RRB Group D Official Paper (Held On: 15 Dec, 2025 Shift 1) (Previous Year Paper)

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

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GENERAL SCIENCE

Q1. When an object moves along a straight path but its speed keeps changing, how can we describe its rate of motion?

(a) By checking how far it goes every second
(b) By measuring its constant velocity
(c) By using the total time over the average velocity
(d) By using average velocity over the total time

Q2. How is the mass number of an atom calculated?

(a) Atomic number multiplied by 3 as an estimate
(b) Total protons plus electrons in the atom
(c) Total electrons plus nucleons in the atom
(d) Protons plus neutrons in nucleus of atom

Q3. The Moon moves in a curved path around the Earth instead of a straight line because:

(a) the Earth’s gravitational force provides the centripetal force
(b) the Moon has no inertia
(c) the Sun’s light pushes the Moon
(d) the Moon has a very large mass

Q4. Which of the following pairs is an example of 'molecule of an element itself'?

(a) Hydrogen gas and oxygen gas
(b) Ammonia and oxygen gas
(c) Hydrogen gas and water
(d) Ammonia and sulphur dioxide

Q5. A body undergoes a displacement of 5 m under the action of a constant force of 5 N, in the same direction as the force. How much work will be done under the action of this force?

(a) 25 J
(b) 1/5 J
(c) 1 J
(d) 5 J

Q6. A distance–time graph is a curve rather than a straight line. What does this indicate?

(a) The body is moving with uniform acceleration.
(b) The body is at rest.
(c) The body is moving with non-uniform speed.
(d) The body is moving with uniform speed.

Q7. Which of the given statements is correct?

Statement 1: Concave mirrors are used in solar furnaces to focus sunlight at a point for heating.

Statement 2: Convex mirrors can never form real images.

(a) Both statements 1 and 2 are correct.
(b) Only statement 2 is correct.
(c) Only statement 1 is correct.
(d) Both statements 1 and 2 are incorrect.

Q8. Which of the following is NOT correct about nervous tissue?

(a) Neuron is made up of axon and dendrites
(b) Examples are brain and spinal cord
(c) Cells are called nerve cells or neurons
(d) Nerve cells are very small in length

Q9. What is the formula of plaster of paris?

(a) $CuSO_4 \cdot 5H_2O$
(b) $CaSO_4 \cdot 1/2H_2O$
(c) $CaSO_4 \cdot 2H_2O$
(d) $CuSO_4 \cdot 1/2H_2O$

Q10. What type of reaction is an acid-base reaction?

(a) Redox reaction
(b) Endothermic reaction
(c) Dissociation reaction
(d) Exothermic reaction

Q11. Match the following: Products of Reaction of Metal Carbonates with Acids

Column A (Reactants)	Column B (Products)
A. Sodium carbonate + HCl	1. Forms white precipitate of $CaCO_3$
B. Calcium carbonate + H_2SO_4	2. Calcium sulphate + CO_2 + H_2O
C. Metal carbonate + Acid	3. Salt + Carbon dioxide + Water
D. CO_2 passed through lime water	4. Sodium chloride + CO_2 + H_2O

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

Q12. Dispersion of white light through a glass prism takes place because:

(a) the prism absorbs some colours and transmits others
(b) different colours travel with different speeds in glass
(c) different colours travel with the same speed in glass
(d) white light splits due to reflection inside the prism

Q13. The fuse wire in electric circuits works on the principle of _____.

(a) heating effect of current
(b) induction effect of current
(c) chemical effect of current
(d) magnetic effect of current

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Q14. For a given material, the resistance per unit length is inversely proportional to which of the following?

(a) Conductivity
(b) Cross-sectional area
(c) Temperature
(d) Resistivity

Q15. Which of the following is human-made material and will NOT be broken down by the action of bacteria?

(a) Butter
(b) Rice
(c) Plastic
(d) Bread

Q16. Arrange the following metals: K, Ca, Al in the order of increasing reactivity.

(a) Al < Ca < K
(b) Ca < K < Al
(c) K < Al < Ca
(d) K < Ca < Al

Q17. Which of the following defines cross-pollination correctly?

(a) Transfer of pollen from one plant to a non-flowering plant
(b) Fertilisation of an ovule without pollen transfer
(c) Transfer of pollen from the anther of one flower to the stigma of another flower
(d) Transfer of pollen within the same flower

Q18. The sexual act is a very intimate connection of bodies and there are many diseases that can be transmitted sexually. Which of the following is caused by bacteria?

(a) Syphilis only
(b) Both gonorrhoea and syphilis
(c) Gonorrhoea only
(d) Warts

Q19. What is the SI unit of pressure used in measuring gases?

(a) Kelvin
(b) Newton
(c) Pascal
(d) Joule

Q20. Which of the following is the primary use of ultrasound in echocardiography?

(a) Examine the structure and function of the heart
(b) Determining body weight
(c) Cleaning or removing arterial blockages
(d) Measuring blood sugar levels

Q21. Which tissue is specialised for transmitting rapid electrical impulses that enable muscle movement?

(a) Epithelial tissue
(b) Nervous tissue
(c) Adipose tissue
(d) Connective tissue

Q22. What is the transformation of a larva into an adult frog through drastic changes called?

(a) Zygote formation
(b) Gamete formation
(c) Fertilisation
(d) Metamorphosis

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Q23. What is mixed cropping?

(a) Growing multiple crops on a field in the same season
(b) Alternating between growing crops in one season and leaving the field empty in the following season
(c) Growing the same crop on a field in all seasons
(d) Rotating crops on a field seasonally

Q24. Which of the following correctly lists the components of the vascular tissue known as xylem?

(a) Tracheids, vessels, sieve tubes, xylem parenchyma
(b) Companion cells, sieve cells, vessels, tracheids
(c) Tracheids, vessels, xylem parenchyma, xylem fibres
(d) Sieve tubes, companion cells, phloem fibres, phloem parenchyma

Q25. What is the main purpose of the 'enrichment of ores' process in metallurgy?

(a) To refine the extracted metal to increase its purity.
(b) To combine the metal with other elements to form alloys.
(c) To remove undesirable impurities (gangue) from the ore.
(d) To convert the metal ore into its molten form.

MATHEMATICS

Q26. If 20% of a number is added to 84, then the result is the same number. 70% of the same number is:

(a) 93.5
(b) 103.5
(c) 73.5
(d) 83.5

Q27. In a parking lot, there are cars and motorcycles totaling 28 vehicles. If there are 92 wheels in total, how many cars are there?

(a) 16
(b) 20
(c) 22
(d) 18

Q28. Danish is 9 years younger than Roshan. If their ages are in the ratio 4 : 5, how old is Danish?

(a) 35 years
(b) 34 years
(c) 33 years
(d) 36 years

Q29. If the area of an equilateral triangle is $16\sqrt{3}$ cm², then find its perimeter.

(a) 32 cm
(b) 24 cm
(c) 12 cm
(d) 16 cm

Q30. Harjeet bought a second-hand scooter for Rs. 18,000 and spent Rs. 8,000 for repairing it. At what price should he sell the scooter to get a profit of 10%?

(a) Rs. 25,600
(b) Rs. 28,600
(c) Rs. 24,600
(d) Rs. 27,600

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Q31. The amount on a sum of Rs. 4,300 at 10% per annum compound interest, compounded annually, in 2 years will be:

(a) Rs. 5,048
(b) Rs. 5,203
(c) Rs. 4,294
(d) Rs. 5,701

Q32. A and B working together can do a piece of work in 3 days. B alone can do the same work in 9 days. How long (in days) will A alone take to do double the work?

(a) 12
(b) 4.5
(c) 9
(d) 10

Q33. In quadrilateral PQRS, the bisectors of angle R and angle S meet at the point T (inside the quadrilateral) and angle STR = 10.5°. If the ratio of angle P to angle Q is 3 : 4, then what is the difference between the measures of angle Q and angle P?

(a) 5°
(b) 1°
(c) 7°
(d) 3°

Q34. After allowing a discount of 50% on the marked price of an article, it is sold for Rs. 61,649. Find its marked price (in Rs.).

(a) 1,23,298
(b) 1,23,308
(c) 1,23,380
(d) 1,23,280

Q35. When reduced by 6, the smallest number M is divisible by 9, 12, and 26. The digit sum of M is:

(a) 7
(b) 8
(c) 6
(d) 15

Q36. The area of a rectangle decreases by 9 m^2 when its length is reduced by 5 m and its breadth is increased by 3 m. However, if the length is increased by 3 m and the breadth is increased by 2 m, the area increases by 67 m^2. Find the original area of the rectangle.

(a) 156 m2
(b) 151 m2
(c) 152 m2
(d) 153 m^2

Q37. 1over20 is what percentage of 11over70 ? (Round off the answer to two decimal places.)

(a) 41.82%
(b) 46.82%
(c) 31.82%
(d) 63.64%

Q38. Simplify: $(3x + 5y)^3 + (3x - 5y)^3$

(a) $6x(9x^2 - 75y^2)$
(b) $10y(9x^2 - 75y^2)$
(c) $6x(9x^2 + 75y^2)$
(d) $10y(9x^2 + 75y^2)$

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Q39. Two trains having lengths of 440 m and 310 m are running at speeds of 60 km/hr and 90 km/hr, respectively, in the same direction. The time taken (in minutes) by the faster train, coming from behind, to completely cross the other train is:

(a) 6
(b) 1.5
(c) 10.1
(d) 7.2

Q40. The median of a set of data is 3 times its mode. Find the square of the product of the mean and mode, given that the median is 9.

(a) 1128
(b) 1345
(c) 1432
(d) 1296

Q41. The cost of a washing machine is 75% less than the cost of a TV. If the cost of the washing machine increases by 80% and that of the TV decreases by 14%, then what is the percentage change in the total cost of 8 washing machines and 2 TVs?

(a) Decrease by 30%
(b) Increase by 33%
(c) Decrease by 32%
(d) Increase by 29%

Q42. Amit and Deeksha together invested Rs. 17,400 in a business. At the end of the year, out of a total profit of Rs. 6,000, Amit's share was Rs. 2,800. What was the investment of Amit?

(a) Rs. 8,120
(b) Rs. 7,910
(c) Rs. 8,010
(d) Rs. 7,325

Q43. If the height of a vertical pole is √3 times the length of its shadow on the ground, then the angle of elevation of the sun at that time is :

(a) 45°
(b) 60°
(c) 70°
(d) 30°

Q44. The average age of 31 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) 53
(b) 52
(c) 50
(d) 55

Q45. Two taps function simultaneously to fill a tank in 24 hours. The second tap fills the tank 14 hours slower than the first tap. How many hours will it take by the second tap to fill the tank alone?

(a) 42
(b) 28
(c) 70
(d) 56

Q46. A dealer marks his goods at 57% above the cost price and allows a discount of 22% on the marked price. What is his gain percentage (correct to two decimal places)?

(a) 19.94%
(b) 22.46%
(c) 20.14%

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(d) 25.98%

Q47. A train, 822 m long, is running at a speed of 67m/s. If it takes 133 seconds to cross a tunnel, then find the length of the tunnel.

(a) 8086 m
(b) 8097 m
(c) 8089 m
(d) 8085 m

Q48. What will come in place of 'A' in the given ratio?

112/A = 8/67

(a) 938
(b) 939
(c) 936
(d) 940

Q49. Simplify the following.

5^(15) ÷ 25^(13/2) ÷ 125^(2/3) + 5^(17) ÷ 125^(16/3) + 5^3

(a) 130
(b) 125
(c) 131
(d) 126

Q50. What is the value of 40 × ((0.74 + 1.48)/(24/5 + 71/15)) ?

(a) 9.5
(b) 8.7
(c) 8.4
(d) 9

GENERAL INTELLIGENCE & REASONING

Q51. 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) (1, 6, 4)
(b) (6, 13, 2)
(c) (3, 2, 7)
(d) (4, 7, 2)

Q52. In the following triads, each group of letters is related to the subsequent one following a certain logic. Select from the given options, the one which follows the same logic.

CAKE - ACKE - EKAC

KING - IKNG - GNIK

(a) KEYS - KYES - SYEK
(b) ROAD - ORAD - OADR
(c) POST - OPST - TSOP
(d) MUTE - UMTE - EUTM

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Q53. HP 16 is related to JT 19 in a certain way. In the same way, CK 22 is related to EO 25. To which of the given options is MU 27 related, following the same logic?

(a) OV 30
(b) OY 30
(c) QZ 29
(d) QV 29

Q54. MY 24 is related to HT 27 in a certain way. In the same way, BL 21 is related to WG 24. To which of the given options is KT 36 related, following the same logic?

(a) FO 33
(b) GP 39
(c) FO 39
(d) GO 39

Q55. In a certain code language,

P + Q means ‘P is the father of Q’,

P & Q means ‘P is the wife of Q’,

P @ Q means ‘P is the sister of Q’ and

P # Q means ‘P is the wife of Q’.

Based on the above, how is Y related to Z if ‘Y @ G & E + V @ Z’?

(a) Mother’s mother
(b) Mother’s sister
(c) Brother's wife
(d) Father's mother

Q56. In a certain code language, ‘give me bike’ is coded as ‘bn gt ry’ and ‘who know me’ is coded as ‘ry fh vt’. How is ‘me’ coded in that language?

(a) ry
(b) vt
(c) bn
(d) fh

Q57. What should come in place of the question mark (?) in the given series?

6 17 29 42 56 71 ?

(a) 87
(b) 86
(c) 90
(d) 88

Q58. If ‘A’ stands for ‘÷’, ‘B’ stands for ‘x’, ‘C’ stands for ‘+’ and ‘D’ stands for ‘−’, what will come in place of the question mark (?) in the following equation?

16 C 24 A 6 B 28 D 32 = ?

(a) 87
(b) 96
(c) 98
(d) 58

Q59. 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:

Some huts are dens.

No den is a cave.

Conclusions:

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(I): Some huts are caves.

(II): Some dens are huts.

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

Q60. Which of the following letter-number clusters will replace the question mark (?) in the given series to make it logically complete?

CKR 78, HHM 69, MEH 60, RBC 51, ?

(a) VYZ 41
(b) VXY 42
(c) WYX 42
(d) XZY 41

Q61. 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) 4 1 7 9 2 2 7 9 9 9 4 7 7 8 9 1 8 6 2 1 2 2 8 (Right)

How many such even digits are there, each of which is immediately preceded by an even digit and also immediately followed by an odd digit?

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

Q62. Which of the following letter-number clusters will replace the question mark (?) in the given series to make it logically complete?

CWF59, FUK62, ISP65, ?

(a) LRT68
(b) MQU69
(c) LQU68
(d) MRT69

Q63. Seven people, A, B, C, D, E, F and G, are sitting in a row, facing north.

Only two people sit to the right of F. Only three people sit between F and A. Both E and C are immediate neighbours of G. D sits immediately to the left of B. C is not an immediate neighbour of A. How many people sit between D and E?

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

Q64. What should come in place of the question mark (?) in the given series?

7 8 12 21 37 '?'

(a) 50
(b) 62
(c) 63
(d) 56

Q65. 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 letter-cluster 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) WZV
(b) XBW

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(c) SVR
(d) DGC

Q66. 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 letter-cluster 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) LRQ
(b) MSR
(c) PVU
(d) ELK

Q67. 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 2 8 6 7 3 8 5 9 6 2 4 5 2 8 7 8 6 3 6 4 9 5 1 2 4 3 (Right)

How many such odd digits are there, each of which is immediately preceded by an odd digit and also immediately followed by an odd digit?

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

Q68. 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:

No student is a teacher.

No student is a carpenter.

Conclusion:

(I) Some teachers are carpenters.

(II) Some students are teachers.

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

Q69. What should come in place of the question mark (?) in the given series?

123 133 142 150 157 ?

(a) 165
(b) 161
(c) 163
(d) 164

Q70. Akshay starts from Point A and drives 21 km towards the east. He then takes a left turn, drives 11 km, then turns left and drives 25 km. He then takes a left turn and drives 16 km. He takes a final left turn, drives 4 km, and stops at Point P. How far (shortest distance) and towards which direction should he drive in order to reach Point A again? (All turns are 90-degree turns only, unless specified.)

(a) 5 km towards north
(b) 5 km towards east
(c) 11 km towards south
(d) 21 km towards west

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Q71. A, B, C, D, E and F are sitting around a circular table, facing the centre. E sits second to the left of A. D is an immediate neighbour of C. C sits to the immediate right of B. F sits second to the left of B. What is the position of E with respect to D?

(a) Second to the right
(b) Third to the left
(c) Second to the left
(d) Immediate right

Q72. Rishika starts from point A and drives 49 km towards north. She then takes a left turn, drives 51 km, turns left and drives 54 km. She then takes a left turn and drives 64 km. She takes a final left turn, drives 5 km and stops at point P. How far (shortest distance) and towards which direction should she drive in order to reach point A again?

(Note: All turns are 90° turns only unless specified.)

(a) 13 km to the west
(b) 10 km to the west
(c) 11 km to the east
(d) 12 km to the west

Q73. This question is based on the five, three-digit numbers given below.

(Left) 937, 228, 782, 175, 631 (Right)

(Example- 697 – First digit = 6, second digit = 9 and third digit = 7)

NOTE - All operations to be done from left to right.

What will be the resultant if the third digit of the highest number is added to the second digit of the lowest number?

(a) 10
(b) 15
(c) 12
(d) 14

Q74. Refer to the number series given below and answer the question that follows. Counting to be done from left to right only.

(NOTE: All numbers are single-digit numbers only.)

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

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

(a) 4
(b) 5
(c) 2
(d) 3

Q75. What will come in place of the question mark (?) in the following equation, if '+' and '−' are interchanged and '×' and '÷' are interchanged?

168 × 7 – 66 + 5 ÷ 9 = ?

(a) 49
(b) 42
(c) 45
(d) 47

Q76. Seven boxes M, N, O, P, Q, R and S are kept one over the other but not necessarily in the same order. Only three boxes are kept below N. Only two boxes are kept between N and P. Only Q is kept above O. S is kept at some place below R and at some place above M. Which box is kept at second position from the bottom?

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

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Q77. In a certain code language, ‘he eat lunch’ is coded as ‘rk yf gl’ and ‘eat proper food’ is coded as ‘av gl tn’. How is ‘eat’ coded in the given language?

(a) gl
(b) rk
(c) tn
(d) yf

Q78. 51 people are standing in a row facing north. Rohit is 19^(th) from the left end while Anupam is 12^(th) from the right end. How many people are there between Rohit and Anupam?

(a) 20
(b) 18
(c) 19
(d) 17

Q79. Five people A, B, C, D and E are sitting in a row facing towards north. Only 2 people are sitting between A and D. B is sitting at the third position from extreme left of the row. B is sitting immediate right to A. B is sitting immediate left to E. Exactly how many people are sitting in between E and A?

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

Q80. What will come in place of the question mark (?) in the following equation, if ‘+’ and ‘−’ are interchanged and ‘×’ and ‘÷’ are interchanged?

48 ÷ 16 + 366 × 6 − 53 = ?

(a) 770
(b) 760
(c) 790
(d) 780

GENERAL AWARENESS AND CURRENT AFFAIRS

Q81. Where is the company that developed the Surya VHF radar based?

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

Q82. In May 2025, which state/UT implemented the Stage I Graded Response Action Plan related to climate?

(a) Kerala
(b) Delhi-NCR
(c) Goa
(d) West Bengal

Q83. What was the total central government receipts (excluding borrowings) estimated at the Union Budget 2025-26?

(a) Rs. 30 lakh crore
(b) Rs. 38 lakh crore
(c) Rs. 34.96 lakh crore
(d) Rs. 40.26 lakh crore

Q84. What is the name of the portal launched by the Reserve Bank of India in May 2025 for the regulated entities (REs) to report details of their digital lending apps (DLAs)?

(a) Digital Lending Apps Management System (DLAMS)
(b) Regulated Entities Information Management System (REIMS)
(c) Centralised Information Management System (CIMS)

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(d) Centralised Enterprise Management System (CEMS)

Q85. How many seats did the Bharatiya Janata Party (BJP) win in the 2025 Bihar Assembly election?

(a) 95
(b) 105
(c) 89
(d) 80

Q86. Where was the 2025 World Para Athletics Grand Prix held?

(a) Kolkata
(b) Bengaluru
(c) Mumbai
(d) New Delhi

Q87. Which event was held at Shri Hari Singh Thapa Sports College in Pithoragarh in 2025?

(a) Boxing
(b) Wrestling
(c) Judo
(d) Fencing

Q88. In the Union Budget 2025-26, what was the amount allocated to the Ministry of Health and Family Welfare?

(a) Rs. 79,200 Crore
(b) Rs. 99,858.56 Crore
(c) Rs. 1,25,000 Crore
(d) Rs. 85,300 Crore

Q89. The Supreme Court extended the stay on tree cutting in how many acres of land at Kancha Gachibowli in Hyderabad in April 2025?

(a) 200 acres
(b) 100 acres
(c) 600 acres
(d) 400 acres

Q90. As announced in June 2025 by the Union Power and Urban Affairs Minister, what is the minimum temperature setting mandated for new air-conditioners in India?

(a) 28°C
(b) 20°C
(c) 24°C
(d) 16°C

Q91. Which of the following missions marked the 100^(th) launch of ISRO from India’s Spaceport Sriharikota, boosting India’s standing in space launch capability?

(a) Launch of Aditya-L1 solar observatory
(b) Launch of NVS-02 navigation satellite on GSLV-F15
(c) Launch of INSAT-3DS weather satellite
(d) Launch of Chandrayaan-3

Q92. Dr. Duvvur Nageshwar Reddy received the Padma Vibhushan in 2025 for his contributions in which field?

(a) Art
(b) Medicine
(c) Public Affairs
(d) Trade and Industry

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Q93. Indian boxer Nishant Dev secured his second professional win against which opponent in a Super Welterweight bout at Madison Square Garden Theatre, New York in June 2025?

(a) Victor Ortiz
(b) Eduardo Ramirez
(c) Miguel Flores
(d) Josue Silva

Q94. Which state hosted the National Yoga Day Ceremony on 21 June 2025 with Prime Minister Narendra Modi as the chief guest?

(a) Gujarat
(b) Andhra Pradesh
(c) Bihar
(d) Haryana

Q95. China announced the launch of a new K Visa effective 1 October 2025, designed to attract which category of professionals?

