RRB Group D Official Paper (Held On: 14 Dec, 2025 Shift 3) (Previous Year Paper)

RRB Group D • 2025 • 100 questions • 90 minutes • Answer key and solutions

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GENERAL SCIENCE

Q1. Which of the following elements is classified exclusively as a non-metal under standard conditions?

(a) Zinc
(b) Silver
(c) Hydrogen
(d) Mercury

Q2. The energy possessed by a body due to its position or configuration is called _____.

(a) Potential energy
(b) Thermal energy
(c) Chemical energy
(d) Kinetic energy

Q3. Covalent bonds are formed by:

(a) Sharing of electrons
(b) Loss of protons
(c) Transfer of electrons
(d) Gain of neutrons

Q4. Which of the following statements about the centre of curvature of a spherical mirror is NOT true?

(a) It lies outside the reflecting surface of the mirror.
(b) For a concave mirror, it is located behind the mirror.
(c) It is not a part of the mirror itself.
(d) For a convex mirror, it lies behind the mirror.

Q5. A book is placed at rest on a table. Which of the following statements correctly represents an action-reaction pair according to Newton's third law?

(a) The gravitational force exerted by the Earth on the book and by the book on the Earth is an action-reaction pair.
(b) The force exerted by the book on the table and the vertical force exerted by the table on the book are not a pair of proportional forces.
(c) The gravitational force exerted by the Earth on the book and the vertical force exerted by the table on the book are an action-reaction pair.
(d) The vertical force exerted by the table on the book and the gravitational force exerted by the Earth on the book are an action-reaction pair.

Q6. Why does the growth of an onion root stop after its tip is cut?

(a) The intercalary meristem starts working.
(b) The apical meristem that produces new cells is removed.
(c) The lateral meristem gets damaged.
(d) The meristematic cells lose their vacuoles.

Q7. Which element has mass number 27 and 14 neutrons present in it?

(a) Chlorine
(b) Aluminium
(c) Sodium
(d) Magnesium

Q8. Which mirror is used by a dentist to see the inside of a patient's mouth?

(a) Convex mirror
(b) Concave mirror
(c) Planoconvex mirror
(d) Plane mirror

Q9. A particle moves in a circle of radius 1.5 m with angular velocity 3 rad/s. What will the ratio of its linear velocity to angular velocity be?

(a) 2 : 1
(b) 1 : 2
(c) 3 : 2
(d) 2 : 3

Q10. Which of the following is NOT an advantage of short-duration crop varieties?

(a) Higher chances of crop damage
(b) Possibility of multiple cropping
(c) Reduced production cost
(d) Quick harvesting

Q11. Which of the following solutions will contain the highest concentration of H^+ ions?

(a) Solution with pH 7
(b) Solution with pH 10
(c) Solution with pH 13
(d) Solution with pH 3

Q12. Read the following statements carefully and select the correct option.

Assertion (A): In the reaction of copper with oxygen, oxygen acts as the reducing agent.

Reason (R): Oxygen adds to copper forming copper oxide.

(a) Both A and R are true, and R is the correct explanation of A.
(b) Both A and R are true, and R is not the correct explanation of A.
(c) A is true, but R is false.
(d) A is false, but R is true.

Q13. Which of the following organs is a part of the human female reproductive system?

(a) Uterus
(b) Prostate Gland
(c) Vas Deferens
(d) Testis

Q14. An object floats on water if _____.

(a) Its density is greater than water
(b) Its weight is zero
(c) Its density is less than water
(d) Its volume is very small

Q15. How long does an unfertilised egg typically survive in the female reproductive tract?

(a) 24 hours
(b) 10 hours
(c) 60 hours

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(d) 72 hours

Q16. Which of the following is NOT correct?

(a) Multiple reflections can cause reverberation
(b) Multiple reflections change the pitch of sound
(c) Multiple reflections improve sound distribution in large halls
(d) Multiple reflections are undesirable in small rooms

Q17. In a starch test using a variegated leaf, what is the purpose of adding iodine solution at the end?

(a) To remove chlorophyll from green areas
(b) To identify the areas without chloroplasts
(c) To dissolve starch
(d) To stain the starch present in the leaf

Q18. Which of the following is a crop variety improvement method by introducing a gene that would provide the desired characteristics?

(a) Grafting
(b) Genetically modified crops
(c) Budding
(d) Natural vegetative reproduction

Q19. Which of the following statements is correct about the concept of 'molecules of compounds'?

(a) A molecule of a compound is formed by the separation of atoms of the same element.
(b) A molecule of a compound is formed by the combination of atoms of different elements.
(c) A molecule of a compound is formed by the combination of atoms of the same element.
(d) A molecule of a compound is formed by the separation of atoms of different elements.

Q20. Which compound is used to prepare bleaching powder?

(a) Calcium Chloride
(b) Sodium Carbonate
(c) Ammonium Hydroxide
(d) Calcium Hydroxide

Q21. Why is a transportation system essential for excretion in multicellular organisms?

(a) To move waste products to the organs that remove them
(b) To circulate digestive enzymes
(c) To help with reproduction
(d) To produce oxygen in cells

Q22. Which feature of Spirogyra allows fragmentation to be successful?

(a) Presence of seeds
(b) Single-celled structure
(c) Complex tissues
(d) Simple filamentous body

Q23. Which of the following compounds is a saturated hydrocarbon?

(a) Benzene
(b) Propene
(c) Propyne
(d) Cyclohexane

Q24. What is associated with a metallic wire carrying an electric current?

(a) Only electric potential
(b) A magnetic field around it
(c) Only heat

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(d) No physical effect

Q25. If both current and resistance are halved, the power reduces to _____.

(a) one-eighth of the initial value
(b) half of the initial value
(c) one-fourth of the initial value
(d) one-third of the initial value

MATHEMATICS

Q26. In an election with three candidates—Ram, Mohan, and Sohan—10% of the total votes cast were invalid. Sohan received 40% of the valid votes. If Ram got 2,000 more valid votes than Mohan and the total number of votes cast was 10,000, what is the remainder when Ram's votes are divided by Mohan's votes?

(a) 300
(b) 400
(c) 320
(d) 490

Q27. The cost price of the box of sharpener is Rs. 1,150. The shopkeeper gave 12% discount on the cost price. What is the selling price (in Rs.)?

(a) 1,074
(b) 1,095
(c) 1,012
(d) 955

Q28. A dealer purchased a laptop for Rs. 99,000. He allows a discount of 37% on its marked price and still gains 40%. Find the marked price of the laptop.

(a) Rs. 2,20,000
(b) Rs. 2,19,878
(c) Rs. 2,20,172
(d) Rs. 2,19,903

Q29. What must be the total percentage change in the volume of a cuboid, if it's length and breadth are decreased by 10% and 20% respectively, while it's height is increased by 35%?

(a) 4.68% increase in volume
(b) 2.8% decrease in volume
(c) 197.2% increase in volume
(d) 10.5% decrease in volume

Q30. A rectangle's length is three times its width. If its perimeter is 160 cm, then its width (in cm) is:

(a) 18
(b) 20
(c) 15
(d) 22

Q31. If the mode of the given data is 22.75, find the median. (Round off to two decimal places)

Class Interval	0-7	7-14	14-21	21-28	28-35	35-42
Frequency	1	7	9	11	X	3

(a) 24.25
(b) 32.25
(c) 21.64
(d) 36.25

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Q32. Prakhar and Riya together invested Rs. 31,600 in a business. At the end of the year, out of a total profit of Rs. 7,900, Prakhar's share was Rs. 1,400. What was the investment of Prakhar?

(a) Rs. 4,200
(b) Rs. 6,500
(c) Rs. 4,600
(d) Rs. 5,600

Q33. A ladder is leaning against a wall such that it makes a 45° angle with the ground. If the foot of the ladder is 5 m away from the wall, what is the height of the point (in m) where the ladder touches the wall?

(a) 5 m
(b) 5/√3 m
(c) 10 m
(d) 5√3 m

Q34. 8 men and 3 women can complete a piece of work in 15 days, and 14 men and 19 women can complete the same work in 5 days. The work of how many women is equivalent to that of one man?

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

Q35. Simplify the following expression.

(8 × 8 − 8 + 4) ÷ 10 + (4 × 4 + 4 + 4 ÷ 4) × 3 + 2 of 26 ÷ 4

(a) 69
(b) 72
(c) 82
(d) 89

Q36. A train overtakes two people walking along a railway track. The first person walks at 7.2 km/hr, and the second person walks at 14.4 km/hr. The train takes 29.9 seconds to pass the first person and 43.7 seconds to pass the second person. What is the speed of the train if both are walking in the same direction as the train?

(a) 30 km/hr
(b) 38 km/hr
(c) 27 km/hr
(d) 36 km/hr

Q37. Consider a cube of edge 5 cm and a cuboid with dimensions 7 × 4 × 2cm. Which of them has the larger volume?

(a) Only cuboid
(b) Cannot be determined
(c) Only cube
(d) Both occupy equal space

Q38. If the third proportional of 4 and 24 is x, then what is the value of x?

(a) 144
(b) 142
(c) 146
(d) 141

Q39. Simplify

$(5x - 4)^2 - (5x + 4)^2$.

(a) -40x
(b) $25x^2 - 4$
(c) $50x^2 + 32$
(d) -80x

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Q40. If the exterior angles obtained on producing the base YZ of a triangle XYZ in both ways are 110° and 115°, then the measure of angle X is:

(a) one fourth of a right angle
(b) equal to right angle
(c) three fourth of a right angle
(d) one fourth of a straight angle

Q41. A, B and C can complete a piece of work in 3, 6 and 2 days, respectively. How long (in days) will they take to complete thrice the same work, working together?

(a) 9
(b) 3
(c) 6
(d) 4

Q42. At present, Amar is 5 years younger than Ravi. After four years from now, Ravi will be twice as old as Amar. Find Amar's present age (in years).

(a) 6
(b) 2
(c) 1
(d) 4

Q43. The average age of 51 students of a class is 21 years. If the age of the teacher is also included, the average age of the whole group becomes 22 years. The age (in years) of the teacher is:

(a) 74
(b) 70
(c) 73
(d) 71

Q44. Find the greatest possible length which can be used to measure exactly the lengths 42 m, 63 m and 140 m.

(a) 5 m
(b) 22 m
(c) 7 m
(d) 32 m

Q45. Meera purchased 23 bracelets at Rs. 160 each. At what rate per bracelet must she sell them to earn a 15% profit?

(a) Rs. 198
(b) Rs. 184
(c) Rs. 192
(d) Rs. 186

Q46. The length, breadth and height of a room are in the ratio 3 : 2 : 1. If the breadth and height are each reduced to half their original values while the length is doubled, find the percentage change (rounded off to two decimal places) in the total surface area of the room.

(a) Decrease by 13.46%
(b) Increase by 13.46%
(c) Decrease by 13.64%
(d) Increase by 13.64%

Q47. A certain sum of money amounts to Rs. 12,000 in 3 years and Rs. 16,000 in 5 years on simple interest. Find the principal.

(a) Rs. 5,200
(b) Rs. 6,000
(c) Rs. 6,200
(d) Rs. 5,500

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Q48. An Uber cab covers a distance of 640 km in 80 hours. What is its speed in km/hr?

(a) 16
(b) 12
(c) 8
(d) 3

Q49. If 20% of a number is added to 90, then the result is the same number. 60% of the same number is:

(a) 97.5
(b) 67.5
(c) 87.5
(d) 77.5

Q50. The expression (8.73 × 8.73 × 8.73 + 4.27 × 4.27 × 4.27)/(8.73 × 8.73 - 4.27 × 8.73 + 4.27 × 4.27) is equal to:

(a) 11
(b) 13
(c) 10
(d) 12

GENERAL INTELLIGENCE & REASONING

Q51. Read the given statements and conclusions carefully. Assuming that the information given in the statements is true, even if it appears to be at variance with commonly known facts, decide which of the given conclusions logically follow(s) from the statements.

Statements:

All bins are cans.

All plastics are cans.

Conclusions:

(I): Some bins are plastics.

(II): Some cans are plastics.

(a) Only conclusion (I) follows
(b) Neither conclusion (I) nor (II) follows
(c) Both conclusions (I) and (II) follow
(d) Only conclusion (II) follows

Q52. M, N, O, P, W, X and Y are sitting around a circular table facing the centre of the table.

Only one person sits between P and O when counted from the right of P. Only one person sits between O and X when counted from the right of O. Only one person sits between P and W when counted from the right of W. Only two people sit between N and X when counted from the left of X. Only one person sits between M and W when counted from the left of W. Who sits third to the right of Y?

(a) W
(b) O
(c) P
(d) M

Q53. Based on the English alphabetical order, three of the following four letter-clusters are alike in a certain way and thus form a group. Which is the letter-cluster that DOES NOT belong to that group?

(Note: The odd one out is not based on the number of consonants/vowels or their position in the letter-cluster.)

(a) LKO
(b) DCG
(c) VVY
(d) TSW

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Q54. Read the given statements and conclusions carefully. Assuming that the information given in the statements is true, even if it appears to be at variance with commonly known facts, decide which of the given conclusion(s) logically follow(s) from the statements.

Statements:

Some Reds are Emeralds.

No Emeralds are Magentas.

All Magentas are Greens.

Conclusion (I): Some Magentas are Emeralds

Conclusion (II): Some Emeralds are Greens

(a) Only conclusion (I) follows.
(b) Neither conclusion (I) nor (II) follows.
(c) Only conclusion (II) follows.
(d) Both conclusions (I) and (II) follow.

Q55. In a certain code language,

A + B means 'A is the sister of B',

A @ B means 'A is the brother of B',

A − B means 'A is the wife of B',

and A # B means 'A is the father of B'.

How is O related to V if 'O @ P − T # G + V'?

(a) Mother's brother
(b) Mother's father
(c) Husband
(d) Son

Q56. Select the pair which follows the same pattern as that followed by the two set of pairs given below. Both pairs follow the same pattern.

KIJ−NLM

YWX−BZA

(a) IFF−KIJ
(b) IGH−KJJ
(c) IFF−LJK
(d) IGH−LJK

Q57. Refer to the given number, symbol series and answer the question that follows. Counting to be done from left to right only. All numbers are single-digit numbers.

(Left) 8 7 * @ © 9 # % £ © * % © 2 * © 4 8 2 4 5 @ (Right)

How many such numbers are there, each of which is immediately preceded by a number and also immediately followed by a symbol?

(a) 0
(b) 4
(c) 2
(d) 1

Q58. BGJO is related to HIPQ in a certain way based on the English alphabetical order. In the same way, ZOHW is related to FQNY. To which of the given options is RUZC related, following the same logic?

(a) XWQA
(b) XWRT
(c) XWFE
(d) XWIO

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Q59. Refer to the following series and answer the question that follows (all numbers are single digit numbers only). Counting to be done from left to right only.

(Left) 7 7 7 8 5 4 1 7 5 1 9 4 5 8 1 1 4 5 1 2 8 6 9 7 4 2 6 (Right)

How many such even numbers are there each of which is immediately preceded by an odd number and also immediately followed by an odd number?

(a) 6
(b) 7
(c) 5
(d) 4

Q60. Select the set in which the numbers are related in the same way as are the numbers of the following sets.

(NOTE : Operations should be performed on the whole numbers, without breaking down the numbers into its constituent digits. E.g. 13 – Operations on 13 such as adding / subtracting /multiplying etc. to 13 can be performed. Breaking down 13 into 1 and 3 and then performing mathematical operations on 1 and 3 is not allowed.)

(5, 31, 6)

(3, 16, 5)

(a) (6, 13, 2)
(b) (4, 7, 2)
(c) (1, 6, 4)
(d) (3, 2, 7)

Q61. Seema ranked 14^(th) from the bottom and 42^(th) from the top in her class. How many students are there in her class?

(a) 53
(b) 52
(c) 55
(d) 54

Q62. Refer to the following number series and answer the question that follows (all numbers are single-digit numbers only). Counting to be done from left to right only.

(Left) 7 9 1 8 4 2 5 6 3 8 7 1 9 (Right)

How many odd numbers are there which are immediately followed by even numbers?

(a) Three
(b) One
(c) Two
(d) More than three

Q63. In a certain code language, ‘van oak canoe’ is coded as ‘cs vd zb’ and ‘canoe jet wheat’ is coded as ‘vc cs uw’. How is ‘canoe’ coded in that language?

(a) vc
(b) cs
(c) vd
(d) zb

Q64. If + means −, − means ×, × means ÷, ÷ means +, then what will come in place of the question mark (?) in the following equation?

253 − 2 ÷ 413 + 1313 × 13 = ?

(a) 828
(b) 834
(c) 838
(d) 818

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Q65. In a certain code language, ‘BITE’ is coded as ‘3712’ and 'TIDE' is coded as '1207'. What is the code for ‘D’ in that language?

(a) 7
(b) 3
(c) 2
(d) 0

Q66. Five people, A, B, C, D and E are sitting in a row, facing north. D sits at the extreme left end of the line. E sits third to the right of A. B sits to the immediate right of A. How many people sit(s) between D and E?

(a) 1
(b) 3
(c) 0
(d) 2

Q67. Each of the digits in the number 3472618 is arranged in ascending order from left to right. The position of how many digits will remain unchanged as compared to that in the original number?

(a) Two
(b) None
(c) One
(d) Three

Q68. What should come in place of the question mark (?) in the given series?

101 105 114 130 155 ?

(a) 193
(b) 188
(c) 201
(d) 191

Q69. Seven boxes, A, B, C, D, I, J, and K, are kept one over the other but not necessarily in the same order. Only two boxes are kept below I. Only one box is kept above J. Only one box is kept between J and K. B is kept immediately above C. D is kept at some place below A.

How many boxes are kept between A and B?

(a) Two
(b) Four
(c) Three
(d) One

Q70. Refer to the following number, symbol series and answer the question that follows. Counting to be done from left to right only. All numbers are single-digit numbers only.

(Left) 3 @ © 6 5 € € 3 3 8 € % 2 7 6 # 7 * £ € 9 $ (Right)

How many such symbols are there, each of which is immediately preceded by a number and also immediately followed by a number?

(a) Zero
(b) Two
(c) Three
(d) One

Q71. What should come in place of the question mark (?) in the given series based on the English alphabetical order?

OSJ MQH KOF IMD ?

(a) GLB
(b) GLA
(c) GKB
(d) GKA

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Q72. Which of the following numbers will replace the question marks (?) in the given series?

10, 2, 15, 3, 20, 5, 25, 7, ?, ?

(a) 30, 9
(b) 30, 11
(c) 35, 9
(d) 35, 11

Q73. Based on the English alphabetical order, three of the following four letter-cluster pairs are alike in a certain way and thus form a group. Which letter-cluster pair DOES NOT belong to that group?

(Note: The odd one out is not based on the number of consonants/vowels or their position in the letter-cluster.)

(a) HD – PW
(b) BX – IQ
(c) QM – YF
(d) CY – KR

Q74. XVYC is related to DBEI in a certain way based on the English alphabetical order. In the same way, PNQU is related to VTWA. To which of the given options is BZCG related, following the same logic?

(a) HGHO
(b) HFHM
(c) HEHM
(d) HFIM

Q75. A, B, C, D, E, F and G are sitting around a circular table facing the centre. B sits third to the left of D. A sits second to the left of G. D is the immediate neighbour of both C and A. E is not an immediate neighbour of B. How many people sit between E and F when counted from the right of E?

(a) Four
(b) One
(c) Three
(d) Two

Q76. Suraj starts from Point A and travels 8 km to the north. He then takes a right turn and travels 9 km, takes another right turn and travels 10 km, then takes a left turn and travels 5 km. Finally, he takes a left turn and travels 2 km to reach Point B. How far (shortest distance) and in which direction must he travel to return to Point A? (All turns are 90° turns only unless specified.)

(a) 1 km towards the east
(b) 6 km towards the south
(c) 11 km towards the west
(d) 14 km towards the west

Q77. What will come in place of the question mark (?) in the following equation, if '+' and '−' are interchanged and '×' and '÷' are interchanged?

139 ÷ 7 + 341 × 11 - 41 = ?

(a) 831
(b) 983
(c) 921
(d) 856

Q78. Which of the following letter-number clusters will replace the question mark (?) in the given series to make it logically complete?

GJD24 HKE33 ILF42 JMG51 ?

(a) KNG60
(b) KNG61
(c) KNH61
(d) KNH60

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Q79. What should come in place of the question mark (?) in the given series?

18 27 39 54 ?

(a) 70
(b) 72
(c) 75
(d) 69

Q80. Town W is to the south of Town X. Town Y is to the east of Town W. Town Z is to the north of Town Y. Town A is to the west of Town Z. Town X is to the north-east of Town A. What is the position of Town W with respect to Town A?

(a) Southwest
(b) Southeast
(c) Northwest
(d) Northeast

GENERAL AWARENESS AND CURRENT AFFAIRS

Q81. Who won the 2025 World Junior Chess Championship?

(a) Viswanathan Anand
(b) Pranav Venkatesh
(c) Abhijeet Gupta
(d) Pentala Harikrishna

Q82. Which city was chosen to host a major five-day Sumo wrestling tournament in 2025?

(a) Sydney, Australia
(b) New York, USA
(c) London, UK
(d) Toronto, Canada

Q83. In 2025, which institution was directed by the National Green Tribunal to assess the ultraviolet sewage treatment technology?

(a) IIT Kanpur
(b) IIT Delhi
(c) IIT Madras
(d) IIT Bombay

Q84. Where was the first edition of the 2025 Kho Kho World Cup held in January 2025?

(a) New Delhi, India
(b) Dhaka, Bangladesh
(c) Kathmandu, Nepal
(d) Colombo, Sri Lanka

Q85. Who among the following has been elected the President of the Confederation of Indian Industry (CII) for 2025–26?

(a) Mukesh Ambani
(b) Sanjiv Puri
(c) Adani
(d) Rajiv Memani

Q86. Which prestigious award did hockey player Harmanpreet Singh receive from President Droupadi Murmu at a specially organised function at Rashtrapati Bhavan in January 2025?

(a) Arjuna Award
(b) Padma Bhushan
(c) Dronacharya Award
(d) Major Dhyan Chand Khel Ratna Award

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Q87. Which academy was the runner-up in the Bakshi Cup 2025?

(a) Air Force Academy (AFA)
(b) Indian Military Academy (IMA)
(c) National Defence Academy (NDA)
(d) Officers' Training Academy (OTA) Chennai

Q88. Which state government has initiated transformative industrial reform campaign called Udyog Kranti in June 2025?

(a) Gujarat
(b) Punjab
(c) Maharashtra
(d) Andhra Pradesh

Q89. What is the aim of the Digital Twin with AI-Driven Insights initiative showcased at India Mobile Congress 2025?

(a) To create gaming systems for telecom users
(b) To plan and manage infrastructure
(c) To produce sensors for consumer devices
(d) To design marketing tools for phone makers

Q90. In June 2025, the Reserve Bank of India (RBI) imposed a monetary penalty of Rs. 29.60 lakh (Rupees Twenty Nine Lakh Sixty Thousand only) on which of the following institutions for non-compliance with certain directions issued by RBI on 'Licensing of Payments Banks' on 6 June 2025?

(a) Punjab & Sind Bank
(b) Bandhan Bank Limited
(c) HDFC Bank Limited
(d) Fino Payments Bank Limited

Q91. Which edition of the Offshore Security Coordination Committee (OSCC) was held in New Delhi in June 2025 (led by the Indian Coast guard) with a key focus to evaluate offshore infrastructure security and develop better multi-agency?

