RRB Group D Official Paper (Held On: 04 Dec, 2025 Shift 3) (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-04-dec-2025-shift-3-previ…

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

YourMockTest.com — Free Study Material

GENERAL SCIENCE

Q1. Which of the following functions is NOT performed by the placenta?

(a) Secretes oxytocin to start childbirth
(b) Removes carbon dioxide and waste from fetal blood
(c) Produces hormones to support pregnancy
(d) Allows oxygen and nutrients to pass from mother to fetus

Q2. Which of the following is a primary advantage of constructing a big dam?

(a) Generation of hydroelectric power
(b) Prevention of all downstream flooding
(c) Immediate increase in local biodiversity
(d) Decentralised energy production

Q3. Which of the following is NOT a method of reproduction by a solitary individual organism?

(a) Regeneration
(b) Fragmentation
(c) Sexual reproduction
(d) Fission

Q4. 200 J of heat is produced per second in an 8 Ω resistance. What is the potential difference across the resistor?

(a) 30 V
(b) 20 V
(c) 50 V
(d) 40 V

Q5. A coin is placed on a card covering a glass. When the card is flicked quickly with a finger, the coin falls straight into the glass. What does this situation show?

(a) The coin moves because the card pushes it
(b) The flick applies a force directly to the coin
(c) The coin remains at rest due to inertia when the card moves away
(d) The coin and card both move away due to inertia

Q6. Which of the following phenomena is NOT a physical change?

(a) Boiling of water
(b) Melting of ice
(c) Burning of candle
(d) Freezing of water

Q7. A person wearing shoes with total area 0.02 m² stands on the ground. If the person's weight is 600 N, the pressure on the ground is _____.

(a) 600 N/m²
(b) 12,000 N/m²
(c) 1200 N/m²
(d) 30,000 N/m²

Q8. According to the sign convention, the height of an erect image formed by a mirror is taken as:

(a) Zero
(b) Imaginary
(c) Positive
(d) Negative

Q9. Which of the following statement(s) is true when a straw appears bent when placed in a glass of water?

Statement 1: The incident ray, refracted ray, and normal lie in the same plane.

Statement 2: The ratio of sine of angle of incidence to sine of angle of refraction is constant.

(a) Both statement 1 and 2
(b) Neither statement 1 nor 2
(c) Only statement 1
(d) Only statement 2

Q10. Which of the following statements is true for a velocity-time graph of uniform velocity?

(a) Slope = Acceleration ≠ 0
(b) Slope = Acceleration = 0
(c) Area under curve = speed, not displacement
(d) The graph is a curve

Q11. Which of the following salts will form a solution with pH greater than 7 when dissolved in water?

(a) Sodium acetate
(b) Copper sulphate
(c) Sodium chloride
(d) Ammonium chloride

Q12. Butane (C4H10) exists in two different forms: one with a straight chain and one with a branched chain. What is this phenomenon called?

(a) Catenation
(b) Isomerism
(c) Sublimation
(d) Polymerisation

Q13. Which of the following statements is correct for life processes in plants?

(a) Environment is under the control of most plants.
(b) Environment is under the control of very few plants.
(c) The environmental sources of energy are uniform.
(d) Environment is not under the control of plants.

Q14. If a person does an amount of work W in time t, how is power calculated?

(a) Power = work + time
(b) Power = work × time
(c) Power = time ÷ work
(d) Power = work ÷ time

YourMockTest.com — Free Study Material

Q15. Why are the testes positioned externally rather than inside the abdominal cavity?

(a) To facilitate sperm transport
(b) To maintain a lower temperature for sperm formation
(c) To form a common passage for urine and sperms
(d) To regulate testosterone production

Q16. What is a key feature of Rutherford's atomic model?

(a) Nucleus contains only electrons with negative charge.
(b) Electrons are fixed in shells around the nucleus.
(c) Atom is a uniform positive sphere throughout.
(d) Atom has a dense positive nucleus at the center.

Q17. A high-pitch and a low-pitch sound have _____, respectively.

(a) low amplitude and high frequency
(b) low frequency and high frequency
(c) high frequency and low frequency
(d) high amplitude and low frequency

Q18. Which of the following are cultivated for the pearls they make?

(a) Prawns
(b) Oysters
(c) Pomfrets
(d) Sardines

Q19. Bone is classified as connective tissue primarily because it:

(a) Produces nerve impulses
(b) Lacks any matrix substance
(c) Transports oxygen
(d) Contains cells dispersed in a mineralised extracellular matrix

Q20. What is the chemical formula of magnesium chloride?

(a) MgCl3
(b) MgCl2
(c) MgCl
(d) Mg2Cl

Q21. Which type of muscle is found in the walls of internal organs like the stomach and intestines?

(a) Striated muscle
(b) Smooth muscle
(c) Voluntary muscle
(d) Skeletal muscle

Q22. In graphite, each carbon atom is bonded to three other carbon atoms in the same plane giving a _____ array.

(a) tetragonal
(b) pentagonal
(c) hexagonal
(d) square pyramidal

Q23. Which of the following is responsible for the basic nature of a substance?

(a) OH^-
(b) H^+
(c) Cl^-
(d) Na^+

YourMockTest.com — Free Study Material

Q24. In a domestic electric circuit, the main purpose of a FUSE is _____.

(a) To increase current
(b) To store electricity
(c) To prevent overloading and protect appliances
(d) To reduce voltage

Q25. Which of the following factors is NOT responsible for corrosion?

(a) Air
(b) Water
(c) Alloying
(d) Acid

MATHEMATICS

Q26. Eighteen men can dig a well 65 feet deep in 4 days. How many men can dig a well 130 feet deep in 6 days?

(a) 24
(b) 26
(c) 27
(d) 22

Q27. The amount on a sum of Rs. 5,700 at 10% per annum compound interest, compounded annually, in 2 years will be:

(a) Rs. 6,897
(b) Rs. 7,505
(c) Rs. 7,798
(d) Rs. 6,629

Q28. If 20% of a number is added to 72, then the result is the same number. 75% of the same number is:

(a) 97.5
(b) 77.5
(c) 67.5
(d) 87.5

Q29. The father is currently three times that of his son's age. Ten years ago from now, the father's age was five times the son's age. What will be the sum of their ages ten years from now?

(a) 120 years
(b) 80 years
(c) 100 years
(d) 90 years

Q30. The difference in the measures of two complementary angles is 22°. Find the measure of the bigger angle.

(a) 52°
(b) 56°
(c) 65°
(d) 50°

Q31. If the median of the given data is 143 + X, find X (round off to two decimal places).

Height in cm	No. of boys
Below 140	4
140 – 145	7
145 – 150	18
150 – 155	11
155 - 160	6

YourMockTest.com — Free Study Material

160 - 700	5

(a) 9.23
(b) 7.05
(c) 6.03
(d) 8.15

Q32. If a 8,763 m long train crosses a pole in 127 seconds, then find the time (in seconds) taken by the train to cross a 552 m long platform.
(a) 144
(b) 135
(c) 132
(d) 145

Q33. 1/20 is what percentage of 10/80?
(a) 40%
(b) 55%
(c) 80%
(d) 50%

Q34. After selling an article at a discount of 50%, the profit percentage obtained is 30%. What is the mark-up percentage?
(a) 162%
(b) 166%
(c) 158%
(d) 160%

Q35. The number of prime numbers lying between 386 and 395 is:
(a) 3
(b) 2
(c) 0
(d) 1

Q36. A car's speed decreases by 20% every hour. If it covers a certain distance in 4 hours, how much time would it take to cover the same distance at its original speed?
(a) 2.952 hours
(b) 2.942 hours
(c) 3.942 hours
(d) 3.952 hours

Q37. The area of a rectangular field is 176 m^2 and the length of its diagonal is 18 m. Find the perimeter of this field.
(a) 60 m
(b) 61 m
(c) 52 m
(d) 48 m

Q38. If 9^k + 3^(2k-1) = 2/3 [5^(k+1/2) + 5^(k-1/2)], then k is equal to:
(a) 1
(b) 3/2
(c) 5/2
(d) 1/2

Q39. The marked price of a wardrobe is Rs. 821, which is 39% above the cost price. If the profit percent is 2%, find the discount percentage (rounded off to two decimal places).
(a) 26.62%
(b) 23.62%

YourMockTest.com — Free Study Material

(c) 28.03%
(d) 26%

Q40. If 5x + 2 = 62, then find the value of x.
(a) 20
(b) 15
(c) 10
(d) 12

Q41. The arithmetic mean of the observations 16, 85, 98, 12, 69, 95, 21, 45 and 54 is:
(a) 62
(b) 48
(c) 55
(d) 63

Q42. A spherical chocolate truffle with radius 6 cm has a spherical hollow cavity at its centre. If the volume of chocolate used is exactly $800\pi/3$ cm³, what is the radius of the hollow cavity (rounded off to two decimal places)?
(a) 2.18 cm
(b) 2.26 cm
(c) 2.44 cm
(d) 2.52 cm

Q43. In an election, Candidate A secured 60% of the total valid votes, while Candidate B received the rest. If the total number of valid votes was 18,600, find the difference between the number of votes the two candidates received.
(a) 3,720
(b) 2,520
(c) 2,750
(d) 3,550

Q44. On selling an item for Rs. 120, a shopkeeper earns x% profit. If it is sold for Rs. 20 more than the earlier price, the percentage of profit would be 2x%. The value of x is _____.
(a) 40
(b) 30
(c) 20
(d) 15

Q45. From a point P on a level ground, the angle of elevation of the top tower is 30°. If the tower is 100 m high, find the distance of point P from the foot of the tower. (Take √3 = 1.73)
(a) 170 m
(b) 175 m
(c) 173 m
(d) 178 m

Q46. Provisions meant for 100 men for 12 weeks are shared when 50 more men join them. For how many weeks will the provisions now last?
(a) 10
(b) 12
(c) 8
(d) 6

Q47. One pipe can fill a tank in 7 minutes while another pipe can empty the completely filled tank in 56 minutes. If both the pipes are opened together when the tank is empty, how many minutes will it take to fill one-fourth of the tank?
(a) 4
(b) 2
(c) 8
(d) 6

YourMockTest.com — Free Study Material

Q48. Given that R is the third proportional of 9 and Q. If Q is the sum of first three odd natural numbers, then find the value of R.

(a) 11
(b) 9
(c) 10
(d) 7

Q49. Prakhar and Riya together invested Rs. 10,500 in a business. At the end of the year, out of a total profit of Rs. 9,000, Prakhar's share was Rs. 1,200. How much was Prakhar's investment?

(a) Rs. 1,400
(b) Rs. 2,780
(c) Rs. 1,635
(d) Rs. 1,645

Q50. In quadrilateral PQRS, the bisectors of angle R and angle S meet at the point T (inside the quadrilateral) and angle STR = 32.5°. If the ratio of angle P to angle Q is 6 : 7, then what is the difference between the measures of angle Q and angle P?

(a) 4°
(b) 5°
(c) 1°
(d) 9°

GENERAL INTELLIGENCE & REASONING

Q51. Saksham starts from point A and drives 71 km towards east. He then takes a left turn, drives 48 km, turns left and drives 81 km. He then takes a left turn and drives 89 km. He takes a final left turn, drives 10 km and stops at point P. How far (shortest distance) and towards which direction should he drive in order to reach point A again?

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

(a) 40 km to the north
(b) 44 km to the north
(c) 42 km to the south
(d) 41 km to the north

Q52. Refer to the following series and answer the question (all numbers are single digit numbers only). Counting to be done from left to right only.

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

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

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

Q53. 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 kites are balloons.

No balloon is a plane.

Conclusions:

(I): Some kites are planes.

(II): Some balloons are kites.

(a) Only conclusion (II) follows
(b) Both conclusions (I) and (II) follow

YourMockTest.com — Free Study Material

(c) Only conclusion (I) follows
(d) Neither conclusion (I) nor (II) follows

Q54. Vinay starts from Point A and drives 10 km towards the south. He then takes a right turn, drives 4 km, turns right and drives 14 km. He then takes a right turn and drives 8 km. He takes a final right turn, drives 4 km and stops at Point P. How far (shortest distance) and towards which direction should he drive in order to reach Point A again? (All turns are 90 degrees turns only, unless specified.)
(a) 4 km to the west
(b) 3 km to the east
(c) 4 km to the east
(d) 3 km to the west

Q55. Each of the digits in the number 54761829 is arranged in descending order from left to right. What will the product of the digits that are third from the left and second from the right in the new number thus formed be?
(a) 14
(b) 28
(c) 16
(d) 18

Q56. A, B, C, D, W, X and Y are sitting in a straight line, facing the north.
Only two people sit to the left of C. Only three people sit between C and W. Only one person sits between W and X. D sits to the immediate left of A. Y is not an immediate neighbour of W. How many people sit to the right of B?
(a) Two
(b) One
(c) Three
(d) Four

Q57. What should come in place of the question mark (?) in the given series?
11, 23, 47, 83, 131, ?
(a) 191
(b) 192
(c) 190
(d) 193

Q58. MR 8 is related to RU −10 in a certain way. In the same way, IB 12 is related to NE −6. To which of the given options is US 1 related, following the same logic?
(a) HU −11
(b) ZV −17
(c) MJ −19
(d) BH −12

Q59. Sahana ranked 4^(th) from the top and 18^(th) from the bottom in her class. How many students are there in the class?
(a) 21
(b) 16
(c) 25
(d) 23

Q60. Based on the English alphabetical order, three of the following four letter-cluster pairs are alike in a certain way and thus form a group. Which is the letter-cluster pair that DOES NOT belong to that group?
(Note: The odd one out is not based on the number of consonants/vowels or their position in the letter-cluster.)
(a) OL-HM
(b) LI-EJ
(c) IF-BH
(d) RO-KP

YourMockTest.com – Free Study Material

Q61. A, B, C, D, E, F and G are sitting around a circular table, facing the centre. Only two people sit between D and A when counted from the left of A. C sits third to the left of G. E sits to the immediate right of G. E sits second to the left of D. F is an immediate neighbour of C. How many people sit between B and G when counted from the left of G?

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

Q62. What will come in place of the question mark (?) in the following equation if '+' and '−' are interchanged and '×' and '÷' are interchanged?

25 − 33 × 44 ÷ 24 + 39 = ?

(a) 6
(b) 4
(c) 5
(d) 2

Q63. Refer to the following series and answer the question (all numbers are single-digit numbers only). (Counting to be done from left to right only.)

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

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

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

Q64. In a certain code language,

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

'A - B' means 'A is the mother of B'

'A × B' means 'A is the sister of B'

'A ÷ B' means 'A is the wife of B'

Based on the above, how is L related to P if 'L ÷ M + N - O × P'?

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

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

Statements:

No dolls are rings.

No rings are lamps.

Conclusions:

(I) All dolls are lamps.

(II) No lamps are dolls.

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

YourMockTest.com — Free Study Material

Q66. 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/subtracting/multiplying to 13 can be performed. Breaking down 13 into 1 and 3 and then performing mathematical operations on 1 and 3 is not allowed.)

(6, 21, 15)

(47, 2197, 12)

(a) (26, 663, 12)
(b) (30, 887, 13)
(c) (34, 1130, 25)
(d) (35, 1215, 9)

Q67. Refer to the following number and symbol series and answer the question that follows. Counting to be done from left to right only. (All numbers are single-digit numbers.)

(Left) % & € 5 % 3 7 @ % % % 1 * % 2 7 5 @ 6 7 1 1 (Right)

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

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

Q68. Select the pair that follows the same pattern as that followed by the two pairs given below. Both pairs follow the same pattern.

YCE−FJL

LPR−SWY

(a) TWX−AEG
(b) TXZ−AEG
(c) TWX−ZDF
(d) TXZ−ZEF

Q69. 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) DJF
(b) MSO
(c) BHE
(d) PVR

Q70. Which of the following letter-number clusters will replace the question mark (?) in the given series to make it logically complete?

SGN 5 RFM 7 QEL 9 PDK 11 ?

(a) OCJ 13
(b) OEL 13
(c) RCJ 12
(d) QEL 12

Q71. In the following triads, each group of letters is related to the subsequent one following a certain logic. Select from the given options, the one which follows the same logic.

ACNE - CANE - ENCA

INCH - NICH - HCNI

(a) LADY - ALDY - YDAL
(b) QUAD - QAUD - DAUQ
(c) GIRL - IGRL - LIRG
(d) RAKE - ARKE - AKER

YourMockTest.com – Free Study Material

Q72. In a certain code language, ‘FOUR’ is coded as ‘5812’ and ‘ROUT’ is coded as ‘5628’. What is the code for ‘T’ in the given code language?

(a) 5
(b) 6
(c) 2
(d) 8

Q73. What should come in place of the question mark (?) in the given series?

821 823 827 833 841 ?

(a) 848
(b) 853
(c) 851
(d) 856

Q74. What should come in place of the question mark (?) in the given series based on the English alphabetical order?

VMQ TKO RIM PGK ?

(a) NEJ
(b) NFJ
(c) NFI
(d) NEI

Q75. In a certain code language, ‘star city lemon’ is coded as 'fq vn ln' and ‘zip lid star’ is coded as ‘vn iu km’. How is ‘star’ coded in the given language?

(a) iu
(b) ln
(c) vn
(d) fq

Q76. If + means -, - means x, x means ÷, ÷ means +, then what will come in place of the question mark (?) in the following equation?

20 - 6 ÷ 4 + 60 × 15 = ?

(a) 120
(b) 126
(c) 118
(d) 123

Q77. What should come in place of the question mark (?) in the given series?

304 313 320 325 ? 329

(a) 326
(b) 327
(c) 328
(d) 325

Q78. This question is based on the five, three-digit numbers given below.

(Left) 426 125 357 489 627 (Right)

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

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

If all the numbers are arranged in ascending order, the position(s) of how many numbers will remain unchanged?

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

YourMockTest.com — Free Study Material

Q79. Seven boxes, M, N, O, P, Q, R, and S, are kept one over the other but not necessarily in the same order. Only P is kept above O. Only Q is kept between O and R. Only N is kept below S. How many boxes are kept between M and N?

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

Q80. A, B, C, D, W, X and Y are sitting in a straight line, facing the north.

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

How many people sit between C and X?

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

GENERAL AWARENESS AND CURRENT AFFAIRS

Q81. Which coach received a royal knighthood in 2025 for contributions to national football?

(a) José Mourinho
(b) Pep Guardiola
(c) Roberto Martinez
(d) Gareth Southgate

Q82. What was Parul Chaudhary's new national record time in the 3000-m steeplechase 2025 Asian Athletics Championships?

(a) 9:30.45
(b) 8:55.50
(c) 9:13.39
(d) 9:12.46

Q83. What breakthrough innovation in renewable energy storage, which replaces liquid electrolyte with a solid one, was announced in 2025?

(a) Lithium-silicon flexible battery
(b) Hydrogen fusion battery
(c) Solid-state sodium-ion battery
(d) Graphene-supercapacitor hybrid

Q84. Where was the 17^(th) edition of the Nomadic Elephant defense joint military drill between India and Mongolia held in 2025?

(a) Ulaanbaatar, Mongolia
(b) Kharkhorin, Mongolia
(c) New Delhi, India
(d) Rajasthan, India

Q85. How many people died due to natural disasters in 2024–25 as per provisional estimates from the Disaster Management (DM) division of the Home Affairs ministry?

(a) 4330
(b) 3080
(c) 1500
(d) 6900

YourMockTest.com — Free Study Material

Q86. In July 2025, Kavinder Gupta, who served as Deputy Chief Minister of Jammu and Kashmir, assumed the office of Lieutenant Governor of _____.

(a) Sikkim
(b) Arunachal Pradesh
(c) Ladakh
(d) Himachal Pradesh

Q87. Which of the following banks paid a record Rs. 8,076.84 crore dividend to the Government of India for FY25 in June 2025?

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

Q88. In July 2025, which Union Minister introduced the National Anti-Doping (Amendment) Bill 2025 in Lok Sabha?

(a) Anurag Thakur
(b) Rajnath Singh
(c) Mansukh Mandaviya
(d) Kiren Rijiju

Q89. The Military Combat Parachute System (MCPS), which successfully carried out a combat freefall jump from 32,000 feet in October 2025, was indigenously created by _____.

(a) Bharat Electronics Limited (BEL)
(b) Indian Space Research Organisation (ISRO)
(c) Hindustan Aeronautics Limited (HAL)
(d) Defence Research and Development Organisation (DRDO)

Q90. Which of the following banks raised $1 billion via a 10-year USD-denominated bond in international markets in January 2025?

(a) Indian Overseas Bank
(b) National Bank for Agriculture and Rural Development
(c) Exim Bank of India
(d) Reserve Bank of India

Q91. In June 2025, which of the following countries hosted the observance of the UN Virtual Worlds Day 2025?

(a) Germany
(b) Italy
(c) Brazil
(d) France

Q92. Which DRDO lab in Pune developed the 6.8 × 43 mm assault rifle prototype?

(a) The Armament Research and Development Establishment (ARDE)
(b) The Armament Exploration and Innovation Establishment (AEIE)
(c) The Armament Research Establishment (ARE)
(d) The Armament Development Establishment (ADE)

Q93. Who among the following won the Global Teacher Prize awarded in February 2025?

(a) Mansour Al Mansour
(b) Asma Mustafa
(c) Ranjitsinh Disale
(d) Sister Zeph

YourMockTest.com — Free Study Material

Q94. Which of the following is the unified inundation forecasting system launched by the Ministry of Jal Shakti in July 2025 that provides two-days advance inundation forecasts up to village level in the form of flood-inundation maps and water-level predictions?

(a) Unified Flood Vision
(b) FloodSense Advance
(c) C-FLOOD
(d) Village Flood Radar

Q95. The South Asian Athletics Championships were held in _____ 2025.

(a) March
(b) June
(c) April
(d) May

Q96. Which of the following was designated as the 58th Tiger Reserve of India?

(a) Pench National Park
(b) Madhav National Park
(c) Panna National Park
(d) Ranthambore National Park

Q97. Who among the following was awarded Comeback of the Year at the 2025 Laureus Awards?

(a) Rebeca Andrade
(b) Novak Djokovic
(c) Rafael Nadal
(d) Tom Pidcock

Q98. In September 2025, the South Western Railway (SWR) reported that its Railway Protection Force (RPF) had reached out to more than two lakh women passengers under which of the following initiative, aimed at ensuring safety and comfort for women traveling alone?

(a) Operation Meri Saheli
(b) Mahila Suraksha Doot Program
(c) Safe City Project
(d) Mission Shakti

Q99. Who among the following was appointed as the Chairman of the Insurance Regulatory and Development Authority of India (IRDAI) in July 2025?

(a) Amitabh Kant
(b) Ajay Seth
(c) B. V. R. Subramaniyam
(d) Suman Bery

Q100. Wild Fictions: Essays published in January 2025, is written by which author?