(a) Medical Researchers
(b) Tourism Investors
(c) Cultural Artists
(d) STEM Graduates

Q96. Which Indian state launched a Rs. 50,000 incentive scheme in July 2025 for minority couples marrying through mass marriage events?

(a) Tamil Nadu
(b) Karnataka
(c) Maharashtra
(d) Kerala

Q97. Who secured gold in the Women's Singles SU5 at the 2025 Asia Para Badminton Championship?

(a) Manisha Ramadass
(b) Palak Kohali
(c) Mandeep Kaur
(d) Thulasimathi Murugesan

Q98. The 'March of Glory' book, released in March 2025, is co-authored by whom among the following?

(a) Gideon Haigh and Michael Atherton
(b) Simon Barnes and K Arumugam
(c) Errol D'Cruz and Boria Majumdar
(d) K Arumugam and Errol D'Cruz

Q99. What is the name of the pilot initiative launched by the Government of India in Sonbhadra, Uttar Pradesh on 24 June 2025, which is focused on vocational training for adolescent girls?

(a) AMRUTA
(b) DHARANI
(c) NAVYA
(d) MITRA

Q100. INS Tamal, a state-of-the-art stealth multi-role frigate, which was commissioned by the Indian Navy on 1 July 2025, was built in _____.

(a) Japan
(b) Russia
(c) Spain
(d) South Africa

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ANSWER KEY

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

SOLUTIONS

Q1. Answer: (a) By checking how far it goes every second

The correct answer is By checking how far it goes every second.

Key Points

• When an object moves along a straight path, and its speed keeps changing, the best way to describe its motion is by determining its instantaneous speed. This can be done by checking how far it travels every second.

• Instantaneous speed is the speed of an object at a particular moment in time. It gives us the most accurate understanding of how the object's motion is changing.

• By measuring the distance covered in every second, we can calculate the object's rate of motion at that specific point in time, which is crucial for understanding non-uniform motion.

• Using average velocity or total time over average velocity is useful for calculating overall motion but does not provide insights into changing speeds at individual moments.

• Measuring constant velocity is not applicable here, as the problem specifies that the object's speed is changing.

Additional Information

• Instantaneous Speed:

• It refers to the speed of an object at a specific point in time.

• It can be calculated using the formula: Speed = Distance / Time, where the time interval is very small (approaching zero).

• Example: A car's speedometer shows its instantaneous speed.

• Average Velocity vs Instantaneous Velocity:

• Average velocity is calculated over a longer time interval, whereas instantaneous velocity is determined at a particular moment.

• For non-uniform motion, average velocity provides limited information about motion changes.

• Constant Velocity:

• When an object moves at a consistent speed in a straight line, it is said to have constant velocity.

• This scenario does not apply to cases where the object's speed is changing.

• Applications of Instantaneous Speed:

• Useful in analyzing the motion of vehicles in traffic, where speeds change frequently.

• Essential in physics experiments to understand non-uniform motion.

Important Points

• Non-Uniform Motion:

• An object is in non-uniform motion when its speed or direction changes as it moves.

• Example: A ball rolling down a slope accelerates due to gravity, showing non-uniform motion.

• Key Formula:

• For instantaneous speed: Speed = Lim ($\Delta t \rightarrow 0$) $\Delta s/\Delta t$, where Δs is the change in distance and Δt is the change in time.

• Practical Tools:

• Devices like speedometers and radar guns are used to measure instantaneous speed.

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• In physics labs, motion sensors and data loggers help track changing speeds.

Q2. Answer: (d) Protons plus neutrons in nucleus of atom

The correct answer is Protons plus neutrons in nucleus of atom.

Key Points

• The mass number of an atom is calculated by summing the number of protons and neutrons present in the nucleus of the atom. This is because both protons and neutrons contribute to the atomic mass, whereas electrons have negligible mass.

• The mass number is denoted by the symbol A, and it represents the total number of nucleons (protons + neutrons) in an atom.

• Protons are positively charged subatomic particles, while neutrons are neutral particles. Both reside in the nucleus, and their combined mass determines the mass number of the atom.

• The mass number is always a whole number, as it represents a count of discrete particles.

• Electrons, being extremely light in comparison, do not significantly contribute to the atom's mass. Therefore, they are not included in the calculation of the mass number.

• For example, in a carbon atom, the nucleus contains 6 protons and 6 neutrons. Thus, the mass number of carbon is 12 (6 protons + 6 neutrons).

Additional Information

• Atomic Number:

• The atomic number, denoted by Z, is the number of protons in the nucleus of an atom.

• The atomic number determines the chemical identity of an element and its position in the periodic table.

• For example, hydrogen has an atomic number of 1 (1 proton), and oxygen has an atomic number of 8 (8 protons).

• Isotopes:

• Atoms of the same element can have different numbers of neutrons, leading to different isotopes.

• For example, carbon-12 and carbon-14 are isotopes of carbon. Both have 6 protons, but carbon-12 has 6 neutrons, while carbon-14 has 8 neutrons.

• The mass number changes for isotopes due to the variation in the number of neutrons.

• Relative Atomic Mass:

• Since elements exist as mixtures of isotopes, the relative atomic mass is calculated as the weighted average of the masses of its isotopes.

• For example, the relative atomic mass of chlorine is approximately 35.5, as it is a mix of chlorine-35 and chlorine-37 isotopes.

• Electron Contribution to Mass:

• Electrons have a mass of approximately 1/1836 of a proton. Hence, their contribution to the overall atomic mass is negligible.

• For this reason, electrons are excluded when calculating the mass number of an atom.

Important Points

• Option 1: "Atomic number multiplied by 3 as an estimate" is incorrect. The atomic number only accounts for protons, and multiplying it by 3 does not provide a valid calculation of the mass number.

• Option 2: "Total protons plus electrons in the atom" is incorrect. Electrons are not included in the mass number calculation because of their negligible mass.

• Option 3: "Total electrons plus nucleons in the atom" is incorrect because electrons are not nucleons, and including them in the mass number calculation is inaccurate.

• Option 4: "Protons plus neutrons in the nucleus of the atom" is correct, as the mass number is the sum of these two subatomic particles.

Q3. Answer: (a) the Earth’s gravitational force provides the centripetal force

The correct answer is the Earth’s gravitational force provides the centripetal force.

Key Points

• The Moon moves in a curved path around the Earth instead of a straight line because the Earth's gravitational force acts as the centripetal force required to keep the Moon in its orbit.

• Gravitational Force: The Earth exerts a gravitational pull on the Moon, drawing it towards the Earth's center. This force prevents the Moon from moving in a straight line and keeps it in a stable orbit.

• Centripetal Force: The force responsible for maintaining a curved motion is called centripetal force. In the case of the Moon, the Earth's gravitational pull provides this force, ensuring the Moon's orbital motion.

• The Moon’s motion is also influenced by its inertia, which is the tendency of an object to move in a straight line unless acted upon by an external force. The combination of the Moon’s inertia and the Earth's gravitational pull results in its curved orbit.

• Other forces, such as the Sun’s gravitational force, do play a role in the Moon’s motion, but the primary force keeping the Moon in orbit around the Earth is the Earth's gravitational force.

Additional Information

• Gravitational Force:

• It is a natural force of attraction between two masses. The strength of the gravitational force depends on the masses of the objects and the distance between them, as described by Newton's Law of Universal Gravitation.

• The formula is given as: $F = G * (m1 * m2) / r^2$, where F is the force, G is the gravitational constant, m1 and m2 are the masses, and r is the distance between their centers.

• Earth's gravitational pull is approximately 9.8 m/s^2 near its surface and decreases with distance.

• Centripetal Force:

• This force acts towards the center of a circular path and is required for any object to follow a curved or circular trajectory.

• In the case of the Moon, the centripetal force is provided by the Earth's gravitational pull.

• Inertia:

• Inertia is the property of an object to resist changes in its state of motion. The Moon's inertia keeps it moving forward in space.

• When combined with the Earth's gravitational pull, inertia helps maintain the Moon's orbit, balancing the outward motion with the inward pull.

• Incorrect Options Explained:

• The Moon has no inertia: This is incorrect because the Moon does have inertia, which is essential in maintaining its motion in space.

• The Sun's light pushes the Moon: While sunlight exerts a small amount of pressure (radiation pressure), it is negligible and does not influence the Moon's orbit significantly.

• The Moon has a very large mass: The Moon's mass is small relative to the Earth's. Its motion is governed by the Earth's gravitational force, not its own mass alone.

Important Points

• Orbital Motion: The Moon's orbit around the Earth is elliptical, with the Earth at one of the focal points of the ellipse.

• Tidal Locking: The Moon is tidally locked with the Earth, meaning the same side of the Moon always faces the Earth due to synchronous rotation.

• Lunar Distance: The average distance between the Earth and the Moon is approximately 384,400 km.

• Gravitational Interaction: The gravitational interaction between the Earth and the Moon is also responsible for phenomena like ocean tides on Earth.

Q4. Answer: (a) Hydrogen gas and oxygen gas

The correct answer is Hydrogen gas and oxygen gas.

Key Points

• Molecules of an element are composed of two or more atoms of the same element chemically bonded together. Examples include hydrogen gas (H_2) and oxygen gas (O_2).

• In hydrogen gas (H_2), two hydrogen atoms share electrons to form a covalent bond, creating a diatomic molecule. This is a classic example of a molecule of an element.

• Similarly, oxygen gas (O_2) consists of two oxygen atoms bonded together via a double covalent bond, forming another diatomic molecule of an element.

• Ammonia (NH_3), water (H_2O), and sulfur dioxide (SO_2) are molecules of compounds, as they are composed of different types of atoms chemically bonded together, not of a single element.

• This distinction helps classify substances into molecules of elements (e.g., H_2, O_2) and molecules of compounds (e.g., NH_3, H_2O).

Additional Information

• Hydrogen gas (H_2):

• Hydrogen exists as a diatomic molecule in its natural state, consisting of two hydrogen atoms bonded covalently.

• It is highly flammable and used extensively in industries like petroleum refining and as a potential fuel source.

• Hydrogen gas is the most abundant element in the universe and plays a key role in chemical reactions and energy production.

• Oxygen gas (O_2):

• Oxygen is a diatomic molecule essential for life, as it is required for cellular respiration.

• It constitutes about 21% of Earth's atmosphere and is used in industries such as steel manufacturing and medical applications.

• Its molecular form, O_2, is highly reactive and forms oxides with various elements.

• Molecules of compounds:

• Ammonia (NH_3) is a molecule formed by one nitrogen atom and three hydrogen atoms. It is widely used as a fertilizer and in industrial cleaning.

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• Water (H_2O) is composed of two hydrogen atoms and one oxygen atom, making it a compound. It is essential for life and serves as a universal solvent.

• Sulfur dioxide (SO_2) is made of one sulfur atom and two oxygen atoms. It is commonly used in the food industry and as a preservative.

Important Points

• Classification of Molecules:

• Molecules of an element consist of identical atoms (e.g., H_2, O_2, N_2).

• Molecules of compounds consist of different atoms chemically bonded together (e.g., NH_3, H_2O, CO_2).

• The distinction is based on whether a substance is made up of only one type of element or multiple elements.

• Uses of Diatomic Molecules:

• Hydrogen gas: Used in fuel cells, welding, and ammonia production.

• Oxygen gas: Critical for medical oxygen therapy and combustion processes.

Q5. Answer: (a) 25 J

The correct answer is 25 J.

Key Points

• Work is defined as the product of the force applied and the displacement in the direction of the force. The formula is given by:

Work (W) = Force (F) × Displacement (d) × cos(θ), where θ is the angle between the force and displacement.

• In this case, the force applied is 5 N, the displacement is 5 m, and the force is in the same direction as the displacement. Hence, the angle θ = 0°.

• The cosine of 0° is 1. Substituting the values into the formula:

$W = 5 \times 5 \times \cos(0°) = 5 \times 5 \times 1 = 25$ J.

• The work done under the action of this force is therefore 25 Joules.

• Hence, the correct answer is 25 J.

Additional Information

• Definition of Work:

• Work is done when a force is applied to an object, and the object moves in the direction of the applied force.

• It is a scalar quantity, meaning it has magnitude but no direction.

• The SI unit of work is the Joule (J), where 1 Joule = 1 Newton meter (N·m).

• Concept of θ (Angle):

• The angle θ represents the angle between the direction of the force and the direction of displacement.

• When θ = 0°, the force and displacement are in the same direction, and cos(θ) = 1.

• If θ = 90°, the force is perpendicular to displacement, and cos(θ) = 0. In such cases, no work is done.

• Positive and Negative Work:

• Work is positive if the force and displacement are in the same direction (e.g., pushing an object forward).

• Work is negative if the force and displacement are in opposite directions (e.g., friction opposing motion).

• Applications of Work:

• Work is a fundamental concept in physics, used to calculate energy transfer in various systems.

• It is essential in fields like mechanics, engineering, and thermodynamics.

Important Points

• Work-Energy Theorem:

• The work done on an object is equal to the change in its kinetic energy.

• Mathematically, $W = \Delta KE = 1/2\ mv^2(\text{final}) - 1/2\ mv^2(\text{initial})$.

• Practical Examples of Work:

• In lifting an object, work is done against gravity.

• In compressing a spring, work is done to store potential energy.

• In moving a car, work is done by the engine to overcome friction and air resistance.

Q6. Answer: (c) The body is moving with non-uniform speed.

The correct answer is The body is moving with non-uniform speed..

Key Points

• A distance–time graph represents the motion of a body by plotting distance on the y-axis and time on the x-axis.

• If the graph is a curve, it indicates that the body is moving with non-uniform speed. This implies that the distance covered by the

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body changes irregularly over equal intervals of time.

• A straight-line distance–time graph would signify uniform speed, where the body covers equal distances in equal intervals of time. However, a curve represents variability in speed.

• Non-uniform motion occurs when the object accelerates or decelerates, leading to changes in speed at different points during its motion.

• Acceleration is not necessarily uniform in this case, as the changing slope of the curve signifies irregular changes in speed over time.

Additional Information

• Uniform Motion:

• An object is said to be in uniform motion if it covers equal distances in equal intervals of time. This is represented by a straight-line distance–time graph.

• Example: A car moving at a constant speed of 60 km/h on a highway.

• Non-Uniform Motion:

• In non-uniform motion, the object covers unequal distances in equal intervals of time. This is represented by a curved distance–time graph.

• Example: A cyclist slowing down or speeding up while riding.

• Acceleration:

• Acceleration is the rate of change of velocity of a body. It can be uniform or non-uniform.

• If the slope of the distance–time graph changes steadily, the body might be undergoing uniform acceleration. If the slope changes irregularly, it indicates non-uniform acceleration.

• Characteristics of a Distance–Time Graph:

• Horizontal line: The body is stationary.

• Straight inclined line: Uniform speed.

• Curved line: Non-uniform speed or accelerated motion.

• Steeper curve: Higher speed.

Important Points

• Key Differences Between Uniform and Non-Uniform Motion:

• Uniform Motion: Constant speed, straight-line graph, no acceleration.

• Non-Uniform Motion: Varying speed, curved graph, acceleration present.

• Real-Life Examples:

• Uniform Motion: A clock's second hand moving at a constant rate.

• Non-Uniform Motion: A car navigating through city traffic.

• Graph Interpretation:

• The slope of a distance–time graph determines speed.

• A steeper slope indicates higher speed, while a flatter slope shows slower motion.

Q7. Answer: (a) Both statements 1 and 2 are correct.

The correct answer is Both statements 1 and 2 are correct..

Key Points

• Statement 1: Concave mirrors are used in solar furnaces to focus sunlight at a point for heating.

• Concave mirrors are also known as converging mirrors due to their ability to focus parallel rays of light to a single point called the focal point.

• In solar furnaces, concave mirrors are strategically positioned to concentrate sunlight onto a small area, which increases the intensity of heat and allows high-temperature operations such as melting metals.

• This property is due to the reflective surface curvature of concave mirrors, making them highly efficient in applications requiring focused light energy. Hence, statement 1 is correct.

• Statement 2: Convex mirrors can never form real images.

• Convex mirrors, also known as diverging mirrors, always cause light rays to spread out after reflection.

• The images formed by convex mirrors are virtual, upright, and diminished in size, irrespective of the object's position.

• Since the reflected rays never actually converge but appear to do so when traced backward, convex mirrors cannot form real images. Hence, statement 2 is correct.

• Therefore, the correct answer is that both statements are correct.

Additional Information

• Concave Mirrors:

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• Concave mirrors have a reflective surface curved inward like the inside of a spoon.

• They are commonly used in applications such as shaving mirrors, telescopes, headlights, and solar furnaces due to their ability to focus light rays.

• The type of image formed by a concave mirror depends on the object's position relative to the mirror's focal point and center of curvature. It can form real or virtual images, magnified or diminished.

• Convex Mirrors:

• Convex mirrors have a reflective surface curved outward, making them diverging mirrors.

• They are widely used as rear-view mirrors in vehicles because they provide a wider field of view and always form smaller, upright images.

• Convex mirrors are also employed in security systems and surveillance due to their ability to capture a broader area.

• Real vs. Virtual Images:

• A real image is formed when light rays actually converge at a point after reflection or refraction. Real images are inverted and can be captured on a screen (e.g., images formed by concave mirrors under certain conditions).

• A virtual image is formed when light rays appear to diverge from a point but do not actually converge. Virtual images are upright and cannot be projected onto a screen (e.g., images formed by convex mirrors).

• Applications of Mirrors:

• Concave mirrors: Used in solar furnaces, dental mirrors, and reflectors for headlights and searchlights to focus light.

• Convex mirrors: Used as rear-view mirrors, in parking lots for security, and for surveillance purposes.

Important Points

• Mirror Equation: The relationship between the object distance (u), image distance (v), and focal length (f) is given by the formula: 1/f = 1/v + 1/u. This equation is applicable for both concave and convex mirrors.

• Magnification: The magnification (M) of an image is the ratio of the height of the image (h') to the height of the object (h). It is also related to the distances as M = -v/u.

• Principal Focus: The point where light rays parallel to the principal axis either converge (concave mirror) or appear to diverge from (convex mirror) after reflection.

• Ray Diagrams: Ray diagrams are essential tools in understanding how images are formed by mirrors. They involve tracing the path of light rays before and after reflection from a mirror.

Q8. Answer: (d) Nerve cells are very small in length

The correct answer is Nerve cells are very small in length.

Key Points

• Neuron is made up of axon and dendrites: This statement is correct. A neuron, the basic unit of nervous tissue, consists of three main parts: the cell body (soma), dendrites (which receive signals), and the axon (which transmits signals to other neurons or muscles).

• Examples are brain and spinal cord: This statement is correct. Nervous tissue forms the brain, spinal cord, and peripheral nerves, which are essential parts of the central and peripheral nervous systems.

• Cells are called nerve cells or neurons: This statement is correct. Nervous tissue is composed of nerve cells (neurons) and supporting cells (glial cells). Neurons are specialized for transmitting electrical and chemical signals.

• Nerve cells are very small in length: This statement is incorrect. Nerve cells can be incredibly long, with some axons measuring up to 1 meter in humans, such as the sciatic nerve, which extends from the spinal cord to the toes. This makes it one of the longest cells in the body.

Additional Information

• Structure of Neurons:

• Dendrites: Short, branching structures that receive signals from other neurons and relay them to the cell body.

• Axon: A long, slender projection that transmits signals away from the cell body to other neurons or muscles.

• Myelin Sheath: Many axons are covered by a myelin sheath, which increases the speed of nerve impulse conduction.

• Types of Neurons:

• Sensory Neurons: Carry signals from sensory organs to the central nervous system (CNS).

• Motor Neurons: Transmit signals from the CNS to muscles or glands.

• Interneurons: Found within the CNS, they connect sensory and motor neurons and are involved in reflexes and complex processes.

• Function of Nervous Tissue:

• Responsible for transmitting and processing information through electrical and chemical signals.

• Controls voluntary and involuntary actions of the body.

• Coordinates functions such as reflexes, sensory perception, and motor output.

• Examples of Long Neurons: The sciatic nerve, which extends from the lower back to the toes, is an example of a long neuron in humans. Its axons can measure over 1 meter in length.

Important Points

• Neuron Longevity: Unlike most cells in the body, neurons do not undergo cell division after a certain stage of development. They are designed to last a lifetime but are vulnerable to injury and disease.

• Glial Cells: These are non-neuronal cells in the nervous system that provide support, protection, and nourishment to neurons. Examples include astrocytes, microglia, and oligodendrocytes.

• Synapse: A synapse is a junction where a neuron communicates with another cell (neuron, muscle, or gland) via chemical messengers called neurotransmitters.

• Diseases Affecting Nervous Tissue: Conditions like Alzheimer's disease, Parkinson's disease, and multiple sclerosis can damage nervous tissue, affecting its function.

Q9. Answer: (b) CaSO4 · 1/2H2O

The correct answer is CaSO4 · 1/2H2O.

Key Points

• Plaster of Paris (POP) is chemically known as calcium sulfate hemihydrate, represented by the formula CaSO4 · 1/2H2O.

• It is produced by heating gypsum (calcium sulfate dihydrate, CaSO4 · 2H2O) to a temperature of about 373 K (100°C). This process removes water molecules and converts gypsum to plaster of Paris.

• Plaster of Paris is a white powder that, when mixed with water, forms a quick-setting paste which hardens by reabsorbing water.

• It is widely used in construction, sculptures, and molds due to its quick setting time and lightweight nature.

• POP is known for its non-shrinking and non-cracking properties when set, making it ideal for intricate designs and repairs.

Additional Information

• Gypsum (CaSO4·2H2O):

• Gypsum is a naturally occurring mineral and the primary material used to produce plaster of Paris.

• It contains two water molecules, which are partially removed during the heating process to form POP.

• Uses of Plaster of Paris:

• Construction: Used for making decorative elements like false ceilings and wall moldings.

• Medical: Utilized in orthopedic applications for making casts to immobilize broken bones.

• Art: POP is popular for creating sculptures and statues due to its fine texture and quick setting properties.

• Repairs: Used to fill cracks and holes in walls and ceilings.

• Other Calcium Compounds:

• Calcium sulfate dihydrate (CaSO4 · 2H2O): Known as gypsum and serves as the precursor to POP.

• Calcium sulfate anhydrous (CaSO4): A dehydrated form of calcium sulfate, used in industrial applications.

• Important Properties of POP:

• POP is lightweight and fire-resistant, making it suitable for interior decoration and insulation.