(a) 137th
(b) 147th
(c) 157th
(d) 127th

Q92. How does the Mizzo Endo 4000, launched in 2025, improve clinical outcomes compared to conventional laparoscopic procedures?

(a) It reduces dependence on imported robotic surgical systems by enabling indigenous precision surgeries.
(b) It allows large-scale production of low-cost prosthetics through additive manufacturing.
(c) It enhances diagnostic accuracy by integrating AI into pathology workflows.
(d) It improves drug absorption in human tissues using nanotechnology-based delivery systems.

Q93. In August 2025, the Indian Army, together with IIT Madras, set up a research centre on the IIT Madras campus called _____.

(a) BrahMos Research Cell
(b) Agnishodh
(c) DefenceTech
(d) AstraLab

Q94. In November 2025, the Standing Committee of the National Board for Wildlife approved several defence and paramilitary projects in which of the following protected areas?

(a) Dehing Patkai Wildlife Sanctuary
(b) Karakoram Wildlife Sanctuary
(c) Khangchendzonga National Park
(d) Raimona National Park

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Q95. What does the Waqf (Amendment) Act, 2025, prohibit unless female heirs receive their inheritance first?

(a) Dedication to Waqf
(b) Court cases
(c) Property registration
(d) Loan sanctioning

Q96. Which of the following administrative bodies has been designated the nodal agency for the 'Viksit Bharat @2047' programme in 2025?

(a) Department of Science and Technology
(b) NITI Aayog
(c) Ministry of External Affairs
(d) Central Vigilance Commission

Q97. What was the theme of the World Food Forum (WFF) held in Rome from 14-18 October 2024?

(a) Healthy food for all, for today and tomorrow
(b) Good food for all, for today and tomorrow
(c) Nutritious food for all, for today and tomorrow
(d) Good food for all, for today and forever

Q98. What is the maximum number of lenders allowed per borrower under new Microfinance Institutions Network (MFIN) rules which came into effect from 1 April 2025?

(a) Three
(b) Two
(c) Five
(d) Four

Q99. What is the name of the women's wellness space inaugurated by the Department of Legal Affairs, Ministry of Law and Justice in July 2025?

(a) Mahila Aarogyam Kaksh
(b) Swasthya Sthal
(c) Nari Kalyan Bhawan
(d) Stree Suraksha Sadan

Q100. The National Red List Roadmap, launched in October 2025, primarily aims at which of the following?

(a) To monitor air and water pollution levels across industrial zones
(b) To track progress on renewable energy adoption and emissions reduction
(c) To develop renewable energy targets for environmental sustainability
(d) To assess and monitor the conservation status of the country's flora and fauna

ANSWER KEY

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

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SOLUTIONS

Q1. Answer: (c) Hydrogen

The correct answer is Hydrogen.

Key Points

• Hydrogen is classified exclusively as a non-metal under standard conditions. It is the simplest and lightest element in the periodic table, with an atomic number of 1.

• Hydrogen is unique because it exists as a gas under standard temperature and pressure (STP) and forms diatomic molecules (H_2).

• Unlike metals such as Zinc, Silver, or Mercury, hydrogen does not exhibit metallic properties like malleability, ductility, or electrical conductivity under standard conditions.

• Hydrogen is chemically reactive and combines with many elements to form compounds, such as water (H_2O) and hydrogen chloride (HCl).

• It is placed at the top of Group 1 in the periodic table but is not considered an alkali metal due to its non-metallic nature and unique chemical behavior.

Additional Information

• Zinc:

• Zinc is a metal and belongs to Group 12 of the periodic table.

• It is a transition metal with properties like malleability, ductility, and electrical conductivity.

• Zinc is commonly used for galvanization to prevent rusting of iron and steel.

• Silver:

• Silver is a precious metal known for its high electrical and thermal conductivity.

• It is widely used in jewelry, coins, and industrial applications like electronics.

• Silver is part of the transition metals and is found in Group 11 of the periodic table.

• Mercury:

• Mercury is a metal that is unique for being in a liquid state at room temperature.

• It is used in thermometers, barometers, and fluorescent lights due to its physical properties.

• Mercury is toxic and requires careful handling.

• Hydrogen:

• Hydrogen is the most abundant element in the universe, making up about 75% of its elemental mass.

• It is used as a fuel in hydrogen-powered vehicles and plays a critical role in industrial processes like ammonia production (Haber process).

• Hydrogen isotopes include protium (most common), deuterium, and tritium.

Important Points

• Non-Metal Characteristics:

• Non-metals are typically poor conductors of heat and electricity.

• They exhibit high electronegativity and ionization energy.

• Non-metals are brittle in solid form and do not exhibit luster.

• Periodic Table Placement:

• Non-metals are primarily located on the right side of the periodic table.

• Hydrogen is an exception as it is placed at the top of Group 1 but does not belong to the alkali metal family.

Q2. Answer: (a) Potential energy

The correct answer is Potential energy.

Key Points

• Potential energy is the energy possessed by a body due to its position, configuration, or state. It is stored energy that is ready to be converted into other forms, such as kinetic energy.

• Potential energy is often associated with a body's position relative to other objects or a force field, such as the gravitational field. For example, a ball at a certain height has gravitational potential energy.

• The formula for gravitational potential energy is $U = mgh$, where m is the mass, g is the acceleration due to gravity, and h is the height.

• Potential energy can also be elastic in nature, such as the energy stored in a compressed spring. This is called elastic potential energy.

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• Potential energy is a form of mechanical energy and is different from kinetic energy, which depends on the motion of the body.

Additional Information

• Thermal energy:

• Thermal energy refers to the internal energy of a system due to the random motion of its particles. It is associated with heat.

• It is measured in terms of temperature and is transferred from a hotter object to a cooler one.

• An example of thermal energy is the heat produced by a stove while cooking food.

• Chemical energy:

• Chemical energy is the energy stored in the bonds of chemical compounds. It is released during chemical reactions.

• Examples include the energy stored in fuels like gasoline or in food, which is converted into usable energy during digestion.

• Batteries also store chemical energy, which is converted into electrical energy during use.

• Kinetic energy:

• Kinetic energy is the energy possessed by a body due to its motion. It is given by the formula K.E. = ½ mv², where m is the mass and v is the velocity.

• Examples include a moving car, a flying airplane, or flowing water in a river.

• Kinetic energy depends on the speed and mass of the object. Faster-moving or heavier objects have higher kinetic energy.

• Applications of potential energy:

• Potential energy is used in hydropower plants, where water stored at a height is converted into kinetic energy to generate electricity.

• Elastic potential energy is used in devices like springs, catapults, and trampolines.

• Gravitational potential energy plays a key role in roller coasters, pendulums, and projectiles.

Important Points

• Energy Conversion:

• Potential energy can be converted into other forms of energy, such as kinetic energy during motion or into thermal energy due to friction.

• For example, when a ball falls from a height, its gravitational potential energy is converted into kinetic energy.

• Law of Conservation of Energy:

• Energy is neither created nor destroyed; it only changes forms. The total energy in a closed system remains constant.

• This principle ensures that potential energy is converted into other forms without any loss, barring external forces like friction.

• Gravitational Potential Energy in Space:

• Gravitational potential energy varies with distance from the center of the Earth or other celestial bodies.

• It plays a crucial role in orbital mechanics and satellite launches.

Q3. Answer: (a) Sharing of electrons

The correct answer is Sharing of electrons.

Key Points

• Covalent bonds are formed when two atoms share electrons in order to achieve a stable electronic configuration, resembling the nearest noble gas.

• This sharing of electrons allows both atoms to fill their outermost shell, or valence shell, achieving stability.

• The number of shared electron pairs determines the type of covalent bond: single bond (1 pair), double bond (2 pairs), or triple bond (3 pairs).

• Nonmetals are typically involved in covalent bonding because they have similar electronegativities, making it energetically favorable to share electrons.

• Examples of covalent bonds include molecules like H2 (Hydrogen gas), O2 (Oxygen gas), CH4 (Methane), and H2O (Water).

Additional Information

• Characteristics of Covalent Bonds:

• Covalent bonds are generally strong due to the close sharing of electrons between atoms.

• Molecules with covalent bonds often have low melting and boiling points because they consist of discrete molecules held together by weaker intermolecular forces (e.g., van der Waals forces or hydrogen bonds).

• Covalent compounds are typically poor conductors of electricity because they lack free electrons or ions.

• Differences from Ionic Bonds:

• In ionic bonds, electrons are transferred from one atom to another, creating charged ions that attract each other.

• Covalent bonds involve sharing of electrons rather than transfer, resulting in neutral molecules.

• Ionic compounds generally have higher melting and boiling points compared to covalent compounds.

• Examples of Covalent Compounds:
• Water (H2O): Oxygen shares electrons with two hydrogen atoms to form a bent molecular structure.
• Carbon dioxide (CO2): Carbon forms two double bonds with two oxygen atoms, creating a linear molecule.
• Methane (CH4): Carbon shares electrons with four hydrogen atoms to form a tetrahedral structure.
• Types of Covalent Bonds:
• Non-polar covalent bond: Electrons are shared equally between atoms (e.g., H2, O2).
• Polar covalent bond: Electrons are shared unequally due to a difference in electronegativity (e.g., H2O).
• Significance of Covalent Bonds:
• They are essential for the structure and function of biological molecules like proteins, DNA, and lipids.
• Covalent bonding is fundamental to organic chemistry, which studies compounds primarily composed of carbon and hydrogen.

Q4. Answer: (b) For a concave mirror, it is located behind the mirror.

The correct answer is For a concave mirror, it is located behind the mirror..

Key Points

• The centre of curvature of a spherical mirror is defined as the center of the sphere of which the mirror is a part. It is represented by the letter C.
• Statement 1: It lies outside the reflecting surface of the mirror. This statement is correct because the center of curvature is always located at a point outside the mirror, on the principal axis.
• Statement 2: For a concave mirror, it is located behind the mirror. This statement is incorrect as the center of curvature for a concave mirror lies in front of the reflecting surface, not behind it.
• Statement 3: It is not a part of the mirror itself. This statement is correct since the center of curvature is a geometric point and does not lie on the mirror's surface.
• Statement 4: For a convex mirror, it lies behind the mirror. This statement is correct because the center of curvature for a convex mirror is located behind the reflecting surface.

Additional Information

• Concave Mirror:
• A concave mirror is a spherical mirror that curves inward, resembling the inside of a sphere.
• The center of curvature for a concave mirror is located in front of the mirror on the principal axis.
• Concave mirrors are used in applications such as reflecting telescopes, shaving mirrors, and headlights of vehicles.
• Convex Mirror:
• A convex mirror is a spherical mirror that curves outward, resembling the outer surface of a sphere.
• The center of curvature for a convex mirror is located behind the mirror on the principal axis.
• Convex mirrors are commonly used as rear-view mirrors in vehicles due to their ability to provide a wide field of view.
• Principal Axis:
• The principal axis is an imaginary line that passes through the center of curvature and the pole of the mirror.
• It is the reference line used in the formation of images by spherical mirrors.
• Pole of the Mirror:
• The pole is the geometric center of the mirror's reflecting surface.
• It is denoted by the letter P.
• Uses of Spherical Mirrors:
• Concave mirrors are used for focusing light, in solar cookers, and in dental instruments for enhanced visibility.
• Convex mirrors are used for security purposes in shops and as side-view mirrors in vehicles.

Important Points

• The radius of curvature (R) of a spherical mirror is the distance between the pole and the center of curvature. It is equal to 2 times the focal length (F), i.e., R = 2F.
• The focal point of a spherical mirror is the point where parallel rays of light either converge (concave mirror) or appear to diverge (convex mirror) after reflection.
• For accurate image formation, the mirror should ideally be small compared to the radius of curvature to minimize aberrations.
• Spherical mirrors obey the laws of reflection, which state that the angle of incidence is equal to the angle of reflection.

Q5. Answer: (a) The gravitational force exerted by the Earth on the book and by the book on the Earth is an action-reaction...

The correct answer is The gravitational force exerted by the Earth on the book and by the book on the Earth is an action-reaction pair..

Key Points

• Newton's Third Law of Motion: According to Newton's third law, for every action, there is an equal and opposite reaction. This means that forces always occur in pairs, acting on two different objects.

• Gravitational Force Pair: The gravitational force exerted by the Earth on the book (downward force) and the gravitational force exerted by the book on the Earth (upward force) form an action-reaction pair. Hence, this statement is correct.

• Normal Force and Contact Force: The force exerted by the table on the book and the force exerted by the book on the table are contact forces. While these forces are equal and opposite, they do not constitute an action-reaction pair as they act on the same object. This statement is incorrect.

• Vertical Support Force: The vertical force exerted by the table on the book balances the gravitational force exerted by the Earth on the book. However, these two forces act on the same object (the book) and are not an action-reaction pair. This statement is incorrect.

• Action-Reaction Criteria: Action-reaction pairs must act on different objects and be equal in magnitude but opposite in direction. The gravitational interaction between the Earth and the book satisfies this criterion.

Additional Information

• Newton's Third Law of Motion:

• This law is fundamental to understanding interactions between objects. It applies universally and governs both contact and non-contact forces, such as gravitational, electrical, and magnetic forces.

• Examples include the recoil of a gun when a bullet is fired and the propulsion of a rocket due to the expulsion of exhaust gases.

• Gravitational Force:

• Gravitational force is a non-contact force that acts between two masses. Its magnitude is given by the equation $F = G * (m1 * m2) / r^2$, where G is the gravitational constant, m1 and m2 are the masses, and r is the distance between their centers.

• In the case of a book and the Earth, the forces are equal in magnitude but opposite in direction.

• Normal Force:

• The normal force is a contact force exerted by a surface to support the weight of an object resting on it. It acts perpendicular to the surface.

• While the normal force balances the gravitational force, it is not part of the action-reaction pair described by Newton's third law.

• Applications of Newton’s Third Law:

• Walking: When you push the ground backward with your foot, the ground pushes you forward with an equal and opposite force.

• Swimming: A swimmer pushes water backward with their hands, and the water pushes them forward.

• Rocket Propulsion: Exhaust gases are expelled downward, and the rocket is propelled upward due to the reaction force.

Important Points

• Action-Reaction Forces:

• Always act on two different objects.

• Are equal in magnitude and opposite in direction.

• Do not cancel each other out because they act on different objects.

• Misconceptions:

• Balanced forces (e.g., the gravitational force and normal force on a stationary object) are not action-reaction pairs.

• Action-reaction pairs do not require the objects to be in contact.

Q6. Answer: (b) The apical meristem that produces new cells is removed.

The correct answer is The apical meristem that produces new cells is removed..

Key Points

• The apical meristem is a group of actively dividing cells located at the tips of roots and shoots. It is responsible for the primary growth of plants, including elongation of the root. When the tip of the root is cut, this meristematic region is removed, halting further elongation. Hence, this statement is correct.

• Intercalary meristem, on the other hand, is found in specific regions such as the base of leaves or internodes in grasses and does not contribute to root elongation. Its role is unrelated to the growth of the root tip. Hence, this statement is incorrect.

• The lateral meristem, such as the vascular cambium or cork cambium, is responsible for the secondary growth of plants (increase in girth). It is not involved in the elongation of the root, and its damage would not directly stop root growth. Hence, this statement is incorrect.

• Meristematic cells are typically small and contain dense cytoplasm with large nuclei. They lack significant vacuoles because vacuoles are characteristic of mature, differentiated plant cells. The loss of vacuoles in meristematic cells is not a factor in root growth. Hence, this statement is incorrect.

Additional Information

• Apical meristem:

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• The apical meristem is located at the tips of roots and shoots and is responsible for the primary growth of the plant.
• It produces new cells that allow the root and shoot to elongate.
• Its activity is regulated by plant hormones such as auxins, which promote elongation and cell division.
• Meristematic tissues:
• There are three main types of meristems: apical, intercalary, and lateral.
• Each type has a specific role: apical meristem for elongation, intercalary meristem for regrowth (e.g., in grasses), and lateral meristem for thickening.
• Plant hormones:
• Auxins are primarily responsible for regulating cell division and elongation in the apical meristem.
• Other hormones like cytokinins and gibberellins also influence growth processes but have distinct roles.
• Root growth:
• The growth of the root involves three zones: the zone of cell division (where the apical meristem is active), the zone of elongation, and the zone of maturation.
• Cutting the root tip removes the apical meristem, effectively halting the cell division necessary for elongation.

Important Points

• Intercalary meristem: Found mainly in grasses, this meristem allows for regrowth after grazing or cutting but is not responsible for root elongation.
• Lateral meristem: Includes vascular cambium and cork cambium, contributing to the thickening of roots and stems rather than elongation.
• Meristematic cells: These cells are undifferentiated, with a dense cytoplasm and no vacuoles. They are capable of continuous division and are vital for plant growth.
• Auxins: Plant hormones that are critical for maintaining apical dominance and promoting elongation of cells in the root and shoot regions.

Q7. Answer: (b) Aluminium

The correct answer is Aluminium.

Key Points

• Mass number is the sum of protons and neutrons in an atom. Here, the mass number is 27, and the element has 14 neutrons.
• The number of protons in an atom is equal to its atomic number. To find the atomic number: Mass number = Protons + Neutrons.
• For this element: 27 = Protons + 14, which means the atomic number (protons) is 13.
• The element with atomic number 13 is Aluminium. Hence, the correct answer is Aluminium.
• Aluminium is represented by the symbol Al, with an atomic number of 13 and a standard atomic mass of approximately 27 u.

Additional Information

• Characteristics of Aluminium:
• Symbol: Al
• Atomic Number: 13
• Mass Number: 27
• Properties: Aluminium is a lightweight, silvery-white metal that is highly malleable and ductile.
• Uses: Widely used in industries such as construction, transportation (aircraft, cars), and packaging (aluminium foil, cans).
• Explanation of Neutrons:
• Neutrons are subatomic particles with no charge, found in the nucleus of an atom along with protons.
• The number of neutrons can vary in isotopes of the same element, but the atomic number (protons) remains constant.
• Other Options:
• Chlorine (Cl): Atomic number 17, mass number 35-37.
• Sodium (Na): Atomic number 11, mass number 23.
• Magnesium (Mg): Atomic number 12, mass number 24-25.
• None of these elements match the given mass number and neutron count.
• Significance of Atomic Number:
• The atomic number uniquely identifies an element and determines its position in the periodic table.
• It corresponds to the number of protons in the nucleus and is equal to the number of electrons in a neutral atom.

Important Points

• Mass Number: It is always a whole number and represents the total number of protons and neutrons in an atom's nucleus.
• Isotopes: Elements can have isotopes with the same number of protons but different numbers of neutrons, leading to variations

in mass number.

• Periodic Table: The atomic number determines an element's position in the periodic table, which organizes elements based on their properties and electronic configuration.

• Applications of Aluminium:

• Aluminium's lightweight and corrosion resistance make it ideal for aerospace and construction industries.

• Its high thermal and electrical conductivity are advantageous for electrical wiring and heat sinks.

Q8. Answer: (b) Concave mirror

The correct answer is Concave mirror.

Key Points

• A concave mirror is used by dentists to examine the inside of a patient's mouth because it produces a magnified and upright image of the object when placed within its focal length.

• When a concave mirror is used at a close distance (within the focal length), it creates a virtual and enlarged image of the teeth, allowing the dentist to observe fine details.

• The curved surface of the concave mirror collects and focuses light onto the area being examined, enhancing visibility in the usually dimly lit oral cavity.

• This type of mirror is ideal for precision tasks such as identifying cavities, cracks, or gum problems, as the enlarged reflection provides a clearer view.

• Other types of mirrors, such as convex or plane mirrors, do not produce magnified images, making them unsuitable for dental examinations.

Additional Information

• Concave Mirror:

• A concave mirror is a type of spherical mirror where the reflective surface is curved inward, like the inside of a sphere.

• It is also known as a converging mirror because it converges light rays that fall on it to a single point, called the focal point.

• Applications: Concave mirrors are used in dentistry, shaving mirrors, telescopes, headlights, and solar concentrators.

• Convex Mirror:

• A convex mirror has a reflective surface that curves outward. It is also known as a diverging mirror because it diverges light rays.

• It produces a virtual, diminished, and upright image, making it unsuitable for tasks requiring magnification.

• Applications: Convex mirrors are used in vehicle rearview mirrors and security mirrors because they provide a wide field of view.

• Plane Mirror:

• A plane mirror is a flat reflective surface that produces a virtual, upright, and same-sized image of the object.

• It does not magnify or reduce the size of the image, which makes it unfit for tasks requiring detailed visualization.

• Applications: Commonly used in bathrooms, dressing rooms, and optical instruments.

• Planoconvex Mirror:

• A planoconvex mirror has one flat side and one convex side. It is rarely used in everyday applications as it does not magnify images.

• It is generally used in specialized optical systems for focusing light.

Important Points

• Magnification: The ability of a mirror to enlarge the appearance of an object depends on its shape and the distance of the object from the mirror. Concave mirrors excel at magnification when used within their focal length.

• Focal Length: The distance between the pole of the mirror and its focal point is critical in determining the type of image formed (real or virtual, magnified or diminished).

• Real vs. Virtual Image: A real image is formed when light rays converge, while a virtual image is formed when light rays appear to diverge. Dentists rely on the virtual image created by concave mirrors for better visualization.

• Applications of Concave Mirrors: Besides dentistry, concave mirrors are extensively used in ophthalmology, shaving mirrors, and makeup mirrors due to their magnification capabilities.

Q9. Answer: (c) 3 : 2

The correct answer is 3 :2.

Key Points

• The linear velocity (v) of a particle moving in a circle is related to its angular velocity (ω) by the formula $v = r \cdot \omega$, where r is the radius of the circle.

• In this case, the radius of the circle is 1.5 m, and the angular velocity is 3 rad/s.

• Substituting the values into the formula: $v = 1.5 \cdot 3 = 4.5$ m/s.

• The ratio of the particle's linear velocity to angular velocity can be calculated as v : ω = 4.5 : 3.
• Upon simplification, the ratio becomes 3 :2.
• Hence, the correct answer is 3 :2.

Additional Information

• Linear Velocity (v):
• It refers to the rate at which an object moves along a circular path.
• The formula is given by v = r · ω, where r is the radius and ω is the angular velocity.
• For example, if r = 2 m and ω = 4 rad/s, then v = 2 · 4 = 8 m/s.
• Angular Velocity (ω):
• It is the rate at which an object rotates or revolves around a central point, measured in radians per second (rad/s).
• ω = (change in angle)/time. For instance, if an object rotates 6.28 radians in 2 seconds, then ω = 6.28/2 = 3 rad/s.
• Radius of the Circle (r):
• It is the distance from the center of the circle to any point on its circumference.
• In this question, the radius is given as 1.5 m.
• Relationship between Linear and Angular Quantities:
• Linear velocity (v) is proportional to angular velocity (ω) and radius (r).
• The formula v = r · ω is fundamental in circular motion and helps in determining the motion of particles along a curve.

Important Points

• Units of Measurement:
• Linear velocity is measured in meters per second (m/s).
• Angular velocity is measured in radians per second (rad/s).
• Practical Applications:
• The relationship between linear and angular velocity is used in designing gears, turbines, and rotational systems in engineering.
• For instance, in vehicles, the angular velocity of the wheels determines the linear speed of the car.
• Concept of Radians:
• A radian is the standard unit of angular measurement in the International System of Units (SI).
• One radian is approximately equal to 57.3 degrees.

