NEXT IAS

PTS (GS): CSE 2026

PTS (जी.एस.): सिविल सेवा परीक्षा 2026

GENERAL STUDIES

Paper-I | Sectional Test-13

Science & Technology, General Science and Current Affairs
(January 2025 - Till Date)

Test Code: 02130225

DATE : 02/11/2025

Test Booklet Series

B

परीक्षण पुस्तिका अनुक्रम

सामान्य अध्ययन

पेपर-I | सेक्शनल टेस्ट-13

विज्ञान एवं प्रौद्योगिकी और सामान्य विज्ञान तथा करेंट अफ़ेयर्स
(जनवरी 2025 - आज तक)

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

Before attempting paper please read the instructions given on page no. 2 or 3 carefully and follow them.

समय: दो घण्टे **पूर्णांक: 200**

कृपया प्रश्न-पत्र हल करने से पहले पृष्ठ संख्या 2 अथवा 3 पर दिए गए अनुदेशों को ध्यानपूर्वक पढ़े तथा उनका अनुसरण करें।

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जब तक आपको यह परीक्षण पुस्तिका खोलने को न कहा जाए तब तक न खोलें।

अ नु दे श

1. परीक्षा प्रारम्भ होने के तुरन्त बाद आप इस परीक्षण पुस्तिका की पड़ताल अवश्य कर लें कि इसमें कोई बिना छपा, फटा या छूटा हुआ पृष्ठ अथवा प्रश्नांश आदि **न हो**। यदि ऐसा है, तो इसे सही परीक्षण पुस्तिका से बदल लें।

2. **कृपया ध्यान रखें कि** OMR **उत्तर-पत्रक में उचित स्थान पर रोल नम्बर और परीक्षण पुस्तिका अनुक्रम** A **या** B **को ध्यान से एवं बिना किसी चूक या विसंगति के भरने और कूटबद्ध करने की जिम्मेदारी उम्मीदवार की है। किसी भी प्रकार की चूक/विसंगति की स्थिति में उत्तर-पत्रक निरस्त कर दिया जाएगा।**

3. इस परीक्षण पुस्तिका पर साथ में दिए गए कोष्ठक में आपको अपना अनुक्रमांक लिखना है। परीक्षण पुस्तिका पर और कुछ न लिखें।

4. इस परीक्षण पुस्तिका में **100** प्रश्नांश (प्रश्न) दिए गए हैं। प्रत्येक प्रश्नांश **हिन्दी और अंग्रेज़ी** दोनों में छपा है। प्रत्येक प्रश्नांश में चार प्रत्युत्तर (उत्तर) दिए गए हैं। इनमें से एक प्रत्युत्तर को चुन लें, जिसे आप उत्तर-पत्रक पर अंकित करना चाहते हैं। यदि आपको ऐसा लगे कि एक से अधिक प्रत्युत्तर सही हैं, तो उस प्रत्युत्तर को अंकित करें जो आपको सर्वोत्तम लगे। प्रत्येक प्रश्नांश के लिए **केवल एक** ही प्रत्युत्तर चुनना है।

5. आपको अपने सभी प्रत्युत्तर अलग से दिए गए उत्तर-पत्रक पर ही अंकित करने हैं। उत्तर-पत्रक में दिए गए निर्देश देखें।

6. **सभी** प्रश्नांशों के अंक समान हैं।

7. इससे पहले कि आप परीक्षण पुस्तिका के विभिन्न प्रश्नांशों के प्रत्युत्तर उत्तर-पत्रक पर अंकित करना शुरू करें, आपको प्रवेश प्रमाण-पत्र के साथ प्रेषित अनुदेशों के अनुसार कुछ विवरण उत्तर-पत्रक में देने हैं।

8. आप अपने सभी प्रत्युत्तरों को उत्तर-पत्रक में भरने के बाद तथा परीक्षा के समापन पर **केवल उत्तर-पत्रक** अधीक्षक को सौंप दें। आपको अपने साथ परीक्षण पुस्तिका ले जाने की अनुमति है।

9. कच्चे काम के लिए पत्रक, परीक्षण पुस्तिका के अन्त में संलग्न हैं।

10. **गलत उत्तरों के लिए दण्ड:**

    सभी प्रश्नों में उम्मीदवार द्वारा दिए गए गलत उत्तरों के लिए दण्ड दिया जाएगा।

    (i) प्रत्येक के लिए चार वैकल्पिक उत्तर है। उम्मीदवार द्वारा प्रत्येक के लिए दिए गए एक गलत उत्तर के लिए हेतु नियत किए गए अंकों का एक-तिहाई दण्ड के रूप में काटा जाएगा।

    (ii) यदि कोई उम्मीदवार एक से अधिक उत्तर देता है, तो इसे गलत उत्तर माना जाएगा, यद्यपि दिए गए उत्तरों में से एक उत्तर सही होता है, फिर भी उस के लिए उपर्युक्तानुसार ही उसी तरह का दण्ड दिया जाएगा।

    (iii) यदि उम्मीदवार द्वारा कोई हल नहीं किया जाता है अर्थात् उम्मीदवार द्वारा उत्तर नहीं दिया जाता है, तो उस के लिए कोई दण्ड नहीं दिया जाएगा।

11. **प्रश्नों से संबंधित चुनौती/आपत्ति:** यदि छात्रों को लगता है कि या तो प्रश्न/उत्तरों को संशोधित करने की आवश्यकता है या स्पष्टीकरण की आवश्यकता है, तो वे pts@nextias.com पर ई-मेल कर सकते हैं।

जब तक आपको यह परीक्षण पुस्तिका खोलने को न कहा जाए तब तक न खोलें।

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

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, GET 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 or B carefully and without any omission or discrepancy at the appropriate places in the OMR Answer Sheet. Any omission/kdiscrepancy 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.

4. This Test Booklet contains **100** items (Questions). Each item is printed in **Hindi** and **English** only. Each item comprises 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.

    (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** of 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 question is left blank, i.e., no answer is given by the candidate, there will be **no penalty** for that question.

11. **CHALLENGE THE QUESTION:** If students feel that either the question(s)/kanswer(s) needs to be modified or require clarification, they can email at **pts@nextias.com**

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

1. Recently, World Athletics mandated the testing of the SRY gene in certain championship events. What is the significance of the SRY gene in humans?
(a) It regulates the production of growth hormones.
(b) It controls the synthesis of hemoglobin in red blood cells.
(c) It determines the development of male sex characteristics.
(d) It influences the rate of muscle recovery after intense physical activity.

2. Consider the following statements regarding the Brain–Computer Interface (BCI) technology, often seen in news:
1. It enables direct communication between the human brain and external devices without involving any muscular movement.
2. It functions primarily by decoding the electrical activity of neurons in the brain.
3. Implantation of Neuralink devices based on BCI does not require any surgical procedure.

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

3. Which of the following are advantages of Lithium-ion batteries over conventional lead–acid batteries?
1. Light weight
2. High energy density
3. Rechargeability
4. Lower cost
5. Thermal runaway

Select the correct answer using the code given below:
(a) 2, 3 and 4 only
(b) 1, 2 and 3 only
(c) 1, 3 and 5 only
(d) 2, 4 and 5 only

4. Which of the following are naturally occurring fissile isotopes?
1. Uranium-233
2. Plutonium-239
3. Uranium-238

Select the correct answer using the code given below:
(a) 1 and 2 only
(b) 2 and 3 only
(c) 3 only
(d) None

5. With respect to Geostationary orbits(GSO) and Sun-synchronous orbits(SSO), consider the following statements :
1. Satellites in SSO pass over the same spot at the same local time, while those in GSO appear stationary over a fixed point.
2. Earth observation satellites are generally placed in SSO, while telecommunication satellites are mainly positioned in GSO.

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

6. Consider the following statements regarding the Three-Parent Baby technique:

Statement I:

A baby born through the Three-Parent Baby technique possesses DNA from both biological parents and a donor mother.

Statement II:

The technique involves replacing the defective nuclear DNA of the mother with that of a donor.

1. हाल ही में, विश्व एथलेटिक्स ने कुछ चैंपियनशिप प्रतियोगिताओं में SRY जीन के परीक्षण को अनिवार्य कर दिया है। मानवों में SRY जीन का क्या महत्त्व है?
(a) यह वृद्धि हार्मोन के उत्पादन को विनियमित करता है।
(b) यह लाल रक्त कणिकाओं में हीमोग्लोबिन के संश्लेषण को नियंत्रित करता है।
(c) यह 'पुरुष लिंग लक्षणों' (Male sex characteristics) के विकास का निर्धारण करता है।
(d) यह अधिक शारीरिक गतिविधि के बाद मांसपेशियों की रिकवरी की दर को प्रभावित करता है।

2. प्राय: समाचारों में देखे जाने वाली मस्तिष्क-कंप्यूटर अंतरापृष्ठ (Brain–Computer Interface - BCI) प्रौद्योगिकी के संबंध में, निम्नलिखित कथनों पर विचार कीजिए:
1. यह किसी भी मांसपेशीय गति के बिना, मानव मस्तिष्क और बाह्य उपकरणों के बीच प्रत्यक्ष संचार को सक्षम बनाता है।
2. यह मुख्य रूप से मस्तिष्क में तंत्रिकाओं (न्यूरॉन्स) की विद्युत गतिविधि का कूटवाचन (Decoding) कर कार्य करता है।
3. BCI पर आधारित न्यूरालिंक (Neuralink) उपकरणों के अंत:स्थापन (Implantation) के लिए किसी भी शल्य चिकित्सा प्रक्रिया (Surgical Procedure) की आवश्यकता नहीं होती है।

उपर्युक्त कथनों में से कौन-से सही हैं?
(a) केवल 1 और 2
(b) केवल 2 और 3
(c) केवल 1 और 3
(d) 1, 2 और 3

3. निम्नलिखित में से कौन-से पारंपरिक लेड-एसिड बैटरियों की तुलना में लिथियम-आयन बैटरियों के लाभ हैं?
1. हल्का वज़न
2. उच्च ऊर्जा घनत्व
3. पुनर्भरण क्षमता (Rechargeability)
4. निम्न लागत
5. अनियंत्रित ताप वृद्धि (Thermal Runaway)

नीचे दिए गए कूट का प्रयोग कर सही उत्तर चुनिए:
(a) केवल 2, 3 और 4
(b) केवल 1, 2 और 3
(c) केवल 1, 3 और 5
(d) केवल 2, 4 और 5

4. निम्नलिखित में से कौन-से प्राकृतिक रूप से पाए जाने वाले विखंडनीय समस्थानिक (Fissile Isotopes) हैं?
1. यूरेनियम-233
2. प्लूटोनियम-239
3. यूरेनियम-238

नीचे दिए गए कूट का प्रयोग कर सही उत्तर चुनिए:
(a) केवल 1 और 2
(b) केवल 2 और 3
(c) केवल 3
(d) कोई नहीं

5. भूस्थैतिक कक्षाओं (Geostationary Orbits - GSO) और सूर्य-तुल्यकालिक कक्षाओं (Sun-Synchronous Orbits - SSO) के संबंध में, निम्नलिखित कथनों पर विचार कीजिए:
1. SSO में उपग्रह एक ही स्थानीय समय पर एक ही स्थान के ऊपर से गुज़रते हैं, जबकि GSO में उपग्रह एक निश्चित बिंदु पर स्थिर नज़र आते हैं।
2. पृथ्वी अवलोकन उपग्रह (Earth Observation Satellites) सामान्यत: SSO में स्थापित किए जाते हैं, जबकि दूरसंचार उपग्रह (Telecommunication Satellites) मुख्य रूप से GSO में स्थापित किए जाते हैं।

उपर्युक्त कथनों में से कौन-सा/से सही है/हैं?
(a) केवल 1
(b) केवल 2
(c) 1 और 2 दोनों
(d) न तो 1, न ही 2

6. 'थ्री-पेरेंट बेबी' (Three-Parent Baby) तकनीक के संबंध में, निम्नलिखित कथनों पर विचार कीजिए:

कथन-I:

'थ्री-पेरेंट बेबी' तकनीक के माध्यम से जन्मा एक शिशु जैविक माता-पिता (Biological Parents) दोनों और एक दाता माता (Donor Mother) से DNA प्राप्त करता है।

कथन-II:

इस तकनीक में माता के दोषपूर्ण केंद्रक DNA (Nuclear DNA) को एक दाता के केंद्रक DNA से प्रतिस्थापित कर दिया जाता है।

Which one of the following is correct in respect of the above statements?

(a) Both Statement-I and Statement-II are correct and Statement-II is the correct explanation for Statement-I
(b) Both Statement-I and Statement-II are correct but Statement-II is not the correct explanation for Statement-I
(c) Statement-I is correct but Statement-II is incorrect
(d) Statement-I is incorrect but Statement-II is correct

7. Which of the following are the advantages of blending ethanol with petrol in the context of India?

1. It helps in saving the country's foreign exchange reserves.
2. It reduces the emission of carbon monoxide and particulate matter from vehicles.
3. It lowers the octane number of petrol, thereby improving its anti-knocking properties.
4. It increases the calorific value of petrol.

Select the correct answer using the code given below:

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

8. The term 'Ultra-conserved Elements (UCEs)', sometimes seen in the news, refers to which of the following?

(a) Extremely stable isotopes found in geological formations that help in radiometric dating.
(b) Segments of DNA that remain identical across diverse species over millions of years of evolution.
(c) Deep-sea mineral deposits that contain rare earth elements resistant to corrosion and decay.
(d) Highly reflective compounds used in spacecraft materials to withstand cosmic radiation.

9. Gaganyaan Analog Experiments (Gyanex), recently seen in the news, primarily aims to:

(a) Develop India's astronaut training and health protocols through on-ground space simulations.
(b) Test India's reusable launch vehicle for human spaceflight missions.
(c) Establish a long-duration habitat module for astronauts in lunar orbit.
(d) Simulate re-entry conditions for crew modules under high-temperature environments.

10. Which of the following types of nuclear reactors can use natural uranium as fuel without enrichment?

(a) Boiling Water Reactor (BWR)
(b) Light Water Reactor (LWR)
(c) Pressurised Heavy Water Reactor (PHWR)
(d) Fast Breeder Reactor (FBR)

11. With reference to the International Thermonuclear Experimental Reactor (ITER), consider the following statements:

1. It aims to build the world's largest magnetic fission device.
2. It uses plutonium as fuel for sustained chain reactions.
3. India has contributed the cryostat, the world's largest stainless-steel vacuum chamber enclosing the ITER tokamak.

Which of the statements given above is/are ***not*** correct?

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

उपर्युक्त कथनों के बारे में, निम्नलिखित में से कौन-सा एक सही है?

(a) कथन-I और कथन-II दोनों सही हैं तथा कथन-II, कथन-I की व्याख्या करता है।
(b) कथन-I और कथन-II दोनों सही हैं, किंतु कथन-II, कथन-I की व्याख्या नहीं करता है।
(c) कथन-I सही है, किंतु कथन-II गलत है।
(d) कथन-I गलत है, किंतु कथन-II सही है।

7. भारत के संदर्भ में, पेट्रोल के साथ एथेनॉल के सम्मिश्रण के निम्नलिखित में से कौन-से लाभ हैं?

1. यह देश के विदेशी मुद्रा भंडार की बचत में सहायता करता है।
2. यह वाहनों से कार्बन मोनोऑक्साइड और कणिकीय पदार्थ (Particulate Matter) के उत्सर्जन को कम करता है।
3. यह पेट्रोल की ऑक्टेन संख्या को कम करता है, जिससे इसकी अपस्फोटन-रोधी (Anti-knocking) विशेषताओं में सुधार होता है।
4. यह पेट्रोल के ऊष्मीय मान में वृद्धि करता है।

नीचे दिए गए कूट का प्रयोग कर सही उत्तर चुनिए:

(a) केवल 1 और 2
(b) केवल 1, 2 और 3
(c) केवल 2, 3 और 4
(d) केवल 1, 3 और 4

8. कभी-कभी समाचारों में देखा जाने वाला 'अति-संरक्षित तत्त्व (UCEs)' पद, निम्नलिखित में से किस एक से संबद्ध है?

(a) भूगर्भीय संरचना में पाए जाने वाले अत्यधिक स्थायी समस्थानिक, जो रेडियोमेट्रिक डेटिंग में मदद करते हैं।
(b) DNA के खंड, जो लाखों वर्षों के उद्विकास में अलग-अलग प्रजातियों में एक जैसे रहते हैं।
(c) गहरे समुद्र में खनिज निक्षेप, जिनमें दुर्लभ मृदा तत्त्व (REE) होते हैं, जो संक्षारण (Corrosion) और क्षय (Decay) से बचाते हैं।
(d) अंतरिक्ष यान सामग्री में कॉस्मिक विकिरण का सामना करने के लिए प्रयुक्त होने वाले अत्यंत परावर्तक यौगिक।

9. हाल ही में समाचारों में उल्लेखित 'गगनयान एनालॉग प्रयोग' (Gaganyaan Analog Experiments – GYANEX) का प्रमुख उद्देश्य क्या है?

(a) पृथ्वी पर किए जाने वाले अंतरिक्ष सिमुलेशन (On-ground space simulations) के माध्यम से भारत के अंतरिक्ष यात्रियों के प्रशिक्षण और स्वास्थ्य प्रोटोकॉल विकसित करना।
(b) मानव अंतरिक्ष उड़ान मिशनों के लिए भारत के पुनः प्रयोज्य प्रक्षेपण यान (Reusable launch vehicle) का परीक्षण करना।
(c) चंद्र कक्षा में अंतरिक्ष यात्रियों के लिए दीर्घकालिक आवास मॉड्यूल (Habitat module) स्थापित करना।
(d) उच्च तापमान वाले वातावरण में क्रू मॉड्यूल्स के पुनः प्रवेश (Re-entry) की स्थितियों का अनुकरण करना।

10. निम्नलिखित में से किस प्रकार का परमाणु रिएक्टर प्राकृतिक यूरेनियम (Natural uranium) को बिना संवर्धित (Enrichment) के ईंधन के रूप में उपयोग कर सकता है?

(a) बॉयलिंग वाटर रिएक्टर
(b) लाइट वाटर रिएक्टर
(c) प्रेशराइज्ड हेवी वाटर रिएक्टर
(d) फ़ास्ट ब्रीडर रिएक्टर

11. अंतर्राष्ट्रीय ताप-नाभिकीय प्रायोगिक रिएक्टर (ITER) के संदर्भ में, निम्नलिखित कथनों पर विचार कीजिए:

1. इसका उद्देश्य विश्व का सबसे बड़ा चुंबकीय विखंडन संयंत्र (Magnetic Fission Device) निर्मित करना है।
2. यह सतत् शृंखला अभिक्रियाओं के लिए ईंधन के रूप में प्लूटोनियम का उपयोग करता है।
3. भारत ने क्रायोस्टैट (Cryostat) का योगदान दिया है, जो ITER टोकामक को घेरने वाला विश्व का सबसे बड़ा स्टेनलेस-स्टील का निर्वात कक्ष है।

उपर्युक्त कथनों में से कौन-सा/से सही नहीं है/हैं?

(a) केवल 3
(b) केवल 1
(c) केवल 1 और 3
(d) केवल 1 और 2

12. With reference to Acquired Immunodeficiency Syndrome (AIDS), consider the following statements:

1. It is caused by a retrovirus that primarily attacks the human immune system.
2. The virus mainly infects B-lymphocytes responsible for antibody production.
3. There is currently no vaccine for AIDS approved by the World Health Organization (WHO).

Which of the statements given above are correct?

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

13. With reference to 'neutrinos', consider the following statements:

1. They are electrically neutral and massless particles.
2. They interact very strongly with other particles of matter, thereby influencing their physical properties.
3. They are the second most abundant subatomic particles after photons.

Which of the statements given above is/are correct ?

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

14. Which of the following are inorganic nutrients that do not provide energy but are essential for various physiological functions and normal growth?

(a) Minerals
(b) Fats
(c) Proteins
(d) Vitamins

15. Consider the following statements:

Statement-I:

Modern satellite-based internet constellations such as Starlink generally prefer Low Earth Orbits (LEO) for placing their satellites.

Statement-II:

Satellites placed in Low Earth Orbit provide lower latency compared to those in higher orbits.

Which one of the following is correct in respect of the above statements?

(a) Both Statement-I and Statement-II are correct, and Statement-II is the correct explanation for Statement-I.
(b) Both Statement-I and Statement-II are correct, but Statement-II is not the correct explanation for Statement-I.
(c) Statement-I is correct, but Statement-II is incorrect.
(d) Statement-I is incorrect, but Statement-II is correct.

16. Recently, Google announced the establishment of its first Artificial Intelligence (AI) hub in India. In which one of the following cities will it be located?

(a) Bengaluru
(b) Hyderabad
(c) Visakhapatnam
(d) Pune

17. Consider the following statements regarding the Codex Alimentarius Commission:

1. It is an intergovernmental body established by the Food and Agriculture Organization (FAO) and the World Health Organization (WHO) to develop international food standards.
2. The Spices Board of India serves as the Secretariat for the Codex Committee on Spices and Culinary Herbs.

12. एक्वायर्ड इम्यूनो डेफिशिएंसी सिंड्रोम (एड्स) के संदर्भ में, निम्नलिखित कथनों पर विचार कीजिए:

1. यह एक रेट्रोवायरस (Retrovirus) के कारण होता है, जो मुख्यत: मानव की प्रतिरक्षा प्रणाली पर आक्रमण करता है।
2. यह वायरस मुख्य रूप से बी-लिम्फोसाइट्स (B-lymphocytes) को संक्रमित करता है, जो एंटीबॉडी (Antibody) उत्पादन के लिए उत्तरदायी होते हैं।
3. वर्तमान में विश्व स्वास्थ्य संगठन (WHO) द्वारा एड्स के लिए कोई टीका (Vaccine) स्वीकृत नहीं किया गया है।

उपर्युक्त में से कौन-से कथन सही हैं?

(a) केवल 1 और 2
(b) केवल 1 और 3
(c) केवल 2 और 3
(d) 1, 2 और 3

13. 'न्यूट्रिनो' के संदर्भ में, निम्नलिखित कथनों पर विचार कीजिए:

1. यह विद्युत उदासीन (Electrically Neutral) और द्रव्यमानरहित (Massless) कण हैं।
2. यह द्रव्य के अन्य कणों के साथ अत्यधिक प्रबलता से अंत:क्रिया करते हैं, इस प्रकार उनके भौतिक गुणों को प्रभावित करते हैं।
3. यह फोटॉन के पश्चात् दूसरे सर्वाधिक प्रचुर मात्रा में पाए जाने वाले अवपरमाणुक कण (Subatomic Particle) हैं।

उपर्युक्त कथनों में से कौन-सा/से सही है/हैं?

(a) केवल 1 और 3
(b) केवल 3
(c) केवल 1 और 2
(d) केवल 2 और 3

14. निम्नलिखित में से कौन-से अकार्बनिक पोषक तत्त्व ऊर्जा प्रदान नहीं करते हैं, परंतु शारीरिक दृष्टि से विभिन्न महत्त्वपूर्ण कार्यों और सामान्य वृद्धि के लिए आवश्यक हैं?

(a) खनिज
(b) वसा
(c) प्रोटीन
(d) विटामिन

15. निम्नलिखित कथनों पर विचार कीजिए:

कथन-I:

स्टारलिंक (Starlink) जैसा आधुनिक उपग्रह-आधारित इंटरनेट नक्षत्र (Satellite-based internet constellations) सामान्यत: अपने उपग्रहों को निम्न पृथ्वी कक्षा (Low Earth Orbit – LEO) में स्थापित करना पसंद करता है।

कथन-II:

निम्न पृथ्वी कक्षा में स्थापित उपग्रह उच्च कक्षाओं (Higher orbits) की तुलना में कम विलंबता (Lower latency) प्रदान करते हैं।

उपर्युक्त कथनों के संदर्भ में निम्नलिखित में से कौन-सा सही है?

(a) कथन-I और कथन-II दोनों सही हैं, तथा कथन-II, कथन-I की व्याख्या करता है।
(b) कथन-I और कथन-II दोनों सही हैं, किंतु कथन-II, कथन-I का सही व्याख्या नहीं करता है।
(c) कथन-I सही है, किंतु कथन-II सही नहीं है।
(d) कथन-I सही नहीं है, किंतु कथन-II सही है।

16. हाल ही में, गूगल ने भारत में अपने पहले कृत्रिम बुद्धिमत्ता (AI) हब की स्थापना की घोषणा की। यह निम्नलिखित में से किस शहर में स्थित होगा?

(a) बेंगलुरु
(b) हैदराबाद
(c) विशाखापत्तनम
(d) पुणे

17. कोडेक्स एलिमेंटेरियस आयोग (Codex Alimentarius Commission) के संदर्भ में, निम्नलिखित कथनों पर विचार कीजिए:

1. यह अंतर्राष्ट्रीय खाद्य मानकों को विकसित करने के लिए खाद्य और कृषि संगठन (FAO) तथा विश्व स्वास्थ्य संगठन (WHO) द्वारा स्थापित एक अंतर-सरकारी निकाय है।
2. भारतीय मसाला बोर्ड मसालों और पाक जड़ी-बूटियों पर कोडेक्स समिति (Codex Committee on Spices and Culinary Herbs) के लिए सचिवालय के रूप में कार्य करता है।

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

18. The term 'Day Zero', often mentioned in the context of environmental management, refers to:
(a) The day when global greenhouse gas emissions reach net zero.
(b) The day when a city or region runs out of its available drinking water supply for distribution.
(c) The first official declaration of a drought emergency by a national government.
(d) The day when the annual rainfall in a river basin falls below its long-term average.

