1. Match the following satellites with their primary data applications:  
   List–I — List–II  
   a. CARTOSAT-3 — 1. High-resolution earth imaging  
   b. SCATSAT-1 — 2. Oceanic weather monitoring  
   c. RISAT-2BR2 — 3. Radar reconnaissance  
   d. NavIC — 4. Navigation  
   Select the correct answer using the codes given below.  
   (A) abcd → 1234  
   (B) abcd → 1243  
   (C) abcd → 1324  
   (D) abcd → 1342

Answer 51. (A) abcd → 1234

Explanation:

* CARTOSAT-3 is an earth observation satellite providing high-resolution images for mapping and urban planning.
* SCATSAT-1 monitors oceanic and atmospheric conditions, including cyclone tracking.
* RISAT-2BR2 uses radar technology for reconnaissance, especially in adverse weather.
* NavIC is India’s regional satellite navigation system providing location services.

1. Which of the following statements about nanomaterials and environmental remediation is/are correct?  
   (i) Nanomaterials can be used to degrade pollutants in water and soil.  
   (ii) Nanomaterials pose no environmental risks due to biodegradability.  
   (iii) Nano-catalysts improve efficiency of catalytic converters.  
   (iv) Nanomaterials enhance the removal of heavy metals from wastewater.  
   Which of the above are correct?  
   (A) (i), (iii), and (iv) only  
   (B) (ii) and (iii) only  
   (C) (i) and (ii) only  
   (D) All the statements are correct

Answer 52. (A) (i), (iii), and (iv) only

Explanation:

* Nanomaterials are effective in degrading pollutants and act as nano-catalysts enhancing chemical reactions.
* They are useful in adsorbing and removing heavy metals from contaminated water.
* The belief that nanomaterials pose no environmental risk is incorrect since their toxicity and persistence can cause environmental concerns.

1. Which of the following features distinguish fusion reactors from fission reactors?  
   (i) Fusion reactors do not produce long-lived radioactive waste.  
   (ii) Fission reactors split heavy atoms, while fusion reactors combine light atoms.  
   (iii) Fusion reactors require extremely high temperatures.  
   (iv) Fission reactors utilize renewable fuel sources.  
   Select the correct answer:  
   (A) (i), (ii), and (iii) only  
   (B) (ii) and (iv) only  
   (C) (i) and (iii) only  
   (D) All the above

Answer 53. (A) (i), (ii), and (iii) only

Explanation:

* Fusion reactors combine light atoms like isotopes of hydrogen, producing minimal long-lived radioactive waste, unlike fission reactors which split heavy atoms such as uranium.
* Fusion requires extremely high temperatures to overcome atomic repulsion.
* Fission reactors do not use renewable fuels but rely on finite uranium or plutonium.

1. Consider the following statements about miRNA in plants and animals:  
   (i) Plant miRNAs generally exhibit perfect complementarity to their target mRNAs.  
   (ii) Animal miRNAs usually have imperfect base pairing with target mRNAs.  
   (iii) miRNA functions are restricted to animals only.  
   (iv) Both plants and animals use miRNAs for post-transcriptional gene regulation.  
   Which of the above are correct?  
   (A) (i), (ii), and (iv) only  
   (B) (ii) and (iii) only  
   (C) (i) and (iii) only  
   (D) All of the above

Answer 54. (A) (i), (ii), and (iv) only

Explanation:

* Plant miRNAs typically bind their targets with near-perfect base pairing, leading to cleavage of mRNA.
* Animal miRNAs usually bind imperfectly, causing translational repression.
* miRNAs function in both plants and animals for regulating gene expression post-transcriptionally.
* Statement (iii) is false as miRNA functions are not restricted to animals.

1. Satyendra Nath Bose’s original work on quantum statistics was based on:  
   (A) Classical statistical modelling of gases  
   (B) Planck’s law of blackbody radiation  
   (C) Newtonian mechanics  
   (D) Maxwell’s electromagnetic theory

Answer 55. (B) Planck’s law of blackbody radiation

Explanation:

* Bose’s pioneering work derived statistical distributions consistent with Planck’s law explaining blackbody radiation.
* This led to Bose-Einstein statistics for indistinguishable particles.
* His work was not based on classical mechanics or Maxwell’s theory directly.

