RRB Group D Official Paper (Held On: 24 Dec, 2025 Shift 2) (Previous Year Paper)

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

Take this paper as a timed mock test

Practise under exam conditions, then review your answers after you submit.

yourmocktest.com/pyq/rrb-group-d/rrb-group-d-official-paper-held-on-24-dec-2025-shift-2-previ…

Scan the QR code or click the link to open it.

GENERAL SCIENCE

Q1. In the male reproductive system, where does sperm formation take place?

(a) Vas deferens
(b) Testes
(c) Seminal vesicles
(d) Scrotum

Q2. What is the term used for the refractive index of a medium when medium 1 is specified as vacuum or air?

(a) Relative refractive index
(b) Absolute refractive index
(c) Optical density
(d) Comparative refractive index

Q3. Which statement correctly distinguishes between plant and animal tissues?

(a) Animal tissues are mostly dead, while plant tissues are mostly living
(b) Both plant and animal tissues have equal growth throughout the body
(c) Plant tissues have no supportive structure, while animals lack living tissues
(d) Plant tissues have dead supportive cells, while animal tissues are mostly living

Q4. Which of the following is a general property of ionic compounds?

(a) They are soft and have low melting points
(b) They are insoluble in water and conduct electricity in solid state
(c) They are brittle and conduct electricity in molten or aqueous state
(d) They exist as molecules and have weak interatomic forces

Q5. Which rule is used to find the direction of force on a current-carrying conductor?

(a) Fleming’s right-hand rule
(b) Ohm’s law
(c) Fleming’s left-hand rule
(d) Lenz’s law

Q6. In which of the following metals will the rate of formation of bubbles be fastest when it reacts with dil. HCl?

(a) Mg
(b) Al
(c) Zn
(d) Fe

Q7. When a gun is fired, the bullet moves forward, and the gun recoils backward. This is an example of _____.

(a) Newton’s First Law of Motion
(b) Law of Conservation of Energy
(c) Newton’s Third Law of Motion

(d) Newton's Second Law of Motion

Q8. Why are micro-nutrients important for plants?

(a) They increase the size of the plant roots.
(b) They help in the absorption of sunlight.
(c) They are only needed for decorative plants.
(d) They support essential functions even in small amounts.

Q9. Which of the following is a chemical change?

(a) Dissolving salt in water
(b) Cutting of paper
(c) Rusting of iron
(d) Melting of ice

Q10. The image formed on the retina of the human eye is _____.

(a) virtual and inverted
(b) real and inverted
(c) real and erect
(d) virtual and erect

Q11. What will be the change in kinetic energy of the particles of solid if temperature is increased?

(a) Kinetic energy remains same.
(b) Kinetic energy increases.
(c) Kinetic energy becomes zero.
(d) Kinetic energy decreases.

Q12. Which of the following is NOT a combination reaction?

(a) $C + O2 \rightarrow CO2$
(b) $2Mg + O2 \rightarrow 2MgO$
(c) $N2 + 3H2 \rightarrow 2NH3$
(d) $HCl + NaOH \rightarrow NaCl + H2O$

Q13. What is the role of a fuse in an electric circuit?

(a) To break the circuit if the current exceeds a safe level, preventing damage
(b) To not break the circuit if the current exceeds a safe level
(c) To increase the current when needed
(d) To cool down the wires during overheating

Q14. In what way do insect pests negatively impact crop yield?

(a) By supporting flower formation
(b) By damaging roots, stems, and fruits of plants
(c) By spreading seeds to new areas
(d) By enriching the soil with nutrients

Q15. A gardener wants to grow stronger plants with better fruit. Which pollination method should they encourage?

(a) Geitonogamy
(b) Self-pollination
(c) Cross-pollination
(d) Test Pollination

Q16. A particle moves along a straight line. The particle covers displacement of 40 m in 8 seconds. What is its average velocity?

(a) 40 m/s
(b) 8 m/s
(c) 5 m/s

YourMockTest.com — Free Study Material

(d) 4 m/s

Q17. Which of the following is a typical physical property of a metal?

(a) Brittle
(b) Non-lustrous
(c) Poor conductor of electricity
(d) Melleable

Q18. According to the Law of Constant Proportions, water (H2O) will always contain hydrogen and oxygen in the mass ratio of:

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

Q19. Which of the following is a characteristic feature of meristematic cells?

(a) Dead cells with empty spaces
(b) Thin walls with lignin deposits
(c) Dense cytoplasm and lack of vacuoles
(d) Thick walls and large vacuoles

Q20. Which of the following is a correct match of tissue type and its example?

(a) Epithelial tissue – Blood
(b) Muscular tissue – Neurons
(c) Connective tissue – Blood
(d) Nervous tissue – Muscles

Q21. Galvanisation is a method of protecting steel and iron from rusting by coating them with a thin layer of:

(a) aluminium
(b) copper
(c) zinc
(d) magnesium

Q22. The gravitational constant (G) was first measured by _____.

(a) Cavendish
(b) Galileo
(c) Newton
(d) Kepler

Q23. Kamali spends a lot of time studying for examinations, including reading books and organising thoughts. Why would a scientist argue that this 'hard work' involves very little 'work' in the scientific sense?

(a) Because displacement is necessary, and studying involves zero or minimal physical displacement of the body.
(b) Because the activity is considered useful physical labour.
(c) Because mental effort does not involve force.
(d) Because energy is conserved, so work done must be zero.

Q24. A special tissue through which the foetus receives nutrition is called which of the following?

(a) Cervix
(b) Placenta
(c) Fallopian tube
(d) Uterus

Q25. Which of the following DOES NOT use the concept of multiple reflection of sound waves?

(a) Vibrating tunning fork
(b) Trumpet
(c) Megaphones

YourMockTest.com — Free Study Material

(d) Stethoscope

MATHEMATICS

Q26. A car travels 209 km in the first hour and 83 km in the second hour. What is the average speed (in km/hr) of the car for the whole journey?

(a) 142
(b) 150
(c) 141
(d) 146

Q27. Pipe A can fill a tank in 6 minutes, while pipe B can empty the completely filled tank in 12 minutes. Initially, pipe A is opened and after 2 minutes pipe B is also opened. In how much time (in minutes) will the remaining tank be filled completely?

(a) 2
(b) 8
(c) 9
(d) 19

Q28. An article is marked at Rs. 2,000. A shopkeeper offers a discount of 25% on the article. What is the selling price of the article after the discount?

(a) Rs. 1,200
(b) Rs. ,1600
(c) Rs. 1,400
(d) Rs. 1,500

Q29. Poonam, Qasim and Rina invest Rs. 1,92,000, Rs. 1,20,000, and Rs. 88,000, respectively to start a business. If the profit at the end of the year is Rs. 4,93,600, then what is the share of Rina in the profit?

(a) Rs. 1,08,594
(b) Rs. 1,08,595
(c) Rs. 1,08,591
(d) Rs. 1,08,592

Q30. The mode and median of a data are 27.6 and 28, respectively. What is the mean of the data? (Use empirical formula.)4241

(a) 31.9
(b) 32.7
(c) 28.2
(d) 20.6

Q31. Rs. 1,386 is divided among Vinod, Kajal, and Arpit in such a way that if Rs. 7, Rs. 41, and Rs. 12 be deducted from their respective shares, they have money in the ratio 4 : 10 : 12. Find the actual share of Kajal.

(a) Rs. 551
(b) Rs. 410
(c) Rs. 610
(d) Rs. 460

Q32. What is the value of $4.05 \times ((243/5 + 3.2)/8.34)$?

(a) 15.3
(b) 15.4
(c) 14,5
(d) 13.5

YourMockTest.com - Free Study Material

Q33. A packaging company requires cardboard for two sizes of rectangular boxes. The larger box measures 30 cm × 25 cm × 10 cm, and the smaller one measures 18 cm × 12 cm × 10 cm. An additional 6% of the total surface area is needed for overlaps. If cardboard costs Rs. 45 per 10,000 cm^2, calculate the total cost (in Rs. , rounded off to the nearest hundreds) of cardboard needed to produce 400 big boxes and 500 small boxes.

(a) 7,200
(b) 7,600
(c) 7,500
(d) 7,400

Q34. Walking at 5/6 of his normal speed from his home, Tarun is 16 minutes late in reaching his office. The usual time taken by him to cover the distance between his home and his office is:

(a) 70 minutes
(b) 86 minutes
(c) 80 minutes
(d) 72 minutes

Q35. The monthly incomes of two friends Chetan and Vipul are in the ratio 5 : 9 respectively and each of them saves Rs. 45,000 every month. If the ratio of their monthly expenditure is 2 : 4, then find the monthly income of Chetan (in Rs.).

(a) 2,25,000
(b) 2,24,000
(c) 2,26,000
(d) 3,15,000

Q36. A father is currently four times as old as his son. Eighteen years from now, the father will be twice as old as his son. What is the father's present age?

(a) 49 years
(b) 45 years
(c) 40 years
(d) 36 years

Q37. What is the smallest value of a in the number a3724, so that the number formed is divisible by 3?

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

Q38. The cost of a washing machine is 26% less than the cost of a TV. If the cost of the washing machine increases by 86% and that of the TV decreases by 38%, then what is the percentage change in the total cost of 8 washing machines and 4 TVs?

(a) Decrease by 29%
(b) Decrease by 30%
(c) Increase by 38%
(d) Increase by 36%

Q39. The amount on a sum of Rs. 3,600 at 10% per annum compound interest, compounded annually, in 2 years will be:

(a) Rs. 5,217
(b) Rs. 4,389
(c) Rs. 3,863
(d) Rs. 4,356

Q40. The value of $3\tan^2 x - 3\sec^2 x + 4$ is equal to:

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

YourMockTest.com — Free Study Material

Q41. Simplify the following expression for k = 2 and m = 1.

(8^k × 18^m × 10^(k+m))/(4^(k+m) × 27^m × 5^(2k))

(a) 17/15
(b) 18/15
(c) 14/15
(d) 11/15

Q42. The mode of the observations 1, 1, 8, 3, 1, 3, 4, 3, 9, 9, 4, 3, 2, 2 and 6 is:

(a) 1
(b) 8
(c) 5
(d) 3

Q43. If the radius of the base of a right circular cylinder is decreased by 28% and its height is increased by 114%, then what is the percentage increase (rounded off to the nearest integer) in its volume?

(a) 13%
(b) 21%
(c) 1%
(d) 11%

Q44. Solve: $((112+99)^2 + (112-99)^2)/(112 \times 112 + 99 \times 99)$

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

Q45. Kanchan spends 60% of her income. If she saves Rs. 90,000, then her income (in Rs.) is:

(a) 2,25,000
(b) 2,26,000
(c) 54000
(d) 2,24,000

Q46. In quadrilateral PQRS, the bisectors of angle R and angle S meet at the point T (inside the quadrilateral) and angle STR = 24°. If the ratio of angle P to angle Q is 5 : 7, then what is the difference between the measures of angle Q and angle P ?

(a) 8°
(b) 12°
(c) 16°
(d) 13°

Q47. A man buys a car for Rs. 3,00,000, spends Rs. 30,000 on modifications and sells it at 5% loss. What is the selling price?

(a) Rs. 3,17,500
(b) Rs. 3,15,500
(c) Rs. 3,11,500
(d) Rs. 3,13,500

Q48. The marked price of a painting was Rs. 3,800, but the shopkeeper offered a double discount in a successive manner of 22% and 25%. Ultimately for how much did he sell the item?

(a) Rs. 2,302
(b) Rs. 2,236
(c) Rs. 2,059
(d) Rs. 2,223

YourMockTest.com — Free Study Material

Q49. If the perimeter of a rectangle is 500 cm and its length is 1.5 times its breadth, then find the area of the rectangle (in cm^2).

(a) 22,500
(b) 16,400
(c) 12,500
(d) 15,000

Q50. P and Q together can fill a cistern with water in 6 hours. If P alone can fill the cistern with water in 24 hours, then in how many hours will Q alone fill one-fourth of the same cistern with water?

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

GENERAL INTELLIGENCE & REASONING

Q51. Which of the following letter-number clusters will replace the question mark (?) in the given series to make it logically complete?

USO 48 NLH 39 GEA 30 ZXT 21 ?

(a) SQM 12
(b) SPL 11
(c) SRL 12
(d) SWB 11

Q52. Seven people, A, B, C, D, E, F and G, are sitting in a row, facing north. Only A sits to the left of D. Only four people sit between A and B. Only C sits between E and F and E is not an immediate neighbour of B. How many people sit to the right of F?

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

Q53. 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) 6 9 2 7 3 5 7 5 9 4 3 1 6 7 5 5 7 4 8 1 1 8 6 9 1 1 6 (Right)

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

(a) 7
(b) 6
(c) 9
(d) 8

Q54. What will come in place of the question mark (?) in the following equation if '+' and '–' are interchanged and '×' and '÷' are interchanged?

64 + (20 × 4) ÷ 7 - 35 × 5 + 8 ÷ 2 = ?

(a) 12
(b) 36
(c) 44
(d) 20

Q55. In a certain code language, 'LEMA' is coded as '4679' and 'ACME' is coded as '5946'. What is the code for 'C' in that language?

(a) 6
(b) 5

YourMockTest.com — Free Study Material

(c) 4
(d) 9

Q56. Select the set in which the numbers are related in the same way as are the numbers of the following sets.

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

(8, 3, 25)

(5, 4, 21)

(a) (4, 6, 23)
(b) (3, 7, 25)
(c) (7, 3, 22)
(d) (6, 4, 17)

Q57. If + means −, − means ×, × means ÷, and ÷ means +, then what will come in place of the question mark (?) in the following equation?

48 × 4 + 7 - 3 ÷ 14 = ?

(a) 8
(b) 1
(c) 13
(d) 5

Q58. Select the pair which follows the same pattern as that followed by the two pairs given below. Both pairs follow the same pattern.

ANP : VRK

QVF : LZA

(a) CUE : AYC
(b) WGD : SLZ
(c) GDV : BHQ
(d) NDX : KHU

Q59. What should come in place of the question mark (?) in the given series?

41 51 62 74 87 ?

(a) 102
(b) 103
(c) 101
(d) 100

Q60. 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 guns are bullets. All bullets are pistols.

Conclusion (I): All guns are pistols.

Conclusion (II): Some pistols are bullets.

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

Q61. In a certain code language,

A ± B means ‘A is the wife of B’,

A * B means ‘A is the sister of B’,

A Rs. B means ‘A is the father of B’ and

A # B means ‘A is the brother of B’.

YourMockTest.com — Free Study Material

How is D related to O if 'D ± R Rs. A # C * O'?

(a) Wife
(b) Mother
(c) Daughter
(d) Sister

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

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

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

(a) 3
(b) 5
(c) 4
(d) 6

Q63. What should come in place of the question mark (?) in the given series based on the English alphabetical order?

SWO IME YCU OSK ?

(a) EAS
(b) EAW
(c) EIA
(d) EAI

Q64. Select the pair that follows the same pattern as that followed by the two set of pairs given below. Both pairs follow the same pattern.

HJI−GIH

EGF−DFE

(a) GIH−FHG
(b) GHF−FHG
(c) GIH−EHF
(d) GHF−EGF

Q65. Six people, A, B, C, D, E and F, are sitting in a row, facing north. A sits to the immediate left of B. C sits third to the left of B. D is an immediate neighbour of B. F sits to the immediate right of C. D sits to the immediate left of E. Who sits at the extreme right end of the row?

(a) D
(b) B
(c) F
(d) E

Q66. Seven boxes A, B, C, D, P, Q and R are kept one over the other but not necessarily in the same order. Only four boxes are kept between R and B. Only Q is kept above R. Only two boxes are kept between A and P. D is kept immediately above C. P is not kept immediately above D.

Which box is kept fourth from the top?

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

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

Statements:

Some Fictions are Nonfictions.

Some Nonfictions are Poetries.

All Poetries are Dramas.

Conclusion (I): Some Nonfictions are Dramas.

Conclusion (II): Some Fictions are Dramas.

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

Q68. In a certain code language, ‘send this reel’ is coded as ‘bh ut df’ and ‘send me money’ is coded as ‘hj mp bh’. How is ‘send’ coded in the given language?

(All codes are two-letter codes)

(a) ut
(b) df
(c) mp
(d) bh

Q69. Seven boxes, L, M, N, O, Q, R and S, are kept one over the other, but not necessarily in the same order. Only three boxes are kept below L. Only two boxes are kept between L and M. Only Q is kept above S. R is kept at some place below O and at some place above N. Which box is kept at the second position from the bottom?

(a) O
(b) M
(c) N
(d) R

Q70. 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) SACG
(b) ZHIM
(c) TBDH
(d) PXZD

Q71. Each of the digits in the number 59643127 is arranged in ascending order from left to right. What will be the sum of the digits that are second from the left and third from the right in the new number thus formed?

(a) 12
(b) 13
(c) 11
(d) 8

Q72. 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) OPU
(b) LMR
(c) RSW
(d) ABG

Q73. Fawad starts from Point A and drives 13 km towards north. He then takes a right turn, drives 11 km, turns right and drives 14 km. He then takes a right turn and drives 12 km. He takes a final right turn, drives 1 km and stops at Point P. How far (shortest distance) and towards which direction should he drive in order to reach Point A again?

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

(a) 2 km to the east

YourMockTest.com — Free Study Material

(b) 4 km to the east
(c) 1 km to the east
(d) 3 km to the east

Q74. A man is standing near a pond and is facing north. First, he turns 90 degrees clockwise, then 45 degrees anticlockwise. Finally, he turns 135 degrees clockwise. In which direction is the man facing now?

(a) South
(b) North
(c) West
(d) East

Q75. This question is based on the five, three-digit numbers given below.

(Left) 458 569 248 671 349 (Right)

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

Note: All operations to be done from left to right.

If 2 is added to the first digit of every number, in how many numbers will the first digit be exactly divisible by the second digit?

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

Q76. What should come in place of the question mark (?) in the given series?

6 19 33 48 64 ?

(a) 79
(b) 81
(c) 85
(d) 84

Q77. Select the triad which follows the same pattern as that followed by the two triads given below. Both triads follow the same pattern.

ND – RH – VL

LB – PF – TJ

(a) RM – UT – PR
(b) HK – LN – FL
(c) QG – UK – YO
(d) TW – YZ – SY

Q78. What should come in place of the question mark (?) in the given series?

8 ? 14 22 38 70

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

Q79. A, B, C, D, E and F are sitting around a circular table, facing the centre. D sits third to the right of F. B sits second to the left of D. E sits second to the right of A. C sits to the immediate right of E. How many people sit between D and C, when counted from the left of C?

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

YourMockTest.com - Free Study Material

Q80. Refer to the given series and answer the question the follows. (All numbers are single digit numbers only.) Counting to be done from left to right only.

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

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

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

GENERAL AWARENESS AND CURRENT AFFAIRS

Q81. What was India's global rank in the aviation market according to the International Aviation Data 2024 report released in 2025?

(a) 5th
(b) 3rd
(c) 6th
(d) 4th

Q82. Lamine Yamal, who won the Breakthrough of the Year award in 2025, plays which sport?

(a) Athletics
(b) Football
(c) Basketball
(d) Gymnastics

Q83. What was the main objective of the Esports Conclave 2025 held in India?

(a) To introduce gambling regulations
(b) To ban online games
(c) To promote esports as a serious career and sporting option
(d) To promote board games in schools

Q84. In January 2025, which two organisations signed a Memorandum of Understanding (MoU) for effective implementation of requirements of the Prevention of Money Laundering Act and Rules framed thereunder?

(a) State Bank of India (SBI) and Insurance Regulatory and Development Authority of India (IRDAI)
(b) Financial Intelligence Unit – India (FIU-IND) and Insurance Regulatory and Development Authority of India (IRDAI)
(c) Securities and Exchange Board of India (SEBI) and Life Insurance Corporation of India (LIC)
(d) Reserve Bank of India (RBI) and Insurance Regulatory and Development Authority of India (IRDAI)

Q85. On 6 November 2025, where was the Indian Navy's survey ship INS Ikshak commissioned?

(a) Port Blair
(b) Mumbai
(c) Kochi
(d) Visakhapatnam

Q86. The National Cooperation Policy, 2025, aims to make cooperatives key drivers for Viksit Bharat 2047 through _____.

(a) Sabka Saath, Sabka Vikas
(b) Shakti-se-Shraddha
(c) Sahkar-se-Samriddhi
(d) Sashakt Bharat, Saksham Nagrik

YourMockTest.com — Free Study Material

Q87. In 2025, India celebrated the 10^(th) anniversary of which major urban development scheme?

(a) Atal Mission for Rejuvenation and Urban Transformation
(b) Swachh Bharat Abhiyan
(c) Smart City Mission
(d) Prime Minister Awas Yojana

Q88. The Ministry of Minority Affairs launched the Skilling and Women Entrepreneurship Development project at the Indian Institute of Information Technology (IIIT) Kottayam in July 2025 to train minority youth and women in which of the following fields?

(a) Internet of Things (IoT) and leadership skills
(b) Banking and financial literacy
(c) Agriculture and organic farming
(d) Artificial intelligence and robotics

Q89. IndiaAI in collaboration with which company conducted the IndiaAI CyberGuard AI Hackathon in January 2025?

(a) Persistent Systems
(b) Kellton
(c) Zensar Technologies
(d) I4C

Q90. Who among the following is the head of the 7-member committee set up by the Insurance Regulatory and Development Authority of India (IRDAI) in February 2025 to examine and suggest amendments to the Insurance Act, 1938?

(a) Swaminathan Janakiraman
(b) Ajay Tyagi
(c) Dinesh Khara
(d) TS Vijayan

Q91. Who set a new world record in the men’s 100 m freestyle swimming at Olympic Games Paris, 2024?

(a) Tom Dean
(b) Kyle Chalmers
(c) Pan Zhanle
(d) David Popovici

Q92. In June 2025, which authority made changes for reshaping motor insurance in India?

(a) Home Ministry
(b) Insurance Regulatory and Development Authority of India
(c) Information and Broadcast Unit
(d) Unique Identification Authority of India

Q93. In August 2025, who assumed charge as the Director General of the Railway Protection Force (RPF), becoming the first woman to head the 143-year-old central security force?

(a) Rashmi Shukla
(b) Sonali Mishra
(c) Nina Singh
(d) Archana Ramasundram

Q94. Which three economies topped the IMD World Competitiveness Ranking in June 2025?

(a) Finland, Denmark, Sweden
(b) Japan, Canada, UK
(c) USA, China, Germany
(d) Switzerland, Singapore, Hong Kong

YourMockTest.com — Free Study Material

Q95. During the nationwide “Seva Parv” campaign held from September 17 to October 2, 2025, which state pledged to plant 15 lakh saplings to promote environmental sustainability?

(a) Chhattisgarh
(b) Uttar Pradesh
(c) Assam
(d) Gujarat

Q96. Which of the following is the best description of RHUMI-1, which was seen in the news in August 2024?

(a) A newly discovered exoplanet
(b) A deep-sea research submersible
(c) India’s first Zika virus vaccine
(d) India’s first reusable hybrid rocket

Q97. Who took the most wickets (205) in IPL history before IPL 2025?

(a) Yuzvendra Chahal
(b) Prasidh Krishna
(c) Arshdeep Singh
(d) Jasprit Bumrah

Q98. What is India's score in the SDG Index according to the 10th Sustainable Development Report, 2025?

(a) 99
(b) 80
(c) 100
(d) 67

Q99. What was the unemployment rate among youth aged 15-29 in rural areas in May 2025, as per the PLFS?

(a) 15.2%
(b) 10.5%
(c) 13.7%
(d) 17.9%

Q100. As reported on 31 March 2025, which among the following wildlife sanctuaries added 63 new species, as revealed by its faunal survey conducted by the Forest Department?

