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Prelims Marathon

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Miscellaneous Applications-IV

1. Consider the following statements regarding the Cleavable Light-Erased Antibody Reporter (CLEAR) platform:

1. It is a spatial protein imaging platform developed indigenously by the National Physical Laboratory (NPL) to map magnetic fields inside live mammalian cells.
2. The mechanism utilizes a high-intensity 365 nm LED light pulse to chemically cleave light-sensitive bonds and erase fluorescent signals without altering the biological sample.
3. The platform allows cyclic rewriting, meaning multiple sets of different proteins can be repeatedly labeled, imaged, and erased within the same optical window.
4. Because it requires a complex array of multi-laser imaging installations, it cannot function using a single fluorophore or a single spectral channel.

Which of the statements given above are correct?

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

Correct Answer: (b)

Explanation:

- **Statement 1 is incorrect:** The CLEAR platform was developed by researchers at the Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR), an autonomous institute under the Department of Science and Technology (DST). Its purpose is spatial protein imaging and mapping, not measuring magnetic fields.
- **Statement 2 is correct:** CLEAR utilizes antibody probes linked to fluorescent tags via a light-sensitive chemical bond. A gentle pulse of 365 nm ultraviolet LED light photolytically cleaves this bond, erasing the signal safely.
- **Statement 3 is correct:** Its chalkboard-like property allows researchers to clear the previous signal and introduce a fresh set of probes to map a large number of proteins within the same sample sequentially (high-plex multiplexing).
- **Statement 4 is incorrect:** A key design advantage of the CLEAR platform is that it simplifies imaging and reduces dependence on complex multi-laser setups by repeatedly utilizing a single fluorescent channel and single fluorophore.

2. Consider the following statements regarding Extracellular RNA (exRNA):

1. It refers to a uniform population consisting exclusively of small messenger RNAs (mRNAs) that are incapable of traveling inside body fluids like blood or saliva.
2. To survive biological degradation by extracellular enzymes, exRNAs travel inside protective molecular containers or associate with carriers like lipo-proteins and exosomes.
3. It functions as an intercellular communication network where a cell releases RNA to deliver functional instructions to another cell located elsewhere in the body.

Which of the statements given above are correct?

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

Correct Answer: (b)

Explanation:

- **Statement 1 is incorrect:** Extracellular RNA (exRNA) comprises a highly heterogeneous population of molecules. It is not uniform, nor is it limited strictly to mRNAs; it includes small non-coding RNAs (like microRNA or miRNA), long non-coding RNAs, and coding RNAs. Furthermore, they are actively found in various bodily fluids, including blood, saliva, urine, and cerebrospinal fluid.
- **Statement 2 is correct:** Because the extracellular environment contains active enzymes that would normally break down free genetic material, exRNA must travel in its own molecular containers or associate with specific carriers. These protective transport systems range from lipo- and ribo-proteins to specialized extracellular vesicles such as exosomes.
- **Statement 3 is correct:** exRNA operates as part of a highly sophisticated, long-distance cell-to-cell communication system. By transferring these RNA instructions across distances, cells can signal other parts of the body to change their behavior or activate specific genes. This process is crucial for coordinating vital physiological responses in development, tissue repair, and the immune system, and it is widely studied as a non-invasive biomarker for cancers and other diseases.

3. Consider the following statements regarding the Solar wind Magnetosphere Ionosphere Link Explorer (SMILE) Mission:

1. It is a joint deep-space exploratory mission implemented by the European Space Agency (ESA) and the Chinese National Space Science Centre (NSSC).
2. The primary scientific aim of the mission is to capture the first X-ray images of Earth's magnetic shield interacting with solar wind streams.
3. SMILE will be positioned in a low-inclination equatorial orbit directly hovering above Earth's geographic equator at an altitude of 500 km.
4. The mission relies entirely on active remote sensing instruments, completely excluding any onboard in-situ particle analyzers or magnetometers.

Which of the statements given above are correct?

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

Correct Answer: (a)

Explanation:

- **Statements 1 and 2 are correct:** The SMILE mission is a collaborative effort between the ESA Science Programme and the Chinese Academy of Sciences (CAS). It aims to map the boundary where the solar wind hits Earth's magnetosphere, enhancing space weather forecasting to protect grid infrastructures, satellites, and GPS networks.
- **Statement 3 is incorrect:** SMILE will be placed in a highly eccentric, high-inclination orbit positioned roughly 1.21 lakh km above Earth's north pole, allowing it to continuously observe Earth's northern magnetic recesses.
- **Statement 4 is incorrect:** The satellite carries four distinct payloads combining both remote sensing and in-situ instruments: the Soft X-ray Imager (SXI), an Ultraviolet aurora Imager (UVI), a Light Ion Analyser (LIA) for on-site charged particle tracking, and a Magnetometer to record magnetic field flux changes.

4. Consider the following statements regarding Geocells:

1. They are three-dimensional cellular confinement systems shaped like honeycombs that are expanded on-site and filled with aggregate, sand, or soil to enhance load-bearing capacity.

2. Geocell matrices are synthesized exclusively from highly biodegradable organic plant fibers, making them structurally unfeasible for permanent heavy infrastructure installations like airport runways.

Which of the statements given above is/are correct?

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

Correct Answer: (a)

Explanation:

- **Statement 1 is correct:** Geocells are flexible, interconnected geosynthetic structures used to stabilize slopes, retain earth, and reinforce base layers in road construction. When filled with compacted materials, they confine soil movement laterally, creating a stiff, stable mattress layer.
- **Statement 2 is incorrect:** Geocells are manufactured from durable geosynthetic materials like high-density polyethylene (HDPE) or polyester. Their high tensile strength and resistance to environmental degradation make them excellent for demanding long-term engineering projects, including steep embankments, retaining walls, and airport runways.

5. Consider the following statements regarding ANEEL nuclear fuel:

1. It is an advanced nuclear fuel option that blends fertile Thorium-232 with High-Assay Low-Enriched Uranium (HALEU) to trigger sustainable reaction cycles.
2. The proprietary fuel composition is designed to be used directly within existing, indigenously developed Pressurized Heavy Water Reactors (PHWRs).
3. The chemical composition of spent ANEEL fuel yields a highly enriched plutonium byproduct, making it an excellent source material for manufacturing nuclear weapons.

Which of the statements given above is/are correct?

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

Correct Answer: (a)

Explanation:

- **Statements 1 and 2 are correct:** Developed by Clean Core Thorium Energy, ANEEL combines abundant Thorium-232 with HALEU (which acts as a "spark plug" to kickstart the reaction). It can be used directly in standard PHWRs, giving nations a way to utilize thorium cycles without building entirely new reactor architectures from scratch.
- **Statement 3 is incorrect:** A key non-proliferation benefit of ANEEL is that its spent fuel cannot be diverted or weaponized for military purposes. It burns fuel highly efficiently and leaves behind a waste stream that is significantly reduced in both volume and operating cost compared to traditional natural uranium.

6. Consider the following statements regarding the apnoea test:

1. It is a critical clinical test used to confirm the complete loss of brainstem function when determining brain death.
2. The test can be accurately administered to patients experiencing severe hypothermia or acute drug intoxication without any medical prerequisites.

Which of the statements given above is/are correct?

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

Correct Answer: (a)
Explanation:

- **Statement 1 is correct:** The apnoea test validates brainstem death by assessing whether a patient's respiratory drive responds to rising levels of carbon dioxide (CO_2) in the blood. If no breathing effort is observed as arterial CO_2 climbs to approximately 60 mmHg (or rises 20 mmHg from baseline), the test is considered positive for brainstem failure.
- **Statement 2 is incorrect:** The test demands strict prerequisites to prevent false conclusions. The patient must be hemodynamically stable, maintaining normal core body temperature, proper blood oxygenation, baseline carbon dioxide levels, and must be completely free of respiratory-depressing drugs before testing can begin.

7. Consider the following statements regarding the SACHET disaster alert platform:
1. The system was developed by the Centre for Development of Telematics (C-DOT) under the oversight of the National Disaster Management Authority (NDMA).
2. It operates strictly on a localized proprietary format, intentionally bypassing the international XML-based Common Alerting Protocol (CAP).
3. Upgraded functionalities use Cell Broadcast technology, allowing alerts to be pushed directly from mobile towers to millions of devices instantly without needing an active internet connection.
4. The platform functions as a geo-targeted system, ensuring that immediate threat alerts are delivered only to users physically located inside the designated hazard zone.

Which of the statements given above are correct?
(a) 1, 2 and 3
(b) 1, 3 and 4 only
(c) 2 and 4 only
(d) 1 and 3 only

Correct Answer: (b)
Explanation:

- **Statements 1, 3, and 4 are correct:** SACHET is an all-hazard emergency warning system operating across India. By utilizing Cell Broadcast technology alongside standard SMS, it can push emergency alerts to all mobile devices within a specific geographic area (e.g., a coastal strip facing a cyclonic storm surge). These messages cross-linguistically override normal phone behaviors, showing up as prominent pop-ups accompanied by unique alert tones.
- **Statement 2 is incorrect:** The platform is built specifically upon the Common Alerting Protocol (CAP), an internationally standardized XML-based format recommended by the International Telecommunication Union (ITU) to synchronize warnings across SMS, television, radio, and public sirens simultaneously.

