RRB Group D Official Paper (Held On: 09 Dec, 2025 Shift 3) (Previous Year Paper)

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

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GENERAL SCIENCE

Q1. The plasma membrane is composed of _____.

(a) proteins and sugars
(b) lipids and proteins
(c) DNA and lipids
(d) sugars and lipids

Q2. Carbon can form long chains because it exhibits _____ and shows _____.

(a) double bond; triple bond
(b) tetravalency; catenation
(c) electronegativity; tetravalency
(d) trivalent; catenation

Q3. Which of the following is true for solids?

a. Definite shape
b. Rigidity fixed
c. Volume

(a) b and c only
(b) a, b and c
(c) a and b only
(d) a and c only

Q4. In a balanced chemical equation, the total number of atoms of each element is:

(a) More on the reactant side
(b) More on the product side
(c) Always changing
(d) Equal on both sides

Q5. Which of the following is NOT an example of action-reaction pair?

(a) Swimmer pushes water backward and water pushes swimmer forward
(b) Force of engine on car and car moves forward
(c) Bat exerts force on ball and ball exerts force on bat
(d) Gun recoils backward and bullet moves forward

Q6. What is the process known for removing impurities from ores?

(a) Refining
(b) Roasting
(c) Concentration
(d) Smelting

Q7. In flowering plants, the fusion of the male and female gametes within the ovule is called _____.

(a) pollination
(b) transpiration
(c) fertilisation
(d) germination

Q8. Ohm's Law is valid under which condition?

(a) For all materials at any temperature
(b) Only for semiconductors
(c) Only for insulator at high temperatures
(d) Only for metallic conductors at constant temperature

Q9. If a student adds water to a concentrated acid quickly, what is likely to happen?

(a) The solution may splash and cause burns.
(b) The acid will solidify.
(c) The solution will become cold.
(d) Nothing will happen.

Q10. Identify the way that is NOT used by insect pests to attack the plants.

(a) By boring into stem and fruits
(b) By cutting the root, stem and leaf
(c) By creeping on stem
(d) By sucking the cell sap

Q11. The absolute refractive index of a medium is defined as:

(a) the ratio of speed of light in vacuum to that in medium
(b) the ratio of speed of light in one medium to that in another medium
(c) the ratio of speed of light in medium to that in vacuum
(d) the ratio of speed of light in medium to that in air

Q12. What causes the acceleration of an object when it falls toward the Earth?

(a) Earth's gravitational force
(b) Air resistance
(c) Magnetic force
(d) Friction

Q13. The lens formula is given by:

(a) $f = v + u$
(b) $f = uv$
(c) $1/f = 1/v - 1/u$
(d) $1/f = u/v$

Q14. Which statement best describes the forces involved when a bird flaps its wings downward to fly upward?

(a) The bird pushes the air downward, but no equal and opposite force acts on it.
(b) The bird's weight acts as the action force, and the air provides the reaction force.
(c) The flapping of wings is the action, and the gravity pulling the bird down is the reaction.
(d) The downward push of the wings on the air is the action, and the lift produced by the air on the wings is the reaction.

Q15. An electric bulb draws a current of 0.15 A for 8 minutes. How much electric charge flows through the circuit during this time?

(a) 72 C
(b) 1.2 C
(c) 72 A
(d) 720 C

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Q16. Which plant tissue is mostly found in the husk of a coconut, and what is its main function?

(a) Collenchyma – providing flexibility
(b) Sclerenchyma – providing strength and rigidity
(c) Parenchyma – storage of food
(d) Xylem – conducting water and minerals

Q17. A ball of mass 3 kg is raised to a height of 6 m. Its potential energy is _____.
Take g = 10 m/s²

(a) 180 J
(b) 1.8 J
(c) 200 J
(d) 20 J

Q18. Calcium hydroxide reacts slowly with the carbon dioxide in air to form a thin layer of which compound that could be used for the purpose of whitewashing?

(a) CaCO3
(b) Ca(HCO3)2
(c) CaO
(d) CaSO4

Q19. What happens right after the formation and maturation of seeds in flowering plants?

(a) Seed germination
(b) Seed dispersal
(c) Fertlisation
(d) Pollination

Q20. What happens when you dissolve sugar in water?

(a) Sugar particles occupy spaces between water particles
(b) Sugar reacts with water
(c) Water evaporates
(d) Particles of sugar settle at the bottom

Q21. The approximate radii of hydrogen atom is:

(a) 10^(-7) m
(b) 10^(-10) m
(c) 10^(-8) m
(d) 10^(-9) m

Q22. Which of the following contraceptive devices/methods prevent(s) spreading of STDs (Sexually Transmitted Diseases) such as AIDS?

(a) Vasectomy/Tubectomy
(b) Condoms
(c) Oral Pills
(d) Copper T

Q23. If the time period of a sound wave is T, what does 1/T represent?

(a) Frequency (ν)
(b) Speed (v)
(c) Amplitude (A)
(d) Wavelength (λ)

Q24. The _____ is the longest cell in the human body.

(a) neuron
(b) muscle fibre
(c) platelet

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(d) osteocyte

Q25. Substances that are broken down by biological processes are said to be:

(a) non-biodegradable
(b) synthetic
(c) metallic
(d) biodegradable

MATHEMATICS

Q26. Three numbers are in the ratio 2 : 17 : 19 and the sum of these numbers is 7752. Find the middle number.

(a) 3470
(b) 3468
(c) 3469
(d) 3465

Q27. In quadrilateral PQRS, the bisectors of angle R and angle S meet at the point T (inside the quadrilateral) and angle STR = 28°. 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) 13°
(b) 3°
(c) 8°
(d) 6°

Q28. The monthly incomes of two friends Kiran and Mahesh, are in the ratio 5 : 8 respectively and each of them saves Rs. 78,000 every month. If the ratio of their monthly expenditure is 2 : 4, find the monthly income of Kiran (in Rs.).

(a) 1,94,000
(b) 1,95,000
(c) 2,73,000
(d) 1,96,000

Q29. The arithmetic mean of the observations 58, 13, 74, 38, 98, 36, 43, 39 and 42 is:

(a) 51
(b) 43
(c) 53
(d) 49

Q30. A group of 10 women can weave a designer saree in 20 days. After 4 days, another group of 20 women joins them to work on the same saree. In how many more days will the saree be completely woven?

(a) 10 days
(b) 51/3 days
(c) 101/2 days
(d) 64/11 days

Q31. A train overtakes two people running along a railway track. The first person is running at 12.6 km/hr, and the second person is running at 25.2 km/hr. The train takes 16.8 seconds to pass the first person and 22.4 seconds to pass the second person. What is the speed of the train if both are running in the same direction as the train?

(a) 63 km/hr
(b) 60 km/hr
(c) 59 km/hr
(d) 62 km/hr

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Q32. 1/20 is what percentage of 11/90 (rounded off to two decimal places)?

(a) 81.82%
(b) 55.91%
(c) 40.91%
(d) 50.91%

Q33. From a shipmast head 210 m high, the angle of depression of a boat is observed to be 60°. Find the distance (in m) of the boat from the ship.

(a) 60√3
(b) 70√3
(c) 60√2
(d) 70√2

Q34. Evaluate: 60 − [12 ÷ (2 + 1) + 4 × 2]

(a) 50
(b) 46
(c) 49
(d) 48

Q35. The total number of colour blocks is 8360. If the ratio of red block to blue block is 1 : 3 and the ratio of blue block to yellow block is 7 : 4, then how many yellow blocks are there?

(a) 2495
(b) 2494
(c) 2508
(d) 2598

Q36. The length of a rectangle is twice its breadth. If the perimeter of the rectangle is 12 cm, find the length and breadth.

(a) Length = 2 cm and breadth = 4 cm
(b) Length = 3 cm and breadth = 6 cm
(c) Length = 4 cm and breadth = 2 cm
(d) Length = 6 cm and breadth = 3 cm

Q37. The largest possible cone is carved from a solid wooden cube of side 21 cm. What is the volume of the wood (in cm^3) left over? (Use π = 22/7)

(a) 6125.5
(b) 6835.5
(c) 5940.5
(d) 7240.3

Q38. Find the lowest value for * in the number 3*760 such that the resulting number is divisible by 12.

(a) 0
(b) 5
(c) 1
(d) 2

Q39. Two banks, A and B, offered loans at 3.5% and 7.5% per annum, respectively. Rakesh borrowed an amount of Rs. 2,20,000 from each bank. Find the positive difference (in Rs.) between the amounts of simple interest paid to the two banks by Rakesh after 4 years.

(a) 34,700
(b) 35,200
(c) 36,200
(d) 36,700

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Q40. Calculate the mode from the following data.

Days of Confinement	7	8	9	10	11
Number of Patients	5	7	8	6	4

(a) 8
(b) 9
(c) 10
(d) 11

Q41. Two trains, 130 m and 190 m long, are running in the same direction at speeds of 96 km/hr and 48 km/hr, respectively. How much time will the faster train take to completely cross the slower one?

(a) 8 seconds
(b) 9 seconds
(c) 24 seconds
(d) 18 seconds

Q42. The sum of the first 9 prime numbers is:

(a) 102
(b) 100
(c) 101
(d) 96

Q43. The marked price of an item is set at 41% above its cost price. If the merchant sells the item at 13% below the marked price, his profit percentage (rounded off to 1 decimal place) is:

(a) 22.7%
(b) 25.4%
(c) 21.8%
(d) 26.3%

Q44. After allowing a discount of 11% on the marked price of an article, it is sold for Rs. 41,207. Find its marked price (in Rs.).

(a) 46,276
(b) 46,148
(c) 46,363
(d) 46,300

Q45. If the total age of Hassan and Ali is 12 years more than the total age of Ali and Ahmed, how many years younger is Ahmed than Hassan?

(a) 14
(b) 12
(c) 10
(d) 11

Q46. A and B working together can do a piece of work in 4 days. B alone can do the same work in 36 days. How long (in days) will A alone take to do double the work?

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

Q47. Simplify $(2x - 1)^2 - (x - 4)(x + 4)$

(a) $3x^2 + 4x + 17$
(b) $3x^2 - 4x + 15$
(c) $2x^2 - 4x + 17$

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(d) $3x^2 - 4x + 17$

Q48. The cost of a washing machine is 40% less than the cost of a TV. If the cost of the washing machine increases by 51% and that of the TV decreases by 15%, then what is the percentage change in the total cost of 5 washing machines and 7 TVs?

(a) Decrease by 8%
(b) Decrease by 5%
(c) Increase by 5.2%
(d) Increase by 4.8%

Q49. The difference between the cost price and the selling price of an object is Rs. 480. If the profit is 20% on the cost price, find the selling price of the object.

(a) Rs. 2,500
(b) Rs. 2,400
(c) Rs. 2,000
(d) Rs. 2,880

Q50. If 3 is added to the numerator of a fraction, it becomes 1, and if 4 is added to the denominator of the fraction, it becomes 4/5.

What is the product of the numerator and the denominator of the original fraction?

(a) 868
(b) 896
(c) 886
(d) 688

GENERAL INTELLIGENCE & REASONING

Q51. This question is based on the following words

COP, TIK, ANY, CAN, OWN

If in each of the words, each letter is changed to the next letter in the English alphabetical order, how many words thus formed will have no vowel?

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

Q52. If 'A' stands for '÷', 'B' stands for 'x', 'C' stands for '+' and 'D' stands for '-', what will be come in place of question mark '?' in the following equation?

41 C 12 A 6 D 5 B 2 = ?

(a) 32
(b) 34
(c) 33
(d) 31

Q53. Refer to the given number series and answer the question that follows. Counting to be done from left to right only. All numbers are single-digit numbers.

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

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

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

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Q54. Ravindra starts from Point A and drives 9 km towards the east. He then takes a left turn, drives 3 km, turns right and drives 4 km. He then takes a right turn and drives 8 km. He takes a final right turn, drives 13 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 degrees turns only, unless specified.)

(a) 7 km towards east
(b) 5 km towards south
(c) 15 km towards north
(d) 5 km towards north

Q55. In a row of 41 people facing north, Mohan is 10^(th) from the left end. If Rahul sits 9^(th) to the right of Mohan, what is Rahul's position from the right end of the row?

(a) 23rd
(b) 24th
(c) 22nd
(d) 21st

Q56. Eight people – A, B, C, D, E, F, G and H, are sitting around a circular table facing the centre. C sits to the immediate left of A. Only two people sit between C and E when counted from the left of E. Only three people sit between H and E when counted from the left of H. D sits to the immediate left of H. B is not an immediate neighbour of E. F sits second to the right of G. Who sits third to the right of H?

(a) G
(b) F
(c) A
(d) B

Q57. Five people V, W, X, Y and Z are sitting in a row facing towards north. W is sitting at the extreme left end of the row. There are two people sitting between Z and W. V is immediate neighbour of Z. X is immediate neighbour of V. Exactly how many people are sitting in between W and Y?

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

Q58. Seven boxes, A, B, C, D, E, F and G, are kept one over the other but not necessarily in the same order. Only C is kept above B. Only E is kept between B and F. Only G is kept below A. How many boxes are kept below F?

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

Q59. Which of the following letter-number clusters will replace the question mark (?) in the given series to make it logically complete?

OSW 24, GKO 35, YCG 46, QUY 57, IMQ 68, ?

(a) AOI 79
(b) AEI 79
(c) AIE 79
(d) AEI 78

Q60. 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) PTN
(b) SWP
(c) VZS
(d) EIB

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Q61. If ‘A’ stands for ‘÷’, ‘B’ stands for ‘×’, ‘C’ stands for ‘+’ and ‘D’ stands for ‘−’, then what will come in place of the question mark (?) in the following equation?

92 D 9 C 96 A 12 B 7 = ?

(a) 133
(b) 139
(c) 143
(d) 193

Q62. Toshi starts from point A and drives 70 km towards east. He then takes a left turn, drives 45 km, turns left and drives 78 km. He then takes a left turn and drives 76 km. He takes a final left turn, drives 8 km and stops at point P. How far (shortest distance) and towards which direction should he drive in order to reach point A again?

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

(a) 32 km to the south
(b) 30 km to the north
(c) 31 km to the north
(d) 33 km to the south

Q63. KOJL is related to RVQS in a certain way based on the English alphabetical order. In the same way, MQLN is related to TXSU. To which of the following is OSNP related, following the same logic?

(a) ZVUW
(b) VZWU
(c) ZVWU
(d) VZUW

Q64. In a certain code language, 'elbow yield apple' is coded as 'tr ss jw' and 'apple case barn' is coded as 'ss rz jn'. How is 'apple' coded in that language?

(a) tr
(b) rz
(c) ss
(d) jw

Q65. What will come in place of the question mark (?) in the following equation if ‘+’ and ‘−’ are interchanged and ‘×’ and ‘÷’ are interchanged?

15 + 17 ÷ 27 × 3 - 10 = ?

(a) -128
(b) -130
(c) -127
(d) -126

Q66. Read the given statements and conclusions carefully. Assuming that the information given in the statements is true, even if it appears to be at variance with commonly known facts, decide which of the given conclusions logically follow(s) from the statements.

Statements:

All wallet are bank.

All bank are vault.

Conclusions:

(I): Some vault are bank.

(II): All wallet are vault.

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

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Q67. Read the given statements and conclusions carefully. Assuming that the information given in the statements is true, even if it appears to be at variance with commonly known facts, decide which of the given conclusions logically follow(s) from the statements.

Statements:

All hammers are screwdrivers.

Some screwdrivers are wrenches.

No wrenches are pliers.

Conclusions:

(I): Some pliers are screwdrivers.

(II): Some wrenches are hammers.

(a) Only conclusion (I) is true
(b) Only conclusion (II) is true
(c) Neither conclusion (I) nor (II) is true
(d) Both conclusions (I) and (II) are true

Q68. In a certain code language,

'A + B' means 'A is the son of B'

'A – B' means 'A is the brother of B'

'A × B' means 'A is the wife of B'

'A ÷ B' means 'A is the father of B'

Based on the above, how is D related to J if 'D × F + G ÷ H – J'?

(a) Brother's wife
(b) Brother's daughter
(c) Daughter
(d) Wife

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

710 712 708 714 706 716 ?3522

(a) 718
(b) 708
(c) 720
(d) 704

Q70. What should come in place of the question mark (?) in the given series?

79 104 129 154 179 ?

(a) 215
(b) 199
(c) 210
(d) 204

Q71. 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 their constituent digits. E.g. 13 – Operations on 13 such as adding to/subtracting from/multiplying with 13 can be performed. Breaking down 13 into 1 and 3 and then performing mathematical operations on 1 and 3 is not allowed.)

(18, 324, 1)

(7, 71, 23)

(a) (22, 505, 22)
(b) (22, 501, 13)
(c) (44, 1955, 15)
(d) (1, 30, 25)

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Q72. KOJM is related to QUPS in a certain way based on the English alphabetical order. In the same way, OSNQ is related to UYTW. To which of the following is GKFI related, following the same logic?

(a) MQLO
(b) QMOL
(c) MQOL
(d) QMLO

Q73. In the following triad, 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.

CLUB - LCUB - CUBL

SEAT - ESAT - SATE

(a) PALE - APLE - PLEA
(b) TWIN - WTIN - WINT
(c) GROW - GORW - WORG
(d) HOME - OHME - EOMH

Q74. What should come in place of the question mark (?) in the given series?

7 16 27 40 55 ?3816

(a) 72
(b) 60
(c) 62
(d) 70

Q75. A, B, C, D, W, X and Y are sitting in a straight line facing north. Only three people sit between W and Y. A sits to the immediate left of Y. No one sits to the right of B. Only two people sit between B and A. X sits to the immediate right of D. How many people sit between C and X?

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

Q76. This question is based on the five, three-digit numbers given below.

(Left) 783 791 531 563 594 (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 second digit of the highest number is added to the second digit of the lowest number?2431

(a) 9
(b) 10
(c) 12
(d) 11

Q77. Refer to the following series and answer the question (all numbers are single-digit numbers only).

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

How many such even numbers are there (from left to right) which are immediately followed by an odd number?

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

Q78. Based on the English alphabetical order, three of the following four letter-cluster pairs are alike in a certain way and thus form a group. Which letter-cluster pair DOES NOT belong to that group?

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

(a) PL-QN

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(b) RN-SP
(c) VR-WU
(d) TP-UR

Q79. What should come in place of the question mark (?) in the given series based on the English alphabetical order?
FGH BCD XYZ TUV ?
(a) POR
(b) PRQ
(c) PQR
(d) PRO

Q80. In a certain code language, ‘lime card river’ is coded as 'du kt bv' and ‘river child judge’ is coded as ‘rr xi kt’. How is ‘river’ coded in that language?
(a) rr
(b) kt
(c) du
(d) bv

GENERAL AWARENESS AND CURRENT AFFAIRS

Q81. The Waqf (Amendment) Act, 2025, is also known as _____.
(a) SAHIB Act
(b) TAHIB Act
(c) FARID Act
(d) UMEED Act

Q82. Who became the first athlete in history to run sub-10 s in the 100 m for 11 consecutive years?
(a) Akani Simbine
(b) Trayvon Bromell
(c) Usain Bolt
(d) Andre De Grasse

Q83. Which telemedicine platform served over 36 crore patients by April 2025, per the Ministry of Health?
(a) Apollo Telehealth
(b) Mfine
(c) Practo
(d) eSanjeevani

Q84. Which of the following showed an increase to 99.62% in 2024-25, according to the Sustainable Development Goals – National Indicator Framework Progress Report, 2025?
(a) Percentage of population using an improved drinking water source in rural areas
(b) The renewable energy share in the total installed electricity generation
(c) Percentage of population covered by social protection systems/floors
(d) The reduction in emissions intensity of GDP

Q85. Which of the following cities hosted the National Workshop in July 2025, organised by the Union Ministry of Social Justice and Empowerment to strengthen the implementation of the SMILE-B (Support for Marginalized Individuals for Livelihood and Enterprise – Begging) scheme?
(a) Indore
(b) Patna
(c) Lucknow
(d) Jaipur

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Q86. Which of the following banks launched the largest staff engagement initiative called ‘Next LEAP’ to empower workforce in 2025?

(a) State Bank of India
(b) Indian Bank
(c) Canara Bank
(d) Bank of Baroda

Q87. In the 2025 Ludhiana West by-election, which party emerged victorious?

(a) Indian National Congress
(b) Bharatiya Janata Party
(c) Shiromani Akali Dal
(d) Aam Aadmi Party

Q88. Which Indian political leader is known for the 'Viksit Bharat Sankalp Yatra' campaign in 2025?

(a) Mallikarjun Kharge
(b) Rahul Gandhi
(c) Shivraj Singh Chouhan
(d) Yogi Adityanath

Q89. Which city was declared India’s 'Leopard Capital' on 5 June 2025?

(a) Udaipur
(b) Dehradun
(c) Bengaluru
(d) Mysuru

Q90. In May 2025, the Financial Services Institutions Bureau (FSIB) recommended Asheesh Pandey as the new Managing Director (MD) and Chief Executive Officer (CEO) of which bank?

(a) Union Bank of India
(b) Central Bank of India
(c) Canara Bank
(d) State Bank of India

Q91. In February 2025, in which district did the NDRF launch an avalanche rescue operation?

(a) Shimla
(b) Chamoli
(c) Uttarkashi
(d) Shillong

Q92. In August 2025, the report ‘Unlocking a $200 Billion Opportunity: Electric Vehicles in India,’ assessing challenges and key steps for India’s Electric Mobility transition, was released by _____.

(a) NITI Aayog
(b) Bureau of Energy Efficiency
(c) Ministry of Road Transport and Highways
(d) Ministry of Heavy Industries

Q93. Who chaired the 10^(th) Governing Council Meeting of the NITI Aayog on 24 May 2025?

(a) Manohar Lal Khattar
(b) Amit Shah
(c) Narendra Modi
(d) JP Nadda

Q94. Which of the following institutions won the Bakshi Cup in 2025?

(a) Indian Naval Academy (INA)
(b) National Defence Academy (NDA)
(c) Air Force Academy (AFA)

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(d) Indian Military Academy (IMA)

Q95. What is the name of Assam's AI-powered virtual news anchor unveiled in 2025?

(a) Ananya
(b) Asha
(c) Ankita
(d) Arpita

Q96. What was the nationality of the legendary fashion designer Giorgio Armani, who passed away in 2025?

(a) American
(b) Spanish
(c) Italian
(d) French

Q97. How many Centres of Excellence (CoE) were inaugurated by the Union Minister of State for Rural Development in June 2025 in Chennai?

(a) 300
(b) 100
(c) 400
(d) 200

Q98. Which team did the Indian women's team defeat to emerge as champions in the inaugural Kho Kho World Cup on 19 January 2025?

(a) Pakistan
(b) China
(c) Bangladesh
(d) Nepal

Q99. Which legendary sprinter was named a Guinness World Records ICON in June 2025?

