

Q.1) Consider the following statements

1. Exoplanets are the planets that orbit stars other than sun and are beyond our solar system.
2. LHS 475 b is a new terrestrial rocky exoplanet discovered recently by the Indian Space Research Organisation.
3. Exoplanets cannot be seen directly through telescopes from the Earth due to their distance
4. The study of exoplanets helps in determining the habitable zone of the discovered space.

Choose the correct code:

- a) 1, 2 and 3
- b) 2, 3 and 4
- c) 1, 3 and 4
- d) 1, 2, 3 and 4

Q.1) Solution (c)

Explanation:

- **Exoplanets are planets that orbit other stars and are beyond our solar system.** They come in a host of different sizes. They can be **gas giants bigger than Jupiter or as small and rocky as Earth.** They are also known to have **different kinds of temperatures** from boiling hot to freezing cold. **Hence, statement 1 is correct.**
- LHS 475 b is a new terrestrial rocky exoplanet **discovered by the National Aeronautics and Space Administration (NASA).** It is roughly the same size as Earth, its diameter is 99% the same as Earth. LHS 475 b is about 41 light-years away from Earth in the constellation Octans and differs from the Earth in that it completes an orbit in just two days and is hundreds of degrees hotter than Earth. According to NASA, more than 5,000 exoplanets have been discovered. **Hence, statement 2 is incorrect.**
- **Exoplanets cannot be seen directly through telescopes from the Earth because they are hidden by the bright glare of the stars they orbit.** So scientists rely on indirect methods, such as the transit method, which is measuring the dimming of a star that happens to have a planet pass in front of it, and gravitational microlensing in which light from a distant

star is bent and focused by gravity as a planet passes between the star and Earth. **Hence, statement 3 is correct.**

- The study of exoplanets **helps in determining the habitable zone of the discovered space and helps us piece together information about our planetary system and origin. Hence, statement 4 is correct.**

Q.2) Consider the following statements about the Lower Earth Orbit (LEO)

1. It is an orbit around the earth with an altitude between 1600 to 8000 km.
2. Unlike geosynchronous satellite, satellites in LEO have a small field of view and so can observe and communicate with only a fraction of the Earth at a time.
3. It has applications in the field of satellite imaging and earth-observing satellites.

Choose the correct code:

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

Q.2) Solution (b)

Explanation:

- The Lower Earth Orbit is an orbit around the earth with an altitude between **160 – 2000 km**. the satellites placed in LEO can have a tilted plane and the majority of human space flights land in LEO. **Hence, statement 1 is incorrect.**
- Unlike geosynchronous satellite, satellites in LEO have a small field of view and so can observe and communicate with only a fraction of the Earth at a time. That means that a network (or "constellation") of satellites is required to provide continuous coverage. Satellites in lower regions of LEO also suffer from fast orbital decay and require either periodic re-boosting to maintain a stable orbit or launching replacement satellites when old ones re-enter. **Hence, statement 2 is correct.**

- It has applications in the field of satellite imaging, communication satellites, remote-sensing satellites, and earth-observing satellites. The International Space Station is located in LEO. **Hence, statement 3 is correct.**

Q.3) Consider the following statements

1. Space debris refers to man-made objects in Earth's orbit that no longer serve a useful purpose.
2. Project NETRA is an early warning system in space launched by the Indian Space Research Organisation to detect debris and other hazards to Indian satellites.
3. Kessler Syndrome refers to a phenomenon where humans on earth might get physically hurt by increasing density of space debris
4. European Space Agency has launched the Clean Space initiative, aimed at reducing the amount of space debris.

Choose the correct code:

- a) 1, 2, 3 only
- b) 1, 2, 4 only
- c) 2, 3, 4 only
- d) 1, 2, 3 and 4

Q.3) Solution (b)

Explanation:

- **Space debris** refers to **man-made objects in Earth's orbit** that no longer serve a useful purpose. This includes defunct satellites, spent rocket stages, and fragments of debris from collisions or other events. Of known and tracked space junk 70 percent is in low-Earth orbit, which extends about 1,250 miles (2,000 km) above the Earth's surface. **Hence, statement 1 is correct.**
- **Project NETRA** is an **early warning system in space** launched by the **Indian Space Research Organisation (ISRO)** to detect debris and other hazards to Indian satellites.