8. Consider the following statements regarding the Sports Genomics Programme:
1. It is a state-level initiative launched by the Gujarat Biotechnology Research Centre (GBRC) in coordination with the Sports Authority of Gujarat.
2. The primary long-term objective of the database is to track age-related adaptation patterns and design personalized training protocols to enhance performance for the 2030 Commonwealth Games.

3. The sampling strategy is designed to collect data exclusively from urban weightlifting cohorts, omitting any evaluation of endurance sports or rural districts.

Which of the statements given above is/are correct?

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

Correct Answer: (a)

Explanation:

- **Statements 1 and 2 are correct:** This genomics program aims to build a comprehensive Athlete Genome Database by mapping genetic, physiological, and performance metrics. This data will help identify early athletic talent, isolate genetic markers linked to injury risks, and customize rehabilitation protocols for Indian sports teams.
- **Statement 3 is incorrect:** The sampling layout is broad and diverse, aiming to collect 2,000 samples annually over 5 years across all districts of the state. The target cohort covers 10 different sports disciplines equally divided between five endurance and five power sports.

9. Consider the following statements regarding Haemophilus influenzae type b (Hib) disease:

1. Hib is a dangerous viral infection that primarily targets respiratory mucosal tissues in geriatric populations over the age of 65.
2. The pathogen is transmitted from person to person through respiratory droplets or prolonged close contact with an infected individual.
3. Within India's Universal Immunization Programme (UIP), protection against Hib is delivered through the multi-disease Pentavalent Vaccine.

Which of the statements given above are correct?

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

Correct Answer: (b)

Explanation:

1. **Statement 1 is incorrect:** Hib is caused by a bacterium, not a virus. Furthermore, its primary target demographic is young children under 5 years of age, who are highly vulnerable to its severe complications.
2. **Statement 2 is correct:** The bacteria spread through droplets produced when infected individuals cough or sneeze, or via close contact. If untreated, the infection can quickly cause life-threatening conditions like meningitis, epiglottitis, pneumonia, and sepsis.
3. **Statement 3 is correct:** India helps prevent Hib through its routine Universal Immunization Programme via the Pentavalent Vaccine, which shields young children from five specific health threats: Diphtheria, Pertussis, Tetanus, Hepatitis B, and Hib.

10. This monoclonal antibody drug, known generically as pembrolizumab, functions as an immune checkpoint inhibitor. By attaching to PD-1 receptors on T cells, it blocks their interaction with PD-L1 receptors on cancer cells, allowing the patient's own immune system to recognize and destroy tumors. Identify this drug:

(a) NexCar19
(b) Keytruda

(c) Ceftriaxone
(d) Inconel-718

Correct Answer: (b)
Explanation:

- **Keytruda (brand name for pembrolizumab)** is a widely utilized monoclonal antibody that acts as an immune checkpoint inhibitor. Cancer cells often escape detection by binding to T-cell receptors, effectively turning off the body's immune response.
- Keytruda blocks this interaction, removing the molecular "brakes" so T cells can actively seek out and eliminate tumor cells. It is used in tertiary care facilities worldwide to treat a variety of advanced malignancies, including non-small cell lung cancer, cervical cancer, renal cell carcinoma, and triple-negative breast cancer.

New Technologies

1. Consider the following statements regarding Aqueous Zinc-Ion Batteries (ZIBs):

1. They utilize metallic zinc as the anode and an entirely aqueous electrolyte, creating a non-flammable alternative to conventional lithium-ion systems.
2. The high-performance modified vanadium oxide cathode, developed by IIT Madras, introduces structural porous pathways that selectively block hydrogen ions while accelerating zinc ion transport.

Which of the statements given above is/are correct?
(a) 1 only
(b) 2 only
(c) Both 1 and 2
(d) Neither 1 nor 2

Correct Answer: (a)
Detailed Explanation

- **Statement 1 is correct:** Aqueous zinc-ion batteries use zinc metal as the anode and an aqueous electrolyte. This design makes the system non-flammable, safer, and more environmentally friendly than lithium batteries, as it relies on abundant zinc rather than scarce lithium or cobalt.
- **Statement 2 is incorrect:** The high-performance ZIB cathode was developed by researchers at the Centre for Nano and Soft Matter Sciences (CeNS), Bengaluru. Additionally, the thermo-electrochemical activation process modifies the structure of to create porous pathways that allow both zinc ions and hydrogen ions to move easily, improving stability during ion insertion rather than blocking them.

2. Consider the following statements regarding the Kavach 4.0 safety system:

1. It is an indigenous Automatic Train Protection system developed by the Research Design and Standards Organisation (RDSO) in collaboration with Indian industry.
2. The network avoids the use of physical track infrastructure, relying entirely on satellite-guided GPS links to manage emergency braking.
3. Kavach 4.0 integrates directly with Electronic Interlocking systems to receive real-time updates on track occupancy and signal status in complex railway yards.

Which of the statements given above are correct?
(a) 1 and 2 only
(b) 2 and 3 only
(c) 1 and 3 only

(d) 1, 2 and 3

Correct Answer: (c)
Detailed Explanation

- **Statements 1 and 3 are correct:** Kavach is India's indigenous ATP system designed to achieve zero accidents by preventing trains from passing signals at danger (SPAD) and managing overspeeding. The upgraded Kavach 4.0 features enhanced precision in crowded railway yards and integrates directly with Electronic Interlocking systems.
- **Statement 2 is incorrect:** The system does not avoid physical track infrastructure. It operates through a real-time network that explicitly requires RFID tags laid on the tracks, alongside on-board equipment in locomotives and radio towers at stations communicating via UHF radio and Optical Fibre Networks.

3. Consider the following statements regarding the Floating LiDAR Buoy system:

1. It is a sophisticated marine platform developed by the National Institute of Ocean Technology (NIOT) to map offshore wind energy potential.
2. The platform operates on the principle of optical remote sensing, emitting infrared laser pulses and measuring the Doppler Shift of backscattered light from atmospheric aerosols.
3. Unlike traditional anemometers, the integrated LiDAR unit is structurally limited to measuring wind conditions exclusively at the sea surface line.

Which of the statements given above is/are correct?

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

Correct Answer: (a)
Detailed Explanation

- **Statements 1 and 2 are correct:** Developed by NIOT (Ministry of Earth Sciences), the Floating LiDAR (Light Detection and Ranging) Buoy maps offshore wind energy and assists in cyclone tracking. It calculates wind speed and direction by tracking the Doppler Shift of infrared laser pulses that reflect off dust, aerosols, and water droplets in the air.
- **Statement 3 is incorrect:** A primary advantage of the Floating LiDAR Buoy is its ability to perform high-resolution vertical profiling. Unlike traditional surface-bound anemometers, it can measure wind conditions at multiple heights up to 300 meters above sea level.

4. Consider the following statements regarding the behavior of AI Tokens in Large Language Models (LLMs):

1. A token represents the smallest unit of data processed by an LLM, and it can consist of a single character, a part of a word, or an entire word.
2. The context window of an AI model represents a flexible, unlimited storage space that allows the model to remember all historical interactions indefinitely without re-sending data.

Which of the statements given above is/are correct?

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

Correct Answer: (a)

Detailed Explanation

- **Statement 1 is correct:** LLMs do not read text word-for-word like humans; instead, tokenizers break text down into tokens. These tokens are then converted into numerical vectors that the model processes using mathematical patterns.
- **Statement 2 is incorrect:** Every AI model has a finite context window limit (e.g., 128k tokens), which strictly defines how much data it can process at one time. Furthermore, LLMs are generally stateless, meaning they process data in chunks and do not retain memory of who a user is unless the previous tokens of the conversation are explicitly re-sent to the model in each new prompt.

5. Consider the following statements regarding the Moltbook platform:

1. It is an AI-only social network where authenticated AI agents interact autonomously via APIs, completely excluding human participation in conversations.
2. The platform is structured around topic-based communities termed submolts, where interactions are driven by probabilistic reasoning and context windows.
3. The platform operates on pre-programmed human scripts that strictly prevent the emergence of unscripted social behaviors, mock political systems, or cultural norms among the agents.

Which of the statements given above are correct?

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

Correct Answer: (a)

Detailed Explanation

- **Statements 1 and 2 are correct:** Moltbook is an AI-only environment resembling Reddit where humans act as passive spectators. AI agents powered by advanced models (like GPT, Claude, and Gemini families) communicate via APIs, posting, debating, and organizing communities autonomously.
- **Statement 3 is incorrect:** The platform has demonstrated unscripted evolution and emergent social behaviors. Without explicit programming or predefined human scripts, the interacting AI agents spontaneously formed mock religions, political debates, cryptocurrencies, unique humor, and cross-model family recognition based on their lineage.

6. Consider the following statements regarding bio-based chemicals and industrial enzymes:

1. Bio-based chemicals are synthesized from fossil hydrocarbons through high-pressure petrochemical refinery processes.
2. Industrial enzymes are biological catalysts, primarily proteins, produced through microbial fermentation followed by purification.
3. Because enzymes exhibit low specificity, they generate high amounts of unexpected chemical byproducts, reducing industrial process efficiency.
4. Enzymes operate efficiently at lower temperatures and pressures compared to standard chemical catalysts, lowering industrial energy footprints.

Which of the statements given above are correct?