19. With reference to the 'Synchronised Asian Elephant Population Estimation (SAEPE) 2021–25', consider the following statements:
1. It is India's first nationwide DNA-based population estimation exercise for elephants.
2. The elephant population in the wild has increased in the last five years.
3. Karnataka has the highest number of wild elephants in India.

How many of the statements given above are correct?
(a) Only one
(b) Only two
(c) All three
(d) None

20. Recently, the Government of India granted a separate code to the Bathou religion for inclusion in the upcoming Census. The Bathou religion is associated with which one of the following communities?
(a) Santhal community of Jharkhand
(b) Bodo community of Assam
(c) Mizo community of Mizoram
(d) Khasi community of Meghalaya

21. Which of the following cell components is/are present in both prokaryotic and eukaryotic cells?
1. Plasma membrane
2. Ribosomes
3. Mitochondria
4. Nucleus

Select the correct answer using the code given below:
(a) 1 only
(b) 2 and 3 only
(c) 1, and 2 only
(d) 2, 3 and 4 only

22. With reference to the Artemis Accords, consider the following statements:
1. The Artemis Accords are a set of legally binding principles formulated to guide civil space exploration and use in the 21st century.
2. India is not a signatory to the Artemis Accords.

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

23. With reference to vitamins, consider the following statements:
1. Vitamin A is a fat-soluble vitamin, whereas Vitamin C is water-soluble.
2. The human body cannot synthesize Vitamin C but can synthesize Vitamin D.
3. Certain gut bacteria can synthesize Vitamin K and Biotin.

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

उपर्युक्त कथनों में से कौन-सा/से सही है/हैं?
(a) केवल 1
(b) केवल 2
(c) 1 और 2 दोनों
(d) न तो 1, न ही 2

18. पर्यावरण प्रबंधन के संदर्भ में प्रायः उल्लेखित शब्द युग्म 'शून्य दिवस (Day Zero)' निम्नलिखित में से किसे संदर्भित करता है?
(a) वह दिन जब वैश्विक ग्रीनहाउस गैस उत्सर्जन निवल शून्य तक पहुँच जाता है।
(b) वह दिन जब किसी शहर या क्षेत्र में वितरण के लिए उपलब्ध पेयजल आपूर्ति समाप्त हो जाती है।
(c) किसी राष्ट्रीय सरकार द्वारा सूखा आपातकाल की पहली आधिकारिक घोषणा।
(d) वह दिन जब किसी नदी बेसिन में वार्षिक वर्षा उसके दीर्घकालिक औसत से कम होती है।

19. 'समकालिक एशियाई हाथी संख्या आकलन (SAEPE) 2021-25' के संदर्भ में, निम्नलिखित कथनों पर विचार कीजिए:
1. यह हाथियों के लिए भारत का पहला राष्ट्रव्यापी DNA-आधारित जनसंख्या आकलन अभ्यास है।
2. पिछले पाँच वर्षों में जंगलों में हाथियों की संख्या में वृद्धि हुई है।
3. भारत में जंगली हाथियों की सर्वाधिक संख्या कर्नाटक राज्य में है।

उपर्युक्त कथनों में से कितने सही हैं?
(a) केवल एक
(b) केवल दो
(c) सभी तीन
(d) कोई नहीं

20. हाल ही में, भारत सरकार ने आगामी जनगणना में शामिल करने के लिए बाथौ धर्म को एक अलग कूट (कोड) प्रदान किया। बाथौ धर्म निम्नलिखित में से किस समुदाय से जुड़ा हुआ है?
(a) झारखंड का संथाल समुदाय
(b) असम का बोडो समुदाय
(c) मिज़ोरम का मिज़ो समुदाय
(d) मेघालय का खासी समुदाय

21. निम्नलिखित में से कौन-से कोशिका घटक प्राककेंद्रकी (Prokaryotic) और सुकेंद्रकी (Eukaryotic) कोशिकाओं दोनों में उपस्थित होते हैं?
1. प्लाज़्मा झिल्ली
2. राइबोसोम
3. माइटोकॉन्ड्रिया
4. केंद्रक

नीचे दिए गए कूट का प्रयोग कर सही उत्तर चुनिए:
(a) केवल 1
(b) केवल 2 और 3
(c) केवल 1 और 2
(d) केवल 2, 3 और 4

22. आर्टमिस समझौते (Artemis Accords) के संदर्भ में, निम्नलिखित कथनों पर विचार कीजिए:
1. आर्टमिस समझौता 21वीं सदी में नागरिक अंतरिक्ष अन्वेषण (Civil Space Exploration) और उपयोग को निर्देशित करने के लिए तैयार किए गए कानूनी रूप से बाध्यकारी सिद्धांतों का एक समूह है।
2. भारत आर्टमिस समझौते का हस्ताक्षरकर्ता नहीं है।

उपर्युक्त कथनों में से कौन-सा/से सही है/हैं?
(a) केवल 1
(b) केवल 2
(c) 1 और 2 दोनों
(d) न तो 1, न ही 2

23. विटामिन-K के संदर्भ में, निम्नलिखित कथनों पर विचार कीजिए:
1. विटामिन A एक वसा में घुलनशील विटामिन है, जबकि विटामिन C जल में घुलनशील होता है।
2. मनुष्य का शरीर विटामिन C को संश्लेषित नहीं कर सकता, लेकिन विटामिन D को संश्लेषित कर सकता है।
3. कुछ आहार नाल के जीवाणु (Gut bacteria) विटामिन K और बायोटिन को संश्लेषित कर सकते हैं।

उपर्युक्त कथनों में से कौन-से सही हैं?
(a) केवल 1 और 2
(b) केवल 2 और 3
(c) केवल 1 और 3
(d) 1, 2 और 3

24. Which of the following statements is/are correct regarding the relation between Biofortified crops and Genetically modified crops?

1. All Genetically modified crops are Biofortified crops.
2. All Biofortified crops are Genetically modified crops.

Select the correct answer using the code given below:

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

25. With reference to the Future Circular Collider (FCC), consider the following statements:

1. It is a proposed next-generation particle accelerator being developed by CERN as a successor to the Large Hadron Collider (LHC).
2. It primarily aims to study gravitational waves produced by massive accelerating celestial objects.

Which of the statements given above is/are correct?

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

26. Consider the following pairs regarding the diseases associated with the deficiency of Vitamins and minerals:

	Vitamin/Mineral	*Deficiency Disease*
1.	Vitamin B3	Pellagra
2.	Vitamin C	Beriberi
3.	Calcium	Anemia
4.	Iodine	Goitre

How many of the above pairs are correctly matched?

(a) Only one pair
(b) Only two pairs
(c) Only three pairs
(d) All four pairs

27. With reference to Renewable Energy Certificates (RECs) in India, consider the following statements:

1. The price of RECs is determined by the Central Electricity Regulatory Commission.
2. State Electricity Regulatory Commissions are responsible for setting renewable purchase obligations (RPO) targets.

Which of the statements given above is/are correct?

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

28. Consider the following statements regarding UV-A, UV-B, and UV-C radiation:

1. UV-A radiation has the shortest wavelength and is the least harmful.
2. UV-B radiation plays a role in the production of Vitamin D in the human body.
3. UV-C radiation is almost completely absorbed by the Earth's atmosphere.

How many of the statements given above are correct?

(a) Only one
(b) Only two
(c) All three
(d) None

29. With reference to the Global Hunger Index (GHI), consider the following statements:

1. It is published annually by the Food and Agriculture Organization (FAO).
2. Undernourishment and child mortality are among the four indicators used for its calculation.

Which of the statements given above is/are correct?

(a) 1 only
(b) 2 only

24. जैव-प्रबलीकृत (Biofortified) फ़सलों और आनुवंशिक रूप से संशोधित फ़सलों (GM Crops) के बीच संबंध के संदर्भ में, निम्नलिखित कथनों में से कौन-सा/से सही है/हैं?

1. सभी आनुवंशिक रूप से संशोधित फ़सलें जैव-प्रबलीकृत फ़सलें हैं।
2. सभी जैव-प्रबलीकृत फ़सलें आनुवंशिक रूप से संशोधित फ़सलें हैं।

नीचे दिए गए कूट का प्रयोग कर सही उत्तर चुनिए:

(a) केवल 1
(b) केवल 2
(c) 1 और 2 दोनों
(d) न तो 1, न ही 2

25. फ़्यूचर सर्कुलर कोलाइडर (Future Circular Collider – FCC) के संदर्भ में, निम्नलिखित कथनों पर विचार कीजिए:

1. यह एक प्रस्तावित अगली पीढ़ी का कण त्वरक (Next-generation particle accelerator) है, जिसे लार्ज हैड्रॉन कोलाइडर (Large Hadron Collider – LHC) के उत्तराधिकारी के रूप में सीईआरएन (CERN) द्वारा विकसित किया जा रहा है।
2. इसका मुख्य उद्देश्य विशाल गति से गतिशील खगोलीय पिंडों द्वारा उत्पन्न गुरुत्वाकर्षण तरंगों (Gravitational waves) का अध्ययन करना है।

उपर्युक्त में से कौन-सा/से कथन सही है/हैं?

(a) केवल 1
(b) केवल 2
(c) दोनों 1 और 2
(d) न तो 1, न ही 2

26. विटामिनों और खनिजों की कमी से जुड़े रोगों के संदर्भ में, निम्नलिखित युग्मों पर विचार कीजिए:

	विटामिन/खनिज	कमी से होने वाला रोग
1.	विटामिन B3	पैलाग्रा
2.	विटामिन C	बेरीबेरी
3.	कैल्शियम	रक्ताल्पता
4.	आयोडीन	घेंघा

उपर्युक्त में से कितने युग्म सही सुमेलित हैं?

(a) केवल एक युग्म
(b) केवल दो युग्म
(c) केवल तीन युग्म
(d) सभी चार युग्म

27. भारत में नवीकरणीय ऊर्जा प्रमाणपत्रों (Renewable Energy Certificates – RECs) के संदर्भ में निम्नलिखित कथनों पर विचार कीजिए:

1. आरईसी (RECs) की कीमत का निर्धारण केंद्रीय विद्युत विनियामक आयोग (Central Electricity Regulatory Commission – CERC) द्वारा किया जाता है।
2. राज्य विद्युत विनियामक आयोग (State Electricity Regulatory Commissions – SERCs) नवीकरणीय ख़रीद दायित्व (Renewable Purchase Obligations – RPO) के लक्ष्य निर्धारित करने के लिए उत्तरदायी होते हैं।

उपर्युक्त में से कौन-सा/से कथन सही है/हैं?

(a) केवल 1
(b) केवल 2
(c) 1 और 2 दोनों
(d) न तो 1, न ही 2

28. यूवी-ए (UV-A), यूवी-बी (UV-B) और यूवी-सी (UV-C) विकिरण के संबंध में निम्नलिखित कथनों पर विचार कीजिए:

1. यूवी-ए विकिरण की तरंगदैर्ध्य (Wavelength) सबसे कम होती है और यह सबसे कम हानिकारक होती है।
2. यूवी-बी विकिरण मानव शरीर में विटामिन D के निर्माण में भूमिका निभाती है।
3. यूवी-सी विकिरण लगभग पूरी तरह पृथ्वी के वायुमंडल द्वारा अवशोषित कर ली जाती है।

उपर्युक्त में से कितने कथन सही हैं?

(a) केवल एक
(b) केवल दो
(c) सभी तीन
(d) कोई नहीं

29. वैश्विक भुखमरी सूचकांक (Global Hunger Index) के संदर्भ में, निम्नलिखित कथनों पर विचार कीजिए:

1. यह खाद्य और कृषि संगठन (FAO) द्वारा वार्षिक रूप से प्रकाशित किया जाता है।
2. अल्पपोषण और बाल मृत्यु दर इसके आकलन के लिए उपयोग किए जाने वाले चार संकेतकों में शामिल हैं।

उपर्युक्त कथनों में से कौन-सा/से सही है/हैं?

(a) केवल 1
(b) केवल 2

(c) Both 1 and 2
(d) Neither 1 nor 2

30. With reference to the Indian Ocean Rim Association (IORA), consider the following statements:

1. All sovereign states bordering the Indian Ocean are eligible for membership of the Association.
2. Both India and Pakistan are members of the Association.
3. The Secretariat of IORA is located in Oman.

How many of the statements given above are correct?

(a) Only one
(b) Only two
(c) All three
(d) None

31. With reference to the role of different types of Ribonucleic Acid (RNA) during protein synthesis, consider the following pairs:

	Type of RNA	*Function*
1.	Messenger RNA	Carries amino acids to the ribosome during translation
2.	Transfer RNA	Contains the genetic blueprint to make proteins.
3.	Ribosomal RNA	Forms structural components of ribosomes

How many of the above pairs are correctly matched ?

(a) Only one
(b) Only two
(c) All three
(d) None

32. Consider the following statements regarding biogas:

1. Unlike natural gas, it is a renewable source of energy.
2. It generally contains a higher proportion of methane than natural gas.
3. It is produced by the anaerobic decomposition of biomass by microorganisms.

Which of the statements given above is/are correct?

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

33. In the context of nuclear reactors, the term 'criticality' refers to which of the following situations?

(a) The stage at which a nuclear reactor sustains a stable chain reaction at a steady rate.
(b) The condition when a reactor's temperature exceeds its design limit, leading to meltdown.
(c) The process of enriching uranium to increase the proportion of fissile isotope U-235.
(d) The initial stage of reactor construction when fuel rods are inserted into the core.

34. Radioisotope Iodine-131 is commonly used in the treatment of which of the following medical conditions?

(a) Lung infections
(b) Prostate cancer
(c) Thyroid disorders
(d) Kidney stones

35. Consider the following statements:

Statement-I:

Foods with a low Glycemic Index are generally considered beneficial for individuals with diabetes.

Statement-II:

Glycemic Index measures the amount of natural sugar present per gram of food.

(c) 1 और 2 दोनों
(d) न तो 1, न ही 2

30. हिंद महासागर रिम संघ (IORA) के संदर्भ में, निम्नलिखित कथनों पर विचार कीजिए:

1. हिंद महासागर से सीमा साझा करने वाले सभी संप्रभु राष्ट्र संघ की सदस्यता के लिए पात्र हैं।
2. भारत और पाकिस्तान, दोनों ही संघ के सदस्य हैं।
3. IORA का सचिवालय ओमान में स्थित है।

उपर्युक्त कथनों में से कितने सही हैं?
(a) केवल एक
(b) केवल दो
(c) सभी तीन
(d) कोई नहीं

31. प्रोटीन संश्लेषण (Protein Synthesis) के दौरान विभिन्न प्रकार के राइबोन्यूक्लिक अम्ल (RNA) की भूमिका के संदर्भ में निम्नलिखित युग्मों पर विचार कीजिए:

	RNA का प्रकार	कार्य
1.	मैसेंजर RNA	अनुवादन के दौरान अमीनो अम्लों को राइबोसोम तक ले जाता है।
2.	अंतरण RNA (Transfer RNA)	प्रोटीन बनाने के लिए आनुवंशिक खाका (Genetic blueprint) को वहन करता है।
3.	राइबोसोमल RNA (Ribosomal RNA)	राइबोसोम के संरचनात्मक घटकों का निर्माण करता है।

उपर्युक्त में से कितने सही सुमेलित हैं?
(a) केवल एक
(b) केवल दो
(c) सभी तीन
(d) कोई नहीं

32. बायोगैस के संदर्भ में, निम्नलिखित कथनों पर विचार कीजिए:

1. प्राकृतिक गैस के विपरीत, यह ऊर्जा का एक नवीकरणीय स्रोत है।
2. इसमें सामान्यत: प्राकृतिक गैस की अपेक्षा मेथेन का अनुपात अधिक होता है।
3. यह सूक्ष्मजीवों द्वारा जैवभार के अवायवीय अपघटन से निर्मित होती है।

उपर्युक्त कथनों में से कौन-सा/से सही है/हैं?
(a) केवल 1
(b) केवल 1 और 2
(c) केवल 1 और 3
(d) केवल 2 और 3

33. नाभिकीय रिएक्टरों (Nuclear reactors) के संदर्भ में 'क्रिटिकलिटी' (Criticality) शब्द निम्नलिखित में से किस स्थिति को दर्शाता है?
(a) वह अवस्था जब एक नाभिकीय रिएक्टर एक स्थिर दर (Steady rate) पर शृंखला अभिक्रिया (Chain reaction) को बनाए रखता है।
(b) वह स्थिति जब रिएक्टर का तापमान उसकी डिज़ाइन सीमा से अधिक हो जाता है, जिससे मेल्टडाउन (Meltdown) की स्थिति उत्पन्न होती है।
(c) यूरेनियम को समृद्ध (Enrich) करने की प्रक्रिया, ताकि विखंडनीय समस्थानिक U-235 का अनुपात बढ़ाया जा सके।
(d) रिएक्टर निर्माण की प्रारंभिक अवस्था, जब ईंधन छड़ें (Fuel rods) को कोर में डाला जाता है।

34. रेडियो समस्थानिक (रेडियोआइसोटोप) आयोडीन-131 का उपयोग सामान्यत: निम्नलिखित में से किस चिकित्सा स्थिति (व्याधि) के उपचार में किया जाता है?
(a) फेफड़ों में संक्रमण
(b) पुर: स्थ (प्रोस्टेट) ग्रंथि कैंसर
(c) अवटुग्रंथि (थाइरॉइड) विकार
(d) वृक्क की पथरी

35. निम्नलिखित कथनों पर विचार कीजिए:

कथन-I:

निम्न ग्लाइसेमिक सूचकांक (Glycemic Index) वाले खाद्य पदार्थ सामान्यत: मधुमेह (Diabetes) से पीड़ित व्यक्तियों के लिए लाभकारी माने जाते हैं।

कथन-II:

ग्लाइसेमिक सूचकांक किसी खाद्य पदार्थ के प्रति ग्राम में उपस्थित प्राकृतिक शर्करा की मात्रा को मापता है।

Which one of the following is correct in respect of the above statements?

(a) Both Statement-I and Statement-II are correct and Statement-II is the correct explanation for Statement-I
(b) Both Statement-I and Statement-II are correct but Statement-II is not the correct explanation for Statement-I
(c) Statement-I is correct but Statement-II is incorrect
(d) Statement-I is incorrect but Statement-II is correct

36. With reference to offshore wind energy, consider the following statements:

1. It refers to the generation of electricity from wind farms located in oceanic or sea areas.
2. India currently has a higher installed capacity of offshore wind energy than onshore wind energy.
3. Offshore wind energy is generally more efficient than onshore wind energy due to stronger and more consistent wind speeds over the sea.

Which of the statements given above are correct?

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

37. With reference to DNA Fingerprinting Technology, consider the following statements:

1. It is used to establish the identity of an individual based on specific patterns in DNA sequences.
2. It involves sequencing the entire genome of a person.
3. It is applied in both criminal investigations and paternity disputes.

Which of the statements given above are correct?

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

38. With reference to Genetically Modified (GM) mosquitoes, consider the following statements:

1. The self-limiting gene in GM mosquitoes prevents male mosquitoes from reaching adulthood.
2. GM mosquitoes are designed to lay eggs that carry the genetic modification to the next generation.

Which of the statements given above is/are correct?

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

39. With reference to the Multi-Lane Free Flow (MLFF) tolling system, consider the following statements:

1. It eliminates the need for physical toll barriers by enabling toll deduction through FASTag and Automatic Number Plate Recognition (ANPR) technology.
2. The first barrier-free toll plaza under this system is being developed in Gujarat.

Which of the statements given above is/are correct?

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

40. Consider the following statements:

Statement I:

The Supreme Court–mandated Central Empowered Committee (CEC) has recommended a ban on the plantation of Conocarpus species across India.

Statement II:

Conocarpus trees depletes groundwater and harms native biodiversity.

उपर्युक्त कथनों के संदर्भ में निम्नलिखित में से कौन-सा सही है?

(a) कथन–I और कथन–II दोनों सही हैं, तथा कथन–II, कथन–I की व्याख्या करता है।
(b) कथन–I और कथन–II दोनों सही हैं, किंतु कथन–II, कथन–I का सही व्याख्या नहीं करता है।
(c) कथन–I सही है, किंतु कथन–II सही नहीं है।
(d) कथन–I सही नहीं है, किंतु कथन–II सही है।

36. अपतटीय (Offshore) पवन ऊर्जा के संदर्भ में निम्नलिखित कथनों पर विचार कीजिए:

1. यह महासागरीय या समुद्री क्षेत्रों में स्थित पवन ऊर्जा संयंत्रों से विद्युत उत्पादन को संदर्भित करती है।
2. भारत में वर्तमान में अपतटीय पवन ऊर्जा की स्थापित क्षमता, तटीय (Onshore) पवन ऊर्जा से अधिक है।
3. समुद्र के ऊपर अधिक मज़बूत और अधिक स्थिर हवा की गति के कारण अपतटीय पवन ऊर्जा सामान्य तौर पर तटीय पवन ऊर्जा की तुलना में अधिक कुशल होती है।

उपर्युक्त में से कौन-से कथन सही हैं?

(a) केवल 1 और 2
(b) केवल 1 और 3
(c) केवल 2 और 3
(d) 1, 2 और 3

37. डीएनए फ़िंगरप्रिंटिंग प्रौद्योगिकी के संदर्भ में निम्नलिखित कथनों पर विचार कीजिए:

1. इसका उपयोग किसी व्यक्ति की पहचान स्थापित करने के लिए डीएनए अनुक्रमों में विशिष्ट पैटर्न के आधार पर किया जाता है।
2. इसमें व्यक्ति के संपूर्ण जीनोम का अनुक्रमण (Sequencing) शामिल होता है।
3. इसका उपयोग आपराधिक जाँचों और पैतृक विवादों - दोनों में किया जाता है।

उपर्युक्त में से कौन-से कथन सही हैं?

(a) केवल 1 और 2
(b) केवल 2 और 3
(c) केवल 1 और 3
(d) 1, 2 और 3

38. आनुवंशिक रूप से संशोधित (GM) मच्छरों के संदर्भ में, निम्नलिखित कथनों पर विचार कीजिए:

1. आनुवंशिक रूप से संशोधित मच्छरों में मौजूद स्व-सीमाकारी जीन नर मच्छरों को वयस्क होने से रोकता है।
2. आनुवंशिक रूप से संशोधित मच्छरों को ऐसे अंडे देने के लिए अभिकल्पित किया गया है, जो आनुवंशिक संशोधन को अगली पीढ़ी तक ले जाते हैं।

उपर्युक्त में से कौन-सा/से कथन सही है/हैं?

(a) केवल 1
(b) केवल 2
(c) 1 और 2 दोनों
(d) न तो 1, न ही 2

39. मल्टी-लेन फ़्री फ़्लो टोलिंग प्रणाली के संदर्भ में, निम्नलिखित कथनों पर विचार कीजिए:

1. यह FASTag और स्वचालित नंबर प्लेट पहचान (ANPR) प्रौद्योगिकी के माध्यम से टोल भुगतान को सक्षम बना कर भौतिक टोल बाधाओं की आवश्यकता को समाप्त करती है।
2. इस प्रणाली के अंतर्गत पहला बाधा-मुक्त टोल प्लाज़ा गुजरात में विकसित किया जा रहा है।

उपर्युक्त कथनों में से कौन-सा/से सही है/हैं?

(a) केवल 1
(b) केवल 2
(c) 1 और 2 दोनों
(d) न तो 1, न ही 2

40. निम्नलिखित कथनों पर विचार कीजिए:

कथन-I:

सर्वोच्च न्यायालय द्वारा गठित केंद्रीय सशक्त समिति (Central Empowered Committee - CEC) ने भारत भर में कोनोकर्पस (Conocarpus) प्रजातियों के वृक्षारोपण पर प्रतिबंध लगाने की सिफ़ारिश की है।

कथन-II:

कोनोकार्पस वृक्ष भूजल को कम कर देते हैं तथा देशज जैव-विविधता को क्षति पहुँचाते हैं।

Which one of the following is correct in respect of the above statements?
(a) Both Statement-I and Statement-II are correct and Statement- II is the correct explanation for Statement-I
(b) Both Statement-I and Statement- II are correct and Statement-II is not the correct explanation for Statement-I
(c) Statement- I is correct but Statement-II is incorrect
(d) Statement-I is incorrect but Statement-II is correct

41. With reference to the 'Axiom-4 Mission', consider the following statements:
1. The mission carried the first astronauts from Hungary and Poland to the International Space Station.
2. The mission involved conducting microgravity experiments aboard the International Space Station.
3. Shubhanshu Shukla became the second Indian to travel to space and the first Indian to step onto the International Space Station.

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

42. Match the following cell organelles with their primary functions:

Column I (Cell Organelle)	*Column II (Function)*
A. Mitochondria	1. Packaging and secretion of cellular products
B. Ribosomes	2. Protein synthesis
C. Lysosomes	3. Intracellular digestion
D. Golgi apparatus	4. Cellular respiration

Select the correct answer using the code given below:

	A	B	C	D
(a)	4	3	1	2
(b)	4	2	3	1
(c)	1	2	4	3
(d)	3	1	2	4

43. Genetic Engineering Appraisal Committee (GEAC), an apex body for approval of commercial release of Genetically Modified Organisms in India, functions under the:
(a) Ministry of Environment, Forest and Climate Change
(b) Ministry of Science and Technology
(c) Ministry of Health and Family Welfare
(d) Ministry of Agriculture and Farmers' Welfare

44. Why is only one side of the Moon visible from the Earth?
(a) Moon's axis of rotation always points toward the Earth.
(b) Moon revolves around the Earth in an elliptical orbit at a constant speed.
(c) Moon does not rotate but only revolves around the Earth
(d) Moon's period of rotation is equal to its period of revolution around the Earth.

