

Q. 1) Consider the following statements about carbon nanotubes

1. They are cylindrical molecules with rolled-up sheets of single-layer carbon atoms.
2. They are always single-walled and can never be multi-walled nanotubes.
3. They can be used as artificial blood capillaries for the injured part of the body.
4. They can be used as carriers of drugs in the human body.

Which of the given statements is correct?

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

Q.1) Solution: (d)

Explanation:

- Carbon nanotubes are cylindrical molecules with rolled-up sheets of single-layer carbon atoms. **Hence statement 1 is correct.**
- They can be single-walled or multi-walled nanotubes. Their length can reach several micrometers or even millimeters.
- Like their building block graphene, CNTs are chemically bonded with sp^2 bonds, an extremely strong form of molecular interaction. **Hence statement 2 is incorrect.**
- Biotechnology facilitates the making of nanodevices with blood-compatible nanomaterials as building blocks for biomedical applications such as structural tissue replacements, and artificial blood capillaries for the injured part of the body. But using carbon nanotubes as blood capillaries creates blood clotting so it is unsafe. **Hence statement 3 is incorrect.**
- Carbon nanotubes easily penetrate cells and improve the therapeutic profile and efficacy of drugs. They can be used as carriers of drugs in the human body. **Hence statement 4 is correct.**
- They can be used in electric wires to reduce losses.

- It can replace silicon-made transistors as they are small and emit less heat and it can revolutionize electronics
- They can be used in solar cell

Q. 2) Consider the following statements

1. Liquid Nano Urea **provides phosphate to plants as an alternative to conventional urea.**
2. Liquid Nano Urea has less efficacy compared to conventional nano urea.
3. Liquid Nano Urea provides a targeted supply of nutrients to crops.

Choose the correct code:

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

Q.2) Solution: (c)

Explanation:

- Liquid Nano Urea **provides nitrogen to plants as an alternative to conventional urea.** It is aimed at reducing the unbalanced and indiscriminate use of conventional urea, increasing crop productivity, and reducing soil, water, and air pollution.
- It has been indigenously developed at Nano **Biotechnology Research Centre, Kalol, Gujarat** in line with **Atmanirbhar Bharat** and Atmanirbhar Krishi. **Hence statement 1 is incorrect.**
- Liquid Nano Urea has more efficacy compared to conventional nano urea. While conventional urea has an efficiency of about 25 %, the efficiency of liquid nano urea can be as high as 85-90 %.
- Conventional urea fails to have the desired impact on crops as it is often applied incorrectly, and the nitrogen in it is vaporised or lost as a gas. A lot of nitrogen is also washed away during irrigation. **Hence statement 2 is incorrect.**

- Liquid Nano Urea provides a targeted supply of nutrients to crops. It is sprayed directly on the leaves and gets absorbed by the plant.
- Fertilizers in nano form provide a targeted supply of nutrients to crops, as they are absorbed by the stomata, and pores found on the epidermis of leaves. **Hence statement 3 is correct.**

Q. 3) Consider the following statements about different types of biosensors

1. Amperometric Biosensor provides exact quantitative analytical information based on current flow.
2. Voltammetric Biosensors is a response indicator used for indicating physical and chemical properties.

Choose the correct code:

- a) 1 only
- b) 2 only
- c) Both 1 and 2
- d) Neither 1 or 2

Q.3) Solution: (a)

Explanation:

- A biosensor can be defined as a device that measures biological or chemical reactions by producing certain signals which would be proportional to the concentration of the analyte in the reaction.
- Amperometric Biosensor provides exact quantitative analytical information based on current flow.
- It works on the basis of the quantity of current released during oxidation. It also uses the Redox response during its operation. The uses of the biosensor are medical screening, quality control, etc. **Hence statement 1 is correct.**
- Impedimetric Biosensors is a response indicators used for indicating physical and chemical properties.

- Currently, this type of biosensor is trending. It is used for recording the catalysed response of enzyme lectins, receptors, etc. **Hence statement 2 is incorrect.**
- Voltammetric Biosensors are the type of biosensor used for observing acrylamide.
- It is made using a carbon glue electrode which has haemoglobin.
- Electrochemical biosensors follow the enzymatic catalysis of a reaction that either produces or consumes electrons. These enzymes are called redox enzymes.
- Optical biosensors follow the phenomenon of surface plasmon resonance (SPR) techniques. It works by using other materials' properties This utilises certain properties of the other materials, for example, a thin layer of gold placed on a glass with a very high refractive index, and the surface can absorb laser light, which produces electron waves or surface plasmons on the gold surface.

