DO NOT OPEN THIS TEST BOOKLET UNTIL YOU ARE TOLD TO DO SO

T.B.C. : STS-K-TPT
Serial No.:

Test Booklet Series

B

TEST BOOKLET

Subject : Test 13 – SCIENCE AND TECHNOLOGY
Question Paper

Time Allowed : Two Hours **Maximum Marks : 200**

INSTRUCTIONS

1.IMMEDIATELY AFTER THE COMMENCEMENT OF THE EXAMINATION, YOU SHOULD CHECK THAT THIS TEST BOOKLET DOES NOT HAVE ANY UNPRINTED OR TORN OR MISSING PAGES OR ITEMS, ETC. IF SO, GOT IT REPLACED BY A COMPLETE TEST BOOKLET.

2. Please note that it is the candidate's responsibility to encode and fill in the Roll Number and Test Booklet Series A, B, C or D carefully and without any omission or discrepancy at the appropriate places in the OMR Answer Sheet. Any omission/discrepancy will render the Answer Sheet liable for rejection.

3. You have to enter your Roll Number on the Test Booklet in the Box provided alongside. DO NOT write anything else on the Test Booklet.

4. This Test Booklet contains 100/80 items (questions). Each item is printed in English. Each item comprises of four responses (answers). You will select the response which you want to mark on the Answer Sheet. In case you feel that there is more than one correct response, mark the response which you consider the best. In any case, choose ONLY ONE response for each item.

5. You have to mark all your responses ONLY on the separate Answer Sheet provided. See directions in the Answer Sheet.

6. All items carry equal marks

7. Before you proceed to mark in the Answer Sheet the response to various items in the Test Booklet, you have to fill in some particulars in the Answer Sheet as per instructions sent to you with your Admission Certificate.

8. After you have completed filling in all your responses on the Answer Sheet and the examination has concluded, you should hand over to the Invigilator only the Answer Sheet. You are permitted to take away with you the Test Booklet.

9. Sheets for rough work are appended in the Test Booklet at the end.

10. **Penalty for wrong answers:**

THERE WILL BE PENALTY FOR WRONG ANSWERS MARKED BY A CANDIDATE IN THE OBJECTIVE TYPE QUESTION PAPERS

(i) There are four alternatives for the answer to every question. For each question for which a wrong answer has been given by the candidate, **one third** if the marks assigned to that question will be deducted as penalty.

(ii) If a candidate gives more than one answer, it will be treated as a wrong answer even if one of the given answers happens to be correct and there will be same penalty as above to that question.

(iii) If a question is left blank, i.e., no answer is given by the candidate, there will be no penalty for that question.

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1. India recently concluded a global summit introducing the “Seven Chakra Framework.” This framework is primarily associated with which of the following?
(a) Maritime security concerns including disruptions in the Strait of Hormuz
(b) Global Artificial Intelligence governance and regulatory cooperation
(c) Expansion of BRICS economic and geopolitical cooperation
(d) Military coordination in the Middle East region

2. With reference to the Machine Vision Inspection System (MVIS) recently introduced in Indian Railways, consider the following statements:

1. It uses Artificial Intelligence and Machine Learning to inspect the undergear of moving trains.
2. It relies primarily on manual inspection supported by low-resolution imaging tools.
3. It can detect defects such as loose, broken, or missing components through image analysis.
4. It facilitates real-time alerts and supports preventive maintenance in railway operations.

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

3. With reference to aviation safety mechanisms and institutions in India, consider the following statements:

1. A Ram Air Turbine (RAT) is a small wind turbine that deploys automatically during emergencies to generate power for critical aircraft systems.
2. RAT primarily functions when at least one engine is operational but electrical systems fail.
3. The Aircraft Accident Investigation Bureau (AAIB) is a statutory body under the Ministry of Civil Aviation.
4. AAIB conducts independent investigations into aircraft accidents and issues safety recommendations in line with international standards.

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

4. With reference to Mitochondrial Donation Treatment (MDT), consider the following statements:

1. It is used to prevent the transmission of mitochondrial DNA disorders from mother to child.
2. The resulting child contains nuclear DNA from three individuals and mitochondrial DNA from both parents.
3. Techniques such as Maternal Spindle Transfer (MST) and Pronuclear Transfer (PNT) differ in the stage at which they are applied relative to fertilization.
4. Mitochondrial diseases primarily affect high energy-demand organs such as muscles, brain, and heart.

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

5. With reference to the Biomolecular Emulator (BioEmu) in recent developments in biotechnology, consider the following statements:

1. BioEmu is an AI-based model that simulates how proteins fold and behave under biological conditions.
2. It predicts only a single stable structure of a protein, similar to traditional static models.
3. It is trained on structural data repositories such as the AlphaFold database.
4. It can model protein dynamics and flexibility, which are crucial for drug discovery and enzyme design.

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

6. With reference to Bluetooth Mesh Networking (BNM) and the 'Bitchat' app, consider the following statements:

1. Bluetooth Mesh Networking enables communication between devices without requiring internet or cellular connectivity.
2. It follows a one-to-one pairing mechanism similar to traditional Bluetooth connections.
3. Messages in a mesh network can be relayed across multiple intermediate devices even if the sender and receiver are not directly connected.

Which of the statements given above is/are correct?
(a) One statement only
(b) Two statements only
(c) All three statements
(d) None

7. With reference to Wi-Fi Extender, Wi-Fi Mesh, and Bluetooth Mesh, consider the following statements:

1. A Wi-Fi extender creates a separate network by rebroadcasting signals from the main router, often leading to reduced bandwidth.
2. A Wi-Fi mesh system operates through multiple interconnected nodes under a single network name (SSID), ensuring seamless connectivity.
3. Bluetooth mesh networking primarily relies on centralized routing through a master device for communication between nodes.
4. Bluetooth mesh allows multi-hop communication where messages are relayed across devices without requiring internet connectivity.

Which of the statements given above is/are correct?
(a) One statement only
(b) Two statements only
(c) Three statements only
(d) All four statements

8. With reference to the recently discovered class of magnetic materials known as Altermagnets, consider the following statements:

1. Altermagnets exhibit zero net magnetisation like antiferromagnets but retain internal spin polarization due to crystal symmetry.
2. Unlike ferromagnets, altermagnets cannot influence electron spin in electronic devices.
3. They are considered promising for spintronics due to their ability to enable control over spin without generating large magnetic fields.
4. Chromium Antimonide (CrSb) is among the materials identified to exhibit altermagnetic properties.

