Q.1) Consider the following statements regarding Hyspectral Imaging Satellite (HysIS) of ISRO –

1. HysIS is an Earth observation satellite.
2. It observes Earth in 3 different ranges including visible, infrared and X-rays.
3. It is launched in the geo-stationary orbit.

Which of the statements given above is/are correct?

a) 1 only
b) 1 and 2 only
c) 1 and 3 only
d) All of the them

Q.1) Solution (a)

Statement 1	**Statement 2**	**Statement 3**
Correct	**Incorrect**	**Incorrect**
HysIS is an earth observation satellite orbiting at 636 km above the surface of the earth.	It observes earth's surface in 3 different ranges including visible, near infrared and shortwave infrared regions in 55 spectral or colour bands.	Sun-synchronous polar orbit

HYSIS: HYSPECTRAL IMAGING SATELLITE

- India's first hyperspectral imaging satellite.
- **Sun-synchronous polar orbit**, 636 km above the surface of the earth.
- It observes earth's surface in **3 different ranges including visible, near infrared and shortwave infrared regions** in 55 spectral or colour bands.
- In short HysIS enables us to do a 'CATSCAN' equivalent of Earth from space.

APPLICATION

- Monitoring agriculture, forestry
- Assessment of coastal zones, inland waters, soil
- Oil and minerals mapping
- Military surveillance

HYPERSPECTRAL IMAGING: BASICS

- Hyperspectral imaging combines digital imaging and spectroscopy.
- For this it uses a critical chip called as 'optical imaging detector array' which enables it to provide better defined images that more clearly than regular optical or remote sensing cameras.

PRINCIPLE OF SPECTROSCOPY AND DIGITAL IMAGING

- When an electromagnetic wave shines on the surface of an object, some wavelengths are absorbed while others are reflected.
- **Example:** The colour of plant leaf is green because it absorbs red and violet light but reflects green light which what we see as colour green.
- Similarly all objects absorb and reflect certain wavelengths of electromagnetic spectrum unique to that object.
- Thus every object has its own 'spectral signature'.
- The sensors or cameras which are sensitive to a particular wavelength (say visible light, UV light, Infrared etc) capture the image in that wavelength.
- This 'image' captured in 'visible light' or 'infrared' is superimposed and converted to usable data.

Q.2) Consider the following statements with regard to LOx Methane Engine:

1. It is less toxic and does not leave a residue upon combustion.
2. It will be installed in the upper stage of GSLV MK-III vehicle.
3. Gaganyaan mission will do technology demonstration for the engine.

Which of the statements given above is/are correct?

a) 1 only
b) 1 and 2 only
c) 1 and 3 only
d) All of the them

Q.2) Solution (a)

Only statement 1 is correct. Rest two are purely imaginary. To solve this question you just need information about Lox Methane Engine (It is not related to Gaganyaan and GSLV).

LOx METHANE ENGINE

- **Liquid Propulsion Systems Centre of ISRO is developing 2 Lox methane-powered rocket engines.**

- The 'LOx methane' engine uses methane as fuel and liquid oxygen as oxidizer.
- Can be synthesized in space (Methane can be synthesized using water and carbon dioxide in space).
- **It is non-toxic**. (Di-Methyl Hydrazine and Nitrogen tetroxide is said to be highly toxic)
- Higher specific impulse
- Easy to store
- Does not leave a residue upon combustion
- Less bulky

Q.3) Consider the following pairs -

Satellite	**Area of Deployment**
1. EMISAT	Defence
2. GiSAT	Communication
3. CHEOPS	Exoplanets

Which of the above is/are correctly matched?

a) 1 and 2 only
b) 1 and 3 only
c) 1 only
d) All of the above

Q.3) Solution (b)

Satellite	**Area of deployment**
EMISAT	Defence
GiSAT	Remote Sensing
CHEOPS	Exoplanets

EMISAT

- It is an electronic intelligence satellite developed by ISRO and DRDO.
- It was developed under project KAUTILYA of DRDO.
- The 435 kg EMISAT was launched in the low earth orbit, 749 km above the surface of the earth.

