RRB Group D Official Paper (Held On: 11 Dec, 2025 Shift 3) (Previous Year Paper)

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

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GENERAL SCIENCE

Q1. In fish production, which of the following comes under the category of shellfish?

(a) Silver carp
(b) Bombay duck
(c) Tuna
(d) Molluscs

Q2. Every section of a current-carrying circular wire contributes to the magnetic field at the centre of the loop in _____.

(a) the opposite direction
(b) a random direction
(c) the perpendicular direction
(d) the same direction

Q3. Which of the following parts of a plant has the dividing tissue region which helps in growth?

(a) Sieve tube
(b) Apical meristem
(c) Sclerenchyma
(d) Vessels

Q4. Which of the following is chosen as a standard reference for determining atomic masses?

(a) Nitrogen-15
(b) Carbon-13
(c) Nitrogen-14
(d) Carbon-12

Q5. If the kinetic energy of a moving body is 450 J and its velocity is 15 m/s, the mass of the body is _____.

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

Q6. Which of the following is a correct use of baking soda (sodium hydrogen carbonate) in daily life?

(a) It is used to make soaps non-greasy
(b) It is used to neutralise strong acids in lead-acid batteries
(c) It is used to prepare edible salts
(d) It is used in fire extinguishers to produce foam

Q7. A molecule of ozone has:

(a) 2 oxygen atoms
(b) 4 oxygen atoms
(c) 3 oxygen atoms

(d) 1 oxygen atom

Q8. By how many degrees Celsius is the temperature of the scrotum lower than the normal body temperature?

(a) About 3°C
(b) About 12°C
(c) About 6°C
(d) About 7°C

Q9. The diffusion of water through a selectively permeable membrane is known as _____.

(a) transpiration
(b) active transport
(c) diffusion
(d) osmosis

Q10. Which of the following human female body part prepares itself every month to receive a fertilised egg?

(a) Kidney
(b) Pancreas
(c) Pharynx
(d) Uterus

Q11. What physical quantity is obtained by multiplying the velocity of an object by the time it travels, assuming the object moves with a uniform velocity?

(a) Acceleration
(b) Displacement
(c) Momentum
(d) Force

Q12. When ethanol reacts with ethanoic acid in the presence of conc H2SO4 it produces _____.

(a) aldehyde
(b) esters
(c) ketone
(d) alcohol

Q13. Which of the following statements about baking soda (sodium hydrogen carbonate) is NOT correct?

A. It is prepared industrially by reacting sodium chloride, ammonia, carbon dioxide, and water.

B. On heating, baking soda releases carbon dioxide gas, which makes it useful in baking.

C. Baking soda is used in antacids because it neutralises excess stomach acid, producing salt and water only.

(a) Only C
(b) Both A and B
(c) Both A and C
(d) Only A

Q14. Which of the following statements is correct?

(a) Magnetic field lines are always straight lines.
(b) Magnetic field lines start from the south pole and end at the north pole outside the magnet.
(c) Magnetic field is zero at the surface of a current-carrying wire.
(d) The direction of magnetic field around a straight current-carrying conductor can be given by the right-hand thumb rule.

Q15. Three rays of light parallel and close to the principal axis are incident on a convex lens, these rays will converge at which point after passing through the lens?

(a) At any point between the optical centre and the focus
(b) At the focus of the lens
(c) At any point beyond the focus
(d) At the optical centre

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Q16. Which of the following is an organic compound?

(a) NaCl
(b) C2H6
(c) CaCO3
(d) Na2CO3

Q17. A car travels at 62 km/hr for 2.5 hours and then at 48 km/hr for 1.5 hours. Its average speed is approximately _____.

(a) 27.5 km/hr
(b) 56.8 km/hr
(c) 58 km/hr
(d) 55 km/hr

Q18. What is the name of the semiconservative process in which DNA duplicates into two identical molecules?

(a) Mutation
(b) Translation
(c) Replication
(d) Transcription

Q19. Which primary feature allows mitochondria to be called the 'powerhouse of the cell'?

(a) They contain digestive enzymes
(b) They synthesise energy as ATP
(c) They control protein synthesis
(d) They store calcium ions

Q20. Which of the following is NOT due to refraction of light?

(a) Image formation by a convex lens
(b) Image formation by a convex mirror
(c) Delayed Sunset
(d) Twinkling of stars

Q21. In industries, how are ultrasonic waves primarily used to ensure the structural integrity of metallic components such as machine parts and bridges?

(a) To change the density of the metal
(b) To detect cracks and flaws inside the block
(c) To polish the surface of the metal
(d) To heat the metal to remove impurities

Q22. Which of the following statements is NOT correct?

(a) The value of G is constant everywhere
(b) Gravitational force is always attractive
(c) Gravitational force is strongest among small bodies
(d) Every object attracts every other object in the universe

Q23. Which of the following has a variable composition?

(a) Hydrogen chloride
(b) Water
(c) Methane
(d) Brass

Q24. What is the valency of oxygen in H2O ?

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

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Q25. What happens when insects suck the sap from leaves of crop plants?

(a) Plant gets pollinated
(b) Plant produces more flowers
(c) Plant health is affected
(d) Plant grows stronger

MATHEMATICS

Q26. A pair of earrings is bought for Rs. 27,650 and is sold at a profit of 5%. Find the profit (in Rs.). (Round off your answer to the nearest rupee)

(a) Rs. 1,462
(b) Rs. 1,383
(c) Rs. 1,450
(d) Rs. 1,362

Q27. Ravi sells only pens and pencils. A pen costs Rs. 12 and a pencil costs Rs. 4. A student buys a total of 25 items and spends Rs. 180. How many pens did the student buy?

(a) 5
(b) 15
(c) 10
(d) 20

Q28. A and B working together can do a piece of work in 6 days. B alone can do the same work in 7 days. How long (in days) will A alone take to do double the work?

(a) 85
(b) 42
(c) 87
(d) 84

Q29. The sides of a triangle are 39 cm, 62 cm, and 85 cm. What is the length of its altitude corresponding to the side with a length of 62 cm?

(a) 12 cm
(b) 57 cm
(c) 36 cm
(d) 18 cm

Q30. A cricketer has an average of 57 runs over 10 innings. If he scores 195 runs in the 11^(th) inning, by how many runs (rounded off to the nearest whole number) does his average score increase?

(a) 8
(b) 14
(c) 16
(d) 13

Q31. A typist takes 40 minutes to type 2 pages. How long (in minutes) will he take to type 101 pages?

(a) 2025
(b) 2030
(c) 2010
(d) 2020

Q32. 11 men and 17 women can complete a piece of work in 6 days, and 18 men and 15 women can complete the same work in 4 days. The work of how many women is equivalent to that of one man?

(a) 4
(b) 6
(c) 7
(d) 10

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Q33. A dealer allowed a 32% discount on an article and was still able to manage a 57% profit. Find the ratio of the cost price to listed price.

(a) 65 : 161
(b) 68 : 157
(c) 71 : 162
(d) 69 : 160

Q34. Simplify: $(5x + 11y)^2 + (5x - 11y)^2$

(a) $50x^2 + 242y^2$
(b) $-220xy$
(c) $50x^2 - 242y^2$
(d) $220xy$

Q35. A piece of land in the form of a rectangle has dimensions 240 m × 180 m. A narrow strip 10 m wide is dug all around it (outside) and the earth dug out is evenly spread over the land, increasing its surface level by 25 cm. Find the depth of the strip, rounded off to two decimal places.

(a) 1.43 m
(b) 1.11 m
(c) 1.34 m
(d) 1.23 m

Q36. The total number of colour blocks is 6409. If the ratio of red blocks to blue blocks is 7 : 5 and the ratio of blue blocks to yellow blocks is 8 : 4, then how many yellow blocks are there?

(a) 1099
(b) 1102
(c) 1098
(d) 1105

Q37. If a 1768 m long train crosses a pole in 68 seconds, then find the time (in seconds) taken by the train to cross a 338 m long platform.

(a) 81
(b) 82
(c) 76
(d) 77

Q38. The income of Raman is Rs. 68,800. He saves 18.5% of his income. If his income increases by 17% and expenditure increases by 25%, then his savings will:

(a) increase by Rs. 2,325
(b) decrease by Rs. 2,322
(c) decrease by Rs. 2,325
(d) increase by Rs. 2,319

Q39. A salesman marks his goods 75% above the cost price and gives a discount of 52% on them. Find the percentage of this gain or loss.

(a) 16% loss
(b) 15% loss
(c) 19% loss
(d) 18% gain

Q40. 1over20 is what percentage of 11over50 ? (Round off the answer to two decimal places.)

(a) 32.73%
(b) 22.73%
(c) 37.73%
(d) 45.45%

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Q41. A cuboid with dimensions 24 cm × 16 cm × 10 cm is melted to form smaller cubes with sides of 4 cm. Determine the number of cubes that can be formed.

(a) 58
(b) 62
(c) 64
(d) 60

Q42. Two trains, having lengths 210 m and 390 m, are running at speeds of 120 km/hr and 150 km/hr, respectively, in the same direction. The time taken (in minutes) by the faster train, coming from behind, to completely cross the other train is:

(a) 9.3
(b) 1.2
(c) 2
(d) 11.1

Q43. In an election between two candidates, 80% of the registered voters cast their votes. Out of these, 2% were declared invalid. One candidate secured 8,820 votes, which accounted for 75% of the valid votes. Find the total number of registered voters.

(a) 16,200
(b) 15,800
(c) 15,200
(d) 15,000

Q44. The fourth proportional to 18, a and 8a is 16. What is the positive value of a ?

(a) 6
(b) 9
(c) 3
(d) 8

Q45. The arithmetic mean of the observations 96, 70, 85, 52, 40, 88, 63, 40 and 60 is:

(a) 74
(b) 66
(c) 65
(d) 56

Q46. Two banks, A and B, offered loans at 3.5% and 7.5% per annum, respectively. Atul borrowed an amount of Rs. 2,20,000 from each bank. Find the positive difference (in Rs.) between the amounts of simple interest paid to the two banks by Atul after 3 years.

(a) 26,400
(b) 25,900
(c) 27,400
(d) 27,900

Q47. A typist takes 40 minutes to type 4 pages. How long (in minutes) will he take to type 112 pages?

(a) 1120
(b) 1130
(c) 1125
(d) 1110

Q48. The difference between the current ages of two brothers is 4 years. Twenty years ago, the age of the elder brother was 1.25 times the age of the younger brother. What is the current age (in years) of the elder brother?

(a) 38
(b) 36
(c) 34
(d) 40

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Q49. A person stands 36 metres away from the foot of a tower. The angle of elevation to the top of the tower is θ, and tan θ = 5/3. What is the height (in metres) of the tower?

(a) 45
(b) 60
(c) 54
(d) 48

Q50. Simplify: ((16^(-1) × 8²)/(4^(-3) × 2^5))^(1/3)

(a) 4
(b) 2
(c) 8
(d) 1

GENERAL INTELLIGENCE & REASONING

Q51. In a certain code language, ‘keep turning pages’ is coded as ‘kd vt fg’ and ‘count the pages’ is coded as ‘kl vt za’. How is ‘pages’ coded in the given language?

(All codes are two-letter codes)

(a) kl
(b) fg
(c) kd
(d) vt

Q52. PI 13 is related to SM 17 in a certain way. In the same way, HA 24 is related to KE 28. To which of the given options is RK 35 related, following the same logic?

(a) VQ 39
(b) UN 38
(c) UO 39
(d) VO 38

Q53. In a certain code language, ‘lab bird set’ is coded as 'ef xo ej' and ‘set web hall’ is coded as ‘ot ef hs’. How is ‘set’ coded in that language?

(a) xo
(b) ej
(c) ot
(d) ef

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

UDB VEC WFD XGE ?

(a) YHW
(b) YHL
(c) YHZ
(d) YHF

Q55. Refer to the number series given below and answer the question that follows. Counting to be done from left to right only.

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

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

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

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

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Q56. A, B, C, E, F, P and Q are sitting around a circular table facing the centre. Only four people sit between C and E when counted from the right of C. C sits third to the left of P. B sits third to the left of F. Q is an immediate neighbour of both E and P. How many people sit between A and Q when counted from the right of A?1854

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

Q57. Mr. Zzz starts from Point A and drives 11 km towards the east. He then takes a left turn, drives 19 km, turns left and drives 21 km. He then takes a left turn and drives 24 km. He takes a final left turn, drives 10 km and stops at Point P. How far (shortest distance) and towards which direction should he drive in order to reach Point A again? (All turns are 90-degree turns only unless specified.)

(a) 7 km to the east
(b) 4 km to the west
(c) 2 km to the south
(d) 5 km to the north

Q58. Saurabh ranked 17^(th) from the top and 28^(th) from the bottom in his class. How many students are there in the class?

(a) 44
(b) 33
(c) 35
(d) 34

Q59. A, B, C, D, W, X and Y are sitting around a circular table facing the centre of the table.

C sits to the immediate left of B. W sits to the immediate left of A. A sits second to the left of X. D sits third to the left of B. Who sits third to the right of Y?

(a) C
(b) W
(c) A
(d) D

Q60. Based on the English alphabetical order, three of the following four letter-clusters are alike in a certain way and thus form a group. Which letter-cluster DOES NOT belong to that group?

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

(a) AZB
(b) CBD
(c) VUW
(d) TTU

Q61. What will come in place of the question mark (?) in the following equation, if '+' and '−' are interchanged and '×' and '÷' are interchanged?

$26 \times 2 - 8 \div 4 + 9 = ?$

(a) 35
(b) 39
(c) 36
(d) 38

Q62. 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 golds are hives.

No hive is a cow.

Conclusions:

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(I): No gold is a cow.

(II): Some cows are hives.

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

Q63. What should come in place of the question mark (?) in the given series to make it logically complete?

5 10 10 20 20 40 40 ?

(a) 80
(b) 20
(c) 40
(d) 50

Q64. 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.

OWES - WOES - OESW

LITE - ILTE - LTEI

(a) JUTE - UJTE - EUTJ
(b) VAST - VSAT - TSAV
(c) EARN - AERN - ERNA
(d) PAIN - APIN - AINP

Q65. In the following number-pairs, the second number is obtained by applying certain mathematical operation(s) to the first number. Select the number-pair in which the numbers are related in the same way as are the numbers of the following pairs.

(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.)

74, 43

98, 55

(a) 122, 66
(b) 142, 76
(c) 46, 29
(d) 64, 39

Q66. HR 15 is related to KU 12 in a certain way. In the same way, SK 18 is related to VN 15. To which of the given options is EW 21 related, following the same logic?

(a) HZ 15
(b) HZ 18
(c) IA 18
(d) HA 18

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

97 80 63 46 29 ?

(a) 8
(b) 14
(c) 12
(d) 10

Q68. Which letter cluster will replace the question mark (?) to complete the given series?

IHT KJS MLR ONQ ?

(a) PTR
(b) QPP

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(c) OPP
(d) HYU

Q69. Seven boxes, A, B, C, D, E, F and G, are kept one over the other but not necessarily in the same order. Only E is kept above B. Only two boxes are kept between B and A. Only C is kept below G. F is not kept immediately above A. How many boxes are kept below A?

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

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

(Left) 1 © % £ 8 8 @ % 4 # 1 © 3 7 6 3 % * & € 9 7 (Right)

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

(a) 3
(b) 1
(c) 5
(d) 4

Q71. What should come in place of the question mark (?) in the given series?

532 542 550 556 560 ?4223

(a) 562
(b) 566
(c) 564
(d) 568

Q72. Refer to the following number series and answer the question that follows (all numbers are single-digit numbers only). Counting to be done from left to right only.

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

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

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

Q73. If ‘A’ stands for ‘÷’, ‘B’ stands for ‘×’, ‘C’ stands for ‘+’ and ‘D’ stands for ‘−’, then what will come in place of the question mark (?) in the following equation?

36 B 8 C 528 A 22 D 55 = ?

(a) 261
(b) 257
(c) 244
(d) 239

Q74. 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 phones are cars.

All phones are lights.

Conclusions:

(I) Some cars are lights.

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(II) All lights are phones.

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

Q75. M, N, O, P, W, X and Y are sitting around a circular table facing the centre of the table.

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

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

Q76. Refer to the following number, symbol series and answer the question that follows. Counting to be done from left to right only. All numbers are single-digit numbers only.

(Left) 6 7 8 9 & 5 £ & $ £ $ 1 * * # * € 8 % 8 © 7 (Right)

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

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

Q77. Based on the English alphabetical order, three of the following four letter-clusters are alike in a certain way and thus form a group. Which letter-cluster DOES NOT belong to that group?

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

(a) MQL
(b) JNI
(c) OSM
(d) KOJ

Q78. If 1 is added to each odd digit and 2 is subtracted from each even digit in the number 7381564, which of the following digits will be second from the left in the new number thus formed?

(a) 8
(b) 4
(c) 2
(d) 6

Q79. Daksha starts from Point A and drives 5 km towards east. She then takes a right turn, drives 6 km, turns left and drives 11 km. She then takes a left turn and drives 6 km. She takes a final left turn, drives 3 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) 15 km towards north
(b) 11 km towards south
(c) 11 km towards east
(d) 13 km towards west

Q80. In a certain code language,

P # Q means ‘P is the mother of Q’,

P @ Q means ‘P is the husband of Q’,

P & Q means ‘P is the sister of Q’, and

P % Q means ‘P is the father of Q’.

Based on the above, how is R related to O if ‘R @ V # E & K % O’?

(a) Father's mother
(b) Mother's father
(c) Sister's husband
(d) Father’s father

GENERAL AWARENESS AND CURRENT AFFAIRS

Q81. Who has been chosen for the Indira Gandhi Prize for Peace, Disarmament and Development for the year 2024?

(a) Malala Yousafzai
(b) Michelle Bachelet
(c) Angela Merkel
(d) Greta Thunberg

Q82. In March 2025, who among the following won the Prague Masters (Masters section) 2025 chess title?

(a) Aravindh Chithambaram
(b) Anish Giri
(c) R Praggnanandhaa
(d) Ediz Gürel

Q83. GARBH-INi-DRISHTI, which was launched at Translational Health Science and Technology Institute (THSTI) in February 2025, provides access to an unprecedented wealth of clinical data, images and biospecimens collected from over 12,000 _____.

(a) patients suffering from haemophilia and other blood diseases
(b) patients who survived COVID-19
(c) pregnant women, newborns and postpartum mothers
(d) cancer and AIDS patients

Q84. Which country along with Indian Air Force conducted their first-ever joint special operations exercise, 'Tiger Claw', from 26 May to 10 June 2025?

(a) United States of America
(b) Russia
(c) Germany
(d) United Arab Emirates

Q85. Which organisation typically supports the implementation of the 'Sports and Games for the Disabled' scheme?

(a) Indian Railways
(b) Reserve Bank of India
(c) Ministry of Education
(d) Ministry of Youth Affairs and Sports

Q86. Who took oath as the ninth Chief Minister of Delhi at the Ramlila Maidan on 20 February 2025?

(a) Manjinder Singh Sirsa
(b) Arvind Kejriwal
(c) Rekha Gupta
(d) Ravinder Indraj

Q87. In April 2025, which IPL franchise became the first team to reach 150 victories in the history of the tournament?

(a) Royal Challengers Bengaluru
(b) Mumbai Indians
(c) Kolkata Knight Riders
(d) Chennai Super Kings

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Q88. Which of the following is the main benefit of the Facial Recognition System (FRS) highlighted during the agenda of the August 2025 Parliamentary Consultative Committee meeting on Mission Saksham Anganwadi and Poshan 2.0?

(a) Ensuring benefits reach only genuine beneficiaries
(b) Expanding nutritional coverage to private school children
(c) Providing digital tablets to all Anganwadi workers
(d) Monitoring attendance of Anganwadi staff in real time

Q89. The Parliament of which country passed the Waqf (Amendment) Bill, 2025?

(a) Kenya
(b) China
(c) Nepal
(d) India

Q90. What is India's Sustainable Development Goals (SDG) Index score as per the SDG Index released in June 2025?

(a) 58
(b) 72
(c) 53
(d) 67

Q91. When did South Korea host the World Environment Day in 2025, as designated by the United Nations Environment Programme (UNEP)?

(a) 5 May
(b) 8 June
(c) 22 April
(d) 5 June

Q92. As per the Sustainable Development Goals – National Indicator Framework Progress Report, 2025, population covered by social protection systems has increased to which level in 2025, indicating substantial expansion in social security coverage in the country?

(a) 59.8%
(b) 64.3%
(c) 81.6%
(d) 72.7%

Q93. Which of the following ministries launched Phase 01 of India's Social Protection Data Pooling Exercise in March 2025 to strengthen welfare schemes and support vulnerable groups through better data consolidation at the Central level?

(a) Ministry of Labour and Employment
(b) Ministry of Rural Development
(c) Ministry of Home Affairs
(d) Ministry of Finance

Q94. Which two organisations have collaborated to develop a Close Quarter Battle (CQB) Carbine for the Indian Armed Forces?

(a) HAL and Tata Advanced Systems
(b) DRDO and Bharat Forge
(c) ISRO and BEML
(d) BEL and L&T

Q95. The city of Awaza, the venue of the Third UN Conference on Landlocked Developing Countries (2025), is located in which nation?

(a) Uzbekistan
(b) Kyrgyz Republic
(c) Kazakhstan
(d) Turkmenistan

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Q96. Announced in 2025, in which state is Similipal National Park located?

(a) Odisha
(b) Madhya Pradesh
(c) Bihar
(d) Karnataka

Q97. When was the 56^(th) meeting of the Monetary Policy Committee held?

(a) 4, 5 and 6 October 2025
(b) 4, 5 and 6 July 2025
(c) 4, 5 and 6 September 2025
(d) 4, 5 and 6 August 2025

Q98. In which of the following countries did Mahendra Gurjar set a world record in para javelin in 2025?

(a) Switzerland
(b) Brazil
(c) India
(d) Germany

Q99. The GST Council has scraped how much percentage tax on all individual life and health insurance policies, effective 22 September 2025?

(a) 16%
(b) 18%
(c) 12%
(d) 14%

Q100. At the 2025 Kalinga Literary Festival, Professor Arunava Sinha won an award for his translation of stories by?

(a) Vikas Swarup
(b) Sandipan Chattopadhyay
(c) Savie Karnel
(d) Jeet Thayil

ANSWER KEY

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

SOLUTIONS

Q1. Answer: (d) Molluscs

The correct answer is Molluscs.