ISRO has also set up a Centre for Space Debris Research to monitor and mitigate the threat of space debris and the **System for Safe and Sustainable Operations Management (IS 4 OM)** to continually monitor objects posing collision threats, predict the evolution of space debris, and mitigate the risk posed by space debris. **Hence, statement 2 is correct.**

- The Kessler syndrome (also called the Kessler effect,[1][2] collisional cascading, or ablation cascade), proposed by NASA scientist Donald J. Kessler in 1978, is a scenario in which the density of objects in low Earth orbit (LEO) due to space pollution is high enough that collisions between objects could cause a cascade in which each collision generates space debris that increases the likelihood of further collisions. **Hence, statement 3 is incorrect.**
- The **European Space Agency has launched the Clean Space initiative**, aimed at reducing the amount of space debris. **Hence, statement 4 is correct.**

Q.4) Consider the following statements about Communication Satellites

1. These are natural satellites present in the earth's orbit to send and receive communication data between a source and a destination.
2. They use microwaves and radiowaves for transmitting signals.
3. Communications satellites are often placed in geostationary orbit.

Choose the correct code:

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

Q.4) Solution (d)

Explanation:

- **Communication Satellite is an artificial satellite that is placed in the earth's orbit to send and receive communication data between a source and a destination.** They are mostly placed in **High-Earth Orbit**. These satellites support telecommunication. Telecasting,

phone calls, internet connectivity, radio, and much remote connectivity are typical applications. **Hence, statement 1 is incorrect.**

- They use **microwaves and radiowaves** for transmitting signals. **Hence, statement 2 is correct.**
- Communications satellites are often in **geostationary orbit**. At the high orbital altitude of 35,800 kilometers, a geostationary satellite orbits the Earth in the same amount of time it takes the Earth to revolve once. From Earth, therefore, the satellite appears to be stationary, always above the same area of the Earth. The area to which it can transmit is called a satellite's footprint. **Hence, statement 3 is correct.**

Q.5) Consider the following statements

1. A Dark Sky Reserve is a designation given to a place that has policies in place to ensure that a tract of land or region has minimal artificial light interference.
2. India's first dark sky reserve, the Indian Astronomical Observatory (IAO) is located in Hanle, Ladakh.
3. Himalayan Chandra Telescope (HCT) is an optical-infrared telescope located at IAO.
4. The International Dark Sky Association is a U.S.-based non-profit organisation that designates places as International Dark Sky Reserves

Choose the correct code:

- a) 1 and 2 only
- b) 2 and 3 only
- c) 1,2 and 3 only
- d) 1, 2, 3 and 4

Q.5) Solution (d)

Explanation:

- A **Dark Sky Reserve** is a designation given to a place that has policies in place to ensure that a tract of land or region has minimal artificial light interference. It is a public or private

land of substantial size that possess an exceptional quality of starry nights that is specifically protected for its scientific, natural, educational, cultural heritage, and public enjoyment. **Hence, statement 1 is correct.**

- **India's first dark sky reserve, the Indian Astronomical Observatory (IAO) is located in Hanle, Ladakh.** Hanle is one of the world's highest-located sites for optical, infrared, and gamma-ray telescopes. **Hence, statement 2 is correct.**
- Indian Astronomical Observatory is situated at an altitude of 4500 meters atop Mt. Saraswati in the vast Nilamkhul Plain in the Hanle Valley of Changthang. The site is a dry, cold desert with a sparse human population and the ancient Hanle monastery is its nearest neighbor. It has the advantages of more clear nights, minimal light pollution, background aerosol concentration, extremely dry atmospheric conditions, and uninterrupted monsoon. Such conditions are considered crucial for astronomers to build huge telescopes and plan for future observatories and predict how they will vary with time.
- Himalayan Chandra Telescope (HCT) is an optical-infrared telescope located at IAO. Also GROWTH-India Telescope is the country's first fully robotic research telescope located at IAO. **Hence, statement 3 is correct.**
- **The International Dark Sky Association is a U.S.-based non-profit** organisation that designates places as International Dark Sky Places, Parks, Sanctuaries and Reserves, depending on the criteria they meet. Several such reserves exist around the world but none so far in India. (Before Hanle). **Hence, statement 4 is correct.**

Q.6) Consider the following statements regarding the NASA's Space Missions

1. Artemis I is a crewed space mission to the satellite moon.
2. Perseverance Rover is a space mission to planet Mars.
3. Messenger is a space mission to planet Venus.
4. Mariner 2 is a space mission to planet Mercury.

