Netherlands continuously ranks high on democracy indices.
- The court ruled that SyRI was violative of principles of transparency and data minimisation laid out in their General Data Protection Regulation.
- Other European tech initiatives have been stalled by the regulation, including a facial recognition system on students in Sweden and France.

### How relevant is this for India?

Similar to the Supreme Court's Aadhaar judgment setting limits on the ID's usage, The Hague Court attempted to balance social interest with personal privacy.

However, the Aadhaar judgment was not regarding **algorithmic decision-making**; it was about data collection.

The ruling is also an example of how a data protection regulation can be used against government surveillance.

India's pending data protection regulation, being analysed by a Joint Select Committee in Parliament, would give broad exemptions to government data processing in its current form.

### Similar regulations by the US:

- India's proposed regulation is similar to the US in the loopholes that could be potentially exploited.
- Hence, attempts to ban facial recognition in cities such as San Francisco have not had the same success as attempts in Europe.
- A system somewhat paralleling the Dutch **SyRI** system was a risk-scoring software being used by US court systems to establish bail times.
- The US Supreme Court declined to hear a related case in 2017.

### Global countries taking note of the 'ruling':

- Digital ID systems are being rolled out at a fast pace in places like **Kenya, Philippines, Nigeria, Mexico**, and more.
- Experts worldwide have been watching the Netherlands case throughout, and agree that the ruling will ripple beyond south Rotterdam.

The ruling sets a strong legal precedent for other nations to follow. This is one of the first times a court has stopped the use of digital technologies and abundant digital information on human rights grounds.

## 3. "GENOME INDIA PROJECT"

### Context

The government has cleared an ambitious gene-mapping project that is being described by those involved as the "first scratching of the surface of the vast genetic diversity of India".

### What is a genome?

- Every organism's genetic code is contained in its Deoxyribose Nucleic Acid (DNA), the building blocks of life.
- A genome, simply put, is all the genetic matter in an organism. It is defined as "an organism's complete set of DNA, including all of its genes."

- Each genome contains all of the information needed to build and maintain that organism. In humans, a copy of the entire genome, more than 3 billion DNA base pairs, is contained in all cells that have a nucleus
- The discovery that DNA is structured as a “double helix” by James Watson and Francis Crick in 1953, for which they won a Nobel Prize in 1962, was the spark in the long, continuing quest for understanding how genes dictate life, its traits, and what causes diseases.

### About the Project:

- The first stage of the project will look at samples of “10,000 persons from all over the country” to form a “grid” that will enable the development of a “reference genome”.
- Nodal agency:** The IISc’s Centre for Brain Research, an autonomous institute, will serve as the nodal point of the project.
- Aim:** Its aim is to ultimately build a grid of the Indian “reference genome”, to understand fully the type and nature of diseases and traits that comprise the diverse Indian population.

### Benefits of the Project:

The Genome India Project, a collaboration of 20 institutions will enable new efficiencies in medicine, agriculture and the life sciences. The major benefits are as given below:

- Improving health:** Several diseases develop through metabolic polymorphisms. If such propensities to disease can be mapped to variations across genomes, it is believed public health interventions can be targeted better, and diseases anticipated before they develop.
- Agriculture:** A better understanding of the genetic basis of susceptibility to blights, rusts and pests can make it possible to deter them genetically, and reduce dependence on chemicals.
- Mapping the diverse gene pools:** Global science would also benefit from a mapping project in one of the world’s most diverse gene pools, which would provide data useful for the mapping of the spread and migration of a range of life forms in the Old World, from plants to humans.
- Deep information on evolution:** Traversing from the world’s tallest mountain range to warm seas through multiple bio-zones demarcated by climate and terrain, India could provide much information on the interplay of species and genetic groups within them.
- A deeper understanding of ecology:** Eventually, a deeper understanding of ecology could emerge from the material thrown up.

### Challenges:

- However, some caution must be exercised in the field of human genetics, because the life sciences sometimes stray into unscientific terrain and heighten political bias.
- The mapping of brain regions to mental functions spun off the utterly unscientific and racist field of phrenology.
- In India, a nation driven by identity politics and obsessed with the myths of pristine origins and authenticity, scientific work in mapping genetic groups may become grist to the political mill of the unscientific notion of race.