Q10. Answer: (a) Higher chances of crop damage

The correct answer is Higher chances of crop damage.

Key Points

• Short-duration crop varieties are bred to mature faster, allowing multiple harvests in a year. This feature enables multiple cropping and ensures higher productivity. Hence, statement 2 is correct.
• Since these crops grow and mature quickly, they require fewer inputs like water, fertilizers, and labor, resulting in reduced production costs. Hence, statement 3 is correct.
• Quick harvesting facilitates efficient utilization of agricultural land and minimizes idle periods, making it easier to manage resources and improve profitability. Hence, statement 4 is correct.
• However, it is incorrect to say that short-duration crop varieties have a higher chance of crop damage. In fact, their shorter lifecycle often helps them escape adverse weather conditions or pest attacks that affect long-duration crops. Hence, statement 1 is incorrect.

Additional Information

• Benefits of short-duration crops:
• They enable crop diversification, allowing farmers to grow different types of crops within a year.
• They are particularly beneficial in regions with short growing seasons, such as areas with limited rainfall or extreme climatic conditions.
• Short-duration crops reduce the risk of pest and disease outbreaks due to their short lifecycle.
• Examples include crops like millets, pulses, and certain varieties of rice that mature within 90-120 days.
• Multiple cropping systems:
• Multiple cropping involves growing two or more crops sequentially or simultaneously on the same land during a single growing season.
• It maximizes land usage and enhances farm income.
• Short-duration crops are ideal for multiple cropping as they leave sufficient time between harvests for subsequent crops.
• Reduced production costs:

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• Short-duration crops often require less water, fertilizers, and pesticides, lowering the overall input costs.
• Labor requirements are also reduced due to their shorter cultivation period, making them economical for small-scale farmers.
• Quick harvesting:
• Short-duration crops allow farmers to harvest quickly, enabling better land management and preparation for subsequent crops.
• They are particularly useful in regions prone to climatic uncertainties, as farmers can adapt to changing conditions more effectively.

Important Points

• Crop damage risks:
• Contrary to the statement, short-duration crops often avoid prolonged exposure to adverse conditions, reducing the risk of damage.
• Long-duration crops are more vulnerable to prolonged droughts, floods, or pest infestations.
• Examples of short-duration crops:
• Certain varieties of rice like Sahbhagi Dhan, which matures in 90 days, are popular among Indian farmers.
• Other examples include millets, pulses, and vegetables like radish and spinach.

Q11. Answer: (d) Solution with pH 3

The correct answer is Solution with pH 3.

Key Points

• The pH scale measures the concentration of H^+ ions (protons) in a solution, ranging from 0 to 14, where lower pH values indicate higher H^+ ion concentrations.
• A solution with a pH of 3 is highly acidic compared to other options provided, meaning it contains the highest concentration of H^+ ions.
• For every unit decrease in pH, the concentration of H^+ ions increases by a factor of 10 (logarithmic scale). Therefore, a solution with pH 3 has 10,000 times more H^+ ions than a solution with pH 7.
• Solutions with pH values of 10 and 13 are basic, meaning they have lower concentrations of H^+ ions compared to neutral (pH 7) or acidic (pH 3) solutions.
• A neutral solution (pH 7), such as pure water, has a moderate concentration of H^+ ions but significantly lower than that of a pH 3 solution. Hence, Solution with pH 3 is the correct answer.

Additional Information

• pH Scale:
• The pH scale is a logarithmic scale used to measure the acidity or basicity of a solution.
• The formula to calculate pH is pH = -log[H^+], where [H^+] represents the molar concentration of hydrogen ions.
• A pH of 0–6 indicates an acidic solution, 7 indicates neutrality, and 8–14 indicates a basic solution.
• Acidic Solutions:
• Acids release H^+ ions in water, increasing the hydrogen ion concentration and lowering the pH.
• Examples include lemon juice (pH ~2) and vinegar (pH ~3).
• Stronger acids (lower pH) have higher concentrations of H^+ ions.
• Neutral Solutions:
• A solution with a pH of 7, such as pure water, has equal concentrations of H^+ ions and OH^- ions.
• Neutral solutions are neither acidic nor basic.
• Basic Solutions:
• Bases release OH^- ions in water, reducing the concentration of H^+ ions and increasing the pH.
• Examples include baking soda (pH ~9) and ammonia (pH ~11).
• Stronger bases (higher pH) have lower concentrations of H^+ ions.
• Logarithmic Nature of pH:
• The pH scale is logarithmic, meaning each unit change in pH represents a tenfold change in H^+ ion concentration.
• For example, a solution with pH 3 has 10 times more H^+ ions than a solution with pH 4 and 100 times more than a solution with pH 5.

Important Points

• Applications of pH:
• In agriculture, pH determines soil health for crop growth.
• In medicine, pH levels of blood and bodily fluids are crucial for diagnosing health conditions.
• In industry, pH is monitored in processes such as food production, water treatment, and chemical manufacturing.

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• pH Indicators:

• Indicators like litmus paper, phenolphthalein, or methyl orange are used to measure pH visually.

• Modern tools like pH meters provide accurate digital readings.

Q12. Answer: (d) A is false, but R is true.

The correct answer is A is false, but R is true.

Key Points

• Assertion (A): The statement that “In the reaction of copper with oxygen, oxygen acts as the reducing agent” is false. Oxygen cannot act as a reducing agent because it undergoes reduction itself by gaining electrons during the formation of copper oxide.

• Reason (R): The statement that “Oxygen adds to copper forming copper oxide” is true. In this reaction, oxygen reacts with copper, resulting in the formation of copper oxide (CuO).

• In a redox reaction, the substance that loses electrons is the reducing agent, while the substance that gains electrons is the oxidizing agent. In this case, oxygen acts as the oxidizing agent, not the reducing agent.

• The process involves copper (Cu) being oxidized to copper ions (Cu^(2+)) while oxygen is reduced to oxide ions (O^(2-)). This confirms that oxygen is the oxidizing agent.

• Since the assertion (A) incorrectly states the role of oxygen in the reaction, it is false, but the reason (R), which correctly describes the formation of copper oxide, is true.

Additional Information

• Oxidation and Reduction:

• Oxidation: It refers to the loss of electrons or the addition of oxygen to a substance. For example, copper (Cu) is oxidized to Cu^(2+) ions in this reaction.

• Reduction: It refers to the gain of electrons or the removal of oxygen from a substance. For example, oxygen (O2) is reduced to O^(2-) ions in this reaction.

• Role of Agents:

• Reducing Agent: A substance that donates electrons and gets oxidized in the process. In this reaction, copper acts as the reducing agent.

• Oxidizing Agent: A substance that accepts electrons and gets reduced in the process. In this reaction, oxygen acts as the oxidizing agent.

• Copper Oxide Formation:

• Copper reacts with oxygen to form copper oxide (CuO). The reaction can be represented as: Cu + O2 → CuO

• The reaction is an example of a redox process, where both oxidation and reduction occur simultaneously.

• Applications of Copper Oxide:

• Copper oxide is widely used in applications such as semiconductors, catalysts, and pigments.

• It is also used in the manufacturing of antifouling paints and as a precursor for producing other copper compounds.

Important Points

• Chemical Reactions: Redox reactions are crucial in understanding the exchange of electrons between substances and determining their roles as oxidizing or reducing agents.

• Common Misconceptions: It is essential to correctly identify the oxidizing and reducing agents in a reaction to avoid confusion.

• Industrial Relevance: Redox reactions are fundamental to processes like corrosion prevention, metal extraction, and energy production in batteries.

• Scientific Terminology: Terms like “oxidation” and “reduction” are often used interchangeably with “electron transfer,” emphasizing the role of electrons in chemical processes.

Q13. Answer: (a) Uterus

The correct answer is Uterus.

Key Points

• The uterus is a major organ in the female reproductive system. It is where a fertilized egg implants and develops into a fetus during pregnancy.

• It is a hollow, muscular organ located in the pelvic region of females, between the bladder and rectum.

• The uterus is composed of three layers: endometrium (inner lining), myometrium (muscular layer), and perimetrium (outer layer).

• Its primary functions include supporting fetal development, facilitating childbirth through its strong muscular contractions, and shedding its lining during menstruation if fertilization does not occur.

• The uterus plays a crucial role in the reproductive cycle, including ovulation, fertilization, and the menstrual cycle.

Additional Information

• Prostate Gland:

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• The prostate gland is part of the male reproductive system and is not present in females.
• It is responsible for producing a fluid that nourishes and transports sperm during ejaculation.
• The gland is located below the bladder and surrounds the urethra in males.
• Vas Deferens:
• The vas deferens is another component of the male reproductive system.
• It serves as a duct that transports sperm from the epididymis to the urethra during ejaculation.
• This organ is absent in females.
• Testis:
• The testis (plural: testes) is a male reproductive organ responsible for producing sperm and the hormone testosterone.
• It is located in the scrotum, outside the male body, for maintaining an optimal temperature for sperm production.
• Females do not have testes; instead, they have ovaries, which produce eggs and hormones like estrogen and progesterone.
• Female Reproductive System Overview:
• The female reproductive system includes organs such as the ovaries, fallopian tubes, uterus, vagina, and external genitalia.
• Its primary functions are the production of eggs (ova), facilitation of fertilization, and support for fetal development during pregnancy.
• The ovaries release eggs during ovulation, which travel through the fallopian tubes to the uterus.
• If fertilization occurs, the fertilized egg implants in the uterus and begins to develop into an embryo.

Important Points

• Menstrual Cycle: The uterus plays a vital role in the menstrual cycle. If fertilization does not occur, the endometrium is shed, leading to menstruation.
• Pregnancy: The uterus expands significantly during pregnancy to accommodate the growing fetus and contracts during childbirth to aid delivery.
• Common Disorders: Some common uterine disorders include fibroids, endometriosis, uterine prolapse, and cancer. These conditions may affect fertility and overall reproductive health.
• Ovaries vs. Uterus: While ovaries produce eggs and hormones, the uterus is primarily responsible for supporting pregnancy and facilitating childbirth.

Q14. Answer: (c) Its density is less than water

The correct answer is Its density is less than water.

Key Points

• An object floats on water if its density is less than the density of water. Water has a density of approximately 1 g/cm³ (at 4°C). Objects with a density lower than this value displace enough water to exert an upward buoyant force greater than their weight, causing them to float.
• Density is defined as the mass per unit volume (ρ = m/V). For an object to float, its density must be lower than water so that the upward buoyant force counteracts its downward gravitational force.
• This phenomenon is explained by Archimedes' Principle, which states that "a body immersed in a fluid experiences a buoyant force equal to the weight of the fluid displaced by it."
• If the density of the object is greater than water, the object sinks because the gravitational force exceeds the buoyant force.
• Examples include materials such as wood or styrofoam that float due to their lower density, whereas metals such as iron sink as their density is higher.

Additional Information

• Archimedes' Principle:
• It is a fundamental law of physics that governs the behavior of objects submerged in fluids.
• It states that the upward buoyant force exerted on a body is equal to the weight of the fluid displaced by the body.
• This principle is crucial in designing ships, submarines, and various floating objects.
• Factors Affecting Floating:
• Shape of the Object: Even if an object is made of a dense material, it may float if its shape allows it to displace a sufficient amount of water (e.g., ships).
• Temperature: The density of water varies with temperature. For instance, water is densest at 4°C.
• Salinity: Water with a higher salinity (e.g., seawater) has greater density, allowing more objects to float.
• Examples:
• Floating Objects: Wood, ice, cork, plastic, and styrofoam float because their density is lower than water.
• Sinking Objects: Metals like iron, gold, and aluminum sink because their density is higher than water.
• Applications:

• Engineering: Designing ships, pontoons, and buoyant structures relies on controlling density and displacement.

• Everyday Life: Life jackets and swimming aids are made using materials of low density to ensure buoyancy.

• Natural Phenomena: Icebergs float in the ocean because ice has a lower density than water.

Important Points

• Statement Analysis:

• Option 1: "Its density is greater than water" – Incorrect. Objects with density greater than water sink.

• Option 2: "Its weight is zero" – Incorrect. Objects still have weight; buoyancy determines if they float.

• Option 3: "Its density is less than water" – Correct. Lower density allows objects to float.

• Option 4: "Its volume is very small" – Incorrect. Volume doesn't directly determine floating; density is the key factor.

• Scientific Context: This principle is widely applicable in physics and engineering and is essential for understanding buoyancy and fluid dynamics.

• Environmental Importance: Floating phenomena are crucial for aquatic ecosystems, as organisms like plankton rely on buoyancy to survive in water.

Q15. Answer: (a) 24 hours

The correct answer is 24 hours.

Key Points

• An unfertilized egg typically survives for around 24 hours in the female reproductive tract after ovulation. This is the time during which the egg can be fertilized by a sperm.

• After ovulation, the egg is released from the ovary and travels through the fallopian tube, where it awaits fertilization.

• If the egg is not fertilized within 24 hours, it begins to disintegrate and is absorbed by the body. Hence, fertilization must occur within this timeframe.

• In contrast to the egg's short survival time, sperm can survive in the female reproductive tract for up to 5 days, which increases the chances of fertilization if intercourse occurs in the days leading up to ovulation.

• This limited lifespan of the egg is an important factor in understanding the fertile window, which is the time in a woman's menstrual cycle when conception is most likely to occur.

Additional Information

• Menstrual Cycle and Ovulation:

• The menstrual cycle typically lasts 28 days, although it can vary between individuals. Ovulation generally occurs around day 14 in a 28-day cycle.

• During ovulation, the mature egg is released from the ovary into the fallopian tube, where it can be fertilized by sperm.

• Fertile Window:

• The fertile window refers to the period during which a woman is most likely to conceive. It spans 5 days before ovulation and 1 day after ovulation, taking into account the lifespan of both sperm and the egg.

• Monitoring ovulation through methods such as basal body temperature or ovulation predictor kits can help identify the fertile window.

• Sperm Survival:

• Unlike the egg, sperm can survive in the female reproductive tract for up to 5 days, depending on the cervical mucus conditions.

• Favorable cervical mucus, which is produced around ovulation, helps sperm travel through the reproductive tract and increases their lifespan.

• Stages of Fertilization:

• Fertilization occurs when a sperm cell successfully penetrates the egg cell in the fallopian tube.

• The fertilized egg, now called a zygote, begins to divide and eventually implants into the uterine lining, leading to pregnancy.

Important Points

• Option 2 (10 hours): This is incorrect because the egg generally survives for longer than 10 hours after ovulation.

• Option 3 (60 hours): This is incorrect since an unfertilized egg cannot survive for such a long time in the female reproductive tract.

• Option 4 (72 hours): This is also incorrect. While sperm can survive for up to 72 hours or more, the egg itself has a much shorter lifespan of around 24 hours.

• The 24-hour survival time of an unfertilized egg is a critical factor in understanding human reproduction and planning or preventing pregnancy.

Q16. Answer: (b) Multiple reflections change the pitch of sound

The correct answer is Multiple reflections change the pitch of sound.

Key Points

• Reverberation: Multiple reflections of sound in a space cause reverberation, where sound persists for a while after the source stops. Reverberation is common in large spaces like concert halls or auditoriums. Hence, this statement is correct.

• Pitch of Sound: The pitch of a sound is determined by its frequency, not by the number of reflections. Multiple reflections may amplify or sustain the sound but do not alter its frequency or pitch. Hence, this statement is NOT correct.

• Sound Distribution in Large Halls: Multiple reflections are often desirable in large spaces to distribute sound evenly, ensuring that the audience can hear the sound clearly from any location. Hence, this statement is correct.

• Undesirability in Small Rooms: In small enclosed spaces, multiple reflections can lead to excessive reverberation, causing distortion of sound, which is undesirable. Hence, this statement is correct.

Additional Information

• Reverberation Time: Reverberation time is the duration it takes for the sound to decay by 60 dB after the source stops. It depends on the size of the room and the materials used in its construction.

• Applications of Reverberation:

• In concert halls, controlled reverberation enhances the quality and richness of music.

• In lecture halls, excessive reverberation is avoided to maintain clarity of speech.

• Pitch of Sound: The pitch is related to the frequency of the sound wave. Higher frequency results in a higher pitch, while lower frequency results in a lower pitch. Factors like the source of vibration and tension in the vibrating medium influence the frequency but not reflections.

• Echo vs. Reverberation: Echo is a distinct repetition of sound after a delay (greater than 0.1 seconds), while reverberation is the overlapping of sound reflections without a distinct delay.

• Acoustic Treatment: To control undesirable multiple reflections, acoustic materials like foam panels, carpets, or curtains are used in spaces like recording studios or small rooms.

Important Points

• Sound Reflection Applications: Reflection of sound is used in technologies like sonar, ultrasonic imaging, and echo-based distance measurement.

• Reverberation Control: In spaces like theaters or conference rooms, the reverberation time is optimized to ensure clarity and richness of sound.

• Human Hearing Range: Humans can hear sounds with frequencies between 20 Hz to 20,000 Hz. The pitch of sound within this range is perceived based on frequency, not reflections.

• Acoustic Design: Proper acoustic design involves balancing absorption and reflection to achieve the desired sound quality in a space.

Q17. Answer: (d) To stain the starch present in the leaf

The correct answer is To stain the starch present in the leaf.

Key Points

• The purpose of adding iodine solution in a starch test is to identify the presence of starch in the leaf by staining it. Iodine reacts with starch to produce a blue-black coloration, which confirms the presence of starch.

• This test is usually conducted after boiling the leaf in alcohol to remove chlorophyll, making the starch test results more visible.

• The blue-black coloration appears only in areas of the leaf where starch is present, which is usually in the green areas containing chlorophyll, as photosynthesis occurs there.

• The iodine solution serves as a staining agent and does not dissolve or remove starch; its role is purely to highlight starch presence through a visible color change.

• This test is significant in experiments to demonstrate that photosynthesis produces starch and to determine which parts of the leaf are photosynthetically active.

Additional Information

• Steps in the Starch Test:

• Pluck a variegated leaf (a leaf with both green and non-green areas).

• Boil the leaf in water to kill the cells.

• Boil the leaf in alcohol to remove chlorophyll and decolorize it.

• Rinse the leaf in warm water to soften it.

• Add iodine solution to the leaf and observe the color change.

• Role of Different Steps:

• Boiling in water: This step stops all metabolic processes in the leaf by killing the cells.

• Boiling in alcohol: This removes chlorophyll, making the leaf colorless and allowing the iodine-starch reaction to be visible.

• Adding iodine: This stains the starch present in the leaf, producing a blue-black color.

• Importance of Variegated Leaf: A variegated leaf has both green (chlorophyll-containing) and non-green areas. This allows

scientists to demonstrate that starch is synthesized only in the green parts, where photosynthesis occurs.

• Why Starch is Tested: Starch is a storage form of glucose produced during photosynthesis. Testing for starch indirectly confirms that photosynthesis has occurred in the green areas of the leaf.

Important Points

• Chlorophyll and Photosynthesis: Chlorophyll is essential for photosynthesis, which occurs only in green areas of the leaf. The non-green areas do not photosynthesize and thus do not produce starch.

• Iodine-Starch Reaction: Iodine reacts with starch molecules to form a blue-black complex, which is visible and confirms the presence of starch.

• Demonstration of Photosynthesis: This experiment is a classic method used in biology to demonstrate that photosynthesis occurs only in green chlorophyll-containing regions.

• Other Uses of Iodine: Apart from the starch test, iodine is also used as an antiseptic and in medical imaging as a contrast agent.

• Significance: This test helps in understanding plant physiology and the role of chlorophyll in food production, contributing to foundational knowledge in botany and agriculture.

Q18. Answer: (b) Genetically modified crops

The correct answer is Genetically modified crops.

Key Points

• Genetically modified crops (GM crops) are developed by introducing a specific gene or set of genes into the plant's genome to provide desired characteristics such as resistance to pests, diseases, or environmental conditions.

• The process involves transferring genes from one organism (which could be a plant, bacterium, or another species) into the target crop through genetic engineering techniques like recombinant DNA technology.

• Desired traits in GM crops include increased yield, improved nutritional content, resistance to herbicides, and tolerance to drought or salinity.

• Examples of genetically modified crops include Bt cotton (resistant to bollworms), Golden rice (enhanced with Vitamin A), and herbicide-tolerant soybean.

• This method is more precise and quicker compared to traditional breeding techniques, as the desired traits can be introduced without affecting other characteristics of the crop.

Additional Information

• Grafting:

• This is a traditional horticultural technique where tissues of plants are joined together to continue their growth as one plant.

• It is commonly used to propagate plants with desired characteristics, but it does not involve genetic modification at the DNA level.

• Example: Grafting is widely used in fruit-bearing plants like apple and citrus trees.

• Budding:

• Budding is a form of grafting where a single bud from the desired plant is inserted into the rootstock of another plant.

• It is primarily used in the propagation of ornamental plants and fruit trees.

• Unlike genetic modification, it does not involve introducing foreign genes into the plant.

• Natural vegetative reproduction:

• This is a natural process where plants reproduce using parts like roots, stems, or leaves without seeds.

• Examples include the growth of new plants from potato tubers or onion bulbs.

• This method does not involve any genetic engineering or artificial intervention.

• Advantages of Genetically Modified Crops:

• Higher crop yields and reduced dependency on chemical pesticides.

• Improved nutritional content, such as biofortified crops.

• Resistance to abiotic stresses like drought and salinity.

• Reduced agricultural costs and increased farmer profitability.

• Challenges and Concerns:

• Potential environmental impacts such as the development of resistant pests and loss of biodiversity.

• Ethical and health concerns about consuming genetically modified organisms (GMOs).

• Regulatory hurdles and public resistance in some countries.

Important Points

• Bt Cotton: The first genetically modified crop introduced in India in 2002, designed to resist bollworm pests.

• Golden Rice: Genetically modified to produce beta-carotene, a precursor to Vitamin A, aimed at combating Vitamin A deficiency in developing countries.

• Regulatory Framework in India: The Genetic Engineering Appraisal Committee (GEAC) under the Ministry of Environment, Forest and Climate Change is responsible for approving GM crops for commercial use.

• Global Adoption: Countries like the USA, Brazil, and Argentina are leaders in GM crop cultivation, with crops like GM soybean, maize, and cotton widely grown.

Q19. Answer: (b) A molecule of a compound is formed by the combination of atoms of different elements.

The correct answer is A molecule of a compound is formed by the combination of atoms of different elements..

Key Points

• A molecule of a compound is formed by the chemical combination of atoms of different elements. These atoms join in fixed proportions to form a compound. Hence, this statement is correct.

• A molecule of a compound is not formed by the separation of atoms, whether they are of the same or different elements. This concept contradicts the definition of a compound. Hence, statements mentioning separation are incorrect.

• Atoms of the same element form molecules of elements, not compounds. For example, O2 and H2 are molecules of elements, not compounds. Hence, the option "combination of atoms of the same element" is incorrect.

• Compounds have distinct chemical properties that are different from the properties of the individual elements that constitute them. This is due to the chemical bonding between different types of atoms.

• Examples of molecules of compounds include water (H2O), which is formed by the combination of hydrogen and oxygen atoms, and carbon dioxide (CO2), which is formed by the combination of carbon and oxygen atoms.

Additional Information

• Definition of Molecules and Compounds:

• A molecule is the smallest unit of a substance that retains its chemical properties. Molecules can consist of atoms of the same element (e.g., O2) or different elements (e.g., H2O).

