

Q.1) Which of the following statements are correct comparisons between Geostationary and Geosynchronous satellite?

1. Geostationary orbit is one while geosynchronous orbits can be many.
2. Geostationary orbit is in equatorial plane while geosynchronous orbits are polar.
3. Both the satellites look stationary in the night sky.

Select the code from below:

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

Q.1) Solution (a)

Geostationary Orbit (GEO)

If we need a satellite for the purpose which needs this satellites to remain at a particular distance from earth at all the time, then we need circular orbits so all the points on circular orbit are at equal distance from earth's surface. The circular equatorial orbit is exactly in the plane of equator on the earth. If the satellite is moving in the circular-equatorial orbit and its angular velocity is equal to earth's angular velocity, the satellite is said to be moving along with the earth. This satellite would appear stationary from the earth and this orbit would be called Geostationary Orbit.

Features of geostationary satellite

The orbit is circular The orbit is in equatorial plane i.e. directly above the equator and thus inclination is zero.

The angular velocity of the satellite is equal to angular velocity of earth Period of revolution is equal to period of rotation of earth.

Finish one revolution around the earth in exactly one day i.e. 23 hours, 56 Minutes and 4.1 seconds

There is ONLY one geostationary orbit.

Geosynchronous Orbit

There is a difference between the geostationary and geosynchronous orbits. We should note that while other orbits may be many, there is ONLY ONE Equatorial orbit, i.e. the orbit which is directly above the earth's equator. Sometimes we send a satellite in the space which though has a period of revolution is equal to period of rotation of earth, but its orbit is neither equatorial nor Circular. So, this satellite will finish one revolution around the earth in exactly one day i.e. 23 hours, 56 Minutes and 4.1 seconds, yet it does NOT appear stationary from the earth. It looks oscillating but NOT stationary and that is why it is called Geosynchronous.

Features of a geosynchronous satellite

- The orbit is NOT circular
- The orbit is NOT in equatorial plane i.e. directly above the equator, it's in inclined orbit The angular velocity of the satellite is equal to angular velocity of earth Period of revolution is equal to period of rotation of earth.
- Finish one revolution around the earth in exactly one day i.e. 23 hours, 56 Minutes and 4.1 seconds
- There are many geosynchronous orbits.

Q.2) Which of the following statements are correct about GRAPES – 3 experiment located in Ooty?

- a) It has been designed to study the God's particle (Higgs boson).
- b) It is specially designed to study cosmic rays.
- c) It is an observatory to study the Gravitational waves.
- d) It is neutrino observatory being built under the Hills in Ooty.

Q.2) Solution (b)

The GRAPES-3 experiment is located at Ooty in India. It was started as a collaboration of the TIFR and the Japanese Osaka City University, and now also includes the Japanese Nagoya Women's University. It is specially designed to study cosmic rays with an array of air shower detectors and a large area muon detector. It aims to probe acceleration of cosmic rays in the four astrophysical settings.

Q.3) Copernicus observation program is the world's largest single earth observation programme. Which of the following statements are correct about this project?

1. It is an Earth's monitoring program started by NASA.
2. It consists of constellation of seven Sentinel Earth observation satellites.
3. They will take high-resolution, colour and infrared images for a wide array of environmental initiatives, including crop forecasting and monitoring natural disasters.

Select the code from following:

- a) 1 and 2
- b) 2 and 3
- c) 1 and 3

d) All of the above

Q.3) Solution (b)

- Copernicus observation program is the world's largest single earth observation programme. It is directed by the European Commission in partnership with ESA.
- It consists of constellation of seven Sentinel Earth observation satellites. The first satellite of the series was launched in April 2014.
- It aims at achieving a global, continuous, autonomous, high quality, wide range Earth observation capacity by providing accurate, timely and easily accessible information.
- It also aims at improving the management of the environment, understand and mitigate the effects of climate change, and ensure civil security.
- Copernicus observation program is successor of previous European Envisat program which operated from 2002 to 2012.

Q.4) Which of the following fuels are used in Cryogenic engines?

- a) Ammonium Nitrate
- b) Polybutadiene Acrylonitrile
- c) Kerosene
- d) Liquid Hydrogen

Q.4) Solution (d)

Indian Space Research Organisation (ISRO) has successfully ground tested India's largest indigenously developed Cryogenic Upper Stage engine for GSLV Mark III. It was tested for full 10 minutes at ISRO's Liquid Propulsion Complex (ILPC) at Mahendragiri in Tirunelveli district of Tamil Nadu.

