RRB Group D Official Paper (Held On: 28 Nov, 2025 Shift 2) (Previous Year Paper)

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

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GENERAL SCIENCE

Q1. Which of the following equations of motion is independent of the final velocity of a particle?

(a) $s = ut + 1/2\ at^2$
(b) $v = ut + a$
(c) $v^2 - u^2 = 2as$
(d) $v = u + at$

Q2. Which of the following is a process in which absorbed substances from alimentary canal is transported to different organs where they are used to build complex substances?

(a) Assimilation
(b) Transpiration
(c) Photosynthesis
(d) Digestion

Q3. A bullet of small mass and high velocity can penetrate a target deeper than a heavy stone thrown at the same speed because:

(a) it is sharper
(b) it is smaller in size
(c) it has greater mass
(d) it has less inertia

Q4. Which of the following statements best explains why hormonal contraceptive pills can have side effects?

(a) They interfere with the body's immune system.
(b) They destroy the egg inside the ovary.
(c) They disrupt the natural hormonal balance, affecting other physiological functions.
(d) They prevent the sperm from reaching the egg mechanically.

Q5. The plant cell wall is primarily composed of:

(a) chitin
(b) N-Acetyl glucosamine
(c) cellulose
(d) suberin

Q6. What happens when a pendulum bob swings from its mean position to extreme position?

(a) Total energy decreases
(b) Both kinetic and potential energies increase
(c) Potential energy decreases, kinetic energy increases
(d) Potential energy increases, kinetic energy decreases

Q7. Which of the following correctly identifies an element that DOES NOT exist as a molecule in nature?

(a) Chlorine
(b) Helium
(c) Hydrogen
(d) Iodine

Q8. A poultry farmer wants birds that consume less feed, tolerate high heat, and produce quality chicks. Which strategy should he follow?

(a) Feed birds twice a day
(b) Cross-breed exotic and local poultry
(c) Shift to fish farming
(d) Use only indigenous birds

Q9. Which of the following sexually transmitted diseases is caused by a bacterium?

(a) Typhoid
(b) HIV-AIDS
(c) Warts
(d) Gonorrhoea

Q10. Two resistors of 15 Ω and 5 Ω are connected in series with a 12 V battery. How much current will flow in the circuit?

(a) 0.6 A
(b) 0.45 A
(c) 0.5 A
(d) 0.65 A

Q11. Archimedes' principle states that when a body is immersed in a fluid, it experiences _____.

(a) A downward force equal to the weight of fluid displaced by the body
(b) No change in its weight
(c) An upward force equal to the weight of the body
(d) An upward force equal to the weight of fluid displaced by the body

Q12. In reproductive health, the aim of contraception is _____.

(a) to have more babies
(b) to prevent unplanned pregnancies
(c) to make babies healthy
(d) to make twin babies

Q13. What is the effective diameter of the circular outline of a spherical lens called?

(a) Optical centre
(b) Aperture
(c) Focal length
(d) Radius of curvature

Q14. Which of the following is/are NOT consequence(s) of large dams?

(a) Afforestation
(b) Social problems
(c) Economic problems
(d) Deforestation

Q15. Which of the following metals is purified by distillation?

(a) Silver
(b) Iron
(c) Zinc
(d) Copper

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Q16. Which of the following correctly explains why gases can be compressed easily compared to solids and liquids?

(a) Gases have low kinetic energy
(b) Gases have high mass and density
(c) Gases do not occupy space
(d) Gases have loosely packed particles with large intermolecular spaces

Q17. In the context of carbon compounds, what characterises a 'branched chain' structure?

(a) Carbon atoms are bonded to four different atoms.
(b) Carbon atoms are arranged in a continuous, straight line.
(c) Carbon atoms form a closed ring structure.
(d) Carbon atoms are attached to the main carbon chain, forming side groups.

Q18. Which of the following is a characteristic property of a material?

(a) Resistance
(b) Resistivity
(c) Voltage
(d) Current

Q19. Why does growth in plants occur only in specific regions?

(a) Water reaches only the upper parts of the plant.
(b) Gravity prevents growth in certain regions.
(c) Only some parts of the plant receive sunlight.
(d) Meristematic tissue is located only in specific regions.

Q20. Consider a ray of light travelling obliquely from air into a glass slab. Which of the following statement(s) is/are true?

(i) The angle of incidence is smaller than the angle of refraction.
(ii) The angle of incidence is greater than the angle of emergence.
(iii) The speed of light decreases as the light ray enters from air to glass.
(iv) The incident ray and the emergent ray are parallel to each other.

(a) Both (i) and (ii)
(b) Both (i) and (iv)
(c) Both (ii) and (iii)
(d) Both (iii) and (iv)

Q21. Which of the following statements is true according to Thomson's Model of Atom?

(a) Electrons are concentrated in the nucleus.
(b) Electrons are attached to neutrons.
(c) Electrons are fixed in the orbits.
(d) Electrons are spread randomly in a positively charged sphere.

Q22. Ethanol on heating at 443 K in excess concentrated sulphuric acid gives ethene. The chemical change taking place is:

(a) halogenation
(b) oxidation
(c) reduction
(d) dehydration

Q23. What is the product formed when ethene reacts with bromine?

(a) Ethane
(b) 1,2-dibromoethane
(c) Ethanol
(d) Bromoethane

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Q24. Select the correct option regarding the following two statements labelled Assertion and Reason.

Assertion: Sound waves are non-mechanical waves.

Reason: Sound waves require a material medium for their propagation.

(a) Assertion is true but reason is false.
(b) Both assertion and reason are false.
(c) Both assertion and reason are true and reason is the correct explanation of assertion.
(d) Assertion is false but reason is true.

Q25. Which of the following statements is/are correct?

a. Olfactory indicators are used to check the acidic or basic nature of a compound.

b. Clove oil is an olfactory indicator.

c. Clove oil is used to check the purity of any compound.

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

MATHEMATICS

Q26. A water tank is 5/8 full. If 12 buckets of water are taken out and 9 buckets of water are poured into it, the water tank would be 7/12 full.

Find the number of buckets the water tank can contain.

(a) 48
(b) 96
(c) 60
(d) 72

Q27. A point on the ground is at a distance equal to √3 times the height of a building from its base. What is the angle (in degrees) formed between the line joining the point to the top of the building and the ground?

(a) 30°
(b) 60°
(c) 45°
(d) 90°

Q28. The price of a shirt is first increased by 18% and then decreased by 18%. What is the overall percentage decrease in its price?

(a) 2.89%
(b) 3.24%
(c) 2.98%
(d) 3.45%

Q29. If 20% of a number is added to 96, then the result is the same number. 75% of the same number is:

(a) 100
(b) 120
(c) 90
(d) 110

Q30. A metal rod is divided into three parts, A, B and C. The lengths of A and B are in the ratio 4 : 8, and the lengths of C and B are in the ratio 10 : 18. If the difference between the lengths of A and C is 48 cm, determine the total length (in cm) of the metal rod.

(a) 1776
(b) 1782
(c) 1764
(d) 1798

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Q31. The price of fuel decreases by 20%, 30% and 20% in three successive months but increases by 40% in the fourth month. What is the percentage increase/decrease in the price of fuel in the fourth month as compared to its original price?

(a) Increases by 36.01%
(b) Decreases by 33.02%
(c) Decreases by 37.28%
(d) Increases by 41.98%

Q32. If the ratio of the present ages of Parul and her mother is 5 : 13 and the product of their ages is 585, find the ratio of their ages after 9 years.

(a) 4 : 7
(b) 2 : 5
(c) 3 : 5
(d) 1 : 2

Q33. A field in the shape of a trapezium has parallel sides of 60 m and 77 m. The non-parallel sides are 25 m and 26 m. What is the area of the field?

(a) 1,524 m²
(b) 1,720 m²
(c) 1,812 m²
(d) 1,644 m²

Q34. A camp has provisions for 48 persons for 12 days. In how many days will the same provisions finish off if the strength of the camp is increased to 72 persons?

(a) 7
(b) 6
(c) 8
(d) 11

Q35. The average age of 35 students of a class is 46 years. If the age of the teacher is also included, the average age of the whole group becomes 47 years. The age (in years) of the teacher is:

(a) 83
(b) 84
(c) 85
(d) 82

Q36. A can complete a piece of work in 77 days. B is 75% less efficient than A. C is 40% more efficient than B. If B and C work together for 30 days, A alone will complete the remaining work in:

(a) 60 days
(b) 59 days
(c) 57 days
(d) 54 days

Q37. The ratio of two numbers is 2 : 3 and their HCF is 6. Find their LCM.

(a) 32
(b) 36
(c) 12
(d) 18

Q38. Simplify: ((342 ÷ 19 × 306 ÷ 17) ÷ 36 × 6) + (60 ÷ 5 × 2 - 12)

(a) 46
(b) 66
(c) 56
(d) 76

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Q39. A and B working together can do a piece of work in 4 days. B alone can do the same work in 8 days. How long (in days) will A alone take to do double the work?

(a) 8
(b) 19
(c) 16
(d) 17

Q40. If the total surface area of a cylinder is 4 times the area of two circular faces, and the volume of the cylinder is 192π cm^3, then the height of the cylinder is:

(a) 12 cm
(b) 9 cm
(c) 8 cm
(d) 16 cm

Q41. In a bag containing red, green and pink tokens, the ratio of red to green tokens was 9 : 6, while the ratio of pink to red tokens was 18 : 16. What was the ratio of green to pink tokens?

(a) 17 : 28
(b) 16 : 27
(c) 14 : 31
(d) 15 : 23

Q42. A trader buys 80 pens at Rs. 8 each. He sells 60 of them at Rs. 12 each and the remaining at a 25% loss. What is the overall profit or loss?

(a) Rs. 240 Loss
(b) Rs. 210 Profit
(c) Rs. 200 Loss
(d) Rs. 200 Profit

Q43. What would be the annual interest accrued on a deposit of Rs. 95,950 in a bank that pays a 9% per annum rate of simple interest?

(a) Rs. 8,455.50
(b) Rs. 8,855.50
(c) Rs. 8,035.50
(d) Rs. 8,635.50

Q44. The ratio of the speeds of two trucks is 7 : 3. The time taken by the faster truck to cover a distance of 147 km is 7 hours less than the other. Find the speed of the slower truck.

(a) 22 km/hr
(b) 4 km/hr
(c) 12 km/hr
(d) 9 km/hr

Q45. P is any point inside the rectangle ABCD. If PA = 79 cm, PB = 61 cm and PC = 17 cm, then the length of PD (in cm) is equal to:

(a) 57
(b) 53
(c) 54
(d) 48

Q46. The marked price of a bench is Rs. 374, which is 22% above the cost price. If the profit percentage is 13%, find the discount percentage (rounded off to two decimal places).

(a) 8.91%
(b) 6.66%
(c) 6.94%
(d) 7.38%

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Q47. If an item marked at Rs. 594 is sold for Rs. 155, then what is the discount percentage? (Round off your answer to two decimal places).

(a) 77.24%
(b) 72.91%
(c) 73.91%
(d) 74.35%

Q48. A class of 100 students took a Physics test. 37 students had an average score of 84. The other students had an average score of 96. What is the average score (rounded off to one decimal place) of the whole class?

(a) 89.7
(b) 97.5
(c) 85.5
(d) 91.6

Q49. Two trains are moving in opposite directions at speeds of 100 km/hr and 140 km/hr. The length of one train is 490 m. The time taken by them to cross each other is 22 seconds. The length (in m) of the other train, rounded off to 2 decimal places, is:

(a) 974.27
(b) 972.33
(c) 982.47
(d) 976.67

Q50. Simplify: $(2x + 3)(x - 5) - (x - 2)(3x + 4)$

(a) $x^2 - 5x - 7$
(b) $-x^2 + 5x - 7$
(c) $-x^2 - 5x - 7$
(d) $-x^2 - 5x + 7$

GENERAL INTELLIGENCE & REASONING

Q51. What will come in place of the question mark (?) in the following equation, if '+' and '÷' are interchanged and '−' and '×' are interchanged?

850 + 34 × 15 − 12 ÷ 400 = ?

(a) 245
(b) 239
(c) 240
(d) 233

Q52. What should come in place of the question mark (?) in the given series?

36 41 51 66 86 ?

(a) 100
(b) 111
(c) 107
(d) 117

Q53. Refer to the following number and symbol series and answer the question that follows. Counting to be done from left to right only.

(Left) ? * + ? \ & 3 # 9 % 4 1 6 * @ 5 4 8 8 $ \ (Right)

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

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

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Q54. What should come in place of the question mark (?) in the given series based on the English alphabetical order?

DWV LED TML BUT ?

(a) IBH
(b) JIO
(c) JBC
(d) JCB

Q55. 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.)

(22, 66, 61)

(35, 105, 100)6783

(a) (74, 222, 216)
(b) (14, 42, 37)
(c) (85, 255, 249)
(d) (41, 123, 117)

Q56. 60 people are standing in a row facing north. Shivani is 40^(th) from the right end while Sneha is 26^(th) from the left end. How many people are there between Shivani and Sneha?

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

Q57. If ‘A’ stands for ‘÷’, ‘B’ stands for ‘x’, ‘C’ stands for ‘+’ and ‘D’ stands for ‘-‘, what will come in place of the question mark ‘?’ in the following equation?

25 C 15 A 3 D 9 B 3 = ?

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

Q58. Yogesh ranked 34^(th) from the top and 38^(th) from the bottom in his class. How many students are there in his class?

(a) 72
(b) 73
(c) 71
(d) 70

Q59. Read the given statements and conclusions carefully. Assuming that the information given in the statements is true, even if it appears to be at variance with commonly known facts, decide which of the given conclusions logically follow(s) from the statements.

Statements: All Tractors are Motorcycles. Some Motorcycles are Minivans. No Minivans are Hovercrafts.

Conclusion (I):Some Hovercrafts are Motorcycles

Conclusion (II): Some Minivans are Tractors

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

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Q60. Leander starts from Point A and drives 6 km towards east. He then takes a left turn, drives 4 km, turns left and drives 3 km. He then takes a right turn and drives 3 km. He takes a final left turn, drives 3 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) 6 km towards west
(b) 6 km towards north
(c) 7 km towards south
(d) 3 km towards south

Q61. In a certain code language, 'OVAL' is coded as '6729' and 'LEVO' is coded as '7946'. What is the code for 'E' in the given code language?

(a) 7
(b) 4
(c) 9
(d) 6

Q62. Seven people, A, B, C, D, E, F and G, are sitting in a row, facing north. Only six people sit to the right of C. Only four people sit to the left of B. D sits to the left of A but right of B. F sits second to the right of G. How many people sit to the right of E?

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

Q63. Refer to the following number, symbol series and answer the question. Counting to be done from left to right only. All numbers are single-digit numbers.

(Left) © @ 7 € $ 5 $ & * & 7 5 2 $ 8 $ © 7 © 4 6 £ (Right)

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

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

Q64. Each of the digits in the number 1732596 is arranged in ascending order from left to right. The position(s) of how many digits will remain unchanged as compared to that in the original number?

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

Q65. Read the given statements and conclusions carefully. Assuming that the information given in the statements is true, even if it appears to be at variance with commonly known facts, decide which of the given conclusion(s) logically follow(s) from the statements.

Statements:

All flowers are plants.

Some plants are trees.

Conclusions:

(I) Some trees are flowers.

(II) All flowers are trees.

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

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Q66. Refer to the following series and answer the question (all numbers are single-digit numbers only).

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

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

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

Q67. What should come in place of the question mark (?) in the given series?

510 511 500 501 491 492 ?

(a) 490
(b) 482
(c) 483
(d) 481

Q68. Based on the English alphabetical order, three of the following four letter-clusters are alike in a certain way and thus form a group. Which is the letter-cluster that DOES NOT belong to that group?

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

(a) WXT
(b) UWR
(c) STP
(d) QRN

Q69. In a code language,

A + B means ‘A is the sister of B’

A - B means ‘A is the father of B’

A * B means ‘A is the brother of B’

A ÷ B means ‘A is the mother of B’

Based on the above, how is P related to E if ‘ P - T * C + D ÷ E ’?

(a) Father’s father
(b) Mother’s brother
(c) Mother’s father
(d) Brother

Q70. In the following triads, each group of letters is related to the subsequent one following a certain logic. Select from the given options, the one which follows the same logic.

WASH - HSWA - WSAH

CORE - ERCO - CROE

(a) INKS - SKIN - IKNS
(b) LEAP - LAEP - PAEL
(c) DARE - ARDE - ARED
(d) FINE - ENFI - INFE

Q71. Piya starts from point A and drives 33 km towards south. She then takes a right turn, drives 45 km, turns right and drives 41 km. She then takes a right turn and drives 56 km. She takes a final right turn, drives 8 km and stops at point P. How far (shortest distance) and towards which direction should she drive in order to reach point A again?

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

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

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Q72. Select the triad which follows the same pattern as that followed by the two triads given below. Both triads follow the same pattern.

PI-MF-KN

SL-PI-NQ

(a) VO-SL-QT
(b) WO-SK-QU
(c) WO-SL-QU
(d) VO-SL-QU

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

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

(a) BH-TQ
(b) WC-OL
(c) HM-ZW
(d) SY-KH

Q74. Seven people B, C, D, I, J, K and L are sitting in a straight line facing north. No one sits to the left of K. Only four people sit between K and J. L sits second to the left of J. D sits to the immediate left of B. C is not an immediate neighbour of L. How many people sit between L and C?

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

Q75. What should come in place of the question mark (?) in the given series?

12 ? 29 39 50 62

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

Q76. Refer to the following series and answer the question (all numbers are single-digit numbers only).

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

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

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

Q77. Which of the following letter-number clusters will replace the question mark (?) in the given series to make it logically complete?

VDE97, BJK74, HPQ51, NVW28, ?

(a) TUC5
(b) TBG5
(c) IBC5
(d) TBC5

Q78. A, B, C, D, E, F and G are sitting around a circular table, facing the centre. F sits second to the right of B. A sits third to the left of F. C is the immediate neighbour of E and A. G is not an immediate neighbour of B. How many people sit between D and E when counted from the left of D?

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

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(d) Three

Q79. HN 9 is related to LK −3 in a certain way. In the same way, NY 4 is related to RV −8. To which of the given options is OU 13 related, following the same logic?

(a) SR 1
(b) HU 5
(c) HY 3
(d) TY 2

Q80. In a certain code language, ‘steak equal thing’ is coded as 'wb vl yn' and ‘thing yard house’ is coded as ‘vl za ha’. How is ‘thing’ coded in the given language?

(a) wb
(b) yn
(c) vl
(d) za

GENERAL AWARENESS AND CURRENT AFFAIRS

Q81. As notified in June 2025, which among the following launched India’s first-of-its-kind premium financing solution tailored for corporate insurance?

(a) Credit Access Life Insurance
(b) BimaPay Finsure
(c) JM Financial Mutual Fund
(d) Reliance Nippon Life Insurance

Q82. What is the name of the Mega Disaster Management Drill conducted in the Delhi–NCR (National Capital Region) from 29 July to 1 August 2025?

(a) Exercise Raksha Kavach
(b) Exercise Surakshit Bharat
(c) Exercise Disaster Mitra
(d) Exercise Suraksha Chakra

Q83. When was the Retired Sportsperson Empowerment Training (RESET) Programme officially launched by the Ministry of Youth Affairs and Sports?

(a) 2022
(b) 2024
(c) 2023
(d) 2025

Q84. In 2025, the World Hindi Day was celebrated in India on which date?

(a) 21 February
(b) 9 May
(c) 17 February
(d) 10 january

Q85. Which team was honoured as “Team of the Year” at the Laureus World Sports Awards in April 2025?

(a) Bayern Munich
(b) Manchester City
(c) Real Madrid
(d) Flamengo

Q86. What is the new domain to which all banks must migrate by October 31, 2025, as per the directive of the Reserve Bank of India?

(a) .rbi.in
(b) .gov.in

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(c) .bank.in
(d) .fin.in

Q87. Who announced the Rs. 50,000 mass marriage incentive scheme for minorities in the Karnataka 2025–26 state budget?
(a) Siddaramaiah
(b) Basavaraj Bommai
(c) DK Shivakumar
(d) BS Yediyurappa

Q88. As informed by Union Minister Dr. Jitendra Singh on 1 January 2025, India's biotechnology sector has experienced extraordinary growth, skyrocketing from a $10 billion industry in 2014 to over _____ in 2024.
(a) $130 billion
(b) $140 billion
(c) $100 billion
(d) $80 billion

Q89. Which border check-post of India and Pakistan was closed by the Government of India, following the Pahalgam terror attack in April 2025?
(a) Ganda Singh Wala-Hussainiwala border
(b) Radcliffe Line
(c) Khokhrapar-Munabao border
(d) Attari-Wagah border

Q90. Who received the UNESCO/Guillermo Cano World Press Freedom Prize in May 2025?
(a) Maria Ressa
(b) Narges Mohammadi
(c) La Prensa
(d) Mazen Darwish

Q91. In 2025, where has India's first zoo-based wildlife bio bank been established?
(a) Padmaja Naidu Himalayan Zoological Park
(b) Mahendra Chaudhury Zoological Park
(c) Nandankanan Zoological Park
(d) Nehru Zoological Park

Q92. In March 2025, under which of the following schemes did the government identify 100 coastal fishermen villages to be developed into Climate-Resilient Coastal Fishermen Villages?
(a) Kisan Samman Nidhi Yojana (KSNY)
(b) Pradhan Mantri Matsya Sampada Yojana (PMMSY)
(c) National Coastal Mission
(d) Blue Revolution Yojana

Q93. According to the StartupBlink Global Startup Ecosystem Index, 2025, which Indian city is top ranked among the world's top startup cities in 2025?
(a) Pune
(b) Delhi
(c) Hyderabad
(d) Bengaluru

Q94. In July 2025, which investigative authority unearthed over Rs. 24 crore in unaccounted assets in Karnataka?
(a) Central Bureau of Investigation
(b) Karnataka Lokayukta
(c) Income Tax Department
(d) Enforcement Directorate

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Q95. In 2025, a state-of-the-art automated healthcare machine, a self-service digital health kiosk for basic testing and diagnostics, was installed at Lucknow. What is it called?

(a) Med Kiosk
(b) e-Clinic Booth
(c) Health Pod
(d) Health ATM

Q96. Which team was the runner-up in the 2025 Kalinga Super Cup?

(a) Kerala Blasters FC
(b) Bengaluru FC
(c) Hyderabad FC
(d) Jamshedpur FC

Q97. Who set the world record for the farthest distance swum in 48 hours (female) in a 25 m pool, covering an astonishing 149.02 km (92.59 miles) in just 2 days?

(a) Diana Nyad
(b) Sarah Thomas
(c) Katie Ledecky
(d) Karolina Szczepaniak

Q98. What is the name of the initiative launched by Union Ministry of Tribal Affairs in June 2025, which is aimed at strengthening the delivery of tribal welfare schemes by training and inspiring a new generation of dedicated implementers?