Which of the statements given above is/are correct?
(a) One statement only
(b) Two statements only
(c) Three statements only
(d) All four statements

9. With reference to Face Authentication (FaceAuth) introduced by the Unique Identification Authority of India (UIDAI), consider the following statements:

1. Face Authentication can be used as a standalone mode of Aadhaar authentication without requiring OTP or biometric verification.
2. It uses Artificial Intelligence-based facial recognition to match a live image with the Aadhaar database.
3. Face Authentication is primarily designed to replace fingerprint and iris authentication completely in all use cases.
4. It enhances accessibility for individuals facing difficulties with fingerprint authentication, such as elderly persons and manual labourers.

Which of the statements given above is/are correct?
(a) One statement only
(b) Two statements only
(c) Three statements only
(d) All four statements

10. With reference to hydrogen-powered trains under India's "Hydrogen for Heritage" initiative, consider the following statements:

1. These trains use hydrogen fuel cells that produce electricity with water vapour as the only direct emission.
2. Green hydrogen used in such trains is primarily produced from fossil fuels with carbon capture technologies.
3. Hydrogen fuel offers higher energy density than lithium-ion batteries, enabling longer range operations.
4. Storage and transportation of hydrogen pose technological and economic challenges.

Which of the statements given above is/are correct?
(a) One statement only
(b) Two statements only
(c) Three statements only
(d) All four statements

11. With reference to the supersolid state of light created using polaritons, consider the following statements:

1. A supersolid combines properties of both crystalline order and fluid-like motion while exhibiting macroscopic quantum coherence.
2. Photons can naturally form solid structures because they possess mass and interact strongly with each other.
3. Polaritons are hybrid particles formed by coupling photons with matter, enabling light to acquire properties necessary for supersolid formation.
4. Supersolid states of light are typically achieved under controlled conditions close to absolute zero temperature.

Which of the statements given above is/are correct?
(a) One statement only
(b) Two statements only
(c) Three statements only
(d) All four statements

12. With reference to quantum noise in quantum computing systems, consider the following statements:

1. Quantum noise arises due to intrinsic quantum uncertainties as well as interactions with the external environment.
2. Bit-flip and phase-flip errors are types of quantum noise that can alter quantum information.
3. Quantum noise enhances the stability and scalability of quantum computing systems.
4. Techniques such as quantum error correction and decoherence-free subspaces are used to mitigate quantum noise.

Which of the statements given above is/are correct?
(a) One statement only
(b) Two statements only
(c) Three statements only
(d) All four statements

13. Consider the following pairs regarding Gravitational Wave Detectors and their status:

Detector	Country	Status
1. LIGO	USA	Operational
2. Virgo	Italy	Operational
3. KAGRA	Japan	Under Construction
4. LIGO-India	India	Operational

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

14. Consider the following pairs regarding Global Navigation Satellite Systems (GNSS):

Country/Region	Navigation System
1. India	NavIC (IRNSS)
2. USA	GLONASS
3. Russia	GPS
4. European Union	Galileo
5. China	BeiDou

Which of the pairs given above are correctly matched?
(a) 1, 4 and 5 only
(b) 1, 2 and 3 only
(c) 1, 3, 4 and 5 only
(d) All five

15. Consider the following pairs regarding Starlink services in India & related institutions

Feature/Entity	Description
1. IN-SPACe	Statutory body under ISRO regulating satellite communication services
2. Starlink Gen1	A constellation of Low Earth Orbit satellites providing broadband services
3. Orbit Altitude	Approximately 540–570 km above Earth
4. Authorisation	Valid indefinitely once granted

Which of the pairs given above are correctly matched?
(a) 2 and 3 only
(b) 1, 2 and 3 only
(c) 2, 3 and 4 only
(d) All four

16. Consider the following pairs regarding DengiaLL vaccine and associated institutions:

Entity/Feature	Description
1. ICMR	Conducts clinical trials and public health research in India
2. CDSCO (under DCGI)	Licenses and regulates drugs and vaccines in India
3. NIH (USA)	India's apex biomedical regulatory authority
4. DengiaLL Vaccine	A tetravalent vaccine targeting all four dengue virus serotypes

Which of the pairs given above are correctly matched?
(a) 1, 2 and 4 only
(b) 1 and 3 only
(c) 2, 3 and 4 only
(d) All four

17. With reference to Starlink satellite internet services, consider the following statements:

1. Starlink operates primarily using Low Earth Orbit (LEO) satellites to provide broadband connectivity.
2. Satellite internet services are dependent on terrestrial fibre infrastructure for last-mile connectivity.
3. LEO satellites help reduce latency compared to traditional geostationary satellite systems.
4. Satellite internet is particularly useful in remote and underserved regions where conventional connectivity is limited.

Which of the statements given above is/are correct?
(a) One statement only
(b) Two statements only
(c) Three statements only
(d) All four statements

18. In modern astronomy, a Dwarf Star is generally any star of "normal" size. It is a celestial body that generates energy through the fusion of hydrogen in its core. Our own Sun is a Yellow Dwarf. Consider the following pairs regarding types of dwarf stellar objects:

Type	Description
1. Red Dwarf	Small, low-mass stars sustaining hydrogen fusion with very long lifespans
2. Brown Dwarf	Stellar remnants that have exhausted nuclear fuel and are cooling gradually
3. White Dwarf	Dead core of a star with no active fusion, gradually cooling over time
4. Black Dwarf	Hypothetical cold remnant formed after a white dwarf loses all its heat

Which of the pairs given above are correctly matched?
(a) 1, 3 and 4 only
(b) 1 and 2 only
(c) 2, 3 and 4 only
(d) All four

19. With reference to Soursop (Graviola), consider the following statements:
1. Soursop is a tropical fruit-bearing plant scientifically known as *Annona muricata*.
2. It belongs to the same plant family as custard apple and cherimoya.
3. Extracts of soursop have been scientifically proven to cure cancer and are widely approved for clinical treatment.
4. Soursop contains compounds such as acetogenins that are being studied for potential medicinal properties.

Which of the statements given above is/are correct?
(a) One statement only
(b) Two statements only
(c) Three statements only
(d) All four statements

20. With reference to engineered *E. coli* used as a biosensor for detecting mercury, consider the following statements:
1. The modified *E. coli* can generate direct electronic signals upon detecting toxic substances like mercury.
2. The biosensor requires an external power source such as batteries to function effectively.
3. It is capable of detecting mercury concentrations below World Health Organization (WHO) safety limits.
4. Arabinose, detected by such biosensors, is a type of protein commonly found in animal tissues.

Which of the statements given above is/are correct?
(a) One statement only
(b) Two statements only
(c) Three statements only
(d) All four statements

21. With reference to the Rhisotope Project and the use of radioisotopes in wildlife conservation, consider the following statements:
1. Radioisotopes are unstable elements that emit radiation and can be used for tracking and detection.
2. The Rhisotope Project involves invasive surgical implantation of radioactive materials into rhinos for long-term monitoring.
3. Radiation Portal Monitors (RPMs), traditionally used for detecting illicit nuclear materials, can detect tagged rhino horns.
4. The project aims to deter poaching by making rhino horns traceable across international borders.