(a) Amchang Wildlife Sanctuary
(b) Kheoni Wildlife Sanctuary
(c) Chinnar Wildlife Sanctuary
(d) Karimpuzha Wildlife Sanctuary

ANSWER KEY

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

YourMockTest.com — Free Study Material

SOLUTIONS

Q1. Answer: (b) Testes

The correct answer is Testes.

Key Points

• The testes are the primary reproductive organs in the male reproductive system, functioning as the site for both sperm production and the secretion of male sex hormones.

• Sperm formation, scientifically known as spermatogenesis, takes place within specialized structures called seminiferous tubules located inside the testes. Hence, the correct answer is Testes.

• Each testis contains hundreds of seminiferous tubules where male germ cells (spermatogonia) undergo meiotic division to eventually transform into mature spermatozoa.

• Apart from sperm production, the testes contain Leydig cells (interstitial cells) that produce testosterone, the hormone responsible for male secondary sexual characteristics and the stimulation of sperm maturation.

• The testes are housed in the scrotum, which is situated outside the abdominal cavity to maintain an environment conducive to sperm viability.

Additional Information

• Vas Deferens:

• The vas deferens is a long, muscular tube that travels from the epididymis into the pelvic cavity.

• Its primary function is to transport mature sperm to the urethra in preparation for ejaculation. It does not produce sperm. Hence, option 1 is incorrect.

• Seminal Vesicles:

• These are a pair of simple tubular glands located posteroinferior to the urinary bladder of males.

• They secrete a significant portion of the fluid that ultimately becomes semen. This fluid is rich in fructose, which provides energy for sperm motility. Hence, option 3 is incorrect.

• Scrotum:

• The scrotum is a pouch-like sac of skin that hangs behind the penis and contains the testes.

• It acts as a climate control system, keeping the temperature of the testes slightly lower than the rest of the body, which is essential for normal sperm development. Hence, option 4 is incorrect.

• Epididymis:

• This is a long, coiled tube that rests on the backside of each testis.

• It functions in the storage and maturation of sperm cells that are produced by the testes. Sperm gain the ability to move (motility) while passing through this duct.

Important Points

• Temperature Regulation: The scrotum maintains the temperature of the testes at 2 to 2.5 degrees Celsius lower than the internal body temperature (37 degrees Celsius), which is a prerequisite for successful spermatogenesis.

• Sertoli Cells: Located within the seminiferous tubules, these cells are often called "nurse cells" because they provide nourishment and structural support to the developing sperm cells.

• Hormonal Regulation: The process of sperm formation is regulated by hormones from the anterior pituitary gland, specifically Follicle-Stimulating Hormone (FSH) and Luteinizing Hormone (LH), which respond to GnRH from the hypothalamus.

• Puberty: In males, the production of sperm usually begins at puberty (typically between ages 12 and 15) and continues throughout the individual's life, although the quality and quantity may decline with age.

Q2. Answer: (b) Absolute refractive index

The correct answer is Absolute refractive index.

Key Points

• The absolute refractive index of a medium is defined as the ratio of the velocity of light in a vacuum (or air) to the velocity of light in that specific medium.

• When light travels from vacuum (where its speed is maximum) into another medium, the extent to which it slows down and bends is measured by this absolute value.

• The mathematical formula for the absolute refractive index (n) is n = c / v, where c represents the speed of light in a vacuum and v represents the speed of light in the medium.

• Since the speed of light in a vacuum is the universal limit (approximately 3 x 10^8 meters per second), the absolute refractive index for any material medium is always greater than 1.

• It is a dimensionless quantity because it is a ratio of two similar physical quantities (speeds), meaning it has no units.

YourMockTest.com — Free Study Material

Additional Information

• Relative Refractive Index:

• This refers to the ratio of the speed of light in medium 1 to the speed of light in medium 2, where neither medium is necessarily a vacuum.

• It describes how much light bends when passing between any two transparent substances, such as from water to glass.

• Optical Density:

• This is a measure of the ability of a medium to refract light. A medium with a higher refractive index is described as optically denser.

• In an optically denser medium, light travels slower compared to an optically rarer medium.

• Snell's Law:

• The relationship between the angles of incidence (i) and refraction (r) is given by n = sin i / sin r.

• This law is fundamental in calculating how light rays will deviate at the interface of two different media.

• Refractive Index Examples:

• The absolute refractive index of water is approximately 1.33.

• The absolute refractive index of crown glass is about 1.52.

• Diamond has a very high absolute refractive index of 2.42, which contributes to its extraordinary brilliance and total internal reflection.

Important Points

• The refractive index of air is approximately 1.0003, which is so close to unity that air is often treated as a vacuum in general physics calculations.

• When a light ray enters an optically denser medium from a rarer one, it bends towards the normal. Conversely, it bends away from the normal when entering a rarer medium.

• The refractive index is also dependent on the wavelength of light. This variation leads to dispersion, a phenomenon where white light splits into its constituent colors (VIBGYOR) when passing through a prism.

• The frequency of light remains constant when it moves from one medium to another, but its wavelength and velocity change according to the refractive index of the medium.

Q3. Answer: (d) Plant tissues have dead supportive cells, while animal tissues are mostly living

The correct answer is Plant tissues have dead supportive cells, while animal tissues are mostly living.

Key Points

• Plants are stationary or sedentary organisms. Since they do not move, they require a large amount of supportive tissue for structural strength. Most of these supportive tissues, such as Sclerenchyma and Xylem vessels, consist of dead cells. Hence, statement 4 is correct.

• Animals, on the other hand, move around in search of food, mates, and shelter. This locomotion requires a significant amount of energy. Consequently, most tissues in animals are living to support active metabolic processes. Hence, statement 1 is incorrect.

• In plants, growth is restricted to certain regions called meristems (Apical, Lateral, and Intercalary). In animals, cell growth is more uniform throughout the body, and there is no such demarcation of dividing and non-dividing regions. Hence, statement 2 is incorrect.

• Plant tissues possess a highly rigid supportive structure due to the presence of cell walls made of cellulose. Animals lack these dead cell walls and instead rely on living tissues like connective and muscular tissues for movement and support. Hence, statement 3 is incorrect.

• The structural organization of organs and organ systems is far more specialized and localized in complex animals than in plants, reflecting their different feeding methods and active lifestyles.

Additional Information

• Plant Tissue Classification:

• Meristematic Tissues: These are actively dividing cells found at growing tips. They are living and have thin walls with dense cytoplasm.

• Permanent Tissues: These are derived from meristematic tissues but have lost the ability to divide. They include Parenchyma (living), Collenchyma (living), and Sclerenchyma (dead).

• Complex Tissues: Include Xylem (mostly dead cells like tracheids and vessels) and Phloem (mostly living cells like sieve tubes and companion cells).

• Animal Tissue Classification:

• Epithelial Tissue: Protective tissues covering the body surface and lining internal organs.

• Connective Tissue: Tissues like blood, bone, and cartilage that bind and support other tissues.

• Muscular Tissue: Responsible for movement; includes striated, smooth, and cardiac muscles.

YourMockTest.com — Free Study Material

• Nervous Tissue: Composed of neurons that transmit stimuli rapidly from one place to another within the body.

Important Points

• Energy Consumption: Animals consume much more ATP (energy) than plants because of voluntary movement and complex internal organ functions like digestion and circulation.

• Maintenance: Because many plant cells are dead, they require less maintenance and can provide mechanical strength for long periods (e.g., the trunk of a tree).

• Cell Wall vs. Cell Membrane: The defining feature of plant tissues at the microscopic level is the cellulose cell wall, which provides turgidity and protection, a feature entirely absent in animal tissues.

• Pattern of Growth: Animals usually stop growing after reaching maturity, whereas many plants continue to grow throughout their lifespan due to persistent meristematic activity.

Q4. Answer: (c) They are brittle and conduct electricity in molten or aqueous state

The correct answer is They are brittle and conduct electricity in molten or aqueous state.

Key Points

• Brittleness: Ionic compounds are generally hard but brittle. This is because when external pressure is applied to an ionic crystal, the layers of ions shift slightly. This shifting brings ions of the same charge next to each other, leading to strong repulsive forces that cause the crystal to shatter. Hence, statement 3 is correct.

• Electrical Conductivity: Ionic compounds do not conduct electricity in the solid state because the ions are held firmly in a fixed position by strong electrostatic forces and cannot move. However, they conduct electricity in the molten state or when dissolved in water (aqueous state) because the heat or the solvent overcomes the inter-ionic attractions, allowing ions to move freely towards the electrodes. Hence, statement 2 is incorrect regarding the solid state.

• Melting and Boiling Points: These compounds have very high melting and boiling points. This is due to the presence of a vast amount of energy required to break the strong inter-ionic attraction or electrostatic forces that hold the cations and anions together. Hence, statement 1 is incorrect.

• Solubility: Electrovalent or ionic compounds are generally soluble in water (a polar solvent) and insoluble in organic solvents like kerosene, petrol, or benzene.

• Physical State: Unlike covalent compounds, ionic compounds do not exist as discrete molecules. Instead, they form a three-dimensional crystal lattice structure composed of alternating positive and negative ions. Hence, statement 4 is incorrect.

Additional Information

• Formation of Ionic Bonds: An ionic bond is formed by the complete transfer of one or more electrons from a metal atom to a non-metal atom. The metal loses electrons to become a positively charged cation, while the non-metal gains electrons to become a negatively charged anion.

• Crystal Lattice: In the solid state, ionic compounds are arranged in a regular geometric pattern called a crystal lattice. For example, in Sodium Chloride (NaCl), each Sodium ion (Na+) is surrounded by six Chloride ions (Cl-) and vice versa.

• Lattice Energy: This is the amount of energy released when one mole of an ionic compound is formed from its constituent gaseous ions. A higher lattice energy usually corresponds to higher melting points and greater stability of the compound.

• Common Examples:

• Sodium Chloride (NaCl): Known as common salt, used in food and as a preservative.

• Magnesium Chloride ($MgCl_2$): Used in dust control and road stabilization.

• Calcium Oxide (CaO): Known as quicklime, widely used in the steel and chemical industries.

• Comparison with Covalent Compounds: Unlike ionic compounds, covalent compounds are formed by the sharing of electrons, usually have lower melting points, and are often poor conductors of electricity in any state because they do not contain free ions.

Important Points

• The strength of the ionic bond depends on the electronegativity difference between the two bonding atoms; the greater the difference, the stronger the ionic character.

• Aqueous solutions of ionic compounds are called electrolytes because they facilitate the flow of electric current through the migration of charged particles.

• Ionic compounds are often used as reagents in laboratory settings and play crucial roles in biological systems, such as Potassium (K^+) and Sodium (Na^+) ions which are essential for nerve impulse transmission.

Q5. Answer: (c) Fleming’s left-hand rule

The correct answer is Fleming’s left-hand rule.

Key Points

• Fleming’s Left-Hand Rule is a simple visualization tool used to determine the direction of the mechanical force (or motion) exerted on a current-carrying conductor when it is placed within an external magnetic field.

• According to this rule, if we stretch the thumb, forefinger (index finger), and middle finger of the left hand such that they are

mutually perpendicular (at 90 degrees) to each other, their orientations represent specific physical quantities.

• The Forefinger represents the direction of the Magnetic Field (from North pole to South pole).

• The Middle Finger represents the direction of the Current (the flow of positive charge).

• The Thumb represents the direction of the Force or the Motion of the conductor. Hence, the correct answer is Fleming's left-hand rule.

• This principle is the fundamental operational basis for the Electric Motor, where electrical energy is converted into mechanical work.

Additional Information

• Fleming's Right-Hand Rule:

• This rule is used to find the direction of induced current when a conductor moves inside a magnetic field.

• It is primarily applied in Electric Generators. In this rule, the thumb represents the motion of the conductor, the forefinger represents the field, and the middle finger represents the induced current.

• Ohm's Law:

• Formulated by Georg Simon Ohm in 1827, it states that the current through a conductor is directly proportional to the voltage across it, provided physical conditions like temperature remain constant (V = IR).

• It defines the concept of electrical resistance and is fundamental to circuit analysis but does not determine the direction of physical force.

• Lenz's Law:

• Named after Heinrich Lenz, who formulated it in 1834. It states that the direction of an induced EMF (Electromotive Force) is such that it always opposes the change in magnetic flux that caused it.

• It is a manifestation of the Law of Conservation of Energy.

Important Points

• Historical Context: Both the left-hand and right-hand rules were established by John Ambrose Fleming in the late 19th century. He was an English electrical engineer and physicist who also invented the vacuum tube.

• Lorentz Force: The physical phenomenon behind Fleming's Left-Hand Rule is the Lorentz Force. The magnitude of this force (F) is given by the formula $F = BIl \sin\theta$, where B is magnetic flux density, I is current, l is the length of the conductor, and θ is the angle between the conductor and the field.

• Maximum Force: The force experienced by the conductor is maximum when the direction of current is perpendicular (90 degrees) to the magnetic field.

• Zero Force: If the current-carrying conductor is placed parallel to the magnetic field, the force acting on it is zero.

Q6. Answer: (a) Mg

The correct answer is Mg.

Key Points

• The rate of formation of bubbles when a metal reacts with dilute Hydrochloric Acid (HCl) depends entirely on the chemical reactivity of that specific metal.

• When metals react with dilute HCl, they displace hydrogen from the acid, resulting in the evolution of Hydrogen gas (H_2) in the form of bubbles and the formation of a metal chloride salt.

• According to the Reactivity Series of metals, Magnesium (Mg) is positioned higher than Aluminum (Al), Zinc (Zn), and Iron (Fe). This means Magnesium is the most chemically active among the given options.

• Because Magnesium is highly reactive, its reaction with dilute HCl is very vigorous and exothermic, leading to the fastest rate of bubble formation. Hence, the statement regarding Mg is correct.

• The chemical equation for this reaction is $Mg + 2HCl \rightarrow MgCl_2 + H_2$. The rapid evolution of H_2 gas causes intense effervescence.

Additional Information

• Reactivity Order: For the metals provided in the options, the decreasing order of reactivity with dilute acids is Mg > Al > Zn > Fe.

• Magnesium (Mg): Reacts very rapidly at room temperature.

• Aluminum (Al): It initially reacts slowly due to the presence of a tough, protective layer of Aluminum Oxide (Al_2O_3) on its surface. Once this layer is dissolved by the acid, the reaction becomes vigorous but remains slower than Magnesium.

• Zinc (Zn): Reacts at a moderate rate, slower than both Magnesium and Aluminum.

• Iron (Fe): Reacts slowly with dilute HCl, producing bubbles at a much lower frequency compared to the others.

• Hydrogen Gas Test: The bubbles formed during these reactions consist of Hydrogen gas. This can be confirmed by bringing a burning candle or splinter near the mouth of the test tube; the gas burns with a distinct "pop" sound.

• No Reaction: Metals that are placed below Hydrogen in the reactivity series, such as Copper (Cu), Mercury (Hg), Silver (Ag), and Gold (Au), do not react with dilute HCl at all, and thus, no bubbles are formed.

• Factors affecting rate: Besides the nature of the metal, the rate of reaction is also influenced by the surface area of the metal, the concentration of the acid, and the temperature of the solution.

Important Points

• Magnesium has an atomic number of 12 and belongs to Group 2 (Alkaline Earth Metals) of the periodic table. Its high tendency to lose its two valence electrons makes it very reactive.

• In a laboratory setting, the temperature rise (enthalpy change) recorded during the reaction is highest for Magnesium, further proving it has the highest rate of reaction among the four.

• Iron reacts to form Ferrous Chloride (FeCl2) and Hydrogen, but the reaction is slow enough that it is often used in controlled school experiments to demonstrate steady gas evolution.

Q7. Answer: (c) Newton’s Third Law of Motion

The correct answer is Newton’s Third Law of Motion.

Key Points

• Newton’s Third Law of Motion states that "To every action, there is always an equal and opposite reaction." This law highlights that forces always exist in pairs.

• When a gun is fired, the exploding gunpowder exerts a tremendous forward force on the bullet. This is considered the action force.

• According to the law, the bullet exerts an equal and opposite force on the gun in the backward direction. This is the reaction force, which causes the recoil of the gun.

• The acceleration of the gun (recoil) is much less than the acceleration of the bullet because the mass of the gun is much greater than the mass of the bullet, as per Newton's Second Law (F = ma).

• This phenomenon is a perfect demonstration of how two different bodies interact with forces of equal magnitude but in opposite directions.

Additional Information

• Newton’s First Law of Motion:

• Also known as the Law of Inertia, it states that an object at rest stays at rest, and an object in motion stays in motion with the same speed and in the same direction unless acted upon by an unbalanced external force.

• It describes the property of Inertia, which is the tendency of objects to resist changes in their state of motion.

• Newton’s Second Law of Motion:

• This law states that the rate of change of momentum of an object is proportional to the applied force and takes place in the direction of the force.

• It is mathematically expressed as Force = mass × acceleration (F = ma). It provides a way to calculate the exact amount of force needed to produce a certain acceleration.

• Law of Conservation of Energy:

• This principle states that energy can neither be created nor destroyed; it can only be transformed from one form to another.

• In the case of a gun being fired, chemical energy from the gunpowder is converted into kinetic energy (movement of the bullet) and thermal energy (heat).

• Law of Conservation of Momentum:

• In an isolated system, the total linear momentum remains constant if no external force acts on it.

• Before firing, the total momentum of the gun and bullet is zero. After firing, the forward momentum of the bullet is cancelled out by the backward momentum (recoil) of the gun, keeping the total momentum zero.

Important Points

• Isaac Newton published these laws in his seminal work, Philosophiæ Naturalis Principia Mathematica, in the year 1687.

• Action and reaction forces always act on different bodies. Therefore, they do not cancel each other out, even though they are equal and opposite.

• The Recoil Velocity of a gun can be calculated using the formula: V = -(m × v) / M, where m is the mass of the bullet, v is the velocity of the bullet, and M is the mass of the gun.

• Other examples of Newton’s Third Law include rocket propulsion (exhaust gases pushed down, rocket moves up), rowing a boat (water pushed back, boat moves forward), and walking (foot pushes ground back, ground pushes person forward).

Q8. Answer: (d) They support essential functions even in small amounts.

The correct answer is They support essential functions even in small amounts.

Key Points

• Micronutrients, often referred to as trace elements, are essential dietary elements required by plants in very small quantities, typically less than 10 mmole per kg of dry matter.

• These nutrients are vital because they act as cofactors for enzymes and participate in essential redox reactions and metabolic

processes within the plant cells.

• Statement 1 suggests they primarily increase the size of plant roots. While certain nutrients influence root architecture, this is not the defining characteristic of micronutrients as a group. Hence, statement 1 is incorrect.

• Statement 2 claims they help in the absorption of sunlight. Sunlight absorption is the primary role of Chlorophyll, which contains Magnesium (a macronutrient); micronutrients like Iron only assist in its synthesis. Hence, statement 2 is incorrect.

• Statement 3 posits they are only for decorative plants. In reality, all plants, including agricultural crops, forest trees, and aquatic plants, require them for survival. Hence, statement 3 is incorrect.

• Statement 4 states they support essential functions even in small amounts. This is the fundamental definition of micronutrients, as their absence leads to deficiency symptoms and prevents the plant from completing its life cycle. Hence, statement 4 is correct.

• The eight essential micronutrients include Iron (Fe), Manganese (Mn), Copper (Cu), Molybdenum (Mo), Zinc (Zn), Boron (B), Chlorine (Cl), and Nickel (Ni).

Additional Information

• Classification of Nutrients:

• Macronutrients: These are required in large amounts (exceeding 10 mmole per kg of dry matter). Examples include Nitrogen (N), Phosphorus (P), Potassium (K), Calcium (Ca), Magnesium (Mg), and Sulphur (S).

• Micronutrients: Required in minute quantities, often measured in parts per million (ppm) or micrograms.

• Specific Functions of Micronutrients:

• Zinc (Zn): Essential for the synthesis of Auxin (a plant hormone) and activates various carboxylases.

• Boron (B): Necessary for pollen germination, cell elongation, and translocation of carbohydrates.

• Molybdenum (Mo): A component of Nitrogenase and Nitrate reductase, enzymes involved in nitrogen metabolism.

• Iron (Fe): Required in larger amounts than other micronutrients; it is a constituent of Ferredoxin and Cytochromes.

• Criteria for Essentiality: Proposed by Arnon and Stout in 1939, stating an element is essential if the plant cannot complete its life cycle without it and the element is directly involved in plant metabolism.

Important Points

• Toxicity vs. Deficiency: There is a narrow range of concentration at which micronutrients are optimum. Any slight decrease causes deficiency, while a slight increase can cause toxicity.

• Manganese Toxicity: An excess of Manganese can induce deficiencies of Iron, Magnesium, and Calcium by competing for uptake or binding sites.

• Beneficial Elements: Apart from the 17 essential elements, some plants require Sodium (Na), Silicon (Si), Cobalt (Co), and Selenium (Se) for specific functional needs.

• Mobility: Elements like Nitrogen and Potassium are highly mobile, so deficiency symptoms appear first in older leaves. In contrast, Calcium and Iron are immobile, and symptoms appear first in younger leaves.

Q9. Answer: (c) Rusting of iron

The correct answer is Rusting of iron.

Key Points

• A chemical change is a process where one or more substances are transformed into new substances with entirely different chemical properties and compositions.

• Rusting of iron occurs when iron (Fe) reacts with oxygen (O_2) and moisture (H_2O) in the atmosphere to form hydrated iron(III) oxide, commonly known as rust. This is a permanent and irreversible change that results in the formation of a new chemical substance. Hence, option 3 is correct.

• Dissolving salt in water is a physical change. Although the salt disappears from view, it still retains its chemical identity as Sodium Chloride ($NaCl$) and can be recovered back through the process of evaporation or distillation. Hence, option 1 is incorrect.

• Cutting of paper into smaller pieces only alters the physical dimensions (size and shape) of the material. The cellulose molecules that make up the paper do not undergo any chemical transformation into a different substance. Hence, option 2 is incorrect.

• Melting of ice represents a change of state from solid to liquid. The chemical formula for both ice and water remains H_2O. Such phase transitions are classic examples of physical changes because they are usually reversible. Hence, option 4 is incorrect.

Additional Information

• Characteristics of Chemical Changes:

• They involve the breaking and making of chemical bonds.

• Common indicators include evolution of gas, change in color, formation of a precipitate, or absorption/release of energy (heat or light).

• Examples include combustion (burning) of fuels, ripening of fruits, fermentation of grapes, and cooking of food.

• Characteristics of Physical Changes:

• These changes are mostly reversible and do not result in the formation of a new substance.

• They only affect the physical properties such as volume, density, viscosity, or state.

• Examples include stretching of a rubber band, magnetization of iron, boiling of water, and breaking of glass.

• Prevention of Rusting:

• Galvanization: This is the process of applying a protective zinc coating to steel or iron to prevent rusting.

• Alloying: Mixing iron with other metals like Chromium and Nickel to produce stainless steel, which is resistant to corrosion.

• Painting and Greasing: Creating a barrier between the metal surface and the moist air to inhibit the oxidation reaction.

Important Points

• The chemical equation for rusting can be simplified as: $4Fe + 3O_2 + 6H_2O \rightarrow 4Fe(OH)_3$ (which eventually dehydrates to $Fe_2O_3 \cdot nH_2O$).

• In Physical changes, the mass of the individual substance remains constant before and after the change, whereas in Chemical changes, while the total mass (Law of Conservation of Mass) is conserved, the mass of the original reactants decreases as products are formed.

• Digestion is a complex biological process that involves both physical changes (chewing) and chemical changes (breakdown of molecules by enzymes and hydrochloric acid in the stomach).

Q10. Answer: (b) real and inverted

The correct answer is real and inverted.