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

Correct Answer: (b)

Detailed Explanation

- **Statements 2 and 4 are correct:** Industrial enzymes are proteins derived from microbial fermentation. They accelerate chemical reactions at lower temperatures and operating pressures, offering a highly sustainable and energy-efficient solution for textile processing, food manufacturing, and pharmaceuticals.
- **Statement 1 is incorrect:** Bio-based chemicals are derived from renewable biological feedstocks (such as agricultural residues, corn, starch, or sugarcane) rather than fossil hydrocarbons.
- **Statement 3 is incorrect:** Enzymes are characterized by high specificity. Their precise catalytic action ensures they target specific substrates, which minimizes waste, prevents unexpected byproducts, and improves overall manufacturing efficiency.

7. Consider the following statements regarding Bio-bitumen:

1. It is a bio-based binder used in road construction produced from agricultural residues, specifically rice straw pellets processed via fast pyrolysis.
2. Real-world structural feasibility was validated through a field trial stretch laid on the Jorabat–Shillong Expressway (NH40) in Meghalaya.
3. Engineering specifications state that bio-bitumen can safely replace a maximum of 5% of conventional petroleum bitumen without causing premature cracking.
4. Due to the high volatile nature of bio-oil fractions, bio-bitumen roads are incapable of resisting moisture damage or vehicular rutting.

Which of the statements given above are correct?

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

Correct Answer: (a)

Detailed Explanation

- **Statements 1 and 2 are correct:** Developed by CSIR institutes (including CSIR-CRRI and CSIR-IIP), bio-bitumen utilizes refined bio-oil extracted from the oxygen-free thermal breakdown (pyrolysis) of rice straw pellets. Its real-world performance was proven in a 100-meter trial stretch on NH40 in Meghalaya.
- **Statement 3 is incorrect:** Testing confirms that bio-bitumen can safely replace a significant portion 20% to 30% of conventional petroleum bitumen, helping reduce crop residue burning and lower construction costs.
- **Statement 4 is incorrect:** The final blended product undergoes strict physical, chemical, and rheological validation. It has been successfully tested and approved for its resistance to rutting, cracking, and moisture damage, matching or exceeding national highway performance standards.

8. Consider the following statements regarding Biomaterials:

1. Drop-in biomaterials are chemically identical to conventional petroleum-based plastics and can be integrated into existing manufacturing lines without machinery upgrades.
2. Drop-out biomaterials, such as Polylactic Acid (PLA), are chemically unique alternatives that can be seamlessly mixed into standard plastic recycling streams without separate handling.
3. Through genetic engineering of fermenting microorganisms, scientists can program or tune the degradation rate, flexibility, and mechanical strength of novel biomaterials.

Which of the statements given above is/are correct?

(a) 1 and 2 only

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

Correct Answer: (c)
Detailed Explanation

- **Statements 1 and 3 are correct:** Drop-in biomaterials (like Bio-PET) are plug-and-play resources identical to their petrochemical counterparts, allowing manufacturers to use them immediately. Additionally, by engineering microbes like *Xanthomonas* in fermentation vessels, researchers can precise-tune the polymers' structural attributes, biocompatibility, and degradation profiles.
- **Statement 2 is incorrect:** Drop-out biomaterials (like PLA) possess chemically unique structures. Because they do not mix with standard plastic recycling streams, they cannot be processed in traditional facilities and require entirely separate end-of-life handling, such as industrial composting facilities.

9. Consider the following statements regarding Sixth-Generation Aero Engines:

1. They feature variable-cycle (three-stream) technology that automatically switches between high-thrust configurations for combat and high-bypass modes for fuel-efficient cruising.
2. India's Kaveri Engine project has already achieved certified operational 6th-generation status, enabling India to build its Advanced Medium Combat Aircraft (AMCA) without any foreign OEM collaboration.

Which of the statements given above is/are correct?
(a) 1 only
(b) 2 only
(c) Both 1 and 2
(d) Neither 1 nor 2

Correct Answer: (a)
Detailed Explanation

- **Statement 1 is correct:** Sixth-generation engines are advanced, variable-cycle powerplants that optimize airflow automatically based on flight conditions. They serve as electrical and thermal hubs, generating the massive power outputs required for directed-energy weapons (lasers) and advanced avionics while using Ceramic Matrix Composites (CMCs) to withstand extreme operational temperatures.
- **Statement 2 is incorrect:** India has historically faced hurdles with indigenous military turbofan development, and the Kaveri Engine project did not achieve its original targeted fighter jet specifications. To secure 6th-generation capabilities for the AMCA roadmap, defense experts and the DRDO indicate that India will likely require a multi-billion dollar co-development partnership with a foreign original equipment manufacturer (OEM), such as France's Safran.

10. Consider the following statements regarding Tensor Processing Units (TPUs):

1. A TPU is a custom Application-Specific Integrated Circuit (ASIC) designed specifically to accelerate matrix-heavy computations and machine learning workloads.
2. TPUs achieve high parallel computing throughput by bypassing matrix-multiply units (MXUs) to process sequential text data one character at a time.

Which of the statements given above is/are correct?
(a) 1 only
(b) 2 only
(c) Both 1 and 2

(d) Neither 1 nor 2

Correct Answer: (a)
Detailed Explanation

- **Statement 1 is correct:** TPUs are specialized ASICs engineered by Google to accelerate deep neural network workloads (such as running TensorFlow infrastructure). They are optimized to handle the massive mathematical demands of frontier AI models.
- **Statement 2 is incorrect:** TPUs achieve massive parallel throughput precisely by using large matrix-multiply units (MXUs), such as 128 times 128 Arithmetic Logic Unit (ALU) arrays. Instead of processing data sequentially one character at a time, they process data in matrix form, running tens of thousands of multiply-accumulate operations simultaneously per clock cycle to optimize efficiency during weeks-long training runs.

New Technologies

1. Consider the following statements regarding Voice over WiFi (VoWiFi) technology recently launched by BSNL:

1. It permits users to execute voice calls and transmit SMS text messages across a Wi-Fi network instead of relying on cellular base stations.
2. The architectural framework utilizes the IP Multimedia Subsystem (IMS) to handle smooth handovers between cellular networks and Wi-Fi networks.
3. Access to the network requires the installation of a verified third-party mobile application to handle secondary authentication.
4. If the active Wi-Fi signal deteriorates, the system automatically migrates the live call to a VoLTE network without causing a call drop.

Which of the statements given above are correct?

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

Correct Answer: (c)
Explanation:

- **Statements 1, 2, and 4 are correct:** VoWiFi routes voice and SMS data over internet networks using digital packets, resolving connectivity issues in basements, rural areas, or signal-dark spots. It runs on the IP Multimedia Subsystem (IMS), ensuring seamless call continuity (handover) to cellular networks (VoLTE) when the Wi-Fi connection weakens.
- **Statement 3 is incorrect:** VoWiFi is an application-free technology that runs natively through the smartphone's built-in software dialer. It uses the phone's physical SIM card for hardware-level security and identity verification, eliminating the need for any third-party software applications.

2. Consider the following statements regarding the humanoid robot ASC ARJUN:

1. It is an artificial intelligence-powered system deployed to assist the Railway Protection Force (RPF) in station surveillance, crowd management, and passenger assistance.
2. It was indigenously designed and built using home-grown technology by an Indian Railways technical team in Visakhapatnam.

3. The platform features semi-autonomous navigation with obstacle avoidance for platform patrols and automatically translates public announcements into English, Hindi, and Telugu.

Which of the statements given above are correct?

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

Correct Answer: (d)

Explanation:

- **Statements 1, 2, and 3 are correct:** ASC ARJUN is an indigenous humanoid robot designed by an Indian Railways technical team in Visakhapatnam and deployed at the Visakhapatnam Railway Station (East Coast Railway).
- It optimizes RPF deployment by incorporating a Face Recognition System (FRS), real-time fire and smoke sensors, and semi-autonomous platform patrolling capabilities. Additionally, it offers multilingual passenger interaction capabilities (English, Hindi, and Telugu) along with welcoming human gestures.

3. Consider the following statements regarding Vehicle-to-Vehicle (V2V) Communication Technology:

1. It acts as a wireless network allowing nearby automobiles to exchange speed, braking, and positional data directly without relying on cellular network towers.
2. The communication protocol utilizes a specialized radio frequency band of 5.875–5.905 GHz authorized by the Department of Telecommunications (DoT).
3. The platform provides a fixed 180-degree front-facing safety warning system, making it structurally unable to detect blind spots along the sides or rear of the vehicle.

Which of the statements given above are correct?

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

Correct Answer: (a)

Explanation:

- **Statements 1 and 2 are correct:** V2V technology enables real-time interaction between moving cars using small internal hardware communication modules. It functions independently of cellular network coverage by operating over a designated short-range radio frequency band (5.875–5.905 GHz) assigned by the DoT, which helps prevent highway pile-ups in dense fog.
- **Statement 3 is incorrect:** The system features 360-degree communication capabilities. It processes safety hazards and provides alerts from all directions front, rear, and sides allowing it to flag vehicles moving beyond the driver's direct line of sight or within blind spots.

4. Consider the following statements regarding the SIM Binding security mandate:

1. It acts as a hardware token mechanism that continuously links a messaging service to unique SIM card hardware identifiers like the IMSI and ICCID, disabling the application if the registered SIM is physically removed from the device.
2. The rules mandate that web-based mirror clients of these messaging platforms must maintain continuous permanent logins to prevent cross-border cyber fraud.