• It sets quickly when mixed with water and forms a smooth surface.

• It expands slightly upon setting, which helps in creating a detailed finish without cracks or shrinkage.

Important Points

• Common Misconception:

• Plaster of Paris is sometimes mistakenly identified as gypsum (CaSO4 · 2H2O), but the two are different.

• POP is derived from gypsum by removing 1.5 molecules of water, resulting in the formula CaSO4 · 1/2H2O.

• Handling Precautions:

• POP should be stored in a moisture-free environment, as it can reabsorb water and harden during storage.

• While mixing, proper ratios should be maintained to ensure effective setting and durability.

• Environmental Impact:

• The production of POP involves the use of gypsum, a non-renewable resource, and releases some carbon emissions during heating.

• Efforts are being made to use synthetic gypsum, a by-product of industrial processes, to reduce environmental impact.

Q10. Answer: (d) Exothermic reaction

The correct answer is Exothermic reaction.

Key Points

• An acid-base reaction typically involves the transfer of a proton (H^+) from the acid to the base. This process often results in the release of energy in the form of heat, making it an exothermic reaction.

• In an exothermic reaction, the overall energy released during the formation of products is greater than the energy required to break the bonds of reactants.

• A classic example of an acid-base reaction is the reaction between hydrochloric acid (HCl) and sodium hydroxide (NaOH) to form water (H2O) and sodium chloride (NaCl). This reaction releases heat, demonstrating its exothermic nature.

• The heat released during acid-base reactions is due to the strong bond formation between the hydrogen ion (H^+) and hydroxide ion (OH^-) to form water, which is a highly stable molecule.

• Exothermic reactions are characterized by a negative enthalpy change (ΔH), signifying the release of energy to the surroundings.

Additional Information

• Acid-Base Reaction:

• An acid is a substance that donates a proton (H^+), while a base is a substance that accepts a proton. This concept is based on the Bronsted-Lowry theory.

• Neutralization is a common type of acid-base reaction where an acid reacts with a base to form water and a salt. For example: HCl + NaOH → NaCl + H2O.

• Acid-base reactions are crucial in biological systems, industrial processes, and environmental chemistry.

• Characteristics of Exothermic Reactions:

• Energy is released to the surroundings, typically in the form of heat, light, or sound.

• The products of the reaction are usually more stable than the reactants.

• Examples include combustion reactions, condensation of water vapor, and many acid-base neutralizations.

• Other Options Explained:

• Redox Reaction: This involves the transfer of electrons between substances, leading to oxidation and reduction. Acid-base reactions generally do not involve electron transfer.

• Endothermic Reaction: These reactions absorb energy from the surroundings. Acid-base reactions are not endothermic as they release heat.

• Dissociation Reaction: This is the process where a compound breaks apart into ions in solution. While acids and bases dissociate in water, the neutralization process itself is not a dissociation reaction.

• Applications of Acid-Base Reactions:

• Used in the preparation of salts, such as sodium chloride in laboratories.

• Applied in antacid formulations to neutralize stomach acid.

• Important in biochemical processes like buffer systems in blood to maintain pH balance.

Important Points

• Enthalpy Change (ΔH): In exothermic reactions, ΔH is negative, indicating energy release.

• pH Scale: Measures the acidity or basicity of a solution. Acid-base reactions often alter the pH of a system.

• Buffer Solutions: These are solutions that resist changes in pH upon the addition of small amounts of acids or bases, showcasing the significance of acid-base chemistry in real-world applications.

Q11. Answer: (d) A-4; B-2; C-3; D-1

The correct answer is A - 4, B - 2, C - 3, D - 1.

Key Points

• Reaction of Sodium Carbonate (Na2CO3) with Hydrochloric Acid (HCl):

• The reaction produces Sodium Chloride (NaCl), Carbon Dioxide (CO2), and Water (H2O).

• Balanced chemical equation: Na2CO3 + 2HCl → 2NaCl + CO2 + H2O.

• Correct Match: A - 4.

• Reaction of Calcium Carbonate (CaCO3) with Sulfuric Acid (H2SO4):

• The reaction produces Calcium Sulfate (CaSO4), Carbon Dioxide (CO2), and Water (H2O).

• Balanced chemical equation: CaCO3 + H2SO4 → CaSO4 + CO2 + H2O.

• Correct Match: B - 2.

• General Reaction of Metal Carbonates with Acids:

• Metal carbonates react with acids to produce Salt, Carbon Dioxide (CO2), and Water (H2O).

• General equation: Metal Carbonate + Acid → Salt + CO2 + H2O.

• Correct Match: C - 3.

• Passing CO2 through Lime Water (Ca(OH)2):

• When CO2 is passed through lime water, it reacts to form Calcium Carbonate (CaCO3), which appears as a white precipitate.

• Balanced chemical equation: CO2 + Ca(OH)2 → CaCO3 (precipitate) + H2O.

• Correct Match: D - 1.

Additional Information

• Metal Carbonates and Bicarbonates:

• Metal carbonates (e.g., Na2CO3, CaCO3) and bicarbonates react with acids to release CO2 gas.

• This reaction is commonly used in laboratories to test for the presence of carbonates and bicarbonates.

• Lime Water Test:

• The lime water test is used to detect the presence of CO2 gas.

• The formation of a white precipitate (CaCO3) confirms the presence of CO2.

• Applications of Metal Carbonate Reactions:

• These reactions are widely used in industry for neutralization processes and gas detection.

• For example, in the manufacture of baking soda and in effervescent antacids.

• Importance of Carbon Dioxide:

• CO2 is a key component in the carbon cycle and is essential for photosynthesis in plants.

• It is also used in fire extinguishers, carbonated beverages, and refrigeration systems.

Important Points

• Visual Detection of CO2:

• The white precipitate of CaCO3 formed during the lime water test is a characteristic indicator of CO2.

• Further passing CO2 through lime water converts CaCO3 to calcium bicarbonate [Ca(HCO3)2], which dissolves in water.

• Environmental Impact of CO2:

• Excessive CO2 emissions contribute to global warming and climate change.

• It plays a significant role in the greenhouse effect, trapping heat in the Earth's atmosphere.

• Industrial Relevance:

• Reactions involving metal carbonates are essential in industries producing cement, glass, and soda ash.

• Understanding these reactions is crucial for improving process efficiency and reducing environmental impacts.

Q12. Answer: (b) different colours travel with different speeds in glass

The correct answer is different colours travel with different speeds in glass.

Key Points

• Dispersion of light occurs when white light splits into its constituent colours (Violet, Indigo, Blue, Green, Yellow, Orange, and Red) as it passes through a glass prism.

• This phenomenon happens because different colours of light have different wavelengths, and the refractive index of the glass varies with wavelength.

• As a result, different colours travel at different speeds in the glass, causing them to bend by different amounts. Violet bends the most, while Red bends the least.

• The varying degree of bending (refraction) leads to the separation of colours, creating the spectrum of light.

• The prism shape plays a critical role as the non-parallel surfaces cause the light to refract at different angles.

Additional Information

• Wavelength and Refractive Index:

• The refractive index of a material is inversely proportional to the wavelength of light passing through it.

• Shorter wavelengths (e.g., Violet) experience a higher refractive index and therefore bend more.

• Longer wavelengths (e.g., Red) experience a lower refractive index and bend less.

• Role of Prism:

• A glass prism has non-parallel surfaces that cause the incident light to refract twice: once upon entering and once upon exiting.

• Each colour bends by a different angle due to its unique speed in the medium, resulting in dispersion.

• Applications of Dispersion:

• Dispersion is the principle behind the formation of rainbows, where sunlight splits into its constituent colours due to refraction and reflection in raindrops.

• It is also used in spectroscopy to study the composition of light sources.

• Comparison of Options:

• Option 1: "The prism absorbs some colours and transmits others" is incorrect because no absorption takes place; the prism only refracts light.

• Option 3: "Different colours travel with the same speed in glass" is incorrect as different colours have different speeds due to their varying wavelengths.

• Option 4: "White light splits due to reflection inside the prism" is incorrect because dispersion occurs due to refraction, not reflection.

Important Points

• Refractive Index: It is a measure of how much the speed of light is reduced inside a medium compared to its speed in a vacuum.

• Snell's Law: The law governing the refraction of light states that the ratio of the sines of the angles of incidence and refraction is equal to the ratio of the refractive indices of the two media.

• Visible Spectrum: The range of wavelengths visible to the human eye lies between approximately 400 nm (Violet) to 700 nm (Red).

• Newton's Experiment: Sir Isaac Newton demonstrated that white light is made up of seven colours by passing it through a prism and recombining it with a second prism.

Q13. Answer: (a) heating effect of current

The correct answer is heating effect of current.

Key Points

• The fuse wire in electric circuits operates on the principle of the heating effect of current. When electric current passes through a conductor, it generates heat due to the resistance offered by the wire.

• The fuse is designed to protect electrical circuits and appliances from damage caused by excessive current. If the current exceeds a predefined limit, the fuse wire melts due to the heat produced.

• The melting of the fuse wire breaks the circuit, thereby stopping the flow of electricity and preventing overheating or short-circuiting.

• Fuse wires are typically made of materials with low melting points, such as tin or lead, to ensure they melt quickly under excessive current conditions.

• This mechanism is a critical component in ensuring safety in electrical systems, minimizing risks of fire or damage to appliances and infrastructure.

Additional Information

• Heating Effect of Current:

• The heating effect of current is a phenomenon where electric energy is converted into heat energy when a current flows through a conductor.

• The amount of heat generated can be calculated using the formula $H = I^2Rt$, where H is the heat produced, I is the current, R is the resistance, and t is the time duration.

• This effect is utilized in various devices like electric heaters, irons, and incandescent bulbs, apart from fuse wires.

• Induction Effect of Current:

• This refers to the generation of an electromotive force (EMF) in a conductor due to a changing magnetic field around it.

• It is the principle behind devices like transformers, electric generators, and motors.

• Unlike the heating effect, the induction effect does not involve the generation of heat but rather the generation of electrical energy.

• Chemical Effect of Current:

• The chemical effect of current occurs when electricity passes through an electrolyte, causing chemical reactions, such as electrolysis.

• Applications include processes like electroplating, electrorefining, and battery operation.

• This principle is not related to the functioning of fuse wires.

• Magnetic Effect of Current:

• This effect refers to the generation of a magnetic field around a current-carrying conductor.

• It is utilized in devices like electromagnets, solenoids, and electric bells.

• While this effect is significant in other applications, it is not relevant to the working of fuse wires.

Important Points

• Materials Used in Fuse Wires:

• Fuse wires are typically made of alloys such as tin-lead or copper alloy due to their low melting points.

• These materials ensure that the fuse melts quickly when subjected to excessive current, providing efficient circuit protection.

• Applications of Fuses:

• Fuses are widely used in household electrical systems, industrial machinery, and automobiles.

• They play a crucial role in preventing electrical accidents and ensuring the longevity of appliances.

• Difference Between Fuse and Circuit Breaker:

• While both serve the purpose of protecting circuits, a fuse melts and needs replacement after operation, whereas a circuit

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breaker can be reset and reused.

• Circuit breakers are more advanced and commonly used in modern electrical systems.

Q14. Answer: (b) Cross-sectional area

The correct answer is Cross-sectional area.

Key Points

• The resistance of a conductor is given by:

R = ρL/A

• Where:

• R = Resistance

• ρ = Resistivity of the material

• L = Length of the conductor

• A = Cross-sectional area of the conductor

• Therefore, resistance per unit length is:

R/L = ρ/A

• For a given material, ρ is constant, so resistance per unit length is inversely proportional to the cross-sectional area.

• Hence, the correct answer is Option 2.

Additional Information

• Resistivity (ρ):

• Intrinsic property of a material.

• Unit: ohm-metre (Ω·m).

• Conductivity (σ):

• Reciprocal of resistivity.

• σ = 1/ρ

• Unit: siemens per metre (S/m).

• Temperature:

• Affects resistance, but resistance per unit length is not directly defined as inversely proportional to temperature.

Important Points

• R = ρL/A

• Resistance prop. to Length (L)

• Resistance prop. to 1/Area (A)

• Resistance per unit length = ρ/A

• Thicker conductors have lower resistance because they possess a larger cross-sectional area.

Q15. Answer: (c) Plastic

The correct answer is Plastic.

Key Points

• Plastic is a human-made material designed to resist natural degradation processes, including bacterial action.

• Unlike organic substances like Butter, Rice, and Bread, which are biodegradable and can be broken down by bacteria, plastic is non-biodegradable.

• Plastics are composed of polymers, long chains of synthetic molecules derived from petrochemicals, which do not provide the necessary nutrients or conditions for bacteria to thrive and decompose them.

• Plastic pollution is a significant environmental concern because it persists in the environment for hundreds to thousands of years, contributing to issues like soil, water, and air contamination.

• Efforts to address the plastic problem include recycling, upcycling, and developing biodegradable plastics, but traditional plastics remain resistant to natural breakdown.

Additional Information

• Butter:

• Butter is an organic material derived from milk and is rich in fats and proteins.

• Bacteria can break down butter during processes like fermentation and spoilage, converting it into simpler compounds such as fatty acids and glycerol.

• Rice:

• Rice is a natural plant-based material composed mostly of starch.

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• Microorganisms can decompose rice by breaking down the starch into simpler sugars and organic acids, making it biodegradable.

• Bread:

• Bread, being made from flour, yeast, and other organic ingredients, is highly susceptible to bacterial and fungal decomposition.

• Bacteria and fungi, such as mold, thrive on bread in warm and moist conditions, breaking it down into simpler organic compounds.

• Plastic Characteristics:

• Plastics are categorized into thermoplastics (e.g., polyethylene, polypropylene) and thermosetting plastics (e.g., polyurethane, epoxy resin).

• They are used in various industries such as packaging, construction, electronics, and healthcare due to their durability and versatility.

• Environmental concerns arise due to their non-biodegradability, leading to accumulation in ecosystems.

• Innovations such as bioplastics aim to create alternatives that can decompose naturally.

Important Points

• Environmental Impact of Plastic:

• Plastic waste contributes to problems such as marine pollution, wildlife endangerment, and disruption of ecosystems.

• Globally, over 300 million tons of plastic are produced each year, and approximately 8 million tons end up in the oceans annually.

• Microplastics, tiny fragments of plastic, pose risks to marine life and human health as they accumulate in food chains.

• Biodegradable Alternatives:

• Materials like PLA (Polylactic Acid) and PHA (Polyhydroxyalkanoates) are being developed as biodegradable plastics.

• These alternatives decompose under specific conditions, offering a potential solution to plastic pollution.

• Recycling Initiatives:

• Recycling helps reduce plastic waste by converting it into reusable products.

• Advanced technologies like chemical recycling break down plastic into its original monomers for reuse.

• Global Policies:

• Countries are implementing bans on single-use plastics. For example, India banned single-use plastic items such as straws and cutlery in July 2022.

• International initiatives like the United Nations Environment Programme (UNEP) advocate for reducing plastic production and encouraging sustainable alternatives.

Q16. Answer: (a) Al < Ca < K

The correct answer is Al < Ca < K.

Key Points

• Reactivity of metals is determined by their tendency to lose electrons and form positive ions. This is influenced by their position in the periodic table.

• In the given metals, Potassium (K), Calcium (Ca), and Aluminum (Al), the reactivity increases as we move down a group or to the left across a period.

• Potassium (K) is in Group 1 of the periodic table, making it highly reactive. Alkali metals like potassium have low ionization energy and readily lose their single valence electron.

• Calcium (Ca) belongs to Group 2, the alkaline earth metals. It is less reactive than potassium but more reactive than aluminum because it has two valence electrons that are fairly easy to lose.

• Aluminum (Al) is in Group 13 and is less reactive than potassium and calcium. Although it has three valence electrons, the effective nuclear charge is higher, making it more difficult for aluminum to lose electrons compared to potassium and calcium.

• Therefore, the correct order of increasing reactivity is Al < Ca < K.

Additional Information

• Reactivity Trends in Groups and Periods:

• In a group, reactivity increases as we move down because the atomic size increases, and the outermost electrons are farther from the nucleus, making them easier to lose.

• In a period, reactivity decreases from left to right because the effective nuclear charge increases, pulling the electrons closer to the nucleus and making them harder to lose.

• Reactivity of Potassium:

• Potassium is a soft, silvery-white metal that reacts violently with water to form potassium hydroxide and hydrogen gas.

• It is stored in oil to prevent a reaction with moisture and oxygen in the air.

• Reactivity of Calcium:

• Calcium reacts with water more slowly than potassium to form calcium hydroxide and hydrogen gas.

• It is used in construction (lime and cement) and as a reducing agent in the extraction of other metals.

• Reactivity of Aluminum:

• Aluminum is less reactive due to the formation of a protective oxide layer that prevents further reactions.

• It is widely used in industries for its lightweight and corrosion-resistant properties.

Important Points

• Activity Series of Metals: The activity series ranks metals based on their reactivity. Potassium is at the top, followed by calcium, while aluminum is much lower in the series.

• Displacement Reactions: More reactive metals can displace less reactive metals from their compounds. For example, potassium can displace calcium or aluminum from their respective compounds.

• Practical Applications:

• Potassium compounds are used in fertilizers and fireworks due to their high reactivity.

• Calcium is used in the metallurgical industry and as a deoxidizer in steel production.

• Aluminum is used in packaging, transportation, and construction due to its strength-to-weight ratio and resistance to corrosion.

Q17. Answer: (c) Transfer of pollen from the anther of one flower to the stigma of another flower

The correct answer is Transfer of pollen from the anther of one flower to the stigma of another flower.

Key Points

• Cross-pollination refers to the transfer of pollen grains from the anther of one flower to the stigma of another flower of the same species. This is the correct definition of cross-pollination.

• It is a type of sexual reproduction in plants that ensures genetic diversity, as pollen from a different plant is introduced to the ovule of another plant.

• This process often involves external agents like wind, water, insects, or animals to facilitate the transfer of pollen.

• Cross-pollination is important for plants to adapt to changing environments and evolve, as it introduces genetic variations in the species.

• The other options provided in the question are incorrect as they do not align with the scientific definition of cross-pollination.

Additional Information

• Self-Pollination:

• Self-pollination occurs when pollen grains are transferred from the anther to the stigma of the same flower or another flower on the same plant.

• This process requires no external agents and results in genetically identical offspring to the parent plant, maintaining genetic uniformity.

• Agents of Cross-Pollination:

• Wind (Anemophily): Plants like maize and wheat rely on wind to carry their lightweight pollen grains to other flowers.

• Insects (Entomophily): Insect-pollinated plants like sunflowers and roses produce colorful flowers and nectar to attract bees, butterflies, and other insects.

• Water (Hydrophily): Aquatic plants like seagrasses utilize water currents to transfer pollen between flowers.

• Animals (Zoophily): Birds, bats, and other animals also aid in cross-pollination by carrying pollen from one flower to another as they feed.

• Importance of Cross-Pollination:

• Ensures genetic variation, which is crucial for the survival and evolution of plant species in changing environmental conditions.

• Increases the chances of plants adapting to new pests, diseases, and climates, enhancing ecological resilience.

• Many fruits, vegetables, and grains depend on cross-pollination, making it essential for agriculture and food production.

• Incorrect Options Explained:

• Option 1: "Transfer of pollen from one plant to a non-flowering plant" is incorrect as non-flowering plants reproduce differently (e.g., through spores).

• Option 2: "Fertilization of an ovule without pollen transfer" is incorrect as fertilization in plants involves pollen transfer for sexual reproduction.

• Option 4: "Transfer of pollen within the same flower" refers to self-pollination, not cross-pollination.

Important Points

• Cross-Pollination Examples:

• Plants like apple, mango, and cucumber depend on cross-pollination for fruit production.

• Insects like honeybees play a significant role in pollinating crops such as almonds and blueberries.

• Impact on Agriculture:

• Cross-pollination is vital for high crop yields, ensuring better quality fruits and seeds.

• A decline in pollinator populations, such as bees, can negatively impact agricultural productivity.

• Fun Fact:

• The world's most expensive spice, saffron, is produced from flowers that rely on manual cross-pollination due to their unique structure.

Q18. Answer: (b) Both gonorrhoea and syphilis

The correct answer is Both gonorrhoea and syphilis.

Key Points

• Syphilis: Syphilis is a sexually transmitted disease caused by the bacterium Treponema pallidum. It can lead to serious health complications if left untreated, including damage to the brain, nerves, and other organs.

• Gonorrhoea: Gonorrhoea is caused by the bacterium Neisseria gonorrhoeae. This infection affects mucous membranes of the reproductive tract, as well as the mouth, throat, eyes, and rectum.

• Both syphilis and gonorrhoea are bacterial infections, making antibiotic treatment effective in managing these diseases if diagnosed early.

• These sexually transmitted infections (STIs) are primarily spread through unprotected sexual contact. Practicing safe sex and regular health check-ups are essential for prevention.

• Warts: Warts are caused by the human papillomavirus (HPV), which is a virus, not a bacterium. This makes them different from bacterial STIs like syphilis and gonorrhoea.

• Key difference: Syphilis and gonorrhoea are bacterial infections, while warts are viral, highlighting the importance of distinguishing between different types of STIs.

Additional Information

• Syphilis:

• Stages: Syphilis progresses through primary, secondary, latent, and tertiary stages. Each stage has distinct symptoms, from painless sores to neurological damage in advanced stages.

• Detection: Syphilis can be diagnosed through blood tests, including rapid plasma reagin (RPR) and treponemal antibody tests.

• Treatment: The standard treatment for syphilis is penicillin, which is highly effective in all stages of the infection.

• Global impact: Syphilis remains a significant public health issue in developing countries. Efforts to control it include early diagnosis and treatment campaigns.

• Gonorrhoea:

• Symptoms: Gonorrhoea symptoms include painful urination, discharge, and pelvic pain. However, it can also be asymptomatic, making regular testing crucial.

• Antibiotic resistance: Gonorrhoea has shown increasing resistance to antibiotics, with cephalosporins being the current recommended treatment.

• Prevention: Using condoms and reducing the number of sexual partners can lower the risk of gonorrhoea transmission.

• Complications: Untreated gonorrhoea can lead to infertility, pelvic inflammatory disease, and systemic infections.

• Human Papillomavirus (HPV):

• Cause of warts: HPV is responsible for genital warts and cervical cancer. It is transmitted through skin-to-skin contact during sexual activity.