Key Points

• Molluscs are classified as shellfish, which include organisms with soft bodies often protected by a hard shell. Examples include clams, oysters, mussels, and scallops.

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• Shellfish are broadly categorized into molluscs and crustaceans. Molluscs are distinct due to their calcium carbonate shells and lack of jointed appendages.

• Unlike finned fish such as Silver carp, Bombay duck, and Tuna, molluscs are invertebrates and are harvested for their edible meat and sometimes their shells.

• Molluscs are primarily found in marine environments, although certain species like freshwater mussels exist in rivers and lakes.

• Shellfish, including molluscs, are a rich source of protein, omega-3 fatty acids, vitamins, and minerals, making them nutritionally valuable and widely consumed globally.

Additional Information

• Silver carp:

• Silver carp is a freshwater fish species commonly found in rivers, lakes, and reservoirs.

• It is widely used in aquaculture due to its rapid growth rate and ability to filter feed on plankton.

• Silver carp is not a shellfish; it belongs to the category of finned fish.

• Bombay duck:

• Bombay duck is a type of lizardfish and is predominantly found along the Arabian Sea, particularly in India.

• Despite the name, Bombay duck is not a shellfish but a finned fish consumed mainly in dried or fresh form.

• Tuna:

• Tuna is a marine finfish and one of the most commercially important fish species globally.

• It is known for its high nutritional value, especially its rich content of omega-3 fatty acids.

• Tuna does not fall under the shellfish category.

• Molluscs:

• Molluscs are invertebrates with soft bodies often enclosed in a calcium carbonate shell.

• They include species like clams, oysters, snails, squids, and octopuses.

• Molluscs are highly valued in the seafood industry for their nutritional benefits and culinary uses.

• They play a crucial role in maintaining marine ecosystems by filtering water and serving as prey for other marine organisms.

Important Points

• Shellfish Classification:

• Shellfish are divided into two major categories: molluscs (e.g., clams, oysters, scallops) and crustaceans (e.g., crabs, lobsters, shrimp).

• Molluscs are characterized by their soft bodies and hard shells, while crustaceans have jointed appendages and exoskeletons.

• Global Consumption:

• Shellfish, especially molluscs, are a key part of diets in coastal regions across the world.

• They are harvested for food, and their shells are used in various industries, including jewelry and construction.

• Environmental Importance:

• Molluscs like oysters and mussels are vital for water filtration in marine ecosystems.

• They help maintain ecological balance and improve water quality by removing pollutants.

Q2. Answer: (d) the same direction

The correct answer is the same direction.

Key Points

• When a current flows through a circular wire, it creates a magnetic field around it due to the motion of electric charges. This behavior is explained by Ampere's Circuital Law and Biot-Savart Law.

• Every small segment of the circular loop contributes to the magnetic field at the center of the loop in the same direction. This is due to the symmetry of the circular loop and the nature of the magnetic field lines.

• The direction of the magnetic field at the center of the loop is determined using the Right-Hand Thumb Rule: If the thumb of the right hand points in the direction of the current, the curled fingers around the loop indicate the direction of the magnetic field.

• The magnetic field created by each segment of the wire at the center of the loop adds up constructively because all the contributions are in the same direction.

• This collective effect results in a strong and uniform magnetic field at the center of the circular loop, while the field decreases as we move away from the center.

Additional Information

• Biot-Savart Law:

• The Biot-Savart Law provides the mathematical expression to calculate the magnetic field produced by a small segment of a current-carrying conductor.

• The law states that the magnetic field dB due to a small current element is proportional to the current (I), the length of the

element (dl), and inversely proportional to the square of the distance (r^2) from the element.

• Mathematically, $dB = (\mu_0 / 4\pi) \times (I \times dl \times \sin\theta) / r^2$, where μ_0 is the permeability of free space.

• Right-Hand Thumb Rule:

• This rule helps determine the direction of the magnetic field surrounding a current-carrying conductor.

• If you curl the fingers of your right hand around a conductor in the direction of current flow, your thumb points in the direction of the resulting magnetic field lines.

• Magnetic Field in Circular Loops:

• The magnetic field at the center of a current-carrying circular loop is stronger compared to other points because all the magnetic field lines from different sections of the loop converge constructively at the center.

• The magnetic field at the center of the loop is given by $B = (\mu_0 \times I) / (2 \times R)$, where I is the current, R is the radius of the loop, and μ_0 is the permeability of free space.

• Applications of Magnetic Fields in Circular Loops:

• Circular loops are used in electromagnets and magnetic coils to create strong and uniform magnetic fields.

• They are also used in inductors in electronic circuits and devices like MRI machines, where controlled magnetic fields are essential.

Important Points

• Option 1 (Opposite Direction): Incorrect. If sections of the wire contributed in the opposite direction, the magnetic field at the center would cancel out, which does not happen in a circular loop.

• Option 2 (Random Direction): Incorrect. The contributions are not random; they follow a specific pattern determined by the Right-Hand Thumb Rule.

• Option 3 (Perpendicular Direction): Incorrect. The magnetic field contributions are not perpendicular but are aligned in the same direction at the center.

• Option 4 (Same Direction): Correct. All sections of the current-carrying circular wire contribute to the magnetic field at the center in the same direction.

Q3. Answer: (b) Apical meristem

The correct answer is Apical meristem.

Key Points

• Apical meristem is a region of actively dividing cells found at the tips of roots and shoots in plants. It is responsible for the primary growth of the plant, which includes elongation of stems and roots.

• The apical meristem contains undifferentiated or embryonic cells that continuously divide to produce new cells. These cells later differentiate to form various tissues and organs of the plant.

• This meristematic tissue plays a key role in increasing the height of the plant and allows it to grow in specific directions (e.g., upward for shoots and downward for roots).

• The apical meristem is protected by the root cap in roots and by young leaves in shoots, ensuring it remains functional during growth.

• In contrast, other plant tissues such as sieve tubes, sclerenchyma, and vessels are differentiated tissues that primarily perform specific functions like transport, support, or conduction, and do not contribute directly to growth through cell division.

Additional Information

• Meristematic Tissues:

• Meristematic tissues are regions in plants where active cell division occurs. These tissues are responsible for the growth and development of plants.

• They can be classified into apical meristem (at tips of roots and shoots), intercalary meristem (found at internodes or base of leaves), and lateral meristem (responsible for secondary growth, e.g., cambium).

• Sieve Tubes:

• Sieve tubes are specialized cells of the phloem tissue responsible for transporting nutrients, particularly sucrose, throughout the plant.

• These tubes lack nuclei and rely on companion cells for their functions. They do not contribute to growth by cell division.

• Sclerenchyma:

• Sclerenchyma is a type of permanent tissue that provides mechanical support to plants.

• It consists of dead cells with thick, lignified walls. These cells lose their ability to divide and hence do not contribute to growth.

• Vessels:

• Vessels are tube-like structures found in the xylem tissue that help in the conduction of water and minerals from roots to other parts of the plant.

• They are composed of dead cells and are specialized for conduction, not for growth through cell division.

• Primary vs Secondary Growth:

• Primary growth is the growth in length of roots and shoots and is facilitated by the apical meristem.

• Secondary growth, on the other hand, involves an increase in the girth or thickness of the plant and is caused by lateral meristems like vascular cambium and cork cambium.

Important Points

• Examples of Meristematic Tissue:

• Apical meristem: Found at the tips of roots and shoots, promotes vertical growth.

• Intercalary meristem: Found at the base of leaves or internodes, helps in regrowth and elongation.

• Lateral meristem: Includes vascular cambium and cork cambium, responsible for secondary growth (girth).

• Characteristics of Meristematic Cells:

• They are small, densely cytoplasmic cells with prominent nuclei.

• They have thin primary cell walls and lack vacuoles to allow rapid division.

• Real-life Application:

• Understanding meristematic tissue is essential for horticulture, as it helps in techniques like grafting and tissue culture.

• Apical meristems are studied for improving crop growth and yield by regulating hormone activity.

Q4. Answer: (d) Carbon-12

The correct answer is Carbon-12.

Key Points

• Carbon-12 is chosen as the standard reference for determining atomic masses due to its stability and wide occurrence in nature.

• The atomic mass unit (amu), also known as the unified mass unit, is defined as one-twelfth the mass of a single carbon-12 atom.

• The decision to use Carbon-12 as the standard was made by the International Union of Pure and Applied Chemistry (IUPAC) in 1961.

• Carbon-12 is a stable isotope of carbon that contains 6 protons and 6 neutrons, making its atomic mass exactly 12 atomic mass units.

• This standardization ensures consistency and accuracy in the measurement of atomic masses across all elements.

Additional Information

• Atomic Mass Unit (amu):

• The atomic mass unit is used to express the masses of atoms and molecules.

• 1 amu is approximately equal to 1.660539066 x 10^(-27) kilograms.

• It is a standard unit of measurement in chemistry, physics, and molecular biology.

• Carbon Isotopes:

• Carbon has three naturally occurring isotopes: Carbon-12, Carbon-13, and Carbon-14.

• Carbon-12 is the most abundant isotope, making up about 98.93% of all carbon found in nature.

• Carbon-13 is stable and used in chemical research and spectroscopy.

• Carbon-14 is radioactive and used in radiocarbon dating to determine the age of ancient objects.

• Why Carbon-12 is Preferred:

• Carbon-12 is chemically inert and does not react easily, making it ideal for a stable reference.

• Its atomic structure is simple and well-understood, ensuring precision in calculations.

• The abundance of Carbon-12 in nature provides practical advantages for standardization.

• Applications of Atomic Mass Standardization:

• Atomic masses are used in chemical equations, stoichiometry, and molecular mass calculations.

• They are crucial in fields like materials science, biochemistry, and pharmacology for accurate molecular composition analysis.

• Atomic mass plays a significant role in determining isotopic distributions and studying nuclear reactions.

Important Points

• Historical Context:

• Before Carbon-12, oxygen isotopes were used as a reference for atomic mass calculations.

• The shift to Carbon-12 eliminated discrepancies between the physicists' and chemists' scales.

• Standardization by IUPAC:

• IUPAC standardized the atomic mass scale globally, making scientific data uniform across disciplines.

• This move facilitated international collaboration in research and development.

• Significance in Research:

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• Atomic mass standardization allows scientists to predict chemical reactions and study the properties of elements.
• It also supports advancements in fields like nanotechnology and quantum mechanics.

Q5. Answer: (a) 4 kg

The correct answer is 4 kg.

Key Points

• The formula for kinetic energy is given as:

K.E. = (1/2) × m × v^2, where:

• K.E. = Kinetic Energy (in joules)
• m = Mass of the object (in kilograms)
• v = Velocity of the object (in m/s)
• In the question, the kinetic energy is 450 J, and the velocity is 15 m/s.
• Rearranging the formula to calculate the mass:

m = (2 × K.E.) / v^2

• Substituting the given values:

m = (2 × 450) / (15 × 15) = 900 / 225 = 4 kg.

• The calculated mass of the body is 4 kg, which matches the correct answer.

Additional Information

• Kinetic Energy:
• Kinetic Energy is the energy possessed by an object due to its motion.
• It depends on two factors: the mass of the object and the square of its velocity.
• K.E. is always a scalar quantity and is measured in joules (J).
• Examples of kinetic energy include a moving car, a flowing river, and a flying bird.
• Velocity:
• Velocity is the rate of change of an object's position with respect to time in a specific direction.
• It is a vector quantity, meaning it has both magnitude and direction.
• Units of velocity are measured in meters per second (m/s).
• Examples of velocity include the speed of a train moving north or a plane flying west at a specific speed.
• Mass:
• Mass is the amount of matter contained in an object.
• It is a scalar quantity and is measured in kilograms (kg) in the SI system.
• Mass is different from weight, which is the force of gravity acting on an object.
• In physics problems, mass plays a significant role in determining an object's inertia and energy.
• Applications of Kinetic Energy Formula:
• It is used in calculating the energy of moving objects, such as vehicles, projectiles, and machinery.
• Helps in designing safety measures such as airbags and helmets by understanding the impact of kinetic energy.
• Widely used in sports science to analyze the motion of athletes and equipment.
• Used in industries like aviation and space exploration for trajectory predictions.

Important Points

• Conservation of Energy: Kinetic energy is a part of the law of conservation of energy, which states that energy can neither be created nor destroyed but can only transform from one form to another.
• Work-Energy Theorem: It states that the work done on an object is equal to the change in its kinetic energy.
• SI Units:
• Kinetic Energy: Joules (J)
• Mass: Kilograms (kg)
• Velocity: Meters per second (m/s)
• Understanding these concepts is essential for fields like physics, engineering, mechanics, and energy analysis.

Q6. Answer: (d) It is used in fire extinguishers to produce foam

The correct answer is It is used in fire extinguishers to produce foam.

Key Points

• Sodium hydrogen carbonate (baking soda) is a crucial component in certain fire extinguishers. It reacts with acid to release carbon dioxide (CO_2) gas, which helps in extinguishing fire by displacing oxygen and creating a foam.

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• This foam acts as a barrier to prevent the fire from spreading further and helps in cooling the burning material.

• When baking soda is used in fire extinguishers, it decomposes upon heating to release carbon dioxide and water vapor, which are effective in putting out flames.

• The reaction can be represented as:

$2NaHCO_3 \rightarrow Na_2CO_3 + H_2O + CO_2$.

• These extinguishers are particularly effective in dealing with Class B and Class C fires, which involve flammable liquids and gases.

Additional Information

• Uses of Baking Soda:

• Option 1: It is used to make soaps non-greasy. This is incorrect because baking soda is not commonly used in soap manufacturing to remove grease.

• Option 2: It is used to neutralize strong acids in lead-acid batteries. This is incorrect because, while baking soda can neutralize acids, it is not specifically used for lead-acid batteries.

• Option 3: It is used to prepare edible salts. This is incorrect because baking soda itself is an edible salt but is not primarily used to prepare other salts.

• Option 4: It is used in fire extinguishers to produce foam. This is correct because baking soda reacts to release carbon dioxide, forming foam to extinguish fires.

• Properties of Baking Soda:

• Its chemical formula is $NaHCO_3$, and it is a mild alkali.

• It is commonly used as a leavening agent in baking due to the release of carbon dioxide gas during decomposition.

• Baking soda is also used as a cleaning agent, deodorizer, and in medical applications for neutralizing stomach acid.

• Types of Fire Extinguishers:

• Fire extinguishers are categorized based on the types of fires they are designed to combat, such as Class A, B, C, D, and electrical fires.

• Baking soda-based extinguishers are effective against Class B (flammable liquids) and Class C (electrical) fires.

• Environmental Impact:

• The use of baking soda in fire extinguishers is environmentally friendly because it produces non-toxic byproducts like sodium carbonate, water, and carbon dioxide.

Important Points

• Reaction in Fire Extinguishers: Baking soda reacts with acids like sulfuric acid to produce carbon dioxide, which extinguishes fire.

• Handling Fires: Always use the appropriate type of fire extinguisher depending on the material involved in the fire (e.g., wood, liquid, gas, or electrical equipment).

• Storage and Safety: Baking soda-based fire extinguishers should be stored in accessible locations and inspected regularly for proper functionality.

Q7. Answer: (c) 3 oxygen atoms

The correct answer is 3 oxygen atoms.

Key Points

• A molecule of ozone (O_3) consists of three oxygen atoms bonded together.

• Ozone is a triatomic molecule and is an allotrope of oxygen, differing from the more common diatomic oxygen molecule (O_2).

• The ozone molecule has a bent structure with an angle of approximately 116.8° between the oxygen atoms.

• It exists naturally in the Earth's atmosphere, particularly in the stratosphere, where it forms the ozone layer that protects life by absorbing harmful ultraviolet (UV) radiation from the Sun.

• Ozone can also be found near the Earth's surface (troposphere) as a result of pollution, where it acts as a harmful air pollutant and a key component of smog.

Additional Information

• Properties of Ozone:

• Ozone is a pale blue gas at standard temperature and pressure, with a strong, pungent odor.

• It is a powerful oxidizing agent and is used in various industrial and medical applications, such as water purification and sterilization.

• Formation of Ozone:

• Ozone is formed naturally in the stratosphere when ultraviolet (UV) light from the Sun splits an oxygen molecule (O_2) into two individual oxygen atoms, which then bond with another oxygen molecule to form ozone (O_3).

• Ozone Layer and Its Importance:

• The ozone layer, located in the stratosphere, absorbs the majority of the Sun's harmful ultraviolet (UV-B and UV-C) radiation, protecting living organisms from DNA damage and other harmful effects.

• The thickness of the ozone layer varies by location and time, and its depletion due to human-made chemicals like chlorofluorocarbons (CFCs) has been a major environmental concern.

• Industrial and Environmental Relevance:

• In the troposphere, ozone is a pollutant that contributes to respiratory problems and environmental damage.

• Ozone is used in industries for applications like water treatment, deodorization, and bleaching.

Important Points

• Ozone Depletion:

• Human-made chemicals such as chlorofluorocarbons (CFCs), halons, and other ozone-depleting substances (ODS) release chlorine and bromine atoms in the stratosphere, which destroy ozone molecules.

• Efforts to protect the ozone layer include the Montreal Protocol (1987), an international treaty aimed at phasing out the production of ODS.

• Health Effects of Ozone:

• While ozone in the stratosphere is essential for life, ozone at ground level can cause respiratory issues, throat irritation, and exacerbate conditions like asthma.

• Exposure to high levels of ozone can damage crops, trees, and other vegetation, impacting agriculture and ecosystems.

Q8. Answer: (a) About 3°C

The correct answer is About 3°C.

Key Points

• The temperature of the scrotum is maintained at approximately 3°C lower than the normal body temperature to ensure optimal conditions for spermatogenesis (the production of sperm).

• The normal human body temperature is about 37°C, while the scrotal temperature remains around 34°C to support the proper functioning of the testes.

• This temperature difference is crucial because sperm production and maturation require a cooler environment than the core body temperature.

• The cremaster muscle and dartos muscle in the scrotum regulate temperature by contracting or relaxing, thus moving the testes closer to or farther away from the body.

• High temperatures can impair sperm quality and lead to issues such as reduced fertility, emphasizing the importance of maintaining this cooler scrotal environment.

Additional Information

• Function of Scrotum:

• The scrotum houses the testes and plays a vital role in thermoregulation to ensure proper sperm production.

• The scrotal skin contains sweat glands that help in cooling through evaporation.

• Role of Muscles:

• The cremaster muscle adjusts the position of the testes relative to the body, moving them closer in cold conditions and away in warm conditions.

• The dartos muscle causes the scrotal skin to wrinkle or relax to aid in temperature regulation.

• Impact of Temperature on Fertility:

• Exposure to higher temperatures for prolonged periods can lead to a temporary decline in sperm count.

• Occupational hazards, such as working in hot environments, can affect male fertility over time.

• Scientific Studies:

• Studies indicate that even a slight increase in scrotal temperature (1-2°C) can negatively affect sperm motility and morphology.

• Wearing tight clothing or prolonged sitting can elevate scrotal temperature and impact sperm quality.

• Evolutionary Advantage:

• The external location of the scrotum in mammals is an evolutionary adaptation to optimize sperm production by maintaining a cooler environment.

Important Points

• Normal Body Temperature: The average human body temperature is 37°C, though it can vary slightly depending on the individual and time of day.

• Testes in Other Mammals: In certain mammals like whales and elephants, the testes are located inside the body, and their sperm production mechanisms have adapted to function at body temperature.

• Medical Conditions: Conditions like cryptorchidism (undescended testes) can lead to infertility due to higher temperatures inside the abdomen.

• Preventive Measures: Avoiding prolonged exposure to high temperatures, wearing loose clothing, and maintaining a healthy lifestyle are recommended to support male fertility.

Q9. Answer: (d) osmosis

The correct answer is osmosis.

Key Points

• Osmosis is the process by which water molecules move from a region of their higher concentration to a region of their lower concentration through a selectively permeable membrane.

• The selectively permeable membrane allows only certain molecules, such as water, to pass through while blocking others, ensuring the balance of substances between the two sides of the membrane.

• Osmosis plays a vital role in biological systems, especially in regulating the water content of cells, maintaining cell turgor, and balancing fluids in organisms.

• It is a passive transport mechanism, meaning it does not require energy (ATP) to occur, as it relies on the natural concentration gradient of water molecules.

• Examples of osmosis include water absorption by plant roots and the regulation of water balance in animal cells.

Additional Information

• Transpiration:

• Transpiration refers to the process by which water vapor is lost from the aerial parts of plants, primarily through the stomata in leaves.

• It is essential for maintaining the water cycle in plants and aiding in nutrient transport from the roots to other parts.

• This process is different from osmosis as it involves the evaporation of water rather than diffusion through a membrane.

• Active Transport:

• This is a biological process in which substances move against their concentration gradient (from lower to higher concentration) across a cell membrane.

• It requires energy in the form of ATP, unlike osmosis, which is passive.

• Examples include the sodium-potassium pump in animal cells and the uptake of minerals by plant roots.

• Diffusion:

• Diffusion is the movement of molecules (e.g., gases like oxygen and carbon dioxide) from a region of higher concentration to a region of lower concentration.

• It can occur in solids, liquids, and gases and does not necessarily involve a selectively permeable membrane.

• Unlike osmosis, diffusion applies to any substance and not just water.

• Importance of Osmosis in Daily Life:

• In plants, osmosis helps maintain turgidity in cells, which supports the plant structure.

• In humans, osmosis regulates the balance of fluids in cells and tissues, such as in kidneys during the filtration of blood.

• Industrial applications include water purification through reverse osmosis systems.

Q10. Answer: (d) Uterus

The correct answer is Uterus.

Key Points

• The uterus is a key reproductive organ in the human female body that prepares itself every month for the possibility of receiving a fertilized egg.

• This preparation is part of the menstrual cycle, which is regulated by hormones such as estrogen and progesterone.

• The inner lining of the uterus, called the endometrium, thickens each month to create a suitable environment for the implantation of a fertilized egg.

• If fertilization does not occur, the endometrial lining sheds, leading to menstruation.

• The uterus plays a critical role in supporting and nourishing a developing fetus during pregnancy and is also involved in childbirth through contractions.

Additional Information

• Menstrual Cycle:

• The menstrual cycle typically lasts 28 days, though it can range from 21 to 35 days.

• The cycle has four main phases: menstrual phase, follicular phase, ovulation, and luteal phase.