Which of the statements given above is/are correct?

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

Correct Answer: (a)
Explanation:

- **Statement 1 is correct:** Administered by the Department of Telecommunications (DoT) under the Telecommunication Cybersecurity Amendment Rules, 2025, SIM binding pairs an application account with hardware-level data (IMSI, ICCID, and the Ki key). This prevents bad actors from spoofing accounts or bypassing OTP protections from outside the country when the physical SIM card is missing.
- **Statement 2 is incorrect:** To minimize security gaps and stop unauthorized access, the government order explicitly states that web versions (such as WhatsApp Web) must automatically log out every six hours rather than remaining logged in permanently.

5. Consider the following statements regarding India's first indigenous High-Precision Diode Laser:

1. It was developed by deep-tech startup Prenishq Pvt. Ltd., a spin-off from IIT Delhi, with support from the National Quantum Mission (NQM).
2. The architecture is engineered to deliver stable, tunable, long-duration light outputs across a spectrum ranging from Ultraviolet (UV) to Near-Infrared (Near-IR).
3. Due to its narrow operational linewidth, the hardware is strictly restricted to educational laboratories and cannot be utilized for Quantum Key Distribution (QKD) or atomic clock metrology.

Which of the statements given above are correct?
(a) 1 and 2 only
(b) 2 and 3 only
(c) 1 and 3 only
(d) 1, 2 and 3

Correct Answer: (a)
Explanation:

- **Statements 1 and 2 are correct:** Supported by the NQM, this compact, high-precision laser provides long-term frequency and power stability across a wide wavelength range (UV to Near-IR). This flexibility allows it to support various quantum computing and sensing configurations.
- **Statement 3 is incorrect:** The ultra-narrow linewidth and high beam quality are highly advantageous for specialized applications. It is engineered specifically to serve as a backbone for Quantum Key Distribution (QKD), to protect secure banking networks, to control qubits in photonic quantum processors, and to support optical atomic clocks for precise metrology.

6. Consider the following statements regarding the DRISHTI surveillance platform:

1. It is an artificial intelligence-powered tracking system designed to monitor the door-locking status of cargo freight wagons in real time during transit.
2. The system was co-developed as a joint innovation initiative between the Northeast Frontier Railway (NFR) and IIT Guwahati.
3. The platform uses a system of manual wireless proximity sensors that require freight trains to halt completely at checking stations to verify lock configurations.

Which of the statements given above are correct?
(a) 1 and 2 only
(b) 2 and 3 only

(c) 1 only
(d) 1, 2 and 3

Correct Answer: (a)
Explanation:

- **Statements 1 and 2 are correct:** Developed through a partnership between NFR and IIT Guwahati – Technology Innovation and Development Foundation (IITG TIDF), 'DRISHTI' uses computer vision and machine learning models to identify unlocked, tampered, or improperly secured wagon doors.
- **Statement 3 is incorrect:** The platform automates anomaly detection without disrupting train operations. It uses wagon-mounted cameras and advanced analytics to spot structural variations dynamically while the train is moving, eliminating the need for slow, manual, stationary checks.

7. Consider the following statements regarding Project Suncatcher:

1. It is an advanced research initiative launched by Google to establish orbital, solar-powered AI data centers using Tensor Processing Units (TPUs) aboard satellites.
2. The orbital data centers eliminate reliance on ground-based fiber systems by using free-space optical laser communication links between satellite nodes.

Which of the statements given above is/are correct?
(a) 1 only
(b) 2 only
(c) Both 1 and 2
(d) Neither 1 nor 2

Correct Answer: (c)
Explanation:

- **Statements 1 and 2 are correct:** Google's Project Suncatcher aims to move resource-intensive AI calculations into space, bypassing the land, water, and carbon footprint of terrestrial data centers. The constellation relies on high-efficiency space solar panels and radiation-tested AI hardware accelerators (Trillium v6e TPUs). These satellite clusters communicate with one another using free-space optical data links capable of transmitting tens of terabits per second.

8. Consider the following statements regarding the Quantum Echoes algorithm:

1. It is a quantum algorithm developed by Google Quantum AI that uses out-of-time-order correlators (OTOC) to analyze how data spreads, scrambles, and reverses within a quantum architecture.
2. The algorithm runs a time-reversal simulation that produces a measurable echo to trace hidden quantum interactions and interference patterns.
3. The process was validated using classical supercomputers, proving that the underlying interference effects can be easily replicated without specialized quantum hardware.

Which of the statements given above are correct?
(a) 1 and 2 only
(b) 2 and 3 only
(c) 1 and 3 only
(d) 1, 2 and 3

Correct Answer: (a)
Explanation:

- **Statements 1 and 2 are correct:** Tested on the Willow quantum processor, the Quantum Echoes algorithm acts as an experimental time-reversal setup. It sends a signal into a network of qubits, tracks

its evolution, and introduces a small mid-process disruption to measure how information scrambles and reforms.

- **Statement 3 is incorrect:** The primary purpose of the experiment was to demonstrate a verifiable quantum advantage. The system confirmed true quantum interference phenomena that classical supercomputers cannot replicate efficiently, offering a valuable new tool for molecular modeling, drug discovery, and materials science.

9. Consider the following statements regarding Quantum Noise:

1. It represents random environmental disturbances that lead to decoherence, causing unstable entangled states in quantum systems.
2. Under mathematical profiling models, quantum noise behaves in a completely deterministic way, ensuring that environmental interactions consistently generate or boost quantum entanglement.

Which of the statements given above is/are correct?

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

Correct Answer: (a)

Explanation:

- **Statement 1 is correct:** Quantum noise stems from Heisenberg's Uncertainty Principle along with thermal or electromagnetic interactions. Because even advanced laboratories cannot completely isolate a quantum system, this noise causes errors and breaks down the links between entangled particles.
- **Statement 2 is incorrect:** Quantum noise exhibits non-deterministic behavior. While it is modeled through specific mathematical channels (like amplitude or phase damping), its effects are random. Although it typically disrupts and degrades quantum systems, it can occasionally alter or even spontaneously generate entanglement under certain specific conditions.

10. Consider the following statements regarding Two-Factor Authentication (2FA):

1. It requires identity verification using two distinct elements: a knowledge factor (such as a password) and a possession factor (such as an authenticator app or hardware token).
2. The Time-based One-Time Password (TOTP) standard relies entirely on a continuous mobile internet connection, making it impossible for authentication apps to generate valid verification codes while offline.

Which of the statements given above is/are correct?

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

Correct Answer: (a)

Explanation:

- **Statement 1 is correct:** 2FA improves security by adding a second layer of verification beyond standard passwords, making brute-force attacks and credential interception much harder.
- **Statement 2 is incorrect:** Authenticator apps work completely offline. The TOTP protocol (standardized by the IETF) generates codes locally using a shared cryptographic secret key and the current time counter (typically changing every 30 seconds via HMAC functions), meaning the device does not need an active internet connection to authenticate.

New Technologies-II

1. X, born in the UK, was conferred the Nobel Prize in 2025. He was a professor in an American university when this prize was announced. Identify 'X':

(a) Michel H. Devoret
(b) Richard Robson
(c) John Clarke
(d) Joel Mokyr

Correct Answer: (a)

Explanation:

- Michel H. Devoret, a British-born physicist who built a highly distinguished academic and research career as a professor at an American institution (Yale University), was awarded the Nobel Prize in Physics in 2025 for his foundational contributions to quantum computing architectures, superconducting qubits, and artificial atoms.

2. Consider the following statements regarding the 'VIKRAM3201' processor:

1. It is a 32-bit indigenously designed semiconductor chip developed by ISRO's Semiconductor Laboratory (SCL) in Mohali, Punjab.
2. The architecture is engineered to run exclusively on civilian automotive engines and is structurally incapable of operating in space launch vehicles.

Which of the statements given above is/are correct?

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

Correct Answer: (a)

Explanation:

- **Statement 1 is correct:** The VIKRAM3201 chip is a 32-bit semiconductor processor designed and manufactured in India. It was developed by ISRO's Semiconductor Laboratory (SCL) located in Mohali, Punjab, under the umbrella of the India Semiconductor Mission launched in 2021. Its goal is to build strategic self-reliance in critical technologies and reduce India's dependence on imported chips.
- **Statement 2 is incorrect:** The processor is specifically engineered with a robust architecture designed to withstand harsh environmental conditions, such as those found in space launch vehicles and defence hardware. Far from being restricted to civilian use, it is built for high-reliability applications across aerospace, defence, automotive, and industrial electronic systems.

3. Consider the following statements with regard to Accelerator Mass Spectrometry (AMS) dating:

1. Unlike conventional radiometric techniques, AMS directly counts individual carbon atoms rather than waiting to detect radioactive decay events.
2. The carbon sample is converted into highly pure liquid ethanol before being bombarded by a high-energy cesium ion beam.
3. The method requires extremely small sample sizes, allowing precise chronological validation using quantities as low as 20 mg.

Which of the statements given above are correct?

