RRB Group D Official Paper (Held On: 30 Dec, 2025 Shift 2) (Previous Year Paper)

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

Take this paper as a timed mock test

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

yourmocktest.com/pyq/rrb-group-d/rrb-group-d-official-paper-held-on-30-dec-2025-shift-2-previ…

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

GENERAL SCIENCE

Q1. Work is said to be positive when _____.

(a) force and displacement are opposite
(b) no displacement occurs
(c) force and displacement are in the same direction
(d) force is perpendicular to the displacement

Q2. Salt dissolves in water because:

(a) It has lower density than water and floats easily
(b) It evaporates quickly in water during mixing
(c) It melts at room temperature forming a liquid
(d) Water has space between particles for ions to enter

Q3. While cooking, steam escapes from a boiling pot and hits the cook's hand. Why does she pull away her hand before feeling the burn?

(a) The heat evaporated quickly.
(b) Her hand muscles detect the steam.
(c) The spinal cord initiated a reflex action.
(d) The brain delayed the response.

Q4. Which of the following best defines a heterogeneous mixture?

(a) A pure substance that cannot be broken down further by chemical means.
(b) A compound formed by the chemical combination of two or more elements.
(c) A mixture where components are uniformly distributed and indistinguishable.
(d) A mixture where components are not uniformly distributed and can be easily seen as separate.

Q5. Which gas is evolved when a metal reacts with a dilute acid?

(a) Nitrogen
(b) Hydrogen
(c) Oxygen
(d) Carbon dioxide

Q6. Which of the following is an allotrope of carbon with a cage-like structure?

(a) Charcoal
(b) Graphite
(c) Diamond
(d) Fullerene

Q7. A satellite moves in a circular orbit of radius 42,250 km and completes one revolution in 24 hours. If a new satellite orbits at half this radius but maintains the same period, how does the speed (v_(new)) compare to the original speed (v_(orig))?

(a) vnew = 2vorig
(b) vnew = vorig
(c) vnew = 4vorig
(d) vnew = 0.5vorig

Q8. In a redox displacement reaction, if element X loses electrons and element Y gains electrons, then:

(a) X is oxidised and Y is reduced
(b) Both are reduced
(c) X is reduced and Y is oxidised
(d) Both are oxidised

Q9. In unicellular organisms, _____ is the method of reproduction.

(a) Regeneration
(b) Rejuvenation
(c) Fission
(d) Fragmentation

Q10. During an experiment, a cell is damaged and its lysosomes burst, releasing digestive enzymes into the cytoplasm. What is most likely to happen next?

(a) The mitochondria will produce more energy.
(b) The cell will grow in size.
(c) The cell will destroy itself and die.
(d) The nucleus will divide rapidly.

Q11. What occurs when a detached leaf of Bryophyllum comes into contact with moist soil?

(a) It shows a loss of chlorophyll.
(b) It decomposes.
(c) It produces new plantlets from notches on the leaf margin.
(d) It absorbs water and grows larger.

Q12. Which of the following is an example of a vibrating body producing sound?

(a) A moving car
(b) A ringing tuning fork
(c) A pendulum swinging silently
(d) A stationary fan

Q13. An electric iron having resistance (R) has a power (P) associated with it when current (I) flows through it on applying potential difference (V) across its ends. Which of the following relations is NOT correct?

(a) $P = V^2/R$
(b) $P = I^2R$
(c) $P = V/I$
(d) $P = VI$

Q14. Which of the following is NOT a consequence of nutrient deficiency in plants?

(a) Low yield
(b) Affected reproduction
(c) Poor growth
(d) Increased resistance to diseases

YourMockTest.com — Free Study Material

Q15. Select the statement regarding cell organelles that is INCORRECT.

(a) Each cell organelle performs a special function.
(b) They are found in Eukaryotic cells.
(c) They are membrane-bound structures.
(d) They are found in Prokaryotic cells.

Q16. Which of the following is an element?

(a) Oxygen
(b) Air
(c) Water
(d) Sodium chloride

Q17. Which of the following is INCORRECT?

(a) Buoyant force = weight of fluid displaced
(b) Buoyant force is maximum for fully submerged body.
(c) Buoyant force acts upwards.
(d) Buoyant force is independent of fluid density.

Q18. When an acid reacts with a reactive metal, the products formed are:

(a) A metal oxide and nitrogen gas evolve
(b) A salt and carbon dioxide gas form
(c) An alkali and hydrogen peroxide form
(d) A salt and hydrogen gas are produced

Q19. Which of the following correctly describes the graphical representation of Ohm's law?

(a) A straight line parallel to x-axis
(b) A hyperbolic curve
(c) An elliptical curve
(d) A straight line through the origin

Q20. The refractive indices of water, glass and diamond are 1.33, 1.5, and 2.42, respectively. Light travels:

(a) the fastest in water medium
(b) at the same speed irrespective of the medium
(c) the fastest in glass medium
(d) the fastest in diamond medium

Q21. If the slope of a distance-time graph changes continuously, it indicates:

(a) instantaneous rest
(b) uniform speed
(c) non-uniform speed
(d) stationary object

Q22. The outermost orbit can hold maximum how many electrons?

(a) 8
(b) 2
(c) 16
(d) 5

Q23. The _____ is a dark, spherical structure in the cell, surrounded by a _____ membrane with pores for material exchange.

(a) nucleoid; single
(b) vacuole; single
(c) nucleoid; double
(d) nucleus; double

YourMockTest.com — Free Study Material

Q24. What was Mendel's contribution to genetics?

(a) Theory of Evolution
(b) Discovery of DNA
(c) Inheritance of Acquired Traits
(d) Laws of Inheritance

Q25. What is the name of the effect seen when light is scattered by tiny particles in a colloidal solution?

(a) Reflection
(b) Dispersion
(c) Refraction
(d) Tyndall Effect

MATHEMATICS

Q26. A person observes an object on the ground from the top of a tower at an angle of depression 60°. If the distance between the foot of the tower and the object is $10\sqrt{3}$ m, then find the height (in m) of the tower.

(a) 21.5
(b) $15\sqrt{3}$
(c) $20\sqrt{3}$
(d) 30

Q27. In an election held in a city, the voting percentage was 72%. The winner got 27% of the polled votes, while the runner-up got 15% of the polled votes. If there were 1,20,000 voters in that city, by how many votes did the winner win the election?

(a) 10,458
(b) 11,458
(c) 11,358
(d) 10,368

Q28. The average of the first 9 even natural numbers is:

(a) 10
(b) 9
(c) 13
(d) 11

Q29. If the number of sides of a regular polygon is 18, then what is the measure of the interior angle of the polygon?

(a) 160°
(b) 150°
(c) 140°
(d) 120°

Q30. Nisha goes to a shop to purchase a toy drum priced at Rs. 5,000. She is offered 4 discount options by the shopkeeper. Which of the following options should she opt for to gain maximum advantage of the discount offered?

(a) Two successive discounts of 23% each
(b) A single discount of 64%
(c) Two successive discounts of 7% and 45%
(d) Two successive discounts of 10% and 39%

Q31. P sells an item to R at a profit of 10%, and R sells it to Q at a profit of 5%. What would have been P's profit percentage if he had sold the item directly to Q at the price R sold it?

(a) 15.5%
(b) 16%
(c) 14.5%
(d) 15%

YourMockTest.com — Free Study Material

Q32. A taxi service charges a fixed base fare plus a variable rate per kilometre. For a 10 km trip, Raju paid Rs. 230, and for a 15 km trip, Meena paid Rs. 330. What is the base fare and the per-kilometre charge?

(a) Base fare = Rs. 50; Per-kilometre Charge = Rs. 18
(b) Base fare = Rs. 60; Per-kilometre Charge = Rs. 20
(c) Base fare = Rs. 30; Per-kilometre Charge = Rs. 20
(d) Base fare = Rs. 40; Per-kilometre Charge = Rs. 18

Q33. If the radius of a sphere is 22 cm, then its surface area is:

(a) 1864 π cm^2
(b) 1936 π cm^2
(c) 2000 π cm^2
(d) 1964 π cm^2

Q34. Three candidates contested an election. The first candidate got 40% votes and the second got 30% votes. If the total number of votes polled were 36,000, find the number of votes obtained by the third candidate.

(a) 10,900
(b) 10,800
(c) 10,200
(d) 10,100

Q35. If the mean proportional of A and 27 is 18, then find the value of A.5768

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

Q36. Two trains, A and B, of lengths 457 m and 113 m are running at speeds of 18 m/s and 20 m/s, respectively, towards each other on parallel tracks. In how much time will they cross each other?