SIGNIFICANCE

- Satellite-based electronic intelligence to augment the armed forces to counter radars.
- Electronic Intelligence basically involves interception of signals from radars.
- Once the signal is intercepted, the ELINT system collects data related to radar signals including its bandwidth, intensity, location from where it is emitted etc. creating what is called a RF signature. (Radio frequency)
- Once the RF signature is created it can be used for locating and identifying the radar in subsequent encounters.
- It can also help in developing appropriate jamming techniques to counter the enemy radar.

GiSAT: GEO-IMAGING SATELLITE SERIES

- New series of remote-sensing satellite
- GiSAT series is the Earth Observation Satellites in the geosynchronous orbit.
- ISRO has planned to launched 2 satellites in this series including GiSat-1 and GiSat-12R
- It will yield multi-spectral and multi-resolution (50m to 1.5 km) images in visible, near infra-red and thermal spectrum.
- Multi-wavelength imaging for land mapping.
- Designed for both military and civilian purposes.

SIGNIFICANCE

- Normally earth observation satellites are put in the Low Earth Orbit at 600km above the surface of the earth. GiSAT series is the 1st among the earth observation satellites in the Geo-stationary Orbit)
- Currently imaging satellites map a particular area only once in 22 days. (remember they in LEO)
- GiSAT can scan or map an area every 2nd day as it will be placed in geostationary orbit

CHEOPS - ESA measure known exoplanets' size by photometry

Q.4) New Frontiers Program of NASA is aimed at which of the following?

a) Discovery of new Exo-planets.
b) Unravelling the mystery of black hole
c) Exploration of our solar system
d) Discovering new habitable zones outside our solar system.

Q.4) Solution (c)

NEW FRONTIER'S PROGRAM

Aimed at exploring the solar system

Various missions under New Frontiers Program are

1. New Horizons – Launched in 2006 to investigate distant solar system object including Pluto and its moons and Kuiper Belt.
2. Juno – launched in 2016 to study Jupiter
3. OSIRIS-REx mission to collect samples from an asteroid (Bennu) and carry it to Earth for further study
4. Dragonfly – To be launched in 2026 to study Saturn and its icy moons

Q.5) Consider the following statements with regard to various Space Missions:

1. Discovery Program is a solar system exploration mission.
2. Dawn Mission aims at studying the solar corona.
3. JUICE mission is to explore Jupiter and its icy moons.

Select the correct answer using the code given below:

a) 1 only
b) 1 and 3 only
c) 3 only
d) All of the above

Q.5) Solution (b)

DISCOVERY PROGRAM

- It is a series of Solar System exploration missions.
- It is a faster, better, cheaper planetary science missions of NASA.
  - **Important Discovery missions**
    - o Lucy
    - o Psyche
    - o Davinci
    - o Io Volcano Observer
    - o Veritas
    - o Trident

DAWN MISSION

- Main aim was to study **two important objects in the asteroid belt, Ceres and Vesta.**
    - Ceres: A dwarf planet and the largest object in the asteroid belt
    - Vesta: a protoplanet, is the second largest object in the region.
- 1st spacecraft to orbit a body in the region between Mars and Jupiter.
- 1st mission to visit a dwarf planet.
- NASA's 1st deep space mission to be propelled by an ion engine.

JUICE

- JUpiter ICy moons Explorer of ESA's (European Space Agency)
- Orbiter mission to explore Jupiter and three of its icy moons: Europa, Callisto and Ganymede.
- 1st non-American outer Solar System mission

Q.6) Recently Japan has launched BIRDS Project. What is the purpose of this project?

a) To support non-spacefaring countries to build their first satellite.
b) To launch drones monitored global avian survey.
c) Electric planes that can be used for commercial purposes
d) Nano technology related project to make miniature flying

Q.6) Solution (a)

BIRDS PROJECT

- Japan's project to **support non-spacefaring countries to build their first satellite.**
- Called as The Joint Global Multi-Nation Birds Satellite project (BIRDS).
- **Birds1**: Five countries participated in the first Bird program: Ghana, Mongolia, Nigeria, and Bangladesh.
- **Birds-2:** Bhutan, the Philippines, and Malaysia

Q.7) Consider the following statements with respect to Gaganyaan?