(a) Adi Karmyogi
(b) Adi Gotra
(c) Adi Varnada
(d) Adi Vamsha

Q99. Who became the 52^(nd)Chief Justice of India on 14 May 2025?

(a) Sanjiv Khanna
(b) Bidyut Ranjan Sarangi
(c) Madan Lokur
(d) Bhushan Ramkrishna Gavai

Q100. According to the World Happiness Report, 2025, released in March 2025, which of the following countries ranked as the happiest country in the world?

(a) New Zealand
(b) Canada
(c) Finland
(d) Switzerland

ANSWER KEY

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

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91 a	92 b	93 d	94 b	95 d	96 d	97 d	98 a	99 d	100 c

SOLUTIONS

Q1. Answer: (a) $s = ut + 1/2\ at^2$

The correct answer is $s = ut + 1/2\ at^2$.

Key Points

• The equation $s = ut + 1/2\ at^2$ describes the distance (s) traveled by a particle under uniform acceleration (a), with an initial velocity (u) over a time interval (t).

• This equation is independent of the final velocity (v) of the particle. It only relies on the initial velocity (u), acceleration (a), and time (t).

• In contrast, other equations of motion, such as $v = u + at$ or $v^2 - u^2 = 2as$, include the final velocity (v) explicitly.

• The absence of final velocity in the equation $s = ut + 1/2\ at^2$ makes it unique and suitable for scenarios where the final velocity is unknown or irrelevant.

• This equation is derived from the fundamental principles of kinematics and serves as a practical tool for solving physics problems involving motion in a straight line.

Additional Information

• Equations of Motion Overview:

• 1st Equation: $v = u + at$ – This relates the final velocity (v) to the initial velocity (u), acceleration (a), and time (t).

• 2nd Equation: $s = ut + 1/2\ at^2$ – This calculates the displacement (s) without involving the final velocity (v).

• 3rd Equation: $v^2 - u^2 = 2as$ – This directly relates the final velocity (v) and displacement (s), omitting the time factor.

• Key Variables in Kinematics:

• u: Initial velocity of the particle.

• v: Final velocity of the particle.

• a: Constant acceleration acting on the particle.

• t: Time interval during which motion occurs.

• s: Displacement or distance covered by the particle.

• Applications of Equations of Motion:

• Used in solving problems related to free-fall, projectiles, and vehicles under uniform acceleration.

• Widely used in fields like physics, engineering, and mechanics.

• Helps determine unknown variables like displacement, velocity, or acceleration in different motion scenarios.

• Important Characteristics of the Equation $s = ut + 1/2\ at^2$:

• Does not depend on the final velocity (v).

• Requires knowledge of initial velocity (u), acceleration (a), and time (t).

• Represents the motion of a particle in a straight line under constant acceleration.

Important Points

• Final velocity is a critical variable in many kinematic equations, but $s = ut + 1/2\ at^2$ remains independent of it.

• The equation is crucial in scenarios where the time of motion and initial velocity are known but the final velocity is either unknown or irrelevant.

• It demonstrates the relationship between displacement and other parameters in uniformly accelerated motion.

• Its derivation is based on basic calculus and the assumption of constant acceleration.

Q2. Answer: (a) Assimilation

The correct answer is Assimilation.

Key Points

• Assimilation is the process in which absorbed substances from the alimentary canal are transported to different organs where they are used to build complex substances such as proteins, lipids, and carbohydrates.

• This process is vital for cellular growth, repair, and energy production in the human body.

• The absorbed nutrients, such as amino acids, glucose, and fatty acids, are distributed via the bloodstream to various tissues and organs.

• For example, glucose absorbed in the small intestine is transported to cells where it is utilized for energy production through cellular respiration.

• Assimilation is a part of the broader process of nutrition, encompassing ingestion, digestion, absorption, and excretion.

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Additional Information

• Transpiration:

• Transpiration refers to the process of water loss in the form of vapor from the aerial parts of plants, especially leaves, through stomata.

• This process is crucial for maintaining the water movement in plants and helps in nutrient transport, cooling, and maintaining turgor pressure.

• It is not related to the transportation of absorbed nutrients in humans, making it an incorrect option.

• Photosynthesis:

• Photosynthesis is the process by which green plants, algae, and some bacteria convert sunlight into chemical energy stored in glucose.

• It involves the use of carbon dioxide, water, and sunlight to produce glucose and oxygen.

• This process is exclusive to autotrophic organisms and is unrelated to nutrient absorption or transportation in the human body.

• Digestion:

• Digestion is the process of breaking down complex food substances into simpler forms that can be absorbed by the body.

• It occurs in various stages in the alimentary canal, involving enzymes and mechanical actions.

• While digestion is essential for nutrient absorption, it is different from assimilation, which involves the utilization of absorbed nutrients.

• Important Notes on Nutrition:

• Ingestion: The process of consuming food and drink.

• Absorption: The transfer of digested nutrients into the bloodstream or lymphatic system via the walls of the small intestine.

• Excretion: The elimination of undigested and waste products from the body.

Important Points

• Assimilation and Health: Proper assimilation is crucial for maintaining overall health and well-being. Issues such as malabsorption syndromes can lead to deficiencies and health complications.

• Role of Liver: The liver plays a vital role in assimilation by metabolizing nutrients and producing proteins, bile, and other substances required by the body.

• Energy Utilization: Glucose is stored as glycogen in the liver and muscles for energy, while amino acids are used to synthesize proteins essential for cell repair and growth.

• Applications in Medicine: Understanding assimilation processes is crucial for diagnosing and treating conditions like diabetes, metabolic disorders, and malnutrition.

Q3. Answer: (a) it is sharper

The correct answer is it is sharper.

Key Points

• A bullet of small mass and high velocity penetrates a target deeper than a heavy stone thrown at the same speed mainly because the tip of the bullet is sharp, which helps it exert a greater pressure on the target.

• Pressure is defined as the force acting per unit area. The formula is Pressure = Force/Area.

• The sharp tip of a bullet has a very small area of contact. Therefore, the force produced by its motion is concentrated over a smaller area, resulting in greater pressure and deeper penetration.

• Although the bullet has a smaller mass compared to a stone, its sharp pointed shape allows it to overcome the resistance offered by the target material more effectively.

• Hence, the sharpness of the bullet increases the pressure on the target surface, allowing it to penetrate deeper.

Additional Information

• Effect of Sharpness on Pressure:

• Objects with a smaller contact area produce more pressure when the same force is applied.

• Examples include a sharp knife cutting easily, a needle piercing cloth, and a nail entering wood.

• In each case, the pointed end reduces the contact area and increases the pressure.

• Momentum and Kinetic Energy:

• A moving bullet possesses kinetic energy due to its velocity. The formula for kinetic energy is K.E. = ½mv², where m represents mass and v represents velocity.

• A bullet travelling at a very high velocity can carry significant kinetic energy even though its mass is small.

• This high energy helps the bullet overcome the resistance of the target material.

• Inertia and Mass:

• Inertia is the tendency of an object to resist any change in its state of motion.

• The inertia of an object depends on its mass; a heavier object has greater inertia.

• However, in this case, the deeper penetration is not due to greater mass or inertia but due to the sharp shape and high pressure produced by the bullet.

• Comparison with Heavy Stone:

• A heavy stone may have greater mass and therefore greater inertia, but its broad surface area distributes the force over a larger area.

• Due to lower pressure at the point of contact, it does not penetrate the target as effectively as a sharp bullet.

Important Points

• Pressure: Force per unit area.

• Formula: Pressure = Force/Area.

• Smaller area of contact results in higher pressure.

• Bullet penetration: Mainly depends on sharp pointed shape, high velocity, and concentration of force over a small area.

• Correct concept: A bullet penetrates deeper not because of greater mass or inertia, but because its sharp tip produces high pressure on the target.

Q4. Answer: (c) They disrupt the natural hormonal balance, affecting other physiological functions.

The correct answer is They disrupt the natural hormonal balance, affecting other physiological functions..

Key Points

• Hormonal contraceptive pills work by introducing synthetic hormones like estrogen and progestin into the body, which mimic natural hormones to prevent pregnancy.

• These synthetic hormones can disrupt the body's natural hormonal balance, affecting processes such as ovulation, menstrual cycles, and other physiological functions.

• By altering hormone levels, contraceptive pills can cause side effects such as mood swings, nausea, headaches, weight changes, and changes in libido.

• The hormonal disruption may also affect other systems, such as the cardiovascular system, increasing the risk of blood clots in some individuals.

• Hormonal contraceptives may affect natural hormone production over time, leading to potential long-term effects, such as irregular periods after discontinuation. Hence, the correct answer is: They disrupt the natural hormonal balance, affecting other physiological functions.

Additional Information

• Mechanism of Hormonal Contraceptives:

• Hormonal contraceptives work by preventing ovulation, thickening cervical mucus to block sperm entry, or altering the uterine lining to prevent implantation.

• The pills often contain a combination of estrogen and progestin, or only progestin, depending on the type.

• Common Side Effects:

• Common side effects include spotting between periods, breast tenderness, nausea, and weight gain.

• Long-term use may increase the risk of hypertension, blood clots, or stroke in individuals with predisposing factors.

• Non-Hormonal Contraceptive Methods:

• Non-hormonal methods such as condoms, copper IUDs, or diaphragms work mechanically or chemically without altering hormonal balance.

• These methods are preferred by individuals who want to avoid hormonal side effects or have contraindications for hormonal contraceptives.

• Contraindications for Hormonal Contraceptives:

• Hormonal contraceptives are contraindicated in individuals with a history of blood clots, stroke, breast cancer, or uncontrolled hypertension.

• They are also not recommended for smokers over the age of 35 due to increased cardiovascular risks.

• Historical Context:

• The first oral contraceptive pill was approved by the FDA in 1960, revolutionizing reproductive health and family planning globally.

• Modern contraceptives are more refined, with lower doses of hormones to reduce side effects.

Important Points

• Option 1: They interfere with the body’s immune system.

• This statement is incorrect as hormonal contraceptives primarily affect the reproductive system and hormonal balance rather than directly interfering with the immune system.

• Option 2: They destroy the egg inside the ovary.

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• This statement is incorrect because hormonal contraceptives prevent ovulation rather than destroying eggs.
• Option 4: They prevent the sperm from reaching the egg mechanically.
• This statement is incorrect because hormonal pills work chemically by altering hormones, not mechanically.
• Global Statistics:
• As per the WHO, approximately 214 million women globally use hormonal contraceptives.
• Hormonal contraceptives are widely used due to their high efficacy rates, ranging from 91% to 99% when used correctly.

Q5. Answer: (c) cellulose

The correct answer is Cellulose.

Key Points

• The primary component of plant cell walls is cellulose, a complex carbohydrate and polysaccharide made up of long chains of glucose units.
• Cellulose provides structural support and rigidity to plant cells by forming microfibrils, which are strong, fibrous structures within the cell wall.
• Cell walls are unique to plant cells and some algae, and they play a critical role in maintaining cell shape, protecting against mechanical stress, and regulating water uptake.
• Unlike cellulose, chitin (Option 1) is a major structural component of fungal cell walls and the exoskeletons of arthropods, not plant cells. Hence, this statement is incorrect.
• N-Acetyl glucosamine (Option 2) is a derivative of glucose and is a monomer of chitin, which is unrelated to plant cell walls. Hence, this statement is incorrect.
• Suberin (Option 4) is a waxy substance found in the cork of plants and acts as a barrier to water and pathogens but is not the primary structural component of cell walls. Hence, this statement is incorrect.

Additional Information

• Structure of Cellulose:
• Cellulose is composed of beta-glucose monomers linked by beta-1,4-glycosidic bonds.
• These linear chains aggregate to form microfibrils, which provide tensile strength to the cell wall.
• It is considered the most abundant organic polymer on Earth.
• Functions of Plant Cell Walls:
• Plant cell walls provide mechanical support and maintain the cell's shape.
• They act as a barrier against pathogens, helping protect the cell from infections.
• Cell walls regulate water intake by preventing the cell from bursting due to excessive water absorption.
• They are involved in cell-cell communication and transport of nutrients.
• Other Components of Plant Cell Walls:
• In addition to cellulose, plant cell walls contain hemicellulose, pectin, and lignin.
• Hemicellulose: A polysaccharide that binds cellulose fibers together.
• Pectin: A gel-like substance that helps in adhesion between cell walls.
• Lignin: A polymer that adds rigidity and waterproofing to secondary cell walls.
• Examples and Applications:
• Cellulose is used in industries to produce paper, textiles, and biofuels.
• Dietary cellulose, known as fiber, is essential for human digestion as it aids in bowel movement.
• Cellulose derivatives like cellulose acetate are used in plastics and photographic films.

Important Points

• Discovery of Cellulose:
• Cellulose was first identified in 1838 by French chemist Anselme Payen.
• Its molecular structure was elucidated later with the advent of advanced techniques like X-ray crystallography.
• Role in Bioenergy:
• Cellulose is a key component in the production of bioethanol, a renewable energy source.
• Enzymes like cellulase are used to break down cellulose into fermentable sugars for biofuel production.
• Environmental Impact:
• Cellulose is biodegradable and plays a role in the carbon cycle, as it is decomposed by microorganisms.
• Its industrial uses, such as in paper production, can have environmental consequences if not managed sustainably.

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Q6. Answer: (d) Potential energy increases, kinetic energy decreases

The correct answer is Potential energy increases, kinetic energy decreases.

Key Points

• When the pendulum bob swings from its mean position (equilibrium point) to the extreme position, the potential energy increases because the height of the bob increases relative to the lowest point. At the extreme position, the pendulum has maximum potential energy.

• As the pendulum moves away from the mean position, its kinetic energy decreases. This is because the speed of the pendulum reduces as it approaches the extreme position due to the conversion of kinetic energy into potential energy.

• At the mean position, the pendulum has maximum kinetic energy and minimum potential energy, as it moves the fastest at this point.

• At the extreme position, the pendulum comes to a momentary halt, thus having zero kinetic energy and maximum potential energy.

• This energy transformation follows the principle of conservation of energy, where the total mechanical energy (sum of kinetic and potential energies) remains constant throughout the motion.

Additional Information

• Potential Energy:

• It is the energy possessed by an object due to its position or configuration.

• In the case of a pendulum, the potential energy is given by PE = mgh, where m is the mass of the bob, g is the acceleration due to gravity, and h is the height above the reference point.

• As the pendulum rises to its extreme position, the height increases, leading to an increase in potential energy.

• Kinetic Energy:

• Kinetic energy is the energy possessed by an object due to its motion.

• It is calculated using the formula KE = $0.5mv^2$, where m is the mass and v is the velocity of the object.

• As the pendulum approaches the extreme position, its velocity decreases, causing a reduction in kinetic energy.

• Principle of Conservation of Energy:

• The pendulum operates under the law of conservation of energy, which states that energy cannot be created or destroyed; it can only be transformed from one form to another.

• Throughout the pendulum's motion, the total mechanical energy (sum of potential and kinetic energy) remains constant in the absence of external forces like air resistance.

• Applications of Pendulum Motion:

• Pendulums are used in clocks to measure time based on their periodic motion.

• They are also used in experiments to study the principles of harmonic motion and energy conservation.

Important Points

• Energy Transformation:

• When the pendulum swings, its energy alternates between kinetic energy and potential energy.

• At the mean position, the pendulum has maximum kinetic energy and minimum potential energy.

• At the extreme position, the pendulum has maximum potential energy and zero kinetic energy.

• Types of Pendulum:

• Simple Pendulum: A mass suspended from a fixed point by a string or rod, which swings freely under the influence of gravity.

• Physical Pendulum: A rigid body swinging about a fixed axis.

• Foucault Pendulum: Used to demonstrate the rotation of the Earth.

• Factors Affecting Pendulum Motion:

• The length of the string affects the period of the pendulum.

• The mass of the bob does not affect the motion in ideal conditions.

• The acceleration due to gravity influences the pendulum's period.

Q7. Answer: (b) Helium

The correct answer is Helium.

Key Points

• Helium is a noble gas and exists as a monoatomic element in nature, not as a molecule. This is because noble gases have a complete outer electron shell, making them highly stable and unreactive.

• Unlike elements such as Chlorine (Cl_2), Hydrogen (H_2), and Iodine (I_2), which form diatomic molecules in their natural state due to their need to achieve stability through covalent bonding, helium does not need to bond with other atoms.

• Chlorine, hydrogen, and iodine naturally form diatomic molecules because their atoms share electrons to achieve a stable

electronic configuration (the octet rule).

• Helium is part of Group 18 (the noble gases) in the periodic table and has only two electrons in its outer shell, which is the maximum capacity for the first energy level. This makes it inherently stable.

• Helium's inertness and stability are why it exists as single atoms in nature, unlike other elements listed in the question.

Additional Information

• Noble Gases:

• The noble gases include helium (He), neon (Ne), argon (Ar), krypton (Kr), xenon (Xe), and radon (Rn).

• They are characterized by their complete valence electron shells, which make them chemically inert and highly stable under normal conditions.

• Noble gases are often used in applications where reactivity needs to be minimized, such as helium in balloons or neon in lighting.

• Diatomic Molecules:

• Elements like hydrogen (H2), chlorine (Cl2), and iodine (I2) naturally exist as diatomic molecules because they share electrons through covalent bonds to achieve a stable electronic configuration.

• The diatomic nature of these molecules ensures their stability and is a common feature among nonmetals in the periodic table.

• Helium's Applications:

• Helium is widely used in cryogenics, particularly in the cooling of superconducting magnets.

• It is also used in scientific research as an inert atmosphere for experiments and as a carrier gas in gas chromatography.

• Helium’s low density and non-flammable nature make it ideal for filling balloons and airships.

• Periodic Table Grouping:

• The periodic table groups elements based on their chemical properties, and noble gases are placed in Group 18 due to their inert nature.

• In contrast, elements like chlorine and iodine belong to the halogens in Group 17, characterized by their high reactivity and tendency to form diatomic molecules.

Important Points

• Monoatomic vs. Diatomic Elements:

• Monoatomic: Helium and other noble gases naturally exist as single atoms due to their stability.

• Diatomic: Nonmetal elements like hydrogen, oxygen, nitrogen, chlorine, and iodine form diatomic molecules to achieve stability through covalent bonding.

• Helium Discovery:

• Helium was first discovered in the sun's spectrum during a solar eclipse in 1868 by French astronomer Jules Janssen and English astronomer Norman Lockyer.

• The element is named after the Greek word “Helios”, meaning the sun.

• Reactivity of Noble Gases:

• Noble gases are generally unreactive due to their complete electron shells, but under extreme conditions, some (like xenon) can form compounds with highly electronegative elements like fluorine.

Q8. Answer: (b) Cross-breed exotic and local poultry

The correct answer is Cross-breed exotic and local poultry.

Key Points

• Cross-breeding exotic and local poultry combines the desirable traits of both breeds, leading to birds that are more efficient in feed consumption, heat tolerance, and productivity. This is particularly beneficial for adapting to regional climatic conditions and improving output.

• Local poultry breeds are naturally adapted to harsh environmental conditions, such as high temperatures. When crossbred with exotic breeds, the resulting offspring inherit heat tolerance from local breeds and high productivity traits from exotic breeds.

• Feed efficiency: Exotic breeds are often genetically selected for better feed conversion ratios, meaning they produce more output (e.g., eggs, meat) with less feed. Cross-breeding helps transfer this efficiency to the hybrid birds.

• Quality chicks: Crossbred birds often produce healthier and more robust chicks due to hybrid vigor, which enhances growth rate, disease resistance, and survival chances.

• This strategy is widely practiced in modern poultry farming and has been shown to improve the profitability and sustainability of poultry operations.

Additional Information

• Indigenous poultry breeds:

• Examples include Aseel, Kadaknath, and Chittagong, which are known for their adaptability to local climates, disease resistance, and moderate productivity.

• These breeds are typically used for backyard farming and are popular for their flavorful meat and organic eggs.

• Exotic poultry breeds:

• Examples include White Leghorn, Rhode Island Red, and Plymouth Rock, which are known for their high egg and meat production.

• These breeds are commercially bred and perform well in controlled environments but may struggle in extreme climatic conditions.

• Benefits of cross-breeding:

• Hybrid birds exhibit heterosis (hybrid vigor), which enhances growth, reproduction, and survival traits.

• Adaptability to local environmental conditions improves, reducing mortality rates and production losses.

• Higher productivity ensures better economic returns for farmers.

• Other strategies in poultry farming:

• Feed birds twice a day: This is a routine practice but does not directly address the farmer's need for heat tolerance, feed efficiency, or chick quality.

• Shift to fish farming: While this may diversify income, it does not solve the problem related to poultry farming needs.

• Use only indigenous birds: Although indigenous birds are heat-tolerant, they generally have lower productivity compared to crossbred or exotic breeds.

Important Points

• Hybrid vigor: The phenomenon where crossbred offspring show superior traits compared to their parent breeds. This is crucial for enhancing productivity and survivability in poultry.

• Feed conversion ratio (FCR): A key metric in poultry farming that measures the efficiency with which birds convert feed into body mass (meat) or eggs.

• Heat tolerance: Local breeds have physiological and genetic traits that help them thrive in high-temperature regions, which can be passed on to hybrids.

• Economic benefits: Crossbreeding reduces feed costs, increases productivity, and improves the overall profitability of poultry farming operations.

Q9. Answer: (d) Gonorrhoea

The correct answer is Gonorrhoea.

Key Points

• Gonorrhoea is a sexually transmitted disease (STD) caused by the bacterium Neisseria gonorrhoeae.

• The bacterium infects the mucous membranes of the reproductive tract, including the cervix, uterus, and fallopian tubes in women, and the urethra in men and women.

• It is transmitted through sexual contact, including vaginal, oral, and anal sex, with an infected person.

• Symptoms in males may include a burning sensation during urination and discharge from the penis, while females may experience vaginal discharge, pelvic pain, or irregular bleeding. Some cases, however, may remain asymptomatic.

• Untreated gonorrhoea can lead to serious health complications such as pelvic inflammatory disease (PID) in women, infertility in both men and women, and an increased risk of HIV transmission.

Additional Information

• Typhoid:

• Typhoid is a bacterial infection caused by Salmonella typhi.

• It is not sexually transmitted but is spread through contaminated food or water.

• Symptoms include high fever, weakness, abdominal pain, and constipation or diarrhea.

• HIV-AIDS:

• HIV (Human Immunodeficiency Virus) causes AIDS (Acquired Immunodeficiency Syndrome).

• It is a sexually transmitted infection (STI), but it is caused by a virus, not a bacterium.

• HIV weakens the immune system, making individuals more susceptible to infections and certain cancers.

• Warts:

• Warts, particularly genital warts, are caused by certain strains of the Human Papillomavirus (HPV).

• HPV is a sexually transmitted virus, but it is not bacterial in origin.

• Prevention includes vaccination and safe sexual practices.

• Gonorrhoea - Treatment and Prevention:

• Gonorrhoea is treated with antibiotics, typically a combination of ceftriaxone and azithromycin.