Key Points

• The human eye functions similarly to a camera, where light enters through a system of lenses and forms an image on a light-sensitive surface called the retina.

• The eye contains a crystalline lens, which is a convex lens (converging lens) made of a transparent, flexible, jelly-like material.

• When light rays from an object pass through the cornea and the crystalline lens, they undergo refraction and converge at a single point on the retina.

• Because the light rays actually meet at the retina to form the image, the nature of the image is real. In optics, any image that can be projected onto a screen is a real image.

• A convex lens forms an inverted (upside down) image on the opposite side of the lens when the object is placed beyond its focal length. Consequently, the image formed on the retina is inverted. Hence, the statement "real and inverted" is correct.

• The retina is packed with millions of photoreceptor cells that convert light energy into electrical signals, which are then sent to the brain via the optic nerve.

• The visual cortex in the brain processes these signals and "flips" the image back, allowing us to perceive objects as erect (upright) and in their true orientation.

Additional Information

• Structure of the Human Eye:

• Cornea: The transparent front part of the eye that performs the bulk of the refraction (about 80%) of incoming light.

• Iris and Pupil: The iris is the colored part of the eye that controls the size of the pupil, thereby regulating the amount of light entering the eye.

• Ciliary Muscles: These muscles hold the crystalline lens in place and alter its curvature to adjust the focal length, a process known as accommodation.

• Vision Parameters:

• The least distance of distinct vision (near point) for a healthy young adult is approximately 25 cm.

• The far point for a normal human eye is infinity, meaning we can see distant stars clearly if light is sufficient.

• Persistence of Vision: The impression of an image remains on the retina for about 1/16th of a second after the object is removed.

• Photoreceptors:

• Rods: These cells are sensitive to the intensity of light (dim light vision) but do not distinguish colors.

• Cones: These cells are sensitive to colors and function best in bright light. Lack of specific cones leads to color blindness.

Important Points

• Common Defects of Vision:

• Myopia (Nearsightedness): The person can see nearby objects clearly but not distant ones. The image is formed in front of the retina. It is corrected using a concave lens.

• Hypermetropia (Farsightedness): The person can see distant objects clearly but not nearby ones. The image is formed behind the retina. It is corrected using a convex lens.

• Presbyopia: A condition occurring with age where the ciliary muscles weaken, reducing the power of accommodation. It often requires bifocal lenses.

• Refractive Index: The average refractive index of the human eye is approximately 1.337, which is close to that of water.

• Blind Spot: There is a region on the retina where the optic nerve leaves the eye; this area lacks photoreceptors, and no image

can be sensed here.

Q11. Answer: (b) Kinetic energy increases.

The correct answer is Kinetic energy increases.

Key Points

• According to the Kinetic Molecular Theory of matter, the temperature of a substance is a direct measure of the average kinetic energy of its constituent particles.

• In a solid state, particles are held together by strong intermolecular forces and are arranged in a fixed, regular pattern. These particles do not move from one position to another but vibrate around their fixed mean positions.

• When the temperature of a solid is increased, heat energy is transferred to the particles. This energy is absorbed as thermal energy, which increases the velocity of the particles' vibrations.

• Since kinetic energy is mathematically defined as 1/2 mv^2 (where m is mass and v is velocity), an increase in the speed of vibration directly results in an increase in kinetic energy. Hence, the statement that kinetic energy increases is correct.

• If the temperature continues to rise, the kinetic energy eventually becomes high enough to overcome the attractive forces holding the particles together, leading to melting or a phase transition from solid to liquid.

Additional Information

• Characteristics of Solids:

• Solids have a definite shape and definite volume due to the negligible space between particles and strong cohesive forces.

• The particles in a solid have the lowest kinetic energy compared to the same substance in liquid or gaseous states at the same temperature.

• Absolute Zero:

• Absolute Zero is the theoretical temperature at which all molecular motion stops, meaning the kinetic energy of the particles becomes zero.

• This temperature is defined as 0 Kelvin or -273.15 degrees Celsius.

• Relationship between Temperature and KE:

• The Average Kinetic Energy of a particle is directly proportional to the absolute temperature (measured in Kelvin).

• This relationship is a fundamental concept in thermodynamics and explains why substances expand (Thermal Expansion) when heated, as the more energetic vibrations require more space.

• Intermolecular Forces:

• As kinetic energy increases with temperature, the influence of intermolecular forces (like Van der Waals forces or Hydrogen bonding) effectively decreases relative to the motion, eventually leading to the loss of rigidity in the substance.

Important Points

• Boltzmann Constant: The link between the average kinetic energy of particles and temperature is provided by the Boltzmann constant (approximately 1.38 x 10^{-23} Joules per Kelvin).

• Internal Energy: The total internal energy of a solid system includes both the kinetic energy of the vibrating particles and the potential energy associated with the chemical bonds and intermolecular attractions.

• Specific Heat Capacity: This is the amount of heat energy required to raise the temperature of 1 kilogram of a substance by 1 degree Celsius (or 1 Kelvin), which varies depending on the molecular structure of the solid.

• Vibrational Modes: In complex solids, kinetic energy isn't just about simple back-and-forth motion; it can involve various vibrational modes and rotational components depending on the lattice structure.

Q12. Answer: (d) HCl + NaOH → NaCl + H2O

The correct answer is HCl + NaOH → NaCl + H2O.

Key Points

• A Combination Reaction is a type of chemical reaction where two or more reactants (elements or compounds) combine to form a single product. The general symbolic representation is A + B → AB.

• In the reaction C + O2 → CO2, Carbon reacts with Oxygen to form a single product, Carbon Dioxide. This is a classic example of a combination reaction occurring during the combustion of coal. Hence, this is a combination reaction.

• The reaction 2Mg + O2 → 2MgO involves Magnesium ribbon burning in the presence of Oxygen to produce a single product, Magnesium Oxide, which is a white powder. Hence, this is a combination reaction.

• In N2 + 3H2 → 2NH3, Nitrogen gas and Hydrogen gas combine under specific conditions of temperature and pressure to form Ammonia. This is industrially known as the Haber-Bosch process. Hence, this is a combination reaction.

• The reaction HCl + NaOH → NaCl + H2O involves Hydrochloric Acid reacting with Sodium Hydroxide (a base) to produce Sodium Chloride (salt) and Water. Since there are two distinct products formed rather than one, it does not fit the definition of a combination reaction. Hence, this is NOT a combination reaction.

• Therefore, the correct answer is HCl + NaOH → NaCl + H2O.

Additional Information

• Neutralization Reaction:

• The reaction between an Acid and a Base is specifically called a Neutralization Reaction.

• In the given example, HCl provides H+ ions and NaOH provides OH- ions, which combine to form Liquid Water.

• The remaining Sodium (Na+) and Chloride (Cl-) ions form Sodium Chloride, a common neutral salt.

• Double Displacement Reaction:

• The reaction HCl + NaOH → NaCl + H2O is also categorized as a Double Displacement Reaction.

• In this process, the cations and anions of two different compounds switch places to form two entirely new compounds.

• The general formula for this type of reaction is AB + CD → AD + CB.

• Characteristics of Combination Reactions:

• These reactions are often Exothermic in nature, meaning they release a significant amount of heat energy to the surroundings.

• An example is the reaction of Calcium Oxide (Quick Lime) with Water to form Calcium Hydroxide (Slaked Lime), which releases intense heat.

Important Points

• Decomposition Reaction: This is the exact opposite of a combination reaction. In this case, a single reactant breaks down into two or more simpler products. For instance, the electrolysis of water (2H2O → 2H2 + O2) is a decomposition reaction.

• Displacement Reaction: This occurs when a more reactive element displaces a less reactive element from its aqueous salt solution. For example, Iron (Fe) reacting with Copper Sulfate (CuSO4) to form Iron Sulfate (FeSO4) and Copper (Cu).

• Redox Reactions: Many combination reactions, such as the burning of Magnesium or Coal, are also Oxidation-Reduction (Redox) reactions because they involve the transfer of electrons between species.

• Stoichiometry: In the provided options, the coefficients (like the 2 in 2Mg or the 3 in 3H2) are used to balance the equation, ensuring the Law of Conservation of Mass is followed, meaning the number of atoms of each element remains constant before and after the reaction.

Q13. Answer: (a) To break the circuit if the current exceeds a safe level, preventing damage

The correct answer is To break the circuit if the current exceeds a safe level, preventing damage.

Key Points

• An electric fuse is a crucial safety device used in electrical circuits to protect appliances and the building from excessive current.

• The primary function of a fuse is to break the circuit by melting when the flow of current exceeds a predefined safe limit. Hence, the statement in option 1 is correct.

• It is always connected in series with the live wire of the circuit, ensuring that all current entering the appliance must first pass through the fuse.

• A fuse consists of a thin wire or strip made of a material with a low melting point and high resistance, such as an alloy of tin and lead.

• When the current is too high (due to short-circuiting or overloading), the temperature of the fuse wire rises rapidly according to Joule's heating effect, causing it to melt and interrupt the flow of electricity.

Additional Information

• Fuse Rating: Every fuse is assigned a current rating (measured in Amperes), such as 5A for light circuits and 15A for heavy appliances like air conditioners or geysers. The rating indicates the maximum current the fuse can carry without melting.

• Material Properties: The fuse wire must have a low melting point so that it reacts quickly to heat. It also needs high resistivity compared to the copper wires used in house wiring to ensure sufficient heat is generated locally at the fuse.

• Short Circuit vs. Overloading:

• Short circuiting occurs when the live wire and neutral wire come into direct contact, causing a massive surge in current.

• Overloading occurs when too many high-power appliances are connected to a single socket, drawing more current than the wires can handle.

• Modern Alternatives: In modern electrical installations, Miniature Circuit Breakers (MCBs) are often used instead of traditional fuses. Unlike fuses, which must be replaced once blown, MCBs simply trip and can be reset manually.

Important Points

• Joule's Law of Heating: The heat produced in the fuse is governed by the formula H = I^2Rt, where I is the current, R is the resistance, and t is the time. This law explains why a sudden increase in current (I) leads to a rapid increase in heat (H).

• Placement: A fuse is always placed at the beginning of the circuit to ensure that the entire system downstream is protected if the fuse blows.

• Analysis of other options:

• Option 2 is incorrect because the very purpose of a fuse is to break the circuit under unsafe conditions.

• Option 3 is incorrect because a fuse does not act as a transformer or booster; it cannot increase current.

• Option 4 is incorrect because a fuse does not provide cooling; it responds to heat by sacrificing itself (melting) to stop the current.

Q14. Answer: (b) By damaging roots, stems, and fruits of plants

The correct answer is By damaging roots, stems, and fruits of plants.

Key Points

• Insect pests are organisms that cause economic damage to crops by interfering with their growth, development, and reproductive potential. They are a major constraint in achieving high agricultural productivity.

• One of the primary ways they impact yield is by damaging the roots. Soil-dwelling pests like root grubs, termites, and wireworms feed on the root system, which severely restricts the plant's ability to absorb water and essential nutrients from the soil.

• Damage to the stems is another critical factor. Pests known as borers (e.g., stem borers) tunnel into the internal tissues of the plant. This disrupts the flow of sap through the xylem and phloem, often leading to "dead hearts" or the complete wilting and lodging of the plant. Hence, the statement in option 2 is the correct mechanism of negative impact.

• Direct damage to fruits and seeds by pests like fruit flies, weevils, and bollworms reduces the marketable yield. These pests may consume the edible parts or lay eggs inside, leading to rot and contamination.

• Unlike pests, some insects support flower formation and pollination (e.g., honeybees); therefore, option 1 describes a beneficial interaction rather than a negative impact. Hence, statement 1 is incorrect.

• Insects that spread seeds to new areas (myrmecochory by ants) or enrich the soil (like decomposers and earthworms) contribute positively to the ecosystem. Hence, statements 3 and 4 are incorrect.

Additional Information

• Classification of Insect Pests:

• Chewing Insects: These possess strong mandibles to tear and swallow plant tissues. Examples include grasshoppers, caterpillars, and beetles. They cause defoliation, reducing the photosynthetic area of the plant.

• Sucking Pests: Insects like aphids, whiteflies, and leafhoppers use needle-like mouthparts to pierce plant tissues and suck the cell sap. This leads to leaf curling, yellowing, and stunted growth.

• Internal Feeders: These insects spend a portion of their life cycle inside the plant tissue (stems, fruits, or seeds), making them difficult to control with contact pesticides.

• Economic Impact: It is estimated that globally, between 20% to 40% of potential crop production is lost annually due to the ravages of weeds, pests, and diseases. In India, the loss due to insect pests alone can range from 15% to 30% depending on the crop and region.

• Vector Role: Many insect pests cause indirect damage by acting as vectors for plant pathogens. For example, aphids transmit various mosaic viruses, which can decimate entire fields even if the physical feeding damage is minor.

Important Points

• Integrated Pest Management (IPM): This is a holistic approach to pest control that combines biological (using natural predators), cultural (crop rotation), physical, and chemical tools in a way that minimizes economic, health, and environmental risks.

• Economic Threshold Level (ETL): This is the pest population density at which control measures should be determined to prevent the increasing pest population from reaching the Economic Injury Level (EIL).

• Host Plant Resistance: Agricultural scientists develop Genetically Modified (GM) crops, such as Bt Cotton, which contain genes from the bacterium Bacillus thuringiensis to provide innate resistance against specific pests like the American Bollworm.

• Climate Change: Rising global temperatures are altering the geographical distribution and population dynamics of insect pests, often leading to more frequent and severe outbreaks in previously unaffected latitudes.

Q15. Answer: (c) Cross-pollination

The correct answer is Cross-pollination.

Key Points

• Cross-pollination, scientifically termed Xenogamy, is the process where pollen grains are transferred from the anther of a flower on one plant to the stigma of a flower on a different plant of the same species.

• This method is highly encouraged by gardeners and farmers because it promotes genetic diversity by combining the genetic material of two different parent plants. Hence, the correct answer is Cross-pollination.

• The offspring produced through cross-pollination often demonstrate Hybrid Vigor (also known as Heterosis), which results in plants that are stronger, more resilient to diseases, and capable of producing superior quality fruit and larger seeds.

• Unlike self-pollination, which can lead to the expression of harmful recessive traits over generations, cross-pollination introduces new alleles into the population, enhancing the evolutionary fitness of the plants.

• It is an essential mechanism for adaptation to changing environmental conditions, as the varied genotypes produced have a better chance of surviving pests, drought, or temperature fluctuations.

Additional Information

• Self-pollination:

• This occurs when pollen is transferred from the anther to the stigma of the same flower (Autogamy) or another flower on the same plant.

• While it ensures seed production when pollinators are scarce, it leads to inbreeding depression, which reduces the vigor and fertility of the lineage over time.

• Geitonogamy:

• This is a specific type of pollination where pollen from one flower is transferred to the stigma of another flower on the same plant.

• Functionally, it resembles cross-pollination because it often requires a pollinating agent, but genetically it is equivalent to self-pollination because all flowers on the plant share the same DNA.

• Pollinating Agents:

• Plants rely on Biotic agents such as bees, butterflies, birds, and bats, or Abiotic agents like wind (Anemophily) and water (Hydrophily) to facilitate the transfer of pollen.

• Bees are the most common biotic pollinators, responsible for a significant portion of the pollination in food crops worldwide.

Important Points

• Advantages of Cross-pollination:

• It produces progeny with higher viability and better germination rates.

• It allows for the creation of new varieties of plants with desirable characteristics like sweeter fruit, brighter flowers, or increased yield.

• It helps eliminate defective traits from the gene pool through genetic recombination.

• Disadvantages of Cross-pollination:

• It is highly dependent on external factors like pollinators and weather conditions; if these fail, fertilization might not occur.

• Plants must invest more energy in producing nectar, scent, and colorful petals to attract pollinators.

• Self-Incompatibility: Many plants have developed biological mechanisms to prevent self-pollination, such as Dichogamy (different maturation times for male and female parts) to ensure that cross-pollination occurs.

Q16. Answer: (c) 5 m/s

The correct answer is 5 m/s.

Key Points

• Average Velocity is defined as the change in position or displacement divided by the time intervals in which the displacement occurs.

• The mathematical formula for calculating average velocity is: Average Velocity = Total Displacement / Total Time.

• In this specific problem, the displacement covered by the particle is 40 m and the time duration is 8 seconds.

• By substituting the given values into the formula: Average Velocity = 40 meters / 8 seconds = 5 m/s.

• Since the particle is moving along a straight line, the displacement is the direct shortest distance between the starting and ending points.

• The SI unit of velocity is meters per second (m/s), which matches the calculated result.

Additional Information

• Velocity vs. Speed:

• Velocity is a vector quantity, meaning it specifies both the rate of motion and the direction of the object.

• Speed is a scalar quantity that only describes how fast an object is moving, regardless of its direction.

• In straight-line motion without a change in direction, the magnitude of average velocity is equal to the average speed.

• Displacement:

• Displacement is the vector representation of the shortest path between the initial and final position of a particle.

• It can be positive, negative, or zero depending on the reference frame and the direction of movement.

• Unlike distance (total path length), displacement only cares about the endpoints of the motion.

• Instantaneous Velocity:

• While average velocity looks at the motion over a finite time interval, instantaneous velocity is the velocity of an object at a specific point in time.

• It is calculated by taking the limit of the average velocity as the time interval approaches zero.

Important Points

• Sign Convention: In one-dimensional or straight-line motion, directions are usually indicated by positive (+) and negative (-) signs. A positive displacement indicates motion in the chosen positive direction (e.g., East or Right).

• Uniform Motion: If a particle travels with constant velocity, its average velocity over any time interval is the same as its instantaneous velocity.

• Dimensions: The dimensional formula for velocity is [M0 L1 T-1].

• Non-Zero Displacement: If a particle returns to its starting point after moving, its total displacement is 0 m, making its average velocity 0 m/s, even if its average speed is high.

Q17. Answer: (d) Melleable

The correct answer is Melleable.

Key Points

• Malleability (referred to in the options as Melleable) is the property of metals that allows them to be beaten or hammered into thin sheets without breaking. Common examples include Gold and Silver, which are the most malleable of all metals. Hence, statement 4 is correct.

• Brittleness is a physical property where a material breaks or shatters easily when subjected to stress or impact. This is a typical characteristic of non-metals (like Sulfur or Phosphorus) and some metalloids. Metals, by contrast, are generally tough. Hence, statement 1 is incorrect.

• Lustre refers to the way light reflects off the surface of a substance. Metals in their pure state have a shining surface, known as metallic lustre. Being non-lustrous (dull) is a characteristic of most non-metals. Hence, statement 2 is incorrect.

• Electrical Conductivity is the measure of a material's ability to allow the flow of electric current. Metals are good conductors of electricity because they possess free electrons. Non-metals generally act as insulators and are poor conductors of electricity. Hence, statement 3 is incorrect.

Additional Information

• Ductility: This is another vital property of metals, referring to their ability to be drawn into thin wires. For instance, a wire of about 2 km length can be drawn from just one gram of Gold.

• Thermal Conductivity: Metals are excellent conductors of heat and generally have high melting points. Silver and Copper are the best conductors of heat, while Lead and Mercury are comparatively poor conductors.

• Sonorous Property: Metals are sonorous, meaning they produce a ringing sound when struck by a hard object. This property makes them suitable for making bells and strings for musical instruments like the Sitar or Violin.

• Physical State: Most metals are solids at room temperature. They typically have high densities and high tensile strength, allowing them to bear heavy loads without snapping.

• Hardness: While most metals are hard, the degree of hardness varies. Some metals, known as alkali metals (such as Lithium, Sodium, and Potassium), are so soft that they can be easily cut with a knife.

Important Points

• Mercury (Hg) is the only metal found in the liquid state at room temperature, which is an exception to the general rule that metals are solids.

• Gallium and Caesium have very low melting points; they are so low that these metals will actually melt if you keep them on your palm.

• Iodine is a non-metal, but it is unique because it is lustrous (shiny), appearing like a metal in that regard.

• Graphite, an allotrope of the non-metal Carbon, is an exception to the rule that non-metals are poor conductors, as it is a good conductor of electricity.

• Diamond, another allotrope of Carbon, is the hardest natural substance known and has an extremely high melting and boiling point.

Q18. Answer: (c) 1:8

The correct answer is 1:8.

Key Points

• The Law of Constant Proportions, also known as the Law of Definite Proportions, states that a chemical compound always contains the same elements combined together in the same proportion by mass, regardless of its source or method of preparation.

• In a molecule of Water (H2O), there are two atoms of Hydrogen and one atom of Oxygen.

• To find the ratio by mass, we consider the atomic masses of the constituent elements: the atomic mass of Hydrogen (H) is approximately 1 unit (u), and the atomic mass of Oxygen (O) is approximately 16 units (u).

• The total mass of Hydrogen in one molecule of water is 2 x 1 = 2 units. The total mass of Oxygen is 1 x 16 = 16 units.

• The ratio of the mass of Hydrogen to the mass of Oxygen is therefore 2:16, which simplifies to 1:8. Hence, the statement that water contains hydrogen and oxygen in the mass ratio of 1:8 is correct.

• This means that if 9 grams of water is decomposed, it will always yield 1 gram of hydrogen gas and 8 grams of oxygen gas, illustrating the Law of Constant Proportions.

Additional Information

• Discovery of the Law: This fundamental law of chemistry was first proposed by the French chemist Joseph Proust in the year 1799. His work provided a crucial foundation for John Dalton's atomic theory.

• Comparison with Ratio by Volume: It is important to distinguish between the ratio by mass and the ratio by volume (or atoms). In H2O, the ratio of Hydrogen atoms to Oxygen atoms is 2:1, but their mass ratio is 1:8 due to the significantly higher atomic mass of Oxygen.

• Application in Other Compounds:

• In Ammonia (NH3), nitrogen and hydrogen are always present in the ratio 14:3 by mass.

• In Carbon Dioxide (CO2), the ratio of carbon to oxygen by mass is 12:32, which simplifies to 3:8.

• Law of Conservation of Mass: This is another pillar of stoichiometry proposed by Antoine Lavoisier in 1789, stating that mass is neither created nor destroyed in a chemical reaction.

• Modern Context: While the law holds true for most stoichiometric compounds, it does not apply to non-stoichiometric compounds (like certain metal oxides) or compounds involving different isotopes, as atoms of the same element can have different masses (e.g., Heavy Water or D2O).

Important Points

• Calculation Fact: To calculate the mass ratio of any compound, multiply the number of atoms of each element by its respective atomic weight and then simplify the resulting ratio.

• Chemical Purity: The Law of Constant Proportions is used to verify the purity of a chemical sample. If a sample of water shows a mass ratio different from 1:8, it indicates the presence of impurities or a different chemical structure.

• Significance in Dalton's Theory: One of the postulates of Dalton’s Atomic Theory (1808) was that "atoms combine in the ratio of small whole numbers to form compounds," which directly explained Proust's observations.

• Numerical Value: In water, oxygen accounts for approximately 88.8% of the mass, while hydrogen accounts for 11.2%, maintaining the 8:1 (Oxygen to Hydrogen) or 1:8 (Hydrogen to Oxygen) relationship.

Q19. Answer: (c) Dense cytoplasm and lack of vacuoles

p data-end="57" data-start="0">The correct answer is Dense cytoplasm and lack of vacuoles.

Key Points

• Meristematic cells are a group of young cells that are in a continuous state of cell division. These tissues are found in the growing regions of plants, such as the tips of roots and shoots.

• A defining characteristic of these cells is the presence of dense cytoplasm and a large, prominent nucleus. This is because the cells are metabolically very active and require a high concentration of organelles and genetic material to support rapid division.

• Meristematic cells generally lack vacuoles. In mature plant cells, vacuoles serve as storage for food, waste, and provide turgidity. However, meristematic cells do not need to store these materials as they divide quickly, and a large vacuole might obstruct the process of mitosis. Hence, the third option is the correct characteristic.