### Hasn’t the human genome been mapped before?

- The Human Genome Project (HGP) was an international programme that led to the decoding of the entire human genome.
- The HGP was an inward voyage of discovery, led by an international team of researchers looking to sequence and map all of the genes of members of our species.
- Beginning on October 1, 1990, and completed in April 2003, the HGP gave the ability, for the first time, to read nature’s complete genetic blueprint for building a human being.

In today’s era, mapping of India’s genetic landscape is essential for next-generation medicine, agriculture and biodiversity management. This move must be supported at all levels to map the diversity of India’s genetic pool and put it on the global map.

\*\*\*\*\*



## 1. "ARSENIC-RESISTANT RICE"

### Context

Researchers have developed and commercialised a rice variety that is resistant to arsenic.

### About Muktoshrri:

- The new rice variety, Muktoshrri, also called IET 21845, was developed jointly by the **Rice Research Station** at Chinsurah coming under West Bengal's **Agriculture** Department and the **National Botanical Research Institute**, Lucknow, over several years.
- Work on developing the variety started in 2006 and by 2013 the scientists were successful.
- This variety uptake very less amount of arsenic from soil and water in comparison to other varieties of rice.
- The variety yields 5.5 metric tonnes per hectare in the Boro season and 4.5 to 5 metric tonnes per hectare in the Kharif season, respectively.

### Arsenic contamination:

- Arsenic is naturally present at high levels in the groundwater of a number of countries. It is highly toxic in its inorganic form.
- Arsenic contamination of groundwater is widespread and there are a number of regions where arsenic contamination of drinking-water is significant.
- Arsenic is one of WHO's 10 chemicals of major public health concern.
- It is now recognized that at least 140 million people in 50 countries have been drinking water containing arsenic at levels above the WHO provisional guideline value of **10 µg/L (4)**.
- According to the latest report of the **Central Ground Water Board (CGWB)**, 21 states across the country have pockets with arsenic levels higher than the Bureau of Indian Standards' (BIS) stipulated permissible limit of **01 milligram per litre (mg/l)**.
- In India, arsenic contamination was first officially confirmed in West Bengal in 1983. Close to four decades after its detection, the scenario has worsened, about 9.6 million people in West Bengal are at immediate risk from arsenic contamination in groundwater.
- **West Bengal** is among the States with the highest concentration of arsenic in groundwater, with as many as 83 blocks across seven districts having higher arsenic levels than permissible limits.

### Impacts:

- **Irreversible damages:** Major impacts of arsenic in water include skin damage, keratosis and skin cancer, cancers of lung and bladder and diseases of the vascular system.
- **Poisoning:** According to the World Health Organization, long-term exposure to arsenic, mainly through drinking water and food, can lead to poisoning.

- **A danger to livestock:** Rice husk, containing high levels of arsenic, is being used as fodder for livestock, exposing them to the hazardous impacts of arsenic contamination. This is also leading to a potential risk for humans when they consume cattle based food products.
- **Cancer-causing agent:** Arsenic poisoning is one of the greatest reasons for the growing cases of cancer for people living in India's Ganga plains. It can lead to the aggravated condition of Cancer.

## 2. "Voyager 2"

### Context

In an incredible feat of remote engineering, NASA has fixed one of the most intrepid explorers in human history. Voyager 2, currently some 11.5 billion miles from Earth, is back online and resuming its mission to collect scientific data on the solar system and the interstellar space beyond.

### Understanding Interstellar Space:

- 'Inter' means between. 'Stellar' refers to stars. Interstellar space is the part of space that exists between stars.
- Scientists define the beginning of interstellar space as the place where the Sun's constant flow of material and magnetic field stop affecting its surroundings.
- This place is called the heliopause.

### What happened to the spacecraft?

- The spacecraft had run into trouble on January 28, when NASA revealed that it had unexpectedly, and for unknown reasons, shut down.
- The venerable probe failed to execute a spin maneuver as intended. As a result, two onboard systems remained on longer than planned, sucking up so much energy that Voyager 2 automatically shut off its science instruments.
- But now, Voyager 2 is back online — gathering and relaying scientific information just as before.