Choose the correct code:

- a) Only one statement is correct
- b) Two statements are correct
- c) Three statements are correct
- d) Four statements are correct

Q.6) Solution (a)

Explanation:

- The **National Aeronautics and Space Administration (NASA)** is an independent agency of the executive branch of the United States federal government responsible for the civilian space program, as well as aeronautics and aerospace research. It was established under the National Aeronautics and Space Act of 1958 and is headquartered in Washington, DC, USA
- **Artemis I is an uncrewed space mission to the moon. Hence, statement 1 is incorrect.**
- **Perseverance Rover is a space mission to Mars. Hence, statement 2 is correct.**
- **Messenger is a space mission to Mercury. Hence, statement 3 is incorrect.**
- **Mariner 2 is a space mission to Venus. Hence, statement 4 is incorrect.**

Q.7) Consider the following statements about Small Satellite Launch Vehicles (SSLV)

1. It is specially designed to carry smaller commercial satellites into the low-earth orbit (LEO) from 200-2,000 km above the Earth's surface.
2. It is a three-stage Launch Vehicle and can carry a payload capacity of up to 500 kg.
3. It currently has the capacity to launch only nano-satellites.

Choose the correct code:

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

Q.7) Solution (a)

Explanation:

- **Small Satellite Launch Vehicles (SSLV)** are specially designed to carry smaller commercial satellites into **low-earth orbit (LEO)** from 200-2,000 km above the Earth's surface. **Hence, statement 1 is correct.**
- It is a **three-stage Launch Vehicle** and can carry a **payload capacity of up to 500 kg**. **Hence, statement 2 is correct.**
- **Nanosatellites, micro, and minisatellites** can be launched through SSLV. **Hence, statement 3 is incorrect.**

Q.8) Consider the following statements about the LASER INTERFEROMETER GRAVITATIONAL-WAVE OBSERVATORY (LIGO) PROJECT

1. It is an observatory for detecting COSMIC GRAVITATIONAL WAVES
2. The LIGO project operates THREE GRAVITATIONAL-WAVE (GW) DETECTORS.
3. The LIGO concept is built to test a component of Sir Isaac Newtons theory on 'law of motions.

Choose the correct code:

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

Q.8) Solution (c)

Explanation:

- **LASER INTERFEROMETER GRAVITATIONAL-WAVE OBSERVATORY (LIGO) PROJECT** is an observatory for detecting COSMIC GRAVITATIONAL WAVES AND FOR CARRYING OUT EXPERIMENTS IN ASTRONOMICAL STUDIES. **Hence, statement 1 is correct.**

- The LIGO project operates **THREE GRAVITATIONAL-WAVE (GW) DETECTORS AMONG WHICH** Two are at Hanford, Washington, and one is at Livingston in Louisiana. **Hence, statement 2 is correct.**
- The LIGO concept built upon early work by many scientists to test a component of Albert Einstein's theory of general relativity. **Hence, statement 3 is incorrect.**

Q.9) Consider the following statements about Neutrinos

1. They are the most abundant particles in the Universe.
2. The fruit Banana emits neutrinos due to radioactive decay.
3. The study of neutrinos helps in studying the origin of the universe.

Choose the correct code:

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

Q.9) Solution (d)

Explanation:

- **Neutrinos** are the **second most abundant particles in the Universe after photons**. They are produced in the **cores of stars**. **Hence, statement 1 is incorrect.**
- Every time atomic nuclei come together (like in the sun) or break apart (like in a nuclear reactor), they produce neutrinos. Even a banana emits neutrinos—they come from the natural radioactivity of the potassium in the fruit. **Hence, statement 2 is correct.**
- **The study of neutrinos helps in studying the origin of the universe** by understanding the oscillations of neutrinos and their relations with mass. **Hence, statement 3 is correct.**

Q.10) Consider the following statements

1. Unlike normal matter, dark matter does not absorb, reflect or emit light, making it extremely hard to spot.
2. The dark matter is more in abundance as compared to the dark energy in the universe
3. While dark matter attracts and holds galaxies together, dark energy repels and causes the expansion of the universe.