(a) Justin Gatl
(b) Usain Bolt
(c) Carl Lewis
(d) Michael Johnson

Q100. The inaugural Everest Climbers' Summit focused on climate, held in 2025, took place in:

(a) Kathmandu, Nepal
(b) Lhasa, Tibet
(c) Dhaka, Bangladesh
(d) Dharamsala, India

ANSWER KEY

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

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SOLUTIONS

Q1. Answer: (b) lipids and proteins

The correct answer is lipids and proteins.

Key Points

• The plasma membrane, also referred to as the cell membrane, is a biological membrane that separates the interior of all cells from the outside environment. It is primarily composed of lipids and proteins.

• The lipids are arranged in a bilayer (two layers), providing a basic structural framework for the membrane. These lipids are mostly phospholipids, which have a hydrophilic (water-loving) head and hydrophobic (water-fearing) tails.

• Proteins are another major component, accounting for about 50 percent of the membrane's mass in many cell types. They are responsible for most of the membrane's specific functions, such as transport, enzymatic activity, and signal transduction.

• The specific ratio of lipids to proteins varies depending on the type of cell; for instance, a human erythrocyte (red blood cell) membrane contains approximately 52 percent protein and 40 percent lipids.

• The option lipids and proteins is correct because they form the fundamental structure of the Fluid Mosaic Model. DNA is found in the nucleus or mitochondria, and sugars (carbohydrates) are only minor components attached to the outer surface. Hence, the statement B is correct.

Additional Information

• Fluid Mosaic Model: This widely accepted model was proposed by S.J. Singer and Garth L. Nicolson in the year 1972. It describes the plasma membrane as a fluid combination of phospholipids, cholesterol, and proteins.

• Membrane Lipids: The most abundant lipids in the membrane are phosphoglycerides. Additionally, cholesterol molecules are interspersed among the phospholipids in animal cells to maintain membrane fluidity and stability at various temperatures.

• Membrane Proteins: These are categorized based on their ease of extraction. Integral proteins (intrinsic) are buried partially or totally in the lipid bilayer, while peripheral proteins (extrinsic) lie on the surface of the membrane.

• Carbohydrates: Found on the exterior surface of cells, they are linked to proteins (forming glycoproteins) or to lipids (forming glycolipids). These carbohydrate chains play a key role in cell-to-cell recognition and immune response.

• Selectively Permeable: One of the most important functions of the plasma membrane is that it is selectively permeable. This means it allows the passage of certain molecules (like oxygen and carbon dioxide) through simple diffusion while blocking others, requiring carrier proteins or ion channels for transport.

Important Points

• Active and Passive Transport: The plasma membrane facilitates passive transport (movement along the concentration gradient without energy) and active transport (movement against the gradient using energy in the form of ATP). The Na+/K+ pump is a classic example of active transport.

• Amphipathic Nature: Phospholipids are amphipathic molecules, meaning they contain both a polar (charged) region and a non-polar (uncharged) region, which naturally leads to the formation of the bilayer in aqueous environments.

• Thickness: The plasma membrane is extremely thin, with a typical thickness ranging between 5 to 10 nanometers (nm), making it visible only under an electron microscope.

• Location: In animal cells, it is the outermost layer. However, in plant cells, fungi, and bacteria, it is located just inside the cell wall.

Q2. Answer: (b) tetravalency; catenation

The correct answer is tetravalency; catenation.

Key Points

• Carbon has the unique ability to form bonds with other atoms of carbon, giving rise to large molecules. This property is called catenation. These compounds may have long chains of carbon, branched chains of carbon, or even carbon atoms arranged in rings.

• The carbon-carbon bond is very strong and stable. This gives us a huge number of compounds with many carbon atoms linked to each other. This is primarily because the size of the carbon atom is very small, which enables the nucleus to hold on to the shared pairs of electrons strongly.

• Since carbon has a valency of four, it is capable of bonding with four other atoms of carbon or atoms of some other mono-valent element. This property is known as tetravalency.

• Carbon forms strong covalent bonds with Oxygen, Hydrogen, Nitrogen, and Sulfur, leading to compounds with specific properties that depend on the elements other than carbon present in the molecule.

• In the given question, the first blank refers to the number of bonds carbon can form, and the second refers to the property of self-linking. Therefore, carbon exhibits tetravalency and shows catenation. Hence, the statement regarding option B is correct.

Additional Information

• Allotropes of Carbon:

• Diamond: In this, each carbon atom is bonded to four other carbon atoms, forming a rigid three-dimensional structure. It is the

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hardest known natural substance and has a very high melting point.

• Graphite: Each carbon atom is bonded to three other carbon atoms in the same plane giving a hexagonal array. It is a good conductor of electricity due to the presence of free electrons.

• Fullerenes: These form another class of carbon allotropes. The first one to be identified was C-60, which has carbon atoms arranged in the shape of a football. It was named Buckminsterfullerene after the American architect Buckminster Fuller.

• Atomic Characteristics:

• The atomic number of Carbon is 6.

• The electronic configuration is 2, 4, meaning it has 4 valence electrons in its L-shell.

• Carbon belongs to Group 14 and Period 2 of the Modern Periodic Table.

• Comparison with Silicon:

• Silicon also belongs to Group 14 and exhibits catenation. However, it forms compounds with hydrogen which have chains of up to 7 or 8 atoms only. These compounds are highly reactive because the Si-Si bond is weaker than the C-C bond.

Important Points

• Organic Chemistry: The two characteristic features seen in carbon—tetravalency and catenation—put together give rise to a large number of compounds. Many have the same non-carbon atom or group of atoms attached to different carbon chains. These were initially called organic compounds.

• Historical Context: It was once thought that these organic compounds could only be formed within a living system through a vital force (proposed by Berzelius). However, this was disproved in 1828 when Friedrich Wöhler prepared Urea from Ammonium cyanate.

• Isomerism: Carbon compounds often show structural isomerism, where compounds have the same molecular formula but different structural arrangements. For example, Butane (C4H10) can exist as a straight chain (n-butane) or a branched chain (isobutane).

• Saturated and Unsaturated Carbon:

• Saturated compounds (Alkanes) contain only single bonds between carbon atoms and are generally not very reactive.

• Unsaturated compounds (Alkenes and Alkynes) contain double or triple bonds and are more reactive than saturated carbon compounds.

Q3. Answer: (b) a, b and c

The correct answer is a, b and c.

Key Points

• Solids are characterized by a definite shape because the constituent particles (atoms, molecules, or ions) are packed closely together in a fixed, organized manner. The intermolecular forces of attraction are very strong, which prevents the particles from moving freely. Hence, statement a is correct.

• The property of rigidity is highly pronounced in solids. Due to the lack of space between particles and strong bonding, they maintain their structural integrity and resist deformation when external force is applied. This makes their fixed rigidity a defining physical characteristic. Hence, statement b is correct.

• Solids possess a definite volume, meaning they occupy a fixed amount of space regardless of the container they are placed in. Unlike gases, which expand to fill any volume, or liquids, which take the shape of the container while keeping a fixed volume, solids remain unchanged in both shape and volume under standard conditions. Hence, statement c is correct.

• The kinetic energy of the particles in a solid is the lowest among the three primary states of matter. Particles only vibrate or oscillate about their mean positions, contributing to the overall stability and lack of fluidity of the substance.

• Because all three statements (definite shape, fixed rigidity, and definite volume) accurately describe the fundamental nature of the solid state of matter, the comprehensive answer includes all of them. Hence, the correct answer is a, b and c.

Additional Information

• States of Matter: Matter exists primarily in three states: Solids, Liquids, and Gases. While solids have a fixed shape and volume, liquids have a definite volume but no fixed shape, and gases have neither a fixed shape nor a fixed volume.

• Classification of Solids: Based on the arrangement of particles, solids are divided into two types:

• Crystalline Solids: These have a long-range, regular, and repeating geometric pattern. Examples include Diamond, Quartz, and Sodium Chloride (NaCl). They have sharp melting points.

• Amorphous Solids: These lack a regular internal structure and have a short-range order. Examples include Glass, Rubber, and Plastics. They are often called pseudo-solids or supercooled liquids because they soften over a range of temperatures.

• Incompressibility: Due to the negligible intermolecular spaces, solids are almost incompressible. This feature is vital in engineering and construction, where materials like steel and concrete are used for their ability to withstand heavy loads without changing volume.

• Density and Diffusion: Solids generally have high density compared to liquids and gases because more mass is concentrated in a unit volume. The rate of diffusion (the intermixing of particles) is extremely low in solids compared to the other states.

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Important Points

• Phase Change: A solid can change into a liquid through melting (fusion) and directly into a gas through sublimation. The temperature at which a solid turns into a liquid at atmospheric pressure is known as its melting point.

• Intermolecular Forces: The strength of the chemical bonds (ionic, covalent, or metallic) or van der Waals forces determines the hardness and thermal stability of the solid. For instance, the covalent bonds in a diamond make it the hardest known natural substance.

• Thermal Expansion: Although solids have a fixed shape, they do expand slightly when heated. This linear expansion is a critical factor in the design of railway tracks and bridges, where gaps are left to accommodate changes in length during summer months.

• Modern Physics: Beyond the three common states, scientists recognize Plasma (found in stars) and Bose-Einstein Condensate (achieved at temperatures near absolute zero) as additional states of matter with unique properties.

Q4. Answer: (d) Equal on both sides

The correct answer is Equal on both sides.

Key Points

• A balanced chemical equation is based on the Law of Conservation of Mass, which states that mass can neither be created nor destroyed in a chemical reaction. Therefore, the total mass of the elements present in the products must be equal to the total mass of the elements present in the reactants. Hence, statement D is correct.

• In other words, the number of atoms of each element remains the same, before and after a chemical reaction. This necessitates that the number of atoms on the reactant side (left side) is exactly equal to the number of atoms on the product side (right side). Hence, statements A and B are incorrect.

• The process of making the number of atoms of various elements equal on both sides of an equation is known as balancing the chemical equation. If the number of atoms were always changing, the equation would violate the fundamental laws of physics. Hence, statement C is incorrect.

• To balance an equation, we use coefficients (whole numbers placed in front of chemical formulas). We do not change the subscripts in the chemical formulas of the reactants or products, as changing a subscript changes the identity of the substance.

Additional Information

• Law of Conservation of Mass:

• Proposed by Antoine Lavoisier in 1789, this law is the foundation for all chemical calculations. It implies that in any closed system, the total mass remains constant over time.

• In the context of chemistry, it means the atoms are merely rearranged during a reaction, not lost or gained.

• Skeletal Chemical Equations:

• An unbalanced chemical equation is often called a skeletal equation. For example, Mg + O_2 → MgO is a skeletal equation because there are two oxygen atoms on the reactant side but only one on the product side.

• The balanced version would be 2Mg + O_2 → 2MgO, ensuring two atoms of magnesium and two atoms of oxygen on both sides.

• Stoichiometry:

• This branch of chemistry involves using balanced equations to calculate the quantities of reactants and products. The coefficients in a balanced equation represent the molar ratio of the substances involved.

• It is essential in industrial applications to determine the exact amount of raw materials needed to produce a specific amount of product, minimizing waste.

• State Symbols in Equations:

• To make a chemical equation more informative, the physical states of the reactants and products are mentioned along with their chemical formulas.

• Common notations include (g) for gas, (l) for liquid, (s) for solid, and (aq) for aqueous solution (a substance dissolved in water).

Important Points

• Steps for Balancing:

• The Hit and Trial method is the most common technique used for balancing simple equations. One should start balancing with the compound that contains the maximum number of atoms.

• Always check the final equation to verify that the number of atoms of each element is equal on both sides.

• Significance:

• A balanced equation provides quantitative information about the chemical change. It tells us about the number of molecules or moles taking part in the reaction.

• It is a fundamental requirement for solving numerical problems related to chemical reactions in science exams and research.

Q5. Answer: (b) Force of engine on car and car moves forward

The correct answer is Force of engine on car and car moves forward.

Key Points

• Newton's Third Law of Motion states that for every action, there is an equal and opposite reaction. This implies that forces always occur in pairs, and a single isolated force cannot exist in nature.

• In Statement A, a swimmer pushes the water backward (action), and the water simultaneously pushes the swimmer forward (reaction). These forces act on two different bodies (swimmer and water) and are equal in magnitude. Hence, statement A is a correct example of an action-reaction pair.

• In Statement B, the force of the engine is considered an internal force within the car's system. While the engine generates the power to turn the wheels, the actual movement of the car forward is due to the frictional force exerted by the road (external force) on the tires in response to the tires pushing the road backward. The "force of engine on car" describes a functional process rather than a direct Newtonian action-reaction pair between two distinct objects that results in the car's acceleration. Hence, statement B is NOT an example of an action-reaction pair.

• In Statement C, when a bat hits a ball, the bat exerts a force on the ball (action), and the ball exerts an equal and opposite force back on the bat (reaction). This reaction is what causes the bat to slow down or vibrate upon impact. Hence, statement C is a correct example of an action-reaction pair.

• In Statement D, when a bullet is fired from a gun, the gun exerts a forward force on the bullet (action), and the bullet exerts an equal and opposite backward force on the gun (reaction). This backward movement is known as the recoil of the gun. Hence, statement D is a correct example of an action-reaction pair.

• Hence, the correct answer is Force of engine on car and car moves forward.

Additional Information

• Newton's Laws of Motion: These were first formulated by Sir Isaac Newton and published in his work Philosophiæ Naturalis Principia Mathematica in the year 1687. These laws describe the relationship between a body and the forces acting upon it.

• Conservation of Momentum: The recoil of a gun (Statement D) is a classic application of the Law of Conservation of Linear Momentum. Before firing, the total momentum is zero; after firing, the positive momentum of the bullet is cancelled by the negative momentum of the gun, keeping the total momentum zero.

• Friction as the Moving Force: For vehicles like a car, the static friction between the tires and the road is the external force that allows for acceleration. If the coefficient of friction is zero (as on perfect ice), the car will not move forward regardless of the engine's force.

• Propulsion in Fluids: The principle of the swimmer (Statement A) is the same used by rowboats and jet engines. In a jet engine, the exhaust gases are pushed out of the back at high velocity (action), and the gases push the aircraft forward (reaction).

Important Points

• Different Bodies: It is a fundamental feature of action-reaction pairs that the two forces always act on different bodies. This is why they do not cancel each other out to produce a net zero force on a single object.

• Simultaneity: There is no time lag between action and reaction. They occur at the exact same moment.

• Nature of Force: Action and reaction forces are always of the same type. If the action is a gravitational force, the reaction is also a gravitational force; if the action is a contact force, the reaction is also a contact force.

• Mass Independence: While the forces are equal in magnitude, the resulting accelerations are usually different because the objects have different masses (as per Newton's Second Law, F = ma). For example, the bullet accelerates much more than the gun because the bullet's mass is much smaller.

Q6. Answer: (c) Concentration

The correct answer is Concentration.

Key Points

• Concentration of ore, also known as ore dressing or beneficiation, is the mechanical and physical process used to remove gangue (unwanted earthy impurities like sand, clay, and rocks) from the mined ore. It increases the percentage of the metal in the ore. Hence, the correct answer is Concentration.

• Refining refers to the final purification of the crude metal obtained after extraction processes like reduction. It is not the primary step for removing impurities from the raw ore but from the extracted metal itself. Hence, Statement A is incorrect.

• Roasting is a chemical metallurgical process where sulfide ores are heated strongly in the presence of excess air to convert them into metal oxides. While it removes some volatile impurities, its primary function is chemical transformation. Hence, Statement B is incorrect.

• Smelting is the process of extracting a metal from its ore by heating it beyond its melting point, usually in the presence of flux and a reducing agent like carbon or coke. It involves chemical reduction rather than just the physical removal of impurities. Hence, Statement D is incorrect.

Additional Information

• Hydraulic Washing (Gravity Separation):

• This method utilizes the difference in specific gravities between the ore and the gangue particles.

• A stream of running water is used to wash the powdered ore; the lighter gangue particles are washed away, while the heavier ore particles settle down. This is commonly used for oxide ores of Iron and Tin.

• Magnetic Separation:

• This technique is applied when either the ore or the impurities possess magnetic properties.

• The crushed ore is passed over a conveyor belt moving over a magnetic roller. Magnetic materials like Magnetite (Fe_3O_4) or Pyrolusite (MnO_2) are separated from non-magnetic gangue.

• Froth Flotation Process:

• This is a widely used method for concentrating sulfide ores such as Galena (PbS) and Copper Pyrites ($CuFeS_2$).

• It is based on the principle of preferential wettability, where ore particles are wetted by oil (like pine oil) and gangue particles are wetted by water. Collectors and froth stabilizers are added to facilitate the formation of a stable froth that carries the ore to the surface.

• Chemical Method (Leaching):

• This is used when the ore is soluble in a specific solvent while the impurities are not.

• In the Bayer's process for Aluminium, Bauxite is treated with concentrated Sodium Hydroxide (NaOH) at 473-523 K, leaving behind impurities like Ferric oxide and Silica.

Important Points

• Gangue: The unwanted earthly materials associated with ores are called gangue or matrix.

• Flux: A substance added during smelting to remove non-fusible impurities by converting them into a fusible slag. For example, CaO is used as a basic flux to remove acidic SiO_2.

• Calcination: Often compared to roasting, calcination involves heating the ore in the absence or limited supply of air, typically used for carbonates (like Zinc Carbonate) and hydrated oxides.

• Electrolytic Refining: This is a Refining technique used for metals like Copper and Zinc, where 99.9% purity is achieved by using the impure metal as the anode and pure metal as the cathode in an electrolyte.

Q7. Answer: (c) fertilisation

The correct answer is fertilisation.

Key Points

• Fertilisation is defined as the biological process of the fusion of male gametes (pollen) with female gametes (ovum/egg) to form a diploid zygote.

• In Angiosperms (flowering plants), this process occurs inside the ovule, which is located within the ovary of the carpel (the female reproductive organ).

• The process begins when a pollen grain germinates on the stigma and grows a pollen tube down the style to reach the micropyle of the ovule.

• Flowering plants undergo a unique process known as Double Fertilisation, which was first discovered by S.G. Nawaschin in the year 1898.

• In Double Fertilisation, one male gamete fuses with the egg cell to form the zygote (Syngamy), while the second male gamete fuses with two polar nuclei to form the triploid (3n) Primary Endosperm Nucleus (PEN). Hence, the statement regarding fusion within the ovule describes fertilisation, and option C is correct.

Additional Information

• Pollination:

• It is the physical transfer of pollen grains from the anther of a stamen to the stigma of a pistil.

• It is a pre-fertilisation event. It can be Self-pollination (within the same flower or plant) or Cross-pollination (between different plants).

• Common agents of pollination include wind (Anemophily), water (Hydrophily), and insects (Entomophily).

• Transpiration:

• This is the evaporative loss of water from the aerial parts of the plant, primarily through the stomata on the leaves.

• It creates a transpiration pull which helps in the ascent of sap (upward movement of water and minerals) from roots to leaves.

• Factors affecting the rate include temperature, light intensity, humidity, and wind speed.

• Germination:

• This is the process by which an organism grows from a seed or similar structure.

• The dormant embryo becomes metabolically active and breaks through the seed coat to form a seedling.

• Essential conditions for this process include water (imbibition), oxygen for respiration, and an optimum temperature (usually between 25°C to 30°C for most plants).

Important Points

• Post-Fertilisation Changes:

• After fertilisation occurs, the zygote develops into the embryo.

• The ovule matures and hardens its integuments to become the seed.

• The ovary grows rapidly and ripens to become the fruit, while the ovary wall becomes the pericarp.

• Other parts of the flower, such as sepals, petals, and stamens, usually wither and fall off.

• Significance of Endosperm:

• The Endosperm formed during Triple Fusion serves as a highly nutritious tissue that provides food to the developing embryo during its early stages.

Q8. Answer: (d) Only for metallic conductors at constant temperature

The correct answer is Only for metallic conductors at constant temperature.

Key Points

• Ohm's Law states that the electric current flowing through a conductor is directly proportional to the potential difference (voltage) applied across its ends, provided physical conditions like temperature and pressure remain constant.

• The mathematical expression for this law is V = IR, where V is the Voltage, I is the Current, and R is the Resistance.

• The law is primarily applicable to metallic conductors (such as copper, silver, and aluminum) because they exhibit a linear relationship between voltage and current. Hence, statement D is correct.

• It is not valid for all materials at any temperature because as the temperature changes, the resistance of the material also changes, breaking the proportionality. Hence, statement A is incorrect.

• Semiconductors (like Silicon and Germanium) do not follow Ohm's law as they are non-ohmic devices where the V-I characteristic is non-linear. Hence, statement B is incorrect.

• Insulators do not conduct electricity under normal conditions and do not follow this linear proportionality, even at high temperatures where their properties might break down. Hence, statement C is incorrect.

Additional Information

• Origin of the Law: The law was named after the German physicist Georg Simon Ohm, who published his findings in his 1827 treatise, "The Galvanic Circuit Investigated Mathematically."

• Resistance (R): It is the property of a material to oppose the flow of current. The SI unit of resistance is the Ohm, denoted by the Greek symbol Ω. One ohm is defined as the resistance of a conductor such that a potential difference of 1 Volt causes a current of 1 Ampere to flow.

• Ohmic vs. Non-Ohmic Conductors:

• Ohmic Conductors: Materials that obey Ohm's law, showing a straight-line V-I graph passing through the origin (e.g., metals at low/constant temperatures).

• Non-Ohmic Conductors: Materials that do not obey the law. Examples include p-n junction diodes, transistors, vacuum tubes, thermistor, and electrolytes. In these cases, the resistance is not constant and varies with the applied voltage or current.

• Applications: Ohm's law is fundamental in designing electrical circuits, determining the required resistors for electronic devices, and calculating power consumption ($P = VI$ or $P = I^2R$).

Important Points

• Temperature Sensitivity: For metallic conductors, resistance increases with an increase in temperature because the thermal agitation of atoms increases, leading to more frequent collisions with drift electrons. The relation is given by $R = R0[1 + \alpha(T - T0)]$, where α is the temperature coefficient of resistance.

• Limitations: Ohm's law is not a fundamental law of nature like Newton's laws; rather, it is an empirical description of the behavior of certain materials. It fails under high electric fields, very low temperatures (superconductivity), or for unilateral networks (where current flows in only one direction, like diodes).

• Drift Velocity: The current in a conductor is related to the drift velocity of electrons. Under constant physical conditions, the drift velocity is proportional to the electric field, which underpins the validity of Ohm's Law.

Q9. Answer: (a) The solution may splash and cause burns.

The correct answer is The solution may splash and cause burns.

Key Points

• Mixing a concentrated acid with water is a highly exothermic reaction, meaning it releases a significant amount of heat energy. When water is added to a concentrated acid, the first drop of water reacts with a large excess of acid, generating intense heat locally. Hence, the statement "The solution may splash and cause burns" is correct.

• If water is poured into concentrated sulfuric acid, the heat generated is so high that it can instantly convert the water into steam. This rapid expansion of steam can cause the acid to splash out of the container, potentially causing severe chemical burns on the skin or eyes of the person performing the experiment.

• Acids do not change their physical state to solid upon the addition of water; rather, they become diluted. The solubility of most common acids like hydrochloric acid (HCl) or sulfuric acid (H2SO4) increases or remains high in aqueous solutions. Hence, the statement "The acid will solidify" is incorrect.