(a) 1 and 2 only
(b) 2 and 3 only

(c) 1 and 3 only
(d) 1, 2 and 3

Correct Answer: (c)
Explanation:

- **Statements 1 and 3 are correct:** Accelerator Mass Spectrometry (AMS) is an advanced radiocarbon dating method that calculates the ratio of Carbon-14 isotopes by isolating and counting individual atoms based on mass. This approach makes it much faster and more accurate than older radiometric tools. Because its sensitivity is exceptionally high, it requires up to 1,000 times less material (as little as 20 mg), making it ideal for rare, fragile, or precious artifacts like ancient seeds or blood residues.
- **Statement 2 is incorrect:** During sample preparation for AMS analysis, the processed archaeological material must be chemically converted into solid graphite, not liquid ethanol. This graphite target is then bombarded with a cesium ion beam to produce the negatively charged carbon ions needed for acceleration.

4. Consider the following statements regarding Altermagnets:

1. They represent a distinct magnetic class that features internal spin ordering like antiferromagnets while maintaining zero net magnetization externally.
2. The specific altermagnetic behavior within Chromium Antimonide (CrSb) was discovered by the Indian Institute of Science (IISc), Bengaluru.
3. CrSb crystals demonstrate Direction-Dependent Conduction Polarity (DDCP), behaving as an n-type conductor along crystal layers and a p-type conductor across them.
4. Due to low thermal thresholds, altermagnets collapse into basic paramagnetic states when exposed to temperatures slightly above 0 degree Celsius.

Which of the statements given above are correct?
(a) 1 and 3
(b) 2 and 4 only
(c) 1, 2 and 4
(d) 1 and 4 only

Correct Answer: (a)
Explanation:

- **Statements 1 and 3 are correct:** Altermagnets are a unique class of materials that offer the high-speed operational advantages of ferromagnets without producing an external magnetic signature. In Chromium Antimonide, asymmetric spin and charge distributions produce Direction-Dependent Conduction Polarity (DDCP)—electrons carry the charge (n-type) along the layers, while holes take over (p-type) across the layers. This eliminates the need for separate materials or complex physical junctions in advanced spintronic memory devices.
- **Statement 2 is incorrect:** This specific altermagnetic behavior in $CrSb$ was discovered and mapped by researchers at the S.N. Bose National Centre for Basic Sciences, Kolkata, an autonomous institution under the Department of Science and Technology (DST), Government of India.
- **Statement 4 is incorrect:** CrSb displays high thermal stability. It preserves its internal magnetic ordering at temperatures more than twice room temperature, proving it can operate reliably under the challenging conditions of industrial electronics.

5. Consider the following statements with regard to HALEU-Thorium nuclear fuel:

1. A commercial variant of this fuel blend, known as ANEEL, has been developed by a specialized energy firm based in the United States.

2. The fuel matrix is manufactured by enriching natural uranium to a concentration exceeding 85% of the fissile isotope U-235 before blending it with Thorium.
3. The design enables the immediate utilization of Thorium in existing Pressurised Heavy Water Reactors (PHWRs) without waiting for the third stage of India's nuclear power program.

Which of the statements given above are correct?

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

Correct Answer: (c)

Explanation:

- **Statements 1 and 3 are correct:** HALEU-Thorium (HALEU-Th) fuel mixes High Assay Low Enriched Uranium with Thorium. Clean Core Thorium Energy (CCTE), a US-based firm, developed a commercial version called ANEEL. This fuel allows nuclear power programs to use Thorium right away in current Pressurised Heavy Water Reactors (PHWRs). This sidesteps the long wait to deploy the complex third stage of India's traditional nuclear expansion roadmap, while cutting radioactive waste output by up to 86%.
- **Statement 2 is incorrect:** The uranium component in this fuel is enriched strictly between 5% and 20% U-235 (defined as HALEU). Keeping the enrichment below the 20% limit ensures the material remains non-weapons grade, complying with global non-proliferation standards. Enriching uranium beyond 20% creates Highly Enriched Uranium (HEU), which is restricted due to its weaponization potential.

6. Consider the following statements with regard to the Greenwald Limit in nuclear fusion research:

1. It defines a theoretical plasma density ceiling for donut-shaped tokamak reactors, beyond which the magnetic confinement system destabilizes and collapses.
2. China's Experimental Advanced Superconducting Tokamak (EAST) recently confirmed that maintaining a stable plasma state becomes mathematically impossible once density reaches 50% of this limit.

Which of the statements given above is/are correct?

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

Correct Answer: (a)

Explanation:

- **Statement 1 is correct:** The Greenwald limit establishes a direct relationship between the maximum safe density of plasma fuel, the physical size of the reactor, and the plasma current. Exceeding this boundary has long been a major bottleneck in fusion development, causing the hot plasma to destabilize and terminate before reaching self-sustaining ignition conditions.
- **Statement 2 is incorrect:** China's EAST fusion reactor achieved a major breakthrough by exceeding the Greenwald limit, maintaining stable plasma densities up to 65% *beyond* this theoretical boundary. This achievement shows that the historical density ceiling can be overcome, clearing a path toward practical, high-density magnetic confinement fusion.

7. Consider the following statements with regard to Radioactive Iodine Therapy (RAI):

1. It utilizes specific radioisotopes, such as Iodine-131, to diagnose and treat hyperactive thyroid glands and thyroid malignant tumors.
2. The therapeutic mechanism relies on emitted alpha particles to selectively destroy surrounding non-thyroid muscular tissue while leaving the thyroid gland completely unaffected.

Which of the statements given above is/are correct?

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

Correct Answer: (a)

Explanation:

- **Statement 1 is correct:** Radioactive Iodine Therapy (RAI) using Iodine-131 is a cornerstone of nuclear medicine's theranostic (therapy + diagnostics) framework. First proposed in the 1930s, it provides a targeted, non-invasive treatment option where patients simply ingest a capsule or liquid.
- **Statement 2 is incorrect:** The treatment works because thyroid cells naturally absorb iodine. Once inside, emitted beta particles destroy the overactive or cancerous thyroid tissue from within. At the same time, the isotope emits gamma rays, which allow clinicians to capture diagnostic images and track the patient's progress while sparing healthy, non-thyroid tissues from radiation.

8. Consider the following statements with regard to Optical Atomic Clocks:

1. They determine the length of a second by measuring light-wave oscillations from atoms stimulated in the optical frequency range rather than microwave frequencies.
2. Electronic transitions are measured using specific ions and atoms, including Strontium-87 and Ytterbium-171.
3. Due to the high volatility of light waves, optical clocks are less stable than traditional cesium clocks, losing approximately one second every few hundred years.

Which of the statements given above are correct?

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

Correct Answer: (a)

Explanation:

- **Statements 1 and 2 are correct:** Next-generation optical atomic clocks track electronic transitions in the optical frequency range using highly stable elements like Strontium-87, Ytterbium-171, and Indium-115 ions. These atoms are held in specialized optical lattices or ion traps and are stimulated by fine-tuned lasers.
- **Statement 3 is incorrect:** Optical transitions use light waves operating at roughly 10^{15} Hz, which is 10,000 times faster than the microwave transitions used in traditional cesium clocks 10^{9}Hz. This higher frequency gives them much better stability and precision. The most advanced optical clocks are accurate to 18 decimal places and lose just one second every 15 billion years, making them far superior to cesium-based clocks.

9. Consider the following statements regarding Biologics:

1. Biologics are large, complex proteins derived from living systems such as microorganisms, mammalian cells, or plant tissues.

2. Unlike small-molecule drugs synthesized through predictable chemical reactions, biologics require extensive testing for every individual batch because they are grown rather than manufactured.
3. The Biopharma SHAKTI strategy focuses entirely on expanding standard chemical synthesis models, actively banning the use of bioreactors for cell cultures.
4. Because biologics possess simple linear molecular structures identical to aspirin, they lack the capacity to target specific human immune pathways.

Which of the statements given above are correct?

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

Correct Answer: (b)

Explanation:

- **Statements 1 and 2 are correct:** Biologics are large, highly complex proteins produced by inserting target DNA sequences into host cells (such as bacteria, yeast, or mammalian cells) and growing them in large bioreactors. Because these drugs are grown within living biological systems rather than built through purely chemical synthesis, every batch must undergo rigorous testing to ensure safety, purity, and structural consistency.
- **Statement 3 is incorrect:** Announced in the Union Budget 2026, the Biopharma SHAKTI strategy is specifically designed to boost domestic production of biologics and biosimilars. It also promotes a shift toward non-animal testing models, encouraging the use of advanced bioreactors and cell culture methods.
- **Statement 4 is incorrect:** Biologics have high molecular complexity and are much larger than traditional small-molecule drugs like aspirin. This intricate structure allows them to bind to specific human receptors and immune pathways, providing highly targeted therapies for complex diseases like cancer, rheumatoid arthritis, and diabetes.

10. Consider the following statements regarding the Maha MedTech Mission:

1. It is a national initiative jointly launched by the Anusandhan National Research Foundation (ANRF), the Indian Council of Medical Research (ICMR), and the Bill & Melinda Gates Foundation.
2. The mission completely excludes funding for artificial intelligence (AI) and robotics, focusing its financial grants exclusively on simple plastic medical consumables.

Which of the statements given above is/are correct?

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

Correct Answer: (a)

Explanation:

- **Statement 1 is correct:** The Mission for Advancement in High-Impact Areas (MAHA)–MedTech is a collaborative national program backed by the ANRF, ICMR, and the Bill & Melinda Gates Foundation. Its goal is to reduce India's reliance on costly medical imports, boost domestic manufacturing, and improve access to medical devices aligned with national health priorities like tuberculosis, cancer, and neonatal care.
- **Statement 2 is incorrect:** The mission features a broad scope that actively includes advanced technologies like AI/ML-based diagnostic tools, robotics, medical implants, and assistive technologies.