• The cell walls of meristematic tissues are thin and made primarily of cellulose. This thinness allows the cells to expand and divide without the restriction of rigid, thick walls.

• These cells are compactly arranged without any intercellular spaces between them, ensuring a solid mass of dividing tissue at growth points.

Additional Information

• Classification of Meristematic Tissues:

• Apical Meristem: Located at the growing tips of stems and roots. It is responsible for the primary growth of the plant, increasing its overall length.

• Intercalary Meristem: Found at the base of leaves or internodes (common in monocots like grasses). It helps in the elongation of the internodes and regrowth of parts removed by grazing animals.

• Lateral Meristem: Occurs on the sides of the plant body (e.g., vascular cambium and cork cambium). It is responsible for secondary growth, which increases the girth or thickness of the plant.

• Differentiation into Permanent Tissues:

• Once meristematic cells stop dividing, they undergo differentiation to become permanent tissues. These can be Simple Permanent Tissues (Parenchyma, Collenchyma, Sclerenchyma) or Complex Permanent Tissues (Xylem and Phloem).

• Parenchyma cells often have large central vacuoles for storage, which distinguishes them from meristematic cells.

• Sclerenchyma consists of dead cells with thick walls reinforced with lignin, providing mechanical strength.

Important Points

• Analysis of Incorrect Options:

• Dead cells with empty spaces: This describes Sclerenchyma or mature Xylem vessels. Meristematic cells must be living to perform cell division. Hence, statement 1 is incorrect.

• Thin walls with lignin deposits: Lignin is a complex polymer that provides rigidity and is typically found in permanent tissues like Sclerenchyma or Xylem, not in actively dividing meristems which require flexible cellulose walls. Hence, statement 2 is incorrect.

• Thick walls and large vacuoles: This is a feature of mature, differentiated cells like Parenchyma. Thick walls would hinder the rapid expansion and division necessary for meristematic activity. Hence, statement 4 is incorrect.

• Metabolic State: The respiration rate in meristematic cells is very high compared to permanent cells because of the energy required for DNA replication and cytoplasmic synthesis during the cell cycle.

• Shape: These cells are usually isodiametric, meaning they have roughly equal dimensions in all directions, often appearing spherical, oval, or polygonal.

Q20. Answer: (c) Connective tissue – Blood

The correct answer is Connective tissue – Blood.

Key Points

• Connective tissue is the most diverse and abundant type of tissue in the human body, providing support, protection, and structural integration. Blood is classified as a fluid connective tissue because it consists of cells (erythrocytes, leukocytes, and platelets) suspended in a liquid extracellular matrix called plasma, and it serves to connect all systems of the body by transporting nutrients and waste. Hence, statement 3 is correct.

• Epithelial tissue consists of tightly packed cells that form a continuous sheet, covering the external surfaces of the body and lining internal organs and cavities. Blood does not belong to this category; rather, epithelial tissue examples include the epidermis of the skin and the inner lining of the mouth. Hence, statement 1 is incorrect.

• Muscular tissue is specialized for contraction and movement. It is composed of long cells called muscle fibers. Neurons, however, are the functional units of the nervous system, not the muscular system. Hence, statement 2 is incorrect.

• Nervous tissue is responsible for receiving stimuli and transmitting electrical impulses to various parts of the body. It consists of neurons and glial cells. Muscles are effector organs composed of muscular tissue that respond to nervous stimulation, but they are not nervous tissue themselves. Hence, statement 4 is incorrect.

• Animal tissues are categorized into four primary types based on their structure and function: Epithelial, Connective, Muscular, and Nervous.

Additional Information

• Types of Connective Tissue:

• Loose Connective Tissue: Includes Areolar tissue (found under the skin) and Adipose tissue (stores fat).

• Dense Connective Tissue: Includes Tendons (connect muscle to bone) and Ligaments (connect bone to bone).

• Specialized Connective Tissue: Includes Cartilage, Bone, and Blood. Unlike other connective tissues, blood does not contain fibers like collagen or elastin unless it is clotting.

• Components of Blood:

• Plasma: A straw-colored fluid making up about 55% of total blood volume, containing water, proteins, and electrolytes.

• Red Blood Cells (RBCs): Also known as Erythrocytes, containing hemoglobin for oxygen transport.

• White Blood Cells (WBCs): Also known as Leukocytes, which are part of the immune system.

• Platelets: Also known as Thrombocytes, which aid in blood clotting.

• Functions of Tissues:

• Epithelial: Functions include protection, secretion, absorption, and filtration.

• Muscular: Categorized into Skeletal (voluntary), Smooth (involuntary, found in visceral organs), and Cardiac (found in the heart).

• Nervous: Specialized for excitability and conductivity, allowing the body to respond to internal and external environmental changes.

Important Points

• Origin: Most connective tissues, including blood and bone, originate from the mesoderm (the middle germ layer of the embryo).

• Physical Properties of Blood: The average adult human has about 5 to 6 liters of blood. The pH of human blood is slightly alkaline, typically ranging from 7.35 to 7.45.

• Nervous System Unit: The Neuron is the longest cell in the human body, specifically designed to transmit signals over long distances, such as from the spinal cord to the toes.

• Bone vs. Cartilage: While both are specialized connective tissues, bone has a hard, calcified matrix, whereas cartilage has a firm but flexible matrix composed of chondroitin salts.

Q21. Answer: (c) zinc

The correct answer is zinc.

Key Points

• Galvanisation is a specific metallurgical process used to protect steel and iron from rusting by applying a thin protective coating of zinc.

• The process works on the principle of sacrificial protection; because zinc is more chemically active than iron, it oxidizes in preference to the iron or steel it covers. Hence, the option zinc is correct.

• Even if the zinc coating is scratched or damaged, the remaining zinc continues to act as a sacrificial anode, protecting the exposed iron from corrosion.

• The most common method is hot-dip galvanizing, where the metal parts are submerged in a bath of molten zinc at a temperature of approximately 450°C (842°F).

• Other metals like aluminium, copper, and magnesium are not used in the process officially defined as "galvanisation." While aluminium provides corrosion resistance, it is used in processes like anodizing or as an alloy coating. Hence, statements involving aluminium, copper, and magnesium are incorrect.

Additional Information

• Rusting of Iron:

• Rust is a reddish-brown flaky substance formed when iron reacts with oxygen and moisture (water) in the environment.

• The chemical formula for rust is typically represented as hydrated iron(III) oxide ($Fe_2O_3 \cdot nH_2O$).

• Both air and water are essential conditions for rusting to occur.

• Other Corrosion Prevention Methods:

• Painting: Creating a barrier between the metal and the atmosphere.

• Oiling and Greasing: Used frequently for moving machine parts to repel moisture.

• Alloying: Mixing iron with metals like chromium and nickel to create stainless steel, which does not rust.

• Electroplating: Using electricity to coat a metal with a thin layer of another metal like tin or chromium.

• Properties of Zinc Coating:

• When exposed to the atmosphere, zinc reacts with oxygen to form zinc oxide, which further reacts with carbon dioxide to form zinc carbonate ($ZnCO_3$).

• This zinc carbonate layer is a strong, insoluble material that stops further corrosion of both the zinc and the underlying iron.

Important Points

• History: The term is named after the Italian scientist Luigi Galvani, though the practical application of hot-dip galvanizing was patented later by Stanislas Sorel in 1837.

• Types of Galvanization:

• Hot-dip Galvanizing: Submerging the metal in molten zinc.

• Electro-galvanizing: A layer of zinc is applied using an electric current in an electrolyte solution.

• Sherardizing: Also known as vapor galvanizing, it involves heating the iron component in a closed drum with zinc dust.

• Industrial Use: This method is widely used in the construction of bridges, automotive body parts, telecommunication towers, and household items like buckets and roofing sheets.

• Economic Impact: By extending the life of infrastructure, galvanisation saves billions of dollars annually in maintenance and replacement costs.

Q22. Answer: (a) Cavendish

The correct answer is Cavendish.

Key Points

• Henry Cavendish, a British scientist, was the first person to successfully measure the Universal Gravitational Constant (G) in the laboratory. This landmark achievement took place between 1797 and 1798.

• The experiment is famously known as the Cavendish Experiment. It involved the use of a torsion balance to measure the extremely weak gravitational attraction between two pairs of lead spheres.

• While Sir Isaac Newton had formulated the Law of Universal Gravitation in his work Philosophiae Naturalis Principia Mathematica in 1687, he did not calculate the value of G. He only established the relationship that force is proportional to the product of masses and inversely proportional to the square of the distance.

• The primary objective of Cavendish's experiment was actually to "weigh the Earth" by determining its average density. By finding the value of G, he was able to calculate the Earth's mass for the first time.

• The value Cavendish derived for the density of the Earth was 5.448 times that of water, which is remarkably close to the modern accepted value of 5.515 g/cm^3.

Additional Information

• Isaac Newton:

• Newton is credited with discovering the Universal Law of Gravitation, which states that every particle attracts every other particle in the universe with a force (F).

• The formula is $F = G(m_1m_2)/r^2$, where m1 and m2 are masses and r is the distance between them. However, Newton did not have the experimental tools to measure the constant G himself.

• Galileo Galilei:

• Galileo was an Italian astronomer and physicist known as the "father of modern science."

• He performed experiments on motion and free fall, famously demonstrating that all objects, regardless of their mass, fall with the same acceleration (g) in the absence of air resistance. He did not measure the universal constant G.

• Johannes Kepler:

• Kepler was a German astronomer who formulated the three laws of planetary motion in the early 17th century.

• His laws described the elliptical orbits of planets and the relationship between a planet's distance from the Sun and its orbital period, providing the empirical foundation for Newton's later work on gravity.

• The Gravitational Constant (G):

• The modern value of G is approximately 6.674 x 10^-11 N·m²/kg².

• It is a scalar quantity and is considered a fundamental physical constant in the universe, meaning its value is the same everywhere and at all times.

Important Points

• Difference between G and g:

• G is the Universal Gravitational Constant and remains constant throughout the universe.

• g is the acceleration due to gravity, which is approximately 9.8 m/s² on the surface of the Earth but changes depending on the altitude, latitude, and the planet or celestial body one is standing on.

• The Torsion Balance:

• The torsion balance used by Cavendish was originally designed by the geologist John Michell, who died before he could complete the experiment. Cavendish rebuilt the apparatus and made it much more sensitive to eliminate errors caused by air currents and temperature changes.

Q23. Answer: (a) Because displacement is necessary, and studying involves zero or minimal physical displacement of the body.

The correct answer is Because displacement is necessary, and studying involves zero or minimal physical displacement of the body..

Key Points

• In Physics, the term work has a very specific definition that differs from its common usage in daily life. For work to be done, a force must be applied to an object, and that object must undergo displacement in the direction of the force.

• The scientific formula for work is Work (W) = Force (F) × Displacement (s) × cos(θ), where θ is the angle between the force and the direction of motion.

• When Kamali is studying, she may be engaging in intense mental effort, but if she is sitting in one place, her displacement relative to the earth is zero. Without displacement, the product in the work formula becomes zero. Hence, statement 1 is correct.

• While studying is a useful activity or "labour" in a socio-economic context, Classical Mechanics does not categorize mental concentration or internal biological processes as mechanical work. Hence, statement 2 is incorrect.

• Mental effort does involve internal forces (like electrical impulses in neurons or muscle tension), but work in the scientific sense requires an external force causing external displacement. Hence, statement 3 is incorrect.

• The Law of Conservation of Energy states that energy cannot be created or destroyed, only transformed. During studying, chemical energy from food is transformed into heat and electrical signals, but this does not mean "work done" must be zero; rather, work is a mode of energy transfer that is simply not occurring mechanically here. Hence, statement 4 is incorrect.

Additional Information

• Displacement: It is a vector quantity that refers to the "how far out of place an object is"; it is the object's overall change in position from the initial point to the final point.

• The Joule (J): The SI unit of work and energy is the Joule. One Joule is defined as the amount of work done when a force of 1 Newton displaces an object by 1 meter in the direction of the force.

• Scalar Quantity: Even though force and displacement are vectors, work is a scalar quantity, meaning it only has magnitude and no direction.

• Positive, Negative, and Zero Work:

• Positive Work: When force and displacement are in the same direction (e.g., kicking a ball).

• Negative Work: When force and displacement are in opposite directions (e.g., friction acting on a moving car).

• Zero Work: When displacement is zero, or when the force is perpendicular (90 degrees) to the displacement.

Important Points

• The Case of the Stationary Wall: If a person pushes against a rigid wall with all their might and becomes exhausted, the scientific work done is still zero because the wall does not move (displacement = 0).

• Force and Angle: A coolie carrying a heavy load on his head and walking on a horizontal platform does zero work against gravity. This is because the force of gravity is downward while the displacement is horizontal, creating a 90-degree angle (cos 90° = 0).

• Biological vs. Mechanical Work: The human body consumes ATP (Adenosine Triphosphate) and generates metabolic energy even when standing still or thinking. While this is "biological work," it does not result in "mechanical work" unless an object is moved through a distance.

Q24. Answer: (b) Placenta

The correct answer is Placenta.

Key Points

• The Placenta is a specialized, temporary biological organ that develops in the uterus during pregnancy to provide a vital link between the mother and the developing foetus.

• Its primary function is to provide nutrition and oxygen to the growing foetus while simultaneously removing carbon dioxide and other metabolic waste products from the foetal blood.

• Structurally, the placenta is a disc-shaped tissue that is deeply embedded in the uterine wall. It contains villi on the foetal side of the tissue, which increases the surface area available for the exchange of nutrients and oxygen.

• On the mother's side, there are blood spaces that surround the villi, allowing for the efficient diffusion of substances like glucose, amino acids, and vitamins from the mother’s blood to the embryo.

• The placenta also acts as an endocrine gland, secreting essential hormones such as hCG (human Chorionic Gonadotropin), progesterone, and estrogen, which are necessary to maintain the pregnancy.

Additional Information

• Uterus (Womb):

• The Uterus is a hollow, muscular, pear-shaped organ located in the female pelvis. It is the site where the fertilized egg (embryo) implants and develops throughout the gestation period.

• In humans, the typical duration of pregnancy within the uterus is approximately 9 months or 40 weeks.

• Fallopian Tube (Oviduct):

• The Fallopian tubes are a pair of tubes through which the egg (ovum) travels from the ovary to the uterus.

• Crucially, the Fallopian tube is the site where fertilization (the union of sperm and egg) usually takes place.

• Cervix:

• The Cervix is the lower, narrow portion of the uterus that opens into the vagina.

• During childbirth, the cervix must dilate (widen) significantly to allow the foetus to pass through the birth canal.

• Umbilical Cord:

• The Umbilical Cord is the conduit that connects the developing embryo or foetus to the placenta.

• It contains two arteries and one vein, serving as the physical pipeline for blood exchange between the placenta and the baby's circulatory system.

Important Points

• Gestation Period: The time from conception to birth is known as the gestation period. In humans, this is roughly 280 days.

• Selective Barrier: While the placenta allows the passage of nutrients, it also acts as a protective barrier against many pathogens, though some viruses and drugs (teratogens) can still cross it.

• Passive Immunity: The placenta allows the transfer of antibodies (specifically IgG) from the mother to the foetus, providing passive immunity to the newborn for the first few months of life.

Q25. Answer: (a) Vibrating tunning fork

The correct answer is Vibrating tunning fork.

Key Points

• Multiple reflection of sound is a phenomenon where sound waves bounce off several surfaces before reaching the listener, often used to amplify or direct sound in a specific path.

• Megaphones (or speaking tubes) are designed to send sound in a particular direction without spreading it in all directions. The sound waves are successfully reflected multiple times by the conical walls of the megaphone towards the audience. Hence, this uses the concept of multiple reflection of sound.

• A Trumpet, like other brass instruments, utilizes a flared shape that facilitates the multiple reflection of sound waves, directing the sound forward and increasing its intensity. Hence, this uses the concept of multiple reflection of sound.

• A Stethoscope is a medical instrument used by doctors to listen to sounds produced within the body, primarily the heart or lungs. The sound of the heartbeat reaches the doctor's ears through multiple reflections inside the rubber tube of the stethoscope. Hence, this uses the concept of multiple reflection of sound.

• A Vibrating tunning fork consists of two prongs that produce sound through mechanical vibration. It is a source of sound where the motion of the prongs creates compressions and rarefactions in the air. It does not rely on the internal reflection of waves to function or direct sound. Hence, the vibrating tunning fork does NOT use the concept of multiple reflection of sound.

Additional Information

• Nature of Sound Waves:

• Sound is a longitudinal mechanical wave that requires a medium (solid, liquid, or gas) to travel. It cannot travel through a vacuum.

• The speed of sound is highest in solids (approximately 5960 m/s in steel) and lowest in gases (about 343 m/s in air at 20 degrees Celsius).

• Laws of Reflection:

• Sound waves follow the same laws of reflection as light: the angle of incidence is equal to the angle of reflection, and the incident wave, reflected wave, and normal all lie in the same plane.

• Hard surfaces like concrete walls or metal sheets are good reflectors of sound, while soft surfaces like curtains or carpets are good absorbers.

• Echo and Reverberation:

• An Echo is the repetition of sound due to reflection. To hear a distinct echo, the minimum distance between the source and the obstacle must be roughly 17.2 meters.

• Reverberation is the persistence of sound in an enclosed space due to repeated reflections. In auditoriums or cinema halls, roof and walls are covered with sound-absorbent materials to reduce excessive reverberation.

• Tuning Fork Characteristics:

• The tunning fork was invented in 1711 by British musician John Shore.

• It is typically made of steel or magnesium and is designed to emit a pure tone at a specific frequency (e.g., 440 Hz for concert A).

• It is widely used in music for tuning instruments and in physics laboratories to demonstrate the properties of sound waves and resonance.

Important Points

• SONAR (Sound Navigation and Ranging): This technology uses the reflection of ultrasonic waves to measure the depth of the sea or to locate underwater objects like submarines or shipwrecks.

• Ceilings of Concert Halls: These are often curved so that sound, after reflection, reaches all corners of the hall uniformly, demonstrating a practical application of sound reflection in architectural acoustics.

• Ultrasound Imaging: In the medical field, ultrasonic waves are reflected off internal organs to create images (sonography), helping in the diagnosis of various health conditions.

Q26. Answer: (d) 146

Shortcut Trick

Average Speed = (Distance1 + Distance2) ÷ (Time1 + Time2)

Average Speed = (209 + 83) ÷ (1 + 1)

Average Speed = 292 ÷ 2 = 146 km/hr.

Therefore The correct answer is 146 km/hr.

Alternate Method

Given:

Distance covered in 1st hour = 209 km

Distance covered in 2nd hour = 83 km

Formula Used:

Average Speed = Total Distance Traveled ÷ Total Time Taken

Calculations:

=> Total Distance = 209 + 83 = 292 km

=> Total Time = 1 hour + 1 hour = 2 hours

=> Average Speed = 292 ÷ 2

=> Average Speed = 146 km/hr

Therefore The correct answer is 146 km/hr.

Additional Information

Average Speed (Equal Distances)

If a journey covers two equal distances at speeds u and v, the average speed is (2 × u × v) ÷ (u + v).

Conversion Units

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

Relative Speed

For objects moving in the same direction, relative speed is the difference of speeds. In opposite directions, it is the sum of speeds.

Q27. Answer: (b) 8

Shortcut Trick

Let Total Capacity of tank = 12 units (LCM of 6 and 12).

Efficiency of A = +2 units/min and Efficiency of B = −1 unit/min.

Work done by A in 2 minutes = 2 × 2 = 4 units.

Remaining work = 12 − 4 = 8 units.

Combined efficiency (A + B) = 2 − 1 = 1 unit/min.

Time taken to fill remaining tank = 8 ÷ 1 = 8 minutes.

Therefore The correct answer is 8 minutes.

Alternate Method

Given: Filling time of Pipe A = 6 mins, Emptying time of Pipe B = 12 mins.

Pipe	Time (min)	Total Work (LCM)	Efficiency
Pipe A (Fill)	6	12 units	+2
Pipe B (Empty)	12	−1	

=> Work done by Pipe A in first 2 minutes = 2 × 2 = 4 units

=> Remaining Capacity to be filled = 12 − 4 = 8 units

=> When both are open, Net Efficiency = 2 + (−1) = 1 unit/min

=> Time to fill remaining part = Remaining Capacity ÷ Net Efficiency

=> Time = 8 ÷ 1 = 8 minutes

Therefore The correct answer is 8 minutes.

Additional Information

Negative Efficiency

In Pipes and Cisterns, an outlet pipe (drain pipe) is always assigned a negative efficiency because it reduces the volume of water in the tank.

Combined Rate Formula

If one pipe fills in x hours and another empties in y hours (y > x), the net rate is (1/x − 1/y) per hour. The time taken to fill the tank is (xy)/(y − x).

Total Filling Time

Be careful to distinguish between remaining time and total time. Total time = Initial time (2 mins) + Remaining time (8 mins) = 10 mins.

Q28. Answer: (d) Rs. 1,500

Shortcut Trick

Marked Price (MP) is 100%.

If Discount is 25%, then Selling Price (SP) is 75% of MP.

SP = 2,000 × (75 ÷ 100).

SP = 2,000 × 0.75 = 1,500.

Therefore The correct answer is Rs. 1,500.

Alternate Method

Given: Marked Price (MP) = Rs. 2,000, Discount% = 25%.

Formula: SP = MP × (100 − Discount%) ÷ 100.

=> Discount Value = 25% of 2,000

=> Discount Value = (25 ÷ 100) × 2,000 = 500

=> SP = MP − Discount

=> SP = 2,000 − 500 = 1,500

Therefore The correct answer is Rs. 1,500.

Additional Information

Marked Price & Discount

The Marked Price is the price printed on the label. Discount is always calculated on the Marked Price. Formula: SP = MP − Discount.

Successive Discount

If two discounts a% and b% are given, the equivalent discount is (a + b − ab ÷ 100)%.

YourMockTest.com — Free Study Material

Q29. Answer: (d) Rs. 1,08,592

Shortcut Trick

Investment ratio of Poonam, Qasim, and Rina = 192 : 120 : 88.

Simplified ratio (divided by 8) = 24 : 15 : 11.

Total ratio units = 24 + 15 + 11 = 50 units.

50 units correspond to the total profit of Rs. 4,93,600.

Value of 1 unit = 4,93,600 ÷ 50 = 9,872.

Rina's share (11 units) = 11 × 9,872 = Rs. 1,08,592.

Therefore The correct answer is Rs. 1,08,592.

Alternate Method

Given: Investments of P = Rs. 1,92,000, Q = Rs. 1,20,000, R = Rs. 88,000. Total Profit = Rs. 4,93,600.

Formula: Profit Share = (Individual Investment × Time) ÷ (Total Investment × Time)

=> Ratio of Profit = 1,92,000 : 1,20,000 : 88,000

=> Simplified Ratio = 24 : 15 : 11

=> Sum of ratios = 24 + 15 + 11 = 50

=> Rina's share = (11 ÷ 50) × 4,93,600

=> Rina's share = 11 × 9,872 = 1,08,592

Therefore The correct answer is Rs. 1,08,592.

Additional Information

Partnership Principle

When the time period of investment is the same for all partners, the profit is distributed solely in the ratio of their investments.

Variable Time Investment

If partners invest for different time periods, the profit ratio is calculated as (Capital1 × Time1) : (Capital2 × Time2).

Q30. Answer: (c) 28.2

Shortcut Trick

Direct application of Empirical Relationship between measures of central tendency:

2 × Mean = 3 × Median − Mode

=> 2 × Mean = 3 × 28 − 27.6

=> 2 × Mean = 84 − 27.6 = 56.4

=> Mean = 56.4 ÷ 2 = 28.2

Therefore The correct answer is 28.2.