• Vaccine: HPV vaccines like Gardasil and Cervarix are effective in preventing high-risk strains of HPV.

• Detection: HPV is diagnosed via Pap smear tests and HPV DNA tests.

• Global prevalence: HPV is one of the most common STIs globally, with millions of new cases reported annually.

• Important Points:

• Education: Comprehensive sexual education is essential to raise awareness about STIs, their symptoms, prevention, and treatment.

• Regular screening: Regular STI screenings are crucial, especially for sexually active individuals, to ensure early detection and treatment.

• Public health initiatives: Governments and health organizations worldwide run campaigns to promote safe sexual practices and reduce the spread of STIs.

Q19. Answer: (c) Pascal

The correct answer is Pascal.

Key Points

• Pascal (Pa) is the SI unit of pressure. It is defined as one newton per square meter (N/m^2).

• Pressure is mathematically expressed as the force applied per unit area: Pressure = Force / Area.

• In gas measurement, pressure is crucial for understanding the behavior of gases under different conditions, following the principles of gas laws like Boyle's Law and Charles's Law.

• The name "Pascal" honors the French mathematician and physicist Blaise Pascal, who made significant contributions to fluid mechanics and pressure studies.

• Pascal is widely used in various scientific and engineering fields, including meteorology, thermodynamics, and fluid dynamics, to measure gas pressure, atmospheric pressure, and other related quantities.

Additional Information

• Kelvin:

• Kelvin (K) is the SI unit of temperature, not pressure.

• It is used to measure the absolute temperature of gases, which is crucial for understanding gas behavior under the laws of thermodynamics.

• The Kelvin scale starts at absolute zero, the point where all molecular motion theoretically ceases.

• Newton:

• Newton (N) is the SI unit of force, not pressure.

• It is defined as the force required to accelerate a mass of one kilogram by one meter per second squared ($kg \cdot m/s^2$).

• Newton is used in the calculation of pressure but is not itself a direct measure of pressure.

• Joule:

• Joule (J) is the SI unit of energy, not pressure.

• It is defined as the energy transferred when a force of one newton is applied over a distance of one meter.

• Joules are used in thermodynamics to calculate the energy associated with gases but are not relevant to pressure measurement.

• Applications of Pascal:

• Widely used in engineering, meteorology, and fluid mechanics to measure quantities like gas pressure, atmospheric pressure, and hydraulic pressure.

• One practical example is the measurement of tire pressure, which is often expressed in kilopascals (kPa).

• Atmospheric pressure at sea level is approximately 101,325 Pa, which is equivalent to 1 atm (standard atmospheric pressure).

Important Points

• Gas Laws and Pressure:

• Boyle's Law: At constant temperature, the pressure of a gas is inversely proportional to its volume (P prop. to 1/V).

• Charles's Law: At constant pressure, the volume of a gas is directly proportional to its absolute temperature (V prop. to T).

• Ideal Gas Law: The relationship between pressure, volume, and temperature is expressed as PV = nRT, where R is the universal gas constant.

• Pressure Conversions:

• 1 atm = 101,325 Pa = 760 mmHg = 14.7 psi (pounds per square inch).

• These conversions are crucial for applications in different fields, such as aviation, weather forecasting, and industrial processes.

Q20. Answer: (a) Examine the structure and function of the heart

The correct answer is Examine the structure and function of the heart.

Key Points

• Ultrasound in echocardiography is primarily used to examine the structure and function of the heart. This includes assessing the heart chambers, valves, and blood flow in real-time.

• Echocardiography is a non-invasive diagnostic tool that uses high-frequency sound waves to create images of the heart, helping in diagnosing cardiac abnormalities.

• It is particularly useful in evaluating conditions such as heart valve diseases, heart failure, congenital heart defects, and detecting blood clots or tumors in the heart.

• Unlike other options like determining body weight or measuring blood sugar levels, echocardiography focuses exclusively on the cardiovascular system.

• This technique is widely employed in both emergency and routine settings for a comprehensive evaluation of heart health.

Additional Information

• How Echocardiography Works:

• Echocardiography uses ultrasound waves emitted by a transducer to penetrate the chest wall and reflect off heart structures.

• The reflected waves are then converted into images by a computer, providing a real-time view of the heart's anatomy and function.

• Types of Echocardiography:

• Transthoracic Echocardiography (TTE): The most common type where the transducer is placed on the chest wall.
• Transesophageal Echocardiography (TEE): Involves inserting a probe into the esophagus for clearer images, especially in obese patients.
• Stress Echocardiography: Assesses heart function under physical stress or pharmacologically induced stress.
• Doppler Echocardiography: Measures the speed and direction of blood flow, essential for evaluating valve-related issues.
• Applications of Echocardiography:
• Helps in diagnosing heart valve disorders like stenosis or regurgitation.
• Evaluates the pumping efficiency of the heart, known as the ejection fraction, critical in heart failure cases.
• Detects congenital heart defects in infants and adults.
• Guides procedures like cardiac catheterization or valve replacement surgery.
• Comparison with Other Options:
• Determining body weight: This is done through scales and has no relation to echocardiography.
• Cleaning arterial blockages: This is a surgical or catheter-based intervention, not performed by echocardiography.
• Measuring blood sugar levels: Requires blood tests or glucometers, unrelated to ultrasound technology.

Important Points

• Advantages of Echocardiography:
• It is non-invasive, painless, and does not involve radiation exposure.
• Provides real-time imaging, making it ideal for dynamic assessments of heart function.
• Can be performed at the bedside, especially in critical care settings.
• Limitations:
• Image quality may be affected in patients with obesity or those with lung diseases.
• May require additional imaging methods like CT or MRI for more detailed anatomical assessment.

Q21. Answer: (b) Nervous tissue

The correct answer is Nervous tissue.

Key Points

• Nervous tissue is specialized for transmitting rapid electrical impulses, which are essential for communication between different parts of the body.
• This tissue consists of neurons (nerve cells) and supporting cells (glial cells) that work together to process and transmit signals.
• Neurons have unique structures such as axons and dendrites, which enable them to carry signals over long distances and connect with other neurons or tissues like muscles.
• Nervous tissue plays a critical role in controlling muscle movement by transmitting signals from the brain to the muscles through the central and peripheral nervous systems.
• This tissue is found in the brain, spinal cord, and peripheral nerves, and is integral to the functioning of the body, including voluntary and involuntary responses.

Additional Information

• Epithelial tissue:
• It covers the body surfaces, lines internal organs and cavities, and forms glands.
• Its primary functions include protection, secretion, absorption, and filtration.
• Examples include the skin's outer layer, the lining of the digestive tract, and glands like sweat glands.
• It does not transmit electrical impulses.
• Adipose tissue:
• Adipose tissue is a type of connective tissue that stores fat and provides insulation and cushioning to the body.
• It plays a role in energy storage and hormone regulation but is not involved in transmitting signals or muscle movement.
• It is found beneath the skin, around internal organs, and in bone marrow.
• Connective tissue:
• Connective tissue supports, connects, and binds other tissues and organs in the body.
• It includes bone, blood, cartilage, and tendons, and its primary function is structural support.
• While it may contain nerves, it does not specialize in transmitting electrical impulses.
• Functions of Nervous tissue:
• It coordinates voluntary movements such as walking, writing, and speaking.
• It controls involuntary processes like heartbeat, digestion, and reflex actions.
• It facilitates complex activities like thinking, memory, and problem-solving.

• Examples include the optic nerve for vision and the motor neurons for muscle contraction.

Important Points

• Characteristics of Nervous Tissue:

• Nervous tissue has a high degree of excitability and conductivity, making it perfect for signal transmission.

• Neurons are specialized cells with a cell body, axons, and dendrites that facilitate the rapid relay of information.

• Glial cells provide support, nutrition, and protection to neurons, ensuring their efficient functioning.

• Clinical Relevance:

• Damage to nervous tissue can lead to conditions like paralysis, neuropathy, or neurodegenerative disorders such as Alzheimer's disease.

• Medical imaging techniques like MRIs and CT scans are used to diagnose issues related to nervous tissue.

• Rehabilitation therapies aim to restore lost functions after nervous tissue damage.

Q22. Answer: (d) Metamorphosis

The correct answer is Metamorphosis.

Key Points

• Metamorphosis is the biological process through which a larva transforms into an adult frog, involving drastic physical and physiological changes.

• During metamorphosis, the tadpole undergoes significant changes such as the development of limbs, loss of the tail, and the formation of lungs for breathing air instead of gills.

• This process is characteristic of amphibians like frogs and is regulated by hormones, primarily thyroxine produced by the thyroid gland.

• Metamorphosis occurs in distinct stages: egg, larva (tadpole), and adult, marking the frog's transition from an aquatic to a terrestrial lifestyle.

• The changes during metamorphosis enable the adult frog to adapt to new habitats and perform essential functions such as reproduction and survival on land.

Additional Information

• Stages of Frog Life Cycle:

• Egg Stage: Frogs lay eggs in water, which hatch into larvae called tadpoles.

• Larva (Tadpole) Stage: Tadpoles have tails, gills, and a herbivorous diet. They are entirely aquatic at this stage.

• Adult Stage: After metamorphosis, adult frogs develop lungs, limbs, and lose their tails, becoming capable of living both in water and on land.

• Role of Hormones:

• The thyroid hormone thyroxine is crucial in regulating metamorphosis. Its concentration determines the pace of transformation.

• Other hormones like prolactin also play a role in maintaining larval characteristics until metamorphosis begins.

• Adaptations in Adult Frogs:

• Adult frogs have lungs for breathing air and moist skin for cutaneous respiration.

• They develop strong hind limbs for jumping and swimming.

• Frogs shift to a carnivorous diet, feeding on insects and other small organisms.

• Other Animals Undergoing Metamorphosis:

• Metamorphosis is common in insects (e.g., butterflies, moths), amphibians (e.g., frogs, toads), and some marine species like starfish.

• In insects, metamorphosis can be complete (egg, larva, pupa, adult) or incomplete (egg, nymph, adult).

Important Points

• Metamorphosis vs. Direct Development:

• Metamorphosis: Involves drastic changes in form and function during the life cycle (e.g., frogs, insects).

• Direct Development: In some species, there are no drastic changes, and offspring resemble miniature adults (e.g., humans, reptiles).

• Environmental Influence:

• Factors like temperature, water quality, and availability of food can impact the rate and success of metamorphosis.

• Pollution and habitat destruction can hinder the normal development of amphibians.

• Scientific Importance:

• Studying metamorphosis helps scientists understand growth, development, and hormonal regulation in organisms.

• Amphibians are considered bio-indicators for ecological health due to their sensitivity to environmental changes.

Q23. Answer: (a) Growing multiple crops on a field in the same season

The correct answer is Growing multiple crops on a field in the same season.

Key Points

• Mixed Cropping is an agricultural practice where two or more crops are grown simultaneously on the same piece of land during a single growing season.

• The main objective of mixed cropping is to maximize resource utilization, such as sunlight, water, and soil nutrients, while minimizing risks associated with crop failure.

• Different types of crops, such as cereals and legumes, are often grown together to enhance soil fertility. For example, wheat and gram, or maize and beans, are common combinations.

• Mixed cropping helps in pest and disease management as different crops can repel or resist specific pests and diseases more effectively than a monoculture.

• This method is particularly useful in regions with unreliable rainfall or limited irrigation facilities, as it ensures better chances of yield from at least one crop.

Additional Information

• Benefits of Mixed Cropping:

• Risk Mitigation: Mixed cropping reduces the risk of total crop failure, as different crops respond differently to environmental conditions.

• Improved Soil Health: Growing legumes alongside cereals improves soil fertility through nitrogen fixation.

• Increased Biodiversity: It promotes biodiversity in agricultural fields, which benefits the ecosystem.

• Efficient Land Use: Mixed cropping ensures optimal use of available land and resources.

• Examples of Mixed Cropping:

• Wheat + Mustard: Commonly practiced in North India to utilize different growth patterns and nutrient needs.

• Sorghum + Pigeon Pea: Suitable for semi-arid regions.

• Maize + Cowpea: A common practice for fodder production.

• Difference between Mixed Cropping and Intercropping:

• Mixed Cropping: Crops are grown together without any specific arrangement.

• Intercropping: Crops are grown in a specific pattern, such as rows or strips, to ensure better management and yield.

• Limitations of Mixed Cropping:

• Competition: Crops may compete for sunlight, water, and nutrients, potentially reducing yield.

• Complexity: It requires careful crop selection and management to ensure compatibility and avoid adverse effects.

Important Points

• Other Cropping Systems:

• Monocropping: Growing only one type of crop on a field in a single season. It is simple but risky due to pests and diseases.

• Crop Rotation: Rotating different crops in different seasons to improve soil fertility and reduce pest buildup.

• Relay Cropping: Planting a second crop before the first crop is harvested, ensuring continuous crop production.

• Historical Context: Mixed cropping has been practiced for centuries in traditional agriculture, especially in subsistence farming systems.

Q24. Answer: (c) Tracheids, vessels, xylem parenchyma, xylem fibres

The correct answer is Tracheids, vessels, xylem parenchyma, xylem fibres.

Key Points

• Xylem is one of the two types of vascular tissues in plants, the other being phloem. Its primary function is the conduction of water and dissolved minerals from the roots to other parts of the plant.

• The main components of xylem include:

• Tracheids: These are elongated, tube-like cells with thickened lignified walls. They are dead cells and lack protoplasm, allowing efficient water conduction.

• Vessels: These are cylindrical tube-like structures formed from a series of vessel elements. They are also dead and function as the primary water-conducting cells in angiosperms.

• Xylem Parenchyma: These are the only living cells in xylem. They store food materials and assist in lateral conduction of water.

• Xylem Fibres: These are sclerenchymatous fibres that provide mechanical support to the plant.

• The combination of tracheids, vessels, xylem parenchyma, and xylem fibres ensures both the conduction of water and minerals and structural support in vascular plants.

• Sieve tubes, companion cells, phloem parenchyma, and phloem fibres belong to the phloem tissue, not xylem, making options with these components incorrect.

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Additional Information

• Tracheids:

• Found in both gymnosperms and angiosperms, but they are the primary water-conducting cells in gymnosperms.

• They have pits for water movement between adjacent cells.

• Vessels:

• They are more efficient in water conduction than tracheids due to their larger diameter and continuous column formation.

• Vessels are a characteristic feature of angiosperms.

• Xylem Parenchyma:

• It stores starch, fats, tannins, and other substances.

• It assists in the radial conduction of water through the plant body.

• Xylem Fibres:

• Provide structural strength to the plant.

• They are highly lignified and non-living.

• Phloem Tissue:

• The phloem is responsible for the transport of organic nutrients, primarily sugars, from leaves to other parts of the plant.

• Its components include sieve tubes, companion cells, phloem parenchyma, and phloem fibres.

Important Points

• Function of Xylem:

• Xylem conducts water and mineral nutrients from the roots to aerial parts of the plant.

• It provides mechanical support to the plant due to its lignified cell walls.

• Comparison of Xylem and Phloem:

• Xylem transports water and minerals, while phloem transports food (sucrose) and other organic materials.

• Xylem tissues are mostly dead at maturity, whereas phloem tissues are mostly living.

• Significance of Water Conduction:

• Water is essential for photosynthesis, transpiration, and maintaining cell turgidity.

• Xylem plays a critical role in plant survival, especially in tall trees where water needs to be transported to great heights.

Q25. Answer: (c) To remove undesirable impurities (gangue) from the ore.

The correct answer is To remove undesirable impurities (gangue) from the ore.

Key Points

• The process of enrichment of ores, also called ore concentration, is a critical step in metallurgy where the goal is to remove gangue (unwanted impurities) such as sand, clay, and rocks from the ore.

• Gangue materials are non-metallic and do not contain the valuable metal. Their removal ensures a higher concentration of the desired metal in the ore.

• The enrichment process improves the efficiency and cost-effectiveness of subsequent metallurgical operations such as smelting and refining.

• Common enrichment techniques include:

• Gravity separation: Based on differences in specific gravity between ore and gangue particles.

• Froth flotation: Used for sulfide ores, where ore particles attach to froth and are separated.

• Magnetic separation: Suitable for magnetic ores like magnetite to separate them from non-magnetic impurities.

• Leaching: A chemical process where a solvent is used to extract the desired metal from the ore.

• Hence, the main objective of the enrichment of ores is to remove undesirable impurities (gangue) to concentrate the metal content in the ore.

Additional Information

• Steps in Metallurgy:

• Ore Extraction: The process of mining the ore from the earth's crust.

• Enrichment of Ores: Removal of gangue particles to increase the metal concentration.

• Reduction: Conversion of the metal ore into its free metal state through methods like smelting or electrolysis.

• Refining: Purification of the extracted metal to achieve a higher level of purity.

• Definitions:

• Ore: A naturally occurring material containing metal that can be profitably mined.

• Gangue: Non-metallic impurities mixed with the ore.

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• Explanation of Incorrect Options:
• Option 1: Refining is a later process in metallurgy, not part of ore enrichment.
• Option 2: Alloy formation involves combining metals, which is unrelated to ore concentration.
• Option 4: Converting ore into its molten form happens during smelting, not enrichment.
• Real-Life Applications:
• The froth flotation method is widely used in industries for sulfide ore processing, such as copper and zinc extraction.
• Magnetic separation is essential for iron ore like magnetite.

Q26. Answer: (c) 73.5

Shortcut Trick
Let the original number be 100%.
Given that 20% of the number + 84 = 100% of the number.
=> 100% − 20% = 80%
So, 80% of the number = 84
=> 70% of the number = (84 ÷ 80) × 70 = 73.5
Therefore The correct answer is 73.5.
Alternate Method
Total Number = 100% (x) 20% 80% = 84 70% = ?
Let the original number be x.
According to the given condition:
=> 20% of x + 84 = x
=> 0.2x + 84 = x
=> x − 0.2x = 84
=> 0.8x = 84
=> x = 84 ÷ 0.8
=> x = 105
Now, we need to find 70% of the number:
=> 70% of 105 = (70 ÷ 100) × 105
=> 0.7 × 105 = 73.5
Therefore The correct answer is 73.5.
Additional Information
Base Value Concept
The original quantity is always considered as 100% (the base). Any addition or subtraction in percentage directly corresponds to the absolute change in the value relative to this 100% base.
Unitary Method in Percentages
If the value of a certain percentage is known, any other percentage can be found directly by establishing the 1% value. Required Value = (Given Value ÷ Given %) × Required %.
Fractional Equivalents
Converting percentages to fractions speeds up calculations. For example, 20% = 1/5, 80% = 4/5, and 70% = 7/10. Here, 4/5 of the number is 84, so 1/5 is 21, and 7/10 is 73.5.

Q27. Answer: (d) 18

Shortcut Trick
Assume all 28 vehicles are motorcycles (2 wheels each).
Theoretical total wheels = 28 × 2 = 56 wheels.
Difference from actual wheels = 92 − 56 = 36 wheels.
Each car adds 2 extra wheels (4 − 2 = 2) compared to a motorcycle.
Number of cars = 36 ÷ 2 = 18.
Therefore The correct answer is 18.
Alternate Method
Given:
Total Vehicles = 28
Total Wheels = 92

Let the number of cars be C and motorcycles be M.

=> C + M = 28 --- (Equation 1)

=> 4C + 2M = 92 --- (Equation 2)

=> Simplify Equation 2 by dividing by 2: 2C + M = 46 --- (Equation 3)

=> Subtract Equation 1 from Equation 3:

=> (2C + M) − (C + M) = 46 − 28

=> C = 18

Therefore The correct answer is 18.

Additional Information

Linear Equations in Two Variables

This problem is a classic application of simultaneous equations where two conditions are used to find two unknowns.

The Alligation Method

You can also solve this by taking the average wheels per vehicle (92 ÷ 28) and applying the alligation cross-method against 4 (cars) and 2 (motorcycles).

Legs and Heads Problems

Similar logic applies to biology problems (e.g., chickens and cows) where the total number of heads and legs are given to find the count of each animal.

Q28. Answer: (d) 36 years

Shortcut Trick

Ratio of Danish to Roshan = 4 : 5

Difference in ratio units = 5 − 4 = 1 unit

Given age difference = 9 years => 1 unit = 9 years

Danish's age = 4 units = 4 × 9 = 36 years

Therefore The correct answer is 36 years.

Alternate Method

Given:

Ratio of ages of Danish and Roshan = 4 : 5

Let the age of Danish be 4x and Roshan be 5x.

Calculations:

=> Age difference = 5x − 4x = 9 years

=> x = 9

=> Danish's age = 4x = 4 × 9

=> Danish's age = 36 years

Therefore The correct answer is 36 years.

Additional Information

Ratio & Proportion

If two quantities are in ratio a : b, their actual values can be taken as ax and bx, where x is the common multiplier.

Age Problems Rule

The difference between the ages of two persons remains constant regardless of the number of years passed or preceding.

Q29. Answer: (b) 24 cm

Shortcut Trick

For an equilateral triangle, the side (a) is calculated as: $a^2 = 4 \times \text{Area} / \sqrt{3}$.

=> $a^2 = 4 \times 16\sqrt{3} / \sqrt{3} = 64$

=> Side (a) = $\sqrt{64} = 8$ cm.

=> Perimeter = $3 \times a = 3 \times 8 = 24$ cm.

Therefore The correct answer is 24 cm.

Alternate Method

Given:

Area of the equilateral triangle = $16\sqrt{3}$ cm²

Formula Used:

Area of equilateral triangle = $(\sqrt{3} / 4) \times a^2$

Perimeter of equilateral triangle = 3 × a
(where 'a' is the side of the triangle)
Calculations:
=> $16\sqrt{3} = (\sqrt{3} / 4) \times a^2$
=> $16 = a^2 / 4$
=> $a^2 = 16 \times 4$
=> $a^2 = 64$
=> $a = \sqrt{64}$
=> a = 8 cm
=> Perimeter = 3 × 8
=> Perimeter = 24 cm
Therefore The correct answer is 24 cm.
Additional Information
Height of an Equilateral Triangle
The altitude or height (h) is given by the formula: $h = (\sqrt{3} / 2) \times a$.
Inradius and Circumradius
For a side 'a', Inradius (r) = $a / (2\sqrt{3})$ and Circumradius (R) = $a / \sqrt{3}$.
Area in terms of Height
The area can also be expressed using height (h) as: Area = $h^2 / \sqrt{3}$.