Which of the statements given above is/are correct?
(a) One statement only
(b) Two statements only
(c) Three statements only
(d) All four statements

22. With reference to the Darwin Tree of Life (DTOL) Project and the Earth BioGenome Project (EBP), consider the following statements:

1. The DTOL Project aims to sequence genomes of all prokaryotic species in Britain and Ireland.
2. The Earth BioGenome Project seeks to sequence and catalog approximately 10 million eukaryotic species globally.
3. Both DTOL and EBP are linked initiatives contributing to biodiversity conservation and genomic research.
4. Eukaryotic organisms are characterized by the presence of a nucleus and membrane-bound organelles.

Which of the statements given above is/are correct?
(a) One statement only
(b) Two statements only
(c) Three statements only
(d) All four statements

23. With reference to Genetically Modified (GM) maize trials in India, consider the following statements:

1. Herbicide-tolerant (HT) GM maize is engineered to resist herbicides such as glyphosate for effective weed management.
2. The Genetic Engineering Appraisal Committee (GEAC) functions under the Ministry of Environment, Forest and Climate Change (MoEFCC).
3. Commercial cultivation of GM crops in India can be undertaken after confined field trials without any additional approvals.
4. Insect-resistant (IR) GM crops are designed to protect against specific pests such as lepidopteran insects.

Which of the statements given above is/are correct?
(a) One statement only
(b) Two statements only
(c) Three statements only
(d) All four statements

24. With reference to lead poisoning and its sources in India, consider the following statements:

1. Lead is a heavy metal that can accumulate in body tissues, causing toxic effects over time.
2. Older aluminium cookware made from unregulated scrap can leach lead into food.
3. The World Health Organization (WHO) considers lead exposure a minor public health concern with limited long-term effects.
4. Lead exposure can result in neurological damage, kidney dysfunction, and developmental issues in children.

Which of the statements given above is/are correct?
(a) One statement only
(b) Two statements only
(c) Three statements only
(d) All four statements

25. With reference to Small Modular Reactors (SMRs) and their proposed use in powering data centres, consider the following statements:

1. SMRs are nuclear reactors with relatively smaller capacity per unit and are designed for modular construction.
2. SMRs require large land areas and extensive cooling infrastructure similar to conventional nuclear power plants.
3. SMRs can be factory-assembled and deployed in clusters, offering flexibility in power generation.
4. Nuclear energy is considered suitable for data centres due to its ability to provide stable baseload power.

Which of the statements given above is/are correct?
(a) One statement only
(b) Two statements only
(c) Three statements only
(d) All four statements

26. With reference to Extreme Nuclear Transients (ENTs) observed in astronomy, consider the following statements:

1. ENTs are extremely energetic cosmic explosions that can exceed gamma-ray bursts in magnitude and duration.
2. They occur when supermassive black holes tear apart massive stars near galactic centres.
3. ENTs are steady, long-term luminous sources similar to main-sequence stars.
4. The process involves formation of an accretion disk and emission of radiation across the electromagnetic spectrum.

Which of the statements given above is/are correct?

(a) One statement only
(b) Two statements only
(c) Three statements only
(d) All four statements

27. With reference to India's first indigenous semiconductor chip "Vikram Processor" and the India Semiconductor Mission (ISM), consider the following statements:

1. The Vikram Processor has been developed by ISRO and is designed for use in space and avionics applications.
2. The processor is manufactured using 7 nm fabrication technology within India.
3. The India Semiconductor Mission aims to establish India as a global semiconductor hub through incentives like the Production Linked Incentive (PLI) scheme.
4. OSAT facilities under ISM are related to semiconductor assembly, testing, and packaging.

Which of the statements given above is/are correct?

(a) One statement only
(b) Two statements only
(c) Three statements only
(d) All four statements

28. With reference to Micro-OLED display technology, consider the following statements:

1. Micro-OLED displays are self-emissive and do not require a backlight for operation.
2. They are typically fabricated directly on silicon chips, enabling very high pixel density.
3. Micro-OLED displays are widely used in large flexible displays due to their high transparency and adaptability.
4. Issues such as burn-in and organic material degradation are associated with OLED-based technologies.

Which of the statements given above is/are correct?

(a) One statement only
(b) Two statements only
(c) Three statements only
(d) All four statements

29. With reference to AdFalciVax, India's indigenous malaria vaccine, consider the following statements:

1. It is a recombinant multi-stage vaccine targeting *Plasmodium falciparum*.
2. The vaccine targets both pre-erythrocytic (liver stage) and blood-stage parasites.
3. It is produced using *Lactococcus lactis*, a bacterium commonly used in fermentation.
4. The vaccine is designed only to protect humans and does not aim to interrupt transmission of malaria.

Which of the statements given above is/are correct?

(a) One statement only
(b) Two statements only
(c) Three statements only
(d) All four statements

30. With reference to the Enteromix mRNA-based cancer vaccine, consider the following statements:

1. It uses messenger RNA (mRNA) to instruct cells to produce tumor-specific antigens that trigger an immune response.
2. The vaccine employs live pathogenic viruses to selectively infect and destroy cancer cells.
3. It can be personalized based on the genetic profile of individual tumors.
4. mRNA vaccines require integration into the host DNA to be effective.

Which of the statements given above is/are correct?
(a) One statement only
(b) Two statements only
(c) Three statements only
(d) All four statements

31. With reference to AI-designed viral genomes and bacteriophages, consider the following statements:

1. Bacteriophages are viruses that infect and replicate within bacteria.
2. The AI-designed viral genome was created using a model trained on a large dataset of viral genomes.
3. Bacteriophages always contain double-stranded DNA as their genetic material.
4. AI-designed bacteriophages have potential applications in targeting antibiotic-resistant bacteria.

Which of the statements given above is/are correct?
(a) One statement only
(b) Two statements only
(c) Three statements only
(d) All four statements

32. With reference to the IT (Intermediary Guidelines) Amendment Rules, 2025 concerning AI-generated deepfakes, consider the following statements:

1. Takedown orders for synthetic content can be issued only by officers not below the rank of Joint Secretary or equivalent.
2. Intermediaries are required to label AI-generated or synthetic content clearly.
3. Users uploading synthetic content are not required to disclose whether the content is altered or AI-generated.
4. Significant social media intermediaries are mandated to use tools for detecting deepfakes.