• Hormones such as follicle-stimulating hormone (FSH) and luteinizing hormone (LH) play key roles in regulating the cycle.

• Role of Hormones:

• Estrogen: Promotes the thickening of the endometrium.

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• Progesterone: Maintains the endometrial lining in preparation for implantation.
• If pregnancy does not occur, the levels of these hormones drop, triggering menstruation.
• Structure of the Uterus:
• The uterus is a hollow, muscular organ located in the pelvis.
• It has three main layers: the perimetrium (outer layer), myometrium (muscular middle layer), and endometrium (inner lining).
• The uterus is connected to the fallopian tubes and the vagina.
• Functions of the Uterus:
• Supports implantation of the fertilized egg.
• Provides nourishment to the developing fetus through the placenta.
• Facilitates childbirth through muscular contractions.

Important Points

• Kidney:
• The kidney is part of the urinary system and is responsible for filtering blood, removing waste products, and maintaining fluid and electrolyte balance.
• It is not involved in the reproductive process.
• Pancreas:
• The pancreas is a gland that plays a dual role in the digestive system and endocrine system.
• It produces insulin and digestive enzymes, but it does not contribute to reproductive functions.
• Pharynx:
• The pharynx is part of the respiratory and digestive systems, serving as a pathway for air and food.
• It has no role in reproduction.

Q11. Answer: (b) Displacement

The correct answer is Displacement.

Key Points

• Displacement is defined as the shortest distance between the initial and final positions of an object, along with its direction.
• When an object moves with a uniform velocity, the product of velocity and time gives the displacement of the object.
• Formula: Displacement (s) = Velocity (v) × Time (t). This is derived from the basic equation of motion when acceleration is zero.
• The SI unit of displacement is the same as distance, which is the meter (m).
• In this case, since the velocity is uniform and there is no change in direction, the displacement will equal the distance covered by the object.

Additional Information

• Acceleration:
• Acceleration is the rate of change of velocity of an object with respect to time.
• It is calculated using the formula: Acceleration (a) = Change in velocity (Δv) / Time (t).
• Its SI unit is meters per second squared (m/s^2).
• It is not obtained by multiplying velocity with time.
• Momentum:
• Momentum is the product of an object's mass (m) and its velocity (v).
• Formula: Momentum (p) = Mass (m) × Velocity (v).
• Its SI unit is kilogram meter per second (kg·m/s).
• It is unrelated to the product of velocity and time.
• Force:
• Force is the interaction that, when unopposed, changes the motion of an object.
• It is calculated using Newton's second law: Force (F) = Mass (m) × Acceleration (a).
• Its SI unit is the Newton (N).
• Force is not derived from the product of velocity and time.
• Displacement Features:
• Displacement is a vector quantity, meaning it has both magnitude and direction.
• For example, if an object moves 5 meters east, its displacement is 5 meters in the east direction.
• Displacement can be zero if the object returns to its starting point.
• It is different from distance, which is a scalar quantity and only measures the path traveled.

Important Points

• Uniform Velocity:

• When an object moves with a constant speed in a straight line, its velocity is uniform.

• Under uniform velocity, displacement is directly proportional to time.

• Difference Between Distance and Displacement:

• Distance: Total path traveled, scalar quantity, always positive.

• Displacement: Shortest path between two points, vector quantity, can be positive, negative, or zero.

• Applications:

• Displacement is crucial in physics for motion analysis in both linear and rotational mechanics.

• It is used in navigation, robotics, and engineering to determine exact positioning.

Q12. Answer: (b) esters

The correct answer is esters.

Key Points

• Reaction between ethanol and ethanoic acid: When ethanol (an alcohol) reacts with ethanoic acid (a carboxylic acid) in the presence of concentrated sulfuric acid (H2SO4), an ester is formed. This process is known as esterification.

• Role of concentrated H2SO4: Concentrated sulfuric acid acts as a dehydrating agent in the reaction, removing water (H2O) formed during the reaction and driving the equilibrium towards ester formation.

• Product of the reaction: The ester formed in this reaction is ethyl ethanoate, which has a characteristic fruity smell.

• Chemical equation: The reaction can be represented as:

CH3COOH + C2H5OH → CH3COOC2H5 + H2O

• Applications of esters: Esters are widely used in perfumes, flavoring agents, and as solvents in various industrial processes.

Additional Information

• What is esterification?

• Esterification is a chemical reaction in which a carboxylic acid reacts with an alcohol in the presence of an acid catalyst (commonly concentrated H2SO4) to form an ester and water.

• This is an example of a condensation reaction, as two molecules combine to form a larger molecule with the elimination of a smaller molecule (water).

• Characteristics of esters:

• Esters are organic compounds with the general formula RCOOR', where R and R' are alkyl or aryl groups.

• They are known for their pleasant fruity odors, making them useful in the perfume and food industries.

• Role of concentrated H2SO4:

• Concentrated sulfuric acid is a strong acid that catalyzes the esterification reaction by donating protons (H^+) to enhance the reactivity of the carboxylic acid and alcohol.

• It also acts as a dehydrating agent, removing water from the reaction mixture and shifting the equilibrium toward ester formation.

• Other reactions involving ethanol and ethanoic acid:

• In the absence of a dehydrating agent, ethanol and ethanoic acid do not readily form esters, highlighting the importance of concentrated H2SO4.

• Both ethanol and ethanoic acid are also involved in various other reactions, such as oxidation and neutralization, but esterification specifically leads to the formation of esters.

Important Points

• Ester usage: Esters like ethyl acetate (ethyl ethanoate) are widely used as solvents in the production of paints, varnishes, and adhesives.

• Reverse reaction: The reverse of esterification is known as ester hydrolysis, where esters react with water to form carboxylic acids and alcohols in the presence of an acid or base catalyst.

• Fischer–Speier esterification: The esterification reaction described is also referred to as Fischer–Speier esterification, named after the scientists Hermann Emil Fischer and Arthur Speier.

• Industrial relevance: Understanding esterification is crucial for industries like pharmaceuticals, cosmetics, and food flavoring.

Q13. Answer: (a) Only C

The correct answer is Only C.

Key Points

• Statement A: Baking soda (sodium hydrogen carbonate) is prepared industrially by reacting sodium chloride, ammonia, carbon dioxide, and water. This reaction is part of the Solvay process, which is widely used in chemical industries. Hence, this statement

is correct.

• Statement B: On heating, baking soda decomposes to release carbon dioxide gas (CO_2), water, and sodium carbonate. This property makes it useful in baking as it helps dough rise. The decomposition reaction is as follows:

$2NaHCO_3 \rightarrow Na_2CO_3 + H_2O + CO_2$. Hence, this statement is correct.

• Statement C: Baking soda is used in antacids to neutralize excess stomach acid; however, it does not produce only salt and water. The reaction also releases carbon dioxide gas, which may lead to belching. The reaction is as follows:

$NaHCO_3 + HCl \rightarrow NaCl + H_2O + CO_2$. Hence, this statement is NOT correct.

• Conclusion: Since statement C is incorrect, the correct answer is Only C.

Additional Information

• Properties of Baking Soda (Sodium Hydrogen Carbonate):

• Its chemical formula is $NaHCO_3$. It is a white crystalline solid, often appearing as a fine powder.

• Baking soda is mildly alkaline in nature and has a pH of around 8-9.

• It is soluble in water and decomposes upon heating to produce sodium carbonate, water, and carbon dioxide.

• Uses of Baking Soda:

• It is used in baking as a leavening agent, where it releases carbon dioxide to make dough rise.

• It is a component of some antacids, as it neutralizes stomach acid.

• Baking soda is used in cleaning products as a mild abrasive and deodorizer.

• It finds application in fire extinguishers, especially for grease and electrical fires.

• Solvay Process:

• This is an industrial process used to manufacture sodium carbonate and sodium bicarbonate.

• It involves the reaction of ammonia, carbon dioxide, and sodium chloride in water.

• The process is efficient and widely used in the chemical industry.

• Health Effects of Baking Soda:

• While it is safe in small amounts (e.g., in baking or as an antacid), excessive consumption may lead to alkalosis or an electrolyte imbalance.

• It should not be used in large doses without medical supervision.

Important Points

• Decomposition Reaction: Heating baking soda leads to its decomposition into sodium carbonate, water, and carbon dioxide. This reaction is crucial for its use in baking.

• Neutralization Reaction: Baking soda reacts with acids like vinegar or lemon juice to produce carbon dioxide, which is useful in cooking and cleaning applications.

• Storage: Baking soda should be stored in a dry, airtight container to prevent it from reacting with moisture and losing its effectiveness.

Q14. Answer: (d) The direction of magnetic field around a straight current-carrying conductor can be given by the right-hand...

The correct answer is The direction of magnetic field around a straight current-carrying conductor can be given by the right-hand thumb rule..

Key Points

• The right-hand thumb rule is used to determine the direction of the magnetic field generated around a current-carrying conductor. According to this rule, if you hold the conductor with your right hand such that your thumb points in the direction of the current, then the curl of your fingers around the conductor indicates the direction of the magnetic field lines.

• Magnetic field lines are not straight lines. They are closed continuous curves that emerge from the north pole of a magnet, loop around, and re-enter at the south pole. Hence, the statement that "magnetic field lines are always straight lines" is incorrect.

• Magnetic field lines do not start from the south pole and end at the north pole outside the magnet. They originate from the north pole and terminate at the south pole outside the magnet. Inside the magnet, they travel from the south pole to the north pole, completing a closed loop. Hence, the second statement is incorrect.

• Magnetic field is not zero at the surface of a current-carrying wire. In fact, the magnetic field is strongest at the surface of the conductor and decreases as the distance from the conductor increases. Hence, the third statement is also incorrect.

• The fourth statement, regarding the right-hand thumb rule, is correct as it accurately describes the method to determine the direction of the magnetic field produced by a straight current-carrying conductor.

Additional Information

• Right-hand thumb rule:

• This rule is specifically applicable to straight current-carrying conductors.

• It helps visualize the magnetic field lines in a circular loop around the conductor.

• It is an essential concept in electromagnetism, widely used in physics and engineering applications.
• Magnetic field lines:
• These are imaginary lines used to represent the direction and strength of the magnetic field.
• The density of the lines indicates the strength of the field; closer lines represent a stronger magnetic field.
• They never intersect each other because a magnetic field cannot have two directions at the same point.
• Magnetic field near a conductor:
• The strength of the magnetic field near a current-carrying conductor depends on the current's magnitude and the distance from the conductor.
• The magnetic field is proportional to the current and inversely proportional to the distance (as per Ampere's circuital law).
• Applications of the right-hand thumb rule:
• Used in designing electric motors, generators, and transformers.
• Helpful in understanding electromagnetic induction and the behavior of magnetic fields in devices like solenoids and toroids.

Important Points

• Biot-Savart Law: This law quantifies the magnetic field produced at a point due to a small segment of current-carrying wire.
• Ampere's Circuital Law: This law relates the integrated magnetic field around a closed loop to the electric current passing through the loop.
• Electromagnetic Induction: The process of generating an electromotive force (EMF) in a conductor due to a changing magnetic field.
• Practical Uses: The understanding of magnetic fields and their direction is pivotal in developing technologies like MRI machines, electric power transmission systems, and maglev trains.

Q15. Answer: (b) At the focus of the lens

The correct answer is At the focus of the lens.

Key Points

• Convex lens: A convex lens is a type of lens that is thicker at the center and thinner at the edges. It is also known as a converging lens because it bends light rays inward.
• Parallel rays: When light rays that are parallel to the principal axis of a convex lens pass through the lens, they converge at a specific point on the principal axis known as the focus.
• The focus of a convex lens is the point where rays of light parallel to the principal axis converge after refraction through the lens. This property is a fundamental characteristic of convex lenses.
• When three rays of light are incident parallel and close to the principal axis, they will always converge at the focus of the lens, irrespective of their distance from the principal axis as long as they are within the paraxial region.
• The correct option reflects this fundamental behavior of a convex lens, making “At the focus of the lens” the accurate answer.

Additional Information

• Principal Axis: The principal axis is an imaginary straight line that passes through the optical center and the center of curvature of the lens. It acts as a reference line for analyzing the behavior of light rays.
• Focal Length: The focal length of a convex lens is the distance between the optical center and the focus of the lens. It determines the lens’s converging power. A shorter focal length indicates stronger converging power.
• Optical Center: The optical center of a lens is the point inside the lens through which light rays pass without any deviation. It lies on the principal axis.
• Refraction in Convex Lens: Refraction occurs when light rays pass from one medium to another with different optical densities (e.g., from air to glass). In a convex lens, this refraction causes the light rays to bend inward and converge.
• Applications: Convex lenses are widely used in various optical devices such as cameras, microscopes, telescopes, magnifying glasses, and corrective lenses for farsightedness.

Important Points

• Other behaviors of light rays in a convex lens:
• If a light ray passes through the optical center of the lens, it remains undeviated.
• If a light ray passes through the focus of the lens before incidence, it emerges parallel to the principal axis after refraction.
• Light rays that are not parallel to the principal axis converge at points on the focal plane, not the focus.
• Other types of lenses:
• Concave Lens: A concave lens diverges light rays that are parallel to the principal axis. It is also known as a diverging lens.
• Concave lenses are primarily used in devices like peepholes, eyeglasses for nearsightedness, and lasers.
• Real vs. Virtual Images: Convex lenses usually form real and inverted images when the object is placed beyond the focal length. However, when the object is within the focal length, the lens forms a virtual, erect, and magnified image.

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Q16. Answer: (b) C2H6

The correct answer is C2H6 (Ethane).

Key Points

• Organic compounds are chemical compounds primarily composed of carbon and hydrogen, often with other elements like oxygen, nitrogen, sulfur, or phosphorus.

• C2H6 (Ethane) is a simple organic compound that belongs to the category of hydrocarbons, specifically an alkane, which contains only carbon (C) and hydrogen (H) atoms. Hence, C2H6 is an organic compound.

• In contrast, compounds like NaCl, CaCO3, and Na2CO3 are considered inorganic compounds because they do not fit the typical structure of organic molecules with carbon-hydrogen bonds.

• Ethane is a gaseous compound under standard conditions and is a component of natural gas. It is used as a fuel and a feedstock in the chemical industry.

• Organic compounds like ethane are essential in biological processes and industrial applications, making them a key focus in chemistry.

Additional Information

• NaCl (Sodium Chloride):

• NaCl is an inorganic compound commonly known as table salt.

• It consists of sodium (Na) and chlorine (Cl) ions arranged in a crystalline lattice.

• It is widely used in cooking, food preservation, and industrial applications.

• CaCO3 (Calcium Carbonate):

• CaCO3 is an inorganic compound found naturally as limestone, chalk, and marble.

• It is used in construction materials, cement, and as a dietary calcium supplement.

• While it contains carbon, it lacks the C-H bonds required to classify it as an organic compound.

• Na2CO3 (Sodium Carbonate):

• Na2CO3, also known as soda ash or washing soda, is an inorganic compound.

• It is widely used in the glass manufacturing industry, water treatment, and as a cleaning agent.

• It contains carbonate ions ($CO3^{2}$^-) but does not belong to organic compounds because of the absence of C-H bonds.

• Organic Compounds:

• Organic chemistry focuses on compounds containing carbon-hydrogen (C-H) bonds.

• Examples of organic compounds include methane (CH4), ethane (C2H6), glucose (C6H12O6), and ethanol (C2H5OH).

• They play an essential role in life processes, fuels, medicines, and industrial products.

• Inorganic Compounds:

• These compounds include salts, oxides, and other substances that do not have C-H bonds, such as water (H2O), carbon dioxide (CO2), and NaCl.

• They are crucial for various applications like construction, agriculture, and chemical synthesis.

Q17. Answer: (b) 56.8 km/hr

The correct answer is 56.8 km/hr.

Key Points

• To calculate the average speed, we use the formula: Average Speed = Total Distance / Total Time.

• The car travels at a speed of 62 km/hr for 2.5 hours. The distance covered during this time is calculated as: Distance = Speed × Time = 62 × 2.5 = 155 km.

• The car then travels at a speed of 48 km/hr for 1.5 hours. The distance covered during this time is calculated as: Distance = Speed × Time = 48 × 1.5 = 72 km.

• The Total Distance covered by the car is: Total Distance = 155 km + 72 km = 227 km.

• The Total Time taken by the car is: Total Time = 2.5 hours + 1.5 hours = 4 hours.

• The Average Speed is therefore: Average Speed = Total Distance / Total Time = 227 / 4 = 56.75 km/hr. This value is approximately 56.8 km/hr.

• Hence, the correct answer is 56.8 km/hr.

Additional Information

• Average Speed Calculation:

• The formula for average speed is applicable only when the distances traveled at different speeds are known.

• If the time intervals are the same for different speeds, then the harmonic mean can be used to calculate the average speed.

• Average speed is a scalar quantity and does not take direction into account.

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• Units of Speed:
• Speed is measured in units such as kilometers per hour (km/hr), meters per second (m/s), or miles per hour (mph).
• To convert from km/hr to m/s, divide the speed by 3.6. For example, 62 km/hr = 62 ÷ 3.6 = 17.22 m/s.
• Applications of Average Speed:
• Average speed is used in transportation planning, vehicle performance analysis, and time-distance calculations.
• It is a crucial metric in industries such as logistics and aviation for optimizing routes and fuel usage.
• :
• The distance-time graph provides a visual representation of speed. A steeper slope indicates higher speed.
• Uniform speed results in a straight line, while variable speed creates a curve.

Important Points

• Key Considerations in Calculations:
• Ensure all units are consistent before performing calculations (e.g., time in hours and speed in km/hr).
• For accurate results, avoid rounding off intermediate values during calculations.
• Real-Life Example:
• If a vehicle travels at different speeds due to traffic conditions, the average speed helps in estimating the total journey time.
• For example, a bus traveling at varying speeds between cities uses average speed to calculate arrival time.

Q18. Answer: (c) Replication

The correct answer is Replication.

Key Points

• Replication is the process by which DNA duplicates into two identical molecules, ensuring that genetic information is passed on accurately during cell division.
• It is a semiconservative process, meaning that each of the two new DNA molecules consists of one original strand and one newly synthesized strand.
• DNA replication begins at specific sites called origins of replication, where the double helix unwinds, and replication forks are formed.
• The enzyme DNA helicase unwinds the DNA strands, while DNA polymerase synthesizes the new DNA by adding complementary nucleotides to the template strand.
• Replication ensures that each daughter cell has an exact copy of the parent cell's DNA, which is critical for maintaining genetic stability in organisms.

Additional Information

• Mutation:
• A mutation is a change in the DNA sequence that can occur due to errors during replication, exposure to mutagens, or other factors.
• Mutations are not responsible for duplicating DNA but can lead to variations in genetic material.
• Examples include point mutations, deletions, insertions, or chromosomal rearrangements.
• Translation:
• Translation is the process of synthesizing proteins from messenger RNA (mRNA) in the ribosome.
• This process involves decoding the genetic code carried by mRNA into a sequence of amino acids, forming a polypeptide chain.
• It is not related to DNA duplication.
• Transcription:
• Transcription is the process of synthesizing RNA from a DNA template by the enzyme RNA polymerase.
• It involves converting genetic information stored in DNA into a complementary RNA sequence.
• Transcription does not duplicate DNA but plays a role in gene expression.
• Semiconservative replication:
• This model was confirmed by the Meselson and Stahl experiment in 1958.
• It ensures that each new DNA molecule retains one strand from the parent DNA and one newly synthesized strand.
• This mechanism is crucial for minimizing errors during replication.
• Important enzymes in DNA replication:
• DNA helicase: Unwinds the DNA double helix.
• DNA polymerase: Adds complementary nucleotides to the growing DNA strand.
• Primase: Synthesizes RNA primers to initiate replication.
• Ligase: Joins fragments of DNA together, especially on the lagging strand.

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Q19. Answer: (b) They synthesise energy as ATP

The correct answer is They synthesise energy as ATP.

Key Points

• Mitochondria are often referred to as the "powerhouse of the cell" because they are the primary site for ATP (Adenosine Triphosphate) production, which is the main energy currency of the cell.

• ATP is synthesised during the process of cellular respiration, specifically in the electron transport chain, which occurs in the inner mitochondrial membrane.

• The mitochondria are equipped with a double membrane structure: an outer membrane and a highly folded inner membrane, which contains proteins essential for ATP production.

• Through the breakdown of glucose and other molecules in processes like the Krebs cycle (in the mitochondrial matrix) and oxidative phosphorylation (on the inner membrane), mitochondria efficiently produce ATP.

• This function is crucial for maintaining cellular activities such as muscle contraction, nerve impulse propagation, and synthesis of biomolecules. Hence, mitochondria are indispensable for energy metabolism in the cell.

Additional Information

• Structure and Function of Mitochondria:

• The mitochondria have a double membrane structure. The outer membrane is permeable to ions and small molecules, while the inner membrane is impermeable and contains folds called cristae, which increase surface area for ATP production.

• The mitochondrial matrix contains enzymes for the Krebs cycle, mitochondrial DNA, and ribosomes.

• Mitochondria have their own DNA and ribosomes, allowing them to synthesise some of their own proteins and enzymes independently of the cell nucleus.

• Other Cellular Functions of Mitochondria:

• In addition to ATP synthesis, mitochondria are involved in calcium ion storage, which is critical for cell signalling, muscle contraction, and other cellular processes.

• They play a role in the regulation of apoptosis, or programmed cell death, which is essential for removing damaged or unwanted cells.

• Mitochondria are also involved in heat production in brown adipose tissue through a process known as non-shivering thermogenesis.

• Explanation of Incorrect Options:

• Option 1: "They contain digestive enzymes" – Incorrect. Digestive enzymes are found in lysosomes, not mitochondria.

• Option 3: "They control protein synthesis" – Incorrect. Protein synthesis is primarily controlled by ribosomes and the cell nucleus.

• Option 4: "They store calcium ions" – Partially correct. While mitochondria do store calcium ions, this is not their primary function and does not justify their title as the "powerhouse of the cell."

• Key Processes Related to Mitochondria:

• Glycolysis: Occurs in the cytoplasm and provides pyruvate for the Krebs cycle in the mitochondria.

• Krebs Cycle: Takes place in the mitochondrial matrix and produces electron carriers like NADH and FADH2.

• Oxidative Phosphorylation: Occurs on the inner mitochondrial membrane, where ATP is generated from ADP and inorganic phosphate.

Q20. Answer: (b) Image formation by a convex mirror

The correct answer is Image formation by a convex mirror.