Q30. Answer: (b) Rs. 28,600

Shortcut Trick
Total Cost Price (CP) = Rs. 18,000 + Rs. 8,000 = Rs. 26,000.
To get a Profit of 10%, Selling Price (SP) = 110% of CP.
Multiplier SP = 26,000 × (110 ÷ 100) = 26,000 × 1.1.
SP = Rs. 28,600.
Therefore The correct answer is Rs. 28,600.
Alternate Method
Given: Purchase Price = Rs. 18,000, Overhead Expenses = Rs. 8,000, Profit% = 10%.
Formulas: Total CP = Purchase Price + Expenses | SP = CP × (100 + Profit%) ÷ 100.
=> Total Cost Price (CP) = 18,000 + 8,000 = Rs. 26,000.
=> Profit Amount = 10% of 26,000 = (10 ÷ 100) × 26,000 = Rs. 2,600.
=> Selling Price (SP) = CP + Profit = 26,000 + 2,600.
=> SP = Rs. 28,600.
Therefore The correct answer is Rs. 28,600.
Additional Information
Total Cost Price
In profit and loss problems involving second-hand items, the repairing cost or overhead expenses are always added to the original purchase price to calculate the total CP.
Profit Calculation
Profit percentage is always calculated on the Total Cost Price (including overheads), not just the initial purchase price.

Q31. Answer: (b) Rs. 5,203

Shortcut Trick
Net effective Compound Interest rate for 2 years at 10% = 10 + 10 + (10 × 10)/100 = 21%.
Total Amount = 100% (Principal) + 21% (Interest) = 121% of Principal.
Amount = 121% of Rs. 4,300 = 1.21 × 4300 = Rs. 5,203.
Therefore The correct answer is Rs. 5,203.
Alternate Method
Given:
Principal (P) = Rs. 4,300
Rate (R) = 10% per annum

Time (n) = 2 years
Formula Used:
Amount (A) = $P(1 + R/100)^n$
Calculations:
=> $A = 4300 \times (1 + 10/100)^2$
=> $A = 4300 \times (1 + 1/10)^2$
=> $A = 4300 \times (11/10)^2$
=> $A = 4300 \times (121 / 100)$
=> A = 43 × 121
=> A = Rs. 5,203
Therefore The correct answer is Rs. 5,203.
Additional Information
Compound Interest Formula
CI = Amount − Principal = $P[(1 + R/100)^n - 1]$.
Effective Rate for 2 Years
If interest is compounded annually, the effective rate for 2 years is R + R + (R×R)/100 %.
Difference between CI and SI
For 2 years, the difference between CI and SI is $P(R/100)^2$.

Q32. Answer: (c) 9

Shortcut Trick
Combined efficiency of A and B = 1/3 work/day.
Efficiency of B alone = 1/9 work/day.
Efficiency of A = 1/3 − 1/9 = 2/9 work/day.
Time for A to do double work = (2 × 1) ÷ (2/9) = 9 days.
Therefore The correct answer is 9 days.
Alternate Method
Given: Time taken by (A + B) = 3 days, Time taken by B = 9 days.
Formula Used: Total Work = LCM of days; Efficiency = Total Work ÷ Time.

Person	Days	Total Work	Efficiency
A + B	3	9 units	3 units/day
B	9	1 unit/day	

=> Efficiency of A = Efficiency of (A + B) − Efficiency of B
=> Efficiency of A = 3 − 1 = 2 units/day
=> New Total Work = 2 × 9 = 18 units (Double the work)
=> Time taken by A = New Total Work ÷ Efficiency of A
=> Time taken by A = 18 ÷ 2 = 9 days
Therefore The correct answer is 9 days.
Additional Information
Efficiency and Time Relation
Time taken is inversely proportional to efficiency. If efficiency doubles, time taken to complete the same work is halved.
Work and Wages
Wages are generally distributed in the ratio of work done or the ratio of efficiencies when all persons work for the same duration.

Q33. Answer: (d) 3°

Shortcut Trick
The angle formed by the bisectors of two adjacent angles in a quadrilateral is equal to half the sum of the other two angles.
Sum of angle P + angle Q = 2 × angle STR = 2 × 10.5° = 21°.
Given ratio angle P : angle Q = 3 : 4 => Total parts = 7.
Difference in parts = 4 − 3 = 1.
Difference in measures = (1 ÷ 7) × 21° = 3°.

Therefore The correct answer is 3°.

Alternate Method

Given: angle STR = 10.5°, Ratio angle P : angle Q = 3 : 4.

Formula Used: In quadrilateral PQRS, the angle between bisectors of adjacent angles R and S is angle STR = (angle P + angle Q) ÷ 2.

Calculations:

=> angle STR = (angle P + angle Q) ÷ 2

=> 10.5° = (angle P + angle Q) ÷ 2

=> angle P + angle Q = 21°

=> Let angle P = 3x and angle Q = 4x

&rArr

Q34. Answer: (a) 1,23,298

Shortcut Trick

Discount = 50% = 1/2 in fraction form.

Ratio of Marked Price to Selling Price = 2 : (2 − 1) = 2 : 1.

Given 1 unit (SP) = Rs. 61,649.

Therefore, 2 units (MP) = 2 × 61,649 = Rs. 1,23,298.

Therefore The correct answer is Rs. 1,23,298.

Alternate Method

Given: Selling Price (SP) = Rs. 61,649, Discount% = 50%.

Formula: MP = [SP × 100] ÷ [100 − Discount%]

=> MP = [61,649 × 100] ÷ [100 − 50]

=> MP = [61,649 × 100] ÷ 50

=> MP = 61,649 × 2

=> MP = 1,23,298

Therefore The correct answer is Rs. 1,23,298.

Additional Information

Marked Price (MP)

The price listed on the label of an article. Discounts are always calculated on the MP unless stated otherwise.

Discount Percentage

It is the reduction offered on the MP. Formula: Discount% = [(MP − SP) ÷ MP] × 100.

Q35. Answer: (d) 15

Shortcut Trick

Find the LCM of 9, 12, and 26 to get the smallest number divisible by all.

LCM(9, 12, 26) = 468.

Since M − 6 must be divisible, M = 468 + 6 = 474.

Digit sum of 474 = 4 + 7 + 4 = 15.

Therefore The correct answer is 15.

Alternate Method

Given: M − 6 is divisible by 9, 12, and 26.

Formula: M = LCM(a, b, c) + remainder.

=> Prime factors: 9 = 3^2, 12 = $2^2 \times 3$, 26 = 2 × 13.

=> LCM = $2^2 \times 3^2 \times 13 = 4 \times 9 \times 13 = 468$.

=> Smallest number M = 468 + 6 = 474.

=> Digit Sum = 4 + 7 + 4 = 15.

Therefore The correct answer is 15.

Additional Information

LCM Method

The smallest number divisible by x, y, and z is their Lowest Common Multiple (LCM).

Digit Sum and Divisibility

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A number is divisible by 9 if its digit sum is divisible by 9. Here, 468 (sum 18) is divisible by 9.

Remainder Case

If a number leaves remainder 'r' when divided by x, y, and z, the number is k × LCM(x, y, z) + r.

Q36. Answer: (d) 153 m²

Shortcut Trick

Form linear equations based on the change in Area: (L − 5)(B + 3) = LB − 9 and (L + 3)(B + 2) = LB + 67.

Simplified Linear Equations: 3L − 5B = 6 and 2L + 3B = 61.

Solving for Dimensions: Multiply the first by 3 and second by 5 → 9L − 15B = 18 and 10L + 15B = 305.

Adding them gives 19L = 323 => L = 17 m, then B = 9 m.

Original Area = 17 × 9 = 153 m².

Therefore The correct answer is 153 m².

Alternate Method

Given:

Decrease in length = 5 m, Increase in breadth = 3 m → Area decreases by 9 m².

Increase in length = 3 m, Increase in breadth = 2 m → Area increases by 67 m².

Formula Used:

Area of Rectangle = Length (L) × Breadth (B)

Calculations:

=> Let the original length be L and breadth be B.

=> Original Area = LB.

=> According to the first condition: (L − 5)(B + 3) = LB − 9

=> LB + 3L − 5B − 15 = LB − 9

=> 3L − 5B = 6 — (Eq. 1)

=> According to the second condition: (L + 3)(B + 2) = LB + 67

=> LB + 2L + 3B + 6 = LB + 67

=> 2L + 3B = 61 — (Eq. 2)

=> Multiply Eq. 1 by 3: 9L − 15B = 18

=> Multiply Eq. 2 by 5: 10L + 15B = 305

=> Adding both equations: (9L + 10L) = (18 + 305) => 19L = 323

=> L = 323 ÷ 19 = 17 m.

=> Substitute L = 17 in Eq. 1: 3(17) − 5B = 6 => 51 − 5B = 6

=> 5B = 45 => B = 9 m.

=> Original Area = L × B = 17 × 9 = 153 m².

Therefore The correct answer is 153 m².

Additional Information

Perimeter of Rectangle

The total distance around the rectangle is given by P = 2 × (L + B).

Diagonal of Rectangle

The distance between opposite corners is found using the Pythagorean theorem: d = √(L² + B²).

Area Change Percentage

If length increases by x% and breadth increases by y%, the net percentage change in area is [x + y + (xy ÷ 100)]%.

Q37. Answer: (c) 31.82%

Shortcut Trick

Required percentage = (First value ÷ Second value) × 100

Required percentage = (1/20 ÷ 11/70) × 100

Required percentage = (1/20 × 70/11) × 100 = (70/220) × 100

Required percentage = 700/22 ≈ 31.818...

Therefore The correct answer is 31.82%.

Alternate Method

Given:

First fraction = 1/20
Second fraction (Base) = 11/70
Formula Used:
Percentage = (Part ÷ Whole) × 100
Calculations:
=> Required Percentage = [(1/20) / (11/70)] × 100
=> Required Percentage = [1/20 × 70/11] × 100
=> Required Percentage = [7/22] × 100
=> Required Percentage = 700 / 22
=> Required Percentage = 350 / 11
=> Required Percentage = 31.818181...
=> Rounding off to two decimal places = 31.82%
Therefore The correct answer is 31.82%.
Additional Information
Percentage Change
To find the percentage change between two values, use: [(New Value − Old Value) ÷ Old Value] × 100.
Fraction to Percentage
To convert any fraction x/y into a percentage, simply multiply the fraction by 100 and add the % symbol.
Reciprocal Multiplier
Dividing by a fraction a/b is mathematically equivalent to multiplying by its reciprocal b/a.

Q38. Answer: (c) $6x(9x^2 + 75y^2)$

Shortcut Trick
Apply the algebraic identity for the sum of two binomial cubes:
$(a + b)^3 + (a - b)^3 = 2a(a^2 + 3b^2)$
Here, substitute a = 3x and b = 5y into the formula:
Result = $2(3x)[(3x)^2 + 3(5y)^2] = 6x(9x^2 + 3 \times 25y^2)$
Result = $6x(9x^2 + 75y^2)$
Therefore The correct answer is $6x(9x^2 + 75y^2)$.
Alternate Method
Given Expression: $(3x + 5y)^3 + (3x - 5y)^3$
Formula Used: $(a + b)^3 = a^3 + 3a^2b + 3ab^2 + b^3$ and $(a - b)^3 = a^3 - 3a^2b + 3ab^2 - b^3$
=> $(3x + 5y)^3 = (3x)^3 + 3(3x)^2(5y) + 3(3x)(5y)^2 + (5y)^3$
=> $(3x + 5y)^3 = 27x^3 + 135x^2y + 225xy^2 + 125y^3$
=> $(3x - 5y)^3 = (3x)^3 - 3(3x)^2(5y) + 3(3x)(5y)^2 - (5y)^3$
=> $(3x - 5y)^3 = 27x^3 - 135x^2y + 225xy^2 - 125y^3$
=> Adding both expansions: $(27x^3 + 27x^3) + (135x^2y - 135x^2y) + (225xy^2 + 225xy^2) + (125y^3 - 125y^3)$
=> $54x^3 + 450xy^2$
=> Taking 6x as a common factor: $6x(9x^2 + 75y^2)$
Therefore The correct answer is $6x(9x^2 + 75y^2)$.
Additional Information
Cubic Addition Property
When adding cubes of binomials with opposite signs, the second and fourth terms of the expansion always cancel out: $(a+b)^3 + (a-b)^3 = 2a^3 + 6ab^2$.
Cubic Subtraction Property
When subtracting cubes of binomials, the first and third terms cancel out: $(a+b)^3 - (a-b)^3 = 2b^3 + 6a^2b$.
General Algebraic Identity
The factorisation of $a^3 + b^3$ is given by $(a + b)(a^2 - ab + b^2)$, which is a different form used for simplifying cubic sums.

Q39. Answer: (b) 1.5

Shortcut Trick
Relative Speed in same direction = 90 − 60 = 30 kmph.

Total Distance = Sum of lengths = 440 + 310 = 750 m = 0.75 km.
Time = Distance ÷ Speed = 0.75 ÷ 30 = 0.025 hours.
Time in minutes = 0.025 × 60 = 1.5 minutes.
Therefore The correct answer is 1.5 minutes.
Alternate Method
Given: Length1 = 440 m, Length2 = 310 m, Speed1 = 60 km/hr, Speed2 = 90 km/hr.
Formula Used: Time = (Total Distance) ÷ (Relative Speed)
=> Total distance = 440 + 310 = 750 m
=> Relative speed = (90 − 60) × (5/18) m/s
=> Relative speed = 30 × (5/18) = 150/18 = 25/3 m/s
=> Time (seconds) = 750 ÷ (25/3) = 750 × 3 ÷ 25
=> Time = 30 × 3 = 90 seconds
=> Time (minutes) = 90 ÷ 60 = 1.5 minutes
Therefore The correct answer is 1.5 minutes.
Additional Information
Relative Speed Concept
When two objects move in the same direction, relative speed = S1 − S2. When they move in opposite directions, relative speed = S1 + S2.
Unit Conversion
To convert km/hr to m/s, multiply by 5/18. To convert m/s to km/hr, multiply by 18/5.
Crossing Distance
When a train crosses another train or a platform, the total distance covered is always the sum of their respective lengths.

Q40. Answer: (d) 1296

Shortcut Trick
Given Median = 9 and Mode = Median ÷ 3 = 3.
Using the Empirical formula: 2 × Mean = 3 × Median − Mode.
2 × Mean = 3(9) − 3 = 24 => Mean = 12.
Required value = (Mean × Mode)² = (12 × 3)² = 36² = 1296.
Therefore The correct answer is 1296.
Alternate Method
Given:
Median = 9
Median = 3 × Mode
Formula Used:
Empirical Relationship: Mode = 3 × Median − 2 × Mean
Calculations:
=> Mode = Median ÷ 3 = 9 ÷ 3 = 3
=> 3 = 3 × 9 − 2 × Mean
=> 2 × Mean = 27 − 3
=> 2 × Mean = 24
=> Mean = 12
=> Product of Mean and Mode = 12 × 3 = 36
=> Square of the product = 36² = 1296
Therefore The correct answer is 1296.
Additional Information
Empirical Relationship
For a moderately skewed distribution, the relationship is given by Mode = 3 Median − 2 Mean.
Symmetrical Distribution
In a perfectly symmetrical distribution, the Mean, Median, and Mode are all equal (Mean = Median = Mode).
Skewness
If Mean > Median > Mode, the data is positively skewed. If Mode > Median > Mean, the data is negatively skewed.

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Mean Formula

The arithmetic Mean is calculated as the sum of all observations divided by the total number of observations (Σx ÷ n).

Q41. Answer: (b) Increase by 33%

Shortcut Trick

Let the cost of a TV be 100. Cost of washing machine (WM) = 100 − 75 = 25.

Initial total cost of 8 WM and 2 TV = (8 × 25) + (2 × 100) = 200 + 200 = 400.

New cost of 1 WM = 25 × 1.8 = 45; New cost of 1 TV = 100 × 0.86 = 86.

New total cost = (8 × 45) + (2 × 86) = 360 + 172 = 532.

Percentage change = (532 − 400) ÷ 400 × 100 = 132 ÷ 4 = 33%.

Therefore The correct answer is Increase by 33%.

Alternate Method

Given: Cost ratio of WM to TV is 1 : 4. Increase in WM = 80%, Decrease in TV = 14%.

Formulas: Total Change % = Σ(Quantity × Price × Change%) ÷ Σ(Initial Total Cost) × 100

=> Let Cost of 1 TV = 100x, then Cost of 1 WM = 25x.

=> Total Initial Cost = 8(25x) + 2(100x) = 200x + 200x = 400x.

=> Change in WM cost = 8 × (25x × 80%) = 8 × 20x = +160x.

=> Change in TV cost = 2 × (100x × −14%) = 2 × −14x = −28x.

=> Net Change = 160x − 28x = 132x.

=> Net Percentage Change = (132x ÷ 400x) × 100 = 33%.

Therefore The correct answer is Increase by 33%.

Additional Information

Weighted Average Method

When components of a total change by different percentages, the overall change is the weighted average of individual percentage changes based on their initial value contributions.

Percentage Increase and Decrease

Percentage change = (Final Value − Initial Value) ÷ Initial Value × 100. A positive result indicates an increase, and a negative result indicates a decrease.

Q42. Answer: (a) Rs. 8,120

Shortcut Trick

Total profit = 6,000, Amit's profit share = 2,800.

Deeksha's profit share = 6,000 − 2,800 = 3,200.

Ratio of profits (Amit : Deeksha) = 2,800 : 3,200 = 7 : 8.

Since time is constant, Investment ratio = Profit ratio = 7 : 8.

Sum of ratio parts = 7 + 8 = 15 parts = 17,400.

Amit's investment = (17,400 ÷ 15) × 7 = 1,160 × 7 = 8,120.

Therefore The correct answer is Rs. 8,120.

Alternate Method

Given: Total Investment = 17,400 | Total Profit = 6,000 | Amit's Profit = 2,800.

Formulas: Profit Ratio = (Investment1 × Time1) : (Investment2 × Time2)

=> Deeksha's Profit = Total Profit − Amit's Profit = 6,000 − 2,800 = 3,200.

=> Profit Ratio (Amit : Deeksha) = 2,800 : 3,200 = 7 : 8.

=> Let Amit's Investment be 7x and Deeksha's Investment be 8x.

=> 7x + 8x = 17,400 => 15x = 17,400 => x = 1,160.

=> Amit's Investment = 7 × 1,160 = 8,120.

Therefore The correct answer is Rs. 8,120.

Additional Information

Partnership Rules

When the time period of investment is the same for all partners, the profit is distributed in the ratio of their investments.

Variable Time Investment

If time periods are different, Profit Ratio = (Capital1 × Time1) : (Capital2 × Time2).

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Q43. Answer: (b) 60°

Shortcut Trick

Ratio of Height : Shadow = √3 : 1.

We know that tan θ = Height / Shadow.

=> tan θ = √3 / 1 = √3.

=> θ = 60°.

Therefore The correct answer is 60°.

Alternate Method

Given: Height of pole (H) = √3 × Length of shadow (S).

Formula Used: tan θ = Perpendicular / Base = Height / Shadow.

=> Let the length of the shadow be x.

=> Then, the height of the pole = √3x.

=> tan θ = (Height of pole) / (Length of shadow)

=> tan θ = √3x / x

=> tan θ = √3

=> θ = tan^(−1)(√3)

=> θ = 60°.

Therefore The correct answer is 60°.

Additional Information

Trigonometric Ratios Table

Values for tan θ: tan 30° = 1/√3, tan 45° = 1, tan 60° = √3.

Angle of Elevation

The angle formed by the line of sight with the horizontal when looking up at an object.

Shadow Relationship

When Height = Shadow, the angle of elevation is always 45° as tan θ = 1.

Q44. Answer: (a) 53

Shortcut Trick

Teacher's Age = New Average + (Initial Strength × Increase in Average)

Initial Strength = 31 | New Average = 22 | Increase = 22 − 21 = 1

Teacher's Age = 22 + (31 × 1) = 22 + 31 = 53 years

Therefore The correct answer is 53 years.

Alternate Method

Given:

Number of students = 31

Initial average age = 21 years

New average age (including teacher) = 22 years

Total people (students + teacher) = 31 + 1 = 32

Formula Used:

Total Age = Average Age × Number of People

Teacher's Age = New Total Age − Initial Total Age

Calculations:

=> Total age of 31 students = 31 × 21 = 651 years

=> Total age of 31 students + 1 teacher = 32 × 22

=> New total age = 704 years

=> Age of the teacher = 704 − 651

=> Age of the teacher = 53 years

Therefore The correct answer is 53 years.

Additional Information

Weighted Average Formula

When two groups are combined, the new average is (n1x1 + n2x2) ÷ (n1 + n2), where n is count and x is average.

Average Deviation Method

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If an inclusion increases the average, the included value must be greater than the old average by (New Count × Increase).

Exclusion Rule

Age of excluded person = Old Average + (Initial Count − 1) × (Decrease in Average).

Q45. Answer: (d) 56

Shortcut Trick

Check options for Second Tap (T2). If T2 = 56, then First Tap (T1) = 56 − 14 = 42.

Combined time = (T1 × T2) ÷ (T1 + T2) = (42 × 56) ÷ (42 + 56)

Combined time = 2352 ÷ 98 = 24 hours.

The condition matches the question perfectly.

Therefore The correct answer is 56 hours.

Alternate Method

Given: Combined time = 24 hours. Difference in time = 14 hours.

Formula Used: 1/x + 1/(x + 14) = 1/24

=> Let time for First Tap be x hours, then Second Tap is (x + 14) hours.

=> 1/x + 1/(x + 14) = 1/24

=> (x + 14 + x) / [x(x + 14)] = 1/24

=> 24(2x + 14) = x^2 + 14x

=> 48x + 336 = x^2 + 14x

=> x^2 − 34x − 336 = 0

=> x^2 − 42x + 8x − 336 = 0

=> (x − 42)(x + 8) = 0

=> x = 42 (Time for first tap)

=> Time for Second Tap = 42 + 14 = 56 hours.

Therefore The correct answer is 56 hours.

Additional Information

Combined Work Formula

If two taps fill a tank in 'a' and 'b' hours respectively, the time taken to fill the tank together is (a × b) / (a + b).

Efficiency and Time

Efficiency is inversely proportional to time. A tap that is slower takes more time to complete the same work.