Choose the correct code:

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

Q.10) Solution (b)

Explanation:

- **Dark matter is made up of particles that do not interact through electromagnetic interactions i.e. they do not have any charge.** So, these are dark particles, namely because they do not emit light, which is an electromagnetic phenomenon, and matter because they possess mass like normal matter and hence interact through gravity. Dark energy is an unknown form of energy that affects the universe on the largest scales. The first observational evidence for its existence came from measurements of supernovae, which showed that the universe does not expand at a constant rate and rather, the expansion of the universe is accelerating. **Hence, statement 1 is correct.**
- The universe is made of about **27% dark matter and 68% dark energy.** **Hence, statement 2 is incorrect.**
- While **dark matter attracts and holds galaxies together, dark energy repels and causes the expansion of the universe.** **Hence, statement 3 is correct.**

Note: Despite both components being invisible, we know a lot more about dark matter, since its existence was suggested as early as the 1920s, while dark energy wasn't discovered until 1998.

Q.11) Consider the following statements

1. The cosmic microwave background (CMB) is a faint cosmic background radiation filling all space that dates back to about 400,000 years after the Big Bang.
2. It is sometimes in rare conditions visible to the naked human eye.
3. CMB-Bharat is a proposal for comprehensive next-generation Cosmic Microwave Background (CMB) mission.

Choose the correct code:

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

Q.11) Solution (c)

Explanation:

- The **cosmic microwave background (CMB)** is a faint cosmic background radiation filling all space that dates back to about 400,000 years after the Big Bang. The CMB is useful to scientists because it helps us learn how the early universe was formed. It is at a uniform temperature with only small fluctuations visible. By studying these fluctuations, cosmologists can learn about the origin of galaxies. **Hence, statement 1 is correct.**
- **Today, the CMB radiation is very cold, only 2.725° above absolute zero, thus this radiation shines primarily in the microwave portion of the electromagnetic spectrum, and is invisible to the naked eye. Hence, statement 2 is incorrect.**
- **CMB-Bharat** is a proposal for comprehensive next-generation Cosmic Microwave Background (CMB) mission in international collaboration with major Indian contributions to revealing the first clear sign of quantum gravity in the very early universe. **Hence, statement 3 is correct.**

Q.12) Consider the following statements about the 'Large Hadron Collider(LHC)'

1. It is a giant, complex machine built to study particles that are the smallest known building blocks of all things.
2. In its operational state, it fires two beams of electrons almost at the speed of light in opposite directions inside a ring of superconducting electromagnets.
3. ATLAS is the largest general-purpose particle detector experiment at the LHC.
4. In the LHC's first run, the Higgs boson was discovered.

Choose the correct code:

- a) 1 and 2
- b) 3 and 4
- c) 2, 3 and 4
- d) 1, 3 and 4

Q.12) Solution (d)

Explanation:

- **The Large Hadron Collider** is a giant, complex machine built to study particles that are the smallest known building blocks of all things. It is **the world's most powerful particle collider. Hence, statement 1 is correct.**
- In its operational state, **it fires two beams of protons** almost at the speed of light in opposite directions inside a ring of superconducting electromagnets. The magnetic field created by the superconducting electromagnets keeps the protons in a tight beam and guides them along the way as they travel through beam pipes and finally collide.
- Just before the collision, another type of magnet is used to 'squeeze' the particles closer together to increase the chances of collisions. The particles are so tiny that the task of making them collide is akin to firing two needles 10 km apart with such precision that they meet halfway. **Hence, statement 2 is incorrect.**
- **ATLAS** is the largest general-purpose particle detector experiment at the LHC. **Hence, statement 3 is correct.**

- In the LHC's first run, the Higgs boson was discovered. The **Higgs boson** is the fundamental particle associated with the Higgs field, a field that gives mass to other fundamental particles such as electrons and quarks. **Hence, statement 4 is correct.**

Q.13) Consider the following statements about the Hyperspectral Imaging Satellite (HysIS)

1. It was launched by the National Aeronautics and Space Administration (NASA) to study the atmosphere of Earth.
2. Its primary goal is to study the Earth's surface in visible, near-infrared, and shortwave infrared regions of the electromagnetic spectrum.