Q.4) Consider the following statements about nanoparticles

1. They are tiny particles between 1 and 1000 nm.
2. They are not naturally found.
3. They are used in the making of cosmetics.
4. They cause lung problems and cardiovascular disease.

Which of the given statements is correct?

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

Q.4) Solution: (b)

Explanation:

- Nanoparticles are tiny particles between 1 and 100 nm. Due to their ultrafine size, they can be suspended in the atmosphere for a long time and can travel larger distances.

- They possess very little mass but are many. **Hence statement 1 is incorrect.**
- They are found naturally, in incidental and manufactured processes.
- **Nanoparticles occur widely in nature** and are objects of study in many sciences such as chemistry, physics, geology, and biology.
- A significant fraction (by number, if not by mass) of interplanetary dust, that is still falling on the Earth at the rate of thousands of tons per year, is in the nanoparticle range; and the same is true of atmospheric dust particles.
- Many viruses have diameters in the nanoparticle range. Iron oxides/sulfides, silver, and gold are some representative examples of naturally-occurring nanoparticles in the environment. **Hence statement 2 is incorrect.**
- They are used in the making of cosmetics. Many cosmetic products used in our daily life are made with the assistance of nanotechnologies.
- Among metal and metal oxide nanoparticles (NPs) potentially present in cosmetics, those containing titanium dioxide and zinc oxide are common ingredients added to obtain sufficient sun protection.
- The addition of silver and gold NPs is also mentioned to increase the antimicrobial and healing properties of some cosmetic formulations. **Hence statement 3 is correct.**
- They cause lung problems and cardiovascular disease. Long exposures to high concentrations of nanoparticles cause lung problems and cardiovascular disease.
- One of the key reasons for their negative health impact is their toxicity and large total surface area per unit mass.
- This increases their potential chemical reactivity and ability to be absorbed.
- They can pass deep into the respiratory system, reacting with the lung tissues and potentially entering the bloodstream. **Hence statement 4 is correct.**

Q. 5) Consider the following statements about Zeolites

1. They are naturally found but cannot be manufactured.
2. They are very stable solids that resist a variety of environmental conditions.
3. They don't get dissolved in water or other inorganic solvents.

4. They are used as ion exchange beds in domestic and commercial water purification.

Choose the correct code:

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

Q.5) Solution: (d)

Explanation:

- Zeolites are microporous, aluminosilicate minerals commonly used as commercial adsorbents and catalysts.
- Zeolites are naturally found but can be manufactured industrially on a large scale.
- Natural zeolites form where volcanic rocks and ash layers react with alkaline groundwater.
- However, naturally occurring zeolites are rarely pure and are contaminated to varying degrees by other minerals.
- For this reason, naturally occurring zeolites are excluded from important commercial applications. **Hence statement 1 is incorrect.**
- They are very stable solids that resist a variety of environmental conditions. The melting point of zeolite is very high (over 1000°C), and they don't burn.
- They also resist high pressures. **Hence statement 2 is correct.**
- They don't get dissolved in water or other inorganic solvents and don't oxidize in the air.
- Since zeolites are not reactive and are obtained from naturally occurring minerals, they do not have any harmful environmental effects. **Hence statement 3 is correct.**
- They are used as ion exchange beds in domestic and commercial water purification.
- They have the potential of providing precise separation of gases. This includes the removal of H₂O, CO₂, and SO₂ from low-grade natural gas streams.

- Zeolites are also marketed as dietary supplements to treat cancer, diarrhoea, autism, herpes, and hangover. It is also used to balance pH and remove heavy metals in the body. **Hence statement 4 is correct.**

Q. 6) Consider the following statements about the All India Council for Robotics and Automation

1. It is a statutory body.
2. It sets up standards in robotics and automation.
3. It organises Technoxian, an Edutech expo.

Choose the correct code:

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

Q.6) Solution: (b)

Explanation:

- The **All India Council for Robotics and Automation** is a **not-for-profit organization** established in **2014**.
- A Statutory body is established by an act of parliament. **Hence statement 1 is incorrect.**
- It sets up **standards in robotics and automation**.
- It helps organizations and professionals to solve difficult technical problems while enhancing their leadership and personal career capabilities.
- It is engaged in various activities and has launched several programs to promote and build an ecosystem for robotics and automation in India. **Hence statement 2 is correct.**
- It organises Technoxian, an Edutech expo.