45. Consider the following statements

Statement I:

Most nuclear reactors require uranium to be enriched for use as nuclear fuel.

Statement II:

Less than 1% of natural uranium is fissile.

Which one of the following is correct in respect of the above statements?
(a) Both Statement-I and Statement-II are correct and Statement-II is the correct explanation for Statement-I
(b) Both Statement-I and Statement-II are correct and Statement-II is not the correct explanation for Statement-I
(c) Statement-I is correct but Statement-II is incorrect
(d) Statement-I is incorrect but Statement-II is correct

उपर्युक्त कथनों के संदर्भ में निम्नलिखित में से कौन-सा सही है?

(a) कथन–I और कथन–II दोनों सही हैं, तथा कथन–II, कथन–I की व्याख्या करता है।
(b) कथन–I और कथन–II दोनों सही हैं, किंतु कथन–II, कथन–I का सही व्याख्या नहीं करता है।
(c) कथन–I सही है, किंतु कथन–II सही नहीं है।
(d) कथन–I सही नहीं है, किंतु कथन–II सही है।

41. 'एक्सिओम-4 मिशन' के संदर्भ में, निम्नलिखित कथनों पर विचार कीजिए:

1. इस मिशन ने हंगरी और पोलैंड के पहले अंतरिक्ष यात्रियों को अंतर्राष्ट्रीय अंतरिक्ष स्टेशन तक पहुँचाया।
2. इस मिशन में अंतर्राष्ट्रीय अंतरिक्ष स्टेशन पर सूक्ष्म-गुरुत्वाकर्षण (Microgravity) प्रयोग करना शामिल था।
3. शुभांशु शुक्ला अंतरिक्ष में यात्रा करने वाले दूसरे भारतीय और अंतर्राष्ट्रीय अंतरिक्ष स्टेशन पर कदम रखने वाले पहले भारतीय बने।

उपर्युक्त कथनों में से कौन-से सही हैं?

(a) केवल 1 और 3
(b) केवल 2 और 3
(c) केवल 1 और 2
(d) 1, 2 और 3

42. निम्नलिखित कोशिकांगों (Cell Organelles) को उनके प्राथमिक कार्यों के साथ सुमेलित कीजिए:

	स्तंभ I (कोशिकांग)	**स्तंभ II (कार्य)**
A.	माइटोकॉन्ड्रिया	1. कोशिकीय उत्पादों की पैकेजिंग एवं स्राव
B.	राइबोसोम	2. प्रोटीन संश्लेषण
C.	लाइसोसोम	3. अंत:कोशिकीय अपचयन
D.	गॉल्जी तंत्र	4. कोशिकीय श्वसन

नीचे दिए गए कूट का प्रयोग कर सही उत्तर चुनिए:

	A	B	C	D
(a)	4	3	1	2
(b)	4	2	3	1
(c)	1	2	4	3
(d)	3	1	2	4

43. आनुवंशिक अभियांत्रिकी मूल्यांकन समिति (GEAC), भारत में आनुवंशिक रूप से संशोधित जीवों के वाणिज्यिक विमोचन/निर्मुक्ति के अनुमोदन के लिए एक शीर्ष निकाय, निम्नलिखित मे से किसके अधीन कार्य करती है?

(a) पर्यावरण, वन एवं जलवायु परिवर्तन मंत्रालय
(b) विज्ञान एवं प्रौद्योगिकी मंत्रालय
(c) स्वास्थ्य एवं परिवार कल्याण मंत्रालय
(d) कृषि एवं किसान कल्याण मंत्रालय

44. पृथ्वी से चंद्रमा का केवल एक ही पक्ष (भाग) क्यों दिखाई देता है?

(a) चंद्रमा के घूर्णन की धुरी सदैव पृथ्वी की ओर होती है।
(b) चंद्रमा पृथ्वी के चारों ओर एक दीर्घवृत्ताकार कक्षा में नियत गति से परिक्रमण करता है।
(c) चंद्रमा घूर्णन नहीं करता है, परंतु केवल पृथ्वी के चारों ओर परिक्रमण करता है।
(d) चंद्रमा का घूर्णन काल इसके पृथ्वी के चारों ओर परिक्रमण काल के समान है।

45. निम्नलिखित कथनों पर विचार कीजिए:

कथन-I:

अधिकांश नाभिकीय रिएक्टरों में यूरेनियम को नाभिकीय ईंधन के रूप में उपयोग करने के लिए इसको संवर्धित करने की आवश्यकता होती है।

कथन-II:

प्राकृतिक यूरेनियम का 1% से कम भाग विखंडनीय (Fissile) होता है।

उपर्युक्त कथनों के बारे में, निम्नलिखित में से कौन-सा एक सही है?

(a) कथन-I और कथन-II दोनों सही हैं तथा कथन-II, कथन-I की व्याख्या करता है।
(b) कथन-I और कथन-II दोनों सही हैं, किंतु कथन-II, कथन-I की व्याख्या नहीं करता है।
(c) कथन-I सही है, किंतु कथन-II गलत है।
(d) कथन-I गलत है, किंतु कथन-II सही है।

46. With reference to Indian Space Policy 2023, consider the following statements:

1. Non-Governmental Entities will be allowed to undertake end-to-end activities in the space sector.
2. ISRO will transition out from the manufacturing of operational space systems.
3. IN-SPACe will act as a single window clearance and authorisation agency for space launches.

How many of the statements given above is/are correct?

(a) Only one
(b) Only two
(c) All three
(d) None

47. Consider the following nuclear power plants in India:

1. Tarapur
2. Kakrapar
3. Kaiga
4. Kudankulam

Which one of the following gives the correct order of these nuclear power plants from north to south?

(a) 1-2-3-4
(b) 2-1-4-3
(c) 2-1-3-4
(d) 1-2-4-3

48. Consider the following statements regarding human blood groups:

1. A person with the 'O' blood group is called a universal donor because of the absence of both A and B antigens on the surface of red blood cells.
2. A person with the 'AB' blood group is called a universal recipient because of the absence of both anti-A and anti-B antibodies in the plasma.

Which of the statements given above is/are correct?

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

49. Which one of the following is the primary objective of the Hong Kong International Convention of the International Maritime Organization (IMO)?

(a) To regulate the design and construction of new ships to minimise fuel consumption and greenhouse-gas emissions.
(b) To establish global standards for the-safe-and-environmentally-sound recycling of ships after they reach their end of life.
(c) To provide a framework for compulsory insurance cover for ship-owners in the event of oil spill disasters.
(d) To harmonise national laws relating to vessel insurance across all IMO member states.

50. Consider the following statements regarding the Vishnupad Temple:

1. It is situated in Gaya, Bihar.
2. It was built on the orders of Raja Man Singh, who served as the Governor of Bihar.
3. It is situated on the bank of river Niranjana, which is also associated with Lord Buddha.

How many of the statements given above are correct?

(a) Only one
(b) Only two
(c) All three
(d) None

51. All forces encountered in daily life arise from four fundamental interactions among subatomic particles. Which of the following is not a fundamental force of nature?

(a) Frictional force
(b) Weak nuclear force

46. भारतीय अंतरिक्ष नीति 2023 (Indian Space Policy 2023) के संदर्भ में निम्नलिखित कथनों पर विचार कीजिए:

1. गैर-सरकारी संस्थाओं (Non-Governmental Entities) को अंतरिक्ष क्षेत्र में प्रारंभ से अंत तक (End-to-End) गतिविधियाँ संचालित करने की अनुमति दी जाएगी।
2. इसरो (ISRO) परिचालन अंतरिक्ष प्रणालियों (Operational space systems) के निर्माण से बाहर हो जाएगा।
3. इन-स्पेस (IN-SPACe) अंतरिक्ष प्रक्षेपणों के लिए एकल खिड़की स्वीकृति तथा प्राधिकरण एजेंसी के रूप में कार्य करेगा।

उपर्युक्त में से कितने कथन सही हैं?

(a) केवल एक
(b) केवल दो
(c) सभी तीन
(d) कोई नहीं

47. भारत के निम्नलिखित परमाणु विद्युत संयंत्रों पर विचार कीजिए:

1. तारापुर
2. काकरापार
3. कैगा
4. कुडनकुलम

इन परमाणु संयंत्रों का उत्तर से दक्षिण की ओर सही क्रम कौन-सा है?

(a) 1-2-3-4
(b) 2-1-4-3
(c) 2-1-3-4
(d) 1-2-4-3

48. मानव रक्त समूहों के संदर्भ में, निम्नलिखित कथनों पर विचार कीजिए:

1. 'O' रक्त समूह वाले व्यक्ति को सार्वभौमिक दाता कहा जाता है, क्योंकि लाल रक्त कणिकाओं की सतह पर A और B दोनों प्रतिजनों (Antigens) का अभाव होता है।
2. 'AB' रक्त समूह वाले व्यक्ति को सार्वभौमिक ग्राही कहा जाता है, क्योंकि प्लाज़्मा में एंटी-A और एंटी-B दोनों प्रतिरक्षियों (Antibodies) का अभाव होता है।

उपर्युक्त कथनों में से कौन-सा/से सही है/हैं?

(a) केवल 1
(b) केवल 2
(c) 1 और 2 दोनों
(d) न तो 1, न ही 2

49. अंतर्राष्ट्रीय समुद्री संगठन (International Maritime Organization - IMO) के हांगकांग अंतर्राष्ट्रीय अभिसमय (Hong Kong International Convention) का प्रमुख उद्देश्य निम्नलिखित में से कौन-सा है?

(a) नए जहाज़ों के डिज़ाइन और निर्माण को विनियमित करना ताकि ईंधन की खपत और ग्रीनहाउस गैस उत्सर्जन को न्यूनतम किया जा सके।
(b) जहाज़ों की आयु समाप्त होने के बाद उनके सुरक्षित और पर्यावरणीय दृष्टि से सही पुनर्चक्रण (Recycling) के लिए वैश्विक मानक स्थापित करना।
(c) तेल रिसाव (Oil spill) जैसी आपदाओं की स्थिति में जहाज़ मालिकों के लिए अनिवार्य बीमा कवरेज का ढाँचा प्रदान करना।
(d) सभी IMO सदस्य देशों में पोत बीमा (Vessel insurance) से संबंधित राष्ट्रीय कानूनों का सामंजस्य स्थापित करना।

50. विष्णुपद मंदिर के संबंध में निम्नलिखित कथनों पर विचार कीजिए:

1. यह बिहार के गया में स्थित है।
2. इसे राजा मानसिंह के आदेश पर बनवाया गया था, जो बिहार के गवर्नर के रूप में कार्यरत थे।
3. यह निरंजना नदी के तट पर स्थित है, जो भगवान बुद्ध से भी संबद्ध है।

उपर्युक्त में से कितने कथन सही हैं?

(a) केवल एक
(b) केवल दो
(c) सभी तीन
(d) कोई नहीं

51. दैनिक जीवन में आने वाले सभी बल उप-परमाण्विक कणों के बीच चार मूलभूत अंत:क्रियाओं से उत्पन्न होते हैं। निम्नलिखित में से कौन-सा प्रकृति का मूलभूत बल नहीं है?

(a) घर्षण बल
(b) दुर्बल नाभिकीय बल

(c) Gravitational force
(d) Electromagnetic force

52. Consider the following statements regarding compulsory licensing in the context of intellectual property:
1. Compulsory licensing enables governments to authorize the use of a patented invention without the consent of the patent holder.
2. It is permitted under the World Trade Organization's TRIPS Agreement, subject to specific conditions.

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

53. With reference to the RNA editing technique, consider the following statements:
1. It modifies the sequence of RNA molecules without altering the underlying DNA.
2. It can lead to the formation of proteins different from those encoded by the DNA.
3. The changes made in RNA are permanent and inheritable.

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

54. Human Papillomavirus (HPV), sometimes seen in the news, is associated with which of the following diseases?
(a) Hepatitis B
(b) Cervical cancer
(c) Monkeypox
(d) Japanese Encephalitis

55. Consider the following:
1. Advanced nuclear power systems for utilization of thorium.
2. Natural uranium fuelled Pressurized Heavy Water Reactors (PHWRs).
3. Fast Breeder Reactors (FBRs) utilizing plutonium based fuel.

What is the correct sequence of the stages given above as envisaged in India's three-stage nuclear power programme?
(a) 1-2-3
(b) 2-3-1
(c) 2-1-3
(d) 1-3-2

56. Consider the following statements regarding Microbial Fuel Cells (MFCs):
1. MFCs utilize the metabolic activity of microorganisms to convert organic matter into electricity.
2. MFCs can also be applied for wastewater treatment.

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

57. With reference to India's first gene-edited sheep, consider the following statements:
1. It has been developed by the National Bureau of Animal Genetic Resources (NBAGR).
2. A foreign DNA sequence was introduced into the Merino sheep's genome to enhance its disease resistance.

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

(c) गुरुत्वाकर्षण बल
(d) वैद्युतचुंबकीय बल

52. बौद्धिक संपदा (Intellectual Property) के संदर्भ में अनिवार्य लाइसेंसिंग (Compulsory Licensing) से संबंधित निम्नलिखित कथनों पर विचार कीजिए:

1. अनिवार्य लाइसेंसिंग के अंतर्गत सरकारों को बिना पेटेंट धारक की सहमति के किसी पेटेंटयुक्त आविष्कार के उपयोग की अनुमति देने का अधिकार होता है।
2. यह विश्व व्यापार संगठन (WTO) के व्यापार-संबंधी बौद्धिक संपदा अधिकार (TRIPS) समझौते के तहत, कुछ विशिष्ट शर्तों के अधीन, अनुमत है।

उपर्युक्त में से कौन-सा/से कथन सही है/हैं?
(a) केवल 1
(b) केवल 2
(c) 1 और 2 दोनों
(d) न तो 1, न ही 2

53. RNA संपादन तकनीक के संदर्भ में, निम्नलिखित कथनों पर विचार कीजिए:

1. यह अधस्थ (Underlying) DNA को परिवर्तन किए बिना RNA अणुओं के अनुक्रम को बदलता है।
2. यह DNA द्वारा कूटित (Encode) किए गए प्रोटीन से भिन्न प्रोटीन बना सकता है।
3 RNA में किए गए बदलाव स्थायी और आनुवंशिक (Heritable) होते हैं।

उपर्युक्त कथनों में से कौन-से सही हैं?
(a) केवल 1 और 2
(b) केवल 2 और 3
(c) केवल 1 और 3
(d) 1, 2 और 3

54. ह्यूमन पैपिलोमा वायरस (Human Papillomavirus - HPV), जो कभी-कभी समाचारों में देखा जाता है, निम्नलिखित में से किस रोग से संबंधित है?
(a) हेपेटाइटिस-बी
(b) सर्वाइकल कैंसर
(c) मंकीपॉक्स
(d) जापानी इन्सेफ़लाइटिस

55. निम्नलिखित पर विचार कीजिए:

1. थोरियम के उपयोग के लिए उन्नत परमाणु ऊर्जा प्रणाली (Advanced nuclear power systems)
2. प्राकृतिक यूरेनियम से संचालित दाबित भारी जल रिएक्टर (Pressurized Heavy Water Reactors – PHWRs)
3. प्लूटोनियम-आधारित ईंधन का उपयोग करने वाले तीव्र प्रजनक रिएक्टर (Fast Breeder Reactors – FBRs)

भारत के तीन-चरणीय (Three-Stage) परमाणु ऊर्जा कार्यक्रम में उपर्युक्त चरणों का सही क्रम कौन-सा है?
(a) 1 - 2 - 3
(b) 2 - 3 - 1
(c) 2 - 1 - 3
(d) 1 - 3 - 2

56. सूक्ष्मजीवीय ईंधन सेल (MFCs) के संदर्भ में, निम्नलिखित कथनों पर विचार कीजिए:

1. MFCs कार्बनिक पदार्थ को विद्युत में परिवर्तित करने के लिए सूक्ष्म जीवों की उपापचयी गतिविधि का उपयोग करते हैं।
2. MFCs का उपयोग अपशिष्ट जल उपचार के लिए भी किया जा सकता है।

उपर्युक्त कथनों में से कौन-सा/से सही है/हैं?
(a) केवल 1
(b) केवल 2
(c) 1 और 2 दोनों
(d) न तो 1, न ही 2

57. भारत की पहली जीन-संपादित भेड़ (Gene-edited Sheep) के संदर्भ में निम्नलिखित कथनों पर विचार कीजिए:

1. इसे राष्ट्रीय पशु आनुवंशिक संसाधन ब्यूरो (NBAGR) द्वारा विकसित किया गया है।
2. रोग-प्रतिरोधक क्षमता बढ़ाने के लिए विदेशी डीएनए अनुक्रम को मेरीनो भेड़ के जीनोम में प्रविष्ट कराया गया था।

उपर्युक्त में से कौन-सा/से कथन सही है/हैं?
(a) केवल 1
(b) केवल 2
(c) 1 और 2 दोनों
(d) न तो 1, न ही 2

58. Which one of the following best describes Underground Coal Gasification (UCG)?

(a) Partial combustion of surface coal in reactors to generate synthesis gas.
(b) Conversion of coal seams into methane through microbial activity.
(c) Injection of oxygen and steam into deep coal seams to produce syngas
(d) Capturing methane released from underground coal mines for use as natural gas

59. Consider the following pairs:

	Object	*Description*
1.	Asteroid	Small celestial bodies that orbit between Mars and Jupiter
2.	Comet	Icy bodies that develop a tail when they approach the Sun
3.	Meteoroid	Space object that lands on Earth's surface after passing through the atmosphere.

How many of the above pairs are correctly matched?

(a) Only one
(b) Only two
(c) All three
(d) None

60. Consider the following statements regarding Vaccine-Derived Polio Virus (VDPV):

1. VDPV is caused by a mutation in the poliovirus strain used in the Inactivated Polio Vaccine (IPV).
2. VDPV primarily spreads in populations with low immunization coverage against polio.

Which of the statements given above is/are correct?

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

61. The term "Next Generation DNA Sequencing (NGS)", sometimes seen in the news, refers to:

(a) A process of amplifying specific DNA segments using polymerase chain reaction (PCR).
(b) A gene-editing tool that corrects mutations by using guide RNA and Cas proteins.
(c) A process of creating identical genetic copies of organisms through somatic cell nuclear transfer
(d) Advanced techniques that enable rapid and simultaneous sequencing of millions of DNA fragments.

62. Which of the following statements is/are correct regarding different types of Intellectual Property Rights (IPRs)?

1. Copyright provides protection to both artistic works and scientific literature.
2. A trademark identifies the source of goods or services, enabling consumers to distinguish them from others.

Select the correct answer using the code given below:

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

63. North India's first nuclear power plant is being established in which of the following places?

(a) Gorakhpur, Haryana
(b) Mandi, Himachal Pradesh
(c) Almora, Uttarakhand
(d) Bulandshahr, Uttar Pradesh

58. निम्नलिखित से कौन-सा एक, 'भूमिगत कोयला गैसीकरण' (UCG) का सर्वोत्तम वर्णन करता है?

(a) संश्लेषित गैस बनाने के लिए रिएक्टर में सतही कोयले का आंशिक दहन करना।

(b) सूक्ष्मजीवीय गतिविधियों के माध्यम से कोयले की परतों को मेथेन में परिवर्तित करना।

(c) सिनगैस बनाने के लिए कोयले की गहरी परतों में ऑक्सीजन और भाप अंतर्वेशित (Inject) कराना।

(d) प्राकृतिक गैस के रूप में प्रयोग हेतु भूमिगत कोयला खदानों से निर्मुक्त होने वाली मेथेन को प्रग्रहित (Capture) करना।

59. निम्नलिखित युग्मों पर विचार कीजिए:

	वस्तु (Object)	विवरण (Description)
1.	क्षुद्रग्रह (Asteroid)	छोटे खगोलीय पिंड जो मंगल और बृहस्पति के मध्य परिक्रमा करते हैं
2.	धूमकेतु (Comet)	बर्फ़ीले पिंड जो सूर्य के निकट आने पर पूँछ (Tail) विकसित कर लेते हैं
3.	उल्कापिंड (Meteoroid)	वह अंतरिक्ष पिंड जो वायुमंडल से गुज़रने के बाद पृथ्वी की सतह पर गिरता है

उपर्युक्त में से कितने युग्म सही सुमेलित हैं?

(a) केवल एक

(b) केवल दो

(c) सभी तीन

(d) कोई नहीं

60. वैक्सीन-व्युत्पन्न पोलियो विषाणु (Vaccine-Derived Polio Virus – VDPV) के संबंध में निम्नलिखित कथनों पर विचार कीजिए:

1. VDPV, निष्क्रिय पोलियो वैक्सीन (Inactivated Polio Vaccine – IPV) में प्रयुक्त पोलियो विषाणु स्ट्रेन में उत्परिवर्तन (Mutation) के कारण होता है।
2. VDPV मुख्यत: उस आबादी में फैलता है जहाँ पोलियो के विरुद्ध टीकाकरण का कवरेज कम होता है।

उपर्युक्त में से कौन-सा/से कथन सही है/हैं?

(a) केवल 1

(b) केवल 2

(c) 1 और 2 दोनों

(d) न तो 1, न ही 2

61. कभी-कभी समाचारों में में देखे जाने वाले "नेक्स्ट जनरेशन डीएनए सीक्वेंसिंग (NGS)" शब्द युग्म का आशय है:

(a) पॉलीमरेज श्रृंखला अभिक्रिया (PCR) का उपयोग करके विशिष्ट DNA खंड को आवर्धित (Amplify) करने की प्रक्रिया।

(b) एक जीन-संपादन उपकरण, जो निर्देशित (Guide) RNA और Cas प्रोटीन का प्रयोग करके उत्परिवर्तन (Mutation) में सुधार करता है।

(c) 'कायिक कोशिका नाभिकीय स्थानांतरण' (SCNT) के माध्यम से जीव की समान आनुवंशिक प्रतिकृति बनाने की प्रक्रिया।

(d) उन्नत तकनीक, जो लाखों DNA खंडों के तीव्र और एकसाथ अनुक्रम को संभव बनाती है।

62. बौद्धिक संपदा अधिकारों (Intellectual Property Rights – IPRs) के विभिन्न प्रकारों के संबंध में निम्नलिखित में से कौन-से कथन सही हैं?

1. कॉपीराइट (Copyright) कलात्मक रचनाओं (Artistic works) और वैज्ञानिक साहित्य (Scientific literature) दोनों की सुरक्षा प्रदान करता है।
2. ट्रेडमार्क वस्तुओं या सेवाओं के स्रोत की पहचान करता है, जिससे उपभोक्ता उन्हें दूसरों से अलग पहचान सकते हैं।

नीचे दिए गए कूट का प्रयोग करके सही उत्तर चुनिए:

(a) केवल 1

(b) केवल 2

(c) दोनों 1 और 2

(d) न तो 1, न ही 2

63. उत्तर भारत का पहला परमाणु ऊर्जा संयंत्र निम्नलिखित में से किस स्थान पर स्थापित किया जा रहा है?

(a) गोहाना, हरियाणा

(b) मंडी, हिमाचल प्रदेश

(c) अल्मोड़ा, उत्तराखंड

(d) बुलंदशहर, उत्तर प्रदेश

64. Consider the following information:

Disease	*Causative Agent*	*Description*
1. Kala-azar	Virus	Spread by the bite of sandflies
2. Lumpy Skin Disease	Virus	A zoonotic disease affecting cattle
3. Tuberculosis	Bacterium	Spreads through the air when infected persons cough, sneeze, or spit

In which of the above rows is the information correctly matched?

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

65. Why is "burning plasma" considered an important milestone in the development of fusion power?

(a) It signifies a stage where fusion reactions are sustained through internal energy without external heating.
(b) It marks the stage where plasma becomes stable enough to be confined indefinitely by magnetic fields.
(c) It represents the phase where plasma begins to emit visible radiation due to recombination of ions.
(d) It is the stage where the fusion reactor attains the critical temperature necessary for initiating fusion reactions.

66. Which of the following are common applications of concave mirrors?

1. As reflectors in vehicle headlights
2. In reflecting telescopes to collect and focus light from distant objects
3. As rear-view mirrors in automobiles
4. In solar furnaces to concentrate sunlight

Select the correct answer using the code given below:

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

67. In the context of space science, what does the term 'Kessler Syndrome' describe?

(a) The temporary swelling of an astronaut's face during prolonged exposure to microgravity.
(b) The overheating of satellites caused by cosmic radiation.
(c) A chain reaction of collisions among space debris
(d) The gradual orbital decay of satellites caused by atmospheric drag in low Earth orbit.

68. With reference to India's Fast Breeder Reactors (FBRs), consider the following statements:

1. India's first Fast Breeder Reactor is located at Kalpakkam in Tamil Nadu.
2. It produces more fissile material than it consumes.
3. Under India's three-stage nuclear power programme, FBRs use spent nuclear fuel from the first stage.
4. They initially utilize Uranium–Plutonium Mixed Oxide (MOX) as fuel.

How many of the statements given above are correct?