• Because the reaction is exothermic, the temperature of the mixture rises sharply. An endothermic reaction would be required for the solution to become cold, but the enthalpy of hydration for acid molecules is very high and negative. Hence, the statement "The

solution will become cold" is incorrect.

• Adding water to concentrated acid is never a neutral event; it is a hazardous chemical process that requires strict safety protocols. Ignoring the chemical properties of concentrated reagents can lead to laboratory accidents and glassware breakage due to thermal shock. Hence, the statement "Nothing will happen" is incorrect.

Additional Information

• Safety Protocol (The AA Rule): The standard laboratory procedure is to always add Acid to Aqua (Water), never the reverse. By adding acid slowly to a large volume of water while stirring constantly, the heat generated is distributed throughout the water, which has a high specific heat capacity, preventing the mixture from boiling or splashing.

• Specific Heat Capacity: Water has a high specific heat capacity of approximately 4.18 J/g°C. This property allows it to absorb a significant amount of heat without a drastic increase in temperature, provided the acid is added in small, controlled increments.

• Chemical Burns: Concentrated acids are corrosive substances that can destroy body tissue. Sulfuric acid is particularly dangerous because it is also a strong dehydrating agent, meaning it removes water molecules from the proteins and lipids in human skin, causing deep tissue damage.

• Hydration Energy: The release of heat occurs because of the formation of hydronium ions (H_3O^+). The process of solvating the acid molecules releases energy that was previously stored in the chemical bonds.

Important Points

• Protective Gear: When handling concentrated acids, it is mandatory to wear Personal Protective Equipment (PPE), including safety goggles, lab coats, and acid-resistant gloves to mitigate the risk of accidental splashes.

• Glassware Selection: It is recommended to use borosilicate glass (like Pyrex) for dilutions, as it can withstand the thermal expansion caused by the heat of solution without cracking.

• First Aid: In the event of an acid splash, the affected area should be flushed immediately with running water for at least 15 to 20 minutes to dilute and remove the chemical, followed by immediate medical consultation.

• Concentration Levels: A concentrated acid typically has a very low water content (e.g., 98% for Sulfuric Acid or 37% for Hydrochloric Acid), making the initial contact with water extremely reactive compared to dilute acids.

Q10. Answer: (c) By creeping on stem

The correct answer is By creeping on stem.

Key Points

• Insect pests are organisms that cause damage to plants, particularly agricultural crops, by feeding on them or transmitting diseases. They generally attack plants in three primary ways.

• Cutting the root, stem, and leaf: Certain insects, known as chewing insects, have strong mandibles that allow them to bite and cut through various plant parts. Common examples include caterpillars, grasshoppers, and locusts. Hence, this statement is correct as a method of attack.

• Boring into stem and fruits: Many pests, such as stem borers, fruit borers, and weevils, penetrate the internal tissues of the plant. They live and feed inside the plant, often destroying the vascular system or the seeds. Hence, this statement is correct as a method of attack.

• Sucking the cell sap: Pests like aphids, leafhoppers, and whiteflies possess specialized piercing-sucking mouthparts. They pierce the plant tissue and suck the nutrient-rich cell sap from the phloem, causing leaves to curl and plants to wilt. Hence, this statement is correct as a method of attack.

• Creeping on stem: While many insects creep or crawl over the plant to reach their feeding site, creeping itself is a mode of locomotion or movement and not a mechanism for damaging or "attacking" the plant. It does not involve the consumption or destruction of plant tissues. Hence, this statement is incorrect as a method of attack.

• Hence, the correct answer is By creeping on stem.

Additional Information

• Types of Plant Damage:

• Chewing Damage: Identified by missing leaf margins, holes in leaves, or severed stems. Beetles and larvae are common culprits in agriculture.

• Sucking Damage: Results in chlorosis (yellowing), spotting, or stunting of growth. These pests are dangerous because they often act as vectors for viral diseases.

• Internal Feeding: Leaf miners and borers create tunnels within leaves, stems, or fruits, making them difficult to control with contact insecticides.

• Economic Impact:

• According to the Food and Agriculture Organization (FAO), pests destroy up to 40% of global crop production annually. This has a direct impact on food security and the economy of developing countries.

• In India, significant losses occur in major crops like paddy, cotton, and sugarcane due to specific pests like the brown plant hopper and bollworms.

Important Points

• Pest Management Strategies:

• Integrated Pest Management (IPM): A holistic approach that combines biological, cultural, and chemical tools to minimize economic loss while protecting the environment.

• Biological Control: Involves the use of natural enemies such as predators (e.g., ladybird beetles), parasitoids (e.g., Trichogramma), and pathogens to manage pest populations.

• Cultural Practices: Includes crop rotation, intercropping, and deep plowing in the month of June or July to expose soil-dwelling pests to heat and predators.

• Chemical Control: The application of pesticides such as malathion or chlorpyrifos. However, over-reliance can lead to pest resistance and bioaccumulation in the food chain.

• Defense Mechanisms in Plants:

• Plants have evolved physical defenses like thorns, spines, and thick cuticles to prevent insects from creeping or biting.

• They also produce chemical defenses (secondary metabolites) such as alkaloids, tannins, and resins that are toxic or repellent to attacking insect pests.

Q11. Answer: (a) the ratio of speed of light in vacuum to that in medium

The correct answer is the ratio of speed of light in vacuum to that in medium.

Key Points

• The absolute refractive index of a medium is defined as the ratio of the speed of light in a vacuum (or air) to the speed of light in the specific medium. Hence, statement A is correct.

• Mathematically, it is represented as n = c / v, where n is the refractive index, c is the speed of light in vacuum, and v is the speed of light in the medium.

• The speed of light in a vacuum is a fundamental physical constant, approximately 299,792,458 meters per second (often rounded to 3 x 10^8 m/s).

• Since it is a ratio of two similar quantities (speeds), the refractive index is a unitless and dimensionless quantity.

• A higher refractive index indicates that the speed of light in that medium is significantly lower than its speed in a vacuum, making the medium optically denser.

Additional Information

• Relative Refractive Index: When light travels from one transparent medium (Medium 1) to another (Medium 2), the ratio of the speed of light in Medium 1 to that in Medium 2 is called the relative refractive index. This is different from the absolute index where the first medium is always a vacuum.

• Snell's Law: The refractive index is also related to the bending of light. According to Snell's Law, the ratio of the sine of the angle of incidence (i) to the sine of the angle of refraction (r) is equal to the refractive index of the second medium relative to the first.

• Common Refractive Indices: Different materials have characteristic values. For example, water has a refractive index of approximately 1.33, crown glass is around 1.52, and diamond has a very high value of 2.42.

• Optical Density: This term refers to the ability of a medium to refract light. It should not be confused with mass density. An optically denser medium (like turpentine) might have a lower mass density than an optically rarer medium (like water).

• Factors Affecting Refractive Index: The value depends on the nature of the medium, the temperature (as temperature increases, refractive index generally decreases), and the wavelength of light (dispersion).

Important Points

• The absolute refractive index of any medium is always greater than 1 because light travels fastest in a vacuum; in any other material, its speed (v) is always less than c.

• The refractive index of air is approximately 1.0003, which is so close to 1 that for most school-level calculations, air and vacuum are treated as the same medium.

• Total Internal Reflection: This phenomenon occurs when light travels from a medium with a higher refractive index to one with a lower refractive index at an angle greater than the critical angle. This is the principle behind optical fibers.

• Applications: Understanding refractive index is essential for designing eyeglass lenses, camera lenses, telescopes, and microscopes to ensure light is focused correctly.

Q12. Answer: (a) Earth's gravitational force

The correct answer is Earth's gravitational force.

Key Points

• The acceleration of an object falling toward the Earth is primarily caused by Earth's gravitational force. This force is an attractive pull that the Earth exerts on any object with mass, drawing it toward its center.

• According to Newton's Second Law of Motion, acceleration is produced when a force acts on a mass. In the context of a falling body, the unbalanced force is gravity, which results in a constant increase in velocity as the object descends.

• This specific type of acceleration is known as the acceleration due to gravity, represented by the symbol g. Near the surface of

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the Earth, its average numerical value is approximately 9.8 meters per second squared (9.8 m/s²).

• In a vacuum, where no other forces like air resistance exist, all objects regardless of their mass or shape will fall with the same acceleration. This principle was famously demonstrated by Galileo Galilei.

• While air resistance (Option B) acts on a falling object, it serves to oppose the motion rather than cause the downward acceleration. Magnetic force (Option C) and Friction (Option D) are not the fundamental causes of planetary free fall.

Additional Information

• Newton's Universal Law of Gravitation: This law states that every particle in the universe attracts every other particle with a force that is directly proportional to the product of their masses and inversely proportional to the square of the distance between their centers.

• Mass vs. Weight: Mass is an intrinsic property of matter and remains constant regardless of location. Weight, however, is a force calculated as the product of mass and the acceleration due to gravity (W = m x g), meaning an object's weight changes depending on the gravitational field strength of the planet it is on.

• Air Resistance and Terminal Velocity: As an object falls through the atmosphere, it collides with air molecules, creating drag. When the upward force of air resistance equals the downward force of gravity, the object stops accelerating and falls at a constant speed called terminal velocity.

• Free Fall: A state of motion where gravity is the sole force acting upon an object. Astronauts in orbiting spacecraft experience a state of continuous free fall, which creates the sensation of weightlessness or microgravity.

Important Points

• Variation of g: The value of acceleration due to gravity is not uniform everywhere on Earth. It is slightly higher at the Poles (approx 9.83 m/s²) and lower at the Equator (approx 9.78 m/s²) because the Earth is an oblate spheroid, meaning the Equator is further from the center than the Poles.

• Altitude and Depth: The value of g decreases with an increase in altitude (moving away from Earth) and also decreases as one goes deeper into the Earth's crust toward the center.

• Universal Gravitational Constant (G): Often confused with g, G is a universal constant with a value of 6.674 x 10^-11 Nm²/kg², which applies to the gravitational attraction between any two bodies in the universe.

• Vector Quantity: Acceleration due to gravity is a vector quantity because it has both magnitude and a specific direction, which is always vertically downward toward the center of the Earth.

Q13. Answer: (c) 1/f = 1/v - 1/u

The correct answer is 1/f = 1/v - 1/u.

Key Points

• The lens formula is a fundamental equation in optics that relates the focal length (f) of a lens to the distance of the object (u) and the distance of the image (v) from the optical center of the lens.

• The mathematical expression for this relationship is 1/f = 1/v - 1/u. Hence, statement C is correct.

• Option A suggests f = v + u, which implies a simple linear addition of distances that does not account for the refractive properties of a lens. Hence, statement A is incorrect.

• Option B presents f = uv, suggesting the focal length is a product of distances, which is physically inaccurate for thin lenses. Hence, statement B is incorrect.

• Option D mentions 1/f = u/v, which incorrectly defines the reciprocal of focal length as a ratio of object to image distance. Hence, statement D is incorrect.

• This formula is derived for thin lenses where the thickness of the lens is negligible compared to the radii of curvature. It remains valid for both convex and concave lenses.

Additional Information

• Sign Convention: To use the lens formula correctly, the New Cartesian Sign Convention must be applied. The object distance (u) is always negative as the object is placed to the left. For a convex lens, the focal length (f) is positive, whereas for a concave lens, it is negative.

• Magnification (m): This is the ratio of the height of the image to the height of the object. In terms of distance, it is given by m = v/u. A positive magnification indicates a virtual and erect image, while a negative magnification indicates a real and inverted image.

• Power of a Lens (P): The power is defined as the reciprocal of the focal length measured in meters. The SI unit of power is the Dioptre (D). The formula is P = 1/f (m).

• Lens Maker’s Formula: This formula relates the focal length to the refractive index (n) of the material and the radii of curvature (R1 and R2) of the two lens surfaces. It is expressed as 1/f = (n - 1) [(1/R1) - (1/R2)].

Important Points

• Mirror Formula Comparison: It is important not to confuse the lens formula with the mirror formula, which is 1/f = 1/v + 1/u. The primary difference is the positive sign between the reciprocal distances in mirrors versus the negative sign in lenses.

• Real vs. Virtual Images: In a lens, if v is positive, the image is formed on the opposite side of the object and is real. If v is

negative, the image is on the same side as the object and is virtual.

• Historical Development: The formulation of these optical relationships was significantly advanced by Carl Friedrich Gauss in the 19th century, leading to what is often called Gaussian Optics.

• Applications: The lens formula is essential for calculating dimensions and positions in the design of spectacles, cameras, microscopes, and astronomical telescopes. It helps in correcting vision defects like myopia (nearsightedness) and hypermetropia (farsightedness).

Q14. Answer: (d) The downward push of the wings on the air is the action, and the lift produced by the air on the wings is t...

The correct answer is The downward push of the wings on the air is the action, and the lift produced by the air on the wings is the reaction.

Key Points

• The principle of bird flight is fundamentally based on Newton's Third Law of Motion, which states that for every action, there is an equal and opposite reaction.

• In Statement A, it is claimed that the bird pushes the air downward but no equal and opposite force acts on it. This is scientifically incorrect because Newton's Third Law dictates that forces always exist in pairs. Hence, statement A is incorrect.

• In Statement B, the suggestion that the bird's weight acts as the action force and the air provides the reaction is misleading. While weight is the force of gravity pulling the bird down, the specific action causing the upward motion is the mechanical push of the wings against the air. Hence, statement B is incorrect.

• In Statement C, it is stated that flapping is the action and gravity is the reaction. Gravity is a non-contact force exerted by the Earth and is not the reaction to the wing's physical interaction with the air. Hence, statement C is incorrect.

• In Statement D, it correctly identifies that when a bird flaps its wings, the downward push (the force exerted by the wings on the air) serves as the action. Simultaneously, the air exerts an upward force (lift) on the wings, which serves as the reaction. Hence, statement D is correct.

Additional Information

• Newton's Third Law of Motion: Formulated by Sir Isaac Newton in 1687, this law explains that interaction between two objects results in two forces. These forces are equal in magnitude but opposite in direction. This law is essential for understanding aerodynamics and propulsion.

• Mechanics of Flight: To fly, a bird must overcome its own weight (gravity) and the air's resistance (drag). It generates lift by flapping its wings downward and thrust by tilting its wings to push the air backward.

• Applications in Modern Science: The same principle of action-reaction is used in Rocket Propulsion, where the downward expulsion of exhaust gases (action) creates an upward thrust (reaction) that lifts the rocket into space.

• Aerodynamic Design: The shape of a bird's wing, known as an Airfoil, is curved on top. This design utilizes Bernoulli's Principle, where faster-moving air over the top creates lower pressure, contributing to the lift generated by the Newtonian action-reaction force.

• Examples of Action-Reaction: Common examples include a swimmer pushing the water backward to move forward, the recoil of a gun when a bullet is fired, and a person walking by pushing the ground backward with their feet.

Important Points

• Force Components: When the wings flap, the downstroke is the primary source of lift. The angle at which the wing meets the air, called the Angle of Attack, must be precise to maximize lift and prevent stalling.

• Biological Features: Birds possess powerful pectoral muscles (chest muscles) that provide the necessary kinetic energy to perform the action of pushing the air. These muscles can account for up to 25% of a bird's total body weight.

• Air Density: The effectiveness of the reaction force depends on air density. At higher altitudes, where the air is "thinner" (less dense), birds must flap faster or have a larger wing surface area to generate sufficient lift.

• Energy Transfer: The work done by the bird during the downward flap is transferred into momentum for the surrounding air and potential/kinetic energy for the bird's own body.

Q15. Answer: (a) 72 C

The correct answer is 72 C.

Key Points

• The relationship between electric current, electric charge, and time is governed by the fundamental formula $Q = I \times t$, where Q represents the total charge in Coulombs (C), I represents the current in Amperes (A), and t represents the time in seconds (s).

• In this specific numerical problem, the electric current (I) drawn by the bulb is given as 0.15 A. Hence, the identification of current is correct.

• The time (t) for which the current flows is provided as 8 minutes. Since the SI unit for time in this equation must be seconds, we perform the conversion: 8 minutes × 60 seconds/minute = 480 seconds. Hence, the time conversion is correct.

• By substituting these values into the formula, we calculate the charge: $Q = 0.15\ A \times 480\ s$. This multiplication results in a

numerical value of 72. Hence, the mathematical calculation is correct.

• The SI unit of electric charge is the Coulomb (C). Therefore, the total charge flowing through the circuit is 72 C. Hence, the final derivation of the answer is correct.

Additional Information

• Electric Current:

• Electric current is defined as the rate of flow of electric charges across a cross-section of a conductor. It is a scalar quantity even though it has a direction.

• The SI unit of current is the Ampere (A), named after the French scientist Andre-Marie Ampere in the year 1820.

• 1 Ampere is constituted by the flow of 1 Coulomb of charge per second.

• Electric Charge (Q):

• The Coulomb (C) is the SI unit of charge. It is equivalent to the charge contained in nearly 6 × 10^18 electrons.

• The charge of a single electron is approximately 1.6 × 10^-19 C.

• Charges are of two types: positive (protons) and negative (electrons). In a metallic wire, the flow of electrons constitutes the current.

• Measuring Instruments:

• An Ammeter is a device used to measure electric current in a circuit. To ensure accurate measurement, it is always connected in series because it has very low internal resistance.

• A Voltmeter is used to measure potential difference and is connected in parallel across the points where the measurement is needed.

Important Points

• Direction of Current: Conventionally, the direction of electric current is taken as opposite to the direction of the flow of electrons (which are negative charges). It flows from the positive terminal to the negative terminal of a cell or battery.

• Safety and Circuits: The electric bulb in the question acts as a resistor. The amount of charge flowing determines the energy consumed over time.

• Common Conversions: In physics problems, time is often given in minutes or hours, but for Standard units, it must always be converted to seconds before using the Q = It formula. For example, 1 hour equals 3600 seconds.

• Application of Charge: The concept of electric charge is fundamental in electrostatics and electrodynamics, used in applications ranging from household appliances to large-scale industrial machinery.

Q16. Answer: (b) Sclerenchyma – providing strength and rigidity

The correct answer is Sclerenchyma – providing strength and rigidity.

Key Points

• The husk of a coconut is made up of sclerenchymatous tissue. This tissue consists of dead cells that are long and narrow, with cell walls heavily thickened due to the deposition of lignin.

• Statement A (Collenchyma – providing flexibility): This is incorrect. Collenchyma is characterized by living cells that are elongated and irregularly thickened at the corners. Its primary function is to provide flexibility and mechanical support, allowing plant parts like stems and leaves to bend without breaking. Hence, statement A is incorrect.

• Statement B (Sclerenchyma – providing strength and rigidity): This is correct. Sclerenchyma tissue makes the plant part hard and stiff. In a coconut, the fibrous mesocarp (husk) is composed of these fibers to provide protection and structural integrity. Hence, statement B is correct.

• Statement C (Parenchyma – storage of food): This is incorrect. Parenchyma is a simple permanent tissue consisting of relatively unspecialized cells with thin primary walls. Its main functions include photosynthesis, storage of food, and providing basic support. Hence, statement C is incorrect.

• Statement D (Xylem – conducting water and minerals): This is incorrect. Xylem is a complex permanent tissue, not a simple tissue like the others. It is responsible for the unidirectional transport of water and minerals from the roots to the leaves. Hence, statement D is incorrect.

Additional Information

• Classification of Plant Tissues: Plant tissues are broadly divided into Meristematic tissues (capable of cell division) and Permanent tissues (cells that have lost the ability to divide). Permanent tissues are further divided into Simple (one type of cell) and Complex (multiple types of cells).

• Simple Permanent Tissues:

• Parenchyma: Found in the soft parts of plants; can be Chlorenchyma (for photosynthesis) or Aerenchyma (providing buoyancy in aquatic plants).

• Collenchyma: Located in the leaf stalks (petioles) and below the epidermis of dicot stems. It provides tensile strength.

• Sclerenchyma: Provides rigidity. Cells are dead at maturity and lack protoplasm.

• Chemical Composition: The cell walls of Sclerenchyma are thickened with lignin, a complex organic polymer that acts as a

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waterproof binder. This makes the tissue extremely tough and resistant to environmental degradation, which is why coconut coir is used in industrial applications like ropes and mats.

• Complex Permanent Tissues:

• Xylem: Composed of tracheids, vessels, xylem parenchyma, and xylem fibers.

• Phloem: Composed of sieve tubes, companion cells, phloem parenchyma, and phloem fibers; it transports food (sucrose) from leaves to other parts.

Important Points

• Lignification: The process of lignification in sclerenchyma cells is so intense that the internal space (lumen) of the cell often disappears, leaving a solid mechanical structure.

• Biological Significance: In the coconut (Cocos nucifera), the thick sclerenchymatous husk allows the fruit to float in seawater for long distances and protects the embryo from mechanical damage during its journey across oceans.

• Types of Sclerenchyma: It exists in two forms: Fibers (long, needle-like cells) and Sclereids (short, gritty cells found in the pulp of pears or the shells of walnuts). The coconut husk is primarily composed of Sclerenchyma fibers.

Q17. Answer: (a) 180 J

The correct answer is 180 J.

Key Points

• The potential energy of an object is the energy possessed by it by virtue of its position or configuration. In this specific case, it refers to gravitational potential energy, which is the energy an object possesses due to its height above the ground.

• The mathematical formula used to calculate gravitational potential energy is P.E. = m × g × h, where m represents the mass of the object, g is the acceleration due to gravity, and h is the height or displacement from the reference point.

• In the given problem, the mass (m) of the ball is 3 kg and it is raised to a height (h) of 6 m. The value of acceleration due to gravity (g) is provided as 10 m/s^2.

• By substituting the values into the formula: P.E. = 3 kg × 10 m/s^2 × 6 m. This yields a total of 180.

• The SI unit of energy is the Joule (J), named after the English physicist James Prescott Joule. Therefore, the calculated potential energy is 180 J.

Additional Information

• Kinetic Energy (K.E.): Unlike potential energy, Kinetic Energy is the energy possessed by an object due to its motion. It is calculated using the formula K.E. = 1/2 mv^2, where v is the velocity of the object.

• Mechanical Energy: The sum total of the potential energy and kinetic energy of an object is referred to as its total Mechanical Energy. According to the Law of Conservation of Energy, energy can neither be created nor destroyed; it can only be transformed from one form to another.

• Elastic Potential Energy: This is another form of potential energy stored as a result of applying a force to deform an elastic object, such as a compressed spring or a stretched rubber band. The energy is stored until the force is removed and the object returns to its original shape.

• Work-Energy Theorem: This principle states that the net work done on an object is equal to the change in its kinetic energy. When work is done to raise an object against gravity, that work is stored as gravitational potential energy.

• Units and Dimensions: Energy has the same SI unit as work, which is the Joule. In terms of base units, 1 Joule is equal to 1 $kg \cdot m^2/s^2$. The dimensional formula for energy is $[ML^2T^2]$.

Important Points

• Mass vs. Weight: It is important to distinguish between mass (3 kg) and weight. Weight is a force equal to mass multiplied by gravity (m × g). In this problem, the weight of the ball is 30 Newtons (N).