- Technoxian provides a global opportunity to participate in different competitions related to innovation, robotics, automation, and many other fascinating challenge-based engineering competitions. **Hence statement 3 is correct.**

Q. 7) Which of the following sectors can benefit from Generative Artificial Intelligence?

1. Healthcare
2. Music
3. Robotics
4. Art

Choose the correct code:

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

Q.7) Solution: (d)

Explanation:

- GAI is a rapidly growing branch of AI that focuses on generating new content (such as images, audio, text, etc.) based on patterns and rules learned from data.
- The rise of GAI can be attributed to the development of advanced generative models, such as Generative Adversarial Networks (GANs) and Variational Autoencoders (VAEs).
- The applications of GAI are
- Healthcare: By generating new medical images and simulations, improving the accuracy and efficiency of medical diagnoses and treatments.
- Music: It can help musicians and music producers explore new sounds and styles, leading to more diverse and interesting music.

- Robotics: It can help optimize manufacturing processes, improving the efficiency and quality of these processes.
- Art: It can be used to generate new works of art that are unique and innovative, helping artists and creatives explore new ideas and push the boundaries of traditional art forms.
Hence option d is correct.

Q. 8) Consider the following statements about Vyommitra

1. It is a female-looking spacefaring humanoid robot.
2. It is developed by NASA to function on board of the Gaganyaan.
3. It will generate warnings, replace carbon dioxide canisters, and operate switches.

Choose the correct code:

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

Q.8) Solution: (a)

Explanation:

- Vyommitra is a female-looking spacefaring humanoid robot.
- A humanoid is a robot with the appearance of a human being. **Hence statement 1 is correct.**
- It is developed by ISRO to function on board the Gaganyaan.
- It will test the ground for human spaceflight and will be a very basic version of a TARS-type, artificial-intelligence-and-robotics system. **Hence statement 2 is incorrect.**
- The activities that Vyom mitra will be able to perform, once fully developed for the unmanned flight, will include:

- ✓ procedures to use the equipment on board the spacecraft's crew module such as safety mechanisms and switches,
- ✓ receiving and acting on commands sent from ground stations
- ✓ attaining launch and orbital postures,
- ✓ responding to the environment,
- ✓ generating warnings,
- ✓ replacing carbon dioxide canisters,
- ✓ operating switches,
- ✓ monitoring of the crew module,
- ✓ receiving voice commands,
- ✓ responding via speech (bilingual). **Hence statement 3 is correct.**

Q. 9) Consider the following statements about Xenobots

1. They are synthetic life forms that are designed by computers.
2. They have been named after the species of **aquatic frog Xenopus laevis**.
3. They help in finding cancer cells in the human body.

Choose the correct code:

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

Q.9) Solution: (d)

Explanation:

- Xenobots are synthetic life forms that are designed by computers to perform desired functions and built by combining different biological tissues. **Hence statement 1 is correct.**
- They have been named after the species of **aquatic frog *Xenopus laevis***, found across sub-Saharan Africa from Nigeria and Sudan to South Africa. **Hence statement 2 is correct.**
- They help in finding cancer cells in the human body. They can move toward a target, perhaps pick up a payload (like a medicine that needs to be carried to a specific place inside a patient) — and heal themselves after being cut.
- Many useful applications of these living robots include searching out nasty compounds or radioactive contamination, gathering microplastic in the oceans, travelling in arteries to scrape out plaque, etc. **Hence statement 3 is correct.**

Q. 10) Consider the following statements

1. A nanotech-based contamination sensor can reveal the presence of E-coli.
2. Nanotech-based wearables can record medical data such as heartbeat, sweat components, and blood pressure.
3. Nanotechnology can improve the display screens of electronic devices.
4. Nanoscience has produced stain and wrinkle-resistant clothes.

Choose the correct code:

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

Q.10) Solution: (c)

Explanation:

- Nanotechnology provides the potential for safe and better quality food and improved texture and taste of the food.
- A contamination sensor, using a flash of light can reveal the presence of E-coli.
- Antimicrobial packaging made out of cinnamon or oregano oil or nanoparticles of zinc, calcium, etc., can kill bacteria. **Hence statement 1 is correct.**
- Nanotech-based wearables have embedded nanosensors in the cloth that record medical data such as heartbeat, sweat components, and blood pressure. It helps save lives by alerting the wearer and medical professionals of any adverse changes faced by the body. **Hence statement 2 is correct.**
- Nanotechnology has greatly improved the capacity of electronic components by:
 - ✓ Reducing the size of the transistors of the integrated circuit
 - ✓ Improving the display screens of the electronic devices
 - ✓ Reducing power consumption, weight, and thickness of electronic devices. **Hence statement 3 is correct.**
- Nanoscience has now produced stain and wrinkle-resistant cloths and may further improve upon the existing innovations. **Hence statement 4 is correct.**

Q. 11) Consider the following statements

1. Ai-Da Robot is the world's first ultra-realistic humanoid artist.
2. Sophia is the first robot to be given legal personhood anywhere in the world.