- The C25 stage is the most powerful upper stage so far developed by ISRO.
- It uses Liquid Oxygen and Liquid Hydrogen propellant combination stored at minus 253 degrees centigrade.
- The development of C25 cryogenic stage will provide ISRO capability to launch 4 ton class satellites in Geosynchronous Transfer Orbit (GTO), an altitude where satellites revolve in sync with Earth's rotation.
- So far, the cryogenic engine consisting very complex technology has been developed only by Russia, US, France, China, Japan and India.

Q.5) ISRO made history by launching world's largest number satellites from one launch

vehicle. It launched 104 satellites in one go. Which of the following vehicles were used by ISRO to launch these satellites?

- a) PSLV – C37
- b) GSLV – Mark III
- c) PSLV – C21
- d) Ariane – 5

Q.5) Solution (a)

Indian Space Research Organisation (ISRO) created history by successfully launching a record 104 satellites in single mission. These satellites were launched on board of Polar Satellite Launch Vehicle PSLV-C37, on its 39th mission from Satish Dhawan Space Centre, Sriharikota, Andhra Pradesh.

- Of the total 104 satellites, three were Indian and remaining 101 belonged to international customers.
- India's three satellites included earth-mapping Cartosat-2 satellite (main payload) and nanosatellites INS-1A and INS-1B.
- Foreign Satellites: Of the 101 co-passenger satellites, 96 belong to US and remaining 5 from Israel, Kazakhstan, Netherlands, Switzerland, United Arab Emirates, respectively. Around 90 small satellites belonged to US-based company Planet Inc.
- They are named 'Doves' and their constellation will be used to image the earth at low cost.

Q.6) ISRO has recently commissioned Hypersonic Wind Tunnel at Vikram's Sarabhai research center. Which of the following statements are not correct regarding this?

1. Hypersonic Wind Tunnel is used to create zero gravity environment for the astronauts to train.
2. This is the world's largest hypersonic wind tunnel ever commissioned.
3. These wind tunnels will be used to study the effects of air flowing past a solid object.

Select the code from following:

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

Q.6) Solution (a)

The Indian Space Research Organisation (ISRO) created history by commissioning the world's third-largest hypersonic wind tunnel at Vikram Sarabhai Space Centre (VSSC) in Thiruvananthapuram, Kerala. In this regard, ISRO chairman A S Kiran Kumar commissioned two facilities – a 1-m Hypersonic Wind Tunnel and a 1-m Shock Tunnel.

These facilities are the third largest in terms of size and simulation capability in the world next only to the ones in the United States (US) and Russia.

These wind tunnels will be used to study the effects of air flowing past a solid object and in ISRO's case, space vehicles. These new facilities will help aerodynamic characterisation of advanced space transportation systems in a hypersonic environment.

Q.7) ASTROSAT, India's space Observatory have captured a rare phenomenon of Vampire Star. Which of the following statements correctly explains the phenomenon of Vampire Star?

- a) The vampire star phenomenon is observed when smaller star sucks material (mass and energy) out of the bigger companion star, causing its eventual death.
- b) The Vampire Star phenomenon is observed when a large Star feasts on a smaller Star causing it's eventual death.
- c) The phenomenon is observed when two similar binary stars fuse with each other and form a larger star.
- d) The Vampire Star phenomenon is observed when a star enlarges to engulf it's planets.

Q.7) Solution (a)

The vampire star phenomenon is observed when smaller star sucks material (mass and energy) out of the bigger companion star, causing its eventual death.

It is also called a blue straggler as small star becomes bigger, hotter and bluer, giving it the appearance of being young, while the ageing companion burns out and collapses to a stellar remnant.

Q.8) consider the following statements regarding Sunspot activity:

1. Sunspots are darker hotter regions on the surface of the sun.
2. Sunspots are temporary and fade away after sometime.

Which of the above statements are correct?

- a) 1 only

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

Q.8) Solution (b)

Sunspots are temporary phenomena on the photosphere of the *Sun* that appear as dark *spots* compared with surrounding regions. They are areas of reduced surface temperature caused by concentrations of magnetic field flux that inhibit convection. *Sunspots* usually appear in pairs of opposite magnetic polarity.