## 3. 'NATIONAL MISSION ON QUANTUM TECHNOLOGIES & APPLICATIONS (NM-QTA)'

### Context

The government in its budget 2020 has announced a National Mission on Quantum Technologies & Applications (NM-QTA) with a total budget outlay of Rs 8000 Crore for a period of five years to be implemented by the Department of Science & Technology (DST).

### About the mission:

- The new mission will oversee the development of quantum technologies for communications, computing, materials development and cryptography.
- It will coordinate the work of scientists, industry leaders and government departments
- **Implementing authority:** The move will be implemented by the Department of Science & Technology (DST).
- **Focus area:** The areas of focus for the Mission will be in fundamental science, translation, technology development, human and infrastructural resource generation, innovation and start-ups to address issues concerning national priorities.



### Quantum Technology:

- Quantum technologies are rapidly developing globally with a huge disruptive potential.
- Quantum technology is a class of technology that works by using the principles of quantum mechanics (the physics of sub-atomic particles), including quantum entanglement and quantum superposition.
  - ▶ **Quantum entanglement** is when two atoms are connected, or entangled, despite being separated.
  - ▶ **Quantum superposition** is the theory that sub-atomic particles exist in multiple states simultaneously.
- It concerns the control and manipulation of quantum systems, with the goal of achieving information processing beyond the limits of the classical world.
- Quantum technology is opening up new frontiers in computing, communications, cyber security with wide-spread applications.
- It is expected that lots of commercial applications would emerge from theoretical constructs which are developing in this area.
- Quantum technology promises improvements to a vast range of everyday gadgets, including:
  - ▶ more reliable navigation and timing systems
  - ▶ more secure communications
  - ▶ more accurate healthcare imaging
  - ▶ more powerful computing
- The next generation transformative technologies that will receive a push under this mission include quantum computers and computing, quantum communication, quantum key distribution, encryption, crypt analysis, quantum devices, quantum sensing, quantum materials, quantum clock and so on.

### Significance of the mission:

- **Super-secure communication network:** The mission may eventually lead to the creation of a super-secure communication network to make online financial transactions hacking-proof besides ensuring full-proof safety of every bit of digital communication.
- **Solution for complex problems:** Quantum principles will be used for engineering solutions to extremely complex problems in computing, communications, sensing, chemistry, cryptography, imaging and mechanics.
- **Global recognition:** India's considerable investment in the field places it alongside the United States, Europe and Russia. In 2018, US decided to invest US\$1.2 billion over five years in a national quantum initiative, and in 2016, Europe pledged US\$1.13 billion for quantum technologies. Russia is also

\*\*\*\*\*



## 1. 'VACCINE TO CONTROL CLASSICAL SWINE FEVER'

### Context

In order to check fall in pig population in India, the government unveiled a new indigenously developed vaccine for controlling classical swine fever, which is a highly contagious fatal pig disease.

### About Classical Swine Fever:

- Classical swine fever (CSF), also known as hog cholera, is a contagious viral disease of domestic and wild swine.
- It is caused by a virus of the **genus Pestivirus** of the family **Flaviviridae**, which is closely related to the viruses that cause **bovine viral diarrhoea** in cattle and **border disease** in sheep.
- Clinical signs:** The virus that causes CSF varies in virulence. Some strains are highly virulent and cause acute (i.e. rapid) serious disease. Some strains are of low virulence and cause chronic (i.e. long-lasting) disease, others are intermediate causing sub-acute disease.
- There is only one serotype of CSF virus (CSFV).
- CSF is a disease listed by the OIE World Organisation for Animal Health (OIE) Terrestrial Animal Health Code and must be reported to the OIE (OIE Terrestrial Animal Health Code).

### The new vaccine:

- Developer:** The new vaccine is developed by Uttar Pradesh-based ICAR-Indian Veterinary Research Institute (IVRI).
- Cost:** It will be much cheaper than the existing one. It would cost only Rs 2 per dose compared to the current vaccine's rate of Rs 15-20 per dose and imported Korean vaccine rate of Rs 30 per dose.
- The new vaccine has been developed using Indian strain and lakhs of doses can be produced very easily using the **cell culture technology**.
- The new vaccine is safe and potent. It does not revert to virulence and provide protective immunity from day 14 of the vaccination till 24 months studied so far.