Which of the statements given above is/are correct?
(a) One statement only
(b) Two statements only
(c) Three statements only
(d) All four statements

33. With reference to Quantum Random Number Generators (QRNGs) and recent developments in India, consider the following statements:

1. QRNGs generate randomness based on the inherent uncertainty of quantum phenomena rather than algorithmic processes.
2. Pseudo-Random Number Generators (PRNGs) are completely unpredictable and immune to external attacks.
3. The Raman Research Institute achieved certification of true randomness using a commercial quantum computer.
4. QRNG-based systems are considered important for enhancing encryption and digital security.

Which of the statements given above is/are correct?
(a) One statement only
(b) Two statements only
(c) Three statements only
(d) All four statements

34. With reference to Quantum Advantage and Google's Willow quantum processor, consider the following statements:

1. Quantum advantage refers to a stage where quantum computers outperform classical computers for specific computational problems.
2. Verifiable quantum advantage ensures that the results produced by a quantum computer can be independently validated.
3. The "Quantum Echoes" algorithm is based on the concept of Out-of-Time-Order Correlators (OTOC), used to study quantum information flow.
4. Classical computers use qubits that exist in superposition, enabling exponential computational power.

Which of the statements given above is/are correct?
(a) One statement only
(b) Two statements only
(c) Three statements only
(d) All four statements

35. With reference to the Time Rondeau Crystal (TRC), consider the following statements:

1. It is a newly discovered phase of matter in which atomic motion shows both periodic order and random fluctuations in time.
2. Unlike conventional time crystals, TRCs exhibit perfectly periodic motion without any irregularity.
3. The concept challenges the idea that temporal order must always be strictly periodic.
4. Time crystals, including TRCs, require continuous external energy input to maintain their oscillations.

Which of the statements given above is/are correct?
(a) One statement only
(b) Two statements only
(c) Three statements only
(d) All four statements

36. With reference to the proposed Laser Interferometer Lunar Antenna (LILA), consider the following statements:

1. LILA is designed to detect gravitational waves in the mid-frequency range that is not effectively covered by existing observatories like LIGO and LISA.
2. It is proposed to be located on the Moon to take advantage of low seismic activity and absence of atmospheric disturbances.
3. LILA uses radio wave interferometry to measure spacetime distortions caused by gravitational waves.
4. The project aims to bridge the frequency gap between ground-based and space-based gravitational wave detectors.

Which of the statements given above is/are correct?
(a) One statement only
(b) Two statements only
(c) Three statements only
(d) All four statements

37. With reference to the recent imaging of binary black holes in quasar OJ287, consider the following statements:

1. The observation was made using a space–ground interferometry system involving the RadioAstron telescope.
2. The quasar OJ287 is powered by a pair of supermassive black holes orbiting each other.
3. The periodic brightness variations observed in OJ287 are linked to interactions between the two black holes.
4. Gravitational waves generated by such systems are confined only to high-frequency bands detectable exclusively by ground-based observatories like LIGO.

Which of the statements given above is/are correct?
(a) One statement only
(b) Two statements only
(c) Three statements only
(d) All four statements

38. With reference to CMS-03 (GSAT-7R) and the LVM3 launch vehicle, consider the following statements:

1. CMS-03 is a multi-band military communication satellite designed for secure communications.
2. It is placed directly into Low Earth Orbit (LEO) for operational deployment.
3. LVM3 uses a cryogenic upper stage for its final propulsion phase.
4. CMS-03 replaces GSAT-7 (Rukmini), which was launched earlier for naval communication.

Which of the statements given above is/are correct?
(a) One statement only
(b) Two statements only
(c) Three statements only
(d) All four statements

39. Match the following:

List I (Aspect)	List II (Description)
1. CMS-03 (GSAT-7R)	A. Cryogenic upper stage propulsion system
2. LVM3	B. Multi-band military communication satellite
3. GSAT-7 (Rukmini)	C. Predecessor naval communication satellite
4. Launch Orbit	D. Geosynchronous Transfer Orbit (GTO)

Which of the following pairs are correctly matched?
(a) 1–B and 2–A
(b) 1–A, 2–B and 3–C
(c) 2–A, 3–C and 4–D
(d) 1–B, 2–A, 3–C and 4–D

40. Match the following:

List I (Feature)	List II (Description)
1. Transmission Medium	A. Uses visible/infrared /UV light via LEDs
2. Security	B. Signals cannot pass through walls
3. Bandwidth Advantage	C. Much wider spectrum than radio frequencies
4. Limitation	D. Requires line-of-sight and is affected by obstacles

Which of the following pairs are correctly matched?
(a) 1–A and 2–B only
(b) 1–A, 2–B and 3–C only
(c) 2–B, 3–C and 4–D only
(d) 1–A, 2–B, 3–C and 4–D

41. Match the following:

List I (Feature)	List II (Description)
1. DIVA Strategy	A. Distinguishes infected animals from vaccinated ones
2. gE Gene	B. Structural protein unrelated to virulence
3. Raksha-IBR	C. Indigenous gE-deleted marker vaccine for cattle
4. Virus Used	D. Bovine Herpesvirus-1 (BHV-1)

How many of the above pairs are correctly matched?
(a) One pair only
(b) Two pairs only
(c) Three pairs only
(d) All four pairs

42. Match the following:

List I (Feature)	List II (Description)
1. Monoclonal Antibodies	A. Laboratory-engineered proteins mimicking immune response
2. MAM01 Mechanism	B. Targets sporozoite stage via circumsporozoite protein (CSP)
3. RTS,S Vaccine	C. Single-dose therapy providing lifelong immunity
4. Malaria Transmission	D. Spread by Anopheles mosquitoes

How many of the above pairs are correctly matched?
(a) One pair only
(b) Two pairs only
(c) Three pairs only
(d) All four pairs

43. With reference to Oral Rehydration Salts (ORS) and recent FSSAI regulations, consider the following statements:

1. Only products conforming to WHO-recommended composition can be labelled and marketed as ORS in India.
2. ORS works primarily by enhancing glucose absorption in the intestine, which indirectly improves water uptake.
3. The standard WHO-recommended ORS composition includes sodium chloride, glucose, potassium chloride, and trisodium citrate.
4. Flavoured beverages and sugary drinks can be used as substitutes for ORS in managing dehydration in children.

Which of the statements given above is/are correct?
(a) One statement only
(b) Two statements only
(c) Three statements only
(d) All four statements

44. With reference to the Low-Altitude Economy (LAE) and drone-based applications in India, consider the following statements:

1. The Low-Altitude Economy refers to economic activities conducted in airspace below 3000 meters using technologies such as drones and eVTOLs.
2. Unmanned Traffic Management (UTM) systems are used to regulate air traffic of manned aircraft in high-altitude airspace.
3. eVTOL aircraft are designed for vertical take-off and landing, enabling urban air mobility solutions.
4. Drones are increasingly used in sectors such as agriculture, logistics, and disaster management.

