

Q.7)

Exp) Option c is the correct answer.

Statement 1 is correct- Vegetative propagation produces clonal populations, meaning that all of the plants produced are genetically identical to the parent plant. This is because the new plants are produced from the parent plant's own cells, rather than from seeds, which are formed by the union of two different gametes.

Statement 2 is incorrect- Vegetative propagation does not help in eliminating viruses. In fact, viruses can be transmitted from the parent plant to the new plants through vegetative propagation.

Statement 3 is correct- Vegetative propagation can be practiced most of the year, but the success rate will vary depending on the type of plant and the environmental conditions.

Q.10)

Exp) Option c is the correct answer.

Most of the stars are shining with a steady light. The movement of air (sometimes called turbulence) in the atmosphere of Earth causes the starlight to get slightly bent as it travels from the distant star through the atmosphere down to us on the ground. The twinkling of a star is due to atmospheric refraction of starlight. The starlight, on entering the earth's atmosphere, undergoes refraction continuously before it reaches the earth. The atmospheric refraction occurs in a medium of gradually changing refractive index. This means that some of the light reaches us directly and some gets bent slightly away. To our eyes, this makes the star seem to twinkle.

Q.11)

Exp) Option d is the correct answer.

Statement 1 is correct- Thorium is more abundant than Uranium. Thorium, a silvery and mildly radioactive metal, is frequently encountered in igneous rocks and deposits of heavy minerals. Despite being three to four times more abundant in the Earth's crust than uranium, thorium has historically seen limited application in industrial and power generation contexts. This is primarily because thorium isn't a direct nuclear fuel source, although it possesses the potential to be transformed into one.

Statement 2 is correct- Thorium can be converted to uranium-233, which is a fissile isotope that can be used to generate energy in nuclear reactors. Thorium can generate more energy than natural uranium because it can be used in a breeder reactor, which produces more fissile material than it consumes.

Statement 3 is correct - Thorium produces less harmful radioactive waste than uranium. This is because thorium-233 has a shorter half-life than uranium-235, which is the primary fissile isotope in natural uranium.

Q.16)

Exp) Option a is the correct answer.

Non-fungible tokens (NFTs) are cryptographic assets on a blockchain with unique identification codes and metadata that distinguish them from each other.

Statement 1 is correct. Anything that can be converted into a digital form can be an NFT. Everything from your drawings, photos, videos, GIFs, music, in-game items, selfies, and even a tweet can be turned into an NFT, which can then be traded online using cryptocurrency.

It is a unique digital asset that represents ownership of real-world items like art, video clips, music, and more.

Statement 2 is correct. Non-fungible tokens (NFTs) are cryptographic assets on a blockchain with unique identification codes and metadata that distinguish them from each other.

Statement 3 is incorrect. Unlike cryptocurrencies, they cannot be traded or exchanged at equivalency. This differs from fungible tokens like cryptocurrencies, which are identical to each other and, therefore, can serve as a medium for commercial transactions

Q.17)

Exp) Option d is the correct answer.

Statement 1 is correct: Mycorrhizal fungi form a symbiotic relationship with plant roots, enhancing the plant's ability to absorb water and nutrients from the soil. This helps plants resist drought conditions by improving their water uptake and increasing the absorptive area through fungal hyphae.

Statement 2 is correct: Mycorrhizal associations can help plants tolerate a wider range of soil pH levels, including extremes. The fungi assist in nutrient uptake even in soils with pH variations, contributing to plant health and growth.

Q.21)

Exp) Option a is the correct answer.

Statement 1 is correct: A geostationary orbit is a type of geosynchronous orbit. Geosynchronous means that the satellite's orbital period matches the Earth's rotation period, so it appears stationary relative to the Earth's surface.

Statement 2 is correct: A geostationary orbit is typically circular to ensure the satellite's altitude remains constant above the Earth's surface. A circular orbit minimizes variations in distance from the satellite to the Earth, allowing it to maintain its fixed position relative to a specific point on the Earth's surface.

Statement 3 is correct: Geostationary satellites orbit above the Earth's equator, and their orbital plane is aligned with the Earth's equatorial plane. This alignment allows them to remain fixed relative to a specific point on the Earth's surface.

Statement 4 is incorrect: Geostationary satellites are typically positioned at an altitude of approximately 35,786 kilometers (about 22,236 miles) above the Earth's equator.

Q.31)

Exp) Option c is the correct answer.

Statement 1 is correct- Carbon nanotubes can be used as carriers of drugs and antigens in the human body because they have a large surface area and can penetrate through cell membranes and capillaries. This makes them ideal for delivering drugs and vaccines to specific cells or tissues

Statement 2 is incorrect- Carbon nanotubes are not blood-compatible. This means that they can cause blood clots to form, which can block blood vessels and lead to serious health problems. Researchers have investigated the use of carbon nanotubes in artificial blood vessels, but they have not yet been able to develop a blood-compatible version.

Statement 3 is correct- Carbon nanotubes can be used in biochemical sensors because they are sensitive to changes in their environment. This makes them ideal for detecting the presence of specific molecules in a sample.

Statement 4 is correct- Studies have shown that modified carbon nanotubes can be broken down by enzymes that work through oxidation. Various microorganisms, including bacteria and fungi, can break down carbon nanotubes, graphene (GRA), and related materials.

Q.34)

Exp) Option d is the correct answer.

A. Aerosol: An aerosol refers to a collection of solid particles or liquid droplets that are dispersed into the atmosphere. Examples include smoke, fog, sea spray, and particles from vehicle emissions.