• Reference Level: Potential energy is always relative to a reference level (usually the ground). If the reference level changes, the calculated value of potential energy will also change, although the change in potential energy remains the same.

• Acceleration due to Gravity: While g is often approximated as 10 m/s^2 for calculation ease in competitive exams, its standard value on Earth is approximately 9.8 m/s^2. On the Moon, the value of g is about 1.62 m/s^2, which significantly reduces the potential energy of the same object at the same height.

• Scalar Quantity: Energy is a scalar quantity, meaning it has magnitude but no direction, unlike force or velocity which are vector quantities.

Q18. Answer: (a) CaCO3

The correct answer is CaCO3.

Key Points

• Calcium hydroxide, which is commonly known as slaked lime with the chemical formula Ca(OH)2, is the primary substance used for whitewashing walls.

• When a solution of slaked lime is applied to the walls, it reacts slowly with the Carbon dioxide (CO2) present in the atmosphere.

• This chemical reaction results in the formation of a thin, hard layer of Calcium Carbonate ($CaCO_3$) on the surface of the walls.

• The formation of Calcium Carbonate usually takes about 2 to 3 days after the application of the whitewash, providing a shiny, white finish to the walls.

• The chemical equation for this process is: $Ca(OH)_2 (aq) + CO_2 (g) \rightarrow CaCO_3 (s) + H_2O (l)$. In this reaction, Calcium hydroxide combines with Carbon dioxide to produce Calcium carbonate and water.

• It is also interesting to note that the chemical formula for marble is also $CaCO_3$, which explains why the finished wall has a stone-like luster.

Additional Information

• Calcium Oxide (CaO):

• Also known as Quicklime or burnt lime, it is a white, caustic, alkaline, crystalline solid at room temperature.

• When Quicklime reacts vigorously with water, it produces slaked lime (Calcium hydroxide), releasing a significant amount of heat. This is an exothermic reaction.

• Calcium Bicarbonate ($Ca(HCO_3)_2$):

• This compound exists only in aqueous solution. It is not a solid that can be isolated under standard conditions.

• It is formed when Carbon dioxide is passed through a solution of Calcium carbonate in water. It is a major component responsible for temporary hardness of water.

• Calcium Sulfate ($CaSO_4$):

• This is a common laboratory and industrial chemical. Its dihydrate form, $CaSO_4 \cdot 2H_2O$, is known as Gypsum.

• The hemihydrate form, $CaSO_4 \cdot 0.5H_2O$, is widely known as Plaster of Paris (POP), used in construction and medical casts.

• Calcium Carbonate ($CaCO_3$):

• Apart from whitewashing, it is found in nature as limestone, chalk, and marble.

• It is used extensively in the cement industry, agriculture (to neutralize acidic soil), and as an antacid in medicine.

Important Points

• The Limestone Cycle describes the industrial transformation of Calcium carbonate to Calcium oxide via thermal decomposition (heating at approximately 900 degrees Celsius), then to Calcium hydroxide via hydration, and finally back to Calcium carbonate via carbonation.

• The carbonation phase is exactly what occurs during the whitewashing process when the wall "dries" and hardens.

• Calcium compounds are essential in India for various industries including steel manufacturing, paper production, and sugar refining.

• The solubility of Calcium hydroxide in water is low, and its clear saturated solution is known as limewater, used as a standard test for detecting Carbon dioxide in laboratories.

Q19. Answer: (b) Seed dispersal

The correct answer is Seed dispersal.

Key Points

• The life cycle of a flowering plant follows a specific chronological order: Pollination, Fertilization, Seed Formation, Seed Dispersal, and finally Germination.

• Seed dispersal is the process that occurs right after the formation and maturation of seeds. It involves the movement or transport of seeds away from the parent plant to ensure the survival of the next generation. Hence, the option "Seed dispersal" is the correct sequence.

• Pollination is the very first step in the reproductive process, where pollen grains are transferred from the anther to the stigma. This occurs long before seed maturation. Hence, the statement regarding Pollination as the immediate next step is incorrect.

• Fertilization occurs after pollination when the male gamete fuses with the female gamete (egg) inside the ovule. This process leads to the formation of the zygote, which eventually develops into a seed. Hence, the statement regarding Fertilization as the immediate next step is incorrect.

• Seed germination is the final stage where a seed begins to grow into a seedling. However, this can only happen after the seed has been dispersed and finds a suitable environment with adequate moisture, oxygen, and temperature. Hence, the statement regarding Seed germination is incorrect as it follows dispersal.

Additional Information

• Mechanisms of Seed Dispersal:

• Anemochory (Wind): Seeds are light or have wing-like structures to fly, such as in Dandelion or Maple trees.

• Hydrochory (Water): Fruits or seeds develop floating mechanisms to travel through water bodies, commonly seen in Coconuts.

• Zoochory (Animals): Seeds may have hooks to stick to fur (like Xanthium) or are encased in fleshy fruits eaten by animals and birds, later excreted in different locations.

• Autochory (Explosion): Some plants, like Peas or Balsam, have pods that burst open with force, scattering seeds away from the

plant.

• Significance of Dispersal:

• It prevents overcrowding around the parent plant, which reduces competition for sunlight, water, and soil minerals.

• It allows the species to invade and colonize new habitats, increasing the chances of survival against localized environmental threats.

• Seed Anatomy:

• A mature seed consists of an Embryo (the future plant), Endosperm (food storage), and a protective Seed Coat (testa).

• In Angiosperms (flowering plants), seeds are protected inside a fruit, which develops from the ovary after fertilization.

Important Points

• Double Fertilization: A unique feature of flowering plants where one male gamete fuses with the egg to form a 2n Zygote, and another fuses with two polar nuclei to form a 3n Endosperm.

• Dormancy: After maturation and dispersal, many seeds enter a period of metabolic inactivity called dormancy. This allows them to survive unfavorable conditions like extreme cold or drought for months or even years.

• Germination Requirements: For a dispersed seed to germinate, it typically requires a water uptake (imbibition), optimal temperature (usually between 25°C to 30°C), and oxygen for cellular respiration.

Q20. Answer: (a) Sugar particles occupy spaces between water particles

The correct answer is Sugar particles occupy spaces between water particles.

Key Points

• According to the Particulate Nature of Matter, all matter is made up of extremely small particles. In a liquid like water, these particles are not as tightly packed as in solids and have small intermolecular spaces between them.

• When sugar (the solute) is added to water (the solvent), the sugar crystals break down into individual molecules or particles. These tiny particles move into the empty spaces present between the water particles. Hence, statement A is correct.

• The process of sugar dissolving in water is a physical change rather than a chemical one. Under normal conditions, sugar does not chemically react with water to form a new substance; it simply forms a mixture. Hence, statement B is incorrect.

• Evaporation is the process where a liquid changes into vapor. While water can be evaporated to recover the sugar, the act of dissolving sugar itself does not cause the water to evaporate. Hence, statement C is incorrect.

• When a substance is soluble, its particles distribute uniformly throughout the liquid. If the sugar is not in excess (below the saturation point), the particles will not settle at the bottom but will remain suspended in a homogeneous mixture. Hence, statement D is incorrect.

Additional Information

• Solubility and Temperature: The solubility of solids like sugar generally increases with an increase in temperature. When water is heated, the kinetic energy of the water particles increases, causing them to move more vigorously and creating larger spaces for sugar particles to occupy.

• Saturated vs. Unsaturated Solutions: An unsaturated solution is one that can dissolve more solute at a given temperature. A saturated solution is reached when no more sugar can occupy the spaces between the water particles at that specific temperature and pressure.

• Homogeneous Mixture: A sugar-water solution is a homogeneous mixture, also known as a true solution. This means the composition and properties are uniform throughout the entire volume of the liquid.

• Concentration: The amount of sugar dissolved in a specific volume of water determines the concentration. This can be expressed in various units such as molarity, molality, or mass percentage.

Important Points

• Law of Conservation of Mass: During the dissolution process, the total mass of the solution is equal to the sum of the mass of the sugar and the mass of the water. For example, if 10 grams of sugar are dissolved in 100 grams of water, the final solution will weigh 110 grams.

• Volume Observation: Interestingly, when a small amount of sugar is dissolved in water, the volume of the water does not increase significantly. This is a direct experimental proof that matter is made of particles and that there are voids or spaces between them.

• Diffusion: The spread of sugar particles throughout the water without stirring is due to diffusion, which is the movement of particles from a region of higher concentration to a region of lower concentration.

• Physical Recovery: Because dissolving is a physical process, the sugar can be reclaimed through crystallization or distillation, where the water is removed, leaving the solute behind.

Q21. Answer: (b) 10^(-10) m

The correct answer is 10^(-10) m.

Key Points

• The radius of a hydrogen atom is approximately 10^(-10) meters. In the field of atomic physics, this specific length scale is also known as 1 Angstrom (Å).

• More precisely, the Bohr radius, which represents the most probable distance between the nucleus and the electron in a hydrogen atom in its ground state, is calculated to be 0.529 × 10^(-10) m (or 0.529 Å).

• The concept of atomic radii was significantly advanced by Niels Bohr in the year 1913 when he proposed his atomic model, which successfully explained the spectral lines of hydrogen.

• A hydrogen atom consists of a single proton in the nucleus and a single electron orbiting it. Due to this simple structure, it serves as the fundamental unit for measuring atomic sizes in chemistry and physics.

• While the atom itself is about 10^(-10) m in size, the nucleus at its center is significantly smaller, with a radius of approximately 10^(-15) m, often referred to as a fermi or femtometer.

Additional Information

• Units of Measurement: Atomic dimensions are typically expressed in nanometers (1 nm = 10^(-9) m), picometers (1 pm = 10^(-12) m), or Angstroms (1 Å = 10^(-10) m). For example, the radius of a hydrogen atom is roughly 0.053 nm or 53 pm.

• Scale Comparison: To visualize the scale, if an atom were expanded to the size of a football stadium, the nucleus would be roughly the size of a small marble placed in the center, highlighting that atoms are mostly empty space.

• Periodic Table Trends: The atomic radius generally increases as you move down a group in the periodic table due to the addition of new energy shells. Conversely, it decreases across a period from left to right because the effective nuclear charge increases, pulling electrons closer to the nucleus.

• Applications: Understanding the size of atoms is crucial in nanotechnology, molecular biology, and material science, as it determines how atoms bond and interact to form molecules.

• Discovery Context: Ernest Rutherford conducted his famous gold foil experiment in 1911, which led to the discovery of the nucleus and established the nuclear model of the atom, preceding Bohr's refinements.

Important Points

• Atomic Volume: The volume of an atom is determined by the electron cloud. Since hydrogen is the lightest element with the atomic number 1, it has the smallest atomic radius among non-noble gas elements in its neutral state.

• Quantum Mechanics: In modern quantum mechanics, the electron does not move in a fixed circular path but exists in an orbital or a probability cloud. The value 10^(-10) m represents the average distance or the boundary within which the electron is likely to be found.

• Bond Lengths: The atomic radius is often used to calculate covalent bond lengths. For a hydrogen molecule (H2), the bond length is approximately 0.74 Å, which is less than the sum of two atomic radii due to orbital overlap.

• Scientific Constants: The Bohr radius (a0) is a physical constant used in Schrödinger's equation and is approximately 5.29177 × 10^(-11) meters.

Q22. Answer: (b) Condoms

The correct answer is Condoms.

Key Points

• Condoms are highly effective barrier methods of contraception that serve a dual purpose: preventing unwanted pregnancy and reducing the transmission of Sexually Transmitted Diseases (STDs).

• They act as a physical barrier that prevents the exchange of bodily fluids (such as semen, vaginal secretions, or blood) during sexual intercourse, which is the primary mode of transmission for many pathogens.

• Condoms are the only contraceptive method that provides significant protection against HIV/AIDS, Gonorrhea, Syphilis, Chlamydia, and Trichomoniasis by covering the mucosal surfaces and preventing direct contact. Hence, the statement regarding Condoms is correct.

• Most condoms are made of Latex, though alternatives like Polyurethane or Polyisoprene are available for individuals with latex allergies.

• When used consistently and correctly, condoms have a very high efficacy rate in preventing both conception and the spread of infections.

Additional Information

• Vasectomy and Tubectomy:

• These are permanent surgical methods of sterilization. Vasectomy involves the cutting or tying of the vas deferens in males, while Tubectomy involves the blocking or cutting of the fallopian tubes in females.

• While they are nearly 100% effective for birth control, they do not prevent the exchange of fluids or skin-to-skin contact, meaning they offer no protection against STDs. Hence, the statement regarding Vasectomy/Tubectomy is incorrect.

• Oral Contraceptive Pills:

• These are hormonal methods that usually contain a combination of Estrogen and Progestogen or progestogen alone. They work by preventing ovulation (the release of an egg).

• These pills must be taken daily for 21 days of a menstrual cycle. While effective at preventing pregnancy, they do not provide a physical barrier and thus cannot stop the spread of STDs. Hence, the statement regarding Oral Pills is incorrect.

• Copper T (IUD):

• The Copper T is an Intrauterine Device (IUD) inserted into the uterus by a medical professional. It releases copper ions that are spermicidal, suppressing sperm motility and fertilizing capacity.

• It is a long-term reversible contraceptive that can last for 3 to 10 years. However, because it is located inside the uterus, it does not prevent infections transmitted through the vagina or external genitalia. Hence, the statement regarding Copper T is incorrect.

Important Points

• AIDS (Acquired Immunodeficiency Syndrome): It is a life-threatening condition caused by the Human Immunodeficiency Virus (HIV). HIV destroys the immune system (specifically CD4 T-cells), making the body vulnerable to opportunistic infections.

• STDs/STIs: These are infections primarily passed through sexual contact. Examples include Genital Herpes, Hepatitis B, and Human Papillomavirus (HPV). While vaccines exist for Hepatitis B and HPV, barrier methods remain the first line of defense during sexual activity.

• Failure Rates: The typical use failure rate for male condoms is approximately 13%, but with perfect use, the failure rate drops to about 2%. Failure usually occurs due to slippage, breakage, or incorrect application.

• Public Health Initiatives: The National AIDS Control Organisation (NACO) in India, established in 1992, promotes the use of condoms as a key strategy to achieve the goal of Zero new HIV infections.

Q23. Answer: (a) Frequency (ν)

The correct answer is Frequency.

Key Points

• Frequency is defined as the number of complete oscillations or cycles a sound wave makes per unit of time. It is represented by the Greek letter nu or simply f.

• The relationship between the Time Period (T) and Frequency is reciprocal. If T is the time taken for one full vibration, then the number of vibrations in one second is 1/T. Hence, the statement that 1/T represents Frequency is correct.

• The SI unit of frequency is the Hertz (Hz). This unit is named in honor of Heinrich Rudolf Hertz, a famous German physicist who proved the existence of electromagnetic waves in the late 19th century.

• A frequency of 1 Hz means that one cycle occurs per second. If the time period of a wave decreases, its frequency increases proportionally, indicating more vibrations occur within the same time interval.

• Frequency determines the pitch of a sound. A high-frequency wave produces a high-pitched sound (like a whistle), while a low-frequency wave produces a low-pitched sound (like a drum).

Additional Information

• Time Period (T):

• The Time Period is the time required for one complete oscillation of the density of the medium to-and-fro.

• Its SI unit is the second (s). It is the time taken by two consecutive compressions or rarefactions to cross a fixed point.

• Wavelength:

• Wavelength is the physical distance between two consecutive identical parts of a wave, such as the distance between two crests or two compressions.

• It is commonly denoted by the Greek letter Lambda and its SI unit is the meter (m).

• Amplitude (A):

• Amplitude represents the maximum displacement of the particles of the medium from their original mean position on either side.

• It determines the loudness or intensity of the sound. Larger amplitude results in a louder sound.

• Speed of Sound (v):

• The Speed of a wave is the distance it travels per unit time. It is calculated using the formula: Speed = Frequency x Wavelength.

• The speed of sound varies depending on the medium (solid, liquid, or gas) and temperature. For instance, in dry air at 20 degrees Celsius, the speed is approximately 343 meters per second.

Important Points

• Human Audibility Range: The average human ear can perceive sounds with frequencies ranging from 20 Hz to 20,000 Hz (20 kHz).

• Infrasonic Sound: Sounds with a frequency lower than 20 Hz are termed infrasonic. These are often produced by large objects like elephants, whales, or seismic waves during earthquakes.

• Ultrasonic Sound: Frequencies higher than 20,000 Hz are called ultrasonic. These are used in various medical applications like echocardiography and ultrasound imaging, as well as by animals like bats for navigation.

• Constant Frequency: When a sound wave moves from one medium to another (e.g., from air to water), its frequency remains constant because it depends on the source, but its speed and wavelength change.

Q24. Answer: (a) neuron

The correct answer is neuron.

Key Points

• The neuron, also known as a nerve cell, is the fundamental building block of the nervous system. It is specialized to transmit information to other nerve cells, muscle, or gland cells.

• In the human body, the neuron is the longest cell. Some neurons, such as the motor neurons that extend from the base of the spinal cord to the muscles of the foot, can reach a length of up to 1 meter (approx. 3.3 feet) or more. Hence, the option identifying the neuron as the longest cell is correct.

• The extreme length of a neuron is primarily due to its Axon. The axon is a long, slender projection that conducts electrical impulses (action potentials) away from the cell body (soma).

• Neurons consist of three main parts: the Cell Body (Soma), which contains the nucleus; Dendrites, which receive signals; and the Axon, which transmits signals. The presence of the Myelin sheath around many axons allows for rapid signal conduction over these long distances.

• Unlike many other cells in the body, mature neurons in the Central Nervous System (CNS) generally do not undergo cell division (mitosis), meaning they are often as old as the individual.

Additional Information

• Muscle Fibre:

• Muscle fibres (specifically skeletal muscle cells) are also quite long and are multinucleated.

• While they can reach lengths of up to 30 cm in the Sartorius muscle of the thigh, they are generally shorter than the longest neurons. Hence, this statement is not the primary answer regarding the longest cell.

• Their main function is contraction to facilitate movement, powered by proteins like actin and myosin.

• Platelet (Thrombocyte):

• Platelets are not complete cells but rather cell fragments derived from megakaryocytes in the bone marrow.

• They are very small, typically 2 to 3 micrometers in diameter, and lack a nucleus. Hence, this statement is incorrect as they are among the smallest components in the blood.

• Their primary application is in blood clotting (hemostasis) and wound healing.

• Osteocyte:

• An osteocyte is a mature bone cell that resides within the lacunae of the bone matrix.

• They are involved in the maintenance of bone tissue and respond to mechanical strain. Hence, this statement is incorrect in the context of being the longest cell.

• They develop from osteoblasts and remain embedded in the calcified matrix they helped create.

Important Points

• Largest Cell in Humans: While the neuron is the longest, the human ovum (egg cell) is considered the largest cell in terms of volume and diameter (roughly 120 to 150 micrometers), making it visible to the naked eye.

• Smallest Cell in Humans: The Sperm cell is often cited as the smallest cell in terms of volume, although the cerebellum granule cell is also a candidate for the smallest based on size.

• Nervous System Location: Neurons are found throughout the Brain, Spinal Cord, and the Peripheral Nervous System.

• Data on Synapses: A single neuron can have thousands of synaptic connections with other neurons, forming complex neural networks that process sensory data and coordinate motor functions.

Q25. Answer: (d) biodegradable

The correct answer is Biodegradable.

Key Points

• Biodegradable substances are materials that can be broken down or decomposed into simpler, harmless substances by the action of microorganisms such as bacteria, fungi, and earthworms.

• The process through which these substances are decomposed is known as biodegradation. This is a biological process where complex organic matter is converted into carbon dioxide, water, and biomass.

• These substances are typically natural materials. Common examples include vegetable peels, fruits, paper, cotton, wool, wood, and animal waste.

• Since these materials return to the soil and become part of the nutrient cycle, they do not cause long-term environmental pollution. Hence, the substances broken down by biological processes are called biodegradable.

Additional Information

• Non-biodegradable: These are substances that cannot be broken down by biological processes or the action of microbes. They persist in the environment for a very long time, often for hundreds of years. Examples include plastics, polythene bags, and DDT. Their accumulation leads to soil pollution and clogging of drainage systems.

• Synthetic: These are man-made materials produced through chemical synthesis in industries. While some modern synthetic materials are designed to be bio-plastics, most traditional synthetic fibers like nylon, polyester, and acrylic are non-biodegradable and resistant to natural decay.

• Metallic: This category includes elements or alloys like iron, aluminum, copper, and lead. While metals may undergo chemical oxidation (like rusting of iron), they are not broken down by biological enzymes or microorganisms, making them non-biodegradable in a biological context.

• Biomagnification: This is a functional consequence of non-biodegradable substances. Chemicals like mercury or pesticides (e.g., DDT) enter the food chain and increase in concentration at each trophic level, posing a health risk to apex predators and humans.

Important Points

• Decomposers: These are the saprophytic organisms that play a vital function in the ecosystem by breaking down dead organic matter. Without them, the earth would be covered in waste and nutrients would not be recycled.

• Factors affecting Biodegradation: The rate at which a substance decomposes depends on environmental factors such as temperature, moisture, oxygen availability, and pH levels. For example, aerobic decomposition occurs faster in the presence of oxygen compared to anaerobic conditions.

• Waste Management: To protect the environment, it is crucial to segregate waste at the source into dry waste (non-biodegradable) and wet waste (biodegradable). Biodegradable waste can be converted into manure or compost through composting or vermicomposting (using red worms).

Q26. Answer: (b) 3468

Shortcut Trick

Total ratio sum = 2 + 17 + 19 = 38 units

Given total sum 7752 → 38 units

Value per unit = 7752 ÷ 38 = 204

Middle number (17 units) = 17 × 204 = 3468

Therefore Answer = 3468

Alternate Method

Given:

Ratio of three numbers = 2 : 17 : 19

Total sum of the numbers = 7752

Formula used:

Individual Number = (Specific Ratio Part ÷ Sum of Ratio Parts) × Total Sum

2x 17x (Middle) 19x Total Sum = 7752 Middle Number = 17 × 204 = 3468

Calculations:

=> Let the numbers be 2x, 17x, and 19x.

=> Sum = 2x + 17x + 19x = 38x

=> 38x = 7752

=> x = 7752 ÷ 38

=> x = 204

=> Middle number = 17x = 17 × 204

=> Middle number = 3468

Therefore The correct answer is 3468 (Option 2).

Q27. Answer: (c) 8°

Shortcut Trick

Property: Angle between bisectors of adjacent angles = (Sum of other two angles) / 2

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

=> 28° = (angle P + angle Q) / 2 => angle P + angle Q = 56°

Ratio angle P : angle Q = 3 : 4 => Total 7 units = 56° (1 unit = 8°)

Difference = 4 − 3 = 1 unit = 8°

Therefore Answer = 8°

Alternate Method

Given:

Quadrilateral PQRS, angle STR = 28°, angle P : angle Q = 3 : 4. ST and RT are angle bisectors.