1. It will carry astronauts to low earth orbit.
2. India will become 3rd country to conduct manned space mission.

Which of the statements given above is/are correct?

a) 1 only
b) 2 only
c) Both 1 and 2
d) Neither 1 nor 2

Q.7) Solution (a)

Statement 1	**Statement 2**
Correct	**Incorrect**
It will carry 3 astronauts to a **low earth orbit of 300 to 400 kilometres** on board GSLV Mark III vehicle, for at least 7 days.	It will make India the 4th country to send manned mission after the Russia, USA and China.

GAGANYAAN

- India's 1st Human spaceflight programme to be launched by 2022.
- It will include two unmanned flights to be launched in December 2020 and July 2021 and one human space flight to be launched in December 2021.
- It will carry 3 astronauts to a low earth orbit of 300 to 400 kilometres on board GSLV Mark III vehicle, for at least 7 days.
- It will make India the 4th country to send manned mission after the Russia, USA and China.

COMPONENTS OF GAGANYAAN

- Rocket: GSLV Mk-III
- Crew Module
- A crew module and service module.
- The crew members will be selected by the IAF and ISR.
- Crew will perform micro-gravity and other scientific experiments for a week.

CREW MODULE ATMOSPHERIC RE-ENTRY TECHNOLOGY - CARE

- Satellites that are launched for communication or remote sensing are meant to remain in space.
- However, a manned spacecraft needs to come back.
- While reentering Earth's atmosphere, the spacecraft needs to withstand very high temperatures created due to friction.

- A prior critical experiment was carried out in 2014 along with GSLV MK-III when the CARE (Crew Module Atmospheric Re-entry Experiment) capsule successfully demonstrated that it could survive atmospheric re-entry.

Q.8) Consider the following pairs:

Solar Missions	Area of exploration
1. ADITYA-L1	A. Solar Poles
2. Parker Probe	B. Corona, Chromosphere, Photosphere
3. Solar Orbiter Mission	C. Corona only

Select the correct answer based on codes given below –

a) 1-A; 2-B; 3-C
b) 1-B; 2-C; 3-A
c) 1-C; 2-A; 3-B
d) 1-C; 2-B; 3-A

Q.8) Solution (b)

ADITYA-L1

- India's 1st first mission to study the Sun to be launched in early 2020
- Its main objective is to study the solar corona.
- **Corona** is the outermost region of the Sun's atmosphere. Interesting thing about Corona is it has high temperatures of more than 1 million degree Kelvin far higher than the surface of the Sun (6000 degrees Kelvin).
- The reason for this is still unknown and this is what Aditya L-1 will aim to understand. (NASA's Parker probe is currently exploring this aspect).

The Parker Solar Probe is a NASA robotic spacecraft launched in 2018, with the mission of repeatedly **probing and making observations of the outer corona of the Sun.**

The Solar Orbiter (SolO) is a Sun-observing satellite, developed by the European Space Agency (ESA). **SolO is intended to perform detailed measurements of the inner heliosphere and nascent solar wind, and perform close observations of the polar regions of the Sun**, which is difficult to do from Earth.

Q.9) Which of the following services can be provided by Cartosat-3 satellite?

1. Creation of land use maps
2. Monsoon prediction
3. Resource exploration
4. Cloud computing
5. Space based internet

Select the correct answer using the code given below:

a) 1 only
b) 1 and 3 only
c) 1, 2, 3 and 5 only
d) All of the above

Q.9) Solution (b)

CARTOSAT will perform only the function of Earth Observation Satellite.

CARTOSAT 3

- 3rd-generation agile advanced **earth observation satellite** launched at an altitude of 509 km.
- It has a pan-chromatic resolution capability of 25cm (highest in the world).
- Application: Cartography for large scale urban planning, rural resource and infrastructure development, Land Information System and Geographical Information System application for various uses, coastal land use.

Q.10) What is TRAPPIST-1 that was in News recently?

a) Telescope
b) Star
c) Exo Planet
d) Electric Vehicle

Q.10) Solution (b)

The red dwarf star TRAPPIST-1 - about 40 light-years away - has 7 Earth-sized exoplanets orbiting it.

Q.11) 2019 Nobel Prize in Physics was awarded for the discovery of the first exoplanet around a Sun-like star. Why discovery of exoplanet is so significant?

1. It will help us find whether life could exist outside our solar system
2. We can have better understanding on formation of planetary systems.
3. Mineral extraction and our energy security.