(a) Only two
(b) Only three
(c) All four
(d) Only one

64. निम्नलिखित जानकारी पर विचार कीजिए:

	रोग	कारक एजेंट	विवरण
1.	कालाज़ार (Kala-azar)	विषाणु (Virus)	रेत-मक्खियों (बालू मक्षिका) के काटने से फैलता है
2.	लम्पी स्किन रोग (Lumpy Skin Disease)	विषाणु (Virus)	मवेशियों को प्रभावित करने वाला एक ज़ूनोटिक (zoonotic) रोग है
3.	तपेदिक (Tuberculosis)	जीवाणु (Bacterium)	संक्रमित व्यक्ति के खाँसने, छींकने या थूकने से वायु द्वारा फैलता है

उपर्युक्त में से कौन-सी पंक्तियाँ सही रूप से सुमेलित हैं?

(a) केवल 1 और 2
(b) केवल 2 और 3
(c) केवल 2
(d) केवल 3

65. संलयन शक्ति के विकास में "दहन प्लाज़्मा" (Burning Plasma) को एक आवश्यक मील का पत्थर क्यों माना जाता है?

(a) यह एक ऐसे चरण को दर्शाता है, जहाँ संलयन अभिक्रिया बिना बाह्य ऊष्मन के आंतरिक ऊर्जा से संचालित होती रहती है।
(b) यह उस चरण को दर्शाता है, जहाँ प्लाज़्मा इतना स्थायी हो जाता है कि वह चुंबकीय क्षेत्र से हमेशा के लिए बँधा रह सकता है।
(c) यह उस चरण को दर्शाता है, जहाँ आयन के पुनर्संयोजन (Recombination) के कारण प्लाज़्मा दृश्य विकिरण का उत्सर्जन शुरू कर देता है।
(d) यह वह चरण है, जहाँ संलयन रिएक्टर संलयन अभिक्रिया शुरू करने के लिए आवश्यक क्रांतिक तापमान (Critical temperature) तक पहुँचता है।

66. निम्नलिखित में से अवतल दर्पण (Concave mirrors) के सामान्य उपयोग कौन-कौन से हैं?

1. वाहनों के हेडलाइट में परावर्तक (Reflectors) के रूप में
2. दूरस्थ वस्तुओं से प्रकाश एकत्रित कर केंद्रित करने हेतु परावर्तक दूरबीनों (Reflecting telescopes) में
3. वाहनों में "पश्चदर्शी दर्पण" (Rear-view mirrors) के रूप में
4. सौर भट्ठियों (Solar furnaces) में सूर्य के प्रकाश को केंद्रित करने हेतु

नीचे दिए गए कूट का प्रयोग कर सही उत्तर चुनिए:

(a) केवल 1 और 3
(b) केवल 2, 3 और 4
(c) केवल 1, 2 और 4
(d) 1, 2, 3 और 4

67. अंतरिक्ष विज्ञान के संदर्भ में 'केसलर सिंड्रोम' (Kessler Syndrome) शब्द किसका वर्णन करता है?

(a) सूक्ष्म-गुरुत्वाकर्षण (Microgravity) के लंबे समय तक संपर्क में रहने पर किसी अंतरिक्ष यात्री के चेहरे की अस्थायी सूजन।
(b) ब्रह्मांडीय विकिरण (Cosmic radiation) के कारण उपग्रहों का अत्यधिक गर्म हो जाना।
(c) अंतरिक्ष मलबे (Space debris) के बीच टक्करों की शृंखलाबद्ध प्रतिक्रिया।
(d) निम्न पृथ्वी कक्षा (Low Earth orbit) में वायुमंडलीय घर्षण के कारण उपग्रहों का क्रमिक कक्षीय पतन।

68. भारत के तीव्र प्रजनक रिएक्टरों (Fast Breeder Reactors – FBRs) के संदर्भ में निम्नलिखित कथनों पर विचार कीजिए:

1. भारत का पहला तीव्र प्रजनक रिएक्टर तमिलनाडु के कल्पक्कम में स्थित है।
2. यह जितनी विखंडनीय (Fissile) सामग्री का उपभोग करता है, उससे अधिक मात्रा में उसका उत्पादन करता है।
3. भारत के तीन-चरणीय परमाणु ऊर्जा कार्यक्रम के अंतर्गत, FBR पहले चरण के व्ययित परमाणु ईंधन का उपयोग करते हैं।
4. प्रारंभिक अवस्था में ये यूरेनियम-प्लूटोनियम मिश्रित ऑक्साइड (Uranium–Plutonium Mixed Oxide – MOX) ईंधन का उपयोग करते हैं।

उपर्युक्त में से कितने कथन सही हैं?

(a) केवल दो
(b) केवल तीन
(c) सभी चार
(d) केवल एक

69. Consider the following statements regarding the first edition of the *State of Finance for Forests (SFF) 2025* Report, recently seen in the news:

1. It was released by the United Nations Environment Programme (UNEP).
2. According to the report, private forest finance exceeded public forest finance in 2023.

Which of the statements given above is/are correct?

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

70. Consider the following statements:

1. Nafithromycin is India's first indigenously developed antibiotic to treat community-acquired bacterial pneumonia in adults.
2. India accounts for around half of the global burden of community-acquired pneumonia.

Which of the statements above is/are correct?

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

71. With reference to stem cells, consider the following statements:

1. Zygote is a totipotent stem cell.
2. Induced pluripotent stem cells can be generated from adult body cells.
3. Adult stem cells are found only in bone marrow.

Which of the statements given above are correct?

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

72. With reference to India's launch vehicles, consider the following statements:

1. The Polar Satellite Launch Vehicle (PSLV) is a four-stage rocket, whereas the Geosynchronous Satellite Launch Vehicle (GSLV) is a three-stage rocket.
2. The GSLV is equipped with a cryogenic upper stage, while the PSLV does not have one.
3. The GSLV is used by ISRO to launch satellites into both geostationary and low Earth orbits, whereas the PSLV is used only for low Earth orbit launches.

Which of the statements given above is/are correct?

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

73. Melatonin, a hormone responsible for regulating the body's sleep–wake cycle, is secreted by which one of the following glands?

(a) Pituitary gland
(b) Pineal gland
(c) Adrenal gland
(d) Thyroid gland

74. Consider the following statements regarding dietary fats:

1. Saturated fats are predominantly found in foods of animal origin.
2. Unsaturated fats remain liquid at room temperature and are generally considered beneficial for heart health.
3. Trans fatty acids are produced industrially and are not found in natural food sources.

Which of the statements given above is/are correct?

(a) 1 only
(b) 3 only

69. हाल ही में समाचारों में उल्लेखित "स्टेट ऑफ़ फ़ाइनेंस फ़ॉर फ़ॉरेस्ट्स (State of Finance for Forests - SFF) 2025 रिपोर्ट" के प्रथम संस्करण के संबंध में निम्नलिखित कथनों पर विचार कीजिए:

1. इसे संयुक्त राष्ट्र पर्यावरण कार्यक्रम (United Nations Environment Programme - UNEP) द्वारा जारी किया गया है।
2. रिपोर्ट के अनुसार, वर्ष 2023 में निजी वन वित्त (Private Forest Finance) ने सार्वजनिक वन वित्त (Public Forest Finance) को पार कर लिया था।

उपर्युक्त में से कौन-सा/से कथन सही है/हैं?

(a) केवल 1
(b) केवल 2
(c) 1 और 2 दोनों
(d) न तो 1, न ही 2

70. निम्नलिखित कथनों पर विचार कीजिए:

1. नाफिथ्रोमाइसिन (Nafithromycin) वयस्कों में सामुदायिक रूप से अर्जित जीवाणुजनित निमोनिया (Community-acquired bacterial pneumonia) के उपचार हेतु भारत में स्वदेशी रूप से विकसित पहली प्रतिजैविक (Antibiotic) दवा है।
2. भारत, सामुदायिक रूप से अर्जित निमोनिया के वैश्विक भार का लगभग आधा हिस्सा रखता है।

उपर्युक्त में से कौन-सा/से कथन सही है/हैं?

(a) केवल 1
(b) केवल 2
(c) 1 और 2 दोनों
(d) न तो 1, न ही 2

71. 'स्टेम कोशिकाओं' के संदर्भ में, निम्नलिखित कथनों पर विचार कीजिए:

1. युग्मनज (Zygote) एक पूर्णशक्त (Totipotent) स्टेम कोशिका है।
2. प्रेरित बहुसक्षम (Induced Pluripotent) स्टेम कोशिकाओं को वयस्क शरीर की कोशिकाओं से उत्पन्न किया जा सकता है।
3. वयस्क स्टेम कोशिकाएँ केवल अस्थि मज्जा (Bone Marrow) में ही पाई जाती हैं।

उपर्युक्त कथनों में से कौन-से सही हैं?

(a) केवल 1 और 2
(b) केवल 2 और 3
(c) केवल 1 और 3
(d) 1, 2 और 3

72. भारत के प्रक्षेपण यानों (Launch Vehicles) के संदर्भ में निम्नलिखित कथनों पर विचार कीजिए:

1. ध्रुवीय उपग्रह प्रक्षेपण यान (पीएसएलवी) चार चरणों वाला रॉकेट है, जबकि भू-समकालिक उपग्रह प्रक्षेपण यान (जीएसएलवी) तीन चरणों वाला रॉकेट है।
2. GSLV में क्रायोजेनिक ऊपरी चरण (Cryogenic Upper Stage) होता है, जबकि PSLV में ऐसा चरण नहीं होता।
3. GSLV का उपयोग इसरो द्वारा भूस्थिर (Geostationary) तथा निम्न पृथ्वी कक्षा (Low Earth Orbit) - दोनों में उपग्रहों के प्रक्षेपण के लिए किया जाता है, जबकि PSLV का उपयोग केवल निम्न पृथ्वी कक्षा के प्रक्षेपणों के लिए किया जाता है।

उपर्युक्त में से कौन-सा/से कथन सही है/हैं?

(a) केवल 1
(b) केवल 3
(c) केवल 1 और 2
(d) 1, 2 और 3

73. मेलाटोनिन, जो हार्मोन शरीर के निद्रा-जागने के चक्र को विनियमित करने के लिए उत्तरदायी है, निम्नलिखित में से किस ग्रंथि द्वारा स्रावित होता है?

(a) पीयूष ग्रंथि (Pituitary Gland)
(b) पीनियल ग्रंथि
(c) अधिवृक्क ग्रंथि (Adrenal Gland)
(d) थायरॉइड ग्रंथि

74. आहार वसाओं (Dietary fats) के संबंध में निम्नलिखित कथनों पर विचार कीजिए:

1. संतृप्त वसा (Saturated fats) मुख्यत: पशु-आधारित खाद्य पदार्थों में पाई जाती हैं।
2. असंतृप्त वसा (Unsaturated fats) सामान्य तापमान पर तरल अवस्था में रहती हैं और सामान्य तौर पर हृदय स्वास्थ्य के लिए लाभदायक मानी जाती हैं।
3. ट्रांस वसीय अम्ल (Trans fatty acids) औद्योगिक रूप से बनाए जाते हैं और प्राकृतिक खाद्य स्रोतों में नहीं पाए जाते।

उपर्युक्त में से कौन-से कथन सही हैं?

(a) केवल 1
(b) केवल 3

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

75. Battery Energy Storage Systems (BESS) play a crucial role in renewable energy systems by:
(a) Balancing fluctuations in power supply from intermittent sources such as solar and wind.
(b) Enhancing the conversion efficiency of photovoltaic cells in solar plants.
(c) Capturing carbon dioxide emissions from renewable energy installations.
(d) Reducing transmission losses through high-voltage grid systems.

76. With reference to satellite navigation systems, consider the following pairs:

Satellite Navigation System	*Country*
1. BeiDou	China
2. Galileo	Russia
3. GLONASS	Japan

How many of the pairs given above are not correctly matched?
(a) Only one pair
(b) Only two pairs
(c) All three pairs
(d) None of the pairs

77. Which of the following statements is not correct regarding shale gas?
(a) It is a type of fossil fuel.
(b) It occurs within large fractures of highly permeable rock formations.
(c) It is primarily composed of methane.
(d) India has identified potential shale gas reserves in the Gondwana and Cauvery basins.

78. With reference to nuclear fission and nuclear fusion, consider the following statements:
1. While nuclear fission is currently used in power reactors, controlled nuclear fusion has not yet been achieved for commercial energy production.
2. Both processes involve the conversion of a small amount of mass into energy.
3. Fusion reactions release less energy per unit mass compared to fission reactions.

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

79. With reference to Stablecoins, consider the following statements:
1. They are blockchain-based digital assets designed to maintain a stable value relative to specified assets such as fiat currencies or commodities.
2. They are issued and regulated by the central banks of the respective countries.

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

80. Recently, Diethylene Glycol (DEG) was seen in the news in which of the following contexts?
(a) It is a pesticide banned under the Stockholm Convention for its persistence in the environment.
(b) It is a toxic chemical detected as a contaminant in certain pharmaceutical syrups.
(c) It is an industrial coolant suspected of causing soil and groundwater contamination in some manufacturing zones.
(d) It is a chemical additive linked to food adulteration incidents in processed beverages.

(c) केवल 2 और 3
(d) केवल 1 और 2

75. 'बैटरी ऊर्जा भंडारण प्रणाली' (BESS) नवीकरणीय ऊर्जा प्रणाली में, निम्नलिखित में से किसके माध्यम से आवश्यक भूमिका निभाती है?
(a) सौर और पवन जैसे असतत् स्रोतों (Intermittent sources) से विद्युत आपूर्ति में उतार-चढ़ाव को संतुलित करना।
(b) सौर संयंत्र में प्रकाश-विभव (Photovoltic) सेल की रूपांतरण दक्षता को बढ़ाना।
(c) नवीकरणीय ऊर्जा स्थापन (Installation) से उत्सर्जित होने वाली कार्बन डाइऑक्साइड को प्रग्रहित करना।
(d) उच्च-विभव ग्रिड प्रणाली के माध्यम से पारेषण क्षति (Transmission loss) को कम करना।

76. उपग्रह नौसंचालन प्रणालियों (Satellite Navigation Systems) के संदर्भ में, निम्नलिखित युग्मों पर विचार कीजिए:

	उपग्रह नौसंचालन प्रणालियाँ	देश
1.	बाईडू	चीन
2.	गैलीलियो	रूस
3.	ग्लोनास	जापान

उपर्युक्त में से कितने युग्म सही सुमेलित नहीं हैं?
(a) केवल एक युग्म
(b) केवल दो युग्म
(c) सभी तीन युग्म
(d) कोई भी युग्म नहीं

77. शेल गैस के संदर्भ में, निम्नलिखित कथनों में से कौन-सा एक सही नहीं है?
(a) यह एक तरह का जीवाश्म ईंधन है।
(b) यह अत्यधिक पारगम्य शैल के बड़े भ्रंश/दरार (Fracture) के अंदर उपस्थित होती है।
(c) यह मुख्यत: मेथेन से निर्मित होती है।
(d) भारत ने गोंडवाना और कावेरी बेसिन में संभावित शेल गैस रिज़र्व की पहचान की है।

78. नाभिकीय विखंडन (Nuclear Fission) और नाभिकीय संलयन (Nuclear Fusion) के संदर्भ में निम्नलिखित कथनों पर विचार कीजिए:
1. जहाँ नाभिकीय विखंडन का उपयोग वर्तमान में विद्युत उत्पादन रिएक्टरों में किया जा रहा है, वहीं नियंत्रित नाभिकीय संलयन (Controlled Nuclear Fusion) का व्यावसायिक ऊर्जा उत्पादन हेतु अभी तक सफलतापूर्वक प्रयोग नहीं किया जा सका है।
2. दोनों प्रक्रियाओं में द्रव्यमान की एक छोटी मात्रा को ऊर्जा में रूपान्तरित किया जाता है।
3. संलयन अभिक्रियाएँ प्रति इकाई द्रव्यमान के आधार पर विखंडन अभिक्रियाओं की तुलना में कम ऊर्जा उत्सर्जित करती हैं।

उपर्युक्त में से कौन-से कथन सही हैं?
(a) केवल 1 और 2
(b) केवल 2 और 3
(c) केवल 1 और 3
(d) 1, 2 और 3

79. स्थिरमुद्राओं (Stablecoins) के संदर्भ में निम्नलिखित कथनों पर विचार कीजिए:
1. ये ब्लॉकचेन-आधारित डिजिटल परिसंपत्तियाँ (Digital assets) होती हैं, जिन्हें निर्दिष्ट परिसंपत्तियों – जैसे कि फिएट मुद्राएँ (Fiat currencies) या वस्तुएँ (Commodities) – के सापेक्ष स्थिर मूल्य बनाए रखने के लिए डिज़ाइन किया गया है।
2. इनका निर्गमन और विनियमन संबंधित देशों के केंद्रीय बैंकों द्वारा किया जाता है।

उपर्युक्त में से कौन-सा/से कथन सही है/हैं?
(a) केवल 1
(b) केवल 2
(c) 1 और 2 दोनों
(d) न तो 1, न ही 2

80. हाल ही में डाइएथिलीन ग्लाइकॉल (Diethylene Glycol - DEG) निम्नलिखित में से किस संदर्भ में समाचारों में था?
(a) यह एक कीटनाशक है जिसे पर्यावरण में लंबे समय तक बने रहने के कारण स्टॉकहोम कन्वेंशन के तहत प्रतिबंधित किया गया है।
(b) यह एक विषैला रासायनिक पदार्थ है जो कुछ औषधीय सिरपों (Pharmaceutical syrups) में संदूषक (Contaminant) के रूप में पाया गया है।
(c) यह एक औद्योगिक शीतलक (Industrial coolant) है, जिसके कुछ विनिर्माण क्षेत्रों में मृदा और भूजल प्रदूषण का कारण होने का संदेह है।
(d) यह एक रासायनिक योजक (Chemical additive) है, जो प्रसंस्कृत पेय पदार्थों (Processed beverages) में मिलावट की घटनाओं से जुड़ा हुआ है।

81. Consider the following statements regarding LUPEX mission recently seen in news:

1. It is a joint mission of the Indian Space Research Organisation (ISRO) and the Japan Aerospace Exploration Agency (JAXA).
2. It aims to explore the lunar south pole region to assess the presence of water ice.

Which of the statements given above is/are correct?

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

82. Consider the following pairs:

Type of Hydrogen	Produced by
1. Pink Hydrogen	Electrolysis of water using electricity generated from nuclear power
2. Grey Hydrogen	Steam methane reformation of natural gas
3. Blue Hydrogen	Electrolysis of water using electricity generated from hydro power
4. White Hydrogen	Naturally occurring

How many of the above pairs are correctly matched?

(a) Only one pair
(b) Only two pairs
(c) Only three pairs
(d) All four pairs

83. Consider the following statements regarding Antimicrobial Resistance (AMR):

1. It refers to a condition in which the human body develops natural immunity after prolonged use of antimicrobial medicines.
2. Antimicrobial resistance occurs only in case of bacterial infections and not in viral infections.

Which of the statements given above is/are correct?

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

84. Which of the following statements best describes the term "gene doping"?

(a) Therapeutic use of gene editing technologies to treat genetic disorders
(b) Application of genetic engineering to increase agricultural productivity by modifying crop genes
(c) Manipulating genes or cells to improve athletic performance
(d) Use of genetic engineering to enhance the growth rate of livestock in agriculture

85. With reference to the NISAR satellite, consider the following statements:

1. It is a microwave remote sensing satellite.
2. ISRO has contributed the S-band Synthetic Aperture Radar (SAR), while NASA has provided the L-band SAR.
3. It can observe Earth's surface through clouds and dense vegetation, both during day and night.

Which of the statements given above are correct?

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

86. Match the following digestive enzymes with their primary functions in the human body:

Enzyme	*Function*
A. Amylase	1. Breakdown of proteins into peptides
B. Lipase	2. Conversion of starch into simple sugars

81. हाल ही में समाचारों में रहे LUPEX मिशन के संबंध में निम्नलिखित कथनों पर विचार कीजिए:

1. यह भारतीय अंतरिक्ष अनुसंधान संगठन (ISRO) और जापान एयरोस्पेस एक्सप्लोरेशन एजेंसी (JAXA) का एक संयुक्त मिशन है।
2. इसका उद्देश्य चंद्रमा के दक्षिणी ध्रुवीय क्षेत्र का अन्वेषण कर वहाँ पानी-की बर्फ़ (Water ice) की उपस्थिति का आकलन करना है।

उपर्युक्त में से कौन-सा/से कथन सही है/हैं?

(a) केवल 1
(b) केवल 2
(c) 1 और 2 दोनों
(d) न तो 1, न ही 2

82. निम्नलिखित युग्मों पर विचार कीजिए:

	हाइड्रोजन का प्रकार	किससे उत्पादित होता है
1.	गुलाबी हाइड्रोजन	नाभिकीय शक्ति से उत्पादित विद्युत का उपयोग करके जल का विद्युत अपघटन (Electrolysis)
2.	धूसर हाइड्रोजन	प्राकृतिक गैस का भापीय मेथेन रूपांतरण (Steam methane reformation)
3.	नीली हाइड्रोजन	जल शक्ति से निर्मित विद्युत का उपयोग करके जल का विद्युत अपघटन
4.	श्वेत हाइड्रोजन	प्राकृतिक रूप से पाई जाती है

उपर्युक्त में से कितने युग्म सही सुमेलित हैं?

(a) केवल एक युग्म
(b) केवल दो युग्म
(c) केवल तीन युग्म
(d) सभी चार युग्म

83. रोगाणुरोधी प्रतिरोध (एएमआर) के संबंध में निम्नलिखित कथनों पर विचार कीजिए:

1. यह एक ऐसी स्थिति को संदर्भित करता है जिसमें मानव शरीर रोगाणुरोधी दवाओं के लंबे समय तक उपयोग के बाद प्राकृतिक प्रतिरक्षा विकसित करता है।
2. रोगाणुरोधी प्रतिरोध केवल जीवाणु संक्रमण (Bacterial infections) के मामलों में होता है, न कि विषाणु संक्रमण (Viral infections) में।

उपर्युक्त में से कौन-सा/से कथन सही है/हैं?

(a) केवल 1
(b) केवल 2
(c) 1 और 2 दोनों
(d) न तो 1, न ही 2

84. निम्नलिखित में से कौन-सा कथन "जीन डोपिंग" शब्द का सर्वोत्तम वर्णन करता है?

(a) आनुवंशिक विकारों के उपचार के लिए जीन संपादन (Editing) तकनीकों का चिकित्सीय उपयोग
(b) फ़सल जीन में संशोधन करके कृषि उत्पादकता बढ़ाने के लिए आनुवंशिक अभियांत्रिकी का अनुप्रयोग
(c) खेलकूद में प्रदर्शन संबंधी सुधार के लिए जीन या कोशिकाओं में हेर-फेर करना
(d) कृषि में पशुधन की वृद्धि दर बढ़ाने के लिए आनुवंशिक अभियांत्रिकी का उपयोग

85. निसार (NISAR) उपग्रह के संदर्भ में निम्नलिखित कथनों पर विचार कीजिए:

1. यह एक माइक्रोवेव रिमोट सेंसिंग उपग्रह है।
2. इसरो ने एस-बैंड सिंथेटिक एपरचर रडार (S-band Synthetic Aperture Radar – SAR) का योगदान दिया है, जबकि नासा ने एल-बैंड SAR प्रदान किया है।
3. यह दिन और रात, दोनों समय में बादलों तथा घने वनस्पति आवरण के आर-पार होकर पृथ्वी की सतह का अवलोकन कर सकता है।

उपर्युक्त में से कौन-से कथन सही हैं?

(a) केवल 1 और 2
(b) केवल 2 और 3
(c) केवल 1 और 3
(d) 1, 2 और 3

86. मानव शरीर में पाचन एंज़ाइमों (Digestive Enzymes) को उनके मुख्य कार्यों के साथ सुमेलित कीजिए:

	एंज़ाइम	कार्य
A.	एमाइलेज (Amylase)	1. प्रोटीन का अपघटन कर पेप्टाइड्स में बदलना
B.	लाइपेज (Lipase)	2. स्टार्च को सरल शर्कराओं में परिवर्तित करना

C. Pepsin	3. Digestion of fats into fatty acids and glycerol
D. Trypsin	4. Digestion of peptides into amino acids

Select the correct answer using the code given below:

	A	B	C	D
(a)	2	3	1	4
(b)	3	2	4	1
(c)	2	4	1	3
(d)	1	3	2	4

87. The term 'Einstein Ring', sometimes seen in the news, refers to which of the following phenomena?

(a) Circular orbit of planets caused by the curvature of spacetime around the Sun.
(b) Formation of a ring-shaped image of a distant object due to gravitational lensing.
(c) Emission of X-rays from the accretion disk surrounding a black hole.
(d) A magnetic field loop observed around rapidly rotating neutron stars.

88. With reference to the Green Hydrogen Certification Scheme of India (GHCI), consider the following statements:

1. The Scheme applies only to the production of green hydrogen through electrolysis of water or conversion of biomass.
2. The Bureau of Energy Efficiency (BEE) is the nodal agency for implementing the Green Hydrogen Certification Scheme.

Which of the statements given above is/are correct?

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

89. Which of the following correctly explains why 'Green Crackers' is/are considered more environment-friendly than conventional ones?

1. They do not contain harmful chemicals such as barium nitrate and mercury.
2. They are designed to release water vapour or dust suppressants that reduce the emission of particulate matter.

Select the correct answer using the code given below:

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

90. Consider the following statements:

Statement I:

The Ministry of Mines has reclassified limestone entirely as a minor mineral, removing the earlier end-use distinction.

