Science & Technology

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Q1.

Which of the following best distinguishes Artificial General Intelligence (AGI) from present-day narrow AI systems?

A. AGI is designed exclusively to perform one predefined task with high accuracy.

B. AGI aims to demonstrate broad cognitive capabilities across diverse tasks and domains.

C. AGI necessarily possesses human emotions and biological consciousness.

D. AGI operates without requiring computational infrastructure or training data.

Correct answer: Option B — AGI aims to demonstrate broad cognitive capabilities across diverse tasks and domains.

Explanation

Correct Answer: (b) — AGI aims to demonstrate broad cognitive capabilities across diverse tasks and domains.

1. **Narrow AI:** Most existing AI systems are developed for specific tasks or defined ranges of applications.
2. **Artificial General Intelligence:** AGI refers to a proposed form of AI capable of performing a broad range of intellectual tasks with generalised adaptability.

3. **Consciousness:** General intelligence and consciousness are separate concepts. Achieving AGI would not automatically establish that a system possesses subjective experiences or emotions.
4. **Present limitations:** Current AI systems can generate sophisticated responses but may produce inaccurate information, struggle with unfamiliar situations and lack reliable contextual judgment.

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Q2.

In a food safety investigation, a regulatory laboratory and two independent laboratories report conflicting results for samples belonging to the same production batch. Which approach would best strengthen the credibility of the regulatory assessment?

A. Accept the results of the laboratory reporting the highest number of compliant parameters.

B. Disregard the regulatory findings if the manufacturer disputes them.

C. Examine sampling procedures, sample integrity, chain of custody and testing methodologies through an independent review.

D. Declare the entire production facility permanently unsafe without further investigation.

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Correct answer: Option C — Examine sampling procedures, sample integrity, chain of custody and testing methodologies through an independent review.

Explanation

Correct Answer: (c) — Examine sampling procedures, sample integrity, chain of custody and testing methodologies through an independent review.

1. **Sampling procedure:** Representative sampling is essential to ensure that the tested material accurately reflects the relevant batch.

2. **Sample integrity:** Proper sealing, storage and transportation help prevent contamination or deterioration before testing.
3. **Chain of custody:** Documenting the collection, transfer and handling of samples establishes their traceability and evidentiary reliability.
4. **Testing methodology:** Standardised procedures, calibrated equipment and competent laboratories improve the reliability and comparability of results.
5. **Regulatory assessment:** Conflicting findings require scientific examination rather than automatically accepting either the manufacturer's or regulator's position.

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Q3.

A laboratory detects coliform bacteria in a packaged drinking water sample. Which is the most scientifically appropriate interpretation of this finding?

A. It conclusively establishes the presence of cholera-causing bacteria.

B. It indicates a possible failure of hygienic conditions and warrants further microbiological investigation.

C. It proves that the water contains heavy metals above permissible limits.

D. It establishes that the water is safe if no unpleasant smell is detected.

Correct answer: Option B — It indicates a possible failure of hygienic conditions and warrants further microbiological investigation.

Explanation

Correct Answer: (b) — It indicates a possible failure of hygienic conditions and warrants further microbiological investigation.

1. **Indicator organisms:** Coliform bacteria are commonly used as indicators of sanitary quality and possible microbial contamination.
2. **Source of contamination:** Their presence may indicate contamination associated with sewage, animal waste or inadequate handling and processing.
3. **Scientific limitation:** Detection of coliforms does not automatically establish the presence of a specific disease-causing pathogen.

4. **Further testing:** Additional microbiological tests, including testing for *Escherichia coli* and specific pathogens where appropriate, help assess the nature of contamination.

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Q4.

A High Court introduces an AI-based tool to summarise case records, conduct legal research and organise judicial documents. Which of the following principles should guide its use?

A. AI-generated recommendations should automatically determine the final judicial outcome.

B. AI should replace judges in routine as well as substantive decision-making.

C. AI may assist administrative and research functions, while judicial reasoning and final decisions remain the responsibility of judges.

D. AI-generated judgments should be legally binding once verified by court staff.

Correct answer: Option C — AI may assist administrative and research functions, while judicial reasoning and final decisions remain the responsibility of judges.

Explanation

Correct Answer: (c) — AI may assist administrative and research functions, while judicial reasoning and final decisions remain the responsibility of judges.

1. **Human accountability:** Judicial decisions involve interpretation of law, evaluation of evidence and application of constitutional principles. Final responsibility must remain with the judge.

2. **Administrative efficiency:** AI can assist with repetitive tasks such as data entry, document classification, transcription and case-file management.
3. **Research assistance:** AI tools can help locate relevant legal materials, but their outputs require independent verification.
4. **Procedural fairness:** Unchecked AI use may introduce errors, bias, confidentiality risks and lack of transparency.

Q5.

The term 'dual-use technology', frequently used in discussions on strategic technology export controls, refers to:

A. Technology that can be used only for civilian industrial applications.

B. Technology that has both civilian and military or strategic applications.

C. Technology jointly developed by two sovereign countries.

D. Technology that can be exported only through bilateral agreements.

Correct answer: Option B — Technology that has both civilian and military or strategic applications.

Explanation

Correct Answer: (b) — Technology that has both civilian and military or strategic applications.

1. **Dual-use nature:** Certain technologies have legitimate civilian applications but can also be adapted for military or strategic purposes.
2. **Artificial intelligence chips:** Advanced semiconductors and high-performance computing systems can support scientific research, commercial AI and military applications.
3. **Export controls:** Governments regulate the export of sensitive technologies to prevent their use in activities considered threats to national security.