### The need:

- Currently, India does not have enough vaccine for controlling classical swine fever (CSF), which has led to high mortality with annual loss of about Rs 4.29 billion.
- Against the annual requirement of 20 million doses, the availability is only 1.20 million doses, according to the IVRI.
- Although there is no health risk to humans, it is highly transmissible among swine.
- Since 1964 a **lapinized CSF vaccine** is being used in India for controlling the disease. The vaccine is produced by sacrificing large numbers of rabbits for each batch.
- To do away sacrificing of rabbits and increase the productivity, IVRI later developed a cell-cultured vaccine using foreign strain and commercialised it in 2016 and 2018.

### Significance of the development:

- **Controlling spread:** The vaccine will nip the spread of the virus at animal stage so that it does not pass on to the human population.
- **Fulfilling requirement:** This new development will help tide over the huge shortfall in vaccine requirement across the country.
- **Lower cost:** CSF is one of the most common diseases affecting pigs, causing high mortality with annual loss of approximately Rs430 crore. The new vaccine will help CSF vaccination costs to come down sharply.

## 2. NASA'S SPITZER SPACE TELESCOPE

### Context

NASA is ending its Spitzer Space Telescope mission, which observed the universe in infrared for 16 years.

### About

- The **Spitzer Space Telescope (SST)**, formerly known as 'Space Infrared Telescope Facility' (SIRTF), is an **infrared space telescope**.
  - ▶ It was launched in 2003.
  - ▶ It retired on 30 January 2020.
- **Naming of the telescope:** Unlike most telescopes that are named after famous deceased astronomers, the new name for SIRTF was obtained from a contest open to the general public.
  - ▶ Keeping with NASA tradition, the telescope was renamed after its successful demonstration of operation.
- **Mission plan:** The planned mission period was to be 2.5 years, with an extendable period depending upon exhaustion of **on-board liquid helium supply**.
  - ▶ Spitzer was launched from Cape Canaveral SLC-17B aboard a Delta II 7920H rocket.
- **Shut down:** NASA is shutting down SIRTF; which was its long-lasting space observatories.
  - ▶ The telescope had been wandering through space for nearly two decades.
  - ▶ NASA has run out of money to fund the spacecraft.
  - ▶ In 2018 it had cost roughly \$12 million to operate the telescope.
  - ▶ In 2017, NASA made an unsuccessful attempt to search for private organizations to take over Spitzer.
- **Infrared Science Archive (IRSA):** All Spitzer data, from both the primary and warm phases, are archived at the Infrared Science Archive (IRSA).

### Lyman Spitzer

- Earlier, the telescope was named in honour of **astronomer Lyman Spitzer**, who had promoted the concept of space telescopes in the 1940s.
  - ▶ He has been cited for his pioneering contributions to rocketry and astronomy.
- **Extra-terrestrial observatory:** In 1946 Spitzer described the advantages of an extra-terrestrial observatory, and how it could be realized with available or upcoming technology.

### Functioning

- **Helium supply:** Liquid helium is needed to cool the telescope to very low temperatures.
  - ▶ Low temperatures are needed in order to operate; otherwise most of the instruments will not be usable.

- **Orbit path:** It follows a heliocentric instead of geocentric orbit, trailing and drifting away from Earth's orbit at approximately 0.1 astronomical units per year (a so-called "earth-trailing" orbit).
- **Earth-trailing orbit:** The spacecraft is in more or less the same orbit as Earth, lagging behind the planet as it travels around the Sun.
  - ▶ Spitzer gets farther and farther from Earth each year and doesn't warm up from the heat coming off our planet.
  - ▶ That way it stays nice and cool.
  - ▶ For an extra layer of coolness, Spitzer is launched to space with a special liquid helium coolant, which helped to keep the spacecraft and its instruments at a frigid temperature of -459 degrees Fahrenheit (or -273 degrees Celsius).
- **Low temperatures:** Anything that emits a lot of heat also emits a lot of infrared light, which means there are plenty of sources that can come up in observations.
  - ▶ Earth's atmosphere is a source of infrared light, which makes it difficult to observe the Universe in infrared from the ground.
  - ▶ If the telescope gets too warm, the infrared light it emits can also be a source of confusion.
  - ▶ Hence, cold telescopes like Spitzer in space.
- **Primary mirror:** The primary mirror is 85 centimetres (33 in) in diameter, f/12, made of beryllium and was cooled to 5.5 K (-268 °C; -450 °F).
- **Three instruments:** The satellite contains three instruments that allow it to perform astronomical imaging.
  - ▶ Photometry from 3.6 to 160 micrometers.
  - ▶ Spectroscopy from 5.2 to 38 micrometers.
  - ▶ Spectrophotometry from 5 to 100 micrometers.
- **Infrared visibility:** Spitzer's charge has been to observe infrared light, a type of light that humans can't see, but can sense as heat.
  - ▶ Objects that are faint and super cold can still be seen by the infrared light that they produce, so Spitzer can show us things that might otherwise seem invisible.

