Science & Technology

DAILY PRACTICE 06/11/2026 · UPSC CSE · Science & Technology

Q1.

With reference to industrial robotics and strategic technology governance, consider the following statements:

1. Industrial robots are used in manufacturing for tasks such as welding, assembly, material handling and precision operations.
2. Robotics integrates disciplines such as mechanical engineering, electronics, control systems and artificial intelligence.
3. Foreign investment screening may be used by governments to examine acquisitions involving national security or strategic technologies.
4. Cross-border acquisitions of technology companies are universally exempt from regulatory scrutiny under international trade rules.

Which of the statements given above is/are correct?

A. 1 and 2 only

B. 1, 2 and 3 only

C. 2 and 4 only

D. 1, 2, 3 and 4

Correct answer: Option B — 1, 2 and 3 only

Explanation

Correct Answer: (b) — Statements 1, 2 and 3 are correct.

1. **Statement 1 is correct:** Industrial robots perform repetitive, precision-based and hazardous manufacturing tasks.
2. **Statement 2 is correct:** Robotics combines mechanical, electronic, computational and intelligent control technologies.
3. **Statement 3 is correct:** Investment screening can assess national security and strategic technology risks associated with foreign acquisitions.
4. **Statement 4 is incorrect:** Cross-border acquisitions may be subject to domestic competition, investment and national security regulations.

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Q2.

With reference to artificial intelligence (AI) governance and child safety, consider the following statements:

1. AI chatbots may generate harmful responses if adequate safety testing and safeguards are absent.
2. The principle of privacy by design requires organisations to consider data protection from the initial stages of system development.
3. The Digital Personal Data Protection Act, 2023, provides specific safeguards for processing children's personal data.
4. AI-generated responses are automatically exempt from legal liability because they are produced by algorithms.

Which of the statements given above is/are correct?

A. 1 and 2 only

B. 1, 2 and 3 only

C. 2, 3 and 4 only

D. 1, 2, 3 and 4

Correct answer: Option B — 1, 2 and 3 only

Explanation

Correct Answer: (b) — Statements 1, 2 and 3 are correct.

1. **Statement 1 is correct:** Inadequate testing and safeguards can allow AI systems to produce harmful outputs.
2. **Statement 2 is correct:** Privacy by design integrates data protection into system development from the beginning.
3. **Statement 3 is correct:** The DPDP Act provides special provisions concerning children's personal data, including parental consent requirements.
4. **Statement 4 is incorrect:** AI deployment does not automatically exempt developers or organisations from applicable legal liability.

Q3.

With reference to science and technology advisory institutions and Artificial Intelligence (AI) governance, consider the following statements:

1. The President's Council of Advisers on Science and Technology (PCAST) is an advisory body to the US President.
2. PCAST is responsible for directly implementing and regulating all scientific research activities in the United States.
3. Artificial Intelligence governance involves addressing issues such as algorithmic bias, data privacy and accountability.
4. Generative AI systems can produce new content such as text, images and audio.

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

Correct answer: Option B — 1, 3 and 4 only

Explanation

Correct Answer: (b) — Statements 1, 3 and 4 only.

1. **Statement 1 is correct:** PCAST provides scientific and technological advice to the US President.
2. **Statement 2 is incorrect:** PCAST is an advisory body, not a direct regulator or implementing agency.
3. **Statement 3 is correct:** AI governance addresses fairness, privacy, transparency and accountability.
4. **Statement 4 is correct:** Generative AI produces new content based on patterns learned during training.

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Q4.

With reference to Artificial Intelligence (AI) in cybersecurity, consider the following statements:

1. AI-based cybersecurity tools can assist in identifying software vulnerabilities and developing security patches.
2. GPT-6 Cyber is designed to support authorised cybersecurity research within defined operational boundaries.
3. ExploitGym is a benchmark used to evaluate the ability of AI models to exploit specified vulnerabilities in remote targets.
4. The use of AI in cybersecurity completely eliminates the possibility of cyberattacks and unauthorised access.