Key Points

• Refraction of light occurs when light travels from one medium to another and bends due to a change in speed. This phenomenon is responsible for effects like image formation by lenses, the twinkling of stars, and the delayed sunset.

• Image formation by a convex lens is due to refraction. Light bends when passing through the curved lens surface, focusing at a particular point to create an image. Hence, this is correct.

• Delayed sunset happens due to atmospheric refraction. Light bends as it passes through the Earth's atmosphere, making the Sun visible even after it has set below the horizon. Hence, this is correct.

• Twinkling of stars is caused by refraction of starlight through layers of the Earth's atmosphere with varying densities. This bending of light causes stars to appear as if they are twinkling. Hence, this is correct.

• Image formation by a convex mirror is not due to refraction, but rather due to reflection. Convex mirrors reflect light rays outward, forming virtual and diminished images. Hence, this is the correct answer.

Additional Information

• Refraction:

• Definition: The bending of light when it passes from one transparent medium to another due to a change in its speed.

• Applications: Refraction is used in lenses (e.g., eyeglasses, microscopes, telescopes) to focus light and form images.

• Examples: Phenomena like the bending of a straw in water, mirages in deserts, and rainbows are due to refraction.
• Convex Lens:
• Function: Convex lenses are thicker at the center and converge light rays to a focal point.
• Uses: Found in cameras, magnifying glasses, and optical instruments.
• Image Formation: Can form both real and virtual images depending on the object's position relative to the focal length.
• Atmospheric Refraction:
• Definition: Refraction caused by the Earth's atmosphere due to varying air densities.
• Effects: Causes phenomena such as the apparent position of celestial bodies and delayed sunrise/sunset.
• Example: Stars twinkle because their light is refracted multiple times through atmospheric layers.
• Convex Mirror:
• Function: Convex mirrors reflect light rays outward, spreading them apart.
• Applications: Commonly used as rear-view mirrors in vehicles due to their wide field of view.
• Image Formation: Always forms virtual, upright, and diminished images.

Important Points

• Key Differences between Refraction and Reflection:
• Refraction: Light bends due to a change in medium (e.g., glass to air).
• Reflection: Light bounces back into the same medium from a surface (e.g., mirrors).
• Convex mirrors: Rely entirely on reflection, not refraction, for image formation.
• Applications of Refraction: Essential for designing optical devices like lenses, prisms, and fiber optics.
• Applications of Reflection: Used in mirrors, solar panels, and optical instruments that rely on light bouncing back.

Q21. Answer: (b) To detect cracks and flaws inside the block

The correct answer is To detect cracks and flaws inside the block.

Key Points

• Ultrasonic waves are widely used in industries for non-destructive testing (NDT) of materials, particularly metals, to detect cracks and flaws inside the structures.
• This technique works by transmitting high-frequency sound waves (typically above 20 kHz) into the material and analyzing the reflected signals to identify irregularities.
• The reflected waves, also called echoes, indicate the presence of flaws, such as cracks, voids, or inclusions, within the metallic block.
• Ultrasonic testing is crucial for ensuring the structural integrity and safety of components like machine parts, bridges, pipelines, and aircraft structures.
• It is a highly effective method because it is non-invasive, meaning it does not damage the component being tested, and can detect flaws even at considerable depths.

Additional Information

• Applications of Ultrasonic Testing:
• Used extensively in the aerospace industry for inspecting aircraft components to detect fatigue cracks and corrosion.
• In the automotive industry, it is utilized to check the quality of welds and the integrity of engine components.
• In civil engineering, ultrasonic waves are used to assess the condition of concrete structures, bridges, and tunnels.
• The oil and gas industry employs ultrasonic testing to detect defects in pipelines and storage tanks.
• Used in the manufacturing sector to ensure the quality of castings, forgings, and other metal products.
• Principle of Ultrasonic Testing:
• Ultrasonic testing is based on the principle of sound wave reflection. When sound waves encounter a boundary between two different materials or a defect, part of the wave is reflected back.
• The time taken for the reflected wave to return helps determine the location and size of the defect.
• The equipment typically includes a transducer (to generate and receive waves), a pulser/receiver, and a display unit for data interpretation.
• Advantages of Ultrasonic Testing:
• It provides precise results and can detect even small defects deep inside a material.
• It is a non-destructive technique, meaning the tested material remains unharmed.
• Ultrasonic testing can be automated and integrated into production lines for real-time quality control.
• Limitations of Ultrasonic Testing:
• Requires skilled operators and proper calibration of equipment for accurate results.

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• Materials with coarse grains, such as cast iron, can scatter sound waves and reduce the accuracy of the test.

• Surface preparation is often necessary to ensure proper coupling of the transducer.

• Other Uses of Ultrasonic Waves:

• Medical Imaging: Used in ultrasound scans to visualize internal organs, monitor pregnancies, and diagnose conditions.

• Cleaning: Used in ultrasonic cleaning devices to remove contaminants from delicate objects like jewelry, surgical instruments, and electronic components.

• Welding: Ultrasonic waves are used in ultrasonic welding to join materials, particularly plastics, without using adhesives or fasteners.

• Flow Measurement: Used to measure the flow rate of liquids and gases in pipelines.

Q22. Answer: (c) Gravitational force is strongest among small bodies

The correct answer is Gravitational force is strongest among small bodies.

Key Points

• The value of G is constant everywhere:

• The gravitational constant (G) is a universal constant with a value of approximately 6.674 × 10^(-11) N·m²/kg². It remains constant throughout the universe.

• This constant is fundamental to Newton's law of gravitation, which governs the attractive force between two masses. Hence, this statement is correct.

• Gravitational force is always attractive:

• Gravitational force acts as an attractive force between two masses, pulling them towards each other.

• Unlike other forces such as electromagnetic forces, gravity does not have a repulsive component. Hence, this statement is correct.

• Gravitational force is strongest among small bodies:

• This statement is incorrect as gravitational force depends on the masses of the objects and the distance between them.

• Gravitational force is stronger between large celestial bodies, such as planets, stars, or moons, compared to smaller objects due to their larger masses.

• For small objects, the gravitational force is negligible. Hence, this statement is incorrect.

• Every object attracts every other object in the universe:

• According to Newton's Universal Law of Gravitation, every object in the universe exerts a gravitational pull on every other object.

• This mutual attraction is proportional to the product of their masses and inversely proportional to the square of the distance between their centers. Hence, this statement is correct.

Additional Information

• Newton's Universal Law of Gravitation:

• The law states that every mass in the universe attracts every other mass with a force that is directly proportional to the product of their masses and inversely proportional to the square of the distance between their centers.

• The formula is given by: F = G × (m1 × m2) / r², where F is the gravitational force, m1 and m2 are the masses of the two objects, r is the distance between their centers, and G is the gravitational constant.

• Gravitational Force Characteristics:

• It is a long-range force that acts over astronomical distances.

• It is the weakest of the fundamental forces but dominates at large scales due to its cumulative effect over massive bodies.

• It is always attractive and never repulsive.

• Applications of Gravity:

• Gravity is responsible for holding planets in orbit around the sun and moons in orbit around planets.

• It governs the motion of celestial bodies, ocean tides, and the structure of galaxies.

• It plays a crucial role in phenomena such as free fall and weight measurement.

• Role of Mass and Distance:

• Greater the mass of the objects, stronger is the gravitational force.

• Greater the distance between the objects, weaker is the gravitational force due to the inverse square law.

• Gravity on Different Celestial Bodies:

• The acceleration due to gravity varies on different celestial bodies due to differences in their mass and radius.

• For example, the gravity on the Moon is about 1/6th of Earth's gravity, making objects weigh less on the Moon.

Important Points

• Gravitational Constant:

• Its value is 6.674 × 10^(-11) N·m²/kg².
• G is a universal constant and remains the same irrespective of location.
• Inverse Square Law:
• The gravitational force decreases as the square of the distance between two objects increases.
• This is why celestial bodies far apart exert negligible gravitational force on each other.
• Gravitational Force vs. Other Forces:
• Gravity is weaker compared to electromagnetic and nuclear forces but dominates over large distances.
• It plays a fundamental role in shaping the universe's structure.
• Weight vs. Mass:
• Mass is a measure of the amount of matter in an object and remains constant everywhere.
• Weight is the gravitational force acting on an object and depends on the location due to variations in gravity.

Q23. Answer: (d) Brass

The correct answer is Brass.

Key Points

• Brass is an alloy, which means it is a mixture of two or more metals. Its composition can vary depending on the desired properties, making it a material with variable composition.
• The primary components of brass are copper (Cu) and zinc (Zn). The ratio of these two metals can be adjusted to achieve different levels of strength, ductility, corrosion resistance, and color.
• Unlike pure substances like hydrogen chloride, water, or methane, brass does not have a fixed chemical formula. Instead, the proportion of its constituents can be tailored according to specific applications.
• Brass is widely used in various industries, including construction, musical instruments, plumbing, and decorative items, due to its malleability and attractive appearance.
• Its variable composition is an essential characteristic that makes brass suitable for diverse purposes, as different ratios of copper and zinc produce variations in physical and chemical properties.

Additional Information

• Hydrogen chloride (HCl):
• It is a pure compound with a fixed composition of one hydrogen atom and one chlorine atom.
• Hydrogen chloride is used in industries for chemical synthesis, cleaning agents, and the production of hydrochloric acid.
• It has a specific molecular formula that does not vary, making it a compound with a fixed composition.
• Water (H2O):
• Water is a pure compound composed of two hydrogen atoms bonded to one oxygen atom.
• Its composition remains constant, and it is vital for life processes, serving purposes such as drinking, sanitation, and industrial cooling.
• Water is not a mixture or alloy, and it does not exhibit variable composition.
• Methane (CH4):
• Methane is a simple hydrocarbon with a fixed molecular composition of one carbon atom and four hydrogen atoms.
• It is used as a fuel in homes and industries and is a major component of natural gas.
• Since methane has a fixed chemical formula, it does not exhibit variable composition.
• Brass:
• As an alloy, brass has a variable composition depending on the percentage of copper and zinc.
• For example, brass with higher copper content tends to be more corrosion-resistant, while higher zinc content increases strength.
• Brass is used for applications like electrical connectors, jewelry, mechanical parts, and marine hardware.
• Its adjustable properties make it versatile and widely applicable in various fields.

Important Points

• Pure substances: Compounds like hydrogen chloride, water, and methane have fixed compositions, meaning their molecular structures and chemical formulas remain constant.
• Alloys: Mixtures like brass are composed of two or more elements, with their ratios adjusted to meet specific requirements. This makes alloys materials with variable compositions.
• Brass is an example of an alloy, as its copper and zinc proportions can be modified for different mechanical, electrical, and aesthetic purposes.
• Understanding the difference between pure substances and alloys is crucial in materials science and industrial applications.

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Q24. Answer: (d) 2

The correct answer is 2.

Key Points

• Valency is the combining capacity of an element, which determines how many atoms of an element can combine with atoms of another element to form a compound.

• In water (H2O), oxygen combines with two hydrogen atoms. Each hydrogen atom has a valency of 1, meaning it can form one bond.

• Oxygen forms two bonds with hydrogen atoms, indicating that its valency is 2. These bonds are covalent in nature, meaning they involve sharing of electrons.

• The concept of valency is based on the number of valence electrons in the outermost shell of an element. Oxygen, with an atomic number of 8, has 6 electrons in its outer shell and needs 2 more electrons to achieve a stable octet configuration.

• Hence, the valency of oxygen in H2O is 2.

Additional Information

• Definition of Valency:

• Valency is defined as the number of electrons an atom can lose, gain, or share to achieve a full outer shell of electrons.

• For elements in Groups 1-4 of the periodic table, valency is equal to the group number, while for Groups 5-8, it is 8 minus the group number.

• Oxygen's Electronic Configuration:

• The atomic number of oxygen is 8, and its electronic configuration is 2, 6.

• Oxygen requires 2 electrons to complete its octet (8 electrons in the outermost shell), giving it a valency of 2.

• Water Molecule Structure:

• Water is formed by the covalent bonding of two hydrogen atoms and one oxygen atom.

• The molecular structure is bent, with a bond angle of approximately 104.5° due to the lone pairs of electrons on the oxygen atom.

• Characteristics of Oxygen in Water:

• Oxygen is more electronegative than hydrogen, causing a partial negative charge on oxygen and a partial positive charge on hydrogen, making water a polar molecule.

• This polarity leads to properties like high surface tension, excellent solvent capabilities, and hydrogen bonding in water.

Important Points

• Valency vs. Oxidation State:

• Valency refers to the number of bonds an atom can form, while the oxidation state indicates the charge of an atom in a compound.

• For oxygen in most compounds, the oxidation state is -2, but it can vary in certain compounds like peroxides (-1) and superoxides (-1/2).

• Other Elements' Valencies in Water:

• Hydrogen has a valency of 1, as it can form a single bond with oxygen in the water molecule.

• The ratio of elements in H2O is 2:1 (two hydrogens for one oxygen), maintaining the valency balance.

Q25. Answer: (c) Plant health is affected

The correct answer is Plant health is affected.

Key Points

• Insects sucking sap from leaves: When insects such as aphids, whiteflies, or mealybugs suck the sap from crop plants, they deplete the plant of essential nutrients. This disrupts the plant's physiological processes, leading to weakened growth and reduced productivity.

• Impact on plant health: The extraction of sap causes significant damage to plant tissues, making the plants more susceptible to diseases and environmental stressors like drought and temperature fluctuations.

• Transmission of diseases: Many sap-sucking insects are vectors for plant diseases, such as viruses and bacteria. For example, aphids are known to transmit over 150 plant viruses.

• Reduction in photosynthesis: Damage to leaves caused by sap-sucking insects reduces the plant's ability to photosynthesize effectively. This impacts energy production and overall growth.

• Visible symptoms: Infestation by sap-sucking insects can cause visible symptoms such as yellowing of leaves, curling, stunted growth, and even premature leaf drop, all of which signal poor plant health.

Additional Information

• Function of sap in plants: Sap contains vital nutrients, including sugars, minerals, and water, which are essential for plant growth and development. Loss of sap weakens the plant's overall vitality.

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• Examples of sap-sucking insects: Common sap-sucking pests include aphids, whiteflies, mealybugs, scale insects, and leafhoppers. These insects damage crops like cotton, tomatoes, and citrus plants.

• Prevention and control: Farmers often use integrated pest management (IPM) techniques such as introducing natural predators (e.g., ladybugs), using insecticidal soaps, or applying organic and chemical pesticides to control sap-sucking pests.

• Economic impact: Sap-sucking insects can cause significant economic losses in agriculture. For instance, in crops like cotton, infestations by pests like whiteflies have been known to reduce yield drastically, impacting farmers' incomes.

• Plant diseases spread by sap-sucking insects: Examples include Tomato Yellow Leaf Curl Virus transmitted by whiteflies and Barley Yellow Dwarf Virus spread by aphids. These diseases can devastate crops if not managed effectively.

Important Points

• Misconception about plant responses: Options such as "Plant gets pollinated" or "Plant grows stronger" are incorrect because sap-sucking insects harm plants rather than benefiting them. Pollination is typically carried out by pollinators like bees, not sap-sucking insects.

• Not all insects are harmful: While sap-sucking insects harm plants, other insects like bees and butterflies are beneficial as they aid in pollination, which is crucial for fruit and seed production.

• Environmental factors: Factors such as climate, humidity, and the presence of natural predators can influence the severity of sap-sucking insect infestations.

• Crop-specific damage: Some crops are more vulnerable to sap-sucking insects. For example, cotton is particularly susceptible to whiteflies, while citrus plants are often attacked by aphids and scale insects.

Q26. Answer: (b) Rs. 1,383

Shortcut Trick

Profit = 5% of Cost Price

Profit = 5% × 27,650

Profit = 27,650 ÷ 20 = 1,382.50

Rounding off 1,382.50 to the nearest rupee → 1,383

Therefore The correct answer is Rs. 1,383.

Alternate Method

Given:

Cost Price (CP) = Rs. 27,650

Profit Percentage = 5%

Formula Used:

Profit = (Profit% ÷ 100) × Cost Price

=> Profit = (5 ÷ 100) × 27,650

=> Profit = 0.05 × 27,650

=> Profit = 1,382.5

=> Rounding off to the nearest rupee ≈ 1,383

Therefore The correct answer is Rs. 1,383.

Additional Information

Selling Price Formula

Selling Price (SP) = CP × (100 + Profit%)/100. In case of loss, SP = CP × (100 − Loss%)/100.

Profit Percentage

Profit % = (Profit ÷ CP) × 100. Always calculate profit and loss percentages on the Cost Price unless specified otherwise.

Successive Discounts

The effective discount for two successive discounts a% and b% is given by (a + b − ab/100)%.

Q27. Answer: (c) 10

Shortcut Trick

Assume all 25 items are pencils: Cost = 25 × 4 = Rs. 100.

Difference from actual cost = 180 − 100 = Rs. 80.

Difference in cost between a pen and a pencil = 12 − 4 = Rs. 8.

Number of pens = 80 ÷ 8 = 10.

Therefore The correct answer is 10.

Alternate Method

Cost of a pen = Rs. 12

Cost of a pencil = Rs. 4

Total items = 25

Total cost = Rs. 180

=> Average price per item = 180 ÷ 25 = Rs. 7.2

=> By Alligation, Ratio of pens to pencils = (7.2 − 4) : (12 − 7.2)

=> Ratio = 3.2 : 4.8 = 2 : 3

=> Total ratio parts = 2 + 3 = 5 units

=> 5 units = 25 items

=> 1 unit = 5 items

=> Number of pens = 2 × 5 = 10

Therefore The correct answer is 10.

Additional Information

Alligation Method

It is a rule that enables us to find the ratio in which two or more ingredients at the given price must be mixed to produce a mixture of a desired price.

Simultaneous Equations

Algebraic method where x + y = Total Quantity and Ax + By = Total Value are solved by substitution or elimination.

Weighted Average Formula

Average = (n1w1 + n2w2) ÷ (n1 + n2), where n is the quantity and w is the weight (cost) of each type.

Q28. Answer: (d) 84

Shortcut Trick

Efficiency ratio (A+B) : B = (1/6) : (1/7) = 7 : 6

Efficiency of A = (Efficiency of A+B) − (Efficiency of B) = 7 − 6 = 1 unit

Total Work = LCM(6, 7) = 42 units

Double the work = 42 × 2 = 84 units

Time taken by A alone = 84 ÷ 1 = 84 days

Therefore The correct answer is 84.

Alternate Method

Given:

Time taken by A and B together = 6 days

Time taken by B alone = 7 days

Formula Used:

Total Work = Efficiency × Time

Persons	Time	Work	Efficiency
A + B	6	42	7
B	7	6	

Calculations:

=> Let total work be LCM of 6 and 7 = 42 units.

=> Efficiency of (A + B) = 42 ÷ 6 = 7 units/day.

=> Efficiency of B = 42 ÷ 7 = 6 units/day.

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

=> Efficiency of A = 7 − 6 = 1 unit/day.

=> Double the work = 2 × 42 = 84 units.

=> Time taken by A to complete double work = 84 ÷ 1 = 84 days.

Therefore The correct answer is 84.

Additional Information

Total Work Concept

Total work is always assumed to be the Least Common Multiple (LCM) of the individual time taken by different persons to simplify efficiency calculations.

Pipes and Cisterns

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Similar to time and work, where an inlet pipe has positive efficiency and an outlet/leakage pipe has negative efficiency.

Work and Wages

Wages are always distributed in the ratio of the work done by individuals, which is often the same as the ratio of their efficiencies if they work for the same duration.

Q29. Answer: (c) 36 cm

Shortcut Trick

Semi-perimeter (s) = (39 + 62 + 85) ÷ 2 = 93 cm

Area = √[93 × (93 − 39) × (93 − 62) × (93 − 85)]

Area = √[93 × 54 × 31 × 8] = 1116 cm²

Altitude to 62 cm side = (2 × Area) ÷ Base = (2 × 1116) ÷ 62

Altitude = 1116 ÷ 31 = 36 cm

Therefore The correct answer is 36 cm.

Alternate Method

Given: Sides a = 39 cm, b = 62 cm, c = 85 cm.

Formula Used: Area = √[s(s − a)(s − b)(s − c)]; Area = (1/2) × base × altitude

=> Semi-perimeter s = (39 + 62 + 85) ÷ 2 = 93 cm

=> Area = √[93 × (93 − 39) × (93 − 62) × (93 − 85)]

=> Area = √[93 × 54 × 31 × 8]

=> Area = √[(31 × 3) × (2 × 27) × 31 × (2 × 4)]

=> Area = √[31² × 3 × 2 × 3³ × 2 × 2²]

=> Area = √[31² × 3^4 × 2^4] = 31 × 9 × 4 = 1116 cm²

=> Area = (1/2) × base × altitude

=> 1116 = (1/2) × 62 × h

=> 1116 = 31 × h

=> h = 1116 ÷ 31 = 36 cm

Therefore The correct answer is 36 cm.

Additional Information

Heron's Formula

Used to find the area of a triangle when all three sides are known: Area = √[s(s − a)(s − b)(s − c)], where s is the semi-perimeter.

Altitude and Area Relationship

For any triangle, the altitude (h) to a specific base (b) is given by h = (2 × Area) ÷ b.

Obtuse Triangle Altitude

In an obtuse-angled triangle, the altitudes to the sides containing the obtuse angle fall outside the triangle on the extensions of the bases.

Q30. Answer: (d) 13

Shortcut Trick

Increase in average = (New Score − Old Average) ÷ Total New Innings

Increase = (195 − 57) ÷ 11

Increase = 138 ÷ 11 ≈ 12.54

Rounding 12.54 to the nearest whole number → 13

Therefore The correct answer is 13.

Alternate Method

Given:

Average of 10 innings = 57 runs

Score in 11^(th) inning = 195 runs

Formula Used:

Average = Total Sum of Observations ÷ Number of Observations

=> Total runs in 10 innings = Average × Number of innings

=> Total runs = 57 × 10 = 570

=> Total runs after 11 innings = 570 + 195 = 765

=> New Average = 765 ÷ 11

=> New Average ≈ 69.545

=> Increase in average = New Average − Old Average

=> Increase = 69.545 − 57 = 12.545

=> Nearest whole number ≈ 13

Therefore The correct answer is 13.

Additional Information

Net Deviation Method

The sum of deviations of all observations from the average is always zero. Surplus score beyond the current average is divided equally among all entities to find the increase.