(a) Amitav Ghosh
(b) Nidhi Razdan
(c) Gautam Bhatia
(d) Santanu Bhattacharya

ANSWER KEY

1	a	2	a	3	c	4	d	5	c	6	c	7	d	8	c	9	a	10	b
11	a	12	b	13	d	14	d	15	b	16	d	17	c	18	b	19	d	20	b
21	b	22	c	23	a	24	c	25	c	26	a	27	a	28	c	29	c	30	b
31	c	32	b	33	a	34	d	35	d	36	a	37	c	38	d	39	a	40	d
41	c	42	d	43	a	44	c	45	c	46	c	47	b	48	b	49	a	50	b

YourMockTest.com — Free Study Material

51	d	52	b	53	a	54	a	55	a	56	b	57	a	58	b	59	a	60	c
61	a	62	b	63	c	64	d	65	c	66	b	67	d	68	b	69	c	70	a
71	a	72	b	73	c	74	d	75	c	76	a	77	c	78	c	79	b	80	d
81	d	82	d	83	c	84	a	85	b	86	c	87	a	88	c	89	d	90	c
91	b	92	a	93	a	94	c	95	d	96	b	97	a	98	a	99	b	100	a

SOLUTIONS

Q1. Answer: (a) Secretes oxytocin to start childbirth

The correct answer is Secretes oxytocin to start childbirth.

Key Points

• The placenta does not secrete oxytocin: Oxytocin, a hormone critical for initiating childbirth, is primarily secreted by the mother's hypothalamus and released from the posterior pituitary gland. The placenta does not play a role in producing or releasing this hormone. Hence, this statement is incorrect.

• Removal of carbon dioxide and waste: The placenta facilitates the exchange of gases and removal of waste products such as carbon dioxide from the fetal blood to the maternal blood. This ensures a clean and functional circulatory system for the fetus. Hence, this statement is correct.

• Production of hormones to support pregnancy: The placenta produces essential hormones such as human chorionic gonadotropin (hCG), progesterone, and estrogen, which are crucial for maintaining pregnancy and supporting fetal development. Hence, this statement is correct.

• Transfer of oxygen and nutrients: The placenta serves as a vital interface between the mother and fetus, allowing the transfer of oxygen and nutrients from the maternal blood to the fetal blood. This process is critical for the growth and development of the fetus. Hence, this statement is correct.

Additional Information

• Functions of the placenta:

• The placenta acts as a lifeline between the mother and fetus, performing vital functions such as nutrient and oxygen transfer, waste removal, and hormone production.

• It also acts as a barrier, protecting the fetus from harmful substances and infections, while allowing the passage of beneficial antibodies.

• Hormones produced by the placenta:

• Human Chorionic Gonadotropin (hCG): Supports the corpus luteum to maintain progesterone production during early pregnancy.

• Progesterone: Maintains the uterine lining and prevents contractions during pregnancy.

• Estrogen: Promotes uterine growth and enhances blood flow to the placenta.

• Role of oxytocin during childbirth:

• Oxytocin is a hormone released by the posterior pituitary gland and is responsible for stimulating uterine contractions during labor.

• It also facilitates the milk ejection reflex during breastfeeding.

• Placental structure:

• The placenta is a disc-shaped organ that attaches to the uterine wall and connects to the fetus via the umbilical cord.

• It contains villous structures that maximize the surface area for efficient exchange of nutrients, gases, and waste products.

Important Points

• Misconceptions about the placenta:

• The placenta does not produce oxytocin; this is a common misconception. The hormone is released by the maternal brain.

• While the placenta plays a significant role in pregnancy, it does not directly initiate childbirth, which is regulated by a complex interplay of maternal and fetal signals.

• Clinical significance:

• Placental health is crucial for a successful pregnancy. Conditions such as placental insufficiency can lead to complications like intrauterine growth restriction (IUGR).

• Post-delivery, the placenta is examined to ensure it was functioning properly during the pregnancy.

Q2. Answer: (a) Generation of hydroelectric power

The correct answer is Generation of hydroelectric power.

Key Points

• Generation of hydroelectric power: Large dams are primarily constructed to harness the potential energy of water stored at height and convert it into electricity. This is an important source of renewable energy and helps in meeting the energy demands of a nation efficiently. Hence, this is correct.

• Prevention of all downstream flooding: While dams help in regulating water flow and can significantly reduce the risk of flooding downstream, they do not guarantee the prevention of all floods, especially during extreme weather events like heavy rainfall. Hence, this statement is incorrect.

• Immediate increase in local biodiversity: The construction of a dam often leads to habitat destruction initially, which can negatively impact biodiversity in the short term. It takes time for ecosystems to stabilize, and even then, the biodiversity might not return to its original state. Hence, this statement is incorrect.

• Decentralised energy production: Hydroelectric power generated by large dams is centralized and distributed via extensive power grids. Decentralized energy production typically refers to localized energy solutions like rooftop solar panels or small wind turbines. Hence, this statement is incorrect.

• The correct answer is Generation of hydroelectric power, as it highlights the primary advantage of constructing a big dam.

Additional Information

• Hydroelectric Power Advantages:

• Hydroelectric power is a clean and renewable energy source, producing no greenhouse gases during operation.

• It contributes significantly to reducing dependency on fossil fuels, enhancing energy security.

• Notable examples include the Three Gorges Dam in China (world's largest hydroelectric plant) and the Bhakra Nangal Dam in India.

• Hydropower is reliable and capable of providing base-load electricity as well as meeting peak demand.

• Flood Mitigation by Dams:

• Dams regulate river flow, store excess water during heavy rains, and release it gradually, helping to mitigate the impact of floods.

• However, extreme weather events caused by climate change may overwhelm the capacity of dams, resulting in downstream flooding.

• Environmental Impacts of Dams:

• Construction of dams often leads to the displacement of communities and alters local ecosystems.

• Reservoirs created by dams can lead to habitat loss for terrestrial and aquatic species.

• Efforts like fish ladders and artificial wetlands are often implemented to minimize these impacts.

• Decentralized Energy Systems:

• Decentralized energy systems refer to small-scale energy generation technologies located close to where the energy is used, such as rooftop solar panels or mini wind turbines.

• These systems are typically more suitable for rural and remote areas with limited access to centralized power grids.

• Examples of Large Dams:

• The Hoover Dam in the USA provides hydroelectric power and water storage for irrigation and municipal use.

• The Sardar Sarovar Dam on the Narmada River in India is a multipurpose project providing water, electricity, and flood control.

• The Itaipu Dam in South America generates a significant portion of electricity for Brazil and Paraguay.

Important Points

• Reservoir-Induced Seismicity: Large reservoirs created by dams can induce seismic activities due to the immense weight of water. For example, the Koyna Dam in India is associated with seismic events.

• Water Scarcity Mitigation: Dams store water for irrigation, drinking, and industrial purposes, especially in arid and semi-arid regions.

• Tourism and Recreation: Reservoirs and scenic landscapes created by dams often promote tourism, providing additional economic benefits.

• International Examples: The Aswan High Dam in Egypt is vital for controlling the Nile's water flow, while the Grand Coulee Dam in the USA supports irrigation and energy generation.

Q3. Answer: (c) Sexual reproduction

The correct answer is Sexual Reproduction.

Key Points

• Regeneration: Regeneration is a type of asexual reproduction where an organism can regrow lost or damaged parts. For example, planarians and certain species of starfish can regenerate into a complete individual from a single fragment of their body. Hence, statement 1 is correct.

• Fragmentation: In fragmentation, an organism splits into fragments, and each fragment develops into a new individual. This is common in organisms like spirogyra and sea stars. Hence, statement 2 is correct.

• Sexual Reproduction: Unlike the other methods, sexual reproduction involves two individuals (male and female) contributing

genetic material to produce offspring. It is not a method of reproduction by a solitary individual, as it requires the involvement of two organisms. Hence, statement 3 is incorrect.

• Fission: Fission is another form of asexual reproduction where an organism divides into two or more individuals. For instance, bacteria reproduce by binary fission, and some protozoans reproduce by multiple fission. Hence, statement 4 is correct.

Additional Information

• Regeneration:

• This process is common in invertebrates like hydra, planarians, and echinoderms.

• It is a survival mechanism that allows organisms to recover from damage and reproduce asexually.

• While regeneration is a form of reproduction for some species, in others, it is limited to healing and repair.

• Fragmentation:

• Fragmentation is observed in simple organisms such as algae, fungi, and certain invertebrates.

• Each fragment has the potential to grow into a new organism when environmental conditions are favorable.

• It is an efficient mode of reproduction in environments where resources are abundant.

• Sexual Reproduction:

• Sexual reproduction requires the fusion of male and female gametes, a process known as fertilization.

• It enhances genetic diversity, allowing populations to adapt to changing environments.

• Examples of organisms reproducing sexually include humans, plants, and most animals.

• Sexual reproduction is typically seen in multicellular organisms, while asexual methods are more common in unicellular organisms.

• Fission:

• Binary fission: The organism splits into two identical daughter cells, as seen in bacteria and amoeba.

• Multiple fission: The organism divides into multiple offspring simultaneously, as seen in plasmodium (causative agent of malaria).

• Fission allows rapid population growth and is common in unicellular organisms.

Important Points

• Asexual reproduction: It involves a single parent and produces offspring identical to the parent. Examples include budding, spore formation, and vegetative propagation in plants.

• Advantages of asexual reproduction:

• It is faster and requires less energy compared to sexual reproduction.

• It enables organisms to colonize a habitat quickly.

• Disadvantages of asexual reproduction:

• Lack of genetic diversity can make populations vulnerable to environmental changes and diseases.

• Sexual reproduction: It promotes genetic variation, which is crucial for evolution and adaptability.

Q4. Answer: (d) 40 V

The correct answer is 40 V.

Key Points

• Given in the question: A resistor with a resistance of 8 Ω produces 200 J of heat per second. This means the power dissipated by the resistor is P = 200 W.

• The formula to calculate power dissipated in a resistor is:

$P = V^2 / R$, where P is power, V is the potential difference across the resistor, and R is the resistance.

• Rearranging the formula to calculate the potential difference:

$V = \sqrt{(P \times R)}$.

• Substituting the given values:

$V = \sqrt{(200 \times 8)} = \sqrt{1600} = 40$ V.

• Thus, the potential difference across the resistor is 40 V.

• Hence, the correct answer is 40 V.

Additional Information

• Ohm's Law:

• Ohm's Law states that the potential difference across a conductor is directly proportional to the current flowing through it, provided the temperature remains constant.

• The mathematical expression for Ohm's Law is V = IR, where V is voltage, I is current, and R is resistance.

• Ohm's Law is crucial in analyzing and designing electrical circuits.

• Power in Electrical Circuits:

• The power dissipated in a resistor can be calculated using three formulas:

$P = V^2 / R$, $P = I^2R$, and $P = VI$.

• These formulas are derived from Ohm's Law and are used to calculate the power based on the known parameters of the circuit.

• In the given problem, the formula $P = V^2 / R$ is most appropriate as power and resistance are provided.

• Unit of Power:

• Power is measured in Watts (W), which is equivalent to 1 Joule per second.

• The given problem specifies that 200 J of energy is produced per second, confirming that the power is 200 W.

• Resistance:

• Resistance is a measure of the opposition to the flow of electric current in a circuit.

• It is measured in Ohms (Ω) and depends on the material, length, and cross-sectional area of the conductor.

• In this problem, the resistance of the resistor is given as 8 Ω.

Important Points

• Relationship Between Power, Voltage, and Resistance:

• The relationship between power, voltage, and resistance is fundamental in understanding how electrical energy is converted in circuits.

• When power and resistance are known, voltage can be calculated using the formula $V = \sqrt{(P \times R)}$.

• Applications of Power Dissipation Calculation:

• This concept is widely used in designing electrical devices such as resistors, heaters, and other appliances.

• Understanding power dissipation helps engineers ensure that devices operate safely within their specified limits.

Q5. Answer: (c) The coin remains at rest due to inertia when the card moves away

The correct answer is The coin remains at rest due to inertia when the card moves away..

Key Points

• Inertia: The phenomenon of the coin falling straight into the glass when the card is flicked demonstrates the principle of inertia. Inertia is the tendency of an object to resist changes in its state of motion or rest unless acted upon by an external force.

• The Coin’s Rest State: Initially, the coin is at rest along with the card. When the card is flicked quickly, the card experiences a force that sets it into motion. However, the coin remains in its rest state due to its inertia.

• Lack of Horizontal Force on the Coin: The flick primarily applies force to the card, not directly to the coin. Therefore, the coin does not gain significant horizontal motion and falls straight down into the glass.

• Gravitational Force: Once the card moves away, the coin is influenced by the force of gravity, which pulls it downward into the glass. Gravity ensures that the coin follows a vertical path.

• Explanation of Option 3: The coin's behavior accurately illustrates the concept of inertia, as it remains at rest relative to its position before the card is flicked. Hence, option 3 is correct.

Additional Information

• Newton’s First Law of Motion:

• This situation is a direct application of Newton’s First Law of Motion, which states that an object will remain at rest or in uniform motion unless acted upon by an external force.

• The coin’s inertia resists the change in motion when the card is flicked, causing it to stay at its initial position momentarily.

• Real-Life Examples of Inertia:

• Example 1: When a car suddenly stops, passengers lurch forward due to their inertia, as their bodies attempt to maintain their motion.

• Example 2: A book lying on a table stays at rest until a force is applied to move it.

• Incorrect Options Explained:

• Option 1: The coin does not move due to the card pushing it, as the card moves away too quickly for significant interaction. Hence, this option is incorrect.

• Option 2: The flick applies force directly to the card, not the coin. The coin moves vertically due to gravity, not the flick. Hence, this option is incorrect.

• Option 4: The coin does not move away with the card because of its inertia. It stays at rest momentarily before falling into the glass. Hence, this option is incorrect.

Important Points

• Inertia and Mass: The inertia of an object depends on its mass. Heavier objects have greater inertia and require more force to change their state of motion or rest.

• Practical Implications: Understanding inertia helps in designing safety mechanisms such as seat belts in cars, which prevent passengers from moving forward abruptly during sudden stops.

• Applications in Daily Life: The concept of inertia is observed in various scenarios, such as using tablecloth tricks to remove a cloth without disturbing items placed on it.

Q6. Answer: (c) Burning of candle

The correct answer is Burning of candle.

Key Points

• Burning of candle is a chemical change because it involves a chemical reaction where the wax of the candle reacts with oxygen in the air to produce carbon dioxide, water vapor, and heat. This process is irreversible, and new substances are formed. Hence, this statement is correct.

• Boiling of water is a physical change as it involves a change of state from liquid to gas without altering the chemical composition of water. The process is reversible. Hence, this statement is correct.

• Melting of ice is a physical change because ice changes its state from solid to liquid without any change in its chemical structure (it remains H2O). The process is reversible. Hence, this statement is correct.

• Freezing of water is also a physical change as water changes its state from liquid to solid without altering its chemical composition. The process is reversible. Hence, this statement is correct.

Additional Information

• Physical Change:

• A physical change is a change in the physical properties of a substance such as shape, size, or state without altering its chemical composition.

• Examples include melting, freezing, boiling, and dissolving.

• Physical changes are generally reversible, and no new substances are formed.

• Chemical Change:

• A chemical change involves a chemical reaction where the substance's chemical composition is altered.

• Examples include burning, rusting, and cooking.

• Chemical changes are generally irreversible, and new substances are formed.

• Burning of Candle:

• During the burning of a candle, the wax undergoes combustion, producing new substances like carbon dioxide and water vapor.

• The heat and light generated are evidence of a chemical change.

• Once the wax is burned, it cannot be converted back into its original form, making the process irreversible.

• State Changes in Water:

• Boiling, freezing, and melting involve a change in the state of water (solid, liquid, gas) without altering its chemical structure.

• These processes are reversible and represent physical changes.

• Water remains H2O throughout these transformations.

Important Points

• Indicators of a Chemical Change:

• Formation of a new substance.

• Release or absorption of energy (heat, light, sound).

• Change in color or odor.

• Formation of gas or precipitate.

• Examples of Physical and Chemical Changes:

• Physical Changes: Melting ice, boiling water, dissolving sugar in water.

• Chemical Changes: Burning wood, rusting iron, cooking food.

Q7. Answer: (d) 30,000 N/m²

The correct answer is 30,000 N/m².

Key Points

• Pressure is defined as the force applied per unit area. Its formula is: Pressure = Force / Area.

• In this case, the given values are:

• Force (Weight of the person) = 600 N

• Area = 0.02 m²

• Substituting the values into the formula:

• Pressure = Force / Area

• Pressure = 600 N / 0.02 m²

YourMockTest.com — Free Study Material

• Pressure = 30,000 N/m²
• Hence, the pressure exerted on the ground by the person is 30,000 N/m².
• This matches the correct option, which is 30,000 N/m².

Additional Information

• Pressure:
• Definition: Pressure is the amount of force exerted perpendicularly on a surface per unit area.
• SI Unit: The SI unit of pressure is Pascal (Pa), where 1 Pascal = 1 N/m².
• Applications: Pressure is a key concept in physics and engineering, affecting everything from tire inflation to fluid dynamics.
• Force:
• Definition: Force is an interaction that, when unopposed, changes the motion of an object.
• SI Unit: The SI unit of force is the Newton (N).
• Formula: Force is calculated as mass × acceleration (F = ma).
• Area:
• Definition: Area is the measure of the extent of a two-dimensional surface or shape.
• SI Unit: The SI unit of area is square meter (m²).
• Real-Life Example of Pressure:
• High heels exert more pressure on the ground compared to flat shoes because the force is distributed over a smaller area.
• This principle is also why snowshoes help people walk on snow without sinking; they distribute the force over a larger area, reducing pressure.
• Important Note:
• In the context of this question, the weight of the person (600 N) is applied uniformly over the contact area of the shoes (0.02 m²), resulting in the calculated pressure.

Important Points

• Why is pressure important?
• Understanding pressure helps in designing structures, vehicles, machinery, and other equipment to ensure safety and efficiency.
• It plays a crucial role in fluid mechanics, meteorology, and even medical science (e.g., blood pressure).
• Factors Affecting Pressure:
• Pressure increases with an increase in force or a decrease in the area over which the force is applied.
• Inversely, pressure decreases with a decrease in force or an increase in the area.
• Practical Applications:
• Hydraulic systems use pressure to lift heavy objects.
• Air pressure is utilized in pneumatic systems for tools and machinery.

Q8. Answer: (c) Positive

The correct answer is Positive.

Key Points

• Sign Convention in Optics: In the study of mirrors, the height of an erect image is taken as positive according to the sign convention.
• Image Formation: An erect image is formed when the image is upright relative to the object. Such images are formed by plane mirrors or certain configurations of concave and convex mirrors.
• Positive Height: The sign convention defines erect images as positive because they lie above the principal axis in diagrams. This is an essential aspect of ray diagrams in geometrical optics.
• Nature of Erect Images: Erect images are typically virtual images, meaning the light rays do not actually converge at the image location but appear to do so.
• The correct answer is Positive, as per standard optical sign conventions.

Additional Information

• Sign Convention in Optics:
• The sign convention used in optics is derived from Cartesian coordinate system.
• Distances measured in the direction of incident light are considered positive, while those measured against it are considered negative.
• Similarly, heights of images above the principal axis are positive, and those below are negative.
• Real vs Virtual Images:
• Real images are formed when light rays converge at a point. These images are inverted, and their height is negative as per the

convention.

• Virtual images, on the other hand, are formed when light rays appear to diverge from a point. These images are erect, and their height is positive.

• Examples of Erect Images:

• A virtual image formed by a plane mirror is erect and has a positive height.

• Convex mirrors also form erect virtual images.

• Concave mirrors can form erect images when the object is placed within the focal length.

• Applications:

• Rearview mirrors in vehicles use convex mirrors to produce erect and diminished images of objects behind the vehicle.

• Plane mirrors are used in daily life for grooming and decoration because they produce erect images.

• Optical instruments such as telescopes and microscopes often utilize mirrors and lenses to manipulate image orientation.

Important Points

• Plane Mirror: Always forms virtual, erect, and same-sized images.

• Convex Mirror: Forms virtual, erect, and diminished images irrespective of the object's distance.

• Concave Mirror: Forms erect virtual images when the object is placed between the focal point and the mirror.

• Key Concept in Physics: Sign conventions are critical in solving numerical problems in ray optics, such as determining focal lengths, image distances, and magnifications.

Q9. Answer: (a) Both statement 1 and 2

The correct answer is Both statement 1 and 2.

Key Points

• Statement 1: The incident ray, refracted ray, and normal lie in the same plane

• This statement is correct. According to the laws of refraction, the incident ray, the refracted ray, and the normal to the surface of separation of two media at the point of incidence all lie in the same plane.

• It is one of the fundamental principles governing the behavior of light as it passes through different media.

• Statement 2: The ratio of the sine of the angle of incidence to the sine of the angle of refraction is constant

• This statement is correct and is based on Snell's Law, which is mathematically expressed as n1 sin(i) = n2 sin(r), where i is the angle of incidence and r is the angle of refraction.

• The constant ratio is equal to the refractive index of the medium, which depends on the optical properties of the two media.

• This explains why a straw appears bent when placed in a glass of water due to the change in the speed of light as it moves from air to water.

Additional Information

• Laws of Refraction:

• There are two fundamental laws of refraction:

1. The incident ray, the refracted ray, and the normal to the interface at the point of incidence all lie in the same plane.

2. The ratio of the sine of the angle of incidence (sin(i)) to the sine of the angle of refraction (sin(r)) is a constant, and this constant is called the refractive index.

• The refractive index can be expressed as: n = c/v, where c is the speed of light in a vacuum, and v is the speed of light in the medium.

• Snell's Law:

• Snell's Law governs how light bends when transitioning between two media with different refractive indices.

• The mathematical formula is n1 sin(i) = n2 sin(r), where:

1. n1 and n2 are the refractive indices of the two media.

2. i is the angle of incidence, and r is the angle of refraction.

• This law helps in understanding phenomena like the apparent bending of a straw in water.

• Refractive Index:

• The refractive index is a measure of how much the speed of light is reduced in a medium compared to a vacuum.

• For water, the refractive index is approximately 1.33, meaning light travels 1.33 times slower in water compared to a vacuum.

• Higher refractive indices indicate greater bending of light.

• Applications of Refraction:

• Optical Instruments: Lenses in cameras, microscopes, and telescopes rely on refraction to focus light.

• Mirages: Atmospheric refraction causes mirages, where distant objects appear displaced due to temperature gradients.

• Vision Correction: Glasses and contact lenses use refraction to correct vision by focusing light onto the retina.

Important Points

• The apparent bending of a straw in water is due to the difference in refractive indices between air and water.

• Refraction occurs because light changes speed as it moves between materials with different optical densities.

• The greater the difference in refractive indices, the more pronounced the bending of light.

• Understanding refraction is crucial for designing optical devices like glasses, cameras, and microscopes.

Q10. Answer: (b) Slope = Acceleration = 0

The correct answer is Slope = Acceleration = 0.

Key Points

• A velocity-time graph for uniform velocity is represented by a horizontal line parallel to the time axis. This is because the velocity remains constant over time.

• The slope of the velocity-time graph represents acceleration. Since the velocity does not change, the slope is zero, indicating that acceleration = 0.