Choose the correct code:

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

Q.13) Solution (b)

Explanation:

- **The Hyperspectral Imaging Satellite (HysIS)** was launched by the **Indian Space Research Organisation**. **Hence, statement 1 is incorrect.**
- Its primary goal is to study the **Earth's surface in visible, near-infrared, and shortwave infrared regions** of the electromagnetic spectrum. It can see in 55 spectral or colour bands from 630 km above the ground. Hyperspectral imaging allows the distinct identification of objects, materials, or processes on Earth by reading the spectrum for each pixel of a scene from space. It can be highly useful in marking out a suspect object or person and separating it from the background. This could aid in detecting transborder or other stealthy movements. **Hence, statement 2 is correct.**

Q.14) Recently in news, the term 'Tycho' refers to

- a) Comet
- b) Meteoid
- c) Supernova
- d) Exoplanet

Q.14) Solution (c)

Explanation:

Tycho is a Type Ia supernova, which occurs when a white dwarf star shreds its companion star, triggering an explosion and sending debris hurtling into space at tremendous speeds. It released as much energy as the Sun would emit over ten billion years and blasted particles out into space near the speed of light. **Hence, option c is correct.**

Note: Imaging X-ray Polarimetry Explorer (IXPE) Space Observatory is a joint effort of NASA and the Italian Space Agency. It studies the **most extreme and mysterious objects in the universe – supernova remnants, supermassive black holes, and dozens of other high-energy objects.**

Q.15) Consider the following statements about the Atacama Large Millimetre/submillimetre Array (ALMA) Telescope

1. It is a state-of-the-art radio telescope that studies celestial objects at millimeter and submillimeter wavelengths.
2. It is built with an international partnership between India and Chile.

Choose the correct code:

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

Q.15) Solution (a)

Explanation:

- The **Atacama Large Millimetre/submillimetre Array (ALMA) Telescope** is a **state-of-the-art radio telescope** that studies celestial objects at **millimeter and submillimetre wavelengths**. they can penetrate through dust clouds and help astronomers examine dim and distant galaxies and stars out there. Ex: In 2015, the ALMA telescope helped scientists observe the **Einstein ring phenomenon**. **Hence, statement 1 is correct.**
- ALMA is an international partnership of the **European Southern Observatory (ESO)**, the **U.S.** National Science Foundation (NSF), and the National Institutes of Natural Sciences (NINS) of **Japan**, together with NRC (**Canada**), MOST, and ASIAA (**Taiwan**), and KASI (Republic of **Korea**), in cooperation with the Republic of **Chile**. **Hence, statement 2 is incorrect.**

Q.16) Consider the following statements

1. Meteoroids are objects in space that range in size from dust grains to small asteroids and when they enter the Earth's atmosphere, they are called a meteorite.
2. If a meteoroid enters the Earth's atmosphere and hits the ground, it is called a meteor.

Choose the *incorrect* code:

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

Q.16) Solution (c)

Explanation:

The question asks for “incorrect code”

- **Meteoroids** are objects in space that range in size from dust grains to small asteroids and when they enter the Earth’s atmosphere, they are called a **meteor**. Hence, **statement 1 is incorrect**.
- If a meteoroid enters the Earth’s atmosphere and hits the ground, it is called a **meteorite**. Hence, **statement 2 is incorrect**.

Note: Aubrite meteorite was recently in news , is a **coarse-grained igneous rock that formed in oxygen-poor conditions and contains exotic minerals not found on Earth**.

Q.17) Consider the following statements about Aditya-L1 Mission

1. It is India’s second solar mission after the first was partially successful in 2010.
2. It will study the Sun’s corona, photosphere, chromosphere, solar emissions, solar winds and flares, and Coronal Mass Ejections (CMEs).
3. It will be launched using the most powerful launch vehicle, GSLV MK III of ISRO.