To support these innovations, it provides substantial funding ranging from ₹5 crore to ₹25 crore per project (and up to ₹50 crore for exceptional cases) to eligible startups, MSMEs, and research groups. It also provides regulatory and intellectual property support through platforms like MedTech Mitra and Patent Mitra.

New Technologies-III

1. Consider the following statements regarding the Research Development and Innovation (RDI) Scheme:

1. It is a long-term financial support initiative launched under the nodal administration of the Department of Science and Technology (DST).
2. The strategic direction of the scheme is guided by the Anusandhan National Research Foundation (ANRF), which is chaired by the Union Minister of Finance.
3. The policy prioritizes low-TRL (Technology Readiness Level) projects over commercialized high-TRL projects to focus strictly on pure theoretical physics.
4. It establishes a dedicated Deep-Tech Fund of Funds (FoF) to finance advanced frontiers such as artificial intelligence, quantum technologies, and semiconductors.

Which of the statements given above are correct?

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

Correct Answer: (c)

Explanation:

- **Statements 1 and 4 are correct:** The RDI scheme is a long-term initiative launched by the Government of India under the Department of Science and Technology (DST) to scale up private sector participation in high-end research and technology commercialization. It includes a ₹1 lakh crore corpus providing low or nil-interest loans, equity risk capital, and a dedicated Deep-Tech Fund of Funds (FoF) targeting critical frontiers like AI, quantum computing, biotechnology, and semiconductors.
- **Statement 2 is incorrect:** While the scheme has policy oversight from an Empowered Group of Secretaries (EGoS) led by the Cabinet Secretary, the Anusandhan National Research Foundation (ANRF) provides strategic direction and is chaired by the Prime Minister of India, not the Union Minister of Finance.
- **Statement 3 is incorrect:** The policy framework explicitly prioritizes high-TRL (Technology Readiness Level) projects rather than restricting focus to low-TRL theoretical research. This prioritization aims to fast-track market readiness, scale up commercialization, and accelerate self-reliance in strategic domains.

2. Consider the following statements with regard to Superbugs:

1. They refer to specific strains of bacteria or fungi that have developed multi-drug resistance against standard clinical antibiotics or antifungals.
2. Microbes can acquire this drug resistance through natural genetic evolution as well as direct gene transfer between different microbial organisms.
3. Common superbugs are entirely limited to bacterial mutations like E. coli, as fungal species structurally cannot develop multi-drug resistance vectors.

Which of the statements given above are correct?
(a) 1 and 2 only
(b) 2 and 3 only
(c) 1 and 3 only
(d) 1, 2 and 3

Correct Answer: (a)
Explanation:

- **Statements 1 and 2 are correct:** Superbugs are infectious strains of bacteria or fungi that have mutated to resist multiple antimicrobial therapies, rendering routine medications ineffective. They evolve through the misuse/overuse of antibiotics, incomplete patient dosing, and exposure inside high-risk hospital units. These pathogens can develop resistance via individual genetic mutations or through horizontal gene transfer, where separate microbes directly exchange protective genetic material.
- **Statement 3 is incorrect:** Superbugs are not limited to bacterial strains. Fungal pathogens, such as Candida auris and Aspergillus fumigatus, have shown rising resistance to standard antifungal treatments. This expanding resistance profile complicates hospital care and increases the risk of untreatable systemic infections.

3. Consider the following statements with regard to the BIRSA 101 gene therapy:
1. It is India's first indigenously developed CRISPR-based gene-editing therapy designed to target and cure Sickle Cell Disease (SCD).
2. The platform was engineered by the CSIR–Institute of Genomics & Integrative Biology (IGIB) in partnership with the Serum Institute of India (SIIPL).

Which of the statements given above is/are correct?
(a) 1 only
(b) 2 only
(c) Both 1 and 2
(d) Neither 1 nor 2

Correct Answer: (c)
Explanation:

- **Statements 1 and 2 are correct:** BIRSA 101 represents India's first indigenous CRISPR-based gene therapy. Developed by CSIR-IGIB using their proprietary enFnCas9 platform, it aims to treat Sickle Cell Disease (SCD) a hereditary blood disorder that heavily impacts India's tribal communities. The project was named to honor the 150th birth anniversary of tribal leader Birsa Munda.
- By partnering with the Serum Institute of India (SIIPL) for technology transfer and large-scale manufacturing, the initiative aligns with India's goal of becoming Sickle Cell-Free by 2047. The collaboration aims to replace expensive global treatments (often costing ₹20–25 crore) with an affordable, localized option. The therapy works like precise genetic surgery, modifying the patient's stem cells to fix the mutations causing sickle-shaped red blood cells, enabling normal hemoglobin production after a single infusion.

4. Consider the following statements with regard to Lab-Grown Milk:
1. It utilizes precision fermentation where milk-producing genes are inserted into microbes like yeast to secrete authentic dairy proteins such as casein and whey.
2. Because it is chemically synthesized from plant-based almond extracts, it lacks the essential amino acid profile and calcium content found in cow's milk.

Which of the statements given above is/are correct?
(a) 1 only
(b) 2 only
(c) Both 1 and 2
(d) Neither 1 nor 2

Correct Answer: (a)
Explanation:

- **Statement 1 is correct:** Lab-grown milk, or animal-free dairy, is pioneered by food-tech firms using precision fermentation. Scientists insert milk-producing genes into host microbes like yeast, which are grown in bioreactors and fed sugar to secrete real milk proteins (casein and whey). These proteins are then blended with plant-derived fats, minerals, and carbohydrates to replicate traditional dairy.
- **Statement 2 is incorrect:** Lab-grown milk is nutritionally identical to traditional cow's milk and contains all nine essential amino acids along with standard calcium levels. Unlike plant-based substitutes (such as almond, soy, or oat milks) which are derived from crushed plant material, lab-grown dairy contains actual animal-free dairy proteins. Because these proteins are molecularly identical to those from a cow, products require allergen labels, though they remain naturally free of lactose, cholesterol, hormones, and antibiotics.

5. Consider the following statements with regard to Mpox (Monkeypox):
1. It is a viral zoonotic disease caused by a pathogen belonging to the Orthopoxvirus genus, which also includes the variola (smallpox) virus.
2. Because its natural evolutionary reservoir is definitively proven to be domesticated birds, the infection presents no health risk to pregnant women or immunocompromised individuals.

Which of the statements given above is/are correct?
(a) 1 only
(b) 2 only
(c) Both 1 and 2
(d) Neither 1 nor 2

Correct Answer: (a)
Detailed Explanation

- **Statement 1 is correct:** Mpox is caused by the monkeypox virus (MPXV), a member of the Orthopoxvirus genus within the Poxviridae family. This genus also contains the variola virus (the causative agent of smallpox), vaccinia virus, and cowpox virus. It was first identified in research monkeys in Denmark in 1958, and the first human case was recorded in 1970 in the Democratic Republic of the Congo.
- **Statement 2 is incorrect:** The exact natural reservoir of the monkeypox virus remains unknown. However, small mammals such as rodents, squirrels, and primates not domesticated birds are highly susceptible and involved in its transmission to humans via bites, scratches, or hunting. Furthermore, far from being harmless, Mpox can cause severe, life-threatening illness in vulnerable populations, including children, pregnant women, and immunocompromised individuals (especially HIV patients).

6. Consider the following statements with regard to Salmonella infections:
1. Salmonella is a bacterial pathogen that targets the intestinal tract, causing the foodborne illness known as salmonellosis.
2. Common transmission pathways include the consumption of undercooked poultry, raw eggs, or food cross-contaminated due to poor hygiene during preparation.

3. The infection can spread from person to person through direct contact with contaminated hands, surfaces, or food utensils.

Which of the statements given above are correct?

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

Correct Answer: (d)

Explanation:

- **Statements 1, 2, and 3 are correct:** Salmonella is a bacterial genus responsible for salmonellosis, an intestinal infection that causes diarrhea, abdominal cramps, fever, and vomiting, typically appearing 12 to 96 hours after exposure.
- The bacteria spread easily through undercooked chicken, raw eggs, unpasteurized dairy, contaminated produce, or handled processed foods like nut butters. It is also contagious between hosts, spreading via person-to-person contact or contact with infected animals (including pets and reptiles) when proper hand hygiene and sanitation are not maintained.

7. Consider the following statements with regard to the Human Papillomavirus (HPV) vaccination initiative:

1. The HPV vaccine is a recombinant product that incorporates virus-like particle genetic material to provoke an immune response without exposing the recipient to a live virus.
2. The government immunisation program utilizes Gardasil-4, which provides targeted protective efficacy against four specific high-risk and low-risk variants: HPV-16, 18, 6, and 11.
3. In alignment with recent global clinical findings, the government has adopted a three-dose initial schedule for 14-year-old girls to establish baseline cellular memory.

Which of the statements given above are correct?