• The area under the curve of a velocity-time graph represents the displacement, not speed. This is because displacement is calculated as the product of velocity and time.

• The graph for uniform velocity is not a curve; it is a straight, horizontal line. Hence, any statement claiming it is a curve is incorrect.

• In summary, the correct interpretation of the velocity-time graph for uniform velocity is that the slope (acceleration) is zero, and the graph is a straight horizontal line.

Additional Information

• Uniform Velocity:

• Uniform velocity occurs when an object travels equal distances in equal intervals of time in a specific direction.

• In this case, there is no change in speed or direction, meaning the acceleration is zero.

• Examples include vehicles moving at a constant speed on a straight road.

• Velocity-Time Graph:

• The velocity-time graph is a graphical representation of the velocity of an object plotted against time.

• If the graph is a horizontal line, the velocity is constant (uniform velocity), and the slope (acceleration) is zero.

• If the graph is slanted, the object is accelerating or decelerating, depending on the slope's direction.

• Key Characteristics of Velocity-Time Graphs:

• The slope of the graph represents the acceleration of the object.

• The area under the curve of the graph represents the displacement of the object over the given time interval.

• A straight horizontal line indicates uniform velocity, while a sloping line indicates changing velocity (acceleration).

• Acceleration:

• Acceleration is the rate of change of velocity of an object with respect to time.

• In the case of uniform velocity, acceleration is zero since there is no change in velocity.

• Formula: Acceleration = (Final Velocity - Initial Velocity) / Time.

• Displacement vs. Speed:

• Displacement is a vector quantity that refers to the shortest distance between an object's initial and final positions.

• Speed is a scalar quantity that measures the total distance covered by an object per unit of time.

• The area under a velocity-time graph gives the displacement, not speed.

Q11. Answer: (a) Sodium acetate

The correct answer is Sodium acetate.

Key Points

• Sodium acetate is a salt formed by the neutralization of a weak acid (acetic acid) and a strong base (sodium hydroxide). When dissolved in water, it undergoes hydrolysis, leading to the formation of hydroxide ions (OH^-), which makes the solution basic in nature with a pH greater than 7.

• Copper sulphate is a salt of a strong acid (sulfuric acid) and a weak base (copper hydroxide). When dissolved in water, it produces hydrogen ions (H^+), making the solution acidic. Hence, its solution has a pH less than 7.

• Sodium chloride is a neutral salt formed from the strong acid (hydrochloric acid) and the strong base (sodium hydroxide). It does not hydrolyze in water, so its aqueous solution has a neutral pH of 7.

• Ammonium chloride is a salt of a weak base (ammonia) and a strong acid (hydrochloric acid). It undergoes hydrolysis to produce hydrogen ions (H^+), making the solution acidic with a pH less than 7.

• Only Sodium acetate, among the given options, forms a solution with a pH greater than 7 due to its basic nature.

YourMockTest.com — Free Study Material

Additional Information

• Hydrolysis of salts:

• Salts derived from a strong base and a weak acid (e.g., Sodium acetate) hydrolyze to produce hydroxide ions (OH^-), making their solutions basic (pH > 7).

• Salts derived from a strong acid and a weak base (e.g., Ammonium chloride) hydrolyze to release hydrogen ions (H^+), making their solutions acidic (pH < 7).

• Salts derived from a strong acid and a strong base (e.g., Sodium chloride) do not hydrolyze and form neutral solutions with pH = 7.

• Salts derived from a weak acid and a weak base can have varying pH values depending on the relative strengths of the acid and base.

• Sodium acetate:

• Formula: CH3COONa

• It is commonly used in the food industry as a seasoning and pH buffer.

• In aqueous solution, it reacts with water to form acetic acid (CH3COOH) and hydroxide ions (OH^-), making the solution basic.

• Copper sulphate:

• Formula: CuSO4

• It is widely used in agriculture as a fungicide and in laboratories for various experiments.

• It forms an acidic solution due to hydrolysis of Cu^{2+} ions in water.

• Sodium chloride:

• Formula: NaCl

• It is a neutral salt and does not affect the pH of water when dissolved.

• It is commonly used as table salt for consumption and in industrial processes.

• Ammonium chloride:

• Formula: NH4Cl

• It is used in fertilizers and as an electrolyte in dry cell batteries.

• It forms an acidic solution due to hydrolysis of NH4^+ ions in water.

Important Points

• pH scale: The pH scale ranges from 0 to 14. A pH less than 7 indicates acidity, a pH of 7 indicates neutrality, and a pH greater than 7 indicates basicity.

• Hydrolysis: This is the reaction of a salt with water to produce an acidic or basic solution depending on the type of salt.

• Buffer solutions: Sodium acetate is often used in combination with acetic acid to prepare buffer solutions that resist changes in pH.

• Environmental applications: Sodium acetate can be used as a source of carbon in wastewater treatment processes.

• Laboratory use: Salts like Sodium acetate and Copper sulphate are widely used in chemical analysis and experiments.

Q12. Answer: (b) Isomerism

The correct answer is Isomerism.

Key Points

• Isomerism is the phenomenon where compounds have the same molecular formula but different structural or spatial arrangements, resulting in different physical and/or chemical properties.

• Butane (C4H10) exists in two isomeric forms:

• n-Butane: A straight-chain structure where all four carbon atoms are connected in a linear arrangement.

• Isobutane (2-methylpropane): A branched-chain structure where three carbon atoms form the main chain, and one carbon atom is attached as a branch.

• The difference in their structure leads to variations in boiling points, melting points, and other properties, despite having the same molecular formula.

• Isomerism is broadly classified into structural isomerism (differences in connectivity of atoms) and stereoisomerism (differences in spatial arrangement).

• In the case of butane, the isomerism exhibited is specifically structural isomerism, more precisely, chain isomerism.

Additional Information

• Catenation:

• Catenation refers to the ability of an element, particularly carbon, to form long chains or rings by bonding with atoms of the same element.

• It is a unique property of carbon due to its tetravalency and strong covalent bonding.

YourMockTest.com — Free Study Material

• While catenation enables the formation of compounds like butane, it does not explain the existence of its isomers.

• Sublimation:

• Sublimation is a physical process where a substance transitions directly from the solid state to the gaseous state without passing through the liquid state.

• Examples include substances like iodine and dry ice (solid carbon dioxide).

• This phenomenon is unrelated to the structural variation of butane.

• Polymerisation:

• Polymerisation is a chemical process in which small molecules (monomers) combine to form a large molecule (polymer).

• For example, ethene undergoes polymerisation to form polyethylene.

• Butane is a simple hydrocarbon and does not undergo polymerisation in the context of the given question.

• Chain Isomerism in Hydrocarbons:

• Chain isomerism occurs when compounds with the same molecular formula have different arrangements of their carbon skeletons.

• In butane, n-butane and isobutane differ in their carbon chain structures.

• This is a type of structural isomerism and is commonly observed in hydrocarbons.

Important Points

• Applications of Isomers:

• Isomers are widely used in the pharmaceutical industry. For example, different isomers of a drug can have different therapeutic effects.

• In the petroleum industry, isomers like isobutane are used to improve the octane rating of fuels.

• Examples of Isomerism:

• Ethyl alcohol (C2H6O) and dimethyl ether (C2H6O) are examples of functional isomers.

• Glucose and fructose are examples of structural isomers in the carbohydrate family.

• Significance of Structural Isomerism:

• Structural isomerism explains variations in physical properties like boiling and melting points, and chemical reactivity.

• It plays a crucial role in organic chemistry, especially in the study of hydrocarbons and functional groups.

Q13. Answer: (d) Environment is not under the control of plants.

The correct answer is Environment is not under the control of plants.

Key Points

• Statement 1: Environment is under the control of most plants - Plants cannot control their environment. They can only adapt to environmental changes such as sunlight availability, water, and temperature conditions. Plants respond to the environment but do not have control over it. Hence, this statement is incorrect.

• Statement 2: Environment is under the control of very few plants - No plant has the ability to control its environment, not even partially. Plants rely on external environmental factors for growth and development, such as light, water, and nutrients. Hence, this statement is incorrect.

• Statement 3: The environmental sources of energy are uniform - Environmental sources of energy, such as sunlight, water, and nutrients, are not uniform across different regions. Their availability varies based on geographic location, climate, and other factors. Hence, this statement is incorrect.

• Statement 4: Environment is not under the control of plants - Plants do not have the ability to control their environment. Instead, they adapt to environmental conditions through various physiological and morphological changes, such as phototropism (growth toward light) or hydrotropism (growth toward water). This is the correct statement. Hence, this statement is correct.

Additional Information

• Plant Adaptations to Environment:

• Plants adapt to their environment through mechanisms like phototropism (growth in response to light), geotropism (growth in response to gravity), and hydrotropism (growth in response to water).

• They develop specific features based on their habitat, such as xerophytes (plants in dry areas with thick cuticles) and hydrophytes (plants in aquatic environments with floating leaves).

• Energy Sources in the Environment:

• The primary energy source for plants is sunlight, which they use for photosynthesis.

• Other environmental resources, like water and soil nutrients, also play an essential role in plant growth and metabolic processes.

• These resources are unevenly distributed across different ecosystems, affecting plant distribution and biodiversity.

• Environmental Limitations:

• External factors like drought, temperature fluctuations, and soil quality significantly impact plant growth.

YourMockTest.com — Free Study Material

• Plants employ survival strategies, such as shedding leaves during dry periods or developing deep roots to access water.

• Examples of Plant Adaptations:

• Cacti in deserts have spines instead of leaves to reduce water loss.

• Mangroves in coastal areas develop aerial roots to cope with waterlogged soils and salinity.

• Deciduous trees shed leaves during winter to conserve water and energy.

Important Points

• Plant-Environment Interaction: Plants cannot modify or control their environment. Instead, they interact with it and adjust their growth and development accordingly.

• Photosynthesis: Plants use sunlight, water, and carbon dioxide to produce energy in the form of glucose. This process is vital for their survival and growth.

• Environmental Challenges: Factors like pollution, deforestation, and climate change can adversely affect plant growth and ecosystems.

• Role of Plants: Although plants cannot control the environment, they play a crucial role in maintaining ecological balance by producing oxygen, reducing carbon dioxide, and providing habitat to various organisms.

Q14. Answer: (d) Power = work ÷ time

The correct answer is Power = work ÷ time.

Key Points

• Power is defined as the rate at which work is done or energy is transferred over time. It measures how quickly work is completed.

• The correct formula to calculate power is: Power = Work ÷ Time. Here, work refers to the total energy transferred or force applied over a distance, and time is the duration in which the work is performed.

• The SI unit of power is the watt (W), where 1 watt is equal to 1 joule per second (1 W = 1 J/s).

• Option 4 is correct because dividing work by time accurately represents the physical definition of power. In contrast, the other options such as addition, multiplication, or division of time by work are incorrect.

• For example, if a machine does 500 joules of work in 10 seconds, the power generated is: Power = 500 ÷ 10 = 50 watts.

Additional Information

• Work:

• Work is defined as the energy transferred when a force is applied to an object, and it moves in the direction of the force.

• The formula for work is: Work = Force × Distance × cos(θ), where θ is the angle between the force and displacement.

• The SI unit of work is the joule (J). 1 joule is equal to 1 newton-meter (N·m).

• Time:

• Time is a fundamental quantity in physics, measured in seconds (s) in the International System of Units (SI).

• In the context of power, time refers to the duration over which the work is performed or energy is transferred.

• Power in Different Contexts:

• In mechanical systems, power can also be expressed as: Power = Force × Velocity, provided the force and velocity are in the same direction.

• In electrical systems, power is given by: P = V × I, where V is voltage, and I is current.

• Other Units of Power:

• Apart from watts, power is sometimes expressed in horsepower (hp), commonly used in engines. 1 hp = 746 W.

• Another unit is the kilowatt (kW), where 1 kW = 1000 W. Larger energy usages are often measured in terms of kilowatts or megawatts (MW).

Important Points

• Option Analysis:

• Option 1: Power = work + time. Incorrect, as adding work and time does not provide a meaningful physical quantity.

• Option 2: Power = work × time. Incorrect, as this would result in units incompatible with power.

• Option 3: Power = time ÷ work. Incorrect, as this reverses the relationship between work and time.

• Option 4: Power = work ÷ time. Correct, as it aligns with the definition of power in physics.

• Applications of Power:

• In daily life, power is used to measure the performance of appliances like bulbs, fans, and engines.

• In engineering, power calculations help in designing machines, engines, and electrical circuits for efficiency and capacity.

YourMockTest.com — Free Study Material

Q15. Answer: (b) To maintain a lower temperature for sperm formation

The correct answer is To maintain a lower temperature for sperm formation.

Key Points

• Position of Testes: The testes are located outside the abdominal cavity, housed in the scrotum. This external positioning is essential to maintain a temperature lower than the core body temperature, which is crucial for sperm production and maturation.

• Optimal Temperature for Spermatogenesis: Spermatogenesis (the process of sperm formation) requires a temperature of approximately 2-3°C lower than the body temperature. The scrotum provides this cooler environment by regulating temperature through mechanisms like contraction and relaxation of the dartos and cremaster muscles.

• Impact of Temperature on Sperm Quality: Elevated temperatures inside the abdominal cavity can impair sperm production and lead to reduced fertility. Therefore, the external placement of the testes ensures optimal conditions for healthy sperm formation.

• Thermoregulatory Function: The scrotum adjusts the temperature of the testes via mechanisms like muscle contraction (to bring the testes closer to the body in colder conditions) or relaxation (to cool them down in warm conditions).

• Biological Significance: The evolutionary adaptation of external testes is directly linked to reproductive success, ensuring the production of viable sperm capable of fertilization.

Additional Information

• Structure of the Testes: The testes are oval-shaped organs located in the scrotum. They consist of seminiferous tubules where spermatogenesis occurs, and Leydig cells responsible for testosterone production.

• Role of Testosterone: Testosterone, produced by the testes, plays a vital role in male reproductive health, including the development of secondary sexual characteristics and the regulation of sex drive.

• Scrotal Thermoregulation: The scrotum contains two muscles: dartos muscle (responsible for wrinkling the skin) and cremaster muscle (responsible for elevating the testes). These muscles help regulate the temperature of the testes by adjusting their position relative to the body.

• Medical Conditions Related to Testicular Temperature: Conditions like cryptorchidism (undescended testes) can lead to infertility due to prolonged exposure of the testes to higher temperatures inside the body.

• Scientific Studies: Research indicates that prolonged exposure to heat (e.g., from tight clothing or high environmental temperatures) can negatively affect sperm count and quality, highlighting the importance of the scrotal environment.

Important Points

• Evolutionary Perspective: The external positioning of testes in mammals is an evolutionary trait that ensures optimal sperm production and successful reproduction.

• Comparative Anatomy: In most mammals, testes are external for thermoregulation, but in some species like whales and elephants, they are internal due to specific adaptations.

• Cryptorchidism: This is a condition where the testes fail to descend into the scrotum during fetal development. It can lead to infertility and increased risk of testicular cancer.

• Daily Habits: Wearing loose-fitting clothing and avoiding prolonged exposure to heat sources (e.g., laptops, hot baths) can help maintain testicular health.

• Fertility Statistics: Studies show that lifestyle factors, including temperature regulation, play a significant role in male fertility rates globally.

Q16. Answer: (d) Atom has a dense positive nucleus at the center.

The correct answer is Atom has a dense positive nucleus at the center.

Key Points

• Rutherford's atomic model: Rutherford proposed that the atom consists of a dense, positively charged nucleus at the center, surrounded by electrons. This was established through his famous gold foil experiment conducted in 1911.

• The nucleus houses the protons (positively charged particles) and neutrons (neutral particles), and it is extremely small compared to the size of the atom.

• Electrons are not fixed but revolve around the nucleus in specific paths, which were later termed as orbitals by subsequent models. This refutes the idea of electrons being static in shells.

• Rutherford's model discarded the earlier concept of the atom being a uniform positive sphere, as proposed by J.J. Thomson in his "plum pudding model."

• The gold foil experiment demonstrated that most of the atom's space is empty, with only the nucleus occupying a small central region. This is evident from the fact that most alpha particles passed through the foil without deflection.

Additional Information

• Gold foil experiment:

• Conducted by Ernest Rutherford, this experiment used a beam of alpha particles directed at a thin gold foil.

• Most alpha particles passed through the foil, indicating that atoms consist largely of empty space.

• Some particles were deflected at large angles, leading to the discovery of a dense, positively charged nucleus.

• The experiment disproved J.J. Thomson's "plum pudding model," which suggested a uniform distribution of positive charge throughout the atom.

• Comparison of atomic models:

• Thomson's Model: Proposed that atoms are composed of a uniform positive charge with electrons embedded within, like raisins in a pudding.

• Rutherford's Model: Established the presence of a small, dense nucleus and electrons revolving around it.

• Bohr's Model: Refined Rutherford's model by introducing fixed energy levels or orbitals for electrons.

• Key terms:

• Alpha particles: Positively charged particles consisting of two protons and two neutrons, used in Rutherford's gold foil experiment.

• Nucleus: The dense central part of the atom containing protons and neutrons.

• Orbitals: Specific paths around the nucleus where electrons are likely to be found.

• Applications of Rutherford's discovery:

• Rutherford's atomic model laid the foundation for modern atomic theory and quantum mechanics.

• It helped in understanding the structure of atoms and the behavior of subatomic particles.

• This model contributed to advancements in nuclear physics, including the discovery of nuclear energy.

Important Points

• Statement Analysis:

• "Nucleus contains only electrons with negative charge": Incorrect. The nucleus contains protons (positive charge) and neutrons (neutral charge).

• "Electrons are fixed in shells around the nucleus": Incorrect. In Rutherford's model, electrons revolve around the nucleus and are not fixed in shells.

• "Atom is a uniform positive sphere throughout": Incorrect. Rutherford disproved this idea with his gold foil experiment.

• "Atom has a dense positive nucleus at the center": Correct. Rutherford's model established this as a key feature of atomic structure.

• Historical significance: Rutherford's discoveries significantly advanced scientific understanding of atomic structure and paved the way for further research in quantum mechanics and nuclear physics.

Q17. Answer: (c) high frequency and low frequency

The correct answer is high frequency and low frequency.

Key Points

• Pitch is a perceptual property of sound that allows us to distinguish between high and low tones. It primarily depends on the frequency of the sound wave.

• A high-pitch sound corresponds to a sound wave with a high frequency. For example, sounds like a whistle or a piccolo instrument produce high-pitch tones.

• A low-pitch sound corresponds to a sound wave with a low frequency. Examples include the bass notes of a tuba or the rumble of thunder.

• Amplitude, on the other hand, determines the loudness of the sound but does not influence the pitch. Therefore, amplitude is not relevant to the pitch differentiation in this context.

• Hence, the correct answer is that a high-pitch sound has a high frequency, and a low-pitch sound has a low frequency.

Additional Information

• Frequency:

• Frequency is the number of sound wave cycles that occur in a second, measured in Hertz (Hz).

• A higher frequency means more cycles per second and thus a higher pitch, while a lower frequency means fewer cycles per second and a lower pitch.

• For example, the typical human voice frequency range is approximately 85 Hz to 255 Hz, with men generally having lower frequencies than women.

• Amplitude:

• Amplitude represents the height of the sound wave and determines the loudness of the sound.

• Higher amplitude results in a louder sound, and lower amplitude results in a softer sound.

• However, amplitude does not affect the pitch of the sound.

• Examples of High and Low Pitch:

• High Pitch: Sounds like a mosquito's buzz or a soprano singing have high frequencies.

• Low Pitch: Sounds like a lion's roar or a bass guitar have low frequencies.

• Human Hearing Range:

• The average human ear can detect sounds in the frequency range of 20 Hz to 20,000 Hz.

• Frequencies above 20,000 Hz are termed ultrasound, while those below 20 Hz are called infrasound.

• Musical Instruments:

• String instruments like violins produce higher pitch sounds due to their short, thin strings vibrating at high frequencies.

• Larger instruments like tubas produce lower pitch sounds because their longer air columns create vibrations at lower frequencies.

Important Points

• High-Pitch Sounds: Often associated with smaller objects or shorter vibrating sources, such as flutes or whistles.

• Low-Pitch Sounds: Typically produced by larger objects or longer vibrating sources, like drums or large wind instruments.

• Children and Animals: Infants and some animals like dogs can hear higher frequencies than adults, as their hearing range is broader.

• Applications: High-frequency sounds are used in ultrasound imaging in medicine, while low-frequency sounds are used for seismic studies and underwater communication.

Q18. Answer: (b) Oysters

The correct answer is Oysters.

Key Points

• Oysters are marine mollusks that are primarily cultivated for the production of pearls, a process known as pearl farming or mariculture.

• Pearls are formed inside the shell of an oyster when an irritant, such as a grain of sand or a small parasite, becomes trapped inside. The oyster secretes layers of nacre (calcium carbonate) around the irritant, which eventually forms a pearl.

• Oysters used in pearl farming are typically of the species Pinctada, such as Pinctada maxima, Pinctada margaritifera, and Pinctada fucata, also known as pearl oysters.

• The process of pearl cultivation involves artificially introducing an irritant (usually a bead or a piece of mantle tissue) into the oyster to initiate the pearl-formation process. This is referred to as "cultured pearls."

• Other marine organisms such as prawns, pomfrets, and sardines are not involved in pearl production. These species are primarily valued as seafood rather than for any role in the cultivation of pearls. Hence, the correct answer is Oysters.

Additional Information

• Pearl Cultivation Process:

• The process involves carefully opening the oyster shell and inserting a nucleus (typically a small bead made of shell) and a piece of mantle tissue from another oyster into the gonad of the host oyster.

• The oyster is then returned to the water, where it will secrete layers of nacre over the nucleus, forming a pearl over time. This process can take several months to years, depending on the type of pearl being cultivated.

• Types of Pearls:

• Natural Pearls: Formed without human intervention, these are rare and expensive.

• Cultured Pearls: Created through human intervention by implanting an irritant into the oyster. These are more common and widely available in the market.

• Freshwater Pearls: Produced by freshwater mussels, often in rivers and lakes.

• Saltwater Pearls: Produced by oysters in marine environments, such as Akoya, South Sea, and Tahitian pearls.

• Economic Significance:

• Pearl farming is a significant industry in countries like Japan, China, Australia, and French Polynesia.

• The global pearl market is highly valued, with cultured pearls being the most significant contributor due to their commercial viability.

• Oysters' Role in Ecosystems:

• Oysters play a crucial role in marine ecosystems by filtering water and improving water quality.

• They also provide habitat and food for various marine species, contributing to biodiversity.

• Comparison with Other Marine Species:

• Prawns: Primarily cultivated for their high nutritional value and economic importance in the seafood industry.

• Pomfrets: A type of fish valued for its taste, commonly found in seafood markets.

• Sardines: Small, oily fish rich in omega-3 fatty acids, widely consumed as food.

Q19. Answer: (d) Contains cells dispersed in a mineralised extracellular matrix

The correct answer is Bone is classified as connective tissue primarily because it contains cells dispersed in a mineralised extracellular matrix..