1. RNA vaccines, like those used for COVID-19, work by:  
   (i) Delivering genetic instructions for making a viral protein to cells.  
   (ii) Stimulating the immune system to recognize the viral protein.  
   (iii) Altering the recipient’s DNA permanently.  
   (iv) Being designed quickly compared to traditional vaccines.  
   Which of the above statements are correct?  
   (A) (i), (ii), and (iv) only  
   (B) (ii) and (iii) only  
   (C) (i) and (iii) only  
   (D) All the statements are correct

Answer 56. (A) (i), (ii), and (iv) only

Explanation:

* RNA vaccines provide instructions for cells to produce viral proteins, triggering immune responses without using live virus.
* They do not alter DNA as RNA does not enter the nucleus.
* RNA vaccines were designed and deployed quickly relative to conventional platforms during the COVID-19 pandemic.

1. If two bodies start moving from the same point simultaneously with uniform velocities in perpendicular directions, their displacement after time ttt will be:  
   (A) Sum of individual displacements  
   (B) Difference of individual displacements  
   (C) Square root of the sum of squares of their displacements  
   (D) Zero

Answer 57. (C) Square root of the sum of squares of their displacements

Explanation:

* When two objects move at right angles, their resultant displacement follows Pythagoras’ theorem.
* Hence, displacement equals the square root of the sum of the squares of displacements along each axis.

1. Which of the following statements is/are true about liquids?  
   (i) Liquids have definite volume but no fixed shape.  
   (ii) Liquids are incompressible to a large extent.  
   (iii) Viscosity is a measure of a liquid’s density.  
   (iv) Liquids exert hydrostatic pressure equally in all directions.  
   Select the correct answer:  
   (A) (i), (ii), and (iv) only  
   (B) (ii) and (iii) only  
   (C) (i) and (iii) only  
   (D) All of the above

Answer 58. (A) (i), (ii), and (iv) only

Explanation:

* Liquids maintain a fixed volume but take the shape of their containers.
* They are largely incompressible, resisting volume change under pressure.
* Liquids exert pressure equally in all directions (Pascal’s principle).
* Viscosity measures resistance to flow, not density.

1. Match the following memoirs/books with their authors:  
   a. My Days in Prison | 1. Tarun Gogoi  
   b. An Autobiography of a Revolutionary in Assam | 2. Hem Barua  
   c. Turning Points in My Life | 3. Hiren Gohain  
   d. An Unfinished Autobiography | 4. Indira Goswami  
   (A) abcd → 2 1 3 4  
   (B) abcd → 2 3 4 1  
   (C) abcd → 1 2 3 4  
   (D) abcd → 3 2 1 4

Answer 59. (A) abcd → 2 1 3 4

Explanation:

* “My Days in Prison” is by Hem Barua, a freedom fighter with political imprisonment experiences.
* “An Autobiography of a Revolutionary in Assam” belongs to Tarun Gogoi, chronicling his political journey.
* “Turning Points in My Life” was written by critic and intellectual Hiren Gohain.
* “An Unfinished Autobiography” is attributed to literary figure Indira Goswami.

1. Which of the following bodies monitor the global progress of SDGs?  
   (i) United Nations High-Level Political Forum (HLPF)  
   (ii) World Bank  
   (iii) The Global Reporting Initiative  
   (iv) National Governments through Voluntary National Reviews  
   Select the correct options:  
   (A) (i) and (iv) only  
   (B) (ii) and (iii) only  
   (C) (i), (ii), and (iv) only  
   (D) All of the above

Answer 60. (D) All of the above

Explanation:

* The UN HLPF is the primary global platform for reviewing SDG progress.
* The World Bank supports data collection and financing related to SDGs.
* The Global Reporting Initiative provides frameworks for sustainability reporting supporting SDG tracking.
* National governments submit Voluntary National Reviews to report their progress, complementing global monitoring.