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

Correct Answer: (a)

Explanation

- **Statements 1 and 2 are correct:** Human Papillomavirus (HPV) is a highly prevalent sexually transmitted virus. Chronic infection with high-risk oncogenic types, particularly types 16 and 18, can cause abnormal cell changes in the cervix that may advance to cervical cancer over a 10 to 15-year period. The vaccine is a non-live recombinant platform that trains the immune system using virus-like particles (VLPs). Gardasil-4 extends protection across both oncogenic variants (16 and 18) and types 6 and 11, which cause genital warts.
- **Statement 3 is incorrect:** The health initiative utilizes a single-dose schedule for the targeted 14-year-old cohort, rather than a three-dose strategy. Clinical evidence backed by the World Health Organization (WHO) demonstrates that a single dose provides robust immune responses and long-term protection comparable to multi-dose regimens for this specific age group. This single-dose configuration optimizes logistics and delivery via public health systems and the digital U-WIN platform.

8. Consider the following statements with regard to the Novel Oral Polio Vaccine Type 2 (nOPV2):

1. It is a next-generation live-attenuated vaccine engineered under the Global Polio Eradication Initiative (GPEI) to combat outbreaks driven by circulating vaccine-derived poliovirus type 2 (cVDPV2).
2. The vaccine features modified genetic structures that render it significantly less stable than older oral polioviruses, intentionally accelerating its mutation rate to clear infections rapidly.

Which of the statements given above is/are correct?

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

Correct Answer: (a)

Explanation

- **Statement 1 is correct:** The novel oral polio vaccine type 2 (nOPV2) is an optimized immunisation tool prequalified by the WHO for outbreak response. It is deployed in targeted campaigns to interrupt the transmission of circulating vaccine-derived poliovirus type 2 (cVDPV2) without creating new transmission chains in communities with low routine immunisation coverage.
- **Statement 2 is incorrect:** The core advantage of nOPV2 is that it is genetically more stable than traditional oral polio vaccines. Its modified molecular structure makes it far less likely to revert to a virulent, disease-causing form. This stabilization drastically lowers the risk of the vaccine virus mutating into new cVDPV2 strains, making it a vital asset for global polio eradication campaigns.

9. Consider the following statements with regard to the Nipah virus (NiV):

1. The primary natural evolutionary reservoir for the virus is fruit bats belonging to the Pteropus genus, commonly referred to as flying foxes.
2. In infected human hosts, the clinical progression is characterized by a low case fatality rate of under 5%, typically presenting with simple localized skin rashes.
3. Due to its potential to trigger catastrophic public health emergencies and the lack of specific approved antivirals, it is designated as a priority pathogen under the WHO R&D Blueprint.

Which of the statements given above are correct?

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

Correct Answer: (c)

Explanation

- **Statements 1 and 3 are correct:** Nipah virus (NiV) is a highly lethal zoonotic Henipavirus. Fruit bats of the Pteropus genus serve as its natural reservoir. Humans can contract the virus through exposure to bat-contaminated food products (such as raw date-palm sap or bitten fruits), contact with intermediate animal hosts like infected pigs, or via direct human-to-human respiratory droplets. Because there are no approved antiviral drugs or vaccines, supportive care is the only clinical option. Consequently, the WHO has placed NiV on its R&D Blueprint to fast-track scientific research.
- **Statement 2 is incorrect:** The Nipah virus is exceptionally severe, with an extremely high case fatality rate ranging between 40% and 75%. Its clinical presentation involves acute, life-threatening neurological and respiratory distress, often progressing rapidly from dizziness and disorientation to severe encephalitis, seizures, and coma within 24 to 48 hours.

10. Consider the following statements regarding the features and classification of the Hepatitis D virus (HDV):

1. It is a sub-viral satellite pathogen that is structurally incapable of replicating independently, requiring the active presence of the Hepatitis B virus (HBV) to complete its lifecycle.
2. The International Agency for Research on Cancer (IARC) has officially classified HDV as a Group 1 carcinogen, confirming it as a proven cause of liver cancer in humans.
3. Epidemiological data indicates that HDV affects nearly 85% of all chronic Hepatitis B carriers globally, showing its highest concentration in Western Europe.
4. There is a highly effective, HDV-specific preventive vaccine available globally that eliminates the need for standard Hepatitis B immunizations.

Which of the statements given above are correct?

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

Correct Answer: (a)

Explanation

- **Statements 1 and 2 are correct:** Hepatitis D (HDV) is a blood-borne virus that hijacks the surface antigens of the Hepatitis B virus (HBV) to package and replicate its own viral particles. It occurs either as a simultaneous co-infection or as a superinfection in individuals who already have chronic HBV. The WHO and IARC have classified HDV as a Group 1 human carcinogen because it accelerates liver damage. HDV superinfections increase the risk of developing hepatocellular carcinoma (liver cancer) by 2 to 6 times compared to HBV infections alone, and up to 75% of infected individuals develop liver cirrhosis within 15 years.
- **Statement 3 is incorrect:** HDV does not affect 85% of HBV carriers; rather, it affects approximately 5% of chronic HBV carriers globally (translating to roughly 12 million people). Its primary regions of high prevalence are located across parts of Asia, Africa, and the Amazon Basin, rather than being concentrated in Western Europe.
- **Statement 4 is incorrect:** There is no specific vaccine designed exclusively to target the Hepatitis D virus. Because HDV relies entirely on HBV to cause infection, the standard Hepatitis B vaccine serves as the primary and only preventive defense against contracting both viral conditions.

Schemes in News

1. Consider the following statements with regard to the UDAN Scheme:

1. It was launched under the National Civil Aviation Policy (NCAP) to link remote Tier-2 and Tier-3 hubs via an incentivized framework featuring Viability Gap Funding (VGF) and airfare caps.
2. In its earliest deployment phase (UDAN 1.0), the policy completely prioritized heliports and water aerodromes, introducing mandatory seaplane guidelines before connecting terrestrial runways.
3. The newer iteration, UDAN 5.0, enforces a rigid 600 km mandatory minimum route distance restriction for all operating passenger aircraft, banning short point-to-point regional flights.

Select the answer using the code given below:

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

Correct Answer: (c)

Detailed Explanation

- **Statement 1 is correct:** The UDAN scheme is a flagship Regional Connectivity Scheme (RCS) designed to democratize aviation by making air travel affordable and accessible. It links remote and regional areas to major economic centers through capped airfares, airport charge waivers, tax concessions on Aviation Turbine Fuel (ATF), and financial support via Viability Gap Funding (VGF).
- **Statement 2 is incorrect:** Strategic extensions to water aerodromes and heliports were introduced much later under the UDAN 5.5 and Seaplane Guidelines (2024) to improve last-mile connectivity, rather than being the exclusive focus of the initial rollout in 2016.
- **Statement 3 is incorrect:** Rather than enforcing a rigid boundary, UDAN 5.0 explicitly removed the 600 km cap on route lengths and prioritized ready-to-operate airports. This change enhanced operational flexibility and expanded the reach of the scheme across diverse geographies.

2. Consider the following statements regarding the features of the Sampoornata Abhiyan 2.0 campaign:

1. It is a mission-mode, time-bound 3-month intensive initiative launched to achieve 100% saturation of key development metrics across selected Aspirational Districts and Aspirational Blocks.
2. The operational monitoring of Key Performance Indicators (KPIs) calculates three educational metrics tracked on an annual verification timeline.
3. At the Aspirational Block level, performance tracking includes evaluating real-time childhood growth measurement efficiency and bovine vaccinations against Foot and Mouth Disease (FMD).
4. Tuberculosis (TB) case notification rates across both public and private health sectors serve as a primary Key Performance Indicator tracked at the Aspirational District level.

Which of the statements given above are correct?

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

Correct Answer: (c)

Detailed Explanation

- **Statements 1, 3, and 4 are correct:** Sampoornata Abhiyan 2.0 is an intensive campaign targeting 112 Aspirational Districts and 513 Aspirational Blocks by NITI Aayog. It aims to achieve complete saturation of crucial social goals. Block-level tracking focuses on 6 KPIs: supplementary nutrition, measurement efficiency at Anganwadis, sanitation, clean drinking water, girls' school toilets, and FMD vaccinations for bovine livestock. District-level tracking focuses on 5 KPIs: newborn birth weight, public/private TB case notification rates, health outreach events (VHSND/UHSND), school infrastructure, and universal livestock vaccination.
- **Statement 2 is incorrect:** The campaign does not limit its indicators to a three annual metric. Instead, it relies on a broad multi-sectoral matrix of 6 Block KPIs and 5 District KPIs, which are monitored via monthly tracking to drive performance and healthy competition.

3. Consider the following statements regarding the features of the PM SHRI scheme:

1. It is a Centrally Sponsored Scheme introduced to upgrade designated schools into model institutions showcasing the holistic and experiential learning tenets of the National Education Policy (NEP) 2020.
2. The infrastructure framework emphasizes eco-friendly campus environments by mandating green initiatives such as solar power integration, rainwater harvesting, and waste management.

3. For North-Eastern and Himalayan States, along with the Union Territory of Jammu & Kashmir, the core project funding pattern is split between the Centre and States in a 60:40 ratio.
4. The selection mechanism adopts a competitive, challenge-mode process utilizing data from the Unified District Information System for Education Plus (UDISE+) alongside field verification.

Which of the statements given above are correct?