Select the correct answer using the code given below:

a) 1 only
b) 1 and 2 only
c) 2 and 3 only
d) All of the above

Q.11) Solution (b)

Statement 3 is incorrect – There is no plan of mineral exploration and extraction from exoplanet yet.

All of the planets in our solar system orbit around the Sun. Planets that orbit around other stars are called exoplanets.

Exoplanets are very hard to see directly with telescopes. They are hidden by the bright glare of the stars they orbit. So, astronomers use other ways to detect and study these distant planets. They search for exoplanets by looking at the effects these planets have on the stars they orbit.

Q.12) The Cosmic Microwave Background (CMB) radiation is the direct evidence of which of the following?

a) Existence of '*god particle*'
b) Expansion of the universe
c) Presence of gravitational waves
d) Theory of relativity

Q.12) Solution (b)

COSMIC MICROWAVE BACKGROUND RADIATION

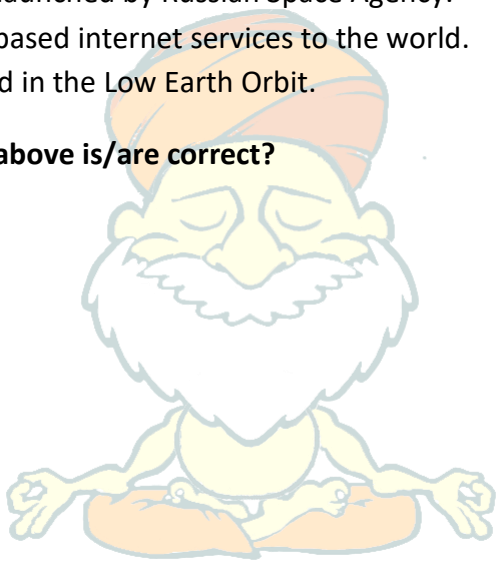
- Immediately after the big bang, the universe was so hot that the thermonuclear reactions (that are usually seen in stars today) happened everywhere in the universe leading to formation of primodial elements, hydrogen and helium.
- The thermonuclear fusion of hydrogen into helium atoms led to release of high-energy shortwave photons which is known to be cosmic background radiation.
- As the universe expanded this radiation also expanded becoming long-wave (microwave) which is why it is called cosmic microwave background radiation which fills the entire space.
- **Thus, CMB is an evidence for expansion of universe.**

Q.13) Consider the following statements about the Starlink Satellite Constellation:

1. It has been planned and launched by Russian Space Agency.
2. It aims to provide space based internet services to the world.
3. Satellites will be deployed in the Low Earth Orbit.

Which of the statements given above is/are correct?

a) 2 only
b) 2 and 3 only
c) 1 and 2 only
d) 1, 2 and 3



Q.13) Solution (b)

STARLINK INTER-NET CONSTELLATION

- **SpaceX has successfully deployed all 60 Starlink satellites** into orbit through Falcon 9 rocket. Starlink satellite constellation will eventually have close to 12,000 satellites.
- These satellites will be deployed in **Low Earth Orbit** they will be deployed in the altitude band of 350 km to 1200 km.

WHY LOW EARTH ORBIT FOR SPACE INTERNET?

- It will have lower latency when compared internet provided by satellites in Geostationary orbit. (Less distance to travel)
- However, to cover the area of the earth and provide continuous internet cover, many more thousands of satellites will be needed.

AIM:

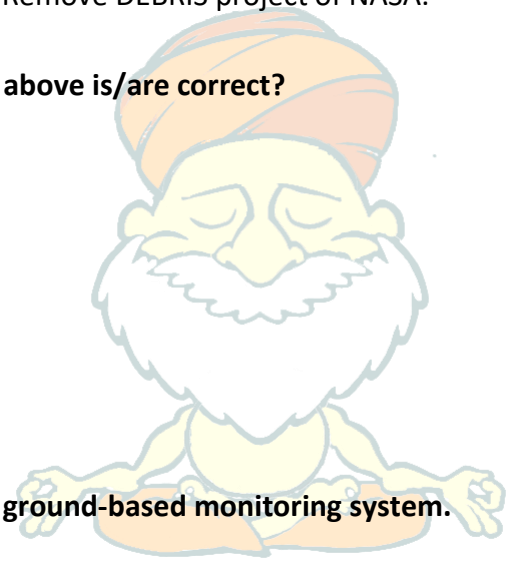
- Provide low-cost, reliable and uninterrupted space-based internet services to the world.
- About 4 billion people do not have access to reliable internet as the traditional method to access internet using fibre optic networks and wireless networks