Average of n Numbers

Average = (x1 + x2 + ... + x_n) ÷ n. If a new value x is added, the new average A′ = (n × A + x) ÷ (n + 1).

Rounding Rules

If the decimal part is 0.5 or greater, round up to the next whole number; if less than 0.5, round down.

Q31. Answer: (d) 2020

Shortcut Trick

Rate of typing = 40 minutes ÷ 2 pages = 20 minutes per page.

Total time for 101 pages = 101 × 20 = 2020 minutes.

Therefore The correct answer is 2020.

Alternate Method

Given:

Time taken for 2 pages = 40 minutes

Total pages to be typed = 101

Formula Used:

In direct proportion: (Work1 / Time1) = (Work2 / Time2)

By unitary method:

=> Time for 2 pages = 40 minutes

=> Time for 1 page = 40 ÷ 2

=> Time for 1 page = 20 minutes

=> Time for 101 pages = 101 × 20

=> Time for 101 pages = 2020 minutes

Therefore The correct answer is 2020.

Additional Information

Direct Proportion

Two quantities are in direct proportion if an increase in one leads to a proportional increase in the other. Formula: x/y = Constant.

Work and Time

Total Work = Rate × Time. If the rate of work is constant, the time taken is directly proportional to the amount of work.

Unitary Method

A technique where you first find the value of a single unit (1 page) and then multiply to find the value of the required units (101 pages).

Q32. Answer: (c) 7

Shortcut Trick

Equate total work: (11M + 17W) × 6 = (18M + 15W) × 4

Divide both sides by 2: 3(11M + 17W) = 2(18M + 15W)

Expand terms: 33M + 51W = 36M + 30W

Rearrange like terms: 36M − 33M = 51W − 30W

3M = 21W => 1M = 7W

Therefore The correct answer is 7.

Alternate Method

Given: 11 men and 17 women in 6 days | 18 men and 15 women in 4 days

Formula Used: Total Work = Efficiency × Time

Let efficiency of 1 man be M and 1 woman be W.

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=> Total Work = (11M + 17W) × 6
=> Total Work = (18M + 15W) × 4
=> 6(11M + 17W) = 4(18M + 15W)
=> 66M + 102W = 72M + 60W
=> 72M − 66M = 102W − 60W
=> 6M = 42W
=> 1M = 7W
Therefore The correct answer is 7.
Additional Information
Man-Day Formula
For group work, M1D1H1/W1 = M2D2H2/W2, where M is number of people, D is days, H is hours, and W is work done.
Efficiency and Time Relationship
Efficiency is inversely proportional to the time taken to complete the work (E prop. to 1/T).
Work Equivalence
When different groups complete the same work, their total man-days must be equated to find individual efficiency ratios.

Q33. Answer: (b) 68 : 157

Shortcut Trick
Direct Formula: Ratio of CP/MP = (100 − Discount%)/(100 + Profit%)
Given: Discount = 32% and Profit = 57%
=> CP : MP = (100 − 32) : (100 + 57)
=> CP : MP = 68 : 157
Therefore The correct answer is 68 : 157.
Alternate Method
Given:
Discount allowed = 32%
Profit earned = 57%
Formula Used:
Selling Price (SP) = CP × (100 + Profit%)/100
Selling Price (SP) = MP × (100 − Discount%)/100
Calculations:
=> Let Cost Price be CP and Listed Price (Marked Price) be MP.
=> SP = CP × (100 + 57)/100 = 157CP/100
=> SP = MP × (100 − 32)/100 = 68MP/100
=> Equating the Selling Price: 157CP/100 = 68MP/100
=> 157 × CP = 68 × MP
=> CP/MP = 68 / 157
=> CP : MP = 68 : 157
Therefore The correct answer is 68 : 157.
Additional Information
CP-MP Relation
The ratio of Cost Price to Marked Price is given by CP/MP = (100 − Discount%)/(100 + Profit%).
Successive Discounts
If two discounts d1% and d2% are given, Net Discount = d1 + d2 − (d1 × d2)/100.
Profit and Loss Percentage
Profit % = (Profit/CP) × 100. Always calculate profit or loss percentage on the Cost Price unless specified.

Q34. Answer: (a) $50x^2 + 242y^2$

Shortcut Trick
Use Algebraic Identity: $(a + b)^2 + (a − b)^2 = 2(a^2 + b^2)$
Here, a = 5x and b = 11y
=> Result = $2[(5x)^2 + (11y)^2]$

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=> $2[25x^2 + 121y^2] = 50x^2 + 242y^2$

Therefore The correct answer is $50x^2 + 242y^2$.

Alternate Method

Given expression: $(5x + 11y)^2 + (5x - 11y)^2$

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

=> $(5x + 11y)^2 = (5x)^2 + 2(5x)(11y) + (11y)^2$

=> $(5x + 11y)^2 = 25x^2 + 110xy + 121y^2$

=> $(5x - 11y)^2 = (5x)^2 - 2(5x)(11y) + (11y)^2$

=> $(5x - 11y)^2 = 25x^2 - 110xy + 121y^2$

=> Adding both results: $(25x^2 + 110xy + 121y^2) + (25x^2 - 110xy + 121y^2)$

=> $(25x^2 + 25x^2) + (110xy - 110xy) + (121y^2 + 121y^2)$

=> $50x^2 + 0 + 242y^2$

=> $50x^2 + 242y^2$

Therefore The correct answer is $50x^2 + 242y^2$.

Additional Information

Standard Algebraic Identities

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

Sum and Difference Identity

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

Perfect Square Trinomial

$(a + b + c)^2 = a^2 + b^2 + c^2 + 2ab + 2bc + 2ca$

Q35. Answer: (d) 1.23 m

Shortcut Trick

Area of rectangular strip (outside) = $2w(L + B + 2w) = 2 \times 10(240 + 180 + 20) = 8800\ m^2$

Volume of earth spread = Area of land × Rise in level = $240 \times 180 \times 0.25 = 10800\ m^3$

Volume dug = Volume spread => Area of strip × Depth = 10800

Depth = 10800 ÷ 8800 = 1.227...

Therefore The correct answer is 1.23 m.

Alternate Method

Given:

Dimensions of land = 240 m × 180 m

Width of strip (w) = 10 m

Rise in land level (h) = 25 cm = 0.25 m

Formula Used:

Volume of earth dug = Area of strip × Depth

Area of rectangular path (outside) = $(L + 2w)(B + 2w) - (L \times B)$

=> Area of land = $240 \times 180 = 43200\ m^2$

=> Volume of earth spread = $43200 \times 0.25 = 10800\ m^3$

=> Outer Length = 240 + 10 + 10 = 260 m

=> Outer Width = 180 + 10 + 10 = 200 m

=> Area of strip = $(260 \times 200) - (240 \times 180)$

=> Area of strip = $52000 - 43200 = 8800\ m^2$

=> Depth of strip × 8800 = 10800

=> Depth = 10800 ÷ 8800

=> Depth = 27 ÷ 22 ≈ 1.2272 m

Therefore The correct answer is 1.23 m.

Additional Information

Area of Path Around a Rectangle

For a path of width 'w' outside a rectangle of L × B, Area = $2w(L + B + 2w)$. For an inside path, Area = $2w(L + B - 2w)$.

Conservation of Volume in Earthwork

Volume of earth removed from a pit/trench is equal to the volume of the platform or layer formed by spreading that earth.

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Unit Conversions

Always ensure all dimensions are in the same unit. 1 cm = 0.01 m, 1 m^2 = 10000 cm^2, 1 m^3 = 1000 litres.

Q36. Answer: (d) 1105

Shortcut Trick

Merge ratios: R : B = 7 : 5 and B : Y = 8 : 4 (or 2 : 1).

R : B : Y = (7 × 8) : (5 × 8) : (5 × 4) = 56 : 40 : 20 = 14 : 10 : 5.

Total units = 14 + 10 + 5 = 29 units.

29 units = 6409 => 1 unit = 221.

Yellow blocks = 5 × 221 = 1105.

Therefore The correct answer is 1105.

Alternate Method

Given:

Total colour blocks = 6409

Ratio of Red : Blue = 7 : 5

Ratio of Blue : Yellow = 8 : 4

Formula Used:

If A : B = x : y and B : C = p : q, then A : B : C = (x × p) : (y × p) : (y × q)

=> Red : Blue = 7 : 5

=> Blue : Yellow = 8 : 4 = 2 : 1

=> To make Blue parts equal, multiply (7 : 5) by 2 and (2 : 1) by 5.

=> Red : Blue = 14 : 10

=> Blue : Yellow = 10 : 5

=> Combined Ratio R : B : Y = 14 : 10 : 5

=> Sum of ratio parts = 14 + 10 + 5 = 29 units

=> 29 units = 6409

=> 1 unit = 6409 ÷ 29 = 221

=> Number of yellow blocks = 5 × 221

=> Yellow blocks = 1105

Therefore The correct answer is 1105.

Additional Information

Ratio Merging

To combine A:B and B:C into A:B:C, the common term (B) must have the same value in both ratios. Use the LCM of the B values to normalize.

Distribution based on Ratio

Value of a specific part = (Particular ratio part ÷ Sum of all ratio parts) × Total quantity.

Compound Ratio

The compound ratio of a:b and c:d is (a × c) : (b × d). It is the product of the individual ratios.

Q37. Answer: (a) 81

Shortcut Trick

Speed of train = 1768 ÷ 68 = 26 m/s.

Total distance to cross platform = Train length + Platform length = 1768 + 338 = 2106 m.

Time taken = Total Distance ÷ Speed = 2106 ÷ 26 = 81 seconds.

Therefore The correct answer is 81.

Alternate Method

Given:

Length of train (L_T) = 1768 m

Time taken to cross a pole (t1) = 68 s

Length of platform (L_P) = 338 m

Formula Used:

Speed = Distance ÷ Time

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When crossing a platform: Total Distance = Length of Train + Length of Platform

Calculations:

=> Speed of the train = L_T ÷ t1

=> Speed = 1768 ÷ 68 = 26 m/s

=> Total distance to cross platform = L_T + L_P

=> Total distance = 1768 + 338 = 2106 m

=> Time taken to cross platform (t2) = Total Distance ÷ Speed

=> t2 = 2106 ÷ 26

=> t2 = 81 seconds

Therefore The correct answer is 81.

Additional Information

Relative Speed

When two objects move in the same direction, relative speed = S1 − S2. In opposite directions, relative speed = S1 + S2.

Unit Conversion

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

Train Crossing Objects

When a train crosses a stationary point object (pole, man), distance = length of train. When crossing an object with length (platform, bridge), distance = train length + object length.

Q38. Answer: (b) decrease by Rs. 2,322

Shortcut Trick

Assume Income = 100 units, Savings = 18.5 units, Expenditure = 81.5 units.

Change in Income = 17% of 100 = +17 units.

Change in Expenditure = 25% of 81.5 = +20.375 units.

Net Change in Savings = Change in Income − Change in Expenditure = 17 − 20.375 = −3.375 units.

Given 100 units = Rs. 68,800 => 1 unit = Rs. 688.

Change in Savings = −3.375 × 688 = −Rs. 2,322 (Decrease).

Therefore The correct answer is decrease by Rs. 2,322.

Alternate Method

Given:

Initial Income = Rs. 68,800

Initial Savings % = 18.5%

Income Increase = 17% | Expenditure Increase = 25%

Formula Used:

Income = Expenditure + Savings

=> Initial Savings = 18.5% of 68,800 = 0.185 × 68,800 = Rs. 12,728

=> Initial Expenditure = 68,800 − 12,728 = Rs. 56,072

=> New Income = 68,800 × (100 + 17)% = 68,800 × 1.17 = Rs. 80,496

=> New Expenditure = 56,072 × (100 + 25)% = 56,072 × 1.25 = Rs. 70,090

=> New Savings = New Income − New Expenditure = 80,496 − 70,090 = Rs. 10,406

=> Net Change in Savings = 10,406 − 12,728 = −Rs. 2,322

Therefore The correct answer is decrease by Rs. 2,322.

Additional Information

Income-Expenditure Fundamental

The basic relation is Income = Expenditure + Savings. Any percentage change in one or two components directly affects the third component based on their relative weights.

Deviation Method

Total Change = (Exp Weight × Exp % Change) + (Sav Weight × Sav % Change). This can be used to find the missing percentage change quickly.

Percentage Change Rule

Percentage Change = (New Value − Old Value) ÷ Old Value × 100. A positive result indicates an increase, while a negative result indicates a decrease.

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Q39. Answer: (a) 16% loss

Shortcut Trick

Net percentage change = a + b + (ab/100)

Where a = markup % = +75 and b = discount % = −52

Net % = 75 − 52 + (75 × −52)/100

Net % = 23 − (3 × 13) = 23 − 39

Net % = −16% (Negative sign denotes loss)

Therefore The correct answer is 16% loss.

Alternate Method

Given:

Markup % = 75%

Discount % = 52%

Formula Used:

Marked Price (MP) = CP × (100 + Markup%)/100

Selling Price (SP) = MP × (100 − Discount%)/100

=> Let Cost Price (CP) = 100 units

=> Marked Price (MP) = 100 + 75% of 100 = 175 units

=> Discount = 52% of MP = (52/100) × 175

=> Discount = 52 × 1.75 = 91 units

=> Selling Price (SP) = MP − Discount = 175 − 91 = 84 units

=> Loss = CP − SP = 100 − 84 = 16 units

=> Loss % = (Loss/CP) × 100 = (16/100) × 100 = 16%

Therefore The correct answer is 16% loss.

Additional Information

Relation between CP and MP

MP/CP = (100 + Profit %)/(100 − Discount %) or (100 − Loss %)/(100 − Discount %)

Markup Percentage

Markup % = [(MP − CP)/CP] × 100. It is the percentage by which the cost price is increased to set the marked price.

Successive Discount Formula

If two successive discounts d1 and d2 are given, the single equivalent discount = d1 + d2 − (d1 × d2)/100.

Q40. Answer: (b) 22.73%

Shortcut Trick

To find the percentage of one fraction relative to another, use the ratio of their decimal values or cross-multiply.

1/20 = 0.05 and 11/50 = 0.22

Required % = (0.05 ÷ 0.22) × 100

Required % = 5/22 × 100 = 500/22

Required % = 22.7272... ≈ 22.73%

Therefore The correct answer is 22.73%.

Alternate Method

Given:

Number 1 = 1/20

Number 2 (Base) = 11/50

Formula:

Percentage = (Value ÷ Base) × 100

=> Percentage = [(1/20) ÷ (11/50)] × 100

=> Percentage = (1/20) × (50/11) × 100

=> Percentage = (1 × 50) ÷ (20 × 11) × 100

=> Percentage = 50/220 × 100

=> Percentage = 5/22 × 100

=> Percentage = 500/22

=> Percentage = 22.7272...

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=> Rounding to two decimal places, we get 22.73%.
Therefore The correct answer is 22.73%.
Additional Information
Percentage of Fractions
To calculate what percentage (a/b) is of (c/d), use: [(a × d) ÷ (b × c)] × 100.
Decimal Conversion
Fractions can be converted to decimals first to simplify calculation: 1/20 = 0.05 and 11/50 = 0.22.
Rounding Rules
When rounding to two decimal places, if the third decimal digit is 5 or greater, increase the second decimal digit by 1.

Q41. Answer: (d) 60

Shortcut Trick
Number of cubes = (Volume of Cuboid) ÷ (Volume of one Cube)
=> (24 × 16 × 10) ÷ (4 × 4 × 4)
=> (24 ÷ 4) × (16 ÷ 4) × (10 ÷ 4)
=> 6 × 4 × 2.5 = 60
Therefore The correct answer is 60.
Alternate Method
Given:
Dimensions of cuboid: L = 24 cm, B = 16 cm, H = 10 cm
Side of small cube (a) = 4 cm
Formula Used:
Volume of Cuboid = Length × Breadth × Height
Volume of Cube = $(Side)^3$
=> Total volume of the cuboid = 24 × 16 × 10
=> Total volume = 3840 cm^3
=> Volume of one small cube = 4 × 4 × 4
=> Volume of one small cube = 64 cm^3
=> Number of cubes = Total volume of cuboid ÷ Volume of one cube
=> Number of cubes = 3840 ÷ 64
=> Number of cubes = 60
Therefore The correct answer is 60.
Additional Information
Total Surface Area of Cuboid
The total area of all six faces is given by TSA = 2 × (LB + BH + HL).
Diagonal of a Cuboid
The longest rod that can be placed inside is D = $\sqrt{(L^2 + B^2 + H^2)}$.
Surface Area of a Cube
The total surface area of a cube with side a is $6a^2$.

Q42. Answer: (b) 1.2

Shortcut Trick
Relative speed in same direction = 150 − 120 = 30 km/hr.
Total distance to be covered = 210 + 390 = 600 m = 0.6 km.
Time taken (in hours) = Distance ÷ Relative Speed = 0.6 ÷ 30 = 0.02 hours.
Time (in minutes) = 0.02 × 60 = 1.2 minutes.
Therefore The correct answer is 1.2.
Alternate Method
Given: L1 = 210 m, L2 = 390 m, S1 = 120 km/hr, S2 = 150 km/hr (same direction).
Formula: Time = (Length1 + Length2) ÷ (Speed2 − Speed1)
=> Relative Speed = 150 − 120 = 30 km/hr
=> Speed in m/s = 30 × (5/18) = 25/3 m/s

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=> Total distance = 210 + 390 = 600 m

=> Time taken (seconds) = 600 ÷ (25/3) = 600 × (3/25)

=> Time taken = 24 × 3 = 72 seconds

=> Time (minutes) = 72 ÷ 60 = 1.2 minutes

Therefore The correct answer is 1.2.

Additional Information

Relative Speed in Opposite Direction

When two objects move toward each other, their relative speed is the sum of their individual speeds (S1 + S2).

Speed Conversion

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

Train Crossing Stationary Object

When a train crosses a pole or a person, the distance covered equals the length of the train (L). If it crosses a platform, distance = L + Length of platform.

Q43. Answer: (d) 15,000

Shortcut Trick

Let total voters = x

Successive percentage equation: x × 80% × 98% × 75% = 8,820

x × (4/5) × (49/50) × (3/4) = 8,820

x × 147/250 = 8,820

x = 60 × 250 = 15,000

Therefore The correct answer is 15,000.

Alternate Method

Given:

Voters cast = 80% | Invalid votes = 2% (Valid = 98%) | Candidate share = 75% of valid votes | Candidate votes = 8,820

=> Let total registered voters = x

=> Number of cast votes = 0.80 × x

=> Number of valid votes = 98% of (0.80 × x) = 0.98 × 0.80 × x

=> Winning candidate's votes = 75% of valid votes

=> 0.75 × (0.98 × 0.80 × x) = 8,820

=> 0.75 × 0.784x = 8,820

=> 0.588x = 8,820

=> x = 8,820 ÷ 0.588

=> x = 15,000

Therefore The correct answer is 15,000.

Additional Information

Successive Percentage Application

When multiple percentages are applied to a base value in sequence, the final value = Base × (P1/100) × (P2/100) × ... × (P_n/100).

Election Terminology

Valid Votes = Total Cast Votes − Invalid Votes. Winning Margin = (Winner% − Loser%) × Valid Votes.

Fractional Conversion Shortcuts

Using fractions simplifies calculation: 80% = 4/5, 75% = 3/4, 25% = 1/4, 20% = 1/5.

Q44. Answer: (a) 6

Shortcut Trick

Product of extremes = Product of means

18 × 16 = a × 8a

288 = 8a²

a² = 36

a = 6

Therefore The correct answer is 6.

Alternate Method

Given: The terms are 18, a, 8a, and the fourth proportional is 16.
Formula Used: If x, y, z, and w are in proportion, then x : y = z : w or x/y = z/w.
=> 18/a = 8a/16
=> 18 × 16 = a × 8a
=> 288 = 8a²
=> a² = 288 ÷ 8
=> a² = 36
=> a = √36
=> a = 6 (as a is positive)
Therefore The correct answer is 6.
Additional Information
Fourth Proportional
If four quantities a, b, c, and d are in proportion, then d is the fourth proportional to a, b, and c such that a/b = c/d.
Mean Proportional
The mean proportional between two numbers a and b is given by x = √(a × b).
Third Proportional
If a, b, and c are in continued proportion such that a/b = b/c, then c is the third proportional given by c = b²/a.

Q45. Answer: (b) 66

Shortcut Trick
Assume a base mean value of 60.
Find deviations from 60: +36, +10, +25, −8, −20, +28, +3, −20, 0.
Sum of deviations = 36 + 10 + 25 + 28 + 3 − 8 − 20 − 20 = 54.
Average deviation = 54 ÷ 9 = 6.
Arithmetic Mean = Base + Average Deviation = 60 + 6 = 66.
Therefore The correct answer is 66.
Alternate Method
Given observations: 96, 70, 85, 52, 40, 88, 63, 40, 60
Formula: Arithmetic Mean = (Sum of observations) ÷ (Number of observations)
=> Total number of observations (n) = 9
=> Sum = 96 + 70 + 85 + 52 + 40 + 88 + 63 + 40 + 60
=> Sum = 594
=> Arithmetic Mean = 594 ÷ 9
=> Arithmetic Mean = 66
Therefore The correct answer is 66.
Additional Information
Sum of Deviations
The sum of the deviations of a set of observations from their arithmetic mean is always zero: Σ(x_i − Mean) = 0.
Effect of Linear Change
If every observation is increased or decreased by a constant k, the arithmetic mean is also increased or decreased by k.
Combined Mean
If two groups have sizes n1, n2 and means x1, x2, the combined mean is (n1x1 + n2x2) ÷ (n1 + n2).