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

Correct Answer: (b)

Detailed Explanation

- **Statements 1, 2, and 4 are correct:** The PM SHRI scheme upgrades existing schools to serve as "lighthouse institutions" that demonstrate NEP 2020 principles. These schools implement smart classrooms, skills labs, inquiry-driven pedagogy, and holistic assessments. They also prioritize sustainability through green campus initiatives like solar arrays and rainwater harvesting systems. Selection uses a challenge-based framework that factors in UDISE+ data and field validation.
- **Statement 3 is incorrect:** The 60:40 funding ratio applies to general states and UTs with legislatures. For North-Eastern and Himalayan States, as well as Jammu & Kashmir, the financial sharing pattern is set at 90:10 (with 100% central funding reserved for UTs without a legislature).

4. Consider the following statements regarding the features of the AMRIT Pharmacy initiative:

1. It functions under the administrative oversight of the Ministry of Health & Family Welfare to supply critical implants, oncology drugs, and life-saving consumables at discounted rates.
2. The nationwide operational implementation and supply-chain logistics of the retail outlets are managed by HLL Lifecare Limited, a Central Public Sector Enterprise (CPSE).
3. The network architecture requires all storefront operations to be staffed by, seasonal volunteers with no compulsion of having formal pharmacological degrees.
4. The initiative features modern digital upgrades, including the launch of the AMRIT ITes Eco-Green Version 2.0 platform to support transparency and operational efficiency.

Which of the statements given above are correct?

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

Correct Answer: (c)

Detailed Explanation

- **Statements 1, 2, and 4 are correct:** Launched in 2015, the AMRIT pharmacy initiative reduces out-of-pocket health expenses by offering 50–90% discounts on essential medicines, cardiac implants, and cancer treatments. Managed by HLL Lifecare Limited under the MoHFW, the network is expanding its footprint to medical colleges and district hospitals. It incorporates tech-driven features like the AMRIT ITes Eco-Green Version 2.0 system, a 24x7 National Contact Centre, and mobile pharmacy vans for rural outreach.
- **Statement 3 is incorrect:** To maintain safety, inventory accuracy, and clinical quality standards, the program exclusively employs certified pharmacy professionals holding formal degrees (D.Pharm or B.Pharm), rather than relying on uncertified volunteers.

5. Consider the following statements with regard to the Niveshak Shivir initiative:

1. It is a nationwide investor assistance program designed to help shareholders easily recover unclaimed dividends and shares from the Investor Education and Protection Fund Authority (IEPFA).
2. The scheme was established by the Investor Education and Protection Fund Authority (IEPFA) in joint collaboration with the Securities and Exchange Board of India (SEBI).
3. The IEPFA operates as a non-statutory private trust that is independent of the administrative jurisdiction of the Ministry of Corporate Affairs.

Select the answer using the code given below:

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

Correct Answer: (a)

Detailed Explanation

- **Statements 1 and 2 are correct:** The Niveshak Shivir initiative is an investor outreach program run by the IEPFA and SEBI. It sets up on-ground helpdesks to connect shareholders with company registries and provides an online portal to search asset status and file digital recovery claims using Form IEPF-5.
- **Statement 3 is incorrect:** The IEPFA is not a private trust. It is a statutory authority established under Section 125 of the Companies Act, 2013, and it functions under the Ministry of Corporate Affairs, Government of India. It manages the IEPF corpus, protects investor interests, and promotes financial literacy.

6. Consider the following statements with regard to the Production Linked Incentive (PLI) Scheme for Advanced Chemistry Cell (ACC):

1. It is a central sector incentive program managed by the Meity to build domestic manufacturing capacity for advanced battery cells used in electric vehicles and energy grids.
2. The policy framework focuses its output-based financial subsidies only for lithium-ion technologies.

Which of the statements given above is/are correct?

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

Correct Answer: (c)

Detailed Explanation

- **Statement 1 is incorrect:** The ACC-PLI scheme has a financial outlay of ₹18,100 crore. It aims to set up 50 GWh of domestic advanced chemistry cell manufacturing capacity, which helps reduce dependence on imported battery materials. The performance-linked incentives require a minimum investment of ₹1,100 crore from manufacturers to ensure large-scale development.
- **Statement 2 is incorrect:** The scheme is designed to capture next-generation energy technologies, focusing on Advanced Chemistry Cells like lithium-ion batteries while explicitly excluding conventional lead-acid architectures. The policy also features a strict localization mandate, requiring manufacturers to hit a 25% domestic value addition within 2 years and scale it up to 60% within 5 years.

7. Which of the following statements regarding the features of the e-Jagriti platform are correct?

1. It is a unified, AI-enabled digital portal designed to integrate all consumer dispute-resolution systems into a single paperless architecture.
2. It provides global accessibility features allowing Indian citizens living abroad to securely file claims and participate in remote hearings.
3. The platform features an AI-powered, multilingual interface that incorporates automated smart case routing and voice-to-text tools.
4. Its automated communication infrastructure distributes integrated SMS and email alerts for real-time case updates, notice issuances, and deadlines.

Select the correct answer using the options below:

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

Correct Answer: (d)

Detailed Explanation

- **Statements 1, 2, 3, and 4 are correct:** The e-Jagriti platform, developed by the Department of Consumer Affairs, modernizes consumer justice in India. It offers a unified portal for e-filing, electronic notices, virtual hearings, and secure role-based dashboards.
- Non-Resident Indians (NRIs) can file, track, and join hearings remotely using secure OTP logins and encrypted document transfers. The system uses AI for multilingual chat assistance, accessibility tools for visually impaired or elderly users, and automated case routing. This configuration has helped clear backlogs, allowing case completions to outpace new filings in several states. It also includes automated SMS/email alerts and integrates with PayGov and Bharat Kosh for secure fee transactions.

8. Consider the following statements with regard to the TALASH initiative:

1. It is a dedicated national digital platform introduced under the nodal administration of the Ministry of Education to train civil engineers in urban grid infrastructure.
2. The platform incorporates specialized psychometric testing models based on NCERT's Tamanna framework to generate personalized student Career Cards.
3. The scheme was launched by the National Education Society for Tribal Students (NESTS) in collaboration with UNICEF India to guide students across Eklavya Model Residential Schools (EMRS).

Select the answer using the code given below:

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

Correct Answer: (b)

Detailed Explanation

- **Statements 2 and 3 are correct:** TALASH is a national-level digital initiative focused on the development of tribal students. Launched by NESTS and UNICEF India under the Ministry of Tribal Affairs, it helps students build self-awareness, emotional intelligence, conflict resolution, and resilience. The platform utilizes psychometric tools based on NCERT's Tamanna model to generate personalized Career Cards that align a student's skills, interests, and goals. It also includes a teacher training portal to help educators mentor students through phased national deployments.

- **Statement 1 is incorrect:** TALASH is administered by the Ministry of Tribal Affairs. Its objective is to support the life skills, aptitude mapping, and holistic career planning of tribal students, rather than training urban grid infrastructure engineers.

9. Consider the following statements with regard to the Village Defence Guards (VDGs) in Jammu & Kashmir:

1. They function under the direct operational control of the District SSP/SP, serving as a localized force multiplier to assist security forces in counter-terrorism and village protection.
2. In contrast to the older Village Defence Committees (VDCs), the revised VDG framework includes monthly remuneration for both group heads and regular guard members.

Which of the statements given above is/are correct?

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

Correct Answer: (c)

Detailed Explanation

- **Statements 1 and 2 are correct:** Approved by the Ministry of Home Affairs (MHA), the Village Defence Guards (VDGs) restructured the older 1995 Village Defence Committees (VDCs). Organized at the panchayat level with up to 15 members per group, they consist primarily of ex-servicemen and trained civilians. They undergo training by the Army and CRPF and are equipped with Self-Loading Rifles (SLRs).
- The units operate under the direction of the District SSP/SP to integrate with local security forces. Unlike the older VDC structure where only Special Police Officers (SPOs) received payment, the updated VDG system pays both group heads (₹4,500/month) and active members (₹4,000/month) for tasks like conducting night patrols and protecting local infrastructure.

10. Consider the following statements with regard to the Employee's Enrolment Scheme 2025:

1. It is a one-time compliance window launched by the Employees' Provident Fund Organisation (EPFO) to allow employers to voluntarily register eligible employees who were previously left out of coverage.
2. The compliance window provides a open-ended operational timeline extending for a minimum of one years.
3. Under the voluntary terms of the scheme, employers are exempted from paying any share of financial contributions, transferring the entire penalty burden onto the unregistered worker.

Select the answer using the code given below:

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

Correct Answer: (c)

Detailed Explanation

- **Statement 1 is correct:** The Employee's Enrolment Scheme 2025 is a dedicated voluntary compliance window introduced by the EPFO under the Ministry of Labour and Employment. It allows establishments to register eligible workers who missed out on EPF coverage between July 2017 and October 2025, expanding social security protections under the EPF Act, 1952. The window applies

even to businesses currently under active inquiry under Section 7A or Paragraph 26B, and the EPFO will not launch *suo motu* retroactive actions for past omissions once an employer complies voluntarily.

- **Statement 2 is incorrect:** The scheme is a time-bound, one-time facility with a six-month operational window spanning from 1 November 2025 to 30 April 2026, rather than being an open-ended program.
- **Statement 3 is incorrect:** The framework waives the employee's past contribution share if it wasn't deducted at the time. To settle the account, the employer must provide their own contribution share along with a nominal ₹100 compliance penalty, protecting the unregistered worker from back-payment burdens.

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