Q.14) Consider the following statements about the Project NETRA:

1. It is an early warning system in the space to detect debris and other hazards to Indian satellites.
2. The project will involve launch of a satellite with telescopes and radars on board into geostationary orbit.
3. Initially there will be monitoring of satellites in low-earth orbits only.
4. It works in tandem with Remove DEBRIS project of NASA.

Which of the statements given above is/are correct?

a) 1 only
b) 2 and 3 only
c) 1 and 3 only
d) None of the above



Q.14) Solution (c)

Statement 2 is incorrect **– It's a ground-based monitoring system.**

Statement 4 is incorrect – there is no such plan.

PROJECT NETRA (NETWORK FOR SPACE OBJECT TRACKING AND ANALYSIS)

- ISRO's early warning system to safeguard space assets
- It includes a network of observational facilities like connected radars, telescopes, data processing units and a control centre.
- The system can spot, track and catalogue objects as small as 10 cm, up to a range of 3,400 km and equal to a space orbit of around 2,000 km.
- The system is deployed to predict threats to Indian satellites from space debris, space attacks etc.
- **The telescopes and radars under the network would be set up at four locations:**
  - Ponmudi in Thiruvananthapuram (Kerala)
  - Mount Abu (Rajasthan)

  - One in Deep North (Leh)
  - One in the Northeast region
  - Multi Object Tracking Radar at Nellore
- The telescope network will be set up under the Directorate of Space Situational Awareness and Management at Bengaluru.
- ISRO currently depends on NORAD (North American Aerospace Defence Command) for tracking of space debris and protect its satellites in course and during launches.
  - An initiative of USA and Canada.
  - It shares selective debris data with many countries.

Q.15) Consider the following pairs:

Mission/spacecraft/satellite	Purpose
1. MAVEN	Composition of Mar's crust
2. Lucy	To study the Trojans asteroids
3. MODIS	Monitoring large-scale changes in the biosphere
4. ICON	To detect dynamic zone of Sun's photosphere
5. Psyche	To examine an object made not of rock and ice, but metal

Which of the above have been correctly matched?

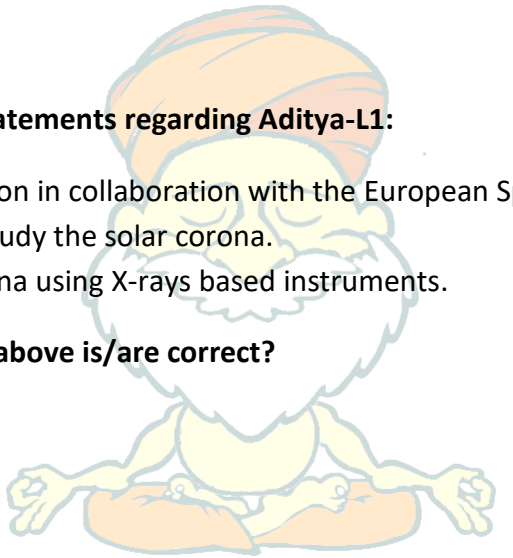
a) 1, 2, 4 and 5 only
b) 1, 2, and 4 only
c) 2, 3 and 5 only
d) All of the above

Q.15) Solution (c)

- Mars Atmosphere and Volatile Evolution (MAVEN) is a spacecraft developed by NASA that went into orbit around Mars to study the **planet's atmosphere**.
- LUCY
  - 1st space mission to study the Trojan asteroids.(NASA)
  - Mission to study Jupiter's **Trojan asteroids**
- MODIS
  - Earth observation satellite of NASA
  - **Monitoring large-scale changes in the biosphere** to understand change in global carbon cycle.