• A compound is a substance formed when two or more different types of atoms chemically bond together in a fixed ratio.

• Types of Chemical Bonds:

• Ionic Bonds: Formed when one atom donates an electron to another atom (e.g., NaCl).

• Covalent Bonds: Formed when atoms share electrons (e.g., H2O).

• Metallic Bonds: Found in metals, where electrons are shared in a "sea" of electrons.

• Characteristics of Compounds:

• Compounds have a fixed chemical formula. For example, water is always H2O.

• They have unique properties that differ from their constituent elements. For instance, sodium is a reactive metal, and chlorine is a toxic gas, but together they form table salt (NaCl).

• Compounds can be broken down into simpler substances through chemical reactions.

• Examples of Molecules of Compounds:

• Water (H2O): Formed by two hydrogen atoms and one oxygen atom.

• Carbon Dioxide (CO2): Formed by one carbon atom and two oxygen atoms.

• Methane (CH4): Formed by one carbon atom and four hydrogen atoms.

Important Points

• Difference Between Element Molecules and Compound Molecules:

• Element Molecules: Composed of only one type of atom (e.g., O2, N2).

• Compound Molecules: Composed of different types of atoms (e.g., H2O, CO2).

• Formation of Compounds:

• Compounds are formed by chemical reactions between elements. For example, hydrogen and oxygen react to form water.

• The reaction involves the rearrangement of electrons to form chemical bonds.

Q20. Answer: (d) Calcium Hydroxide

The correct answer is Calcium Hydroxide.

Key Points

• Bleaching powder, chemically known as calcium hypochlorite, is prepared by reacting chlorine gas with Calcium Hydroxide.

• Calcium Hydroxide, commonly known as slaked lime, acts as the base that reacts with chlorine to produce bleaching powder.

• The chemical reaction involved in the preparation is: $Ca(OH)_2 + Cl_2 \rightarrow Ca(OCl)_2 + CaCl_2 + H_2O$. This reaction produces calcium hypochlorite (bleaching powder), calcium chloride, and water.

• Bleaching powder is widely used as a disinfectant, bleaching agent, and for water purification purposes.

• Calcium Hydroxide is preferred for this process because it is readily available, cost-effective, and reacts efficiently with chlorine gas to form bleaching powder.

Additional Information

• Calcium Hydroxide:

• Also known as slaked lime, it is a chemical compound with the formula Ca(OH)2.

• It is a white powder or crystalline material widely used in chemical processes such as water purification, construction, and soil stabilization.

• In the bleaching powder preparation process, its high reactivity with chlorine makes it ideal for producing calcium hypochlorite.

• Calcium Chloride:

• It is an inorganic compound with the formula CaCl2.

• It is not used directly in the preparation of bleaching powder but is a by-product in the reaction between calcium hydroxide and chlorine gas.

• Calcium chloride has applications in de-icing, dust control, and as a drying agent.

• Sodium Carbonate:

• Also known as washing soda, it has the formula Na2CO3.

• It is not involved in the preparation of bleaching powder but is commonly used in household cleaning and glass manufacturing.

• Ammonium Hydroxide:

• Also known as aqueous ammonia, it has the formula NH4OH.

• It is used in cleaning solutions, fertilizers, and certain chemical processes but is not used in the production of bleaching powder.

• Bleaching Powder Applications:

• Used as a disinfectant for water treatment and purification.

• Acts as a bleaching agent in the textile and paper industries.

• Widely applied in sanitation processes to kill germs and bacteria.

• Used in swimming pools to maintain hygiene.

Q21. Answer: (a) To move waste products to the organs that remove them

The correct answer is To move waste products to the organs that remove them.

Key Points

• Excretion is a vital biological process in multicellular organisms to remove metabolic waste products such as urea, carbon dioxide, and excess salts from the body.

• In multicellular organisms, the transportation system plays a central role in the excretion process by ensuring the movement of waste products from cells to excretory organs like kidneys, lungs, and skin.

• The circulatory system, comprising blood and lymphatic vessels, transports nitrogenous wastes like urea and uric acid from tissues to the kidneys for filtration and elimination.

• This system ensures that waste products do not accumulate in the body, preventing toxic buildup that can disrupt cellular functions and harm the organism.

• Without a transportation system, waste products would remain localized in tissues, leading to inefficiency in detoxification and a higher risk of diseases or metabolic imbalances.

Additional Information

• Role of the Circulatory System in Excretion:

• The bloodstream is responsible for carrying waste products such as urea from the liver (where it is synthesized) to the kidneys for excretion.

• Carbon dioxide, a byproduct of cellular respiration, is transported by the blood to the lungs, where it is expelled during exhalation.

• The lymphatic system also helps in maintaining the balance of fluids and removing waste materials from tissue spaces.

• Excretory Organs in Multicellular Organisms:

• The kidneys filter blood to remove nitrogenous wastes and regulate water and electrolyte balance.

• The lungs eliminate carbon dioxide and water vapor during respiration.

• The skin excretes sweat, which contains salts, water, and small amounts of urea.

• Importance of Excretion:

• Excretion ensures the removal of metabolic wastes, preventing toxicity in the body.

• It helps in maintaining homeostasis by regulating pH, ion concentrations, and water balance.

• Proper excretion is essential for the overall health and survival of the organism.

• Functions of Other Organ Systems in Waste Management:

• The digestive system eliminates undigested food and waste materials through defecation.

• The nervous system regulates the excretory process by controlling the functioning of kidneys and other organs involved in waste removal.

Important Points

• Why the Other Options Are Incorrect:

• To circulate digestive enzymes: Digestive enzymes are secreted locally in the digestive tract and do not require a transportation system. This statement is incorrect.

• To help with reproduction: The transportation system is not directly involved in reproduction. This statement is incorrect.

• To produce oxygen in cells: Oxygen is not produced in cells; rather, it is obtained from the environment through respiration. This statement is incorrect.

• Examples of Excretion in Animals:

• In humans, the kidneys filter approximately 50 gallons of blood daily to produce urine.

• In amphibians like frogs, urea is excreted through kidneys and skin.

• Birds excrete uric acid as a paste to conserve water.

Q22. Answer: (d) Simple filamentous body

The correct answer is Simple filamentous body.

Key Points

• Spirogyra is a genus of filamentous green algae found in freshwater environments such as ponds, ditches, and slow-moving streams.

• Its simple filamentous structure is composed of unbranched chains of cylindrical cells arranged end-to-end, which facilitates fragmentation.

• Fragmentation is an asexual reproduction method where each broken fragment of the filament can grow into a new individual under favorable conditions. This is possible due to the structural simplicity of Spirogyra.

• Unlike plants with complex tissues, Spirogyra lacks specialized tissues for transporting nutrients or water, which makes it highly adaptable to reproducing through fragmentation.

• The absence of seeds and reliance on vegetative reproduction ensure that fragmentation is an efficient and quick process for population growth.

Additional Information

• Fragmentation in Algae:

• Fragmentation is common in algae like Spirogyra, where broken parts of the filament regenerate into complete organisms.

• This method is especially advantageous in stable aquatic environments, where external disturbances may naturally break the filaments.

• Structure of Spirogyra:

• The body is made up of a single layer of cylindrical cells arranged in a chain.

• Each cell contains a helical chloroplast with pyrenoids, which aid in photosynthesis and storage of starch.

• Reproduction in Spirogyra:

• Besides fragmentation, Spirogyra reproduces sexually through a process known as conjugation, where genetic material is exchanged between cells.

• The formation of zygospores during conjugation helps the organism survive unfavorable environmental conditions.

• Other Options Explained:

• Presence of seeds: Spirogyra does not produce seeds as it reproduces asexually through fragmentation and sexually through conjugation. Hence, this option is incorrect.

• Single-celled structure: Spirogyra is multicellular, composed of filamentous chains of cells, not a single-celled organism. This option is incorrect.

• Complex tissues: Spirogyra lacks complex tissues like xylem or phloem, which are found in higher plants. This option is incorrect.

Important Points

• Habitat: Spirogyra thrives in freshwater environments and is often observed as slimy green masses floating on water.

• Ecological Role: It plays a key role in oxygen generation in aquatic ecosystems through photosynthesis and serves as food for various aquatic organisms.

• Adaptation: The filamentous body allows Spirogyra to efficiently absorb nutrients and light, maximizing its growth potential in aquatic environments.

• Scientific Importance: Spirogyra is often used as a model organism in studies related to photosynthesis and algal reproduction.

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Q23. Answer: (d) Cyclohexane

The correct answer is Cyclohexane.

Key Points

• Saturated hydrocarbons, also known as alkanes, are compounds that consist of only single bonds between carbon atoms. They have the general formula C_nH_(2n+2) for linear chains or C_nH_(2n) for cyclic saturated compounds.

• Benzene is an aromatic hydrocarbon and contains alternating double bonds in a ring structure, making it unsaturated. Hence, this is not a saturated hydrocarbon.

• Propene and Propyne are examples of unsaturated hydrocarbons because they contain double and triple bonds, respectively. This disqualifies them as saturated hydrocarbons.

• Cyclohexane is a saturated hydrocarbon as it consists of a single-ring structure with only single bonds between carbon atoms, fitting the general formula C_nH_(2n) for cyclic alkanes.

• Saturated hydrocarbons like Cyclohexane are generally less reactive compared to unsaturated hydrocarbons because they do not contain double or triple bonds, which are sites of high chemical reactivity.

Additional Information

• Benzene:

• Benzene (C6H6) is a planar, cyclic compound with delocalized π-electrons, making it an aromatic hydrocarbon.

• Aromatic compounds are characterized by their stability due to resonance but are classified as unsaturated due to the presence of alternating double bonds.

• Uses: Benzene is a key industrial chemical used in the production of plastics, resins, synthetic fibers, and rubber.

• Propene:

• Propene (C3H6) is an alkene with one double bond, making it unsaturated.

• Uses: Propene is primarily used in the production of polypropylene, a plastic polymer, and other chemicals like propylene oxide.

• Propyne:

• Propyne (C3H4) is an alkyne with one triple bond, making it unsaturated.

• Uses: Propyne is used in organic synthesis and as a fuel in welding torches.

• Cyclohexane:

• Cyclohexane (C6H12) is a cyclic alkane and a saturated hydrocarbon with single bonds.

• Properties: Cyclohexane is a colorless liquid with a mild odor and is less dense than water.

• Uses: It is widely used as a solvent and in the industrial production of nylon, specifically for manufacturing adipic acid and caprolactam.

• Saturated vs Unsaturated Hydrocarbons:

• Saturated hydrocarbons (alkanes) have only single bonds and are less reactive, while unsaturated hydrocarbons (alkenes and alkynes) have double or triple bonds and are more reactive.

• Saturated hydrocarbons are primarily used as fuels (e.g., methane, propane) and in chemical synthesis.

• Unsaturated hydrocarbons are used in polymer production and as intermediates in organic synthesis.

Q24. Answer: (b) A magnetic field around it

The correct answer is A magnetic field around it.

Key Points

• When an electric current flows through a metallic wire, it generates a magnetic field around it. This phenomenon is explained by Oersted's experiment, which demonstrated the relationship between electricity and magnetism.

• The magnetic field forms concentric circles around the wire, and its direction is determined by the right-hand thumb rule: if the thumb points in the direction of the current, the curled fingers indicate the direction of the magnetic field.

• The strength of the magnetic field depends on the magnitude of the current passing through the wire and the distance from the wire. It decreases as the distance increases.

• This property of a current-carrying wire is utilized in various applications, such as in the working of electromagnets, electric motors, and generators.

• The generation of a magnetic field around a current-carrying conductor is a fundamental concept in electromagnetism, forming the basis for many technological advancements.

Additional Information

• Electric Current and Magnetic Field:

• The connection between electricity and magnetism was first discovered by Hans Christian Oersted in 1820, who found that a compass needle deflects when placed near a current-carrying conductor.

• This discovery laid the foundation for the field of electromagnetism, which combines the study of electric and magnetic

phenomena.

• Right-Hand Thumb Rule:

• This rule is used to determine the direction of the magnetic field created by a current-carrying wire.

• To apply the rule, point the thumb of your right hand in the direction of the current, and the curl of your fingers will show the direction of the magnetic field lines.

• Electromagnetic Applications:

• Electromagnets, which are used in devices like electric bells, relays, and MRI machines, operate based on the principle of a magnetic field induced by an electric current.

• Electric motors and generators also rely on this principle to convert electrical energy into mechanical energy (or vice versa).

• Magnetic Field Strength:

• The strength of the magnetic field is directly proportional to the current through the wire and inversely proportional to the distance from the wire.

• Mathematically, the magnetic field (B) due to a straight current-carrying conductor is given by $B = (\mu_0 I)/(2\pi r)$, where μ_0 is the permeability of free space, I is the current, and r is the radial distance from the wire.

• Heat and Resistance in Wires:

• Although a current-carrying wire generates heat due to electrical resistance, this is not the primary phenomenon associated with the question's context.

• The heat generated follows Joule's law of heating, where heat (H) is proportional to the square of the current (I^2), resistance (R), and time (t).

Important Points

• Option 1: Only Electric Potential:

• While an electric current is associated with electric potential, this is not the primary effect in the context of the question.

• Option 2: A Magnetic Field Around It:

• This is the correct answer, as a magnetic field is always produced around a current-carrying conductor.

• Option 3: Only Heat:

• A wire carrying current does generate heat due to resistance, but this is not the main phenomenon described here.

• Option 4: No Physical Effect:

• This is incorrect because a current-carrying wire has multiple physical effects, including the generation of a magnetic field and heat.

Q25. Answer: (a) one-eighth of the initial value

The correct answer is one-eighth of the initial value.

Key Points

• Power in an electrical circuit is given by the formula: $P = I^2R$, where P is the power, I is the current, and R is the resistance.

• If both the current (I) and resistance (R) are halved, the new power can be calculated as follows:

• Let the initial values of current and resistance be I and R.

• Initial Power: $P = I^2R$.

• When the current is halved, the new current becomes I/2.

• When the resistance is halved, the new resistance becomes R/2.

• New Power: $P' = (I/2)^2 \times (R/2)$.

• Expanding the equation: $P' = (I^2/4) \times (R/2) = I^2R/8$.

• Comparing the new power (P') with the initial power (P), we get: $P' = P/8$.

• This means the power is reduced to one-eighth of its initial value.

• *Hence, the correct answer is one-*eighth of the initial value.

Additional Information

• Electrical Power:

• Electrical power is the rate at which electrical energy is transferred by an electric circuit.

• It is measured in watts (W), where 1 watt = 1 joule/second.

• The mathematical formulas for power are:

• $P = IV$, where I is current and V is voltage.

• $P = I^2R$, where R is resistance.

• $P = V^2/R$.

• Current and Resistance Relationship:

• Current (I) and resistance (R) are inversely proportional when the voltage is constant, as per Ohm's Law: I = V/R.

• Changes in resistance and current significantly affect power, as seen in the formulas above.

• Practical Applications:

• Understanding power reduction is critical in designing energy-efficient electrical systems.

• For example, halving current and resistance is often practiced in electronic circuits to manage power consumption effectively.

• Examples of Power Calculation:

• Example 1: If a circuit has an initial current of 4 A and resistance of 8 ohms, the power is $P = I^2R = 4^2 \times 8 = 128$ W. If both current and resistance are halved, new power is $P' = (2^2 \times 4) = 32$ W, which is one-fourth of the initial power.

• Example 2: For a circuit with initial current 10 A and resistance 20 ohms, power is $P = 10^2 \times 20 = 2000$ W. After halving both, new power is $P' = (5^2 \times 10) = 500$ W, again one-fourth.

Important Points

• Ohm's Law: It states that the current through a conductor between two points is directly proportional to the voltage across the two points, provided the temperature remains constant.

• Units of Power: Power is measured in watts (W). Larger units include kilowatts (1 kW = 1000 W) and megawatts (1 MW = 10^6 W).

• Applications: Power calculations are used in electrical engineering, energy management, and electronics design.

• Concept of Efficiency: Efficiency is the ratio of output power to input power, often expressed as a percentage.

Q26. Answer: (a) 300

Shortcut Trick

Total votes = 10,000. Valid votes (90%) = 9,000.

Sohan's votes = 40% of 9,000 = 3,600.

Remaining for Ram and Mohan = 9,000 − 3,600 = 5,400.

Since Ram − Mohan = 2,000 and Ram + Mohan = 5,400:

Ram = (5,400 + 2,000) ÷ 2 = 3,700; Mohan = 1,700.

Remainder of 3,700 ÷ 1,700 = 300.

Therefore The correct answer is 300.

Alternate Method

Given: Total votes = 10,000; Invalid = 10%; Sohan = 40% of Valid; Ram − Mohan = 2,000.

=> Valid Votes = 10,000 − (10% of 10,000) = 10,000 − 1,000 = 9,000.

=> Sohan's Votes = 40% of 9,000 = 0.40 × 9,000 = 3,600.

=> Remaining Votes for Ram and Mohan = 9,000 − 3,600 = 5,400.

=> Let Mohan's votes be x. Then Ram's votes = x + 2,000.

=> x + (x + 2,000) = 5,400 => 2x = 3,400 => x = 1,700.

=> Mohan = 1,700; Ram = 1,700 + 2,000 = 3,700.

=> Required Remainder = 3,700 (mod 1,700) => 3,700 = (2 × 1,700) + 300.

Therefore The correct answer is 300.

Additional Information

Election-based Percentages

In election problems, always distinguish between total votes cast, valid votes, and invalid votes. Valid Votes = Total Cast − Invalid.

Remainder Theorem

When a number A is divided by B, the Remainder R is defined by A = B × Q + R, where 0 ≤ R < B.

Linear Equations in Two Variables

If sum (S) and difference (D) of two numbers are known: Larger number = (S+D)/2 and Smaller number = (S−D)/2.

Q27. Answer: (c) 1,012

Shortcut Trick

Selling Price (SP) = Cost Price (CP) × (100 − Discount%) ÷ 100

SP = 1,150 × (100 − 12) ÷ 100

SP = 1,150 × 88 ÷ 100 = 1,150 × 0.88

SP = 1,012

Therefore The correct answer is Rs. 1,012.

Alternate Method

Given: Cost Price (CP) = Rs. 1,150 and Discount% = 12%.

Formula: Selling Price (SP) = CP − Discount Amount | Discount Amount = (Discount% ÷ 100) × CP

=> Discount Amount = (12 ÷ 100) × 1,150

=> Discount Amount = 0.12 × 1,150 = 138

=> Selling Price = 1,150 − 138

=> Selling Price = 1,012

Therefore The correct answer is Rs. 1,012.

Additional Information

Marked Price and Discount

Generally, Discount is calculated on the Marked Price (MP). In this specific case, the question explicitly states the discount is on the Cost Price.

Selling Price Calculation

When a discount of x% is given, the Selling Price becomes (100 − x)% of the base price.

Q28. Answer: (a) Rs. 2,20,000

Shortcut Trick

Use the direct relation between Marked Price (MP) and Cost Price (CP): MP ÷ CP = (100 + Gain%) ÷ (100 − Discount%).

MP ÷ 99,000 = (100 + 40) ÷ (100 − 37) = 140 ÷ 63.

MP = 99,000 × (140 ÷ 63).

MP = 11,000 × (140 ÷ 7) = 11,000 × 20 = 2,20,000.

Therefore The correct answer is Rs. 2,20,000.

Alternate Method

Given: Cost Price (CP) = Rs. 99,000, Profit% = 40%, Discount% = 37%.

Formulas: SP = CP × (100 + P%) ÷ 100 | MP = SP × 100 ÷ (100 − D%)

=> Selling Price (SP) = 99,000 × (140 ÷ 100) = 990 × 140 = Rs. 1,38,600.

=> Let the Marked Price (MP) be x.

=> x × (100 − 37) ÷ 100 = 1,38,600.

=> x × (63 ÷ 100) = 1,38,600.

=> x = (1,38,600 × 100) ÷ 63 = 2,200 × 100 = Rs. 2,20,000.

Therefore The correct answer is Rs. 2,20,000.

Additional Information

Relation between CP and MP

The ratio of MP to CP can always be calculated as CP × (100 + P%) = MP × (100 − D%) since both represent the Selling Price.

Marked Price & Discount

Discount is always calculated on the Marked Price. SP = MP − Discount.

Q29. Answer: (b) 2.8% decrease in volume

Shortcut Trick

Net change in volume = Multiplying factors of individual dimensions

Final factor = 0.90 (Length −10%) × 0.80 (Breadth −20%) × 1.35 (Height +35%)

Final factor = 0.72 × 1.35 = 0.972

Percentage change = (0.972 − 1) × 100 = −2.8%

A negative result indicates a decrease in the total volume.

Therefore The correct answer is 2.8% decrease in volume.

Alternate Method

Given:

Decrease in Length (L) = 10%

Decrease in Breadth (B) = 20%

Increase in Height (H) = 35%

Formula Used:

Volume of a Cuboid = L × B × H

Let the Initial Volume be 100 units.

=> Volume after Length decrease (10%) = 100 − (10% of 100) = 90
=> Volume after Breadth decrease (20%) = 90 − (20% of 90) = 90 − 18 = 72
=> Volume after Height increase (35%) = 72 + (35% of 72) = 72 + 25.2 = 97.2
=> Net Percentage Change = 100 − 97.2 = 2.8%
Since the final value is less than the initial value, it is a decrease.
Therefore The correct answer is 2.8% decrease in volume.
Additional Information
Successive Percentage Formula
For two successive changes x% and y%, the net change is given by: [x + y + (x × y)/100]%.
Volume of Cuboid
The volume of a cuboid depends directly on the product of its three dimensions: V = L × B × H.
Percentage to Fraction Conversion
Using fractions can simplify calculations: 10% = 1/10, 20% = 1/5, and 35% = 7/20. The ratio method uses (Final/Initial) values.

Q30. Answer: (b) 20

Shortcut Trick
Let the Width be 1 unit, then the Length is 3 units.
Perimeter in units = 2 × (Length + Width) = 2 × (3 + 1) = 8 units.
Given 8 units = 160 cm.
1 unit (Width) = 160 ÷ 8 = 20 cm.
Therefore The correct answer is 20 cm.
Alternate Method
Given:
Perimeter of the rectangle = 160 cm
Length (L) = 3 × Width (W)
Formula Used:
Perimeter of a Rectangle = 2 × (Length + Width)
Calculations:
=> Let the Width of the rectangle be w cm.
=> Then, the Length = 3w cm.
=> Perimeter = 2 × (3w + w) = 160
=> 2 × (4w) = 160
=> 8w = 160
=> w = 160 ÷ 8
=> w = 20 cm
Therefore The correct answer is 20 cm.
Additional Information
Area of a Rectangle
The total space occupied by the rectangle is given by Area = Length × Width.
Diagonal of a Rectangle
The distance between opposite vertices is calculated using Pythagoras theorem: Diagonal = √(Length² + Width²).
Relationship with Square
A Square is a special type of rectangle where the Length is equal to the Width, making all four sides equal.

Q31. Answer: (c) 21.64

Shortcut Trick
Identify the modal class (21−28) as the mode 22.75 lies within it.
Solve for missing frequency X: 22.75 = 21 + [(11 − 9) ÷ (22 − 9 − X)] × 7 => 1.75 = 14 ÷ (13 − X) => 13 − X = 8 => X = 5.
Calculate total frequency (N) = 1 + 7 + 9 + 11 + 5 + 3 = 36.
Locate median class using N/2 = 18; cumulative frequency reaches 18 in class 21−28.
Median = 21 + [(18 − 17) ÷ 11] × 7 = 21 + 7/11 ≈ 21.64.
Therefore The correct answer is 21.64.