Choose the correct code:

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

Q.11) Solution: (c)

Explanation:

- Ai-Da Robot is the world's **first ultra-realistic humanoid artist**. It can draw creatively due to in-built artificial intelligence (AI) technology.
- Ai-Da is named after Ada Lovelace, the English mathematician and writer often called the world's first computer coder. **Hence statement 1 is correct.**
- Sophia is a humanoid robot designed to respond to questions.
- It is developed by Hong Kong-based company Hanson Robotics.
- It uses artificial intelligence, visual data processing and facial recognition to make simple conversations on predefined topics (e.g. on the weather).
- In 2017, Sophia was confirmed as a citizen of Saudi Arabia. By this, Saudi Arabia has become the first country to give a robot citizenship. **Hence statement 2 is correct.**

Q. 12) Consider the following statements about Nano Mission

1. It focuses on funding individual scientist-centric nano-research projects.
2. It does not promote public-private partnerships (PPPs).
3. It focuses on promoting foreign collaboration.

Choose the correct code:

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

Q.12) Solution: (c)

Explanation:

- The Government of India launched the Nano Mission in 2007 as an umbrella capacity-building programme. As a result of the efforts led by the Nano Mission, today, India is amongst the top five nations in the world in terms of scientific publications in nanoscience and technology.
- The mission focuses on the funding of basic research in nanotechnology by individual scientists and groups of scientists and the creation of centres of excellence for pursuing studies. The mission is funding about 235 individual scientist-centric research projects on fundamental research in Nanosystems. This will lead to the fundamental understanding of matter that enables control and manipulation at the nanoscale. **Hence statement 1 is correct.**
- The mission aimed at establishing a chain of shared facilities across the country with sophisticated equipment required for Nano research. It also focuses on establishing linkages between industry and research and educational institutions and promoting public-private partnerships (PPPs). **Hence statement 2 is incorrect.**
- Apart from exploratory visits of scientists, organization of joint workshops and conferences, and joint research projects. It focuses on promoting foreign collaboration in nanotechnology programmes. **Hence statement 3 is correct.**

Q. 13) Consider the following statements about the basic components of robots

1. Actuators allow the parts of the robot to operate together.
2. Controller converts stored energy into movement in robots.
3. Sensors are what allow a robot to gather information about its environment.
4. End-Effectors directly interact with objects in the world.

Choose the correct code:

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

Q.13) Solution: (b)

Explanation:

- The controller is the “brain” of the industrial robotic arm and allows the parts of the robot to operate together. It works as a computer and allows the robot to also be connected to other systems.
- The robotic arm controller runs a set of instructions written in code called a program. **Hence statement 1 is incorrect.**
- Actuators are like the “muscles” of a robot, the parts which convert stored energy into movement. By far the most popular actuators are electric motors that spin a wheel or gear, and linear actuators that control industrial robots in factories. **Hence statement 2 is incorrect.**
- Sensors are what allow a robot to gather information about its environment. This information can be used to guide the robot’s behaviour. Some sensors are relatively familiar pieces of equipment.
- Cameras allow a robot to construct a visual representation of its environment. This allows the robot to judge attributes of the environment that can only be determined by vision, such as shape and color, as well as aid in determining other important qualities, such as the size and distance of objects.
- Microphones allow robots to detect sounds. Some robots come equipped with thermometers and barometers to sense temperature and pressure. **Hence statement 3 is correct.**
- End-Effectors are the tools at the end of robotic arms that directly interact with objects in the world. The effectors are the parts of the robot that do the work. **Hence statement 4 is correct.**

Q. 14) Consider the following statements about the India Innovation Centre for Graphene

1. It is a cross-functional plan that incentives new ideas.
2. It is the country’s first Graphene Innovation Centre.
3. It would come up in the Indian state of Karnataka.

Choose the correct code:

- a) 1 and 2

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

Q.14) Solution: (a)

Explanation:

- The **India Innovation Centre for Graphene** is a **cross-functional plan that creates a haven for new ideas**.
- With opportunities for individual and group collaboration across time zones and continents, it's a place that fosters a culture of innovation through the creation, sharing, and testing of ideas. **Hence statement 1 is correct.**
- It is the **country's first Graphene Innovation Centre**. The project would give a major fillip for scientific research as well as the state's industrial sector. **Hence statement 2 is correct.**
- It would come up in the Indian state of Kerala.
- The India Innovation Centre for Graphene would come up in Thrissur at Rs 86.41 crore.
- Of the 86.41 crores, the Union Government would provide Rs 49.18 crore, and private business houses Rs 11.48 crore.
- The state government would provide the basic infrastructure for the project. The Centre would help attract investors to develop graphene products. **Hence statement 3 is incorrect.**