(a) 23 seconds
(b) 12 seconds
(c) 15 seconds
(d) 5 seconds

Q37. Find the smallest number which when increased by 20 is completely divisible by 12, 20, 15, 18 and 24.

(a) 330
(b) 340
(c) 320
(d) 310

Q38. Simplify: (10 × a^5 × b^6)/(2 × a^2 × b^3)

(a) 2 a^3 b^3
(b) 10 a^3 b^3
(c) 5 a^3 b^3
(d) 5 a^2 b^3

Q39. The capacity of a cylindrical vessel is 25.872 litres. If the height of the cylinder is three times the radius of its base, then what is the curved surface area of the cylinder?

(Use π = 22/7)

(a) 3945 cm2
(b) 4276 cm2
(c) 3696 cm^2
(d) 4122 cm2

YourMockTest.com — Free Study Material

Q40. The salaries of X, Y and Z are in the ratio 18:5:10. If the increments of 45%, 86% and 89% are allowed, respectively, in their salaries, then what will be new ratio of their salaries?

(a) 89:37:64
(b) 85:38:67
(c) 90:34:66
(d) 87:31:63

Q41. The marked price of a toy truck is Rs. 8,730, and its selling price is Rs. 5,940. Find the discount percentage. (Round off the answer to two decimal places.)

(a) 28.98%
(b) 31.96%
(c) 31.89%
(d) 35.12%

Q42. P and Q together can fill a cistern with water in 8 hours. If P alone can fill the cistern with water in 16 hours, then in how many hours will Q alone fill one-fourth of the same cistern with water?

(a) 4
(b) 8
(c) 9
(d) 5

Q43. A cyclist rides a 180 km course consisting of three segments. For the first 60 km, the cyclist rides at a speed of 20 km/hr. For the next 60 km, the cyclist rides at 30 km/hr. For the final 60 km, the cyclist rides at 60 km/hr. What is the cyclist's average speed for the entire journey?

(a) 28.57 km/hr
(b) 30 km/hr
(c) 26 km/hr
(d) 29.14 km/hr

Q44. The average age of 34 students of a class is 29 years. If the age of the teacher is also included, the average age of the whole group becomes 30 years. The age (in years) of the teacher is:

(a) 70
(b) 64
(c) 68
(d) 66

Q45. Which of the following pairs of numbers are relatively prime to each other?

(a) (68, 85)
(b) (102, 153)
(c) (65, 91)
(d) (52, 105)

Q46. Two pipes A and B fill a tank in 32 and 36 minutes, respectively and pipe C empties 13 cubic units per minute. All three pipes together can fill the tank in 20 minutes. Find the capacity (in cubic units) of the tank.

(a) 1560
(b) 720
(c) 1440
(d) 480

Q47. Simplify: $(x + 2)^2 - (x - 3)^2$

(a) 10x + 5
(b) 2x − 5
(c) 10x − 5
(d) 2x + 5

YourMockTest.com — Free Study Material

Q48. If the price of rice increases by 20% and a person reduces its consumption by 20%, by what percentage will his total expenditure on rice decrease?

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

Q49. The present age of a father is two times the age of his son. Fifteen years ago from now, the father was three times as old as his son was at that time. Find the present age of the father.

(a) 65 years
(b) 40 years
(c) 30 years
(d) 60 years

Q50. The amount on a sum of Rs. 3,500 at 20% per annum compound interest, compounded annually, in 2 years will be:

(a) Rs. 5,138
(b) Rs. 5,040
(c) Rs. 5,564
(d) Rs. 6,011

GENERAL INTELLIGENCE & REASONING

Q51. In a certain code language, 'MIST' is coded as '5321' and 'KITS' is coded as '5128'. What is the code for 'K' in that language?

(a) 5
(b) 2
(c) 1
(d) 8

Q52. Town K is to the north of Town L. Town M is to the east of Town K. Town N is to the south of Town M. Town O is to the west of Town N. Town L is to the south-west of Town O. What is the position of Town K with respect to Town O?

(a) South-west
(b) North-west
(c) North-east
(d) South-east

Q53. Select the set in which the numbers are related in the same way as are the numbers of the following sets.

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

(5, 20, 13)

(9, 32, 25)

(a) (15, 50, 43)
(b) (20, 65, 72)
(c) (14, 37, 30)
(d) (12, 41, 48)

Q54. If 1 is added to each odd digit and 2 is subtracted from each even digit in the number 8341756, then how many digits will appear more than once in the new number thus formed?

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

YourMockTest.com — Free Study Material

Q55. Six colleagues — Hussain, Anita, Manshaad, Emily, Sunita, and Shanti — are sitting around a circular table facing the centre. Hussain is sitting second to the right of Anita. Manshaad is an immediate neighbour of both Emily and Anita. Sunita is sitting second to the left of Manshaad. Who is sitting second to the left of Shanti?

(a) Emily
(b) Anita
(c) Manshaad
(d) Sunita

Q56. Refer to the following number series and answer the question that follows (all numbers are single digit numbers only). Counting to be done from left to right only.

(Left) 8 9 4 1 2 3 7 3 1 4 6 (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) Four
(b) Two
(c) Three
(d) One

Q57. What should come in place of the question mark (?) in the given series?

2, 5, 10, 17, 26, ?

(a) 41
(b) 37
(c) 39
(d) 35

Q58. Seven boxes, A, B, C, D, E, F and G, are kept one over the other, but not necessarily in the same order.

Only three boxes are kept below D. Only two boxes are kept between D and E. Only C is kept immediately above A. F is kept at some place below B and at some place above G.

How many boxes are kept below G?

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

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

SWE33, LPX50, EIQ67, XBJ84, ?

(a) QUC101
(b) QVC101
(c) OUC101
(d) QUD101

Q60. Read the given statements and conclusions carefully. Assuming that the information given in the statements is true, even if it appears to be at variance with commonly known facts, decide which of the given conclusions logically follow(s) from the statements.

Statements:

Some elephants are horses.

No horse is a donkey.

Conclusions:

(I) No elephant is a donkey.

(II) No horse is an elephant.

(a) Only II follows
(b) Neither follows
(c) Both follow

YourMockTest.com — Free Study Material

(d) Only I follows

Q61. In a certain code language, ‘bring hot food’ is coded as ‘cf tk rg’ and ‘food is good’ is coded as ‘ml do cf’. How is ‘food’ coded in that language?

(a) ml
(b) do
(c) tk
(d) cf

Q62. Based on the English alphabetical order, three of the following four letter-cluster pairs are alike in a certain way and thus form a group. Which letter-cluster pair DOES NOT belong to that group?

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

(a) BF−EI
(b) VZ−YC
(c) ZD−BI
(d) IM−LP

Q63. Select the pair that follows the same pattern as that followed by the two pairs given below. Both pairs follow the same pattern.

CZB−EBD

IFH−KHJ

(a) DAC−FCE
(b) DAC−ECD
(c) DZA−FCE
(d) DZA−EBD

Q64. If ‘A’ stands for ‘÷’, ‘B’ stands for ‘×’, ‘C’ stands for ‘+’ and ‘D’ stands for ‘−’, then what will come in place of the question mark (?) in the following equation?

21 A 3 C 2 B 6 D 14 = ?

(a) 5
(b) 11
(c) 2
(d) 17

Q65. All 81 people are standing in a row facing the north. Mr. Hepa is 11^(th) from the left end, while Mr. Annu is 16^(th) from the right end. How many people are there between Mr. Hepa and Mr. Annu?

(a) 55
(b) 58
(c) 54
(d) 56

Q66. What should come in place of the question mark (?) in the given series?

1011 1010 1007 1002 995 ?

(a) 984
(b) 985
(c) 986
(d) 987

Q67. Select the pair which follows the same pattern as that followed by the two pairs given below. Both pairs follow the same pattern.

WZX−TWU

QTR−NQO

(a) YAX−UXV
(b) YAX−VYW
(c) YBZ−VYW

YourMockTest.com — Free Study Material

(d) YBZ−UYV

Q68. What will come in the place of the question mark (?) in the following equation, if '+' and '−' are interchanged and '×' and '÷' are interchanged?

189 – 153 × 9 ÷ 3 + 195 = ?

(a) 40
(b) 46
(c) 44
(d) 45

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

489 479 469 ? 449 ? 429

(a) 459 and 429 respectively
(b) 469 and 439 respectively
(c) 449 and 439 respectively
(d) 459 and 439 respectively

Q70. This question is based on the five, three-digit numbers given below.