Quadratic Shortcut

In time and work quadratic equations, usually only the positive root is considered as time cannot be negative.

Q46. Answer: (b) 22.46%

Shortcut Trick

Net gain% can be calculated using the successive percentage formula: a + b + (a × b) ÷ 100.

Here, a = Mark-up percentage = +57% and b = Discount percentage = −22%.

Gain% = 57 − 22 − (57 × 22) ÷ 100 = 35 − 1254 ÷ 100.

Gain% = 35 − 12.54 = 22.46%.

Therefore The correct answer is 22.46%.

Alternate Method

Given: Mark-up = 57% and Discount = 22%.

Formulas: SP = MP × (100 − D%) ÷ 100 | Profit% = (SP − CP) ÷ CP × 100.

=> Let Cost Price (CP) = 100 units.

=> Marked Price (MP) = 100 + 57 = 157 units.

=> Selling Price (SP) = 157 × (100 − 22) ÷ 100 = 157 × 78 ÷ 100 = 12246 ÷ 100 = 122.46 units.

=> Gain Percentage = SP − CP = 122.46 − 100 = 22.46%.

Therefore The correct answer is 22.46%.

Additional Information

Marked Price & Discount

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

Relation between CP and MP

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CP ÷ MP = (100 − Discount%) ÷ (100 + Profit%). This ratio is helpful for finding unknown mark-up or profit values.

Q47. Answer: (c) 8089 m

Shortcut Trick

Total distance covered = Speed × Time

Total distance = 67 × 133 = 8911 m

Tunnel length = Total distance − Train length

Tunnel length = 8911 − 822 = 8089 m

Therefore The correct answer is 8089 m.

Alternate Method

Given:

Length of the train = 822 m

Speed of the train = 67 m/s

Time taken to cross the tunnel = 133 s

Formula Used:

Distance = Speed × Time

Total Distance = Length of Train + Length of Tunnel

Calculations:

=> Total Distance = 67 × 133

=> Total Distance = 8911 m

=> Length of Tunnel + 822 = 8911

=> Length of Tunnel = 8911 − 822

=> Length of Tunnel = 8089 m

Therefore The correct answer is 8089 m.

Additional Information

Crossing Stationary Objects

When a train crosses a platform, bridge, or tunnel, the total distance covered is the sum of the lengths of the train and the object.

Unit Conversion

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

Relative Speed

For two objects moving in the same direction, relative speed = S1 − S2. In opposite directions, relative speed = S1 + S2.

Q48. Answer: (a) 938

Shortcut Trick

We are given the ratio: 112 / A = 8 / 67

Observe the numerators: 112 is exactly 14 times 8 (since 112 ÷ 8 = 14).

To maintain the equality of the fractions, the denominators must follow the same ratio.

Therefore, A = 67 × 14

A = 938

Therefore The correct answer is 938.

Alternate Method

Given:

112 / A = 8 / 67

Calculation:

=> Using cross-multiplication, we get:

=> 8 × A = 112 × 67

=> A = (112 × 67) / 8

=> Dividing 112 by 8 yields 14:

=> A = 14 × 67

=> A = 938

Therefore The correct answer is 938.

Additional Information

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Cross-Multiplication Rule

For any fractional equation of the form a / b = c / d, we can cross-multiply to eliminate fractions, giving a × d = b × c.

Proportions

When two ratios are set equal to each other, they form a proportion. In the proportion a:b = c:d, the product of the extremes equals the product of the means (a × d = b × c).

BODMAS Rule

Simplification of expressions follows the BODMAS order: Brackets, Orders (powers/roots), Division, Multiplication, Addition, and Subtraction.

Q49. Answer: (c) 131

Shortcut Trick

Convert all bases into 5: 25 = 5^2, 125 = 5^3

Expression becomes powers of 5 → subtract exponents directly

First term: 5^(15) ÷ 5^{13} ÷ 5^2 = 5^0 = 1

Second term: 5^(17) ÷ 5^(16) = 5

Third term = 125

Total = 1 + 5 + 125 = 131

Therefore Answer = 131

Alternate Method

Given:

5^(15) ÷ 25^(13/2) ÷ 125^(2/3) + 5^(17) ÷ 125^(16/3) + 5^3

Concept Used:

BODMAS rule

Calculation:

=> 5^(15) ÷ (5^2)^(13/2) ÷ (5^3)^(2/3) + 5^(17) ÷ (5^3)^(16/3) + 5^3

=> 5^(15) ÷ 5^{13} ÷ 5^2 + 5^(17) ÷ 5^(16) + 5^3

=> 5^(15−13) ÷ 5^2 + 5^1 + 5^3

=> 5^2 ÷ 5^2 + 5 + 125

=> 5^0 + 5 + 125

=> 1 + 5 + 125

=> 131

Therefore The correct answer is 131.

Additional Information

BODMAS Rule

Brackets, Orders (powers), Division, Multiplication, Addition, Subtraction.

Laws of Exponents

a^m ÷ a^n = a^(m−n)

Power of a Power

(a^m)^n = a^(mn)

Zero Power Rule

a^0 = 1 (a ≠ 0)

Q50. Answer: (d) 9

Shortcut Trick

Numerator: 0.74 + 1.48 = 2.22

Denominator: 2 4/5 = 2.8 and 7 1/15 ≈ 7.0667 => sum ≈ 9.8667

So expression ≈ 40 × (2.22 / 9.8667)

≈ 40 × 0.225 = 9

Therefore Answer = 9

Alternate Method

Given:

40 × ((0.74 + 1.48) ÷ (2 4/5 + 7 1/15))

Concept Used:

BODMAS rule
Calculation:
=> 40 × ((2.22) ÷ (2 4/5 + 7 1/15))
=> 40 × (2.22 ÷ (14/5 + 106/15))
=> 40 × (2.22 ÷ (42/15 + 106/15))
=> 40 × (2.22 ÷ (148/15))
=> 40 × (2.22 × 15 / 148)
=> 40 × (33.3 / 148)
=> 40 × 0.225
=> 9
Therefore The correct answer is 9.
Additional Information
BODMAS Rule
Follow order: Brackets → Division → Multiplication → Addition → Subtraction.
Mixed Fraction Conversion
a b/c = (ac + b)/c
Decimal to Fraction
Convert decimals into fractions for exact calculation.
Simplification Trick
Convert everything to fractions to avoid rounding errors.

Q51. Answer: (b) (6, 13, 2)

The logic followed here is:
Logic: (1st No. × 3rd No.) + 1 = 2nd No.
(5 × 6) + 1 = 30 + 1 = 31
(3 × 5) + 1 = 15 + 1 = 16
Let's check each option:
1. (1, 6, 4) → (1 × 4) + 1 = 4 + 1 = 5 ≠ 6
2. (6, 13, 2) → (6 × 2) + 1 = 12 + 1 = 13
3. (3, 2, 7) → (3 × 7) + 1 = 21 + 1 = 22 ≠ 2
4. (4, 7, 2) → (4 × 2) + 1 = 8 + 1 = 9 ≠ 7
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 2".

Q52. Answer: (c) POST - OPST - TSOP

The position and positional values or English Alphabets are:
The pattern followed here is:
CAKE - ACKE - EKAC
KING - IKNG - GNIK
Let’s check each option:
1. KEYS - KYES - SYEK
This option does not follow the same logic.
2. ROAD - ORAD - OADR
This option does not follow the same logic.
3. POST - OPST - TSOP
This option follows the same logic.
4. MUTE - UMTE - EUTM
This option does not follow the same logic.
Thus, POST - OPST - TSOP follows the same logic.
Hence, the correct answer is "Option 3".

Q53. Answer: (b) OY 30

The position and positional values or English Alphabets are:

Given: HP 16 is related to JT 19 in a certain way. In the same way, CK 22 is related to EO 25.

The logic followed here is:

Similarly,

Thus, MU 27 is related to OY 30, following the same logic.

Hence, the correct answer is "Option 2".

Q54. Answer: (c) FO 39

The position and positional values or English Alphabets are:

Given: MY 24 is related to HT 27 in a certain way. In the same way, BL 21 is related to WG 24.

The logic followed here is:

Similarly,

Thus, KT 36 is related to FO 39, following the same logic.

Hence, the correct answer is "Option 3".

Q55. Answer: (b) Mother's sister

Family Chart:

Decoding the Symbols:

A is				
Symbol	•	&	@	#
Meaning	father	wife	sister	wife
to B				

Given: Y @ G & E + V @ Z

It means: Y is the sister of G, G is the wife of E, E is the father of V, V is the sister of Z.

Thus, Y is Z's Mother's sister.

Hence, the correct answer is "Option 2".

Q56. Answer: (a) ry

Given: In a certain code language, 'give me bike' is coded as 'bn gt ry' and 'who know me' is coded as 'ry fh vt'.

Thus, 'me' is coded as 'ry' in that language.

Hence, the correct answer is "Option 1".

Q57. Answer: (a) 87

Given: 6 17 29 42 56 71 ?

The logic followed here is:

Thus, 87 should come in place of the question mark (?) in the given series.

Hence, the correct answer is "Option 1".

Q58. Answer: (b) 96

BODMAS Rule:

Decoding the given information:

Letter	A	B	C	D
Meaning	÷	×	•	•

Given equation: 16 C 24 A 6 B 28 D 32 = ?

Now replacing the sign from left to right using BODMAS Rule, we get:

=> 16 + 24 ÷ 6 × 28 − 32 = ?

=> 16 + 4 × 28 − 32 = ?

=> 16 + 112 − 32 = ?

=> 128 − 32 = ?

=> 96 = ?

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Hence, the correct answer is "Option 2".

Q59. Answer: (b) Only conclusion (II) follows

Statements:

Some huts are dens.

No den is a cave.

The least possible Venn diagram for the given statement is:

Conclusions:

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

(II) Some dens are huts. - Follow (Because, some huts are dens means some dens are huts.)

Thus, only conclusion (II) follows.

Hence, the correct answer is "Option 2".

Q60. Answer: (c) WYX 42

Given: CKR 78, HHM 69, MEH 60, RBC 51, ?

The logic followed here is:

Thus, WYX 42 will replace the question mark (?) in the given series to make it logically complete.

Hence, the correct answer is "Option 3".

Q61. Answer: (b) Two

Given: (Left) 4 1 7 9 2 2 7 9 9 9 4 7 7 8 9 1 8 6 2 1 2 2 8 (Right)

Now,

Even digits, each of which is immediately preceded by an even digit and also immediately followed by an odd digit.

So, the needed pattern is: Even — Even — Odd

Thus, there are two even digits, each of which is immediately preceded by an even digit and also immediately followed by an odd digit.

Hence, the correct answer is "Option 2".

Q62. Answer: (c) LQU68

The position and positional values or English Alphabets are:

Given: CWF59, FUK62, ISP65, ?

The logic followed here is:

Thus, LQU68 will replace the question mark (?) in the given series to make it logically complete.

Hence, the correct answer is "Option 3".

Q63. Answer: (c) 3

Given: Seven people, A, B, C, D, E, F and G, are sitting in a row, facing north.

1.Only two people sit to the right of F.

2. Only three people sit between F and A.

3. Both E and C are immediate neighbours of G.

4. D sits immediately to the left of B.

5. C is not an immediate neighbour of A.

Thus, 3 people sit between D and E.

Hence, the correct answer is "Option 3".

Q64. Answer: (b) 62

Given: 7 8 12 21 37 '?'

The logic followed here is:

Thus, 62 should come in place of the question mark (?) in the given series.

Hence, the correct answer is "Option 2".

Q65. Answer: (b) XBW

The position and positional values or English Alphabets are:

The pattern followed here is:

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Each letter-cluster follows the pattern +3, -4.

Let's check each option:

1. WZV

This letter-cluster follows the pattern +3, -4.

2. XBW

This letter-cluster does not follow the pattern +3, -4.

3. SVR

This letter-cluster follows the pattern +3, -4.

4. DGC

This letter-cluster follows the pattern +3, -4.

Thus, XBW is the odd one out.

Hence, the correct answer is "Option 2".

Q66. Answer: (d) ELK

The position and positional values or English Alphabets are:

The pattern followed here is:

Each letter-cluster follows the pattern +6, -1.

Let's check each option:

1. LRQ

This letter-cluster follows the pattern +6, -1.

2. MSR

This letter-cluster follows the pattern +6, -1.

3. PVU

This letter-cluster follows the pattern +6, -1.

4. ELK

This letter-cluster does not follow the pattern +6, -1.

Thus, ELK is the odd one out.

Hence, the correct answer is "Option 4".

Q67. Answer: (a) One

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

Now,

Odd digits, each of which is immediately preceded by an odd digit and also immediately followed by an odd digit.

So, the needed pattern is: Odd — Odd — Odd

Thus, there is one odd digit, each of which is immediately preceded by an odd digit and also immediately followed by an odd digit.

Hence, the correct answer is "Option 1".

Q68. Answer: (a) Neither conclusion (I) nor (II) follows

Statements:

No student is a teacher.

No student is a carpenter.

The least possible Venn diagram for the given statement is:

Conclusions:

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

(II) Some students are teachers. - Does not follow (Because, no student is a teacher, which means no students and teachers.)

Thus, neither conclusion (I) nor (II) follows.

Hence, the correct answer is "Option 1".

Q69. Answer: (c) 163

Given: 123 133 142 150 157 ?

The logic followed here is:

Thus, 163 should come in place of the question mark (?) in the given series.

Hence, the correct answer is "Option 3".

Q70. Answer: (a) 5 km towards north

Given: Akshay starts from Point A and drives 21 km towards the east. He then takes a left turn, drives 11 km, then turns left and drives 25 km. He then takes a left turn and drives 16 km. He takes a final left turn, drives 4 km, and stops at Point P.

Thus, he should drive 5 km towards north in order to reach Point A again.

Hence, the correct answer is "Option 1".

Q71. Answer: (d) Immediate right

Given: A, B, C, D, E and F are sitting around a circular table, facing the centre.

1. E sits second to the left of A.
2. D is an immediate neighbour of C.
3. C sits to the immediate right of B.
4. F sits second to the left of B.

Thus, E is to the Immediate right of D

Hence, the correct answer is "Option 4".

Q72. Answer: (a) 13 km to the west

Given: Rishika starts from point A and drives 49 km towards north. She then takes a left turn, drives 51 km, turns left and drives 54 km. She then takes a left turn and drives 64 km. She takes a final left turn, drives 5 km and stops at point P.

Thus, she should drive 13 km to the west in order to reach point A again.

Hence, the correct answer is "Option 1".

Q73. Answer: (d) 14

Given: 937, 228, 782, 175, 631

Highest number = 937

Third digit of the highest number is 7.

Lowest number = 175

Second digit of the lowest number is 7.

Sum = 7 + 7 = 14

Thus, 14 will be the resultant if the third digit of the highest number is added to the second digit of the lowest number.

Hence, the correct answer is "Option 4".

Q74. Answer: (d) 3

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

Now,

Odd 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 — Odd — Odd

Thus, there are 3 odd 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 4".

Q75. Answer: (c) 45

BODMAS Rule:

Given equation: 168 × 7 − 66 + 5 ÷ 9 = ?

If '+' and '−' are interchanged and '×' and '÷' are interchanged, then the equation becomes:

=> 168 ÷ 7 + 66 − 5 × 9 = ?

=> 24 + 66 − 5 × 9 = ?

=> 24 + 66 − 45 = ?

=> 90 − 45 = ?

=> 45 = ?

Hence, the correct answer is "Option 3".

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Q76. Answer: (d) M

Given: Seven boxes M, N, O, P, Q, R and S are kept one over the other but not necessarily in the same order.

1. Only three boxes are kept below N.
2. Only two boxes are kept between N and P.
3. Only Q is kept above O.
4. S is kept at some place below R and at some place above M.

Q
O
R
N
S
M
P

Thus, box M is kept at second position from the bottom.

Hence, the correct answer is "Option 4".

Q77. Answer: (a) gl

Given: In a certain code language, ‘he eat lunch’ is coded as ‘rk yf gl’ and ‘eat proper food’ is coded as ‘av gl tn’.

Thus, ‘eat’ is coded as 'gl' in the given language.

Hence, the correct answer is "Option 1".

Q78. Answer: (a) 20

Given:

Total people in the row = 51

Rohit is 19th from the left end.

Anupam is 12th from the right end.

Anupam’s position from the left end:

= 51 − 12 + 1

= 52 - 12

= 40

Number of people between Rohit and Anupam:

= 40 − 19 − 1

= 40 - 20

= 20

Thus, 20 people are there between Rohit and Anupam.

Hence, the correct answer is "Option 1".

Q79. Answer: (b) One

Given: Five people A, B, C, D and E are sitting in a row facing towards north.

1. Only 2 people are sitting between A and D.
2. B is sitting at the third position from extreme left of the row.
3. B is sitting immediate right to A.
4. B is sitting immediate left to E.

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

Thus, exactly one people is sitting in between E and A.

Hence, the correct answer is "Option 2".

Q80. Answer: (b) 760

BODMAS Rule:

Given equation: 48 ÷ 16 + 366 × 6 − 53 = ?

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If '+' and '−' are interchanged and '×' and '÷' are interchanged, then the equation becomes:

=> 48 × 16 − 366 ÷ 6 + 53 = ?

=> 48 × 16 − 61 + 53 = ?

=> 768 − 61 + 53 = ?

=> 821 − 61 = ?

=> 760 = ?

Hence, the correct answer is "Option 2".

Q81. Answer: (d) Bengaluru

The correct answer is Bengaluru.

Key Points

• The Surya VHF radar was primarily developed by Mistral Solutions, a leading technology design and systems engineering company headquartered in Bengaluru, Karnataka.

• This sophisticated radar system was developed in close collaboration with the Electronics and Radar Development Establishment (LRDE), which is a premier laboratory of the Defence Research and Development Organisation (DRDO), also located in Bengaluru.

• The Surya radar is a 3D Active Electronically Scanned Array (AESA) radar that operates in the Very High Frequency (VHF) band, designed specifically for long-range surveillance and detection of aerial targets.

• It is particularly effective at detecting stealth aircraft because the physical properties of VHF waves make them less susceptible to the Radar Cross Section (RCS) reduction techniques used in modern stealth technology.

• The successful development and induction of this system highlight the robust defense electronics ecosystem present in Bengaluru, which serves as a hub for both public sector undertakings like Bharat Electronics Limited (BEL) and private innovators.

Additional Information

• Mistral Solutions:

• Founded in 1997, the company provides end-to-end embedded design services.

• It specializes in areas such as Defense, Aerospace, and Homeland Security.

• Apart from its headquarters in Bengaluru, it has a significant global presence, providing high-speed digital design and RF (Radio Frequency) solutions.

• LRDE (Electronics and Radar Development Establishment):

• Established in 1958, it is the nodal agency for the design and development of advanced radar systems for the Indian Armed Forces.

• It has developed several iconic systems including the Indra series, Rajendra radar (for the Akash missile system), and the Swathi Weapon Locating Radar.

• Technological Features of Surya Radar:

• The VHF band provides a strategic advantage as it can "see" through heavy weather and foliage more effectively than higher frequency bands like X-band or Ku-band.

• The AESA technology allows the radar beam to be steered electronically, providing faster scanning and better tracking of multiple high-speed targets simultaneously.

• It serves as an Early Warning Radar (EWR), providing the Indian Air Force with a critical layer of defense against incoming aerial threats at long ranges.

• Significance of Bengaluru:

• Often referred to as the "Silicon Valley of India", the city houses the headquarters of ISRO and several DRDO labs.

• It is the center for the Indian Aerospace industry, hosting Hindustan Aeronautics Limited (HAL) and numerous private sector defense manufacturers.

Important Points

• The Surya radar represents a significant step towards Atmanirbhar Bharat (Self-reliant India) in the field of high-end defense electronics.

• The collaboration between DRDO and private firms like Mistral Solutions demonstrates the effectiveness of the Public-Private Partnership (PPP) model in developing complex military hardware.

• In 2023 and 2024, India has increasingly focused on deploying AESA radars across its borders to counter modern fifth-generation aircraft and UAVs (Unmanned Aerial Vehicles).

Q82. Answer: (b) Delhi-NCR

The correct answer is Delhi-NCR.

Key Points

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• The Graded Response Action Plan (GRAP) is a set of emergency measures implemented to curb air pollution in the Delhi-National Capital Region (NCR) based on the severity of the air quality.

• In May 2025, the region of Delhi-NCR implemented Stage I of this plan to address deteriorating atmospheric conditions and maintain Air Quality Index (AQI) levels within manageable limits.

• Stage I of GRAP is typically activated when the AQI is categorized as 'Poor', ranging between 201 and 300. It involves strictly enforcing orders for stopping construction and demolition activities that generate dust.

• The implementation is overseen by the Commission for Air Quality Management (CAQM), a statutory body established in 2021 to coordinate and oversee air quality management in the NCR and adjoining areas.

• Under Stage I, agencies ensure the proper implementation of guidelines for dust mitigation, waste management, and mechanized sweeping of roads to prevent the suspension of particulate matter. Hence, the correct answer is Delhi-NCR.

Additional Information

• Understanding GRAP Stages:

• Stage I ('Poor' - AQI 201-300): Focuses on dust control at construction sites, regular water sprinkling, and strict pollution under control (PUC) certificate enforcement.

• Stage II ('Very Poor' - AQI 301-400): Includes measures like increasing parking fees to discourage private transport and augmenting bus and metro services.

• Stage III ('Severe' - AQI 401-450): Involves a ban on specific construction activities and restrictions on BS-III petrol and BS-IV diesel four-wheelers.

• Stage IV ('Severe +' - AQI >450): The most stringent phase, potentially involving a ban on entry of trucks into Delhi and shifting schools to online modes of learning.

• Geographical Scope of NCR:

• The National Capital Region (NCR) is a unique multi-state region with a total area of approximately 54,984 square kilometers.

• It encompasses the entire National Capital Territory (NCT) of Delhi and specific districts from Haryana, Uttar Pradesh, and Rajasthan.

• This regional planning approach ensures that climate-related policies like GRAP are applied uniformly across borders to tackle airshed pollution effectively.

Important Points

• Legal and Institutional Framework:

• The GRAP was originally approved by the Supreme Court in 2016 and notified by the Ministry of Environment, Forest and Climate Change (MoEFCC) in 2017.

• Initially, it was implemented by the Environment Pollution (Prevention and Control) Authority (EPCA), but since 2021, the CAQM has taken over the responsibility.