Q. 15) Which of the following are ethical challenges associated with Artificial Intelligence?

1. Increased Inequalities
2. Risk of Unemployment
3. Data Privacy Concerns
4. Technological addiction

Choose the correct code:

- a) 1 and 2
- b) 3 and 4
- c) None
- d) 1, 2, 3 and 4

Q.15) Solution: (d)

Explanation:

- Using artificial intelligence, a company can drastically cut down on relying on the human workforce, and this means that revenues will go to fewer people.
- Consequently, individuals who have ownership in AI-driven companies will make all the money. Also, AI could compound digital exclusion.
- Further, investment is likely to shift to countries where AI-related work is already established, widening gaps among and within countries.
- Therefore, without clear policies on reskilling workers, the promise of new opportunities will create serious new inequalities.
- The hierarchy of labour is concerned primarily with automation. Robotics and AI companies are building intelligent machines that perform tasks typically carried out by low-income workers: self-service kiosks to replace cashiers, fruit-picking robots to replace field workers, etc.
- AI also presents serious data privacy concerns. The algorithm's never-ending quest for data has led to our digital footprints being harvested and sold without our knowledge or informed consent. Ex: Cambridge Analytica Case
- Technological addiction is the new frontier of human dependency. AI has already become effective at directing human attention and triggering certain actions. **Hence option d is correct.**

Q. 16) Consider the following statements about Graphene

1. It is the most electrically and thermally conductive material in the world.
2. It could bring down the cost of OLED (organic light-emitting diode) screens in smartphones.
3. It has applications in anti-corrosion coatings and paints.

Choose the correct code:

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

Q.16) Solution: (d)

Explanation:

- Graphene is a one-atom-thick layer of carbon atoms arranged in a hexagonal lattice.
- It is the building block of Graphite, but graphene is a remarkable substance on its own with a multitude of astonishing properties.
- It is the **most electrically and thermally conductive material in the world. It is flexible, transparent, and incredibly strong. Hence statement 1 is correct.**
- It could **bring down the cost of OLED** (organic light-emitting diode) screens in smartphones as it can **replace Indium which is more costly . Hence statement 2 is correct.**
- It has applications in anti-corrosion coatings and paints, efficient and precise sensors, faster and efficient electronics, flexible displays, efficient solar panels, faster **DNA sequencing**, and drug delivery. **Hence statement 3 is correct.**

Q. 17) Consider the following statements about self-cleaning fabrics

1. Hydrophobicity and hydrophilicity are two principal ways of self-cleaning.
2. The photocatalytic process will decompose the dirt molecules by utilizing sunlight.
3. Titanium Dioxide (TiO₂) is used for self-cleaning surfaces.
4. They have applications in medical textiles, sports tech, defense textiles, and smart textiles.

Choose the incorrect code:

- a) 2 and 3
- b) 1 and 2
- c) None
- d) 1, 2, 3 and 4

Q.17) Solution: (c)

Explanation:

Here the question asks for 'incorrect code'. **So option c is correct.**

- **The self-cleaning fabric has massive potential for improvement of products not only in the clothing industry but also in the health industry due to time, material, and energy reduction and consequently cost-efficiency during production.**
- Hydrophobicity and hydrophilicity are two principal ways of self-cleaning.
- Both types of coating clean themselves with the action of water by rolling droplets for hydrophobic and sheeting water for hydrophilic that carries dirt away. Nevertheless, hydrophilic has an additional property, which can chemically break down the adsorbed dirt in sunlight through the help of a photocatalyst also known as the hydrophilic photocatalytic coating. **Hence statement 1 is correct.**
- The photocatalytic process is the acceleration of a photoreaction in the presence of a catalyst. It will decompose the dirt molecules by utilizing sunlight.
- By utilizing the photoreaction induced by the photocatalyst, the organic contaminants will be degraded into air and water. The mechanism of photocatalytic reaction begins

when a photocatalyst is irradiated by light, usually ultraviolet light. **Hence statement 2 is correct.**

- Titanium Dioxide (TiO₂) is a semiconductor material that acts as a photocatalyst and has been proven to be an excellent catalyst in the photodegradation of colorants and other organic pollutants. It is widely used because of its various advantages, such as non-toxicity, availability, cost-effectiveness, chemical stability, and favorable physical and chemical properties.
- TiO₂ is used in paint and cosmetics as pigment and as a food additive. It is also used in anti-pollution applications and for water purification. **Hence statement 3 is correct.**
- They have applications in medical textiles, sports tech, defense textiles, and smart textiles. **Hence statement 4 is correct.**