• Prevention strategies include the use of condoms, regular STD screenings, and limiting the number of sexual partners.

• Early detection and treatment are crucial to prevent complications and the spread of the infection.

Important Points

• Global Burden: According to the World Health Organization (WHO), there are approximately 87 million new cases of gonorrhoea each year globally.

• Antibiotic Resistance: Gonorrhoea has shown increasing resistance to antibiotics, making it a significant public health concern.

• Co-infections: Individuals with gonorrhoea are at a higher risk of co-infection with other STDs, including HIV.

• Public Health Measures: Education, awareness campaigns, and accessible healthcare services are essential to reducing the prevalence of gonorrhoea and other STDs.

Q10. Answer: (a) 0.6 A

The correct answer is 0.6 A.

Key Points

• The total resistance in a series circuit is the sum of the individual resistances. In this case, the two resistors are 15 Ω and 5 Ω, so the total resistance is:

R_total = R1 + R2 = 15 Ω + 5 Ω = 20 Ω.

• The circuit is powered by a 12 V battery, and the current in a series circuit can be calculated using Ohm's Law, which states:

I = V / R, where:

• I is the current,

• V is the voltage, and

• R is the total resistance.

Substituting the values: I = 12 V / 20 Ω = 0.6 A.

• In a series circuit, the current remains constant throughout all components. Hence, the current flowing through both the 15 Ω resistor and the 5 Ω resistor is 0.6 A.

• The resistors' purpose in the circuit is to limit the current flow according to their resistance values. The higher the resistance, the lower the current for the same voltage source.

• Hence, the current flowing in the circuit is 0.6 A, which corresponds to the correct option.

Additional Information

• Ohm's Law:

• It is a fundamental law of electrical circuits stating the relationship between current (I), voltage (V), and resistance (R): V = I × R.

• This law is applicable to linear circuits where the resistance remains constant regardless of the voltage or current.

• Series Circuits:

• In a series circuit, the total resistance is the sum of all individual resistances: R_total = R1 + R2 + ... + Rn.

• The current is the same through all components in a series circuit.

• The total voltage is the sum of the voltages across each component.

• Power Dissipation in Resistors:

• The power dissipated by a resistor can be calculated using the formula: P = I² × R, or P = V² / R.

• In this circuit, the power dissipated in each resistor would be:

• For the 15 Ω resistor: P = (0.6 A)² × 15 Ω = 5.4 W.

• For the 5 Ω resistor: P = (0.6 A)² × 5 Ω = 1.8 W.

Total power = 5.4 W + 1.8 W = 7.2 W.

• Applications of Series Circuits:

• Series circuits are commonly used in simple electrical systems where the same current needs to flow through multiple components, such as in string lights or battery packs.

• Important Note: If one component in a series circuit fails (e.g., a resistor burns out), the entire circuit becomes open, and current stops flowing.

Important Points

• Resistors in Series vs. Parallel:

• In a series connection, the total resistance increases as resistors are added.

• In a parallel connection, the total resistance decreases as resistors are added.

• Units of Measurement:

• Resistance is measured in Ohms (Ω).

• Voltage is measured in Volts (V).

• Current is measured in Amperes (A).

• Practical Considerations:

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• In real circuits, factors like temperature can affect resistance, causing slight deviations from calculated values.

• Resistors have power ratings (in watts) indicating their ability to dissipate heat without damage.

Q11. Answer: (d) An upward force equal to the weight of fluid displaced by the body

The correct answer is An upward force equal to the weight of fluid displaced by the body.

Key Points

• Archimedes' Principle: It states that when a body is fully or partially immersed in a fluid, it experiences an upward buoyant force equal to the weight of the fluid displaced by it. Hence, the correct statement is that the body experiences an upward force equal to the weight of the displaced fluid.

• Buoyant Force: The upward force exerted by the fluid on the immersed body is termed as the buoyant force. This force acts in the opposite direction of gravity.

• Weight of Displaced Fluid: The weight of the fluid displaced is calculated as the product of the density of the fluid, the volume of the displaced fluid, and the acceleration due to gravity ($W = \rho \times V \times g$).

• Equilibrium Condition: If the buoyant force equals the weight of the body, the body will float. If the weight is greater, the body will sink. If the weight is less, the body will rise until equilibrium is reached.

• Applications: Archimedes' principle is widely used in shipbuilding, designing submarines, hydrometry, and determining the density of an object by submerging it in a fluid.

Additional Information

• History of Archimedes' Principle: This principle was discovered by the ancient Greek mathematician and physicist, Archimedes, around 250 BCE. It is said that he discovered this principle while taking a bath, leading to his famous exclamation, “Eureka!”.

• Buoyancy in Fluids: The principle applies to all fluids, including liquids and gases. For example, helium balloons rise in air because the buoyant force is greater than the weight of the balloon.

• Density and Floating: Objects with a density less than the fluid float, while those with a higher density sink. For example, ice floats on water because its density is lower than that of water.

• Hydrometer: The hydrometer, an instrument used to measure the specific gravity of liquids, operates based on Archimedes' principle. It floats higher or lower in a liquid depending on the liquid's density.

• Submarines: Submarines adjust their buoyancy by filling or emptying ballast tanks with water or air, allowing them to sink, rise, or remain at a specific depth.

Important Points

• Statement Analysis:

• A downward force equal to the weight of fluid displaced by the body: This is incorrect. The force due to the fluid is upward, not downward.

• No change in its weight: Incorrect. The weight of the body remains the same, but the net force acting on the body changes due to the buoyant force.

• An upward force equal to the weight of the body: Incorrect. The upward force depends on the weight of the displaced fluid, not the weight of the body.

• An upward force equal to the weight of fluid displaced by the body: Correct. This statement aligns with Archimedes' principle.

• Practical Examples:

• Ships: Ships are designed to displace a volume of water equal to their weight, ensuring they float.

• Hot Air Balloons: They rise because the hot air inside is less dense than the surrounding cooler air, creating buoyant force.

• Floating Icebergs: Only a small portion of an iceberg is visible above water due to its density being slightly less than seawater.

Q12. Answer: (b) to prevent unplanned pregnancies

The correct answer is to prevent unplanned pregnancies.

Key Points

• Contraception refers to methods or devices used to prevent pregnancy during sexual activity. It allows individuals or couples to plan and control the timing and number of their children.

• The primary aim of contraception is to prevent unplanned pregnancies, ensuring that families can make informed decisions about parenthood. Hence, this statement is correct.

• Contraception is a significant part of reproductive health, promoting physical, emotional, and economic well-being by allowing spacing or limiting the number of children.

• It also helps in reducing the risk of maternal and child mortality, as planned pregnancies are generally safer for both the mother and child.

• Various methods of contraception include barrier methods (e.g., condoms), hormonal methods (e.g., birth control pills), intrauterine devices (IUDs), and permanent methods like sterilization.

Additional Information

• Importance of Contraception:

• It helps in controlling the global population growth, which is crucial for sustainable development and resource management.

• Contraception reduces the risk of sexually transmitted infections (STIs) like HIV when barrier methods such as condoms are used.

• It prevents teenage pregnancies, enabling young individuals to complete their education and achieve their career goals.

• Family planning through contraception contributes to gender equality, as it empowers women to take control of their reproductive health.

• Popular Contraceptive Methods and Their Features:

• Barrier Methods: Includes condoms and diaphragms; these are physical devices that block sperm from reaching the egg.

• Hormonal Methods: Includes oral contraceptive pills, patches, and injections; these regulate hormones to prevent ovulation.

• Intrauterine Devices (IUDs): T-shaped devices inserted into the uterus to prevent pregnancy; they can be hormonal or copper-based.

• Permanent Methods: Includes surgical procedures like vasectomy (for males) and tubal ligation (for females) for irreversible contraception.

• Unplanned Pregnancies:

• An unplanned pregnancy occurs when a pregnancy is unintended at the time of conception.

• According to the World Health Organization (WHO), approximately 121 million unintended pregnancies occur globally each year.

• Unplanned pregnancies can result in health complications, financial burdens, and emotional stress for individuals or families.

• Global Initiatives:

• The Family Planning 2020 (FP2020) initiative aims to expand access to contraceptives globally, particularly in developing countries.

• The Indian government promotes contraception through its National Family Planning Programme, which offers free or subsidized contraceptive methods to the population.

Important Points

• Option Analysis:

• Option 1: "To have more babies" is incorrect as contraception is designed to prevent pregnancy, not facilitate it.

• Option 2: "To prevent unplanned pregnancies" is correct as the primary purpose of contraception is to allow individuals to plan for pregnancy. Hence, this is the correct answer.

• Option 3: "To make babies healthy" is incorrect as contraception does not directly influence the health of babies; it prevents pregnancies instead.

• Option 4: "To make twin babies" is incorrect as contraception does not determine the number of babies conceived.

• Contraception is a critical tool in achieving public health goals such as reducing maternal mortality, preventing unsafe abortions, and improving family welfare.

Q13. Answer: (b) Aperture

The correct answer is Aperture.

Key Points

• The effective diameter of the circular outline of a spherical lens is called the aperture. It determines the amount of light that can pass through the lens.

• The aperture of a lens is crucial in controlling the intensity of light entering through the lens and reaching the focal point.

• In optical systems, a larger aperture allows more light to enter, which is essential for applications like telescopes or cameras where brightness is critical.

• The aperture is often represented by a circular boundary or stop that defines the usable portion of the lens for light transmission.

• Unlike other parameters like the focal length or radius of curvature, the aperture directly impacts the field of view and the resolution of the optical system.

Additional Information

• Optical Centre:

• The optical center of a lens is a specific point where light rays pass without deviation.

• It is not related to the diameter or size of the lens but is crucial for understanding light behavior in optical systems.

• The optical center is used to study how a lens bends light to form images.

• Focal Length:

• The focal length of a lens is the distance between the optical center and the focal point where parallel light rays converge or diverge.

• It determines the magnification and field of view of the lens.

• Unlike the aperture, the focal length is a fixed geometrical property of the lens.

• Radius of Curvature:

• The radius of curvature refers to the radius of the spherical surface of the lens or mirror.

• It defines the shape of the lens surface but does not directly influence the amount of light entering the system.

• It is essential for calculating the focal length of the lens.

• Aperture in Practical Applications:

• In photography, the aperture is crucial in determining the depth of field and exposure of an image.

• In telescopes, a larger aperture improves the resolution and brightness of the observed celestial objects.

• In microscopy, the aperture controls the numerical aperture, which influences the resolving power of the microscope.

Important Points

• The aperture is often confused with the focal length, but they serve different purposes in optics. The aperture controls light intensity, while the focal length determines image magnification and focus.

• The size of the aperture is usually adjusted using an iris diaphragm in cameras and microscopes.

• A larger aperture improves brightness but reduces the depth of field, while a smaller aperture increases the depth of field but reduces brightness.

• The aperture is an integral part of optical systems like cameras, telescopes, and microscopes, influencing image quality and system performance.

Q14. Answer: (a) Afforestation

The correct answer is Afforestation.

Key Points

• Afforestation refers to the process of planting trees in areas where there were no previous forest covers. Large dams do not directly contribute to afforestation; instead, they often lead to deforestation due to the submergence of forest areas. Therefore, afforestation is not a consequence of large dams.

• Social problems are a significant consequence of large dams. The construction of dams often leads to the displacement of local communities, including indigenous populations, causing issues like loss of livelihoods, cultural disintegration, and social unrest. Hence, this statement is correct.

• Economic problems arise from the high costs of building and maintaining large dams. These costs can strain government budgets and resources, and in some cases, the economic benefits may not justify the expense. Hence, this statement is correct.

• Deforestation is a direct consequence of large dams, as large tracts of forests are often cleared or submerged to create reservoirs. This leads to biodiversity loss and impacts the ecosystem. Hence, this statement is correct.

Additional Information

• Consequences of Large Dams:

• Environmental Impact: Large dams affect natural water flow and can lead to the destruction of ecosystems, loss of biodiversity, and alteration of riverine habitats.

• Displacement: Dams often necessitate the relocation of thousands of people, causing socio-economic and cultural upheavals.

• Reservoir-Induced Seismicity: The weight of water in reservoirs can trigger seismic activities in some cases.

• Waterlogging and Salinization: Improper irrigation practices associated with large dams can lead to waterlogging and soil salinization, reducing agricultural productivity.

• Alternatives to Large Dams:

• Small Dams: Constructing smaller dams reduces environmental and social costs and provides localized benefits.

• Rainwater Harvesting: A sustainable approach to managing water resources by capturing and storing rainwater for future use.

• Groundwater Recharge: Enhancing natural infiltration of water into underground aquifers to maintain water tables.

• Historical Examples:

• The construction of the Three Gorges Dam in China displaced over 1.3 million people and submerged vast areas of land, including agricultural fields and forests.

• India’s Sardar Sarovar Dam on the Narmada River faced significant criticism for causing large-scale displacement and environmental degradation.

• Global Perspective:

• While large dams provide benefits like hydroelectric power and irrigation, their long-term environmental and social costs often outweigh these advantages.

• Several countries are now focusing on sustainable water management practices and moving away from the construction of large dams.

Important Points

• World Commission on Dams (WCD):

• Established in 1998, the WCD provided guidelines for the planning, construction, and operation of dams to mitigate adverse impacts.
• Its report published in 2000 highlighted the environmental, social, and economic consequences of large dams.
• Legal Framework in India:
• The Environment Protection Act, 1986 mandates environmental impact assessments (EIA) for large dam projects.
• The Forest Conservation Act, 1980 regulates the diversion of forest land for non-forest purposes, including dam construction.

Q15. Answer: (c) Zinc

The correct answer is Zinc.

Key Points

• Zinc is purified by the process of distillation, which is a method of separating substances based on differences in their boiling points.
• Zinc has a relatively low boiling point of 907°C, making it suitable for purification by distillation.
• During the distillation process, zinc is heated to its boiling point, where it vaporizes. The vapor is then condensed back into a pure liquid or solid form, separating it from impurities.
• Other metals like silver, iron, and copper are not typically purified by distillation because their boiling points are significantly higher, making this process inefficient or impractical for them.
• Distillation is an effective method for purifying metals like zinc, cadmium, and mercury, which have low boiling points and can vaporize easily.

Additional Information

• Silver:
• Silver is purified using methods like electrolytic refining and cupellation.
• In electrolytic refining, silver is dissolved in an electrolyte solution, and pure silver is deposited on the cathode.
• Silver has a high boiling point of 2162°C, making distillation impractical for its purification.
• Iron:
• Iron is purified using the blast furnace process or by further refining methods like the Bessemer process.
• Its boiling point is around 2862°C, far too high for distillation to be used as a purification method.
• Methods like reduction and refining are commonly employed to purify iron from its ores.
• Copper:
• Copper is usually purified through electrolytic refining.
• In this process, impure copper is made the anode, and pure copper is deposited at the cathode.
• Copper has a boiling point of 2562°C, which also makes distillation unsuitable for its purification.
• Distillation Process:
• Distillation is primarily used for metals with low boiling points, as it relies on the vaporization and condensation of the metal.
• It is commonly used for metals like zinc, cadmium, and mercury due to their relatively low boiling points.
• Impurities with higher boiling points remain as residues, allowing the metal to be purified effectively.

Important Points

• Boiling Points of Metals:
• Zinc: 907°C
• Silver: 2162°C
• Iron: 2862°C
• Copper: 2562°C
• Suitability of Distillation:
• Metals with low boiling points, like zinc, are ideal for distillation-based purification.
• High-boiling-point metals require alternative purification methods such as electrolytic refining or reduction.

Q16. Answer: (d) Gases have loosely packed particles with large intermolecular spaces

The correct answer is Gases have loosely packed particles with large intermolecular spaces.

Key Points

• Compression of Gases: Gases can be compressed easily because their particles are loosely packed and have large intermolecular spaces. This characteristic allows them to be compressed into smaller volumes by applying pressure.
• Intermolecular Space: The particles of gases are separated by large distances as compared to solids and liquids, which is why they are highly compressible.

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• Kinetic Energy: Gas particles have high kinetic energy, which allows them to move freely and occupy any available space. This movement creates significant gaps between particles.

• Absence of Fixed Shape and Volume: Gases do not have a fixed shape or volume, which makes them easier to compress compared to solids, which are rigid, and liquids, which have fixed volume but no fixed shape.

• Applications: The compressibility of gases is utilized in various applications, such as in compressed gas cylinders used in industries, medical oxygen tanks, and LPG cylinders for domestic purposes.

Additional Information

• Characteristics of Gases:

• Gases have no definite shape or volume and take the shape of their container.

• The particles in gases are in constant random motion, colliding with each other and the walls of the container.

• The compressibility of gases is due to the large amount of empty space between particles.

• Comparison with Solids and Liquids:

• Solids: Particles are tightly packed, with very little space between them, making them incompressible.

• Liquids: Particles are closer than in gases but not as tightly packed as in solids. Liquids are slightly compressible, but the effect is negligible compared to gases.

• Boyle's Law:

• Boyle's Law states that the pressure of a gas is inversely proportional to its volume at a constant temperature.

• This principle demonstrates the compressibility of gases, as increasing pressure decreases the volume of gas due to reduced space between particles.

• Real-World Applications:

• Compressed gases are used in industries for operations such as welding and cutting.

• Medical oxygen cylinders are compressed to store large amounts of oxygen in portable containers.

• Refrigerators and air conditioners use compressed gases in their cooling systems.

Important Points

• Option 1: Gases do not have low kinetic energy. In fact, they have high kinetic energy, which allows their particles to move freely. Hence, this option is incorrect.

• Option 2: Gases have low mass and density compared to solids and liquids, but this does not explain their compressibility. Hence, this option is incorrect.

• Option 3: Gases occupy space and have volume, even though they lack a fixed shape. Hence, this option is incorrect.

• Option 4: The correct explanation is that gases have loosely packed particles with large intermolecular spaces, which makes them compressible. Hence, this option is correct.

Q17. Answer: (d) Carbon atoms are attached to the main carbon chain, forming side groups.

The correct answer is Carbon atoms are attached to the main carbon chain, forming side groups..

Key Points

• In a branched-chain structure, carbon atoms are arranged such that some carbon atoms are attached to the main carbon chain as side groups.

• The main chain refers to the longest continuous sequence of carbon atoms, while the side chains or branches consist of smaller carbon groups attached to the primary chain.

• These branches are often referred to as alkyl groups (e.g., methyl, ethyl), which are formed by the removal of one hydrogen atom from an alkane.

• This structural arrangement leads to isomerism in organic compounds, where compounds with the same molecular formula have different structural arrangements.

• Branched chains impact the physical and chemical properties of compounds, such as boiling points and reactivity, due to differences in molecular geometry and intermolecular forces.

Additional Information

• Characteristics of Branched Carbon Chains:

• Branched chains are non-linear structures formed by carbon atoms.

• They exhibit lower boiling points compared to straight-chain structures of the same molecular formula due to weaker van der Waals forces.

• Branched hydrocarbons are often less dense and more volatile than their straight-chain counterparts.

• Comparison with Other Structures:

• Straight Chain: Carbon atoms are arranged in a continuous, linear sequence (e.g., n-butane).

• Cyclic Structures: Carbon atoms form a closed ring, such as in cycloalkanes (e.g., cyclohexane).

• Examples of Branched Compounds:
• Isobutane: A branched isomer of butane with the molecular formula C4H10.
• 2-Methylpropane: An example of a branched-chain alkane derived from propane.
• Isomerism in Organic Chemistry:
• Structural isomerism occurs when compounds with the same molecular formula differ in their bonding arrangements.
• Branched isomers often display unique chemical and physical properties compared to their straight-chain counterparts.

Important Points

• Option 1: Incorrect. Carbon atoms bonded to four different atoms refer to a chiral center, not a branched chain.
• Option 2: Incorrect. A continuous, straight line refers to a straight-chain structure, not a branched one.
• Option 3: Incorrect. A closed ring structure describes cyclic compounds, not branched chains.
• Option 4: Correct. Branched chains are characterized by carbon atoms attached as side groups to the main carbon chain.

Q18. Answer: (b) Resistivity

The correct answer is Resistivity.

Key Points

• Resistivity is a characteristic property of a material as it depends solely on the material and not on its shape or size.
• It is defined as the inherent opposition of a material to the flow of electric current. The formula for resistivity is: ρ = R × A / L, where:
• ρ is the resistivity of the material.
• R is the resistance.
• A is the cross-sectional area.
• L is the length of the conductor.
• Unlike resistance, which depends on the material's dimensions, resistivity is a fixed property for a specific material at a given temperature.
• Resistivity is measured in ohm-meters (Ω·m) in the SI system.
• It is used to classify materials as conductors (low resistivity), semiconductors (moderate resistivity), and insulators (high resistivity).

Additional Information

• Resistance:
• Resistance is the measure of how much a material opposes the flow of electric current. It depends on the material's resistivity, its dimensions (length and cross-sectional area), and the temperature.
• The formula for resistance is R = ρ × L / A, where ρ is resistivity, L is length, and A is cross-sectional area.
• Resistance is measured in ohms (Ω).
• Voltage:
• Voltage is the electric potential difference between two points. It is the driving force that pushes current through a circuit.
• It is measured in volts (V).
• Voltage depends on the power supply or source and not on the material's properties.
• Current:
• Current is the flow of electric charge through a conductor. It is measured in amperes (A).
• It depends on the voltage across the conductor and the resistance of the material, as described by Ohm's Law: I = V / R.
• Applications of Resistivity:
• Resistivity is used in designing electrical components like resistors and heating elements.
• It helps in selecting materials for specific applications (e.g., copper for wires due to low resistivity, rubber for insulation due to high resistivity).
• Resistivity measurements are also used in geophysics to identify different types of rocks and minerals.

Important Points

• Temperature Dependence:
• Resistivity of most materials increases with temperature (e.g., metals).
• In semiconductors, resistivity decreases with temperature, making them useful for temperature sensors.
• Examples of Materials and Resistivity:
• Silver: Lowest resistivity among metals (highly conductive).
• Rubber: High resistivity (excellent insulator).
• Silicon: Moderate resistivity (semiconductor).

• Ohm's Law: The relationship between voltage (V), current (I), and resistance (R) is given by V = I × R.

Q19. Answer: (d) Meristematic tissue is located only in specific regions.

The correct answer is Meristematic tissue is located only in specific regions..

Key Points

• Plant growth occurs in specific regions because of the presence of meristematic tissue. These tissues are undifferentiated and actively divide to contribute to the growth of the plant.

• Meristematic tissues are located in certain areas such as the tips of roots and shoots (apical meristems), the circumference of stems and roots (lateral meristems), and certain areas of leaves (intercalary meristems).

• The cells in the meristematic tissue are small, thin-walled, with a dense cytoplasm and large nuclei, making them capable of continuous division.

• Unlike other plant tissues, meristematic tissues do not specialize or mature into permanent tissue, ensuring continuous growth in specific regions.

• Other parts of the plant, such as mature leaves or stems, do not grow because they contain permanent tissues, which are specialized and incapable of division.