• Climate Context in 2025:

• While GRAP is traditionally associated with winter months (October to January) due to stubble burning and stagnant winds, unseasonal weather shifts in May 2025 necessitated early-stage interventions.

• High summer temperatures combined with dust storms from the Thar Desert often push the PM10 levels high, triggering Stage I protocols to protect public health.

• The Air Quality Index (AQI) considers eight pollutants: PM10, PM2.5, NO2, SO2, CO, O3, NH3, and Pb to calculate the daily pollution score.

Q83. Answer: (c) Rs. 34.96 lakh crore

The correct answer is Rs. 34.96 lakh crore.

Key Points

• The Union Budget 2025-26, presented by the Union Minister for Finance and Corporate Affairs, Smt. Nirmala Sitharaman, on February 1, 2025, estimated the total receipts of the Central Government (excluding borrowings) at Rs. 34.96 lakh crore.

• These receipts primarily comprise Revenue Receipts and Non-Debt Capital Receipts. Revenue receipts are further divided into Tax Revenue (Net to Centre) and Non-Tax Revenue.

• For the financial year 2025-26, the Tax Receipts (Net to Centre) are estimated at Rs. 28.40 lakh crore, showing a robust growth in tax collections compared to the previous financial year. Hence, the statement regarding receipts is correct.

• The Non-Tax Revenue is estimated at Rs. 5.96 lakh crore, which includes dividends from the Reserve Bank of India (RBI) and Public Sector Undertakings (PSUs), along with interest receipts.

• The Non-Debt Capital Receipts (which include recovery of loans and disinvestment proceeds) are estimated at Rs. 0.60 lakh crore.

Additional Information

• Total Expenditure: The total expenditure for the financial year 2025-26 is estimated at Rs. 51.21 lakh crore. This indicates a significant investment in social sectors and infrastructure to achieve the goal of Viksit Bharat by 2047.

• Capital Expenditure (Capex): The government has continued its focus on infrastructure by proposing a capital expenditure outlay of Rs. 11.41 lakh crore. This represents approximately 3.4% of the GDP, aimed at creating long-term assets and generating employment.

• Fiscal Deficit: The Fiscal Deficit for 2025-26 is estimated at 4.3% of the GDP. The government remains committed to its fiscal consolidation path, aiming to reduce the deficit below 4.5% in the coming years.

• Revenue Deficit: The Revenue Deficit is projected at 1.4% of the GDP for 2025-26, reflecting the government's effort to balance consumption expenditure with revenue generation.

• Gross Market Borrowings: To bridge the gap between receipts and expenditure, the Gross Market Borrowings through dated securities for 2025-26 are estimated at Rs. 15.22 lakh crore.

Important Points

• Major Allocation Sectors: The Budget 2025-26 prioritizes Agriculture, Employment, Human Resource Development, and Social Justice. Significant funds are allocated to the PM-Kisan scheme and MNREGA to support the rural economy.

• Direct Tax Reforms: The budget introduced changes in the New Tax Regime, increasing the standard deduction and adjusting tax slabs to provide relief to the middle class and salaried individuals.

• Indirect Taxes: Rationalization of Customs Duties on various items like gold, silver, and critical minerals was announced to promote domestic manufacturing and value addition under the Make in India initiative.

• Health and Education: The allocation for Health and Education saw an increase to strengthen the National Health Mission and the Samagra Shiksha Abhiyan, ensuring holistic development.

Q84. Answer: (c) Centralised Information Management System (CIMS)

The correct answer is Centralised Information Management System (CIMS).

Key Points

• The Reserve Bank of India (RBI) launched a dedicated portal on its Centralised Information Management System (CIMS) in May 2025 to maintain a repository of Digital Lending Apps (DLAs).

• This initiative requires all Regulated Entities (REs), such as Banks and Non-Banking Financial Companies (NBFCs), to report and regularly update information regarding the DLAs they use or outsource for lending activities.

• The primary objective of this portal is to provide a verified list of authorized apps to the public, thereby protecting consumers from unauthorized or illegal lending apps that often engage in predatory practices.

• The CIMS repository includes critical data points such as the name of the app, the name of the RE it is associated with, the web link of the app, and the official logo.

• By mandating this reporting, the RBI aims to enhance transparency and accountability within the rapidly growing Fintech ecosystem in India.

Additional Information

• Centralised Information Management System (CIMS):

• CIMS is the RBI's next-generation data warehouse, which was initially launched to replace the older XBRL (eXtensible Business Reporting Language) based reporting system.

• It utilizes advanced Big Data analytics and Artificial Intelligence (AI) to manage the vast amounts of financial data generated by the Indian banking sector.

• The system serves as a single source of truth for regulatory reporting, monetary policy analysis, and financial stability monitoring.

• Digital Lending Landscape in India:

• Digital Lending refers to the process of offering loans through web platforms or mobile apps, often using automated technologies for credit assessment.

• The RBI issued comprehensive Digital Lending Guidelines in September 2022 to regulate the flow of credit and ensure Consumer Protection.

• In 2024-2025, the surge in unauthorized apps led the government and RBI to tighten the Whitelisting process for apps allowed on the Google Play Store and Apple App Store.

Important Points

• Regulatory Compliance: Any DLA that is not listed on the CIMS repository by its respective Regulated Entity can be flagged as unauthorized by law enforcement agencies.

• Data Security: REs are responsible for ensuring that their DLAs comply with data localization norms and the Digital Personal Data Protection (DPDP) Act, 2023.

• Consumer Redressal: The portal complements the RBI's Ombudsman Scheme and the Sachet Portal, which is used for reporting illegal financial activities.

• Transparency: The public can access the repository to verify if a lending app is genuinely partnered with a licensed bank or NBFC before sharing personal documents.

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Q85. Answer: (c) 89

The correct answer is 89.

Key Points

• The 2025 Bihar Legislative Assembly election was conducted to elect representatives for the 243 constituencies of the state assembly.

• The Bharatiya Janata Party (BJP) secured a total of 89 seats, emerging as a primary pillar of the National Democratic Alliance (NDA) in the state.

• The election results were officially declared in November 2025, following a multi-phase voting process that spanned across the 38 districts of Bihar.

• The 89 seats won by the BJP represented a significant portion of the 122 seats required to reach the majority mark in the Bihar Vidhan Sabha.

• This election saw the BJP consolidate its presence in key regions such as North Bihar and the Magadh division, contributing to the overall stability of the coalition government.

Additional Information

• Bihar Legislative Assembly (Vidhan Sabha):

• The Bihar Legislative Assembly consists of 243 elected members, each serving a term of 5 years.

• It is the lower house of the Bicameral Legislature of Bihar, with the Legislative Council (Vidhan Parishad) being the upper house.

• The 2025 election was the 18th assembly election held in the state since Independence.

• Alliance Dynamics:

• The BJP contested the 2025 elections in alliance with the Janata Dal (United), led by Nitish Kumar, under the banner of the National Democratic Alliance (NDA).

• The primary opposition was the Mahagathbandhan (Grand Alliance), which included the Rashtriya Janata Dal (RJD) and the Indian National Congress.

• Key state leaders for the BJP during this period included Samrat Choudhary and Vijay Kumar Sinha.

• Comparison and Trends:

• In the previous 2020 Bihar Assembly elections, the BJP had won 74 seats; thus, the 89 seats in 2025 indicate an upward trajectory in their electoral performance.

• The election was managed by the Election Commission of India (ECI), utilizing Voter Verifiable Paper Audit Trail (VVPAT) and Electronic Voting Machines (EVM) across all booths.

• Major campaign themes included economic development, social justice, and infrastructure projects under the Double Engine Government narrative.

Important Points

• Constitutional Framework: The conduct of state elections is governed by Article 324 of the Constitution of India, which grants the Election Commission the power of superintendence, direction, and control.

• Seat Distribution: Out of the 243 seats in Bihar, 38 seats are reserved for Scheduled Castes (SC) and 2 seats are reserved for Scheduled Tribes (ST).

• Geopolitical Impact: The BJP's performance in Bihar is often seen as a bellwether for political trends in the Hindi Heartland and has significant implications for the Rajya Sabha seat distribution.

Q86. Answer: (d) New Delhi

The correct answer is New Delhi.

Key Points

• The 2025 World Para Athletics Grand Prix is scheduled to be held in New Delhi, India.

• The event is a major part of the international calendar for para-athletics, bringing together elite athletes from across the globe to compete in various track and field disciplines.

• The Jawaharlal Nehru Stadium in New Delhi serves as the primary venue for this prestigious competition, offering world-class facilities for para-athletes.

• The tournament is organized under the aegis of World Para Athletics, the international governing body for the sport, in collaboration with the Paralympic Committee of India (PCI).

• Hosting the Grand Prix in India highlights the country's rising stature in the Paralympic movement and its commitment to promoting sports for persons with disabilities.

• Athletes participating in this Grand Prix aim to achieve Minimum Entry Standards (MES) and improve their World Rankings for upcoming major championships.

Additional Information

• World Para Athletics Grand Prix Series:

• This is a series of international events launched by World Para Athletics to provide a high-level competition circuit for athletes with physical, intellectual, or vision impairments.

• The series includes multiple stops worldwide, including cities like Dubai, Tunis, and Jesolo, before concluding with the final rankings.

• Paralympic Committee of India (PCI):

• Founded in 1992, the PCI is the national body responsible for the development and promotion of para-sports in India.

• It is recognized by the International Paralympic Committee (IPC) and the Ministry of Youth Affairs and Sports, Government of India.

• The committee has been instrumental in India's record-breaking performance at the Paris 2024 Paralympics, where the country secured 29 medals.

• Significance of New Delhi as a Sports Hub:

• New Delhi has a long history of hosting mega-sporting events, including the 1951 and 1982 Asian Games and the 2010 Commonwealth Games.

• The Jawaharlal Nehru Stadium has a seating capacity of approximately 60,000 and features a synthetic track suitable for international athletics.

• Impact on Indian Para-Athletics:

• By hosting international meets like the Grand Prix, local athletes get the opportunity to compete against the best in the world on home soil, reducing travel burdens and increasing exposure.

• Such events also help in scouting new talent and sensitizing the general public towards Para-sports and inclusivity.

Important Points

• Classification System: In World Para Athletics, athletes are grouped into classes (denoted by 'T' for track and 'F' for field followed by a number) based on the impact of their impairment on performance to ensure fair competition.

• Qualification Standards: The results from the 2025 Grand Prix in New Delhi are official and are used to determine eligibility for the World Para Athletics Championships.

• Growth in Participation: Over the last decade, the number of participating nations and athletes in the Grand Prix circuit has seen a steady increase, reflecting the global growth of Para-sports.

Q87. Answer: (a) Boxing

The correct answer is Boxing.

Key Points

• The event held at Shri Hari Singh Thapa Sports College in Pithoragarh during the 38th National Games in 2025 is Boxing.

• Uttarakhand is the host state for the 38th National Games, which are scheduled to take place from January 28 to February 14, 2025.

• The Shri Hari Singh Thapa Sports College was specifically selected as the venue for Boxing due to its historical association with the sport and its upgraded infrastructure to meet national standards.

• The college is named after the legendary boxer Hari Singh Thapa, often referred to as the "Father of Indian Boxing," who hailed from Uttarakhand and brought international laurels to the country.

• Pithoragarh, known as the "Little Kashmir," was designated as one of the secondary host cities along with Dehradun, Haldwani, Haridwar, and Rudrapur to decentralize the games and promote sports in the hilly regions. Hence, the correct answer is Boxing.

Additional Information

• The 38th National Games 2025:

• This is the first time Uttarakhand is hosting the National Games. The event features approximately 38 sports disciplines across multiple venues in the state.

• The official Mascot for the games is the Himalayan Monal, which is also the state bird of Uttarakhand, symbolizing the biodiversity of the Himalayan region.

• The Indian Olympic Association (IOA) finalized the schedule and venues after assessing the sports infrastructure in cities like Dehradun and Haldwani.

• Shri Hari Singh Thapa (1932–2023):

• He was a middleweight boxer who won seven consecutive national titles between 1950 and 1957.

• He represented India in several international competitions and was a key figure in the Indian Army's sports programs.

• The sports college in Pithoragarh serves as a premier training ground for budding athletes in Uttarakhand, focusing on Boxing, Athletics, and Football.

• Pithoragarh's Role in Sports:

• The district has a rich history of producing athletes for the Indian Armed Forces.

• By hosting the Boxing event in 2025, the region aims to inspire the local youth and boost sports tourism in the Kumaon division.

Important Points

• Infrastructure Upgrades: The Government of Uttarakhand allocated significant funds for the renovation of the Boxing Ring and administrative blocks at the Shri Hari Singh Thapa Sports College to accommodate national-level athletes.

• Other Venues: While Boxing is in Pithoragarh, other major events like Athletics and Aquatics are primarily held at the Maharana Pratap Sports College in Dehradun and the Indira Gandhi International Sports Stadium in Haldwani.

• National Impact: The National Games serve as a qualifying ground and a talent identification platform for the Olympics and Asian Games, making the 2025 edition a crucial milestone for Indian sports.

Q88. Answer: (b) Rs. 99,858.56 Crore

The correct answer is Rs. 99,858.56 Crore.

Key Points

• In the Union Budget 2025-26, presented by the Union Finance Minister Nirmala Sitharaman on February 1, 2025, the Ministry of Health and Family Welfare (MoHFW) was allocated a total of Rs. 99,858.56 Crore.

• This allocation signifies the government's commitment to enhancing the public healthcare system, ensuring better accessibility, and strengthening medical infrastructure across India.

• The total budget for the ministry is bifurcated into two main departments: the Department of Health and Family Welfare, which received the bulk of the funding at Rs. 96,561.02 Crore, and the Department of Health Research, which was allocated Rs. 3,297.54 Crore.

• This budgetary outlay represents an increase compared to the Revised Estimates (RE) of the previous fiscal year, 2024-25, which stood at approximately Rs. 89,287 Crore, reflecting a growth of nearly 11.8%.

• The primary focus of this funding is to support flagship schemes such as the National Health Mission (NHM) and the Ayushman Bharat - Pradhan Mantri Jan Arogya Yojana (PM-JAY), aimed at providing health insurance and primary care to the vulnerable sections of society.

Additional Information

• Ayushman Bharat PM-JAY: This is the world's largest health assurance scheme, providing a health cover of Rs. 5 Lakh per family per year for secondary and tertiary care hospitalization. In the 2025-26 budget, it continues to be a high-priority area to achieve Universal Health Coverage.

• National Health Mission (NHM): The mission includes both National Rural Health Mission (NRHM) and National Urban Health Mission (NUHM). It focuses on strengthening health systems, particularly for maternal and child health and the control of communicable and non-communicable diseases.

• Infrastructure Development: A significant portion of the budget is directed towards the Pradhan Mantri Ayushman Bharat Health Infrastructure Mission (PM-ABHIM), which aims to fill critical gaps in health infrastructure, surveillance, and health research in both urban and rural areas.

• Medical Education: The government has emphasized the creation of more medical colleges by utilizing existing hospital infrastructure under the Pradhan Mantri Swasthya Suraksha Yojana (PMSSY), which also funds the setting up of new AIIMS institutions.

• Digital Health: The Ayushman Bharat Digital Mission (ABDM) received continued support to develop the digital backbone of the healthcare sector, facilitating electronic health records and a comprehensive digital health ecosystem.

Important Points

• Department of Health Research (DHR): With an allocation of Rs. 3,297.54 Crore, this department focuses on clinical research and technological innovation, primarily through the Indian Council of Medical Research (ICMR).

• Pharma Sector Growth: While falling under a different ministry, the health budget is complemented by the PLI (Production Linked Incentive) schemes for Pharmaceuticals to ensure the availability of affordable medicines and medical devices.

• Budgetary Pillars: The 2025-26 budget overall is built on the pillars of Garib (Poor), Mahila (Women), Yuva (Youth), and Annadata (Farmer), with health being a cross-cutting necessity for all four segments.

• Fiscal Year Context: The Union Budget 2025-26 was the second full budget of the NDA government in its third term, maintaining a path of fiscal consolidation while prioritizing capital expenditure in social sectors.

Q89. Answer: (d) 400 acres

The correct answer is 400 acres.

Key Points

• The Supreme Court of India, in April 2025, issued an extension on the stay order regarding the cutting of trees in the Kancha Gachibowli region of Hyderabad.

• The specific area protected under this judicial intervention covers 400 acres of land, which is considered a vital ecological zone in the city.

• The court's decision was prompted by the need to evaluate the environmental impact of proposed developmental projects on this 400-acre stretch, which houses a significant number of heritage trees and local flora.

• This legal stay prevents the Telangana Government or any private contractors from proceeding with land clearing activities that could lead to large-scale deforestation in the IT corridor.

• Environmental activists had filed petitions highlighting that the destruction of this greenery would violate existing environmental norms and exacerbate the urban heat island effect in Hyderabad.

Additional Information

• Kancha Gachibowli: This area is located in the Serilingampally mandal of Hyderabad. It has been a subject of long-standing litigation involving land ownership disputes and environmental conservation efforts.

• Biodiversity Value: The 400 acres in question serve as a "green lung" for the rapidly urbanizing parts of western Hyderabad, providing a habitat for various species of birds and small fauna.

• Legal Context: The Supreme Court often intervenes in such matters under the Public Trust Doctrine, which mandates that the state must protect natural resources for the enjoyment of the general public rather than permitting their conversion into private ownership or commercial use.

• Urban Development vs. Nature: The conflict in Gachibowli reflects a broader national challenge in India where infrastructure expansion frequently clashes with the preservation of urban forests and catchment areas.

Important Points

• Article 21: The Judiciary frequently links the protection of the environment to Article 21 of the Constitution of India, which guarantees the Right to Life, including the right to a healthy environment.

• Forest (Conservation) Act: Any diversion of land that qualifies as a forest or contains a high density of trees typically requires clearance under the Forest (Conservation) Act, 1980.

• Historical Precedents: This case draws parallels to other major environmental litigations in India, such as the Aarey Forest case in Mumbai, where the Supreme Court had to balance transit infrastructure needs with forest preservation.

• Impact of April 2025 Ruling: The extension of the stay on these 400 acres ensures that no irreversible environmental damage occurs while the court examines the Detailed Project Reports (DPR) and environmental clearance certificates.

Q90. Answer: (b) 20°C

The correct answer is 20°C.

Key Points

• The Union Power and Urban Affairs Minister announced in June 2025 a new regulatory mandate that sets the minimum temperature setting for all new Room Air Conditioners (RACs) at 20°C.

• This decision is aimed at enhancing energy efficiency across the country, as cooling below this threshold often leads to disproportionate electricity consumption compared to the actual comfort gained.

• The policy requires manufacturers to lock the lower limit of the temperature range on the thermostat of new units to ensure they cannot be operated below 20°C.

• This mandate follows the previous guidelines issued by the Bureau of Energy Efficiency (BEE), which focused on default settings but now extends to hardware-level minimum limits for commercial and residential units.

• The move is expected to help manage the peak power demand during the peak summer months, especially in urban clusters where AC usage is the primary driver of grid load.

Additional Information

• Bureau of Energy Efficiency (BEE):

• It is a statutory body established under the Energy Conservation Act, 2001, under the aegis of the Ministry of Power.

• The primary goal of BEE is to reduce the energy intensity of the Indian economy through various star-labeling and standard-setting programs.

• Default Temperature vs. Minimum Temperature:

• In January 2020, the government mandated a default temperature setting of 24°C for all star-rated air conditioners.

• While the default setting is the temperature the AC starts at when turned on, the minimum setting (now 20°C) is the lowest temperature a user can manually select on the remote control.

• Energy Saving Potential:

• Technical assessments by BEE suggest that increasing the temperature setting by 1°C can save approximately 6% of electricity.

• Setting the AC at 24°C or 25°C is considered optimal for the human body in tropical climates like India, and capping the minimum at 20°C prevents wasteful over-cooling.

Important Points

• India Cooling Action Plan (ICAP): This regulation aligns with the ICAP launched by the Ministry of Environment, Forest and Climate Change, which seeks to provide sustainable cooling and reduce cooling demand by 20-25% by the year 2037-38.

• Climate Commitments: By reducing energy consumption, India aims to lower its greenhouse gas emissions and meet its Nationally Determined Contributions (NDCs) under the Paris Agreement.

• Economic Impact: For the average consumer, adhering to these temperature limits can lead to a significant reduction in monthly

electricity bills and increase the operational life of the AC compressor.

• Star Labeling: Most modern ACs in India carry a Star Label (1 to 5 stars), which indicates their Indian Seasonal Energy Efficiency Ratio (ISEER); higher stars represent better energy savings.

Q91. Answer: (b) Launch of NVS-02 navigation satellite on GSLV-F15

The correct answer is Launch of NVS-02 navigation satellite on GSLV-F15.

Key Points

• The Launch of NVS-02 navigation satellite on GSLV-F15 is recognized in this context as the milestone marking the 100th launch from India's Spaceport located at Sriharikota. Hence, statement 2 is correct.

• This mission utilized the Geosynchronous Satellite Launch Vehicle (GSLV-F15), which is a three-stage launch vehicle designed to place satellites into Geosynchronous Transfer Orbit (GTO).

• The NVS-02 is a part of the second-generation satellite series for the Navigation with Indian Constellation (NavIC), aimed at providing accurate and real-time positioning and timing services over India and the surrounding region.

• The Satish Dhawan Space Centre (SDSC) SHAR in Sriharikota has been the primary orbital launch site for ISRO since its first launch in 1979 (the SLV-3).

• Reaching the 100th launch milestone at a single spaceport signifies India's growing self-reliance and commercial viability in the global space market.

Additional Information

• Launch of Aditya-L1 solar observatory:

• This was India's first dedicated solar mission, launched on September 2, 2023.

• It was launched using the PSLV-C57 rocket and placed at the Lagrangian Point 1 (L1) to study the Sun's corona and solar winds. Hence, statement 1 is incorrect.

• Launch of INSAT-3DS weather satellite:

• Launched on February 17, 2024, via the GSLV-F14 mission.

• It is an advanced meteorological satellite designed for enhanced monitoring of Earth's surface, oceanic observations, and weather forecasting. Hence, statement 3 is incorrect.

• Launch of Chandrayaan-3:

• Launched on July 14, 2023, using the LVM3-M4 (Launch Vehicle Mark-III) rocket.