Q. 18) Which of the following sectors have the applications of drones?

1. Defence
2. Healthcare
3. Agriculture
4. Law enforcement

Choose the correct code:

- a) 1, 2 and 4
- b) 2, 3 and 5
- c) 2 and 3
- d) 1, 2, 3 and 4

Q.18) Solution: (d)

Explanation:

- Drones can be used as a symmetric weapon against terrorist attacks.
- It can be integrated into the national airspace system. **Hence option 1 is correct.**

- **Drone technology has uses in healthcare as it can be used to deliver vaccines** in remote areas. **Hence option 2 is correct.**
- In the agriculture sector, micronutrients can be spread with the help of drones.
- It can also be used for performing surveys for identifying the challenges faced by the farmers. **Hence option 3 is correct.**
- Drones are also significant for law enforcement agencies, the fire, and emergency services wherever human intervention is not safe. **Hence option 4 is correct.**

Q. 19) Which of the following statement is incorrect about Self Driving Cars?

- a) It is a vehicle capable of sensing its environment and operating without human involvement.
- b) It helps in reducing traffic congestion and cutting transportation costs.
- c) It cannot go everywhere a traditional car goes.
- d) It can reduce urban CO2 emissions.

Q.19) Solution: (c)

Explanation:

- A self-driving car is a vehicle capable of sensing its environment and operating without human involvement.
- A human passenger is not required to take control of the vehicle at any time, nor is a human passenger required to be present in the vehicle at all.
- It helps in reducing traffic congestion and cutting transportation costs.
- A self-driving car can go anywhere a traditional car goes and do everything that an experienced human driver does. **Hence option c is incorrect.**

Q. 20) Consider the following statements about FINAL EXPERIMENTAL DEMONSTRATION OBJECT RESEARCH (FEDOR)

1. It was the first robot to be sent to space.

2. It is used in operations that are dangerous for humans onboard spacecraft.
3. It was sent by Russia on an unmanned rocket.

Choose the correct code:

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

Q.20) Solution: (c)

Explanation:

- FINAL EXPERIMENTAL DEMONSTRATION OBJECT RESEARCH (FEDOR) is not the first robot to go into space in 2019
- In 2011, NASA sent up ROBONAUT 2, a humanoid robot developed with General Motors that had a similar aim of working in high-risk environments.
- In 2013, Japan sent up a small robot called KIROBO along with the ISS's first Japanese space commander. **Hence statement 1 is incorrect.**
- It is used in operations that are dangerous for humans onboard spacecraft.
- It copies human movements, a key skill that allows it to remotely help astronauts or even people on Earth to carry out tasks while the humans are strapped into an exoskeleton.
- Fedor is described as potentially useful on Earth for working in high radiation environments, demining, and tricky rescue missions. **Hence statement 2 is correct.**
- It is sent by Russia on an unmanned rocket. It is the first humanoid robot to be sent to space by Russia. **Hence statement 3 is correct.**

Q.21) Consider the following statements with respect to 'Infrastructure Investment Trusts (InvITs)'

1. InvIT contains investment in real infrastructure assets like roads, power plants and pipelines etc
2. They are regulated under the Securities and Exchange Board of India (Real Estate Investment Trusts) Regulations, 2014
3. SEBI has allowed Foreign Direct Investment in InvITs, but has barred Foreign Portfolio Investment

Choose the correct answer using the code given below

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

Q.21) Solution (a)

Explanation:

- **An Infrastructure Investment Trust (InvITs) is like a mutual fund, which enables direct investment of small amounts of money from possible individual/institutional investors in infrastructure to earn a small portion of the income as return.**
- While mutual funds invest the sum received in financial securities, an InvIT invests the same in real infrastructure assets like **roads, power plants, transmission lines, pipelines etc. Hence statement 1 is correct.**
- **Sebi notified the Sebi (Infrastructure Investment Trusts) Regulations, 2014 on September 26, 2014, providing for registration and regulation of InvITs in India.** The objective of InvITs is to facilitate investment in the infrastructure sector. **Hence statement 2 is not correct.**
- An announcement was made in the **Union Budget 2021-22** that debt financing of Infrastructure Investment Trusts (InvITs) and Real Estate Investment Trusts (REITs) by Foreign Portfolio Investors (FPIs) will be enabled by making suitable amendments in the relevant legislations.
- **FPIs can acquire debt securities issued by InvITs and REITs under the Medium-Term Framework (MTF) or the Voluntary Retention Route (VRR).** Such investments shall be reckoned within the limits and shall be subject to the terms and conditions for

investments by FPIs in debt securities under the respective regulations of MTF and VRR.
Hence statement 3 is not correct.