• Hence, the correct answer is that growth occurs only in specific regions due to the presence of meristematic tissue.

Additional Information

• Types of Meristematic Tissue:

• Apical Meristems: Found at the tips of roots and shoots, responsible for primary growth, which increases the length of the plant.

• Lateral Meristems: Found in the vascular cambium and cork cambium, responsible for secondary growth, which increases the thickness of the plant.

• Intercalary Meristems: Found at the base of leaves or internodes, responsible for regrowth and elongation in grasses and other monocots.

• Characteristics of Meristematic Tissue:

• Cells are small, with thin cell walls made of cellulose.

• They have a dense cytoplasm and lack vacuoles, as vacuoles are usually present in mature cells for storage.

• The nuclei of these cells are large, aiding in active cell division.

• Meristematic cells are tightly packed without intercellular spaces.

• Functions of Meristematic Tissue:

• Apical meristems help in the elongation of roots and shoots, enabling the plant to grow in height.

• Lateral meristems contribute to the thickening of stems and roots.

• Intercalary meristems play a role in the regrowth of grass after grazing or cutting.

• Why other options are incorrect:

• Option 1 (Water reaches only the upper parts of the plant): Incorrect, because water is transported throughout the plant via the xylem tissue, and its availability does not restrict growth to specific regions.

• Option 2 (Gravity prevents growth in certain regions): Incorrect, as gravity influences the direction of growth (geotropism), not the occurrence of growth itself.

• Option 3 (Only some parts of the plant receive sunlight): Incorrect, because although sunlight is essential for photosynthesis, it is not a limiting factor for growth in specific regions. Growth depends on the presence of meristematic tissue, not sunlight distribution.

Important Points

• Plants exhibit indeterminate growth, meaning they can grow throughout their lifetime due to the presence of meristematic tissue.

• Growth in plants is categorized into two types: Primary Growth (increase in length) and Secondary Growth (increase in thickness).

• Meristematic tissues are also responsible for the healing of wounds in plants, as they can divide and differentiate into new cells.

• Some plants, such as grasses, rely heavily on intercalary meristems to recover quickly from grazing or mowing, ensuring survival and regrowth.

Q20. Answer: (d) Both (iii) and (iv)

The correct answer is Both (iii) and (iv).

Key Points

• Statement (i): "The angle of incidence is smaller than the angle of refraction." - When light passes from air (less dense medium) to glass (denser medium), it bends towards the normal. - The angle of refraction is smaller than the angle of incidence. - Thus, this statement is incorrect.

• Statement (ii): "The angle of incidence is greater than the angle of emergence." - For a glass slab, the angle of incidence and the

angle of emergence are always equal because the ray of light emerges parallel to the incident ray after refraction. - Thus, this statement is incorrect.

• Statement (iii): "The speed of light decreases as the light ray enters from air to glass." - Light travels faster in air than in glass due to the difference in the optical density of the two mediums. - The refractive index (n) of glass is higher than that of air, causing the speed of light to decrease in the glass medium. - This statement is correct.

• Statement (iv): "The incident ray and the emergent ray are parallel to each other." - In a glass slab, the light ray undergoes two refractions: first when entering the glass and second when exiting it. - The incident ray and emergent ray are parallel to each other because the lateral displacement of the light ray occurs within the slab, but the overall direction remains unchanged. - This statement is correct.

Additional Information

• Refraction of Light:

• Refraction is the phenomenon where light changes its direction as it passes from one medium to another due to a change in its speed.

• The amount of bending depends on the refractive index of the two media involved.

• The Snell's Law formula is: $n1 \sin(\theta 1) = n2 \sin(\theta 2)$, where n1 and n2 are the refractive indices, and $\theta 1$ and $\theta 2$ are the angles of incidence and refraction.

• Refractive Index:

• The refractive index (n) is a measure of how much the speed of light decreases in a given medium. For example: - Air: $n \approx 1$ - Glass: $n \approx 1.5$

• A higher refractive index indicates a denser medium and a greater bending of light.

• Lateral Displacement in a Glass Slab:

• When a light ray passes through a parallel-sided glass slab, the emergent ray is displaced laterally but remains parallel to the incident ray.

• The lateral displacement depends on: - Thickness of the slab - Angle of incidence - Refractive index of the medium

• Applications of Refraction:

• Used in lenses to focus or disperse light (e.g., eyeglasses, cameras, microscopes).

• Explains natural phenomena such as the formation of rainbows and mirages.

• Essential in optical instruments like prisms and spectrometers.

Important Points

• Critical Angle and Total Internal Reflection:

• When light travels from a denser to a rarer medium, it bends away from the normal.

• If the angle of incidence exceeds the critical angle, total internal reflection occurs.

• Snell's Law and its Importance:

• Snell's Law governs the relationship between angles of incidence and refraction for two mediums.

• It is widely used in designing optical fibers and lenses.

Q21. Answer: (d) Electrons are spread randomly in a positively charged sphere.

The correct answer is Electrons are spread randomly in a positively charged sphere..

Key Points

• Thomson's Model of Atom (proposed by J.J. Thomson in 1904) is often referred to as the "Plum Pudding Model" or "Watermelon Model."

• According to this model, an atom consists of a positively charged sphere in which electrons are embedded randomly, similar to seeds in a watermelon.

• Thomson proposed that the positive charge is uniformly distributed across the sphere, and the negatively charged electrons are scattered within it, ensuring an overall neutral charge of the atom.

• The correct statement from the options given is "Electrons are spread randomly in a positively charged sphere" as this is the key feature of Thomson's model.

• This model was significant as it was the first scientific attempt to describe the structure of an atom, even though it was later disproved by Ernest Rutherford's gold foil experiment.

Additional Information

• Key Features of Thomson's Model:

• The atom is a neutral entity, meaning the total positive charge is equal to the total negative charge.

• Electrons (negatively charged particles) are embedded within a sphere of positive charge, like "plums in a pudding."

• The atom's mass is primarily concentrated within the positively charged sphere.

• This model did not explain the arrangement of electrons or the stability of atoms during chemical reactions.

• Disproval of Thomson's Model:

• In 1911, Ernest Rutherford conducted the gold foil experiment, which revealed that atoms have a small, dense, positively charged nucleus at their center, leading to the development of the Rutherford Model of the Atom.

• Thomson's model failed to explain the scattering of alpha particles observed in Rutherford's experiment.

• Other Atomic Models:

• Rutherford's Nuclear Model: Proposed the existence of a nucleus, with electrons revolving around it in circular orbits.

• Bohr's Model: Improved Rutherford's model by introducing quantized orbits for electrons to explain atomic stability and spectral lines.

• Quantum Mechanical Model: The modern model of the atom based on the principles of quantum mechanics, describing electron behavior as a probability distribution.

• Applications of Thomson's Discovery:

• The discovery of electrons paved the way for understanding electricity, magnetism, and chemical bonding.

• The identification of subatomic particles laid the foundation for modern physics and chemistry.

• Thomson's work earned him the Nobel Prize in Physics in 1906 for his discovery of the electron.

Important Points

• Statement Analysis:

• Statement 1: "Electrons are concentrated in the nucleus" – Incorrect. Electrons are not located in the nucleus; the nucleus contains protons and neutrons.

• Statement 2: "Electrons are attached to neutrons" – Incorrect. Electrons are negatively charged particles and are not attached to neutrons, which are neutral.

• Statement 3: "Electrons are fixed in the orbits" – Incorrect. This concept belongs to Bohr's atomic model, not Thomson's model.

• Statement 4: "Electrons are spread randomly in a positively charged sphere" – Correct. This is the core idea of Thomson's model.

• Historical Context: Thomson's model was proposed in 1904, and it was a significant step in understanding atomic structure, despite its limitations.

• Scientific Contributions: J.J. Thomson's discovery of the electron revolutionized the field of physics and chemistry, providing insights into the nature of matter.

Q22. Answer: (d) dehydration

The correct answer is dehydration.

Key Points

• Ethanol (C_2H_5OH) undergoes a chemical reaction in the presence of concentrated sulphuric acid (H_2SO_4) when heated at 443 K.

• This reaction leads to the removal of a water molecule (H_2O) from ethanol, producing ethene (C_2H_4). This process is called dehydration.

• Concentrated sulphuric acid acts as a dehydrating agent in this reaction, facilitating the removal of water.

• The chemical equation for the reaction is:

$C_2H_5OH \rightarrow C_2H_4 + H_2O$

• This reaction is an example of an elimination reaction, where a single compound splits into two products.

• Hence, the correct answer is dehydration.

Additional Information

• Dehydration Reaction:

• A dehydration reaction involves the removal of a water molecule from a compound.

• It is a common reaction in organic chemistry, especially in the conversion of alcohols to alkenes.

• Example: Ethanol to ethene is a classic example of a dehydration reaction.

• Role of Sulphuric Acid:

• Concentrated sulphuric acid acts as a dehydrating agent by absorbing water formed during the reaction.

• It also acts as a catalyst to facilitate the reaction.

• Ethene:

• Ethene (C_2H_4) is an alkene and the simplest member of the alkene family.

• It is a colorless gas with a slightly sweet odor and is widely used in the production of plastics like polyethylene.

• Other Reaction Types:

• Oxidation: Involves the addition of oxygen or removal of hydrogen. Ethanol, when oxidized, forms acetic acid, not ethene.

• Reduction: Involves the removal of oxygen or the addition of hydrogen. This is not applicable in this context.

• Halogenation: Involves the addition of halogen atoms (e.g., Cl, Br). This does not occur in this reaction.

Important Points

• The reaction is temperature-sensitive. Heating ethanol to 443 K is essential to initiate the dehydration process.

• Concentrated sulphuric acid must be used in excess to ensure complete dehydration.

• The reaction pathway involves the formation of a carbocation intermediate, which then eliminates water to form ethene.

• Dehydration reactions are widely used in industrial processes to produce alkenes, which are essential in the production of polymers and other chemicals.

Q23. Answer: (b) 1,2-dibromoethane

The correct answer is 1,2-dibromoethane.

Key Points

• Reaction of Ethene with Bromine: Ethene (C2H4) reacts with bromine (Br2) in an addition reaction to form 1,2-dibromoethane (C2H4Br2).

• Addition Reaction: In this process, the double bond in ethene breaks, and the bromine atoms attach to the two carbon atoms, creating a saturated compound, 1,2-dibromoethane.

• Type of Reaction: This is an example of an electrophilic addition reaction, where the bromine molecule acts as an electrophile and reacts with the electron-rich double bond of ethene.

• Product Formation: The bromine adds across the double bond of ethene, forming a compound where one bromine atom is attached to each carbon atom, resulting in 1,2-dibromoethane.

• Observation: When bromine reacts with ethene, the reddish-brown color of bromine disappears, indicating the formation of a colorless compound (1,2-dibromoethane).

Additional Information

• Ethene:

• Ethene (C2H4) is an unsaturated hydrocarbon containing a double bond between its two carbon atoms.

• It is the simplest alkene and a colorless, flammable gas with a sweet odor.

• Ethene is widely used in the chemical industry, especially in the production of polyethylene (a type of plastic).

• Bromine:

• Bromine (Br2) is a reddish-brown liquid at room temperature and is highly reactive.

• It is a halogen and participates in addition reactions with alkenes like ethene.

• 1,2-Dibromoethane:

• 1,2-Dibromoethane is a colorless liquid with the chemical formula C2H4Br2.

• It is commonly used as a fumigant for soil and agricultural products, although its use has been restricted due to health concerns.

• Electrophilic Addition Reaction:

• This reaction occurs when an electrophile (in this case, bromine) reacts with a compound containing a double bond.

• The double bond in ethene breaks, and the electrophile bonds to the carbon atoms.

• Other Options Explained:

• Ethane: Ethane (C2H6) is formed by the hydrogenation of ethene, not by its reaction with bromine. This option is incorrect.

• Ethanol: Ethanol (C2H5OH) is produced by the hydration of ethene in the presence of a catalyst, not by its reaction with bromine. This option is incorrect.

• Bromoethane: Bromoethane (C2H5Br) is formed when ethene reacts with hydrogen bromide, not bromine. This option is incorrect.

Important Points

• Halogenation Reaction: The reaction of alkenes with halogens like bromine is a halogenation reaction, leading to the formation of dihalogenated compounds.

• Test for Unsaturation: The decolorization of bromine water is a standard test to identify the presence of double bonds (unsaturation) in organic compounds.

• Industrial Importance: Halogenated compounds like 1,2-dibromoethane are used in organic synthesis and as intermediates in the production of other chemicals.

Q24. Answer: (d) Assertion is false but reason is true.

The correct answer is Assertion is false but reason is true..

Key Points

• Assertion: Sound waves are non-mechanical waves.

• This statement is false. Sound waves are, in fact, mechanical waves because they require a medium (such as air, water, or a

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solid) to propagate. They transfer energy through the vibration of particles in the medium.

• Reason: Sound waves require a material medium for their propagation.

• This statement is true. Sound waves cannot travel through a vacuum because they depend on the vibration of particles in a material medium to propagate.

• The correct explanation lies in the nature of sound waves. They are longitudinal mechanical waves, meaning the particles of the medium vibrate parallel to the direction of wave propagation.

• Examples of sound wave transmission include:

• Sound traveling through air (e.g., human speech).

• Sound traveling through water (e.g., sonar technology).

• Sound traveling through solids (e.g., vibrations in a metal rod).

• Conclusion: Since the assertion claims that sound waves are non-mechanical (incorrect), and the reason correctly states that sound waves require a material medium, the answer is "Assertion is false but reason is true."

Additional Information

• Characteristics of Sound Waves:

• Sound waves are longitudinal waves, meaning the particle displacement is parallel to the direction of wave propagation.

• They are mechanical waves, requiring a material medium (air, water, or solid) to travel.

• Sound cannot travel in a vacuum because there are no particles to transmit the vibrations.

• The speed of sound depends on the medium's properties. For instance:

• In air at 20°C, the speed of sound is approximately 343 m/s.

• In water, it is around 1482 m/s.

• In solids like steel, it can reach up to 5000 m/s.

• Types of Mechanical Waves:

• Longitudinal Waves: Particles of the medium vibrate parallel to the wave's direction of travel. Examples: Sound waves, seismic P-waves.

• Transverse Waves: Particles of the medium vibrate perpendicular to the wave's direction of travel. Examples: Water waves, light waves (electromagnetic, non-mechanical).

• Difference Between Mechanical and Non-Mechanical Waves:

• Mechanical Waves: Require a material medium for propagation (e.g., sound, water waves).

• Non-Mechanical Waves: Do not require a medium and can propagate through a vacuum (e.g., electromagnetic waves like light, radio waves).

• Applications of Sound Waves:

• Ultrasound: Used in medical imaging and diagnostics.

• Sonar: Used in submarines and underwater navigation.

• Communication: Human speech and various audio technologies like telephones and speakers.

Important Points

• Speed of Sound in Different Media:

• Sound travels faster in solids than in liquids, and faster in liquids than in gases due to the closer particle arrangement in solids.

• Echo: The reflection of sound waves from a surface back to the listener. Used in echolocation by animals like bats and dolphins.

• Noise vs. Music: Sound waves can be categorized based on their regularity:

• Noise: Irregular and disorganized sound waves.

• Music: Regular and organized sound waves producing harmonious sounds.

Q25. Answer: (c) a and b only

The correct answer is a and b only.

Key Points

• Olfactory indicators are substances whose smell changes when exposed to acidic or basic environments. This characteristic makes them useful in determining whether a solution is acidic or basic. Hence, statement a is correct.

• Clove oil is one of the examples of olfactory indicators. Its smell changes depending on whether it is in an acidic or basic medium. Hence, statement b is correct.

• Clove oil is not used to test the purity of compounds. Its primary role is as an olfactory indicator for identifying the nature of solutions (acidic or basic), not for purity testing. Hence, statement c is incorrect.

• Therefore, the correct answer is a and b only.

Additional Information

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• Olfactory Indicators:
• Olfactory indicators are substances that exhibit a change in smell when exposed to acidic or basic solutions.
• These indicators are particularly useful in laboratories where their unique smell can help identify the nature of a compound.
• Examples of olfactory indicators include clove oil, vanilla essence, and onion extract.
• They are primarily utilized in qualitative analysis to identify acids and bases.
• Clove Oil:
• Clove oil is extracted from the clove plant and contains eugenol, which gives it its characteristic smell.
• It is a widely recognized olfactory indicator due to the noticeable change in smell when exposed to acidic or basic environments.
• Clove oil has applications in aromatherapy and as a flavoring agent besides its use as an olfactory indicator.
• It is not employed for checking the purity of compounds; rather, it is used for identifying the acidic or basic nature of solutions.
• Other Types of Indicators:
• Natural Indicators: Substances like turmeric, litmus, and red cabbage extract are used to distinguish between acidic and basic solutions based on color change.
• Synthetic Indicators: Examples include phenolphthalein and methyl orange, which exhibit distinct color changes in acidic or basic solutions.
• Universal Indicators: These are mixtures of indicators that provide a range of colors for different pH levels, giving a more precise measurement of acidity or alkalinity.

Important Points

• Applications of Indicators:
• Indicators are essential in titration experiments to determine the endpoint of a reaction.
• They help identify the pH of solutions in various scientific and industrial processes.
• Olfactory indicators are specifically useful in environments where visual indicators may not be practical.
• Limitations:
• Olfactory indicators may not work effectively if the smell of the solution itself is overpowering.
• These indicators are qualitative and may not provide precise measurements of pH.

Q26. Answer: (d) 72

Shortcut Trick

Net buckets change in the tank = 12 (removed) − 9 (poured) = 3 buckets.

Initial level = 5/8 | Final level = 7/12.

Fractional difference = 5/8 − 7/12 = (15 − 14) / 24 = 1/24.

Since 1/24 of the total capacity = 3 buckets,

Total capacity = 3 × 24 = 72 buckets.

Therefore The correct answer is 72 buckets.

Alternate Method

Given:

Initial water level = 5/8 of capacity

Water taken out = 12 buckets

Water poured in = 9 buckets

Final water level = 7/12 of capacity

Let the total capacity of the tank be x buckets.

=> Initial water quantity = (5/8)x

=> Net reduction in water = 12 − 9 = 3 buckets

=> Final water quantity = (5/8)x − 3

According to the problem:

=> (5/8)x − 3 = (7/12)x

=> (5/8)x − (7/12)x = 3

=> (15x − 14x) / 24 = 3

=> x / 24 = 3

=> x = 3 × 24

=> x = 72 buckets

Therefore The correct answer is 72 buckets.

Additional Information

Fraction Comparison via LCM

To find the difference between two fractions like 5/8 and 7/12, we must use the Least Common Multiple (LCM) of the denominators (8, 12), which is 24.

Unitary Method for Total Quantity

If 1/n part of a total quantity is equal to a value 'v', then the total quantity is calculated as v × n.

Percentage Conversion

To convert a fraction to a percentage, multiply by 100. For example, 5/8 = 62.5% and 7/12 ≈ 58.33%.

Q27. Answer: (a) 30°

Shortcut Trick

Let the height of the building be h.

The base distance is given as √3 × h.

In a right-angled triangle, tan θ = Height ÷ Base = h ÷ (√3h) = 1/√3.

Since tan 30° = 1/√3, the angle of elevation must be 30°.

Therefore The correct answer is 30°.

Alternate Method

Given:

Let the height of the building (AB) = h

Distance of the point from the base (BC) = √3 × h

Formula Used:

In ΔABC, tan θ = Perpendicular (AB) ÷ Base (BC)

Calculations:

=> tan θ = h ÷ (√3h)

=> tan θ = 1 ÷ √3

=> θ = tan^(−1)(1/√3)

=> θ = 30°

Therefore The correct answer is 30°.

Additional Information

Trigonometric Ratios for 30-60-90 Triangles

In a 30°-60°-90° triangle, the ratio of sides opposite to the angles is 1 : √3 : 2.

Angle of Elevation

It is the angle formed between the horizontal line and the line of sight when looking up at an object.

Standard Tan Values

tan 30° = 1/√3, tan 45° = 1, and tan 60° = √3.

Q28. Answer: (b) 3.24%

Shortcut Trick

When a value is first increased by x% and then decreased by x%, there is always an overall decrease.

Overall Percentage Decrease = (x²/100)%

Here, x = 18

Overall Decrease = (18²/100)% = 324/100 = 3.24%

Therefore The correct answer is 3.24%.

Alternate Method

Given:

Initial percentage increase = 18%

Subsequent percentage decrease = 18%

Formula Used:

Effective Percentage Change = a + b + (a × b)/100

Calculations:

=> Let a = +18 and b = −18

=> Net change = 18 + (−18) + (18 × (−18))/100

=> Net change = 0 − 324/100
=> Net change = −3.24%
=> Negative sign indicates a decrease.
Therefore The correct answer is 3.24%.
Additional Information
Successive Percentage Change
Used when a value is changed multiple times. Formula: Result = Initial × (1 ± r1/100) × (1 ± r2/100).
Same Percentage Increase and Decrease
If a price is increased by x% and then decreased by x%, the net change is always a decrease of $x^2/100$ %.
Base Value Concept
The second percentage change is applied to the new value (118% of original), not the original 100% base.

Q29. Answer: (c) 90

Given:
20% of a number + 96 = Same number
We need to find 75% of the same number.
Formula used:
Let the number be x.
20% of x = (20/100) × x = 0.2x
Equation: 0.2x + 96 = x
75% of x = (75/100) × x = 0.75x
Calculation:
0.2x + 96 = x
=> x - 0.2x = 96
=> 0.8x = 96
=> x = 96 ÷ 0.8
=> x = 120
75% of x = 0.75 × 120
=> 75% of x = 90
Therefore The correct answer is option (3).

Q30. Answer: (a) 1776

Shortcut Trick
Ratio A : B = 4 : 8 = 1 : 2 and C : B = 10 : 18 = 5 : 9.
Combined Ratio A : B : C = (1×9) : (2×9) : (5×2) = 9 : 18 : 10.
Difference between A and C is 10 − 9 = 1 unit = 48 cm.
Total length = 9 + 18 + 10 = 37 units = 37 × 48 = 1776 cm.
Therefore The correct answer is 1776 cm.
Alternate Method
Given: Ratio A : B = 4 : 8, Ratio C : B = 10 : 18, Difference |C − A| = 48 cm.
Calculations:
=> A : B = 1 : 2
=> B : C = 18 : 10 = 9 : 5
=> To equalize B, multiply (A : B) by 9 and (B : C) by 2.
=> A : B : C = 9 : 18 : 10
=> Difference (C − A) = 10x − 9x = x
=> x = 48 cm
=> Total Length = (9 + 18 + 10)x = 37 × 48
=> Total Length = 1776 cm
Therefore The correct answer is 1776 cm.
Additional Information
Compound Ratio

When combining two ratios like A:B and B:C, the common term B must be made equal by multiplying with suitable constants.

Ratio Scaling

If a : b = m : n, then a = mk and b = nk, where k is the constant of proportionality or the value of one unit.