### Achievements of SIRT

- Spitzer took images of some of the **coldest and most ancient objects** in the Universe.
- It proven to be a remarkable tool for learning more about the **cosmos**.
- Helped discover **newly forming stars**, new rings of Saturn, and even an **entire solar system** around 40 light-years away.
- The telescope revealed a **new ring around the planet Saturn**.
- **Old stars and galaxies** were Spitzer's specialty, as well as **extra cold objects** that may be cold by human standards, but are actually warmer than the backdrop of our extra cold Universe.
- Spitzer could spot baby stars in the middle of forming, which are too faint to see but observable in infrared.
- The **North America Nebula** seen in visible and infrared light was taken from Spitzer Image.
- Despite being offline, Spitzer could still help scientists make **more discoveries in the future**.
- The entire archive of observations made by the telescope will be available to anyone who wants to use it.
- It's possible that **even more great finds** are hiding in these records.

### Spitzer Warm Mission

- Spitzer operated in its "cold mission" for 5.5 years, well beyond the 2.5 years that NASA had hoped.
- But eventually, the spacecraft ran out of the liquid helium coolant, which prompted Spitzer's warm mission.

- The telescope warmed up, but it didn't warm up very much.
- It wasn't able to observe as much as it could before.
- Its biggest find during its warm phase: the discovery of an entire solar system of seven Earth-sized planets, orbiting a star called TRAPPIST-1.

### NASA observatories

- Spitzer is one of four space telescopes operated by NASA known as the Great Observatories.
  - Compton Gamma Ray Observatory
  - Chandra X-ray Observatory
  - Hubble Space Telescope.
  - Spitzer Space Telescope
- Combined, the four telescopes were meant to observe the Universe in as many wavelengths of light as possible — ranging from the visible light that we can see, to the kinds of light our eyes cannot register.
- **James Webb Space Telescope:** NASA's next great space observatory, the James Webb Space Telescope is in making.
  - Designed to study the Universe in infrared, the James Webb will be the most powerful space telescope ever made.
  - It will be able see back in time to the beginning of the Universe.

## 3. 'POLYCRACK TECHNOLOGY'

### Context

Indian Railways has commissioned the country's first governmental waste to energy plant in Mancheswar Carriage Repair workshop at Bhubaneswar in East Coast Railway.

### About the Waste-To-Energy Plant:

- This Waste to Energy Plant, a patented technology called **POLYCRACK**, is first-of-its-kind in Indian Railways in India.
- While this is the first such plant over railways, it is the fourth in the country. The first plant is a small one with capacity of 50 kg/day set up by Infosys at Bangalore in 2011.
- The second one is at Moti Bagh, Delhi in 2014 with a capacity of 50 kg per day. The third one set up at Hindalco in 2019 with 50 kg capacity per batch.
- It is world's first patented heterogeneous catalytic process which converts multiple feed stocks into hydrocarbon liquid fuels, gas, carbon and water.
- **Important features:** Polycrack has the following advantages over the conventional approach of treating solid waste:
  - Pre-segregation of waste is not required to reform the waste. Waste as collected can be directly fed into Polycrack.
  - It has high tolerance to moisture hence drying of waste is not required.
  - Waste is processed and reformed within 24 hours.
  - It is an enclosed unit hence the working environment is dust free.
  - Excellent air quality surrounding the plant.
  - Biological decomposition is not allowed as the Waste is treated as it is received.
  - The foot print of the plant is small hence the area required for installing the plant is less when compared with conventional method of processing.