Statement II:

The use of limestone for making building lime has declined, while its industrial use in cement and chemical production has become dominant.

Which one of the following is correct in respect of the above statements?

(a) Both Statement-I and Statement-II are correct and Statement- II is the correct explanation for Statement-I
(b) Both Statement-I and Statement- II are correct and Statement-II is not the correct explanation for Statement-I
(c) Statement- I is correct but Statement-II is incorrect
(d) Statement-I is incorrect but Statement-II is correct

91. With reference to Sickle Cell Anaemia, consider the following statements:

1. It is an inherited genetic disorder.
2. It causes the white blood cells to develop an abnormal sickle-like shape, obstructing normal blood flow.

C.	पेप्सिन (Pepsin)	3. वसा का अपचयन कर वसीय अम्ल एवं ग्लिसरॉल में बदलना
D.	ट्रिप्सिन (Trypsin)	4. पेप्टाइड्स का अपघटन कर अमीनो अम्लों में बदलना

नीचे दिए गए कूट का प्रयोग कर सही उत्तर चुनिए:

	A	B	C	D
(a)	2	3	1	4
(b)	3	2	4	1
(c)	2	4	1	3
(d)	1	3	2	4

87. 'आइंस्टीन रिंग' (Einstein Ring) शब्द, जो कभी-कभी समाचारों में देखा जाता है, निम्नलिखित में से किस घटना से संबंधित है?

(a) सूर्य के चारों ओर स्पेस टाइम की वक्रता के कारण ग्रहों की वृत्ताकार कक्षा।

(b) गुरुत्वाकर्षण लेंसिंग (Gravitational lensing) के कारण किसी दूरस्थ पिंड की वलयाकार (Ring-shaped) छवि का निर्माण।

(c) कृष्ण विवर (Black hole) के चारों ओर स्थित अभिवृद्धि चक्र (Accretion disk) से एक्स-किरणों का उत्सर्जन।

(d) तीव्र गति से घूमते न्यूट्रॉन तारों के चारों ओर देखा जाने वाला चुंबकीय क्षेत्र लूप।

88. भारत की हरित हाइड्रोजन प्रमाणन योजना (GHCI) के संदर्भ में, निम्नलिखित कथनों पर विचार कीजिए:

1. यह योजना केवल जल के विद्युत अपघटन या जैवभार (बायोमास) के रूपांतरण के माध्यम से हरित हाइड्रोजन के उत्पादन पर लागू होती है।
2. ऊर्जा दक्षता ब्यूरो (BEE) हरित हाइड्रोजन प्रमाणन योजना के कार्यान्वयन के लिए नोडल एजेंसी है।

उपर्युक्त कथनों में से कौन-सा/से सही है/हैं?

(a) केवल 1

(b) केवल 2

(c) 1 और 2 दोनों

(d) न तो 1, न ही 2

89. निम्नलिखित में से कौन-सा विकल्प यह सही रूप से स्पष्ट करता है कि 'ग्रीन क्रैकर्स' (Green Crackers) पारंपरिक पटाखों की तुलना में अधिक पर्यावरण-अनुकूल माने जाते हैं?

1. इनमें बेरियम नाइट्रेट (Barium nitrate) और पारा (Mercury) जैसे हानिकारक रसायन नहीं होते।
2. इन्हें जल वाष्प या धूल दमनक छोड़ने के लिए डिज़ाइन किया गया है, जो कणिकीय पदार्थों के उत्सर्जन को कम करते हैं।

नीचे दिए गए कूट का प्रयोग करके सही उत्तर चुनिए:

(a) केवल 1

(b) केवल 2

(c) 1 और 2 दोनों

(d) न तो 1, न ही 2

90. निम्नलिखित कथनों पर विचार कीजिए:

कथन-I:

खनन मंत्रालय (Ministry of Mines) ने चूना पत्थर (Limestone) को पूरी तरह एक गौण खनिज (Minor mineral) के रूप में पुनर्वर्गीकृत कर दिया है, जिससे पूर्व में लागू अंतिम उपयोग (End-use) आधारित भेद समाप्त हो गया है।

कथन-II:

निर्माण हेतु चूना बनाने में चूना पत्थर के उपयोग में कमी आई है, जबकि सीमेंट और रासायनिक उत्पादन में इसका औद्योगिक उपयोग प्रमुख हो गया है।

उपर्युक्त कथनों के संदर्भ में निम्नलिखित में से कौन-सा सही है?

(a) कथन–I और कथन–II दोनों सही हैं, तथा कथन–II, कथन–I की व्याख्या करता है।

(b) कथन–I और कथन–II दोनों सही हैं, किंतु कथन–II, कथन–I का सही व्याख्या नहीं करता है।

(c) कथन–I सही है, किंतु कथन–II सही नहीं है।

(d) कथन–I सही नहीं है, किंतु कथन–II सही है।

91. दात्र कोशिका रोग (Sickle Cell Disease) के संदर्भ में, निम्नलिखित कथनों पर विचार कीजिए:

1. यह एक वंशानुगत आनुवंशिक विकार है।
2. इसमें श्वेत रक्त कणिकाएँ (WBC) एक असामान्य दात्र जैसा आकार विकसित कर सामान्य रक्त प्रवाह को अवरुद्ध कर देती हैं।

3. It is more prevalent among the tribal population in India.
4. The National Sickle Cell Anaemia Elimination Mission aims to eliminate the disease as a public health problem in India by 2030.

How many of the statements given above are correct?
(a) Only one
(b) Only two
(c) Only three
(d) All four

92. Consider the following statements :

Statement-I:

Gravitational waves travel through the universe with minimal obstruction, carrying information about their origins without distortion.

Statement-II:

Gravitational waves interact very weakly with matter.

Which one of the following is correct in respect of the above statements?
(a) Both Statement-I and Statement-II are correct and Statement-II is the correct explanation for Statement-I
(b) Both Statement-I and Statement-II are correct, but Statement-II is not the correct explanation for Statement-I
(c) Statement-I is correct, but Statement-II is incorrect
(d) Statement-I is incorrect, but Statement-II is correct

93. With reference to microRNAs (miRNAs), consider the following statements:
1. They carry genetic information from DNA and assist in the synthesis of proteins.
2. They bind to messenger RNA (mRNA) to inhibit its translation or promote its degradation.

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

94. With reference to rooftop solar panels, consider the following statements:
1. They use solar thermal technology to convert sunlight directly into electricity.
2. They generate direct current (DC) electricity.
3. Electricity produced by solar panels cannot be used directly in most household appliances without an inverter.

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

95. Consider the following:
1. Deuterium
2. Tritium
3. Lithium
4. Helium-3

Which of the above can be directly used as a fuel for a nuclear fusion reactor?
(a) 1 and 2 only
(b) 1, 2, and 4 only
(c) 1, 3, and 4 only
(d) 1, 2, 3, and 4

96. 'Shiv Shakti Point', sometimes seen in the news, is related to which of the following?
(a) The designated location for India's upcoming Gaganyaan crew module recovery tests in the Bay of Bengal
(b) The proposed site for the construction of India's highest solar observatory near Mount Abu
(c) The location identified for setting up India's Deep Space Network (DSN) tracking station in Ladakh
(d) The landing site of India's Chandrayaan-3 mission on the Moon

3. यह भारत में जनजातीय आबादी के बीच अधिक प्रचलित है।
4. राष्ट्रीय दात्र कोशिका रक्ताल्पता उन्मूलन मिशन का लक्ष्य वर्ष 2030 तक भारत में इस रोग का एक सार्वजनिक स्वास्थ्य समस्या के रूप में उन्मूलन करना है।

उपर्युक्त कथनों में से कितने सही हैं?

(a) केवल एक
(b) केवल दो
(c) केवल तीन
(d) सभी चार

92. निम्नलिखित कथनों पर विचार कीजिए:

कथन-I:

गुरुत्वाकर्षण तरंगें न्यूनतम बाधा के साथ ब्रह्मांड में यात्रा करती हैं और बिना विरूपण (Distortion) के अपने मूल (Origin) के संबंध में सूचना ले जाती हैं।

कथन-II:

गुरुत्वाकर्षण तरंगें द्रव्य (पदार्थ) के साथ बहुत दुर्बलता से अंत:क्रिया करती हैं।

उपर्युक्त कथनों के बारे में, निम्नलिखित में से कौन-सा एक सही है?

(a) कथन-I और कथन-II दोनों सही हैं तथा कथन-II, कथन-I की व्याख्या करता है।
(b) कथन-I और कथन-II दोनों सही हैं, किंतु कथन-II, कथन-I की व्याख्या नहीं करता है।
(c) कथन-I सही है, किंतु कथन-II गलत है।
(d) कथन-I गलत है, किंतु कथन-II सही है।

93. माइक्रो RNA (miRNAs) के संदर्भ में, निम्नलिखित कथनों पर विचार कीजिए:

1. यह DNA से आनुवंशिक सूचना ले जाते हैं और प्रोटीनों के संश्लेषण में सहायता करते हैं।
2. या तो संदेशवाहक RNA (mRNA) से बंध बनाकर उसके अनुवादन (Translation) को अवरुद्ध करते हैं या उसके निम्नीकरण को बढ़ावा देते हैं।

उपर्युक्त कथनों में से कौन-सा/से सही है/हैं?

(a) केवल 1
(b) केवल 2
(c) 1 और 2 दोनों
(d) न तो 1, न ही 2

94. छत पर स्थापित सौर पैनलों (Rooftop Solar Panels) के संदर्भ में, निम्नलिखित कथनों पर विचार कीजिए:

1. ये सूर्य के प्रकाश को प्रत्यक्ष रूप से विद्युत में परिवर्तित करने के लिए सौर ताप प्रौद्योगिकी का उपयोग करते हैं।
2. ये दिष्ट धारा (DC) विद्युत उत्पन्न करते हैं।
3. सौर पैनलों द्वारा उत्पादित विद्युत को इन्वर्टर के बिना अधिकांश घरेलू उपकरणों में प्रत्यक्ष रूप से उपयोग नहीं किया जा सकता है।

उपर्युक्त कथनों में से कौन-से सही हैं?

(a) केवल 1 और 2
(b) केवल 2 और 3
(c) केवल 1 और 3
(d) 1, 2 और 3

95. निम्नलिखित पर विचार कीजिए:

1. ड्यूटेरियम (Deuterium)
2. ट्रिटियम (Tritium)
3. लिथियम (Lithium)
4. हीलियम-3 (Helium-3)

उपर्युक्त में से कौन-से प्रत्यक्ष रूप में परमाणु संलयन (Nuclear Fusion) रिएक्टर के ईंधन के रूप में उपयोग किए जा सकते हैं?

(a) केवल 1 और 2
(b) केवल 1, 2 और 4
(c) केवल 1, 3 और 4
(d) 1, 2, 3 और 4

96. 'शिव शक्ति प्वॉइंट' (Shiv Shakti Point), जो कभी-कभी समाचारों में देखा जाता है, निम्नलिखित में से किससे संबंधित है?

(a) बंगाल की खाड़ी में भारत के आगामी गगनयान क्रू मॉड्यूल रिकवरी परीक्षणों के लिए निर्धारित स्थान
(b) माउंट आबू के पास भारत के सबसे ऊँचे सौर वेधशाला के निर्माण हेतु प्रस्तावित स्थल
(c) लद्दाख में भारत के डीप स्पेस नेटवर्क (DSN) ट्रैकिंग स्टेशन की स्थापना के लिए चिह्नित स्थान
(d) चंद्रमा पर भारत के चंद्रयान-3 मिशन के लिए लैंडिंग स्थल

97. Arrange the following sources of energy in descending order of their contribution to India's current installed electricity capacity:

1. Bio Power
2. Solar
3. Nuclear
4. Wind

Select the correct answer using the code given below:

(a) 2 - 4 - 1 - 3
(b) 4 - 2 - 3 - 1
(c) 2 - 4 - 3 - 1
(d) 4 - 2 - 1 - 3

98. In the context of cancer therapy, how do Oncolytic Vaccines differ from conventional vaccines?

(a) Oncolytic vaccines prevent infections that can cause cancer, whereas conventional vaccines are used after cancer develops.
(b) Conventional vaccines employ live attenuated viruses, whereas oncolytic vaccines use inactivated bacterial vectors.
(c) Conventional vaccines act directly on tumour cells, whereas oncolytic vaccines stimulate antibody production.
(d) Oncolytic vaccines are therapeutic in nature, while conventional vaccines are primarily preventive.

99. Which of the following statements are correct regarding the differences between bacteria and viruses?

1. Bacteria have a cellular structure enclosed by a cell wall, while viruses lack a cellular structure.
2. Bacteria can reproduce independently, while viruses require a host cell to replicate.
3. Antibiotics are generally effective against bacteria but not against viruses.
4. Some bacteria are beneficial for humans, while all viruses are obligate parasites.

Select the correct answer using the code given below:

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

100. Which of the following are advantages of Bharat Small Modular Reactors (SMRs) for India's energy sector?

1. They require shorter construction time due to factory-based manufacturing.
2. They can be deployed for both on-grid and off-grid power generation.
3. They are capable of reusing spent nuclear fuel without the need for reprocessing.

Select the correct answer using the code given below:

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

■■■■

97. भारत की वर्तमान स्थापित विद्युत क्षमता में उनके योगदान के आधार पर निम्नलिखित ऊर्जा स्रोतों को अवरोही क्रम (Descending Order) में व्यवस्थित कीजिए:

1. जैव ऊर्जा (Bio Power)
2. सौर ऊर्जा (Solar)
3. परमाणु ऊर्जा (Nuclear)
4. पवन ऊर्जा (Wind)

नीचे दिए गए कूट का प्रयोग करके सही उत्तर चुनिए:

(a) 2 - 4 - 1 - 3
(b) 4 - 2 - 3 - 1
(c) 2 - 4 - 3 - 1
(d) 4 - 2 - 1 - 3

98. कैंसर चिकित्सा के संदर्भ में, ऑन्कोलिटिक टीके (Oncolytic Vaccines) पारंपरिक टीकों से किस प्रकार भिन्न हैं?

(a) ऑन्कोलिटिक टीके उन संक्रमणों का निवारण करते हैं, जो कैंसर विकसित कर सकते हैं, जबकि पारंपरिक टीके कैंसर के विकसित होने के बाद प्रयोग किए जाते हैं।
(b) पारंपरिक टीके जीवित क्षीण विषाणुओं (Live Attenuated Viruses) का उपयोग करते हैं, जबकि ऑन्कोलिटिक टीके निष्क्रिय जीवाणु वाहकों (Inactivated Bacterial Vectors) का उपयोग करते हैं।
(c) पारंपरिक टीके प्रत्यक्ष रूप से ट्यूमर कोशिकाओं पर क्रिया करते हैं, जबकि ऑन्कोलिटिक टीके प्रतिरक्षियों (एंटीबॉडी) के उत्पादन को प्रोत्साहित करते हैं।
(d) ऑन्कोलिटिक टीके प्रकृति में उपचारात्मक (Therapeutic) होते हैं, जबकि पारंपरिक टीके मुख्य रूप से निवारक (Preventive) होते हैं।

99. जीवाणु और विषाणु के बीच अंतर के संदर्भ में, निम्नलिखित कथनों में से कौन-से सही हैं?

1. जीवाणु में कोशिका भित्ति से आवृत्त एक कोशिकीय संरचना होती है, जबकि विषाणु में कोशिकीय संरचना नहीं होती है।
2. जीवाणु स्वतंत्र रूप से प्रजनन कर सकते हैं, जबकि विषाणु को प्रतिकृति बनाने के लिए पोषी (Host) कोशिका की आवश्यकता होती है।
3. प्रतिजैविक (Antibiotics) सामान्यत: जीवाणुओं के विरुद्ध प्रभावी होते हैं, लेकिन विषाणु के विरुद्ध नहीं।
4. कुछ जीवाणु मानवों के लिए लाभदायक होते हैं, जबकि सभी विषाणु अनिवार्य परजीवी (Obligate parasites) होते हैं।

नीचे दिए गए कूट का प्रयोग कर सही उत्तर चुनिए:

(a) केवल 1 और 2
(b) केवल 2, 3 और 4
(c) केवल 1, 2 और 3
(d) 1, 2, 3 और 4

100. भारत लघु मॉड्यूलर रिएक्टरों (BSMRs) के निम्नलिखित में से कौन-से लाभ भारत के ऊर्जा क्षेत्रक के लिए हैं?

1. फैक्ट्री-आधारित विनिर्माण के कारण उन्हें कम निर्माण समय की आवश्यकता होती है।
2. उन्हें ऑन-ग्रिड और ऑफ़-ग्रिड विद्युत उत्पादन दोनों के लिए परिनियोजित किया जा सकता है।
3. यह पुन:प्रसंस्करण की आवश्यकता के बिना प्रयुक्त हो चुके नाभिकीय ईंधन को पुन: उपयोग करने में सक्षम है।

नीचे दिए गए कूट का प्रयोग कर सही उत्तर चुनिए:

(a) केवल 1 और 2
(b) केवल 2 और 3
(c) केवल 1 और 3
(d) 1, 2 और 3

■■■■

Space for Rough Work

NEXT IAS

GENERAL STUDIES

CSE Prelims Test Series (PTS): 2026

2nd November, 2025 | Test-13 [Sectional Test]

Answer Key

1. (c)	21. (c)	41. (d)	61. (d)	81. (c)
2. (a)	22. (d)	42. (b)	62. (c)	82. (c)
3. (b)	23. (d)	43. (a)	63. (a)	83. (d)
4. (d)	24. (d)	44. (d)	64. (b)	84. (c)
5. (c)	25. (a)	45. (a)	65. (a)	85. (d)
6. (c)	26. (b)	46. (c)	66. (c)	86. (a)
7. (a)	27. (b)	47. (c)	67. (c)	87. (b)
8. (b)	28. (b)	48. (c)	68. (c)	88. (c)
9. (a)	29. (b)	49. (b)	69. (a)	89. (c)
10. (c)	30. (a)	50. (b)	70. (a)	90. (d)
11. (d)	31. (a)	51. (a)	71. (a)	91. (b)
12. (b)	32. (c)	52. (c)	72. (c)	92. (a)
13. (b)	33. (a)	53. (a)	73. (b)	93. (b)
14. (a)	34. (c)	54. (b)	74. (d)	94. (b)
15. (a)	35. (c)	55. (b)	75. (a)	95. (b)
16. (c)	36. (b)	56. (c)	76. (b)	96. (d)
17. (c)	37. (c)	57. (d)	77. (b)	97. (a)
18. (b)	38. (b)	58. (c)	78. (a)	98. (d)
19. (b)	39. (c)	59. (b)	79. (a)	99. (d)
20. (b)	40. (a)	60. (b)	80. (b)	100. (a)

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General Studies
Test-13

Sectional Test:

Science & Technology, General Science and Current Affairs (January 2025 - Till Date)

1. (c)

- **Context:** World Athletics has recently introduced a once-in-a-lifetime SRY gene test for athletes wishing to compete in the female category. SRY gene test is considered a reliable proxy for determining biological sex.
- **Option (c) is the correct answer**: The **SRY gene (Sex-determining Region Y gene)** is a gene located on the **Y chromosome** that plays a **crucial role in male sex determination** in humans. The SRY gene produces a protein called the Testis Determining Factor (TDF), which initiates the process of testis formation and subsequently the production of male hormones (like testosterone).
- World Athletics has started testing for the SRY gene to determine sex eligibility in female categories. It is a cheek swab or blood test, which is done once in an athlete's life by each national federation. If the test is negative for the Y chromosome - i.e. it is absent - the athlete is eligible to compete in the female category. A positive SRY test may occur if the athlete is a transgender individual with a male chromosomes (46XY) regardless of their past, present or future gender affirming hormonal therapy

2. (a)

- **Statement 1 is correct:** Brain–Computer Interface (BCI) technology allows **direct communication between the human brain and an external device** (such as a computer, robotic arm, or prosthetic limb) **without the use of any muscles or peripheral nerves.**
  - It bypasses the body's usual output pathways (like speech or movement) and translates brain activity into digital commands.
- This helps patients with paralysis or neurological disorders (like ALS) to control devices using only their brain signals.
  - **Statement 2 is correct:** BCIs work by recording and decoding the electrical activity of neurons in the brain, usually through electrodes placed on or within brain tissue.
- **Statement 3 is not correct:** Implantation of Neuralink devices requires a surgical procedure. Neuralink's brain chip, developed by Elon Musk's company, involves the use of a **surgical robot** to implant ultra-thin electrode threads directly into specific brain regions

3. (b)

- **Statement 1 is correct: Lithium-ion batteries are much lighter** than conventional lead–acid batteries for the same energy output. This makes them highly suitable for portable electronics, electric vehicles, and drones where weight reduction is critical.
- **Statement 2 is correct: They have a high energy density**, meaning they can store more energy per unit mass or volume compared to lead–acid batteries.
- **Statement 3 is correct: Lithium-ion batteries are rechargeable**, with hundreds to thousands of charge–discharge cycles without significant capacity loss.
- **Statement 4 is not correct:** Lithium-ion batteries are **more expensive** to manufacture than lead–acid batteries because of advanced materials, safety mechanisms, and complex production processes.
- **Statement 5 is not correct:** refers to a condition where excessive heat generation within the battery can lead to overheating, fire, or even explosion. It is **one of the major safety concerns in lithium-ion technology.**, not an advantage.

4. (d)

- **Fissile and fertile material:**
  - Fissile materials are isotopes that are capable of undergoing fission after capturing low-

energy thermal (slow) neutrons. The three primary fissile materials are uranium-233, uranium-235, and plutonium-239.

- ♦ Fertile material consists of isotopes that are not fissionable by thermal neutrons but can be converted into fissile isotopes (after neutron absorption and subsequent nuclear decay). There are two basic fertile materials: uranium-238 and thorium-232.

- **Statement 1 is not correct: Uranium-233 (U-233)** is a **fissile isotope**, but it is **not naturally occurring**. It is **artificially produced** in nuclear reactors by neutron irradiation of **Thorium-232 (Th-232)**.
- **Statement 2 is not correct: Plutonium-239 (Pu-239)** is also **fissile**, but **not naturally found**. It is **produced artificially** when **Uranium-238 (U-238)** absorbs a neutron and undergoes a series of beta decays.
- **Statement 3 is not correct: Uranium-238 (U-238)** is **not fissile**, it is **fertile**

5. (c)

- **Statement 1 is correct :**
  - ♦ A Geostationary Orbit (GSO) is a circular orbit around Earth's equator (~35,786 km altitude). Satellites in geostationary orbit (GEO) circle Earth above the equator from west to east following Earth's rotation – taking 23 hours 56 minutes and 4 seconds – by travelling at exactly the same rate as Earth. This makes satellites in GEO appear to be 'stationary' over a fixed position.
  - ♦ Sun synchronous orbits (SSO) are a specialized type of polar orbit, designed to ensure a satellite passes over the same part of the Earth at approximately the same local solar time. Satellites in SSO, travelling over the polar regions, are synchronous with the Sun. This means they are synchronised to always be in the same 'fixed' position relative to the Sun. This means that the satellite always visits the same spot at the same local time – for example, passing the city of Paris every day at noon exactly.
- **Statement 2 is correct:**
  - ♦ **Earth observation satellites** (like Cartosat, Resourcesat, and Landsat) are generally placed in **Sun-synchronous orbits**, as they need consistent daylight conditions for optical imaging and data comparison.
  - ♦ **Telecommunication and weather satellites** (like INSAT, GSAT, and METEOSAT) are placed in **Geostationary orbits**, as remaining fixed over one point allows continuous communication or monitoring of a specific region.

6. (c)

- **Three-parent baby:** Human offspring produced from the genetic material of one man and two women through the use of assisted reproductive technologies, specifically mitochondrial replacement therapy (MRT) and three-person in vitro fertilization (IVF). It is a reproductive technology designed to prevent the transmission of mitochondrial diseases from mother to child.
- Statement I is correct: In this technique, the resulting baby possesses DNA from three people — the father, the mother, and the donor woman who provides healthy mitochondria. Hence, the baby has genetic material from both biological parents (nuclear DNA) and a donor (mitochondrial DNA).
- **Statement II is not correct:** The technique does **not replace nuclear DNA** of the mother. Instead, it **replaces the defective mitochondria** (which are outside the nucleus) in the mother's egg with **healthy mitochondria** from a donor egg. The **nuclear DNA from the biological mother is retained**, ensuring that the child resembles the biological parents.
- **Additional information**: Three main methods are used in mitochondrial replacement therapy
  - ♦ **Maternal Spindle Transfer (MST):** It is performed before fertilization. The mother's nucleus is transferred into a donor egg (whose nucleus is removed but mitochondria are intact).
  - ♦ **Pronuclear Transfer**: It is performed after fertilization.The nuclei from a fertilized

egg of the mother are moved into a donor embryo with healthy mitochondria after removing its own nuclei.

- **Polar body transfer (PBT):** The mother's polar bodies, which contain her nuclear DNA and mitochondria, are transferred into a donor egg.