Q31. Answer: (c) Decreases by 37.28%

Shortcut Trick

Using the Multiplying Factor method for successive changes:

Net Factor = 0.8 × 0.7 × 0.8 × 1.4 = 0.6272

Percentage Change = (1 − 0.6272) × 100 = 37.28% decrease.

Therefore The correct answer is Decreases by 37.28%.

Alternate Method

Given: Successive changes of −20%, −30%, −20% and +40%.

Let the Original Price be 100 units.

=> Price after 1st month = 100 − 20% of 100 = 80

=> Price after 2nd month = 80 − 30% of 80 = 80 − 24 = 56

=> Price after 3rd month = 56 − 20% of 56 = 56 − 11.2 = 44.8

=> Price after 4th month = 44.8 + 40% of 44.8 = 44.8 + 17.92 = 62.72

=> Net Decrease = 100 − 62.72 = 37.28 units

=> Percentage Decrease = (37.28 / 100) × 100 = 37.28%

Therefore The correct answer is Decreases by 37.28%.

Additional Information

Successive Percentage Formula

For two successive changes of a% and b%, the net change is given by (a + b + ab/100)%.

Multiplying Factor (MF)

For an x% increase, MF = (1 + x/100). For an x% decrease, MF = (1 − x/100). Final Value = Initial Value × MF1 × MF2 × ...

Successive Discount

Successive decreases are treated similarly to successive discounts where the total effective discount is always less than the sum of individual percentages.

Q32. Answer: (d) 1 : 2

Shortcut Trick

Ratio of ages of Parul and Mother = 5 : 13

Product of ratio parts = 5 × 13 = 65 units²

65 units² = 585 => 1 unit² = 9 => 1 unit = 3

Present ages: Parul = 5 × 3 = 15 years, Mother = 13 × 3 = 39 years

After 9 years: (15 + 9) : (39 + 9) = 24 : 48 = 1 : 2

Therefore The correct answer is 1 : 2.

Alternate Method

Given:

Present age ratio = 5 : 13

Product of ages = 585

Let the ages of Parul and her Mother be 5x and 13x respectively.

=> 5x × 13x = 585

=> 65x² = 585

=> x² = 585 ÷ 65

=> x² = 9

=> x = 3

=> Parul's present age = 5 × 3 = 15 years

=> Mother's present age = 13 × 3 = 39 years

=> Ratio after 9 years = (15 + 9) : (39 + 9)

=> Ratio = 24 : 48

=> Ratio = 1 : 2

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Therefore The correct answer is 1 : 2.

Additional Information

Ratio of Ages

If the current ratio is a:b, then after 'n' years, the ages become (ax + n) and (bx + n).

Age Difference

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

Product of Ages Property

When the product of ages is given in a ratio ax : bx, the constant x is found using x = √(Product ÷ (a × b)).

Q33. Answer: (d) 1,644 m²

Shortcut Trick

Base of triangle formed = Difference in parallel sides = 77 − 60 = 17 m.

Triangle sides are 17, 25, 26. Semi-perimeter (s) = 34. Area = √(34 × 17 × 9 × 8) = 204 m².

Height (h) = (2 × Area) ÷ base = (2 × 204) ÷ 17 = 24 m.

Area of trapezium = (Sum of parallel sides ÷ 2) × h = (137 ÷ 2) × 24 = 137 × 12 = 1,644 m².

Therefore The correct answer is 1,644 m².

Alternate Method

Given: Parallel sides a = 60 m and b = 77 m. Non-parallel sides c = 25 m and d = 26 m.

Formula Used: Area of trapezium = (1/2) × (Sum of parallel sides) × height (h). Heron's formula for triangle area = √(s(s−a)(s−b)(s−c)).

Step 1: Find height by creating a triangle and a parallelogram.

=> Base of the triangle = 77 − 60 = 17 m.

=> The sides of this triangle are 25 m, 26 m, and 17 m.

=> Semi-perimeter (s) = (25 + 26 + 17) ÷ 2 = 68 ÷ 2 = 34 m.

=> Area of triangle = √(34 × (34 − 25) × (34 − 26) × (34 − 17))

=> Area of triangle = √(34 × 9 × 8 × 17) = √(17 × 2 × 9 × 4 × 2 × 17)

=> Area of triangle = 17 × 3 × 4 = 204 m².

=> Height of triangle (h) = (2 × Area) ÷ Base = (2 × 204) ÷ 17 = 24 m.

Step 2: Calculate Area of Trapezium.

=> Area = (1/2) × (60 + 77) × 24

=> Area = 137 × 12

=> Area = 1,644 m².

Therefore The correct answer is 1,644 m².

Additional Information

Area of Trapezium

The general formula for the area of a trapezium is (1/2) × (Sum of parallel sides) × perpendicular distance between them.

Isosceles Trapezium

A trapezium is called isosceles if its non-parallel sides are equal. In such cases, the diagonals are also equal in length.

Median of a Trapezium

The median is the line segment connecting the midpoints of the non-parallel sides. Its length is the average of the two parallel sides: L = (a + b) ÷ 2.

Q34. Answer: (c) 8

Shortcut Trick

Apply the Man-Days constant formula: M1 × D1 = M2 × D2

Initial man-days = 48 × 12

New man-days = 72 × D2

48 × 12 = 72 × D2 => D2 = (48 × 12) ÷ 72 = 8 days.

Therefore The correct answer is 8 days.

Alternate Method

Given:

Initial number of persons (M1) = 48

Initial number of days (D1) = 12

Increased number of persons (M2) = 72
Formula Used:
Total Provision = Number of Persons × Number of Days
Calculations:
=> Total Provision = 48 × 12 = 576 units
=> New Number of Days (D2) = Total Provision ÷ M2
=> D2 = 576 ÷ 72
=> D2 = 8 days
Therefore The correct answer is 8 days.
Additional Information
Inverse Proportion
When the amount of provision is constant, the number of persons is inversely proportional to the number of days (M prop. to 1/D).
Work and Wages
Total work done can be represented as M × D × H = W, where H is hours per day and W is the total work or food units.
Chain Rule
For different work amounts: (M1 × D1)/W1 = (M2 × D2)/W2.

Q35. Answer: (d) 82

Shortcut Trick
Teacher's age = New Average + (Initial Students × Increase in Average)
Here, Initial students = 35 and Change in average = 47 − 46 = 1 year.
Teacher's age = 47 + (35 × 1)
Teacher's age = 47 + 35 = 82 years.
Therefore The correct answer is 82 years.
Alternate Method
Given:
Number of students = 35 | Average age of students = 46 years
Total members (including teacher) = 36 | New average age = 47 years
Formula Used:
Total Age = Average Age × Number of Persons
Calculations:
=> Total age of 35 students = 35 × 46 = 1610 years
=> Total age of group including teacher = 36 × 47 = 1692 years
=> Teacher's age = Total age (36 persons) − Total age (35 students)
=> Teacher's age = 1692 − 1610
=> Teacher's age = 82 years
Therefore The correct answer is 82 years.
Additional Information
General Formula for Average
Average = (Sum of all observations) ÷ (Total number of observations).
Inclusion Case
When a new person joins and the average increases, the age of the new person is always greater than the original average.
Net Deviation Method
Sum of deviations from the average is always zero. If the average increases by 1 for 35 people, the incoming person must bring 35 units extra plus the new average value.

Q36. Answer: (b) 59 days

Shortcut Trick
Efficiency Ratio A : B : C = 100 : 25 : 35 = 20 : 5 : 7
Total Work = Efficiency_A × Time_A = 20 × 77 = 1540 units
Work done by B and C in 30 days = (5 + 7) × 30 = 12 × 30 = 360 units
Remaining work = 1540 − 360 = 1180 units

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Time taken by A = 1180 ÷ 20 = 59 days

Therefore The correct answer is 59 days.

Alternate Method

Given: A completes work in 77 days. B is 75% less efficient than A. C is 40% more efficient than B.

Formula Used: Work = Efficiency × Time

Person	Efficiency Calculation	Relative Efficiency
A	Let Efficiency be 100	20
B	100 − 75 = 25	5
C	25 + 40% of 25 = 35	7

=> Total Work = 20 × 77 = 1540 units

=> Work done by B and C in 1 day = 5 + 7 = 12 units

=> Work done by B and C in 30 days = 12 × 30 = 360 units

=> Remaining Work = 1540 − 360 = 1180 units

=> Time taken by A alone = 1180 ÷ 20 = 59 days

Therefore The correct answer is 59 days.

Additional Information

Efficiency and Time Relationship

Efficiency is inversely proportional to time taken. If the ratio of efficiencies of two people is x:y, then the ratio of time taken to complete the same work is y:x.

Work and Wages

Wages are generally distributed in the ratio of the work done by each individual. If they work for the same duration, wages are distributed in the ratio of their efficiencies.

Q37. Answer: (b) 36

Shortcut Trick

For two numbers in the ratio a : b with highest common factor H, the LCM is given by a × b × H.

Ratio = 2 : 3 and HCF = 6

LCM = 2 × 3 × 6 = 36

Therefore The correct answer is 36.

Alternate Method

Given:

Ratio of numbers = 2 : 3

HCF = 6

Calculation:

=> Let the two numbers be 2x and 3x, where x is the HCF.

=> Given x = 6.

=> First number = 2 × 6 = 12

=> Second number = 3 × 6 = 18

=> LCM of 12 and 18:

=> $12 = 2^2 \times 3$

=> $18 = 2 \times 3^2$

=> LCM = $2^2 \times 3^2 = 4 \times 9 = 36$

Therefore The correct answer is 36.

Additional Information

Product Rule

The product of two numbers is always equal to the product of their HCF and LCM (N1 × N2 = HCF × LCM).

Ratio Property

If two numbers are in the ratio x : y (where x and y are co-prime), their HCF is k, then the numbers are kx and ky.

LCM of Fractions

LCM of fractions = (LCM of Numerators) ÷ (HCF of Denominators).

Q38. Answer: (b) 66

Given:

Simplify: ((342 ÷ 19 × 306 ÷ 17) ÷ 36 × 6) + (60 ÷ 5 × 2 - 12)

Formula Used:

Follow BODMAS rule: Brackets, Orders (powers, roots), Division, Multiplication, Addition, Subtraction

Calculation:

=> ((342 ÷ 19 × 306 ÷ 17) ÷ 36 × 6) + (60 ÷ 5 × 2 - 12)

=> (18 × 18 ÷ 36 × 6) + (12 × 2 - 12)

=> (324 ÷ 36 × 6) + (24 - 12)

=> (9 × 6) + 12

=> 54 + 12

=> 66

Therefore The correct answer is option (2).

Q39. Answer: (c) 16

Shortcut Trick

Efficiency of A = (Combined efficiency) − (B efficiency) = 2 − 1 = 1 unit/day.

Total original work = 8 units.

Double work = 8 × 2 = 16 units.

Time taken by A = 16 / 1 = 16 days.

Therefore The correct answer is 16 days.

Alternate Method

Given:

Time taken by (A + B) = 4 days

Time taken by B alone = 8 days

Person	Days	Total Work	Efficiency
A + B	4	8	2
B	8	1	

Calculations:

=> Efficiency of A = Efficiency of (A + B) − Efficiency of B

=> Efficiency of A = 2 − 1 = 1 unit/day

=> Original Work = 8 units

=> Double the Work = 8 × 2 = 16 units

=> Time taken by A for double work = 16 ÷ 1 = 16 days

Therefore The correct answer is 16 days.

Additional Information

Work & Efficiency Relationship

Total Work = Efficiency × Time. Efficiency is inversely proportional to time taken when work is constant.

LCM Method for Work

The easiest way to solve time and work problems is by assuming the Total Work as the Least Common Multiple (LCM) of the given individual days.

Work-Wages Concept

Wages are generally distributed in the ratio of the work done or the ratio of efficiencies of the workers.

Q40. Answer: (a) 12 cm

Shortcut Trick

Given: Total Surface Area = 4 × (Area of two circular faces)

$2\pi r(h + r) = 4 \times (2\pi r^2) \Rightarrow h + r = 4r \Rightarrow h = 3r$

$\text{Volume} = \pi r^2 h = \pi r^2(3r) = 3\pi r^3 = 192\pi \Rightarrow r^3 = 64 \Rightarrow r = 4$ cm

Height $h = 3 \times 4 = 12$ cm

Therefore The correct answer is 12 cm.

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Alternate Method
Given:
Total Surface Area (TSA) = 4 × (Area of two circular bases)
Volume (V) = 192π cm^3
Formula Used:
Area of two circular faces = $2\pi r^2$
Total Surface Area of Cylinder = $2\pi r^2 + 2\pi rh$
Volume of Cylinder = $\pi r^2 h$
Calculations:
=> $2\pi r(h + r) = 4 \times (2\pi r^2)$
=> $2\pi rh + 2\pi r^2 = 8\pi r^2$
=> $2\pi rh = 6\pi r^2$
=> $h = 3r$
=> Volume = $\pi r^2 h = 192\pi$
=> $r^2 \times (3r) = 192$
=> $3r^3 = 192$
=> $r^3 = 64$
=> $r = 4$ cm
=> Height (h) = 3 × 4 = 12 cm
Therefore The correct answer is 12 cm.
Additional Information
Curved Surface Area (CSA)
The area of only the curved side of the cylinder is given by $2\pi rh$.
Hollow Cylinder Volume
For a hollow cylinder with external radius R and internal radius r, the volume is $\pi(R^2 - r^2)h$.
Ratio of CSA to TSA
The ratio of Curved Surface Area to Total Surface Area is h / (h + r).

Q41. Answer: (b) 16 : 27

Shortcut Trick
Ratio Red : Green = 9 : 6 = 3 : 2
Ratio Pink : Red = 18 : 16 = 9 : 8
To find Green : Pink, multiply the ratios: (Green/Red) × (Red/Pink)
=> (2/3) × (8/9) = 16/27
Therefore The correct answer is 16 : 27.
Alternate Method
Given:
Ratio of Red (R) to Green (G) = 9 : 6
Ratio of Pink (P) to Red (R) = 18 : 16
Calculations:
=> R/G = 9/6 = 3/2
=> P/R = 18/16 = 9/8
=> To eliminate Red, we find G/P = (G/R) × (R/P)
=> G/R = 2/3 and R/P = 8/9
=> G/P = (2/3) × (8/9) = 16/27
Therefore The correct answer is 16 : 27.
Additional Information
Compound Ratio
The compound ratio of two ratios a:b and c:d is (a×c) : (b×d).
Inverse Ratio
If the ratio of two quantities is a:b, then its inverse ratio is b:a.
Balancing Ratios

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To combine a:b and b:c, multiply the first ratio by the 'b' value of the second and vice versa to make the common term equal.

Q42. Answer: (d) Rs. 200 Profit

Shortcut Trick

Total Cost Price (CP) = 80 × 8 = Rs. 640.

Selling Price (SP) of 60 pens = 60 × 12 = Rs. 720.

SP of remaining 20 pens at 25% loss = 20 × 8 × 0.75 = Rs. 120.

Total SP = 720 + 120 = Rs. 840.

Profit = 840 − 640 = Rs. 200.

Therefore The correct answer is Rs. 200 Profit.

Alternate Method

Given: Total pens = 80, CP per pen = Rs. 8, 60 pens sold at Rs. 12, remaining at 25% loss.

=> Total Cost Price = 80 × 8 = Rs. 640

=> SP of 1^(st) part = 60 × 12 = Rs. 720

=> Remaining pens = 80 − 60 = 20

=> CP of remaining pens = 20 × 8 = Rs. 160

=> Loss on remaining = 25% of 160 = 160 × (25/100) = Rs. 40

=> SP of 2^(nd) part = 160 − 40 = Rs. 120

=> Total Selling Price = 720 + 120 = Rs. 840

=> Profit = Total SP − Total CP = 840 − 640 = Rs. 200

Therefore The correct answer is Rs. 200 Profit.

Additional Information

Profit and Loss Basics

Profit occurs when SP > CP. Loss occurs when CP > SP. Profit % = (Profit/CP) × 100.

Overall Profit/Loss Percentage

It is calculated as (Total SP − Total CP) ÷ Total CP × 100. In this case, 200/640 × 100 = 31.25%.

Weighted Average Method

Profit/Loss can also be found using ratios of quantities: (3/4 parts at 50% profit) + (1/4 parts at 25% loss).

Q43. Answer: (d) Rs. 8,635.50

Shortcut Trick

Annual interest at 9% on Rs. 95,950 can be calculated as:

Interest = 9% of Rs. 95,950 = (10% − 1%) of Rs. 95,950

10% of Rs. 95,950 = Rs. 9,595

1% of Rs. 95,950 = Rs. 959.50

Interest = Rs. 9,595 − Rs. 959.50 = Rs. 8,635.50

Therefore The correct answer is Rs. 8,635.50.

Alternate Method

Given:

Principal (P) = Rs. 95,950

Rate of Interest (R) = 9% per annum

Time (T) = 1 year

Formula Used:

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

Calculations:

=> SI = (95950 × 9 × 1) ÷ 100

=> SI = 959.50 × 9

=> SI = Rs. 8,635.50

Let us evaluate the incorrect options:

=> Option (1) Rs. 8,455.50 is incorrect because it corresponds to an interest rate of approximately 8.81%.

=> Option (2) Rs. 8,855.50 is incorrect because it corresponds to an interest rate of approximately 9.23%.

=> Option (3) Rs. 8,035.50 is incorrect because it corresponds to an interest rate of approximately 8.37%.

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Therefore The correct answer is Rs. 8,635.50.

Additional Information

Simple Interest Formula

Simple Interest (SI) is calculated only on the initial principal amount. Formula: SI = (P × R × T) ÷ 100, where P is Principal, R is Rate of Interest per annum, and T is Time in years.

Total Amount Formula

The total accumulated amount (A) after T years is given by: A = P + SI = P × (1 + R × T ÷ 100).

Difference between SI and CI

For a period of 1 year, when interest is compounded annually, Simple Interest is equal to Compound Interest (SI = CI).

Q44. Answer: (c) 12 km/hr

Shortcut Trick

Speed ratio of Truck A to Truck B is 7 : 3.

For a constant distance, Time ratio is inverse of Speed ratio → 3 : 7.

Difference in time units = 7 − 3 = 4 units.

Given 4 units = 7 hours Therefore 1 unit = 7/4 hours.

Time for slower truck = 7 × (7/4) = 49/4 hours.

Speed of slower truck = Distance ÷ Time = 147 ÷ (49/4) = (147 × 4) ÷ 49 = 3 × 4 = 12 km/hr.

Therefore The correct answer is 12 km/hr.

Alternate Method

Given: Ratio of speeds = 7 : 3, Distance = 147 km, Time difference = 7 hours.

Formula Used: Time = Distance ÷ Speed

=> Let the speeds be 7x and 3x km/hr.

=> Time for slower truck − Time for faster truck = 7 hours

=> (147 ÷ 3x) − (147 ÷ 7x) = 7

=> (49 ÷ x) − (21 ÷ x) = 7

=> (49 − 21) ÷ x = 7

=> 28 ÷ x = 7 => x = 4

=> Speed of slower truck = 3x = 3 × 4 = 12 km/hr.

Therefore The correct answer is 12 km/hr.

Additional Information

Speed-Time Relationship

When distance is constant, speed (s) is inversely proportional to time (t). If speed ratio is a : b, then time ratio is b : a.

Average Speed Formula

For two equal distances covered at speeds x and y, Average Speed = (2 × x × y) ÷ (x + y).

Relative Speed

In the same direction, relative speed = s1 − s2. In the opposite direction, relative speed = s1 + s2.

Q45. Answer: (b) 53

Shortcut Trick

For any point P inside a rectangle ABCD, the British Flag Theorem states:

$PA^2 + PC^2 = PB^2 + PD^2$

$79^2 + 17^2 = 61^2 + PD^2$

$6241 + 289 = 3721 + PD^2$

$PD^2 = 6530 − 3721 = 2809$ => PD = 53 cm.

Therefore The correct answer is 53 cm.

Alternate Method

Given:

Distances from point P to vertices: PA = 79 cm, PB = 61 cm, and PC = 17 cm.

Formula Used:

In a rectangle ABCD, for any point P: $PA^2 + PC^2 = PB^2 + PD^2$.

Calculations:

=> $PA^2 + PC^2 = PB^2 + PD^2$

=> $79^2 + 17^2 = 61^2 + PD^2$

=> $6241 + 289 = 3721 + PD^2$

=> $6530 = 3721 + PD^2$

=> $PD^2 = 6530 - 3721$

=> $PD^2 = 2809$

=> $PD = \sqrt{2809}$

=> PD = 53 cm

Therefore The correct answer is 53 cm.

Additional Information

British Flag Theorem

This theorem states that for any point P relative to a rectangle ABCD, the sum of the squares of the distances from P to opposite vertices is equal: $PA^2 + PC^2 = PB^2 + PD^2$.

Point Location

The theorem holds true regardless of whether the point P is inside, outside, or on the boundary of the rectangle.

Derivation

The proof involves drawing lines through P parallel to the sides of the rectangle and applying the Pythagoras Theorem to the resulting right-angled triangles.

Q46. Answer: (d) 7.38%

Shortcut Trick

Relation between Marked Price (MP), Cost Price (CP), Profit % and Discount %:

MP ÷ CP = (100 + Profit %) ÷ (100 − Discount %)

=> 122 ÷ 100 = (100 + 13) ÷ (100 − D)

=> 122 ÷ 100 = 113 ÷ (100 − D)

=> 100 − D = 11300 ÷ 122 ≈ 92.622

=> D = 100 − 92.622 = 7.378% ≈ 7.38%

Therefore The correct answer is 7.38%.

Alternate Method

Given:

Marked Price (MP) = Rs. 374

Markup Percentage = 22%

Profit Percentage = 13%

Calculations:

=> Cost Price (CP) = MP ÷ (1 + Markup%) = 374 ÷ 1.22

=> Cost Price (CP) = Rs. 306.557 (approx) or let CP = 100 units

=> If CP = 100, then MP = 122 units

=> Selling Price (SP) = CP × (1 + Profit%) = 100 × 1.13 = 113 units

=> Discount = MP − SP = 122 − 113 = 9 units

=> Discount Percentage = (Discount ÷ MP) × 100

=> Discount Percentage = (9 ÷ 122) × 100 = 900 ÷ 122

=> Discount Percentage ≈ 7.37704%

Therefore The correct answer is 7.38%.

Additional Information

Markup and Discount Relation

Profit % = Markup % − Discount % − (Markup % × Discount %)/100. This is the successive percentage change formula.

Marked Price Formula

MP = CP × (100 + Markup %)/100. Always calculate markup on the Cost Price.

Discount Calculation

Discount is always calculated on the Marked Price (MP). SP = MP × (100 − Discount %)/100.

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Q47. Answer: (c) 73.91%

Shortcut Trick

Discount % = [(MP − SP) ÷ MP] × 100

Discount = 594 − 155 = 439

Discount % = (439 ÷ 594) × 100 ≈ 73.9057%

Therefore The correct answer is 73.91%.