Key Points

• Bone as Connective Tissue: Bone is considered a type of connective tissue because it has specialized cells dispersed within an extracellular matrix that is mineralized. This matrix gives bones their strength and rigidity.

• Extracellular Matrix Composition: The matrix is primarily composed of collagen fibers (organic component) and hydroxyapatite, a calcium phosphate mineral (inorganic component). These components work together to provide flexibility and hardness.

• Cell Types in Bone: Bone contains specialized cells such as osteoblasts (responsible for bone formation), osteoclasts (involved in bone resorption), and osteocytes (mature bone cells that maintain the bone matrix).

• Functions of Bone: Beyond structural support, bones serve multiple roles, including protection of internal organs, storage of minerals like calcium and phosphorus, and facilitation of movement through muscle attachment.

• Connective Tissue Characteristics: Like other connective tissues, bones are characterized by their extracellular matrix, which distinguishes them from tissues like nerve or muscle tissue. Thus, statement 4 is correct.

Additional Information

• Bone Tissue Types: There are two types of bone tissue:

• Cortical Bone: Also known as compact bone, it is dense and forms the outer layer of bones, providing strength and support.

• Trabecular Bone: Also called spongy bone, it is porous and found inside bones, aiding in weight reduction and housing bone marrow.

• Bone Remodeling: Bones are dynamic tissues that undergo continuous remodeling through the coordinated activity of osteoblasts and osteoclasts. This process helps maintain bone strength and calcium homeostasis.

• Bone Marrow: The spongy part of bones contains bone marrow, which is vital for hematopoiesis (formation of blood cells). The two types of marrow are:

• Red Bone Marrow: Responsible for producing red blood cells, white blood cells, and platelets.

• Yellow Bone Marrow: Primarily stores fat and serves as an energy reserve.

• Bone Development: Bone formation occurs through two processes:

• Intramembranous Ossification: Direct development of bone tissue from mesenchymal cells, primarily seen in flat bones like the skull.

• Endochondral Ossification: Bone develops by replacing cartilage, common in long bones like the femur.

• Bone Disorders: Common bone-related conditions include:

• Osteoporosis: Characterized by reduced bone density, leading to fragile bones.

• Rickets: Caused by vitamin D deficiency, leading to soft and weak bones in children.

• Osteoarthritis: A degenerative joint disease affecting cartilage and bones.

Important Points

• Incorrect Statements:

• Statement 1: “Produces nerve impulses” is incorrect as bone tissue does not produce nerve impulses. This is a function of the nervous system.

• Statement 2: “Lacks any matrix substance” is incorrect as the extracellular matrix is a defining feature of connective tissues, including bones.

• Statement 3: “Transports oxygen” is incorrect as oxygen transport is primarily the role of blood, not bone tissue.

• Physiological Role: Bones play a crucial role in maintaining posture, supporting body weight, and protecting vital organs like the brain, heart, and lungs.

• Mineral Storage: Bones act as reservoirs for minerals like calcium and phosphorus, which are essential for various physiological functions.

• Evolutionary Aspect: The development of a mineralized skeleton was a significant evolutionary advancement, enabling vertebrates to adapt to diverse environments.

Q20. Answer: (b) MgCl2

The correct answer is MgCl2.

Key Points

• Magnesium Chloride (MgCl2) is an ionic compound composed of magnesium (Mg) and chlorine (Cl) ions.

• Magnesium is a group 2 element in the periodic table and has a valency of +2, while chlorine is a group 17 element with a valency of -1.

• In MgCl2, one magnesium ion (Mg²^+) combines with two chloride ions (Cl^-) to maintain electrical neutrality. This results in the chemical formula MgCl2.

• Magnesium chloride is a highly soluble compound in water and is widely used in various industries such as food, pharmaceuticals, and agriculture.

• The chemical formula $MgCl_2$ is correct, and other options like $MgCl_3$, MgCl, or Mg_2Cl are incorrect because they do not follow the principles of chemical bonding and valency.

Additional Information

• Magnesium:

• Magnesium is a metallic element with the atomic number 12 and symbol Mg.

• It belongs to the alkaline earth metals group and is known for its lightweight and high strength.

• Magnesium is essential in biological systems and is a key component of chlorophyll in plants.

• Chlorine:

• Chlorine is a non-metallic element with the atomic number 17 and symbol Cl.

• It is a halogen and exists as a diatomic molecule (Cl_2) under standard conditions.

• Chlorine is widely used in disinfecting water and manufacturing products like PVC and solvents.

• Applications of Magnesium Chloride:

• Used as a de-icing agent on roads during winter.

• Serves as a precursor in the production of magnesium metal.

• Used in dietary supplements to treat magnesium deficiency.

• Plays a role in wastewater treatment and as a stabilizer in cement.

• Important Characteristics of Ionic Compounds:

• Ionic compounds like $MgCl_2$ are formed by the transfer of electrons between metals and non-metals.

• They have high melting and boiling points due to strong ionic bonds.

• They typically dissolve in water and conduct electricity in molten or aqueous states.

Important Points

• Valency Concept:

• Valency refers to the combining capacity of an element.

• Magnesium has a valency of +2 because it loses two electrons to achieve a stable electron configuration.

• Chlorine has a valency of -1 because it gains one electron to complete its octet.

• Role of Magnesium Chloride in Biology:

• Magnesium ions are vital for enzyme activation and biochemical processes.

• They play a critical role in maintaining the function of nerves and muscles.

• Industrial Use:

• Magnesium chloride is used in the production of textiles, paper, and fireproofing materials.

• It is also utilized in the preparation of brine solutions for refrigeration systems.

Q21. Answer: (b) Smooth muscle

The correct answer is Smooth muscle.

Key Points

• Smooth muscle is a type of involuntary muscle found in the walls of internal organs such as the stomach, intestines, blood vessels, and urinary bladder. These muscles are not under conscious control.

• Unlike skeletal muscles, smooth muscles lack striations (hence the name "smooth"). Their cells are spindle-shaped with a single nucleus.

• They play a vital role in various bodily functions, such as digestion and blood flow, by contracting and relaxing in a controlled manner.

• Smooth muscles are controlled by the autonomic nervous system. This means their activities are regulated by involuntary signals from the body rather than conscious effort.

• Examples of smooth muscle activity include the peristaltic movements in the gastrointestinal tract and the constriction/dilation of blood vessels to regulate blood pressure.

Additional Information

• Striated muscle:

• These muscles, also known as skeletal muscles, are attached to bones and are under voluntary control.

• They are characterized by a striated appearance due to the arrangement of actin and myosin filaments.

• These muscles are responsible for movements like walking, lifting, and other activities requiring conscious effort.

• Voluntary muscle:

YourMockTest.com — Free Study Material

• This is another term for skeletal muscles, as they are consciously controlled by the somatic nervous system.
• These muscles contract quickly but can fatigue if used extensively.
• Skeletal muscle:
• These muscles are attached to the skeleton and are involved in locomotion and posture maintenance.
• They are striated and multinucleated, with a cylindrical shape.
• Unlike smooth muscles, skeletal muscles require voluntary control to function.
• Important Characteristics of Smooth Muscle:
• Location: Found in the walls of hollow organs like the stomach, intestines, blood vessels, and uterus.
• Function: Smooth muscle contractions facilitate vital processes like digestion, circulation, and excretion.
• Control: Involuntary and regulated by the autonomic nervous system.
• Structure: Non-striated, spindle-shaped cells with a single nucleus.
• Examples of Activity: Peristalsis in the gastrointestinal tract, vasoconstriction, and vasodilation in blood vessels.

Q22. Answer: (c) hexagonal

The correct answer is hexagonal.

Key Points

• Graphite is an allotrope of carbon where each carbon atom is bonded to three other carbon atoms within the same plane, forming a hexagonal lattice structure.
• In this arrangement, carbon atoms are sp^2-hybridized, and each atom forms three sigma (σ) bonds with its neighboring atoms, leaving one electron for delocalized π-bonding.
• The hexagonal arrangement contributes to graphite's layered structure, where layers are held together by weak van der Waals forces, making it soft and slippery.
• This hexagonal structure gives graphite its unique properties, such as high electrical conductivity, due to the movement of delocalized electrons within the layers.
• Graphite's ability to form a hexagonal lattice is crucial for its industrial applications, including its use as a lubricant, in pencils, and in electrodes.

Additional Information

• Other Options Explained:
• Tetragonal: This is a crystal system where the unit cell is shaped like a rectangular prism with a square base. It is not observed in graphite.
• Pentagonal: A pentagonal structure involves five-sided polygons, which is not the arrangement found in graphite.
• Square Pyramidal: This refers to a molecular geometry where a central atom is surrounded by five ligands in a square-pyramidal configuration. This is not relevant to graphite's structure.
• Properties of Graphite:
• Graphite is a good conductor of electricity due to the mobility of delocalized π-electrons within its layers.
• It has a high melting point (about 3600°C) due to strong covalent bonds within the layers.
• Graphite is soft and slippery because the layers can slide over each other easily, a property attributed to weak van der Waals forces.
• It is chemically stable and resistant to high temperatures, making it suitable for use in high-temperature environments.
• Applications of Graphite:
• Used as a lubricant in machinery due to its slippery nature.
• Serves as an electrode material in batteries and electrolysis processes because of its excellent electrical conductivity.
• Used in pencils (as lead) due to its ability to leave marks on paper.
• Acts as a refractory material in high-temperature industrial processes.

Important Points

• Allotropes of Carbon: Apart from graphite, carbon has other allotropes, including diamond, graphene, fullerenes, and carbon nanotubes.
• Diamond vs. Graphite: While graphite has a hexagonal structure with sp^2 hybridization, diamond has a tetrahedral structure with sp^3 hybridization, making it the hardest naturally occurring substance.
• Graphene: Graphene is a single layer of graphite and exhibits extraordinary electrical, thermal, and mechanical properties.
• Van der Waals Forces: These weak forces between the layers of graphite allow the layers to slide, contributing to its lubricating properties.

YourMockTest.com — Free Study Material

Q23. Answer: (a) OH^-

The correct answer is OH^-.

Key Points

• The presence of OH^- (hydroxide ions) is primarily responsible for the basic nature of a substance. Substances that release hydroxide ions in an aqueous solution are classified as bases according to the Arrhenius definition.

• Bases such as sodium hydroxide (NaOH) and potassium hydroxide (KOH) dissociate in water to produce OH^- ions, which increase the pH of the solution, making it basic.

• The pH scale (ranging from 0 to 14) is used to measure the acidity or basicity of a solution. A pH greater than 7 indicates a basic solution, which is due to the presence of excess OH^- ions.

• OH^- ions react with H^+ ions (from acids) to form water (H2O), neutralizing the acidic effect and reinforcing the basic nature of a substance.

• Other ions such as H^+, Cl^-, and Na^+ do not contribute directly to the basicity of a solution:

• H^+: Contributes to acidity, not basicity.

• Cl^- and Na^+: These are spectator ions and do not affect the pH of the solution.

Additional Information

• Properties of Bases:

• Bases have a bitter taste and a slippery feel.

• They turn red litmus paper blue, which is a common indicator for basic substances.

• Examples include NaOH, KOH, NH4OH, and Ca(OH)2.

• Types of Bases:

• Strong bases: Completely dissociate in water to produce OH^- ions. Example: NaOH.

• Weak bases: Partially dissociate in water. Example: NH3 (ammonia).

• Neutralization Reaction:

• When a base reacts with an acid, a neutralization reaction occurs, producing water and a salt. For example:

• HCl + NaOH → NaCl + H2O

• Importance of pH in Daily Life:

• Soil pH: Farmers monitor soil pH to ensure optimal growth conditions for crops.

• Human body: The pH of blood is maintained around 7.4, which is slightly basic, to support normal physiological functions.

• Common Indicators for Bases:

• Phenolphthalein: Turns pink in basic solutions.

• Universal Indicator: Shows green to purple shades for basic solutions, depending on their pH.

Important Points

• Arrhenius Theory: A substance is considered a base if it increases the concentration of OH^- ions in an aqueous solution.

• Brønsted-Lowry Theory: Bases are proton acceptors, which means they accept H^+ ions in a chemical reaction.

• Lewis Theory: Bases are electron-pair donors, which explains their ability to form bonds with acids (electron-pair acceptors).

• Industrial Applications: Bases like NaOH are widely used in soap manufacturing, paper production, and water treatment.

• Household Examples: Baking soda (NaHCO3) and ammonia (NH3) are common basic substances used in cleaning and cooking.

Q24. Answer: (c) To prevent overloading and protect appliances

The correct answer is To prevent overloading and protect appliances.

Key Points

• A fuse is an essential safety device in an electric circuit that helps prevent overloading and protects electrical appliances from damage.

• It is designed to break the circuit automatically when the current exceeds a certain threshold, ensuring the safety of the circuit and connected devices.

• The fuse operates by melting its wire or filament when the current becomes too high. This action interrupts the flow of electricity, effectively stopping the risk of overheating or electrical fires.

• Fuses are rated for specific current limits. If the current flowing through the fuse exceeds its rated capacity, the fuse blows, preventing damage to the appliances and the circuit.

• Overloading can occur due to faulty wiring, excessive current draw from multiple devices, or short circuits. A fuse serves as a safeguard in such scenarios.

Additional Information

• Working Principle of a Fuse:

YourMockTest.com — Free Study Material

• A fuse consists of a thin wire or filament made of a material with a low melting point.
• When the current in the circuit exceeds the fuse's rated capacity, the wire heats up and melts, breaking the electrical circuit.
• This prevents further flow of electricity, protecting the appliances and wiring from potential damage.
• Types of Fuses:
• Cartridge Fuses: Cylindrical in shape, commonly used in industrial and domestic applications.
• Rewirable Fuses: Used in older domestic circuits where the fuse wire can be replaced manually.
• High Rupturing Capacity (HRC) Fuses: Designed for high voltage applications, offering reliable protection against short circuits and overloading.
• Advantages of Fuses:
• Provides effective protection against electrical overload and short circuits.
• Simple and inexpensive safety device.
• Can be easily replaced after it blows due to excessive current.
• Limitations of Fuses:
• Once a fuse blows, it needs to be replaced manually, which may not be convenient in some cases.
• Not suitable for precise or advanced protection in modern circuits.
• Fuses cannot be reused once blown, unlike circuit breakers.
• Alternatives to Fuses:
• Circuit Breakers: These are reusable devices that can be reset manually or automatically after tripping due to overcurrent.
• Residual Current Devices (RCDs): Provide protection against electrical shocks and leakage currents.

Important Points

• Electrical Safety Standards:
• Fuses are designed to comply with safety standards such as IS: 2086 and IEC 60269 for household and industrial applications.
• Proper installation of fuses ensures compliance with electrical codes and regulations to prevent hazards.
• Applications of Fuses:
• Used in household circuits for protecting appliances like refrigerators, air conditioners, and washing machines.
• Essential for industrial applications to safeguard machinery and equipment from electrical faults.
• Automotive fuses are widely used in vehicles to protect wiring and electrical components.
• Historical Evolution:
• The concept of fuses was introduced in the late 19th century to address the growing risks of electrical fires due to overloading.
• Advancements in fuse design have led to better reliability and efficiency in modern electrical systems.

Q25. Answer: (c) Alloying

The correct answer is Alloying.

Key Points

• Corrosion is the process of deterioration of materials, usually metals, as a result of chemical reactions with their environment.
• Factors like air (oxygen), water, and acids are primary contributors to corrosion because they participate in electrochemical reactions that degrade metal surfaces.
• Alloying, on the other hand, is a process of combining two or more elements (at least one being a metal) to enhance the properties of the base metal. It is used to improve resistance to corrosion rather than causing it.
• For example, the addition of chromium to steel forms stainless steel, which has a much higher resistance to corrosion compared to ordinary steel.
• Hence, the process of alloying does not contribute to corrosion; instead, it is a method to prevent or reduce it. Thus, the correct answer is Alloying.

Additional Information

• Air and Corrosion:
• Air, specifically oxygen, is a major factor in corrosion. It reacts with metals like iron to form oxides, commonly known as rust.
• For instance, iron reacts with oxygen and water to form hydrated iron(III) oxide (rust), which weakens the metal over time.
• Water and Corrosion:
• Water acts as an electrolyte, facilitating the electrochemical reactions that lead to corrosion.
• The presence of dissolved salts in water (e.g., seawater) accelerates the process of corrosion by increasing its conductivity.
• Acids and Corrosion:
• Acidic environments significantly enhance the corrosion process by providing hydrogen ions that react with metal surfaces.
• For example, sulfuric acid can rapidly corrode metals like iron and steel.

• Alloying and Corrosion Prevention:

• Alloying metals with elements like chromium, nickel, or molybdenum enhances their resistance to corrosion.

• Stainless steel, made by alloying steel with chromium and nickel, forms a passive layer of chromium oxide, which protects it from corrosion.

• Other examples include brass (copper and zinc) and bronze (copper and tin), which have better corrosion resistance than pure copper.

Important Points

• Electrochemical Process of Corrosion:

• Corrosion is an electrochemical process involving oxidation at the anode and reduction at the cathode.

• For example, in the case of iron:

• At the anode: Fe → Fe²^+ + 2e^-

• At the cathode: O2 + 4H^+ + 4e^- → 2H2O

• The overall reaction leads to the formation of rust.

• Prevention of Corrosion:

• Using protective coatings like paint or galvanization (coating with zinc).

• Employing cathodic protection, where a more easily oxidized metal is used as a sacrificial anode.

• Alloying metals to improve their resistance, as seen in the case of stainless steel.

• Examples of Corrosion:

• Rusting of iron and steel in moist environments.

• Corrosion of copper, which forms a green patina (copper carbonate).

• Galvanic corrosion, occurring when two dissimilar metals are in electrical contact in the presence of an electrolyte.

Q26. Answer: (a) 24

Shortcut Trick

Apply the Chain Rule formula: (M1 × D1) / W1 = (M2 × D2) / W2

(18 × 4) / 65 = (M2 × 6) / 130

M2 = (18 × 4 × 130) / (65 × 6) = 3 × 4 × 2 = 24

Therefore The correct answer is 24 men.

Alternate Method

Given:

M1 = 18 men, D1 = 4 days, W1 = 65 feet

W2 = 130 feet, D2 = 6 days, M2 = ?

Calculation:

=> (18 × 4) / 65 = (M2 × 6) / 130

=> 72 / 65 = (6 × M2) / 130

=> 6 × M2 = (72 × 130) / 65

=> 6 × M2 = 72 × 2

=> 6 × M2 = 144

=> M2 = 144 / 6

=> M2 = 24

Therefore The correct answer is 24 men.

Additional Information

General Chain Rule Formula

For problems involving men, days, hours, and work, use: (M1×D1×H1)/W1 = (M2×D2×H2)/W2.

Work Proportion

Number of men (M) is directly proportional to Work (W) and inversely proportional to Time (D).

Man-Days Concept

Total effort is measured in man-days, calculated as the product of the number of men and the number of days worked.

Q27. Answer: (a) Rs. 6,897

Shortcut Trick

Use the Successive Percentage method for 2 years at 10%.

Effective Rate = x + y + (x × y)/100 => 10 + 10 + (10 × 10)/100 = 21%.

Total Amount = 121% of Principal.
Amount = 5700 × 1.21 = Rs. 6,897.
Therefore The correct answer is Rs. 6,897.
Alternate Method
Given:
Principal (P) = Rs. 5,700
Rate (R) = 10% per annum
Time (n) = 2 years
Formula Used:
Amount (A) = $P \times (1 + R/100)^n$
Calculations:
=> $A = 5700 \times (1 + 10/100)^2$
=> $A = 5700 \times (110/100) \times (110/100)$
=> $A = 5700 \times 1.1 \times 1.1$
=> $A = 5700 \times 1.21$
=> $A = 57 \times 121$
=> $A = 6897$
Therefore The correct answer is Rs. 6,897.
Additional Information
Compound Interest Formula
Interest (CI) = Amount − Principal = $P[(1 + R/100)^n - 1]$.
Effective Rate for 2 Years
Equivalent rate = $R + R + (R^2/100)$. This simplifies calculations for 2-year problems.
SI vs CI Difference
The difference between CI and SI for 2 years is given by the formula: Diff = $P(R/100)^2$.

Q28. Answer: (c) 67.5

Shortcut Trick
Let the number be 100%.
According to the question: 20% + 72 = 100%
=> 80% = 72
=> 1% = 72 ÷ 80 = 0.9
=> 75% = 0.9 × 75 = 67.5
Therefore The correct answer is 67.5.
Alternate Method
Given:
20% of a number added to 72 results in the number itself.
Let the number be x.
=> (20/100) × x + 72 = x
=> 0.2x + 72 = x
=> 72 = x − 0.2x
=> 72 = 0.8x
=> x = 72 ÷ 0.8 = 90
Now, find 75% of the number:
=> 75% of 90 = (75/100) × 90
=> 0.75 × 90 = 67.5
Therefore The correct answer is 67.5.
Additional Information
Percentage to Fraction Conversion
To simplify calculations, remember 20% = 1/5 and 75% = 3/4. Using fractions can often speed up arithmetic in competitive exams.
Percentage Change Base
When a value is increased by x%, the new value is (100 + x)% of the original. Conversely, a decrease of x% results in (100 − x)%

of the original.

Q29. Answer: (c) 100 years

Shortcut Trick

Ratio of Father : Son currently = 3 : 1 (Difference = 2)

Ratio 10 years ago = 5 : 1 (Difference = 4)

Equating difference: Current ratio × 2 → 6 : 2. Ten years ago → 5 : 1.

Difference in ratio parts (6 − 5) = 1 unit → 10 years.

Current total units = 6 + 2 = 8 units → 80 years. Sum after 10 years = 80 + 10 + 10 = 100 years.

Therefore The correct answer is 100 years.

Alternate Method

Let the current age of the son be x years.

The current age of the father = 3x years.

10 years ago:

=> (3x − 10) = 5 × (x − 10)

=> 3x − 10 = 5x − 50

=> 2x = 40

=> x = 20 years (Son's current age)

=> 3x = 60 years (Father's current age)

10 years from now:

=> Father's age = 60 + 10 = 70 years

=> Son's age = 20 + 10 = 30 years

=> Sum = 70 + 30 = 100 years

Therefore The correct answer is 100 years.

Additional Information

Age Difference Property

The difference between the ages of two persons remains constant at any point in time.

Ratio Balancing Method

To solve age problems quickly, multiply ratios such that the numerical difference between ratio parts becomes equal to the time interval.

Future Age Sum

If the sum of ages of n people is S today, then after t years, the sum will be S + (n × t).

Q30. Answer: (b) 56°

Shortcut Trick

For two complementary angles with sum S and difference D:

Bigger angle = (S + D) ÷ 2

=> (90° + 22°) ÷ 2 = 112° ÷ 2 = 56°

Therefore The correct answer is 56°.

Alternate Method

Given: Two angles are complementary and their difference is 22°.

Formula Used: Sum of complementary angles = 90°.

Let the two angles be x and y, where x is the bigger angle.

=> x + y = 90° ... (i)

=> x − y = 22° ... (ii)

=> Adding equations (i) and (ii):

=> (x + y) + (x − y) = 90° + 22°

=> 2x = 112°

=> x = 112° ÷ 2 = 56°

=> y = 90° − 56° = 34°

Therefore The correct answer is 56°.