Source: [CLCIK HERE](#)

Q.22) Consider the following statements with respect to 'Like Minded Developing Countries (LMDC) Group'

1. They are an inter-governmental group consisting of developing countries that tend to share similar sustainable development challenges.
2. India is part of the LMDC grouping along with China and Saudi Arabia
3. They were first recognized as a distinct group of developing countries at the United Nations Conference on Environment and Development

Choose the correct answer using the code given below

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

Q.22) Solution (b)

Explanation:

- The Like Minded-Group of Developing Countries (LMDC) is a **group of developing countries who organise themselves as a block negotiators in international organizations** such as the United Nations and the World Trade Organization, they represent more than 50% of the world's population. **Hence statement 1 is not correct.**
- LMDC countries who negotiate in the United Nations Framework Convention on Climate Change fora, the members are Algeria, Bangladesh, Bolivia, China, Cuba, Ecuador, Egypt, El Salvador, India, Indonesia, Iran, Iraq, Jordan, Kuwait, Malaysia, Mali, Nicaragua, Pakistan, Saudi Arabia, Sri Lanka, Sudan, Syria, Venezuela and Vietnam. **Hence statement 2 is correct.**
- The **SIDS and not LMDC were first recognized as a distinct group of developing countries at the United Nations Conference on Environment and Development in June 1992.** **Hence statement 3 is not correct.**

Source: [CLICK HERE](#)

Q.23) Consider the following statements

1. Site-Directed Nuclease (SDN) genome editing involves the use of different RNA-cutting enzymes (nucleases)
2. All the SDN processes do not involve alien genetic material and the end result is indistinguishable from conventionally bred crop varieties

Select the correct statement(s)

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

Q.23) Solution (d)

Explanation:

- Site-Directed Nuclease (SDN) **genome editing** involves the **use of different DNA-cutting enzymes (nucleases)** that are **directed to cut the DNA at a predetermined location by a range of different DNA binding systems**. After the cut is made, the cell's own DNA repair mechanism recognizes the break and repairs the damage, using one of two pathways that are naturally present in cells. **Hence statement 1 is not correct.**
- **SDN 1 & SDN 2 processes do not involve alien genetic material and the end result is indistinguishable from conventionally bred crop varieties.** The SDN3 process involves larger DNA elements or full length genes of foreign origin which makes it similar to Genetically modified organisms (GMO) development. **Hence statement 2 is not correct.**

Source: [CLICK HERE](#)

Q.24) Consider the following statements with respect to 'Unlawful Activities (Prevention) Act'

1. It will apply to the offenders in the same manner even if a crime is committed outside India

2. There is a provision for default bail but normal bail rules do not apply to an accused under this Act
3. An investigating officer does not require any approval to seize properties that may be connected with terrorism under this Act

Choose the correct answer using the code given below

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

Q.24) Solution (a)

Explanation:

- Under UAPA, both **Indian and foreign nationals can be charged. It will apply to the offenders in the same manner, even if a crime is committed in a foreign land, outside India. Hence statement 1 is correct.**
- The police normally have **60 to 90 days to investigate a case and submit a charge-sheet failing which the accused may obtain default bail.** However, under the UAPA, this pre-charge sheet time is extended to 180 days. Further, normal bail rules do not apply to an accused under Section 43(d)5 of the UAPA. **Hence statement 2 is correct.**
- Under the Act, **an investigating officer** is required to obtain the **prior approval of the Director General of Police to seize properties that may be connected with terrorism.** The Bill adds that if the investigation is conducted by an officer of the National Investigation Agency (NIA), the approval of the Director General of NIA would be required for seizure of such property. **Hence statement 3 is not correct.**

Source: [CLICK HERE](#)

Q.25) 'Glyphosate' considered harmful is most likely used in which one of the following?

- a) Food preservatives
- b) Plastic Manufacturing
- c) Industrial solvent
- d) Herbicides

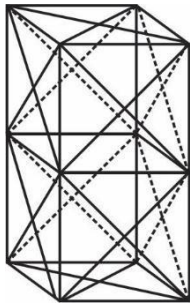
Q.25) Solution (d)

Explanation:

Glyphosate is an herbicide. It is applied to the leaves of plants to kill both broadleaf plants and grasses. **The sodium salt form of glyphosate is used to regulate plant growth and ripen specific crops.** It is widely used in plantation agriculture.

Source: [CLICK HERE](#)

Q.26) Consider the following three-dimensional figure:



An individual lifts the structure and tries to count the triangles on all six external faces. How many triangles will he be able to count?