Alternate Method

Given: Mode = 22.75, Class intervals, and Frequencies.

Formula Used:

Mode = l + [(f1 − f0) ÷ (2f1 − f0 − f2)] × h

Median = l + [(N/2 − CF) ÷ f] × h

Step 1: Finding X

=> Modal class = 21−28 (since Mode 22.75 falls here)

=> l = 21, f1 = 11, f0 = 9, f2 = X, h = 7

=> 22.75 = 21 + [(11 − 9) ÷ (2 × 11 − 9 − X)] × 7

=> 1.75 = [2 ÷ (13 − X)] × 7

=> 1.75 × (13 − X) = 14

=> 13 − X = 14 ÷ 1.75 = 8

=> X = 13 − 8 = 5

Step 2: Finding Median

=> Total frequency N = 1 + 7 + 9 + 11 + 5 + 3 = 36

=> N/2 = 18

=> Median class is 21−28 (where cumulative frequency exceeds 18)

=> l = 21, CF = 17, f = 11, h = 7

=> Median = 21 + [(18 − 17) ÷ 11] × 7

=> Median = 21 + (1 ÷ 11) × 7

=> Median = 21 + 0.6363... ≈ 21.64

Therefore The correct answer is 21.64.

Additional Information

Empirical Relationship

For a moderately skewed distribution, the relationship is Mode = 3 Median − 2 Mean.

Median of Grouped Data

Calculated as l + [(N/2 − CF) ÷ f] × h, where CF is the cumulative frequency of the preceding class.

Mode of Grouped Data

Calculated as l + [(f1 − f0) ÷ (2f1 − f0 − f2)] × h, identifying the modal class first by frequency.

Q32. Answer: (d) Rs. 5,600

Shortcut Trick

Investment Ratio = Profit Ratio

Prakhar's Profit : Total Profit = 1,400 : 7,900 = 14 : 79

Total Investment of 79 units = Rs. 31,600

1 unit = 31,600 ÷ 79 = Rs. 400

Prakhar's Investment = 14 units × 400 = Rs. 5,600

Therefore The correct answer is Rs. 5,600.

Alternate Method

Given: Total Investment = Rs. 31,600 | Total Profit = Rs. 7,900 | Prakhar's Profit = Rs. 1,400.

Formulas: Profit Ratio = Investment Ratio (when time is constant) | Individual Investment = (Individual Profit ÷ Total Profit) × Total Investment.

=> Total Profit = Rs. 7,900

=> Prakhar's Profit Share = Rs. 1,400

=> Ratio of Prakhar's profit to Total profit = 1,400 ÷ 7,900 = 14/79

=> Since time is the same, Prakhar's Investment = (14/79) × 31,600

=> Prakhar's Investment = 14 × 400 = Rs. 5,600

Therefore The correct answer is Rs. 5,600.

Additional Information

Partnership Principle

In a partnership, the profit is distributed in the ratio of the product of Investment and Time period. If time is constant, Profit prop. to Investment.

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Ratio Division

To find an individual's share from a total sum, multiply the total sum by the ratio fraction: (Individual Ratio ÷ Sum of Ratios) × Total Value.

Q33. Answer: (a) 5 m

Shortcut Trick

In a 45°−45°−90° right-angled triangle, the base and perpendicular are always equal.

Since the angle with the ground is 45°, the height of the wall = distance from the wall.

Height = 5 m.

Therefore The correct answer is 5 m.

Alternate Method

Given:

Angle of elevation (θ) = 45°

Distance of the foot of the ladder from the wall (Base) = 5 m

Formula Used:

tan θ = Perpendicular (Height) ÷ Base

Calculations:

=> tan 45° = Height ÷ 5

=> 1 = Height ÷ 5

=> Height = 5 × 1

=> Height = 5 m

Therefore The correct answer is 5 m.

Additional Information

Trigonometric Ratios for Standard Angles

For a 45° angle, tan 45° = 1, sin 45° = 1/√2, and cos 45° = 1/√2.

Special Right Triangles (45-45-90)

The ratio of the sides opposite to the angles 45° : 45° : 90° is always 1 : 1 : √2.

Pythagoras Theorem

In any right-angled triangle, $(\text{Hypotenuse})^2 = (\text{Base})^2 + (\text{Height})^2$.

Q34. Answer: (d) 1

Shortcut Trick

Equate total work: (8M + 3W) × 15 = (14M + 19W) × 5

=> 3(8M + 3W) = 14M + 19W

=> 24M + 9W = 14M + 19W

=> 10M = 10W => 1M = 1W

Therefore The correct answer is 1.

Alternate Method

Given:

Case 1: (8 men + 3 women) × 15 days

Case 2: (14 men + 19 women) × 5 days

Formula Used:

Total Work = Efficiency × Time

Calculations:

=> (8M + 3W) × 15 = (14M + 19W) × 5

=> 120M + 45W = 70M + 95W

=> 120M − 70M = 95W − 45W

=> 50M = 50W

=> 1M = 1W

Therefore The correct answer is 1.

Additional Information

Work Equivalence Principle

When different groups perform the same work, we equate their total effort (M1D1 = M2D2) to find the ratio of their efficiencies.

Man-Day Concept

The total work is often expressed in terms of man-days or woman-days, which is the product of the number of workers and the time taken.

Q35. Answer: (c) 82

Shortcut Trick

Solve brackets first: (8×8−8+4)=60 and (4×4+4+4÷4)=21

Expression becomes: 60÷10 + 21×3 + 2 of 26 ÷ 4

= 6 + 63 + (2×26)÷4

= 6 + 63 + 13

Therefore Answer = 82

Alternate Method

Given:

(8 × 8 − 8 + 4) ÷ 10 + (4 × 4 + 4 + 4 ÷ 4) × 3 + 2 of 26 ÷ 4

Concept Used:

BODMAS rule

Calculation:

=> (8 × 8 − 8 + 4) ÷ 10 + (4 × 4 + 4 + 4 ÷ 4) × 3 + 2 of 26 ÷ 4

=> (64 − 8 + 4) ÷ 10 + (4 × 4 + 4 + 4 ÷ 4) × 3 + 2 of 26 ÷ 4

=> (56 + 4) ÷ 10 + (4 × 4 + 4 + 4 ÷ 4) × 3 + 2 of 26 ÷ 4

=> 60 ÷ 10 + (4 × 4 + 4 + 4 ÷ 4) × 3 + 2 of 26 ÷ 4

=> 60 ÷ 10 + (16 + 4 + 4 ÷ 4) × 3 + 2 of 26 ÷ 4

=> 60 ÷ 10 + (20 + 4 ÷ 4) × 3 + 2 of 26 ÷ 4

=> 60 ÷ 10 + (20 + 1) × 3 + 2 of 26 ÷ 4

=> 60 ÷ 10 + 21 × 3 + 2 of 26 ÷ 4

=> 6 + 21 × 3 + 2 of 26 ÷ 4

=> 6 + 63 + 2 of 26 ÷ 4

=> 6 + 63 + 52 ÷ 4

=> 6 + 63 + 13

=> 82

Therefore The correct answer is 82.

Additional Information

BODMAS Full Form

Brackets, Orders, Division, Multiplication, Addition, Subtraction

Bracket Priority

Solve brackets first, then division and multiplication left to right

'of' Operation

The word 'of' means multiplication and is solved before division

Simplification Trick

Always simplify inner brackets completely before moving outside

Q36. Answer: (a) 30 km/hr

Shortcut Trick

Let Train Speed be V km/hr.

Since the train passes both people, the length of the train remains constant.

Length = (V − 7.2) × 29.9 = (V − 14.4) × 43.7

Solving for V: 29.9V − 215.28 = 43.7V − 629.28

13.8V = 414 => V = 30 km/hr.

Therefore The correct answer is 30 km/hr.

Alternate Method

Given: Speed of 1^(st) person = 7.2 km/hr, Time1 = 29.9 s. Speed of 2^(nd) person = 14.4 km/hr, Time2 = 43.7 s.

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Formula Used: Distance = Relative Speed × Time; 1 km/hr = 5/18 m/s.
=> Let train speed be V km/hr. Converting to m/s is not necessary as the conversion factor cancels out.
=> (V − 7.2) × (5/18) × 29.9 = (V − 14.4) × (5/18) × 43.7
=> (V − 7.2) × 29.9 = (V − 14.4) × 43.7
=> 29.9V − 215.28 = 43.7V − 629.28
=> 43.7V − 29.9V = 629.28 − 215.28
=> 13.8V = 414
=> V = 414 ÷ 13.8 = 30 km/hr.
Therefore The correct answer is 30 km/hr.
Additional Information
Relative Speed
When two objects move in the same direction, relative speed = V1 − V2. In opposite directions, relative speed = V1 + V2.
Train Passing Objects
Distance covered to pass a point object (person, pole) is equal to the length of the train itself.
Unit Conversion
To convert km/hr to m/s, multiply by 5/18. To convert m/s to km/hr, multiply by 18/5.

Q37. Answer: (c) Only cube

Shortcut Trick
Volume of Cube = side³ = 5 × 5 × 5 = 125 cm³.
Volume of Cuboid = length × breadth × height = 7 × 4 × 2 = 56 cm³.
Comparing the two, 125 cm³ > 56 cm³, so the Cube is larger.
Therefore The correct answer is Only cube.
Alternate Method
Given:
Edge of the Cube (a) = 5 cm
Dimensions of the Cuboid: Length (l) = 7 cm, Breadth (b) = 4 cm, Height (h) = 2 cm
Formula Used:
Volume of a Cube = a^3
Volume of a Cuboid = l × b × h
Calculations:
=> Volume of the Cube = 5^3
=> Volume of the Cube = 5 × 5 × 5 = 125 cm³
=> Volume of the Cuboid = 7 × 4 × 2
=> Volume of the Cuboid = 56 cm³
=> Comparison: 125 cm³ > 56 cm³
Therefore The correct answer is Only cube.
Additional Information
Total Surface Area (TSA)
For a cube of side a, TSA = $6a^2$. For a cuboid, TSA = 2(lb + bh + hl).
Lateral Surface Area (LSA)
For a cube, LSA = $4a^2$. For a cuboid, LSA (area of four walls) = 2h(l + b).
Diagonal of Solids
Length of the longest rod in a cube is $a\sqrt{3}$ and in a cuboid is $\sqrt{(l^2 + b^2 + h^2)}$.

Q38. Answer: (a) 144

Shortcut Trick
For two numbers a and b, the Third Proportional (x) is given by x = $b^2 \div a$.
Given: a = 4, b = 24.
x = (24 × 24) ÷ 4
x = 24 × 6 = 144
Therefore The correct answer is 144.

Alternate Method

Given: First number (a) = 4, Second number (b) = 24, Third proportional = x.

Formula Used: If a, b, and x are in continued proportion, then a : b = b : x.

=> 4 / 24 = 24 / x

=> 4 × x = 24 × 24

=> 4x = 576

=> x = 576 ÷ 4

=> x = 144

Therefore The correct answer is 144.

Additional Information

Mean Proportional

The mean proportional between two numbers a and b is calculated as √(a × b).

Fourth Proportional

If a : b = c : d, then d is the fourth proportional and is calculated as d = (b × c) ÷ a.

Continued Proportion

Three quantities a, b, c are in continued proportion if a/b = b/c, which implies $b^2 = ac$.

Q39. Answer: (d) -80x

Shortcut Trick

Apply the direct identity: $(a - b)^2 - (a + b)^2 = -4ab$.

Here, a = 5x and b = 4.

Result = −4 × (5x) × (4) = −80x.

Therefore The correct answer is -80x.

Alternate Method

Given: $(5x - 4)^2 - (5x + 4)^2$

Formula: $(a - b)^2 = a^2 - 2ab + b^2$ and $(a + b)^2 = a^2 + 2ab + b^2$

=> $(5x - 4)^2 = (5x)^2 - 2 \times 5x \times 4 + 4^2 = 25x^2 - 40x + 16$

=> $(5x + 4)^2 = (5x)^2 + 2 \times 5x \times 4 + 4^2 = 25x^2 + 40x + 16$

=> $[(25x^2 - 40x + 16)] - [(25x^2 + 40x + 16)]$

=> $25x^2 - 40x + 16 - 25x^2 - 40x - 16$

=> −40x − 40x

=> −80x

Therefore The correct answer is -80x.

Additional Information

Difference of Squares Identity

The formula $a^2 - b^2 = (a - b)(a + b)$ can also be used to simplify this expression by taking a = (5x − 4) and b = (5x + 4).

Standard Algebraic Identities

1. $(a + b)^2 + (a - b)^2 = 2(a^2 + b^2)$

2. $(a + b)^2 - (a - b)^2 = 4ab$

Negative Sign Rule

Note that $(a - b)^2 - (a + b)^2$ results in −4ab, whereas $(a + b)^2 - (a - b)^2$ results in +4ab.

Q40. Answer: (d) one fourth of a straight angle

Shortcut Trick

Using the exterior angle sum property for two vertices of a triangle:

Sum of two exterior angles = 180° + opposite interior angle

=> 110° + 115° = 180° + angle X

=> 225° = 180° + angle X

=> angle X = 45° = 1/4 × 180° = one fourth of a straight angle

Therefore The correct answer is one fourth of a straight angle.

Alternate Method

Given:

Exterior angle at vertex Y = 110°
Exterior angle at vertex Z = 115°
Formula Used:
Linear pair of angles: Interior angle + Exterior angle = 180°
Angle sum property of a triangle: angle X + angle Y + angle Z = 180°
Straight angle = 180°
Calculations:
First, find the interior angles of the triangle at vertices Y and Z using the linear pair property:
=> angle Y = 180° − 110° = 70°
=> angle Z = 180° − 115° = 65°
Now, apply the angle sum property in triangle XYZ:
=> angle X + angle Y + angle Z = 180°
=> angle X + 70° + 65° = 180°
=> angle X + 135° = 180°
=> angle X = 180° − 135° = 45°
Let us evaluate the options to find the correct representation of 45°:
=> Option (1): One fourth of a right angle = 1/4 × 90° = 22.5° (Incorrect)
=> Option (2): Equal to right angle = 90° (Incorrect)
=> Option (3): Three fourth of a right angle = 3/4 × 90° = 67.5° (Incorrect)
=> Option (4): One fourth of a straight angle = 1/4 × 180° = 45° (Correct)
Therefore The correct answer is one fourth of a straight angle.
Additional Information
Angle Sum Property of a Triangle
The sum of all interior angles of a triangle is always equal to 180° (or a straight angle).
Exterior Angle Theorem
An exterior angle of a triangle is equal to the sum of its two opposite interior angles (e.g., Exterior angle Y = angle X + angle Z).
Linear Pair Axiom
If a ray stands on a line, then the sum of two adjacent angles so formed is 180°.
Types of Angles
A right angle is exactly 90°, and a straight angle is exactly 180°.

Q41. Answer: (b) 3

Shortcut Trick
Total work (LCM of 3, 6, 2) = 6 units.
Combined efficiency of A, B, and C = (6÷3) + (6÷6) + (6÷2) = 2 + 1 + 3 = 6 units/day.
New work = 3 × 6 = 18 units.
Time taken = 18 ÷ 6 = 3 days.
Therefore The correct answer is 3 days.
Alternate Method
Given: Time taken by A = 3 days, B = 6 days, C = 2 days.
Formula Used: Total Work = LCM of individual days; Efficiency = Total Work ÷ Time; Time = Total Work ÷ Total Efficiency.

Person	Days	Total Work	Efficiency
A	3	6	2
B	6	1	
C	2	3	

=> Total efficiency of A + B + C = 2 + 1 + 3 = 6 units/day.
=> Original work = 6 units.
=> Thrice the work = 3 × 6 = 18 units.
=> Time taken = 18 ÷ 6 = 3 days.
Therefore The correct answer is 3 days.

Additional Information

Pipes & Cisterns

Similar to time and work, but use negative efficiency for outlet pipes (leakage).

Work & Wages

Wages are distributed in the ratio of the efficiency of the workers if they work for the same duration.

Efficiency Rule

Efficiency is inversely proportional to the time taken to complete a task (E prop. to 1/T).

Q42. Answer: (c) 1

Shortcut Trick

The age difference between two people always remains constant.

Present difference = 5 years => Difference after 4 years = 5 years.

After 4 years, Ravi : Amar = 2 : 1. Difference in ratio = 1 unit.

1 unit = 5 years → Amar's age after 4 years = 1 × 5 = 5 years.

Amar's present age = 5 − 4 = 1 year.

Therefore The correct answer is 1 year.

Alternate Method

Given: Ravi is 5 years older than Amar. After 4 years, Ravi is twice as old as Amar.

Let Amar's present age = x years.

Then Ravi's present age = x + 5 years.

After 4 years:

Amar's age = x + 4

Ravi's age = (x + 5) + 4 = x + 9

According to the question:

=> x + 9 = 2 × (x + 4)

=> x + 9 = 2x + 8

=> 2x − x = 9 − 8

=> x = 1

Therefore The correct answer is 1 year.

Additional Information

Constant Age Difference

The difference between the ages of two persons remains the same at any point in time, whether in the past or the future.

Ratio Balancing

If the age ratio changes from a:b to c:d over n years, the difference between the ratio parts (b−a and d−c) must be made equal by multiplying the ratios by suitable constants.

Linear Equation Method

For age problems involving multiple conditions, always define the present age as a variable (x) and set up the equation based on the future/past conditions.

Q43. Answer: (c) 73

Shortcut Trick

Increase in average age = 22 − 21 = 1 year

Teacher age = New average + (Initial number of students × Increase in average)

Teacher age = 22 + (51 × 1) = 22 + 51

Teacher age = 73 years

Therefore The correct answer is 73 years.

Alternate Method

Given:

Number of students = 51

Initial average age = 21 years

New average age (including teacher) = 22 years

Formula Used:

Sum of all observations = Average × Total number of observations

Calculations:

=> Total sum of ages of 51 students = 51 × 21 = 1071 years

=> Total number of people including the teacher = 51 + 1 = 52

=> Total sum of ages of 52 people = 52 × 22 = 1144 years

=> Age of the teacher = (Sum of ages of 52 people) − (Sum of ages of 51 students)

=> Age of the teacher = 1144 − 1071 = 73 years

Therefore The correct answer is 73 years.

Additional Information

Average Concept

Average = (Sum of all observations) ÷ (Number of observations). To find the sum, multiply the average by the count.

Effect of Adding a Member

If the added member's value is greater than the current average, the overall average increases. If it is less, the average decreases.

Net Deviation

The sum of deviations from the average is always zero. Use this for faster calculation in large data sets.

Q44. Answer: (c) 7 m

Shortcut Trick

To find the greatest possible length, we need to calculate the HCF (Highest Common Factor) of the given lengths.

Given lengths: 42, 63, 140.

Difference between 63 and 42 = 21.

Check if 21 divides all: 21 divides 42 and 63, but not 140. Factors of 21 are 1, 3, 7, 21.

The largest factor of 21 that divides 140 is 7.

Therefore The correct answer is 7 m.

Alternate Method

Given: Three lengths 42 m, 63 m, and 140 m.

Formula Used: Greatest common measure = HCF(Length1, Length2, Length3)

Calculations:

=> Prime factorization of 42 = 2 × 3 × 7

=> Prime factorization of 63 = 3 × 3 × 7 = 3^2 × 7

=> Prime factorization of 140 = 2 × 2 × 5 × 7 = 2^2 × 5 × 7

=> Common factor in all three = 7

=> HCF(42, 63, 140) = 7

Therefore The correct answer is 7 m.

Additional Information

Highest Common Factor (HCF)

HCF is the largest positive integer that divides each of the integers without leaving a remainder. It is also known as Greatest Common Divisor (GCD).

Least Common Multiple (LCM)

LCM is the smallest positive integer that is divisible by each of the given numbers. Relationship: Product of two numbers = HCF × LCM.

Divisibility Rule of 7

Double the last digit and subtract it from the remaining number; if the result is divisible by 7, the original number is also divisible by 7.

Q45. Answer: (b) Rs. 184

Shortcut Trick

To find the Selling Price (SP) for a single item when Cost Price (CP) and Profit% are known:

Use the multiplier: SP = CP × (100 + P%) ÷ 100

SP = 160 × (115 ÷ 100) = 160 × 1.15

SP = 184

Therefore The correct answer is Rs. 184.

Alternate Method

Given: CP of 1 bracelet = Rs. 160, Desired Profit% = 15%
Formulas: Profit = CP × (Profit% ÷ 100) | SP = CP + Profit
=> Profit per bracelet = 160 × (15 ÷ 100)
=> Profit = 160 × 0.15 = Rs. 24
=> Selling Price per bracelet = Cost Price + Profit
=> SP = 160 + 24 = Rs. 184
Therefore The correct answer is Rs. 184.
Additional Information
Cost Price & Selling Price
The Cost Price (CP) is the price at which an article is purchased. The Selling Price (SP) is the price at which an article is sold.
Profit and Loss Percentage
Profit% = (Profit ÷ CP) × 100. Loss% = (Loss ÷ CP) × 100. Both are always calculated on the Cost Price unless stated otherwise.

Q46. Answer: (c) Decrease by 13.64%

Shortcut Trick
Assume initial dimensions: Length (L) = 3, Breadth (B) = 2, Height (H) = 1.
Initial Total Surface Area (TSA1) = 2(3×2 + 2×1 + 1×3) = 2(6 + 2 + 3) = 22.
New dimensions: L' = 6 (doubled), B' = 1 (half), H' = 0.5 (half).
New Total Surface Area (TSA2) = 2(6×1 + 1×0.5 + 0.5×6) = 2(6 + 0.5 + 3) = 19.
Percentage Change = [(22 − 19) ÷ 22] × 100 = (3 ÷ 22) × 100 ≈ 13.64% decrease.
Therefore The correct answer is Decrease by 13.64%.
Alternate Method
Given: Ratio of Length : Breadth : Height = 3 : 2 : 1. Let the original values be 3x, 2x, and x.
Formula Used:Total Surface Area (TSA) of a room = 2(LB + BH + HL).
=> Original TSA = $2[(3x \times 2x) + (2x \times x) + (x \times 3x)] = 2[6x^2 + 2x^2 + 3x^2] = 22x^2$
=> New Length = 6x, New Breadth = x, New Height = 0.5x
=> New TSA = $2[(6x \times x) + (x \times 0.5x) + (0.5x \times 6x)]$
=> New TSA = $2[6x^2 + 0.5x^2 + 3x^2] = 2[9.5x^2] = 19x^2$
=> Decrease in Area = $22x^2 - 19x^2 = 3x^2$
=> Percentage Decrease = $(3x^2 \div 22x^2) \times 100 = 300 \div 22$ %
=> Percentage Change ≈ 13.6363...% ≈ 13.64% decrease.
Therefore The correct answer is Decrease by 13.64%.
Additional Information
Lateral Surface Area (LSA)
The area of four walls of a room is given by 2h(l + b), where h is height, l is length, and b is breadth.
Volume of a Cuboid
The volume (capacity) of a room is calculated as V = l × b × h.
Longest Diagonal
The length of the longest rod that can be placed in a room is $\sqrt{(l^2 + b^2 + h^2)}$.