Which of the statements given above is/are correct?
(a) One statement only
(b) Two statements only
(c) Three statements only
(d) All four statements

45. With reference to Xenobiology, consider the following statements:

1. Xenobiology involves the study and creation of life forms using alternative genetic systems different from DNA and RNA.
2. Synthetic nucleic acids (XNAs) used in xenobiology can store and transmit genetic information.
3. Organisms developed through xenobiology can freely exchange genetic material with natural organisms in ecosystems.
4. Xenobiology has applications in bioengineering, including the production of medicines using engineered microbes.

Which of the statements given above is/are correct?
(a) One statement only
(b) Two statements only
(c) Three statements only
(d) All four statements

46. With reference to siphon-powered thermal desalination, consider the following statements:

1. The system uses a thermal process combined with a siphon mechanism to maintain continuous flow of water.
2. It prevents salt crystallization by ensuring uninterrupted movement of saline water.
3. The system is dependent entirely on grid-based electricity and cannot operate using renewable energy sources.
4. It can be suitable for off-grid and disaster-affected regions.

Which of the statements given above is/are correct?
(a) One statement only
(b) Two statements only
(c) Three statements only
(d) All four statements

47. With reference to CMS-03 (GSAT-7R) and the LVM3-M5 launch vehicle, consider the following statements:

1. CMS-03 is a multi-band military communication satellite primarily serving the Indian Navy.
2. It provides secure communication coverage across the Indian Ocean Region (IOR).
3. LVM3 uses only solid propulsion in all its stages.
4. The cryogenic upper stage of LVM3 is designated as C25.

Which of the statements given above is/are correct?
(a) One statement only
(b) Two statements only
(c) Three statements only
(d) All four statements

48. With reference to the Integrated Main Parachute Airdrop Test (IMAT) under the Gaganyaan Mission, consider the following statements:

1. IMAT is conducted to test the parachute system of the crew module for safe atmospheric re-entry.
2. The test involves dropping a full-scale crew module from a satellite in Low Earth Orbit.
3. The system includes redundancy such that the mission remains safe even if one of the parachutes fails.
4. Gaganyaan aims to send astronauts to Geostationary Orbit (GEO) for long-duration missions.

Which of the statements given above is/are correct?
(a) One statement only
(b) Two statements only
(c) Three statements only
(d) All four statements

49. With reference to space debris and global mitigation mechanisms, consider the following statements:

1. Space debris larger than 1 cm can potentially damage satellites and spacecraft in Low Earth Orbit.
2. The Kessler Syndrome refers to a cascading chain reaction of collisions that can render certain orbits unusable.
3. The Zero Debris Charter 2030 aims to eliminate all existing space debris currently orbiting the Earth.
4. Active Debris Removal (ADR) techniques include robotic capture, nets, and harpoons to deorbit debris.

Which of the statements given above is/are correct?
(a) One statement only
(b) Two statements only
(c) Three statements only
(d) All four statements

50. With reference to geomagnetic storms and their impacts, consider the following statements:

1. Geomagnetic storms are primarily triggered by Coronal Mass Ejections (CMEs) interacting with Earth's magnetosphere.
2. The Dst (Disturbance Storm Time) index increases sharply during intense geomagnetic storms.
3. Interplanetary Magnetic Field (IMF) conditions influence how solar particles penetrate Earth's magnetic shield.
4. Strong geomagnetic storms can disrupt satellite operations, GPS signals, and power grids.

Which of the statements given above is/are correct?
(a) One statement only
(b) Two statements only
(c) Three statements only
(d) All four statements

51. With reference to Black Hole "Morsels", consider the following statements:

1. Black hole morsels are hypothetical micro black holes that may form during extreme astrophysical events such as black hole mergers.
2. They are extremely long-lived objects comparable to stellar-mass black holes.
3. Hawking radiation plays a significant role in their rapid evaporation and short lifespan.
4. Observations of such objects could provide insights into quantum gravity and Planck-scale physics.

Which of the statements given above is/are correct?
(a) One statement only
(b) Two statements only
(c) Three statements only
(d) All four statements

52. Which of the following best describes Young Stellar Objects (YSOs)?
(a) Fully formed stars that have exhausted their nuclear fuel and are cooling remnants
(b) Forming stars surrounded by disks of gas and dust, yet to begin stable hydrogen fusion
(c) Massive stars undergoing supernova explosions at the end of their lifecycle
(d) Compact stellar remnants composed primarily of neutrons

53. With reference to Digital Sovereignty, consider the following statements:

1. Digital sovereignty refers to a country's ability to control its data, digital infrastructure, and technology ecosystem.
2. Dependence on foreign digital platforms and infrastructure can pose risks to national security and policy autonomy.
3. Digital Public Infrastructure (DPI) such as Aadhaar and UPI reduces reliance on global tech systems.
4. The OECD's Pillar-One framework fully supports unrestricted digital taxation by individual countries.

Which of the statements given above is/are correct?
(a) One statement only
(b) Two statements only
(c) Three statements only
(d) All four statements

54. With reference to Bhashini (National Language Translation Mission) and vernacular AI tools in India, consider the following statements:

1. Bhashini aims to enable real-time translation and speech-to-text services across multiple Indian languages using Artificial Intelligence.
2. It is implemented under the Ministry of Electronics and Information Technology (MeitY).
3. Bhashini primarily focuses on promoting English as a common digital language across India.
4. Vernacular AI tools under Bhashini can enhance accessibility of digital services

such as governance, education, and banking.

Which of the statements given above is/are correct?
(a) One statement only
(b) Two statements only
(c) Three statements only
(d) All four statements

55. With reference to ESTIC 2025 and the ₹1 lakh crore Research, Development & Innovation (RDI) Scheme, consider the following statements:

1. ESTIC is an annual flagship platform aimed at strengthening India's research and innovation ecosystem through cross-sector collaboration.
2. The RDI Scheme focuses only on government-funded research institutions and excludes private sector participation.
3. The scheme includes financial instruments such as long-term loans and equity support for high-technology startups.
4. The Special Purpose Fund (SPF) under the scheme is managed by the Anusandhan National Research Foundation (ANRF).

Which of the statements given above is/are correct?
(a) One statement only
(b) Two statements only
(c) Three statements only
(d) All four statements

56. With reference to the Quantum Diamond Microscope (QDM), consider the following statements:

1. QDM is based on nitrogen-vacancy (NV) centres in diamond that are sensitive to magnetic fields.
2. It operates using Optically Detected Magnetic Resonance (ODMR) to enable magnetic imaging.
3. QDM requires cryogenic temperatures to maintain quantum coherence during operation.
4. It can be used for non-destructive analysis of semiconductor devices and subsurface current mapping.