- ICON - The Ionospheric Connection Explorer is a NASA's satellite designed to investigate changes in the Earth's ionosphere, the dynamic region high in our atmosphere where terrestrial weather from below meets space weather from above

- PSYCHE
    - It is a NASA mission to explore the origin of planetary core by studying metallic asteroid Psyche.
    - Psyche is the heaviest known Metallic asteroid in the asteroid belt. It is thought to be exposed iron core of a protoplanet.
    - It appears to be the exposed metal core of an early planet. (made of nickel-iron like earth's core)
    - Psyche Mission is NASA's 1st mission to examine an object made not of rock and ice, but metal.



Q.16) Consider the following statements regarding Aditya-L1:

1. It is India's 1st solar mission in collaboration with the European Space Agency.
2. Its main objective is to study the solar corona.
3. Aditya L1 will study Corona using X-rays based instruments.

Which of the statements given above is/are correct?

a) 1 and 2 only
b) 2 only
c) 2 and 3 only
d) All of the above

Q.16) Solution (c)

Aditya or Aditya-L1 is a spacecraft mission to study the Sun. It has been designed and will be built in collaboration between the Indian Space Research Organisation and various Indian research institutes.

- **India's 1st first mission to study the Sun to be launched in early 2020.**
- **Its main objective is to study the solar corona**.
- Corona is the outermost region of the Sun's atmosphere. Interesting thing about Corona is it has high temperatures of more than 1 million degree Kelvin far higher than the surface of the Sun (6000 degrees Kelvin).
- The reason for this is still unknown and this is what Aditya L-1 will aim to understand. (**NASA's Parker probe is currently exploring this aspect**).

- X-rays are why we know that solar corona is hotter than the rest of the Sun. Only very hot gases, like the corona, have the ability to emit X-rays.
- **The Solar Low Energy X-ray Spectrometer (SoLEXS) and High Energy L1 Orbiting X-ray Spectrometer (HEL1OS) are two instruments aboard Aditya L1 to study those X-rays.**

Q.17) Consider the following statements regarding *Gravitational Lensing*:

1. It is a phenomenon of distortion and magnification of light coming from distant galaxies.
2. It helps to map the distribution of dark energy in the space.

Which of the statements given above is/are correct?

a) 1 only
b) 2 only
c) Both 1 and 2
d) Neither 1 nor 2

Q.17) Solution (a)

The light from distant galaxies gets distorted and magnified by massive, invisible clouds of **dark matter** in the phenomenon known as Gravitational Lensing.

DARK MATTER

- It was in 1930s when Fritz Zwicky observed that many galaxies were moving faster than theoretical calculations.
- This implied that there was some mysterious gravitational pull towards the centre of those galaxies. The quantity of matter needed to exert such a pull far exceeds the observed matter. This extra matter which invisible and undetected has been termed as Dark Matter.
- Gradually many astronomers started researching on dark matter. It was when the Andromeda Galaxy was observed to be moving faster than expected that dark matter took the centre stage of astronomical research.
- It has not yet been observed yet directly. It doesn't interact with matter and is completely invisible to light and other forms of electromagnetic radiation making it impossible to detect.
- Scientists are confident it exists because of the gravitational effects it has on galaxies and galaxy clusters.

Q.18) Consider the following statements about the LIGO India project:

1. It is collaboration among India, NASA and European Union.
2. It is a part of the global network gravitational waves interferometers.
3. Gravitational Waves were predicted by Einstein's General Theory of Relativity.

Which of the statements given above is/are correct?

a) 1 only
b) 2 and 3 only
c) 1 and 3 only
d) 1, 2 and 3

Q.18) Solution (b)

LIGO-INDIA

- IndIGO (Indian Initiative in Gravitational-wave Observations) is a consortium of Indian gravitational wave physicists to set up advanced experimental gravitational-wave observatory facilities in India.
- LIGO-India is a **planned advanced gravitational-wave observatory to be located in India** as part of the worldwide network.
- LIGO-India is planned as a collaborative project between a consortium of Indian research institutions and the **LIGO Laboratory in the USA,** along with its **international partners Australia, Germany and the UK.**
- To establish this, a site near Aundha Nagnath in the Hingoli District, Maharashtra has been selected

Q.19) Which of the following can be used to investigate black hole?

1. Astrosat
2. GROWTH-India
3. Thirty Meter Telescope

Select the correct answer using the code given below:

a) 1 only
b) 1 and 2 only
c) 2 only
d) All of the above

Q.19) Solution (d)

All of the above are used to study black hole.