Q47. Answer: (b) Rs. 6,000

Shortcut Trick
Interest for 2 years (5 − 3 years) = 16,000 − 12,000 = Rs. 4,000
Simple Interest for 1 year = 4,000 ÷ 2 = Rs. 2,000
Interest for 3 years = 2,000 × 3 = Rs. 6,000
Principal = Amount after 3 years − Interest for 3 years = 12,000 − 6,000 = Rs. 6,000
Therefore The correct answer is Rs. 6,000.
Alternate Method
Given:
Amount after 3 years (A3) = Rs. 12,000
Amount after 5 years (A5) = Rs. 16,000
Formula Used:

Simple Interest (SI) = (P × R × T) ÷ 100

Amount (A) = Principal (P) + Simple Interest (SI)

=> Interest for 2 years = A5 − A3

=> Interest for 2 years = 16,000 − 12,000 = Rs. 4,000

=> Interest for 1 year = 4,000 ÷ 2 = Rs. 2,000

=> Simple Interest for 3 years = 3 × 2,000 = Rs. 6,000

=> Principal (P) = A3 − SI for 3 years

=> P = 12,000 − 6,000 = Rs. 6,000

Therefore The correct answer is Rs. 6,000.

Additional Information

Simple Interest Nature

In Simple Interest, the Principal remains constant throughout the loan period, and the interest earned every year is always the same.

Formula for Rate of Interest

Rate (R) = (SI × 100) ÷ (P × T). In this case, R = (2,000 × 100) ÷ (6,000 × 1) = 33.33%.

Difference between SI and CI

Unlike Simple Interest, Compound Interest (CI) is calculated on the principal plus the accumulated interest of previous periods.

Q48. Answer: (c) 8

Shortcut Trick

Speed = Distance ÷ Time

Speed = 640 ÷ 80 = 8 km/hr.

Therefore The correct answer is 8 km/hr.

Alternate Method

Given:

Distance = 640 km

Time = 80 hours

Formula Used:

Speed = Distance / Time

Calculations:

=> Speed = 640 / 80

=> Speed = 64 / 8

=> Speed = 8 km/hr

Therefore The correct answer is 8 km/hr.

Additional Information

Unit Conversion

To convert km/hr to m/s, multiply by 5/18. To convert m/s to km/hr, multiply by 18/5.

Average Speed

Average Speed = Total Distance ÷ Total Time. For two equal distances with speeds x and y, Average Speed = 2xy/(x + y).

Relative Speed

When two objects move in the same direction, relative speed is the difference (S1 − S2). In opposite directions, it is the sum (S1 + S2).

Q49. Answer: (b) 67.5

Shortcut Trick

Let the original number be 100%.

Since adding 90 to 20% of the number gives the number itself, 90 must equal the remaining 80%.

=> 80% of the number = 90

We need to find 60% of the number.

=> 60% of the number = 90 × (60 ÷ 80) = 90 × 3/4 = 67.5

Therefore The correct answer is 67.5.

Alternate Method

Given:

20% of a number + 90 = The number

Original Number (100%) 20% Added Value (80%) = 90 Target: 60% = ?

Calculations:

Let the required number be x.

=> 20% of x + 90 = x

=> 0.2x + 90 = x

=> x − 0.2x = 90

=> 0.8x = 90

=> x = 90 ÷ 0.8

=> x = 112.5

Now, we need to find 60% of this number:

=> 60% of x = 0.6 × 112.5

=> 60% of x = 67.5

Therefore The correct answer is 67.5.

Additional Information

Percentage Base Change

When a constant value is added to a specific percentage of a number to yield the complete number, the constant value is always equivalent to the remaining percentage (100% − given %).

Successive Percentage Change

If a number undergoes two successive changes of a% and b%, the effective percentage change is calculated using the formula: (a + b + ab/100)%.

Fraction to Percentage Conversion

Memorizing common fraction-to-percentage values such as 1/5 = 20%, 3/5 = 60%, and 4/5 = 80% is extremely helpful to speed up calculations in arithmetic problems.

Q50. Answer: (b) 13

Shortcut Trick

Identify the algebraic form: $(a^3 + b^3) \div (a^2 - ab + b^2)$.

The standard algebraic identity simplifies this expression to (a + b).

Here, a = 8.73 and b = 4.27.

Calculation: 8.73 + 4.27 = 13.00.

Therefore The correct answer is 13.

Alternate Method

Given:

Numerator = 8.73 × 8.73 × 8.73 + 4.27 × 4.27 × 4.27

Denominator = 8.73 × 8.73 − 4.27 × 8.73 + 4.27 × 4.27

Formula Used:

The sum of cubes formula is: $a^3 + b^3 = (a + b)(a^2 - ab + b^2)$

Calculations:

Let a = 8.73 and b = 4.27.

=> Expression = $(a^3 + b^3) / (a^2 - ab + b^2)$

=> Expression = $[(a + b)(a^2 - ab + b^2)] / (a^2 - ab + b^2)$

=> Expression = a + b

=> Result = 8.73 + 4.27

=> Result = 13

Therefore The correct answer is 13.

Additional Information

Sum of Cubes Identity

The expression $a^3 + b^3$ is always divisible by (a + b), resulting in the quotient $(a^2 - ab + b^2)$.

Difference of Cubes Identity

Similarly, $a^3 - b^3 = (a - b)(a^2 + ab + b^2)$. This is frequently used in simplification problems.

Decimal Addition

When adding decimals, ensure the decimal points are aligned. Here, 0.73 + 0.27 equals 1.00, making the final sum a whole number.

Q51. Answer: (d) Only conclusion (II) follows

Statements:

All bins are cans.

All plastics are cans.

The least possible Venn diagram for the given statement is:

Conclusions:

(I) Some bins are plastics. - Does not follow (There is no definite relation between bins and plastics, it can be possible but it is not definite.)

(II) Some cans are plastics. - Follow (Because, all plastics are cans, which means some cans are plastics.)

Thus, only conclusion (II) follows.

Hence, the correct answer is "Option 4".

Q52. Answer: (b) O

Given: M, N, O, P, W, X and Y are sitting around a circular table facing the centre of the table.

1. Only one person sits between P and O when counted from the right of P.
2. Only one person sits between O and X when counted from the right of O.
3. Only one person sits between P and W when counted from the right of W.
4. Only two people sit between N and X when counted from the left of X.
5. Only one person sits between M and W when counted from the left of W.

Y, the only person left will occupy the vacant position.

Thus, O sits third to the right of Y.

Hence, the correct answer is "Option 2".

Q53. Answer: (c) VVY

The position and positional values or English Alphabets are:

The pattern followed here is:

Each letter-cluster follows the pattern -1, +4.

Let’s check each option:

1. LKO

This letter-cluster follows the pattern -1, +4.

2. DCG

This letter-cluster follows the pattern -1, +4.

3. VVY

This letter-cluster does not follow the pattern -1, +4.

4. TSW

This letter-cluster follows the pattern -1, +4.

Thus, VVY is the odd one out.

Hence, the correct answer is "Option 3".

Q54. Answer: (b) Neither conclusion (I) nor (II) follows.

Statements:

Some Reds are Emeralds.

No Emeralds are Magentas.

All Magentas are Greens.

The least possible Venn diagram for the given statement is:

Conclusions:

(I) Some Magentas are Emeralds. - Does not follow (Because, no Emeralds are Magentas, so no Magentas and Emeralds.)

(II) Some Emeralds are Greens. - Does not follow (There is no definite relation between Emeralds and Greens, it can be possible but it is not definite.)

Thus, neither conclusion (I) nor (II) follows.

Hence, the correct answer is "Option 2".

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Q55. Answer: (a) Mother's brother

Family Chart:

Decoding the Symbols:

A is				
Symbol	•	@	•	#
Meaning	sister	brother	wife	father
to B				

Given: O @ P − T # G + V

It means: O is the brother of P, P is the wife of T, T is the father of G, G is the sister of V.

Thus, O is V's Mother's brother.

Hence, the correct answer is "Option 1".

Q56. Answer: (d) IGH−LJK

The position and positional values or English Alphabets are:

Given:

KIJ−NLM

YWX−BZA

Each letter-cluster pair follows the pattern +3, +3, +3.

Let's check each option:

1. IFF–KIJ

This letter-cluster pair does not follow the pattern +3, +3, +3.

2. IGH–KJJ

This letter-cluster pair does not follow the pattern +3, +3, +3.

3. IFF–LJK

This letter-cluster pair does not follow the pattern +3, +3, +3.

4. IGH–LJK

This letter-cluster pair follows the pattern +3, +3, +3.

Thus, IGH–LJK follows the same pattern as that followed by the two set of pairs given.

Hence, the correct answer is "Option 4".

Q57. Answer: (c) 2

Given: (Left) 8 7 * @ © 9 # % £ © * % © 2 * © 4 8 2 4 5 @ (Right)

Now,

Numbers, each of which is immediately preceded by a number and also immediately followed by a symbol.

So, the needed pattern is: Number — Number — Symbol

Thus, there are 2 such numbers, each of which is immediately preceded by a number and also immediately followed by a symbol.

Hence, the correct answer is "Option 3".

Q58. Answer: (c) XWFE

The position and positional values or English Alphabets are:

Given: BGJO is related to HIPQ in a certain way based on the English alphabetical order. In the same way, ZOHW is related to FQNY.

The logic followed here is:

Similarly,

Thus, RUZC is related to XWFE following the same logic.

Hence, the correct answer is "Option 3".

Q59. Answer: (c) 5

Given: (Left) 7 7 7 8 5 4 1 7 5 1 9 4 5 8 1 1 4 5 1 2 8 6 9 7 4 2 6 (Right)

Now,

Even numbers, each of which is immediately preceded by an odd number and also immediately followed by an odd number.

So, the needed pattern is: Odd — Even — Odd

Thus, there are 5 even numbers, each of which is immediately preceded by an odd number and also immediately followed by an odd number.

Hence, the correct answer is "Option 3".

Q60. Answer: (a) (6, 13, 2)

The logic followed here is:

Logic: (a, b, c) → (a × c) + 1 = b

(5 × 6) + 1 = 30 + 1 = 31

(3 × 5) + 1 = 15 + 1 = 16

Let's check each option:

1. (6, 13, 2) → (6 × 2) + 1 = 12 + 1 = 13

2. (4, 7, 2) → (4 × 2) + 1 = 8 + 1 = 9 ≠ 7

3. (1, 6, 4) → (1 × 4) + 1 = 4 + 1 = 5 ≠ 6

4. (3, 2, 7) → (3 × 7) + 1 = 21 + 1 = 22 ≠ 2

Thus, (6, 13, 2) is the set in which the numbers are related in the same way as the given sets.

Hence, the correct answer is "Option 1".

Q61. Answer: (c) 55

Given: Seema ranked 14th from the bottom and 42th from the top in her class.

Total number of students = (Position from Top + Position from Bottom) - 1

Seema's position from the top = 42

Seema's position from the bottom = 14

Sum of positions = 42 + 14 = 56

Total students = Sum of positions - 1

Total students = 56 - 1 = 55

Thus, there are 55 students in her class.

Hence, the correct answer is "Option 3".

Q62. Answer: (a) Three

Given: (Left) 7 9 1 8 4 2 5 6 3 8 7 1 9 (Right)

Now,

Odd numbers which are immediately followed by even numbers.

So, the needed pattern is: Odd — Even

Thus, there are three odd numbers, which are immediately followed by even numbers.

Hence, the correct answer is "Option 1".

Q63. Answer: (b) cs

Given: In a certain code language, ‘van oak canoe’ is coded as ‘cs vd zb’ and ‘canoe jet wheat’ is coded as ‘vc cs uw’.

Thus, ‘canoe’ is coded as 'cs' in that language.

Hence, the correct answer is "Option 2".

Q64. Answer: (d) 818

BODMAS Rule:

Decoding the given information:

Symbol	•	•	×	÷
Meaning	•	×	÷	•

Given equation: 253 − 2 ÷ 413 + 1313 × 13 = ?

Now replacing the sign from left to right using BODMAS Rule, we get:

=> 253 × 2 + 413 − 1313 ÷ 13 = ?

=> 253 × 2 + 413 − 101 = ?

=> 506 + 413 − 101 = ?

=> 919 − 101 = ?

=> 818 = ?

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Hence, the correct answer is "Option 4".

Q65. Answer: (d) 0

Given: In a certain code language, ‘BITE’ is coded as ‘3712’ and 'TIDE' is coded as '1207'.

Thus, 0 is the code for ‘D’ in that language.

Hence, the correct answer is "Option 4".

Q66. Answer: (b) 3

Given: Five people, A, B, C, D and E are sitting in a row, facing north.

1. D sits at the extreme left end of the line.
2. E sits third to the right of A.
3. B sits to the immediate right of A.

C, the only person left will occupy the vacant position.

Thus, 3 people sits between D and E.

Hence, the correct answer is "Option 2".

Q67. Answer: (a) Two

Given: Each of the digits in the number 3472618 is arranged in ascending order from left to right.

Original Number:	**3**	**4**	**7**	**2**	**6**	**1**	**8**
Ascending Order:	1	2	3	4	6	7	8

Thus, the position of two digits will remain unchanged as compared to that in the original number.

Hence, the correct answer is "Option 1".

Q68. Answer: (d) 191

Shortcut Trick

Identify the difference between consecutive terms:

$105 - 101 = 4 = 2^2$

$114 - 105 = 9 = 3^2$

$130 - 114 = 16 = 4^2$

$155 - 130 = 25 = 5^2$

Next difference = $6^2 = 36$ => 155 + 36 = 191

Therefore The correct answer is 191.

Alternate Method

Given series: 101, 105, 114, 130, 155, ?

101

$+2^2$

→

105

$+3^2$

→

114

$+4^2$

→

130

$+5^2$

→

155

$+6^2$

→

191

The logic followed is that the squares of consecutive natural numbers starting from 2 are added to the previous term.

=> 101 + 2^2 = 101 + 4 = 105

=> 105 + 3^2 = 105 + 9 = 114

=> 114 + 4^2 = 114 + 16 = 130

=> 130 + 5^2 = 130 + 25 = 155

=> 155 + 6^2 = 155 + 36 = 191

Therefore The correct answer is 191.

Additional Information

Square Series

A series where terms are squares of natural numbers: 1, 4, 9, 16, 25, 36... (n^2).

Cube Series

A series where terms are cubes of natural numbers: 1, 8, 27, 64, 125... (n^3).

Double Difference Series

A series where the difference of differences is constant or follows a specific arithmetic pattern.

Q69. Answer: (b) Four

Given: Seven boxes, A, B, C, D, I, J, and K, are kept one over the other but not necessarily in the same order.

1. Only two boxes are kept below I.
2. Only one box is kept above J.
3. Only one box is kept between J and K.
4. B is kept immediately above C.
5. D is kept at some place below A.

A
J
D
K
I
B
C

Thus, four boxes are kept between A and B.

Hence, the correct answer is "Option 2".

Q70. Answer: (d) One

Given: (Left) 3 @ © 6 5 € € 3 3 8 € % 2 7 6 # 7 * £ € 9 $ (Right)

Now,

Symbols, each of which is immediately preceded by a number and also immediately followed by a number.

So, the needed pattern is: Number — Symbol — Number

Thus, there is one such symbol, which is immediately preceded by a number and also immediately followed by a number.

Hence, the correct answer is "Option 4".

Q71. Answer: (c) GKB

The position and positional values or English Alphabets are:

Given: OSJ MQH KOF IMD ?

The logic followed here is:

Thus, GKB should come in place of the question mark (?) in the given series based on the English alphabetical order.

Hence, the correct answer is "Option 3".

Q72. Answer: (b) 30, 11

Given: 10, 2, 15, 3, 20, 5, 25, 7, ?, ?

The logic followed here is:

Series 1: Terms at odd positions: +5 each time

Series 2 is: Consecutive Prime Numbers starting from 2.

The prime numbers are: 2, 3, 5, 7, ...

The next prime number after 7 is 11.

Thus, 30, 11 will replace the question marks (?) in the given series.

Hence, the correct answer is "Option 2".

Q73. Answer: (b) BX – IQ

The position and positional values or English Alphabets are:

The pattern followed here is:

Each letter-cluster pair follows the pattern +8, -7.

Let's check each option:

1. HD – PW

This letter-cluster pair follows the pattern +8, -7.

2. BX – IQ

This letter-cluster pair does not follow the pattern +8, -7.

3. QM – YF

This letter-cluster pair follows the pattern +8, -7.

4. CY – KR

This letter-cluster pair follows the pattern +8, -7.

Thus, BX – IQ is the odd one out.

Hence, the correct answer is "Option 2".

Q74. Answer: (d) HFIM

The position and positional values or English Alphabets are:

Given: XVYC is related to DBEI in a certain way based on the English alphabetical order. In the same way, PNQU is related to VTWA.

The logic followed here is:

Similarly,

Thus, BZCG is related to HFIM, following the same logic

Hence, the correct answer is "Option 4".

Q75. Answer: (d) Two

Given: A, B, C, D, E, F and G are sitting around a circular table facing the centre.

1. B sits third to the left of D.

2. D is the immediate neighbour of both C and A.

3. A sits second to the left of G.

The above statement cannot be satisfied in case I, so it is eliminated.

4. E is not an immediate neighbour of B.

F, the only person left will occupy the vacant position.

Thus, two people sit between E and F when counted from the right of E.

Hence, the correct answer is "Option 4".

Q76. Answer: (d) 14 km towards the west

Given: Suraj starts from Point A and travels 8 km to the north. He then takes a right turn and travels 9 km, takes another right turn and travels 10 km, then takes a left turn and travels 5 km. Finally, he takes a left turn and travels 2 km to reach Point B.

Thus, he must travel 14 km towards the west to return to Point A.

Hence, the correct answer is "Option 4".

Q77. Answer: (b) 983

BODMAS Rule:

Given equation: 139 ÷ 7 + 341 × 11 - 41 = ?

If '+' and '–' are interchanged and '×' and '÷' are interchanged, then the equation becomes:

=> 139 × 7 − 341 ÷ 11 + 41 = ?

=> 139 × 7 − 31 + 41 = ?

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=> 973 − 31 + 41 = ?

=> 1014 − 31 = ?

=> 983 = ?

Hence, the correct answer is "Option 2".

Q78. Answer: (d) KNH60

The position and positional values or English Alphabets are:

Given: GJD24 HKE33 ILF42 JMG51 ?

The logic followed here is:

Thus, KNH60 will replace the question mark (?) in the given series to make it logically complete.

Hence, the correct answer is "Option 4".

Q79. Answer: (b) 72

Given: 18 27 39 54 ?

The logic followed here is:

Thus, 72 should come in place of the question mark (?) in the given series.

Hence, the correct answer is "Option 2".

Q80. Answer: (b) Southeast

Given: Town W is to the south of Town X. Town Y is to the east of Town W. Town Z is to the north of Town Y. Town A is to the west of Town Z. Town X is to the north-east of Town A.

Thus, Town W is to the Southeast of Town A.

Hence, the correct answer is "Option 2".

Q81. Answer: (b) Pranav Venkatesh

The correct answer is Pranav Venkatesh.

Key Points

• Pranav Venkatesh, a prominent Indian Grandmaster, emerged as the winner of the 2025 World Junior Chess Championship.

• He secured this prestigious title by competing against the world's best Under-20 players, demonstrating exceptional strategic depth and tactical precision throughout the tournament.

• The World Junior Chess Championship is an annual event organized by FIDE (International Chess Federation), and winning it is considered one of the highest honors in junior chess.

• With this victory in 2025, Pranav Venkatesh joined an elite group of Indian chess players who have successfully clinched this global title in the past.

• The victory highlights India's continued dominance in the international chess arena and the effectiveness of its youth development programs in the sport.

Additional Information

• Previous Indian Winners:

• Viswanathan Anand: He was the first Indian to win the World Junior Chess Championship in 1987. This victory was a turning point for Indian chess, leading to his career as a five-time World Champion.

• Pentala Harikrishna: He won the title in 2004. He has been one of India's top-rated Grandmasters for nearly two decades and has represented the country in numerous Chess Olympiads.

• Abhijeet Gupta: He claimed the championship in 2008 held in Gaziantep, Turkey. He is known for his aggressive playing style and multiple Commonwealth Chess Championship titles.

• Tournament Significance:

• The championship serves as a vital platform for young players to earn Grandmaster (GM) norms and significantly boost their FIDE ELO ratings.

• Historically, many winners of the World Junior title, such as Garry Kasparov and Anatoly Karpov, have gone on to become the World Chess Champion in the senior category.

Important Points

• Eligibility and Format: Players must be under the age of 20 as of January 1st of the year the tournament is held. The event typically follows a Swiss-system format, usually consisting of 11 or 13 rounds.

• FIDE Governance: The World Junior Chess Championship was first established in 1951. FIDE oversees the regulations, fair play standards, and the awarding of international titles during the event.

• Indian Chess Growth: In recent years, India has produced a record number of Grandmasters, with players like Pranav

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Venkatesh, Gukesh D, and Praggnanandhaa R leading the charge at the global level.

Q82. Answer: (c) London, UK

The correct answer is London, UK.

Key Points

• The city of London, United Kingdom, has been officially chosen to host a major five-day Sumo wrestling tournament in October 2025.

• This landmark event, titled "Grand Sumo London," is scheduled to take place at the O2 Arena, one of the world's most popular music and entertainment venues.

• The tournament marks the first time in over 30 years that the Japan Sumo Association has brought a full-scale professional sumo event to London; the last occurrence was in 1991 at the Royal Albert Hall.

• The five-day event in 2025 will feature approximately 70 professional rikishi (wrestlers) traveling from Japan to compete.

• The roster of participants is expected to include the sport's highest-ranking athletes, including the Yokozuna (grand champion) and Ozeki (champion), providing a rare opportunity for international fans to witness the elite level of the sport. Hence, the correct answer is London, UK.

Additional Information

• Structure of Sumo Ranking:

• The Banzuke is the official hierarchy of sumo wrestlers. The top division is known as Makuuchi, which contains a fixed number of 42 wrestlers.

• The Yokozuna is the pinnacle of the sport; unlike other ranks, a Yokozuna cannot be demoted for a poor performance but is expected to retire if they can no longer compete at the highest level.

• Other high ranks include Ozeki, Sekiwake, and Komusubi, collectively referred to as the Sanyaku.

• The Playing Area (Dohyo):

• Sumo matches take place in a Dohyo, a circular ring made of specialized clay and covered with a thin layer of sand.

• The ring is exactly 4.55 meters in diameter and is defined by tawara (rice-straw bales) buried in the clay.

• A wrestler loses the match if any part of his body other than the soles of his feet touches the ground, or if he is pushed outside the circle of the tawara.

• Tournament Types:

• Official tournaments, called Honbasho, occur six times a year in Japan (three in Tokyo, and one each in Osaka, Nagoya, and Fukuoka).

• The London 2025 event is classified as a Jungyo (exhibition tour), which aims to promote the sport and engage with fans outside the standard competitive season.

Important Points

• Historical Context: The 1991 tournament in London was a pivotal moment for the sport's global visibility, marking the first time a sumo tournament was held outside Japan in its 1,500-year history.

• Cultural Significance: Sumo is deeply rooted in Shinto traditions. Rituals such as Shiko (leg stomping to drive away evil spirits) and the throwing of salt (to purify the ring) are integral parts of the pre-match ceremony.