Sunspots are darker, cooler areas on the surface of the *sun* in a region called the photosphere. The photosphere has a temperature of 5,800 degrees Kelvin. *Sunspots* have temperatures of about 3,800 degrees K. They look dark only in comparison with the brighter and hotter regions of the photosphere around them.

Q.9) Which of the following countries have launched Gaofen project, a network of observation satellites orbiting Earth to provide global surveillance capabilities which is due to be completed in 2020?

- a) USA
- b) Russia
- c) Israel
- d) China

Q.9) Solution (d)

Gaofen (GF, "High Resolution") is a series of civilian Earth observation satellites developed and launched for the China High-definition Earth Observation System (CHEOS), a state-sponsored programme aimed to develop a near-real time, all-weather, global surveillance network consisting of satellite, near-space (stratosphere) airships, and aerial observation platforms. Originally proposed in 2006, the CHEOS programme was officially approved by the Chinese government in May 2010. As many as 14 satellites equipped with CCD camera, multi-spectrum imagers and SAR radar are set for launch between 2013 to 2020.

Q.10) China has successfully launched experimental satellite XPNAV – 1. Which of the following statements are correct regarding this satellite?

1. It is the world's first pulsar navigation satellite or spacecraft.
2. It will operate in a sun synchronous orbit.

Select the code from below:

- a) 1 only
- b) 2 only

- c) Both 1 and 2
- d) Neither 1 nor 2

Q.10) Solution (c)

China has successfully launched experimental X-ray pulsar navigation satellite XPNAV-1. It is the world's first pulsar navigation satellite or spacecraft.

The satellite weighs more than 200 kilogrammes and carries two detectors. It will operate in a Sun-synchronous orbit (500 kilometers) inclined 97 degrees. It will conduct in-orbit experiments of autonomous spacecraft navigation using pulsar detectors to demonstrate new technologies. It will also test its detectors' functions in responding to the background noise of the universe, outline pulsar contours, and create a database for pulsar navigation.

Q.11) The Magnetospheric Multistage Mission (MMS) launched by NASA to map 'magnetic reconnection'. Which of the following statements correctly explains the process of magnetic reconnection?

- a) A process that occurs as the sun and Earth's magnetic fields interact.
- b) A process that occurs when the magnetic fields of two or more communication satellites interact and causes disturbance in transmission.
- c) The process of change of earth's magnetic field.
- d) None of the above.

Q.11) Solution (a)

NASA's MMS mission is an unmanned space mission to study the Earth's magnetosphere, using four identical satellites flying in a tetrahedral or pyramid formation.

The mission launched in March 2015 aims to map magnetic reconnection, a process that occurs as the sun and Earth's magnetic fields interact.

Understanding causes of magnetic reconnection is important for understanding phenomena of auroras on Earth, flares on surface of sun, and areas surrounding black holes. The mission is also designed to gather information about the microphysics of energetic particle acceleration and turbulence, processes that occur in many astrophysical plasmas.

Q.12) With reference to 'Astrosat', the astronomical observatory launched by India, which of the following statements is/are correct?

1. Other than USA and Russia, India is the only country to have launched a similar observatory into space.
2. Astrosat mission is capable of performing observations in Ultraviolet (UV), optical, low and high energy X-ray wavebands at the same time.

Select the correct answer using the code given below:

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

Q.12) Solution (b)

USA, Russia, Japan and Europe have such space observatories. Hence, statement (1) is wrong.

Indian space observatory ASTROSAT was in news recently. Link: <http://indianexpress.com/article/technology/tech-news-technology/vampire-star-caught-in-the-act-by-indian-space-observatory-4498660/>

About ASTROSAT:

Astrosat is India's first dedicated multi-wavelength space observatory launched in September 2015. It is one of the major scientific missions of ISRO after the highly acclaimed Chandrayaan-I and Mangalyaan.

It is placed at low earth equatorial orbit at altitude of 650 km. It has ability to observe celestial bodies like cosmic X-Ray sources and distant stars in different wavelengths simultaneously. It can observe the universe through ultraviolet, optical, low and high energy X-ray components of the electromagnetic spectrum. It has mission life of 5 years.

According to ISRO, the mission is capable of performing observations in Ultraviolet (UV), optical, low and high energy X-ray wavebands at the same time.

Its successful launch made India member of select elite group of nations comprising US, Japan, Russia and Europe having its own space observatory.