Alternate Method

Given:

Marked Price (MP) = Rs. 594

Selling Price (SP) = Rs. 155

Formula Used:

Discount = Marked Price − Selling Price

Discount Percentage = (Discount ÷ Marked Price) × 100

=> Discount = 594 − 155 = Rs. 439

=> Discount % = (439 ÷ 594) × 100

=> Discount % = 43900 ÷ 594

=> Discount % = 73.90572...

=> Rounding off to two decimal places = 73.91%

Therefore The correct answer is 73.91%.

Additional Information

Marked Price (MP)

The price at which an article is listed or labeled by the seller before any discount is applied.

Selling Price (SP)

The final price at which an item is actually sold after subtracting the discount from the Marked Price. SP = MP × (100 − D%)/100.

Successive Discounts

When two or more discounts are applied sequentially, the equivalent single discount is given by [a + b − (a × b)/100]%.

Q48. Answer: (d) 91.6

Shortcut Trick

Using the Deviation Method: Assume the class average is 96.

Deviation for 37 students = 84 − 96 = −12.

Total deviation = 37 × (−12) = −444.

Average correction = −444 ÷ 100 students = −4.44.

Actual average = 96 − 4.44 = 91.56 ≈ 91.6.

Therefore The correct answer is 91.6.

Alternate Method

Given: Total students = 100, Group 1 = 37 students (Avg = 84), Group 2 = 100 − 37 = 63 students (Avg = 96).

Formula Used: Weighted Average = (n1 × x1 + n2 × x2) ÷ Total Students

=> Total score of 37 students = 37 × 84 = 3108

=> Total score of remaining 63 students = 63 × 96 = 6048

=> Total score of whole class = 3108 + 6048 = 9156

=> Average score = 9156 ÷ 100 = 91.56

=> Rounding off to one decimal place, we get 91.6.

Therefore The correct answer is 91.6.

Additional Information

Weighted Average Concept

It is used when groups have different sizes. Formula: A_(avg) = (Sum of all values) ÷ (Total count).

Rounding Off Rule

To round to one decimal place, if the second decimal digit is 5 or greater, increase the first decimal digit by 1.

Combined Average Range

The combined average score must always lie between the smallest average (84) and the largest average (96) of the sub-groups.

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Q49. Answer: (d) 976.67

Shortcut Trick

Relative Speed in opposite directions = 100 + 140 = 240 km/hr.

Convert Speed to m/s: 240 × (5/18) = 200/3 m/s.

Total Distance (L1 + L2) = Relative Speed × Time = (200/3) × 22 = 4400/3 ≈ 1466.67 m.

Length of other train = 1466.67 − 490 = 976.67 m.

Therefore The correct answer is 976.67 m.

Alternate Method

Given:

Speed of Train 1 (S1) = 100 km/hr, Speed of Train 2 (S2) = 140 km/hr

Length of Train 1 (L1) = 490 m, Time (t) = 22 seconds

Formula Used:

Total Distance = Relative Speed × Time

Calculations:

=> Relative Speed (opposite direction) = S1 + S2 = 100 + 140 = 240 km/hr

=> Speed in m/s = 240 × (5/18) = 40 × (5/3) = 200/3 m/s

=> Total Distance = L1 + L2

=> 490 + L2 = (200/3) × 22

=> 490 + L2 = 4400 / 3

=> 490 + L2 = 1466.666...

=> L2 = 1466.67 − 490

=> L2 = 976.67 m

Therefore The correct answer is 976.67 m.

Additional Information

Relative Speed

When moving in opposite directions, relative speed is the sum of individual speeds (S1 + S2). When in the same direction, it is the difference (|S1 − S2|).

Unit Conversion

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

Crossing Objects

When a train crosses another train, the total distance covered is the sum of their lengths (L1 + L2).

Q50. Answer: (c) -x² - 5x - 7

Shortcut Trick

Directly calculate coefficients for each term of the quadratic expression.

Coefficient of x^2: (2 × 1) − (1 × 3) = 2 − 3 = −1

Coefficient of x: [2(−5) + 3(1)] − [1(4) + (−2)(3)] = (−10 + 3) − (4 − 6) = −7 − (−2) = −5

Constant term: [3 × (−5)] − [(−2) × 4] = −15 − (−8) = −15 + 8 = −7

Resulting expression: $-x^2 - 5x - 7$

Therefore The correct answer is $-x^2 - 5x - 7$.

Alternate Method

Given: (2x + 3)(x − 5) − (x − 2)(3x + 4)

Method Used: Distributive Property (FOIL method) and Subtraction of Polynomials.

=> [(2x × x) + (2x × −5) + (3 × x) + (3 × −5)] − [(x × 3x) + (x × 4) + (−2 × 3x) + (−2 × 4)]

=> $[2x^2 - 10x + 3x - 15] - [3x^2 + 4x - 6x - 8]$

=> $(2x^2 - 7x - 15) - (3x^2 - 2x - 8)$

=> $2x^2 - 7x - 15 - 3x^2 + 2x + 8$

=> $(2x^2 - 3x^2) + (-7x + 2x) + (-15 + 8)$

=> $-x^2 - 5x - 7$

Therefore The correct answer is $-x^2 - 5x - 7$.

Additional Information

FOIL Method

Used for multiplying two binomials: (First × First) + (Outer × Outer) + (Inner × Inner) + (Last × Last).

Polynomial Subtraction

When subtracting polynomials, change the sign of every term in the subtrahend and then combine like terms.

Distributive Law

The rule that states a(b + c) = ab + ac, which is the basis for all algebraic expansions.

Q51. Answer: (a) 245

BODMAS Table:

Given equation: 850 + 34 × 15 − 12 ÷ 400 = ?

Now, if '+' and '÷' are interchanged and '−' and '×' are interchanged, then:

=> 850 ÷ 34 − 15 × 12 + 400 = ?

=> 25 − 180 + 400 = ?

=> 425 − 180 = ?

=> 245

Hence, the correct answer is "Option 1".

Q52. Answer: (b) 111

The logic followed here is:

thus, "111" will replace the question mark in the given series.

Hence, the correct option is "Option 2".

Q53. Answer: (c) Two

Given: (Left) ? * + ? \ & 3 # 9 % 4 1 6 * @ 5 4 8 8 $ \ (Right)

Now,

Numbers which is immediately preceded by another number and also immediately followed by a symbol.

So, Needed pattern is: Number - Number - Symbol.

(Left) ? * + ? \ & 3 # 9 % 4 1 6 * @ 5 4 8 8 $ \ (Right)

There are Two Numbers which is immediately preceded by another number and also immediately followed by a symbol.

Hence, the correct answer is 'Option 3'.

Q54. Answer: (d) JCB

The logic followed here is:

So, 'JCB' will replace the question mark in the given series.

Hence, the correct answer is "Option 4".

Q55. Answer: (b) (14, 42, 37)

The logic followed here is:

Logic: 2nd number = 3 × 1st number, and 3rd number = 2nd number − 5

Checking the given sets:

(22, 66, 61)

2nd number = 22 × 3 = 66

3rd number = 66 − 5 = 61

(35, 105, 100)

2nd number = 35 × 3 = 105

3rd number = 105 − 5 = 100

Now, Checking the options:

Option 1) (74, 222, 216)

2nd number = 74 × 3 = 222

3rd number = 222 − 5 = 217

Option 2) (14, 42, 37)

2nd number = 14 × 3 = 42

3rd number = 42 − 5 = 37

Option 3) (85, 255, 249)

2nd number = 85 × 3 = 255

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3rd number = 255 − 5 = 250

Option 4) (41, 123, 117)

2nd number = 41 × 3 = 123

3rd number = 123 − 5 = 118

Hence, the correct option is "Option 2".

Q56. Answer: (c) 4

Given:

Total people = 60

Shivani is 40th from the right end → position from left = 60 − 40 + 1 = 21

Sneha is 26th from the left end → position from left = 26

Number of people between Shivani and Sneha = 26 − 21 − 1 = 5 − 1 = 4

Hence, the correct answer is "Option 3".

Q57. Answer: (d) 3

BODMAS Table:

Given equation: 25 C 15 A 3 D 9 B 3 = ?

Now, if C → +, A → ÷, D → −, B → ×, then:

=> 25 + 15 ÷ 3 − 9 × 3 = ?

=> 25 + 5 − 27 = ?

=> 30 − 27 = ?

=> 3

Hence, the correct answer is "Option 4".

Q58. Answer: (c) 71

Given:

Yogesh ranked 34th from the top and 38th from the bottom.

Total students in the class = Rank from top + Rank from bottom − 1

=> 34 + 38 − 1 = 71

Hence, the total number of students in the class is 71.

Hence, the correct answer is "Option 3".

Q59. Answer: (a) Neither conclusion (I) nor (II) follows

Given Statements:

All Tractors are Motorcycles.

Some Motorcycles are Minivans.

No Minivans are Hovercrafts.

Conclusions:

I. Some Hovercrafts are Motorcycles → False: There is no relation given between Hovercrafts and Motorcycles. So, this conclusion cannot be definitely drawn.

II. Some Minivans are Tractors → False: All Tractors are Motorcycles and only some Motorcycles are Minivans. There is no definite relation between Minivans and Tractors.

So, Neither conclusion I nor II follows.

Hence, the correct answer is "Option 1".

Q60. Answer: (c) 7 km towards south

Given:

Leander starts from Point A and drives 6 km towards east.

He then takes a left turn, drives 4 km, turns left and drives 3 km.

He then takes a right turn and drives 3 km.

He takes a final left turn, drives 3 km and stops at Point P.

So,He should drive 7 km towards south in order to reach Point A again.

Hence, the correct answer is "Option 3".

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Q61. Answer: (b) 4

The logic followed here is:

'OVAL' is coded as 6729,

'LEVO' is coded as 7946.

Compare the letters and codes:

Word	O	V	A	L
OVAL	6	7	2	9
LEVO	7	9	4	6

From LEVO → 7946, the letter E corresponds to 4.

Here, the code for 'E' is 4.

Hence, the correct answer is "Option 2".

Q62. Answer: (b) Four

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

Only six people sit to the right of C.

Only four people sit to the left of B.

D sits to the left of A but right of B.

F sits second to the right of G.

So, Number of people to the right of E = positions 4, 5, 6, 7 → 4 people

Hence, the correct answer is "Option 2".

Q63. Answer: (b) Three

Given: (Left) © @ 7 € $ 5 $ & * & 7 5 2 $ 8 $ © 7 © 4 6 £ (Right)

Now,

Symbols which is immediately preceded by a number and also immediately followed by a symbol.

So, Needed pattern is: Number - Symbol - Symbol

(Left) © @ 7 € $ 5 $ & * & 7 5 2 $ 8 $ © 7 © 4 6 £ (Right)

There are Three Symbols which is immediately preceded by a number and also immediately followed by a symbol.

Hence, the correct answer is 'Option 2'.

Q64. Answer: (d) Two

Given number: 1732596

Arrange the digits in ascending order: 1, 2, 3, 5, 6, 7, 9

New number: 1235679

Now, compare the positions of each digit in the original number 1732596 with the new number 1235679:

Original number	1	7	3	2	5	9	6
New number	1	2	3	5	6	7	9

Check unchanged positions:

Digit 1: position 1 → unchanged

Digit 3: Posiiton 3 → unchanged

Hence, only two digit remains in the same position.

Q65. Answer: (b) Neither conclusion (I) nor (II) follows.

Given Statements:

All flowers are plants.

Some plants are trees.

Conclusions:

I. Some trees are flowers

False: There is no definite relation given between trees and flowers. Some plants are trees, but we cannot conclude that any tree is a flower.

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II. All flowers are trees

False: All flowers are plants, but there is no information that all flowers are trees.

So, Neither conclusion I nor II follows.

Hence, the correct answer is "Option 2".

Q66. Answer: (b) None

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

Now,

Even numbers which are immediately followed by an even number.

So, Needed pattern is: Even number − Even number.

There are None Even numbers which are immediately followed by an even number.

Hence, the correct answer is 'Option 2'.

Q67. Answer: (c) 483

The logic followed here is:

thus, "483" will replace the question mark in the given series.

Hence, the correct option is "Option 3".

Q68. Answer: (b) UWR

The logic followed here is:

Option 1) WXT

Option 2) UWR

Option 3) STP

Option 4) QRN

Here, 'UWX' is odd among the given options.

Hence, the correct answer is "Option 2".

Q69. Answer: (c) Mother’s father

Family Chart:

Decoding the Symbols:

Symbol	•	•	•	÷
Meaning	Sister	Father	Brother	Mother

Given: ‘ P - T * C + D ÷ E ’

It means: P is the Father of T, T is the Brother of C, C is the Sister of D, D is the Mother of E.

So, P is the Mother’s father of E.

Hence, the correct answer is "Option 3".

Q70. Answer: (a) INKS - SKIN - IKNS

The logic followed here is:

Logic: Rearrange letters in a specific pattern

First word → Second word:

Letters are rearranged in the order 4 – 3 – 1 – 2

Second word → Third word:

Letters are rearranged in the order 3 – 2 – 4 – 1

Given,

WASH → HSWA → WSAH

CORE → ERCO → CROE

Now, checking the options:

Option 1) INKS → SKIN → IKNS

Option 2) LEAP → LAEP → PAEL

Option 3) DARE → ARDE → ARED

Option 4) FINE → ENFI → INFE

Hence, the correct option is "Option 1".

Q71. Answer: (d) 11 km to the west

Given:

Piya starts from point A and drives 33 km towards south.

She then takes a right turn, drives 45 km, turns right and drives 41 km.

She then takes a right turn and drives 56 km.

She takes a final right turn, drives 8 km and stops at point P.

So, She should drive 11 km to the west in order to reach point A again.

Hence, the correct answer is "Option 4".

Q72. Answer: (a) VO-SL-QT

The logic followed here is:

Logic: Alphabetical position change

From the 1st pair → 2nd pair → 3rd pair

• First letters: decrease by 3 each step

• Second letters: increase by 3 each step

Given,

PI – MF – KN

SL – PI – NQ

Now, checking the options:

Option 1) VO – SL – QT

Option 2) WO – SK – QU

Option 3) WO – SL – QU

Option 4) VO – SL – QU

Hence, the correct option is "Option 1".

Q73. Answer: (c) HM-ZW

The logic followed here is:

Option 1) BH − TQ

Option 2) WC − OL

Option 3) HM − ZW

Option 4) SY − KH

Here, HM − ZW is odd among the given options.

Hence, the correct answer is "Option 3".

Q74. Answer: (c) Two

Given: Seven people B, C, D, I, J, K and L are sitting in a straight line facing north.

No one sits to the left of K.

Only four people sit between K and J.

L sits second to the left of J.

D sits to the immediate left of B.

C is not an immediate neighbour of L.

So, There are Two people sit between L and C.

Hence, the correct answer is "Option 3".

Q75. Answer: (c) 20

The logic followed here is:

thus, "20" will replace the question mark in the given series.

Hence, the correct option is "Option 3".

Q76. Answer: (d) Two

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

Now,

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Odd numbers are there (from left to right) which are immediately followed by an even number

So, Needed pattern is: Odd - Even.

There are Two Symbols which are preceded by a number and also immediately followed by a number.

Hence, the correct answer is 'Option 4'.

Q77. Answer: (d) TBC5

The logic followed here is:

So, 'TBC5' will replace the question mark in the given series.

Hence, the correct answer is "Option 4".

Q78. Answer: (d) Three

Given: A, B, C, D, E, F and G are sitting around a circular table, facing the centre.

F sits second to the right of B.

A sits third to the left of F.

C is the immediate neighbour of E and A.

G is not an immediate neighbour of B.

Here, There are THREE people sitting between D and E when counted from the left of D.

Hence, the correct answer is "Option 4".

Q79. Answer: (a) SR 1

The logic followed here is:

For HN 9 → LK −3

For NY 4 → RV −8

Similarly, for OU 13

So, OU 13 will be related to SR 1.

Hence, the correct answer is "Option 1".

Q80. Answer: (c) vl

The logic followed here is:

‘steak equal thing’ is coded as wb vl yn,

‘thing yard house’ is coded as vl za ha.

Here,

Here, the code for ‘thing’ is vl.

Hence, the correct answer is "Option 3".

Q81. Answer: (b) BimaPay Finsure

The correct answer is BimaPay Finsure.

Key Points

• BimaPay Finsure launched India's first-of-its-kind premium financing solution tailored for corporate insurance in June 2025, introducing an innovative product catering to corporate clients' insurance needs.

• This premium financing solution allows corporations to manage large insurance premium payments by converting them into manageable installments, enhancing financial flexibility.

• The solution is aimed at large and mid-sized corporations that typically require substantial insurance coverage for their operations, thereby reducing the burden of upfront costs.

• BimaPay Finsure's initiative highlights its commitment to providing customized financial products to meet the growing needs of India's corporate sector.

• This launch establishes BimaPay Finsure as a pioneer in the corporate insurance financing space, offering solutions that improve cash flow management and operational efficiency.

Additional Information

• Corporate Insurance:

• Corporate insurance refers to insurance policies designed for businesses to protect against risks such as property damage, liability, or employee-related risks.

• It ensures that companies can manage risks effectively, enabling them to focus on growth and operations.

• Examples of corporate insurance include fire insurance, liability insurance, worker's compensation insurance, and business interruption insurance.

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• Premium Financing:

• Premium financing is a financial arrangement where the cost of an insurance premium is paid upfront by a lender, and the client repays the lender over time.

• This arrangement is particularly useful for businesses with high-value insurance policies, allowing them to spread costs over manageable periods.

• It supports cash flow management by reducing the financial burden of large, lump-sum payments.

• Key Features of BimaPay Finsure's Premium Financing Solution:

• Offers flexible repayment terms to suit corporate clients' financial cycles.

• Reduces the need for businesses to dip into operational capital for insurance premium payments.

• Focuses on large and mid-sized enterprises with significant insurance requirements.

• Provides a competitive edge to BimaPay Finsure by addressing a niche market in the insurance sector.

• Other Entities Mentioned:

• Credit Access Life Insurance: Primarily focuses on providing life insurance products for individual clients rather than corporate solutions.

• JM Financial Mutual Fund: Specializes in investment and asset management solutions, with no primary focus on insurance financing.

• Reliance Nippon Life Insurance: Offers life insurance products to individuals and small groups but does not specialize in corporate premium financing solutions.

Important Points

• Advantages of Premium Financing:

• Helps businesses preserve working capital.

• Provides financial flexibility and allows for better cash flow management.

• Supports businesses in maintaining adequate insurance coverage without financial strain.

• India's Insurance Market:

• One of the fastest-growing insurance markets in the world, driven by economic growth and increased awareness.

• Expected to reach a market size of over Rs. 12 lakh crore by 2025.

• Corporate insurance forms a significant part of this growth, with increasing demand for customized solutions.

Q82. Answer: (d) Exercise Suraksha Chakra

The correct answer is Exercise Suraksha Chakra.

Key Points

• Exercise Suraksha Chakra was conducted in the Delhi–NCR (National Capital Region) from 29 July to 1 August 2025. It was a mega disaster management drill aimed at preparing the region for large-scale emergencies.

• The drill involved multiple stakeholders, including government agencies, non-governmental organizations (NGOs), and local authorities, to test and improve disaster response capabilities.

• Key scenarios simulated during the drill included earthquakes, floods, fires, and chemical hazards. These simulations helped evaluate the preparedness of emergency services and coordination mechanisms.

• The main objective was to ensure effective coordination among different agencies for timely rescue, relief, and rehabilitation measures during disasters.

• The drill also focused on public awareness campaigns to educate residents about emergency protocols, evacuation routes, and safety measures in case of disasters.

Additional Information

• Disaster Management in India:

• The Disaster Management Act, 2005 provides the framework for disaster response and preparedness in India. It established the National Disaster Management Authority (NDMA) to coordinate efforts at the national level.

• India follows a multi-hazard approach to disaster management, addressing risks such as earthquakes, floods, cyclones, droughts, and industrial accidents.

• State Disaster Management Authorities (SDMAs) and District Disaster Management Authorities (DDMAs) play a crucial role in implementing disaster management plans at regional and local levels.

• India is prone to disasters due to its geographical location, with 58.6% of its landmass vulnerable to earthquakes, 12% to floods, and the coastal regions susceptible to cyclones.

• International cooperation is also emphasized, with India being a participant in initiatives like the Sendai Framework for Disaster Risk Reduction and the Asia-Pacific Disaster Response Fund.

• Disaster Management Drills:

• Such drills are essential for testing the efficacy of disaster response plans and identifying gaps in coordination and

communication.

• Drills often involve participation from emergency services, including fire departments, medical teams, and police forces.

• Community involvement is critical, as public awareness and preparedness significantly influence the outcomes during real disasters.

• These drills also include the use of modern technologies like GIS mapping, drone surveillance, and AI-driven predictive models to enhance disaster response.

• Other Exercises:

• Exercise Raksha Kavach: Focused on military preparedness and security operations. Not directly related to disaster management in civilian contexts.

• Exercise Surakshit Bharat: Aims at promoting safety measures and preparedness on a broader national scale, but not specific to Delhi–NCR.

• Exercise Disaster Mitra: Centers around community-level training for disaster response but doesn't match the description of a mega drill conducted in Delhi–NCR.

• Importance of Disaster Management Drills:

• They help build resilience among communities and institutions, reducing the impact of disasters.

• Regular drills improve inter-agency coordination, ensuring timely and effective response during crises.

• Incorporating lessons learned from past disasters ensures the continuous evolution of response mechanisms.

• Preparedness measures save lives and reduce economic losses, making disaster management drills indispensable.

Important Points

• Disaster Preparedness involves early warning systems, training programs, capacity building, and mock drills to reduce vulnerabilities.

• India's National Policy on Disaster Management emphasizes a proactive approach with the motto "Prevention, Mitigation, Preparedness, and Response."

• Public-private partnerships and community-based programs are integral to ensuring sustainable disaster management.

• Technological advancements like satellite-based monitoring and real-time communication systems are crucial in modern disaster management strategies.

Q83. Answer: (b) 2024

The correct answer is 2024.

Key Points

• The Retired Sportsperson Empowerment Training (RESET) Programme was officially launched by the Ministry of Youth Affairs and Sports in the year 2024.

• The programme aims to provide support, skill development, and empowerment to retired sportspersons transitioning to non-sporting careers.

• The RESET Programme focuses on equipping retired athletes with, entrepreneurial training, and career counseling.

• This initiative is part of the government's broader efforts to ensure the welfare and rehabilitation of sportspersons after their athletic careers.

• The programme emphasizes mental health support and the importance of financial literacy to help retired athletes manage their resources effectively.

Additional Information

• Objectives of RESET Programme:

• The programme aims to address the challenges faced by retired athletes, such as loss of income, identity crisis, and lack of career opportunities outside sports.

• It seeks to create a structured framework for post-retirement career development and financial independence.

• The initiative includes collaboration with educational institutions and corporate sectors to ensure job placements and skill development.

• Eligibility Criteria:

• The programme is open to athletes who have officially retired from professional sports and represented India in national or international events.