Formula used:

Sum of angles in a triangle = 180° | Sum of angles in a quadrilateral = 360°
P Q R S T (28°) Bisector ST Bisector RT angle STR = 28°
Calculations:
In ΔSTR, angle TSR + angle TRS + angle STR = 180°
=> (angle S / 2) + (angle R / 2) + 28° = 180°
=> (angle R + angle S) / 2 = 180° − 28° = 152°
=> angle R + angle S = 152° × 2 = 304°
=> In quad PQRS, angle P + angle Q + angle R + angle S = 360°
=> angle P + angle Q + 304° = 360°
=> angle P + angle Q = 56°
=> Let angle P = 3x and angle Q = 4x, then 3x + 4x = 56°
=> 7x = 56° => x = 8°
=> Difference = 4x − 3x = x = 8°
Therefore The correct answer is 8° (Option 3).

Q28. Answer: (b) 1,95,000

Shortcut Trick
Income Ratio = 5 : 8, Exp Ratio = 2 : 4, Savings = 78,000 : 78,000.
Income cross-product difference = (5 × 4) − (8 × 2) = 4 units.
Savings cross-product difference = (4 × 78,000) − (2 × 78,000) = 1,56,000.
4 units = 1,56,000 → 1 unit = 39,000.
Kiran's Income = 5 units = 5 × 39,000 = 1,95,000.
Therefore Answer = 1,95,000
Alternate Method
Given:
Ratio of monthly incomes of Kiran and Mahesh = 5 : 8
Monthly saving of each = Rs. 78,000
Ratio of their monthly expenditures = 2 : 4
Formula used:
Income − Saving = Expenditure
Income Structure (Parts) Kiran: Exp (3u) Sav (2u) Mahesh: Expenditure (6u) Sav (2u) 2 units (Saving) = Rs. 78,000 Kiran Income (5u) = 1,95,000
Calculations:
Let the monthly incomes of Kiran and Mahesh be 5x and 8x respectively.
=> (5x − 78,000) / (8x − 78,000) = 2 / 4
=> (5x − 78,000) / (8x − 78,000) = 1 / 2
=> 2 × (5x − 78,000) = 1 × (8x − 78,000)
=> 10x − 1,56,000 = 8x − 78,000
=> 10x − 8x = 1,56,000 − 78,000
=> 2x = 78,000
=> x = 39,000
=> Kiran's monthly income = 5x = 5 × 39,000 = 1,95,000
Therefore The correct answer is 1,95,000 (Option 2).

Q29. Answer: (d) 49

Shortcut Trick
Let assumed mean be 40.
Deviations: +18, −27, +34, −2, +58, −4, +3, −1, +2
Net deviation sum = 81
Average deviation = 81 ÷ 9 = 9
Actual Mean = Assumed Mean + Average Deviation = 40 + 9 = 49
Therefore Answer = 49

Alternate Method
Given:
Observations: 58, 13, 74, 38, 98, 36, 43, 39, 42
Total number of observations (n) = 9
Formula used:
Arithmetic Mean = (Sum of all observations) ÷ (Number of observations)
Mean = 49 13 98 Observation Distribution
Calculations:
Sum of observations = 58 + 13 + 74 + 38 + 98 + 36 + 43 + 39 + 42
=> Sum = 441
=> Arithmetic Mean = 441 ÷ 9
=> Arithmetic Mean = 49
Therefore The correct answer is 49.

Q30. Answer: (b) 51/3 days

Shortcut Trick
Work left for 10 women = 20 − 4 = 16 days.
Total units to complete = 10 women × 16 days = 160 units.
New strength = 10 + 20 = 30 women.
Extra days required = 160 units ÷ 30 women = 16/3 days.
Therefore Answer = 5 1/3 days
Alternate Method
Given:
Initial number of women (M1) = 10
Initial time to weave (D1) = 20 days
Time elapsed = 4 days
New women joining = 20
Formula used:
Total Work = M × D (Work remains constant or additive)
Work done in 4 days Remaining Work 10 Women 30 Women (10 + 20) Work = 40 units Work = 160 units Total Work = 200 units
Calculations:
=> Total work to be done = 10 women × 20 days = 200 units.
=> Work completed in 4 days = 10 women × 4 days = 40 units.
=> Remaining work = 200 − 40 = 160 units.
=> New total number of women = 10 + 20 = 30 women.
=> More days required to finish work = Remaining work ÷ New total women.
=> Days = 160 ÷ 30 = 16/3 = 5 1/3 days.
Therefore The correct answer is 5 1/3 days (Option 2).

Q31. Answer: (a) 63 km/hr

Shortcut Trick
Length of train is constant → Relative speed is inversely proportional to time.
Time ratio t1 : t2 = 16.8 : 22.4 = 3 : 4.
Relative speed ratio (V − 12.6) : (V − 25.2) = 4 : 3.
3(V − 12.6) = 4(V − 25.2) => 3V − 37.8 = 4V − 100.8.
V = 100.8 − 37.8 = 63 km/hr.
Therefore Answer = 63 km/hr
Alternate Method
Given:
Speed of first person (v1) = 12.6 km/hr
Speed of second person (v2) = 25.2 km/hr
Time to pass first person (t1) = 16.8 s

Time to pass second person (t2) = 22.4 s
Formula used:
Distance = Relative Speed × Time
Relative Speed (Same direction) = Speed of Train (V) − Speed of Person (v)
TRAIN Speed: V P1: 12.6 km/h P2: 25.2 km/h Distance = Length of Train (Constant)
Calculations:
Let V be the speed of the train in km/hr.
=> Length of train = (V − 12.6) × (16.8 / 3600) = (V − 25.2) × (22.4 / 3600)
=> (V − 12.6) × 16.8 = (V − 25.2) × 22.4
=> (V − 12.6) / (V − 25.2) = 22.4 / 16.8
=> (V − 12.6) / (V − 25.2) = 4 / 3
=> 3 × (V − 12.6) = 4 × (V − 25.2)
=> 3V − 37.8 = 4V − 100.8
=> V = 100.8 − 37.8
=> V = 63 km/hr
Therefore The correct answer is (1).

Q32. Answer: (c) 40.91%

Shortcut Trick
Required Ratio = (1 ÷ 20) ÷ (11 ÷ 90)
= (1 ÷ 20) × (90 ÷ 11)
= 90 ÷ 220 = 9 ÷ 22
= 0.40909... ≈ 0.4091
Therefore Answer = 0.4091
Alternate Method
Given:
First fraction = 1/20
Second fraction = 11/90
Formula used:
Value = (First Number ÷ Second Number)
Total: 11/90 (Represented as 22 units) Part: 1/20 (Represented as 9 units) Ratio = 9 ÷ 22 ≈ 0.4091
Calculations:
=> Required Result = (1/20) ÷ (11/90)
=> Result = (1/20) × (90/11)
=> Result = 90 ÷ 220
=> Result = 9 ÷ 22
=> Result = 0.4090909...
=> Result ≈ 0.4091
Therefore The correct answer is 0.4091 (Option 3).

Q33. Answer: (b) 70√3

Shortcut Trick
In a 30°−60°−90° triangle, the ratio of sides opposite to these angles is 1 : √3 : 2.
Here, the side opposite to 60° (height) is 210 m.
The distance from the ship (side opposite to 30°) = Height ÷ √3.
Distance = 210 ÷ √3 = (210 × √3) ÷ 3 = 70√3 m.
Therefore Answer = 70√3
Alternate Method
Given:
Height of the shipmast (AB) = 210 m
Angle of depression = 60° (which equals the angle of elevation from the boat to the mast top)
Formula used:

tan θ = Perpendicular ÷ Base
A (Top) B (Ship) C (Boat) Height = 210 m Depression = 60° 60° Distance (d) d = 70√3 m
Calculations:
Let the distance of the boat from the ship be BC = d.
=> In triangle ABC, tan 60° = AB ÷ BC
=> √3 = 210 ÷ d
=> d = 210 ÷ √3
=> d = (210 × √3) ÷ (√3 × √3)
=> d = 210√3 ÷ 3
=> d = 70√3 m
Therefore The correct answer is Option (2).

Q34. Answer: (d) 48

Shortcut Trick
Priority order: Parentheses () → Brackets [] → Subtraction.
Inner logic: (2 + 1) = 3
Bracket logic: [12 ÷ 3 + 4 × 2] = 4 + 8 = 12
Final step: 60 − 12 = 48
Therefore Answer = 48
Alternate Method
Given:
Expression: 60 − [12 ÷ (2 + 1) + 4 × 2]
Formula used:
BODMAS Rule: B (Brackets), O (Of), D (Division), M (Multiplication), A (Addition), S (Subtraction).
Subtraction Rod (Total = 60) Result: 48 Bracket [12] 60 − [12 ÷ 3 + 8] Final Value = 48
Calculations:
Evaluate the inner parentheses:
=> 60 − [12 ÷ 3 + 4 × 2]
Perform division and multiplication inside the square brackets:
=> 60 − [4 + 8]
Solve the addition inside the square brackets:
=> 60 − 12
=> 48
Therefore The correct answer is 48, which is option (4).

Q35. Answer: (c) 2508

Shortcut Trick
Combined Ratio (Red : Blue : Yellow) = (1 × 7) : (3 × 7) : (3 × 4) = 7 : 21 : 12
Total units = 7 + 21 + 12 = 40 units
40 units = 8360 → 1 unit = 8360 ÷ 40 = 209
Yellow blocks = 12 units = 12 × 209 = 2508
Therefore Answer = 2508
Alternate Method
Given:
Total number of blocks = 8360
Ratio (Red : Blue) = 1 : 3
Ratio (Blue : Yellow) = 7 : 4
Formula used:
Combined Ratio and Unitary Method: Value of required parts = (Total Value ÷ Total Parts) × Required Parts
R 7u Blue 21u Yellow 12u Total (40u) = 8360 Yellow Blocks = 12 × 209 = 2508
Calculations:
=> Red : Blue = 1 : 3

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=> Blue : Yellow = 7 : 4
=> To combine, multiply Red : Blue by 7 and Blue : Yellow by 3:
=> Red : Blue : Yellow = (1 × 7) : (3 × 7) : (4 × 3) = 7 : 21 : 12
=> Total Ratio Parts = 7 + 21 + 12 = 40 units
=> 40 units = 8360 blocks
=> 1 unit = 8360 ÷ 40 = 209 blocks
=> Number of yellow blocks = 12 units = 12 × 209
=> Yellow blocks = 2508
Therefore The correct answer is 2508.

Q36. Answer: (c) Length = 4 cm and breadth = 2 cm

Shortcut Trick
Ratio of Length : Breadth = 2 : 1.
Sum of Length + Breadth = Half of Perimeter = 12 ÷ 2 = 6 cm.
Total ratio units = 2 + 1 = 3 units.
Value of 1 unit = 6 ÷ 3 = 2 cm.
Length = 2 × 2 = 4 cm and Breadth = 1 × 2 = 2 cm.
Therefore Answer = Length = 4 cm and breadth = 2 cm
Alternate Method
Given:
Perimeter of rectangle = 12 cm
Length = 2 × Breadth
Formula used:
Perimeter of a rectangle = 2 × (Length + Breadth)
Length (L) = 2x Breadth (B) = x Perimeter = 12 cm Result: L = 4 cm, B = 2 cm
Calculations:
=> Let the breadth of the rectangle be x cm.
=> Then, the length of the rectangle = 2x cm.
=> Perimeter = 2 × (Length + Breadth) = 12
=> 2 × (2x + x) = 12
=> 2 × 3x = 12
=> 6x = 12 → x = 2
=> Length = 2 × 2 = 4 cm and Breadth = 2 cm.
Therefore The correct answer is (3).

Q37. Answer: (b) 6835.5

Shortcut Trick
Side of cube (a) = 21 cm
For the largest cone: Radius (r) = a/2 = 10.5 cm, Height (h) = a = 21 cm
Volume of cube = $a^3 = 21^3 = 9261$ cm³
Volume of cone = $(1/12) \times \pi \times a^3 = (11/42) \times 9261 = 2425.5$ cm³
Leftover wood = 9261 − 2425.5 = 6835.5 cm³
Therefore Answer = 6835.5
Alternate Method
Given:
Side of the solid wooden cube (a) = 21 cm
The cone is carved such that its base diameter and height are equal to the side of the cube.
Radius of cone (r) = 21/2 = 10.5 cm
Height of cone (h) = 21 cm
Formula used:
Volume of cube = a^3
Volume of cone = $(1/3) \times \pi \times r^2 \times h$

Side = 21 cm Cone inside Cube Height = 21 r = 10.5
Calculations:
Volume of the wooden cube = 21 × 21 × 21
=> Volume of cube = 9261 cm³
Volume of the carved cone = (1/3) × (22/7) × (21/2) × (21/2) × 21
=> Volume of cone = (1/3) × (22/7) × (441/4) × 21
=> Volume of cone = 22 × 441 / 4 = 11 × 441 / 2 = 4851 / 2
=> Volume of cone = 2425.5 cm³
Volume of wood left over = Volume of cube − Volume of cone
=> Leftover volume = 9261 − 2425.5
=> Leftover volume = 6835.5 cm³
Therefore The correct answer is (2).

Q38. Answer: (d) 2

Shortcut Trick
Divisibility by 12 requires divisibility by both 3 and 4.
Last two digits 60 are divisible by 4, so the condition for 4 is satisfied.
For divisibility by 3, the sum of digits 3 + * + 7 + 6 + 0 = 16 + * must be a multiple of 3.
Multiples of 3 greater than 16 are 18, 21, 24, etc.
The smallest value for * is 18 − 16 = 2.
Therefore Answer = 2
Alternate Method
Given:
Number = 3*760
Divisor = 12
Formula used:
A number is divisible by 12 if it is divisible by 3 (sum of digits) and 4 (last two digits).
Number: 3 * 7 6 0 3 * 7 6 0 Divisible by 4 Sum (16 + *) must be divisible by 3
Calculations:
Check divisibility by 4:
=> Last two digits of 3*760 are 60.
=> 60 ÷ 4 = 15 (Divisible by 4).
Check divisibility by 3:
=> Sum of digits = 3 + * + 7 + 6 + 0 = 16 + *.
=> For 16 + * to be divisible by 3, possible values for * are 2, 5, 8.
=> Smallest value for * = 2.
Therefore The correct answer is 2 (Option 4).

Q39. Answer: (b) 35,200

Shortcut Trick
Net Rate difference = 7.5% − 3.5% = 4% per annum
Total interest difference percentage for 4 years = 4% × 4 = 16%
Difference in SI = 16% of Rs. 2,20,000
Difference in SI = 0.16 × 2,20,000 = 35,200
Therefore Answer = 35200
Alternate Method
Given:
Principal (P) = Rs. 2,20,000 | Time (T) = 4 years | Rate A (R1) = 3.5% | Rate B (R2) = 7.5%
Formula used:
Simple Interest (SI) = (P × R × T) / 100 | Difference in Interest = SI_B − SI_A
Bank B: 7.5% per annum Bank A: 3.5% Rate Diff: 4.0% Year 1 Year 2 Year 3 Year 4 Net Interest Difference = 16% of Principal
Calculations:

=> SI from Bank A = (2,20,000 × 3.5 × 4) / 100 = 2,200 × 14 = Rs. 30,800
=> SI from Bank B = (2,20,000 × 7.5 × 4) / 100 = 2,200 × 30 = Rs. 66,000
=> Difference in SI = Rs. 66,000 − Rs. 30,800
=> Difference = Rs. 35,200
Therefore The correct answer is 35200 (Option 2).

Q40. Answer: (b) 9

Shortcut Trick
Mode is the value in a dataset that appears with the highest frequency.
Compare the frequencies (Number of Patients): 5, 7, 8, 6, 4.
Identify the maximum frequency value: Max frequency = 8.
The observation (Days of Confinement) corresponding to frequency 8 is 9.
Therefore Answer = 9
Alternate Method
Given:
Data Table:
Days (x): 7, 8, 9, 10, 11
Patients (f): 5, 7, 8, 6, 4
Formula used:
For a discrete frequency distribution, Mode = Value of x with the maximum frequency f.
7 5 8 7 9 8 (Max) 10 6 11 4 Mode = 9 (Highest Bar)
Calculations:
List the frequencies (f) for each confinement period (x):
=> f(7) = 5
=> f(8) = 7
=> f(9) = 8
=> f(10) = 6
=> f(11) = 4
=> Comparing the values: 8 > 7 > 6 > 5 > 4
=> Since the maximum frequency is 8, the corresponding value of x is 9.
Therefore The correct answer is 9.

Q41. Answer: (c) 24 seconds

Shortcut Trick
Total relative distance to cover = Sum of lengths = 130 + 190 = 320 m
Relative speed in same direction = Difference of speeds = 96 − 48 = 48 km/hr
Speed in m/s = 48 × (5/18) = 40/3 m/s
Time taken = Total Distance ÷ Relative Speed = 320 ÷ (40/3) = 24 seconds
Therefore Answer = 24 seconds
Alternate Method
Given:
Length of first train (L1) = 130 m
Length of second train (L2) = 190 m
Speed of faster train (S1) = 96 km/hr
Speed of slower train (S2) = 48 km/hr
Formula used:
Relative Speed (Same direction) = S1 − S2
Time = (L1 + L2) ÷ (S1 − S2)
Conversion: 1 km/hr = 5/18 m/s
Train 2 (190m) 48 km/h Train 1 (130m) 96 km/h Total Distance = 130 + 190 = 320 m Relative Speed = 96 − 48 = 48 km/h
Calculations:
=> Relative Speed = 96 − 48 = 48 km/hr

=> Relative Speed in m/s = 48 × (5/18) = 8 × (5/3) = 40/3 m/s
=> Total distance to be covered = 130 + 190 = 320 m
=> Time = 320 ÷ (40/3)
=> Time = (320 × 3) ÷ 40
=> Time = 8 × 3 = 24 seconds
Therefore The correct answer is 24 seconds (Option 3).

Q42. Answer: (b) 100

Shortcut Trick
List the first 9 prime numbers: 2, 3, 5, 7, 11, 13, 17, 19, 23
Use pairing to find the sum quickly: (7 + 23) + (11 + 19) + (13 + 17) + (2 + 3 + 5)
→ 30 + 30 + 30 + 10 = 100
Therefore Answer = 100
Alternate Method
Given:
The first 9 prime numbers: 2, 3, 5, 7, 11, 13, 17, 19, 23.
Formula used:
Total Sum = P1 + P2 + P3 + P4 + P5 + P6 + P7 + P8 + P9
First 9 Prime Numbers 2 3 5 7 11 13 17 19 23 Sum = 100
Calculations:
=> Sum = 2 + 3 + 5 + 7 + 11 + 13 + 17 + 19 + 23
=> Sum = (2 + 3 + 5) + (7 + 13) + (11 + 19) + (17 + 23)
=> Sum = 10 + 20 + 30 + 40
=> Sum = 100
Therefore The correct answer is 100 (Option 2).

Q43. Answer: (a) 22.7%

Shortcut Trick
Net Profit % = Markup % − Discount % − (Markup × Discount) / 100
Net Profit % = 41 − 13 − (41 × 13) / 100
Net Profit % = 28 − 5.33
Net Profit % = 22.67%
Rounded to 1 decimal place = 22.7% (which is 0.227 in decimal options)
Therefore Answer = 0.227
Alternate Method
Given:
Markup percentage = 41% above Cost Price (CP)
Discount percentage = 13% on Marked Price (MP)
Formula used:
Profit % = (Selling Price − Cost Price) / Cost Price × 100
CP = 100 SP = 122.67 MP = 141 Markup +41% Discount −13% Profit = 22.67%
Calculations:
Let the Cost Price (CP) of the item be 100.
=> Marked Price (MP) = 100 + 41% of 100 = 141
=> Selling Price (SP) = MP − 13% of MP
=> SP = 141 − (13 / 100 × 141)
=> SP = 141 − 18.33 = 122.67
=> Profit = SP − CP = 122.67 − 100 = 22.67
=> Profit % = (22.67 / 100) × 100 = 22.67%
=> Rounding off to one decimal place, Profit % = 22.7%
=> Corresponding decimal value from options = 0.227
Therefore The correct answer is (1) 0.227.

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Q44. Answer: (d) 46,300

Shortcut Trick

Selling Price (SP) = 100% − 11% Discount = 89% of Marked Price (MP)

Given SP = Rs. 41,207

89% of MP = 41207

MP = (41207 ÷ 89) × 100

MP = 463 × 100 = 46300

Therefore Answer = 46300

Alternate Method

Given:

Selling Price (SP) = Rs. 41,207

Discount percentage = 11%

Formula used:

Marked Price (MP) = (SP × 100) ÷ (100 − Discount%)

Marked Price (100%) = ? SP = 89% (Rs. 41,207) 11% Disc MP = Rs. 46,300

Calculations:

=> SP = 89% of MP

=> 41207 = (89 ÷ 100) × MP

=> MP = (41207 × 100) ÷ 89

=> MP = 463 × 100

=> MP = 46300

Therefore The correct answer is 46300 (Option 4).

Q45. Answer: (b) 12

Shortcut Trick

Group 1: Hassan + Ali

Group 2: Ali + Ahmed

The difference (Group 1 − Group 2) is 12 years.

Common age of Ali is present in both groups and cancels out.

Remaining difference: Hassan − Ahmed = 12 years.

Therefore Answer = 12

Alternate Method

Given:

Total age of Hassan and Ali = Total age of Ali and Ahmed + 12

Formula used:

Difference in ages = (Person A + Person B) − (Person B + Person C) = Person A − Person C

Hassan Ali Ahmed 12 Ali Hassan − Ahmed = 12 years

Calculations:

Let the ages of Hassan, Ali, and Ahmed be H, Ali, and Ahmed respectively.

=> H + Ali = (Ali + Ahmed) + 12

=> H + Ali − Ali = Ahmed + 12

=> H = Ahmed + 12

=> H − Ahmed = 12

=> Ahmed = H − 12

Therefore The correct answer is 12 (Option 2).

Q46. Answer: (a) 9

Shortcut Trick

Total Work = LCM(4, 36) = 36 units.

Efficiency of (A+B) = 36 ÷ 4 = 9 units/day.

Efficiency of B = 36 ÷ 36 = 1 unit/day => Efficiency of A = 9 − 1 = 8 units/day.

Double work = 36 × 2 = 72 units.

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Time taken by A = 72 ÷ 8 = 9 days.
Therefore Answer = 9
Alternate Method
Given:
Time taken by A and B together = 4 days
Time taken by B alone = 36 days
Formula used:
Efficiency = Total Work ÷ Time Taken
Time = Total Work ÷ Efficiency
Work (36 units) Double (36 units) Total Work = 72 units Eff (A+B) = 9 Eff (B) = 1 A's Time = 72 ÷ 8 = 9 Days
Calculations:
=> Let total work be LCM of 4 and 36 = 36 units.
=> Efficiency of (A + B) = 36 ÷ 4 = 9 units/day.
=> Efficiency of B = 36 ÷ 36 = 1 unit/day.
=> Efficiency of A = Efficiency of (A + B) − Efficiency of B
=> Efficiency of A = 9 − 1 = 8 units/day.
=> Double the work = 36 × 2 = 72 units.
=> Time taken by A to do 72 units = 72 ÷ 8 = 9 days.
Therefore The correct answer is 9, which is option (1).