(Left) 672 323 561 307 529 (Right)

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

(NOTE - All operations to be done from left to right.)

What will be the resultant if the second digit of the highest number is added to the third digit of the lowest number?

(a) 15
(b) 14
(c) 18
(d) 16

Q71. Read the given statements and conclusions carefully. Assuming that the information given in the statements is true, even if it appears to be at variance with commonly known facts, decide which of the given conclusions logically follow(s) from the statements.

Statements:

All glasses are tiles.

All glasses are cups.

All cups are mugs.

Conclusions:

(I): All glasses are mugs.

(II): Some cups are tiles.

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

Q72. Rohit starts from point A and drives 2 km towards the east. He then takes a left turn, drives 5 km and then again turns left and drives 2 km. He then takes a final left turn and drives 3 km and stops at point E. How far and towards which direction should he drive in order to reach point A again? (All turns are 90-degree turns only unless specified.)

(a) 2 km towards the east
(b) 4 km towards the north
(c) 4 km towards the west
(d) 2 km towards the south

YourMockTest.com — Free Study Material

Q73. In a certain code language,

'A ± B' means 'A is the wife of B',

'A * B' means 'A is the daughter of B',

'A Rs. B' means 'A is the father of B' and

'A # B' means 'A is the brother of B'.

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

(a) Husband
(b) Father
(c) Brother
(d) Son

Q74. 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) MQO
(b) GKI
(c) OSU
(d) QUS

Q75. What should come in place of the question mark (?) in the given series based on the English alphabetical order?

HEM JGO LIQ NKS ?

(a) PNU
(b) PMV
(c) PNV
(d) PMU

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

(Left) 284 286 297 213 246 273 (Right)

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

(NOTE: All operations to be done from left to right.)

What will be the resultant if the third digit of the highest number is added to the third digit of the lowest number?

(a) 8
(b) 9
(c) 10
(d) 13

Q77. This question is based on the five, three-digit numbers given below.

(Left) 624 859 742 154 348 (Right)

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

(NOTE: All operations to be done from left to right.)

What will be the resultant if the third digit of the second highest number is added to the third digit of the second lowest number?

(a) 8
(b) 9
(c) 7
(d) 10

Q78. Six people, A, B, C, D, E and F, are sitting in a row, facing the north. D sits to the immediate left of F. C sits third to the left of B. F is an immediate neighbour of C. E sits second to the right of C. A sits to the immediate left of E.

Who sits at the extreme right end of the row?

(a) A
(b) E
(c) B

YourMockTest.com — Free Study Material

(d) F

Q79. Six people G, H, I, Q, R and S are sitting in a straight line facing the north. Only two people are seated to the left of G. Only two people are seated between G and I. Only one person is seated between I and R. Q is seated to the immediate left of H. How many people are seated to the right of S?

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

Q80. BRMJ is related to XNIF in a certain way based on the English alphabetical order. In the same way, TQSN is related to PMOJ. To which of the given options is LDSK related, following the same logic?

(a) HZOG
(b) GXNF
(c) KAQI
(d) IZPH

GENERAL AWARENESS AND CURRENT AFFAIRS

Q81. In March 2025, the Disaster Management (Amendment) Bill 2024 was passed in the Lok Sabha. This bill seeks to amend which of the following Acts?

(a) The Epidemic Diseases Act, 1897
(b) The Disaster Management Act, 2005
(c) The Environmental Protection Act, 1986
(d) The National Green Tribunal Act, 2010

Q82. Which of the following districts emerged as the best-performing district in the Northeastern Region according to the 2023–24 SDG Index released by NITI Aayog in July 2025?

(a) Aizawl (Mizoram)
(b) East Sikkim (Sikkim)
(c) Hnahthial (Mizoram)
(d) West Tripura (Tripura)

Q83. Which sport is associated with Rafael Nadal, recipient of the 2025 Sporting Icon Award?

(a) Table Tennis
(b) Athletics
(c) Tennis
(d) Golf

Q84. On 1 September 2025, the rupee _____ to a record low before recovering after likely RBI intervention.

(a) stabilised at Rs. 80 per USD
(b) rose to Rs. 75 per USD
(c) rose to Rs. 88 per USD
(d) fell to Rs. 88.33 per USD

Q85. Where was Asia's longest double-decker flyover inaugurated in October 2024?

(a) Hyderabad
(b) Nagpur
(c) Chennai
(d) Bengaluru

Q86. On 26 May 2025, which government agency released a report titled 'Designing a Policy for Medium Enterprises', offering a comprehensive roadmap for transforming medium enterprises into future growth engines of India’s economy?

(a) Securities and Exchange Board of India

YourMockTest.com — Free Study Material

(b) State Bank of India
(c) NITI Aayog
(d) Reserve Bank of India

Q87. In 2025, Uttar Pradesh and which other state hosted the Defence Industrial Corridor that together have attracted investments worth over Rs. 8,658 crore?
(a) Tamil Nadu
(b) Gujarat
(c) Maharashtra
(d) Karnataka

Q88. In August 2025, DRDO's Defence Metallurgical Research Laboratory (DMRL) transferred the technology for manufacturing high-strength radomes to which of the following companies?
(a) Hindustan Aeronautics Limited (HAL)
(b) Bharat Dynamics Limited (BDL)
(c) Bharat Heavy Electricals Limited (BHEL)
(d) Armoured Vehicles Nigam Limited (AVNL)

Q89. The 6^(th) edition of the UMAI National Muaythai Championship was held in June 2025. What was its host city?
(a) Ranchi
(b) Rohtak
(c) Raipur
(d) Bhopal

Q90. Which among the following technology-based methods of beneficiary registration under Poshan 2.0 was announced for implementation from 1^(st) August 2025 during the Zonal Meeting at Kevadia, Gujarat, organised by the Ministry of Women and Child Development?
(a) One-Time Password Verification Method
(b) Facial Recognition System
(c) Biometric Authentication System
(d) Quick Response Code Scanning Process

Q91. What was the penalty amount imposed by the Insurance Regulatory and Development Authority of India (IRDAI) on Acko General Insurance in May 2025?
(a) Rs. 1 crore
(b) Rs. 2 crore
(c) Rs. 50 lakh
(d) Rs. 25 lakh

Q92. In October 2024, which of the following companies was awarded the contract for design, manufacturing and commissioning of two high-speed trainsets by Integral Coach Factory (ICF) to be used in India’s first bullet train between Mumbai and Ahmedabad?
(a) Bharat Earth Movers Limited (BEML)
(b) Rail Coach Factory (RCF) Kapurthala
(c) Modern Coach Factory (MCF) Raebareli
(d) Braithwaite and Co. Limited

Q93. Which city hosted the first Indian Grand Prix athletics meet in March 2025?
(a) Thiruvananthapuram
(b) Bhubaneswar
(c) Chennai
(d) Bengaluru

YourMockTest.com – Free Study Material

Q94. The new FASTag Annual plan system is specifically NOT designed for which type of vehicles?

(a) Commercial trucks
(b) Jeeps
(c) Private cars
(d) Vans

Q95. Who won the 2025 Pulitzer Prize for Fiction with the novel 'James', a reimagining of 'Huckleberry Finn' from Jim's perspective?

(a) Percival Everett
(b) Tim Minshall
(c) Danny Boy O'Connor
(d) Charles McQueer

Q96. Who scored centuries in both innings of the 1^(st) Test against England at Headingley in 2025?

(a) Virat Kohli
(b) Rishabh Pant
(c) KL Rahul
(d) Jasprit Bumrah

Q97. At the Eighth Session of the International Solar Alliance (ISA) Assembly held at Bharat Mandapam in October 2025, which of the following initiatives was launched to address solar waste and promote circularity in the solar sector?

(a) SURYA – Solar Urban Rooftop Yojana for Asia
(b) SUNRISE – Solar Upcycling Network for Recycling, Innovation & Stakeholder Engagement
(c) JYOTI – Joint Yearly Outlook for Technology and Innovation
(d) PRABHA – Programme for Rural and Bharat Household Access to Solar

Q98. Which of the following Ministries conferred the prestigious National Dhanwantari Ayurveda Awards in 2025 for distinguished practitioners for their exceptional contributions to the field of traditional Indian medicine?

(a) Ministry of Education
(b) Ministry of Culture
(c) Ministry of AYUSH
(d) Ministry of Tribal Affairs

Q99. Rebakanta Mahanta, who was awarded the Padma Shri in January 2025, is renowned for which art form?