D. Targeted Drugs: Nanotechnology offers numerous advantages in the treatment of chronic human diseases by enabling precise and site-specific delivery of medications. Nanomedicines and nano-based drug delivery systems involve a comprehensive examination of how nanomaterials enhance the effectiveness of both new and existing drugs, as well as the identification of disease markers.

B. 3D Networking: 3D networking and nanotechnology offer a wide range of benefits and distinctive properties, making them highly advantageous. Nanotechnology has opened up various pathways to miniaturize materials and devices.

C. Molecular Manufacturing: This branch of nanotechnology involves the utilization of nanoscale tools and non-biological processes to construct structures, devices, and systems at the molecular level

Q.35)

Exp) Option b is the correct answer.

Statement 1 is incorrect: Augmented Reality (AR) does not create a simulated environment but rather adds virtual elements to the real world. For example, an AR app can show you how a piece of furniture would look in your room, or how a tattoo would look on your skin. The physical world is not shut out, but rather enhanced by AR.

Statement 2 is incorrect: Virtual Reality (VR) does not project images onto real-life objects, but rather blocks out the real world and immerses the user in a digital environment. For example, a VR headset can make you feel like you are in a different place, such as a game world, a movie scene, or a historical site. The real-life objects or surroundings are not visible but rather replaced by VR.

Statement 3 is correct: AR allows users to interact with the real world and enhance their experience with virtual information or objects, using devices such as smartphones or PCs. For example, an AR app can show you directions on the street, or information about a landmark, using the camera of your smartphone or PC.

Statement 4 is correct: VR transports users to a different reality and provides a complete immersion experience, using devices such as headsets or goggles. For example, a VR headset can make you feel like you are flying in the sky, or diving in the ocean, providing a sense of presence and realism.

Q.39)

Exp) Option c is the correct answer.

Accelerometers are devices that measure the vibration, or acceleration of motion of a structure. They have a transducer that converts mechanical force caused by vibration or a change in motion, into an electrical current using the piezoelectric effect.

Statement 1 is correct: Any reliable car crash detection system requires an accelerometer that can measure up to several hundred g-force accelerations. In the event of a crash, the crash sensor (an accelerometer) sends a signal to the airbag control unit. This control unit triggers the inflation device, which generates nitrogen gas by igniting a mixture of sodium azide (NaN_3) and potassium nitrate (KNO_3).

Statement 2 is correct: Accelerometers in laptops protect hard drives from damage. If the laptop were to suddenly drop while in use, the accelerometer would detect the sudden free fall and immediately turn off the hard drive to avoid hitting the reading heads into the hard drive platter.

Statement 3 is correct: An accelerometer detects acceleration, vibration, and tilt to determine movement and exact orientation along the three axes. Apps use this smartphone sensor to determine whether your phone is in portrait or landscape orientation. It can also tell if your phone screen is facing upward or downward.

Q.40)

Exp) Option a is the correct answer.

Statement 1 is correct- RNAi can be used to silence the expression of specific genes, which could be used to treat a variety of diseases, including cancer, genetic disorders, and infectious diseases.

Statement 2 is correct- RNAi can be used to target cancer cells and silence the genes that are essential for their growth and survival. This could lead to new and more effective treatments for cancer.

Statement 3 is incorrect- RNA interference (RNAi) has limitations in hormone replacement therapies because off-target effects can lead to side effects, a critical concern in therapies where precise hormone levels are essential. Also, the fragile nature of RNAi molecules poses delivery challenges, especially in the context of hormone replacement therapies requiring specific tissue targeting. Furthermore, the short duration of RNAi's effects necessitates frequent administration, which is impractical for hormone replacement therapies typically requiring daily or weekly dosing.

Statement 4 is correct- RNAi can be used to silence the genes of viral pathogens that infect crops. This could lead to the development of new crop varieties that are resistant to viral diseases.

Q.45)

Exp) Option a is the correct answer.

Statement 1 is correct: PSLVs (Polar Satellite Launch Vehicles) are primarily used for launching satellites dedicated to Earth resources monitoring, remote sensing, and scientific research missions. On the other hand, GSLVs (Geosynchronous Satellite Launch Vehicles) are designed to launch heavier payloads, mainly communication satellites, into geosynchronous orbits for purposes like telecommunication and broadcasting services.

Statement 2 is incorrect: Satellites launched by PSLV (Polar Satellite Launch Vehicle) are typically placed in polar orbits or sun-synchronous orbits. These orbits allow the satellites to pass over different parts of the Earth during each orbit, rather than remaining fixed in the same position. Geosynchronous satellites, mostly launched by GSLV, are the ones that appear stationary relative to a specific point on Earth.

Statement 3 is incorrect: GSLV Mk III (Geosynchronous Satellite Launch Vehicle Mark III) is a three-stage launch vehicle. The first stage uses two solid rocket boosters, and the core stage uses liquid engines. The third stage is powered by a cryogenic engine. In contrast, PSLV (Polar Satellite Launch Vehicle) is a four-stage launch vehicle with the first and third stages using solid rocket motors; and the second and fourth stages using liquid rocket engines.

Q.50)

Exp) Option d is the correct answer.

Statement 1 is correct- Scientists have developed genetically modified (GM) crops that are resistant to pests, diseases, and herbicides. For example, Bt corn is a GM crop that produces a protein that is toxic to certain pests. This helps to reduce the need for farmers to use pesticides.

Statement 2 is correct- Scientists have developed GM plants that produce proteins that are normally found in animals. For example, some GM tomatoes produce a protein that is found in human milk. This protein could help to improve the nutrition of people who do not have access to animal products.

Statement 3 is correct- Scientists have developed GM animals that produce proteins that are normally found in microorganisms. For example, some GM goats produce a protein that is found in lactoferrin, a human breast milk protein. This protein could be used to make new drugs and treatments for a variety of diseases.