- ▶ All constituents are converted into valuable energy thereby making it Zero Discharge Process.
- ▶ Gas generated in the process is re-used to provide energy to the system thereby making it self-reliant and also bring down the operating cost.
- ▶ There is no atmospheric emission during the process unlike other conventional methods except for combustion gases which have pollutants less than the prescribed norms the world over.
- ▶ Operates around 450 degrees, making it a low temperature process when compared with other options.
- ▶ Safe and efficient system with built-in safety features enables even an unskilled user to operate the machine with ease.
- ▶ Low capital cost and low operating cost.
- ▶ Fully automated system requires minimum man power.

### **How the waste will be processed?**

- Polycrack Plant can be fed with all types of Plastic, Petroleum sludge, Un-segregated MSW (Municipal Solid Waste) with moisture up to 50%, E-Waste, Automobile fluff, Organic waste including bamboo, garden waste etc., and Jatropha fruit and palm bunch.
- Waste generated from Mancheswar Carriage Repair Workshop, Coaching Depot and Bhubaneswar Railway Station will be feeder material for this plant.
- The process is a closed loop system and does not emit any hazardous pollutants into the atmosphere.
- The combustible, non-condensed gases are re-used for providing energy to the entire system and thus, the only emission comes from the combustion of gaseous fuels.
- The emissions from the combustion are found to be much less than prescribed environmental norms.
- This process will produce energy in the form of Light Diesel Oil which is used to light furnaces.

\*\*\*\*\*





## 1. 'DHANUSH, INDIA'S FIRST INDIGENOUS LONG-RANGE ARTILLERY GUN'

### Context

The Dhanush gun system was showcased for the first time at the 71st Republic Day parade.

### About Dhanush:

- Dhanush, the 155 mm/45-calibre gun system is a towed Howitzer designed indigenously by the Ordnance Factory Board (OFB).
- It is the first long-range artillery gun to be produced in India and has been billed as a success of the government's **Make in India**
- **Hitting range:** The gun has a maximum range of 36.5 km and has the capability of automatic alignment and positioning.
- It is equipped with:
  - an inertial navigation-based sighting system
  - an auto-laying facility
  - an onboard ballistic computation
  - an advanced day and night direct firing system
- Apart from the above, the gun is also fitted with an inertial navigation system with global positioning system- (GPS) based gun recording and auto-playing, an enhanced tactical computer for onboard ballistic computations, an onboard muzzle velocity recording, an automated gun sighting system equipped with the camera, thermal imaging and laser range finder.
- **Joint effort:** It is a joint effort by the OFB, the Army, Defence Research and Development Organisation (DRDO), Directorate General Quality Assurance, PSUs Bharat Electronics Limited, SAIL, and private firms.

### Desi-Bofors:

- Dhanush is an improved version of the FH-77B 155 mm/39-calibre field howitzers that were originally produced by AB Bofors of Sweden, which is now BAE Systems.
- It is compatible with all **North Atlantic Treaty Organization (NATO)** 155 mm ammunition system.
- Referred to as 'desi Bofors', Dhanush is the first long-range artillery gun to be produced under the 'Make in India' initiative.

### Significance of Dhanush for India:

- **Difficult terrain:** Dhanush's lightweight (13 tonnes), makes it easy to mobilize in hilly terrain and remote areas.

- **Operational in all climatic conditions:** Being a versatile weapon, it can operate in all climatic conditions.
- **Enhancing the Army's power:** It is the first long-range artillery gun to be produced in the country. It will significantly enhance the Army's firepower.