(a) Pottery
(b) Kathakali
(c) Bamboo mask-making
(d) Madhubani painting

Q100. Who was awarded the Nobel Peace Prize 2025?

(a) Maria Corina Machado
(b) Malala Yousafzai
(c) Svetlana Tikhanovskaya
(d) Greta Thunberg

ANSWER KEY

1	c	2	d	3	c	4	d	5	b	6	d	7	d	8	a	9	c	10	c
11	c	12	b	13	c	14	d	15	d	16	a	17	d	18	d	19	d	20	a
21	c	22	a	23	d	24	d	25	d	26	d	27	d	28	a	29	a	30	b
31	a	32	c	33	b	34	b	35	d	36	c	37	b	38	c	39	c	40	d
41	b	42	a	43	b	44	b	45	d	46	c	47	c	48	c	49	d	50	b
51	d	52	b	53	a	54	d	55	c	56	b	57	b	58	b	59	a	60	b

YourMockTest.com — Free Study Material

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

SOLUTIONS

Q1. Answer: (c) force and displacement are in the same direction

The correct answer is force and displacement are in the same direction.

Key Points

• Work is defined in physics as the product of the component of the force in the direction of the displacement and the magnitude of that displacement.

• The mathematical formula for work is W = Fs cos θ, where F represents the magnitude of the force, s represents the displacement, and θ is the angle between the force vector and the displacement vector.

• Positive work is performed when the force acts in the same direction as the displacement. In this scenario, the angle θ is 0 degrees. Since the value of cos 0 is +1, the resulting work value is positive. Hence, statement 3 is correct.

• Examples of positive work include a horse pulling a cart on a level road or a person lifting an object from the ground (where the applied force and displacement are both upward).

• For work to be considered positive, the force must have a component that facilitates the motion of the object, typically occurring when the angle θ is acute (between 0 and 90 degrees).

Additional Information

• Negative Work: This occurs when the force and displacement act in opposite directions. Here, the angle θ is 180 degrees, and since cos 180 is -1, the work done is negative. A common example is the force of friction acting against a moving vehicle. Hence, statement 1 is incorrect.

• Zero Work (No Displacement): If an applied force does not result in any movement or displacement (s = 0), the total work done is zero. For example, pushing against a rigid stone wall that does not move results in no work. Hence, statement 2 is incorrect.

• Zero Work (Perpendicular Force): Work is also zero when the force is applied perpendicularly to the direction of motion. In this case, the angle θ is 90 degrees, and cos 90 is 0. An example is a coolie carrying a load on his head while walking on a horizontal platform; the force of gravity acts downward while displacement is horizontal. Hence, statement 4 is incorrect.

• Units of Work: In the SI system, the unit of work is the Joule (J), which is equivalent to 1 Newton-meter (N-m). In the CGS system, the unit is the erg. 1 Joule is equal to 10^7 ergs.

Important Points

• Nature of Quantity: Work is a scalar quantity, meaning it has only magnitude and no direction, despite being derived from two vector quantities (force and displacement).

• Dimensional Formula: The dimensional formula for work is [ML2T-2]. This is identical to the dimensional formula for Energy, confirming the Work-Energy Theorem, which states that work done on an object results in a change in its kinetic energy.

• Sign Significance: The sign of work (positive or negative) does not indicate direction in space but rather whether energy is being transferred to the object (positive) or removed from the object (negative).

• Total Work: When multiple forces act on a body, the net work is the algebraic sum of the work done by each individual force.

Q2. Answer: (d) Water has space between particles for ions to enter

The correct answer is Water has space between particles for ions to enter.

Key Points

• Common Salt (NaCl) is an ionic compound made up of sodium (Na+) and chloride (Cl-) ions held together by strong electrostatic forces.

• Water is known as a universal solvent because its molecules have a polar nature, featuring a partial negative charge on the oxygen atom and a partial positive charge on the hydrogen atoms.

• According to the Kinetic Molecular Theory, matter is composed of particles that have inter-molecular spaces between them. When salt is added to water, the water molecules surround the salt ions, pull them away from the crystal lattice, and these ions then occupy the empty spaces between the water particles. Hence, statement 4 is correct.

• The density of salt is approximately 2.16 g/cm³, while the density of water is 1.0 g/cm³. Salt is denser than water and would naturally sink to the bottom if it did not dissolve; floating is not a reason for its solubility. Hence, statement 1 is incorrect.

• Evaporation is the process of a liquid turning into a gas. Salt is a solid with a very high boiling point of about 1413°C and does not evaporate or turn into a gas during the mixing process in liquid water. Hence, statement 2 is incorrect.

YourMockTest.com — Free Study Material

• Salt has a very high melting point of approximately 801°C. It does not melt at room temperature (typically 25°C); rather, it dissolves through a chemical interaction with the solvent molecules. Hence, statement 3 is incorrect.

• Hence, the correct answer is Water has space between particles for ions to enter.

Additional Information

• The Process of Dissolution:

• When NaCl enters water, the dielectric constant of water reduces the electrostatic force of attraction between the Na+ and Cl- ions.

• This process is called solvation (specifically hydration when the solvent is water), where the positive ends of water molecules attract the Cl- ions and the negative ends attract the Na+ ions.

• Lattice Energy vs. Hydration Energy:

• A substance dissolves only if its hydration energy (energy released during interaction with water) is greater than its lattice energy (energy required to break the solid crystal).

• For Sodium Chloride, the hydration energy is sufficient to overcome the lattice energy, making it highly soluble.

• Polarity:

• Water is a polar covalent molecule. The "like dissolves like" rule applies here, meaning polar solvents dissolve polar or ionic solutes.

• Saturation Point:

• There is a maximum amount of salt that can be dissolved in a specific volume of water at a given temperature. When no more salt can be dissolved, the solution is said to be saturated.

Important Points

• Physical Change: Dissolving salt in water is generally considered a physical change because the salt can be recovered through evaporation or distillation.

• Conductivity: Once salt dissolves and dissociates into ions, the resulting solution becomes an electrolyte, which can conduct electricity due to the mobility of the charged particles.

• Temperature Effect: The solubility of most solid solutes, including salt, typically increases with an increase in temperature because higher kinetic energy helps break the solute-solute bonds.

• Diffusion: The spread of salt ions throughout the water is also aided by diffusion, where particles move from an area of higher concentration to an area of lower concentration.

Q3. Answer: (c) The spinal cord initiated a reflex action.

The correct answer is The spinal cord initiated a reflex action.

Key Points

• The immediate withdrawal of the hand when touching a hot object or steam is known as a reflex action, which is an involuntary and nearly instantaneous response to a stimulus.

• This rapid reaction occurs through a neural pathway called the reflex arc. When the steam hits the hand, thermoreceptors (heat sensors) in the skin are activated and send an electrical impulse through sensory neurons.

• Instead of the signal traveling all the way to the brain for processing, it reaches the spinal cord, where it is immediately redirected. Hence, the statement that the spinal cord initiated a reflex action is correct.

• Within the spinal cord, the signal is passed to an interneuron and then directly to a motor neuron, which carries the command to the muscles of the arm to contract and pull the hand away.

• The brain only receives the message after the action has been initiated; this is why we often feel the burn or pain a split second after we have already moved our hand.

Additional Information

• The Central Nervous System (CNS): It comprises the brain and the spinal cord. While the brain is the main control center for complex processing and decision-making, the spinal cord serves as a relay station and the primary center for reflexes.

• Components of a Reflex Arc: A typical reflex arc consists of five components:

1. Receptor (senses the stimulus).

2. Sensory Neuron (transmits the signal to the CNS).

3. Integration Center (the spinal cord).

4. Motor Neuron (transmits the signal from the CNS to the effector).

5. Effector (the muscle or gland that responds).

• Significance of Reflexes: The primary function of a reflex action is protection. By bypassing the conscious thought process of the brain, the body significantly reduces response time, thereby minimizing potential tissue damage from harmful stimuli like fire, sharp objects, or steam.

• Types of Reflexes: Reflexes can be categorized as unconditioned reflexes (inborn, like the knee-jerk or pulling away from heat)

and conditioned reflexes (acquired through learning or experience, like salivating at the smell of food).

• Thermoreception: Humans possess specialized nerve endings in the skin called thermoreceptors. These are specifically tuned to detect changes in temperature. When steam (which carries high latent heat) hits the skin, these receptors trigger the reflex mechanism much faster than the perception of pain can reach the cerebral cortex.

Important Points

• Sensory vs. Motor Neurons: Sensory neurons (afferent) carry information toward the Central Nervous System, while motor neurons (efferent) carry commands away from the CNS to the muscles.