7. (a)

- **Ethanol blending** refers to mixing ethanol (an alcohol derived mainly from sugarcane, maize, or other biomass) with petrol to produce cleaner fuel. The Government of India under the Ethanol Blended Petrol (EBP) Programme has recently achieved 20% ethanol blending (E20).
- **Statement 1 is correct:** Ethanol is produced domestically from agricultural feedstocks. Blending it with petrol **reduces the need for crude oil imports**, thereby **saving foreign exchange reserves**. According to NITI Aayog's "Roadmap for Ethanol Blending in India 2020–25," achieving 20% blending could save about **$4 billion annually** in foreign exchange.
- **Statement 2 is correct:** Ethanol blending results in lower emissions of carbon monoxide (CO), unburnt hydrocarbons, and particulate matter (PM) — improving urban air quality.
- **Statement 3 is not correct:** Ethanol **increases**, not lowers, the **octane number** of petrol. A higher octane number means **better anti-knocking properties**, improving engine performance and efficiency.
- **Statement 4 is not correct:** Ethanol has a **lower calorific value** than petrol. Hence, blending ethanol with petrol **reduces** the overall energy content of the fuel.

8. (b)

- **Option (b) is the correct answer:** Ultra-conserved Elements (UCEs) are segments of DNA that are identical or nearly identical across different species, including humans, mice, and other vertebrates. These sequences have remained unchanged (highly conserved) for hundreds of millions of years, suggesting they perform vital biological functions that tolerate almost no mutation.

9. (a)

- **Context:** In preparation for sending humans to space, Indian research agencies are working on a series of "analog experiments" that will inform the country's own astronaut protocols.
- **Option (a) is the correct answer:** An analog mission is essentially an on-ground simulation of activities astronauts will have to carry out in space. The Gaganyaan Analog Experiments (Gyanex) will see India's first astronaut designates, along with other defence and research personnel, live in a confined crew module and space station. Participants will follow the same routine as astronauts in space, complete with carrying out scientific experiments. Gyanex-1, the first in the series of experiments, was carried out recently. These experiments are meant to help India develop its own astronaut protocols, including preparing contingencies for the unknowns.
  - Key learnings from these experiments will be regarding how the body and mind adapt to the unique conditions of space missions, such as living in a confined environment, working in teams, and the physical and mental stresses that such conditions put on humans.

10. (c)

- **Option (c) is the correct answer:** Natural uranium contains only about 0.7% Uranium-235 (U-235), the fissile isotope, and about 99.3% Uranium-238 (U-238), which is not fissile. Most reactors require enriched uranium (increased U-235 concentration) because natural uranium alone cannot sustain a chain reaction efficiently. However, Pressurised Heavy Water Reactors — designed to use heavy water (D_2O) as both coolant and moderator — can use natural uranium directly as fuel without enrichment.

11. (d)

- **International Thermonuclear Experimental Reactor (ITER): ITER** is an **international collaborative project** aimed at demonstrating the feasibility of **nuclear fusion** — the process that powers the Sun — as a large-scale, carbon-free source of energy. It is being built in

Cadarache, France, with participation from **India, USA, EU, Russia, Japan, China, and South Korea**.

- **Statement 1 is not correct:** ITER is a **magnetic fusion device**, not a **magnetic fission device**. It uses **magnetic confinement** (via a tokamak) to contain extremely hot plasma where fusion of hydrogen isotopes occurs.
- **Statement 2 is not correct:** ITER does **not use plutonium** as fuel. It uses **hydrogen isotopes — deuterium and tritium —** to achieve fusion reactions.
- **Statement 3 is correct**: **India**, through its domestic industry led by the **Institute for Plasma Research (IPR), Ahmedabad**, has contributed the **cryostat** — the **world's largest stainless-steel vacuum chamber** that encloses the ITER tokamak. The cryostat provides **ultra-cold vacuum insulation** to maintain the superconducting magnets at cryogenic temperatures. It was designed and manufactured by **Larsen & Toubro (L&T)** in India.

12. (b)

- **AIDS** is a late-stage condition caused by infection with the **Human Immunodeficiency Virus (HIV)**, which weakens the body's **immune system** by targeting specific immune cells.
- **Statement 1 is correct:** AIDS is caused by **HIV**, a **retrovirus** meaning it carries its genetic material as **RNA** and uses the enzyme **reverse transcriptase** to convert it into DNA inside human cells. The virus primarily attacks the body's **immune system**, making individuals vulnerable to opportunistic infections and certain cancers.
- **Statement 2 is not correct:** HIV **does not infect B-lymphocytes**; it mainly infects **CD4+ T-lymphocytes (T-helper cells)**, which coordinate the immune response. B-lymphocytes are responsible for antibody production, but they are not the primary target of HIV. Whereas, Helper T cells are critical for activating B cells to produce antibodies
- **Statement 3 is correct:** As of now, there is **no WHO-approved vaccine** for AIDS. However, **antiretroviral therapy (ART)** is available, which helps control the virus, prevent transmission, and allow patients to live longer, healthier lives.
- **Additional information**:
  - **Transmission:** HIV spreads through unprotected sexual contact, infected blood transfusions, shared needles, and from mother to child during childbirth or breastfeeding.
  - **Treatment:** The treatment for HIV is called antiretroviral therapy (ART). ART involves taking a combination of HIV medicines. ART cannot cure HIV, but these HIV medicines help people with HIV live long, healthy lives. ART also reduces the risk of HIV transmission. HIV medicines prevent HIV from multiplying (making copies of itself), which reduces the amount of HIV in the body (called the viral load).

13. (b)

- **Statement 1 is not correct :** Proton, neutron, and electron are tiny particles that make up atoms. The neutrino is also a tiny elementary particle, but it is not part of the atom. Such particles are also found to exist in nature. **Neutrino has a very tiny mass (but not massless)**, no charge and spin half. Thus, they are chargeless particles but are not massless.
- **Statement 2 is not correct :** It interacts very weakly with other matter particles. So weakly that every second trillions of neutrinos fall on us and pass through our bodies unnoticed. They hardly interact with anything (that is why sometimes known as Ghost particles). This means that they can travel massive distances undisturbed and that in turn means that it is much easier to trace them back to their source, helping us understand more about the distant universe.
- **Statement 3 is correct :** They are one of the fundamental particles the universe is built of, and are the second most abundant subatomic particles after photons.

14. (a)

- **Option (a) is the correct answer**: Minerals such as calcium, iron, magnesium, iodine,

phosphorus, zinc, and potassium are inorganic nutrients essential for normal body functions. They do not yield energy (unlike carbohydrates, fats, or proteins) but play crucial roles such as bone formation (calcium, phosphorus), oxygen transport (iron), nerve signaling (sodium, potassium), and thyroid regulation (iodine).

- **Additional information:**
  - **Fats, proteins, and carbohydrates** are **organic macronutrients** that provide energy.
  - **Vitamins**, though essential, are **organic compounds**, not inorganic.
  - Both **minerals and vitamins** are classified as **micronutrients** because they are required in small amounts compared to energy-giving nutrients.

15. (a)

- **Statement I is correct:** Modern Satellite-based internet constellations like Starlink and OneWeb use LEO orbits instead of higher orbits (like Geostationary or Medium Earth Orbit). Low Earth Orbit (LEO) refers to an orbital range up to 2,000 km above Earth's surface.
- **Statement II is correct and correctly explains Statement I:** Satellites in LEO provide lower latency (signal travel time delay) because signals travel a much shorter distance between the user terminal and the satellite. Since lower latency is the primary reason LEO satellites are preferred for broadband constellations, Statement II correctly explains Statement I.
- **Additional information:** Disadvantage of LEO systems:
- They require thousands of satellites to maintain continuous global coverage because each satellite covers a smaller portion of Earth's surface and moves rapidly across the sky.

16. (c)

- **Option (c) is the correct answer:** Google has announced an artificial intelligence (AI) hub in Visakhapatnam (Vizag), Andhra Pradesh, enabling Google to deploy its full AI stack with the aim of helping accelerate AI-driven transformation across India. This AI hub is a multi-faceted investment combining powerful gigawatt scale data center operations, new large-scale energy sources, and an expanded fiber-optic network. This investment of approximately $15 billion (USD) over five years (2026-2030) is Google's largest investment in India to date.

17. (c)

- **Statement 1 is correct:** Codex Alimentarius Commission (CAC) is an intergovernmental body jointly established in 1963 by the Food and Agriculture Organization (FAO) and the World Health Organization (WHO). Its main purpose is to develop harmonized international food standards, guidelines, and codes of practice to protect consumer health and ensure fair practices in global food trade.
- **Statement 2 is correct:** The Spices Board of India (under the Ministry of Commerce and Industry) acts as the Secretariat for the Codex Committee on Spices and Culinary Herbs (CCSCH). The committee formulates global standards for spices and culinary herbs, strengthening India's role in the international spice trade.

18. (b)

- **Option (b) is the correct answer:** The term **"Day Zero"** is used in **water resource management** to describe the day when a **city or region's reservoirs reach critically low levels**, and **regular piped water supply has to be shut down** for the population. The term gained global attention during the **2018 Cape Town water crisis (South Africa)**, when authorities warned that the city could run out of municipal water due to severe drought and overuse. "Day Zero" is therefore a **warning threshold** indicating **extreme water scarcity**, urging conservation and better water management practices.

19. (b)

- **Statement 1 is correct**: Synchronous All India Population Estimation of Elephants (SAIEE) 2021-25 is India's first nationwide DNA-based census conducted by the Wildlife Institute of India, under the aegis of Project Elephant Ministry of Environment, Forest and Climate Change.

- **Statement 2 is not correct:** Wild elephant population fell by about 25% in eight years, underscoring growing threats from shrinking forests and rising conflict with humans. India is home to more than 60% of the world's remaining Asian elephants, but their habitats continue to shrink due to encroachment, infrastructure projects and human-elephant conflict.
- **Statement 3 is correct: State-wise, Karnataka continues to host the highest number of elephants at 6,013,** followed by Assam (4,159), Tamil Nadu (3,136), Kerala (2,785), Uttarakhand (1,792) and Odisha (912). Region-wise, the Western Ghats remain the biggest stronghold with 11,934 elephants, followed by the North Eastern Hills and Brahmaputra floodplains with 6,559.

20. (b)

- **Context:** Bodo community's ancient Bathou religion will receive a separate code in the upcoming census, a decision being hailed as historic national recognition.
- **Option (b) is the correct answer:** Bathouism is the traditional faith of the Bodos, the largest plains tribe of Assam. Their homeland has been on the north bank of the Brahmaputra, with the foothills of Bhutan to the north. Bathou faith is centred on the Sijou plant (Euphorbia splendens). The Sijou is planted in the Bathou altar at the centre as the symbol of Bathou religion of the Bodos.

21. (c)

- Prokaryotic cells (like bacteria and archaea) are simple, primitive cells without a true nucleus or membrane-bound organelles. Whereas, Eukaryotic cells (like those in plants, animals, fungi, and protists) are more complex and contain a nucleus and several membrane-bound organelles such as mitochondria, chloroplasts, Golgi apparatus, etc.
- **1 and 2 are not correct:** Following components are present in all the living cells, whether Prokaryotic or Eukaryotic: Plasma membrane (Cell membrane), Genetic material, and Ribosomes
- **Statement 3 is not correct: Mitochondria** are **absent in prokaryotic cells**; instead, energy-related reactions occur across their **plasma membrane**. Eukaryotic cells contain mitochondria as the **"powerhouse of the cell"** for ATP production.
- **Statement 4 is not correct: N**ucleus is a defining feature of eukaryotic cells only. Prokaryotic cells lack a true nucleus; they have a **nucleoid region** where DNA is loosely located without a nuclear membrane.

22. (d)

- **Statement 1 is not correct :** Grounded in the Outer Space Treaty of 1967 (OST), the Artemis Accords are a non-binding set of principles designed to guide civil space exploration and use in the 21st century. They were introduced in 2020 by the United States (NASA).
- **Statement 2 is not correct :** India signed the Artemis Accords in 2023. The Accords could fast-track India's human spaceflight capabilities and ambitions, and do so cost-effectively, via collaborations with not just the US but other members of the Accords as well.

23. (d)

- **Statement 1 is correct: Vitamins** are organic compounds required in small quantities for various **biochemical and physiological functions**.They are broadly classified into fat-soluble (A, D, E, K) and water-soluble (B-complex, C) vitamins. Vitamin A is fat-soluble, stored in the liver and adipose tissue, and plays a key role in vision, immunity, and cell growth. Vitamin C (ascorbic acid) is water-soluble and functions as a powerful antioxidant aiding collagen synthesis and immune defense.
- **Statement 2 is correct:** The human body cannot synthesize Vitamin C, which is why it must be obtained from fruits and vegetables (e.g., citrus fruits, amla). The body can synthesize Vitamin D when the skin is exposed to sunlight, specifically UV-B rays, which convert 7-dehydrocholesterol into Vitamin D_3 (cholecalciferol).
- **Statement 3 is correct:** Certain gut bacteria (mainly in the large intestine) can synthesize Vitamin K and Biotin (Vitamin B7). Although these vitamins are produced in the gut, their

absorption efficiency varies, so dietary intake is still important.

24. (d)

- **Biofortified crops** are cultivated to possess elevated levels of essential nutrients like vitamins, minerals, and proteins.
- **Genetically modified (GM) crops** are developed through genetic engineering to incorporate specific traits, such as pest resistance or herbicide tolerance.
- **Statement 1 is not correct:** Not all GM crops are biofortified; **GM crops may be modified for traits unrelated to nutrient content**. GM crops are often engineered for traits like pest resistance or drought tolerance, not necessarily for increased nutrients.
- **Statement 2 is not correct:** Not all biofortified crops are GM. Biofortification is the process of improving the nutritional quality of food crops. This can be achieved through agronomic practices, conventional breeding or biotechnology-based approaches like genetic engineering and genome editing.

25. (a)

- **Statement 1 is correct:** Future Circular Collider (FCC) is a proposed next-generation particle accelerator project by CERN (European Organization for Nuclear Research). It is envisioned as a successor to the Large Hadron Collider (LHC) and aims to explore the fundamental structure of matter at energies several times higher than the LHC's capacity.
- **Statement 2 is not correct:** FCC is not designed to study gravitational waves. Gravitational waves are ripples in spacetime produced by massive accelerating celestial bodies (like merging black holes or neutron stars), and they are studied using detectors such as LIGO, Virgo, and KAGRA, not particle accelerators. The FCC focuses instead on high-energy particle collisions, not astrophysical phenomena. FCC will enable physicists to study elementary particles such as Higgs bosons, top quarks, dark matter candidates, and search for new physics beyond the Standard Model.

26. (b)

- **Pair 1 is correctly matched: Vitamin B3 (Niacin)** deficiency causes **Pellagra**, characterized by **Dermatitis, Diarrhoea, and Dementia**.
- **Pair 2 is not correctly matched: Vitamin C (Ascorbic acid)** deficiency causes **Scurvy**, leading to bleeding gums, joint pain, and poor wound healing.
- **Pair 3 is not correctly matched: Calcium** deficiency causes **weak bones, rickets (in children), and osteoporosis (in adults)**, not anemia. **Anemia** usually results from **iron, folate, or Vitamin B12** deficiency.
- **Pair 4 is correctly matched:** Iodine deficiency leads to Goitre, an abnormal enlargement of the thyroid gland, and in severe cases, cretinism (in children).

27. (b)

- **Statement 1 is not correct : Renewable Energy Certificate (REC) mechanism is a market based instrument** to promote renewable energy and facilitate compliance of renewable purchase obligations (RPO). It is aimed at addressing the mismatch between availability of RE resources in state and the requirement of the obligated entities to meet the renewable purchase obligation (RPO). The REC issued shall remain valid until they are redeemed. The p**rice of Certificates shall be as discovered in the Power Exchange(s) or as mutually agreed between eligible entities and the electricity traders.**
- **Statement 2 is correct : RPO is the obligation mandated by the State Electricity Regulatory Commission (SERC) under the Act**, to purchase a minimum level of renewable energy out of the total consumption in the area of a distribution licensee.
- **Following entities are eligible for the issuance of Certificates:**
  - ♦ Renewable energy generating stations,
  - ♦ Captive generating stations based on renewable energy sources,
  - ♦ Distribution licensees, and
  - ♦ Open access consumers

28. (b)

- **About ultraviolet (UV) radiation:** The sun is one of the strongest sources of UV radiation in our environment. **Solar emissions include visible light, heat and UV radiation.** The three types of **UV radiation** are **classified according to their wavelength.** They differ in their biological activity and the extent to which they can penetrate the skin. **The shorter the wavelength, the more harmful the UV radiation.**
- **Statement 1 is not correct: UVA has the highest wavelength** (315-400 nm). It can **penetrate into the deeper layers of the skin** and is responsible for **skin ageing, wrinkling, tanning** etc. It accounts for approximately 95 per cent of the UV radiation reaching the Earth's surface.
- **Statement 2 is correct:** UVB has a wavelength of 280-315 nm. **During exposure to sunlight, the UVB photons enter the skin and induce the production of vitamin D.**
- **Statement 3 is correct: UVC** has a wavelength of 100-280 nm. Because of having **short-wavelength**, it is the **most damaging type** of UV radiation. It is almost **completely absorbed by the Earth's atmosphere.**

29. (b)

- **Statement 1 is not correct:** The Global Hunger Index is a peer-reviewed annual report, jointly published by Concern Worldwide, Welthungerhilfe, and the Institute for International Law of Peace and Armed Conflict (IFHV), designed to comprehensively measure and track hunger at the global, regional, and country levels. The aim of the GHI is to trigger action to reduce hunger around the world.
- **Statement 2 is correct:** Each country's GHI score is calculated based on a formula that combines four indicators that together capture the multidimensional nature of hunger:
  - Undernourishment: the share of the population whose caloric intake is insufficient;
  - Child stunting: the share of children under the age of five who have low height for their age, reflecting chronic undernutrition.
  - Child wasting: the share of children under the age of five who have low weight for their height, reflecting acute undernutrition; and
  - Child mortality: the share of children who die before their fifth birthday, reflecting in part the fatal mix of inadequate nutrition and unhealthy.

30. (a)

- **Indian Ocean Rim Association is an intergovernmental organization of 23 Member States and 12 Dialogue Partners, for regional cooperation in the Indian Ocean region across six Priority Areas and two Cross-Cutting Issues.** It was established in **1997** (originally as the Indian Ocean Rim Initiative, later IOR-ARC). Its goal is to promote regional cooperation, sustainable growth, and maritime security among countries bordering the Indian Ocean.
- **Statement 1 is correct:** All sovereign States of the Indian Ocean Rim, the shores of which are directly washed by the Indian Ocean, are eligible for membership of the Association. To become members, States must adhere to the principles and objectives enshrined in the Charter of the Association.
- **Statement 2 is not correct**: India is one of the founding members of IORA. However, Pakistan is not a member of the IORA.
- **Statement 3 is not correct:** The IORA Secretariat is located at Port Louis, Mauritius.

31. (a)

- There are **three major types of RNAs:** mRNA (messenger RNA), tRNA (transfer RNA), and rRNA (ribosomal RNA).
- All three RNAs are needed to synthesise a protein in a cell.
- **Pair 1 is not correctly matched:** mRNA carries the genetic code (sequence of codons) copied from DNA that specifies the sequence of amino acids in a protein.
- **Pair 2 is not correctly matched :** tRNA does not contain the genetic blueprint. Its actual function is to carry specific amino acids to the ribosome and match them with codons on the

mRNA through its anticodon region during translation.

- **Pair 3 is correctly matched : rRNAs** play **structural and catalytic role during translation.** rRNA forms ribosomes, which are essential in protein synthesis.

32. (c)

- **Statement 1 is correct:** Biogas is a renewable, eco-friendly fuel produced by the anaerobic (oxygen-free) decomposition of organic matter such as agricultural waste, animal dung, sewage, and food waste by microorganisms. It is a mixture mainly composed of methane (CH_4) and carbon dioxide (CO_2), with small traces of hydrogen sulfide (H_2S) and water vapor.
  - ♦ Whereas, natural gas is a fossil fuel formed over millions of years and hence non-renewable.
- **Statement 2 is not correct:** The methane content of biogas typically ranges from 45% to 75% by volume. Whereas methane content of natural gas is generally higher in the range of 85–95%. Hence, biogas has a lower methane content and therefore lower calorific value compared to natural gas.
- **Statement 3 is correct:** Biogas is produced by anaerobic microbial decomposition (also called methanogenesis) of biomass such as animal dung, crop residue, and organic waste. The microbes break down complex organic matter into simpler gases in biogas plants or digesters.

33. (a)

- **Option (a) is the correct answer:** In nuclear physics, **criticality** refers to the condition in which a **nuclear fission chain reaction becomes self-sustaining**. This means that each fission event releases enough neutrons to cause, on average, one more fission event, keeping the reaction going at a steady rate — neither increasing nor decreasing in intensity. If the reaction rate increases, the reactor becomes supercritical; if it decreases, the reactor becomes subcritical.

34. (c)

- **Option (c) is the correct answer**: Iodine-131 is a radioactive isotope of iodine that emits both beta (β) and gamma (γ) radiation. Iodine-131 therapy is primarily used for the diagnosis and treatment of thyroid disorders because the thyroid gland naturally absorbs iodine to produce thyroid hormones, allowing targeted treatment.
- **Additional information:**
  - ♦ **Co-60** is used medically for radiation therapy as implants and as an external source of radiation exposure. Cobalt therapy is the medical use of gamma rays from the radioisotope cobalt-60 to **treat conditions such as cancer.**
  - ♦ **Radium 223** dichloride is approved to treat **Prostate cancer.** It is used in patients whose cancer has spread to the bones and is causing symptoms but has not spread to other organs.

35. (c)

- **Statement I is correct**: Foods with a low Glycemic Index are indeed beneficial for individuals with diabetes because they release glucose slowly into the bloodstream, helping to maintain steady blood sugar levels.
- **Statement II is not correct:** Glycemic Index does not measure the amount of sugar present in a food. Glycemic Index (GI) is a numerical scale (0–100) that indicates how quickly a carbohydrate-containing food raises blood glucose levels after being eaten. GI depends on several factors such as the type of carbohydrate, fiber content, cooking method etc.

36. (b)

- **Statement 1 is correct**: Offshore wind energy refers to the generation of electricity from wind turbines installed in oceanic or sea areas, typically on continental shelves. These turbines convert the kinetic energy of stronger and steadier sea winds into electrical energy.
- **Statement 2 is not correct**: India currently has no operational offshore wind farms. The country's entire installed wind energy capacity comes from onshore projects.
- **Statement 3 is correct:** Offshore wind energy is generally more efficient than onshore wind because:

- Winds at sea are stronger and more consistent than those on land.
- The absence of terrain and obstacles allows for smoother, faster wind flow.
- However, offshore projects have higher installation and maintenance costs due to harsh marine conditions.

37. (c)

- **Statement 1 is correc**t: DNA fingerprinting (also called DNA profiling) is a technique used to identify individuals based on unique patterns in specific regions of their DNA. Although more than 99.9% of human DNA is identical across individuals, certain segments called Variable Number Tandem Repeats (VNTRs) or Short Tandem Repeats (STRs) differ greatly from person to person — forming a unique genetic pattern or "fingerprint."
- **Statement 2 is not correct:** DNA fingerprinting **does not involve sequencing the entire genome**. Instead, it focuses only on a **few specific regions** of DNA that vary highly among individuals (like STRs or VNTRs).
- **Statement 3 is correct**: DNA fingerprinting is widely used in:
  - **Criminal investigations** – to match biological evidence (like blood, hair, or saliva) with suspects.
  - **Paternity and maternity disputes** – to determine biological relationships with high precision.
  - It is also used in **wildlife conservation**, **immigration cases**, and **identifying disaster victims**

38. (b)

- **Statement 1 is not correct:** GM mosquitoes are mass-produced in a laboratory to carry two types of genes:
  - A **self-limiting gene** that **prevents female mosquito offspring from surviving to adulthood.**
  - A **fluorescent marker gene** that glows under a special red light. This allows researchers to identify GM mosquitoes in the wild.
- **Statement 2 is correct: GM mosquitoes produced in a lab lay eggs**, which carry the self-limiting and fluorescent marker genes. Mosquito control professionals release GM mosquito eggs into an area. When the eggs hatch, they develop into adult mosquitoes. These mosquitoes mate with wild females. The **genes are passed on to offspring.** The expected result of using GM mosquitoes is that the numbers of Ae. aegypti mosquitoes in an area decreases.

39. (c)

- **Statement 1 is correct:** The **Multi-Lane Free Flow (MLFF) tolling system** is a **barrier-less tolling mechanism** that allows **automatic toll deduction** using **FASTag and Automatic Number Plate Recognition (ANPR) technology**. The system reads the **Vehicle Registration Number (VRN)** and **FASTag** through **high-performance RFID readers and cameras**, enabling toll payment without vehicles stopping at toll plazas. This reduces congestion, travel time, and emissions while improving toll collection efficiency.
  - The **MLFF system is being implemented by the National Highways Authority of India (NHAI)** under the **Ministry of Road Transport and Highways (MoRTH)**. MoRTH is responsible for the overall rollout and coordination of the system across national highways.
- **Statement 2 is correct:** The **first barrier-free toll plaza under the MLFF system** is being developed at **Choryasi Fee Plaza in Gujarat**. An agreement was signed between **Indian Highway Management Company Limited (IHMCL)** and **ICICI Bank** to implement India's first comprehensive MLFF tolling system at this location.

40. (a)

- **Statement I is correct:** The **Supreme Court–mandated Central Empowered Committee (CEC)** has **recommended a nationwide ban on the plantation of Conocarpus species**. The Committee stated that this fast-growing exotic tree poses **ecological and public health risks**,

making it unsuitable for large-scale plantation in India.