Which of the statements given above is/are correct?

A. 1, 2 and 3 only

B. 1 and 4 only

C. 2 and 4 only

D. 1, 2, 3 and 4

Correct answer: Option A — 1, 2 and 3 only

Explanation

Correct Answer: (a) — Statements 1, 2 and 3 are correct.

1. **Statement 1 is correct:** AI can identify vulnerabilities, analyse code and assist in developing security patches.
2. **Statement 2 is correct:** GPT-6 Cyber is designed for authorised vulnerability research within specified boundaries.
3. **Statement 3 is correct:** ExploitGym evaluates whether models can exploit specified vulnerabilities in remote targets.
4. **Statement 4 is incorrect:** AI can strengthen cybersecurity but cannot completely eliminate cyber threats.

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Q5.

With reference to the regulation and safety monitoring of medical devices in India, consider the following statements:

1. Medical devices in India are regulated under the Drugs and Cosmetics Act, 1940 and the Medical Devices Rules, 2017.
2. The Central Drugs Standard Control Organisation (CDSCO) functions under the Ministry of Health and Family Welfare.
3. The Materiovigilance Programme of India (MvPI) monitors adverse events associated with medical devices.
4. Every adverse event reported under medical device surveillance automatically establishes that the device caused the reported harm.

Which of the statements given above is/are correct?

A. 1, 2 and 3 only

B. 1 and 4 only

C. 2 and 4 only

D. 1, 2, 3 and 4

Correct answer: Option A — 1, 2 and 3 only

Explanation

Correct Answer: (a) — Statements 1, 2 and 3 are correct.

1. **Statement 1 is correct:** Medical devices are regulated through the Drugs and Cosmetics Act and Medical Devices Rules, 2017.
2. **Statement 2 is correct:** CDSCO operates under the Directorate General of Health Services, Ministry of Health and Family Welfare.
3. **Statement 3 is correct:** MvPI monitors and analyses adverse events associated with medical devices.
4. **Statement 4 is incorrect:** An adverse-event report indicates a possible safety concern, not necessarily proven causation.

Q6.

With reference to Voyager 1 and NASA's Deep Space Network (DSN), consider the following statements:

1. Voyager 1 communicates with Earth using radio waves transmitted through its high-gain antenna.
2. Radio signals transmitted by Voyager 1 travel at approximately the speed of light.
3. NASA's Deep Space Network uses large parabolic antennas to receive signals from distant spacecraft.
4. Voyager 1 is currently orbiting Jupiter and transmitting data from its magnetosphere.

Which of the statements given above is/are correct?

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A. 1 and 2 only

B. 1, 2 and 3 only

C. 2 and 4 only

D. 1, 2, 3 and 4

Correct answer: Option B — 1, 2 and 3 only

Explanation

Correct Answer: (b) — Statements 1, 2 and 3 only.

1. **Statement 1 is correct:** Voyager 1 uses its high-gain antenna to communicate with Earth through radio signals.
2. **Statement 2 is correct:** Radio waves are electromagnetic waves and travel at the speed of light in a vacuum.
3. **Statement 3 is correct:** DSN uses large parabolic dish antennas to receive extremely weak spacecraft signals.
4. **Statement 4 is incorrect:** Voyager 1 has travelled beyond the heliosphere into interstellar space.

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Q7.

When the alarm of your smartphone rings in the morning, you wake up and tap it to stop the alarm which causes your geyser to be switched on automatically. The smart mirror in your bathroom shows the day's weather and also indicates the level of water in your overhead tank. After you take some groceries from your refrigerator for making breakfast, it recognizes the shortage of stock in it and places an order for the supply of fresh grocery items. When you step out of your house and lock the door, all lights, fans, geysers and AC machines get switched off automatically. On your way to office, your car warns you about traffic congestion ahead and suggests an alternative route, and if you are late for a meeting, it sends a message to your office accordingly.