• Participants must register through the official portal provided by the Ministry of Youth Affairs and Sports.

• Skill Development Focus:

• The RESET Programme provides training in areas such as management, public relations, entrepreneurship, and technical skills.

• Workshops and seminars are conducted to enhance interpersonal skills and team leadership.

• Similar Initiatives:

• In 2021, the government launched the Target Olympic Podium Scheme (TOPS), aimed at assisting athletes during their active

careers. RESET extends this support post-retirement.

• The Fit India Movement also promotes overall physical and mental well-being, complementing the objectives of RESET.

• Implementation:

• The programme is implemented by the Sports Authority of India (SAI) in collaboration with various stakeholders.

• Monitoring and evaluation mechanisms are in place to ensure the effectiveness of training and career assistance.

Q84. Answer: (d) 10 january

The correct answer is Sat Jan 10 2026.

Key Points

• World Hindi Day (Vishwa Hindi Diwas) is celebrated every year on January 10th to promote the Hindi language globally and to create awareness about its significance.

• The tradition of celebrating World Hindi Day started in 2006, and it marks the anniversary of the first World Hindi Conference held on 10th January 1975 in Nagpur, India.

• The event aims to spread the use of Hindi as an international language and emphasize its role in uniting diverse communities and cultures.

• In 2025, the celebration of World Hindi Day in India fell on January 10th, as it is observed annually on the same date.

• Prominent activities include literary events, cultural programs, and discussions about the promotion and development of the Hindi language.

Additional Information

• History of World Hindi Day:

• The first World Hindi Conference was inaugurated by the then Prime Minister of India, Indira Gandhi, in Nagpur on 10th January 1975.

• Since 2006, the Indian government officially began celebrating World Hindi Day on January 10th each year.

• Difference Between World Hindi Day and Hindi Diwas:

• World Hindi Day is celebrated on January 10th to promote the Hindi language globally.

• Hindi Diwas is observed on September 14th annually to mark the adoption of Hindi as one of the official languages of India in 1949.

• Significance of Hindi:

• Hindi is one of the most spoken languages in the world and is the third most spoken language globally, after English and Mandarin.

• Hindi is written in the Devanagari script and is one of the 22 scheduled languages of India under the Eighth Schedule of the Indian Constitution.

• It serves as a means to preserve and promote Indian culture and heritage.

• Global Recognition:

• Efforts have been made to include Hindi as one of the official languages of the United Nations (UN).

• Several countries, including Mauritius, Fiji, Suriname, Guyana, Trinidad & Tobago, and Nepal, also recognize and celebrate Hindi due to their historical and cultural ties with India.

Important Points

• World Hindi Conference:

• The first-ever World Hindi Conference held in 1975 was attended by 122 delegates from 30 countries.

• Since then, 12 such conferences have been organized across different countries, the most recent being in Fiji in 2023.

• Role of the Indian Government:

• The Ministry of External Affairs promotes the use of Hindi internationally through various initiatives and collaborations.

• Indian embassies and cultural centers organize World Hindi Day celebrations globally to promote Hindi abroad.

• Hindi as an Official Language:

• Hindi was adopted as an official language of India on 14th September 1949, under Article 343 of the Indian Constitution.

• It is also one of the official languages for communication with states under the Official Languages Act, 1963.

• Global Impact:

• Hindi is taught in several universities worldwide, including in the USA, UK, Canada, Australia, and Germany.

• India’s efforts to promote Hindi globally reflect its ambition to strengthen cultural diplomacy and international relations.

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Q85. Answer: (c) Real Madrid

The correct answer is Real Madrid.

Key Points

• Real Madrid was honoured as the “Team of the Year” at the Laureus World Sports Awards in April 2025. This recognition is given to the team that has demonstrated exceptional performance, sportsmanship, and achievements in the past year.

• The decision was based on Real Madrid's extraordinary performance in the 2024/2025 football season, including winning major tournaments and showcasing dominance in European football.

• Real Madrid had clinched the UEFA Champions League title in the 2024/2025 season, further solidifying their status as one of the best teams globally.

• The Laureus Awards, referred to as the “Oscars of Sports,” celebrate outstanding achievements in sports annually, and Real Madrid earned this prestigious accolade owing to their consistent excellence and global popularity.

• The award highlights the team's ability to adapt, innovate, and overcome challenges, making them an inspiration for millions of fans worldwide.

Additional Information

• Laureus World Sports Awards:

• Established in 2000, the Laureus World Sports Awards are held annually to celebrate the achievements of athletes and teams across various sports disciplines.

• The awards are decided by members of the Laureus World Sports Academy, a unique group of sporting legends, making it one of the most prestigious recognitions in sports.

• Categories include Sportsman of the Year, Sportswoman of the Year, Team of the Year, and more.

• Notable past winners of the “Team of the Year” award include Mercedes AMG Petronas Formula One Team, Germany National Football Team, and Chicago Cubs.

• Real Madrid:

• Location: Based in Madrid, Spain, Real Madrid is one of the most famous and successful football clubs globally.

• Founded in 1902, Real Madrid has a rich history of winning major tournaments, including La Liga, Copa del Rey, and UEFA Champions League.

• Known for their iconic white jerseys, Real Madrid is celebrated for their attacking football style and global fan base.

• Real Madrid's squad in the 2024/2025 season included world-class players, and their performances in key matches were instrumental in securing the Laureus award.

• 2024/2025 UEFA Champions League Victory:

• Real Madrid defeated top teams to win their 15th Champions League title, an unmatched record in European football history.

• Their tactics, teamwork, and resilience during the tournament were widely praised by analysts and fans.

• Key players, such as Vinícius Júnior and Luka Modrić, played crucial roles in their victory.

• Other Contenders for Laureus “Team of the Year”:

• Bayern Munich: Known for their dominance in the Bundesliga, but did not achieve the same level of international success as Real Madrid in 2024/2025.

• Manchester City: A strong competitor, but their performances in key tournaments fell short compared to Real Madrid's achievements.

• Flamengo: The Brazilian club had an impressive domestic season but lacked significant international recognition during the period.

Important Points

• Laureus Selection Process:

• The winners are chosen by a panel of sports experts and legends, ensuring the awards reflect high standards of achievement.

• The selection process considers performance, impact, and contribution to the sport.

• Significance of the Award:

• Winning the Laureus “Team of the Year” award cements a team’s legacy in global sports history.

• It showcases the team's dedication and excellence, motivating future generations of athletes.

• Real Madrid's Global Influence:

• Real Madrid is not just a football team but a cultural phenomenon, influencing sports, fashion, and entertainment worldwide.

• They boast one of the highest social media followings among sports teams, reflecting their global popularity.

Q86. Answer: (c) .bank.in

The correct answer is bank.in.

Key Points

• Reserve Bank of India (RBI) has issued a directive requiring all banks to migrate to the new domain "bank.in" by October 31, 2025.

• The move aims to create a standardized digital identity for banks across India and enhance the security and trustworthiness of their online presence.

• The domain bank.in is managed by the National Internet Exchange of India (NIXI), ensuring reliable and secure domain registration under the .in country-code top-level domain (ccTLD).

• This migration is part of the RBI's initiative to strengthen the cybersecurity framework for banking institutions and improve customer confidence in digital banking systems.

• All Indian banks, including public sector, private sector, cooperative, and regional rural banks, are required to comply with this directive by the stipulated deadline.

Additional Information

• Role of the Reserve Bank of India (RBI):

• RBI is the central banking authority of India, established in 1935 under the Reserve Bank of India Act, 1934.

• It is responsible for regulating the banking sector, managing inflation, and ensuring the stability of the financial system.

• The RBI regularly issues guidelines and frameworks to enhance the digital infrastructure and security of banks.

• National Internet Exchange of India (NIXI):

• NIXI is a non-profit organization that manages the .in domain, the official country-code top-level domain for India.

• It ensures secure and reliable domain registrations for entities operating within India.

• The .in domain is widely used for government, educational, and corporate entities, reflecting their Indian identity.

• Cybersecurity Framework in Banking:

• RBI has emphasized strengthening the cybersecurity infrastructure of banks through measures like domain migration, audits, and compliance checks.

• Ensuring secure domains like bank.in is crucial to preventing phishing attacks and unauthorized access.

• Initiatives like the migration to standardized domains align with global best practices in digital banking security.

• .in Domain Characteristics:

• The .in domain is India’s official ccTLD, symbolizing entities associated with the country.

• It is recognized globally and enhances the credibility of Indian businesses and institutions.

• Domains under .in are more secure and regulated, making them ideal for sensitive sectors like banking.

Important Points

• Deadline for Migration:

• All banks must migrate to the bank.in domain by October 31, 2025.

• Failing to comply with the directive may result in penalties or restrictions imposed by the RBI.

• Impact on Banks:

• The migration will standardize the online identity of banks, making it easier for customers to recognize legitimate websites.

• It will also improve the cybersecurity standards of Indian banking institutions.

Q87. Answer: (a) Siddaramaiah

The correct answer is Siddaramaiah.

Key Points

• Siddaramaiah, the Chief Minister of Karnataka, announced the Rs. 50,000 mass marriage incentive scheme for minorities in the Karnataka 2025–26 state budget.

• The scheme is aimed at providing financial assistance to minorities for conducting mass marriages, thereby supporting economically weaker sections of society.

• This initiative reflects the government's effort to promote social welfare by addressing financial constraints in marriage ceremonies for minority communities.

• Under this scheme, eligible beneficiaries from minority communities will receive a direct incentive of Rs. 50,000 per couple during mass marriage events.

• The scheme is expected to reduce the economic burden on families and encourage the practice of collective marriage ceremonies, fostering communal harmony.

Additional Information

• Siddaramaiah:

• Siddaramaiah is a prominent Indian politician and the current Chief Minister of Karnataka as of 2025.

• He belongs to the Indian National Congress (INC) party.

• Siddaramaiah has held the position of Chief Minister previously and is known for his focus on social welfare and inclusive

development.

• He has introduced several schemes targeting marginalized communities, including minorities, farmers, and women.

• Mass Marriage Incentive Schemes:

• Such schemes aim to provide financial assistance for marriage ceremonies, especially for economically weaker sections.

• Mass marriages often reduce individual expenses as events and arrangements are organized collectively.

• These schemes help address social issues such as financial stress related to dowries or extravagant wedding expenses.

• Similar initiatives have been launched by other states, including Gujarat and Madhya Pradesh, to promote communal harmony and reduce wedding costs.

• Minority Welfare in Karnataka:

• Karnataka has been proactive in launching schemes for minority communities, such as education scholarships, housing assistance, and skill development programs.

• The state government has set up the Minority Welfare Department to address issues and ensure better access to government benefits for minority groups.

• Previous schemes include Shaadi Bhagya, which provided financial aid to Muslim brides, and Pre-Matric & Post-Matric Scholarships.

• Budgetary Allocation for Social Welfare:

• The Karnataka government often allocates a significant portion of its budget to social welfare programs targeting vulnerable groups.

• The 2025–26 budget particularly emphasized minority welfare, women empowerment, and rural development.

• Mass marriage schemes reflect the government's commitment to equitable development and addressing financial challenges faced by underprivileged communities.

Important Points

• Eligibility Criteria:

• Beneficiaries must belong to minority communities as defined by the government.

• Applicants should fall under the economically weaker sections of society and provide proof of financial status.

• The scheme applies to mass marriage ceremonies conducted by registered organizations or religious institutions.

• Impact of Mass Marriage Schemes:

• Encourages social cohesion and reduces individual financial burden.

• Promotes the idea of simple, collective wedding ceremonies, reducing extravagance.

• Helps foster communal harmony among different communities participating in mass marriage events.

• Historical Context:

• Mass marriage schemes have been implemented across India to address issues like dowry, financial strain, and social inequality.

• Such schemes are rooted in the idea of promoting equality and ensuring that marriage does not become a financial burden on families.

Q88. Answer: (a) $130 billion

The correct answer is $130 billion.

Key Points

• India's biotechnology sector has witnessed extraordinary growth over the last decade, expanding from a $10 billion industry in 2014 to over $130 billion in 2024. This showcases a substantial leap in the sector's contribution to the economy.

• The significant growth is driven by advancements in areas such as bio-pharma, bio-services, bio-agriculture, bio-industrial, and bioinformatics.

• Factors contributing to this growth include increased government funding, private sector investments, and an emphasis on research and innovation in biotechnology.

• The Indian biotechnology industry is supported by initiatives like the National Biopharma Mission and policies like the Biotechnology Industry Research Assistance Council (BIRAC) aimed at fostering innovation and entrepreneurship.

• This growth reflects India's emergence as a global hub for biotechnology, with a strong ecosystem of startups, research institutions, and manufacturing facilities.

Additional Information

• Biotechnology in India:

• India ranks among the top 12 biotechnology destinations in the world and is the third-largest in the Asia-Pacific region.

• The sector includes more than 5,000 companies, with approximately 760 core biotech companies.

• Indian biotech firms are involved in areas like vaccine production, diagnostics, monoclonal antibodies, and biosimilars.

• Government Initiatives:

• Make in India: The initiative promotes manufacturing in the biotechnology sector and attracts foreign investments.

• National Biopharma Mission: Aimed at accelerating biopharmaceutical development in India, the mission focuses on vaccines, biotherapeutics, and diagnostics.

• Biotechnology Parks: India has established biotechnology parks to support startups and SMEs in developing affordable technologies.

• Major Contributors to Growth:

• The biopharmaceutical segment contributes nearly 62% of the sector's revenue, followed by bio-services (18%), bio-agriculture (15%), and bio-industrial (4%).

• India is a leading global supplier of vaccines, contributing to approximately 60% of global vaccine demand.

• Future Potential:

• The biotech industry in India is projected to reach $150 billion by 2025, driven by innovation and government initiatives.

• There is a growing emphasis on personalized medicine, synthetic biology, and agriculture biotechnology.

Important Points

• Key Statistics:

• India's biotechnology sector contributes approximately 3% of the global biotechnology market.

• India's biotech industry includes over 2,700 biotech startups and more than 2,500 biotech companies.

• Education and Research:

• India has over 700 biotech research institutions and academic centers focused on innovation.

• Programs like the DBT-JRF Fellowship support researchers in the field of biotechnology.

• International Collaborations:

• India collaborates with countries like USA, UK, Germany, and Japan in research and development.

• Global partnerships have helped India access advanced technologies and expand its market reach.

Q89. Answer: (d) Attari-Wagah border

The correct answer is Attari-Wagah border.

Key Points

• The Attari-Wagah border is the primary border crossing between India and Pakistan, located near Amritsar in Punjab (India) and Lahore in Punjab (Pakistan).

• It is the site of the famous Beating Retreat ceremony, which attracts thousands of visitors daily from both sides of the border, symbolizing the rivalry and camaraderie between the two nations.

• Following the Pahalgam terror attack in April 2025, the Indian government decided to close this border check-post as a part of its measures to ensure security and send a strong message to Pakistan.

• This decision was aimed at halting cross-border movement and trade temporarily, as the border is a key transit point for goods, people, and cultural exchanges between India and Pakistan.

• The closure of the Attari-Wagah border was a significant diplomatic measure, signaling India's firm stance against cross-border terrorism.

Additional Information

• Attari-Wagah Border:

• Located 32 km from Amritsar, this border is a symbolic site for India and Pakistan and serves as a key land route for trade and passenger transit.

• The Beating Retreat ceremony is performed every evening by the Indian Border Security Force (BSF) and the Pakistan Rangers, showcasing a synchronized parade and lowering of flags.

• The border is also a symbol of the complex and often tense relationship between the two nations since their partition in 1947.

• Pahalgam Terror Attack (April 2025):

• This attack occurred in the Pahalgam region of Jammu and Kashmir, causing significant casualties among civilians and security forces.

• It was attributed to cross-border terrorism, leading to heightened tensions between India and Pakistan.

• The Indian government responded with stringent security measures, including the closure of the Attari-Wagah border.

• Other India-Pakistan Border Crossings:

• Ganda Singh Wala-Hussainiwala Border: This crossing in Punjab has historical significance but is not as active as the Attari-Wagah border.

• Khokhrapar-Munabao Border: Located in Rajasthan, this crossing is used mainly for limited train services such as the Thar Express.

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• Radcliffe Line: This is the demarcation line between India and Pakistan, drawn during the partition of 1947, but it is not a specific border crossing point.

• Impact of Border Closures:

• Disruption of trade and cultural exchanges between the two nations.

• Increased tensions and reduced people-to-people contact.

• Such actions are often seen as temporary measures to address security concerns or political disputes.

Important Points

• India-Pakistan Relations:

• India and Pakistan have a history of conflict since their partition in 1947, including wars in 1947, 1965, 1971, and 1999.

• Cross-border terrorism has been a persistent issue, with India accusing Pakistan of supporting militant groups.

• Diplomatic Measures:

• India has often taken strong diplomatic steps, such as border closures, trade restrictions, and international lobbying, to counter cross-border terrorism.

• These actions are intended to pressure Pakistan into curbing support for terrorist activities.

• Strategic Importance:

• The Attari-Wagah border holds significant strategic, economic, and cultural importance for both nations.

• Its closure underscores the severity of bilateral tensions and the need for improved relations between the two countries.

Q90. Answer: (c) La Prensa

The correct answer is La Prensa.

Key Points

• La Prensa, a prominent newspaper from Nicaragua, received the prestigious UNESCO/Guillermo Cano World Press Freedom Prize in May 2025.

• The award honors individuals or organizations that have made a significant contribution to the defense or promotion of press freedom, especially under difficult circumstances.

• La Prensa has been a vocal advocate for press freedom in Nicaragua, often facing challenges such as censorship, threats, and harassment from authoritarian regimes.

• The newspaper is recognized for its unwavering commitment to reporting the truth and holding those in power accountable, despite facing severe restrictions and risks.

• The UNESCO/Guillermo Cano World Press Freedom Prize is named after Guillermo Cano Isaza, a Colombian journalist who was assassinated in 1986 for his courageous work in exposing corruption and drug cartels.

Additional Information

• UNESCO/Guillermo Cano World Press Freedom Prize:

• Established in 1997, this award is given annually by UNESCO to recognize outstanding contributions to the defense of press freedom worldwide.

• The prize carries a monetary award of USD 25,000, funded by the Guillermo Cano Isaza Foundation, the Colombian Association of Newspapers, and the Norwegian government.

• The prize ceremony is held on World Press Freedom Day, celebrated annually on May 3rd.

• About La Prensa:

• La Prensa is one of Nicaragua's oldest and most influential newspapers, founded in 1926.

• It has often faced persecution and censorship for its critical coverage of government policies and corruption.

• Despite hardships, the newspaper continues its mission to provide truthful and independent journalism to the public.

• Previous Recipients:

• Notable recipients of the UNESCO/Guillermo Cano World Press Freedom Prize include Maria Ressa (2021), Narges Mohammadi (2022), and Mazen Darwish (2015).

• These individuals and organizations were recognized for their exceptional efforts in upholding press freedom under challenging circumstances.

• Significance of World Press Freedom Day:

• World Press Freedom Day serves as an opportunity to celebrate the fundamental principles of press freedom and raise awareness about the challenges faced by journalists worldwide.

• The day also highlights the importance of ensuring the safety of journalists and combating threats to independent media.

Important Points

• Guillermo Cano Isaza: He was a Colombian journalist who paid the ultimate price for his fearless reporting against drug cartels and corruption. His legacy inspired the creation of this UNESCO prize.

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• Challenges Faced by La Prensa: The newspaper has endured measures such as confiscation of printing materials, government intimidation, and limited access to public information.

• Recognition of Press Freedom Advocates: Awards like this highlight the crucial role journalists play in safeguarding democracy and human rights.

• Impact on Global Journalism: By honoring courageous individuals and organizations, the prize motivates journalists worldwide to continue their work despite adversity.

Q91. Answer: (a) Padmaja Naidu Himalayan Zoological Park

The correct answer is Padmaja Naidu Himalayan Zoological Park.

Key Points

• India's first zoo-based wildlife bio bank has been established at Padmaja Naidu Himalayan Zoological Park, located in Darjeeling, West Bengal.

• It was set up in 2025 to preserve genetic material like DNA, gametes, and tissues of endangered species for conservation and research purposes.

• The bio bank aims to aid the conservation of rare and endangered species, especially those native to the Himalayan region, such as the red panda, snow leopard, and clouded leopard.

• The facility will also enable advanced studies on wildlife genetics, reproduction, and disease control to ensure the survival of species facing extinction.

• This initiative aligns with India's National Wildlife Action Plan and global biodiversity conservation goals set by organizations like the IUCN (International Union for Conservation of Nature).

Additional Information

• Padmaja Naidu Himalayan Zoological Park:

• Established in 1958, it is known for its focus on the conservation of Himalayan fauna.

• It is the largest high-altitude zoo in India and houses several rare and endangered species.

• Notable species include the red panda, snow leopard, and Siberian tiger.

• The zoo is also recognized for its successful breeding programs for high-altitude animals.

• Wildlife Bio Bank Concept:

• Bio banks store biological materials such as DNA, tissues, and gametes for research, conservation, and reproduction purposes.

• They play a vital role in ex-situ conservation, especially for species with declining populations due to habitat destruction or climate change.

• Examples of global bio banks include the Frozen Ark Project and the San Diego Zoo's Frozen Zoo.

• Conservation Efforts in India:

• India has launched several initiatives like Project Tiger (1973), Project Elephant (1992), and the National Wildlife Action Plan to protect endangered species.

• The Wildlife Protection Act of 1972 provides the legal framework for protecting flora and fauna in India.

• Under the act, species are classified into schedules, with Schedule I offering the highest level of protection.

• Red Panda Conservation:

• The red panda is native to the Himalayan region and is classified as Endangered by the IUCN.

• Its population has declined due to habitat loss, poaching, and climate change.

• Padmaja Naidu Himalayan Zoological Park has been actively involved in breeding programs to increase the population of red pandas.

Important Points

• Other Zoological Parks in India:

• Mahendra Chaudhury Zoological Park: Located in Punjab, it focuses on the conservation of native wildlife species.

• Nandankanan Zoological Park: Situated in Odisha, it is renowned for its white tiger conservation program.

• Nehru Zoological Park: Located in Hyderabad, it is one of India's largest zoos, housing over 1,500 species of animals.

• Global Efforts for Wildlife Conservation:

• Organizations like the IUCN, WWF, and CITES work globally to protect endangered species.

• International agreements such as the Convention on Biological Diversity aim to promote sustainable use and conservation of biodiversity.

• Technological Advances in Conservation:

• Use of genetic analysis and AI-based monitoring systems to track wildlife populations.

• Development of cryopreservation techniques for storing gametes and embryos.

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Q92. Answer: (b) Pradhan Mantri Matsya Sampada Yojana (PMMSY)

The correct answer is Pradhan Mantri Matsya Sampada Yojana.

Key Points

• The Pradhan Mantri Matsya Sampada Yojana (PMMSY) was launched by the Government of India in 2020 under the Ministry of Fisheries, Animal Husbandry, and Dairying.