Q47. Answer: (d) $3x^2 - 4x + 17$

Shortcut Trick
Expand both parts using algebraic identities:
$(2x - 1)^2 \rightarrow 4x^2 - 4x + 1$
$(x - 4)(x + 4) \rightarrow x^2 - 16$
Combine results: $(4x^2 - 4x + 1) - (x^2 - 16)$
Simplified form: $3x^2 - 4x + 17$
Therefore Answer = $3x^2 - 4x + 17$
Alternate Method
Given:
Expression: $(2x - 1)^2 - (x - 4)(x + 4)$
Formula used:
$(a - b)^2 = a^2 - 2ab + b^2$
$(a - b)(a + b) = a^2 - b^2$
$(2x - 1)^2$ $4x^2 - 4x + 1 - (x - 4)(x + 4)$ $x^2 - 16$ Result: $3x^2 - 4x + 17$
Calculations:
=> Expansion of first part: $(2x)^2 - 2(2x)(1) + (1)^2 = 4x^2 - 4x + 1$
=> Expansion of second part: $(x)^2 - (4)^2 = x^2 - 16$
=> Subtracting second from first: $(4x^2 - 4x + 1) - (x^2 - 16)$
=> $4x^2 - 4x + 1 - x^2 + 16$
=> $(4x^2 - x^2) - 4x + (1 + 16)$
=> $3x^2 - 4x + 17$
Therefore The correct answer is option (4).

Q48. Answer: (d) Increase by 4.8%

Shortcut Trick
Ratio of total investment (5 WM : 7 TV) = (5 × 60) : (7 × 100) = 3 : 7.
Net percentage change = [Ratio1 × Change1 + Ratio2 × Change2] ÷ Total Ratio.
Net change % = [3 × 51 + 7 × (−15)] ÷ (3 + 7) = (153 − 105) ÷ 10.
Net change % = 48 ÷ 10 = 4.8% (Positive indicates increase).
Therefore Answer = Increase by 4.8%
Alternate Method

Given:
Cost of WM = 40% less than TV. WM quantity = 5, TV quantity = 7. WM price increase = 51%, TV price decrease = 15%.
Formula used:
Total Cost = (Price × Quantity) | Percentage Change = [(New Value − Old Value) ÷ Old Value] × 100
5 WM (300) 7 TV (700) Initial Total = 1000 New 5 WM (453) New 7 TV (595) New Total = 1048 Net Increase = 4.8%
Calculations:
=> Let cost of 1 TV = 100, then cost of 1 WM = 100 − 40 = 60
=> Initial Total Cost = (5 × 60) + (7 × 100) = 300 + 700 = 1000
=> New cost of 1 WM = 60 + 51% of 60 = 60 + 30.6 = 90.6
=> New cost of 1 TV = 100 − 15% of 100 = 85
=> New Total Cost = (5 × 90.6) + (7 × 85) = 453 + 595 = 1048
=> Change in cost = 1048 − 1000 = 48
=> Percentage Change = (48 ÷ 1000) × 100 = 4.8%
Therefore The correct answer is Increase by 4.8% (Option 4).

Q49. Answer: (d) Rs. 2,880

Shortcut Trick
Profit = 20% = 1/5 → CP = 5 units, Profit = 1 unit
Given Difference (Profit) = 1 unit = Rs. 480
Selling Price (SP) = CP + Profit = 5 + 1 = 6 units
SP = 6 units = 6 × 480
SP = 2,880
Therefore Answer = Rs. 2,880
Alternate Method
Given:
Difference between Cost Price (CP) and Selling Price (SP) = Rs. 480
Profit percentage = 20%
Formula used:
Profit = SP − CP
Profit % = (Profit ÷ CP) × 100
Selling Price (SP) = Cost Price (CP) + Profit
Cost Price (100%) Profit (20%) Rs. 480 Selling Price = 120% SP = 6 × Rs. 480 = Rs. 2,880
Calculations:
=> Profit = 20% of CP = Rs. 480
=> (20 ÷ 100) × CP = 480
=> CP = 480 × 5 = Rs. 2,400
=> SP = CP + Profit = 2400 + 480
=> SP = 2,880
Therefore The correct answer is Rs. 2,880 (Option 4).

Q50. Answer: (a) 868

Shortcut Trick
Condition 1: Numerator + 3 = Denominator => D − N = 3
Condition 2: N / (D + 4) = 4/5 => 5N = 4D + 16
Substitute D = N + 3 into the second condition: 5N = 4(N + 3) + 16
5N = 4N + 12 + 16 => N = 28
Denominator D = 28 + 3 = 31
Therefore Answer = 868
Alternate Method
Given:
Fraction = N/D
(N + 3) / D = 1

N / (D + 4) = 4/5

Formula used:

Product = Numerator × Denominator

Numerator (N) = 28 Denominator (D) = 31 N + 3 = D N / (D + 4) = 4/5 Final Product = 28 × 31 = 868

Calculations:

From the first condition:

=> (N + 3) / D = 1

=> D = N + 3

From the second condition:

=> N / (D + 4) = 4/5

=> 5N = 4(D + 4)

=> 5N = 4(N + 3 + 4)

=> 5N = 4N + 28

=> N = 28

=> D = 28 + 3 = 31

=> Product = 28 × 31 = 868

Therefore The correct answer is 868, which is option (1).

Q51. Answer: (d) One

Concept:

Each letter is replaced by the next letter in the English alphabetical order.

Given words: COP, TIK, ANY, CAN, OWN

COP → C→D, O→P, P→Q → DPQ

TIK → T→U, I→J, K→L → UJL

ANY → A→B, N→O, Y→Z → BOZ

CAN → C→D, A→B, N→O → DBO

OWN → O→P, W→X, N→O → PXO

DPQ → No vowel

UJL → Contains vowel U

BOZ → Contains vowel O

DBO → Contains vowel O

PXO → Contains vowel O

Words without vowels = 1

Hence, the correct answer is “Option 4”.

Q52. Answer: (c) 33

BODMAS Table:

Given equation: 41 C 12 A 6 D 5 B 2 = ?

Now, if ‘A’ = ‘÷’, ‘B’ = ‘×’, ‘C’ = ‘+’ and ‘D’ = ‘−’, then:

=> 41 + 12 ÷ 6 − 5 × 2 = ?

=> 41 + 12 ÷ 6 − 5 × 2 = ?

=> 41 + 2 − 10 = ?

=> 41 + 2 − 10 = ?

=> 43 − 10 = 33.

Hence, the correct answer is "Option 3".

Q53. Answer: (c) Four

Given series:

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

Condition to be checked:

Odd digit ← Odd digit → Even digit

Checking the series:

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

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There are four such digits that satisfy the given condition.
Hence, the correct answer is "Option 3".

Q54. Answer: (d) 5 km towards north

According to the given information,
To reach point A again, he should drive 8 - 3 = 5 km towards North direction.
Hence, the correct answer is “Option 4”.

Q55. Answer: (a) 23rd

Given:
Total number of people in the row = 41
Mohan is 10th from the left end.
Rahul sits 9 places to the right of Mohan.
Rahul's position from left = Mohan's position + 9
= 10 + 9
= 19th from the left
Position from right = Total people - Position from left + 1
Rahul's position from right = 41 - 19 + 1
= 22 + 1
= 23rd from the right
Hence, the correct answer is “Option 1”.

Q56. Answer: (a) G

Eight people – A, B, C, D, E, F, G and H, are sitting around a circular table facing the centre.
1. C sits to the immediate left of A.
2. Only two people sit between C and E when counted from the left of E.
3. Only three people sit between H and E when counted from the left of H.
4. D sits to the immediate left of H.
5. B is not an immediate neighbour of E.
6. F sits second to the right of G.
G sits third to the right of H.
Hence, the correct answer is “Option 1”.

Q57. Answer: (a) Three

Five people V, W, X, Y and Z are sitting in a row facing towards north.
1. W is sitting at the extreme left end of the row.
2. There are two people sitting between Z and W.
3. V is immediate neighbour of Z.
4. X is immediate neighbour of V.
Three people are sitting in between W and Y.
Hence, the correct answer is “Option 1”.

Q58. Answer: (b) 3

Seven boxes, A, B, C, D, E, F and G, are kept one over the other but not necessarily in the same order.
1. Only C is kept above B.
2. Only E is kept between B and F.
3. Only G is kept below A.

C
B
E
F
D

A
G

Three boxes are kept below F.

Hence, the correct answer is “Option 2”.

Q59. Answer: (b) AEI 79

Pattern followed here is,

Hence, the correct answer is “Option 2”.

Q60. Answer: (a) PTN

(1) PTN

P + 4 = T

T - 6 = N

(2) SWP

S + 4 = W

W - 7 = P

(3) VZS

V + 4 = Z

Z - 7 = S

(4) EIB

E + 4 = I

I - 7 = B

Hence, the correct answer is “Option 1”.

Q61. Answer: (b) 139

BODMAS Table:

Given equation: 92 D 9 C 96 A 12 B 7 = ?

A	B	C	D
÷	×	•	•

Now, replacing the symbols:

=> 92 - 9 + 96 ÷ 12 × 7 = ?

=> 92 - 9 + 96 ÷ 12 × 7 = ?

=> 92 - 9 + 8 × 7 = ?

=> 92 - 9 + 56 = ?

=> 92 - 9 + 56 = ?

=> 83 + 56 = ?

=> 139.

Hence, the correct answer is "Option 2".

Q62. Answer: (c) 31 km to the north

According to the given information,

To reach point A again, he should drive 76 - 45 = 31 km towards North direction.

Hence, the correct answer is “Option 3”.

Q63. Answer: (d) VZUW

KOJL is related to RVQS,

MQLN is related to TXSU.

Similarly,

OSNP related to,

Hence, the correct answer is “Option 4”.

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Q64. Answer: (c) ss

Given:

'elbow yield apple' is coded as 'tr ss jw'

And

'apple case barn' is coded as 'ss rz jn'.

'apple' coded in that language as "ss".

Hence, the correct answer is “Option 3”.

Q65. Answer: (a) -128

BODMAS Table:

Given equation: 15 + 17 ÷ 27 × 3 − 10 = ?

•	−	×	÷
−	•	÷	×

Now, replacing the symbols:

=> 15 − 17 × 27 ÷ 3 + 10 = ?

=> 15 − 17 × 27 ÷ 3 + 10 = ?

=> 15 − 459 ÷ 3 + 10 = ?

=> 15 − 153 + 10 = ?

=> 15 − 153 + 10 = ?

=> -138 + 10 = ?

=> -128

Hence, the correct answer is "Option 1".

Q66. Answer: (b) Both conclusions (I) and (II) follow.

Least possible Venn diagram,

Conclusions:

(I): Some vault are bank → Follow (As all bank are vault. so, some vault are definitely bank).

(II): All wallet are vault → Follow (All wallet are bank and all bank are vault. so, all wallet are definitely vault).

Both conclusions (I) and (II) follow.

Hence, the correct answer is “Option 2”.

Q67. Answer: (c) Neither conclusion (I) nor (II) is true

Least possible Venn diagram,

Conclusions:

(I): Some pliers are screwdrivers → Does not follow (There is no direct relation given between pilers and screwdrivers. so, it is possible not definite).

(II): Some wrenches are hammers → Does not follow (There is no direct relation given between wrenches and hammers. so, it is possible not definite).

Neither conclusion (I) nor (II) is true.

Hence, the correct answer is “Option 3”.

Q68. Answer: (a) Brother's wife

Given:

A is				
Symbol	•	•	×	÷
Meaning	Son	Brother	Wife	Father
of B				

Given equation: D × F + G ÷ H – J → D is wife of F, F is son of G, G is father of H and H is brother of J.

D is J's Brother's wife.

Hence, the correct answer is an Option (1).

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Q69. Answer: (d) 704

Logic followed here is,
710 + 2 = 712
712 - 4 = 708
708 + 6 = 714
714 - 8 = 706
706 + 10 = 716
716 - 12 = 704
Hence, the correct answer is “Option 4”.

Q70. Answer: (d) 204

Logic followed here is,
79 + 25 = 104
104 + 25 = 129
129 + 25 = 154
154 + 25 = 179
179 + 25 = 204
Hence, the correct answer is “Option 4”.

Q71. Answer: (a) (22, 505, 22)

The logic followed here is:
Logic: (1st number)² + (3rd number − 1) = 2nd number.
Now,
For, (18, 324, 1)
=> (18 × 18) + (1 − 1) = 324 + 0 = 324.
For, (7, 71, 23)
=> (7 × 7) + (23 − 1) = 49 + 22 = 71.
Similarly,
For (22, 505, 22)
=> (22 × 22) + (22 − 1) = 484 + 21 = 505.
Hence, the correct answer is "Option 1".

Q72. Answer: (a) MQLO

KOJM is related to QUPS,
OSNQ is related to UYTW.
Similarly,
GKFI related to,
Hence, the correct answer is “Option 1”.

Q73. Answer: (a) PALE - APLE - PLEA

Pattern followed here is,
Set 1: CLUB - LCUB - CUBL
Set 2: SEAT - ESAT - SATE
Similarly,
Option (1): PALE - APLE - PLEA
Hence, the correct answer is “Option 1”.

Q74. Answer: (a) 72

Logic followed here is,
7 + 9 = 16
16 + 11 = 27
27 + 13 = 40
40 + 15 = 55

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55 + 17 = 72

Hence, the correct answer is “Option 1”.

Q75. Answer: (a) Two

A, B, C, D, W, X and Y are sitting in a straight line facing north.

1. Only three people sit between W and Y.
2. A sits to the immediate left of Y.
3. No one sits to the right of B.
4. Only two people sit between B and A.
5. X sits to the immediate right of D.

Two people sit between C and X.

Hence, the correct answer is “Option 1”.

Q76. Answer: (c) 12

Given: (Left) 783 791 531 563 594 (Right)

Highest number = 791

Second digit of the highest number = 9

Lowest number = 531

Second digit of the lowest number = 3

Now, 9 + 3 = 12

Hence, the correct answer is “Option 3”.

Q77. Answer: (b) More than three

Given series:

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

Condition to be checked:

Even digit → Odd digit

Checking the series:

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

There are four such digits that satisfy the given condition.

Hence, the correct answer is "Option 2".

Q78. Answer: (c) VR-WU

(1) PL-QN

(2) RN-SP

(3) VR-WU

(4) TP-UR

Hence, the correct answer is “Option 3”.

Q79. Answer: (c) PQR

Pattern followed here is,

Hence, the correct answer is “Option 3”.

Q80. Answer: (b) kt

Given:

‘lime card river’ is coded as 'du kt bv'

And

‘river child judge’ is coded as ‘rr xi kt’.

‘river’ coded in that language as "kt".

Hence, the correct answer is “Option 2”.

Q81. Answer: (d) UMEED Act

The correct answer is UMEED Act.

Key Points

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• The Waqf (Amendment) Bill, 2024, which is popularly referred to as the UMEED Act, was introduced in the Lok Sabha on August 8, 2024.

• The acronym UMEED stands for Unified Waqf Management, Empowerment, Efficiency and Development. This name reflects the government's objective to modernize and streamline the administration of Waqf properties in India.

• The bill was introduced by Kiren Rijiju, the Union Minister of Minority Affairs, aiming to amend the existing Waqf Act, 1995, which had been criticized for lacking transparency and accountability.

• One of the primary features of the UMEED Act is the mandatory registration of all Waqf properties on a centralized portal to ensure better monitoring and prevent illegal encroachments.

• The act proposes significant changes to the composition of the State Waqf Boards and the Central Waqf Council, including the mandatory representation of two women and two non-Muslim members to ensure a more inclusive administrative structure.

Additional Information

• Historical Context of Waqf Laws:

• The first major legislation was the Waqf Act, 1954, which was later replaced by the more comprehensive Waqf Act, 1995.

• In 2013, the United Progressive Alliance (UPA) government introduced amendments to provide more powers to the Waqf Boards, but the current 2024-2025 amendment seeks to balance these powers with government oversight.

• Definition of Waqf:

• Waqf refers to the permanent dedication of movable or immovable property for purposes recognized by Muslim Law as pious, religious, or charitable.

• The person making such a dedication is known as a Wakif, and the manager of the property is called a Mutawalli.

• Central Waqf Council:

• It is a statutory body established in 1964 by the Government of India under the original Act.

• Its function is to advise the Union Government on matters concerning the working of State Waqf Boards and the due administration of Waqf properties in the country.

• Waqf-al-Aulad:

• This refers to a Waqf created for the maintenance and support of the donor's own family and descendants. The UMEED Act seeks to bring more clarity to the rights of women in such family-based endowments.

Important Points

• Role of the District Collector: Under the Waqf (Amendment) Bill, 2024, the power to conduct a survey of Waqf properties and decide whether a property is "Waqf" or "Government land" has been transferred from the Survey Commissioner to the District Collector.

• Removal of 'Waqf by User': The new bill proposes to remove the concept of Waqf by User, meaning a property cannot be declared as Waqf merely because it has been used for religious purposes for a long duration; it now requires a formal Waqfnama (deed).

• Financial Audits: To increase efficiency and reduce corruption, the act mandates that the accounts of Waqf Boards be audited by the Comptroller and Auditor General (CAG) of India or a designated authority.

• Joint Parliamentary Committee (JPC): Following intense debate in Parliament, the bill was referred to a Joint Parliamentary Committee (JPC) consisting of 31 members (21 from Lok Sabha and 10 from Rajya Sabha) for further scrutiny and stakeholder consultation.

• Data and Scale: India has the largest landholding under Waqf outside the Islamic world, with over 8.7 lakh registered properties covering approximately 9.4 lakh acres of land across various states.

Q82. Answer: (a) Akani Simbine

The correct answer is Akani Simbine.

Key Points

• The South African sprinter Akani Simbine made history in July 2024 by becoming the first athlete to record sub-10 second times in the 100m for 11 consecutive years.

• He achieved this milestone at the London Diamond League held at the London Stadium, where he clocked a season-best time of 9.86 seconds.

• This remarkable streak began in 2014 when he first broke the 10-second barrier, and he has maintained this world-class performance level every single year through 2024.

• By reaching 11 consecutive years, he officially surpassed the previous record of 9 consecutive years held by the legendary Jamaican sprinter Usain Bolt, who maintained his streak from 2008 to 2016. Hence, the statement regarding his record-breaking consistency is correct.

• The Diamond League performance in 2024 served as a crucial warm-up for the Paris 2024 Olympics, reinforcing his status as one of the most consistent sprinters in athletic history. Hence, Akani Simbine is the correct answer.

Additional Information

• Akani Simbine:

• Born on 21 September 1993 in Johannesburg, South Africa, Simbine is a specialist in the 100 meters sprint.

• He is the South African national record holder in the 100m and has consistently finished in the top 5 at major championships, including the Tokyo 2020 and Paris 2024 Olympics.

• His career is defined by extreme consistency, having reached the finals of the World Athletics Championships and Olympic Games multiple times since 2016.

• Usain Bolt:

• An eight-time Olympic gold medalist, Bolt is the world record holder in the 100m (9.58s) and 200m (19.19s).

• While he is considered the greatest sprinter of all time, his streak of sub-10 second finishes lasted 9 years, ending with his retirement in 2017.

• Trayvon Bromell:

• An American sprinter who was the first high school athlete to break the 10-second barrier.

• Although he has recorded extremely fast times, including a personal best of 9.76 seconds, his career has been plagued by Achilles tendon injuries, preventing a long consecutive yearly streak.

• Andre De Grasse:

• A Canadian sprinter and the 2020 Olympic 200m champion.

• Known as a "big-game performer," De Grasse has won numerous medals at the Olympics and World Championships, but his sub-10 second performances in the 100m have not occurred in 11 consecutive years.

Important Points

• The sub-10 second barrier is a historical hallmark of elite sprinting. While many athletes have achieved it, maintaining the physical condition to do so annually for over a decade is rare due to the high risk of injuries and age-related physiological declines.

• Asafa Powell, another Jamaican legend, holds the record for the most total sub-10 second clockings in history (97 times), but Simbine’s record focuses on the consecutive nature of the years in which the feat was achieved.

• The World Athletics governing body tracks these statistics to highlight longevity in the sport, where Akani Simbine now stands as the benchmark for sustained excellence in the 100m dash.

• Simbine's 2024 season also saw him anchor the South African 4x100m relay team to a Silver Medal at the Paris 2024 Olympics, further cementing his legacy in African athletics.

Q83. Answer: (d) eSanjeevani

The correct answer is eSanjeevani.

Key Points

• eSanjeevani is the National Telemedicine Service of India, designed to provide online medical consultations to citizens across the country.

• By April 2025, the platform achieved a significant milestone by serving over 36 crore patients, as reported by the Ministry of Health and Family Welfare (MoHFW).

• It was conceptualized to implement Ayushman Bharat's mandate of providing health and wellness services digitally, ensuring that rural and remote areas have access to quality healthcare.

• The platform operates through two primary modes: eSanjeevaniAB-HWC (provider-to-provider) and eSanjeevaniOPD (patient-to-doctor), facilitating a wide range of medical advice from general medicine to specialized care.

• This initiative has been instrumental in reducing the out-of-pocket expenditure (OOPE) for patients by eliminating the need for long-distance travel to reach tertiary care hospitals.

Additional Information

• eSanjeevaniAB-HWC:

• This is a doctor-to-doctor telemedicine system launched in November 2019.

• It connects Health and Wellness Centres (HWCs) at the village level with Hubs located at District Hospitals or Medical Colleges.

• This model ensures that patients at the grassroots level can consult with specialists without leaving their locality.

• eSanjeevaniOPD:

• Launched during the COVID-19 pandemic in April 2020, this variant allows patients to consult doctors directly from their homes using a smartphone or laptop.

• It features video consultations, online prescriptions, and SMS notifications, making it a highly user-friendly application for the general public.

• Technological Backbone:

• The platform was developed by the Centre for Development of Advanced Computing (C-DAC) in Mohali.

• It is integrated with the Ayushman Bharat Digital Mission (ABDM), allowing for the seamless creation of Ayushman Bharat Health

Account (ABHA) IDs and the digital storage of health records.

• Geographical Impact:

• States such as Andhra Pradesh, Tamil Nadu, Karnataka, and Uttar Pradesh have emerged as leaders in terms of the highest number of teleconsultations performed on the platform.

• The service supports over 20 languages, making it accessible to a diverse population across different geographical locations in India.

Important Points

• Data and Statistics: The platform records an average of over 4 lakh consultations daily, showcasing its scalability and the growing digital literacy among Indian citizens.

• Specializations: Beyond general consultations, the platform offers access to super-specialty services in areas like Cardiology, Oncology, and Gynaecology through its hub-and-spoke architecture.

• Global Recognition: eSanjeevani has been recognized globally as one of the world's largest government-run telemedicine taxonomies, serving as a model for digital health interventions in developing nations.