Q46. Answer: (a) 26,400

Shortcut Trick
Rate difference = 7.5% − 3.5% = 4% per annum.
Total interest percentage difference for 3 years = 4% × 3 = 12%.
Required difference = 12% of Principal = 12/100 × 2,20,000.
Required difference = 12 × 2,200 = 26,400.
Therefore The correct answer is 26,400.
Alternate Method
Given:

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Principal (P) = Rs. 2,20,000
Rate 1 (R1) = 3.5% | Rate 2 (R2) = 7.5%
Time (T) = 3 years
Formula Used:
Simple Interest (SI) = (P × R × T) ÷ 100
=> SI paid to Bank A = (2,20,000 × 3.5 × 3) ÷ 100
=> SI paid to Bank A = 2,200 × 10.5 = 23,100
=> SI paid to Bank B = (2,20,000 × 7.5 × 3) ÷ 100
=> SI paid to Bank B = 2,200 × 22.5 = 49,500
=> Positive Difference = SI paid to Bank B − SI paid to Bank A
=> Positive Difference = 49,500 − 23,100
=> Positive Difference = 26,400
Therefore The correct answer is 26,400.
Additional Information
Simple Interest Concept
Simple interest is calculated only on the initial principal amount. Formula: SI = (P × R × T) ÷ 100.
Interest Difference Rule
When Principal and Time are constant, the difference in SI is proportional to the difference in rates: ΔSI = P × ΔR × T ÷ 100.
Amount Calculation
The total amount (A) payable after time T is the sum of Principal and Simple Interest: A = P + SI.

Q47. Answer: (a) 1120

Shortcut Trick
Unitary Method: Time taken per page = 40 / 4 = 10 minutes.
For 112 pages, time required = 112 × 10 = 1120 minutes.
Therefore The correct answer is 1120.
Alternate Method
Given:
Work1 = 4 pages | Time1 = 40 minutes
Work2 = 112 pages | Time2 = ?
Formula used: Work1 / Time1 = Work2 / Time2 (Direct Proportion)
=> Let the time taken for 112 pages be x.
=> 4 / 40 = 112 / x
=> 1 / 10 = 112 / x
=> x = 112 × 10
=> x = 1120 minutes
Therefore The correct answer is 1120.
Additional Information
Direct Proportion
When one quantity increases as the other increases, the ratio x/y remains constant. Formula: x1/y1 = x2/y2.
Work and Time Relationship
For a constant efficiency, the amount of work done is directly proportional to the time taken (W prop. to T).
Rate of Work
Rate is defined as Work done divided by Time taken. It represents the efficiency of the person or machine.

Q48. Answer: (d) 40

Shortcut Trick
Age difference between two people is always constant = 4 years.
20 years ago, ratio (Elder : Younger) = 1.25 : 1 = 5 : 4.
Ratio difference = 5 − 4 = 1 unit → 4 years.
Elder age (20 years ago) = 5 × 4 = 20 years.
Current age of Elder = 20 + 20 = 40 years.

Therefore The correct answer is 40.
Alternate Method
Given:
Current difference (E − Y) = 4 years.
20 years ago, Elder age = 1.25 × Younger age.
Let current age of Elder brother be E and Younger be Y.
Formula: Age_(past) = Age_(current) − Time_(interval)
=> E − Y = 4
=> Y = E − 4
20 years ago:
=> (E − 20) = 1.25 × (Y − 20)
=> E − 20 = 1.25 × (E − 4 − 20)
=> E − 20 = 1.25 × (E − 24)
=> E − 20 = 1.25E − 30
=> 30 − 20 = 1.25E − E
=> 10 = 0.25E
=> E = 10 / 0.25
=> E = 40
Therefore The correct answer is 40.
Additional Information
Constant Age Difference
The difference between the ages of two individuals remains the same throughout their lives, regardless of how many years pass.
Decimal to Ratio Conversion
Converting multipliers to fractions (e.g., 1.25 = 5/4, 1.5 = 3/2, 1.75 = 7/4) simplifies the Unitary Method for solving age problems.
Future/Past Age Calculation
If current age is X, age after n years is X + n, and age n years ago was X − n.

Q49. Answer: (b) 60

Shortcut Trick
Ratio of Height : Distance from foot = 5 : 3
Given, distance (3 units) = 36 m
1 unit = 36 / 3 = 12 m
Height (5 units) = 5 × 12 = 60 m
Therefore The correct answer is 60.
Alternate Method
Given: Distance of person from tower foot (Base) = 36 m
Angle of elevation = θ, where tan θ = 5/3
Formula: tan θ = Perpendicular (Height) / Base (Distance)
=> tan θ = Height / 36
=> 5 / 3 = Height / 36
=> Height = (5 × 36) / 3
=> Height = 5 × 12
=> Height = 60 m
Therefore The correct answer is 60.
Additional Information
Trigonometric Ratios
In a right-angled triangle, tan θ = Perpendicular/Base, sin θ = Perpendicular/Hypotenuse, and cos θ = Base/Hypotenuse.
Angle of Elevation
It is the angle between the horizontal line and the line of sight when an observer looks at an object above the horizontal level.
Pythagoras Theorem
For a right triangle with height h and base b, the hypotenuse l is given by $l = \sqrt{(h^2 + b^2)}$.

Q50. Answer: (b) 2

Shortcut Trick

Convert all bases to power 2: 16 = 2^4, 8 = 2^3, 4 = 2^2.

Numerator: 2^(−4) × 2^6 = 2^2

Denominator: 2^(−6) × 2^5 = 2^(−1)

Expression simplifies to: (2^2 ÷ 2^(−1))^(1/3) = (2^(2−(−1)))^(1/3) = (2^3)^(1/3)

Result = 2^(3 × 1/3) = 2

Therefore The correct answer is 2.

Alternate Method

Given:

((16^(−1) × 8^2) ÷ (4^(−3) × 2^5))^(1/3)

Formula Used:

1. a^m × a^n = a^(m+n)

2. a^m ÷ a^n = a^(m−n)

3. (a^m)^n = a^(m×n)

Calculations:

=> [((2^4)^(−1) × (2^3)^2) ÷ ((2^2)^(−3) × 2^5)]^(1/3)

=> [(2^(−4) × 2^6) ÷ (2^(−6) × 2^5)]^(1/3)

=> [2^((−4 + 6)) ÷ 2^((−6 + 5))]^(1/3)

=> [2^2 ÷ 2^(−1)]^(1/3)

=> [2^(2 − (−1))]^(1/3)

=> [2^3]^(1/3)

=> 2^(3 × 1/3)

=> 2^1 = 2

Therefore The correct answer is 2.

Additional Information

Negative Exponent Rule

Any base raised to a negative power is the reciprocal of the base raised to the positive power: a^(−n) = 1/a^n.

BODMAS in Indices

Always simplify the innermost brackets and powers before applying the outer roots or exponents.

Fractional Exponents

An exponent of 1/n represents the nth root of the number: a^(1/n) = $\sqrt[n]{a}$.

Q51. Answer: (d) vt

Given: In a certain code language, ‘keep turning pages’ is coded as ‘kd vt fg’ and ‘count the pages’ is coded as ‘kl vt za’.

Thus, 'pages' is coded as 'vt' in the given language.

Hence, the correct answer is "Option 4".

Q52. Answer: (c) UO 39

The position and positional values or English Alphabets are:

Given: PI 13 is related to SM 17 in a certain way. In the same way, HA 24 is related to KE 28.

The logic followed here is:

Similarly,

Thus, RK35 is related to UO39, following the same logic.

Hence, the correct answer is "Option 3".

Q53. Answer: (d) ef

Given: In a certain code language, ‘lab bird set’ is coded as 'ef xo ej' and ‘set web hall’ is coded as ‘ot ef hs’.

Thus, ‘set’ is coded as 'ef' in that language.

Hence, the correct answer is "Option 4".

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Q54. Answer: (d) YHF

The position and positional values or English Alphabets are:

Given: UDB VEC WFD XGE ?

The logic followed here is:

Thus, YHF should come in place of the question mark (?) in the given series based on the English alphabetical order.

Hence, the correct answer is "Option 4".

Q55. Answer: (d) 2

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

Now,

Even numbers, each of which is immediately preceded by an odd number and also immediately followed by an even number.

So, the needed pattern is: Odd — Even — Even

Thus, there are 2 even numbers, each of which is immediately preceded by an odd number and also immediately followed by an even number.

Hence, the correct answer is "Option 4".

Q56. Answer: (d) Two

Given: A, B, C, E, F, P and Q are sitting around a circular table facing the centre.

1. C sits third to the left of P.

2. Q is an immediate neighbour of both E and P.

3. Only four people sit between C and E when counted from the right of C.

The above statement cannot be satisfied in case I, so it is eliminated.

4. B sits third to the left of F.

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

Thus, two people sit between A and Q when counted from the right of A.

Hence, the correct answer is "Option 4".

Q57. Answer: (d) 5 km to the north

Given:

Mr. Zzz starts from Point A and drives 11 km East.

Turns left and drives 19 km (North), then turns left and drives 21 km (West).

Turns left and drives 24 km (South), then takes a final left turn and drives 10 km (East) to reach Point P.

North South West East Point A 11 km 19 km 21 km 24 km 10 km Point P (5 km distance)

Since Point P is 5 km South of Point A, to reach Point A again, he must drive 5 km towards the North.

Hence, the correct answer is "Option 4".

Q58. Answer: (a) 44

The logic followed here is:

Position of Saurabh from the top = 17th

Position of Saurabh from the bottom = 28th

So,

Total number of students = (Position from the top + Position from the bottom) - 1

= 17 + 28 - 1

= 45 - 1 = 44.

Hence, the correct answer is "Option 1".

Q59. Answer: (d) D

Given: A, B, C, D, W, X and Y are sitting around a circular table facing the centre of the table.

1. C sits to the immediate left of B.

2. D sits third to the left of B.

3. W sits to the immediate left of A.

4. A sits second to the left of X.

The above statement cannot be satisfied in case II, so it is eliminated.

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

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Thus, D sits third to the right of Y.
Hence, the correct answer is "Option 4".

Q60. Answer: (d) TTU

The position and positional values or English Alphabets are:
The pattern followed here is:
Each letter-cluster follows the pattern -1, +2.
Let's check each option:
1. AZB
This letter-cluster follows the pattern -1, +2.
2. CBD
This letter-cluster follows the pattern -1, +2.
3. VUW
This letter-cluster follows the pattern -1, +2.
4. TTU
This letter-cluster does not follow the pattern -1, +2.
Thus, TTU is the odd one out.
Hence, the correct answer is "Option 4".

Q61. Answer: (c) 36

BODMAS Rule:
Given equation: 26 × 2 − 8 ÷ 4 + 9 = ?
Now, if '+' and '−' are interchanged and '×' and '÷' are interchanged, then the equation becomes:
=> 26 ÷ 2 × 8 − 4 + 9 = ?
=> 13 × 8 − 4 + 9 = ?
=> 104 − 4 + 9 = ?
=> 113 − 4 = ?
=> 109 = ?
Hence, the correct answer is "Option 3".

Q62. Answer: (a) Only conclusion (I) follows

Statements:
All golds are hives.
No hive is a cow.
The least possible Venn diagram for the given statement is:
Conclusions:
(I): No gold is a cow. - Follow (Because, All golds are hives and No hive is a cow, which means all gold being hives are not cow.)
(II): Some cows are hives. - Does not follow (Because, No hive is a cow, which means no cows are hives.)
Thus, Only conclusion (I) follows.
Hence, the correct answer is "Option 1".

Q63. Answer: (a) 80

The logic followed here is:
Thus, the missing term in the series is 80.
Hence, the correct answer is "Option 1".

Q64. Answer: (c) EARN - AERN - ERNA

The logic followed here is:
OWES - WOES - OESW
LITE - ILTE - LTEI
Now, let's check each option:
1. JUTE - UJTE - EUTJ
This group of triads does not follow the same logic.
2. VAST - VSAT - TSAV

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This group of triads does not follow the same logic.

3. EARN - AERN - ERNA

This group of triads follows the same logic.

4. PAIN - APIN - AINP

This group of triads does not follow the same logic.

Thus, EARN - AERN - ERNA from the given options is the one which follows the same logic.

Hence, the correct answer is "Option 3".

Q65. Answer: (c) 46, 29

Given:

74, 43

98, 55

The logic followed here is:

Logic: (a, b) → b = (a ÷ 2) + 6

74 ÷ 2 + 6 = 37 + 6 = 43

98 ÷ 2 + 6 = 49 + 6 = 55

Let's check each option:

1. (122, 66) → 122 ÷ 2 + 6 = 61 + 6 = 67 ≠ 66

2. (142, 76) → 142 ÷ 2 + 6 = 71 + 6 = 77 ≠ 76

3. (46, 29) → 46 ÷ 2 + 6 = 23 + 6 = 29

4. (64, 39) → 64 ÷ 2 + 6 = 32 + 6 = 38 ≠ 39

Thus, (46, 29) is the number-pair in which the numbers are related in the same way as the given pairs.

Hence, the correct answer is "Option 3".

Q66. Answer: (b) HZ 18

The position and positional values or English Alphabets are:

Given: HR 15 is related to KU 12 in a certain way. In the same way, SK 18 is related to VN 15.

The logic followed here is:

Similarly,

Thus, EW 21 is related to HZ18, following the same logic.

Hence, the correct answer is "Option 2".

Q67. Answer: (c) 12

The logic followed here is:

Thus, the missing term in the series is 12.

Hence, the correct answer is "Option 3".

Q68. Answer: (b) QPP

The position and positional values or English Alphabets are:

Given: IHT KJS MLR ONQ ?

The logic followed here is:

Thus, QPP will replace the question mark (?) to complete the given series.

Hence, the correct answer is "Option 2".

Q69. Answer: (b) 2

Given: Seven boxes, A, B, C, D, E, F and G, are kept one over the other but not necessarily in the same order.

1. Only E is kept above B.

2. Only two boxes are kept between B and A.

3. Only C is kept below G.

4. F is not kept immediately above A.

E
B

F
A
D
C

G, the only box left will occupy the vacant position.

E
B
F
G
A
D
C

Thus, 2 boxes are kept below A.

Hence, the correct answer is "Option 2".

Q70. Answer: (a) 3

Given: (Left) 1 © % £ 8 8 @ % 4 # 1 © 3 7 6 3 % * & € 9 7 (Right)

Now,

Symbols, each of which is immediately preceded by a number and also immediately followed by a symbol.

So, the needed pattern is: Number — Symbol — Symbol

Thus, there are 3 such symbols, each of which is immediately preceded by a number and also immediately followed by a symbol.

Hence, the correct answer is "Option 1".

Q71. Answer: (a) 562

The logic followed here is:

Thus, the missing term in the series is 562.

Hence, the correct answer is "Option 1".

Q72. Answer: (b) One

Given: (Left) 7 8 9 4 6 7 3 9 6 1 9 8 3 4 (Right)

Now,

Even numbers, each of which is immediately preceded by an even number and also immediately followed by an odd number.

So, the needed pattern is: Even — Even — Odd

Thus, there is one even number, which is immediately preceded by an even number and also immediately followed by an odd number.

Hence, the correct answer is "Option 2".

Q73. Answer: (b) 257

BODMAS Rule:

Decoding the given information:

Letter	**A**	**B**	**C**	**D**
Meaning	÷	×	•	•

Given equation: 36 B 8 C 528 A 22 D 55 = ?

Now replacing the sign from left to right using BODMAS Rule, we get:

=> 36 × 8 + 528 ÷ 22 − 55 = ?

=> 36 × 8 + 24 − 55 = ?

=> 288 + 24 − 55 = ?

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=> 312 − 55 = ?

=> 257 = ?

Hence, the correct answer is "Option 2".

Q74. Answer: (d) Only conclusion (I) follows.

Statements:

All phones are cars.

All phones are lights.

The least possible Venn diagram for the given statement is:

Conclusions:

(I) Some cars are lights. - Follow (Because, All phones are cars and All phones are lights, which means some cars being phones are lights.)

(II) All lights are phones. - Does not follow (Because, All phones are lights, which means some lights are phones.)

Thus, Only conclusion (I) follows.

Hence, the correct answer is "Option 4".

Q75. Answer: (d) O

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

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

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

Thus, O sits third to the right of Y.

Hence, the correct answer is "Option 4".

Q76. Answer: (d) Four

Given: (Left) 6 7 8 9 & 5 £ & $ £ $ 1 * * # * € 8 % 8 © 7 (Right)

Now,

Numbers, each of which is immediately preceded by a symbol and also immediately followed by a symbol.

So, the needed pattern is: Symbol — Number — Symbol

Thus, there are 4 such numbers, each of which is immediately preceded by a symbol and also immediately followed by a symbol.

Hence, the correct answer is "Option 4".

Q77. Answer: (c) OSM

The position and positional values or English Alphabets are:

The pattern followed here is:

Each letter-cluster follows the pattern +4, -5.

Let's check each option:

1. MQL

This letter-cluster follows the pattern +4, -5.

2. JNI

This letter-cluster follows the pattern +4, -5.

3. OSM

This letter-cluster does not follow the pattern +4, -5.

4. KOJ

This letter-cluster follows the pattern +4, -5.

Thus, OSM is the odd one out.

Hence, the correct answer is "Option 3".

Q78. Answer: (b) 4

Given: If 1 is added to each odd digit and 2 is subtracted from each even digit in the number 7381564.

Thus, 4 will be second from the left in the new number thus formed.

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Hence, the correct answer is "Option 2".

Q79. Answer: (d) 13 km towards west

Given:

Daksha starts from Point A and drives 5 km East.

Turns right and drives 6 km (South), then turns left and drives 11 km (East).

Turns left and drives 6 km (North), then takes a final left turn and drives 3 km (West) to reach Point P.

North South West East Point A 5 km 6 km 11 km 6 km 3 km Point P (13 km west to A)

Since Point P is 13 km East of Point A, she must drive 13 km towards the West to reach Point A again.

Hence, the correct answer is "Option 4".

Q80. Answer: (d) Father’s father

Family Chart:

Decoding the Symbols:

A is				
Symbol	#	@	&	%
Meaning	mother	husband	sister	father
to B				

Given: R @ V # E & K % O

It means: R is the husband of V, V is the mother of E, E is the sister of K, K is the father of O.

Thus, R is O's Father’s father.

Hence, the correct answer is "Option 4".

Q81. Answer: (b) Michelle Bachelet

The correct answer is Michelle Bachelet.

Key Points

• The Indira Gandhi Prize for Peace, Disarmament and Development for the year 2024 has been awarded to Michelle Bachelet, the former President of Chile.

• She was selected for the prestigious award by an international jury chaired by the former Vice-President of India, M. Hamid Ansari.

• The award recognizes her "extraordinary contribution" to human rights, gender equality, and her leadership in global health and poverty alleviation.

• Michelle Bachelet made history as the first female President of Chile, serving two non-consecutive terms from 2006 to 2010 and 2014 to 2018.

• She was also the inaugural Executive Director of UN Women (United Nations Entity for Gender Equality and the Empowerment of Women) and served as the United Nations High Commissioner for Human Rights from 2018 to 2022.

• The Indira Gandhi Memorial Trust noted her lifelong commitment to democratic values and her work in defending the rights of the marginalized and vulnerable populations worldwide.

Additional Information

• The Indira Gandhi Prize for Peace, Disarmament and Development:

• This prestigious award was instituted in 1986 by the Indira Gandhi Memorial Trust in memory of the former Prime Minister of India.

• It is awarded annually to individuals or organizations that have made outstanding contributions toward promoting international peace, disarmament, and a new international economic order.

• The prize carries a cash award of Rs. 25 lakh and a citation.

• Past recipients include world leaders and organizations such as Mikhail Gorbachev, Nelson Mandela, UNICEF, ISRO, and Jimmy Carter.

• In 2023, the prize was jointly awarded to classical pianist Daniel Barenboim and peace activist Ali Abu Awwad for their efforts in the Middle East.

• Michelle Bachelet's Background:

• Born on September 29, 1951, in Santiago, Chile, she is a physician by training with a specialization in Pediatrics and Public Health.

• Before her presidency, she served as Chile's Minister of Health and Minister of National Defense, becoming the first woman in

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Latin America to hold a defense portfolio.

• During her tenure as President, she introduced significant social reforms, including the expansion of childcare and pension systems to support the elderly and the poor.

• Her leadership during the 2010 earthquake in Chile and her efforts to rebuild the nation were highly commended internationally.

Important Points

• The prize highlights the intersection of development and peace, emphasizing that sustainable growth is impossible without a stable and equitable global environment.

• Michelle Bachelet is the second Chilean to be associated with high-level international peace recognition in recent years, reinforcing the country's role in global diplomacy.

• The selection of a former UN High Commissioner for Human Rights underscores the Indira Gandhi Memorial Trust's focus on multilateralism and the protection of civil liberties in the 21st century.

• The award ceremony typically takes place in New Delhi, where the citation is presented by the Chairperson of the Trust.

Q82. Answer: (a) Aravindh Chithambaram

The correct answer is Aravindh Chithambaram.

Key Points

• Indian Grandmaster Aravindh Chithambaram emerged as the champion of the Prague Masters (Masters section) 2025.

• The prestigious chess tournament was held in Prague, Czech Republic, and concluded in March 2025.

• Aravindh Chithambaram secured the title by delivering a stellar performance against a field of elite international Grandmasters in a round-robin format.

• This victory marks a significant milestone in his career, further establishing his presence in the upper echelons of global chess and boosting his FIDE rating.

• The Masters section of the Prague Chess Festival is renowned for inviting top-tier talent, and Aravindh's win continues the trend of Indian dominance in international chess circuits.

Additional Information

• Aravindh Chithambaram:

• Born in 1999 in Madurai, Tamil Nadu, he is one of India's most accomplished chess players.

• He earned the Grandmaster title in 2015 at the age of 14.

• He is a two-time Indian National Champion, winning consecutive titles in 2018 and 2019.

• Known for his exceptional intuition and tactical depth, he was the first Indian to win the National Triple Crown (winning the National titles in Classical, Rapid, and Blitz formats).

• Prague Chess Festival:

• It is an annual event established in 2019 to provide a platform for world-class chess in the Czech Republic.

• The festival features several categories including Masters, Challengers, Futures, and Open tournaments.

• Previous winners of the Masters section include notable names like Vidit Gujrathi (India), Alireza Firouzja (France), and Nodirbek Abdusattorov (Uzbekistan).

• Other Notable Participants:

• R Praggnanandhaa: A teenage sensation from India and a World Cup 2023 finalist who is a regular at elite events like the Prague Masters.

• Anish Giri: A top-ranked Dutch Grandmaster known for his solid play and deep opening preparation, frequently competing for top honors in major European festivals.

• Ediz Gürel: A rising prodigy from Turkey who became a Grandmaster at the age of 15 in 2024, representing the next generation of chess superstars.

• Indian Chess Growth:

• The success of Aravindh Chithambaram in 2025 reflects the massive growth of chess in India, which currently boasts more than 80 Grandmasters and a high density of players in the World Top 100.