India's first dedicated satellite, **AstroSat**, which was launched by ISRO in 2015, has recently observed for the very first time rapid variability of high energy X-ray emission from a black hole system.

GROWTH-India, the facility at Hanle is part of a multi-country collaborative initiative known as 'Global Relay of Observatories Watching Transients Happen' (GROWTH) to observe transient events in the universe. The fully robotic optical research telescope is designed to capture cosmic events occurring in timescales much shorter than light years – years, days and even hours.

Since its commencement, the telescope has been engaged in studying various phenomena like supernovae, neutron stars (black hole mergers), and near-earth asteroids.

The **Thirty Meter Telescope** is a new class of extremely large telescopes that will allow us to see deeper into space and observe cosmic objects with unprecedented sensitivity. With its 30 m prime mirror diameter, TMT will be three times as wide, with nine times more area, than the largest currently existing visible-light telescope in the world.

- TMT's high resolution will extend scientists' capability to detect and investigate black holes that reside in the center of many distant galaxies, as well as study in detail the black hole in the center of our own Milky Way.
- TMT will also play a very important role in advancing our knowledge of the physical processes that lead to star and planet formation.
- TMT will be able to characterize and study the properties of exoplanets leading us closer to finding out if life exists beyond the Earth.
- Finally, the advanced capabilities of the TMT will very likely lead to discoveries that we cannot anticipate and scientific impact far beyond what we envision today.

Q.20) Consider the following matches

Fundamental Particle	**Characteristics**
1. Neutrinos	It moves nearly at the speed of light; completely massless; no electric charge; not affected by electric or nuclear forces.
2. Higgs boson	It is the particle that gives all matter its mass including neutrinos.
3. Antimatter	Every known matter has antimatter which has the different mass and volume. It has an opposite

	charge when compared to its matter.

Which of the above have been correctly matched?

a) 3 only
b) 2 and 3 only
c) 1 and 3 only
d) All of the above

Q.20) Solution (a)

Statement 1 is incorrect – Neutrinos are not completely massless. They are million times lighter than electrons and hence have negligible mass.

Statement 1 is incorrect – Higgs boson through Higgs field has given matter its mass after the 'Big Bang'. However extremely low mass of neutrinos is not explained by the theory. Neutrinos seems to have gained mass not through the Higgs field.

Statement 3 is correct.

- Antimatter refers to sub-atomic particles that have properties opposite normal sub-atomic particles. Antimatter is the opposite of normal matter. More specifically, the sub-atomic particles of antimatter have properties opposite those of normal matter.
- In theory, a particle and its anti-particle (for example, proton and antiproton) have the same mass, but opposite electric charge and other differences in quantum numbers.

Q.21) 'Surjit Bhalla Committee' which was in news recently, is associated with which of the following?

a) Net Metering
b) Elephant Bonds
c) Naxalism
d) Prison Reforms

Q.21) Solution (b)

High Level Advisory Group (HLAG) headed by Dr. Surjit S. Bhalla has been constituted by the Department of Commerce. The HLAG has made several recommendations for boosting India's share and importance in global merchandise and services trade. Among other things, the Report identifies tax reforms also to boost export and investment channels for exports.

It has asked the government to allow people to declare their 'undisclosed income' with a mandatory condition to invest 50% in a government bond, termed as Elephant Bond, which should be utilised only for infrastructure projects.

It has also made recommendations for reforms in Financial Services Framework for making India a Preferred Destination for financial services.

Q.22) Which of the following statements is correct with respect to 'Vallam Kali'?

a) It is a traditional boat race in Kerala.
b) It is an art form in which patterns are created on the floor or the ground using materials such as colored rice, dry flour, colored sand or flower petals in West Bengal.
c) It refers to a floral embroidery from Tamil Nadu.
d) It is a drum made out of the wood of the jackfruit tree.

Q.22) Solution (a)

It is a traditional boat race in Kerala. It is a form of canoe racing, and uses paddled war canoes. It is mainly conducted during the season of the harvest festival Onam in autumn.

Chundan vallam ('beaked boat'), known outside Kerala as Kerala snake boats, are one of the icons of Kerala culture used in the Vallamkali.