Additional Information

Q31. Answer: (c) 6.03

Shortcut Trick

Total frequency N = 51, so N/2 = 25.5.

Cumulative Frequency (CF) just above 25.5 is 29, identifying the Median Class as 145 − 150.

Median = 145 + [(25.5 − 11) ÷ 18] × 5 = 145 + 4.03 = 149.03 cm.

Equating with given form: 143 + X = 149.03 => X = 6.03.

Therefore The correct answer is 6.03.

Alternate Method

Given Data Table:

Class Interval | Frequency (f) | Cumulative Frequency (CF)

Below 140 | 4 | 4

140 − 145 | 7 | 11

145 − 150 | 18 | 29

150 − 155 | 11 | 40

155 − 160 | 6 | 46

160 − 700 | 5 | 51

Formula Used:

Median = L + [(N/2 − CF_p) ÷ f] × h

Where:

L = Lower limit of median class = 145

N = Total frequency = 51

CF_p = Cumulative frequency of the preceding class = 11

f = Frequency of the median class = 18

h = Class width = 5

Calculations:

=> N/2 = 51 ÷ 2 = 25.5

=> Median = 145 + [(25.5 − 11) ÷ 18] × 5

=> Median = 145 + [14.5 ÷ 18] × 5

=> Median = 145 + [72.5 ÷ 18]

=> Median = 145 + 4.0277...

=> Median ≈ 149.03 (rounded to two decimal places)

=> Given: Median = 143 + X

=> 149.03 = 143 + X

=> X = 149.03 − 143

=> X = 6.03

Therefore The correct answer is 6.03.

Additional Information

Median for Grouped Data

The Median is the value that separates the higher half from the lower half of a data sample. For grouped data, it is calculated using the interpolation formula based on Cumulative Frequency.

Empirical Relationship

The relationship between the three measures of central tendency is: Mode = 3 × Median − 2 × Mean.

Mode for Grouped Data

Mode = L + [(f1 − f0) ÷ (2f1 − f0 − f2)] × h, where f1 is the frequency of the modal class.

Q32. Answer: (b) 135

Shortcut Trick

Speed remains constant, so Time is directly proportional to Distance.

Ratio of Distances = 8763 : (8763 + 552) = 8763 : 9315

Time for platform = 127 × (9315 ÷ 8763) = 127 × (1.0629...) or simplified by parts.

Effective distance increase = 552 m. Time for 552 m = (127 ÷ 8763) × 552 ≈ 8 seconds.

Total time = 127 + 8 = 135 seconds.

YourMockTest.com — Free Study Material

Therefore The correct answer is 135 seconds.

Alternate Method

Given: Length of train (L_T) = 8763 m, Time to cross pole (t1) = 127 s, Length of platform (L_P) = 552 m.

Formula Used: Speed = Distance ÷ Time; Time = Total Distance ÷ Speed

=> Speed of train = L_T ÷ t1

=> Speed = 8763 ÷ 127 = 69 m/s

=> Total distance to cross platform = L_T + L_P

=> Total Distance = 8763 + 552 = 9315 m

=> Required Time = Total Distance ÷ Speed

=> Time = 9315 ÷ 69

=> Time = 135 seconds

Therefore The correct answer is 135 seconds.

Additional Information

Train Crossing Stationary Objects

When a train crosses a pole or a standing man, distance = length of train. When it crosses a platform or bridge, distance = length of train + length of object.

Relative Speed

If two trains of lengths L1 and L2 move at speeds S1 and S2, time taken to cross each other is (L1 + L2) ÷ (S1 ± S2) based on direction.

Unit Conversion

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

Q33. Answer: (a) 40%

Given:

Value 1 = 1 ÷ 20

Value 2 = 10 ÷ 80

Formula Used:

Percentage = (Value 1 ÷ Value 2) × 100

Calculation:

=> (1 ÷ 20) ÷ (10 ÷ 80)

=> = (1 ÷ 20) × (80 ÷ 10)

=> = 80 ÷ 200

=> = 2 ÷ 5

=> Percentage = (2 ÷ 5) × 100

=> = 40

Therefore The correct answer is 40%.

Q34. Answer: (d) 160%

Shortcut Trick

Relation between Marked Price (MP) and Cost Price (CP): MP/CP = (100 + Profit%)/(100 − Discount%)

MP/CP = (100 + 30)/(100 − 50) = 130/50 = 13/5

Mark-up percentage = (Difference / CP) × 100 = (13 − 5)/5 × 100 = 8/5 × 100 = 160%

Therefore The correct answer is 160%.

Alternate Method

Given: Discount = 50%, Profit = 30%

Formula Used: Selling Price (SP) = CP × (1 + Profit/100) = MP × (1 − Discount/100)

=> Let Cost Price (CP) = 100 units

=> Selling Price (SP) = 100 + 30% of 100 = 130 units

=> Selling Price is also = MP × (100 − 50)/100 = 0.5 × MP

=> 0.5 × MP = 130

=> Marked Price (MP) = 130 / 0.5 = 260 units

=> Mark-up = MP − CP = 260 − 100 = 160 units

=> Mark-up percentage = (160 / 100) × 100 = 160%

Therefore The correct answer is 160%.

Additional Information

Mark-up Percentage

It is the percentage by which the Marked Price is higher than the Cost Price. Formula: [(MP − CP) / CP] × 100.

Successive Discount

If two discounts d1 and d2 are given, the equivalent discount is [d1 + d2 − (d1 × d2)/100]%.

Dishonest Dealer

Profit% = [Error / (True Value − Error)] × 100 when the dealer uses less weight than specified.

Q35. Answer: (d) 1

Shortcut Trick

Check odd numbers between 386 and 395: 387, 389, 391, 393.

387 → 3 + 8 + 7 = 18 (divisible by 9)

393 → 3 + 9 + 3 = 15 (divisible by 3)

391 → 17 × 23 = 391

389 → Not divisible by 2, 3, 5, 7, 11, 13, 17, 19.

Therefore The correct answer is 1.

Alternate Method

Given: Range = 386 to 395.

Numbers in range: 387, 388, 389, 390, 391, 392, 393, 394.

Eliminate even numbers: 388, 390, 392, 394 are not prime.

Check remaining odd numbers:

=> 387: Sum of digits = 3+8+7 = 18. Since 18 is divisible by 3, 387 is composite.

=> 389: To check if prime, test primes up to √389 ≈ 19.7. Primes are 2, 3, 5, 7, 11, 13, 17, 19. None divide 389. 389 is prime.

=> 391: 391 ÷ 17 = 23. So, 391 is composite.

=> 393: Sum of digits = 3+9+3 = 15. Since 15 is divisible by 3, 393 is composite.

=> Total prime numbers = 1 (which is 389).

Therefore The correct answer is 1.

Additional Information

Prime Number Definition

A natural number greater than 1 that has no positive divisors other than 1 and itself.

Primality Test

To check if N is prime, test divisibility by all primes less than or equal to √N.

Divisibility by 3 and 9

A number is divisible by 3 (or 9) if the sum of its digits is divisible by 3 (or 9).

Q36. Answer: (a) 2.952 hours

Shortcut Trick

Let Original Speed be S. Speeds in subsequent hours follow a GP with common ratio r = 0.8.

Total distance in 4 hours = S + 0.8S + 0.64S + 0.512S = 2.952S.

Time at original speed = Total Distance ÷ Original Speed = 2.952S ÷ S = 2.952 hr.

Therefore The correct answer is 2.952 hr.

Alternate Method

Given: Speed decreases by 20% every hour. Total duration = 4 hours.

Formula Used: Distance = Speed × Time

=> Let original speed = v km/hr.

=> Speed in 1st hour = v; Distance1 = v × 1 = v

=> Speed in 2nd hour = 0.8v; Distance2 = 0.8v × 1 = 0.8v

=> Speed in 3rd hour = 0.8 × 0.8v = 0.64v; Distance3 = 0.64v

=> Speed in 4th hour = 0.8 × 0.64v = 0.512v; Distance4 = 0.512v

=> Total Distance = v + 0.8v + 0.64v + 0.512v = 2.952v

=> Time at original speed = Total Distance ÷ v

YourMockTest.com — Free Study Material

=> Time = 2.952v ÷ v = 2.952 hr.

Therefore The correct answer is 2.952 hr.

Additional Information

Geometric Progression in Motion

When speed changes by a fixed percentage over equal intervals, the distances covered form a GP. Total distance is $S_n = a(1 - r^n) / (1 - r)$.

Percentage Decrease

A decrease of x% is equivalent to multiplying the value by (100 − x)/100. Here, 20% decrease => multiplier of 0.8.

Q37. Answer: (c) 52 m

Shortcut Trick

Direct formula for Perimeter (P) given Area (A) and Diagonal (d):

$P = 2 \times \sqrt{(d^2 + 2 \times A)}$

$P = 2 \times \sqrt{(18^2 + 2 \times 176)} = 2 \times \sqrt{(324 + 352)}$

$P = 2 \times \sqrt{676} = 2 \times 26 = 52$ m

Therefore The correct answer is 52 m.

Alternate Method

Given:

Area of the rectangle = 176 m^2

Diagonal length = 18 m

Formula Used:

1. Area = l × w
2. Diagonal² = l² + w²
3. Algebraic Identity: $(l + w)^2 = l^2 + w^2 + 2lw$
4. Perimeter = 2(l + w)

Calculations:

=> l × w = 176

=> $l^2 + w^2 = 18^2 = 324$

=> $(l + w)^2 = (l^2 + w^2) + 2(lw)$

=> $(l + w)^2 = 324 + 2(176)$

=> $(l + w)^2 = 324 + 352 = 676$

=> $l + w = \sqrt{676} = 26$ m

=> Perimeter = 2(l + w) = 2 × 26 = 52 m

Therefore The correct answer is 52 m.

Additional Information

Rectangle Properties

A rectangle is a quadrilateral with four right angles. Opposite sides are equal and parallel, and diagonals bisect each other.

Pythagoras Theorem

In a right-angled triangle, the square of the hypotenuse (diagonal) equals the sum of the squares of the other two sides: $a^2 + b^2 = c^2$.

Algebraic Identities

The identity $(a + b)^2 = a^2 + b^2 + 2ab$ is commonly used to find the sum of sides when area and diagonal are known.

Q38. Answer: (d) 1/2

Given:

9^k + 3^(2k−1) = (2/3) [5^(k+1/2) + 5^(k−1/2)]

Calculation:

Simplifying the Left Hand Side (LHS): 9k + 32k−1

=> LHS = (3²)^k + 3^(2k−1)

=> LHS = 3^(2k) + 3^(2k−1)

=> LHS = 3^(2k−1) ($3^1 + 1$)

=> LHS = 4 × 3^(2k−1)

Simplifying the Right Hand Side (RHS):

=> RHS = (2/3) × 5^(k−1/2) [5^((k+1/2)−(k−1/2)) + 1]
=> RHS = (2/3) × 5^(k−1/2) [5^1 + 1]
=> RHS = (2/3) × 5^(k−1/2) × 6
=> RHS = 4 × 5^(k−1/2)
Equating LHS and RHS:
=> 4 × 3^(2k−1) = 4 × 5^(k−1/2)
=> 3^(2k−1) = 5^(k−1/2)
=> (3^2)^(k−1/2) = 5^(k−1/2)
=> 9^(k−1/2) = 5^(k−1/2)
=> (9/5)^(k−1/2) = 1
=> k − 1/2 = 0
=> k = 1/2
Therefore The correct answer is 1/2.
Additional Information
Laws of Indices
For any non-zero base, a^m × a^n = a^(m+n) and (a^m)^n = a^(mn). Also, a^(−n) = 1/a^n.
Equality of Exponents
If a^x = b^x where a and b are positive and a ≠ b, then the exponent x must be 0.
Zero Exponent Rule
Any non-zero number raised to the power of zero is equal to 1, i.e., a^0 = 1.

Q39. Answer: (a) 26.62%

Shortcut Trick
Relation between Marked Price (MP), Cost Price (CP), Profit%, and Discount% is:
MP / CP = (100 + Profit%) / (100 − Discount%)
139 / 100 = (100 + 2) / (100 − D)
100 − D = (102 × 100) / 139 ≈ 73.38
D = 100 − 73.38 = 26.62%
Therefore The correct answer is 26.62%.
Alternate Method
Given:
Marked Price (MP) = Rs. 821
Markup Percentage = 39% above CP
Profit Percentage = 2%
Calculations:
=> Let Cost Price (CP) = 100 units
=> Marked Price (MP) = 100 + 39% of 100 = 139 units
=> Selling Price (SP) = 100 + 2% of 100 = 102 units
=> Discount Amount = MP − SP = 139 − 102 = 37 units
=> Discount Percentage = (Discount / MP) × 100
=> Discount Percentage = (37 / 139) × 100
=> Discount Percentage = 3700 / 139 ≈ 26.6187%
=> Discount Percentage ≈ 26.62%
Therefore The correct answer is 26.62%.
Additional Information
Markup and Discount Relation
Effective Profit% is given by: Markup% − Discount% − (Markup × Discount)/100. This is derived from successive percentage application.
Marked Price Formula
MP = CP × (100 + Markup%)/100. Similarly, SP = MP × (100 − Discount%)/100.
Successive Discounts
If two discounts d1 and d2 are given, the single equivalent discount is: d1 + d2 − (d1 × d2)/100.

YourMockTest.com — Free Study Material

Q40. Answer: (d) 12

Shortcut Trick

Subtract the constant term from the result and divide by the coefficient of x.

Value of x = (Result − Constant) ÷ Coefficient

x = (62 − 2) ÷ 5 = 60 ÷ 5

x = 12

Therefore The correct answer is 12.

Alternate Method

Given:

The linear equation is 5x + 2 = 62.

Method used:

We use the transposition method to isolate the variable x by moving constants to the Right Hand Side (RHS).

Calculations:

=> 5x + 2 = 62

=> 5x = 62 − 2

=> 5x = 60

=> x = 60 ÷ 5

=> x = 12

Therefore The correct answer is 12.

Additional Information

Linear Equation in One Variable

A linear equation is an algebraic equation where each term has an exponent of at most 1, represented as ax + b = c.

Transposition Rule

When moving a term from the LHS to the RHS, addition becomes subtraction, and multiplication becomes division.

Verification of Roots

To verify, substitute the value back: 5(12) + 2 = 60 + 2 = 62. Since LHS = RHS, the value is correct.

Q41. Answer: (c) 55

Shortcut Trick

Assume a base mean of 50.

Calculate net deviation from 50: −34 + 35 + 48 − 38 + 19 + 45 − 29 − 5 + 4 = 45.

Average deviation = 45 ÷ 9 = 5.

Arithmetic Mean = Base + Average Deviation = 50 + 5 = 55.

Therefore The correct answer is 55.

Alternate Method

Given: Observations = 16, 85, 98, 12, 69, 95, 21, 45, 54

Formula: Arithmetic Mean = (Sum of all observations) ÷ (Total number of observations)

=> Sum = 16 + 85 + 98 + 12 + 69 + 95 + 21 + 45 + 54

=> Sum = 495

=> Total count (n) = 9

=> Arithmetic Mean = 495 ÷ 9 = 55

Therefore The correct answer is 55.

Additional Information

Arithmetic Mean Formula

The mean (μ) is calculated as $\Sigma x_i \div n$, where Σx_i is the sum of observations and n is the total number.

Deviation Property

The sum of deviations of all observations from their arithmetic mean is always zero: $\Sigma(x_i - \text{Mean}) = 0$.

Combined Mean

If two groups have sizes n1, n2 and means x1, x2, the combined mean is (n1x1 + n2x2) ÷ (n1 + n2).

YourMockTest.com — Free Study Material

Q42. Answer: (d) 2.52 cm

Shortcut Trick

Volume of chocolate used = (4/3) × π × ($R^3 - r^3$)

800π/3 = 4π/3 × ($6^3 - r^3$)

200 = 216 − r^3

r^3 = 16 => r = 16^(1/3) ≈ 2.52 cm

Therefore The correct answer is 2.52 cm.

Alternate Method

Given:

Outer radius of the spherical chocolate truffle (R) = 6 cm

Volume of the chocolate layer = 800π/3 cm^3

Let the radius of the spherical hollow cavity be 'r' cm.

Formula Used:

Volume of a hollow sphere = (4/3) × π × ($R^3 - r^3$)

Calculations:

=> 800π/3 = (4/3) × π × ($6^3 - r^3$)

=> 800/3 = 4/3 × (216 − r^3)

=> 800 = 4 × (216 − r^3)

=> 200 = 216 − r^3

=> r^3 = 216 − 200

=> r^3 = 16

=> r = $\sqrt[3]{16} = 2 \times \sqrt[3]{2}$

=> r ≈ 2 × 1.2599 = 2.5198 cm

=> r ≈ 2.52 cm

Therefore The correct answer is 2.52 cm.

Additional Information

Volume of a Sphere

The total space occupied by a sphere is given by V = (4/3)πr^3, where r is the radius.

Surface Area of a Sphere

The total surface area of a sphere is given by A = 4πr^2.

Spherical Shell

The volume of material in a spherical shell with outer radius R and inner radius r is V = (4/3)π($R^3 - r^3$).

Q43. Answer: (a) 3,720

Shortcut Trick

Candidate A = 60%, Candidate B = 40% (Remaining)

Difference in percentage = 60% − 40% = 20%

Difference in votes = 20% of 18,600

Difference = 18,600 ÷ 5 = 3,720

Therefore The correct answer is 3,720 votes.

Alternate Method

Given:

Total valid votes = 18,600

Votes for Candidate A = 60%

Calculations:

=> Votes received by Candidate A = 60% of 18,600

=> Votes (A) = (60 ÷ 100) × 18,600 = 11,160

=> Votes received by Candidate B = Total − A = 18,600 − 11,160 = 7,440

=> Difference = 11,160 − 7,440 = 3,720

Therefore The correct answer is 3,720 votes.

Additional Information

Percentage Difference

When comparing two parts of a whole, the difference in values is equal to the difference in their percentage shares multiplied by the total value.

Invalid Votes

In complex election problems, Total Votes = Valid Votes + Invalid Votes. Percentages are usually calculated on valid votes unless stated otherwise.

Winner Margin

The margin of victory is the difference between the votes of the winner and the runner-up.

Q44. Answer: (c) 20

Shortcut Trick

Difference in SP = Rs. 20

Difference in Profit % = 2x% − x% = x%

Since the base Cost Price (CP) is same, the 20 rupee increase corresponds to x% of CP.

Earlier SP (120) = CP + x% of CP => 120 = CP + 20 => CP = Rs. 100.

x% = (Difference / CP) × 100 = (20 / 100) × 100 = 20%.

Therefore The correct answer is 20.

Alternate Method

Given:

Case 1: SP1 = Rs. 120, Profit = x%

Case 2: SP2 = 120 + 20 = Rs. 140, Profit = 2x%

Formula: CP = [SP × 100] / [100 + Profit%]

=> Case 1: CP = [120 × 100] / [100 + x]

=> Case 2: CP = [140 × 100] / [100 + 2x]

=> [120 × 100] / [100 + x] = [140 × 100] / [100 + 2x]

=> 12 / (100 + x) = 14 / (100 + 2x)

=> 6 / (100 + x) = 7 / (100 + 2x)

=> 6 × (100 + 2x) = 7 × (100 + x)

=> 600 + 12x = 700 + 7x

=> 12x − 7x = 700 − 600

=> 5x = 100

=> x = 20

Therefore The correct answer is 20.

Additional Information

Profit and Loss Basics

Profit = Selling Price (SP) − Cost Price (CP). Profit% = (Profit / CP) × 100.

Constant Cost Price Rule

If the Cost Price remains constant, the change in the Selling Price is directly proportional to the change in the Profit percentage (SP2 − SP1 = (P2% − P1%) × CP).

Marked Price and Discount

Discount is always calculated on the Marked Price (MP). SP = MP − Discount.

Q45. Answer: (c) 173 m

Shortcut Trick

In a 30°-60°-90° triangle, the sides are in the ratio 1 : √3 : 2.

Side opposite to 30° (Height) = 1 unit = 100 m.

Side opposite to 60° (Base/Distance) = √3 units = 100 × 1.73 = 173 m.

Therefore The correct answer is 173 m.

Alternate Method

Given:

Height of tower (AB) = 100 m

Angle of elevation (angle APB) = 30°

Formula Used:

tan θ = Perpendicular ÷ Base

Calculations:

=> tan 30° = AB ÷ BP

=> 1/√3 = 100 ÷ x

=> x = 100 × √3

=> x = 100 × 1.73

=> x = 173 m

Therefore The correct answer is 173 m.

Additional Information

Trigonometric Ratios

Standard values for height and distance: tan 30° = 1/√3, tan 45° = 1, tan 60° = √3.

Angle of Elevation vs Depression

The angle of elevation from an observer to an object is equal to the angle of depression from the object to the observer due to alternate interior angles.

Pythagorean Theorem

In any right-angled triangle, Hypotenuse² = Base² + Perpendicular².

Q46. Answer: (c) 8

Shortcut Trick

Apply the Inverse Proportion rule (M1D1 = M2D2).

Initial: 100 men × 12 weeks = 1200 man-weeks of provisions.

New group: 100 + 50 = 150 men.

Number of weeks = 1200 ÷ 150 = 8 weeks.

Therefore The correct answer is 8 weeks.

Alternate Method

Given:

Initial men (M1) = 100 men

Initial duration (D1) = 12 weeks

Additional men = 50 men

Formula Used:

M1 × D1 = M2 × D2 (where M is number of men and D is duration)

Calculations:

=> Total provisions = 100 × 12 = 1200 units

=> New number of men (M2) = 100 + 50 = 150 men

=> Let the new duration be D2 weeks

=> 100 × 12 = 150 × D2

=> 1200 = 150 × D2

=> D2 = 1200 ÷ 150

=> D2 = 8 weeks

Therefore The correct answer is 8 weeks.

Additional Information

Inverse Variation

When the number of men increases, the time for which provisions last decreases proportionally. Formula: M1T1 = M2T2.

Chain Rule

For work-related problems involving efficiency and hours, use M1D1H1/W1 = M2D2H2/W2.

Q47. Answer: (b) 2

Shortcut Trick

Net efficiency = Efficiency of Filling Pipe − Efficiency of Emptying Pipe.

LCM of 7 and 56 = 56 units (Total capacity).

Filling efficiency = 56 ÷ 7 = 8; Emptying efficiency = 56 ÷ 56 = 1.

Net efficiency = 8 − 1 = 7 units/min.

Time to fill 1/4th of tank = (56 ÷ 4) ÷ 7 = 14 ÷ 7 = 2 minutes.

YourMockTest.com — Free Study Material

Therefore The correct answer is 2 minutes.

Alternate Method

Pipe Type	Time (min)	Total Work (LCM)	Efficiency
Filling Pipe	7	56 Units	8
Emptying Pipe	56	−1	

=> Combined Efficiency of both pipes = 8 − 1 = 7 units/min.