Choose the correct code:

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

Q.17) Solution (b)

Explanation:

- **Aditya-L1 Mission is India’s first solar mission**. Hence, **statement 1 is incorrect**.
- It will study the **Sun’s corona, photosphere, chromosphere, solar emissions, solar winds and flares, and Coronal Mass Ejections (CMEs)**. It will carry out **round-the-clock imaging of the Sun**. Hence, **statement 2 is correct**.
- It will be launched **using the Polar Satellite Launch Vehicle (PSLV)** with **seven payloads**. They are –

- ✓ **Visible Line Emission Coronagraph (VELC)**
- ✓ Solar Ultraviolet Imaging Telescope (SUIT)
- ✓ Solar Low Energy X-ray Spectrometer (SoLEXS)
- ✓ Aditya Solar wind Particle Experiment (ASPEX)
- ✓ High Energy L1 Orbiting X-ray Spectrometer (HEL1OS)
- ✓ Plasma Analyser Package for Aditya (PAPA)
- ✓ Advanced Tri-axial High-Resolution Digital Magnetometers

Hence, statement 3 is incorrect.

Q.18) Consider the following statements about the term 'Local Bubble'

1. It is a large, low-density region in the interstellar medium (ISM) of our galaxy, the Milky Way.
2. It's a cavity is thought to have been created by a series of supernovae explosions that occurred about 30 to 50 million years ago.

Choose the correct code:

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

Q.18) Solution (c)

Explanation:

- The **Local Bubble** is a large, **low-density region in the interstellar medium (ISM) of our galaxy, the Milky Way**. It's a **1,000-light-year-wide** cavity that is thought to have been created by a series of supernovae explosions that occurred about 30 to 50 million years ago. **Hence, statement 1 is correct.**
- It's a cavity that is thought to have been **created by a series of supernovae explosions** that occurred about 30 to 50 million years ago. A supernova is a powerful and luminous

explosion that occurs at the end of the life of a massive star. It is caused by the collapse of the core of the star, which can trigger a massive release of energy and are important for the enrichment of the interstellar medium with heavy elements and for the propagation of cosmic rays. **Hence, statement 2 is correct.**

Q.19) Consider the following statements

1. The Kuiper Belt is a region of the solar system that exists beyond the inner planets, extending from the orbit of Jupiter.
2. The Asteroid Belt has the maximum number of known asteroids and is found between Mars and Jupiter in the solar system.

Choose the correct code:

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

Q.19) Solution (b)

Explanation:

- The **Kuiper Belt** is a region of the solar system that **exists beyond the eight major planets, extending from the orbit of Neptune. Hence, statement 1 is incorrect.**
- The **Asteroid Belt** has the maximum number of known asteroids and is found **between Mars and Jupiter** in the solar system. **Hence, statement 2 is correct.**

Q.20) Consider the following statements about the Indian Data Relay Satellite System (IDRSS)

1. It helps to track and be constantly in touch with Indian satellites, in particular to those in the low earth orbits.

2. Currently, only the US and Russia have their own data relay satellite systems.

Choose the correct code:

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

Q.20) Solution (a)

Explanation:

- The **Indian Data Relay Satellite System (IDRSS)** helps to track and be constantly in touch with Indian satellites, in particular those in **low-earth orbits**. It is an Indian geostationary data relay satellite system consisting of two geostationary satellites. IDRSS will facilitate the relay of information between various Indian spacecraft, in-flight launch vehicle monitoring, and assist Indian Human Spaceflight Programme. **Hence, statement 1 is correct .**
- Currently, the **US, Russia, China, and Europe** have their data relay satellites. **Hence, statement 2 is incorrect.**

Q.21) 'PARIMAN' a portal launched recently is related to

- a) Mining
- b) Digistack
- c) Local planning
- d) Secondary education

Q.21) Solution(c)

- NCR Geo-portal (**PARIMAN**) is a robust system **to facilitate better sub-regional and local planning**. This contains various layers collected from authentic sources. The portal has many Base Maps, Satellite Image services and Night Light Data of different time spans.
- The Portal consists of around 179 Layers presented as Line, Point & Polygon feature covering details of various sectors like Land Use, Transport, Industries, Water, Power, Health, Shelter, Heritage & Tourism, Disaster Management, etc.