Q.13) A communication satellite is essentially –

- a) A transmitter station in space
- b) A repeater station in space

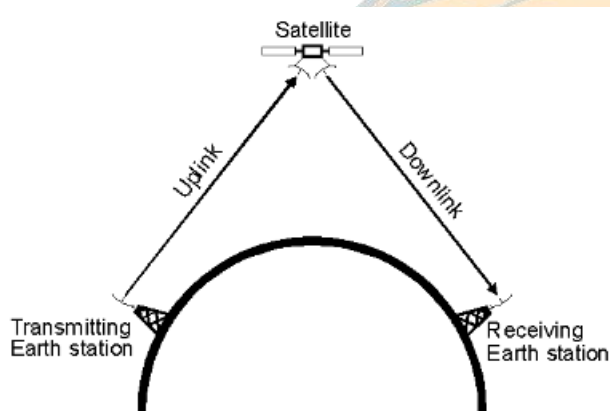
- c) A modulation station in space
- d) An attenuation station in space

Q.13) Solution (b)

The functions of a communication satellite are as given below:

- (i) Picks up the signal transmitted by transmitter.
- (ii) Amplifies it.
- (iii) Retransmits it towards information users.

These all are also functions of repeater to receive, amplify and retransmit the signal.

**Using a satellite for long distance communications**

A communication satellite is essentially a repeater station in space because it receives the signal from one location, it amplifies it and then it resends it to another location on earth.

Q.14) Consider the following statements about Mangalyaan, launched by ISRO:

1. It is also called the Mars Orbiter Mission
2. It made India the second country to have a spacecraft orbit the Mars after USA
3. It made India the only country to be successful in making its spacecraft orbit the Mars in its very first attempt

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.14) Solution (c)

Statement (2) is incorrect as European Space Agency's Mars Express (2003) has two components 1) Mars Orbiter 2) Beagle 2 Lander.

India had created global history by becoming the first Asian nation to reach the Mars orbit in a space mission. The success is sweeter because this had been done in its maiden attempt. No other country that has attempted a mission to Mars has succeeded in reaching the planet on debut.

Marking India's first venture into the interplanetary space, MOM will explore and observe Mars surface features, morphology, mineralogy and the Martian atmosphere. Further, a specific search for methane in the Martian atmosphere will provide information about the possibility or the past existence of life on the planet.

Q.15) Consider the following statements:

1. Both electromagnetic and gravitational waves travel with the speed of light.
2. Both electromagnetic and gravitational waves can create ripples in space-time.

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.15) Solution (a)

Gravitational waves are ripples in the curvature of space-time which propagate as waves, travelling outward from the source. Predicted in 1916 by Albert Einstein on the basis of his theory of general relativity. Gravitational waves transport energy as gravitational radiation, a form of radiant energy similar to electromagnetic radiation. The speed of gravitational waves in the general theory of relativity is equal to the speed of light in vacuum, c .

Electromagnetic waves are synchronized oscillations of electric and magnetic fields that propagate at the speed of light through a vacuum. Visible light is one type of electromagnetic radiation; other familiar forms are invisible electromagnetic radiations, such as radio waves, infrared light and X rays.

Only gravitational waves can create ripples in space-time, electromagnetic waves create vibrations of electric and magnetic field in space only. Thus, statement 1 is correct and statement 2 is wrong. Hence, (a) is the correct answer.

Link: <http://www.thehindu.com/sci-tech/science/what-are-gravitational-waves/article5800227.ece>

Q.16) Consider the following statements

1. India is the largest recipient of Japanese official development assistance (ODA)
2. India is the first non-member of the non-proliferation treaty (NPT) to have signed nuclear deal with Japan

Which of the following statements is/are *incorrect*?

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

Q.16) Solution (d)

Both the statements are correct.

Official development assistance (ODA) is a term coined by the Development Assistance Committee (DAC) of the Organisation for Economic Co-operation and Development (OECD) to measure aid. The DAC first used the term in 1969. It is widely used as an indicator of international aid flow. It includes some loans.

Most ODA comes from the 28 members of the DAC, or about \$135 billion in 2013. A further \$15.9 billion came from the European Commission and non-DAC countries gave an additional \$9.4 billion. Although development aid rose in 2013 to the highest level ever recorded, a trend of a falling share of aid going to the neediest sub-Saharan African countries continued.

Source: <http://indianexpress.com/article/india/india-news-india/india-agrees-to-link-nuclear-testing-to-termination-of-deal-with-japan-4372448/>

Q.17) Which of the following statements is correct about 'Saur Sujala Yojana'?