• Inclusion: The service is provided free of cost to all citizens, fulfilling the Sustainable Development Goal (SDG) 3 of ensuring healthy lives and promoting well-being for all at all ages.

Q84. Answer: (a) Percentage of population using an improved drinking water source in rural areas

The correct answer is Percentage of population using an improved drinking water source in rural areas.

Key Points

• According to the Sustainable Development Goals – National Indicator Framework (NIF) Progress Report, 2025, the Percentage of population using an improved drinking water source in rural areas has shown a significant increase, reaching 99.62% in the 2024-25 period.

• This indicator is a crucial component of SDG Goal 6, which aims to ensure the availability and sustainable management of water and sanitation for all.

• The data reflects the massive progress made under the Jal Jeevan Mission (JJM), which was launched to provide Functional Household Tap Connections (FHTC) to every rural household in India.

• The National Indicator Framework (NIF) is the backbone of monitoring SDGs in India, developed by the Ministry of Statistics and Programme Implementation (MoSPI) to track the progress of global goals through a localized lens.

• The achievement of 99.62% signifies near-universal access to improved water sources, which include piped water, boreholes, protected wells, and rainwater collection, reducing the burden of water-borne diseases in rural India. Hence, option A is correct.

Additional Information

• Jal Jeevan Mission (JJM):

• Launched on August 15, 2019, by the Prime Minister, it aims to provide 55 litres of water per person per day to every rural household through FHTCs by 2024.

• The mission is implemented by the Department of Drinking Water and Sanitation under the Ministry of Jal Shakti.

• It emphasizes community-based management, where Pani Samitis (Water Committees) play a vital role in planning and implementing village-level water supply systems.

• Sustainable Development Goal 6 (SDG 6):

• This global goal targets universal and equitable access to safe and affordable drinking water for all by 2030.

• It also covers aspects of sanitation and hygiene, water quality improvement, and the protection of water-related ecosystems.

• Ministry of Statistics and Programme Implementation (MoSPI):

• MoSPI is the nodal agency for the development of the National Indicator Framework.

• It publishes annual Progress Reports that provide a statistical assessment of India’s performance across 17 SDGs and 169 targets.

• Other Indicators in Options:

• Renewable Energy Share: India has set a target to achieve 500 GW of non-fossil fuel-based energy capacity by 2030. As of 2024, the share is growing but has not reached the 99% threshold.

• Emissions Intensity: India committed to reducing the emissions intensity of its GDP by 45% by 2030 from 2005 levels, as per its Nationally Determined Contributions (NDCs).

• Social Protection Systems: This includes schemes like PM-GKAY and MGNREGA, aiming to cover the vulnerable population under a safety net.

Important Points

• Definition of Improved Source: An improved drinking water source is one that, by the nature of its construction and when properly used, adequately protects the source from outside contamination, particularly fecal matter.

• Impact on Health: Achieving a 99.62% access rate in rural areas directly correlates with a reduction in infant mortality and

morbidity caused by diseases like Cholera, Diarrhea, and Typhoid.

• Data Source: The NIF Progress Report 2025 serves as an official document for policymakers to evaluate the efficiency of government schemes and identify regions that require further administrative intervention.

Q85. Answer: (a) Indore

The correct answer is Indore.

Key Points

• The National Workshop on the SMILE-B (Support for Marginalized Individuals for Livelihood and Enterprise – Begging) scheme was organized in Indore, Madhya Pradesh.

• This workshop was conducted on July 10, 2024 (notably the most significant recent national gathering for this scheme), by the Union Ministry of Social Justice and Empowerment, Government of India.

• The primary objective of the workshop was to strengthen the implementation of the SMILE-B sub-scheme and facilitate the rehabilitation of persons engaged in the act of begging.

• Indore was selected as the host city due to its exemplary performance in social initiatives and its status as a leader in urban cleanliness and social welfare management.

• The event saw participation from more than 100 delegates, including Municipal Commissioners and representatives from 30 pilot cities across the country, along with officials from the National Institute of Social Defence (NISD).

Additional Information

• The SMILE Scheme:

• Launched on February 12, 2022, the SMILE (Support for Marginalized Individuals for Livelihood and Enterprise) scheme is a central sector umbrella initiative aimed at the welfare of marginalized groups.

• It encompasses two major sub-schemes: SMILE-B, which focuses on the Comprehensive Rehabilitation of persons engaged in the act of Begging, and SMILE-T, focused on the welfare of Transgender persons.

• The Ministry of Social Justice and Empowerment has allocated a total budget of Rs. 365 crore for the implementation of this scheme for the five-year period from 2021-22 to 2025-26.

• Core Components of SMILE-B:

• Survey and Identification: Identifying individuals engaged in begging through rigorous field surveys conducted by municipal authorities and NGOs.

• Mobilization: Encouraging individuals to move to shelter homes and access government services through persistent counseling and outreach.

• Shelter and Resettlement: Providing basic facilities like food, clothing, and safe living conditions in dedicated rehabilitation centers.

• Education and Skill Development: Offering vocational training and skill-building to ensure long-term economic independence and integration into mainstream society.

• Implementing Agencies:

• The scheme is implemented through State Governments, Union Territory administrations, Local Urban Bodies, and Non-Governmental Organizations (NGOs).

• The National Institute of Social Defence (NISD) and National Backward Classes Finance & Development Corporation (NBCFDC) play pivotal roles in capacity building and financial support.

Important Points

• Pilot Cities Initiative: Initially, 30 cities across India, including Delhi, Mumbai, Chennai, Kolkata, Bengaluru, and Hyderabad, were selected to run pilot projects for the rehabilitation of persons in begging.

• Convergence with Health Schemes: Beneficiaries under the SMILE-B scheme are integrated with the Ayushman Bharat (Pradhan Mantri Jan Arogya Yojana) to ensure they receive comprehensive health insurance and medical treatment.

• Social Security and Dignity: The scheme aligns with the spirit of Article 21 of the Constitution of India, which guarantees the Right to Life with Dignity, by focusing on rehabilitation rather than criminalization.

• Data Management: A centralized portal has been developed to track the progress of beneficiaries and maintain a database for transparency in fund utilization and impact assessment.

Q86. Answer: (a) State Bank of India

The correct answer is State Bank of India.

Key Points

• The State Bank of India (SBI) launched the ‘Next LEAP’ initiative in May 2025 as part of its massive workforce empowerment and staff engagement drive.

• Scale: It is the largest staff engagement and training programme ever undertaken in the Indian banking sector, targeting SBI's entire workforce of approximately 2.3 lakh employees.

• 'Next LEAP': Focuses on direct engagement between top management and employees to ensure skill adequacy and gather ground-level feedback.

• 'SuPer SBI: Great to Greater': A mass training program aimed at instilling organizational pride and equipping staff with future-ready skills.

• Objectives: The initiative aims to enhance productivity, operational efficiency, and customer service by fostering a growth mindset and leadership potential across all levels of the bank.

Additional Information

• Profile of Indian Bank:

• Indian Bank was established on August 15, 1907, as part of the Swadeshi Movement to promote indigenous enterprises.

• The bank is headquartered in Chennai, Tamil Nadu, and has a significant presence with thousands of branches and ATMs across India and international locations like Singapore and Colombo.

• On April 1, 2020, Allahabad Bank was merged into Indian Bank, making it the seventh-largest public sector bank in the country in terms of business volume.

• Significance of the Year 2025 Vision:

• The 2025 target for ‘Next LEAP’ coincides with the broader national goal of achieving a $5 trillion economy, where public sector banks play a pivotal role in financial inclusion.

• The bank aims to achieve a significant increase in its Net Interest Margin (NIM) and Return on Assets (ROA) by the end of the 2025 financial cycle through these HR reforms.

• Digital Initiatives:

• Apart from staff engagement, the bank has introduced ‘IndOASIS’, a comprehensive mobile banking application, to provide seamless digital banking experiences to its customers.

• The bank is also focusing on RAM (Retail, Agriculture, and MSME) sectors to drive its credit growth and support the Atmanirbhar Bharat initiative.

Important Points

• The ‘Next LEAP’ initiative is a response to the rapidly changing banking landscape in India, characterized by intense competition from Private Banks and FinTech companies.

• It emphasizes talent management and succession planning, ensuring that the bank has a steady pipeline of leaders to manage its growing asset base.

• By fostering a culture of innovation and accountability, bank intends to improve its Asset Quality and reduce Non-Performing Assets (NPAs) through better-trained credit appraisal teams.

Q87. Answer: (d) Aam Aadmi Party

The correct answer is Aam Aadmi Party.

Key Points

• The Aam Aadmi Party (AAP) successfully retained its political influence in the Ludhiana West constituency during the 2025 by-election, following the trends established in the 2022 General Assembly Elections.

• The victory was attributed to the party's focus on governance models, improvements in public infrastructure, and the implementation of welfare schemes such as Aam Aadmi Clinics and subsidized electricity in the state of Punjab.

• The election process was conducted under the stringent supervision of the Election Commission of India (ECI), ensuring the use of Electronic Voting Machines (EVM) and Voter Verifiable Paper Audit Trail (VVPAT) for transparency.

• Ludhiana West, being a high-profile urban constituency, saw a significant voter turnout, reflecting the active political participation of the city's industrial and business communities.

• This by-election result served as a crucial political barometer for the Bhagwant Mann-led government, reinforcing the legislative majority of the Aam Aadmi Party in the Punjab Vidhan Sabha.

Additional Information

• Ludhiana West Constituency: It is one of the 117 assembly seats in the Punjab Legislative Assembly. Historically, it has been a battleground for the Indian National Congress (INC) and the Shiromani Akali Dal (SAD)-BJP alliance before the AAP sweep in 2022.

• By-election (Bypoll) Provisions: According to Section 151A of the Representation of the People Act, 1951, the Election Commission is mandated to fill vacancies in the Houses of Parliament and State Legislatures within six months from the date of the vacancy.

• Role of Ludhiana: Known as the "Manchester of India," Ludhiana is the largest city in Punjab and a major hub for hosiery, textiles, and bicycle manufacturing, making its political outcomes vital for the state's economic policies.

• Political Competitors: The Indian National Congress, Bharatiya Janata Party (BJP), and Shiromani Akali Dal remain the primary opposition forces in Punjab, focusing on issues such as agrarian distress, drug abuse, and industrial stagnation.

• Election Administration: The Chief Electoral Officer (CEO) of Punjab manages the local logistics, while the Model Code of

Conduct (MCC) is enforced from the date of announcement until the declaration of results to ensure a level playing field.

Important Points

• Constitutional Mandate: Under Article 324 of the Constitution of India, the Election Commission holds the power of superintendence, direction, and control over all elections to the State Legislature.

• Anti-Defection Law: Many by-elections in India are triggered by resignations or disqualifications under the Tenth Schedule of the Constitution, commonly known as the Anti-Defection Law, which was inserted by the 52nd Amendment Act, 1985.

• Voter Demographics: The Ludhiana West seat consists of a high percentage of urban voters, including a significant Hindu and Sikh population, which often results in multi-cornered contests.

• Economic Impact: Political stability in Ludhiana is essential for the MSME sector, as the district contributes a massive share to Punjab's GST revenue and industrial output.

Q88. Answer: (c) Shivraj Singh Chouhan

The correct answer is Shivraj Singh Chouhan.

Key Points

• The Viksit Bharat Sankalp Yatra is a nationwide outreach initiative of the Government of India aimed at achieving 100% saturation of flagship schemes across all Gram Panchayats and urban local bodies.

• Shivraj Singh Chouhan, as the Union Minister of Rural Development and Agriculture & Farmers' Welfare (appointed in June 2024), is a key leader responsible for the campaign's progress and rural outreach in 2024 and 2025. Hence, this option is correct.

• The Yatra was officially launched by Prime Minister Narendra Modi on November 15, 2023, coinciding with Janjatiya Gaurav Divas from Khunti, Jharkhand.

• The primary function of the Yatra is to raise awareness and provide on-the-spot enrollment for welfare programs through specially designed Information, Education, and Communication (IEC) vans.

• Key schemes promoted during this campaign include PM-Kisan, Ayushman Bharat, PM Ujjwala Yojana, and PM Garib Kalyan Anna Yojana, ensuring that the benefits reach the "last mile" of the population.

Additional Information

• Viksit Bharat @2047: This is a vision document and roadmap to transform India into a developed nation by the 100th year of Independence in 2047. The Yatra serves as a foundational step toward this long-term economic and social goal.

• Janjatiya Gaurav Divas: The campaign launch date, November 15, marks the birth anniversary of the legendary tribal leader Birsa Munda. This emphasizes the government's focus on tribal development and inclusion.

• Scope and Data: The Yatra targets coverage of over 2.6 lakh Gram Panchayats and approximately 4,000 urban local bodies, making it one of the largest ever government-to-citizen outreach programs in the country.

• Digital Integration: The campaign tracks real-time progress through a dedicated portal and mobile app, capturing data on the number of beneficiaries reached and testimonies ("Meri Kahani Meri Zubani") shared by citizens.

• Role of Government Departments: Various ministries, including the Ministry of Information and Broadcasting and the Ministry of Rural Development, collaborate to manage the logistics of the mobile vans and community interaction sessions.

Important Points

• Rahul Gandhi: He is a senior leader of the Indian National Congress known for leading the Bharat Jodo Yatra (2022–2023) and the Bharat Jodo Nyay Yatra (2024), which were opposition-led political marches. Hence, this option is incorrect.

• Mallikarjun Kharge: He currently serves as the President of the Indian National Congress and the Leader of the Opposition in the Rajya Sabha. His role is primarily focused on parliamentary and party leadership rather than government-led outreach campaigns like Viksit Bharat. Hence, this option is incorrect.

• Yogi Adityanath: He is the Chief Minister of Uttar Pradesh. While he has been instrumental in implementing the Yatra within Uttar Pradesh, he is not the national leader identified with the broader 2025 central ministerial oversight of the campaign. Hence, this option is incorrect.

• Target Beneficiaries: The campaign specifically focuses on women, farmers, youth, and the economically marginalized (Gareeb), often referred to as the "four pillars" of a developed India by the current administration.

Q89. Answer: (c) Bengaluru

The correct answer is Bengaluru.

Key Points

• On 5 June 2025, Bengaluru was named India's "Leopard Capital" following a comprehensive year-long camera-trap survey.

• The city earned this title by recording the highest number of free-ranging wild leopards among all Indian metropolitan cities, surpassing Mumbai.

• Estimated Population: The survey, conducted by the Holématthi Nature Foundation (HNF) and led by conservationist Dr. Sanjay Gubbi, estimated 80–85 leopards in the forests and scrublands surrounding the city.

• Surpassing Mumbai: Bengaluru overtook Mumbai's previous record of approximately 54 leopards in Sanjay Gandhi National

Park.

• Bannerghatta Contribution: A significant portion of the population—54 individuals—was recorded within Bannerghatta National Park, with roughly 30 more found in fringe forest patches like Turahalli and Roerich Estate.

Additional Information

• Project Leopard (Rajasthan):

• Rajasthan became the first state in India to launch a dedicated Project Leopard in 2017.

• The project focuses on habitat conservation, prey base management, and mitigating man-animal conflict across eight identified sanctuaries.

• Other major leopard habitats in the state include Jhalana Leopard Reserve in Jaipur and the Jawai region in Pali.

• Leopard Characteristics and Features:

• The leopard (Panthera pardus) is the smallest of the big cats but is known for its extreme agility and nocturnal hunting habits.

• They are highly adaptable and can survive in diverse climates, ranging from tropical rainforests to arid rocky terrains like the Aravalli Range.

• Leopards are solitary animals, and their rosettes (spots) serve as excellent camouflage in the scrub forests of Rajasthan.

• Geographical Context:

• The Aravalli Hills are among the world's oldest fold mountains, stretching across Gujarat, Rajasthan, and Haryana.

• The rocky outcrops and cave systems in the Udaipur segment of the Aravallis provide natural shelters for leopards, making it a prime location for their survival.

Important Points

• Conservation Status:

• Leopards are protected under Schedule I of the Indian Wildlife (Protection) Act, 1972, granting them the highest level of legal protection in the country.

• On the IUCN Red List of Threatened Species, the leopard is categorized as Vulnerable due to habitat loss and illegal wildlife trade.

• Population Data:

• According to the Status of Leopards in India report (latest cycles), India has seen a significant percentage increase in its leopard population. Madhya Pradesh generally holds the highest number, but Rajasthan excels in density per square kilometer in specific hilly pockets like Udaipur.

• The 2025 declaration serves as a milestone for the Ministry of Environment, Forest and Climate Change to promote community-based conservation.

• Applications in Tourism:

• The 'Leopard Capital' tag facilitates the development of Leopard Safaris, similar to the Jhalana model, providing employment opportunities for local youth in Udaipur.

Q90. Answer: (a) Union Bank of India

The correct answer is Union Bank of India.

Key Points

• The Financial Services Institutions Bureau (FSIB), the headhunter for state-owned banks and financial institutions, recommended Asheesh Pandey for the position of Managing Director (MD) and Chief Executive Officer (CEO) of Union Bank of India.

• As per the recommendation made in May 2024 (often referred to for future terms like 2025), Asheesh Pandey is slated to succeed the current MD & CEO, Ms. A. Manimekhalai, upon the completion of her tenure. Hence, the statement regarding his recommendation for Union Bank of India is correct.

• Prior to this recommendation, Asheesh Pandey served as the Executive Director of the Bank of Maharashtra, where he contributed significantly to the bank's growth and digital transformation initiatives.

• The selection process was conducted by a panel headed by Bhanu Pratap Sharma, the Chairman of FSIB. The bureau interviewed several candidates from various Public Sector Banks (PSBs) before finalizing the name.

• The final decision on the appointment will be taken by the Appointments Committee of the Cabinet (ACC), which is headed by the Prime Minister of India.

Additional Information

• Financial Services Institutions Bureau (FSIB):

• The FSIB was constituted by the Government of India in July 2022, replacing the erstwhile Banks Board Bureau (BBB).

• It is headquartered in Mumbai and is responsible for recommending persons for appointment as full-time directors and non-executive chairpersons on the boards of Public Sector Banks, Public Sector Insurers, and Financial Institutions.

• The FSIB aims to enhance the corporate governance structure in the financial sector by ensuring a transparent and merit-based

selection process.

• Union Bank of India:

• Union Bank of India is one of the largest Government of India-owned banks, established on November 11, 1919.

• The bank's corporate headquarters is located in Mumbai, Maharashtra.

• It was inaugurated by Mahatma Gandhi and was nationalized in 1969. After the merger of Corporation Bank and Andhra Bank into Union Bank in 2020, it expanded its footprint significantly across the country.

• Role of the Appointments Committee of the Cabinet (ACC):

• The ACC is responsible for taking final decisions on several top-level appointments in the Government of India, including heads of PSBs and Regulatory Bodies.

• The committee consists of the Prime Minister and the Minister of Home Affairs.

Important Points

• Candidate Background: Asheesh Pandey has over three decades of experience in the banking sector, having worked in various capacities across Bank of Maharashtra, IDBI Bank, and Corporation Bank.

• Tenure and Eligibility: Typically, the MD & CEO of a Public Sector Bank is appointed for a term of 3 years, which may be extended based on performance and the retirement age of 60 years.

• Significance of the Move: This recommendation is part of a broader cycle of leadership changes in Indian PSBs as the government seeks to strengthen the management of major lenders to support economic growth and manage Non-Performing Assets (NPAs) effectively.

Q91. Answer: (b) Chamoli

The correct answer is Chamoli.

Key Points

• In February 2025, the National Disaster Response Force (NDRF) launched a major rescue operation in the Chamoli district of Uttarakhand following a significant avalanche in the high-altitude regions.

• The rescue operation was necessitated by heavy snowfall and sudden temperature variations that led to snow instability in the Dhauliganga and Rishiganga river valleys. Chamoli is a high-risk zone for such geological and climatic events. Hence, the statement regarding the location being Chamoli is correct.

• The NDRF worked in close coordination with the State Disaster Response Force (SDRF) and the Indo-Tibetan Border Police (ITBP) to locate individuals stranded in remote trekking routes and border villages.

• The operation utilized advanced equipment, including thermal sensors and snow-probes, to identify life beneath the snow layers. This highlights the technical capabilities of the NDRF in specialized mountain rescues.

• The Chamoli district is strategically and ecologically sensitive, housing major pilgrimage sites like Badrinath and Hemkund Sahib, making rapid response by central agencies like the NDRF crucial for safety and infrastructure protection.

Additional Information

• National Disaster Response Force (NDRF):

• The NDRF was established under the Disaster Management Act, 2005. It is a specialized force constituted for the purpose of a specialist response to a threatening disaster situation or disaster.

• It operates under the Ministry of Home Affairs and currently consists of 16 battalions (as of 2024-25) stationed across the country to ensure a quick response to various types of calamities, including earthquakes, floods, and CBRN (Chemical, Biological, Radiological, and Nuclear) emergencies.

• Geography of Chamoli District:

• Chamoli is the second-largest district of Uttarakhand and is located in the Central Himalayas. It is bounded by Tibet to the north.

• The region is characterized by steep slopes and narrow valleys, making it highly susceptible to Glacial Lake Outburst Floods (GLOFs) and landslides. Notable past events include the 2021 Rishi Ganga disaster.

• Avalanche Causes and Monitoring:

• Avalanches in the Himalayan region are often triggered by the accumulation of heavy snow on slopes exceeding 30-45 degrees.

• The Defence Geo-Informatics Research Establishment (DGRE), formerly known as SASE, is the primary body responsible for monitoring and issuing avalanche warnings in the mountainous terrains of India.

Important Points

• Climate Impact: Increased frequency of avalanches in February is often linked to climate change, which causes erratic Western Disturbances and rapid melting-refreezing cycles of Himalayan glaciers.

• Legal Framework: The National Disaster Management Authority (NDMA), headed by the Prime Minister, provides the policy framework, while the NDRF acts as the executive force on the ground.

• Uttarkashi vs. Chamoli: While Uttarkashi also experienced an avalanche in recent years (notably the 2022 Draupadi ka Danda incident), the specific rescue operation mentioned for February 2025 identifies Chamoli as the primary zone of deployment.

Q92. Answer: (a) NITI Aayog

The correct answer is NITI Aayog.

Key Points

• The report titled 'Unlocking a $200 Billion Opportunity: Electric Vehicles in India' was released by NITI Aayog (National Institution for Transforming India) in August 2025 to provide a roadmap for the country's transition toward Electric Mobility.

• This comprehensive study was developed in collaboration with RMI (Rocky Mountain Institute) and RMI India to assess the capital requirements and financing challenges in the Electric Vehicle (EV) sector.

• The report highlights that India requires a cumulative investment of $200 billion (approximately Rs 14.37 lakh crore) by the year 2030 to achieve its targets for vehicle production, charging infrastructure, and battery manufacturing.

• It identifies that the transition to electric vehicles is not just an environmental necessity but a massive economic opportunity that can reduce oil imports and position India as a global manufacturing hub.

• The primary focus of the report is on mobilizing private capital and identifying the financing gap that exists for retail EV loans, which is crucial for the 2-wheeler and 3-wheeler segments. Hence, the statement regarding NITI Aayog being the releasing authority is correct.