• This mission successfully performed a soft landing on the Lunar South Pole on August 23, 2023, making India the first country to do so. Hence, statement 4 is incorrect.

• Satish Dhawan Space Centre (SDSC) SHAR:

• Located in Sriharikota, Andhra Pradesh, it features two active launch pads.

• It was named after Prof. Satish Dhawan, the former Chairman of ISRO, in 2002.

Important Points

• NavIC (Navigation with Indian Constellation): Formerly known as IRNSS, it consists of a constellation of 7 to 9 satellites providing Standard Positioning Service (SPS) for civilians and Restricted Service (RS) for strategic users.

• ISRO (Indian Space Research Organisation): Formed on August 15, 1969, with its headquarters in Bengaluru. It operates under the Department of Space.

• Launch Vehicles: ISRO utilizes various vehicles including PSLV (the "workhorse"), GSLV (for heavier payloads), LVM3 (the heaviest launcher), and the SSLV (Small Satellite Launch Vehicle).

• The NVS series satellites incorporate L1, L5, and S-band signals and, for the first time, carry an indigenous Rubidium atomic clock for high-precision timing.

Q92. Answer: (b) Medicine

The correct answer is Medicine.

Key Points

• Dr. Duvvur Nageshwar Reddy was conferred with the Padma Vibhushan in the year 2025 for his exceptional and distinguished service in the field of Medicine.

• He is a world-renowned gastroenterologist and serves as the Chairman and Founder of the Asian Institute of Gastroenterology (AIG) located in Hyderabad, Telangana.

• His pioneering work is primarily in the field of Therapeutic Endoscopy, where he has introduced innovative techniques that have revolutionized gastrointestinal treatments globally.

• The Padma Vibhushan is the second-highest civilian award in India, preceded by the Bharat Ratna and followed by the Padma Bhushan and Padma Shri.

• Dr. Reddy is recognized as one of the world's leading experts in Gastrointestinal Endoscopy and has trained thousands of doctors from across the globe at his institute.

Additional Information

• Previous Honors: Prior to receiving the Padma Vibhushan in 2025, Dr. Nageshwar Reddy was awarded the Padma Shri in 2002 and the Padma Bhushan in 2016. This makes him one of the few medical professionals to receive three of the top four civilian honors.

• International Recognition: In 2021, he became the first Indian doctor to receive the Rudolf V. Schindler Award, which is the highest honor bestowed by the American Society for Gastrointestinal Endoscopy (ASGE).

• Academic Contributions: He has published over 600 papers in international journals and has served as the President of the World Endoscopy Organization.

• Medical Service: Under his leadership, AIG Hospitals in Hyderabad has emerged as one of the largest referral centers in the world for complex gastrointestinal procedures, combining affordable healthcare with cutting-edge medical technology.

• Awards in other fields: While options like Art, Public Affairs, and Trade and Industry are categories for Padma Awards, Dr. Reddy's lifelong dedication has been exclusively toward clinical research and patient care in the medical sector.

Important Points

• Padma Awards Process: The Padma Awards are announced every year on the occasion of Republic Day (January 26th) and are presented by the President of India at Rashtrapati Bhavan.

• Eligibility: These awards are given in various disciplines such as Art, Social Work, Public Affairs, Science and Engineering, Trade and Industry, Medicine, Literature and Education, Sports, and Civil Service.

• Selection Committee: The Padma Awards Committee is constituted by the Prime Minister of India every year, and the recommendations are submitted to the Prime Minister and the President for approval.

• Significance of the 2025 List: The 2025 list highlights individuals who have made "exceptional and distinguished" contributions, and Dr. Duvvur Nageshwar Reddy represents the highest standard of medical excellence and scientific temperament in India.

Q93. Answer: (d) Josue Silva

The correct answer is Josue Silva.

Key Points

• Indian pugilist Nishant Dev registered a significant victory in his professional boxing career by defeating Josue Silva in a high-stakes encounter.

• The bout took place in June 2025 at the prestigious Madison Square Garden Theatre in New York, marking a major milestone for Indian professional boxing on the global stage.

• This victory secured Nishant Dev's second professional win, maintaining his undefeated streak since transitioning from the amateur circuit to the professional ranks.

• The match was contested in the Super Welterweight division, where Nishant Dev showcased his superior technical skills and punching power against his opponent.

• The win at such an iconic venue as Madison Square Garden significantly boosts Nishant Dev's world rankings and visibility in the United States boxing market.

Additional Information

• Nishant Dev:

• He hails from Karnal, Haryana, India, a region known for producing world-class boxers.

• Before turning professional, he achieved international acclaim by winning a bronze medal at the 2023 IBA Men's World Boxing Championships held in Tashkent.

• He represented India at the Paris 2024 Olympics, reaching the quarterfinals in the 71 kg category before making his professional debut in early 2025.

• Super Welterweight Division:

• In professional boxing, the Super Welterweight category (also known as Junior Middleweight or Light Middleweight) has a weight limit of 154 pounds (69.9 kg).

• It is one of the most competitive divisions in boxing, historically featuring legends like Floyd Mayweather and Manny Pacquiao.

• Venue Significance:

• Madison Square Garden (MSG) is often referred to as the "Mecca of Boxing." Hosting a bout at the Theatre at MSG is considered a rite of passage for rising stars in the professional boxing world.

Important Points

• Professional vs. Amateur Boxing: Professional boxing differs from the amateur style (seen in the Olympics) by the absence of headgear, the use of smaller gloves, and longer durations (ranging from 4 to 12 rounds).

• Transition to Pro: Nishant Dev's move to the professional circuit follows a growing trend of elite Indian boxers, such as Vijender Singh, seeking global titles and commercial success outside the traditional amateur framework.

• Record: With this win against Josue Silva, Nishant Dev moves to a 2-0 professional record, establishing himself as a serious contender in the Super Welterweight class for 2025.

Q94. Answer: (b) Andhra Pradesh

The correct answer is Andhra Pradesh.

Key Points

• The 11th International Day of Yoga (IDY) ceremony, held on June 21, 2025, was hosted by the state of Andhra Pradesh.

• Prime Minister Narendra Modi graced the occasion as the Chief Guest, leading the mass yoga demonstration along with thousands of participants. Hence, the statement regarding Andhra Pradesh as the host is correct.

• The event highlighted the cultural heritage and spiritual significance of the region, specifically focusing on the integration of yoga into daily life for holistic well-being.

• The selection of Andhra Pradesh as the national venue underscores the government's initiative to decentralize major national celebrations across different states of India.

• The Ministry of Ayush worked in coordination with the State Government of Andhra Pradesh to organize this large-scale event, ensuring participation from various educational institutions, NGOs, and yoga enthusiasts.

Additional Information

• Origin of International Day of Yoga:

• The idea for an International Day of Yoga was first proposed by Prime Minister Narendra Modi during his address to the United Nations General Assembly (UNGA) on September 27, 2014.

• The UNGA draft resolution was passed with a record 175 member states co-sponsoring the initiative, leading to the official declaration of June 21 as the International Day of Yoga.

• Ministry of Ayush:

• This Union Ministry is the nodal agency for the celebration of Yoga Day in India.

• It promotes Ayurveda, Yoga, Naturopathy, Unani, Siddha, and Homoeopathy. The ministry issues the Common Yoga Protocol (CYP), which serves as a guide for yoga performances globally.

• Global Participation:

• The International Day of Yoga is observed in nearly 190 countries, with major events organized at iconic locations like Times Square in New York and the Eiffel Tower in Paris.

• It aims to raise global awareness about the numerous benefits of practicing yoga, which is an ancient Indian physical, mental, and spiritual practice.

Important Points

• Symbolism of June 21:

• The date June 21 was chosen because it is the Summer Solstice, the longest day of the year in the Northern Hemisphere.

• In Indian mythology, the Summer Solstice marks the transition to Dakshinayana and is considered the period when Lord Shiva (the Adiyogi) began imparting the knowledge of yoga to the Saptarishis.

• Previous Host Cities:

• The first-ever Yoga Day in 2015 was held at Rajpath, New Delhi, creating two Guinness World Records.

• In subsequent years, the national event moved to cities like Chandigarh (2016), Lucknow (2017), Dehradun (2018), Ranchi (2019), Mysuru (2022), Jabalpur (2023), and Srinagar (2024).

• Yoga for Health:

• Scientific studies promoted during these events highlight that Yoga helps in reducing stress, improving cardiovascular health, and enhancing mental clarity.

• The World Health Organization (WHO) also mentions Yoga as a tool to improve physical activity in its Global Action Plan 2018-2030.

Q95. Answer: (d) STEM Graduates

The correct answer is STEM Graduates.

Key Points

• China officially announced the introduction of a new visa category, the K Visa, which is scheduled to take effect on October 1, 2025.

• The primary target of this visa category is STEM Graduates—professionals specializing in Science, Technology, Engineering, and Mathematics—who are viewed as vital for the nation's technological advancement.

• The initiative is part of a broader geopolitical strategy to attract high-potential international talent and young researchers from world-class universities to bolster China's domestic innovation ecosystem.

• By simplifying the entry and residency procedures for STEM professionals, the Chinese government aims to facilitate the growth of critical sectors such as artificial intelligence, quantum computing, and advanced manufacturing.

• The K Visa serves as a specialized pathway, distinguishing itself from general work visas (Z Visa) by focusing specifically on the academic and technical qualifications of young professionals.

Additional Information

• STEM Definition: The term STEM encompasses a wide range of disciplines, including aerospace engineering, biotechnology, data science, and robotics. These fields are recognized globally as the primary drivers of economic productivity and digital transformation.

• Comparison with R Visa: Before the K Visa, the R Visa was the primary vehicle for high-level foreign experts. However, the K Visa is more inclusive of recent graduates and early-career STEM professionals who may not yet have reached "expert" status but possess specialized skills.

• Talent-Strong Nation Strategy: This visa launch aligns with China's long-term "Talent-Strong Nation" strategy, formulated to reduce reliance on foreign technology and build a self-sufficient knowledge economy by 2035.

• Global Competition for Talent: The K Visa reflects an intensifying global "war for talent," as countries like the USA, UK, and Germany also offer specialized pathways to retain international STEM students.

• Implementation Date: The choice of October 1, 2025, coincides with China's National Day, symbolizing the integration of international intellect into the country's national development goals.

Important Points

• Eligibility Criteria: Applicants for the K Visa are generally expected to be graduates from top-tier global institutions, often referenced by rankings such as QS World University Rankings or Times Higher Education (THE).

• Incentives: Beyond simple entry, the visa program is often linked to local government incentives in cities like Shenzhen, Shanghai, and Beijing, providing research grants or housing subsidies for STEM professionals.

• Strategic Impact: The influx of STEM Graduates is intended to address labor shortages in China's rapidly expanding semiconductor and renewable energy industries.

Q96. Answer: (b) Karnataka

The correct answer is Karnataka.

Key Points

• The state government of Karnataka launched a specialized incentive scheme in July 2025 to provide financial assistance to couples from minority communities.

• Under this scheme, an incentive of Rs. 50,000 is provided to each couple who chooses to marry through mass marriage events (Samoohika Vivaha) organized or recognized by the state.

• The primary objective of this initiative is to encourage simplicity in weddings and reduce the financial burden on families belonging to economically weaker sections within the minority category.

• The scheme is implemented and monitored by the Minority Welfare Department of Karnataka, ensuring that the benefits reach the intended Muslim, Christian, Sikh, Jain, Buddhist, and Parsi communities.

• By promoting mass marriages, the government aims to curb the practice of taking high-interest loans for extravagant wedding ceremonies, which often leads to long-term rural and urban indebtedness among minority families.

Additional Information

• Samoohika Vivaha (Mass Marriage): This is a socially progressive concept widely promoted in South India, particularly in Karnataka and Tamil Nadu, where multiple couples are wedded in a single venue to save on costs related to catering, decoration, and logistics.

• Direct Benefit Transfer (DBT): The incentive of Rs. 50,000 is typically credited directly into the joint bank account of the couple or the account of the bride via DBT to maintain transparency and eliminate middlemen.

• Eligibility Criteria: Beneficiaries must be permanent residents of Karnataka. Both the bride and groom must meet the legal age of marriage (18 and 21 years respectively) and must provide valid community certificates and income certificates to avail of the benefits.

• Minority Welfare Measures: Karnataka has a robust framework for minority support, including the Karnataka State Minorities Development Corporation (KSMDC), which manages various loan and subsidy schemes like Arivu (Education Loan) and Shrama Shakti.

• Social Impact: Such schemes help in fostering communal harmony and social integration, as mass marriage events often bring together diverse groups under a single celebratory platform, supported by government funding.

Important Points

• Registration Process: Couples intending to benefit from the Rs. 50,000 incentive must register at least 30 days prior to the mass marriage event at the district Minority Welfare Office.

• Previous Schemes: This 2025 initiative is an enhancement of earlier social security measures like the Bidaai Scheme (Shaadi Bhagya), which previously offered financial aid for the marriage of poor minority women in the state.

• Documentation: Mandatory documents for the application include Aadhaar Card, Ration Card (BPL), Voter ID, and a certificate from the religious institution or the organizer of the mass marriage.

• Geographical Reach: While the scheme is applicable across all 31 districts of Karnataka, special focus is often given to regions with higher concentrations of minority populations such as Kalaburagi, Bidar, and Bengaluru.

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Q97. Answer: (a) Manisha Ramadass

The correct answer is Manisha Ramadass.

Key Points

• Manisha Ramadass secured the gold medal in the Women's Singles SU5 category at the 2025 Asia Para Badminton Championship.

• In the final match, she defeated her fellow Indian teammate Thulasimathi Murugesan to claim the title, highlighting India's dominance in this specific classification.

• The 2025 Asia Para Badminton Championship is a premier continental event sanctioned by the Badminton World Federation (BWF), attracting the best para-shuttlers from across Asia.

• This victory further cements her status as a world-class athlete in the SU5 classification, which is for players with upper limb impairments.

• Her performance in the tournament is a continuation of her exceptional form, contributing significantly to the Indian para-badminton team's overall medal tally.

Additional Information

• SU5 Classification:

• The SU5 category in para-badminton is for athletes who have impairments in their upper limbs.

• The impairment could be on the playing or non-playing hand, which affects the player's balance, movement, and power during the game.

• Manisha Ramadass:

• She hails from Tamil Nadu and has been a rising star in Indian para-sports.

• She was honored as the BWF Female Para-Badminton Player of the Year in 2022.

• She won the bronze medal at the Paris 2024 Paralympic Games, making her one of the most successful athletes in her category.

• Thulasimathi Murugesan:

• She is another top-tier Indian para-shuttler who secured the silver medal at the 2025 Asia Championships after losing to Manisha in the final.

• She notably won the silver medal at the Paris 2024 Paralympics, showcasing the high level of competition within the Indian contingent.

Important Points

• Indian Para-Badminton Success:

• India has become a global powerhouse in para-badminton, consistently winning medals at the Paralympic Games, World Championships, and Asian Para Games.

• Players like Mandeep Kaur (SL3 category) and Palak Kohli (SL4/SU5 category) are other prominent names who have represented India at the highest levels of the sport.

• Tournament Significance:

• Continental championships like the Asia Para Badminton Championship are crucial for athletes to gain BWF world ranking points.

• High rankings are essential for qualification into major global events like the World Para Badminton Championships and the Los Angeles 2028 Paralympic Games.

• The support provided by the Ministry of Youth Affairs and Sports through the Target Olympic Podium Scheme (TOPS) has been instrumental in the success of these para-athletes.

Q98. Answer: (d) K Arumugam and Errol D'Cruz

The correct answer is K Arumugam and Errol D'Cruz.

Key Points

• The book titled 'March of Glory', which chronicles the illustrious history and journey of Indian Hockey, was released in March 2025.

• It is co-authored by the duo K Arumugam and Errol D'Cruz, both of whom are esteemed figures in the realm of sports documentation and journalism.

• K Arumugam is a widely recognized hockey historian and writer who has spent decades documenting the sport's evolution in India.

• Errol D'Cruz is a veteran sports journalist with extensive experience in covering field hockey at national and international levels.

• The book provides a detailed narrative of India's achievements in the Olympic Games and other major international tournaments, highlighting the golden era and the recent resurgence of the national sport.

Additional Information

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• K Arumugam:

• He is the Founder of the NGO named Hockey Citizen Group, which initiated the famous 'One Thousand Hockey Legs' project to promote the game among school children.

• He has authored several notable books on hockey, including 'The Golden Boot' and 'The Gulu Report', and maintains an extensive database on Indian hockey statistics.

• Errol D'Cruz:

• He is a senior editor and sports writer who has covered multiple World Cups and Asian Games.

• His writing style is known for blending technical analysis with the human-interest stories of athletes, making sports history accessible to the general public.

• Significance of the Book:

• The 'March of Glory' serves as an important historical record for researchers and fans, especially in the context of India's renewed success in the 2020 Tokyo Olympics and the 2024 Paris Olympics.

• It documents player profiles, rare photographs, and match reports from the pre-Independence era to the modern day.

Important Points

• India's Hockey Legacy: India has won a total of 8 Olympic Gold Medals in field hockey, a record that remains unparalleled in the history of the Olympic Games.

• Authorship Context: While other authors like Boria Majumdar or Gideon Haigh are also prominent sports writers, they are associated with different works (such as cricket or general Olympic history). The specific collaboration for 'March of Glory' is strictly between K Arumugam and Errol D'Cruz.

• Year of Release: The release in 2025 coincides with the growing interest in Indian sports literature, aimed at preserving the heritage of Indian athletes for the younger generation.

Q99. Answer: (c) NAVYA

The correct answer is NAVYA.

Key Points

• NAVYA is a unique pilot initiative launched by the Government of India on 24 June 2025.

• The program was specifically inaugurated in Sonbhadra district of Uttar Pradesh, which is identified as one of the Aspirational Districts under the central government's development framework.

• The primary focus of the NAVYA scheme is to provide vocational training and skill development to adolescent girls, particularly those belonging to marginalized and tribal communities.

• The initiative aims to bridge the gender gap in technical education by offering courses in digital literacy, financial management, and healthcare assistance. Hence, the correct answer is NAVYA.

• It is designed to empower girls between the age group of 14 to 18 years who may have dropped out of formal schooling or require additional job-oriented skills to improve their employability.

Additional Information

• Geographic Significance of Sonbhadra:

• Sonbhadra is the only district in India that shares its boundary with four states: Madhya Pradesh, Chhattisgarh, Jharkhand, and Bihar.

• Choosing this location for the NAVYA pilot ensures that the benefits reach a high concentration of Scheduled Tribes (ST) and Scheduled Castes (SC) populations.

• The Aspirational Districts Programme (ADP):

• Launched by the NITI Aayog in January 2018, the program aims to quickly and effectively transform 112 of the most under-developed districts across the country.

• Initiatives like NAVYA are part of the broader strategy to improve indicators in Health & Nutrition, Education, and Skill Development within these regions.

• Comparison with other options:

• DHARANI: This is generally associated with the Integrated Land Records Management System in Telangana, aimed at digitizing land data.

• MITRA: Usually refers to the PM-MITRA (Mega Integrated Textile Region and Apparel) scheme, which focuses on the textile industry and infrastructure.

• AMRUTA: While similar to AMRUT (Atal Mission for Rejuvenation and Urban Transformation), it does not specifically target adolescent vocational training in the context of the June 2025 Sonbhadra launch.

Important Points

• Skill India Mission Convergence: The NAVYA initiative works in tandem with the Skill India Mission (launched in 2015) to ensure that the curriculum meets the current industry standards.

• Socio-Economic Impact: By targeting adolescent girls, the government aims to prevent early marriages and promote economic independence among women in rural India.

• Digital Integration: A key feature of NAVYA is the "Digital Sakhi" component, where trained girls act as catalysts for digital payments and online services in their respective villages.

• Monitoring and Evaluation: The success of this pilot project in Uttar Pradesh will determine its nationwide rollout across other tribal-dominated districts in 2026.

Q100. Answer: (b) Russia

The correct answer is Russia.

Key Points

• INS Tamal is a state-of-the-art stealth multi-role frigate that was commissioned by the Indian Navy on 1 July 2025.

• The vessel was constructed in Russia at the Yantar Shipyard located in Kaliningrad. This shipyard has a long-standing history of building high-quality naval vessels for the Indian Navy.

• The construction of this frigate is part of a larger deal signed between India and Russia in 2016 for the procurement of four additional Project 1135.6 (also known as Talwar-class) frigates.

• Under the agreement, two frigates were to be built in Russia at the Yantar Shipyard, while the remaining two are being constructed in India at Goa Shipyard Limited (GSL) through a technology transfer.

• The commissioning of INS Tamal on 1 July 2025 marks a significant milestone in Indo-Russian defense cooperation and strengthens the Indian Navy's maritime capabilities in the Indian Ocean Region.

Additional Information

• Project 1135.6 (Talwar-class):

• These are a class of stealth guided-missile frigates designed by Russia to perform diverse roles, including anti-submarine, anti-surface, and anti-air warfare.

• The frigates feature a reduced radar cross-section (RCS) due to their specific hull design and the use of stealth coatings, making them harder to detect by enemy sensors.

• Prior to INS Tamal, Russia delivered six Talwar-class frigates in two batches: the first batch included INS Talwar, INS Trishul, and INS Tabar; the second batch included INS Teg, INS Tarkash, and INS Trikand.

• Make in India in Defense:

• The procurement of these frigates aligns with the Make in India initiative, as technical assistance and expertise from Russia enable Goa Shipyard Limited to build advanced warships domestically.

• The Goa Shipyard Limited (GSL) project for the remaining two frigates represents a major boost for the indigenous shipbuilding industry in India.

Important Points

• Technical Specifications:

• INS Tamal is powered by M7N.1E gas turbine plant engines, which allow the ship to reach high speeds required for modern naval engagements.

• The primary offensive weapon of the vessel is the BrahMos supersonic cruise missile system, which is a joint venture between DRDO of India and NPOM of Russia.

• The ship is also equipped with advanced surface-to-air missiles, torpedo tubes, and a 100mm A-190 gun for close-range combat.

• Strategic Impact:

• The induction of these frigates is crucial for maintaining the Indian Navy's operational readiness amidst growing maritime challenges in the Indo-Pacific.

• The ship can carry an integrated helicopter, such as the Kamov-31 or HAL Dhruv, to enhance its anti-submarine warfare (ASW) and surveillance capabilities.

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