Which of the statements given above is/are correct?
(a) One statement only
(b) Two statements only
(c) Three statements only
(d) All four statements

57. Which of the following best describes a Scintillometer?
(a) An instrument used to measure atmospheric pressure variations at high altitudes
(b) A device that measures heat and moisture exchange between land surface and atmosphere using light beam fluctuations
(c) A satellite-based sensor used for mapping ocean salinity and temperature
(d) A ground-based instrument used to detect seismic waves during earthquakes

58. With reference to the indigenous gene-editing system based on TnpB proteins, consider the following statements:

1. TnpB proteins are considered evolutionary precursors of CRISPR-Cas enzymes and function as molecular scissors for gene editing.
2. TnpB-based systems are significantly larger in size than Cas9 and Cas12a, making them less efficient for delivery.
3. The compact size of TnpB enables efficient delivery into cells and may reduce off-target effects.
4. TnpB proteins used in such systems have been derived from extremophilic bacteria like *Deinococcus radiodurans*.

Which of the statements given above is/are correct?
(a) One statement only
(b) Two statements only
(c) Three statements only
(d) All four statements

59. With reference to DNA (Deoxyribonucleic Acid) and its structure, consider the following statements:

1. DNA has a double-helix structure consisting of two strands wound around each other.
2. Adenine pairs with Cytosine, and Guanine pairs with Thymine in DNA.
3. In eukaryotic cells, DNA is primarily located in the nucleus and mitochondria.
4. DNA carries genetic information that directs protein synthesis and regulates biological processes.

Which of the statements given above is/are correct?
(a) One statement only
(b) Two statements only
(c) Three statements only
(d) All four statements

60. With reference to the National Action Plan on Antimicrobial Resistance (NAP-AMR) 2.0, consider the following statements:

1. It adopts a One Health approach integrating human, animal, and environmental health sectors.
2. It focuses exclusively on human healthcare and excludes agriculture and veterinary sectors.
3. Strengthening infection prevention and control (IPC) and laboratory surveillance are among its priority areas.
4. It is a short-term annual programme aligned only with World AMR Awareness Week.

Which of the statements given above is/are correct?
(a) One statement only
(b) Two statements only
(c) Three statements only
(d) All four statements

61. With reference to Antimicrobial Resistance (AMR) and superbugs, consider the following statements:

1. ESBL-producing bacteria can break down commonly used antibiotics such as penicillins and cephalosporins.
2. Carbapenem-resistant organisms are resistant to last-resort antibiotics, making infections difficult to treat.
3. Antimicrobial resistance is primarily caused only by overuse of antibiotics in human healthcare settings.
4. Poor infection control and excessive use of antibiotics in livestock contribute to the spread of antimicrobial resistance.

Which of the statements given above is/are correct?
(a) One statement only
(b) Two statements only
(c) Three statements only
(d) All four statements

62. With reference to antibiotic combinations and antimicrobial resistance (AMR), consider the following statements:

1. Combining bacteriostatic and bactericidal antibiotics can sometimes reduce treatment effectiveness.
2. Bactericidal antibiotics require actively dividing bacteria to effectively kill them.
3. Antibiotic antagonism can lead to increased survival of bacteria under treatment.
4. Use of multiple antibiotics together always reduces the risk of antimicrobial resistance.

Which of the statements given above is/are correct?
(a) One statement only
(b) Two statements only
(c) Three statements only
(d) All four statements

63. With reference to Encephalomyocarditis Virus (EMCV), consider the following statements:

1. EMCV is a positive-sense, single-stranded RNA virus.
2. It is primarily transmitted by mosquitoes and other insect vectors.
3. Rodents act as natural reservoirs and can carry the virus asymptomatically.
4. There is a widely available commercial vaccine for EMCV in humans.

Which of the statements given above is/are correct?
(a) One statement only
(b) Two statements only
(c) Three statements only
(d) All four statements

64. With reference to H5N5 Avian Influenza, consider the following statements:

1. H5 refers to haemagglutinin, which helps the virus enter host cells, while N5 refers to neuraminidase, which aids in viral release.
2. H5N5 and H5N1 are identical strains of influenza A virus since they share the same haemagglutinin subtype.
3. Human infections of H5N5 are extremely rare and primarily occur through direct contact with infected birds or contaminated environments.
4. Sustained human-to-human transmission has been established for H5N5.

Which of the statements given above is/are correct?
(a) One statement only
(b) Two statements only
(c) Three statements only
(d) All four statements

65. With reference to the Nipah Virus (NiV) and monoclonal antibody (mAb) therapy, consider the following statements:

1. Nipah virus is a single-stranded, negative-sense RNA virus belonging to the Paramyxoviridae family.
2. Fruit bats of the genus *Pteropus* are natural reservoirs of the virus.
3. Monoclonal antibodies are laboratory-engineered molecules that target specific antigens and can be used in treating viral infections.
4. Nipah virus has a widely available approved antiviral drug and vaccine for human use.

Which of the statements given above is/are correct?
(a) One statement only
(b) Two statements only
(c) Three statements only
(d) All four statements

66. With reference to Hepatitis A, consider the following statements:

1. Hepatitis A virus (HAV) is a non-enveloped RNA virus transmitted primarily through the faecal–oral route.
2. Hepatitis A infection is usually chronic and leads to long-term liver damage in most cases.
3. There is no specific antiviral treatment for Hepatitis A, and management is largely supportive.
4. Vaccination against Hepatitis A is considered the most effective preventive measure.

Which of the statements given above is/are correct?
(a) One statement only
(b) Two statements only
(c) Three statements only
(d) All four statements

67. With reference to Ricin and ANFO, consider the following statements:
1. Ricin is a highly toxic protein derived from castor seeds and acts by inhibiting protein synthesis in cells.
2. Ricin remains stable at all temperatures and cannot be inactivated by heat.
3. Ammonium nitrate by itself is non-explosive under normal conditions but can become explosive when mixed with fuel oil.
4. ANFO is widely used as a high explosive in military-grade weapons systems.

Which of the statements given above is/are correct?
(a) One statement only
(b) Two statements only
(c) Three statements only
(d) All four statements

68. With reference to Auramine O, consider the following statements:
1. Auramine O is a synthetic dye that is not approved for use in food in India.
2. It is commonly used as a permitted food colour due to its bright yellow appearance.
3. Long-term exposure to Auramine O may increase the risk of cancer.

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

69. With reference to the recent seizure of Chinese mitten crabs containing sulfadiazine, consider the following statements:
1. Sulfadiazine is a sulfonamide antibiotic that inhibits bacterial growth by blocking folic acid synthesis.
2. Residues of sulfonamide antibiotics in seafood are permitted within safe limits under Indian food safety regulations.
3. Overuse of sulfonamide antibiotics can contribute to antimicrobial resistance (AMR).