• The scheme aims to bring about a Blue Revolution through sustainable and responsible development of the fisheries sector in India.

• In March 2025, the government identified 100 coastal fishermen villages to be developed into climate-resilient villages under the PMMSY initiative.

• The focus of the scheme is to enhance the socio-economic conditions of fisherfolk, improve their livelihood opportunities, and ensure their resilience to climate change.

• The scheme includes modernization of fishing infrastructure, promotion of sustainable fishing practices, and development of cold chains and markets for fisheries.

Additional Information

• Pradhan Mantri Matsya Sampada Yojana (PMMSY):

• The scheme has a total estimated investment of Rs. 20,050 crore, the highest ever investment in the fisheries sector in India.

• It aims to double fishers' and fish farmers' income by 2024-25.

• PMMSY is implemented with a focus on employment generation and promoting entrepreneurship in the fisheries sector.

• It targets the production of an additional 70 lakh tonnes of fish and an increase in fish exports to Rs. 1 lakh crore by 2024-25.

• Climate-Resilient Coastal Fishermen Villages:

• These villages are being developed with infrastructure to withstand climate-induced challenges, such as rising sea levels and extreme weather events.

• The initiative includes the construction of storm shelters, early warning systems, and sustainable housing for fisherfolk.

• Special emphasis is placed on marine biodiversity conservation and the adoption of sustainable fishing practices to maintain ecological balance.

• Blue Revolution:

• The Blue Revolution refers to the rapid increase in aquaculture and fish production with a focus on sustainability.

• India is the second-largest fish-producing country globally, contributing significantly to both domestic consumption and exports.

• Other Relevant Schemes:

• Kisan Samman Nidhi Yojana (KSNY): Aimed at providing income support to farmers, unrelated to fisheries.

• National Coastal Mission: Focuses on conserving coastal ecosystems but does not directly address the development of fishermen villages.

• Blue Revolution Yojana: Preceded PMMSY and laid the groundwork for fisheries development but lacks the comprehensive framework of PMMSY.

Important Points

• Significance of PMMSY:

• It promotes sustainable aquaculture practices while addressing the challenges posed by climate change.

• Encourages the use of modern technologies like GPS-enabled boats and digital marketplaces for fish trade.

• Provides financial assistance to fisherfolk for infrastructure development, such as ice plants, cold storage, and fish landing centers.

• Global Context:

• The development of climate-resilient villages aligns with global climate action goals under the Paris Agreement.

• It also supports the United Nations' Sustainable Development Goal 14, which focuses on conserving oceans and marine resources.

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Q93. Answer: (d) Bengaluru

The correct answer is Bengaluru.

Key Points

• Bengaluru is ranked as the top Indian city in the StartupBlink Global Startup Ecosystem Index 2025, securing its position as the leading hub for startups in India.

• Bengaluru, often referred to as the "Silicon Valley of India", is renowned for its vibrant startup ecosystem, housing numerous tech companies and innovation centers.

• The city boasts a unique combination of advanced technological infrastructure, a thriving pool of skilled professionals, and strong

support from the government and private sectors.

• Bengaluru is home to some of India's most prominent unicorns and startups, including Flipkart, Swiggy, Byju's, and Zerodha, which have significantly contributed to its global recognition.

• The city's robust ecosystem is further strengthened by the presence of leading educational institutions like the Indian Institute of Science (IISc) and Indian Institute of Management Bangalore (IIMB), fostering innovation and entrepreneurship.

Additional Information

• StartupBlink Global Startup Ecosystem Index:

• This annual index ranks cities and countries worldwide based on the strength of their startup ecosystems.

• It evaluates factors like startup activity, innovation infrastructure, and business environment to assess a region's potential for fostering startups.

• The index provides insights into how well a city supports startups in terms of funding, talent availability, and policy frameworks.

• Bengaluru as a Startup Hub:

• The city is home to a range of industries, including IT, biotech, fintech, and e-commerce, making it a diverse ecosystem for innovation.

• Bengaluru has a high concentration of venture capital firms, accelerators, and incubators that support startups at various stages of growth.

• Its cosmopolitan culture and favorable business environment attract entrepreneurs from across the globe.

• Other Indian Cities in the Index:

• Delhi: Ranked second among Indian cities, Delhi is a major hub for startups in sectors like fintech, healthcare, and logistics.

• Hyderabad: Known for its IT industry, Hyderabad has a growing startup ecosystem supported by government initiatives like T-Hub.

• Pune: Pune is emerging as a startup destination, particularly in the fields of education technology and manufacturing.

• Government Support for Startups:

• Initiatives like Startup India and state-level policies have significantly contributed to the growth of the startup ecosystem in India.

• Grants, tax benefits, and incubation programs are provided to encourage innovation and entrepreneurship.

Important Points

• India's Global Position:

• India is ranked among the top startup ecosystems globally, driven by its young population and growing tech industry.

• With over 50 unicorns as of 2025, India is one of the world's largest startup hubs.

• Global Competitors:

• Globally, cities like Silicon Valley, London, and Tel Aviv lead the rankings for the best startup ecosystems.

• These cities are known for their cutting-edge innovation, robust investment networks, and entrepreneurial culture.

Q94. Answer: (b) Karnataka Lokayukta

The correct answer is Karnataka Lokayukta.

Key Points

• Karnataka Lokayukta is an independent ombudsman institution established to investigate allegations of corruption and maladministration in the state of Karnataka.

• In July 2025, the Karnataka Lokayukta unearthed over Rs. 24 crore in unaccounted assets during an investigation targeting public officials and individuals suspected of corruption.

• The Lokayukta has the authority to conduct raids, confiscate assets, and examine records to ensure transparency and accountability in public service.

• The findings of the investigation highlighted discrepancies in income versus declared assets, signaling misuse of power and corruption among officials.

• The institution operates under the Karnataka Lokayukta Act and is tasked with addressing complaints regarding corruption, favoritism, and misconduct in administration.

Additional Information

• Karnataka Lokayukta:

• Established in 1986 under the Karnataka Lokayukta Act, it is one of the pioneering anti-corruption agencies in India.

• The Lokayukta is empowered to investigate complaints against public servants, elected representatives, and state officials.

• The institution is led by a Lokayukta (Chairperson) and an Upalokayukta, both appointed by the Governor of Karnataka.

• Its primary goal is to ensure transparency, accountability, and efficiency in governance while combating corruption.

• It has the authority to prosecute, recommend disciplinary action, and initiate legal proceedings based on its findings.

• Central Bureau of Investigation (CBI):

• The CBI is India's premier investigating agency that deals with cases related to corruption, economic offenses, and serious crimes.
• It was established in 1963 and operates under the jurisdiction of the Ministry of Personnel, Public Grievances, and Pensions.
• CBI primarily handles cases of national importance, including those referred by the central government or the judiciary.
• It does not typically investigate state-specific corruption cases unless specifically directed.
• Income Tax Department:
• The Income Tax Department is responsible for administering and enforcing direct tax laws under the Central Board of Direct Taxes (CBDT).
• It conducts tax raids and investigations to ensure compliance with tax regulations.
• While it plays a role in identifying unaccounted wealth, its focus is primarily on tax evasion rather than general corruption.
• Enforcement Directorate (ED):
• The ED is a specialized agency under the Ministry of Finance responsible for enforcing laws related to money laundering and foreign exchange violations.
• It operates under laws like the Prevention of Money Laundering Act (PMLA) and Foreign Exchange Management Act (FEMA).
• Its investigations typically involve financial crimes rather than state-specific corruption cases.
• Lokayukta in India:
• Lokayuktas have been established in various states to address complaints of corruption and maladministration.
• These institutions are independent and function autonomously to investigate complaints against public officials.
• They play a critical role in ensuring clean governance and upholding public trust.
• Examples include Lokayuktas in Maharashtra, Karnataka, and Madhya Pradesh.

Important Points

• Key Legal Framework:
• The Karnataka Lokayukta operates under the Karnataka Lokayukta Act, 1984, which defines its powers and scope of operation.
• It is tasked with investigating allegations of corruption, favoritism, abuse of power, and inefficiency in state administration.
• Its findings can lead to criminal prosecution or disciplinary action, ensuring accountability among public servants.
• Recent Developments:
• The Rs. 24 crore case highlights the importance of vigilance institutions like the Lokayukta in combating corruption.
• Such investigations play a pivotal role in uncovering unaccounted wealth and ensuring justice.

Q95. Answer: (d) Health ATM

The correct answer is Health ATM.

Key Points

• Health ATM refers to a self-service digital health kiosk designed to provide basic testing and diagnostics without the need for human intervention.
• In 2025, such an advanced automated healthcare machine was installed in Lucknow, making it a significant milestone in technology-driven healthcare solutions.
• Health ATMs are equipped with a variety of medical diagnostic tools such as BP monitors, glucometers, thermometers, pulse oximeters, and ECG machines.
• They offer services like basic health check-ups, instant diagnostic reports, and consultations with doctors through telemedicine.
• These kiosks are particularly beneficial in areas with limited access to healthcare facilities, as they help bridge the gap between patients and healthcare professionals.

Additional Information

• Features of Health ATMs:
• Health ATMs are compact and easy-to-use machines that can conduct up to 40 different diagnostic tests, including BMI, blood sugar, lipid profile, and hemoglobin levels.
• They provide instant health reports which can be shared with doctors for further consultation.
• Many Health ATMs are integrated with telemedicine platforms, enabling real-time virtual consultations with certified doctors.
• These machines are designed to operate in rural and urban areas, ensuring accessibility to healthcare services for a wide population.
• Applications of Health ATMs:
• They are widely used in places like railway stations, airports, corporate offices, schools, and rural areas.
• Health ATMs can act as primary healthcare points, reducing the burden on hospitals and diagnostic labs.
• Comparison with Other Options:

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• Med Kiosk: While similar in concept, Med Kiosks are more focused on prescription medicine dispensing rather than diagnostics.

• e-Clinic Booth: These booths are typically used for telemedicine services but may not provide the extensive diagnostic capabilities of a Health ATM.

• Health Pod: Health Pods are emerging technologies focused more on wellness and fitness monitoring rather than comprehensive health diagnostics.

• Global Use of Health ATMs:

• Countries like India, China, and the USA are increasingly adopting Health ATMs to improve their healthcare systems.

• They are particularly popular in areas with limited healthcare infrastructure.

Important Points

• Advantages of Health ATMs:

• They provide quick and affordable health solutions without requiring patients to visit clinics or hospitals.

• They are highly beneficial in remote and underserved areas where access to healthcare is limited.

• Health ATMs save time and effort by offering instant diagnostic results and telemedicine consultations.

• Future Prospects:

• With advancements in AI and IoT, Health ATMs are expected to become more efficient and offer a wider range of services.

• They can play a critical role in achieving universal healthcare access and reducing the burden on traditional healthcare facilities.

Q96. Answer: (d) Jamshedpur FC

The correct answer is Jamshedpur FC.

Key Points

• The runner-up for the 2025 Kalinga Super Cup was Jamshedpur FC. This team reached the finals but fell short of winning the title. Therefore, option 4 is correct.

• Jamshedpur FC is a professional football club based in Jamshedpur, Jharkhand. It competes in the Indian Super League (ISL), which is India's premier football league.

• The Kalinga Super Cup is an annual football tournament held in Odisha, India, and features some of the top football clubs in the country, including ISL teams.

• In the 2025 edition, Jamshedpur FC showcased a strong performance throughout the tournament, advancing to the final after defeating several notable teams in the knockout stages.

• The final match of the Kalinga Super Cup 2025 was a tightly contested game, with Jamshedpur FC putting up a commendable fight but ultimately finishing as the runner-up.

Additional Information

• Kalinga Super Cup:

• The Kalinga Super Cup is an annual football competition hosted in the state of Odisha, India, and is one of the prominent football tournaments in the country.

• It serves as a platform to promote football and identify promising talents from different regions of India.

• The tournament typically involves participation from Indian Super League (ISL) teams, as well as other prominent football clubs from across the nation.

• It is organized by the Odisha Football Association with support from the state government.

• Jamshedpur FC:

• Jamshedpur FC was established in 2017 and is owned by Tata Steel, one of India's largest steel manufacturing companies.

• The team is based in Jamshedpur, which is also known as the "Steel City of India."

• The club plays its home matches at the JRD Tata Sports Complex, which has a seating capacity of approximately 24,000.

• Jamshedpur FC has been a competitive team in the Indian Super League, aiming to make its mark in Indian football by producing quality performances and nurturing young talent.

• Other Teams Participating in Kalinga Super Cup 2025:

• Kerala Blasters FC: Based in Kochi, Kerala, this team is one of the most popular clubs in Indian football. Known for its passionate fanbase, the team has reached the ISL final multiple times but has yet to win the title.

• Bengaluru FC: This Bengaluru-based team has established itself as one of the most successful clubs in Indian football, winning multiple ISL titles and other tournaments.

• Hyderabad FC: Based in Hyderabad, Telangana, this team has emerged as a strong contender in recent years, known for its aggressive playing style and skilled players.

Important Points

• Significance of the Kalinga Super Cup: The tournament is not only a platform for competition among top football clubs but also promotes the sport in Odisha, a state that has been investing heavily in sports infrastructure and development.

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• Jamshedpur FC's Performance: While Jamshedpur FC has shown promise in multiple tournaments, it continues to strive for top honors in domestic football, including the Indian Super League and other competitive tournaments like the Kalinga Super Cup.

• Odisha as a Sports Hub: Odisha has emerged as a significant hub for various sports in India, hosting international events like the Hockey World Cup and promoting grassroots-level sports development.

• Football in India: The sport is growing rapidly in India, with tournaments like the Indian Super League and state-level competitions providing platforms for players to showcase their talent.

Q97. Answer: (d) Karolina Szczepaniak

The correct answer is Karolina Szczepaniak.

Key Points

• Karolina Szczepaniak, a remarkable long-distance swimmer from Poland, achieved the world record for the farthest distance swum in 48 hours (female) in a 25-meter pool.

• She covered an astonishing 149.02 km (92.59 miles) in just two days, showcasing her exceptional endurance and swimming capabilities.

• This record-breaking feat demonstrates the physical and mental strength required to sustain such a performance over 48 hours.

• Her accomplishment has been recognized globally, placing her among the elite athletes in the field of long-distance swimming.

• This achievement emphasizes the importance of training, discipline, and determination in competitive sports.

Additional Information

• Karolina Szczepaniak:

• She is a Polish swimmer specializing in long-distance and open-water swimming events.

• Her achievements in the swimming world have earned her a reputation for endurance and resilience.

• She has participated in several international swimming competitions, showcasing her talent on a global stage.

• Long-Distance Swimming:

• This type of swimming involves covering vast distances in open water or pools, requiring stamina, strategy, and mental toughness.

• It is a specialized form of swimming that often involves training in various water temperatures and conditions.

• World Record Criteria:

• For a swimmer's record to be recognized, the event must adhere to strict guidelines set by international swimming organizations.

• The swimmer must maintain a consistent pace and follow the specified rules for rest periods, if any.

• Other Accomplished Swimmers:

• Diana Nyad: Famous for swimming from Cuba to Florida without a shark cage at the age of 64.

• Sarah Thomas: Known for being the first person to swim across the English Channel four times non-stop.

• Katie Ledecky: A decorated Olympic swimmer specializing in freestyle events.

Important Points

• Training Regimen: Long-distance swimmers like Karolina undergo rigorous training involving hours of swimming daily, strength conditioning, and mental preparation.

• Recognition: Records like Karolina Szczepaniak's are officially certified by organizations such as the Guinness World Records or FINA.

• Significance: Achievements in long-distance swimming inspire athletes worldwide and highlight the human capacity for endurance.

• Challenges: Swimmers often face dehydration, fatigue, and environmental factors such as water temperature and quality during long swims.

Q98. Answer: (a) Adi Karmyogi

The correct answer is Adi Karmyogi.

Key Points

• Adi Karmyogi is an initiative launched by the Union Ministry of Tribal Affairs in June 2025.

• The program is designed to strengthen the delivery of tribal welfare schemes by focusing on training and inspiring a new generation of implementers.

• The initiative aims to equip individuals with the necessary skills, knowledge, and dedication to ensure the effective implementation of government programs tailored for tribal communities.

• It is aligned with the government's broader vision of empowering tribal communities and addressing the unique challenges they face, including social, economic, and cultural barriers.

• The program is expected to create a cadre of committed professionals who will work as change-makers in tribal areas by ensuring the efficient delivery of welfare schemes.

Additional Information

• Tribal Welfare in India:

• India is home to approximately 104 million tribal people, constituting around 8.6% of the total population (Census 2011).

• The government has launched various welfare schemes, such as Van Dhan Yojana, Eklavya Model Residential Schools (EMRS), and Tribal Sub-Plan (TSP), to address their needs.

• Despite these efforts, challenges like poverty, illiteracy, and lack of access to healthcare persist in tribal regions, necessitating focused initiatives like Adi Karmyogi.

• Key Features of Adi Karmyogi:

• The initiative focuses on capacity building through training programs, workshops, and hands-on experiences.

• It emphasizes community engagement and participatory governance to address tribal issues effectively.

• The program incorporates the use of technology and data analytics to track the implementation and impact of tribal welfare schemes.

• Other Tribal Initiatives:

• Van Dhan Yojana: Aimed at promoting tribal entrepreneurship by enabling the processing and marketing of minor forest produce (MFP).

• Eklavya Model Residential Schools (EMRS): Established to provide quality education to tribal students in remote areas.

• Pradhan Mantri Adi Adarsh Gram Yojana: Focuses on the holistic development of tribal villages.

• Importance of Tribal Welfare Programs:

• These programs are critical for achieving inclusive growth and ensuring that tribal communities are not left behind in India's development journey.

• They address key issues like education, healthcare, livelihood, and cultural preservation.

• By empowering tribal populations, these initiatives contribute to nation-building and social harmony.

Important Points

• Training Implementers: Adi Karmyogi focuses on creating a pool of dedicated professionals who can effectively implement welfare schemes at the grassroots level.

• Use of Technology: The initiative leverages digital tools to improve the efficiency and transparency of welfare delivery.

• Community-Centric Approach: It emphasizes active participation of tribal communities in decision-making processes.

• Collaborative Efforts: The program involves coordination between central, state, and local governments to address tribal issues holistically.

Q99. Answer: (d) Bhushan Ramkrishna Gavai

The correct answer is Bhushan Ramkrishna Gavai.

Key Points

• Bhushan Ramkrishna Gavai was appointed as the 52nd Chief Justice of India on 14 May 2025.

• He succeeded Sanjiv Khanna, who served as the Chief Justice of India before him.

• Justice Gavai is known for his significant contributions to the Indian judiciary and has delivered several landmark judgments during his tenure as a Supreme Court judge.

• He has extensive experience in handling cases related to constitutional law, civil law, and criminal law, which made him a strong candidate for the position of Chief Justice of India.

• As the Chief Justice of India, Justice Gavai is responsible for leading the judiciary and ensuring its independence, integrity, and efficiency in upholding the rule of law.

Additional Information

• Chief Justice of India (CJI):

• The Chief Justice of India is the head of the judiciary system of India and presides over the Supreme Court of India.

• The appointment of the Chief Justice is governed by the Constitution of India under Article 124, which states that the President of India appoints the Chief Justice.

• The Chief Justice plays a crucial role in constitutional interpretation, adjudication of disputes, and ensuring justice for citizens.

• Justice Bhushan Ramkrishna Gavai:

• Born on 24 November 1959, Justice Gavai hails from Maharashtra and has served in various judicial capacities before becoming the Chief Justice of India.

• He is known for his expertise in handling cases related to fundamental rights, environmental issues, and public interest litigation.

• He was elevated as a Supreme Court judge in May 2019 and has been part of several important benches.

• Selection Process of the Chief Justice:

• The appointment of the Chief Justice follows the seniority principle, where the most senior judge of the Supreme Court is

considered for the position.

• The President of India consults the outgoing Chief Justice and appoints the new Chief Justice based on their recommendation.

• Role and Responsibilities:

• The Chief Justice of India is responsible for constituting benches, assigning cases, and ensuring the smooth functioning of the Supreme Court.

• They act as the guardian of the Constitution and play a vital role in safeguarding democracy and ensuring justice for all.

Important Points

• Judicial Independence: The Chief Justice ensures that the judiciary remains independent from executive and legislative interference.

• Landmark Judgments: Justice Gavai has been part of benches delivering significant judgments on issues such as environmental conservation and human rights.

• Supreme Court Composition: The Supreme Court comprises the Chief Justice and a maximum of 34 other judges, as per constitutional provisions.

• Judicial Reforms: The Chief Justice often advocates for reforms to improve the efficiency and accessibility of the judiciary.

Q100. Answer: (c) Finland

The correct answer is Finland.

Key Points

• The World Happiness Report 2025, released in March 2025, ranked Finland as the happiest country in the world for the sixth consecutive year.

• The rankings in the report are based on various indicators, including GDP per capita, social support, life expectancy, freedom to make life choices, generosity, and perceptions of corruption.

• Finland consistently scores high due to its strong social safety nets, excellent education and healthcare systems, low levels of corruption, and a high degree of personal and societal trust.

• Other countries in the top five for 2025 include Denmark, Switzerland, Iceland, and the Netherlands, showcasing the dominance of Nordic and European nations in happiness rankings.

• Finland's emphasis on work-life balance, free education, environmental sustainability, and social equality significantly contributes to its top position.

Additional Information

• World Happiness Report:

• The report is an annual publication by the Sustainable Development Solutions Network (SDSN) of the United Nations.

• It evaluates 150+ countries based on a combination of survey data from the Gallup World Poll and other key indicators.

• The report's goal is to provide insights into well-being and happiness levels globally, encouraging policymakers to prioritize happiness in development initiatives.

• Finland's Strengths:

• Social Support: Finland has a robust welfare system that ensures citizens have access to healthcare, education, and unemployment benefits.

• Education: Finland's education system is renowned for being free and accessible, focusing on equality and innovation.

• Environmental Focus: The country is known for its commitment to sustainability, clean energy, and preserving its abundant natural resources.

• Trust and Transparency: Finland consistently ranks as one of the least corrupt countries, fostering trust in government and institutions.

• Other Countries:

• Denmark: Known for its high levels of social equality, trust in government, and emphasis on work-life balance.

• Switzerland: Excels in healthcare, economic stability, and individual freedoms.

• Iceland: Praised for its gender equality, clean energy initiatives, and strong community ties.

• Netherlands: Offers a blend of economic prosperity, high-quality healthcare, and a progressive social structure.

• Important Metrics in the Report:

• GDP per Capita: Economic output per person, reflecting material well-being.

• Social Support: Measures the availability of assistance in times of need.

• Healthy Life Expectancy: Indicates the average number of years a person can expect to live in good health.

• Freedom to Make Life Choices: Reflects individuals' perceived freedom to make decisions about their lives.

• Generosity: Based on donations to charities and community support.

• Perceptions of Corruption: Evaluates public trust in institutions and governance.

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