- a) Solar powered irrigation pumps will be provided to farmers at a subsidized price
- b) Setting up of over 300MW of solar PV power projects by defence establishments
- c) Development of solar parks and ultra-mega solar power projects

- d) Grid interactive solar power plants on the rooftop

Q.17) Solution (a)

PM launched the Saur Sujala Yojana in Chhattisgarh that would provide solar powered irrigation pumps to farmers at a subsidized price.

Chhattisgarh would be the first state to implement the scheme.

Under the scheme, solar powered irrigation pumps of 3HP and 5HP capacity worth Rs 3.5 lakh and Rs 4.5 lakh respectively would be distributed to the farmers by March 31, 2019. The beneficiaries would get the pumps at the subsidised price.

Source: http://www.business-standard.com/article/current-affairs/pm-narendra-modi-launches-saur-sujala-yojana-in-chhattisgarh-116110100699_1.html

Q.18) Bhitarkanika National Park is located in which of the following states?

- a) West Bengal
b) Odisha
c) Both (a) and (b)
d) Arunachal Pradesh

Q.18) Solution (b)

- Bhitarkanika National Park is a national park located in the Kendrapara District Odisha in eastern India.
- The national park is surrounded by the Bhitarkanika Wildlife Sanctuary
- Gahirmatha Beach and Marine Sanctuary lies to the east, and separates swamp region cover with canopy of mangroves from the Bay of Bengal. Thus it become a vicinity of rich biodiversity.
- The national park was created in September 1998 from the core area of the Bhitarkanika Wildlife Sanctuary, which was created in 1975. The sanctuary is the second largest mangrove ecosystem in India.
- The national park presently figures in the listed of protected wetlands under the Ramsar Convention.
- In 1974, the Ministry of Forests, in collaboration with UNDP, had started a crocodile hatchery project at Dangmal in the park.

Source: <http://www.thehindu.com/todays-paper/tp-national/global-conservation-team-visits-odishas-bhitarkanika-park/article9307209.ece>

Q.19) Consider the following statements about Pradhan Mantri YUVA Yojana

1. It has been launched by Ministry of Human Resource Development
2. It is envisaged to facilitate protection of Patents, Trademark and Designs of innovative and interested Start Ups
3. It aims at creating an enabling ecosystem for Entrepreneurship development through Entrepreneurship education and training

Select the correct statements

- a) Only 3
- b) 1 and 3
- c) 2 and 3
- d) 1 and 2

Q.19) Solution (a)

Pradhan Mantri YUVA Yojana (Yuva Udyamita Vikas Abhiyan) is a centrally sponsored Scheme on entrepreneurship education and training being implemented by the Ministry of Skill Development and Entrepreneurship, Government of India.

The Scheme aims at creating an enabling ecosystem for Entrepreneurship development through Entrepreneurship education and training; Advocacy and easy access to entrepreneurship support network and Promoting social enterprises for inclusive growth.

The scheme spans over five years (2016-17 to 2020-21) with a project cost of Rs. 499.94 crore, and will provide entrepreneurship education and training to over 7 lakh students in 5 years through 3050 Institutes. It will also include easy access to information and mentor network, credit, incubator and accelerator and advocacy to create a pathway for the youth.

The institutes under the PMYY include 2,200 institutes of higher learning (colleges, universities, and premier institutes), 500 ITIs, 300 schools and 50 entrepreneurship development centres through Massive Open Online Courses (MOOCs).

Source: <http://www.pradhanmantriyojana.co.in/yuva-yojna-pmmy/>

Q.20) The Bio-Indicator Lidar Instrument (BILI) is developed by

- a) ISRO
- b) Space X
- c) NASA
- d) European Space Agency

Q.20) Solution (c)

National Aeronautics and Space Administration (Nasa) scientists have developed a new instrument that may “sniff” for signs of life on Mars, inspired by a sensing technique used to monitor the air for life-threatening chemicals and bio-hazards.

The Bio-Indicator Lidar Instrument (BILI) is a fluorescence-based lidar, a type of remote-sensing instrument similar to radar in principle and operation. Instead of using radio waves, however, lidar instruments use light to detect and ultimately analyse the composition of particles in the atmosphere.

Source: <http://www.livemint.com/Science/0z6g5WZXsxq923dl8z8ivK/Nasa-develops-new-instrument-that-could-sniff-out-life-on.html>