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

70. With reference to the Minamata Convention on Mercury, consider the following statements:
1. The Minamata Convention is a legally binding international treaty aimed at protecting human health and the environment from mercury.
2. It mandates a complete and immediate global ban on all mercury use in industrial and medical applications.
3. The Convention includes measures such as phasing out mercury-added products and controlling emissions and releases.

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

71. With reference to bioremediation using Bokashi balls, consider the following statements:
1. Bokashi balls contain effective microorganisms such as lactic acid bacteria and yeast that help in decomposing organic waste.
2. They are primarily used to increase salinity levels in water bodies for pollutant removal.
3. Bokashi balls can help improve dissolved oxygen levels and reduce foul odour in polluted water bodies.
4. Biochar or charcoal may be added to Bokashi balls to aid in adsorption of pollutants.

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

72. With reference to the Vanadium Redox Flow Battery (VRFB), consider the following statements:

1. VRFB stores energy using vanadium ions in different oxidation states dissolved in liquid electrolytes.
2. It uses solid electrodes to store energy internally, similar to lithium-ion batteries.
3. VRFB systems are suitable for large-scale grid energy storage due to their scalability and long life.
4. Flow batteries typically use two separate liquid electrolytes stored in external tanks.

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

73. With reference to the recently observed "Superkilonova" event AT2025ulz, consider the following statements:

1. A superkilonova is theorized as a combination of a supernova explosion and a kilonova originating from the same progenitor system.
2. Kilonovae occur due to the merger of neutron stars and emit both gravitational waves and electromagnetic radiation.
3. In a superkilonova event, the kilonova phase precedes the supernova explosion.
4. Observations of AT2025ulz included both gravitational wave detection and electromagnetic follow-up.

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

74. With reference to Google's Project Suncatcher, consider the following statements:

1. The project proposes deploying solar-powered data centres in space to reduce reliance on Earth-based energy and resources.
2. Satellites under this project are expected to use laser-based optical communication for data transmission.
3. The system depends primarily on fossil fuel-based backup systems to ensure uninterrupted power supply in space.
4. Radiation-hardened chips are required for reliable operation of computing systems in space environments.

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

75. With reference to Tensor Processing Units (TPUs) and Graphics Processing Units (GPUs), consider the following statements:

1. TPUs are application-specific integrated circuits (ASICs) designed to accelerate machine learning workloads.
2. GPUs are specialized only for AI workloads and cannot be used for general-purpose parallel computing.
3. TPUs are particularly efficient in performing tensor-based operations such as matrix multiplications.
4. Compared to GPUs, TPUs can offer higher throughput per watt in certain AI workloads.

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

76. With reference to DHRUV64, India's indigenous microprocessor, consider the following statements:

1. DHRUV64 is a 64-bit dual-core microprocessor based on the RISC-V open instruction set architecture.
2. It has been developed by the Centre for Development of Advanced Computing (C-DAC) under MeitY.
3. RISC-V is a proprietary instruction set architecture controlled by a single private company.
4. DHRUV64 is part of India's effort to build an indigenous semiconductor and electronics design ecosystem.

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

77. With reference to Out-of-Time-Order Correlators (OTOCs), consider the following statements:

1. OTOCs are used to study quantum chaos and information scrambling in quantum systems.
2. A high OTOC value indicates stable and reversible quantum evolution.
3. OTOCs are useful in benchmarking quantum hardware by testing coherence and error resilience.

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

78. With reference to quantum computing and its implications for cryptography, consider the following statements:

1. Quantum computers can potentially break widely used public-key cryptosystems like RSA by efficiently solving factorization problems.
2. Post-quantum cryptography aims to develop encryption systems resistant to quantum attacks.
3. The "Harvest Now, Decrypt Later" strategy refers to discarding encrypted data to avoid future decryption risks.

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

79. With reference to Optical Frequency Combs (OFCs), consider the following statements:

1. OFCs generate a spectrum of evenly spaced discrete frequencies that act as precise reference points.
2. They function like ultra-precise rulers for measuring frequency, wavelength, and time.
3. OFCs are primarily used only in optical communication and have no applications in astronomy or atomic clocks.
4. Mode-locked laser combs are among the most widely used types due to their stability and accuracy.

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

80. With reference to autophagy and recent findings on the exocyst complex, consider the following statements:

1. Autophagy is a cellular process that removes damaged organelles and protein aggregates through lysosomal degradation.
2. The exocyst complex plays a role in autophagosome formation.
3. Disruption of autophagy pathways can lead to accumulation of toxic cellular waste and neuronal cell death.
4. Autophagy is a process found only in higher organisms and is absent in simpler organisms like yeast.

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

81. With reference to biostimulants in agriculture, consider the following statements:

1. Biostimulants enhance plant growth and stress tolerance without directly acting as fertilizers.
2. They primarily function by supplying essential nutrients like nitrogen, phosphorus, and potassium to plants.
3. Biostimulants can be derived from sources such as seaweed extracts, microbes, and amino acids.
4. In India, biostimulants are regulated under the Fertiliser Control Order (FCO).

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

82. With reference to Mephadrone (4-MMC), consider the following statements:

1. Mephadrone is a synthetic stimulant chemically related to amphetamines.
2. It is legally permitted for recreational use under regulated conditions in India.
3. It is classified as a xenobiotic substance, meaning it is foreign to biological systems.
4. Mephadrone is regulated in India under the NDPS Act, 1985.

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

83. With reference to nitrofurans and their presence in food products, consider the following statements:

1. Nitrofurans are synthetic antimicrobial drugs previously used in veterinary and human medicine.
2. They are completely safe for long-term human consumption and pose no carcinogenic risk.
3. Nitrofurans can act as bacteriostatic at low doses and bactericidal at higher doses.
4. In India, the use of nitrofurans in food-producing animals has been formally banned.

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

84. With reference to Directed Energy Weapons (DEWs), consider the following statements:

1. DEWs use focused electromagnetic energy or subatomic particles to neutralize targets.
2. High-power microwave (HPM) weapons are primarily designed to destroy targets through explosive kinetic impact.
3. High-energy lasers (HEL) can damage drones, missiles, and sensors by emitting concentrated light energy.
4. DEWs can engage targets at or near the speed of light, enabling rapid response.

Which of the statements given above is/are correct?

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

85. With reference to Software Defined Radios (SDRs), consider the following statements:

1. SDRs replace traditional hardware-based signal processing components with software-based processing.
2. SDRs cannot be reconfigured once deployed, as their functionality depends on fixed hardware architecture.
3. SDRs support multiple frequency bands and communication modes through software updates.
4. SDRs can enable Mobile Ad hoc Networks (MANETs), allowing decentralized and resilient communication.