Q83. Answer: (c) pregnant women, newborns and postpartum mothers

p data-end="57" data-start="0">The correct answer is pregnant women, newborns and postpartum mothers.

Key Points

• The GARBH-INi-DRISHTI platform was launched in February 2025 at the Translational Health Science and Technology Institute (THSTI) located in Faridabad, Haryana.

• The platform provides access to a comprehensive database containing clinical data, medical images, and biospecimens from over 12,000 participants, specifically pregnant women, newborns, and postpartum mothers. Hence, the correct answer is pregnant women, newborns and postpartum mothers.

• The initiative is part of the GARBH-Ini (Interdisciplinary Group for Advanced Research on Birth Outcomes—DBT India Initiative) program, which is a flagship project of the Department of Biotechnology (DBT).

• The primary goal of this data repository is to facilitate research into maternal and child health, particularly focusing on identifying risks associated with Preterm Birth (PTB) and other adverse pregnancy outcomes.

• By utilizing artificial intelligence (AI) and machine learning (ML) models on this vast dataset, researchers aim to develop predictive tools for early intervention in high-risk pregnancies.

Additional Information

• Translational Health Science and Technology Institute (THSTI):

• THSTI is an autonomous institute of the Department of Biotechnology, Ministry of Science and Technology, Government of India.

• It was established with the mission to integrate multi-disciplinary fields of science and technology to perform translational research that improves human health.

• GARBH-Ini Cohort Study:

• The GARBH-Ini cohort is a unique urban-population-based pregnancy study established in 2014.

• The study has been primarily conducted at the Gurugram Civil Hospital, tracking thousands of women from early pregnancy through the postpartum period.

• This cohort is essential for understanding the biological, clinical, and environmental factors contributing to preterm birth in the Indian population.

• Maternal and Neonatal Health Statistics:

• India accounts for a significant portion of the global burden of preterm births and neonatal mortality.

• Precision medicine approaches through platforms like DRISHTI are designed to provide data-driven solutions to reduce these mortality rates.

Important Points

• DRISHTI Platform Features:

• The DRISHTI (Data Repository and Information System for Health-related Insights) platform acts as a secure multimodal data hub.

• It integrates ultrasound images, proteomic and genomic data, and electronic health records (EHR) to build a 360-degree view of maternal health.

• Impact on Public Health:

• The research generated from this data helps the Government of India in formulating better health policies under missions like the National Health Mission (NHM).

• It enables the development of low-cost diagnostic kits and screening tools specifically tailored for the Indian genetic makeup.

• The project represents a leap towards Atmanirbhar Bharat in the field of biotechnology and healthcare diagnostics.

Q84. Answer: (a) United States of America

The correct answer is United States of America.

Key Points

• The 'Tiger Claw' exercise is a significant milestone as it marks the first-ever joint special operations exercise specifically involving the Indian Air Force (IAF) and the United States of America.

• This strategic engagement was conducted from 26 May to 10 June 2025, focusing on the integration of elite special forces and aerial warfare tactics. Hence, the statement regarding the country and the exercise name is correct.

• The primary objective of 'Tiger Claw' is to enhance interoperability between the special operations units of both nations, facilitating the exchange of best practices in counter-terrorism, unconventional warfare, and behind-enemy-lines operations.

• The Indian Air Force deployed its specialized Garud Commando Force, while the United States participated with its highly trained Special Operations Command (SOCOM) units.

• The exercise underscores the deepening strategic partnership and defense cooperation between India and the USA in the Indo-Pacific region.

Additional Information

• List of Important India-USA Joint Exercises:

• Yudh Abhyas: An annual Army-to-Army exercise aimed at enhancing cooperation and interoperability.

• Vajra Prahar: A specific Special Forces exercise conducted between the Indian Army and the US Army special units.

• Cope India: A series of Air Force exercises that focus on enhancing operational capabilities and tactical skills of the IAF and the USAF.

• Malabar: Originally a bilateral Naval exercise between India and the USA, it now includes Japan and Australia (the QUAD nations).

• Tiger Triumph: A tri-service humanitarian assistance and disaster relief (HADR) exercise launched in 2019.

• Defense Cooperation: In 2016, the United States designated India as a Major Defense Partner (MDP), which elevated the defense relationship to a level commensurate with its closest allies.

• Garud Commando Force: Formed in September 2004, it is the special forces unit of the Indian Air Force tasked with protection of critical airfields, search and rescue, and counter-terrorism.

Important Points

• Foundational Agreements: The defense relationship is bolstered by four foundational agreements signed between India and the USA:

• GSOMIA (2002): General Security of Military Information Agreement.

• LEMOA (2016): Logistics Exchange Memorandum of Agreement.

• COMCASA (2018): Communications Compatibility and Security Agreement.

• BECA (2020): Basic Exchange and Cooperation Agreement for Geo-Spatial Cooperation.

• Geopolitical Context: Exercises like 'Tiger Claw' are crucial for maintaining security and stability in the Indo-Pacific, addressing shared threats such as maritime piracy and territorial aggression.

• Technology Sharing: The Defense Technology and Trade Initiative (DTTI) serves as a mechanism to facilitate co-development and co-production of defense equipment between the two nations.

Q85. Answer: (d) Ministry of Youth Affairs and Sports

The correct answer is Ministry of Youth Affairs and Sports.

Key Points

• The Ministry of Youth Affairs and Sports is the primary nodal agency in India responsible for the formulation and implementation of policies related to sports development, including the specialized scheme for Sports and Games for the Disabled.

• The main objective of this scheme is to promote broad-basing of sports among differently-abled persons (Divyangjan) by providing them with opportunities to participate in competitive sports and physical activities.

• Under this initiative, the Government of India provides financial assistance for the organization of National Coaching Camps, procurement of specialized sports equipment, and the conduct of State and National level competitions.

• The scheme specifically targets three categories of disabled athletes: the Orthopedically Impaired, the Visually Impaired, and those with Intellectual Disabilities (formerly referred to as Mentally Retallenged).

• The implementation is carried out through various specialized sports bodies such as the Paralympic Committee of India (PCI), Special Olympics Bharat, and the All India Sports Council of the Deaf (AISCD), all of which receive grants from the Ministry.

Additional Information

• Integration with Khelo India:

• In recent years, the standalone scheme for the disabled has been integrated as a specific vertical under the Khelo India - National Programme for Development of Sports.

• This vertical, titled "Promotion of sports among persons with disabilities," ensures a more streamlined flow of funds and better infrastructure access for para-athletes across the country.

• Role of Sports Authority of India (SAI):

• The Sports Authority of India, an autonomous body under the Ministry of Youth Affairs and Sports, provides the necessary technical support and training facilities for athletes selected under these schemes.

• SAI centers across India are increasingly becoming barrier-free to accommodate the unique needs of disabled sports persons.

• International Participation:

• The ministry facilitates the participation of Indian contingents in major international events such as the Paralympic Games, Asian Para Games, and the Special Olympics World Games.

• Financial support for international exposure is provided through the Scheme of Assistance to National Sports Federations (NSFs).

Important Points

• Legislative Context: The promotion of sports for the disabled aligns with the mandates of the Rights of Persons with Disabilities (RPwD) Act, 2016, which emphasizes equality and non-discrimination in the fields of culture, leisure, and sports.

• Annual Calendar of Training and Competitions (ACTC): The Ministry approves a specific ACTC for para-sports every year, ensuring that athletes have a fixed schedule for training and tournaments with dedicated budgets.

• Recognition: Successful para-athletes are eligible for prestigious national honors such as the Major Dhyan Chand Khel Ratna Award and the Arjuna Award, further incentivizing excellence in disabled sports.

• Cash Incentives: Under the Scheme of Special Awards, the Ministry grants significant monetary rewards to medal winners at international championships to recognize their achievements and provide financial security.

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Q86. Answer: (c) Rekha Gupta

The correct answer is Rekha Gupta.

Key Points

• Rekha Gupta took the oath as the ninth Chief Minister of the National Capital Territory (NCT) of Delhi.

• The swearing-in ceremony was held on 20 February 2025 at the historic Ramlila Maidan, a venue synonymous with major political shifts in India's capital.

• She represents the Bharatiya Janata Party (BJP), which emerged victorious in the 2025 Delhi Legislative Assembly elections.

• The oath of office and secrecy was administered by the Lieutenant Governor (L-G) of Delhi, acting on behalf of the President of India.

• By assuming this office, Rekha Gupta became the fourth woman to serve as the Chief Minister of Delhi, following in the footsteps of Sushma Swaraj, Sheila Dikshit, and Atishi.

Additional Information

• Political Career of Rekha Gupta:

• She began her political journey as a student leader with the Akhil Bharatiya Vidyarthi Parishad (ABVP) and served as the General Secretary of the Delhi University Students' Union (DUSU) in 1996-97.

• She has been a prominent face in the Municipal Corporation of Delhi (MCD), serving as a Councillor from the Shalimar Bagh ward for multiple terms.

• She also held the position of Member of the Standing Committee in the MCD and has been a member of the BJP National Executive.

• Constitutional Framework:

• The governance of Delhi is governed by Article 239AA of the Indian Constitution, inserted by the 69th Amendment Act, 1991.

• This article provides the Union Territory of Delhi with a Legislative Assembly and a Council of Ministers headed by a Chief Minister.

• The Delhi Legislative Assembly has 70 seats, and the tenure of the house is five years unless dissolved earlier.

• History of Chief Ministers in Delhi:

• The post was first established in 1952 (with Brahm Prakash as the first CM) but was abolished in 1956 and later reinstated in 1993.

• Sheila Dikshit remains the longest-serving Chief Minister of Delhi, holding the office for 15 years from 1998 to 2013.

Important Points

• Administrative Significance: Under the GNCTD (Amendment) Act, the Chief Minister of Delhi leads the executive, but powers regarding Public Order, Police, and Land remain with the Central Government via the Lieutenant Governor.

• Election Context: The 2025 Delhi Elections saw a high voter turnout across 70 constituencies, where the BJP secured a majority, surpassing the halfway mark of 36 seats to form the government.

• Venue History: Ramlila Maidan, where the oath took place, has been the site of the JP Movement (1975) and the Anna Hazare anti-corruption crusade (2011), making it a symbolic choice for the 2025 transition of power.

Q87. Answer: (b) Mumbai Indians

The correct answer is Mumbai Indians.

Key Points

• Mumbai Indians (MI) scripted history in April 2025 by becoming the first franchise to record 150 victories in the history of the Indian Premier League (IPL).

• The milestone was achieved during a league match at their home ground, the iconic Wankhede Stadium in Mumbai.

• This tally of 150 wins includes victories achieved across all seasons of the IPL since its inception in 2008, excluding matches decided by Super Overs if counted as draws in official statistics, though generally, all format wins are aggregated for this milestone.

• Mumbai Indians was also the first team to reach the 100-win milestone in the IPL, demonstrating their long-standing dominance in the tournament. Hence, the statement regarding Mumbai Indians is correct.

• The franchise is owned by India's largest conglomerate, Reliance Industries, through its subsidiary IndiaWin Sports.

Additional Information

• Chennai Super Kings (CSK):

• Commonly referred to as the most consistent team, CSK has won the IPL title five times (2010, 2011, 2018, 2021, and 2023).

• Led by MS Dhoni for over a decade, they hold the record for the highest win percentage and the most appearances in the IPL playoffs.

• Kolkata Knight Riders (KKR):

• Owned by Shah Rukh Khan and Juhi Chawla, KKR has secured the IPL trophy three times, with wins in 2012, 2014, and 2024.

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• The team is known for its strong spin department and aggressive brand of cricket.

• Royal Challengers Bengaluru (RCB):

• Despite featuring world-class players like Virat Kohli and AB de Villiers, RCB is yet to win an IPL title as of the 2025 season.

• They have reached the finals on three occasions (2009, 2011, and 2016) but finished as runners-up each time.

• Tournament Format:

• The IPL is a professional Twenty20 cricket league in India contested by ten teams.

• It was founded by the BCCI in 2007 and has a dedicated window in the ICC Future Tours Programme.

Important Points

• Mumbai Indians Championship Years: The team has won five IPL titles in 2013, 2015, 2017, 2019, and 2020.

• Captaincy: Most of these victories came under the leadership of Rohit Sharma, who is the most successful captain in the team's history. In 2024, the captaincy was transitioned to Hardik Pandya.

• Global Expansion: The MI brand has expanded globally with teams like MI Cape Town (SA20), MI Emirates (ILT20), and MI New York (MLC).

• Win Count Context: As of early 2024, Mumbai Indians were already the first team to reach 150 wins in T20 cricket (including Champions League T20 victories), and by April 2025, they solidified their position at the top of the IPL specific victory charts.

Q88. Answer: (a) Ensuring benefits reach only genuine beneficiaries

The correct answer is Ensuring benefits reach only genuine beneficiaries.

Key Points

• The Parliamentary Consultative Committee meeting held in August 2025 focused on the progress and digital innovations under Mission Saksham Anganwadi and Poshan 2.0.

• One of the primary highlights of the agenda was the implementation of the Facial Recognition System (FRS) to enhance the transparency and accountability of the nutrition delivery ecosystem.

• The FRS is designed to ensure that the Take-Home Ration (THR) and Hot Cooked Meals (HCM) reach only genuine beneficiaries, thereby preventing leakages and identifying ghost beneficiaries. Hence, statement 1 is correct.

• This technology is integrated into the Poshan Tracker mobile application, which is used by Anganwadi Workers (AWWs) across the country to monitor service delivery in real-time.

• The system uses Artificial Intelligence (AI) based facial validation to confirm the identity of children (in the 0-6 years age group) and pregnant/lactating women before benefits are dispensed.

• By transitioning from manual records to Aadhaar-seeded and face-verified digital entries, the Ministry of Women and Child Development aims to optimize resource allocation for millions of beneficiaries.

Additional Information

• Mission Saksham Anganwadi and Poshan 2.0:

• Launched by the Government of India in the year 2022, this is an Integrated Nutrition Support Programme that realigns existing schemes like the Integrated Child Development Services (ICDS) and Poshan Abhiyaan.

• The mission aims to address the challenges of malnutrition in children, adolescent girls, pregnant women, and lactating mothers through a strategic shift in nutrition delivery.

• Digital Infrastructure (Poshan Tracker):

• The Poshan Tracker is a robust ICT platform that monitors the activities of approximately 13.9 lakh Anganwadi Centres (AWCs).

• It facilitates the growth monitoring of children by capturing data on height and weight, helping health workers identify stunting and wasting early.

• Saksham Anganwadis:

• Under this mission, traditional Anganwadis are being upgraded to Saksham Anganwadis, which are equipped with clean drinking water, solar power, smart learning aids, and audiovisual tools.

• The target is to upgrade 2 lakh Anganwadi Centres across India to provide a better learning and nutritional environment.

• Primary Objectives:

• The mission focuses on nutritional content, delivery, outreach, and outcomes, with a particular emphasis on health and wellness.

• It promotes Poshan Vatika (nutrition gardens) at Anganwadi Centres to provide fresh, local produce for the beneficiaries.

Important Points

• The Facial Recognition System (FRS) is a key part of the "Governance with Digital Technology" pillar of the mission.

• As of 2024-2025, the Poshan Tracker has registered over 10 crore beneficiaries, making it one of the largest real-time monitoring databases for nutrition in the world.

• The August 2025 agenda specifically emphasized that the FRS does not replace Aadhaar but acts as a supplementary layer for verification in areas where fingerprint biometrics might fail.

• The Ministry has also provided smartphones to Anganwadi Workers and Growth Monitoring Devices like Infantometers and

Stadiometers to ensure accurate data collection.

Q89. Answer: (d) India

The correct answer is India.

Key Points

• The Waqf (Amendment) Bill, 2025 was introduced and deliberated in the Parliament of India to bring significant reforms to the management of Waqf properties across the country.

• The bill seeks to amend the existing Waqf Act, 1995, which has governed the administration of Waqf assets for nearly three decades.

• One of the primary objectives of the 2025 amendment is to rename the act to the Unified Waqf Management, Empowerment, Efficiency and Development Act.

• The legislation proposes mandatory representation of women and non-Muslims in both the Central Waqf Council and the State Waqf Boards to ensure diversity and inclusive governance.

• It aims to digitize records and streamline the registration process through a centralized portal, addressing long-standing issues of mismanagement and encroachment on property.

Additional Information

• Definition of Waqf: In India, Waqf refers to property permanently dedicated in the name of God for religious, pious, or charitable purposes as recognized under Muslim Law.

• Waqf Act, 1995: This act was established to provide better administration of Waqfs. It was previously amended in 2013 during the UPA government to grant Waqf Boards extensive powers regarding property determination.

• Central Waqf Council: Established in 1964, it is an Indian statutory body under the Ministry of Minority Affairs that advises the Government of India on the working of State Waqf Boards.

• Land Holdings: India has the largest landholding of Waqf properties in the world, with over 9 lakh acres of land distributed across approximately 8.7 lakh registered properties.

• Role of the Collector: The 2025 amendment proposes to give the District Collector the authority to survey and determine whether a property is Waqf or Government land, a power previously held primarily by the Waqf Tribunal.

Important Points

• The bill was referred to a Joint Parliamentary Committee (JPC) comprising members from both the Lok Sabha and Rajya Sabha for detailed scrutiny following intense debates in August 2024.

• The JPC was tasked with consulting various stakeholders, including Islamic scholars, legal experts, and Waqf Board representatives, before finalizing the bill for passage in 2025.

• Key reforms include the abolition of the "Waqf by User" clause, which allowed properties to be declared as Waqf based on historical use without formal documentation.

• The Parliament of India consists of the President and two houses: the Council of States (Rajya Sabha) and the House of the People (Lok Sabha).

• These legislative changes are part of the Government of India's efforts to improve transparency and ensure that the income from Waqf assets is used for the welfare of the Muslim community, specifically for education and healthcare.

Q90. Answer: (d) 67

The correct answer is 67.

Key Points

• India's overall composite score in the Sustainable Development Goals (SDG) India Index released in June 2025 is 67.

• With a score of 67, India continues to be classified in the Front Runner category, which includes entities with scores ranging from 65 to 99.

• The SDG India Index is the country's principal tool for measuring progress toward the United Nations' 2030 Agenda, and it is meticulously compiled and released by NITI Aayog.

• The 2024-25 assessment shows a significant upward trend compared to the 2020-21 score of 66 and the 2019 score of 60, indicating steady national progress across various socio-economic and environmental dimensions.

• The improvement in the national score is primarily driven by exemplary performance in Goal 7 (Affordable and Clean Energy), Goal 12 (Responsible Consumption and Production), and Goal 6 (Clean Water and Sanitation).

Additional Information

• Understanding the SDG India Index:

• The index was first launched in December 2018 by NITI Aayog to monitor the progress of States and Union Territories in achieving the 17 Sustainable Development Goals.

• It uses a set of indicators aligned with the National Indicator Framework (NIF) developed by the Ministry of Statistics and Programme Implementation (MoSPI).

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• The score ranges from 0 to 100, where 100 signifies that the state or country has fully achieved the targets set for 2030.

• Categorization of States/UTs:

• Aspirant: Scores between 0 and 49.

• Performer: Scores between 50 and 64.

• Front Runner: Scores between 65 and 99.

• Achiever: A perfect score of 100.

• Global Context of SDGs:

• The Sustainable Development Goals (SDGs) were adopted by all United Nations Member States in 2015.

• There are 17 Goals and 169 Targets intended to be reached by the year 2030, focusing on ending poverty, protecting the planet, and ensuring peace and prosperity for all.

• Top Performing Entities:

• Historically, states like Kerala, Tamil Nadu, and Himachal Pradesh have consistently topped the rankings due to high standards in healthcare (Goal 3) and quality education (Goal 4).

• Among Union Territories, Chandigarh has frequently maintained a leading position in the Front Runner category.

Important Points

• Collaborative Effort: The SDG India Index is developed in collaboration with the United Nations in India and the Global Green Growth Institute.

• Competitive Federalism: The index creates a sense of competitive federalism among Indian states, encouraging them to outperform one another in developmental sectors like Gender Equality (Goal 5) and Climate Action (Goal 13).

• Data Sources: The index relies on data from various Union Ministries and departments, ensuring that the numerical values and facts reflect ground-level realities across the 28 States and 8 Union Territories.

• Significant Milestone: India's jump to a score of 67 in 2025 highlights the success of flagship government schemes like Swachh Bharat Abhiyan and Saubhagya in contributing to the global 2030 Agenda.

Q91. Answer: (d) 5 June

The correct answer is 5 June.

Key Points

• World Environment Day is celebrated globally every year on 5 June. This date was established by the United Nations to encourage worldwide awareness and action for the protection of the environment. Hence, option 4 is correct.

• For the year 2025, the United Nations Environment Programme (UNEP) designated the Republic of Korea (South Korea) as the global host for World Environment Day.

• The 2025 celebration in South Korea aims to highlight the urgency of ending plastic pollution and fostering global sustainability.

• The event is particularly significant as it precedes the potential conclusion of a global, legally binding instrument on plastic pollution, for which South Korea also hosted the fifth session of the Intergovernmental Negotiating Committee (INC-5).

• The primary goal of World Environment Day 2025 is to underscore the importance of a circular economy and the reduction of plastic waste on a global scale.

Additional Information

• History of World Environment Day:

• It was established by the UN General Assembly in 1972 on the first day of the Stockholm Conference on the Human Environment.

• The first-ever World Environment Day was celebrated in 1973 with the theme "Only One Earth".

• UN Environment Programme (UNEP):

• UNEP is the leading global environmental authority that sets the global environmental agenda and promotes the coherent implementation of the environmental dimension of sustainable development within the United Nations system.

• The headquarters of UNEP is located in Nairobi, Kenya. It was founded by Maurice Strong in June 1972.

• Significance of Other Dates:

• 22 April: This date is celebrated as Earth Day (International Mother Earth Day), which focuses on broader environmental issues and climate literacy.

• 8 June: This date is observed as World Oceans Day, dedicated to celebrating the role of the oceans in our everyday lives and inspiring action to protect them.

• 5 May: While not the World Environment Day, 5 May is occasionally associated with regional environmental observances or national days in various countries, such as Children's Day in South Korea and Japan.

Important Points

• Recent Hosts and Themes:

• 2024 Host: Saudi Arabia hosted the event with a focus on land restoration, desertification, and drought resilience.

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• 2023 Host: Côte d'Ivoire (in partnership with the Netherlands) hosted the day with the theme "Solutions to Plastic Pollution".