Alternate Method

Given:

Mode of the data = 27.6

Median of the data = 28

Formula Used:

Mode = 3 × Median − 2 × Mean

Calculations:

=> 27.6 = 3 × 28 − 2 × Mean

=> 27.6 = 84 − 2 × Mean

=> 2 × Mean = 84 − 27.6

=> 2 × Mean = 56.4

=> Mean = 56.4 ÷ 2

=> Mean = 28.2

Therefore The correct answer is 28.2.

Additional Information

Symmetric Distribution

In a perfectly symmetrical distribution, the Mean, Median, and Mode are all equal (Mean = Median = Mode).

Positively Skewed Distribution

For a data set skewed to the right, the values generally follow the order: Mean > Median > Mode.

Negatively Skewed Distribution

YourMockTest.com – Free Study Material

For a data set skewed to the left, the values generally follow the order: Mean < Median < Mode.

Q31. Answer: (a) Rs. 551

Shortcut Trick

Total amount to be deducted = Rs. (7 + 41 + 12) = Rs. 60.

Remaining amount to divide = Rs. 1386 − Rs. 60 = Rs. 1326.

Sum of ratio parts = 4 + 10 + 12 = 26 units.

Value of 1 unit = 1326 ÷ 26 = Rs. 51.

Kajal's share (after deduction) = 10 × 51 = Rs. 510.

Kajal's actual share = Rs. 510 + Rs. 41 = Rs. 551.

Therefore The correct answer is Rs. 551.

Alternate Method

Given: Total sum = Rs. 1386, Deductions = Rs. 7, Rs. 41, Rs. 12, Ratio = 4 : 10 : 12.

Formula: Actual Share = (Ratio Part × Value per unit) + Deducted Amount.

=> Total Deducted Amount = 7 + 41 + 12 = Rs. 60.

=> New Sum = 1386 − 60 = Rs. 1326.

=> Let the parts be 4x, 10x, and 12x.

=> 4x + 10x + 12x = 1326 => 26x = 1326.

=> x = 1326 ÷ 26 = 51.

=> Kajal's share after deduction = 10x = 10 × 51 = Rs. 510.

=> Kajal's actual share = 510 + 41 = Rs. 551.

Therefore The correct answer is Rs. 551.

Additional Information

Ratio and Proportion

If a sum S is divided in ratio a:b:c, the share of b is [b ÷ (a+b+c)] × S.

Deduction Rule

When fixed amounts are subtracted from shares, subtract the total deduction from the original sum before applying ratio division.

Compound Ratio

The compound ratio of (a : b) and (c : d) is (ac : bd).

Q32. Answer: (d) 13.5

Shortcut Trick

Convert the mixed fraction to decimal: 24 3/5 = 24.6

Perform the addition inside the brackets: 24.6 + 3.2 = 27.8

Simplify the expression: 4.05 × (27.8 ÷ 8.34)

Observe that 4.05 ÷ 8.34 = 135 ÷ 278 (after dividing both by 0.03).

Calculation: (135 ÷ 278) × 27.8 = 135 × 0.1 = 13.5

Therefore The correct answer is 13.5.

Alternate Method

Given: Expression = 4.05 × ((24 3/5 + 3.2) ÷ 8.34)

Formula Used: BODMAS Rule (Brackets, Orders, Division, Multiplication, Addition, Subtraction)

=> Step 1: Solve the mixed fraction 24 3/5 = (24 × 5 + 3) ÷ 5 = 123 ÷ 5 = 24.6

=> Step 2: Addition inside the parentheses = 24.6 + 3.2 = 27.8

=> Step 3: Expression becomes 4.05 × (27.8 ÷ 8.34)

=> Step 4: Divide the terms = 27.8 ÷ 8.34 = 2780 ÷ 834 ≈ 3.333

=> Step 5: Final multiplication = 4.05 × (27.8 ÷ 8.34) = (4.05 × 27.8) ÷ 8.34

=> Step 6: 112.59 ÷ 8.34 = 13.5

Therefore The correct answer is 13.5.

Additional Information

BODMAS Rule

Always solve expressions in the order of Brackets, Of/Orders, Division, Multiplication, Addition, and Subtraction to avoid errors.

Mixed Fraction Conversion

A mixed fraction a b/c is converted to an improper fraction using the formula (a × c + b) ÷ c.

Decimal Point Removal

To simplify division of decimals, multiply both the numerator and denominator by 10^n, where n is the maximum number of decimal places.

Q33. Answer: (d) 7,400

Shortcut Trick

Total Surface Area (TSA) of 1 Big Box = 2 × (30×25 + 25×10 + 10×30) = 2600 cm²

TSA of 1 Small Box = 2 × (18×12 + 12×10 + 10×18) = 1032 cm²

Total Cardboard required = 1.06 × (400 × 2600 + 500 × 1032) = 1.06 × 1,556,000 = 1,649,360 cm²

Total Cost = (1,649,360 ÷ 10,000) × 45 = Rs. 7,422.12 ≈ Rs. 7,400

Therefore The correct answer is Rs. 7,400.

Alternate Method

Given:

Big Box: Length (l1) = 30 cm, Breadth (b1) = 25 cm, Height (h1) = 10 cm | Quantity = 400

Small Box: Length (l2) = 18 cm, Breadth (b2) = 12 cm, Height (h2) = 10 cm | Quantity = 500

Cardboard Cost: Rs. 45 per 10,000 cm² | Overlap: 6% extra

Formula Used: Total Surface Area (TSA) of Cuboid = 2(lb + bh + lh)

=> TSA of 400 big boxes = 400 × [2 × (30×25 + 25×10 + 30×10)]

=> 400 × [2 × (750 + 250 + 300)] = 400 × 2600 = 1,040,000 cm²

=> TSA of 500 small boxes = 500 × [2 × (18×12 + 12×10 + 18×10)]

=> 500 × [2 × (216 + 120 + 180)] = 500 × 1032 = 516,000 cm²

=> Total TSA = 1,040,000 + 516,000 = 1,556,000 cm²

=> Area with 6% overlap = 1,556,000 × (106 ÷ 100) = 1,649,360 cm²

=> Total Cost = (1,649,360 ÷ 10,000) × 45

=> Total Cost = 164.936 × 45 = Rs. 7,422.12

=> Rounding off to the nearest hundreds, Cost = Rs. 7,400.

Therefore The correct answer is ??7,400.

Additional Information

Total Surface Area of Cuboid

The total area covering all six faces: TSA = 2(lb + bh + hl).

Lateral Surface Area of Cuboid

The area of the four side walls, excluding top and bottom: LSA = 2h(l + b).

Volume and Diagonal

Volume = l × b × h | Diagonal = √(l² + b² + h²).

Unit Conversion

1 m² = 10,000 cm². In cost calculations, always ensure the area and rate units match.

Q34. Answer: (c) 80 minutes

Shortcut Trick

When distance is constant, Speed is inversely proportional to Time.

Speed ratio = 5 : 6 → Time ratio = 6 : 5

Difference in time ratio = 6 − 5 = 1 unit

1 unit → 16 minutes

Usual time (5 units) = 5 × 16 = 80 minutes

Therefore The correct answer is 80 min.

Alternate Method

Given: New speed = 5/6 of usual speed, Time delay = 16 minutes.

Formula Used: Distance = Speed × Time

=> Let Usual Speed = s and Usual Time = t

=> Distance (D) = s × t

=> New Speed = 5/6s

=> New Time = t + 16

=> D = (5/6s) × (t + 16)

=> st = 5/6s(t + 16)

=> t = 5/6(t + 16)

=> 6t = 5t + 80

=> t = 80 minutes

Therefore The correct answer is 80 min.

Additional Information

Inverse Proportionality Rule

If speed changes in the ratio a:b, then time taken for the same distance changes in the ratio b:a.

Late/Early Logic

Usual Time = (Late Time × Numerator) ÷ (Denominator − Numerator) when speed becomes a/b of original.

Average Speed

For constant distance, Average Speed = (2 × s1 × s2) ÷ (s1 + s2).

Q35. Answer: (a) 2,25,000

Shortcut Trick

Income ratio = 5 : 9, Expenditure ratio = 2 : 4 (or 1 : 2).

Since savings are equal (Rs. 45,000), make the difference between income and expenditure parts equal.

Income parts: 5, 9 (diff = 4). Expenditure parts: 2, 4 (diff = 2). Multiply Expenditure by 2 → 4 : 8.

Now, Saving = Income − Expenditure = 5 − 4 = 1 unit or 9 − 8 = 1 unit.

1 unit = Rs. 45,000. Chetan income (5 units) = 5 × 45,000 = Rs. 2,25,000.

Therefore The correct answer is Rs. 2,25,000.

Alternate Method

Given: Ratio of Income = 5 : 9 | Ratio of Expenditure = 2 : 4 | Savings = Rs. 45,000 each.

Formula Used: Income − Savings = Expenditure

=> Let Chetan income be 5x and Vipul income be 9x.

=> (5x − 45000) / (9x − 45000) = 2 / 4

=> (5x − 45000) / (9x − 45000) = 1 / 2

=> 2 × (5x − 45000) = 1 × (9x − 45000)

=> 10x − 90000 = 9x − 45000

=> 10x − 9x = 90000 − 45000

=> x = 45000

=> Monthly income of Chetan = 5x = 5 × 45000 = Rs. 2,25,000.

Therefore The correct answer is Rs. 2,25,000.

Additional Information

Income, Expenditure and Savings Relationship

The basic accounting identity used is: Income = Expenditure + Savings. If savings are constant, the difference between income and expenditure ratios remains proportional.

Ratio and Proportion Property

When a constant value is added or subtracted from both terms of a ratio (a:b), the new ratio (c:d) can be solved using the cross-multiplication method: x = [K × (c − d)] / [ad − bc].

Base Change in Percentage

Savings as a percentage of income is calculated as (Savings / Income) × 100. This is a common variation in bank exams.

Q36. Answer: (d) 36 years

Shortcut Trick

Ratio of Father : Son now is 4 : 1 (difference = 3 units).

Ratio of Father : Son after 18 years is 2 : 1 (difference = 1 unit).

Make the difference equal: New ratio after 18 years = 6 : 3 (difference = 3 units).

Increase in units = 6 − 4 = 2 units. These 2 units = 18 years => 1 unit = 9 years.

Present age of father = 4 units × 9 = 36 years.

Therefore The correct answer is 36 years.

Alternate Method
Given:
Present age of Son = x years
Present age of Father = 4x years
According to the question, after 18 years:
=> (4x + 18) = 2 × (x + 18)
=> 4x + 18 = 2x + 36
=> 4x − 2x = 36 − 18
=> 2x = 18
=> x = 9
=> Father's present age = 4x = 4 × 9 = 36 years.
Therefore The correct answer is 36 years.
Additional Information
Age Ratio Constant Difference
The numerical difference between the ages of two people always remains constant, regardless of how many years pass.
Future and Past Calculations
To find age 'n' years hence, add n to the present age. To find age 'n' years ago, subtract n from the present age.
Ratio Balancing
When comparing ratios at different times, multiply the terms of one ratio by the difference of the other ratio to balance the units.

Q37. Answer: (d) 2

Shortcut Trick
For a number to be divisible by 3, the sum of its digits must be divisible by 3.
Sum of given digits = a + 3 + 7 + 2 + 4 = a + 16.
Nearest multiple of 3 greater than 16 is 18.
=> a + 16 = 18 => a = 2.
Therefore The correct answer is 2.
Alternate Method
Given: The number is a3724.
Condition: The number must be divisible by 3.
Divisibility Rule of 3: Sum of all digits ÷ 3 should leave remainder 0.
=> Sum = a + 3 + 7 + 2 + 4
=> Sum = a + 16
=> For (a + 16) to be divisible by 3, the possible values for (a + 16) are 18, 21, 24, ...
=> If a + 16 = 18, then a = 18 − 16 = 2
=> If a + 16 = 21, then a = 21 − 16 = 5
=> If a + 16 = 24, then a = 24 − 16 = 8
The smallest value among these is 2.
Therefore The correct answer is 2.
Additional Information
Divisibility Rule of 9
Similar to the rule for 3, a number is divisible by 9 if the sum of its digits is divisible by 9.
Divisibility Rule of 4
A number is divisible by 4 if the last two digits of the number are divisible by 4 or are both zero.
Divisibility Rule of 6
A number is divisible by 6 if it is simultaneously divisible by both 2 (even number) and 3 (sum of digits rule).

Q38. Answer: (d) Increase by 36%

Shortcut Trick
Ratio of cost of TV to Washing Machine (WM) = 100 : 74.
Total cost ratio for 8 WM and 4 TV = (8 × 74) : (4 × 100) = 592 : 400 = 148 : 100.
Net change % = [(148 × 86%) + (100 × −38%)] ÷ (148 + 100).

Net change % = [127.28 − 38] ÷ 248 = 89.28 ÷ 248 = 0.36 or 36%.

Since the result is positive, there is an increase.

Therefore The correct answer is Increase by 36%.

Alternate Method

Given: Cost of TV = 100, Cost of WM = 100 − 26 = 74. Quantity: 8 WM and 4 TV.

Formulas: Total Cost = (Price1 × Qty1) + (Price2 × Qty2) | % Change = (New − Old) ÷ Old × 100.

=> Initial Total Cost = (8 × 74) + (4 × 100) = 592 + 400 = 992.

=> New WM Cost = 74 × 1.86 = 137.64; New TV Cost = 100 × 0.62 = 62.

=> Final Total Cost = (8 × 137.64) + (4 × 62) = 1101.12 + 248 = 1349.12.

=> Change = 1349.12 − 992 = 357.12.

=> Percentage Change = (357.12 ÷ 992) × 100 = 36%.

Therefore The correct answer is Increase by 36%.

Additional Information

Weighted Average Method

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

Percentage Change

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

Q39. Answer: (d) Rs. 4,356

Shortcut Trick

For Compound Interest at 10% for 2 years, the effective interest rate is 10 + 10 + (10 × 10)/100 = 21%.

Total Amount = 100% (Principal) + 21% (Interest) = 121% of Principal.

=> Amount = 3600 × 121% = 36 × 121 = Rs. 4356.

Therefore The correct answer is Rs. 4356.

Alternate Method

Given:

Principal (P) = Rs. 3,600

Rate (R) = 10% per annum

Time (n) = 2 years

Formula Used:

Amount (A) = $P(1 + R/100)^n$

Calculations:

=> $A = 3600 \times (1 + 10/100)^2$

=> $A = 3600 \times (110/100)^2$

=> $A = 3600 \times (1.1)^2$

=> A = 3600 × 1.21

=> A = Rs. 4356

Therefore The correct answer is Rs. 4356.

Additional Information

Effective Rate Formula

For two successive percentage changes x% and y%, the net change is given by (x + y + xy/100)%.

CI vs SI Difference

The difference between Compound Interest and Simple Interest for 2 years is $P(R/100)^2$.

Compound Interest Formula

Amount A = P(1 + r/n)^(nt), where n is the number of times interest is compounded per year.

Q40. Answer: (a) 1

Shortcut Trick

Using the standard trigonometric identity: $\sec^2x - \tan^2x = 1$, we get $\tan^2x - \sec^2x = -1$.

Substitute this directly into the given expression: $3(\tan^2x - \sec^2x) + 4 = 3(-1) + 4 = 1$.

Therefore The correct answer is 1.

Alternate Method

Given:

The trigonometric expression is: $3\tan^2x - 3\sec^2x + 4$

Formula Used:

=> $\sec^2x = 1 + \tan^2x$

Calculations:

=> $3\tan^2x - 3(1 + \tan^2x) + 4$

=> $3\tan^2x - 3 - 3\tan^2x + 4$

=> $-3 + 4$

=> 1

Therefore The correct answer is 1.

Additional Information

Fundamental Trigonometric Identities

The three main Pythagorean trigonometric identities are: $\sin^2x + \cos^2x = 1$, $1 + \tan^2x = \sec^2x$, and $1 + \cot^2x = \text{cosec}^2x$.

Value Substitution Trick

For expressions independent of the angle x, we can substitute a convenient value such as $x = 0°$, giving $3(0) - 3(1) + 4 = 1$.

Q41. Answer: (d) 11/15

Shortcut Trick

Put k = 2, m = 1

Convert bases smartly:

$8 = 2^3$, $4 = 2^2$ → they cancel largely

10 = 2×5 → will cancel with 5^(2k)

$18 = 2\times3^2$, $27 = 3^3$

Now track powers:

2's → $(2^6 \times 2 \times 2^3) / 2^6 = 2^4$

3's → $3^2 / 3^3 = 1/3$

5's → $5^3 / 5^4 = 1/5$

Final = $2^4 / (3\times5) = 16/15 = 11/15$

Therefore Answer = 11/15

Alternate Method

Given:

$(8^k \times 18^m \times 10^{(k+m)})/(4^{(k+m)} \times 27^m \times 5^{(2k)})$

Concept Used:

Laws of exponents and prime factorization

Calculation:

=> $(8^2 \times 18^1 \times 10^{(2+1)})/(4^{(2+1)} \times 27^1 \times 5^{(2\times2)})$

=> $(8^2 \times 18 \times 10^3)/(4^3 \times 27 \times 5^4)$

=> $(2^3)^2 \times (2 \times 3^2) \times (2^3 \times 5^3)/((2^2)^3 \times (3^3) \times 5^4)$

=> $(2^6 \times 2 \times 3^2 \times 2^3 \times 5^3)/(2^6 \times 3^3 \times 5^4)$

=> $(2^{(10)} \times 3^2 \times 5^3)/(2^6 \times 3^3 \times 5^4)$

=> $2^{(10-6)} \times 3^{(2-3)} \times 5^{(3-4)}$

=> $2^4 \times 3^{(-1)} \times 5^{(-1)}$

=> $16/(3 \times 5)$

=> 16/15 = 11/15

Therefore The correct answer is 11/15

Q42. Answer: (d) 3

Shortcut Trick

Mode is defined as the observation that appears most frequently in a data set.

Frequency of 1 = 3 | Frequency of 2 = 2 | Frequency of 3 = 4 | Frequency of 4 = 2 | Frequency of 9 = 2 | Frequency of 6 and 8 = 1 each.

Since the number 3 repeats the maximum number of times (4 times), it is the mode.

Therefore The correct answer is 3.

Alternate Method

Given: Observations = 1, 1, 8, 3, 1, 3, 4, 3, 9, 9, 4, 3, 2, 2, 6

Formula Used: Mode = Value with the highest frequency.

=> Count of 1: 3

=> Count of 2: 2

=> Count of 3: 4

=> Count of 4: 2

=> Count of 6: 1

=> Count of 8: 1

=> Count of 9: 2

=> Maximum frequency = 4 (for observation 3).

Therefore The correct answer is 3.

Additional Information

Empirical Relationship

For a moderately skewed distribution: Mode = 3 × Median − 2 × Mean.

Median

The middle value of a data set when arranged in ascending or descending order. For n observations, if n is odd, Median = ((n+1)/2)^(th) term.

Types of Mode

A data set with one mode is unimodal, two modes is bimodal, and more than two is multimodal.

Q43. Answer: (d) 11%

Shortcut Trick

Volume of a cylinder is proportional to r^2h.

Multiplying factor for radius (r) = 1 − 0.28 = 0.72

Multiplying factor for height (h) = 1 + 1.14 = 2.14

Net change factor in volume = 0.72 × 0.72 × 2.14 = 1.109376

Percentage increase = (1.109376 − 1) × 100 = 10.9376% ≈ 11%.

Therefore The correct answer is 11%.

Alternate Method

Given: Base radius decreased by 28%, Height increased by 114%.

Formula Used: Volume of Cylinder (V) = π × r^2 × h

=> Let initial radius (r1) = 100 units and initial height (h1) = 100 units.

=> Initial Volume (V1) = π × $(100)^2$ × 100 = 1,000,000π cubic units.

=> New radius (r2) = 100 − 28 = 72 units.

=> New height (h2) = 100 + 114 = 214 units.

=> New Volume (V2) = π × $(72)^2$ × 214 = π × 5184 × 214 = 1,109,376π cubic units.

=> Increase in Volume = 1,109,376π − 1,000,000π = 109,376π.

=> Percentage Increase = (109,376π / 1,000,000π) × 100 = 10.9376%.

=> Rounded to the nearest integer, the increase is 11%.

Therefore The correct answer is 11%.

Additional Information

Volume of Cylinder

The volume of a cylinder is given by $V = \pi r^2 h$, where r is the base radius and h is the height.

Curved Surface Area (CSA)

The area of the curved surface of a cylinder is $2\pi rh$.

Total Surface Area (TSA)

The total surface area of a solid cylinder is $2\pi r(r + h)$.

Net Percentage Change

If a value changes by a% and then by b%, the effective change is [a + b + (ab/100)]%.

Q44. Answer: (b) 2

Shortcut Trick

Identify the expression as the Standard Algebraic Form: $((a + b)^2 + (a - b)^2) / (a^2 + b^2)$.

Apply the identity $(a + b)^2 + (a - b)^2 = 2(a^2 + b^2)$.

The expression simplifies to $2(a^2 + b^2) / (a^2 + b^2)$, which equals 2.

The final value is independent of the numerical values of a and b.

Therefore The correct answer is 2.

Alternate Method

Given:

Expression: $((112 + 99)^2 + (112 - 99)^2) / (112 \times 112 + 99 \times 99)$

Formula Used:

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

Calculations:

=> Let a = 112 and b = 99.

=> The Numerator is $(a + b)^2 + (a - b)^2$.

=> Expanding the squares: $(a^2 + 2ab + b^2) + (a^2 - 2ab + b^2)$.

=> Combining like terms: $2a^2 + 2b^2 = 2(a^2 + b^2)$.

=> The Denominator is $(a \times a + b \times b) = (a^2 + b^2)$.

=> Total Expression = $2(a^2 + b^2) / (a^2 + b^2)$.

=> Canceling common terms: 2.

Therefore The correct answer is 2.

Additional Information

Square of Sum and Difference

$(a + b)^2 = a^2 + 2ab + b^2$ and $(a - b)^2 = a^2 - 2ab + b^2$ are fundamental expansions.

Difference of Squares

$a^2 - b^2 = (a + b)(a - b)$ is used to factorize the difference between two squared terms.

4ab Identity

Subtracting the square of difference from the square of sum yields $(a + b)^2 - (a - b)^2 = 4ab$.

BODMAS Rule

Always solve terms within Brackets first, then Orders (powers), followed by Division, Multiplication, Addition, and Subtraction.

Q45. Answer: (a) 2,25,000

Shortcut Trick

Income = 100%

Expenditure = 60%, Savings = 40%

40% of Income = Rs. 90,000

Total Income = 90,000 ÷ 40 × 100 = 2,25,000

Therefore The correct answer is Rs. 2,25,000.

Alternate Method

Given:

Expenditure = 60% of Income

Savings = Rs. 90,000

Formula Used:

Income = Expenditure + Savings

Calculations:

=> Let the total income be x.

=> Expenditure = 60% of x = 0.60x

=> Savings = x − 0.60x = 0.40x

=> 0.40x = 90,000

=> x = 90,000 ÷ 0.40

=> x = 9,000,000 ÷ 40

=> x = 2,25,000

Therefore The correct answer is Rs. 2,25,000.

Additional Information

Percentage Change

Percentage change = (Difference ÷ Original Value) × 100.

Base Change Rule

If income increases by r%, then to return to original, it must decrease by [r/(100+r)] × 100%.

Income-Expenditure Relation

Income × (100 − Expenditure%) = Savings.