Which of the statements given above is/are correct?

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

86. With reference to Maglev (Magnetic Levitation) technology, consider the following statements:

1. Maglev trains eliminate wheel–rail contact, thereby significantly reducing friction.
2. Electromagnetic Suspension (EMS) systems can achieve levitation even when the train is stationary.
3. Electrodynamic Suspension (EDS) systems require wheels at low speeds before sufficient magnetic lift is generated.
4. Maglev propulsion relies on conventional internal combustion engines to generate forward motion.

Which of the statements given above is/are correct?

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

87. With reference to space insurance in India, consider the following statements:

1. Space insurance covers risks associated with satellite manufacturing, launch, and in-orbit operations.
2. Under international space law, a country bears liability for space activities launched from its territory, including private missions.
3. Absolute liability applies only to damages occurring in outer space and not on Earth.
4. A well-defined insurance and liability framework can enhance investor confidence and support commercialization of the space sector.

Which of the statements given above is/are correct?

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

88. With reference to international patent law and its application in outer space, consider the following statements:

1. Patent rights are territorial and are enforced within the jurisdiction of a specific nation-state.
2. There exists a single global patent system that grants universal protection across all countries.
3. Under space law, jurisdiction over a space object is determined by the state in which the object is registered.
4. The International Space Station (ISS) follows a module-based jurisdiction system where each module is governed by the laws of the contributing country.

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

89. With reference to ultracold atoms and their applications, consider the following statements:

1. Ultracold atoms are cooled to temperatures near absolute zero, where quantum effects become macroscopically observable.
2. At ultracold temperatures, atoms behave purely as classical particles with negligible wave-like properties.
3. Techniques such as laser cooling and evaporative cooling are used to achieve ultracold temperatures.
4. Bose–Einstein Condensate (BEC) represents a state where atoms behave as a single quantum entity.

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

90. With reference to nuclear fusion and tokamak reactors, consider the following statements:

1. Nuclear fusion involves combining light nuclei such as deuterium and tritium to form helium, releasing large amounts of energy.
2. The Greenwald limit defines the maximum temperature beyond which plasma becomes unstable in a tokamak.
3. Tokamaks use strong magnetic fields to confine high-temperature plasma for controlled fusion reactions.
4. Fusion energy produces long-lived radioactive waste comparable to that of nuclear fission reactors.

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

91. With reference to the Mpemba Effect, consider the following statements:

1. The Mpemba Effect refers to the phenomenon where, under certain conditions, hot water can freeze faster than cold water.
2. It is fully explained by classical thermodynamics without involving any intermediate molecular states.
3. Recent studies suggest that cold water may get trapped in metastable intermediate states, delaying crystallisation.
4. The Mpemba Effect was first observed in modern times by Erasto Mpemba and had no historical references before that.

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

92. With reference to PathGenie, consider the following statements:

1. PathGenie is an open-source computational tool designed to simulate drug–protein unbinding events.
2. Drug unbinding kinetics refers to how quickly a drug binds to its target protein.
3. Drugs with longer residence time on target proteins often show better therapeutic performance.
4. PathGenie was developed under the Department of Science and Technology (DST).

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

93. With reference to *Bacillus subtilis*, recently declared as a State Microbe by Kerala, consider the following statements:

1. *Bacillus subtilis* is a Gram-positive, rod-shaped bacterium capable of forming endospores.
2. It is an obligate anaerobe that cannot survive in the presence of oxygen.
3. It is naturally competent, meaning it can uptake foreign DNA from its surroundings.
4. It has applications in agriculture as a bio-fungicide and plant growth promoter.

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

94. With reference to bio-bitumen, consider the following statements:

1. Bio-bitumen is produced from biomass residues and can partially replace petroleum-based bitumen in road construction.
2. It is produced through processes such as pyrolysis of agricultural or organic waste.
3. Bio-bitumen completely replaces conventional bitumen without any blending requirements.
4. Use of bio-bitumen can help reduce greenhouse gas emissions and dependence on fossil fuels.

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

95. With reference to Vehicle-to-Vehicle (V2V) communication technology, consider the following statements:

1. V2V communication enables vehicles to exchange real-time data such as speed, position, and braking information.
2. V2V systems rely entirely on cellular networks and telecom towers for communication between vehicles.
3. V2V operates through Vehicular Ad-hoc Networks (VANETs), where vehicles act as nodes in a network.
4. V2V data can be integrated with Advanced Driver Assistance Systems (ADAS) to improve road safety.

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

96. With reference to ECOFIX pothole repair technology, consider the following statements:

1. ECOFIX is a cold-mix, ready-to-use material that can be applied even in wet or waterlogged conditions.
2. It primarily uses petroleum-based hot bitumen and requires high-temperature application.
3. Processed steel slag is used as a core material in ECOFIX.
4. ECOFIX technology helps reduce carbon footprint compared to conventional hot-mix road repair methods.

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

97. With reference to biomaterials, consider the following statements:

1. Biomaterials are derived wholly or partially from biological sources and can replace conventional fossil-based materials.
2. Drop-in biomaterials are chemically different from petro-materials and require new processing systems.
3. Drop-out biomaterials such as PLA require new processing or end-of-life systems.
4. Biomaterials contribute to a low-carbon and circular economy by reducing dependence on fossil resources.

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

98. With reference to recent developments in Artificial Intelligence applied to genomics, consider the following statements regarding AlphaGenome:

1. It primarily focuses on predicting the effects of mutations in non-coding regions of DNA that regulate gene expression.
2. It directly predicts the impact of mutations on protein synthesis by altering coding DNA sequences.
3. It builds upon earlier models like AlphaMissense, which classify harmful mutations in coding regions.
4. Non-coding DNA does not produce proteins but can influence gene activity through regulatory mechanisms.

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

99. The recently launched ₹1 lakh crore Research, Development and Innovation (RDI) Fund in India is primarily aimed at which of the following?
(a) Providing direct grants and subsidies for agricultural inputs to farmers
(b) Financing large-scale infrastructure projects such as highways and ports
(c) Supporting the commercialisation of indigenous research and deep-tech innovations
(d) Offering universal income support to startups and MSMEs

100. The 16th Finance Commission's recommendation to include heatwaves and lightning in India's list of notified disasters would primarily have which of the following implications?
(a) It will automatically classify them as international disasters under UN frameworks
(b) It will enable access to structured disaster relief funding under SDRF and NDRF
(c) It will transfer complete disaster management responsibility to the Central Government
(d) It will eliminate the need for state-level disaster response mechanisms