• Synapse: The small gap between two neurons where neurotransmitters are released to transmit the signal is called a synapse. In a reflex arc, the number of synapses is minimized to ensure maximum speed.

• Peripheral Nervous System (PNS): All the nerves that branch out from the brain and spinal cord to the rest of the body (like the ones in the cook's hand) make up the PNS.

• Gray Matter: The integration of the reflex signal typically happens in the gray matter of the spinal cord, which contains the cell bodies of the neurons.

Q4. Answer: (d) A mixture where components are not uniformly distributed and can be easily seen as separate.

The correct answer is A mixture where components are not uniformly distributed and can be easily seen as separate.

Key Points

• A heterogeneous mixture is defined as a mixture that possesses a non-uniform composition throughout its mass. This means the proportions of the components vary in different parts of the sample.

• In this type of mixture, the components remain physically separate and can be observed as distinct phases, either with the naked eye or under a microscope. Hence, statement 4 is correct.

• The physical properties of the individual components are retained because they are not chemically bonded. For instance, in a mixture of iron filings and sulfur, the iron remains magnetic.

• Because the substances are not chemically combined, they can be separated using physical methods such as filtration, decantation, manual sorting, or evaporation.

• Typical examples include oil and water, sand in water, concrete, and a fruit salad, where each constituent part maintains its own identity and state.

Additional Information

• Homogeneous Mixture:

• This is a mixture where the components are uniformly distributed and the mixture exists in a single phase. It is commonly referred to as a solution.

• Examples include air (a mixture of gases), brass (an alloy), and saltwater. Hence, statement 3 is incorrect as it describes a homogeneous mixture.

• Pure Substances (Elements):

• An element is a pure substance consisting of only one type of atom and cannot be broken down into simpler substances by chemical means.

• Gold, Oxygen, and Hydrogen are primary examples. Hence, statement 1 is incorrect as it defines an element.

• Compounds:

• A compound is a substance formed when two or more elements are chemically combined in a fixed ratio by mass.

• Compounds like Water (H_2O) or Carbon Dioxide (CO_2) have entirely different properties from their constituent elements. Hence, statement 2 is incorrect as it defines a compound.

• Suspensions and Colloids:

• A suspension is a specific type of heterogeneous mixture with large particles that settle over time, such as chalk powder in water.

• A colloid (like milk or fog) appears homogeneous to the naked eye but is heterogeneous at the microscopic level because it scatters light (the Tyndall effect).

Important Points

• Phase Boundaries: Heterogeneous mixtures always contain visible boundaries between the different substances, known as interfaces.

• Variable Composition: Unlike compounds, mixtures do not have a fixed formula. You can add more sand to a sand-water mixture without changing its fundamental classification as a mixture.

• Energy Changes: The formation of a mixture is a physical change, and usually, no significant energy (heat or light) is released or absorbed during the mixing process.

• Applications: Understanding heterogeneity is vital in industries like mining (separating ores), waste management (sorting recyclables), and food processing.

YourMockTest.com — Free Study Material

Q5. Answer: (b) Hydrogen

p data-end="57" data-start="0">The correct answer is Hydrogen.

Key Points

• When a reactive metal reacts with a dilute acid, it typically produces a metal salt and evolves Hydrogen gas.

• The general chemical equation for this reaction is: Metal + Dilute Acid → Metal Salt + Hydrogen (H2).

• This process is classified as a displacement reaction because the metal atoms displace hydrogen atoms from the acid molecules. Hence, the correct answer is Hydrogen.

• For example, when Zinc (Zn) granules are added to dilute Hydrochloric acid (HCl), the reaction yields Zinc Chloride (ZnCl2) and releases Hydrogen gas.

• Not all metals react with dilute acids; only those metals that are placed above hydrogen in the reactivity series (like Potassium, Sodium, Calcium, Magnesium, Aluminium, Zinc, and Iron) can displace it.

• Metals such as Copper, Silver, and Gold are located below hydrogen in the reactivity series and do not react with dilute acids to evolve hydrogen gas under standard conditions.

Additional Information

• Hydrogen Gas:

• It is a colorless, odorless, and highly flammable diatomic gas with the molecular formula H2.

• It was first recognized as a distinct substance by Henry Cavendish in the year 1766.

• It is the lightest element in the universe, having an atomic number of 1 and an atomic mass of approximately 1.008.

• Identification of Evolved Gas:

• The presence of hydrogen gas can be confirmed using the "Pop Sound" test. When a burning splinter or matchstick is brought near the mouth of the test tube containing the gas, it burns with a characteristic pop sound.

• Other Options Context:

• Nitrogen: It is relatively inert and is not typically evolved during simple metal-acid reactions. It makes up about 78% of the Earth's atmosphere.

• Oxygen: It is evolved during the decomposition of certain oxides or through electrolysis of water, but not during the reaction of metals with dilute acids.

• Carbon Dioxide: This gas is evolved when metal carbonates or metal bicarbonates react with dilute acids, not when pure metals react with them.

Important Points

• Exception with Nitric Acid:

• Hydrogen gas is generally not evolved when a metal reacts with dilute Nitric acid (HNO3).

• This is because Nitric acid is a strong oxidizing agent. It oxidizes the Hydrogen (H2) produced into water (H2O) and itself gets reduced to various nitrogen oxides like N2O, NO, or NO2.

• However, Magnesium (Mg) and Manganese (Mn) are exceptions as they can react with very dilute Nitric acid to evolve hydrogen gas.

• Reactivity Trends:

• The rate of evolution of hydrogen gas depends on the position of the metal in the reactivity series.

• Magnesium reacts very rapidly, while Iron reacts much more slowly with dilute acids.

• Sodium and Potassium react so vigorously (exothermic) that the evolved hydrogen catches fire immediately.

Q6. Answer: (d) Fullerene

The correct answer is Fullerene.

Key Points

• Fullerenes are a unique class of carbon allotropes that possess a cage-like structure, which can be in the form of a hollow sphere, ellipsoid, or tube.

• The most well-known member of this group is C60, commonly referred to as Buckminsterfullerene. It consists of 60 carbon atoms arranged in a spherical shape resembling a soccer ball.

• The structure of C60 is composed of 20 hexagons and 12 pentagons. This specific arrangement allows the molecule to be exceptionally stable and symmetrical.

• These molecules were named after the famous architect Richard Buckminster Fuller, as the geodesic domes he designed bear a striking resemblance to the molecular structure of fullerenes.

• The discovery of fullerenes occurred in 1985 by researchers Harold Kroto, Robert Curl, and Richard Smalley. For this landmark discovery, they were awarded the Nobel Prize in Chemistry in 1996.

Additional Information

• Diamond:

• It is a crystalline allotrope of carbon where each atom is covalently bonded to four other carbon atoms in a tetrahedral geometry.

• It is recognized as the hardest known natural substance on Earth and has a very high melting point and refractive index.

• Due to its hardness, it is widely used in industrial cutting tools, drilling bits, and as a gemstone in jewelry.

• Graphite:

• This allotrope is made of hexagonal layers of carbon atoms that are held together by weak Van der Waals forces.

• Unlike other allotropes, graphite is a good conductor of electricity due to the presence of delocalized electrons.

• It is commonly used as a dry lubricant, in electrodes, and as the lead in pencils.

• Charcoal:

• It is an amorphous (non-crystalline) form of carbon created by the carbonization of organic matter like wood in a low-oxygen environment.

• It is highly porous and has a high surface area, making it excellent for water filtration and gas masks.

Important Points

• Physical Properties of Fullerenes: They are generally semiconductors but can be converted into superconductors when "doped" with alkali metals like potassium or rubidium.

• Applications: Fullerenes are being researched for nanotechnology, drug delivery systems in medicine (due to their ability to "trap" molecules inside the cage), and as antioxidants.

• Natural Occurrence: While often synthesized in laboratories using an electric arc between graphite electrodes, fullerenes have also been found in interstellar dust and in soot from lightning strikes.

• Graphene: Another modern allotrope, it is a two-dimensional single layer of carbon atoms arranged in a honeycomb lattice, known for its incredible tensile strength.

Q7. Answer: (d) vnew = 0.5vorig

The correct answer is vnew = 0.5vorig.

Key Points

• The speed of an object moving in a circular orbit is defined by the distance it travels divided by the time it takes to complete that distance. The distance for one full revolution is the circumference of the circle, which is calculated as 2πr.

• The formula for orbital speed (v) is expressed as v = 2πr / T, where r represents the radius of the orbit and T represents the time period or the time taken for one revolution.