- a) 48
- b) 80
- c) 96
- d) 88

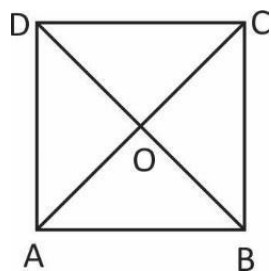
Q.26) Solution (d)

Explanation:

On observing the structure carefully, we find that it consists of two cubes, one placed on top of the other.

The resulting structure is a cuboid. Also, we can see that diagonals have been drawn on external faces of both of these cubes.

Looking at one such external face of the structure, we find that 8 triangles are there:

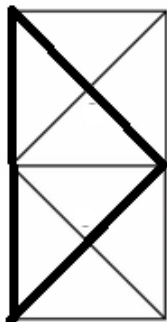


$\Delta AOB, \Delta COB, \Delta AOD, \Delta DOC, \Delta ABC, \Delta ADC, \Delta ABD, \Delta BDC$

Similarly, all the faces will have 8 triangles each. As the cubes are placed such that one is on top of the other, one of the faces of each cube will not be visible. Hence, 10 out of 12 faces would be visible.

Therefore, the individual will only be able to count 80 such triangles in total.

Moreover, on observing the longer faces of the cuboidal structure, we can see that every such face has 2 more triangles visible. One such triangle has been highlighted in the figure given below:



There will be 2 such triangles in each of the 4 elongated faces, i.e. a total of 8 such triangles in the structure.

So, total number of triangles = $80 + 8 = 88$

Q.27) The diagonal of a rectangle is $\sqrt{21}$ cm and its area is 50 sq. cm. What is the perimeter of the rectangle?

- a) 18
- b) 22
- c) 26
- d) 14

Q.27) Solution (b)

Explanation:

For a rectangle, $d^2 = l^2 + b^2$

Where, l =length, b = breadth and d = diagonal of the rectangle

$$d = \sqrt{21}$$

$$d^2 = l^2 + b^2$$

$$(l^2 + b^2 = 21) \dots\dots\dots (1)$$

$$\text{Area} = l * b = 50 \dots\dots\dots (2)$$

$$[(a + b)^2 = a^2 + b^2 + 2ab]$$

Using the above formula, we have

$$(l + b)^2 = l^2 + b^2 + 2lb$$

$$(l + b)^2 = 21 + 2 * 50 \dots\dots\dots [\text{from (1) and (2)}]$$

$$(l + b)^2 = 121$$

$$(l+b) = 11$$

$$\text{Perimeter of rectangle} = 2 (l+b)$$

$$= 2 (11) = 22\text{cm}$$

Q.28) Find the number of rectangles and squares in an 8 by 8 chess board respectively.

- a) 296, 204
- b) 1092, 204
- c) 204, 1092
- d) 204, 1296

Q.28) Solution (b)

Explanation:

Chess board consists of 9 horizontal 9 vertical lines. A rectangle can be formed by any two horizontal and two vertical lines. Number of rectangles = ${}^9C_2 \times {}^9C_2 = 1296$. For squares there is one 8 by 8 square four 7 by 7 squares, nine 6 by 6 squares and like this

Number of squares on chess board = $1^2+2^2+\dots+8^2 = 204$

Only rectangles = $1296 - 204 = 1092$.

Q.29) What will be the cost of building a fence around a square plot with area equal to 289 sq ft, if the price per foot of building the fence is Rs. 58?

- a) Rs. 3748
- b) Rs. 3847
- c) Rs. 3944
- d) Rs. 3154

Q.29) Solution (c)

Explanation:

Let the side of the square plot be 'a' ft.

Given area of the plot ($a \times a$) = 289 $\Rightarrow a = 17$

Length of the fence = Perimeter of the plot = $4a = 68$ ft.

Cost of building the fence = $68 \times 58 = \text{Rs. } 3944$.

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

Passage 1

The casual horrors and real disasters are thrown at newspaper reader without discrimination. In the contemporary arrangements for circulating the news, an important element, evaluation is always weak and often wanting entirely. There is no point anywhere along the line somewhere someone put his foot down for certain and says, "This is important and that does not amount to

row of beans; deserves no one's attention, and should travel the wires no farther". The junk is dressed up to look as meaningful as the real news.

Q.30) The writer of the above passage

- a) seems to be happy with the contemporary arrangements for circulating news
- b) is shocked by the casual stories about horrors and disasters reported in the newspapers
- c) wants better evaluation of news before publication
- d) wants to put his foot down on news stories

Q.30) Solution (c)

Explanation:

Option a is wrong and option b does not give the whole idea of the passage. Option d is also wrong as it is not mentioned in the passage but option c explains the whole idea of the passage.

Hence option c is the correct answer.