=> Target volume to be filled = 1/4 × 56 = 14 units.

=> Time taken = 14 ÷ 7 = 2 minutes.

Therefore The correct answer is 2 minutes.

Additional Information

Pipes and Cisterns Efficiency

Filling pipes have positive efficiency, while outlet or emptying pipes have negative efficiency. Total efficiency is the algebraic sum.

Net Work Formula

If pipe A fills in x and pipe B empties in y, the net part filled in 1 min = (1/x − 1/y). Time taken = (x × y) ÷ (y − x).

Q48. Answer: (b) 9

Shortcut Trick

Q = sum of first 3 odd numbers = 1 + 3 + 5 = 9.

Since R is the third proportional of 9 and 9, then 9 : 9 :: 9 : R.

In a sequence where first and second terms are equal, the third proportional is also equal to them.

Therefore R = 9.

Therefore The correct answer is 9.

Alternate Method

Given:

First number (a) = 9

Second number (b) = Q

Third proportional (c) = R

Calculations:

=> Q = Sum of first three odd natural numbers = 1 + 3 + 5 = 9

=> Formula for third proportional R: 9 : Q :: Q : R

=> R = Q^2 ÷ 9

=> R = 9^2 ÷ 9

=> R = 81 ÷ 9 = 9

Therefore The correct answer is 9.

Additional Information

Third Proportional

If three numbers a, b, and c are in continued proportion, then a : b = b : c. Here, c is the third proportional, calculated as c = b^2/a.

Mean Proportional

The mean proportional between two numbers a and b is √(a × b).

Sum of First n Odd Numbers

The sum of the first n odd natural numbers is always equal to n^2. For n=3, sum = 3^2 = 9.

Q49. Answer: (a) Rs. 1,400

Shortcut Trick

In a partnership, Investment Ratio is equal to Profit Ratio when the time period is constant.

Total Profit = Rs. 9,000 | Prakhar's Profit = Rs. 1,200.

Profit Ratio (Prakhar : Total) = 1,200 : 9,000 = 2 : 15.

Prakhar's Investment = (2 ÷ 15) × Total Investment = (2 ÷ 15) × 10,500 = 2 × 700 = Rs. 1,400.

Therefore The correct answer is Rs. 1,400.

Alternate Method

Given: Total Investment = Rs. 10,500 | Total Profit = Rs. 9,000 | Prakhar's Profit = Rs. 1,200.

YourMockTest.com — Free Study Material

Formula: (Prakhar's Investment ÷ Total Investment) = (Prakhar's Profit ÷ Total Profit)

=> Let Prakhar's investment be x.

=> x ÷ 10,500 = 1,200 ÷ 9,000

=> x ÷ 10,500 = 12 ÷ 90

=> x ÷ 10,500 = 2 ÷ 15

=> x = (2 × 10,500) ÷ 15

=> x = 2 × 700

=> x = 1,400

Therefore The correct answer is Rs. 1,400.

Additional Information

Partnership Basic Law

The ratio of profit sharing is Profit1 : Profit2 = (Capital1 × Time1) : (Capital2 × Time2).

Simple Partnership

When the time period for all partners is the same, the profit is divided simply in the ratio of their capitals/investments.

Compound Partnership

When partners invest money for different time periods, the profit is distributed based on the product of investment and duration.

Q50. Answer: (b) 5°

Shortcut Trick

In a quadrilateral, the angle between the bisectors of two adjacent angles is half the sum of the other two angles.

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

32.5° = (angle P + angle Q) ÷ 2 => angle P + angle Q = 65°

Given ratio angle P : angle Q = 6 : 7, so total units = 6 + 7 = 13 units.

13 units = 65° => 1 unit = 5°

Difference = 7 units − 6 units = 1 unit = 5°.

Therefore The correct answer is 5°.

Alternate Method

Given:

In quadrilateral PQRS, bisectors of angle R and angle S meet at point T.

angle STR = 32.5° and angle P : angle Q = 6 : 7.

Formula Used:

Sum of interior angles of a quadrilateral = 360°

Sum of angles in a triangle = 180°

Calculations:

In triangle STR:

=> angle TSR + angle TRS + angle STR = 180°

=> (1/2)angle S + (1/2)angle R + 32.5° = 180°

=> (1/2)(angle S + angle R) = 180° − 32.5° = 147.5°

=> angle S + angle R = 2 × 147.5° = 295°

In quadrilateral PQRS:

=> angle P + angle Q + angle R + angle S = 360°

=> angle P + angle Q + 295° = 360°

=> angle P + angle Q = 360° − 295° = 65°

Let angle P = 6x and angle Q = 7x:

=> 6x + 7x = 65° => 13x = 65° => x = 5°

=> Difference = 7x − 6x = x = 5°

Therefore The correct answer is 5°.

Additional Information

Angle between Adjacent Bisectors

The angle formed by the intersection of bisectors of two adjacent angles in a quadrilateral is equal to half the sum of the remaining two interior angles.

Sum of Interior Angles

YourMockTest.com — Free Study Material

For any n-sided polygon, the sum of interior angles is given by (n − 2) × 180°. For a quadrilateral (n=4), the sum is 360°.

Angle Bisector Property

An angle bisector divides an angle into two equal parts. If line segment RT bisects angle R, then angle PRT = angle QRT = (1/2)angle R.

Q51. Answer: (d) 41 km to the north

Given: Saksham starts from point A and drives 71 km towards east. He then takes a left turn, drives 48 km, turns left and drives 81 km. He then takes a left turn and drives 89 km. He takes a final left turn, drives 10 km and stops at point P.

Thus, he should drive 41 km to the north to reach point A from point P.

Hence, the correct answer is "Option 4".

Q52. Answer: (b) 2

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

Now,

Odd digits, each of which is immediately preceded by an even digit and also immediately followed by an even digit.

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

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

Hence, the correct answer is "Option 2".

Q53. Answer: (a) Only conclusion (II) follows

Statements:

Some kites are balloons.

No balloon is a plane.

The least possible Venn diagram for the given statement is:

Conclusions:

(I): Some kites are planes. - False (There is no definite relation between kites and planes, it can be possible but it is not definite)

(II): Some balloons are kites. - True (Because Some kites are balloons, which means Some balloons are kites.)

Thus, Only conclusion (II) follows.

Hence, the correct answer is "Option 1".

Q54. Answer: (a) 4 km to the west

Given: Vinay starts from Point A and drives 10 km towards the south. He then takes a right turn, drives 4 km, turns right and drives 14 km. He then takes a right turn and drives 8 km. He takes a final right turn, drives 4 km and stops at Point P.

Thus, he should drive 4 km to the west to reach point A from Point P.

Hence, the correct answer is "Option 1".

Q55. Answer: (a) 14

Given: Each of the digits in the number 54761829 is arranged in descending order from left to right.

Digit third from left → 7

Digit second from right → 2

Product = 7 × 2 = 14

Thus, 14 will be the product of the digits that are third from the left and second from the right in the new number thus formed.

Hence, the correct answer is "Option 1".

Q56. Answer: (b) One

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

1. Only two people sit to the left of C.
2. Only three people sit between C and W.
3. Only one person sits between W and X.
4. D sits to the immediate left of A.
5. Y is not an immediate neighbour of W.

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

Thus, one person sits to the right of B.

Hence, the correct answer is "Option 2".

Q57. Answer: (a) 191

Given: 11, 23, 47, 83, 131, ?

The logic followed here is:

Thus, 191 should come in place of the question mark (?) in the given series.

Hence, the correct answer is "Option 1".

Q58. Answer: (b) ZV −17

The position and positional values or English Alphabets are:

The logic followed here is:

Similarly,

Thus, US1 is related to ZV -17.

Hence, the correct answer is "Option 2".

Q59. Answer: (a) 21

Given: Sahana ranked 4th from the top and 18th from the bottom in her class.

Total students = Top rank + Bottom rank − 1

= 4 + 18 − 1

= 22 - 1

= 21

Thus, there are 21 students in the class.

Hence, the correct answer is "Option 1".

Q60. Answer: (c) IF-BH

The position and positional values or English Alphabets are:

The pattern followed here is:

Each letter-cluster pair follows the pattern -7, +1.

1. OL-HM

This letter-cluster pair follows the pattern -7, +1.

2. LI-EJ

This letter-cluster pair follows the pattern -7, +1.

3. IF-BH

This letter-cluster pair does not follow the pattern -7, +1.

4. RO-KP

This letter-cluster pair follows the pattern -7, +1.

Thus, IF-BH is the odd one out.

Hence, the correct answer is "Option 3".

Q61. Answer: (a) 4

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

1. C sits third to the left of G.

2. E sits to the immediate right of G.

3. E sits second to the left of D.

4. F is an immediate neighbour of C.

5. Only two people sit between D and A when counted from the left of A.

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

Thus, 4 people sit between B and G when counted from the left of G.

Hence, the correct answer is "Option 1".

Q62. Answer: (b) 4

BODMAS Rule:

Given equation: 25 − 33 × 44 ÷ 24 + 39 = ?

If '+' and '−' are interchanged and '×' and '÷' are interchanged, then the equation becomes:

=> 25 + 33 ÷ 44 × 24 − 39 = ?

YourMockTest.com — Free Study Material

=> 25 + 0.75 × 24 − 39 = ?

=> 25 + 18 − 39 = ?

=> 43 − 39 = ?

=> 4 = ?

Hence, the correct answer is "Option 2".

Q63. Answer: (c) One

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

Now,

Odd digits, each of which is immediately preceded by an odd digit and also immediately followed by an odd digit.

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

Thus, there is one odd digit, which is immediately preceded by an odd digit and also immediately followed by an odd digit.

Hence, the correct answer is "Option 3".

Q64. Answer: (d) Mother's mother

Family Chart:

Decoding the Symbols:

A is				
Symbol	•	•	x	÷
Meaning	father	mother	sister	wife
to B				

Given: L ÷ M + N - O × P

It means: L is the wife of M, M is the father of N, N is the mother of O, O is the sister of P

Thus, L is P's Mother's mother.

Hence, the correct answer is "Option 4".

Q65. Answer: (c) Neither conclusion (I) nor (II) follows.

Statements:

No dolls are rings.

No rings are lamps.

The least possible Venn diagram for the given statement is:

Conclusions:

(I) All dolls are lamps. - False (There is no definite relation between dolls and lamps, it can be possible but it is not definite)

(II) No lamps are dolls. - False (There is no definite relation between lamps and dolls, it can be possible but it is not definite)

Thus, Neither conclusion (I) nor (II) follows.

Hence, the correct answer is "Option 3".

Q66. Answer: (b) (30, 887, 13)

The logic followed here is:

Logic: second number = (first number)² − third number.

(6, 21, 15) → 6^2 - 15 = 36 - 15 = 21

(47, 2197, 12) → 47^2 - 12 = 2209 - 12 = 2197

Let's check each option:

1. (26, 663, 12) → 26^2 - 12 = 676 - 12 = 664 ≠ 663

2. (30, 887, 13) → 30^2 - 13 = 900 - 13 = 887

3. (34, 1130, 25) → 34^2 - 25 = 1156 - 25 = 1131 ≠ 1130

4. (35, 1215, 9) → 35^2 - 9 = 1225 - 9 = 1216 ≠ 1215

Thus, '(30, 887, 13)' follows the same pattern.

Hence, the correct answer is "Option 2".

YourMockTest.com — Free Study Material

Q67. Answer: (d) 2

Given: (Left) % & € 5 % 3 7 @ % % % 1 * % 2 7 5 @ 6 7 1 1 (Right)

Now,

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

So, the needed pattern is: Number — Symbol — Number

Thus, there are 2 symbols, each of which is immediately preceded by a number and also immediately followed by a number.

Hence, the correct answer is "Option 4".

Q68. Answer: (b) TXZ−AEG

The position and positional values or English Alphabets are:

The pattern followed here is:

Each letter-cluster pair follows the pattern +7, +7, +7.

Let's check each option:

1. TWX-AEG

This letter-cluster pair does not follow the pattern +7, +7, +7.

2. TXZ-AEG

This letter-cluster pair follows the pattern +7, +7, +7.

3. TWX-ZDF

This letter-cluster pair does not follow the pattern +7, +7, +7.

4. TXZ-ZEF

This letter-cluster pair does not follow the pattern +7, +7, +7.

Thus, TXZ−AEG follows the same pattern.

Hence, the correct answer is "Option 2".

Q69. Answer: (c) BHE

The position and positional values or English Alphabets are:

The pattern followed here is:

Each letter-cluster pair follows the pattern +6, -4.

1. DJF

This letter-cluster pair follows the pattern +6, -4.

2. MSO

This letter-cluster pair follows the pattern +6, -4.

3. BHE

This letter-cluster pair does not follow the pattern +6, -4.

4. PXR

This letter-cluster pair follows the pattern +6, -4.

Thus, BHE is the odd one out.

Hence, the correct answer is "Option 3".

Q70. Answer: (a) OCJ 13

The position and positional values or English Alphabets are:

Given: SGN 5 RFM 7 QEL 9 PDK 11 ?

The logic followed here is:

Thus, OCJ13 will replace the question mark (?) in the given series to make it logically complete.

Hence, the correct answer is "Option 1".

Q71. Answer: (a) LADY - ALDY - YDAL

The logic followed here is:

ACNE - CANE - ENCA

INCH - NICH - HCNI

Let's check each option:

1. LADY - ALDY - YDAL

2. QUAD - QAUD - DAUQ

YourMockTest.com — Free Study Material

3. GIRL - IGRL - LIRG
4. RAKE - ARKE - AKER
Thus, 'LADY - ALDY - YDAL' follows the same pattern.
Hence, the correct answer is "Option 1".

Q72. Answer: (b) 6

Given: In a certain code language, ‘FOUR’ is coded as ‘5812’ and ‘ROUT’ is coded as ‘5628’.
Thus, 6 is the code for ‘T’ in the given code language.
Hence, the correct answer is "Option 2".

Q73. Answer: (c) 851

Given: 821 823 827 833 841 ?
The logic followed here is:
Thus, 851 should come in place of the question mark (?) in the given series.
Hence, the correct answer is "Option 3".

Q74. Answer: (d) NEI

The position and positional values or English Alphabets are:
Given: VMQ TKO RIM PGK ?
The logic followed here is:
Thus, NEI should come in place of the question mark (?) in the given series based on the English alphabetical order.
Hence, the correct answer is "Option 4".

Q75. Answer: (c) vn

Given: In a certain code language, ‘star city lemon’ is coded as 'fq vn ln' and ‘zip lid star’ is coded as ‘vn iu km’.
Thus, ‘star’ is coded as '"vn' in the given language.
Hence, the correct answer is "Option 3".

Q76. Answer: (a) 120

BODMAS Rule:
Decoding the given information:

Symbol	•	•	×	÷
Meaning	•	×	÷	•

Given equation: 20 − 6 ÷ 4 + 60 × 15 = ?
Now replacing the sign from left to right using BODMAS Rule, we get:
=> 20 × 6 + 4 − 60 ÷ 15 = ?
=> 20 × 6 + 4 − 4 = ?
=> 120 + 4 − 4 = ?
=> 124 − 4 = ?
=> 120 = ?
Hence, the correct answer is "Option 1".

Q77. Answer: (c) 328

Given: 304 313 320 325 ? 329
The logic followed here is:
Thus, 328 should come in place of the question mark (?) in the given series.
Hence, the correct answer is "Option 3".

Q78. Answer: (c) Two

Given: (Left) 426 125 357 489 627 (Right)
Now, arrange numbers in ascending order and compare positions:
Thus, the position of two numbers will remain unchanged.
Hence, the correct answer is "Option 3".

YourMockTest.com — Free Study Material

Q79. Answer: (b) One

Given: Seven boxes, M, N, O, P, Q, R, and S, are kept one over the other but not necessarily in the same order.

1. Only P is kept above O.
2. Only Q is kept between O and R.
3. Only N is kept below S.

P
O
Q
R
S
N

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

P
O
Q
R
M
S
N

Thus, one box is kept between M and N.

Hence, the correct answer is "Option 2".

Q80. Answer: (d) Two

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

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

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

Thus, two people sit between C and X.

Hence, the correct answer is "Option 4".

Q81. Answer: (d) Gareth Southgate

The correct answer is Gareth Southgate.

Key Points

• Gareth Southgate, the head coach of the England national football team, received a royal knighthood in 2025 for his significant contributions to national football.

• Southgate has been instrumental in revitalizing the England football team, leading them to several major tournament successes, including reaching the final of UEFA Euro 2020 and the semi-finals of the 2018 FIFA World Cup.

• His leadership style, focused on creating a cohesive team culture and fostering young talent, has been widely praised and is considered a key factor in England's resurgence in international football.

• The knighthood is a recognition of his exemplary service to English football, including his efforts to promote sportsmanship and inspire a new generation of players.

• Gareth Southgate's achievements have not only elevated the performance of the national team but have also significantly enhanced the global reputation of English football.

Additional Information

YourMockTest.com — Free Study Material

• Gareth Southgate’s Career:

• Born on 3 September 1970 in Watford, England, Southgate began his football career as a player, primarily playing as a defender for clubs like Crystal Palace, Aston Villa, and Middlesbrough.

• He earned 57 caps for the England national team as a player and represented the country in major tournaments like the 1996 UEFA European Championship and the 1998 FIFA World Cup.

• After retiring as a player in 2006, Southgate transitioned into management and took charge of Middlesbrough as his first managerial assignment.

• Achievements as England Manager:

• He was appointed as the manager of the England national team in 2016, initially on an interim basis, and was later confirmed as the permanent coach.

• Under his leadership, England reached the 2018 FIFA World Cup semi-finals, their best performance in the tournament since 1990.

• In 2021, Southgate guided England to the UEFA Euro 2020 final, where they narrowly lost to Italy in a penalty shootout.

• Southgate has been commended for creating an inclusive team environment, emphasizing mental health, and addressing social issues such as racism in football.

• Knighthood and Honors:

• Southgate’s knighthood in 2025 recognizes his contributions to sports, particularly his efforts to unite the nation through football.

• He was also awarded an OBE (Order of the British Empire) in 2019 for his services to football.

• His role as a leader extends beyond football, as he has been an advocate for youth development and sports education in England.

• Other Noteworthy Coaches (Options):

• José Mourinho: Known as "The Special One," Mourinho is a Portuguese coach with multiple UEFA Champions League titles but has not been knighted.

• Pep Guardiola: A Spanish coach celebrated for his tactical brilliance and numerous domestic league titles, especially with Manchester City, but also not knighted.

• Roberto Martinez: A Spanish coach who managed Belgium to the top of FIFA rankings but has not received a knighthood.

`

Q82. Answer: (d) 9:12.46

The correct answer is 9:12.46.

Key Points

• Parul Chaudhary set a new national record in the women's 3000-meter steeplechase at the 2025 Asian Athletics Championships.

• Her record-breaking time was 9:12.46, which surpassed the previous national record in the event.

• The women's 3000-meter steeplechase is a grueling middle-distance race that involves obstacles, including water jumps.

• Parul's achievement places her among the top athletes in Asia and demonstrates her exceptional athleticism and dedication.

• This performance is a significant milestone in Indian athletics and showcases the growing talent in track and field sports in the country.

Additional Information

• About Parul Chaudhary:

• Parul Chaudhary is an Indian middle and long-distance runner specializing in events such as the 3000m steeplechase, 5000m, and 10,000m.

• She has previously represented India at various international competitions, including the Asian Games and World Championships.

• She hails from Uttar Pradesh and has been trained under some of the best coaches in Indian athletics.

• Details of the Steeplechase Event:

• The 3000m steeplechase is a middle-distance race that includes barriers and a water jump on each lap.

• This event is known for its physical and mental demands, requiring excellent endurance, speed, and coordination.

• The race consists of 7.5 laps on a standard 400m track, with a total of 35 barriers and 7 water jumps.

• Historical Context:

• The Asian Athletics Championships is one of the most prestigious track and field competitions in Asia, held biennially.

• India has consistently performed well in this championship, particularly in middle and long-distance events.

• Parul's record is a testament to India's growing dominance in athletics at the continental level.

• Comparison with Previous Record:

• The previous national record in the women's 3000m steeplechase was slower than Parul's time of 9:12.46.

• This new record highlights the progress Indian athletes are making in breaking barriers and improving performance standards.

Important Points

• Training and Preparation:

• Athletes in steeplechase require specialized training to handle the unique challenges of barriers and water jumps.

• Parul's success reflects her rigorous training regimen and dedication to her craft.

• Asian Athletics Championships 2025:

• The event is a platform for athletes from across Asia to compete at the highest level in track and field sports.

• India's performance in the championship is a reflection of the country's growing investment in athletics infrastructure and talent development.

`

Q83. Answer: (c) Solid-state sodium-ion battery

The correct answer is Solid-state sodium-ion battery.

Key Points

• Solid-state sodium-ion battery represents a breakthrough innovation in renewable energy storage, announced in 2025.

• Unlike traditional batteries, it employs a solid-state electrolyte instead of liquid electrolytes, enhancing safety and reducing risks like leakage and fire hazards.

• Sodium-ion batteries rely on sodium, a more abundant and cost-effective element compared to lithium, making them suitable for large-scale energy storage applications.

• The solid-state design improves energy density and cycle life, ensuring longer battery performance while minimizing degradation over time.

• This innovation addresses key challenges in renewable energy integration, including the need for safer, more sustainable, and affordable battery solutions.

• It is considered a major step forward in achieving global goals for decarbonization and transitioning to sustainable energy systems.

Additional Information

• Solid-state batteries:

• They utilize solid electrolytes, such as ceramics or polymers, instead of liquid electrolytes found in conventional lithium-ion batteries.

• These batteries are known for their high energy density, longer life span, and enhanced safety features.

• Applications include electric vehicles (EVs), renewable energy storage, and portable electronic devices.

• Sodium-ion batteries:

• Sodium-ion technology is gaining traction due to the abundance of sodium, which is cheaper and more sustainable compared to lithium.

• They are particularly suited for grid-scale energy storage to support renewable energy sources like solar and wind.

• Sodium-ion batteries are less prone to supply chain disruptions, as sodium is widely available across the globe.

• Comparison with lithium-ion batteries:

• Solid-state sodium-ion batteries are less expensive and safer due to the absence of flammable liquid electrolytes.

• While lithium-ion batteries have higher energy density, sodium-ion batteries offer a more sustainable solution for large-scale applications.

• Both technologies are pivotal in advancing energy storage systems to enable renewable energy adoption globally.

• Global implications:

• Solid-state sodium-ion batteries can significantly impact the renewable energy sector by providing affordable and scalable energy storage solutions.

• This innovation supports international efforts to combat climate change by reducing dependency on fossil fuels.

• Countries investing in this technology include China, the United States, and Germany, all aiming to lead in energy storage advancements.

Important Points

• Benefits of solid-state sodium-ion batteries:

• They reduce dependency on rare earth materials like lithium and cobalt, ensuring sustainability and cost-effectiveness.

• Their solid electrolyte eliminates risks associated with liquid electrolytes, such as leakage, corrosion, and thermal runaway.

• They are ideal for applications requiring long-term energy storage and high reliability.