• In the given problem, the original satellite has a radius (rorig) of 42,250 km and a time period (T) of 24 hours. Its speed is vorig = (2π × 42,250) / 24.

• The new satellite orbits at half the original radius, meaning rnew = 0.5 × rorig, which equals 21,125 km. However, the problem specifies that it maintains the same period of 24 hours.

• By substituting the new radius into the speed formula while keeping T constant, we get vnew = (2π × 0.5rorig) / T. Since vnew = 0.5 × (2πrorig / T), it mathematically follows that vnew = 0.5vorig. Hence, the statement that the new speed is half the original is correct.

Additional Information

• Uniform Circular Motion:

• This describes the motion of a body traversing a circular path at a constant speed. While the speed remains constant, the velocity is constantly changing because the direction of motion changes at every point.

• The acceleration in such motion is called centripetal acceleration, which always points toward the center of the circular path.

• Geostationary Orbit (GEO):

• A satellite in a circular orbit at an altitude of approximately 35,786 km (resulting in a radius of about 42,164 km from Earth's center) with a period of 24 hours is in a Geostationary Orbit.

• Such satellites appear stationary relative to a fixed point on the Earth's surface, making them ideal for telecommunications and weather monitoring.

• Relationship between Speed, Radius, and Time:

• When the time period (T) is kept constant, the orbital speed (v) is directly proportional to the orbital radius (r). If you double the radius, the speed doubles; if you halve the radius, the speed is halved.

• In real-world celestial mechanics (governed by Kepler's Third Law), the period T usually changes with r (T^2 prop. to r^3). However, in purely kinematic problems like this one, we follow the constraints provided by the question.

Important Points

• Calculation of Original Speed: Using the radius of 42,250 km and time of 24 hours, the speed vorig is approximately 11,055 km/h or 3.07 km/s.

• Linear Velocity vs. Angular Velocity: While the linear speed changes when the radius is halved (at constant T), the angular

velocity (ω), defined as ω = 2π / T, remains identical for both satellites because their periods are the same.

• Units and Conversion: In physics problems, ensure that units for distance (km) and time (hours or seconds) are consistent. If the speed was required in m/s, the 42,250 km would be converted to 42,250,000 meters and 24 hours to 86,400 seconds.

Q8. Answer: (a) X is oxidised and Y is reduced

The correct answer is X is oxidised and Y is reduced.

Key Points

• Oxidation is defined as the process involving the loss of electrons by a molecule, atom, or ion during a chemical reaction. When element X loses electrons, its oxidation state increases, and it is said to be oxidised.

• Reduction is the chemical process where a substance gains electrons. In the given scenario, element Y gains electrons, leading to a decrease in its oxidation state, meaning Y is reduced.

• A Redox reaction (Reduction-Oxidation) is a type of chemical reaction that involves a transfer of electrons between two species. It consists of two half-reactions occurring simultaneously: one species undergoes oxidation while the other undergoes reduction.

• In a displacement reaction, a more reactive element displaces a less reactive element from its compound. This movement of elements is fundamentally driven by the transfer of electrons, making most displacement reactions redox in nature.

• The relationship between the two elements is reciprocal: the electrons lost by X are the same electrons gained by Y. Therefore, X is oxidised and Y is reduced.

• Hence, the correct answer is X is oxidised and Y is reduced.

Additional Information

• Reducing Agent (Reductant):

• A reducing agent is a substance that donates electrons to another substance in a redox reaction.

• Since element X loses electrons to facilitate the reduction of Y, X acts as the reducing agent.

• Reducing agents are typically metals or substances with low electronegativity.

• Oxidizing Agent (Oxidant):

• An oxidizing agent is a substance that accepts electrons from another substance.

• In this reaction, Y gains electrons from X, thereby causing X to be oxidised; hence, Y is the oxidizing agent.

• Common oxidizing agents include Oxygen, Halogens, and concentrated acids.

• Oxidation Number (Oxidation State):

• This is a numerical value assigned to an atom representing the number of electrons lost or gained.

• For X, the oxidation number becomes more positive. For Y, the oxidation number becomes more negative or less positive.

• In elemental form, the oxidation state of any atom is 0.

Important Points

• Mnemonics for Memory:

• OIL RIG: This stands for Oxidation Is Loss and Reduction Is Gain (of electrons). This is the most common way to remember the electronic concept of redox.

• LEO says GER: This stands for Lose Electrons Oxidation and Gain Electrons Reduction.

• Types of Displacement:

• Single Displacement: A more active metal displaces a less active metal ion from a solution, such as Zinc (Zn) reacting with Copper Sulfate (CuSO4). In this, Zn loses 2 electrons (oxidized) and Cu2+ gains 2 electrons (reduced).

• Double Displacement: These are generally not redox reactions because they involve the exchange of ions without a change in the oxidation state of the atoms.

• Electrochemical Series:

• The ability of element X to displace Y depends on their relative positions in the Activity Series.

• An element higher in the series has a higher oxidation potential and can easily lose electrons to reduce elements lower in the series.

Q9. Answer: (c) Fission

The correct answer is Fission.

Key Points

• Fission is the primary method of asexual reproduction in unicellular organisms such as bacteria, archaea, and many protozoa.

• In this process, a single parent cell divides into two or more independent daughter cells. It involves the division of the nucleus (karyokinesis) followed by the division of the cytoplasm (cytokinesis).

• Binary Fission: This is the most common form where the parent organism splits into two equal halves. For example, Amoeba undergoes binary fission in any plane, while Leishmania (which causes kala-azar) undergoes fission in a specific orientation relative to its whip-like structures.

YourMockTest.com - Free Study Material

• Multiple Fission: In this type, the parent cell divides into many daughter cells simultaneously. This is often observed in the malarial parasite, Plasmodium, especially during unfavorable conditions.

• Since there is no fusion of gametes, the offspring produced are genetically identical to the parent, often referred to as clones.

Additional Information

• Fragmentation:

• This is a method of reproduction found in multicellular organisms with relatively simple body designs.

• An organism simply breaks up into smaller pieces upon maturation, and each piece grows into a new individual.

• A classic example is Spirogyra, a filamentous alga.

• Regeneration:

• If an individual is somehow cut or broken into many pieces, many of these pieces grow into separate individuals.

• It is carried out by specialized cells that proliferate and make large numbers of cells.

• Examples include Hydra and Planaria. While regeneration is a method of producing new individuals, it is fundamentally a process of repair and renewal.

• Budding:

• In organisms like Yeast (a unicellular fungus) and Hydra, a small outgrowth or 'bud' forms due to repeated cell division at one specific site.

• These buds develop into tiny individuals and, when fully mature, detach from the parent body to become independent.

• Rejuvenation:

• In a biological context, this refers to the reversal of the aging process or the restoration of vigor, but it is not a recognized method of reproduction in the biological classification of life cycles.

Important Points

• Genetic Stability: Because fission involves mitosis or amitosis, it ensures that the DNA sequence remains consistent across generations, which is advantageous in stable environments.

• Reproduction Speed: Under favorable conditions, bacteria like Escherichia coli can undergo binary fission every 20 minutes, leading to exponential population growth.

• Cell Cycle: In unicellular organisms, the cell cycle and the reproductive cycle are effectively the same thing, as the division of one cell results in a new organism.

• Environmental Adaptation: While fission is rapid, the lack of genetic variation (unlike sexual reproduction) means the entire population is equally susceptible to environmental changes or antibiotics.

Q10. Answer: (c) The cell will destroy itself and die.

The correct answer is The cell will destroy itself and die.

Key Points

• Lysosomes are membrane-bound organelles found in almost all eukaryotic cells. They are known as the "suicide bags" of the cell because of their unique function in cell death.

• These organelles contain powerful digestive enzymes called acid hydrolases, which are capable of breaking down proteins, nucleic acids, lipids, and carbohydrates.

• When a cell is damaged or undergoes significant stress, the membrane of the lysosome can burst, releasing its enzymatic contents directly into the cytoplasm.

• Once released, these enzymes begin to digest the cell's own components (organelles and structural proteins). This biological process of self-digestion is called autolysis.

• As a result of this uncontrolled digestion, the cell is unable to maintain its structural integrity or metabolic functions, leading to the death of the cell. Hence, the statement that the cell will destroy itself and die is correct.

• The other processes mentioned, such as mitochondrial energy production (Option 1) or nuclear division (Option 4), require a stable and healthy cytoplasmic environment. The presence of destructive enzymes inhibits these vital functions. Hence, these statements are incorrect.