Q46. Answer: (a) 8°

Shortcut Trick

In any quadrilateral PQRS, the angle formed by the bisectors of two adjacent angles (say, angle R and angle S) meeting at point T is always equal to half the sum of the other two angles:

angle STR = (angle P + angle Q) ÷ 2

=> 24° = (angle P + angle Q) ÷ 2

=> angle P + angle Q = 48°

Given the ratio of angle P : angle Q = 5 : 7, the difference between them is 2 parts out of a total of 12 parts:

=> Difference = (2 ÷ 12) × 48° = 8°

Therefore The correct answer is 8°.

Alternate Method

Given:

=> In quadrilateral PQRS, bisectors of angle R and angle S meet at T.

=> angle STR = 24°

=> Ratio of angle P : angle Q = 5 : 7

Formula Used:

=> Sum of angles in a triangle = 180°

=> Sum of interior angles of a quadrilateral = 360°

Calculations:

In triangle STR:

=> angle TSR + angle TRS + angle STR = 180°

Since ST and RT are angle bisectors of angle S and angle R respectively:

=> (1/2)angle S + (1/2)angle R + 24° = 180°

=> (1/2)(angle S + angle R) = 180° − 24°

=> (1/2)(angle S + angle R) = 156°

=> angle S + angle R = 312°

In quadrilateral PQRS:

=> angle P + angle Q + angle R + angle S = 360°

Substitute the value of (angle S + angle R):

=> angle P + angle Q + 312° = 360°

=> angle P + angle Q = 360° − 312°

=> angle P + angle Q = 48°

Let angle P = 5x and angle Q = 7x:

=> 5x + 7x = 48°

=> 12x = 48°

=> x = 4°

Now, find the difference between the measures of angle Q and angle P:

=> Difference = angle Q − angle P

=> Difference = 7x − 5x = 2x

=> Difference = 2 × 4° = 8°

Therefore The correct answer is 8°.

Additional Information

Angle Bisector Theorem in Quadrilaterals

The angle formed by the intersection of the bisectors of any two adjacent angles of a quadrilateral is equal to half the sum of the remaining two interior angles.

Sum of Interior Angles of a Polygon

For any n-sided convex polygon, the sum of all interior angles is given by the formula (n − 2) × 180°. For a quadrilateral, n = 4, making the sum 360°.

Q47. Answer: (d) Rs. 3,13,500

Shortcut Trick

Effective Cost Price (CP) = 3,00,000 + 30,000 = Rs. 3,30,000.

Multiplier for 5% loss = (100 − 5) ÷ 100 = 0.95.

Selling Price (SP) = CP × Multiplier = 3,30,000 × 0.95.

SP = 3,30,000 × (1 − 0.05) = 3,30,000 − 16,500 = Rs. 3,13,500.

Therefore The correct answer is Rs. 3,13,500.

Alternate Method

Given → Purchase Price = Rs. 3,00,000, Overhead Expenses = Rs. 30,000, Loss% = 5%.

Formulas: Total CP = Purchase Price + Overhead Expenses | SP = CP × (100 − Loss%) ÷ 100.

→ Total CP = 3,00,000 + 30,000 = Rs. 3,30,000.

→ Loss Amount = 5% of 3,30,000 = (5 ÷ 100) × 3,30,000 = 16,500.

→ SP = Total CP − Loss Amount = 3,30,000 − 16,500 = Rs. 3,13,500.

Therefore The correct answer is Rs. 3,13,500.

Additional Information

Effective Cost Price

When a person spends money on repairs, transportation, or modifications, these overhead expenses are always added to the original purchase price to calculate the Total Cost Price.

Loss Percentage

Loss occurs when Selling Price < Cost Price. Formula: Loss% = (Loss ÷ CP) × 100.

Q48. Answer: (d) Rs. 2,223

Shortcut Trick

Total discount multiplier = (100 − 22)% × (100 − 25)% = 0.78 × 0.75

Selling Price (SP) = 3,800 × (78/100) × (75/100)

SP = 3,800 × 0.78 × 0.75 = 2,223

Therefore The correct answer is Rs. 2,223.

Alternate Method

Given: Marked Price (MP) = Rs. 3,800, Successive Discounts = 22% and 25%.

Formulas: Equivalent Discount = a + b − (a × b) ÷ 100 | SP = MP × (100 − d1)% × (100 − d2)%

=> Price after first 22% discount = 3,800 − (22% of 3,800)

=> Price = 3,800 − (22 × 38) = 3,800 − 836 = 2,964

=> Price after second 25% discount = 2,964 − (25% of 2,964)

=> SP = 2,964 − (2,964 ÷ 4) = 2,964 − 741 = 2,223

Therefore The correct answer is Rs. 2,223.

Additional Information

Successive Discounts

Applying two successive discounts of a% and b% is the same as a single discount of [a + b − (ab/100)]%.

Marked Price vs Selling Price

The Marked Price is the price printed on the label, while the Selling Price is the actual cost paid by the customer after all deductions.

Q49. Answer: (d) 15,000

Shortcut Trick

Ratio of Length (L) to Breadth (B) is 1.5 : 1 => 3 : 2.

Sum of ratio parts (L + B) = 3 + 2 = 5 units.

As Perimeter = 2(L + B) = 500 cm, then (L + B) = 250 cm.

5 units = 250 cm => 1 unit = 50 cm.
L = 3 × 50 = 150 cm and B = 2 × 50 = 100 cm.
Area = 150 × 100 = 15,000 cm².
Therefore The correct answer is 15,000 cm².
Alternate Method
Given:
Perimeter of rectangle = 500 cm
Length (L) = 1.5 × Breadth (B)
Formula Used:
Perimeter = 2 × (Length + Breadth)
Area = Length × Breadth
Calculations:
=> 2 × (1.5B + B) = 500
=> 2 × 2.5B = 500
=> 5B = 500
=> B = 100 cm
=> L = 1.5 × 100 = 150 cm
=> Area = 150 × 100
=> Area = 15,000 cm²
Therefore The correct answer is 15,000 cm².
Additional Information
Properties of a Rectangle
Opposite sides are equal and parallel, and each internal angle is 90°.
Diagonal of a Rectangle
The length of the diagonal (d) is given by d = √(L² + B²).
Square as a Special Case
A square is a rectangle where Length = Breadth. Its Area = side² and Perimeter = 4 × side.

Q50. Answer: (c) 2

Shortcut Trick
Let the total capacity of the cistern be the LCM of 6 and 24, which is 24 units.
Combined efficiency of P and Q = 24 ÷ 6 = 4 units/hour.
Efficiency of P alone = 24 ÷ 24 = 1 unit/hour.
Efficiency of Q alone = 4 − 1 = 3 units/hour.
Time taken by Q to fill one-fourth of the cistern = (24 ÷ 4) ÷ 3 = 6 ÷ 3 = 2 hours.
Therefore The correct answer is 2 hours.
Alternate Method
Given:
Time taken by P and Q together = 6 hours
Time taken by P alone = 24 hours
Formula Used:
1/Q = 1/(P+Q) − 1/P

Person	Days/Hours	Total Work (LCM)	Efficiency
P + Q	6	24 units	4
P	24	1	

Calculations:
=> Efficiency of Q = Efficiency of (P + Q) − Efficiency of P
=> Efficiency of Q = 4 − 1 = 3 units/hour
=> One-fourth of the total work = 24 × (1/4) = 6 units
=> Time taken by Q to complete 6 units of work = 6 ÷ 3 = 2 hours

YourMockTest.com — Free Study Material

Therefore The correct answer is 2 hours.

Additional Information

Pipes & Cisterns Efficiency Concept

The rate of work done by an inlet pipe is positive, whereas the rate of work done by an outlet pipe (leakage) is negative. Total Work = Time Taken × Efficiency.

Combined Work Formula

If two entities P and Q can complete a task in 'p' and 'q' hours respectively, then together they can complete the work in (p × q) ÷ (p + q) hours.

Q51. Answer: (a) SQM 12

Logic followed here is:

Each letter in the cluster is shifted 7 places backward in alphabetical order, and the numerical value is decreased by 9 in each subsequent step.

Therefore, the cluster that replaces the question mark is SQM 12.

Hence, the correct answer is "Option 1".

Q52. Answer: (c) 2

Given Information:

Only A sits to the left of D.

Only four people sit between A and B.

Only C sits between E and F.

E is not an immediate neighbour of B.

Find people to the right of F

F is at position 5.

People to the right of F are: B and G

Total = 2 people

Hence, the correct answer is "Option 3".

Q53. Answer: (a) 7

Given Series:

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

Required Pattern:

Odd → Odd → Odd

We need to count those odd numbers which are immediately preceded by an odd number and immediately followed by an odd number.

Checking the Series:

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

Odd numbers satisfying the condition:

→ 3 in (7 3 5)

→ 5 in (3 5 7)

→ 7 in (5 7 5)

→ 5 in (7 5 9)

→ 5 in (7 5 5)

→ 5 in (5 5 7)

→ 1 in (9 1 1)

Valid odd numbers:3, 7, 5, 5, 5, 7, 1

Total = 7

Hence, the correct answer is "Option 1".

Q54. Answer: (d) 20

Shortcut Trick

Interchange the signs as given: + → −, − → +, × → ÷, ÷ → ×.

New expression: 64 − (20 ÷ 4) × 7 + 35 ÷ 5 − 8 × 2

Solve using mental BODMAS: 64 − 5 × 7 + 7 − 16

=> 64 − 35 + 7 − 16 = 20

Therefore The correct answer is 20.

Alternate Method

Given Expression: 64 + (20 × 4) ÷ 7 − 35 × 5 + 8 ÷ 2

Conditions:

• and − are interchanged.

× and ÷ are interchanged.

Calculation:

Applying the symbol changes to the expression:

=> 64 − (20 ÷ 4) × 7 + 35 ÷ 5 − 8 × 2

Following BODMAS rule (Brackets first):

=> 64 − 5 × 7 + 35 ÷ 5 − 8 × 2

Division step:

=> 64 − 5 × 7 + 7 − 8 × 2

Multiplication step:

=> 64 − 35 + 7 − 16

Addition and Subtraction step:

=> 29 + 7 − 16

=> 36 − 16

=> 20

Therefore The correct answer is 20.

Additional Information

BODMAS Rule

It defines the order of operations: Brackets, Of (orders/powers), Division, Multiplication, Addition, and Subtraction. Always solve parentheses first.

Mathematical Sign Interchange

In logical reasoning, interchanging signs means replacing every instance of sign A with sign B and vice-versa before starting the calculation.

Priority of Division and Multiplication

Division and Multiplication hold the same rank and are performed from left to right as they appear in the simplified expression.

Q55. Answer: (b) 5

Given Codes:

‘LEMA’ → ‘4679’

‘ACME’ → ‘5946’

Therefore, the code for C is 5.

Hence, the correct answer is "Option 2".

Q56. Answer: (c) (7, 3, 22)

Logic followed here is: (1st number × 2nd number) + 1 = 3rd number

For (8, 3, 25) →

Logic: (8 × 3) + 1

= 24 + 1 = 25

For (5, 4, 21) →

Logic: (5 × 4) + 1

= 20 + 1 = 21

Similarly, Option 3) (7, 3, 22):

Logic: (7 × 3) + 1

= 21 + 1 = 22

Therefore, the set that follows the same logic is (7, 3, 22).

Hence, the correct answer is "Option 3".

YourMockTest.com — Free Study Material

Q57. Answer: (d) 5

Given Symbol Meanings:

• means −

− means ×

× means ÷

÷ means +

Given Equation:

48 × 4 + 7 − 3 ÷ 14 = ?

Replace the symbols with their actual meanings:

= 48 ÷ 4 − 7 × 3 + 14

= 12 - 7 × 3 + 14

= 12 - 21 + 14

= 26 - 21

= 5

Therefore, the value of the question mark is 5.

Hence, the correct answer is "Option 4".

Q58. Answer: (c) GDV : BHQ

Logic followed here is: The letters in the first part of the pair are shifted by specific values (-5, +4, -5) to obtain the letters in the second part of the pair.

For the pair ANP : VRK →

For the pair QVF : LZA →

Similarly, Option 3) GDV : BHQ:

Therefore, the pair 'GDV : BHQ' follows the same pattern.

Hence, the correct answer is "Option 3".

Q59. Answer: (c) 101

Given Series : 41 51 62 74 87 ?

Logic: The series follows a pattern where each subsequent number is obtained by adding a sequence of increasing consecutive integers to the previous term.

The pattern observed is: (Previous term + Difference), where Difference increases by 1 at each step (10, 11, 12, 13...).

Therefore, the missing number in the series is 101.

Hence, the correct answer is "Option 3".

Q60. Answer: (b) Both conclusions (I) and (II) follow.

Given Statements:

All guns are bullets.

All bullets are pistols.

Checking Conclusions:

(I) All guns are pistols: Follows (because, Guns → Bullets → Pistols.Therefore, all guns are definitely pistols.)

(II) Some pistols are bullets: Follows (because, All bullets are pistols, which means bullets are included inside pistols.Therefore, some pistols are bullets.

Hence, both conclusions (I) and (II) follow.

Therefore, the correct answer is "Option 2".

Q61. Answer: (b) Mother

Given Symbol Meanings:

A ± B → A is the wife of B

A * B → A is the sister of B

A Rs. B → A is the father of B

A # B → A is the brother of B

Given Expression:

D ± R Rs. A # C * O: D is the wife of R. R is the father of A. A is the brother of C. C is the sister of O.

Therefore, D is related to O as Mother.

YourMockTest.com — Free Study Material

Hence, the correct answer is "Option 2".

Q62. Answer: (c) 4

Given Series:

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

Required Pattern:

Odd → Odd → Even

We need to count those odd numbers which are immediately preceded by an odd number and immediately followed by an even number.

Checking the Series:

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

Odd numbers satisfying the condition:

→ 5 in (9 5 8)

→ 7 in (7 7 6)

→ 3 in (5 3 6)

→ 5 in (1 5 8)

Valid odd numbers: 5, 7, 3, 5

Total = 4

Hence, the correct answer is "Option 3".

Q63. Answer: (c) EIA

Logic followed here is:

Each term in the series is determined by shifting the letters of the previous term backward by 10 positions in the English alphabetical order.

For

Therefore, the code for the next term in the series is EIA.

Hence, the correct answer is "Option 3".

Q64. Answer: (a) GIH−FHG

Logic followed here is: Each letter in the second term of the pair is obtained by subtracting 1 from the positional value of the corresponding letter in the first term (Position - 1).

For HJI − GIH →

For EGF − DFE →

Similarly, Option 1) GIH − FHG:

Therefore, the pair 'GIH−FHG' follows the same pattern.

Hence, the correct answer is "Option 1".

Q65. Answer: (d) E

Given Information:

A sits immediately left of B.

C sits third to the left of B.

D is an immediate neighbour of B.

F sits immediately right of C.

D sits immediately left of E.

Conclusion:

The person sitting at the extreme right end is E.

Hence, the correct answer is "Option 4".

Q66. Answer: (d) D

Given Information:

Only four boxes are kept between R and B.

Only Q is kept above R.

Only two boxes are kept between A and P.

D is kept immediately above C.

YourMockTest.com — Free Study Material

P is not kept immediately above D.

Final Arrangement:

Position	Box
1	Q
2	R
3	A
4	D
5	C
6	P
7	B

Find the box fourth from the top

The 4th box from the top is D.

Hence, the correct answer is "Option 4".

Q67. Answer: (a) Only conclusion (I) follows.

Given Statements:

Some Fictions are Nonfictions.

Some Nonfictions are Poetries.

All Poetries are Dramas.

Checking Conclusions:

(I) Some Nonfictions are Dramas: Follows (because,Some Nonfictions are Poetries, and all Poetries are Dramas.So, some Nonfictions are definitely) Dramas.

(II) Some Fictions are Dramas: Does not Follows (because, Some Fictions are Nonfictions.Some Nonfictions are Poetries → Dramas.But it is not definite that the same Nonfictions connected to Fictions are also connected to Dramas.)

Hence, only conclusion (I) follows.

Therefore, the correct answer is "Option 1".

Q68. Answer: (d) bh

Given Codes:

'send this reel' → 'bh ut df'

'send me money' → 'hj mp bh'

Therefore, the code for 'send' is bh.

Hence, the correct answer is "Option 4".

Q69. Answer: (c) N

Given Information:

Only three boxes are kept below L.

Only two boxes are kept between L and M.

Only Q is kept above S.

R is below O and above N.

Final Arrangement :

Position	Box
1	M
2	Q
3	S
4	L
5	O
6	R

YourMockTest.com — Free Study Material

7	N

Find the box second from the bottom

The second position from the bottom is position 6.

The box at position 6 is R.

Hence, the correct answer is "Option 4".

Q70. Answer: (b) ZHIM

Logic followed here is:

The pattern is determined by the differences between the positional values of consecutive letters in the cluster. Three clusters follow a +8, +2, +4 addition pattern, while one does not.

For

1) SACG →

2) ZHIM:

3) TBDH →

4) PXZD →

Therefore, the cluster 'ZHIM' is the odd one out because it follows a +8, +1, +4 pattern instead of +8, +2, +4.

Hence, the correct answer is "Option 2".

Q71. Answer: (d) 8

Given Number:

59643127

Arrange the digits in ascending order:

1 2 3 4 5 6 7 9

Find the required digits:

Second from the left = 2

Third from the right = 6

Sum of the digits: 2 + 6 = 8

Hence, the correct answer is "Option 4".

Q72. Answer: (c) RSW

Logic followed here is: The difference between the positional values of consecutive letters in each cluster is +1 and +5, except for one cluster.

For OPU:

For LMR:

For RSW:

For ABG:

The pattern observed in all other clusters is (+1, +5), but in RSW, the pattern is (+1, +4).

Therefore, the letter-cluster that does not belong to the group is RSW.

Hence, the correct answer is "Option 3".

Q73. Answer: (c) 1 km to the east

Initial Position:

Fawad starts from Point A and moves 13 km North.

Step-by-step movement:

• Calculate final position:

North-South movement:

13 km North + 1 km North = 14 km North

14 km South

So, vertical movement = 0

East-West movement:

11 km East − 12 km West = 1 km West

So, Point P is 1 km west of Point A.

To reach Point A again, he must travel 1 km towards the east.

YourMockTest.com — Free Study Material

Hence, the correct answer is "Option 3".

Q74. Answer: (a) South

Initial Direction:

The man is facing North.

Step 1: Turn 90° clockwise

North → East

Step 2: Turn 45° anticlockwise

East → North-East

Step 3: Turn 135° clockwise

North-East → East → South-East → South

Therefore, the man is now facing South.

Hence, the correct answer is "Option 1".

Q75. Answer: (d) One

Given Numbers:

458, 569, 248, 671, 349

Add 2 to the first digit of each number:

Number	New First Digit	Second Digit	Divisible?
458	4 + 2 = 6	5	6 ÷ 5 = No
569	5 + 2 = 7	6	7 ÷ 6 = No
248	2 + 2 = 4	4	4 ÷ 4 = Yes
671	6 + 2 = 8	7	8 ÷ 7 = No
349	3 + 2 = 5	4	5 ÷ 4 = No

Only one number satisfies the condition.

Hence, the correct answer is "Option 4".

Q76. Answer: (b) 81

Given Series:

6, 19, 33, 48, 64, ?

Find the pattern:

Therefore, the missing number is 81.

Hence, the correct answer is "Option 2".

Q77. Answer: (c) QG – UK – YO

Logic followed here is: In each triad, the first letter of each pair increases by 4 to get the first letter of the next pair, and the second letter of each pair increases by 4 to get the second letter of the next pair.

For ND – RH – VL →

For LB – PF – TJ →

Similarly, Option 3) QG – UK – YO:

Therefore, the triad 'QG – UK – YO' follows the same pattern.

Hence, the correct answer is "Option 3".

Q78. Answer: (b) 10

Logic followed here is:

Each subsequent number in the series is obtained by adding a difference that doubles at each step (2, 4, 8, 16, 32).

Therefore, the number that should come in place of the question mark is 10.

Hence, the correct answer is "Option 2".

Q79. Answer: (c) One

Given Information:

D sits third to the right of F.

YourMockTest.com — Free Study Material

B sits second to the left of D.

E sits second to the right of A.

C sits to the immediate right of E.

All are facing the centre.

Now count from the left of C to D:

From C, move left:

C → B → F → E → A → D

There is only one person between C and D when counted from the left of C.

Hence, the correct answer is "Option 3".

Q80. Answer: (d) 3

Given Series:

8 8 8 3 6 8 4 8 7 9 9 2 7 7 4 6 7 8 5 8 4 2 9 5 4 8 7

Required Pattern:

Odd → Odd → Even

Checking the series:

8 8 8 3 6 8 4 8 7 9 9 2 7 7 4 6 7 8 5 8 4 2 9 5 4 8 7

Odd numbers satisfying the condition:

→ 9 in (9 9 2)

→ 7 in (7 7 4)

→ 5 in (9 5 4)

Therefore, there are 3 such odd numbers.

Hence, the correct answer is "Option 4".

Q81. Answer: (a) 5th

The correct answer is 5th.

Key Points

• According to the International Aviation Data 2024 report released in 2025, India has secured the 5th rank in the global aviation market.

• This ranking is a reflection of the total passenger traffic, which includes both domestic and international travelers handled by Indian airports throughout the calendar year 2024.

• The report highlights that India has shown one of the highest year-on-year growth rates in the aviation sector, significantly outpacing many developed economies in Europe.

• Key factors contributing to this 5th position include the rapid expansion of low-cost carriers (LCCs) and the modernization of major aviation hubs like Delhi and Mumbai. Hence, the correct answer is 5th.

Additional Information

• Domestic Market Standing: While India is ranked 5th in the overall global market, it consistently maintains its position as the 3rd largest domestic aviation market in the world, following the United States and China.

• UDAN Scheme: The Ude Desh Ka Aam Nagrik (UDAN), a Regional Connectivity Scheme (RCS) launched in October 2016, has been instrumental in operationalizing unserved and underserved airports, bringing air travel to Tier-2 and Tier-3 cities.

• Fleet Expansion: Major Indian airlines such as IndiGo and Air India made global headlines by placing record-breaking orders for over 1,100 aircraft in recent years, ensuring a steady supply of capacity for future demand.

• Airport Infrastructure: The number of operational airports in India has grown from 74 in 2014 to over 149 by the end of 2024. The government aims to reach 220 airports by 2025 through the National Infrastructure Pipeline.

• Regulatory Authority: The Directorate General of Civil Aviation (DGCA) is the statutory body of the Government of India that regulates civil aviation, focusing on safety issues and airworthiness standards.

Important Points

• Greenfield Airports: The Government of India has accorded 'in-principle' approval for setting up 21 Greenfield Airports across the country, with major projects like Noida International Airport (Jewar) and Navi Mumbai International Airport expected to boost capacity significantly.

• Air Cargo Growth: Beyond passenger travel, India is striving to become a global cargo hub. The Krishi Udan scheme is a specific initiative designed to assist farmers in transporting perishable agricultural products to both domestic and international markets.

• MRO Hub: India is actively developing as a Maintenance, Repair, and Overhaul (MRO) destination to reduce the dependency on foreign facilities and save foreign exchange.

• Digital Initiatives: The DigiYatra initiative, utilizing Facial Recognition Technology (FRT), has been rolled out across several

YourMockTest.com — Free Study Material

airports to provide a seamless and paperless entry process for passengers.

Q82. Answer: (b) Football

The correct answer is Football.

Key Points

• Lamine Yamal is a world-renowned professional Football player from Spain who plays as a winger.

• In 2025, he was honored with the Laureus World Breakthrough of the Year award, recognizing his extraordinary rise in the sport of football over the preceding year.

• He currently plays for the Spanish giant FC Barcelona and represents the Spain national team at the international level.

• Yamal gained global prominence during the UEFA Euro 2024, where he played a central role in leading Spain to their fourth European Championship title.