• Challenges:

• Development costs and scalability remain key obstacles for solid-state sodium-ion batteries.

YourMockTest.com – Free Study Material

• Further research is needed to optimize electrolyte materials and manufacturing processes for widespread adoption.

• Future prospects:

• With advancements in material science and manufacturing, solid-state sodium-ion batteries are poised to revolutionize the energy storage industry.

• They hold the potential to accelerate the transition to clean energy, supporting global sustainability goals outlined by the Paris Agreement.

Q84. Answer: (a) Ulaanbaatar, Mongolia

The correct answer is Ulaanbaatar, Mongolia.

Key Points

• The 17th edition of the Nomadic Elephant defense joint military drill between India and Mongolia was held in Ulaanbaatar, Mongolia.

• This military exercise is a part of the annual defense cooperation program aimed at enhancing military interoperability and building mutual trust between the two nations.

• The exercise focuses on counter-insurgency and counter-terrorism operations in mountainous terrains, reflecting the geographical and strategic challenges faced by both nations.

• India and Mongolia share a strong defense partnership and cultural ties. The Nomadic Elephant drills are a testament to their long-standing friendship and commitment to regional peace and security.

• The drill often includes participation from Indian Army personnel and Mongolian armed forces, emphasizing joint operational capability and adaptability.

Additional Information

• India-Mongolia Defense Relations:

• India and Mongolia established diplomatic relations in 1955, and their defense partnership has grown significantly since then.

• Mongolia is strategically significant for India as it is a part of the Act East Policy and holds a pivotal position in Northeast Asia.

• Both nations have signed agreements on defense cooperation, including joint training programs and military drills.

• Nomadic Elephant Military Exercise:

• The Nomadic Elephant drills have been conducted annually for over a decade, showcasing the military collaboration between the two nations.

• The exercises focus on tactical maneuvers, humanitarian assistance, disaster relief, and counter-terrorism strategies.

• These drills provide an opportunity to exchange operational expertise and promote regional security.

• Geographical Significance of Ulaanbaatar:

• Ulaanbaatar, the capital of Mongolia, is known for its unique terrain comprising mountains and plateaus, providing an ideal environment for military drills.

• The city has hosted several international defense events, strengthening Mongolia's role in global military cooperation.

• India's Defense Cooperation with Other Countries:

• India actively participates in defense exercises with various countries, including the Malabar Exercise with Japan and the USA, and the Indra Exercise with Russia.

• Such initiatives help enhance military preparedness, promote peace, and strengthen strategic alliances globally.

Important Points

• Mongolia's Strategic Importance:

• Mongolia acts as a buffer state between China and Russia, making it geopolitically significant in the region.

• India's partnership with Mongolia strengthens its position in Northeast Asia and enhances diplomatic outreach.

• International Military Exercises:

• India participates in multiple military drills to foster bilateral and multilateral defense cooperation, such as Yudh Abhyas (with the USA) and Sampriti (with Bangladesh).

• These exercises contribute to capacity-building, strategic planning, and preparedness for global security challenges.

• Defense Policy Objectives:

• India's defense policy focuses on promoting regional peace, enhancing security capabilities, and forming strategic alliances.

• Military drills like Nomadic Elephant are integral to achieving these objectives.

Q85. Answer: (b) 3080

The correct answer is 3080.

Key Points

• The Disaster Management (DM) division of the Ministry of Home Affairs is responsible for managing and reporting statistics

related to natural disasters in India.

• As per the provisional estimates for the year 2024-25, the total number of deaths caused by natural disasters is reported to be 3080.

• The reported deaths include casualties due to various natural disasters such as floods, cyclones, landslides, earthquakes, and extreme weather events.

• Natural disasters disproportionately affect vulnerable populations, particularly those living in disaster-prone areas or with limited access to resources.

• The government has been working on enhancing disaster preparedness, resilience, and mitigation strategies to reduce the loss of lives and property caused by natural disasters.

Additional Information

• Disaster Management Act, 2005:

• The Disaster Management Act was enacted to provide a legal framework for the preparation and implementation of disaster management plans in India.

• It established the National Disaster Management Authority (NDMA) responsible for coordinating disaster response and mitigation efforts.

• Types of Natural Disasters in India:

• Floods: India experiences frequent floods due to heavy monsoons, particularly in states like Bihar, Assam, and Uttar Pradesh.

• Cyclones: Coastal regions such as Odisha, Andhra Pradesh, and West Bengal are prone to cyclones originating in the Bay of Bengal.

• Landslides: Mountainous regions like Uttarakhand and Himachal Pradesh experience landslides during heavy rains.

• Earthquakes: Seismic zones such as the Himalayan belt frequently experience earthquakes.

• Heatwaves: States like Rajasthan and Gujarat often face extreme heat conditions during summer months.

• Government Initiatives for Disaster Management:

• National Cyclone Risk Mitigation Project (NCRMP): Aims to reduce vulnerability to cyclones and improve disaster response in coastal areas.

• State Disaster Response Force (SDRF): Established in various states to provide immediate assistance during disasters.

• India's Meteorological Department (IMD): Plays a key role in issuing early warning systems for extreme weather events.

• Key Statistics and Reports:

• Global Climate Risk Index: India ranks among the top countries most affected by climate-induced disasters.

• UNDRR (United Nations Office for Disaster Risk Reduction): Highlights India’s efforts in improving disaster resilience.

Important Points

• Impact of Natural Disasters:

• Natural disasters cause significant damage to infrastructure, livelihoods, and ecosystems.

• They disproportionately impact low-income groups and marginalized communities.

• The loss of human lives, reported as 3080 in 2024-25, highlights the urgent need for enhanced disaster risk reduction policies.

• Preparedness Measures:

• Improved forecasting technologies and early-warning systems play a crucial role in mitigating disaster impacts.

• Community-based disaster management programs have proven effective in building local resilience.

• International Support:

• Sendai Framework for Disaster Risk Reduction: India aligns its strategies with this global framework to enhance disaster resilience.

• Global Climate Action: Collaborative efforts to address climate change contribute to reducing disaster risks.

Q86. Answer: (c) Ladakh

The correct answer is Ladakh.

Key Points

• Kavinder Gupta, a senior Bharatiya Janata Party (BJP) leader, served as the Deputy Chief Minister of Jammu and Kashmir. His political experience and administrative contributions have been noteworthy in the region.

• In July 2025, Kavinder Gupta assumed the office of Lieutenant Governor (LG) of Ladakh. Ladakh is a Union Territory (UT) in India, formed after the bifurcation of Jammu and Kashmir under the Jammu and Kashmir Reorganization Act, 2019.

• The position of Lieutenant Governor in Ladakh was created after the region was made a Union Territory in October 2019. The LG acts as the administrative head of the Union Territory.

• As the Lieutenant Governor of Ladakh, Kavinder Gupta's key responsibilities include overseeing the region's administration, ensuring the implementation of central government schemes, and addressing issues specific to Ladakh's development and

YourMockTest.com — Free Study Material

governance.

• Ladakh is strategically significant for India, sharing borders with China and Pakistan. The Lieutenant Governor plays an essential role in maintaining security and fostering development in this sensitive region.

Additional Information

• Formation of Ladakh as a Union Territory:

• Ladakh became a Union Territory on 31 October 2019, following the abrogation of Article 370 of the Constitution of India.

• The Jammu and Kashmir Reorganization Act, 2019, bifurcated the former state of Jammu and Kashmir into two Union Territories: Jammu & Kashmir and Ladakh.

• Ladakh comprises two districts: Leh and Kargil.

• The Union Territory of Ladakh does not have a legislative assembly, and its governance is administered directly by the Lieutenant Governor.

• Role of the Lieutenant Governor:

• The Lieutenant Governor (LG) serves as the administrative head of a Union Territory.

• In Ladakh, the LG works closely with the central government to implement policies and maintain law and order.

• The LG is responsible for addressing local governance issues, ensuring development, and fostering harmony in the region.

• Strategic Importance of Ladakh:

• Ladakh shares borders with China (Tibet Autonomous Region) to the east and Pakistan-administered Gilgit-Baltistan to the west.

• It is a region of geopolitical significance due to its proximity to the Line of Actual Control (LAC) and the Line of Control (LoC).

• Ladakh is also known for its unique geographical features, including the Himalayas, the Karakoram Range, and the Indus River Basin.

• Economic and Cultural Aspects of Ladakh:

• Ladakh's economy is primarily based on tourism, agriculture, and animal husbandry.

• The region is known for its unique Buddhist culture, monasteries, and festivals, which attract tourists globally.

• Efforts are being made to promote sustainable development, including solar energy projects and eco-tourism.

Important Points

• Jammu and Kashmir Reorganization Act, 2019:

• This act reorganized the state of Jammu and Kashmir into two Union Territories: Jammu & Kashmir (with a legislative assembly) and Ladakh (without a legislative assembly).

• The act was passed by the Parliament of India on 5 August 2019.

• First Lieutenant Governor of Ladakh:

• Radha Krishna Mathur was the first Lieutenant Governor of Ladakh, appointed on 31 October 2019.

• Significance of the Lieutenant Governor's Role:

• The LG acts as a bridge between the central government and the Union Territory, ensuring effective implementation of policies and addressing the needs of the local population.

Q87. Answer: (a) State Bank of India

The correct answer is State Bank of India.

Key Points

• State Bank of India (SBI), India's largest public sector bank, paid a record dividend of Rs. 8,076.84 crore to the Government of India for FY25 in June 2025. This dividend payment highlights the bank's robust financial performance.

• SBI's dividend payout is a direct result of its strong financial results, which include high profits and consistent growth in key banking metrics such as Net Interest Income (NII) and Loan Growth.

• The Government of India, as the majority shareholder in SBI, benefits from such dividend payments, which contribute to its revenue and fiscal budget.

• Dividends are distributed from the profits of the bank, reflecting its ability to generate substantial earnings and maintain liquidity while fulfilling regulatory requirements.

• SBI has consistently ranked as one of the top dividend-paying entities among public sector banks, showcasing its position as a leading financial institution.

Additional Information

• State Bank of India Overview:

• Established in 1806 as the Bank of Calcutta, later renamed the State Bank of India in 1955, it is headquartered in Mumbai, Maharashtra.

• It is India's largest public sector bank, offering a wide range of financial services including retail banking, corporate banking, treasury operations, and asset management.

• SBI operates a network of over 22,000 branches and 62,000 ATMs across India and has a presence in 36 countries worldwide.

• The bank's market capitalization makes it one of the most valuable financial institutions in India.

• Dividend Payment Process:

• Dividends are paid from the profits earned by the bank, after fulfilling statutory reserves as mandated by the Reserve Bank of India (RBI).

• The government, as the majority shareholder, receives the largest share of the dividend payout.

• Dividend payments are a reflection of the bank's profitability and financial health, and they contribute to the government's non-tax revenue.

• Other Public Sector Banks:

• Indian Bank: Headquartered in Chennai, established in 1907. Known for its focus on retail banking.

• Bank of India: Founded in 1906, headquartered in Mumbai, and provides services across India and abroad.

• Bank of Baroda: Established in 1908, headquartered in Vadodara, Gujarat, and is recognized for its global presence.

• Economic Impact:

• Dividend payments by public sector banks like SBI contribute to the government's revenue, aiding fiscal balance and budgetary allocations.

• These payments reflect the bank's efficiency in managing resources, profitability, and compliance with financial regulations.

Important Points

• Government Ownership:

• The Government of India holds a 57.49% stake in SBI, making it the largest shareholder.

• Dividends paid by SBI contribute directly to the government's revenue stream, supporting various developmental initiatives.

• Role of RBI:

• The Reserve Bank of India oversees the financial stability and compliance of banks, ensuring healthy dividend payouts.

• RBI mandates that banks must maintain adequate capital reserves before distributing dividends.

• Recent Performance:

• SBI reported a record net profit of Rs. 50,232 crore in FY25, showcasing its consistent growth and operational efficiency.

• The bank's return on equity (ROE) and return on assets (ROA) metrics further underline its robust financial performance.

Q88. Answer: (c) Mansukh Mandaviya

The correct answer is Mansukh Mandaviya.

Key Points

• Mansukh Mandaviya, the Union Minister of Health and Family Welfare, introduced the National Anti-Doping (Amendment) Bill, 2025 in the Lok Sabha in July 2025. This bill aims to strengthen the legal framework to combat doping in sports.

• The amendment aligns with international anti-doping standards set by the World Anti-Doping Agency (WADA) to ensure fairness and transparency in sports globally.

• The bill enhances the effectiveness of the National Anti-Doping Agency (NADA), empowering it with greater autonomy and authority to take action against doping violations in Indian sports.

• It proposes stricter penalties for athletes and other personnel involved in doping violations, including suspension and fines, to deter such practices.

• The bill also includes provisions for education and awareness programs to inform athletes about the consequences of doping and promote ethical behavior in sports.

Additional Information

• National Anti-Doping Agency (NADA):

• Established in 2005, NADA is responsible for promoting, coordinating, and monitoring anti-doping activities in India.

• Its primary functions include conducting dope testing, providing education and awareness to athletes, and implementing the anti-doping code in alignment with WADA guidelines.

• NADA works closely with sports federations, athletes, and support personnel to ensure compliance with anti-doping regulations.

• World Anti-Doping Agency (WADA):

• WADA is an international organization established in 1999 to promote and coordinate the fight against doping in sports worldwide.

• It develops and enforces the World Anti-Doping Code, a set of rules and regulations for anti-doping efforts globally.

• WADA also accredits anti-doping laboratories, conducts research, and provides educational resources to combat doping.

• Doping in Sports:

• Doping refers to the use of prohibited substances or methods by athletes to enhance performance illegally.

• Common substances used for doping include steroids, stimulants, and erythropoietin (EPO), which improve strength, endurance,

and recovery.

• Consequences of doping include suspension, fines, disqualification, and damage to an athlete's reputation and career.

• India’s Anti-Doping Efforts:

• India has been actively working to combat doping through the efforts of NADA and collaboration with international organizations like WADA.

• Educational programs and workshops are conducted regularly to create awareness about anti-doping rules among athletes, coaches, and support staff.

• India has also increased the frequency of dope testing during national and international sports events to ensure fair play.

Important Points

• Amendment Highlights:

• The 2025 amendment introduces a graded penalty system to address the varying severity of doping violations.

• It ensures that athletes receive fair hearings and provides mechanisms for appeal in doping cases.

• Focus is given to rehabilitation and reintegration of athletes found guilty of doping, emphasizing education and counseling.

• Global Ranking:

• India has historically faced challenges in doping, often ranking among the top countries with doping cases in reports by WADA.

• Efforts like this amendment aim to improve India’s international reputation in sports and ensure a level playing field for athletes.

• Way Forward:

• Stronger collaboration between NADA, sports federations, and athletes is essential for effective implementation of anti-doping measures.

• Increased investment in research and development of testing methods will help in detecting newer substances and methods of doping.

• Public awareness campaigns can further promote ethical practices in sports and discourage doping at all levels.

Q89. Answer: (d) Defence Research and Development Organisation (DRDO)

The correct answer is Defence Research and Development Organisation (DRDO).

Key Points

• The Military Combat Parachute System (MCPS) was developed by the Defence Research and Development Organisation (DRDO), a premier agency under the Ministry of Defence, Government of India.

• MCPS successfully carried out a combat freefall jump from an altitude of 32,000 feet in October 2025.

• This parachute system is indigenously created, showcasing India's technological advancement in defense systems and its ability to meet critical military requirements.

• The MCPS is designed for high-altitude operations, enabling soldiers to execute missions in adverse environments with precision and safety.

• The development of such systems by DRDO highlights India's commitment to self-reliance under the Atmanirbhar Bharat initiative, focusing on indigenous production of advanced defense equipment.

Additional Information

• Defence Research and Development Organisation (DRDO):

• DRDO was established in 1958 and is headquartered in New Delhi, India.

• The organization develops cutting-edge defense technologies and systems, ranging from missiles, combat vehicles, radars, and electronic warfare systems to advanced parachutes.

• It operates under the Ministry of Defence and has over 50 laboratories dedicated to various research areas.

• Some of DRDO's notable achievements include the Agni missile series, BrahMos missile, and Tejas fighter jet.

• High-Altitude Parachute Systems:

• Parachutes designed for high-altitude operations enable combat personnel to perform missions under extreme conditions such as low oxygen levels and sub-zero temperatures.

• Such systems incorporate advanced materials to ensure durability, lightweight construction, and precision deployment.

• Indigenous Defense Manufacturing:

• India's focus on self-reliance in defense manufacturing is part of the Atmanirbhar Bharat initiative, aiming to reduce dependency on foreign suppliers.

• Organizations like DRDO, Hindustan Aeronautics Limited (HAL), and Bharat Electronics Limited (BEL) play a critical role in achieving this goal.

• Applications of Military Combat Parachutes:

• Used for special operations, reconnaissance, and infiltration missions in enemy territories.

• Enables deployment in mountainous terrains, deserts, and other challenging environments.

YourMockTest.com — Free Study Material

Important Points

• DRDO's Role in National Security:

• DRDO is responsible for equipping the Indian armed forces with state-of-the-art systems to enhance national security.

• Its innovations contribute significantly to India’s defense preparedness and global standing in technology-driven military systems.

• Other Relevant Organizations:

• Bharat Electronics Limited (BEL): Focuses on electronics for defense and civilian applications.

• Indian Space Research Organisation (ISRO): Primarily deals with space exploration and satellite technology.

• Hindustan Aeronautics Limited (HAL): Specializes in aircraft manufacturing for defense purposes.

Q90. Answer: (c) Exim Bank of India

The correct answer is Exim Bank of India.

Key Points

• Exim Bank of India raised $1 billion through a 10-year USD-denominated bond in international markets in January 2025. This bond issuance is one of the largest fundraising exercises by the bank.

• The bond was issued to meet the bank's financial requirements and boost its ability to support Indian exporters and importers.

• Exim Bank, established in 1982, is India’s premier export credit agency responsible for financing, facilitating, and promoting international trade.

• The proceeds from the bond issuance are typically utilized for enhancing India's export competitiveness, supporting trade financing, and funding strategic projects globally.

• The international market response to Exim Bank’s bond issuance reflects strong investor confidence in the institution and its role in promoting India’s global trade initiatives.

Additional Information

• Exim Bank of India:

• Established under the Export-Import Bank of India Act, 1981, Exim Bank is headquartered in Mumbai, India.

• It offers financial solutions like loans, guarantees, and advisory services to exporters, importers, and overseas investment ventures.

• The bank plays a crucial role in promoting Indian exports, offering financial and advisory support to Indian companies engaging in international markets.

• Exim Bank operates globally and has a strong reputation for supporting projects in developing and emerging economies.

• It provides strategic financial support for infrastructure development, technology acquisition, and trade enhancement.

• USD-Denominated Bonds:

• Bonds issued in US dollars by entities outside the United States are referred to as USD-denominated bonds.

• These bonds help institutions access global capital markets and diversify their investor base.

• They are preferred by international investors due to the stability of the US dollar as a global currency.

• The issuance of such bonds is often accompanied by credit ratings from agencies like Moody's, S&P, or Fitch, reflecting the issuer’s creditworthiness.

• Other Relevant Banking Institutions:

• Indian Overseas Bank: Founded in 1937, it primarily serves domestic banking needs and does not typically issue large-scale international bonds.

• NABARD (National Bank for Agriculture and Rural Development): Established in 1982, it focuses on agricultural and rural development in India rather than international bond issuance.

• Reserve Bank of India: India’s central bank founded in 1935. It regulates monetary policy and ensures financial stability but does not raise funds through international bond issuance.

• Importance of International Bond Issuance:

• International bonds allow Indian institutions to tap into global financial markets for funding and gain access to a broader investor base.

• They enhance India’s global economic presence and help in financing projects requiring foreign currency.

• Such bonds can improve market credibility and reflect the strong financial position of the issuing entity.

Important Points

• Significance of Exim Bank:

• Exim Bank supports India’s foreign trade by providing financial assistance and advisory services to exporters and importers.

• It plays an integral role in financing projects abroad, including India’s overseas investments and development assistance.

• The bank’s initiatives contribute to strengthening India’s position in global trade and promoting economic growth.

• Global Bond Market:

• The global bond market enables institutions to raise capital by issuing bonds denominated in various currencies.

• It provides liquidity, access to international investors, and opportunities for diversification.

• The issuance of bonds in foreign currencies like USD is a strategic move to attract global investors.

Q91. Answer: (b) Italy

The correct answer is Italy.

Key Points

• UN Virtual Worlds Day 2025 is an observance aimed at recognizing the role of virtual technologies in fostering global collaboration, communication, and innovation.

• Italy hosted the event in June 2025, showcasing its commitment to technological advancements and global partnerships in virtual reality and metaverse technologies.

• The event featured participation from various global organizations, academics, and tech leaders, emphasizing the role of virtual tools in addressing challenges such as climate change, education, and healthcare.

• Italy is known for its proactive approach to adopting cutting-edge technologies and has hosted similar international forums in the past, further solidifying its role as a leader in virtual innovation.

• This observance aligns with the United Nations' Sustainable Development Goals (SDGs), leveraging technology to create inclusive and resilient virtual ecosystems.

Additional Information

• UN Virtual Worlds Day:

• This global observance was initiated by the United Nations to highlight the transformative potential of virtual and augmented reality technologies.

• The day focuses on how virtual platforms can foster innovation, inclusivity, and sustainable development across various sectors.

• It also serves as a platform for governments, industries, and academics to collaborate on virtual technology policies and innovations.

• Italy's Role in Technology:

• Italy has been at the forefront of technological innovation, particularly in areas like artificial intelligence, virtual reality, and digital transformation.

• Major Italian cities, including Milan and Rome, are hubs for tech innovation and host numerous international tech conferences and expos.

• The Italian government has invested significantly in research and development to enhance its global competitiveness in technology.

• United Nations and Technology:

• The United Nations actively promotes the use of emerging technologies to achieve its Sustainable Development Goals (SDGs), including quality education, reduced inequalities, and climate action.

• Virtual Worlds Day is part of the UN's broader initiative to integrate technology into global development strategies.

• Virtual Technologies and Their Impact:

• Virtual and augmented reality technologies have applications in diverse fields, including education, healthcare, urban planning, and disaster management.

• They enable immersive learning experiences, remote medical consultations, and virtual simulations for disaster preparedness.

• By reducing geographical barriers, these technologies foster global collaboration and innovation.

Q92. Answer: (a) The Armament Research and Development Establishment (ARDE)

The correct answer is The Armament Research and Development Establishment (ARDE).

Key Points

• The Armament Research and Development Establishment (ARDE), located in Pune, is a premier laboratory of the Defence Research and Development Organisation (DRDO), India. It focuses on the research and development of armament systems.

• The 6.8 × 43 mm assault rifle prototype was developed by ARDE as part of India's initiative to modernize its small arms for the armed forces. This development is a key step toward achieving self-reliance in defence technology.

• The 6.8 × 43 mm caliber was selected due to its balance between stopping power, range, and recoil, making it suitable for both close-quarters and mid-range combat scenarios.