Additional Information

• Discovery: The lysosome was discovered and named by the Belgian cytologist Christian de Duve in 1955, for which he later received a Nobel Prize in Physiology or Medicine in 1974.

• Enzyme Environment: The enzymes within a lysosome work best in acidic conditions, typically maintaining a pH of about 4.5 to 5.0 inside the organelle. The cytoplasm, by contrast, has a near-neutral pH of about 7.2.

• Formation: Lysosomes are formed by the budding off from the Golgi apparatus. The hydrolytic enzymes they contain are originally synthesized in the Rough Endoplasmic Reticulum (RER).

• Functions: Beyond self-destruction, they serve critical roles in waste removal, autophagy (digesting old cell parts to recycle materials), and phagocytosis (digesting foreign invaders like bacteria or viruses).

YourMockTest.com — Free Study Material

Important Points

• Lysosomal Storage Diseases (LSDs): If the lysosomal enzymes are missing or malfunctioning due to genetic mutations, substances that should be broken down accumulate in the cell. Examples include Tay-Sachs disease, Gaucher's disease, and Pompe disease.

• Autolysis vs. Apoptosis: Autolysis is usually a pathological process occurring after cell injury. In contrast, apoptosis is a genetically programmed and orderly form of cell death used during embryonic development (like the removal of webbing between fingers) and to eliminate cancerous cells.

• Location: While primarily associated with animal cells, lysosome-like vacuoles perform similar digestive functions in plant cells and fungi.

Q11. Answer: (c) It produces new plantlets from notches on the leaf margin.

The correct answer is It produces new plantlets from notches on the leaf margin.

Key Points

• Bryophyllum is a genus of plant species belonging to the Crassulaceae family, famously known as the "Sprout Leaf Plant" due to its unique reproductive capabilities.

• The primary mode of reproduction in Bryophyllum is vegetative propagation, which occurs through its leaves rather than seeds or flowers in many common scenarios.

• The margins (edges) of the Bryophyllum leaf contain small notches. Within these notches, specialized tissues called adventitious buds (specifically epiphyllous buds) are present.

• When a mature leaf is detached from the parent plant and falls onto moist soil, the contact with water and nutrients triggers these buds to sprout.

• Each bud develops into a complete new plantlet, featuring its own roots, stem, and tiny leaves while still attached to the parent leaf. Hence, the statement regarding the production of new plantlets is correct.

• Once the parent leaf decomposes or the plantlets grow large enough, they detach and establish themselves as independent plants in the soil.

Additional Information

• Vegetative Propagation: This is a form of asexual reproduction where a new plant grows from a fragment of the parent plant or a specialized reproductive structure like rhizomes, tubers, runners, or leaves.

• Genetic Clones: Since this process involves only one parent and no fusion of gametes, the resulting plantlets are genetically identical to the parent plant.

• Environmental Factors: The presence of moisture is critical. Without moist soil, the adventitious buds may remain dormant or the leaf might simply dry up without producing offspring.

• Other Examples: Besides Bryophyllum, other plants like Begonia also exhibit vegetative propagation through leaf cuttings or leaf margins, though the specific mechanisms may vary slightly.

• Advantages: This method allows for rapid multiplication of the species and ensures the survival of the plant even if the environmental conditions for seed germination are unfavorable.

Important Points

• Adventitious Organs: In biology, the term adventitious refers to structures that develop in an unusual location. For instance, roots growing from a leaf (as in Bryophyllum) are called adventitious roots because they do not arise from the radicle of a seed.

• Biological Significance: This adaptation is particularly useful in arid or rocky environments where Bryophyllum species are often found, as it provides a robust backup to sexual reproduction.

• Distinction from other options:

• Loss of chlorophyll: While a leaf eventually yellows as it dies, the primary biological event upon contact with moist soil is growth, not decay or chlorosis.

• Decomposition: While the old leaf eventually decomposes, it does so only after providing the necessary nutrients and moisture to the emerging plantlets.

• Water Absorption: While the leaf may absorb water, its primary response is the activation of meristematic tissue in the notches rather than just increasing in size.

Q12. Answer: (b) A ringing tuning fork

The correct answer is A ringing tuning fork.

Key Points

• Sound is a form of energy that is produced when an object vibrates. A vibration is defined as a rapid, periodic back-and-forth motion of an object about its mean position.

• A ringing tuning fork is a classic example of a vibrating body producing sound. When the prongs of the fork are struck, they oscillate at a specific frequency, disturbing the air molecules around them and creating audible sound waves. Hence, statement 2 is correct.

• While a moving car contains various components like an engine that vibrates, the motion of the car itself is translational. In physics problems of this nature, the tuning fork is the most accurate representation of a simple vibrating source. Hence, statement 1 is incorrect.

• A pendulum swinging silently moves back and forth, but its frequency of oscillation is extremely low (usually much less than 20 Hz). Because this frequency falls below the human audible range, it does not produce sound that we can hear. Hence, statement 3 is incorrect.

• A stationary fan is not in motion and its parts are not undergoing vibration; therefore, it cannot generate sound waves in its static state. Hence, statement 4 is incorrect.

Additional Information

• Characteristics of Sound Waves:

• Sound waves are longitudinal waves, meaning the particles of the medium travel parallel to the direction of the wave energy.

• They consist of compressions (regions of high pressure/density) and rarefactions (regions of low pressure/density).

• The amplitude of the vibration determines the loudness or intensity of the sound, measured in decibels (dB).

• Frequency and Pitch:

• The number of vibrations per second is called the frequency, which is measured in Hertz (Hz).

• The pitch of a sound is directly proportional to its frequency; higher frequencies produce shrill sounds, while lower frequencies produce grave sounds.

• Requirement of a Medium:

• Sound requires a material medium (solid, liquid, or gas) for propagation. It cannot travel through a vacuum because there are no molecules to transmit the vibrational energy.

• Sound travels fastest in solids (due to high elasticity and density) and slowest in gases.

Important Points

• Audible Range: For the average human ear, the range of frequencies that can be heard is between 20 Hz and 20,000 Hz. Sounds below this range are called infrasonic, and sounds above this range are called ultrasonic.

• Tuning Fork Mechanics: Invented in 1711 by John Shore, the tuning fork is designed to emit a very pure musical tone. Its U-shape ensures that the vibrational energy is concentrated, allowing it to ring for a significant duration.

• Echo and Reflection: Just like light, sound can be reflected off surfaces. An echo is heard when the reflected sound reaches the ear at least 0.1 seconds after the original sound, requiring a minimum distance of approximately 17.2 meters in air.

Q13. Answer: (c) P = V/I

The correct answer is P = V/I.

Key Points

• Electric Power (P) is defined as the rate at which electrical energy is consumed or dissipated in an electric circuit. The fundamental formula for power is the product of potential difference (V) and current (I), expressed as P = VI. Hence, statement 4 is correct.

• According to Ohm's Law, the potential difference across a conductor is directly proportional to the current flowing through it, provided physical conditions remain constant, given by V = IR.

• By substituting V = IR into the power formula (P = VI), we get P = (IR) × I, which simplifies to P = I^2R. This relation shows that power is proportional to the square of the current. Hence, statement 2 is correct.

• Alternatively, by substituting I = V/R (from Ohm's Law) into the power formula (P = VI), we derive P = V × (V/R), which results in P = V^2/R. This indicates that power is inversely proportional to resistance for a constant voltage. Hence, statement 1 is correct.

• The expression P = V/I is mathematically and physically incorrect for electric power. In reality, the ratio V/I defines the Electrical Resistance (R) of the component, not its power. Hence, statement 3 is incorrect.

Additional Information

• Units of Measurement:

• The SI unit of Electric Power is the Watt (W). One Watt is the power consumed by a device that carries 1 Ampere of current when operated at a potential difference of 1 Volt.

• Electric Current (I) is measured in Amperes (A) using an instrument called an Ammeter, which is always connected in series.

• Potential Difference (V) is measured in Volts (V) using a Voltmeter, which is always connected in parallel across the points where the potential is to be measured.

• Ohm's Law:

• Proposed by Georg Simon Ohm in 1827, it is a fundamental law in physics. It states that the current passing through a conductor between two points is directly proportional to the voltage across the two points, provided the temperature and other physical factors remain constant.

• Electrical Energy:

• Power is the rate of doing work. Therefore, Electric Energy (E) is the product of power and time (E = P × t).

• The commercial unit of electrical energy is the Kilowatt-hour (kWh), often referred to as a "unit." 1 kWh is equal to 3.6 × 10^6 Joules.