### Other important display:

- Other than Dhanush artillery, the **Anti-Satellite (ASAT) missile** also made an appearance for the first time.
  - ▶ With space becoming a vital dimension of any country's economic and military superiority, A-SAT (Anti-Satellite) weapons play a critical role in providing the necessary strategic deterrence.
  - ▶ In March last year, the Defence Research Development Organisation (DRDO) launched '**Mission Shakti**', India's first A-SAT mission and demonstrated its anti-satellite technology.
- The **K9 Vajra**, another indigenous gun system inducted in the Indian Army, was also seen at the parade this year.
- The short-span bridging system and the **Sarvatra Bridge system** was also displayed.
- Heavylift helicopter **Chinook** and attack helicopter **Apache**, both recently inducted in the Indian Air Force (IAF), also made a debut in the parade.
  - ▶ The Chinooks can airlift diverse loads in remote locations.
  - ▶ The Apache, on the other hand, is a versatile helicopter capable of firing air to air and air to ground missiles, rockets and front gun aided through fire control radar which can unleash havoc on the adversary.

## 2. 'BIOROCK OR MINERAL ACCRETION TECHNOLOGY'

### Context

The Zoological Survey of India (ZSI), with help from Gujarat's forest department, is attempting for the first time a process to restore coral reefs using biorock or mineral accretion technology.

### Locating the biorock:

- Biorock is the name given to the substance formed by electro accumulation of minerals dissolved in seawater on steel structures that are lowered onto the sea bed and are connected to a power source, in this case solar panels that float on the surface.
- A biorock structure has been installed one nautical mile off the Mithapur coast in the Gulf of Kachchh.
- The location for installing the biorock had been chosen keeping in mind the high tidal amplitude in the Gulf of Kachchh.
- The low tide depth where the biorock has been installed is four metres, and at high tide it is about eight metres.

### About the technology:

- Mineral Accretion Technology is a coral reef restoration technology that utilizes low voltage electricity to improve the health and growth rates of corals and other marine organisms.
- The technology works by passing a small amount of electrical current through electrodes in the water.
- When a positively charged anode and negatively charged cathode are placed on the sea floor, with an electric current flowing between them, calcium ions combine with carbonate ions and adhere to the structure (cathode).
- This results in calcium carbonate formation. Coral larvae adhere to the  $\text{CaCO}_3$  and grow quickly.

- Fragments of broken corals are tied to the biorock structure, where they are able to grow at least four to six times faster than their actual growth as they need not spend their energy in building their own calcium carbonate skeletons.

### What are Coral Reefs?

- Coral reefs are the large number underwater structures composed of the skeleton of the colonial marine invertebrates known as 'coral'.
- Each individual coral animal is called a '**polyp**'. Most of them live in groups of thousands of genetically identified polyps that form a '**colony**', which is created by a process called **budding**, where the original polyp grows copies of itself.
- Corals are invertebrates belonging to the group of **Cnidarians**. They are generally classified into two groups:
  - **Hard or hermatypic corals:** They extract calcium carbonate from seawater to create a hard, durable exoskeleton that protects their bodies.
  - **Soft corals:** They are flexible organisms and resemble trees and plants.

### Threat to Coral Reefs:

- **Ocean warming:** Corals cannot survive in high water temperature. Global warming has already led to increased levels of coral bleaching.
- **Pollution:** Pollution arising from urban and industrial waste, sewage, agrochemicals, and oil pollution are poisoning reefs, increasing the level of nitrogen in seawater, causing an overgrowth of algae, which smothers reefs by cutting off their sunlight.
- **Destructive Fishing Practices:** Destructive fishing practices such as cyanide fishing, dynamite fishing, bottom trawling, and muro-ami, bottom-trawling are some of the greatest threats to cold-water coral reefs.
- **Overfishing:** Overfishing adversely affects the ecological balance of the coral reef, disturbing the food chain.
- **Sedimentation:** Furthermore, erosion caused by construction, mining is leading to increased sediment in rivers, which ends up in the ocean. In addition to this, the destruction of mangrove forests, which generally trap large amounts of sediment, is exacerbating the problem.

### Significance of the initiative:

- **Sustainability:** The initiative of coral restoration using biorock technology could potentially help to sustain the earlier successes.
- **Strengthening corals:** The technology helps corals, including the highly sensitive branching corals, to counter the threats posed by global warming.

## 3. 'ACCRETION BURST EVENT'

### Context

In a latest development, astronomers have found that the funneling of matter into a forming star happens at different rates over time. Sometimes the forming star swallows up a huge amount of matter, resulting in a burst of activities in the massive star. This is called an accretion burst event.