Q.23) The 'Joint Security Area (JSA)' refer to which of the following countries?

a) Israel and Palestine
b) South Korea and North Korea
c) Ethiopia and Eretria
d) Sudan and South Sudan

Q.23) Solution (b)

The Korean Demilitarized Zone (DMZ) is a region 4 km wide and 240 km long, dividing the Korean Peninsula into the Democratic People's Republic of Korea on the north and Republic of Korea on the south. The DMZ was created after the 1953 Korean War Armistice Agreement, which ended the Korean

War. **The site where the Armistice was signed is called the Joint Security Area (JSA), located 53 km to the north of Seoul.**

Q.24) Which of the following statements with respect to 'Distributed Ledger Technologies (DLT)' is/are correct?

1. It uses independent computers to record, share and synchronize transactions in their respective electronic ledgers.
2. All Blockchain is considered to be a form of DLT.

Select the correct statements

a) 1 Only
b) 2 Only
c) Both 1 and 2
d) Neither 1 nor 2

Q.24) Solution (c)

Blockchain is one type of a distributed ledger. Distributed **ledgers use independent computers (referred to as nodes) to record, share and synchronize transactions in their respective electronic ledgers** (instead of keeping data centralized as in a traditional ledger).

All Blockchain is considered to be a form of DLT. But there are also Distributed Ledger Tables that are not Blockchain. These non-Blockchain DLT's can be in the form of a distributed Cryptocurrency or they may be the architecture on which private or public data is stored or shared. The main difference being that while Blockchain requires Global Consensus across all nodes a DLT can achieve consensus without having to validate across the entire Blockchain.

Q.25) Which of the following pairs are correctly matched?

1. Pilibhit Tiger Reserve – Uttarakhand
2. Tadoba-Andhari Tiger reserve – Maharashtra
3. Kawal Wildlife Sanctuary – Telangana

Select the correct code:

a) 1 and 2
b) 2 and 3

c) 1 and 3
d) All of the above

Q.25) Solution (b)

Pilibhit Tiger Reserve – Uttar Pradesh

Tadoba-Andhari Tiger reserve – Maharashtra

Kawal Wildlife Sanctuary – Telangana

Q.26) 'Bimal Jalan Committee' is concerned with which of the following?

a) Corporate Governance
b) Economic Capital Framework for the RBI
c) Insolvency and Bankruptcy Code
d) Code on Wages

Q.26) Solution (b)

The Reserve Bank of India, in consultation with the government, constituted a committee led by the central bank's former Governor Bimal Jalan to look into **its Economic Capital Framework.**

Q.27) The 'State of Food Security and Nutrition in the World' report is published by

a) Food and Agriculture Organization of the United Nations (FAO)
b) World Economic Forum (WEF)
c) The Economist Intelligence Unit (EIU)
d) None of the above

Q.27) Solution (a)

The State of Food Security and Nutrition in the World 2019 report is released by the UN Food and Agriculture Organization (FAO).

Q.28) Consider the following statements with respect to 'The Coalition of the Willing on Pollinators'.

1. It was founded at the 14th session of the Conference of the Parties to the Convention on Biological Diversity (CBD 14) in 2018.
2. The Coalition is initiated by the Government of India.

Select the correct statements

a) 1 Only
b) 2 Only
c) Both 1 and 2
d) Neither 1 nor 2

Q.28) Solution (d)

The Coalition of the Willing on Pollinators was founded at the **13th session of the Conference of the Parties to the Convention on Biological Diversity (CBD 13) in 2016.**

It was formed to follow up on the findings of IPBES Assessment on Pollinators, Pollination and Food Production, which found that many of the world's pollinator species are on the decline.

It is initiated by the Government of the Netherlands.

Q.29) Which of the following pairs is/are correctly matched?

1. Kharchi Puja – West Bengal
2. Ashadhi Beej – Gujarat
3. Vat Pournima – Maharashtra

Select the correct statements

a) 1 and 2
b) 2 and 3
c) 1 and 3
d) All of the above

Q.29) Solution (b)

Kharchi Puja – Tripura

Ashadhi Beej – Gujarat

Vat Pournima – Maharashtra

Q.30) 'Godawan' is a state bird of

a) Rajasthan
b) Odisha
c) Telangana
d) Chhattisgarh

Q.30) Solution (a)

The Great Indian Bustard (Godawan) is a state bird of Rajasthan.