Q.22) With reference to 'Red Panda', consider the following statements

1. The red panda is largely carnivorous and feeds primarily on insects and small mammals
2. Adult pandas are generally solitary ,territorial and are active during nights
3. The IUCN status of red pandas is 'Vulnerable'

Choose the correct answer using the code given below

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

Q.22) Solution(b)

Explanation:

- Statement 1 – Incorrect, The red panda is **largely herbivorous and feeds primarily on bamboo**. It also feeds on fruits, blossoms, acorns, eggs, birds and small mammals. Bamboo leaves may be the most abundant food item year-round and the only food they can access during winter
- Statement 2 – Correct, Adult pandas are **generally solitary and territorial**. The red panda appears to be both nocturnal and crepuscular, sleeping in between periods of activity at night.
- Statement 3 – Incorrect, The IUCN status of red pandas is '**Endangered**'

Q.23) Consider the following statements with respect to 'Oncolytic virus'

1. An oncolytic virus is a virus that preferentially infects and kills cancer cells
2. Adenovirus, reovirus and herpes simplex virus are some of the viruses which can be potentially used as oncolytic agents

Select the correct statement(s)

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

Q.23) Solution (c)

Explanation:

- Statement 1 – Correct, An oncolytic virus is a **virus that preferentially infects and kills cancer cells**. As the infected cancer cells are destroyed by oncolysis, they release new infectious virus particles or virions to help destroy the remaining tumour.
- Statement 2 – Correct, A number of viruses including **adenovirus, reovirus, measles, herpes simplex, Newcastle disease virus, and vaccinia have been clinically tested as oncolytic agents**. Most current oncolytic viruses are engineered for tumour selectivity, although there are naturally occurring examples such as reovirus and the senecavirus resulting in clinical trials

Q.24) Consider the following statements regarding India Innovation Index(III)

1. The index is released by the NITI Aayog with the help of the Confederation of Indian Industry
2. The index is based on a cumulative average of Social capital, Investment and knowledge worker

Select the correct statement/s:

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

Q.24) Solution (d)

Explanation:

- Statement 1 – Incorrect, The **NITI Aayog in collaboration** with the **Institute for Competitiveness** developed benchmark for the innovation ecosystem among Indian States and Union territories.
- Statement 2 – Incorrect, Indicators used for ranking are :-
 - *Five Enablers pillars (**Human capital , Investment, Knowledge worker, Business Environment, Safety and Legal Environment**)
 - *Two Performance Pillars (**Knowledge Output, Knowledge Diffusion**).

Q.25) Consider the following statements with respect to 'Indian Antarctic Bill, 2022'

1. The bill proposes to set up Indian Antarctic Authority under the Ministry of Earth Sciences
2. India is a signatory to the Antarctic Treaty and has a consultative party status with a right to vote
3. The bill is pursuant to Canberra protocol to the Antarctic treaty

Choose the correct answer using the code give below

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

Q.25) Solution (a)

Explanation:

- Statement 1 – Correct, The Bill also proposed to set-up **Indian Antarctic Authority (IAA) under the Ministry of Earth Sciences**, which shall be the apex decision making authority and shall facilitate programmes and activities permitted under the Bill.
- Statement 2 – Correct, A total of fifty-four State Parties to the Treaty, but **twenty-nine countries have the status of Consultative Party with a right to vote** in the Antarctic Consultative Meetings and twenty-five countries are Non-Consultative Parties having no right to vote. **India signed the Antarctic Treaty on the 19th August, 1983 and received the consultative status** on the 12th September, 1983.
- Statement 3 – Incorrect, The bill is in pursuant to India's accession to Antarctic Treaty, the Protocol on **Environment Protection (Madrid Protocol)** to the Antarctic Treaty and to the Convention on the Conservation of Antarctic Marine Living Resources.

Q.26) How many boys are there in the class if the number of boys in the class is 8 more than the number of girls in the class, which is five times the difference between the number of girls and boys in the class.