### Key-highlights of the findings:

- The international group of scientists, for the first time in history has been able to trace by masers and examine the subluminal propagation of a thermal radiation 'heatwave' emanating from an accreting high-mass protostar of the high-mass protostar **G358-MM1**.
- The object is eight times the mass of the sun; located at a distance of about 22,000 light years from Earth.

- High-mass stars radically rebuild their surroundings and thus redetermine the structure and evolution of galaxies. One of the modern hypotheses is that high-mass protostars grow due to episodic accretion (an increase in mass due to the influx of matter from the surrounding objects).
- Large fragments of the surrounding matter fall on the star, dying in bright flashes.

### What is Accretion Burst Event?

- Accretion burst event is incredibly rare. Till now, only three such events have been observed, out of all the billions of massive stars in the Milky Way.
- After the first detection of an accretion burst, in 2016, astronomers from around the world agreed in 2017 to coordinate their efforts to observe more.
  - ▶ Reported bursts have to be validated and followed up with more observations, and this takes a joint, global effort – which led to the formation of the **Maser Monitoring Organisation(M2O)**.
- In January 2019, astronomers at Ibaraki University in Japan noticed that one such massive protostar, **G358-MM1**, showed signs of new activity. The masers associated with the object brightened significantly over a short period of time.
  - ▶ Follow-up observations with the Australian Long Baseline Array revealed something astronomers are witnessing for the first time– a blast of heat-wave coming from the source and travelling through the surroundings of the forming big star.
  - ▶ Blasts can last for about two weeks to a few months.

### What is Maser?

- A maser (microwave amplification by stimulated emission of radiation) is the microwave (radio frequency) equivalent of laser.
- Masers are observed using radio telescopes and most of them are observed at centimetre wavelength. They are very compact.
- A maser flare can be a sign of an extraordinary event such as the formation of a star.
- Since 2017 radio telescopes in Japan, Poland, Italy, China, Russia, Australia, New Zealand and South Africa (HartRAO, in the country's Gauteng province) have been working together to detect a flare stimulated by a burst in the funnelling of materials into a massive star.

### Formation of Stars:

- Stars are giant, luminous spheres of plasma. There are billions of them — including our own sun, in the Milky Way Galaxy.
- Stars are born within the clouds of dust and scattered throughout most galaxies. A familiar example of such as a dust cloud is the Orion Nebula.
- Turbulence deep within these clouds gives rise to knots with sufficient mass that the gas and dust can begin to collapse under its own gravitational attraction.
- As the cloud collapses, the material at the center begins to heat up.
- Known as a protostar, it is this hot core at the heart of the collapsing cloud that will one day become a star.
- As the cloud collapses, a dense, hot core forms and begins gathering dust and gas. Not all of this material ends up as part of a star, the remaining dust can become planets, asteroids, or comets or may remain as dust.

### Significance of the findings:

- The recent findings will help the astronomers to develop and test theories to explain how high-mass stars gain their mass.
- Furthermore, these findings promote the advantages of maser observations in understanding high-mass-star formation.

\*\*\*\*\*



**An Institute for Civil Services**

# **IAS PRELIMS 2020**

## **ONLINE**

**01**

### **TARGET PT 2020**

45 Days Online Prelims Classes through 400+ MCQ

**02**

### **PRELIMS Test Series**

SECTIONAL + MOCK + CURRENT AFFAIRS | TOTAL: 31 TESTS

**03**

### **CSAT Online Classes**

4 WEEKS CSAT ONLINE CLASSES

**04**

### **PRELIMS MOCK TEST**

TOTAL: 20 TESTS

**05**

### **PRELIMS Test Series**

(COMPLETE REVISION TESTS | TOTAL: 32 TESTS)

**06**

### **Current Affairs Classes**

Complete Revision of Prelims Current Affairs in 60 Hrs.

📍 1B, 2<sup>nd</sup> Floor, Pusa Road Karol Bagh, New Delhi-110005,  
(Adjacent to Karol Bagh Metro Gate No. 8)

✉ [info@iasscore.in](mailto:info@iasscore.in) | [f/iasscore](https://www.facebook.com/iasscore)

Visit: [www.iasscore.in](http://www.iasscore.in)

☎ **8448496262**