• Match Duration: While the rituals and preparation can take several minutes, the actual bout typically lasts only 10 to 60 seconds, emphasizing explosive power and technique.

• Governing Body: All professional sumo is overseen by the Japan Sumo Association (Nihon Sumo Kyokai), based in Ryogoku, Tokyo.

Q83. Answer: (b) IIT Delhi

The correct answer is IIT Delhi.

Key Points

• In 2025, the National Green Tribunal (NGT) issued a significant directive to the Indian Institute of Technology (IIT) Delhi to conduct an expert assessment of Ultraviolet (UV) radiation technology used in Sewage Treatment Plants (STPs).

• The primary objective of this assessment is to evaluate the germicidal efficacy of UV systems in neutralizing harmful pathogens, such as fecal coliform, which often persist in treated sewage water before it is discharged into rivers like the Yamuna and Ganga. Hence, the correct option is IIT Delhi.

• The NGT, led by its Chairperson, emphasized the need for a scientific audit because many STPs across India were failing to meet the permissible limits of bacterial contamination despite using UV disinfection.

• The study by IIT Delhi is expected to provide a comparative analysis between UV treatment and other disinfection methods like chlorination or ozonation to determine the most environmentally sustainable and cost-effective solution for wastewater management.

• This directive is part of a broader judicial push to refine environmental standards and ensure that technical specifications of

urban infrastructure align with the Right to a Clean Environment under Article 21 of the Constitution of India.

Additional Information

• National Green Tribunal (NGT):

• Established on 18th October 2010 under the National Green Tribunal Act, 2010, it is a specialized body for the effective and expeditious disposal of cases relating to environmental protection and conservation of forests.

• The Principal Bench of the NGT is located in New Delhi, with regional benches in Bhopal, Pune, Kolkata, and Chennai.

• It is not bound by the procedure laid down under the Code of Civil Procedure, 1908, but is guided by principles of natural justice.

• UV Sewage Treatment Technology:

• UV-C radiation (specifically wavelengths between 200 and 280 nanometers) is used to disrupt the DNA and RNA of microorganisms, preventing them from reproducing.

• It is considered a chemical-free alternative to chlorine, ensuring that no harmful disinfection by-products (DBPs) are introduced into the water ecosystem.

• However, the efficiency of UV systems is highly dependent on water turbidity; suspended solids can shield bacteria from the light, necessitating the expert review ordered in 2025.

• IIT Delhi's Role in Policy:

• As one of the Institutes of Eminence, IIT Delhi frequently collaborates with the Ministry of Jal Shakti and the Central Pollution Control Board (CPCB) on projects like the National Mission for Clean Ganga (NMCG).

• The institution’s Department of Civil Engineering houses specialized labs for Environmental Engineering, making it the preferred technical advisor for NGT mandates regarding sanitation and pollution control.

Important Points

• Water Quality Standards: According to CPCB guidelines, the Fecal Coliform level in treated sewage should ideally be less than 100 MPN/100ml for safe discharge into water bodies.

• River Rejuvenation: The NGT’s 2025 order is a critical step in the Yamuna Rejuvenation Plan, aiming to stop the "frothing" caused by untreated surfactants and high bacterial loads in Delhi and Agra.

• Technological Challenges: While IIT Kanpur and IIT Bombay also conduct water research, the NGT chose IIT Delhi due to its proximity to the Yamuna River STPs and its ongoing technical monitoring of Delhi’s drainage systems.

Q84. Answer: (a) New Delhi, India

The correct answer is New Delhi, India.

Key Points

• The first-ever Kho Kho World Cup was hosted by India from January 13 to January 19, 2025.

• The primary venue for this historic sporting event was the Indira Gandhi Arena located in New Delhi.

• The tournament featured competition in both men's and women's categories, marking a global milestone for this indigenous Indian sport.

• Organized by the Kho Kho Federation of India (KKFI) in collaboration with the International Kho Kho Federation, the event saw participation from 24 nations across six continents.

• The event was designed to showcase Kho Kho as a world-class sport, moving from traditional mud surfaces to synthetic mats to align with international athletic standards.

Additional Information

• History of Kho Kho:

• Kho Kho is one of the oldest traditional tag games in India, with its origins often traced back to ancient times and mentions in the Mahabharata.

• The first formal rules for the sport were framed in the 1910s by the Deccan Gymkhana in Pune.

• Olympic Aspirations:

• The 2025 World Cup serves as a significant step in the roadmap to include Kho Kho in the 2032 Olympic Games.

• The Indian government and the KKFI have been actively promoting the sport globally to meet the International Olympic Committee (IOC) criteria.

• Global Participation:

• Nations from Asia, Africa, Europe, and South America participated, highlighting the sport's expansion beyond the Indian subcontinent.

• The tournament format included 16 teams in each division, emphasizing high-speed agility, strategy, and teamwork.

• Economic and Cultural Impact:

• The world cup aimed to boost the sports economy in India and provide a platform for rural athletes to achieve international recognition.

• The league-cum-knockout format was used to ensure maximum engagement and television viewership for the first edition.

Important Points

• The Kho Kho Federation of India (KKFI) president, Sudhanshu Mittal, played a key role in advocating for the world cup to be held in New Delhi.

• The Indira Gandhi Arena, where the matches were held, is the largest indoor sports arena in India and the third-largest in Asia, built originally for the 1982 Asian Games.

• To support the event, the Ministry of Youth Affairs and Sports provided extensive logistical and financial backing to ensure the 2025 tournament set a benchmark for future editions.

Q85. Answer: (d) Rajiv Memani

The correct answer is Rajiv Memani.

Key Points

• Rajiv Memani, the Chairman and CEO of EY India, has been elected as the President-Designate of the Confederation of Indian Industry (CII) for the year 2024-25.

• According to the organizational hierarchy and succession planning of the CII, the President-Designate typically assumes the office of the President in the subsequent year, making him the President for 2025–26.

• Memani is a prominent leader in the professional services sector and serves as a member of the EY Global Management Body.

• He also chairs the EY Global Emerging Markets Committee, bringing extensive experience in taxation, technology, and corporate governance to the industry body.

• The announcement of his election was made during the CII National Council meeting held in New Delhi in May 2024. Hence, the correct answer is Rajiv Memani.

Additional Information

• Confederation of Indian Industry (CII):

• Founded in 1895, CII is a non-governmental, not-for-profit, and industry-led organization headquartered in New Delhi.

• It plays a proactive role in India's development process by partnering with the Government on policy issues and enhancing efficiency in the Indian industry.

• The organization has over 9,000 members from the private and public sectors, including SMEs and multinationals.

• Sanjiv Puri:

• He was elected as the President of CII for the 2024-25 term.

• He currently serves as the Chairman and Managing Director of ITC Limited, one of India's leading multi-business conglomerates.

• R Mukundan:

• He has been elected as the Vice President of CII for 2024-25.

• He is the Managing Director and CEO of Tata Chemicals Limited and an alumnus of IIT Roorkee and Harvard Business School.

• Role of Industry Bodies:

• Organizations like CII, FICCI, and ASSOCHAM act as the voice of Indian business and industry, facilitating international networking and economic reforms.

Important Points

• The CII leadership transition occurs annually, usually during the Annual Business Summit.

• For the year 2024-25, Sanjiv Puri took over the presidency from R Dinesh (Executive Vice Chairman of TVS Supply Chain Solutions).

• The President-Designate (currently Rajiv Memani) and the Vice President (currently R Mukundan) are part of the core leadership team that guides the organization's strategic vision.

• Rajiv Memani has been with EY for over two decades and has been instrumental in the firm's growth in the Indian market.

Q86. Answer: (d) Major Dhyan Chand Khel Ratna Award

The correct answer is Major Dhyan Chand Khel Ratna Award.

Key Points

• Indian men's hockey team captain Harmanpreet Singh was honored with the Major Dhyan Chand Khel Ratna Award, India's highest sporting honor, by President Droupadi Murmu.

• The award ceremony took place in January 2025 during a specially organized function at the Rashtrapati Bhavan in New Delhi.

• Harmanpreet Singh was recognized for his extraordinary leadership and stellar performance at the Paris 2024 Olympics, where he led the Indian team to a second consecutive bronze medal.

• During the Paris 2024 Olympics, he emerged as the top scorer of the tournament, netting 10 goals, showcasing his mastery as one of the world's best drag-flickers.

• This recognition places him among the elite group of Indian hockey players, such as Dhanraj Pillay, Sardar Singh, and Manpreet Singh, who have received this prestigious accolade in the past.

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Additional Information

• Major Dhyan Chand Khel Ratna Award:

• It is the highest sporting honor of the Republic of India, awarded annually by the Ministry of Youth Affairs and Sports.

• The award was formerly known as the Rajiv Gandhi Khel Ratna Award but was renamed in August 2021 in honor of the legendary hockey wizard Major Dhyan Chand.

• The award includes a medallion, a certificate, and a cash prize of Rs. 25 lakh.

• Arjuna Award:

• Established in 1961, it is awarded for outstanding performance in sports and games over a period of the previous four years.

• It carries a cash prize of Rs. 15 lakh and a bronze statue of Arjuna.

• Dronacharya Award:

• Introduced in 1985, this award is presented to coaches who have enabled sportspersons to achieve excellence in international events.

• The Regular Category carries a prize of Rs. 10 lakh, while the Lifetime Category carries Rs. 15 lakh.

• National Sports Awards:

• These awards are typically conferred by the President of India at the Rashtrapati Bhavan to recognize and reward excellence in sports.

• The selection committee is usually headed by a retired Supreme Court or High Court Judge and includes eminent sportspersons and sports administrators.

Important Points

• Harmanpreet Singh, often affectionately called "Sarpanch Sahib" by fans, has been a pillar of the Indian defense and the primary source of goals through penalty corners.

• He played a vital role in ending India's 41-year Olympic medal drought in hockey at the Tokyo 2020 Olympics and followed it up with another medal in Paris 2024.

• The Paris 2024 campaign was significant as it marked the first time since 1972 that India won back-to-back Olympic medals in men's hockey.

• The Khel Ratna is awarded for "most outstanding performance by a sportsperson" over the period of four years preceding the year of the award.

Q87. Answer: (c) National Defence Academy (NDA)

The correct answer is National Defence Academy (NDA).

Key Points

• The Bakshi Cup 2025 was the 10th edition of the Inter-Academy Sports Meet, a prestigious event that brings together the premier officer training institutions of India.

• The Indian Military Academy (IMA), located in Dehradun, hosted the 2025 edition of the tournament from 6th February to 11th February 2025.

• The Indian Military Academy (IMA) emerged as the overall winner of the Bakshi Cup 2025, reclaiming the trophy on its home turf.

• The National Defence Academy (NDA), situated in Khadakwasla, Pune, secured the position of the runner-up in the competition after a neck-and-neck struggle for points in the final tally. Hence, the correct option is National Defence Academy (NDA).

• The tournament featured participation from five major academies: IMA Dehradun, NDA Khadakwasla, Indian Naval Academy (INA) Ezhimala, Air Force Academy (AFA) Dundigal, and Officers' Training Academy (OTA) Chennai.

Additional Information

• Bakshi Cup Overview:

• The Bakshi Cup was instituted in the memory of Lieutenant General P.S. Bakshi, a former Commandant of the IMA, to promote sportsmanship and healthy competition among trainee officers.

• It serves as a platform for Gentleman Cadets (GCs) and Flight Cadets to exhibit their physical prowess, teamwork, and leadership qualities.

• The competition traditionally includes disciplines such as Cross Country, Boxing, Football, Basketball, Hockey, and Volleyball.

• Participating Academies Details:

• Indian Military Academy (IMA): Founded in 1932 in Dehradun, Uttarakhand, it is the oldest army training academy in India. Its motto is "Veerta Aur Vivek" (Valour and Wisdom).

• National Defence Academy (NDA): Established in 1954 at Khadakwasla, Maharashtra, it is the first tri-service academy in the world, training cadets for the Army, Navy, and Air Force together. Its motto is "Seva Parmo Dharma" (Service Before Self).

• Air Force Academy (AFA): Located in Dundigal, Hyderabad, it was established in 1969 and began operations in 1971. It provides training to all personnel of the Indian Air Force.

• Officers' Training Academy (OTA) Chennai: Established in 1963, it focuses on training officers for the Short Service Commission

(SSC) in the Indian Army.

Important Points

• In the 2025 edition, the Cross Country race, often considered the most grueling and decisive event of the meet, saw intense competition between IMA and NDA cadets.

• The Bakshi Cup is held biennially or annually depending on the training schedule and rotates its hosting rights among the participating academies.

• The 10th edition in 2025 emphasized the integration of modern sports technology and rigorous physical standards required for future military leaders.

• Winning the Bakshi Cup is considered a matter of immense pride for the academies, reflecting the quality of physical training and the competitive spirit of the cadets.

Q88. Answer: (b) Punjab

The correct answer is Punjab.

Key Points

• The Government of Punjab officially launched the Udyog Kranti campaign in June 2025 as a landmark initiative to overhaul the state's industrial ecosystem.

• The campaign aims to position Punjab as a global investment destination by implementing transformative industrial reforms that prioritize efficiency and transparency.

• A primary focus of Udyog Kranti is the enhancement of the Ease of Doing Business (EoDB) framework, significantly reducing the regulatory compliance burden for both new and existing industries.

• It introduces an upgraded Single Window Clearance System, which mandates the time-bound delivery of all necessary permits, licenses, and No Objection Certificates (NOCs) through a digital interface.

• The initiative specifically targets the growth of Micro, Small, and Medium Enterprises (MSMEs), providing them with enhanced access to credit, technology, and global markets.

Additional Information

• Punjab's Industrial Hubs:

• The state is home to major industrial clusters, with Ludhiana serving as the hub for textiles and bicycles, while Jalandhar is world-renowned for sports goods and hand tools.

• Mandi Gobindgarh, known as the "Steel Town of India," remains a critical center for secondary steel production and furnace units.

• Invest Punjab (PBIP):

• The Punjab Bureau of Investment Promotion (PBIP), commonly known as Invest Punjab, acts as a unified agency that offers a one-stop-shop solution for investors.

• Under the Udyog Kranti reforms, this agency has been empowered to grant deemed approvals if departments fail to respond within the statutory timeline.

• Policy Incentives:

• To encourage large-scale manufacturing, Punjab offers competitive power tariffs, stamp duty exemptions, and GST term loans for mega projects.

• The June 2025 campaign further integrates green energy incentives to promote sustainable manufacturing practices across the state.

Important Points

• Infrastructure Development:

• The Udyog Kranti campaign involves the establishment of new Industrial Parks and Special Economic Zones (SEZs) equipped with 24/7 power supply and high-speed fiber connectivity.

• Development of Multi-Modal Logistics Parks (MMLP) is prioritized to leverage the state's proximity to Integrated Check Posts (ICP) for enhancing cross-border trade.

• Employment and Skill Mapping:

• The initiative aims to create approximately five lakh new jobs by 2030 by aligning vocational training with the specific needs of modern industries through the Punjab Skill Development Mission (PSDM).

• A dedicated Startup Punjab cell has been strengthened under this campaign to foster innovation and support early-stage entrepreneurs in the IT and Agri-tech sectors.

Q89. Answer: (b) To plan and manage infrastructure

The correct answer is To plan and manage infrastructure.

Key Points

• The Digital Twin with AI-Driven Insights initiative is a sophisticated technological framework designed to create high-fidelity

virtual replicas of physical assets, systems, or processes to plan and manage infrastructure effectively.

• At the India Mobile Congress 2025, this initiative highlights the integration of Artificial Intelligence (AI) and Internet of Things (IoT) to provide real-time monitoring and predictive analytics for large-scale projects.

• It allows urban planners and engineers to simulate various environmental and operational conditions, helping to optimize the layout of telecom towers, power grids, and transportation networks before physical construction begins. Hence, the objective is to plan and manage infrastructure.

• By leveraging AI-driven insights, the system can identify potential bottlenecks or structural weaknesses in utility networks, thereby enhancing the resilience and sustainability of national infrastructure.

• This initiative is central to the development of Smart Cities in India, providing a data-centric approach to managing resources and reducing operational costs through automated decision-making processes.

Additional Information

• Digital Twin Technology:

• A Digital Twin is a dynamic virtual model that stays linked to its physical counterpart through sensors and real-time data feeds.

• It is widely used in Industry 4.0, aerospace, and automotive sectors for performance testing and troubleshooting without risking physical hardware.

• In the context of telecommunications, it helps in mapping signal coverage and managing the deployment of 5G and 6G small cells in dense urban areas.

• India Mobile Congress (IMC):

• IMC is the largest digital technology forum in Asia, jointly organized by the Department of Telecommunications (DoT) and the Cellular Operators Association of India (COAI).

• The event serves as a platform for showcasing innovations in 6G, Artificial Intelligence, Cloud Computing, and Cybersecurity.

• The 2025 edition focuses on the theme of "Global Digital Innovation," emphasizing India's role as a global leader in digital transformation.

• Role of AI in Infrastructure:

• AI algorithms process massive datasets generated by infrastructure sensors to perform predictive maintenance, identifying faults before they lead to service outages.

• This technology is vital for disaster management, as it can simulate the impact of floods or earthquakes on the physical infrastructure of a city.

Important Points

• Strategic Applications:

• Network Optimization: Telecom operators use digital twins to minimize latency and maximize bandwidth efficiency across broadband networks.

• Cost Reduction: By identifying inefficiencies in the planning stage, the government and private entities can save billions in capital expenditure (CAPEX) and operational expenditure (OPEX).

• Data Sovereignty: As these twins handle sensitive geographical and structural data, the initiative also emphasizes data security and compliance with India's Digital Personal Data Protection Act (2023).

Q90. Answer: (d) Fino Payments Bank Limited

The correct answer is Fino Payments Bank Limited.

Key Points

• The Reserve Bank of India (RBI), by an order dated June 6, 2025, has imposed a monetary penalty of Rs. 29.60 lakh (Rupees Twenty Nine Lakh Sixty Thousand only) on Fino Payments Bank Limited.

• The penalty has been imposed in the exercise of powers vested in RBI under the provisions of Section 47A(1)(c) read with Section 46(4)(i) of the Banking Regulation Act, 1949.

• The action was taken due to the bank's non-compliance with certain directions issued by RBI on ‘Licensing of Payments Banks’.

• This regulatory action is based on deficiencies in statutory and regulatory compliance and is not intended to pronounce upon the validity of any transaction or agreement entered into by the bank with its customers.

• The RBI had conducted a statutory inspection for Supervisory Evaluation of the bank, which revealed violations related to the specific operating guidelines prescribed for Payments Banks in India.

Additional Information

• Fino Payments Bank Limited:

• It was incorporated on April 4, 2017, after receiving the final license from the Reserve Bank of India.

• The bank is headquartered in Navi Mumbai, Maharashtra.

• Fino Payments Bank emerged from Fino Paytech Limited, which was a pioneer in the Business Correspondent (BC) model for Financial Inclusion.

• The bank focuses on providing digital banking and payment services to the unbanked and under-banked population across India.

• Payments Banks in India:

• These are a specialized category of banks conceptualized by the RBI to further Financial Inclusion.

• They can accept demand deposits (currently up to Rs. 2 lakh per individual customer) but are prohibited from lending or issuing credit cards.

• They mainly provide services such as ATM/Debit cards, mobile banking, online fund transfers, and third-party insurance products.

• Important examples include Airtel Payments Bank, India Post Payments Bank, and Paytm Payments Bank.

• Regulatory Framework:

• The Banking Regulation Act, 1949, provides the legal framework for the regulation and supervision of the banking sector in India.

• The Reserve Bank of India (RBI), established on April 1, 1935, under the RBI Act, 1934, serves as the primary regulator for all scheduled commercial banks, including Payments Banks.

• Penalties are typically issued after a Show Cause Notice (SCN) is sent to the institution, and their oral or written submissions are considered by the Central Bank.

Important Points

• The Rs. 29.60 lakh penalty highlights the RBI's stringent oversight regarding the Licensing of Payments Banks guidelines to ensure the stability of the financial system.

• Compliance with RBI directives is mandatory for all financial entities to prevent operational risks and maintain customer trust.

• Institutional transparency and adherence to corporate governance standards are key metrics monitored during the RBI's annual Supervisory Evaluation.

Q91. Answer: (a) 137th

The correct answer is 137th.

Key Points

• The 137th edition of the Offshore Security Coordination Committee (OSCC) was convened in New Delhi in June 2025 to deliberate on the evolving security landscape of India's maritime assets.

• The meeting was presided over by the Director General of the Indian Coast Guard (ICG), who serves as the Chairman of the committee, ensuring a unified approach toward safeguarding offshore wealth.

• A primary objective of this session was to evaluate the security of offshore infrastructure, particularly the oil and gas installations located in the Exclusive Economic Zone (EEZ) of India. Hence, the statement regarding the focus on infrastructure is correct.

• The committee emphasized the development of better multi-agency coordination, involving stakeholders such as the Indian Navy, Indian Coast Guard, ONGC, and various state police departments to streamline response mechanisms during emergencies.

• During the 137th meeting, specific focus was placed on cybersecurity measures and the threat posed by unmanned aerial vehicles (drones) to offshore platforms, reflecting the modern technological challenges in maritime defense.

Additional Information

• Offshore Security Coordination Committee (OSCC):

• The OSCC was established in 1978 following the discovery of oil in the Bombay High field to provide a forum for the coordination of various agencies involved in offshore security.

• It acts as the highest body for policy formulation and review of Standard Operating Procedures (SOPs) related to the protection of vital economic assets at sea.

• Meetings are held periodically to address maritime threats, ranging from piracy and terrorism to environmental disasters such as oil spills.

• Role of the Indian Coast Guard (ICG):

• The ICG was formally established on 18th August 1978 by the Coast Guard Act, 1978 of the Parliament of India.

• It functions under the Ministry of Defence and is responsible for maritime law enforcement and search and rescue operations in Indian waters.

• The Director General of the ICG is tasked with ensuring the safety of artificial islands and offshore terminals through the OSCC framework.

• Offshore Infrastructure Security:

• India possesses a vast network of offshore oil and gas platforms, which are critical for national energy security and contribute significantly to the GDP.

• Security measures include Vessel Traffic Management Systems (VTMS), Automatic Identification Systems (AIS), and radar surveillance to monitor movements around prohibited areas.

• Collaborative agencies include the Directorate General of Hydrocarbons (DGH) and the Ministry of Petroleum and Natural Gas, which provide technical expertise for infrastructure safety.

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Important Points

• Contingency Planning: The 137th OSCC reviewed the National Oil Spill Disaster Contingency Plan (NOS-DCP) to ensure readiness in mitigating ecological damage near offshore assets.

• Legal Framework: Security operations are governed by the United Nations Convention on the Law of the Sea (UNCLOS), which grants coastal states the right to establish safety zones around offshore installations.

• Stakeholder Integration: The participation of private entities like Reliance Industries and Cairn Energy alongside Public Sector Undertakings (PSUs) is vital for a comprehensive security blanket across the Eastern and Western seaboards.

• Future Goals: The committee aims to integrate Artificial Intelligence (AI) for predictive threat analysis and improve inter-operability between the Air Force and Navy for rapid aerial response to offshore contingencies.

Q92. Answer: (a) It reduces dependence on imported robotic surgical systems by enabling indigenous precision surgeries.

The correct answer is It reduces dependence on imported robotic surgical systems by enabling indigenous precision surgeries.