- **Statement II is correct and correctly explains Statement I:** The **Conocarpus species depletes groundwater and damages nearby infrastructure** due to its **deep and invasive root system**. CEC's report states that Conocarpus trees pose adverse impacts on native biodiversity, alteration of local ecosystems, excessive groundwater consumption and deep and aggressive root system that extracts significant amounts of groundwater.
- **Additional Information:**
  - **Conocarpus**, also called **buttonwood** or **damas**, has been widely planted in **Delhi, Telangana, Andhra Pradesh, Maharashtra, Karnataka, and Tamil Nadu** for roadside greenery.
  - The CEC report highlighted that the plant's **brittle wood is highly flammable during summers**, posing a fire hazard.
  - The species originates from **tropical America, parts of West Africa, and the Arabian Peninsula**, and is considered **ecologically unsuitable** for India.

41. (d)

- **Statement 1 is correct :** The Axiom 4 mission was operated by the private US space company Axiom Space, in partnership with NASA and SpaceX. Notably, the mission carried the first astronauts from Hungary and Poland to the space station. The Ax-4 mission featured an international crew from the United States, India, Poland, and Hungary. Former NASA astronaut and director of human spaceflight at Axiom Space, Peggy Whitson, commanded the commercial mission, and ISRO astronaut Shubhanshu Shukla served as pilot. The private mission also carried ESA (European Space Agency) project astronaut Sławosz Uznański-Wiśniewski of Poland and Tibor Kapu of Hungary.
- **Statement 2 is correct :** ISRO had designed about 10 experiments for the mission. These included investigations into the effects of microgravity on muscle dysfunctions and the physical and cognitive impacts of utilizing computer screens in space. Another experiment studied the impact of spaceflight on the growth of six varieties of crop seeds
- **Statement 3 is correct :** Four decades after Rakesh Sharma became the first Indian to travel to space, Shubhanshu Shukla, a 39-year-old Indian Air Force officer, became the second Indian to travel to space and the first Indian to step onto the International Space Station.

42. (b)

- **A. Mitochondria — (4) Cellular respiration:** Known as the "powerhouse of the cell," mitochondria generate ATP (adenosine triphosphate) through the process of cellular respiration, converting glucose and oxygen into usable energy.
- **B. Ribosomes — (2) Protein synthesis:** Ribosomes are the **sites of protein synthesis**, where **amino acids are assembled into proteins** as instructed by messenger RNA (mRNA).
- **C. Lysosomes — (3) Intracellular digestion:** Lysosomes contain **hydrolytic enzymes** that digest worn-out organelles, food particles, and engulfed pathogens. They are often called the **"suicidal bags"** of the cell.
- **D. Golgi apparatus — (1) Packaging and secretion of cellular products**: The Golgi apparatus **modifies, sorts, and packages proteins and lipids** received from the endoplasmic reticulum and **prepares them for secretion or transport** within the cell.

43. (a)

- Option (a) is the correct answer: The Genetic Engineering Appraisal Committee (GEAC) functions in the Ministry of Environment, Forest and Climate Change (MoEF&CC). As per Rules, 1989, it is responsible for appraisal of activities involving large scale use of hazardous microorganisms and recombinants in research and industrial production from the environmental angle. The committee is also responsible for appraisal of proposals relating to release of genetically engineered (GE) organisms and products into the environment including experimental field trials.

44. (d)

- **Option (d) is the correct answer:** The same side of the Moon always faces Earth, which means we only ever see one hemisphere of the Moon from Earth, while the "far side" remains hidden. This is due to a phenomenon called "synchronous rotation" or "tidal locking," which means the Moon rotates on its axis at the same rate that it orbits Earth. The Moon takes about 27.3 days to both complete one orbit around the Earth and to make one rotation on its axis. This synchronization (tidal locking) is the reason why we only see one side of the Moon from Earth, as the Moon's rotation matches its orbital period around Earth.

45. (a)

- **Statement I is correct:** Most nuclear reactors require uranium to be enriched for use as nuclear fuel. Natural uranium contains mostly uranium-238 (non-fissile) and only a small percentage of uranium-235, which is fissile. Enrichment increases the concentration of uranium-235, making the uranium more suitable for sustaining a nuclear chain reaction in reactors.
- **Statement II is also correct** and correctly explains statement I: Less than 1% of natural uranium is fissile, as natural uranium contains about 0.7% uranium-235, which is the isotope that undergoes fission. The remaining majority is uranium-238, which is not readily fissile in typical nuclear reactors. This is the reason why most nuclear reactors require uranium to be enriched for use as nuclear fuel.

46. (c)

- **Statement 1 is correct:** As per the **Indian Space Policy, 2013**, **Non-Governmental Entities (NGEs) shall be allowed to undertake end-to-end activities in space sector** through establishment and operation of space objects, ground-based assets and related services, such as communication, remote sensing, navigation, etc. This would be subject to such guidelines/ regulations as prescribed by IN-SPACe.
- **Statement 2 is correct:** It states that the **ISRO will transition out from** the existing practice of being present in the **manufacturing of operational space systems.** Hereafter, mature systems shall be transferred to industries for commercial exploitation. ISRO shall focus on R&D in advanced technology, proving newer systems and realization of space objects for meeting national prerogatives.
- **Statement 3 is correct: IN-SPACe shall act as the single window agency for the authorisation of space activities** by government entities as well as NGEs, subject to relevant Government directives, keeping in mind safety, national security, international obligations and/ or foreign policy considerations. It shall accord authorisation for space activities, including **launch and operation** of launch vehicles including sub-orbital launches.

47. (c0

- The correct order of the nuclear plants from north to south is represented by the code 2-1-3-4.
- Kakrapar nuclear power plant lies in the state of Gujarat.
- Tarapur nuclear power plant lies in the state of Maharashtra.
- Kaiga nuclear power plant lies in the state of Karnataka.
- Kudankulam and Kalpakkam nuclear power plants lie in the state of Tamil Nadu.

48. (c)

- **ABO blood group system** is based on the presence or absence of **antigens (A and B)** on the surface of **red blood cells (RBCs)** and **antibodies (anti-A and anti-B)** in the plasma. These combinations determine compatibility for **blood transfusions**.
- **Statement 1 is correct:** A person with blood group O has no A or B antigens on the surface of red blood cells. Hence, their red cells are not recognized as foreign by recipients of any blood group, allowing them to donate blood to all groups. Therefore, individuals with group O (specifically O negative) are called universal donors.
- **Statement 2 is correct:** A person with blood group AB has both A and B antigens on their red blood cells and no anti-A or anti-B antibodies in their plasma. Because they lack antibodies that would attack incoming A or B antigens, they can receive blood from all ABO types. Thus, individuals with AB (especially AB positive) are called universal recipients.

49. (b)

- **Option (b) is the correct answer**: Hong Kong Convention was adopted at a Diplomatic Conference held in Hong Kong, China, in May 2009. It entered into force recently in June 2025. It is aimed at ensuring that ships, when being recycled after reaching the end of their operational lives, do not pose any unnecessary risk to human health and safety or to the environment.
  - The Hong Kong convention was developed with input from IMO Member States and non-governmental organizations, and in co-operation with the International Labour Organization and the Parties to the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal.
  - It intends to address all the issues around ship recycling, including the fact that ships sold for scrapping may contain environmentally hazardous substances such as asbestos, heavy metals, hydrocarbons, ozone depleting substances and others. It will address concerns about working and environmental conditions in many of the world's ship recycling facilities.

50. (b)

- **Context: Government has** announced **comprehensive development of Vishnupad Temple Corridor** and **Mahabodhi Temple Corridor**, modelled on the successful Kashi Vishwanath Temple Corridor, to transform them into world class pilgrim and tourist destinations.
- **Statement 1 is correct: Vishnupad Temple** is a temple dedicated to Lord Vishnu, located in **Gaya city of Bihar.**
- **Statement 2 is not correct:** It was **built** in 1787 on the orders of **Queen Ahilyabai Holkar of Ahmadnagar.**
- **Statement 3 is correct:** The temple is **located on the banks of the Falgu River**, which is **also known as Niranjana river.** Lord Buddha's first bath in the River Niranjana known in Pāli as Lilajan is the most striking event in his process of becoming Buddha. A river mentioned in Ramayana as Phalgu and later classical Sanskrit literature has been often stated to be the same as Niranjana.

51. (a)

- Among given options, Frictional force is not a fundamental force.
- All the forces we encounter in our daily lives come from just four fundamental types of interactions between subatomic particles.
- **The four fundamental forces are as follows:**
  - **Gravity** is the force that everybody knows about, yet the one that most eludes modern physics. In Newtonian physics, gravity is the attraction between any two objects in the universe. The force's strength increases with the objects' mass and diminishes with the distance separating them.
  - The **electromagnetic force,** like gravity, has infinite range but is a lot stronger. However, its net effects are often not felt because it can be both attractive and repulsive, which tend to cancel. This is the force, through interaction between electric

charges, that makes television work and magnets stick, causes friction between bodies and tension in strings, and all of chemistry.

- The **weak force operates only up to distances of 10-18 m** – about one-thousandth the size of a proton. For reasons we don't understand, it acts only on particles that, if they are moving near the speed of light, spin counter-clockwise with respect to the direction of their momentum. As a result, this force would vanish in a universe in the mirror dimension: there, the same particles would spin clockwise relative to their momentum.
- The **strong force ranges over somewhat longer distances, around 10-15 m.** It keeps the nucleus of an atom bound together, rather than flying apart, and sustains the nuclear fusion that powers the sun.

52. (c)

- **Statement 1 is correct:** Compulsory licensing allows governments to authorize the use of a patented invention without the consent of the patent holder, typically to address public health emergencies or ensure access to essential goods.
- **Statement 2 is correct:** Compulsory licensing is permitted under the World Trade Organization's TRIPS Agreement (Trade-Related Aspects of Intellectual Property Rights). Article 31 of the TRIPS Agreement outlines specific conditions under which compulsory licenses can be issued, such as ensuring adequate compensation to the patent holder and restricting the use to meet domestic needs

53. (a)

- **Statement 1 is correct:** RNA editing is a post-transcriptional modification process in which the sequence of an RNA molecule is chemically altered after it is transcribed from DNA, without changing the underlying DNA sequence. RNA editing directly modifies the nucleotide sequence of RNA molecules. This change affects the RNA transcript and the protein it codes for, but it does not alter the underlying DNA sequence. The genome remains unchanged.
- **Statement 2 is correct:** Because RNA editing changes the codons within messenger RNA (mRNA), it can alter the amino acid sequence of the resulting protein. Thus, proteins produced after RNA editing may differ from those originally encoded by the DNA.
- **Statement 3 is not correct:** The changes made in RNA are temporary and not inherited, because RNA molecules are short-lived and degrade after translation. Only changes in DNA can be passed on to the next generation; RNA editing affects gene expression within a single cell or organism only.

54. (b)

- **Option (b) is the correct answer**: Human papillomavirus (HPV) is a common sexually transmitted infection. Almost all sexually active people will be infected at some point in their lives, usually without symptoms. HPV usually goes away on its own without treatment. Some HPV infections cause genital warts. Others can cause abnormal cells to develop, which go on to become cancer. Persistent HPV infection with high-risk HPV types is the cause of cervical cancer and is associated with cancers of the vulva, vagina, mouth/throat, penis and anus. HPV is not the sole cause of cervical cancer, but studies have shown a 90% correlation

55. (b)

- **Option (B) is the correct answer :** India's three-stage nuclear power programme is formulated to achieve the country's long term energy security and independence, through the use of uranium and vast thorium reserves.
- **The three stages are :**
  - Natural uranium fuelled Pressurized Heavy Water Reactors (PHWRs).
  - Fast Breeder Reactors (FBRs) utilizing plutonium based fuel.
  - Advanced nuclear power systems for utilization of thorium.
  - The first two stages, natural uranium-fuelled heavy water reactors (First stage) and plutonium-fuelled fast breeder reactors

(second stage) are intended to generate sufficient fissile material from India's limited uranium resources, so that all vast thorium reserves can be fully utilized in the third stage of nuclear power program. In stage three of the program, self-sustaining advanced nuclear power systems will use Thorium-232-U-233 fuel to generate power, utilising large resources of thorium and thus ensuring long term energy security and independence.

56. (c)

- **Statement 1 is correct:** A microbial fuel cell (MFC) is a bio-electrochemical system that converts chemical energy to electrical energy through reactions catalyzed by microorganisms under anaerobic conditions. Microbial Fuel Cells (MFCs) have been aptly described as "**bioreactors that convert the energy in the chemical bonds of organic compounds into electrical energy through catalytic activity of microorganisms under anaerobic conditions**".
- **Statement 2 is correct:** Microbial fuel cells (MFCs) have shown immense potential as a one-stop solution for three major sustainability issues confronting the world today—energy security, global warming and wastewater management. MFCs have applications in wastewater treatment as the microorganisms in the fuel cells can degrade organic pollutants in wastewater, simultaneously producing electricity as a byproduct.

57. (d)

- **Statement 1 is not correc**t: The gene-edited sheep was developed by Sher-e-Kashmir University of Agricultural Sciences and Technology (SKUAST)-Kashmir, not by the National Bureau of Animal Genetic Resources (NBAGR).
- **Statement 2 is not correct:** The edited sheep contains no foreign DNA, distinguishing it from transgenic organisms. The gene edit targeted the sheep's own myostatin gene via CRISPR-Cas9. By disrupting this gene, muscle mass in the animal was enhanced by nearly 30 per cent, a trait naturally absent in Indian sheep breeds but known in select European breeds like the Texel

58. (c)

- **Underground coal gasification** entails converting coal, present in deep-seated reserves, into synthetic gas or syngas (broadly, carbon monoxide and hydrogen rich gases), whilst the coal or lignite remains intact underground. The process involves injecting air or oxygen and steam into deep, unmineable coal seams through boreholes to partially oxidize (gasify) the coal.

59. (b)

- **Pair 1 is correctly matched: Asteroids** refer to numerous tiny bodies that also move around the sun. They are found **between the orbits of Mars and Jupiter.**
- **Pair 2 is correctly matched: Comet**, a small body orbiting the Sun with a **substantial fraction of its composition made up of volatile ices. When** a comet **comes close to the Sun**, the ices sublimate (go directly from the solid to the gas phase) and form, along with entrained dust particles, a bright outflowing atmosphere around the comet nucleus known as a coma. As dust and gas in the coma flow freely into space, the comet forms two tails, one composed of ionized molecules and radicals and one of dust.
- **Pair 3 is not correctly matched:** The small pieces of rocks which move around the sun are called **meteoroids**. Sometimes these meteoroids **come near the earth and tend to drop upon it.** During this process **due to friction with the air they get heated up and burn.** It causes a flash of light.

60. (b)

- **Statement 1 is not correct:** Vaccine-derived polio is a condition that occurs when the weakened/attenuated strain of poliovirus used in the oral polio vaccine (OPV) mutates and regains the ability to cause paralysis. VDPV is not caused by the Inactivated Polio Vaccine (IPV), since IPV contains killed (inactivated) viruses, which cannot replicate or mutate.
- **Statement 2 is correct**: VDPVs usually cause outbreaks in populations where vaccine coverage

is low. People with certain immunodeficiency disorders can shed the virus for long periods of time, during which the virus can continue to change and can infect an unvaccinated person. Additionally, VDPV can also spread in regions with poor sanitation and hygiene.

61. (d)

- **Option (d) is the correct answer:** Next Generation Sequencing (NGS) refers to a group of advanced DNA sequencing technologies that allow scientists to read and analyze millions of DNA fragments simultaneously, providing a comprehensive view of an organism's genome. It represents a major advancement over the earlier Sanger sequencing method, which could process only one DNA fragment at a time. NGS is also called High-Throughput Sequencing (HTS) because it can generate large-scale genomic data rapidly and at lower cost per base.

62. (c)

- Intellectual Property Rights are legal rights that protect creations of the mind, such as inventions, artistic works, designs, and symbols used in commerce.
- **Statement 1 is correct:** Copyright protects a wide range of original works, including literary, scientific, and artistic works. Scientific literature is included under copyright protection, as long as it is an original work.
- **Statement 2 is correct:** A trademark is any symbol, logo, name, or design that helps identify the source of goods or services and distinguish them from those of others.
- **Additional information:** Major types of IPRs include:
  - **Patent:** Protects inventions and technological innovations.
  - **Copyright:** Protects literary, musical, and artistic works.
  - **Trademark:** Protects brand identity and source identification.
  - **Geographical Indication (GI):** Identifies goods from a specific region (e.g., Darjeeling Tea).
  - **Industrial Design:** Protects the visual appearance or aesthetic aspect of products such as its shape, pattern, or color combination.
  - **Trade Secrets:** Protect confidential business information.

63. (a)

- **Option (a) is the correct answer**: North India's first Nuclear Plant is coming up in Haryana in the town of Gorakhpur. Gorakhpur Haryana Anu Vidyut Pariyojana's(GHAVP) having two units of 700 MWe capacity each of Pressurised Heavy Water Reactor (PHWR) indigenous design is under implementation near Gorakhpur village in Fatehabad district in Haryana.

64. (b)

- **Row 1 is not correct** : Kala-azar or Visceral Leishmaniasis is a protozoan parasitic disease, spread by sandfly bites. Sandflies are brown in colour and have hairs on their bodies. The flies are infected with the parasite called 'leishmania donovani'. The disease affects some of the poorest people and is linked to malnutrition, population displacement, poor housing, a weak immune system and a lack of financial resources. Leishmaniasis is also linked to environmental changes such as deforestation, and urbanisation, according to WHO
- **Row 2 is correct** : Lumpy skin disease is a highly host-specific and causes diseases only in cattle and water buffalo and has been reported in some wild ruminants. LSD virus belongs to the family Poxviridae, subfamily Chordopoxviridae, and genus Capripoxvirus. Lumpy skin disease (LSD) is an infectious disease that can have significant impacts on animal health and welfare. While LSD is not a threat to human health, it is economically important for producers as it can cause a temporary reduction in milk production, impact on fertility, damage to hides and, occasionally, death of cattle.
- **Row 3 is correct** : Tuberculosis (TB) is an infectious disease caused by bacteria that most often affects the lungs. It spreads through the air when people with TB cough, sneeze or spit. Tuberculosis is preventable and curable. About a quarter of the global population is estimated to have been infected with TB bacteria

65. (a)

- **Option (b) is the correct answer:** In a fusion reactor, plasma (a hot, ionized gas of deuterium and tritium) must be heated to extremely high temperatures for atomic nuclei to fuse and release energy. A burning plasma is reached when the fusion reactions themselves generate enough heat to sustain the plasma temperature, without relying primarily on external heating sources such as lasers or magnetic confinement devices. In other words, the plasma becomes self-heating and self-sustaining — a critical step toward achieving net energy gain in fusion reactors. Achieving a burning plasma is a key scientific milestone toward developing practical fusion energy, as it shows that the plasma can sustain itself once initiated.

66. (c)

- **About concave mirrors:** A concave mirror is a spherical mirror whose reflecting surface is curved inward, resembling the inner surface of a sphere. It converges parallel rays of light to a single focus point, which makes it useful for applications requiring concentration or magnification of light.
- **Statement 1 is correct**: **Vehicle headlights** use **concave mirrors** as **reflectors** to focus light from the bulb into a strong, parallel beam directed forward.
- **Statement 2 is correct: Reflecting telescopes** use **concave mirrors** to **collect and focus light from distant celestial objects**, forming a bright, real image that can be magnified by an eyepiece.
- **Statement 3 is not correct**: **Rear-view mirrors** in automobiles are **convex mirrors**, not concave. Convex mirrors provide a **wider field of view**, allowing drivers to see more area behind the vehicle.
- **Statement 4 is correct**: **Solar furnaces** use **large concave mirrors** (often parabolic) to **concentrate sunlight at a single focal point**, generating very high temperatures for heating or power generation.

67. (c)

- **Option (c) is the correct answer: Kessler Syndrome** predicts an **escalating space debris population that leads to an increased likelihood of collisions and further debris creation**, resulting in a cascade of detrimental impacts.

68. (c)

- **Statement 1 is correct** : India's first fast breeder reactor is the Prototype Fast Breeder Reactor (PFBR) located at Kalpakkam, Tamil Nadu. In line with the true spirit of Aatmanirbhar Bharat, PFBR has been fully designed and constructed indigenously by BHAVINI with significant contribution from more than 200 Indian industries including MSMEs. Once commissioned, India will only be the second country after Russia to have a commercial operating Fast Breeder Reactor.
- **Statements 2 and 4 are correct** : The Fast Breeder Reactor (FBR) will initially use the Uranium-Plutonium Mixed Oxide (MOX) fuel. The Uranium-238 "blanket" surrounding the fuel core will undergo nuclear transmutation to produce more fuel, thus earning the name 'Breeder'. The use of Throium-232, which in itself is not a fissile material, as a blanket is also envisaged in this stage. By transmutation, Thorium will create fissile Uranium-233 which will be used as fuel in the third stage. FBR is thus a stepping stone for the third stage of the program paving the way for the eventual full utilization of India's abundant thorium reserves.
- **Statement 3 is correct** : The first stage uses Pressurised Heavy Water Reactors (PHWRs) fueled by natural uranium, which produces Plutonium-239 ($\text{Pu}-239$) as a byproduct in the spent fuel. The second stage uses FBRs, which are designed to be fueled by this reprocessed $\text{Pu}-239$ recovered from the spent fuel of the first stage.

69. (a)

- **Statement 1 is correct**: The first edition of the State of Finance for Forests (SFF) 2025 Report (titled "Unlock. Unleash. Realizing forest potential requires tripling investments in forests by 2030") was indeed released by the United Nations Environment Programme (UNEP).
- **Statement 2 is not correct**: According to the SFF 2025 Report, the total investment in forests

in 2023 was approximately $84 billion. Of this, public finance accounted for the vast majority: around 91% (or approximately $76 billion). Whereas, Private finance contributed only US$7.5 billion in 2023.

70. (a)

- **Statement 1 is correct: Nafithromycin** (trade name Miqnaf) is an **indigenously developed antibiotic** created by the Indian pharmaceutical company **Wockhardt Ltd.** It has been approved by the **Drugs Controller General of India (DCGI)** for the **treatment of community-acquired bacterial pneumonia (CABP) in adults**. Nafithromycin belongs to the **macrolide class** of antibiotics and has been developed to address **antimicrobial resistance (AMR)** challenges.
- **Statement 2 is not correct:**Drug-resistant pneumonia is a condition responsible for over two million deaths globally each year. India, which bears **23 per cent** of the world's community pneumonia burden, faces challenges with existing treatments, including widespread resistance to drugs like azithromycin.
- **Additional Information:**
  - **Nafithromycin** was developed as part of India's push for **indigenous pharmaceutical innovation** to combat **AMR**.
  - It shows **broad-spectrum activity** against bacteria causing **respiratory tract infections**.
  - **Community-acquired pneumonia (CAP)** is an infection of the lungs contracted **outside hospital settings**.
  - Pneumonia remains one of the **leading infectious causes of death** globally, especially among children and the elderly.

71. (a)

- Stem cells are classified based on their potency: **totipotent, pluripotent, multipotent, and unipotent**, with totipotent being the most versatile.
- **Statement 1 is correct:** The **zygote** is a **totipotent stem cell** because it has the ability to give rise to all types of cells in the body as well as the extraembryonic tissues such as the placenta. This totipotency is present only during the early stages of development, specifically in the zygote and the first few embryonic cells after fertilization.
- **Statement 2 is correct: Induced pluripotent stem cells (iPSCs)** can be produced from **adult body (somatic) cells** by introducing specific genes that reprogram them into a pluripotent state. These iPSCs can differentiate into almost all types of cells in the body, similar to embryonic stem cells, and are widely used in regenerative medicine and research. The discovery of iPSCs has reduced ethical concerns associated with the use of embryonic stem cells.
- **Statement 3 is not correct: Adult stem cells** are not confined only to the **bone marrow**. They are also present in other tissues such as the **brain, liver, skin, intestine, and muscles**, where they help in tissue repair and regeneration. Bone marrow stem cells are well-known for producing blood cells, but they represent only one category of adult stem cells.

72. (c)

- **Statement 1 is correct:** The **Polar Satellite Launch Vehicle (PSLV)** is a **four-stage rocket** that alternates between **solid and liquid propulsion stages**, while the **Geosynchronous Satellite Launch Vehicle (GSLV)** is a **three-stage rocket** consisting of **solid, liquid, and cryogenic stages**.
- **Statement 2 is correct:** The **GSLV** uses a **cryogenic upper stage** as its third stage, which provides greater thrust efficiency for placing heavier payloads into **geostationary transfer orbits (GTO)**. The **PSLV** does **not have a cryogenic stage**; its uppermost stage, known as the PS4, uses liquid propellants.
  - The cryogenic engine in GSLV uses liquid hydrogen (fuel) and liquid oxygen (oxidizer), allowing higher efficiency in the upper stage.
- **Statement 3 is not correct:** PSLV is ISRO's "workhorse" and has launched satellites into both Low Earth Orbit (LEO), particularly Sun-Synchronous Polar Orbits (SSPO), and Geostationary Transfer Orbits (GTO). Notable

examples include Chandrayaan-1 and the IRNSS navigation satellites.

73. (b)

- **Option (b) is the correct answer: Melatonin**, the hormone that regulates the **sleep–wake cycle** (also called the **circadian rhythm**), is secreted by the **pineal gland**, a small, pea-shaped endocrine gland located in the brain. The secretion of melatonin increases during the **night** and decreases during **daylight**, helping the body maintain its natural rhythm of sleep and wakefulness.
- **Additional Information:**
  - **Melatonin** production is controlled by the **hypothalamus** through the **suprachiasmatic nucleus (SCN)**, which serves as the body's internal clock.
  - Artificial light exposure at night can **suppress melatonin secretion**, leading to disturbed sleep patterns.