In the context of emerging communication technologies, which one of the following terms best applies to the above scenario?

A. Border Gateway Protocol

B. Internet of Things

C. Internet Protocol

D. Virtual Private Network

Correct answer: Option B — Internet of Things

Explanation

Correct Answer: (b) — Internet of Things:

The Internet of Things (IoT) refers to a network of physical objects embedded with sensors, software and communication technologies that enable them to collect and exchange data over the internet.

In the given scenario, smartphones, refrigerators, smart mirrors, vehicles and household appliances communicate with each other and perform automated functions.

Border Gateway Protocol is used for routing information between autonomous systems on the internet. Internet Protocol provides addressing and communication rules, while a Virtual Private Network creates an encrypted network connection.

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Q8.

Consider the following pairs:

Terms	Context/Topic
1. Belle II experiment	Artificial Intelligence
2. Blockchain technology	Digital/Cryptocurrency
3. CRISPR-Cas9	Particle Physics

Which of the pairs given above is/are correctly matched?

A. 1 and 3 only

B. 2 only

C. 2 and 3 only

D. 1, 2 and 3

Correct answer: Option B — 2 only

Explanation

Correct Answer: (b) — 2 only:

Pair 1 is incorrectly matched. Belle II is a particle physics experiment conducted to study fundamental particles and their interactions.

Pair 2 is correctly matched. Blockchain is a distributed digital ledger technology widely associated with cryptocurrencies such as Bitcoin.

Pair 3 is incorrectly matched. CRISPR-Cas9 is a gene-editing technology used to modify DNA sequences in living organisms. It is not related to particle physics.

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Q9.

With reference to the Genetically Modified mustard (GM mustard) developed in India, consider the following statements:

1. GM mustard has the genes of a soil bacterium that give the plant the property of pest-resistance to a wide variety of pests.
2. GM mustard has the genes that allow the plant cross-pollination and hybridization.
3. GM mustard has been developed jointly by the IARI and Punjab Agricultural University.

Which of the statements given above is/are correct?

A. 1 and 3 only

B. 2 only

C. 2 and 3 only

D. 1, 2 and 3

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Correct answer: Option B — 2 only

Explanation

Correct Answer: (b) — 2 only:

Statement 1 is incorrect. GM mustard DMH-11 is not a Bt crop developed for resistance against a wide variety of insect pests. Its genetic

modification primarily facilitates hybrid seed production.

Statement 2 is correct. The Barnase and Barstar genes help overcome the difficulty of self-pollination in mustard and facilitate the production of hybrid seeds. The Bar gene is used as a selectable marker and provides herbicide tolerance.

Statement 3 is incorrect. GM mustard was developed by researchers at the Centre for Genetic Manipulation of Crop Plants, University of Delhi, not jointly by IARI and Punjab Agricultural University.

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Q10.

Consider the following phenomena:

1. Light is affected by gravity.
2. The universe is constantly expanding.
3. Matter warps its surrounding space-time.

Which of the above is/are the prediction/predictions of Albert Einstein's General Theory of Relativity, often discussed in media?

A. 1 and 2 only

B. 3 only

C. 1 and 3 only

D. 1, 2 and 3

Correct answer: Option C — 1 and 3 only

Explanation

Correct Answer: (c) — 1 and 3 only:

Statement 1 is correct. General Relativity predicts that gravity influences the path of light. This phenomenon is known as gravitational lensing.

Statement 2 is incorrect in the context of the question. The expansion of the universe is described by cosmological solutions of Einstein's field equations, but it is not an unavoidable prediction that the universe must constantly expand under every possible condition.

Statement 3 is correct. According to General Relativity, matter and energy curve the fabric of spacetime. Objects move through this curved spacetime, and this curvature is perceived as gravity.

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