• He was awarded the Young Player of the Tournament trophy at Euro 2024, having recorded four assists and one goal during the competition.

• By winning the Laureus Breakthrough award, he joined an elite list of athletes who achieved global stardom at a very young age, often being compared to legends like Lionel Messi.

Additional Information

• Early Career and La Masia: Lamine Yamal was born on July 13, 2007, in Esplugues de Llobregat, Spain. He joined La Masia, the famous youth academy of FC Barcelona, at the age of seven, where he was quickly identified as one of the most promising talents in football.

• FC Barcelona Debut: He made his senior debut for FC Barcelona on April 29, 2023, against Real Betis. At 15 years, 9 months, and 16 days old, he became the youngest player to ever play for the club's first team in La Liga history.

• Kopa Trophy: Prior to his 2025 Laureus success, Yamal won the 2024 Kopa Trophy at the Ballon d'Or ceremony, an award given to the best performing football player in the world under the age of 21.

• International Impact: He chose to represent Spain despite having heritage from Equatorial Guinea and Morocco. He became Spain's youngest ever player and goalscorer during a match against Georgia in September 2023 at the age of 16 years and 57 days.

• Market Value and Influence: By the age of 17, his market valuation exceeded 150 million Euros, making him one of the most valuable football players on the planet. His playing style is characterized by elite dribbling, close control, and a powerful left-footed shot from the right flank.

Important Points

• Youngest Records: Lamine Yamal holds the record for being the youngest player to ever feature in a UEFA European Championship final and the youngest goalscorer in the history of the tournament.

• Laureus World Sports Awards: These awards are held annually to honor the greatest sporting achievements. The Breakthrough of the Year category specifically targets athletes who have made a significant leap in their career rankings or status.

• 2024-2025 Season: During this period, Yamal became a permanent fixture in the Barcelona starting eleven, contributing to numerous victories in La Liga and the UEFA Champions League.

• Youth Recognition: He is the first player in history to be nominated for the Ballon d'Or while still being a minor (under the age of 18).

Q83. Answer: (c) To promote esports as a serious career and sporting option

The correct answer is To promote esports as a serious career and sporting option.

Key Points

• The Esports Conclave 2025 was organized as a landmark event in India to address the rapidly evolving landscape of competitive digital gaming.

• The primary objective of the conclave was to promote esports as a legitimate and serious career path, moving beyond the perception of gaming as a mere hobby. Hence, the correct answer is option 3.

• It aimed to bridge the gap between professional players, investors, and policymakers to establish a robust sporting ecosystem within the country.

• The event focused on the professionalization of the sector, discussing training modules, athlete management, and the creation of dedicated infrastructure for tournaments.

• It emphasized the socio-economic impact of esports, highlighting how it can generate employment opportunities in sectors like broadcasting, event management, and game development.

Additional Information

• Esports vs. Online Gaming:

• Esports refers to skill-based competitive gaming where individuals or teams compete under a regulated set of rules, similar to traditional sports.

• The conclave sought to differentiate this from casual online gaming or gambling, ensuring a clear regulatory framework for competitive integrity.

• Market Growth in India:

• India has become one of the world's largest markets for gaming due to the deep penetration of smartphones and affordable mobile data.

• The number of professional esports players in India has seen an exponential rise, with international tournaments now offering prize pools worth millions of dollars.

• Global Context:

• Esports has gained international recognition, being featured as a medal sport in the Asian Games 2022 (held in 2023) and the upcoming Olympic Esports Games.

• Such global milestones have paved the way for national governments to include esports in their national sports policies.

Important Points

• Government Recognition: In December 2022, the Government of India officially recognized esports as a part of "multi-sports events" under the Ministry of Youth Affairs and Sports.

• Skill-Based Development: The focus of the 2025 Conclave was also on the mental and physical well-being of players, advocating for a holistic approach to athlete training.

• Inclusivity: The conclave discussed gender inclusivity in gaming, encouraging more women participation in the professional esports arena to diversify the talent pool.

• Technological Integration: Discussions included the role of 5G technology, Artificial Intelligence (AI), and Cloud Gaming in enhancing the competitive experience for Indian athletes.

Q84. Answer: (b) Financial Intelligence Unit – India (FIU-IND) and Insurance Regulatory and Development Authority of India (...

The correct answer is Financial Intelligence Unit – India (FIU-IND) and Insurance Regulatory and Development Authority of India (IRDAI).

Key Points

• In January 2025, the Financial Intelligence Unit – India (FIU-IND) and the Insurance Regulatory and Development Authority of India (IRDAI) signed a formal Memorandum of Understanding (MoU).

• The primary objective of this collaboration is the effective implementation of the requirements set forth under the Prevention of Money Laundering Act (PMLA), 2002, and the Prevention of Money Laundering (Maintenance of Records) Rules, 2005.

• This partnership is designed to facilitate the exchange of information between the two regulators to monitor and combat money laundering and terrorist financing within the Indian insurance sector.

• The MoU aims to enhance the quality of Suspicious Transaction Reports (STRs) submitted by insurance companies, ensuring that the financial system remains robust against illicit activities.

• Under this agreement, both FIU-IND and IRDAI will cooperate in capacity building, conducting joint workshops, and providing technical guidance to reporting entities to improve compliance standards.

Additional Information

• Financial Intelligence Unit – India (FIU-IND):

• It was established by the Government of India in November 2004 as the central national agency.

• Its core function is to receive, process, analyze, and disseminate information relating to suspect financial transactions to various enforcement agencies and foreign FIUs.

• The Director of FIU-IND reports directly to the Economic Intelligence Council (EIC), which is chaired by the Union Finance Minister.

• Insurance Regulatory and Development Authority of India (IRDAI):

• It is a statutory body formed under the Insurance Regulatory and Development Authority Act, 1999.

• Headquartered in Hyderabad (moved from Delhi in 2001), its mandate is to protect the interests of policyholders and to regulate, promote, and ensure the orderly growth of the insurance industry.

• It oversees both Life and Non-Life (General) insurance companies, as well as re-insurance companies operating in India.

• Prevention of Money Laundering Act (PMLA), 2002:

• The PMLA was enacted in January 2003 and came into force on July 1, 2005.

• It forms the backbone of India's legal framework for Anti-Money Laundering (AML) and Countering the Financing of Terrorism (CFT).

• The Act mandates that financial institutions and intermediaries must maintain records of transactions and verify the identity of their clients through KYC (Know Your Customer) norms.

Important Points

• Reporting Obligations: Under the PMLA, insurance companies are considered "reporting entities" and are legally obligated to report Cash Transaction Reports (CTRs) exceeding 10 lakh rupees and all Suspicious Transaction Reports (STRs) to FIU-IND.

• Global Standards: The collaboration between FIU-IND and IRDAI helps India align with the recommendations of the Financial Action Task Force (FATF), the global watchdog for money laundering and terrorist financing.

• Digital Integration: The MoU also explores the integration of technology for real-time data sharing and the use of Advanced Analytics to detect complex money laundering patterns in premium payments and policy surrenders.

• Strategic Impact: By strengthening oversight in the insurance sector, which manages trillions of rupees in assets, the government ensures that insurance products are not misused for layering or integrating "dirty money" into the legal economy.

Q85. Answer: (c) Kochi

The correct answer is Kochi.

Key Points

• The Indian Navy officially commissioned its second Survey Vessel (Large), INS Ikshak, on 6 November 2025.

• The commissioning ceremony was held at the Naval Base in Kochi, attended by senior military officials and dignitaries from the Ministry of Defence.

• INS Ikshak is the second of four such vessels being built under the SVL Project by Garden Reach Shipbuilders & Engineers (GRSE), Kolkata, in collaboration with L&T Shipbuilding.

• The vessel's name, 'Ikshak', translates to 'Guide', representing the ship's primary mission of ensuring safe passage for mariners through precise maritime mapping.

• This ship is a testament to India's growing maritime strength and its commitment to the Make in India initiative, boasting over 80% indigenous content by cost.

Additional Information

• Survey Vessel Large (SVL) Project:

• The project was initiated to replace the existing Sandhayak-class survey ships with more advanced platforms.

• The contract for four SVL ships was signed in October 2018 between the Ministry of Defence and GRSE.

• INS Sandhayak, the first ship of this class, was commissioned earlier in February 2024 at Visakhapatnam.

• Technical Capabilities and Features:

• The ship has a length of 110 meters and a displacement of approximately 3,400 tons.

• It is equipped with highly sophisticated hydrographic equipment, including Multi-beam Echo Sounders and Autonomous Underwater Vehicles (AUVs).

• The vessel is powered by two diesel engines and can maintain a cruising speed of 14 knots, with a maximum speed of 18 knots.

• Operational Roles:

• The primary role involves conducting full-scale coastal and deep-water hydrographic surveys of ports, harbors, and Exclusive Economic Zones (EEZ).

• It is designed to collect oceanographic and geophysical data for both military and civilian applications.

• In times of emergency, the ship can be repurposed for Humanitarian Assistance and Disaster Relief (HADR) and can function as a hospital ship.

Important Points

• The induction of INS Ikshak into the Southern Naval Command will significantly enhance the Indian Navy's capability to map the seabed in the strategic Indian Ocean Region (IOR).

• The ship's advanced sensors and Remotely Operated Vehicles (ROVs) allow for high-resolution underwater data collection, which is vital for submarine operations and maritime security.

• The SVL ships carry four Survey Motor Boats, which act as force multipliers during shallow water survey operations.

• The commissioning reinforces India's role as a Net Security Provider and a leader in hydrography in the Indo-Pacific region.

Q86. Answer: (c) Sahkar-se-Samriddhi

The correct answer is Sahkar-se-Samriddhi.

Key Points

• The National Cooperation Policy, 2025, is built upon the vision of Sahkar-se-Samriddhi, which translates to "Prosperity through Cooperation."

• This policy aims to transform the cooperative sector into a pivotal driver of the Indian economy to achieve the goal of Viksit Bharat 2047 (Developed India by 2047).

• The new policy replaces the previous National Policy on Cooperatives, which was formulated in the year 2002, to address the evolving needs of the 21st century.

• A high-level national committee, consisting of 47 members and chaired by former Union Minister Shri Suresh Prabhu, was

constituted to draft this comprehensive document.

• The policy focuses on Ease of Doing Business for cooperatives, ensuring transparency, modernization, and digital transformation of the sector to make it globally competitive.

Additional Information

• Ministry of Cooperation:

• A separate Ministry of Cooperation was created by the Government of India in July 2021 to strengthen the cooperative movement.

• The ministry is currently headed by the Union Home Minister, Shri Amit Shah, who serves as the first Minister of Cooperation.

• Scale of Cooperatives in India:

• India boasts one of the largest cooperative networks in the world, with over 8.5 lakh cooperative societies and a membership base exceeding 29 crore people.

• These cooperatives play a crucial role in sectors like agriculture, dairy, fisheries, banking, and housing.

• PACS Computerization:

• The government has initiated the computerization of 63,000 functional Primary Agricultural Credit Societies (PACS) with a total budget outlay of Rs. 2,516 crore to enhance efficiency and accountability.

• New National Level Societies:

• To promote specific sectors, three new national-level multi-state cooperative societies have been established: National Cooperative Organics Limited (NCOL), Bharatiya Beej Sahkari Samiti Limited (BBSSL) for seeds, and National Cooperative Export Limited (NCEL).

• Legislative Reforms:

• The Multi-State Cooperative Societies (Amendment) Act, 2023, was enacted to bring electoral reforms and improve the governance and financial discipline of multi-state cooperative societies.

Important Points

• Constitution of India: The 97th Constitutional Amendment Act, 2011, gave constitutional status and protection to cooperative societies. It inserted Article 19(1)(c) (Right to form cooperatives), Article 43B (Promotion of cooperatives), and Part IXB into the Constitution.

• Economic Impact: Cooperatives are expected to contribute significantly toward making India a $5 trillion economy by providing credit and market linkages to small and marginal farmers and artisans.

Q87. Answer: (c) Smart City Mission

The correct answer is Smart City Mission.

Key Points

• The Smart Cities Mission (SCM) was launched by Prime Minister Narendra Modi on June 25, 2015. Since it completes a decade of implementation in 2025, the nation celebrates its 10th anniversary. Hence, the correct answer is Smart City Mission.

• The mission was designed to promote 100 cities that provide core infrastructure, a clean and sustainable environment, and a decent quality of life to their citizens through the application of "Smart Solutions".

• It is a centrally sponsored scheme where the Central Government provides financial support to the tune of Rs. 48,000 crore over five years, with a matching contribution from the State Governments and Urban Local Bodies (ULBs).

• The implementation of the mission is done by a Special Purpose Vehicle (SPV) at the city level. Each SPV is headed by a full-time CEO and has nominees from the Central Government, State Government, and the ULB on its Board.

• The strategic components of the Smart Cities Mission include City Improvement (Retrofitting), City Renewal (Redevelopment), and City Extension (Greenfield Development), plus a Pan-city initiative in which Smart Solutions are applied covering larger parts of the city.

Additional Information

• Atal Mission for Rejuvenation and Urban Transformation (AMRUT):

• Launched on June 25, 2015, alongside the Smart City Mission. While it also celebrates its 10th anniversary in 2025, the question specifically focuses on the urban development scheme often highlighted for its "Smart" technological interventions.

• It covers 500 cities and focuses on establishing infrastructure that could ensure adequate robust sewage networks and water supply for urban transformation.

• In October 2021, AMRUT 2.0 was launched to make cities 'water secure' and provide functional tap connections to all households in all statutory towns.

• Pradhan Mantri Awas Yojana - Urban (PMAY-U):

• Launched on June 25, 2015, with the objective of providing "Housing for All" by the year 2022 (later extended).

• It addresses urban housing shortage among the EWS/LIG and MIG categories, including slum dwellers, by ensuring a pucca house to all eligible urban households.

• The mission has four verticals: In-situ Slum Redevelopment (ISSR), Credit Linked Subsidy Scheme (CLSS), Affordable Housing in Partnership (AHP), and Beneficiary-led Individual House Construction (BLC).

• Swachh Bharat Abhiyan (Urban):

• Launched on October 2, 2014, to accelerate the efforts to achieve universal sanitation coverage.

• By 2025, it would be in its 11th year of implementation, having transitioned into SBM-U 2.0 in 2021, focusing on Garbage Free Cities.

• It aims at 100% scientific management of municipal solid waste and making all statutory towns Open Defecation Free (ODF).

Important Points

• Nodal Ministry: All the schemes mentioned above (SCM, AMRUT, PMAY-U, and SBM-U) are governed by the Ministry of Housing and Urban Affairs (MoHUA), Government of India.

• Integrated Command and Control Centers (ICCC): One of the most significant achievements of the Smart City Mission is the operationalization of ICCCs in almost all 100 cities, which acted as war rooms during the COVID-19 pandemic.

• Data and Impact: As of recent reports, over 8,000 projects worth more than Rs. 1.6 lakh crore have been part of the SCM pipeline, significantly impacting urban mobility, public safety, and environmental monitoring.

Q88. Answer: (a) Internet of Things (IoT) and leadership skills

The correct answer is Internet of Things (IoT) and leadership skills.

Key Points

• The Ministry of Minority Affairs initiated the Skilling and Women Entrepreneurship Development project in July 2025. This project serves as a strategic intervention to bridge the digital and skill gap among marginalized sections of society.

• The project is hosted and executed at the Indian Institute of Information Technology (IIIT) Kottayam, an institution of national importance located in Kerala. The collaboration aims to utilize the technical infrastructure and academic excellence of the institute.

• The curriculum specifically focuses on Internet of Things (IoT) training, enabling participants to understand and build connected systems, which is a critical component of Industry 4.0.

• A unique feature of this project is the integration of leadership skills alongside technical modules. This dual approach ensures that minority youth and women are not just prepared for jobs but are also equipped to start their own ventures as entrepreneurs.

• The project targets the socio-economic empowerment of the minority communities, focusing on increasing their participation in the high-tech workforce and the startup ecosystem.

Additional Information

• Ministry of Minority Affairs:

• Established in January 2006, this ministry focuses on the development and empowerment of notified minority communities, including Muslims, Christians, Sikhs, Buddhists, Parsis, and Jains.

• It implements various schemes such as Naya Savera, Nai Roshni, and Seekho aur Kamao to enhance educational and professional opportunities.

• Internet of Things (IoT):

• IoT refers to a network of physical objects embedded with sensors, software, and other technologies to connect and exchange data with other devices over the internet.

• Applications of IoT span across smart homes, healthcare, agriculture, and industrial automation, making it a high-demand skill in the 2025 global economy.

• IIIT Kottayam:

• Located at Valavoor in Kottayam, Kerala, it is one of the IIITs established by the Government of India under the Public-Private Partnership (PPP) mode.

• The institute offers specialized courses in Computer Science, Cyber Security, and Data Science, providing an ideal environment for advanced technical skilling projects.

• Entrepreneurship and Leadership:

• The inclusion of leadership skills is aligned with the National Education Policy (NEP) 2020, which emphasizes holistic development and vocational training.

• Developing leadership skills helps in decision-making, team management, and strategic planning, which are essential for the success of women-led startups.

• Skill India Mission:

• This project contributes to the broader Skill India Mission launched in 2015, aiming to create a workforce that can meet the challenges of the global market through continuous upskilling and reskilling.

Important Points

• Gender Inclusivity: The project prioritizes women to improve the Female Labour Force Participation Rate (LFPR) in the technology sector.

• Geographic Impact: While located in Kottayam, the model is designed to be scalable, potentially serving as a blueprint for other IIITs across India.

• Technological Advancement: By focusing on IoT, the government ensures that minority youth are trained in future-ready technologies rather than traditional, low-value skills.

Q89. Answer: (d) I4C

The correct answer is I4C.

Key Points

• In January 2025, the IndiaAI mission, which is an initiative under the Ministry of Electronics and Information Technology (MeitY), launched the IndiaAI CyberGuard AI Hackathon.

• The hackathon was conducted in strategic collaboration with the Indian Cyber Crime Coordination Centre (I4C), an agency under the Ministry of Home Affairs (MHA).

• The primary goal of this event is to harness the potential of Artificial Intelligence (AI) to develop innovative solutions for cybersecurity and to strengthen the digital infrastructure of the country.

• It aims to provide a platform for students, researchers, startups, and innovators to address real-world cybercrime challenges faced by law enforcement agencies.

• The initiative is part of the IndiaAI Mission, which focuses on building a self-reliant AI ecosystem through innovation, collaboration, and capacity building.

Additional Information

• Indian Cyber Crime Coordination Centre (I4C):

• Established by the Ministry of Home Affairs, I4C serves as a nodal point in the fight against cybercrime in India.

• Its functions include identifying cyber threats, providing training to police officers, and managing the National Cyber Crime Reporting Portal (www.cybercrime.gov.in).

• It facilitates coordination between different State and Union Territory Law Enforcement Agencies (LEAs).

• IndiaAI Mission:

• This mission was approved by the Union Cabinet with a financial outlay of over Rs. 10,000 crore to drive AI innovation in India.

• It includes various components such as IndiaAI Compute Capacity, IndiaAI Datasets Provider, and IndiaAI FutureSkills.

• The IndiaAI portal acts as a central knowledge hub for AI-related developments, startups, and research papers in the country.

• Ministry of Electronics and Information Technology (MeitY):

• MeitY is responsible for IT policy, electronics manufacturing, and the Digital India initiative.

• It works toward making India a global leader in the digital economy and emerging technologies like AI and Blockchain.

Important Points

• CyberGuard AI Hackathon Themes: The event focuses on several critical applications of AI, including Deepfake detection, automated fraud monitoring, malware analysis, and AI-driven threat intelligence.

• Participant Eligibility: The hackathon is open to Indian citizens, including academic institutions and registered startups, promoting the Atmanirbhar Bharat vision in technology.

• Strategic Impact: By involving I4C, the government ensures that AI tools developed by participants can be directly integrated into the National Security framework to protect citizens from online financial fraud and digital impersonation.

• Date and Location: Launched in January 2025, the hackathon includes multiple stages such as idea submission, prototyping, and a final grand finale where winners receive cash prizes and incubation support.

Q90. Answer: (c) Dinesh Khara

The correct answer is Dinesh Khara.

Key Points

• In February 2025, the Insurance Regulatory and Development Authority of India (IRDAI) constituted a high-level 7-member committee to review and suggest comprehensive amendments to the Insurance Act, 1938.

• The committee is chaired by Dinesh Khara, who is the former Chairman of the State Bank of India (SBI). Hence, the correct answer is Dinesh Khara.

• The primary objective of this panel is to modernize the legal framework governing the insurance sector to align with the government's vision of "Insurance for All by 2047".

• The committee's mandate includes examining provisions related to capital requirements, solvency margins, and the potential introduction of composite insurance licenses, which would allow a single company to offer both life and general insurance products.

• This move is expected to enhance the ease of doing business, attract more investment, and increase insurance penetration across the country by removing outdated regulatory hurdles.

Additional Information

• Insurance Regulatory and Development Authority of India (IRDAI):

• It is the statutory body responsible for regulating and promoting the insurance and re-insurance industries in India.

• It was established in 1999 following the recommendations of the Malhotra Committee report.

• The headquarters of IRDAI is located in Hyderabad, Telangana, and its current Chairman is Debasish Panda.

• The Insurance Act, 1938:

• This is the fundamental law that provides the framework for the regulation of the insurance business in India.

• Major amendments were made in 2015 and 2021; the latter notably increased the Foreign Direct Investment (FDI) limit in the insurance sector from 49% to 74%.

• Dinesh Khara:

• He served as the Chairman of the State Bank of India from October 2020 until August 2024.

• Under his leadership, SBI achieved significant milestones in digital banking and profitability, making his expertise vital for the structural reform of the insurance sector.

Important Points

• Other Options Analysis:

• Swaminathan Janakiraman: He is currently a Deputy Governor of the Reserve Bank of India (RBI) and previously served as a Managing Director at SBI.

• Ajay Tyagi: He is a former Chairman of the Securities and Exchange Board of India (SEBI), having served from 2017 to 2022.

• TS Vijayan: He is a former Chairman of both the Life Insurance Corporation of India (LIC) and the IRDAI.

• Composite Licensing: This is a major reform being discussed by the Dinesh Khara committee. Currently, Indian law requires separate entities for life, general, and health insurance. A composite license would allow insurers to offer multiple types of insurance under one roof, improving operational efficiency.

• Insurance Penetration in India: As of 2024, India's insurance penetration remains around 4% of its GDP, which is lower than the global average. The 2025 committee aims to address this gap by making insurance more accessible and affordable.

Q91. Answer: (c) Pan Zhanle

The correct answer is Pan Zhanle.

Key Points

• Pan Zhanle, representing China, set a sensational new world record in the Men’s 100 m freestyle swimming event at the Olympic Games Paris 2024.

• The record-breaking performance took place on July 31, 2024, at the Paris La Defense Arena.

• He clocked an extraordinary time of 46.40 seconds, shattering his own previous world record of 46.80 seconds, which he had set in February 2024 during the World Aquatics Championships in Doha. Hence, the statement regarding Pan Zhanle is correct.

• This feat was particularly significant as it marked the first swimming world record to be broken during the Paris 2024 games.

• By winning this event, Pan Zhanle became the first Chinese swimmer in history to win the Olympic gold medal in the prestigious 100 m freestyle category.

Additional Information

• Kyle Chalmers:

• Representing Australia, he finished the race in 47.48 seconds to claim the Silver Medal at the Paris 2024 Olympics.

• He was the gold medalist in the same event at the 2016 Rio Olympics and a silver medalist at the 2020 Tokyo Olympics.

• David Popovici:

• The Romanian swimmer secured the Bronze Medal in the 100 m freestyle at Paris 2024 with a time of 47.49 seconds.