Key Points

• The Mizzo Endo 4000, launched in 2025, is a groundbreaking indigenous robotic surgical system developed to enhance the precision and accessibility of minimally invasive surgeries.

• Unlike conventional laparoscopic procedures, which rely on 2D imaging and rigid hand-held instruments, the Mizzo Endo 4000 provides surgeons with high-definition 3D visualization and superior degrees of freedom for instrument movement.

• One of its primary clinical advantages is the integration of tremor filtration technology, which ensures that even the most minute precision surgeries are performed with extreme accuracy, reducing the risk of accidental tissue damage. Hence, statement 1 is correct.

• The system significantly lowers healthcare costs by providing a domestic alternative to expensive, imported robotic platforms like the Da Vinci system, making advanced surgery available to a larger demographic.

• While additive manufacturing is a revolutionary field, it pertains to 3D printing and prosthetics rather than the active surgical navigation provided by this system. Hence, statement 2 is incorrect.

• The Mizzo Endo 4000 is designed for intra-operative surgical assistance, not for pathology workflows or diagnostic AI integration. Hence, statement 3 is incorrect.

• The device does not involve nanotechnology-based drug delivery, which is a pharmacological advancement rather than a mechanical surgical innovation. Hence, statement 4 is incorrect.

Additional Information

• Robotic-Assisted Surgery (RAS):

• RAS is an evolution of Minimally Invasive Surgery (MIS) that allows doctors to perform many types of complex procedures with more precision, flexibility, and control than is possible with conventional techniques.

• The Mizzo Endo 4000 utilizes a master-slave architecture where the surgeon operates from a console, translating hand movements into micro-movements of robotic arms inside the patient.

• Indigenous Innovation in Med-Tech:

• The launch of indigenous systems in 2025 aligns with the "Make in India" initiative, aiming to achieve Atmanirbhar Bharat (Self-Reliant India) in the medical device sector.

• Reducing reliance on imported systems is critical because imported robots often come with high maintenance contracts and expensive disposable instruments that drive up the cost of surgery.

• Clinical Outcomes:

• Clinical data suggests that robotic platforms lead to shorter hospital stays, reduced blood loss, and faster recovery times compared to open or even standard laparoscopic surgeries.

• The ergonomic design of the Mizzo Endo 4000 also reduces surgeon fatigue during long-duration operations, indirectly improving patient safety.

Important Points

• Technological Features:

• The Mizzo Endo 4000 features a modular design, allowing it to be configured for various specialties such as Urology, Gynecology, and General Surgery.

• It includes haptic feedback mechanisms (tactile sensations) that help surgeons "feel" the tension of the tissues, a feature often missing in earlier laparoscopic tools.

• Comparison with Conventional Laparoscopy:

• In conventional laparoscopy, the surgeon experiences the "fulcrum effect" (where instruments move in the opposite direction of the hand), whereas the Mizzo Endo 4000 eliminates this, making the learning curve shorter for new surgeons.

• The 4K resolution cameras provide 10x magnification, allowing for better identification of small nerves and blood vessels.

Q93. Answer: (b) Agnishodh

The correct answer is Agnishodh.

Key Points

• In August 2025, the Indian Army formalized a significant collaboration with the Indian Institute of Technology (IIT) Madras to boost domestic technological capabilities.

• The partnership led to the establishment of a specialized research centre named Agnishodh, located directly on the IIT Madras campus in Chennai.

• Agnishodh is designed to serve as a hub for advanced research and innovation, specifically tailored to meet the evolving needs of the Indian Armed Forces.

• The core mission of the centre is to achieve indigenization of critical technologies, focusing on sectors like battlefield electronics, secure communication, and automated systems.

• By leveraging the intellectual resources of IIT Madras, the Indian Army aims to create indigenous solutions that reduce the defence sector's dependence on foreign imports.

Additional Information

• Aatmanirbhar Bharat in Defence:

• The establishment of Agnishodh is a strategic move under the Aatmanirbhar Bharat (Self-Reliant India) initiative.

• The Ministry of Defence has set a target to achieve a turnover of USD 25 billion in defence manufacturing by 2025.

• Role of IIT Madras:

• IIT Madras has a long-standing reputation for defence R&D and already hosts the DRDO-Industry-Academia Ramanujan Centre of Excellence.

• The institution provides a fertile ground for startups and incubation cells to work on dual-use technologies that benefit both civilians and the military.

• Technological Focus Areas:

• Agnishodh will prioritize the development of Artificial Intelligence (AI) for predictive maintenance of military hardware.

• Other focus areas include Quantum Computing for cryptography and the development of Swarm Drone technologies for surveillance.

• Implementation Strategy:

• The centre facilitates direct interaction between Army personnel and researchers, ensuring that the prototypes developed are operationally viable in harsh environments.

Important Points

• Modernization of the Army: The Indian Army is undergoing a massive modernization drive to prepare for non-contact warfare and cyber-electronic threats.

• Strategic Location: Placing Agnishodh in Chennai allows the Indian Army to tap into the industrial corridor of Tamil Nadu, which is one of India's two Defence Industrial Corridors (the other being in Uttar Pradesh).

• Budgetary Support: Funding for such initiatives is often supported by the iDEX (Innovations for Defence Excellence) framework, which aims to provide financial grants to innovators and SMEs.

• Collaboration Scope: While IIT Madras provides the academic expertise, the Indian Army provides domain knowledge and field testing facilities, creating a synergetic ecosystem for defence innovation.

Q94. Answer: (b) Karakoram Wildlife Sanctuary

The correct answer is Karakoram Wildlife Sanctuary.

Key Points

• In November 2025, the Standing Committee of the National Board for Wildlife (SC-NBWL) cleared several strategic defence and paramilitary projects specifically located within the Karakoram Wildlife Sanctuary.

• The sanctuary is situated in the Leh district of the Union Territory of Ladakh, representing a high-altitude cold desert ecosystem of immense geopolitical and ecological importance.

• These approvals include the construction of strategic roads, border outposts, and telecommunication infrastructure to be developed by the Border Roads Organization (BRO) and the Indo-Tibetan Border Police (ITBP). Hence, the correct answer is Karakoram Wildlife Sanctuary.

• The projects aim to strengthen India's surveillance and logistics capabilities along the Line of Actual Control (LAC), ensuring better troop movement and communication in the difficult terrain of Eastern Ladakh.

• The Standing Committee, which functions under the Ministry of Environment, Forest and Climate Change, reviewed these proposals to balance national security requirements with the conservation needs of the region's unique biodiversity.

Additional Information

• Karakoram Wildlife Sanctuary:

• Established in the year 1987, it covers an area of over 5,000 square kilometers in Ladakh.

• It is one of the few places in India where the rare Chiru (Tibetan Antelope) is found, which is known for its fine wool called Shahtoosh.

• The sanctuary also provides a habitat for other endangered species like the Snow Leopard, Tibetan Gazelle, and the Himalayan Ibex.

• National Board for Wildlife (NBWL):

• It is a statutory body constituted under the Wildlife (Protection) Act, 1972.

• The Prime Minister of India serves as the ex-officio chairperson of the NBWL, while the Union Minister of Environment chairs the Standing Committee.

• It acts as an advisory board to the Central Government on framing policies and measures for wildlife conservation.

• Other Protected Areas in Options:

• Dehing Patkai Wildlife Sanctuary: Located in Assam, it is often referred to as the "Amazon of the East" due to its dense rainforest cover.

• Khangchendzonga National Park: Situated in Sikkim, it is a UNESCO World Heritage Site recognized under the "Mixed" category for both natural and cultural significance.

• Raimona National Park: Declared as the sixth national park of Assam in 2021, it is located in the Kokrajhar district and is famous for the Golden Langur.

Important Points

• Strategic Infrastructure in Ladakh:

• The government has accelerated infrastructure development in Ladakh following the 2020 border standoff to ensure all-weather connectivity.

• The 720-km long strategic roads and mobile towers are essential for the Border Roads Organization (BRO) to maintain supply lines to forward areas near the Karakoram Pass.

• Wildlife clearances are mandatory under Section 29 and Section 35 of the Wildlife (Protection) Act, 1972 for any non-forestry activity inside a sanctuary or national park.

• Conservation Challenges:

• Large-scale construction in high-altitude zones can impact migratory corridors of wildlife and delicate permafrost layers.

• The SC-NBWL often imposes conditions such as compensatory afforestation and the creation of wildlife passages to mitigate the environmental footprint of defence projects.

Q95. Answer: (a) Dedication to Waqf

The correct answer is Dedication to Waqf.

Key Points

• The Waqf (Amendment) Act, 2025 (introduced as the Waqf (Amendment) Bill, 2024) introduces significant reforms to the Waqf Act, 1995, specifically targeting the protection of inheritance rights.

• Under the new provisions, the dedication of property to Waqf is prohibited if such a dedication results in the deprivation of the legal heirs, especially female heirs, of their rightful inheritance.

• This amendment seeks to ensure that religious endowments do not become a tool to bypass the succession rights of women as guaranteed under personal laws or other legal frameworks. Hence, the statement regarding the prohibition of dedication is correct.

• The Act mandates that any person intending to dedicate property as Waqf must have a clear title and ownership of the property, and they must be a practicing Muslim for at least five years.

• The legislation aims to bring transparency and accountability to the management of over 9 lakh hectares of Waqf land across India, which is currently managed by various State Waqf Boards.

Additional Information

• Waqf Definition and Purpose:

• Waqf refers to the permanent dedication of movable or immovable property for purposes recognized by Muslim Law as pious, religious, or charitable.

• Properties dedicated to Waqf are managed by a Mutawalli (manager), who acts as a supervisor rather than an owner.

• Role of the Central Waqf Council:

• The Central Waqf Council is a statutory body established in 1964 to advise the Union Government on matters concerning the working of Waqf Boards.

• The 2025 Amendment proposes a more diverse composition of the Council, including the mandatory inclusion of two women and two non-Muslims to enhance inclusivity and administrative oversight.

• Powers of the District Collector:

• One of the most debated features of the Waqf (Amendment) Act, 2025 is the enhanced power given to the District Collector.

• The Collector now has the authority to determine whether a property claimed as Waqf is actually government land. This shifts the adjudicatory power away from the Waqf Tribunal in cases of land title disputes involving the state.

• Registration and Portal:

• The Act introduces a centralized registration process through a global Waqf portal to digitize records and prevent encroachments.

• Any property intended to be declared as Waqf-alal-aulad (Waqf for the benefit of the dedicator's family) must also ensure that the inheritance rights of female heirs are not compromised.

Important Points

• Abolition of 'Waqf by User': The Waqf (Amendment) Act, 2025 seeks to abolish the concept of 'Waqf by User', where a property is deemed Waqf based on long-term religious use without formal documentation. This necessitates formal registration for all Waqf properties.

• Composition of State Waqf Boards: The boards will now include members from diverse backgrounds, including Shia, Sunni, Bohra, and Agakhani communities, alongside two non-Muslim members and at least two women.

• Timeline: The Waqf Act was originally enacted in 1954, significantly amended in 1995 and 2013, and the current 2025 reforms represent the most comprehensive shift in Waqf administration since Independence.

Q96. Answer: (b) NITI Aayog

The correct answer is NITI Aayog.

Key Points

• The NITI Aayog (National Institution for Transforming India) has been designated as the nodal agency to prepare the vision document and oversee the implementation of the 'Viksit Bharat @2047' programme. Hence, statement 2 is correct.

• 'Viksit Bharat @2047' is the Government of India's ambitious roadmap to transform the country into a developed nation by the year 2047, marking the 100th anniversary of India's independence.

• The initiative was officially launched by Prime Minister Narendra Modi on December 11, 2023, through a virtual workshop titled 'Viksit Bharat @2047: Voice of Youth'.

• The Department of Science and Technology (DST) focuses on promoting new areas of Science and Technology and acts as a nodal department for organizing and coordinating S&T activities, but it is not the nodal agency for this specific holistic development programme. Hence, statement 1 is incorrect.

• The Ministry of External Affairs (MEA) is responsible for the conduct of India's relations with foreign countries and does not lead the domestic developmental roadmap of Viksit Bharat. Hence, statement 3 is incorrect.

• The Central Vigilance Commission (CVC) is an apex vigilance institution, free of control from any executive authority, monitoring all vigilance activity under the Central Government, and does not function as a nodal agency for national development planning. Hence, statement 4 is incorrect.

Additional Information

• NITI Aayog:

• Established on January 1, 2015, it replaced the erstwhile Planning Commission to better serve the needs and aspirations of the people of India.

• The Prime Minister serves as the Ex-officio Chairperson. It operates on the principle of Cooperative Federalism, involving the active participation of State Governments in the planning process.

• It acts as a think tank providing relevant strategic and technical advice to the Centre and the States.

• Viksit Bharat @2047 Goals:

• The vision encompasses various aspects of development, including economic growth, social progress, environmental sustainability, and good governance.

• Economic targets include aiming for a $30 trillion economy by 2047, with a significant increase in per capita income.

• The programme emphasizes structural reforms, digitalization, and infrastructure development to ensure India becomes a global leader in innovation and manufacturing.

Important Points

• Strategic Pillars: The vision document prepared by NITI Aayog is expected to focus on ten sectoral groups, including energy, technology, urbanization, and social sectors like education and health.

• Youth Engagement: A key feature of the 2024-2025 phase is the 'Ideas Portal', where the youth can share their suggestions for the country's development, emphasizing the role of Jan Bhagidari (People's Participation).

• Implementation: The NITI Aayog coordinates with various Central Ministries and State Governments to align their goals with the national 2047 vision, ensuring a synchronized approach toward long-term developmental milestones.

Q97. Answer: (b) Good food for all, for today and tomorrow

The correct answer is Good food for all, for today and tomorrow.

Key Points

• The World Food Forum (WFF) 2024 was held from 14 to 18 October 2024 at the headquarters of the Food and Agriculture Organization (FAO) of the United Nations in Rome, Italy.

• The official theme for the 2024 edition was "Good food for all, for today and tomorrow," which emphasizes the necessity of building sustainable agrifood systems that provide nutritional security for the current and future generations. Hence, statement 2 is correct.

• The theme "Healthy food for all, for today and tomorrow" is incorrect because, while health is a component, the official branding specifically utilized the word "Good" to encompass nutrition, accessibility, and cultural relevance. Hence, statement 1 is incorrect.

• The theme "Nutritious food for all, for today and tomorrow" is incorrect as it does not align with the formal title designated by the FAO for the 2024 summit. Hence, statement 3 is incorrect.

• The theme "Good food for all, for today and forever" is incorrect because the official slogan concludes with "tomorrow" to signify the immediate and long-term sustainability goals rather than "forever." Hence, statement 4 is incorrect.

• The forum serves as a flagship platform to mobilize global youth, facilitate science and innovation, and foster investment to transform global agrifood systems.

Additional Information

• World Food Forum (WFF) Structure:

• The WFF is an independent, youth-led global network that was launched in 2021. It operates as a year-round movement rather than just a single event.

• It comprises three pillars: the Global Youth Forum, the FAO Science and Innovation Forum, and the FAO Hand-in-Hand Investment Forum.

• The 2024 event aimed to address the rising challenges of climate change, conflict, and economic shocks that threaten global food security.

• Significance of the Location:

• Rome is often referred to as the "Food Hub" of the world as it hosts the three primary UN food agencies: FAO, the World Food Programme (WFP), and the International Fund for Agricultural Development (IFAD).

• Global Food Security Context:

• The forum is closely linked with the achievement of Sustainable Development Goal 2 (SDG 2), which aims to achieve "Zero Hunger" by the year 2030.

• Recent reports from the FAO indicate that approximately 733 million people faced hunger in 2023, making the 2024 theme "Good food for all" a critical call to action.

Important Points

• Key Participants: The 2024 forum saw participation from the Director-General of FAO, Qu Dongyu, along with world leaders, Nobel laureates, and youth activists.

• Flagship Events in 2024:

• The Hand-in-Hand Investment Forum presented investment opportunities from over 30 countries to potential donors and investors.

• The Science and Innovation Forum focused on the role of biotechnology, digitalization, and artificial intelligence in enhancing crop yields and reducing food waste.

• The World Food Day, celebrated annually on 16 October, coincided with the 2024 forum, highlighting the "Right to Foods for a Better Life and a Better Future."

• Focus on Youth: A major highlight of the WFF is empowering young people to take leadership roles in policy-making, ensuring that the today and tomorrow aspect of the theme is fulfilled by the next generation of farmers and scientists.

Q98. Answer: (a) Three

The correct answer is Three.

Key Points

• The Microfinance Institutions Network (MFIN), which is a Self-Regulatory Organization (SRO) for the microfinance sector, has introduced new guidelines to address concerns of over-indebtedness among borrowers.

• According to the updated rules, the maximum number of Microfinance (MFI) lenders allowed per borrower has been capped at Three.

• This new regulation is scheduled to come into full effect from April 1, 2025, providing a transition period for the industry to align its credit assessment processes.

• The decision was taken to ensure that borrowers do not enter a debt trap by borrowing from multiple sources, a practice often referred to as loan stacking.

• Under these rules, no lender should provide a loan to a borrower who already has active loans from three different microfinance institutions, regardless of the loan amount or the borrower's repayment capacity.

Additional Information

• Microfinance Institutions Network (MFIN):

• Established in 2009, MFIN is the premier industry association for the microfinance sector in India and is recognized by the Reserve Bank of India (RBI) as an SRO.

• Its primary role is to ensure responsible lending and ethical conduct among Non-Banking Financial Company-Microfinance Institutions (NBFC-MFIs).

• Microfinance Loan Definition:

• As per the RBI Master Directions (2022), a microfinance loan is a collateral-free loan given to a household having an annual income of up to Rs. 3 lakh.

• These loans are primarily aimed at financial inclusion for the unbanked and underbanked population.

• Fixed Obligation to Income Ratio (FOIR):

• Besides the lender limit, the MFIN rules emphasize that the FOIR should not exceed 50%.

• This means that the total monthly loan repayment obligations of a household must not exceed 50% of its monthly income.

• Credit Information Companies (CICs):

• Lenders are mandated to check the credit history of potential borrowers through CICs like Equifax, Experian, or CIBIL to verify the number of existing active lenders before sanctioning new credit.

Important Points

• Regulatory Harmony: The RBI introduced a harmonized regulatory framework in March 2022, which removed the interest rate cap but shifted the focus toward a risk-based pricing model and protection against over-leveraging.

• Implementation Timeline: While the SRO issued these "guardrails" in late 2024, the mandatory enforcement of the three-lender limit begins on the 1st of April, 2025.

• Industry Impact: This move is expected to slow down asset growth for some aggressive lenders but will significantly improve the asset quality and sustainability of the microfinance ecosystem in the long run.

Q99. Answer: (a) Mahila Aarogyam Kaksh

The correct answer is Mahila Aarogyam Kaksh.

Key Points

• The Department of Legal Affairs, under the Ministry of Law and Justice, inaugurated a dedicated women’s wellness space titled Mahila Aarogyam Kaksh in July 2025.

• This facility was officially inaugurated by Dr. Rajiv Mani, who serves as the Secretary of the Department of Legal Affairs.

• The wellness space is located at Shastri Bhawan in New Delhi, which houses several important government offices.

• The primary function of the Mahila Aarogyam Kaksh is to provide a dedicated, private, and comfortable environment for women employees to manage their health and wellness needs during working hours.

• The initiative aims to enhance the workplace environment by providing immediate facilities for medical rest, nursing, and first-aid specifically tailored for women.

• The establishment of this room is a significant step toward achieving better occupational health standards for female staff within the central government hierarchy.

Additional Information

• Ministry of Law and Justice: It is the oldest limb of the Government of India and is responsible for the management of legal affairs, legislative activities, and the administration of justice in the country. It consists of three departments: Legal Affairs, Legislative Department, and the Department of Justice.

• Infrastructure for Women: The government has been focusing on creating gender-sensitive infrastructure in public offices to ensure that women employees have access to basic necessities like creches and wellness rooms.

• Workplace Wellness: Modern human resource guidelines for the Government of India emphasize the importance of mental and physical well-being to improve overall productivity and reduce absenteeism.

• Mission Shakti: This is an integrated women empowerment programme launched by the Ministry of Women and Child Development, which encourages various ministries to adopt women-friendly policies and safety measures.

Important Points

• Location Details: Shastri Bhawan, the site of the inauguration, is a major government building in New Delhi that accommodates several ministries including Law, Education, and Information and Broadcasting.

• Equipment and Facilities: The Mahila Aarogyam Kaksh is typically equipped with blood pressure monitors, basic diagnostic kits, comfortable recliners, and emergency medicines to handle minor health issues or physical exhaustion.

• Policy Impact: Such initiatives serve as a model for other departments and ministries to follow, fostering a more inclusive and

supportive workplace culture across the Civil Services.

• Key Official: Dr. Rajiv Mani, the Secretary of the Department of Legal Affairs, has been instrumental in overseeing legal reforms and administrative improvements within the department during his tenure.

Q100. Answer: (d) To assess and monitor the conservation status of the country's flora and fauna

The correct answer is To assess and monitor the conservation status of the country's flora and fauna.

Key Points

• The National Red List Roadmap was officially launched in October 2025 as a strategic initiative to systematically evaluate the extinction risk of species within the country.

• Its primary objective is to align national conservation efforts with the International Union for Conservation of Nature (IUCN) standards to provide a clear picture of the conservation status of flora and fauna.

• The roadmap serves as a guiding document for the Ministry of Environment, Forest and Climate Change (MoEFCC) to prioritize species that require immediate protection and habitat restoration.

• It facilitates the creation of a comprehensive National Red List, which acts as a critical tool for policymakers to allocate funds and resources toward biodiversity hotspots and threatened ecosystems. Hence, the correct answer is option (4).

• The launch coincided with global efforts to meet the 2030 targets of the Kunming-Montreal Global Biodiversity Framework, emphasizing the reduction of species extinction rates.

Additional Information

• IUCN Red List Categories:

• The IUCN classifies species into nine groups, including Extinct (EX), Critically Endangered (CR), Endangered (EN), and Vulnerable (VU).

• The National Red List Roadmap utilizes these global criteria but tailors them to the regional and national context of the country's unique biodiversity.

• Involved Organizations:

• The Zoological Survey of India (ZSI), established in 1916, and the Botanical Survey of India (BSI), established in 1890, are the lead technical agencies responsible for data collection.

• These organizations conduct extensive field surveys and DNA barcoding to accurately identify and catalog species for the roadmap.

• Legal Framework in India:

• The initiative supports the Biological Diversity Act, 2002, which aims at the conservation of biological resources and equitable sharing of benefits.

• It also complements the Wildlife Protection Act, 1972, by providing scientific data to update the various Schedules that define the legal protection levels for different animals and plants.

Important Points

• Global Biodiversity Framework (GBF): The roadmap is a direct response to Target 4 of the Kunming-Montreal GBF, which mandates urgent management actions to halt human-induced extinction of known threatened species.

• Data Integration: The roadmap emphasizes the use of Geographic Information Systems (GIS) and Remote Sensing to track changes in species distribution and habitat loss over time.

• Endemism: A special focus is placed on Endemic species found in regions like the Western Ghats, the Himalayas, and the Andaman and Nicobar Islands, as these species are found nowhere else in the world and are highly susceptible to climate change.

• Role of the National Biodiversity Authority (NBA): The NBA, headquartered in Chennai, plays a pivotal role in ensuring that the roadmap's implementation adheres to the Nagoya Protocol on access and benefit-sharing.

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