- a) 32
- b) 40
- c) 38
- d) 46

Q.26) Solution (b)

Explanation:

Let number of boys = b

Number of girls = g

Then, $b = 8 + g = 5(b - g)$ [$b - g = 8$ from given equation]

$$\rightarrow b = 5 \times 8$$

$$b = 40$$

Q.27) It is required to seat 5 men and 4 women in a row so that the women occupy the even places. How many such arrangements are possible?

- a) 2240
- b) 2460
- c) 2880
- d) 2890

Q.27) Solution (c)

Explanation:

5 men and 4 women are to be seated in a row such that the women occupy the even places.

The 5 men can be seated in $5!$ Ways.

The 4 women can be seated only at the cross marked places (so that women occupy the even places).

$$M \times M \times M \times M \times M$$

Therefore, the women can be seated in $4!$ Ways.

$$\text{Hence, possible number of arrangements} = 4! \times 5! = 24 \times 120 = 2880$$

Q.28) In how many ways 11 identical toys be placed in 3 distinct boxes such that no box is empty?

- a) 72

- b) 54
- c) 45
- d) 36

Q.28) Solution (c)

Explanation:

This is nothing but the number of ways of having a, b, c such that $a + b + c = 11$, where a, b, c are natural numbers.

By having them to be natural numbers, we ensure that no box can be empty. (No zeroes)

The question is similar to the previous one. $10C2 = 45$ ways

Q.29) A group of 8 people decide to go on vacation which consists of five males and three females. Now a two member group comprising of one male and one female member is to be constituted out of these. Amongst the females, Ms Abhishek refuses to be a member of the committee in which Mr Bharath is chosen as the member. Considering this scenario, In how many different ways can the committee be constituted?

- a) 15
- b) 14
- c) 12
- d) 10

Q.29) Solution (b)

Explanation:

1 male out of 5 males can be selected in 5C_1 ways

Similarly 1 female out of 3 can be selected in 3C_1 ways

Since Ms Abhishek refuses to be in the committee which has Mr Bharath, the possible ways

so that a committee can be constituted is ${}^5C_1 \times {}^3C_1 - 1 = 5 \times 3 - 1 = 14$

Read the following passage and answer the items that follow. Your answer to these items should be based on the passages only.

Passage

Many people like to eat pizza, but not everyone knows how to make it. Making the perfect pizza can be complicated, but there are lots of ways for you to make a more basic version at home. When you make pizza, you must begin with the crust. The crust can be hard to make. If you want to make the crust yourself, you will have to make dough using flour, water, and yeast. You will have to knead the dough with your hands. If you do not have enough time to do this, you can use a prepared crust that you buy from the store.

After you have chosen your crust, you must then add the sauce. Making your own sauce from scratch can take a long time. You have to buy tomatoes, peel them, and then cook them with spices. If this sounds like too much work, you can also purchase jarred sauce from the store. Many jarred sauces taste almost as good as the kind you make at home.

Now that you have your crust and your sauce, you need to add the cheese. Cheese comes from milk, which comes from cows. Do you have a cow in your backyard? Do you know how to milk the cow? Do you know how to turn that milk into cheese? If not, you might want to buy cheese from the grocery store instead of making it yourself.

When you have the crust, sauce, and cheese ready, you can add other toppings. Some

people like to put meat on their pizza, while other people like to add vegetables. Some people even like to add pineapple! The best part of making a pizza at home is that you can customize it by adding your own favourite ingredients.

Q.30) The author's main purpose in writing this passage is to

- a) describe the history of pizza
- b) teach a healthier way to make pizza
- c) outline steps to make a basic pizza at home
- d) provide tips about how to make your pizza especially delicious

Q.30) Solution (c)

Explanation:

In the first paragraph, the author introduces the main idea. The author says, "Making the perfect pizza can be complicated, but there are lots of ways for you to make a more basic version at home". Here, the author tells us that he or she wants to give us some ways to make a more basic pizza at home.

The author spends the rest of the passage outlining the steps we need to take to make the pizza. This means option (c) is correct. The passage does not provide information to support choices (a), (b), and (d). Therefore they are incorrect.