74. (d)

- **Statement 1 is correct: Saturated fats** are mainly found in foods of **animal origin** such as **butter, ghee, cheese, red meat, and dairy products**. They are solid at room temperature and excessive intake can raise **LDL (bad) cholesterol** levels, increasing the risk of heart disease.
- **Statement 2 is correct: Unsaturated fats** remain **liquid at room temperature** and are considered **beneficial for heart health**. They are found in **vegetable oils (like olive, sunflower, and mustard oils), nuts, seeds, and fish**. Unsaturated fats help in reducing LDL cholesterol and maintaining HDL (good) cholesterol levels.
- **Statement 3 is not correct: Trans fatty acids** are not exclusively industrially produced. While **industrially produced trans fats** (formed during hydrogenation of vegetable oils) are harmful and used in processed foods like margarine and baked goods, **small amounts of naturally occurring trans fats** are found in the **milk and meat of ruminant animals** such as cows and sheep. Hence, trans fats are not absent in natural food sources.
- **Additional Information:**
  - **Saturated fats** are solid at room temperature, while **unsaturated fats** (mono- and polyunsaturated) are liquid.
  - **Trans fats** increase the risk of **coronary heart disease** and are targeted for elimination under India's **FSSAI "Eat Right" initiative**.
  - The **World Health Organization (WHO)** recommends limiting trans fat intake to **less than 1% of total energy intake**.

75. (a)

- **Option (a) is the correct answer: Battery Energy Storage Systems (BESS)** are primarily used to **store excess electricity** generated from **intermittent renewable sources** like **solar and wind** and release it when generation drops or demand increases. This helps in **balancing fluctuations in power supply**, ensuring **grid stability and reliability**.
- **Additional Information:**
  - BESS enables **peak load management**, **frequency regulation**, and **energy shifting**, improving the overall efficiency of renewable energy systems.
  - They play a key role in **integrating renewable energy** into the grid by maintaining a **steady power output** despite variable generation.
  - India's **National Energy Storage Mission (NESM)** and **National Electricity Plan (2023)** emphasize large-scale deployment of BESS to support the country's renewable energy targets.

76. (b)

- **Pair 1 is correctly matched: BeiDou** is a **global satellite navigation system developed by China**. It is officially known as the **BeiDou Navigation Satellite System (BDS)** and provides global positioning, navigation, and timing services similar to GPS.
- **Pair 2 is not correctly matched: Galileo** is **Europe's (European Union's)** global satellite navigation system, **not Russia's**. It is operated by the **European Union Agency for the Space**

Programme (EUSPA) and aims to provide high-precision positioning services independent of the U.S. GPS and other systems.

- **Pair 3 is not correctly matched: GLONASS** stands for **Global Navigation Satellite System** and is operated by **Russia**, **not Japan**. It is Russia's counterpart to the U.S. GPS and provides worldwide navigation coverage.
- **Additional Information:**
  - Major global navigation systems include **GPS (USA)**, **GLONASS (Russia)**, **Galileo (European Union)**, and **BeiDou (China)**.
  - **India** operates a **regional navigation system** called **NavIC (Navigation with Indian Constellation)**.
  - These systems are essential for **navigation, timing, disaster management, and military applications**.

77. (b)

- **Option (b) is not correct: Shale gas** is found in **fine-grained sedimentary rocks (shale)** that are **impermeable or have very low permeability**, not in large fractures of highly permeable rocks. The gas is trapped within the **tiny pores and microscopic fractures** of the shale formations, and extraction requires techniques like **hydraulic fracturing (fracking)** to release it.
- **Additional Information:**
  - **Shale gas** is a **type of fossil fuel** and is **primarily composed of methane (CH_4)**.
  - India has identified **potential shale gas reserves** in basins such as the **Cambay, Gondwana, Krishna-Godavari, Cauvery, and Assam-Arakan**.
  - The **Directorate General of Hydrocarbons (DGH)** oversees shale gas exploration under the **Ministry of Petroleum and Natural Gas**.
  - Shale gas exploration in India faces challenges like **water-intensive extraction processes**, **environmental concerns**, and **technological limitations**.

78. (a)

- **Statement 1 is correct: Nuclear fission** is the process currently used in **nuclear power reactors** across the world for electricity generation. In fission, heavy atomic nuclei such as **uranium-235 or plutonium-239** split into smaller nuclei, releasing a large amount of energy. On the other hand, **controlled nuclear fusion**, which involves combining light nuclei (like hydrogen isotopes) to form heavier nuclei, has **not yet been achieved on a commercial scale**. Fusion is still under experimental research, such as in the **ITER project**.
- **Statement 2 is correct:** In both **fission and fusion**, a small portion of the **mass of the reacting nuclei is converted into energy**, as described by **Einstein's equation ($E = mc^2$)**. This mass defect accounts for the enormous energy released in both reactions.
- **Statement 3 is not correct: Fusion reactions release far more energy per unit mass than fission reactions.** For instance, the fusion of hydrogen isotopes in the Sun releases several times more energy than the fission of uranium. Therefore, the statement that fusion releases less energy per unit mass is incorrect.
- **Additional Information:**
  - **Fission** produces **radioactive waste**, whereas **fusion** produces minimal long-lived radioactive byproducts.
  - The **fuel for fusion (like deuterium and tritium)** is more abundant and cleaner compared to uranium used in fission.

79. (a)

- **Statement 1 is correct: Stablecoins** are **blockchain-based digital assets** designed to **maintain a stable value** by being **pegged to specific assets** such as **fiat currencies (like the US dollar)**, **commodities (like gold)**, or sometimes **other cryptocurrencies**. Their value stability is achieved through mechanisms like **collateralization** or **algorithmic supply adjustments**, which aim to minimize volatility compared to traditional cryptocurrencies such as Bitcoin.
- **Statement 2 is not correct:** Stablecoins are **not issued or regulated by central banks**. They are typically **issued by private entities or decentralized protocols**, not by government authorities. However, **central banks issue**

Central Bank Digital Currencies (CBDCs), which are **sovereign digital currencies** distinct from stablecoins.

- **Additional Information:**
  - Stablecoins are a **distinct class of Virtual Digital Assets (VDAs)** backed by fiat currencies, commodities, or other assets.

80. (b)

- **Context: Recently, Twenty-four children have died in Madhya Pradesh and three others were in a critical condition after consuming an adulterated cough syrup.**
- **Option (b) is the correct answer: Diethylene Glycol (DEG)** is a **toxic chemical** that has been found as a **contaminant in some pharmaceutical syrups**, leading to cases of **mass poisoning** in several countries, including India. DEG is an industrial chemical used in antifreeze, brake fluids, and industrial solvents, not meant for pharmaceutical or food use.
- DEG is sometimes **illegally or accidentally substituted** for safer solvents such as **glycerin or propylene glycol** used in cough syrups and liquid medicines. Its ingestion can cause **acute kidney failure, neurological disorders, and death**, especially in children.

81. (c)

- **Statement 1 is correct:** The **LUPEX (Lunar Polar Exploration) Mission** is a **joint collaboration between the Indian Space Research Organisation (ISRO)** and the **Japan Aerospace Exploration Agency (JAXA)**. Under this partnership, **JAXA** will provide the **lunar lander**, while **ISRO** will contribute the **lunar rover** and launch vehicle, likely the **GSLV Mk III (LVM3)**.
- **Statement 2 is correct:** The **primary objective** of the LUPEX mission is to **explore the lunar south pole region** and **assess the presence and quantity of water ice** on the Moon's surface and subsurface. The mission will also study **lunar soil characteristics**, **surface composition**, and the **feasibility of in-situ resource utilization (ISRU)** for future lunar habitation.
- **Additional Information:**
  - The **lunar south pole** is of particular scientific interest because it contains **permanently shadowed craters** that may hold **frozen water deposits**.

LUPEX will help both India and Japan prepare for **future human exploration missions** to the Moon. The mission is tentatively planned for **launch around 2026**, following Chandrayaan-3's success.

82. (c)

- **Pair 1 is correctly matched: Pink hydrogen** is produced by **electrolysis of water** using **electricity generated from nuclear energy**. This method is considered low-carbon because nuclear power produces minimal greenhouse gas emissions during generation.
- **Pair 2 is correctly matched: Grey hydrogen** is the most common form of hydrogen produced today. It is generated through **steam methane reforming (SMR)** of **natural gas**, a process that releases **carbon dioxide (CO_2)** into the atmosphere without any carbon capture, making it the **most polluting form** of hydrogen production.
- **Pair 3 is not correctly matched: Blue hydrogen** is produced from **natural gas (like grey hydrogen)** but with **carbon capture, utilization, and storage (CCUS)** to prevent CO_2 emissions. Hydrogen produced using hydroelectric power is instead called **green hydrogen**, not blue.
- **Pair 4 is correctly matched: White hydrogen** refers to **naturally occurring geological hydrogen** found in **underground deposits or released through natural processes** such as serpentinization. It is not produced industrially but discovered in nature.
- **Additional Information:**
  - **Green hydrogen** is produced via **electrolysis using renewable energy** (solar, wind, hydro).

Turquoise hydrogen is produced by **methane pyrolysis**, yielding solid carbon as a by-product.

83. (d)

- **Statement 1 is not correct.** Antimicrobial Resistance (AMR) does **not** occur because the **human body develops immunity**; rather, it occurs when **microorganisms such as bacteria,**

viruses, fungi, and parasites evolve and become **resistant to antimicrobial medicines** (like antibiotics, antivirals, antifungals, and antiparasitics). The **resistance develops in microbes**, not in the human body.

- **Statement 2 is not correct.** AMR is **not limited to bacterial infections**. It also occurs in **viral infections (antiviral resistance)**, **fungal infections (antifungal resistance)**, and **parasitic infections (antiparasitic resistance)**. For example, resistance in **HIV to antiretroviral drugs** and **malaria parasites to antimalarial drugs** are forms of AMR.

84. (c)

- **Option (c) is the correct answer: Gene doping** refers to the **non-therapeutic use of gene therapy or genetic modification techniques** to **enhance athletic performance**. It involves the **insertion, deletion, or modification of genes or genetic material** to artificially improve strength, endurance, or recovery beyond natural human capacity.
- **Additional Information:**
  - The **World Anti-Doping Agency (WADA)** prohibits gene doping as it violates the principles of **fair play and athlete health safety**.
  - Techniques potentially used for gene doping include **CRISPR-Cas9 gene editing**, **viral vector delivery of performance-enhancing genes**, or **RNA-based interventions**.
  - Unlike traditional doping (which uses drugs), gene doping alters the **athlete's genetic makeup**, making detection more complex.
  - Legitimate **gene therapy** is used for **treating genetic disorders** such as hemophilia or muscular dystrophy, but when applied for athletic enhancement, it constitutes gene doping.

85. (d)

- **Statement 1 is correct:** The **NISAR (NASA–ISRO Synthetic Aperture Radar)** satellite is a **microwave remote sensing satellite**. It uses **Synthetic Aperture Radar (SAR)** technology to capture high-resolution images of Earth's surface using **microwave frequencies**. The satellite will operate in a **sun-synchronous orbit and will be used to study ecosystem changes, ice-sheet dynamics, earthquakes, landslides, and soil moisture.**
- **Statement 2 is correct:** In this joint mission, **ISRO** has provided the **S-band SAR**, while **NASA** has contributed the **L-band SAR** instrument. The dual-frequency configuration allows for detailed observation of land and ice surfaces, vegetation, and soil moisture.
- **Statement 3 is correct:** Being a **microwave radar satellite**, NISAR can **penetrate clouds, smoke, and dense vegetation** and can observe Earth's surface **both during day and night**, making it suitable for **all-weather monitoring**.

86. (a)

- **Pair A (Amylase) is matched with Option 2 (Conversion of starch into simple sugars):** Amylase is secreted by the **salivary glands and pancreas**. It helps in the **hydrolysis of starch (a polysaccharide) into maltose and other simple sugars**. It functions in an **alkaline medium**, mainly in the **mouth and small intestine**.
- **Pair B (Lipase) is matched with Option 3 (Digestion of fats into fatty acids and glycerol):** Lipase is produced by the **pancreas** and acts in the **small intestine**. It **breaks down fats (triglycerides) into fatty acids and glycerol** after emulsification by **bile salts**. Lipase acts in an **alkaline medium**.
- **Pair C (Pepsin) is matched with option 1 (Breakdown of proteins into peptides):** Pepsin is secreted by the **gastric glands of the stomach** in the inactive form **pepsinogen**, which is activated by **hydrochloric acid**. It converts **proteins into smaller peptides** (peptones).
- **Pair D (Trypsin) is correctly matched with Option 4 (Digestion of peptides into amino acids):** Trypsin is secreted by the **pancreas** as **trypsinogen**, which is activated in the **small intestine** by **enterokinase**. It breaks down **peptides and polypeptides into amino acids**,

aiding absorption. It functions in an **alkaline medium**.

87. (b)

- **Option B is correct:** An **Einstein Ring** is a phenomenon predicted by **Albert Einstein's General Theory of Relativity**. It occurs when the **light from a distant galaxy or star** is **bent by the gravity of a massive object** (like another galaxy or black hole) lying directly between the distant light source and the observer.
- If the alignment between the **source, lens, and observer** is perfect, the bent light forms a **complete ring-shaped image** called an **Einstein Ring**.
- It is a special case of **gravitational lensing**, which demonstrates the **curvature of spacetime** due to massive objects.
- This phenomenon is often observed using **space telescopes such as Hubble** and is used to **estimate the mass of galaxies and dark matter distribution**.
- **Additional Information**
  - **Gravitational lensing** helps astronomers detect **dark matter** and **distant galaxies** that cannot be seen directly.
  - Einstein Rings are one of the strongest visual proofs of **General Relativity** in modern astrophysics.

88. (c)

- **Statement 1 is correct:** In 2023, the Ministry of New and Renewable Energy (MNRE) introduced a green hydrogen standard, capping emissions at 2 kg of CO2 per kg of hydrogen produced. The certification scheme, based on the standard, applies only to green hydrogen production from electrolysis or conversion of biomass.
- **Statement 2 is correct:** The **Bureau of Energy Efficiency (BEE)**, under the **Ministry of Power**, has been designated as the **Nodal Agency** for the **implementation and operation** of the **Green Hydrogen Certification Scheme**.
- BEE's responsibilities include:
  - Issuing **Certificates of Green Hydrogen Production** to eligible producers.
  - Maintaining a **digital registry** of producers and certificates.
  - Verifying the **emission data** and **energy sources** used in production.

89. (c)

- **Statement 1 is correct:** Green crackers are a cleaner alternative to conventional fireworks, developed by the **Council of Scientific and Industrial Research – National Environmental Engineering Research Institute (CSIR–NEERI)**. They are manufactured **without or with reduced use of harmful chemicals** like: **Barium nitrate**, **lithium**, **arsenic**, and **mercury**, which are responsible for **toxic emissions and heavy metal pollution**. By eliminating or substituting these chemicals, green crackers emit **30–40% less particulate matter (PM)** and **less sulphur oxides and nitrogen oxides (SOx and NOx)** than traditional ones.
- **Statement 2 is correct:** Green crackers are designed with **dust suppressants and moisture-releasing agents**. During combustion, they **release water vapour** which helps to **reduce the temperature and trap suspended particles**, thereby lowering **airborne particulate matter (PM10 and PM2.5)**. The **dust suppressants** reduce **smoke density and visible emissions**. These mechanisms collectively contribute to **cleaner combustion** and **lower overall pollution load**.
- **Additional Information**
  - Green crackers are marketed under **three standard labels** approved by CSIR–NEERI:
  - **SWAS** – Safe Water Releaser (releases water vapour and suppresses dust).
  - **STAR** – Safe Thermite Cracker (reduced sound and emissions).
  - **SAFAL** – Safe Minimal Aluminium (less metallic oxide emission).
  - Manufacturers can use the **CSIR–NEERI logo and QR code** on packaging to authenticate certified green crackers.

90. (d)

- **Statement I is not correct:** The **Ministry of Mines** has **reclassified limestone entirely as**

a major mineral, eliminating the earlier **end-use-based distinction**. Previously, limestone used in **kilns for making lime for building materials** was treated as a minor mineral, while limestone used for **cement, chemicals, fertilizers, steel, and other industries** was categorized as a major mineral. However, through a recent **gazette notification**, this distinction was removed by **deleting the category of limestone used for building lime** from the minor mineral list. Consequently, **all forms of limestone are now classified as major minerals**, streamlining regulation and promoting ease of doing business.

- **Statement II is correct:** The **use of limestone for making building lime has declined sharply**, while its **industrial applications** particularly in **cement manufacturing, chemical industries, fertilizer units, and steel plants** have become **dominant**. This shift in usage pattern reflects the changing industrial landscape and has been a key factor influencing the Ministry's decision to reclassify limestone.

91. (b)

- **Statement 1 is correct:** Sickle Cell Anaemia is an **inherited genetic disorder** caused by a mutation in the **HBB gene**, leading to the production of abnormal haemoglobin (HbS).
- **Statement 2 is not correct:** The disorder affects **red blood cells (RBCs)**, not white blood cells. The RBCs assume a **crescent or sickle shape**, which obstructs blood flow.
- **Statement 3 is correct:** Sickle Cell Anaemia is **more prevalent among tribal populations** in central and eastern India (e.g., Madhya Pradesh, Chhattisgarh, Odisha, Jharkhand).
- **Statement 4 is not correct:** The **National Sickle Cell Anaemia Elimination Mission (2023)** aims to **eliminate the disease by 2047**, not 2030.

92. (a)

- **Statement-I is correct:** Gravitational waves transmit undistorted information about their origins as they propagate across the universe. This is because they are not significantly absorbed or scattered by matter, preserving the original signal from their source.
- **Statement-II is correct:** Unlike electromagnetic waves, gravitational waves interact very weakly with matter. This weak interaction allows them to traverse vast cosmic distances without distortion, enabling accurate detection and study of events like black hole mergers and neutron star collisions.
  - ♦ Since the weak interaction of gravitational waves with matter is the reason for their ability to transmit undistorted information, Statement-II is the correct explanation for Statement-I.

93. (b)

- **Statement 1 is not correct: microRNAs (miRNAs)** do **not** carry genetic information from DNA for protein synthesis. That function is performed by **messenger RNA (mRNA)**. miRNAs are **short, non-coding RNA molecules** that do not encode proteins. Their role is **regulatory**, not informational.
- **Statement 2 is correct:** miRNAs **bind to messenger RNA (mRNA)** molecules, usually at their **3' untranslated region (3' UTR)**, to: **Inhibit translation** (preventing the mRNA from being read by ribosomes), or **Promote degradation** of the mRNA, thereby reducing protein synthesis.
  - ♦ miRNAs play a crucial role in **gene expression regulation**, **cell differentiation**, and **disease mechanisms** including cancers.

94. (b)

- **Statement 1 is not correct:** Rooftop solar panels primarily use photovoltaic (PV) technology, not solar thermal technology, to convert sunlight directly into electricity. In photovoltaic systems, solar cells in the panels absorb sunlight and create an electric field across layers, which generates electricity. Solar thermal technology, on the other hand, captures sunlight to produce heat, which is typically used for heating water or generating steam to produce electricity in large-scale plants, not in standard rooftop solar panel setups.
- **Statement 2 is correct:** Solar photovoltaic (PV) panels **generate Direct Current (DC)**

electricity as sunlight excites electrons within the semiconductor.

- **Statement 3 is correct:** Most household appliances operate on **Alternating Current (AC)**. Therefore, the **DC electricity** produced by solar panels **must be converted into AC** using an **inverter** before it can be used or supplied to the grid.

95. (b)

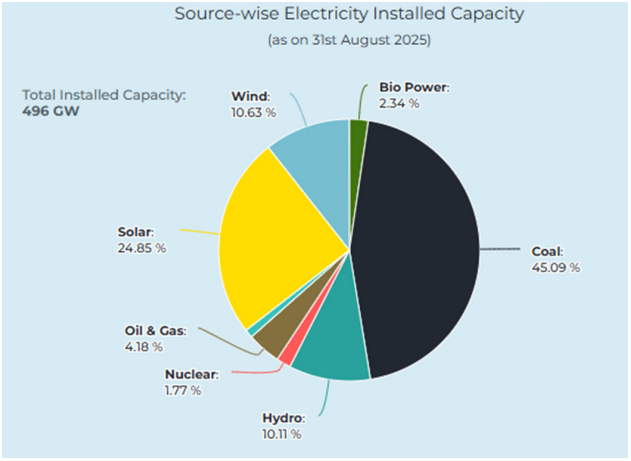
- **1 is correct: Deuterium** is a **stable isotope of hydrogen** that contains one proton and one neutron. It is **directly used as a fusion fuel** in several experimental reactors (e.g., **Deuterium–Tritium (D–T)** and **Deuterium–Deuterium (D–D)** fusion reactions). Deuterium is abundantly available in **seawater**.
- **2 is correct: Tritium (^3H)** is a **radioactive isotope of hydrogen** with one proton and two neutrons. It is also a **primary fuel for nuclear fusion**, especially in the **D–T fusion reaction**, which yields **Helium-4 and a neutron**, releasing high energy.
- **3 not correct: Lithium** itself is **not directly used** as a fusion fuel. However, it is a **breeding material** when bombarded with neutrons, it produces **tritium**, which can then be used as fuel in fusion reactors.
- **4 is correct: Helium-3 (^3He)** is a **light, non-radioactive isotope of helium**. It can be **directly used as a fusion fuel** in advanced reactions such as **Deuterium–Helium-3 fusion**, which produces **Helium-4 and a proton**, generating clean energy with minimal radiation.

96. (d)

- **Option (d) is correct: 'Shiv Shakti Point'** refers to the **landing site of India's Chandrayaan-3 mission** on the **Moon's South Pole region**.
- On **August 23, 2023**, **ISRO's Chandrayaan-3 Vikram lander** successfully touched down on the lunar surface making **India the first country** to achieve a soft landing near the **lunar south pole**.
- Prime Minister **Narendra Modi** announced that the **landing site** would be named **"Shiv Shakti Point."**

97. (a)

- The correct descending order is: **Solar → Wind → Bio Power → Nuclear**. The source-wise distribution of India's installed capacity is as follows (as of August 2025):



98. (d)

- **Option (d) is the correct answer:**
  - **Conventional Vaccines (Preventive)**: These vaccines are administered before an infection or disease develops. They work by introducing weakened or inactive forms of a pathogen (like a virus or bacterium) to train the immune system to recognize and remember it, allowing the body to mount a rapid defense upon future exposure
  - **Oncolytic vaccines (or oncolytic viruses):** They are a form of cancer immunotherapy that uses genetically modified viruses to infect and selectively destroy cancer cells while stimulating the body's immune system to recognize and attack tumors. Unlike traditional vaccines, which prevent disease, oncolytic vaccines are used after cancer has developed, making them therapeutic rather than preventive.

99. (d)

- Statement 1 is correct: Bacteria have a cellular structure enclosed by a cell wall, while viruses lack a cellular structure. **Bacteria** are **prokaryotic, unicellular organisms** having a **cell wall**, **cytoplasm**, and **genetic material (DNA)** not enclosed in a nucleus. **Viruses**, on the other hand, are **acellular (non-cellular)** entities — consisting only of **genetic material**

(DNA or RNA) enclosed within a **protein coat (capsid)**. They lack cytoplasm, ribosomes, or cell membranes.

- **Statement 2 is correct: Bacteria can reproduce independently, while viruses require a host cell to replicate. Bacteria** reproduce **independently** through **binary fission** under suitable environmental conditions. **Viruses** are **obligate intracellular parasites**. They can **replicate only inside a host cell** by hijacking its machinery to produce new viral particles.
- **Statement 3 is correct: Antibiotics are generally effective against bacteria but not against viruses. Antibiotics** (like penicillin, tetracycline) act on **bacterial cell walls or metabolic pathways**, which **viruses lack**. Hence, viral infections (e.g., influenza, dengue, COVID-19) **cannot be treated by antibiotics**. **Antivirals** are used instead to block viral replication.
- **Statement 4 is correct: Some bacteria are beneficial for humans, while all viruses are obligate parasites. Beneficial bacteria** perform vital roles such as:
- **Nitrogen fixation** (Rhizobium),
  - **Fermentation** (Lactobacillus in curd),
  - **Decomposition** and **vitamin synthesis** (E. coli in gut).
  - **All viruses** depend on living hosts for survival and reproduction; hence, they are **obligate parasites** and **none are free-living**.

100. (a)

- **Statement 1 is correct:** Small Modular Reactors (SMRs) require shorter construction time due to factory-based manufacturing. **Small Modular Reactors (SMRs)** are **compact nuclear reactors** designed for **modular, factory-based fabrication** and **on-site assembly**. This approach **reduces construction time**, **lowers costs**, and **improves safety and quality control** compared to conventional large nuclear plants.
- **Statement 2 is correct:** Small Modular Reactors (SMRs) can be deployed for both on-grid and off-grid power generation. SMRs have **flexible deployment options** — they can support **on-grid power** (connected to the national electricity grid) and **off-grid applications** such as **remote, island, or defense areas**. Their **scalable capacity** makes them suitable for **industrial heat, hydrogen production**, and **desalination projects**.
- **Statement 3 is not correct:** SMRs **cannot directly reuse spent fuel** without **reprocessing**. Spent nuclear fuel must undergo **chemical reprocessing** to extract usable fissile materials (like uranium or plutonium).

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