• 2018 Host: India hosted the global event with the theme "Beat Plastic Pollution", leading to a significant domestic commitment to ban single-use plastics.

• Global Impact: World Environment Day has grown to be the largest global platform for environmental public outreach, with millions of people from over 150 countries participating in activities to protect the planet.

Q92. Answer: (b) 64.3%

The correct answer is 64.3%.

Key Points

• The Sustainable Development Goals – National Indicator Framework (NIF) Progress Report, 2025, released by the Ministry of Statistics and Programme Implementation (MoSPI), provides a comprehensive overview of India's progress toward the 2030 Agenda.

• According to the 2025 report, the percentage of the population covered by social protection systems or floors has seen a substantial increase, reaching 64.3%.

• This indicator is specifically linked to SDG Target 1.3, which focuses on implementing nationally appropriate social protection systems and measures for all, including floors, to achieve substantial coverage of the poor and the vulnerable.

• The expansion to 64.3% reflects the successful scaling of various government-led interventions designed to provide a safety net against economic and social risks.

• The National Indicator Framework (NIF) serves as the backbone for monitoring SDGs in India, currently tracking 284 indicators across all 17 Sustainable Development Goals.

Additional Information

• Social Protection Systems:

• These systems encompass a set of policies and programs designed to reduce poverty and vulnerability by promoting efficient labour markets and enhancing the capacity of individuals to manage risks such as sickness, disability, unemployment, and old age.

• In India, this includes major schemes such as the Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA), PM-KISAN, and various pension schemes for the elderly and widowed.

• Sustainable Development Goal 1 (No Poverty):

• SDG 1 aims to end poverty in all its forms everywhere. Indicator 1.3.1 specifically tracks the proportion of the population covered by social protection floors/systems, disaggregated by sex and key vulnerable groups.

• The 2025 report indicates that India is moving closer to its targets through digital transformation and Direct Benefit Transfer (DBT) mechanisms.

• Role of MoSPI:

• The Ministry of Statistics and Programme Implementation (MoSPI) is the nodal agency for the Sustainable Development Goals indicators in India.

• It collaborates with various Central Ministries and State Governments to collect and validate data for the National Indicator Framework.

• Digital Public Infrastructure (DPI):

• The expansion of social security coverage to 64.3% is largely attributed to the JAM Trinity (Jan Dhan, Aadhaar, and Mobile), which has streamlined the identification and delivery of benefits to the unorganized sector.

• The e-Shram portal has also played a pivotal role in registering over 29 crore unorganized workers, facilitating their inclusion into the national social security net.

Important Points

• Target 1.3 Implementation: India's approach to social protection is multi-layered, covering health insurance through Ayushman Bharat, life insurance through PMJJBY, and accidental insurance through PMSBY.

• Impact of the 2025 Report: The report serves as a critical tool for policy makers to identify gaps in service delivery and re-allocate resources to states or sectors that are lagging in social security reach.

• Global Comparison: The increase to 64.3% positions India as a leader among developing nations in terms of the rapid scale-up of social safety floors within a decade.

• Future Projections: The government aims to achieve near-universal coverage by 2030, focusing on the gig economy and migrant laborers who were previously outside the formal social protection ambit.

Q93. Answer: (a) Ministry of Labour and Employment

The correct answer is Ministry of Labour and Employment.

Key Points

• The Ministry of Labour and Employment launched Phase 01 of India's Social Protection Data Pooling Exercise in March 2025.

• This initiative is designed to strengthen welfare schemes and enhance support for vulnerable groups by consolidating fragmented data at the Central level.

• The primary objective of this exercise is to create a comprehensive database that integrates information from multiple ministries to ensure that social security benefits reach the intended beneficiaries without duplication.

• It builds upon the foundation of the e-Shram portal, which was established to register unorganized workers, including migrant workers, construction workers, and gig workers.

• By pooling data, the Government of India aims to identify gaps in social protection coverage and streamline the delivery of Direct Benefit Transfers (DBT) and insurance services.

Additional Information

• e-Shram Portal:

• Launched in August 2021, it is the first-ever national database of unorganized workers.

• As of 2024-2025, it has registered over 29 crore workers, providing them with a Universal Account Number (UAN).

• Code on Social Security, 2020:

• This Act provides the legal framework for extending social security to all workers, including those in the unorganized sector, gig workers, and platform workers.

• The Data Pooling Exercise is a critical step toward implementing the provisions of this Code effectively.

• Vulnerable Groups Covered:

• The exercise specifically targets street vendors, domestic workers, agricultural laborers, and beedi workers.

• It also aims to include inter-state migrant workers to ensure portability of welfare benefits across state borders.

• Inter-Ministerial Coordination:

• The Ministry of Labour and Employment works in tandem with the Ministry of Electronics and Information Technology (MeitY) and the National Informatics Centre (NIC) for technical execution.

• Data is often cross-verified with Aadhaar, Ration Card (PDS), and ESIC/EPFO records to ensure accuracy.

Important Points

• Data Convergence: The pooling exercise focuses on convergence, allowing the Central Government to have a "single source of truth" regarding the socio-economic status of over 40 crore workers in the informal economy.

• Policy Impact: Better data allows for the evidence-based formulation of policies, helping the Finance Ministry and Rural Development Ministry allocate budgets more efficiently for poverty alleviation.

• Global Context: India's move toward digital social protection is often cited by international organizations like the World Bank and ILO as a model for large-scale digital inclusion.

• Phase 01 Focus: The initial phase prioritizes the cleansing and integration of existing datasets from the National Social Assistance Programme (NSAP) and PM-Kisan into the labor database.

Q94. Answer: (b) DRDO and Bharat Forge

The correct answer is DRDO and Bharat Forge.

Key Points

• The Defence Research and Development Organisation (DRDO), through its Pune-based laboratory, the Armament Research and Development Establishment (ARDE), has successfully designed and developed a 5.56x45mm Close Quarter Battle (CQB) Carbine.

• For the manufacturing and production phase, DRDO collaborated with Bharat Forge Limited, a prominent private sector defense manufacturer under the Kalyani Group.

• This indigenous CQB Carbine was developed to fulfill the Indian Army's requirement for a modern, high-performance weapon to replace the aging 9mm Sterling 1A1 submachine guns.

• The weapon successfully completed various user trials, including summer trials in extreme heat and winter trials in high-altitude regions, ensuring its reliability across India's diverse geographical terrains.

• The collaboration marks a significant milestone in the Atmanirbhar Bharat (Self-Reliant India) initiative, showcasing the ability of Indian industry and research institutions to produce world-class small arms.

Additional Information

• Technical Specifications:

• The carbine has an effective range of approximately 200 meters and utilizes 5.56x45mm NATO standard ammunition.

• It features a rate of fire of approximately 700 to 800 rounds per minute, making it highly effective for urban warfare and counter-insurgency operations.

• The weapon is designed to be lightweight, weighing roughly 3 kg, and includes a retractable butt for better handling in confined spaces.

• Features and Versatility:

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• The CQB Carbine is equipped with MIL-STD 1913 Picatinny rails, which allow for the mounting of various accessories like reflex sights, laser pointers, and visible/infrared illuminators.

• It is primarily intended for use by paratroopers, special forces, and frontline infantry units who require a compact yet powerful weapon.

• Industry Role:

• Bharat Forge, as the industry partner, manages the large-scale production using advanced manufacturing techniques to meet the Indian Armed Forces' volume requirements.

• This shift toward domestic production reduces dependency on foreign suppliers from countries like the UAE or Israel for carbine imports.

Important Points

• The Indian Army has a total requirement of over 93,000 carbines to modernize its small arms inventory.

• Apart from the CQB Carbine, DRDO has also developed the Joint Venture Protective Carbine (JVPC), also known as the Asmi machine pistol, for different tactical applications.

• The development of this weapon aligns with the Ministry of Defence's "Positive Indigenisation List," which bans the import of certain defense equipment to promote local manufacturing.

• The 5.56 mm caliber ensures logistical compatibility with the existing INSAS (Indian Small Arms System) ammunition infrastructure already present within the Armed Forces.

Q95. Answer: (d) Turkmenistan

The correct answer is Turkmenistan.

Key Points

• The city of Awaza, also known as the Awaza National Tourist Zone, is located in Turkmenistan on the eastern coast of the Caspian Sea.

• It has been officially selected as the host venue for the Third United Nations Conference on Landlocked Developing Countries (LLDC3), which is scheduled to take place in 2025.

• The conference was originally planned to be held in Kigali, Rwanda, in 2024, but was later rescheduled and moved to Turkmenistan following UN General Assembly consultations.

• This high-level global summit aims to evaluate the progress of the Vienna Programme of Action and adopt a new 10-year strategic document to support landlocked developing countries in overcoming geographical and economic hurdles.

• The choice of Turkmenistan highlights its strategic role as a major transport and logistics hub in Central Asia, facilitating trade between Europe, Asia, and the Middle East.

Additional Information

• Turkmenistan: It is a sovereign state in Central Asia, bordered by Kazakhstan to the northwest, Uzbekistan to the north and east, Afghanistan to the southeast, and Iran to the south and southwest. Its capital is Ashgabat.

• Landlocked Developing Countries (LLDCs): This is a category of 32 nations that lack direct access to the sea. These countries face higher transaction costs for international trade and are often dependent on transit through neighboring countries.

• Awaza National Tourist Zone: Launched in 2007, this is a massive tourism project in the Balkan Province of Turkmenistan. It features numerous luxury hotels, resorts, and international convention centers built to host global events.

• UN-OHRLLS: The United Nations Office of the High Representative for the Least Developed Countries, Landlocked Developing Countries and Small Island Developing States is the lead agency coordinating the 2025 conference.

• Caspian Sea: It is the world's largest inland body of water, often classified as the world's largest lake or a full-fledged sea. Turkmenistan shares its coastline with Russia, Iran, Azerbaijan, and Kazakhstan.

Important Points

• Regional Connectivity: Turkmenistan has been an active proponent of sustainable transport, hosting the first Global Sustainable Transport Conference in 2016.

• Vienna Programme of Action (VPoA): This was a decade-long framework (2014-2024) designed to address the special needs of LLDCs; the 2025 Awaza conference will establish the successor to this program.

• Trade Challenges: Statistics show that LLDCs pay more than double the amount that coastal developing countries pay for transport and insurance services, which the LLDC3 summit aims to mitigate through better digital and physical infrastructure.

• Sustainable Development Goals (SDGs): The conference outcome will be crucial for the 2030 Agenda, ensuring that geographically disadvantaged nations are not left behind in global development efforts.

Q96. Answer: (a) Odisha

The correct answer is Odisha.

Key Points

• Similipal National Park is located in the Mayurbhanj district of the Indian state of Odisha. It is one of the largest national parks in

India, spanning an area of approximately 2,750 square kilometers.

• The name of the park is derived from the abundance of Simul (Red Silk Cotton) trees that bloom vividly in the region, contributing to its unique ecosystem.

• It was formally designated as a Tiger Reserve under Project Tiger in the year 1973. The area was earlier a hunting ground for the royalty of Mayurbhanj.

• The government declared it a Wildlife Sanctuary in 1979 and subsequently a National Park in 1980. It serves as a vital habitat for the Bengal Tiger and the Asian Elephant.

• Similipal is world-renowned for being the only natural habitat of the Melanistic Tiger (Black Tiger), characterized by thick black stripes due to genetic mutations. Hence, the correct answer is Odisha.

Additional Information

• UNESCO Recognition:

• In 1994, the Government of India declared Similipal a Biosphere Reserve.

• It was added to the UNESCO World Network of Biosphere Reserves in May 2009, recognizing its global ecological significance and biodiversity.

• Geographical Features:

• The park is home to some of India's most breathtaking waterfalls, including Barehipani Falls, which has a height of 399 meters, and Joranda Falls.

• The terrain is characterized by high plateaus and hills, with the highest peak being Khairiburu, standing at an elevation of about 1,178 meters.

• Several perennial rivers originate from these hills, such as the Budhabalanga, Salandi, and the Palpala rivers.

• Flora and Fauna:

• The park's vegetation is a rich mosaic of Northern Tropical Moist Deciduous Forests and Semi-Evergreen Forests.

• It boasts over 1,000 species of plants and 96 species of orchids. The wildlife includes Gaur (Indian Bison), Chausingha (Four-horned Antelope), Leopard, and over 300 species of birds such as the Hill Myna.

Important Points

• Tribal Inhabitants: The region is inhabited by several indigenous tribes, including the Kolha, Santhal, Bhumija, and Mankidia. These communities have a deep cultural and symbiotic relationship with the forest.

• Conservation Efforts: The Mayurbhanj Elephant Reserve includes the Similipal-Hadgarh-Kuldiha forests, forming a massive conservation landscape for elephants in Eastern India.

• Environmental Concerns: The park frequently faces threats from forest fires during the summer months (February to June) and issues related to poaching, which the state government of Odisha manages through specialized forest protection squads.

• Tourism: Entry to the park is usually regulated and remains closed during the monsoon season (June to October) to ensure visitor safety and allow for wildlife breeding.

Q97. Answer: (d) 4, 5 and 6 August 2025

The correct answer is 4, 5 and 6 August 2025.

Key Points

• The 56th meeting of the Monetary Policy Committee (MPC) is scheduled to be held over three days on 4, 5 and 6 August 2025.

• This meeting is part of the bi-monthly review cycle conducted by the Reserve Bank of India (RBI) for the financial year 2025-26.

• The primary function of this 56th meeting is to deliberate on the prevailing macroeconomic conditions and decide the appropriate Policy Repo Rate to maintain price stability.

• As per the statutory provisions, the MPC must meet at least four times a year, although the RBI typically schedules six meetings annually to ensure responsive monetary policy.

• The decisions taken during the August 2025 meeting will be based on the assessment of inflation and the growth outlook of the Indian economy.

Additional Information

• Statutory Framework: The Monetary Policy Committee (MPC) was constituted by the Central Government under Section 45ZB of the amended Reserve Bank of India Act, 1934. It replaced the previous system where the Governor had the sole authority over interest rate decisions.

• Composition: The committee consists of six members. The Governor of the RBI serves as the ex-officio Chairperson. Other members include the Deputy Governor in charge of monetary policy, one officer of the Bank nominated by the Central Board, and three external members appointed by the Central Government for a period of four years.

• Voting Mechanism: Each member of the MPC has one vote. In case of a tie, the Governor exercises a casting vote. The resolution is adopted through a majority vote.

• Inflation Target: The Government of India, in consultation with the RBI, sets the inflation target once every five years. Currently, the target is 4% for the Consumer Price Index (CPI), with an upper tolerance limit of 6% and a lower tolerance limit of 2%.

Important Points

• Quorum: The quorum for the MPC meeting is four members. At least one of the four members present must be the Governor or the Deputy Governor.

• Publication of Minutes: After each meeting, the RBI publishes the resolution adopted by the committee. On the 14th day following the meeting, the minutes are released, detailing the vote of each member and the statement of each member on the resolution.

• Monetary Policy Report: Once every six months, the Reserve Bank is required to publish a Monetary Policy Report explaining the sources of inflation and the forecast of inflation for the next 6 to 18 months.

• Key Instruments: The MPC primarily uses the Repo Rate (the rate at which RBI lends money to commercial banks) as its main instrument to control the money supply and inflation in the economy.

Q98. Answer: (a) Switzerland

The correct answer is Switzerland.

Key Points

• Mahendra Gurjar, a prominent Indian para-athlete, made headlines in 2025 by setting a new World Record in the para javelin throw.

• The record-shattering performance took place at the World Para Athletics Grand Prix held in Nottwil, Switzerland.

• Gurjar competed in the F-44 category, which is specifically for athletes with a limb deficiency or impaired muscle power, often affecting one or both legs but allowing them to throw from a standing position.

• He achieved a massive distance of 65.04 metres, which stands as the new benchmark in the F-44 classification, surpassing the previous world record.

• This victory in Switzerland is considered a major milestone for Indian Para-Athletics, further establishing India's dominance in the field of javelin throw on the international stage.

Additional Information

• Mahendra Gurjar's Background:

• He hails from the state of Rajasthan, India. His journey is marked by immense perseverance against physical disabilities, and he has been training under the aegis of the Sports Authority of India (SAI).

• His success in Switzerland follows a trend of exceptional performances by Indian javelin throwers in both Olympic and Paralympic categories.

• Understanding the F-44 Category:

• In Para Athletics, the "F" stands for Field events. The number 44 refers to athletes with a lower limb impairment who compete without a wheelchair.

• This category includes athletes with a unilateral or bilateral transtibial amputation or equivalent loss of function.

• The Venue - Nottwil, Switzerland:

• Nottwil is globally renowned for its state-of-the-art facilities for para-athletes, particularly at the Swiss Paraplegic Centre.

• The World Para Athletics Grand Prix series held here is a crucial qualifying and ranking event for the Paralympic Games and World Championships.

• Role of the Paralympic Committee of India (PCI):

• The PCI, recognized by the Ministry of Youth Affairs and Sports, is the governing body responsible for selecting and training athletes like Gurjar for international competitions in countries like Switzerland, Brazil, and Germany.

• The Target Olympic Podium Scheme (TOPS) has been instrumental in providing financial and technical support to high-potential para-athletes to ensure they achieve World Records.

Important Points

• The year 2025 has seen a significant surge in Indian athletes breaking World Records in technical field events.

• The distance of 65.04 metres is particularly notable as it places Mahendra Gurjar as a top contender for the gold medal in upcoming major championships.

• Consistent investment in Sports Science and International Exposure trips to Europe (including Switzerland and Germany) has played a vital role in improving the performance of Indian para-throwers.

Q99. Answer: (b) 18%

The correct answer is 18%.

Key Points

• The GST Council, in a landmark decision, has decided to scrap the 18% Goods and Services Tax (GST) previously levied on individual life and health insurance policies.

• This decision is set to become effective from September 22, 2025, aiming to provide financial relief to millions of policyholders across India.

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• The move specifically targets individual health insurance premiums and term life insurance policies, ensuring that essential social security remains affordable for the common man.

• This policy change was recommended during the 54th GST Council Meeting, chaired by the Union Finance Minister, Nirmala Sitharaman, following extensive deliberations by a Group of Ministers (GoM) on insurance rate rationalization.

• By removing the 18% tax burden, the government intends to boost insurance penetration in the country, which is currently lower than the global average.

• Hence, the correct answer is 18%.

Additional Information

• GST Council and Constitution:

• The GST Council is a constitutional body established under Article 279A of the Indian Constitution.

• It is chaired by the Union Finance Minister and includes the Union Minister of State in charge of Revenue or Finance and Ministers in charge of Finance or Taxation of all States.

• Significance for Senior Citizens:

• One of the primary beneficiaries of this exemption will be senior citizens, who often face high premium costs due to age-related risks. The removal of the 18% tax significantly lowers their annual out-of-pocket expenditure.

• Insurance Regulatory and Development Authority of India (IRDAI):

• The IRDAI, established in 1999, has been working towards the vision of "Insurance for All by 2047." Tax exemptions on premiums are seen as a critical step toward achieving this objective.

• Tax Slabs in GST:

• Currently, India follows a multi-tiered tax structure for GST with slabs of 5%, 12%, 18%, and 28%. Essential services and certain food items are often placed in the 0% (exempt) category to protect vulnerable sections of society.

• Health and Life Insurance Types:

• Term Insurance: Provides pure life cover without any savings or profits component; the scraping of tax makes this primary safety net cheaper.

• Health Insurance: Covers medical expenses; the exemption is expected to encourage more individuals to opt for higher coverage amounts, such as Rs. 5 lakh or more, without worrying about tax inflation on the premium.

Important Points

• Financial Impact: The removal of the 18% tax is expected to result in a revenue foregone of several thousand crores for the government, but it is expected to be offset by the increased volume of insurance buyers.

• Implementation Date: The specific effective date of September 22, 2025, provides insurance companies and the GST Network (GSTN) sufficient time to recalibrate their systems for premium calculations.

• GoM (Group of Ministers): The Bihar Deputy Chief Minister Samrat Choudhary led the GoM that looked into the details of these tax exemptions before the final council decision.

Q100. Answer: (b) Sandipan Chattopadhyay

The correct answer is Sandipan Chattopadhyay.

Key Points

• The Kalinga Literary Festival (KLF) 2025, held in Bhubaneswar, Odisha, honored Professor Arunava Sinha for his outstanding contributions to the field of literary translation.

• Professor Arunava Sinha won the prestigious award for his English translation of the collected stories of the eminent Bengali writer Sandipan Chattopadhyay.

• Sandipan Chattopadhyay was a trailblazing figure in modern Bengali literature, celebrated for his experimental style and profound exploration of the human psyche.

• The award recognizes Arunava Sinha's role in making regional masterpieces accessible to a global audience, bridging the linguistic gap between Bengali and English readers.

• The KLF Book Awards are a major highlight of the festival, aimed at acknowledging the best literary works published in India across various genres including fiction, non-fiction, and poetry.

Additional Information

• Kalinga Literary Festival (KLF):

• Launched in 2014 by Rashmi Ranjan Parida, the festival has grown into one of India's most significant annual literary gatherings.

• It provides a platform for dialogue between national and international writers, fostering a deeper understanding of Indian cultural heritage and contemporary literature.

• Arunava Sinha:

• He is a prolific translator based in India who has translated over 80 books from Bengali into English.

• He serves as an Associate Professor of Creative Writing at Ashoka University and has previously won several Crossword Book

Awards for his translations.

• Sandipan Chattopadhyay (1933–2005):

• A prominent member of the "Hungry Generation" movement in Bengali literature during the 1960s.

• He was awarded the Sahitya Akademi Award in 1995 for his novel "Ami O Banabihari." His stories often deal with themes of urban existentialism and subconscious desires.

• Other Authors Mentioned:

• Vikas Swarup: An Indian diplomat and author known for "Q & A," which was the basis for the film Slumdog Millionaire.

• Jeet Thayil: A Kerala-born poet and novelist who won the Sahitya Akademi Award and was shortlisted for the Man Booker Prize in 2012 for "Narcopolis."

Important Points

• The 2025 edition of the festival continued its tradition of promoting multilingualism by focusing on translations that bring Bhasha literature to the forefront.

• Translation is increasingly being recognized as a creative art form in itself, with major awards like the International Booker Prize and the JCB Prize for Literature highlighting its importance in India.

• The KLF Book Award for translation specifically evaluates the fluidity, accuracy, and cultural resonance of the translated text compared to the original work.

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