Additional Information

• FAME-II Scheme: The Faster Adoption and Manufacturing of (Hybrid &) Electric Vehicles (FAME) India Phase II was launched by the Ministry of Heavy Industries with a significant budgetary outlay to subsidize EV purchases and support charging stations.

• PLI Scheme for ACC: The Government of India introduced a Production Linked Incentive (PLI) scheme for Advanced Chemistry Cell (ACC) battery storage with an investment of Rs 18,100 crore to boost domestic manufacturing and reduce dependency on imports.

• 2030 EV Ambition: India aims to achieve 30% electric vehicle penetration for private cars, 70% for commercial vehicles, and 80% for two and three-wheelers by the year 2030.

• e-AMRIT Portal: NITI Aayog launched the e-AMRIT (Accelerated e-Mobility Revolution for India's Transportation) web portal during the COP26 summit to serve as a one-stop-shop for all information regarding electric vehicles in India.

• GST Benefits: To encourage consumers, the GST Council reduced the tax rate on Electric Vehicles from 12% to 5%, and on chargers/charging stations from 18% to 5%.

Important Points

• Priority Sector Lending (PSL): One of the key recommendations in such NITI Aayog reports is the inclusion of Electric Vehicles under the Reserve Bank of India's (RBI) Priority Sector Lending guidelines to ensure low-cost financing.

• Economic Impact: Achieving the $200 billion investment target is estimated to reduce carbon dioxide emissions significantly and save billions in foreign exchange by reducing crude oil demand.

• Infrastructure Requirements: The report emphasizes that India will need approximately 2.9 million public charging points by 2030 to support the projected growth of the EV fleet.

• State-Level Policies: Various States like Delhi, Maharashtra, and Karnataka have released their own EV policies providing road tax exemptions and registration fee waivers to supplement Central Government efforts.

Q93. Answer: (c) Narendra Modi

The correct answer is Narendra Modi.

Key Points

• The Governing Council of NITI Aayog (National Institution for Transforming India) is chaired by the Prime Minister of India, who serves as its Ex-officio Chairperson. As of the year 2025, Shri Narendra Modi holds this position and thus chaired the 10th Governing Council Meeting on 24 May 2025. Hence, statement C is correct.

• The meeting focuses on the National Development Agenda, involving a shared vision between the Center and the States to foster Cooperative Federalism.

• The Governing Council comprises the Prime Minister, Chief Ministers of all States and Union Territories with Legislatures, and Lieutenant Governors of other Union Territories.

• Key agendas for the 10th meeting typically revolve around the roadmap for Viksit Bharat @ 2047, emphasizing economic growth, social welfare, and infrastructure development.

• Amit Shah, Manohar Lal Khattar, and JP Nadda are high-ranking Union Ministers who serve as Ex-officio members or Special Invitees but do not hold the authority to chair the Governing Council meeting when the Prime Minister is present. Hence, statements A, B, and D are incorrect.

Additional Information

• NITI Aayog Establishment: It was established on January 1, 2015, by a resolution of the Union Cabinet. It replaced the Planning Commission, which had been in existence since 1950. Unlike the Planning Commission, which followed a top-down approach, NITI Aayog follows a bottom-up approach.

• Organizational Structure: The hierarchy includes a Vice-Chairperson (appointed by the PM), a Chief Executive Officer (CEO), Full-time Members, Ex-officio Members (maximum 4 from the Union Council of Ministers), and Special Invitees.

• Hubs of NITI Aayog: It operates through two main hubs: the Team India Hub (carrying the interface of States with the Center) and the Knowledge and Innovation Hub (building the think-tank capacity).

• Reports and Indices: NITI Aayog is responsible for publishing several important indices, such as the SDG India Index, Composite Water Management Index, School Education Quality Index, and the India Innovation Index.

• Cooperative Federalism: One of the primary mandates is to recognize that strong States make a strong Nation. It provides a platform to resolve inter-sectoral and inter-departmental issues to accelerate the development agenda.

Important Points

• Role of the Prime Minister: As the Chairperson, the PM sets the tone for national priorities. The Governing Council meetings are the highest decision-making platform in the organization.

• Membership Nuances: Amit Shah serves as the Union Minister of Home Affairs, while JP Nadda serves as the Union Minister of Health and Family Welfare. Both are Ex-officio members of NITI Aayog as of 2024-2025.

• Administrative Location: The headquarters of NITI Aayog is located at Yojana Bhawan, Sansad Marg, New Delhi.

• Policy Functions: The organization performs Strategic and Long-term Policy and program frameworks, and monitors their progress through data-driven governance.

Q94. Answer: (a) Indian Naval Academy (INA)

The correct answer is Indian Naval Academy (INA).

Key Points

• The Indian Naval Academy (INA), located in Ezhimala, Kerala, emerged as the overall champion of the prestigious Bakshi Cup 2025.

• The tournament was hosted by the National Defence Academy (NDA) at Khadakwasla, Pune, and was held from February 14 to February 16, 2025.

• The Bakshi Cup is an annual inter-academy sports meet that brings together the four premier officer training institutions of India: NDA (Pune), IMA (Dehradun), INA (Ezhimala), and AFA (Dundigal).

• The INA contingent showcased exceptional performance across various sports disciplines, securing gold medals in Basketball, Volleyball, and the grueling Cross Country race, which ultimately led to them lifting the championship trophy. Hence, the option mentioning Indian Naval Academy is correct.

• The closing ceremony was graced by Vice Admiral Gurcharan Singh, the Commandant of the NDA, who presented the trophy to the winning team and emphasized the importance of jointmanship and camaraderie among the future leaders of the Indian Armed Forces.

Additional Information

• Indian Naval Academy (INA):

• Located at Ezhimala in the Kannur district of Kerala, it is the largest naval academy in Asia.

• It was formally inaugurated on January 8, 2009, by the then Prime Minister of India, Dr. Manmohan Singh.

• The academy is responsible for the basic training of all officers inducted into the Indian Navy and the Indian Coast Guard.

• National Defence Academy (NDA):

• Situated in Khadakwasla, Pune, it is the world’s first tri-service academy where cadets of the Army, Navy, and Air Force train together before proceeding to their respective service academies.

• The NDA was inaugurated on January 16, 1955, and its motto is "Seva Paramo Dharma" (Service Before Self).

• Indian Military Academy (IMA):

• Located in Dehradun, Uttarakhand, it was established in 1932 following the recommendations of the Chetwode Committee.

• It trains officers specifically for the Indian Army and is known for its historic Chetwode Building.

• Air Force Academy (AFA):

• Located in Dundigal, Telangana (near Hyderabad), it was established in 1971 to provide training to the flying, technical, and ground duty branches of the Indian Air Force.

Important Points

• Tournament Structure: The Bakshi Cup typically includes six major sporting events: Football, Volleyball, Basketball, Squash, Tennis, and Cross Country. Points are awarded based on standings in each sport to determine the overall winner.

• Objective: The primary goal of the tournament, named after Captain Bakshi, is to foster inter-service cooperation and build bonds of friendship between cadets who will later serve together in integrated commands.

• Historical Context: The tournament rotates its hosting duties among the four academies, ensuring that cadets experience different training environments across the country. In 2025, the NDA provided state-of-the-art facilities for the 71st edition (or relevant sequence) of the meet.

Q95. Answer: (c) Ankita

The correct answer is Ankita.

Key Points

• Ankita is the first AI-powered virtual news anchor from the state of Assam, introduced to the public in February 2025.

• She was launched by DY365, a leading regional satellite news channel based in Guwahati, marking a significant milestone in the digital transformation of Northeast India's media landscape.

• The virtual anchor is designed using advanced Artificial Intelligence and machine learning algorithms to deliver news with human-like facial expressions, gestures, and synchronized lip movements.

• Ankita possesses the capability to present news in multiple languages, primarily Assamese and English, ensuring that regional content reaches a diverse demographic effectively.

• The introduction of this AI anchor aims to enhance newsroom efficiency by allowing for 24/7 news broadcasting without the physical constraints faced by human presenters.

Additional Information

• India's First AI Anchor (Sana): The India Today Group launched India's first AI news anchor named Sana in March 2023 for the channel Aaj Tak. Sana is capable of speaking multiple languages and providing weather updates and news bulletins.

• First Regional AI Anchor (Lisa): In July 2023, Odisha TV (OTV) unveiled Lisa, who became the first regional AI news anchor in India, presenting news in Odia and English.

• Soundarya (News18 Kannada): In June 2023, the Kannada news industry saw the debut of Soundarya, an AI anchor launched by News18 Kannada to cater to the Karnataka region.

• Global Context: The world's first AI news anchor was developed and debuted by China's state-run news agency, Xinhua, in the year 2018, which set the global trend for AI integration in journalism.

• Technical Functions: These AI entities utilize Natural Language Processing (NLP) to convert text into speech and Deep Learning to improve their delivery style based on the data they process.

Important Points

• Location and Impact: The launch of Ankita in Assam highlights the growing technological footprint in Northeast India, encouraging local media houses to adopt modern tech tools.

• Applications: Beyond daily news, AI anchors like Ankita are used for short news snippets, social media updates, and emergency alerts where rapid information dissemination is required.

• Data Processing: These virtual anchors can process vast amounts of real-time data, such as stock market trends or election results, and present them instantly without the need for traditional script rehearsals.

• Cost Efficiency: For media organisations, AI anchors represent a cost-effective solution for secondary news channels or late-night shifts, reducing the operational overhead of human staff.

Q96. Answer: (c) Italian

The correct answer is Italian.

Key Points

• Giorgio Armani was a legendary and highly influential Italian fashion designer, widely regarded as one of the most successful designers to emerge from Europe.

• He was born on July 11, 1934, in the city of Piacenza, located in the Emilia-Romagna region of Northern Italy.

• After initially studying medicine at the University of Milan and serving in the military, he transitioned into the fashion industry, starting as a window dresser at La Rinascente, a famous department store in Milan.

• In 1975, along with his business partner Sergio Galeotti, he founded Giorgio Armani S.p.A. in Milan, which grew to become a global luxury powerhouse.

• He became globally famous for his unstructured jackets and minimalist designs, which revolutionized menswear and womenswear by introducing a more relaxed yet elegant Italian aesthetic.

• Armani's international breakthrough occurred in 1980 when he designed the wardrobe for Richard Gere in the film American Gigolo, establishing the "Armani look" as a symbol of sophistication and power.

Additional Information

• Brand Portfolio and Diversification: The Armani empire encompasses a wide range of sub-brands including Giorgio Armani (signature line), Emporio Armani (targeted at a younger demographic), Armani Exchange (A|X) (mass-market urban style), and Armani Privé (high-end couture).

• Global Expansion: By the 1990s and 2000s, the brand expanded into numerous industries including cosmetics, eyewear, watches, and home interiors through the Armani/Casa line.

• Hospitality Industry: Armani ventured into luxury hospitality with the opening of the Armani Hotel in the Burj Khalifa, Dubai, in 2010, and a second flagship hotel in Milan in 2011.

• Economic Powerhouse: Giorgio Armani remains one of the few major Italian fashion houses to remain independent, resisting

acquisition by major luxury conglomerates like LVMH or Kering.

• Sports and Cultural Impact: He has a significant presence in sports, notably as the owner of the Olimpia Milano basketball team and the designer of the Italian Olympic team's parade uniforms for multiple Olympic Games.

Important Points

• Ethical Leadership: In 2006, Armani was the first major designer to ban models with a body mass index (BMI) under 18 following the death of a model due to anorexia-related complications.

• Sustainability: In 2016, the Armani Group committed to going fur-free across all its labels, highlighting a significant shift toward animal welfare in the luxury fashion sector.

• Honors and Awards: He was honored with the Knight Grand Cross of the Order of Merit of the Italian Republic in 2021, the highest civil honor in Italy, for his contribution to Italian culture and economy.

• Legacy: Often called "King Giorgio," his legacy is defined by the neutral color palettes (especially greige) and the "power suit" that empowered women in the workforce during the 1980s and 1990s.

Q97. Answer: (a) 300

The correct answer is 300.

Key Points

• In June 2025, the Union Minister of State for Rural Development, Shri Kamlesh Paswan, inaugurated 300 Centres of Excellence (CoE) during an event in Chennai.

• These centres were established in collaboration with Garuda Aerospace to advance drone innovation, research, and skill development across India.

• Agri-Drone Indigenization Facility: Along with the 300 CoEs, the Minister inaugurated a state-of-the-art facility in Chennai for the design and manufacturing of Unmanned Aerial Systems (UAS).

• Train the Trainer (TTT): The event also marked the launch of a DGCA-approved program to certify educators as drone instructors.

• Strategic Goal: These initiatives support the Prime Minister’s vision of making India a global drone hub and empowering rural communities through technology like the "Namo Drone Didi" program.

Additional Information

• Lakhpati Didi Scheme:

• This is a flagship initiative of the Government of India aimed at enabling rural women in Self-Help Groups to earn a sustainable income of at least Rs. 1 lakh per annum.

• In the Interim Budget 2024, the target for the number of Lakhpati Didis was increased from 2 crore to 3 crore women.

• The scheme focuses on diversified livelihood activities, including agriculture, livestock, handicrafts, and service sectors.

• DAY-NRLM (Deendayal Antyodaya Yojana):

• Launched by the Ministry of Rural Development in June 2011, it is one of the world's largest initiatives to improve the livelihoods of the poor.

• It aims to organize the rural poor into Self-Help Groups (SHGs) and continuously nurture them until they exit poverty.

• The mission has mobilized over 10 crore women into approximately 90 lakh SHGs across India.

• Role of Centres of Excellence (CoEs):

• The 100 newly inaugurated centers provide specialized support in product design, packaging, branding, and marketing.

• They help SHG members access global markets and e-commerce platforms like the GeM (Government e-Marketplace).

Important Points

• Financial Inclusion: A key function of these centers is to facilitate bank linkages and provide financial literacy to rural women, ensuring they have access to credit and insurance.

• Technological Advancement: The CoEs encourage the adoption of digital tools and modern machinery in rural production processes to improve efficiency and quality.

• Institutional Support: The NIRD&PR acts as the apex body for research and training in rural development, playing a crucial role in the management and curriculum design of these 100 centers.

• Social Impact: By targeting 3 crore women, the government aims to bridge the gender income gap and promote women's leadership at the grassroots level in India.

Q98. Answer: (d) Nepal

The correct answer is Nepal.

Key Points

• The Indian women’s team etched their names in history by winning the inaugural Kho Kho World Cup on 19 January 2025. In a high-intensity final held at the Indira Gandhi International Stadium in New Delhi, India defeated Nepal with a scoreline of 26-16. This victory established India as the first-ever women's world champion in this indigenous sport. Hence, the statement that India

defeated Nepal is correct.

• In the men's category, the Indian men's team also secured the championship title on the same day. They defeated Bangladesh in the final with a convincing score of 30-18. This dual victory for both the men's and women's teams highlighted India's dominance in the sport of Kho Kho globally. Hence, the statement regarding the men's victory over Bangladesh is correct.

• The tournament was the first of its kind, organized to bring the traditional Indian sport of Kho Kho to the international stage. It featured participation from 24 different countries, including 12 men's teams and 12 women's teams, representing 6 continents.

• The event concluded with a grand closing ceremony where the winners were celebrated for their exceptional agility, teamwork, and strategic play. The Kho Kho Federation of India (KKFI) played a pivotal role in hosting this historic event, aiming to promote the sport for future inclusion in the Asian Games and the Olympic Games.

Additional Information

• Participants and Global Reach: The 2025 Kho Kho World Cup saw teams from nations such as the United Kingdom, South Africa, Kenya, Brazil, USA, Malaysia, and South Korea. The inclusion of non-South Asian countries signifies the growing international appeal of the sport, which traditionally has been most popular in the Indian subcontinent.

• Kho Kho Federation of India (KKFI): The KKFI is the governing body for the sport in India. Led by President Sudhanshu Mittal, the federation has been instrumental in modernizing the sport through initiatives like the Ultimate Kho Kho league, which introduced new rules, mats, and technology to make the game more viewer-friendly.

• Game Format: Kho Kho is a traditional "tag" sport. In the World Cup format, each team consists of 12 players, but only 9 players take the field at a time. The game is divided into innings, where one team acts as the chasers and the other as the defenders. The objective for the chasers is to tag all defenders in the shortest time possible.

• Government Support: The Government of India, under the Ministry of Youth Affairs and Sports, provided significant financial and administrative support for the World Cup. This aligns with the Khelo India initiative, which seeks to revitalize indigenous sports and provide platforms for Indian athletes to excel at the international level.

Important Points

• Historical Context: While Kho Kho has been played for centuries in India, the first national championship was held in 1959 at Vijayawada. The 2025 World Cup is a culmination of decades of efforts to institutionalize and professionalize the sport.

• Key Figures: The success of the Indian teams is attributed to captains like Nasreen Shaikh (women's team) and intensive training camps held across the country. Players are selected based on their performance in national circuits and the Ultimate Kho Kho league.

• Future Prospects: Following the success of the inaugural World Cup, the International Kho Kho Federation plans to hold the event every two or four years. Efforts are underway to standardize the rules across all member nations to ensure fair play and competitive balance in future editions.

Q99. Answer: (b) Usain Bolt

The correct answer is Usain Bolt.

Key Points

• Usain Bolt, the Jamaican sprinting legend, was named a Guinness World Records ICON in June 2025 (marking a milestone anniversary of his peak achievements) for his unprecedented dominance and lasting impact on Track and Field. Hence, option B is correct.

• He is the world record holder in the 100 metres, 200 metres, and the 4 × 100 metres relay, making him the fastest man in history. His 100m record of 9.58 seconds and 200m record of 19.19 seconds were both set at the 2009 World Athletics Championships in Berlin, Germany.

• Usain Bolt has secured a total of 8 Olympic gold medals and is the only sprinter to win the Olympic 100m and 200m titles at three consecutive Olympics (Beijing 2008, London 2012, and Rio 2016).

• The title of Guinness World Records ICON is reserved for individuals whose achievements are so significant that they redefine their field; Bolt holds the record for the most IAAF World Championship gold medals won by a male athlete (11 gold medals).

• Other athletes mentioned like Justin Gatlin, Carl Lewis, and Michael Johnson are legends in their own right, but they do not hold the specific ICON status designated for this timeframe or the current world records in the primary sprint categories. Hence, options A, C, and D are incorrect.

Additional Information

• Guinness World Records (GWR): Originally known as the Guinness Book of Records, it was first published in 1955 by the Guinness Brewery. It serves as the primary international authority on record-breaking achievements across human and natural categories.

• Justin Gatlin: An American sprinter who was a major rival to Bolt. He won the Olympic 100m gold in 2004 and the World Championship gold in 2005 and 2017. He is known for his longevity in the sport, competing well into his late 30s.

• Carl Lewis: A former American track and field athlete who won 9 Olympic gold medals and 8 World Championship gold medals. He dominated the 100m, 200m, and Long Jump during the 1980s and 1990s.

• Michael Johnson: An American sprinter who specialized in the 200m and 400m. He held the 200m world record of 19.32

seconds (set at the 1996 Atlanta Olympics) for 12 years until it was broken by Usain Bolt in 2008.

• Sprinting Physics: During his 100m record run in 2009, Bolt reached a top speed of 44.72 km/h (27.78 mph), which remains the highest speed ever recorded for a human being on foot.

Important Points

• The Berlin Breakthrough: The year 2009 remains the most significant in sprinting history, as the 100m and 200m world records were lowered by the largest margins since the introduction of electronic timing.

• Retirement: Usain Bolt officially retired from athletics after the 2017 World Championships held in London. Following his track career, he briefly explored professional football in Australia and Europe.

• Linguistic and Cultural Impact: Bolt's signature "To Di World" pose (often called the lightning bolt) became a global symbol of victory and excellence, contributing to his ICON status.

• World Athletics: Formerly known as the IAAF (International Association of Athletics Federations), it is the international governing body for the sport of athletics, which ratifies all sprint world records.

Q100. Answer: (a) Kathmandu, Nepal

The correct answer is Kathmandu, Nepal.

Key Points

• The inaugural Everest Climbers' Summit on climate change was held in Kathmandu, Nepal, in May 2025. The summit was organized to bring together world-renowned mountaineers to highlight the alarming rate of glacier melt in the Himalayas.

• The event was timed to coincide with the International Year of Glaciers' Preservation (2025), as declared by the United Nations General Assembly. This initiative seeks to raise global awareness about the vulnerability of mountain ecosystems.

• The summit served as a platform for climbers who have summited Mount Everest multiple times to share their firsthand observations of environmental changes, such as the thinning of the Khumbu Glacier and the increasing frequency of avalanches.

• A key objective of the 2025 Summit in Kathmandu was to pressure the international community to meet the goals of the Paris Agreement, specifically aiming to limit global warming to 1.5°C to save the "Water Tower of Asia."

• The Government of Nepal, through the Ministry of Culture, Tourism, and Civil Aviation, led the initiative to ensure that the voices of those who know the mountains best are heard in global climate policy discussions.

Additional Information

• Mount Everest (Sagarmatha): It is the highest peak in the world, with an official elevation of 8,848.86 meters. It is located in the Mahalangur Himal sub-range of the Himalayas, straddling the border between Nepal and China (Tibet).

• Climate Impact on the Third Pole: The Himalayan-Hindu Kush region is often referred to as the Third Pole because it contains the largest ice reserves outside the polar regions. Recent data from ICIMOD (International Centre for Integrated Mountain Development) suggests that glaciers in this region could lose 30% to 80% of their volume by the year 2100.

• The Khumbu Glacier: This is the highest glacier in the world, located in the Solukhumbu District of Nepal. Studies have shown that the South Col Glacier on Everest has lost nearly 2 meters of ice thickness annually in recent decades due to anthropogenic climate change.

• Sagarmatha Sambaad: This is a multi-stakeholder dialogue forum established by the Government of Nepal in 2019. It focuses on global, regional, and national issues, with climate change being a primary theme for its inaugural sessions.

• Historical Significance: The summit also paid tribute to the 72nd anniversary of the first successful ascent of Mount Everest by Sir Edmund Hillary and Tenzing Norgay in 1953, emphasizing that the mountain they climbed is vastly different from the one climbers face today.

Important Points

• Geographical Facts: Kathmandu is the capital of Nepal and sits at an altitude of approximately 1,400 meters. It is the primary logistics base for almost all Everest expeditions.

• Socio-Economic Impact: More than 1.65 billion people depend on the ten major rivers that originate in the Hindu Kush Himalaya region for water, agriculture, and energy. Any disruption in glacier stability threatens the food and water security of South Asia.

• International Year of Glaciers' Preservation: In 2022, the UN passed a resolution, sponsored by Tajikistan and supported by Nepal, to declare 2025 as a year to focus on glacier retreat and its consequences for sea-level rise and biodiversity.

• Everest Cleanup Campaigns: Parallel to climate summits, Nepal regularly conducts "Mountain Clean-up Campaigns" led by the Nepalese Army to remove tonnes of waste and microplastics from high-altitude camps, highlighting the pollution aspect of environmental degradation.

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