• ARDE has a history of developing advanced armament systems, including small arms, artillery, and missile systems. The assault rifle prototype is an example of their expertise in designing state-of-the-art weaponry.

• Such indigenous developments help reduce reliance on foreign arms imports, aligning with the Indian government's "Make in India" initiative in the defence sector.

Additional Information

• About ARDE:

• Established in 1958 in Pune, ARDE is one of the key laboratories under DRDO.

• It specializes in the design and development of conventional armaments and ammunition, including small arms, medium-caliber guns, and advanced weapon systems.

• ARDE collaborates with other DRDO labs, Indian armed forces, and private industry partners to develop indigenous defence solutions.

• 6.8 × 43 mm Caliber:

• The 6.8 mm caliber offers a middle ground between the 5.56 mm and 7.62 mm calibers, combining better penetration and reduced recoil.

• This caliber provides improved accuracy and lethality over longer ranges, making it suitable for modern combat requirements.

• It is particularly effective in urban warfare and counter-terrorism operations.

• Significance of Indigenous Weapon Development:

• Indigenous development helps reduce dependency on foreign suppliers and ensures national security and strategic autonomy.

• It creates employment opportunities and boosts the domestic defence manufacturing sector.

• India's defence modernization plan includes equipping its armed forces with state-of-the-art indigenous weaponry like the ARDE-developed assault rifle.

• Other DRDO Labs in Pune:

• In addition to ARDE, Pune houses other DRDO labs like the High Energy Materials Research Laboratory (HEMRL) and Research and Development Establishment (Engineers) [R&DE (E)], which work on complementary defence technologies.

• These labs collectively contribute to India's defence preparedness by focusing on areas such as explosives, materials engineering, and infrastructure development.

Important Points

• Other Options Explained:

• 2) The Armament Exploration and Innovation Establishment (AEIE): This is an incorrect option as there is no such DRDO lab named AEIE.

• 3) The Armament Research Establishment (ARE): This is also incorrect as it is not an official DRDO lab.

• 4) The Armament Development Establishment (ADE): Incorrect, as ADE is not related to the development of the 6.8 × 43 mm assault rifle prototype.

• Global Context:

• Countries like the USA and Russia have been investing in developing intermediate-caliber rifles for modern combat scenarios, similar to India's 6.8 × 43 mm rifle project.

• India’s indigenous efforts aim to ensure parity with global standards in small arms technology.

Q93. Answer: (a) Mansour Al Mansour

The correct answer is Mansour Al Mansour.

Key Points

• Mansour Al Mansour won the Global Teacher Prize, which is an annual award recognizing exceptional teachers around the globe who have made outstanding contributions to their profession.

• The award was established by the Varkey Foundation to elevate the status of teaching and highlight the critical role teachers play in shaping the future.

• In the year 2025, Mansour Al Mansour was honored for his innovative teaching methods and his contributions to improving education accessibility in underprivileged areas.

• The Global Teacher Prize carries a substantial monetary reward of $1 million and is recognized as one of the most prestigious awards in the field of education.

• Mansour's work primarily focused on integrating technology in education, fostering inclusive learning environments, and addressing the challenges of marginalized communities in his region.

Additional Information

• Global Teacher Prize:

• Launched in 2014 by the Varkey Foundation, the prize aims to celebrate the best educators worldwide.

• It recognizes teachers who have gone beyond traditional teaching practices to inspire students and create a lasting impact on their lives and communities.

• The prize is open to teachers from all countries and levels of schooling, from kindergarten through high school.

• Varkey Foundation:

• The Varkey Foundation is a global charitable organization dedicated to improving the quality of education for children around the world.

• It was founded by Sunny Varkey, an education entrepreneur and philanthropist.
• The foundation focuses on empowering teachers, enhancing educational opportunities, and addressing global education challenges.
• Importance of Education Accessibility:
• Education accessibility ensures that individuals from all socio-economic backgrounds can access quality education.
• It plays a critical role in reducing inequalities and promoting social mobility.
• Integrating technology, as Mansour Al Mansour demonstrated, can bridge gaps in educational infrastructure and resources.
• Other Notable Winners:
• In 2020, Ranjitsinh Disale from India won the prize for his work in promoting girls' education and using QR codes in textbooks.
• Sister Zeph, a nominee in earlier years, gained recognition for her efforts in educating girls in rural Pakistan.
• Asma Mustafa, another notable educator, has contributed significantly to refugee education in conflict zones.

Important Points

• Eligibility for Global Teacher Prize:
• Open to all working teachers who teach children between the ages of 5 and 18 or provide education to students in a formal school setting.
• Applicants are evaluated based on their achievements, innovative teaching practices, and impact on their communities.
• Prize Significance:
• The $1 million award is meant to highlight the importance of teachers and their contribution to society.
• Winners often use the prize money to further their educational projects and benefit their communities.
• Future Implications:
• Recognizing teachers through such awards encourages more individuals to pursue teaching as a career.
• It fosters global discussions on the value of education and the need for systemic improvements in teaching methodologies.

Q94. Answer: (c) C-FLOOD

The correct answer is C-FLOOD.

Key Points

• C-FLOOD is a unified inundation forecasting system launched by the Ministry of Jal Shakti in July 2025.
• The system provides two-day advance flood inundation forecasts at the village level, allowing for better preparedness and disaster management.
• It generates flood-inundation maps and water-level predictions, which are critical for local authorities and communities to plan evacuation and relief operations.
• The initiative is part of the government's focus on leveraging technology and data analytics to mitigate the impact of floods, which annually affect millions across India.
• This forecasting system integrates data from multiple sources, including weather forecasts, hydrological models, and satellite imagery, to provide accurate and actionable insights.

Additional Information

• Importance of Flood Forecasting:
• Flooding affects over 75 lakh hectares of land annually in India, causing significant economic losses and affecting livelihoods.
• Forecasting systems like C-FLOOD reduce the loss of life and property by enabling timely evacuation and resource allocation.
• Technology Used in C-FLOOD:
• Incorporates hydrological and hydraulic models to simulate flood scenarios.
• Utilizes satellite data for real-time monitoring of water levels and rainfall patterns.
• Relies on machine learning algorithms to improve the accuracy of predictions over time.
• Ministry of Jal Shakti's Role:
• The Ministry oversees water resource management, including flood control and forecasting.
• It collaborates with agencies such as the India Meteorological Department (IMD) and Central Water Commission (CWC) for data sharing and analysis.
• Comparison with Other Systems:
• Unlike older systems, C-FLOOD provides granular, village-level data, making it more effective for localized disaster management.
• It offers forecasts up to 48 hours in advance, which is a significant improvement over earlier models that provided shorter lead times.

Important Points

• Challenges in Flood Forecasting:

• Limited availability of high-resolution data in remote areas.

• Need for inter-agency coordination to ensure timely dissemination of forecasts.

• Improving community awareness and response mechanisms to maximize the utility of forecasts.

• Other Flood Management Initiatives in India:

• The National Flood Forecasting and Warning Network run by the Central Water Commission.

• Deployment of Automatic Rain Gauges (ARGs) and Telemetry Systems for real-time data collection.

• State-level initiatives such as flood zoning and embankment construction.

Q95. Answer: (d) May

The correct answer is May.

Key Points

• The South Asian Athletics Championships is a biennial event organized under the auspices of the South Asian Athletics Federation (SAAF).

• The 2025 edition of this championship is scheduled to be held in the month of May, aligning with favorable weather conditions and the international athletics calendar.

• May is strategically chosen for the event as it avoids conflicts with other major global athletics competitions, thereby ensuring the participation of top athletes from South Asia.

• This championship provides a platform for athletes from South Asian countries, including India, Pakistan, Nepal, Sri Lanka, Bhutan, Maldives, Afghanistan, and Bangladesh, to showcase their talent.

• Past editions of the South Asian Athletics Championships have been instrumental in fostering sportsmanship, cultural exchange, and athletic development in the region.

Additional Information

• Significance of South Asian Athletics Championships:

• The championship fosters regional cooperation and promotes the spirit of sportsmanship among South Asian countries.

• It serves as a stepping stone for athletes aiming to compete in global events such as the Asian Games and the Olympics.

• The event plays a crucial role in identifying young talent and providing them with international exposure.

• Weather Considerations in May:

• May is typically a month with stable weather conditions in most South Asian regions, making it suitable for outdoor athletic events.

• The moderate climate during this time helps ensure optimal performance and reduces the risk of weather-related disruptions.

• Participation and Events:

• The championship includes events such as track and field races, long jump, high jump, throwing events, and relay races.

• Top athletes from each South Asian country participate, making the competition highly competitive and prestigious.

• Role of the South Asian Athletics Federation (SAAF):

• The SAAF oversees the organization of the event and ensures it adheres to international standards set by the World Athletics Federation.

• It plays a vital role in promoting athletics in the region and nurturing young talent.

Important Points

• Historical Background:

• The South Asian Athletics Championships was first held in 1984 and has since become a key event in the region.

• The event has significantly contributed to the development of athletics in South Asia by providing international exposure to athletes.

• Achievements of Participants:

• Several athletes who have participated in the South Asian Athletics Championships have gone on to achieve success at the Asian Games and the Olympics.

• Notable athletes include Milkha Singh (India) and Susanthika Jayasinghe (Sri Lanka), who have brought glory to their respective nations.

• Future Prospects:

• The championship continues to inspire young athletes and serves as a platform for talent identification and development.

• It is anticipated that the 2025 edition will witness a record number of participants and groundbreaking performances.

YourMockTest.com — Free Study Material

Q96. Answer: (b) Madhav National Park

The correct answer is Madhav National Park.

Key Points

• Madhav National Park was designated as the 58th Tiger Reserve of India in 2023, under the Project Tiger initiative, which aims to conserve tigers and their habitats.

• Madhav National Park is located in the Shivpuri District of Madhya Pradesh, a state known for its significant contribution to tiger conservation in India.

• This designation is part of the Indian government's effort to expand the network of protected areas for tigers and strengthen biodiversity conservation.

• The park spans over an area of approximately 354 square kilometers, making it an ideal habitat for tigers and other wildlife species.

• The inclusion of Madhav National Park as a tiger reserve reflects the government's commitment to achieving conservation goals under the National Tiger Conservation Authority (NTCA).

Additional Information

• Madhav National Park:

• Madhav National Park was established in 1959 and is one of the oldest national parks in Madhya Pradesh.

• It is named after Madhav Rao Scindia, a prominent figure from the royal family of Gwalior.

• The park is home to a variety of wildlife, including Tigers, Leopards, Indian Gazelle (Chinkara), and Nilgai.

• It also features two important water bodies, Sakhya Sagar Lake and Chandrashila Lake, which provide water resources for the animals and act as tourist attractions.

• The park's vegetation is primarily dry deciduous forest, interspersed with grasslands, creating an ideal environment for predators and prey.

• Project Tiger:

• Launched in 1973, Project Tiger is a flagship conservation initiative of the Government of India, aiming to protect tigers and their natural habitats.

• The project is implemented by the National Tiger Conservation Authority (NTCA) and has led to the establishment of tiger reserves across the country.

• India is home to approximately 70% of the global tiger population, and the project has been pivotal in increasing tiger numbers through scientific management and anti-poaching measures.

• The latest All-India Tiger Estimation Report of 2022 recorded a significant increase in tiger population, emphasizing the success of such initiatives.

• Tiger Reserves in Madhya Pradesh:

• Madhya Pradesh is known as the "Tiger State of India" due to its high tiger population and the presence of multiple tiger reserves.

• Notable reserves include Kanha Tiger Reserve, Bandhavgarh Tiger Reserve, Panna Tiger Reserve, Satpura Tiger Reserve, and now Madhav National Park.

• The state's tiger reserves contribute significantly to eco-tourism and conservation education.

• National Tiger Conservation Authority (NTCA):

• The NTCA was established in 2006 under the Wildlife Protection Act of 1972 to strengthen tiger conservation efforts in India.

• It provides funding, technical support, and policy guidance for tiger reserves and ensures adherence to conservation protocols.

• The authority also conducts periodic assessments of tiger populations and their habitats.

Important Points

• Madhya Pradesh has consistently ranked among the top states in India for tiger conservation efforts, earning national and international recognition.

• The designation of Madhav National Park as the 58th Tiger Reserve aligns with the objectives of the Global Tiger Initiative, a worldwide effort to double tiger populations by 2022.

• The park's location near urban centers like Gwalior and Shivpuri increases its potential for eco-tourism and awareness programs.

• The involvement of local communities in conservation activities under the NTCA framework ensures sustainable management and reduces human-wildlife conflict.

• Continuous monitoring and capacity-building initiatives are crucial for the long-term success of tiger reserves like Madhav National Park.

YourMockTest.com – Free Study Material

Q97. Answer: (a) Rebeca Andrade

The correct answer is Rebeca Andrade.

Key Points

• Rebeca Andrade, a Brazilian artistic gymnast, was awarded the prestigious title of "Comeback of the Year" at the 2025 Laureus Awards.

• She is known for her remarkable resilience and determination, overcoming significant challenges including injuries that had impacted her career in the past.

• Rebeca achieved global recognition for her stellar performances in gymnastics, including earning accolades at the 2024 Paris Olympics and other international competitions.

• The Laureus Awards celebrate individuals and teams in the world of sports who exhibit extraordinary achievements, sportsmanship, and inspiration to others.

• This recognition underscores Rebeca Andrade's ability to bounce back from adversities and establish herself as a dominant force in gymnastics on the world stage.

Additional Information

• Rebeca Andrade's Career Highlights:

• Rebeca Andrade is the first Brazilian gymnast to win an Olympic gold medal in gymnastics. She achieved this feat at the 2024 Paris Olympics.

• Her career was marked by multiple injuries, including three anterior cruciate ligament (ACL) surgeries, which she overcame with resilience and hard work.

• Andrade is celebrated for her artistry, technical precision, and powerful routines, which have set her apart in the gymnastics community.

• She became the 2021 World All-Around Champion, further solidifying her status as one of the best gymnasts globally.

• The Laureus World Sports Awards:

• These awards are often referred to as the "Oscars of Sports", recognizing the best in the world of sports annually.

• The "Comeback of the Year" award specifically honors athletes who have made a noteworthy return to their sport after facing challenges such as injuries or setbacks.

• Winners are chosen by the Laureus World Sports Academy, which comprises 71 of the greatest sporting legends.

• Other Nominees for the 2025 Laureus "Comeback of the Year":

• Novak Djokovic: The Serbian tennis legend, known for his incredible return to form and record-breaking achievements in Grand Slam tournaments.

• Rafael Nadal: Another tennis icon who has battled injuries and continued to perform at the highest level in his career.

• Tom Pidcock: A British cyclist renowned for his achievements in mountain biking and road cycling after recovering from setbacks.

• Importance of the Award:

• The "Comeback of the Year" award highlights the spirit of perseverance, determination, and excellence in sports, inspiring millions worldwide.

• It serves as a reminder of how athletes can overcome adversities and achieve greatness through hard work and dedication.

Important Points

• Rebeca Andrade's Legacy:

• She is an inspiration for athletes globally, especially for those coming from underrepresented regions in sports like Brazil.

• Her achievements have brought attention to gymnastics in Brazil, encouraging young talent to pursue the sport.

• Broader Impact of Laureus Awards:

• The awards not only honor athletic achievements but also emphasize the role of sports in driving social change, unity, and inspiration.

• Their global outreach has helped highlight stories of perseverance, like that of Rebeca Andrade, to inspire others worldwide.

Q98. Answer: (a) Operation Meri Saheli

The correct answer is Operation Meri Saheli.

Key Points

• Operation Meri Saheli is an initiative launched by the Railway Protection Force (RPF) with the aim of ensuring the safety and comfort of women passengers traveling alone.

• It was started in October 2020 by the Indian Railways to provide round-the-clock safety for women passengers during their train journey.

• Under this operation, RPF personnel reach out to women passengers during train journeys, provide necessary safety tips, and ensure assistance in case of distress.

YourMockTest.com — Free Study Material

• The initiative involves dedicated teams of RPF personnel, specifically tasked with monitoring and interacting with women passengers to ensure their safety.

• In September 2025, South Western Railway (SWR) reported that its RPF had reached out to more than two lakh women passengers under Operation Meri Saheli.

• This initiative has been commended for its proactive approach to addressing security concerns for women traveling alone, making railway travel safer and more comfortable.

Additional Information

• Mahila Suraksha Doot Program:

• It is another initiative by Indian Railways focused on women's safety.

• Under this program, female RPF personnel are deployed to assist women passengers during their journey.

• However, this program is not the correct answer as it is different from Operation Meri Saheli.

• Safe City Project:

• This project aims to create a safer environment for women in cities by implementing measures like CCTV surveillance, installation of panic buttons, and lighting in public spaces.

• While it contributes to women's safety, it is not specifically related to railways or Operation Meri Saheli.

• Mission Shakti:

• Mission Shakti is a program launched by the Government of Uttar Pradesh to empower women and improve their safety.

• It includes various initiatives like the distribution of self-defense training and awareness programs for women.

• Although it focuses on women's welfare, it is not linked to the Indian Railways or Operation Meri Saheli.

• Key Features of Operation Meri Saheli:

• It involves interactive sessions with women passengers to address their concerns and provide safety tips.

• RPF personnel track the journey of identified women passengers and ensure that they are safe until they reach their destination.

• Emergency helpline numbers and assistance are provided if required.

• The initiative is being implemented across various zones of Indian Railways.

Important Points

• South Western Railway:

• One of the 18 zones of Indian Railways headquartered in Hubballi, Karnataka.

• It plays a crucial role in implementing various safety initiatives, including Operation Meri Saheli.

• Railway Protection Force (RPF):

• RPF is a security force under Indian Railways responsible for the protection of railway passengers, property, and assets.

• It actively works towards ensuring a safe travel experience for passengers, especially women.

• Women's Safety in Indian Railways:

• Indian Railways has implemented several measures like CCTV monitoring, women-only coaches, and emergency helplines to ensure women's safety.

• These initiatives highlight the commitment of Indian Railways to provide a secure traveling environment for women passengers.

Q99. Answer: (b) Ajay Seth

The correct answer is Ajay Seth.

Key Points

• Ajay Seth was appointed as the Chairman of the Insurance Regulatory and Development Authority of India (IRDAI) in July 2025.

• The IRDAI is the apex regulatory body overseeing the insurance sector in India, ensuring its orderly development and protecting policyholders' interests.

• Ajay Seth is a senior IAS officer with significant experience in finance and administration, making him a suitable candidate for this critical role.

• His responsibilities include overseeing the regulation of the insurance sector, implementing reforms, and promoting innovation within the industry.

• The appointment of Ajay Seth as the IRDAI Chairman highlights the government's focus on improving transparency, efficiency, and customer-centricity in the insurance sector.

Additional Information

• Insurance Regulatory and Development Authority of India (IRDAI):

• The IRDAI was established by the Insurance Regulatory and Development Authority Act, 1999, and is headquartered in Hyderabad.

• The primary objective of the IRDAI is to regulate, promote, and ensure the growth of the insurance and reinsurance industry in India.

• It safeguards the interests of policyholders and ensures fair practices in the insurance market.

• Key functions include granting licenses to insurance companies, monitoring policy compliance, and addressing grievances.

• Ajay Seth's Background:

• Ajay Seth is a senior Indian Administrative Service (IAS) officer with a proven track record in public administration and financial management.

• He has served in various high-profile roles, including positions in the Ministry of Finance and state governments.

• His expertise in policymaking and governance makes him instrumental in driving reforms in the insurance sector.

• Importance of IRDAI Leadership:

• The Chairman of the IRDAI plays a pivotal role in ensuring stability and growth in the insurance sector.

• Under the Chairman's guidance, the IRDAI formulates policies to ensure equitable regulation and foster innovation in insurance products.

• The leadership also focuses on increasing insurance penetration across rural and urban areas in India.

• Impact on the Insurance Sector:

• The appointment of a competent leader like Ajay Seth is expected to bring structural and operational improvements to the insurance sector.

• His tenure could witness the introduction of advanced digital technologies to enhance customer service and operational transparency.

• Efforts are anticipated to improve grievance redressal mechanisms and policyholder satisfaction.

Important Points

• Other Key Appointments in IRDAI:

• The IRDAI board comprises the Chairman, whole-time members, and part-time members who collectively oversee the functioning of the organization.

• Appointments to the IRDAI are made by the government, ensuring a robust selection process to bring in experienced professionals.

• Role of IRDAI in Digital Transformation:

• In recent years, the IRDAI has emphasized adopting digital technologies like AI and blockchain to enhance service delivery.

• Digital platforms are being utilized to simplify insurance policy issuance, claim settlements, and fraud detection.

Q100. Answer: (a) Amitav Ghosh

The correct answer is Amitav Ghosh.

Key Points

• Wild Fictions: Essays is authored by the renowned Indian writer Amitav Ghosh. This book is set to be published in January 2025.

• Amitav Ghosh is widely known for his exploration of themes such as climate change, colonial history, and cultural intersections in his works.

• He has been recognized globally for his contributions to literature, and his works often focus on the impact of globalization, the environment, and the human condition.

• The essays in Wild Fictions are expected to delve into the intricate relationship between humanity and the natural world, reflecting his continued advocacy for addressing environmental crises.

• Amitav Ghosh has previously authored notable works such as The Great Derangement, which also addresses climate change, and his renowned novels include The Shadow Lines and The Glass Palace.

Additional Information

• Amitav Ghosh:

• Amitav Ghosh was born on July 11, 1956, in Calcutta (now Kolkata), India.

• He is a recipient of prestigious awards, including the Jnanpith Award in 2018, the highest literary honor in India.

• He holds a Ph.D. in social anthropology from Oxford University and has an interdisciplinary approach in his writings.

• His novels often blend elements of history, science, and politics, making them highly relevant and thought-provoking.

• Other notable works by Amitav Ghosh:

• Sea of Poppies: Part of the Ibis Trilogy, this book explores the opium trade in the 19th century.

• Gun Island: A novel that intertwines themes of mythology, migration, and climate change.

• The Great Derangement: A non-fiction work discussing how literature and culture have failed to address the urgency of climate change.

• About the theme of Wild Fictions:

• The book is expected to address the interconnectedness of ecology, fiction, and human narratives, emphasizing the need for a renewed understanding of the environment.

• It is anticipated to critique modern society's approach to environmental degradation and offer reflections on how literature can act as a medium for environmental activism.

• Other prominent authors mentioned in the options:

• Nidhi Razdan: An Indian journalist and author known for her work in political and social commentary.

• Gautam Bhatia: An architect and writer recognized for his contributions to urban and architectural discourse.

• Santanu Bhattacharya: An emerging Indian author whose works explore themes of identity and belonging.

Important Points

• Amitav Ghosh's accolades: He was awarded the Padma Shri by the Government of India in 2007 for his contributions to literature.

• Climate change in literature: Ghosh is among the few writers emphasizing the need for stories that address the climate crisis and its impact on humanity.

• Interdisciplinary writing: His works are a blend of fiction, history, and environmental science, making them unique in the literary world.

More previous year papers and mock tests: **www.yourmocktest.com/pyq**

YourMockTest.com — Free Study Material