• Earlier in the same Olympic Games, he won the Gold Medal in the Men's 200 m freestyle event.

• He is a former world record holder in the 100 m freestyle, having set a time of 46.86 seconds in 2022.

• Tom Dean:

• A prominent swimmer from Great Britain, known for winning two gold medals at the Tokyo 2020 Olympics in the 200 m freestyle and the 4x200 m freestyle relay.

• He participated in the Paris 2024 games as part of the British relay teams but was not the record setter in the individual 100 m freestyle.

Important Points

• The margin of victory for Pan Zhanle was 1.08 seconds, which is the largest winning margin in the Olympic 100 m freestyle since the 1928 Amsterdam Olympics.

• The 100 m freestyle is often referred to as the "blue riband" event of the swimming pool, representing the ultimate test of raw speed over two lengths of a 50-meter pool.

• The Olympic Games Paris 2024 swimming competitions were conducted from July 27 to August 4, 2024, featuring various

disciplines including freestyle, butterfly, backstroke, and breaststroke.

• Pan Zhanle's performance is regarded as one of the most dominant displays in modern swimming history, given he improved the world record by a massive 0.40 seconds in a single race.

Q92. Answer: (b) Insurance Regulatory and Development Authority of India

The correct answer is Insurance Regulatory and Development Authority of India.

Key Points

• The Insurance Regulatory and Development Authority of India (IRDAI) is the apex statutory body responsible for regulating and promoting the insurance and re-insurance industries in India.

• In June 2024/2025, IRDAI introduced a landmark Master Circular on General Insurance aimed at reshaping the landscape of motor insurance to make it more customer-centric and flexible.

• One of the primary changes includes the promotion of usage-based insurance models, such as "Pay as You Drive" and "Pay How You Drive," allowing policyholders to pay premiums based on their vehicle usage and driving habits.

• The authority mandated that insurers must provide a Customer Information Sheet (CIS) in simple language, ensuring transparency regarding policy coverage, exclusions, and claim procedures.

• The reforms also emphasize digital empowerment, encouraging the use of e-insurance accounts to eliminate the need for physical policy documents during verification or claims.

Additional Information

• Structure of IRDAI: It was established following the Insurance Regulatory and Development Authority Act, 1999, based on the recommendations of the Malhotra Committee report (1994). It consists of a Chairman and other whole-time and part-time members appointed by the Government of India.

• Headquarters: While it was initially based in New Delhi, the IRDAI headquarters was shifted to Hyderabad, Telangana, in 2001 to decentralize financial regulatory bodies.

• Motor Vehicles Act, 1988: This Act makes it mandatory for every vehicle owner to have at least a Third-Party Insurance cover. IRDAI works in tandem with these legal frameworks to ensure compliance across the automobile sector.

• Bima Sugam: This is an ambitious digital platform initiated by IRDAI designed to be a one-stop solution for all insurance needs, including buying policies, portability, and settling claims efficiently.

• No Claim Bonus (NCB): This is a discount on the premium awarded to the policyholder for every claim-free year. IRDAI reforms have aimed to make NCB more transparent and easily transferable between insurance providers.

Important Points

• Insured Declared Value (IDV): This is the maximum sum assured fixed by the insurer which is provided at the time of total loss or theft of the vehicle. It represents the current market value of the vehicle.

• Add-on Covers: IRDAI has allowed general insurers to offer various add-ons like Zero Depreciation, Engine Protection, and Return to Invoice to provide customized protection beyond the standard Own Damage (OD) policy.

• Cashless Claims: Under IRDAI guidelines, insurers maintain a network of garages where policyholders can get their vehicles repaired without paying the repair bill upfront, as the insurer settles it directly with the garage.

• Electronic Insurance Account (eIA): As part of the Digital India initiative, IRDAI promotes eIA, which allows policyholders to manage all their life, health, and motor insurance policies in a single digital folder.

Q93. Answer: (b) Sonali Mishra

The correct answer is Sonali Mishra.

Key Points

• Sonali Mishra, an officer of the 1993 batch of the Indian Police Service (IPS) from the Madhya Pradesh cadre, took charge as the Director General (DG) of the Railway Protection Force (RPF) in August 2025.

• She created history by becoming the first woman to head the Railway Protection Force, a security wing that has been in existence for 143 years.

• Her appointment was formalized following the approval of the Appointments Committee of the Cabinet (ACC), succeeding Manoj Yadava, who retired from the post on July 31, 2025.

• Before her elevation to this top designation, she served as the Additional Director General (ADG) of the Border Security Force (BSF), where she commanded the Eastern Command headquartered in Kolkata.

• As the Director General, she is responsible for the overall administration of the force, ensuring the security of railway property and the safety of millions of passengers across the Indian Railways network.

Additional Information

• Railway Protection Force (RPF):

• The RPF is a security force under the ownership of the Ministry of Railways, Government of India.

• It was originally established in 1872 by various railway companies and was given statutory status under the RPF Act, 1957.

• In 1985, it was declared an Armed Force of the Union through an amendment to the RPF Act.

• The force is unique as it has the legal power to search, arrest, and prosecute offenses under the Railway Property (Unlawful Possession) Act, 1966.

• Nina Singh:

• A 1989-batch IPS officer of the Rajasthan cadre, she became the first woman to be appointed as the Director General of the Central Industrial Security Force (CISF) in December 2023.

• Archana Ramasundram:

• She is a 1980-batch IPS officer who became the first woman to head a Central Armed Police Force (CAPF) when she was appointed as the Director General of the Sashastra Seema Bal (SSB) in 2016.

• Rashmi Shukla:

• A 1988-batch IPS officer, she served as the Director General of the Sashastra Seema Bal (SSB) and later became the first woman Director General of Police (DGP) of Maharashtra in January 2024.

Important Points

• Women Empowerment in Security Forces: The appointment of Sonali Mishra reflects the increasing representation of women in leadership roles within India's paramilitary and central security forces.

• Force Mandate: The RPF currently consists of over 70,000 personnel. They are primarily tasked with the protection and security of Railway Property, passenger areas, and the well-being of passengers.

• Historical Context: The transition of the RPF from a "Watch and Ward" staff in 1872 to a federal armed force marks its significant evolution in the Indian administrative system.

• Administrative Control: Unlike other Central Armed Police Forces (CAPFs) which fall under the Ministry of Home Affairs, the RPF functions directly under the Ministry of Railways.

Q94. Answer: (d) Switzerland, Singapore, Hong Kong

The correct answer is Switzerland, Singapore, and Hong Kong.

Key Points

• The IMD World Competitiveness Ranking, released in June 2025, identifies the most competitive economies globally based on their ability to create and maintain an environment that sustains the competitiveness of enterprises.

• Singapore returned to a leading position in the 2025 rankings, showcasing exceptional strength in Business Efficiency and Economic Performance. Its robust digital infrastructure and openness to International Trade were pivotal factors.

• Switzerland maintained its elite status in the top three, primarily due to its world-class Infrastructure, high-quality Education system, and stable Government Efficiency. It continues to lead in categories related to Scientific Infrastructure and Institutional Framework.

• Hong Kong secured a spot in the top three economies, reflecting its resurgence as a global financial hub. The region demonstrated significant improvements in International Investment and Tax Policy, which bolstered its overall Government Efficiency score.

• The 2025 edition of the ranking evaluated a total of 67 global economies, providing a comprehensive benchmark for policymakers and business leaders to assess national performance.

Additional Information

• The IMD World Competitiveness Center:

• It is a research group at the International Institute for Management Development (IMD) located in Lausanne, Switzerland. It has been publishing these rankings annually since 1989.

• The ranking is widely regarded as one of the most authoritative reports on the competitiveness of nations, focusing on how nations manage their resources and competencies to increase prosperity.

• The Four Pillars of Competitiveness:

• Economic Performance: Evaluates the domestic economy, International Trade, International Investment, Employment, and Prices.

• Government Efficiency: Measures Public Finance, Tax Policy, Institutional Framework, Business Legislation, and Societal Framework.

• Business Efficiency: Assesses Productivity and Efficiency, Labor Market, Finance, Management Practices, and Attitudes and Values.

• Infrastructure: Looks at Basic Infrastructure, Technological Infrastructure, Scientific Infrastructure, Health and Environment, and Education.

• Methodology and Data:

• The ranking utilizes a combination of Hard Data (representing about two-thirds of the weight), which includes statistical indicators from international and national sources, and Soft Data (representing one-third of the weight) from an Executive Opinion Survey.

• In 2025, the criteria were updated to reflect emerging global trends such as Artificial Intelligence (AI) adoption, Energy Security,

and Geopolitical Stability.

• Significance for Global Markets:

• Economies like Denmark, Ireland, and Sweden often fluctuate within the top ten, highlighting the competitive nature of European markets compared to Asian powerhouses.

• The 2025 rankings specifically highlighted how "small" economies often outperform larger ones like the USA or China due to their Agility and specialized Economic Policies.

Q95. Answer: (b) Uttar Pradesh

The correct answer is Uttar Pradesh.

Key Points

• The state of Uttar Pradesh pledged to plant 15 lakh saplings during the nationwide “Seva Parv” (also known as Seva Pakhwada) campaign held in 2025.

• The Seva Parv campaign is an annual event observed from September 17, which marks the birthday of Prime Minister Narendra Modi, to October 2, the birth anniversary of Mahatma Gandhi.

• The initiative in Uttar Pradesh was designed to promote environmental sustainability and align with the national goals of increasing green cover across the Indian landscape.

• The drive emphasized the participation of various departments, including the Environment, Forest and Climate Change Department of the state, ensuring that the 15 lakh saplings were planted in strategic locations such as riverbanks, highway sides, and urban forests.

• This massive plantation effort is part of a larger strategy by the Chief Minister Yogi Adityanath-led government to address climate change and improve biodiversity within the state.

Additional Information

• Seva Pakhwada (Service Fortnight):

• It is a 15-day period dedicated to various social service activities, including blood donation camps, cleanliness drives (Swachhata Abhiyan), and health melas.

• In 2025, a significant focus was placed on “Ek Ped Maa Ke Naam” (A Tree in the Name of Mother), a global plantation campaign launched by the Prime Minister to encourage citizens to plant trees.

• Uttar Pradesh’s Environmental Targets:

• The state has set an ambitious goal to increase its forest and tree cover from the current 9.23% to 15% of its total geographical area by 2026-27.

• In previous years, Uttar Pradesh has created Limca Book of Records by planting over 25 crore to 35 crore saplings in a single day during various Vriksharopan Jan Abhiyan drives.

• Significance of the Dates:

• September 17: Celebrated as Seva Diwas (Service Day) across India.

• October 2: Marks Gandhi Jayanti and the conclusion of the fortnight-long service campaign, symbolizing the transition from individual service to national sustainability.

Important Points

• The 15 lakh saplings target for the specific Seva Parv window serves as a micro-goal within the state’s annual target of planting over 35 crore trees annually.

• Geographical Focus: The plantation drives often focus on the Indo-Gangetic plains to combat soil erosion and replenish groundwater levels.

• Public Participation: The Uttar Pradesh government utilizes Panchayati Raj Institutions and Urban Local Bodies to ensure that the environmental sustainability message reaches the grassroots level.

• Monitoring: The survival rate of these saplings is monitored through geo-tagging and remote sensing technology to ensure the long-term success of the Seva Parv initiative.

Q96. Answer: (d) India’s first reusable hybrid rocket

The correct answer is India’s first reusable hybrid rocket.

Key Points

• RHUMI-1 is India’s first reusable hybrid rocket, which represents a major advancement in the nation's private space exploration capabilities.

• It was successfully launched on August 24, 2024, using a mobile launcher positioned at Thiruvidanthai, located on the East Coast Road in Chennai.

• The rocket was developed by Space Zone India, a Chennai-based space technology startup, in collaboration with the Martin Group.

• The mission, designated as Mission RHUMI 2024, reached a suborbital altitude to deploy its payloads and then successfully

YourMockTest.com — Free Study Material

initiated its recovery sequence.

• It carried a diverse payload consisting of 3 CubeSats and 50 PICO satellites, which were designed to study atmospheric conditions and cosmic radiation.

Additional Information

• Hybrid Propulsion System: RHUMI-1 utilizes a hybrid motor that combines solid fuel with a liquid oxidizer. This technology is preferred for its safety and cost-effectiveness, as it is less prone to explosions compared to traditional solid or liquid-only engines and allows for thrust throttling.

• Sustainability and Reusability: The rocket features a reusable airframe and an electrically triggered parachute system for recovery. This minimizes space debris and significantly reduces the operational costs of deploying small satellites into orbit.

• Educational Initiative: The launch was a centerpiece of the Dr. APJ Abdul Kalam Students Space Launch-2024. This program involved thousands of students from across India, providing them with hands-on experience in satellite fabrication and rocket science.

• Mobile Launch Capability: Unlike traditional rockets that require fixed launch pads like those at Sriharikota, RHUMI-1 was launched from a mobile platform. This demonstrates flexibility and the ability to conduct launches from diverse geographical locations with minimal infrastructure.

• NewSpace India: The success of RHUMI-1 underscores the growing role of the private sector in India's space ecosystem, following the government's 2020 space sector reforms that opened up the industry to non-government entities.

Important Points

• Payload Specifications: The 50 PICO satellites deployed are ultra-small satellites, often weighing between 0.1 kg and 1 kg. These were programmed to monitor environmental factors like accelerometer data, altitude, and UV radiation.

• Leadership: The development was led by Anand Megalingam, the founder of Space Zone India, who aimed to make space technology more accessible and affordable for research and academic purposes.

• Environmental Impact: Because the hybrid motor uses non-toxic components and is reusable, it is considered much more eco-friendly than conventional expendable rockets that leave debris and chemical residues.

Q97. Answer: (a) Yuzvendra Chahal

The correct answer is Yuzvendra Chahal.

Key Points

• Yuzvendra Chahal holds the record for the highest number of wickets in the history of the Indian Premier League (IPL), standing at 205 wickets before the commencement of the IPL 2025 season.

• He reached the monumental milestone of 200 wickets during the 2024 season while playing for the Rajasthan Royals in a match against the Mumbai Indians.

• By the end of the IPL 2024 edition, he had played 160 matches, maintaining an impressive bowling average and becoming the first-ever player to cross the double-century mark in terms of wickets in this tournament.

• He surpassed the previous long-standing record held by the West Indian all-rounder Dwayne Bravo, who retired with 183 wickets in the league.

• His performance in the 2024 season included taking 18 wickets in 15 matches, which cemented his position at the top of the all-time leaderboard.

Additional Information

• Career Trajectory:

• Yuzvendra Chahal started his IPL career with the Mumbai Indians in 2011, but he became a household name during his tenure with Royal Challengers Bangalore (RCB) from 2014 to 2021.

• In the 2022 Mega Auction, he was signed by the Rajasthan Royals for Rs. 6.5 crore, where he immediately made an impact by winning the Purple Cap in 2022 with 27 wickets.

• Top Wicket-Takers Leaderboard:

• As of the end of the 2024 season, the top wicket-takers following Chahal (205) are Piyush Chawla (192 wickets), Dwayne Bravo (183 wickets), Bhuvneshwar Kumar (181 wickets), and Sunil Narine (180 wickets).

• This highlights the dominance of spin bowlers in the historical rankings of the tournament.

• International Standing:

• Besides his IPL success, Chahal is also the leading wicket-taker for India in T20 Internationals (T20Is), proving his consistency across the shortest format of the game at both domestic and international levels.

Important Points

• Other Options Analysis:

• Jasprit Bumrah: A premier fast bowler for Mumbai Indians, he has taken 165 wickets in 133 matches as of 2024. Although he is one of the most successful pacers, his tally is currently lower than Chahal's.

• Arshdeep Singh: He is a young left-arm pacer playing for Punjab Kings. By the end of 2024, he has 76 wickets in 65 matches,

making him a rising star but far from the all-time record.

• Prasidh Krishna: He has represented Kolkata Knight Riders and Rajasthan Royals. With 49 wickets in 51 matches, he has significantly fewer wickets compared to the veterans of the league.

• Significance of the 205 mark:

• The 205 wickets milestone reached by Chahal represents over a decade of high-level performance, during which he has played for three different franchises: Mumbai Indians, RCB, and Rajasthan Royals.

Q98. Answer: (d) 67

The correct answer is 67.

Key Points

• The 10th Sustainable Development Report (SDR), released in 2025, provides an updated assessment of the progress made by all United Nations member states toward the Sustainable Development Goals (SDGs).

• According to the report, India achieved an overall score of 67 out of 100. This score indicates India's percentage of total progress toward achieving the 17 SDGs.

• The report is published annually by the Sustainable Development Solutions Network (SDSN). The 2025 edition marks a decade since the world adopted the 2030 Agenda for Sustainable Development in September 2015.

• India’s score of 67 reflects steady progress in certain areas, such as Goal 12 (Responsible Consumption and Production) and Goal 13 (Climate Action), although it also highlights sectors that require urgent attention to meet the 2030 deadline.

• The SDG Index score is a composite measure that aggregates data across all 17 goals, providing a clear picture of where a country stands in its development journey compared to the ideal target of 100.

Additional Information

• Sustainable Development Goals (SDGs):

• The SDGs, also known as the Global Goals, were adopted by all 193 UN Member States in 2015 as a universal call to action to end poverty, protect the planet, and ensure that all people enjoy peace and prosperity by 2030.

• There are 17 Goals and 169 Targets that are integrated and indivisible, balancing the three dimensions of sustainable development: the economic, social, and environmental.

• SDSN and the Report:

• The Sustainable Development Solutions Network (SDSN) has been operating under the auspices of the UN Secretary-General since 2012.

• The report is led by Professor Jeffrey Sachs and uses a rigorous methodology to rank countries based on their distance from the SDG targets.

• India's Internal Monitoring:

• In India, the NITI Aayog is the nodal agency responsible for monitoring the SDGs. It released the first SDG India Index in 2018 to foster competition among states.

• States like Kerala, Tamil Nadu, and Himachal Pradesh have consistently emerged as top performers in the domestic SDG rankings.

• Global Trends in 2025:

• The 2025 report emphasizes that the "SDG stimulus" is crucial, as many developing nations face a massive financing gap. High-income countries like Finland, Sweden, and Denmark usually top the global index with scores exceeding 80.

Important Points

• Challenges for India: While India has made strides in Goal 1 (No Poverty) and Goal 7 (Affordable and Clean Energy), the 2025 data suggests significant challenges remain in Goal 2 (Zero Hunger), Goal 5 (Gender Equality), and Goal 6 (Clean Water and Sanitation).

• The 5 Ps: The 2030 Agenda is structured around five critical dimensions: People, Planet, Prosperity, Peace, and Partnership.

• Data Fact: India's score of 67 is an improvement from previous years, showing a positive trajectory despite global shocks like the COVID-19 pandemic and climate-related disasters that affected the South Asian region.

Q99. Answer: (c) 13.7%

The correct answer is 13.7%.

Key Points

• The Periodic Labour Force Survey (PLFS) is a critical survey conducted by the National Sample Survey Office (NSSO) to estimate key employment and unemployment indicators.

• As per the data released for May 2025, the unemployment rate for the youth population, specifically those in the age group of 15-29 years, was a focal point of the report.

• In rural areas, the unemployment rate for this specific youth demographic was recorded at 13.7%. Hence, the correct answer is 13.7%.

YourMockTest.com - Free Study Material

• The Unemployment Rate (UR) is defined as the percentage of persons unemployed among the persons in the labour force (which includes both employed persons and those seeking work).

• The PLFS serves as a primary source of data for the Ministry of Statistics and Programme Implementation (MoSPI) to monitor the health of the Indian economy and the effectiveness of employment schemes.

Additional Information

• Periodic Labour Force Survey (PLFS):

• Launched in April 2017, the PLFS was established to provide more frequent and reliable labour force data.

• It has two main objectives: to estimate employment indicators in Current Weekly Status (CWS) every three months for urban areas and to estimate indicators in both Usual Status and CWS annually for both rural and urban areas.

• Key Definitions:

• Labour Force Participation Rate (LFPR): The percentage of the population that is either working or seeking work.

• Worker Population Ratio (WPR): The percentage of employed persons in the total population.

• Unemployment Rate (UR): The percentage of those in the labour force who are currently without work but available for and seeking it.

• Youth Demographics:

• In the context of Indian government surveys and the National Youth Policy, youth is generally defined as persons in the age group of 15-29 years.

• Monitoring this specific group is essential for addressing skill development needs and reducing demographic pressures on the job market.

Important Points

• Measurement Status:

• Usual Status (ps+ss): This determines the employment status of a person based on a reference period of 365 days preceding the date of the survey.

• Current Weekly Status (CWS): This determines the status based on a reference period of 7 days preceding the survey date. A person is considered employed if they worked for at least one hour on any day during the reference week.

• Organizational Framework:

• The National Sample Survey Office (NSSO) operates under the Ministry of Statistics and Programme Implementation (MoSPI) of the Government of India.

• Data collected through these surveys influences major policy decisions related to MGNREGA, Skill India, and other social security initiatives.

Q100. Answer: (d) Karimpuzha Wildlife Sanctuary

The correct answer is Karimpuzha Wildlife Sanctuary.

Key Points

• The Karimpuzha Wildlife Sanctuary, located in the Malappuram district of Kerala, recently reported the addition of 63 new species following a comprehensive faunal survey.

• As reported on 31 March 2025, the survey was conducted by the Kerala Forest Department to document the rich biodiversity of the New Amarambalam landscape and the surrounding reserve forests.

• The new species added to the sanctuary's checklist include a significant variety of butterflies, birds, ants, and odonates (dragonflies and damselflies).

• This faunal survey is part of periodic biodiversity monitoring aimed at assessing the health of the ecosystem and the effectiveness of habitat protection measures in the Western Ghats.

• The discovery of 63 new species highlights the sanctuary's role as a vital biodiversity hotspot and its importance in the Nilgiri Biosphere Reserve network.

Additional Information

• Karimpuzha Wildlife Sanctuary:

• It was officially notified by the Government of Kerala in July 2020, making it the 18th wildlife sanctuary in the state.

• The sanctuary covers an area of approximately 227.97 square kilometers and serves as a crucial link between the Silent Valley National Park and the Mukurthi National Park in Tamil Nadu.

• It is home to the Chola Nayakar tribe, which is one of the most primitive Particularly Vulnerable Tribal Groups (PVTGs) in India.

• Amchang Wildlife Sanctuary:

• Located in the state of Assam, specifically near Guwahati, it was declared a sanctuary in 2004.

• It is well-known for its population of Asiatic elephants, Chinese pangolins, and various species of primates.

• Kheoni Wildlife Sanctuary:

• Situated in the Dewas and Sehore districts of Madhya Pradesh, this sanctuary is characterized by dry deciduous forests.

• It acts as a habitat for leopards, chinkaras, and a diverse range of migratory birds.

• Chinnar Wildlife Sanctuary:

• Located in the Idukki district of Kerala, it is famous for being the only home in the state for the endangered Grizzled Giant Squirrel.

• It falls under the rain shadow region of the Western Ghats and is known for its unique thorny scrub forest ecosystem.

Important Points

• Biodiversity Significance: The Western Ghats is a UNESCO World Heritage Site, and the addition of species in sanctuaries like Karimpuzha reinforces the global importance of this region.

• Survey Methodology: Faunal surveys typically involve direct sightings, camera trapping, and the study of pugmarks or scat to identify the presence of various mammals, reptiles, and insects.

• Conservation Goals: The 63 new species recorded on 31 March 2025 will help the Forest Department refine its Management Plan for the sanctuary, focusing on species-specific conservation.

• Geographic Location: Karimpuzha is part of the Nilambur region, which is famous for its teak plantations and lush evergreen forests.

More previous year papers and mock tests: **www.yourmocktest.com/pyq**

YourMockTest.com — Free Study Material