4. **Enforcement challenges:** Smuggling, shell companies, third-country intermediaries and misrepresentation of end users can undermine export restrictions.

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Q6.

Consider the following constitutional provisions and their relevance to the composition of the Lok Sabha:

1. Article 81 deals with the composition of the House of the People.
2. Article 82 provides for readjustment of the allocation of seats and territorial constituencies following each census, subject to constitutional provisions.
3. Article 170 deals with the composition of State Legislative Assemblies.

Which of the statements given above are correct?

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A. 1 and 2 only

B. 2 and 3 only

C. 1 and 3 only

D. 1, 2 and 3

Correct answer: Option D — 1, 2 and 3

Explanation

Correct Answer: (d) — All three statements are correct.

1. **Statement 1 is correct:** Article 81 specifies the composition of the Lok Sabha and the allocation of seats among States and Union Territories.
2. **Statement 2 is correct:** Article 82 provides for readjustment after each census, subject to constitutional amendments and applicable provisions governing the delimitation process.
3. **Statement 3 is correct:** Article 170 deals with the composition of State Legislative Assemblies and the allocation of seats within them.

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Q7.

With reference to AI safety and governance, which one of the following best describes the concept of an AI 'red-teaming' exercise?

A. Training an AI model exclusively on government-owned datasets

B. Deliberately testing an AI system to identify vulnerabilities, harmful capabilities and potential misuse

C. Replacing human oversight with automated decision-making

D. Restricting AI development to defence and intelligence applications

Correct answer: Option B — Deliberately testing an AI system to identify vulnerabilities, harmful capabilities and potential misuse

Explanation

Correct Answer: (b) — Deliberately testing an AI system to identify vulnerabilities, harmful capabilities and potential misuse.

(a) Government datasets may be used for training, but this is not the meaning of red-teaming.

(b) **Correct:** Red-teaming involves systematic adversarial testing to discover weaknesses, unsafe outputs and possible exploitation pathways before or after deployment.

(c) Red-teaming does not eliminate human oversight; it can help strengthen safety mechanisms and accountability.

(d) It is a safety-testing approach applicable across sectors, including healthcare, finance, education and defence.

AI red-teaming is increasingly important for evaluating risks such as misinformation, cyber misuse, harmful instructions and the potential misuse of advanced AI capabilities.

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Q8.

With reference to coliform bacteria in drinking water, consider the following statements:

1. Coliform bacteria are commonly used as indicators of possible microbial contamination of water.
2. Their presence necessarily confirms that the water contains pathogenic viruses.
3. Detection of coliform bacteria may indicate deficiencies in water treatment or distribution systems.

Which of the statements given above are correct?

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A. 1 only

B. 1 and 3 only

C. 2 and 3 only

D. 1, 2 and 3

Correct answer: Option B — 1 and 3 only

Explanation

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

1. **Statement 1 is correct:** Coliform bacteria are widely used as indicator organisms to assess the microbiological quality of drinking water.
2. **Statement 2 is incorrect:** Their presence does not necessarily establish the presence of pathogenic viruses. It indicates possible contamination and the need for further investigation.
3. **Statement 3 is correct:** Coliform detection may point towards inadequate treatment, contamination during storage or leakage in distribution systems.

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Q9.

In the context of cybersecurity, what is the primary purpose of a Zero Trust security architecture in protecting sensitive networks such as military cloud platforms?

A. To allow unrestricted access to users within an organisation's internal network.

B. To eliminate the need for encryption by relying entirely on physical security.

C. To continuously verify users, devices and access permissions before granting access to network resources.

D. To transfer all sensitive data to publicly accessible cloud servers for easier monitoring.

Correct answer: Option C — To continuously verify users, devices and access permissions before granting access to network resources.

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Explanation

Correct Answer: (c) — To continuously verify users, devices and access permissions before granting access to network resources.

1. **Option (a):** Incorrect. Zero Trust does not automatically trust users merely because they are operating within an organisation's internal network.
2. **Option (b):** Incorrect. Encryption remains an important component of cybersecurity and is not replaced by Zero Trust.
3. **Option (c):** Correct. Zero Trust follows the principle of "never trust, always verify", requiring authentication and authorisation before granting access.

4. **Option (d):** Incorrect. Zero Trust does not require sensitive information to be made publicly accessible.

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Q10.

With reference to cybersecurity in cloud computing, consider the following statements:

1. A control plane in cloud computing is responsible for managing and configuring cloud resources.
2. Compromise of a cloud control plane may potentially provide attackers with extensive access to cloud infrastructure.
3. Multi-factor authentication alone can eliminate all risks associated with cloud-based cyberattacks.

Which of the statements given above are correct?

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A. 1 and 2 only

B. 2 and 3 only

C. 1 and 3 only

D. 1, 2 and 3

Correct answer: Option A — 1 and 2 only

Explanation

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

1. **Statement 1:** Correct. The control plane manages cloud resources, including their configuration, access permissions and operational

settings.

2. **Statement 2:** Correct. If attackers compromise the control plane, they may potentially gain extensive visibility or control over cloud infrastructure, depending on their access privileges.
3. **Statement 3:** Incorrect. Multi-factor authentication strengthens access security but cannot eliminate all risks, including software vulnerabilities, insider threats, misconfigurations and sophisticated cyberattacks.