• Heating Effect:

• The formula P = I^2R is closely related to Joule's Law of Heating, which states that the heat produced in a resistor is directly proportional to the square of the current, the resistance, and the time for which the current flows (H = I^2Rt).

Q14. Answer: (d) Increased resistance to diseases

The correct answer is Increased resistance to diseases.

Key Points

• Nutrient deficiency in plants occurs when an essential element is not available in the required concentration, leading to morphological changes and physiological disorders.

• Low yield: When plants lack primary nutrients like Nitrogen (N), Phosphorus (P), or Potassium (K), their metabolic efficiency drops. This results in reduced production of seeds, fruits, and overall biomass, leading to a significantly low yield for farmers. Hence, statement 1 is a consequence.

• Affected reproduction: Nutrients like Boron and Phosphorus are critical for the reproductive phase. Deficiency can lead to delayed flowering, poor pollen germination, and abscission of flowers or fruits, directly hindering the plant's ability to reproduce. Hence, statement 2 is a consequence.

• Poor growth: Essential elements are structural and functional components of cells. For instance, Nitrogen is a part of proteins and Magnesium is the central atom of chlorophyll. Their absence causes stunted growth, reduced leaf size, and weak stems. Hence, statement 3 is a consequence.

• Increased resistance to diseases: This is incorrect because nutrient-deficient plants actually become more susceptible to infections. Deficiency weakens cell walls and slows down the production of secondary metabolites (like phytoalexins) that defend against pathogens, fungi, and bacteria. Hence, statement 4 is NOT a consequence and is the correct answer.

Additional Information

• Essential Elements: There are 17 essential elements required for plant growth. These are divided into Macronutrients (needed in large amounts) and Micronutrients (needed in traces).

• Common Deficiency Symptoms:

• Chlorosis: The loss of chlorophyll leading to yellowing of leaves. It is caused by the deficiency of N, K, Mg, S, Fe, Mn, Zn, and Mo.

• Necrosis: This is the death of tissues, particularly leaf tissue, often caused by the lack of Ca, Mg, Cu, and K.

• Inhibition of Cell Division: Lack of N, K, S, and Mo can prevent cells from dividing properly, leading to stunted development.

• Delay in Flowering: Elements like N, S, and Mo, if low in concentration, can significantly delay the flowering process in plants.

• Critical Concentration: The concentration of an essential element below which plant growth is retarded is termed as critical concentration.

• Mobility of Nutrients: If a nutrient is mobile (like Nitrogen or Magnesium), deficiency symptoms appear first in older tissues. If the nutrient is immobile (like Calcium or Sulphur), symptoms appear first in younger tissues.

Important Points

• Nitrogen (N): Highly mobile; required for meristematic tissues and metabolic activities.

• Phosphorus (P): Component of cell membranes, nucleic acids, and all phosphorylation reactions.

• Potassium (K): Helps in maintaining anion-cation balance in cells and is involved in stomata opening and closing.

• Magnesium (Mg): Activates enzymes of respiration and photosynthesis and maintains ribosome structure.

• Toxicity: While deficiency is harmful, an excess of micronutrients can cause toxicity. For example, Manganese (Mn) toxicity can induce deficiencies of Iron, Magnesium, and Calcium.

Q15. Answer: (d) They are found in Prokaryotic cells.

The correct answer is They are found in Prokaryotic cells.

Key Points

• Cell organelles are specialized, internal organized structures within a living cell that perform specific metabolic functions. Examples include the nucleus, mitochondria, ribosomes, and endoplasmic reticulum.

• Statement 1: "Each cell organelle performs a special function." Organelles act like the "organs" of the cell; for instance, mitochondria are responsible for cellular respiration and ATP production, while chloroplasts in plants handle photosynthesis. Hence, statement 1 is correct.

• Statement 2: "They are found in Eukaryotic cells." The defining characteristic of eukaryotic cells (found in plants, animals, fungi, and protists) is the presence of a well-defined nucleus and membrane-bound organelles. Hence, statement 2 is correct.

• Statement 3: "They are membrane-bound structures." Most organelles in complex cells are enclosed by lipid membranes to

separate different chemical reactions from each other, ensuring cellular efficiency. Hence, statement 3 is correct.

• Statement 4: "They are found in Prokaryotic cells." Prokaryotic cells, such as bacteria and archaea, lack a true nucleus and membrane-bound organelles. While they contain ribosomes, these are not membrane-bound. They do not possess mitochondria, lysosomes, or Golgi bodies. Hence, statement 4 is incorrect.

• Therefore, the incorrect statement regarding cell organelles is that they are found in prokaryotic cells.

Additional Information

• Prokaryotic Cells:

• These cells are generally small, typically ranging from 0.1 to 5.0 micrometers in diameter.

• Their DNA is found in a region called the nucleoid and is usually circular.

• They contain 70S ribosomes but lack internal compartmentalization.

• Eukaryotic Cells:

• These are larger and more complex, usually 10 to 100 micrometers in size.

• They possess linear DNA organized into chromosomes within a nuclear envelope.

• They contain 80S ribosomes in the cytoplasm and 70S ribosomes within certain organelles like mitochondria.

• Major Organelles and Functions:

• Nucleus: Known as the "Control Center" of the cell, it contains genetic material.

• Mitochondria: Known as the "Powerhouse of the Cell" where ATP (Adenosine Triphosphate) is generated.

• Lysosomes: Often called "Suicide Bags" because they contain digestive enzymes to break down waste.

• Endoplasmic Reticulum (ER): The Rough ER is involved in protein synthesis, while the Smooth ER is involved in lipid synthesis.

Important Points

• Cell Theory: Proposed by Matthias Schleiden and Theodor Schwann in 1838-1839, stating that all living things are composed of cells. Rudolf Virchow later added in 1855 that all cells arise from pre-existing cells.

• Discovery: The cell was first discovered and named by Robert Hooke in 1665 using a primitive microscope to observe cork.

• Ribosomes: These are unique because they are found in both prokaryotes and eukaryotes. They are the site of protein synthesis and are not surrounded by a membrane, which is why they are often referred to as non-membranous organelles.

• Endosymbiotic Theory: This theory suggests that mitochondria and chloroplasts were once free-living prokaryotic organisms that were engulfed by a larger cell, leading to the evolution of eukaryotic cells.

Q16. Answer: (a) Oxygen

The correct answer is Oxygen.

Key Points

• An element is a pure substance consisting of only one type of atom that cannot be broken down into simpler substances by chemical means. Oxygen is a chemical element with the symbol O and atomic number 8.

• Oxygen is the most abundant element in the human body and the Earth's crust. In its standard form, it is a colorless, odorless gas that exists as diatomic molecules (O_2). Hence, option 1 is the correct answer.

• Air is not an element; it is a homogeneous mixture of several gases, primarily Nitrogen (78%), Oxygen (21%), Argon (0.93%), and Carbon dioxide (0.04%). Hence, option 2 is incorrect.

• Water (H_2O) is a chemical compound consisting of two Hydrogen atoms and one Oxygen atom chemically bonded together. It can be decomposed into its constituent elements through electrolysis. Hence, option 3 is incorrect.

• Sodium chloride (NaCl), commonly known as table salt, is an ionic compound formed by the chemical reaction between Sodium (a metal) and Chlorine (a non-metal). Hence, option 4 is incorrect.

Additional Information

• Classification of Matter:

• Elements: Currently, there are 118 confirmed elements in the Periodic Table. They are categorized into metals, non-metals, and metalloids. Examples include Gold (Au), Iron (Fe), and Helium (He).

• Compounds: These are substances formed when two or more elements are chemically bonded in a fixed ratio. Their properties are usually entirely different from their constituent elements. For instance, Carbon dioxide (CO_2) is a compound.

• Mixtures: These consist of two or more substances that are physically combined but not chemically bonded. They can be homogeneous (uniform composition, like brass) or heterogeneous (non-uniform, like sand and water).

• Properties of Oxygen:

• It belongs to the chalcogen group (Group 16) on the periodic table and is a highly reactive non-metal.

• It is an oxidizing agent that readily forms oxides with most elements. It is essential for combustion and the respiration of most living organisms on Earth.

Important Points

• Historical Context: Oxygen was discovered independently by Carl Wilhelm Scheele in 1773 and Joseph Priestley in 1774. However, Antoine Lavoisier is credited with naming the element in 1777 and correctly identifying its role in combustion.

• Earth's Composition: Oxygen makes up about 46.6% of the Earth's crust by mass, mostly as part of oxide minerals like silica.

• Atomic Details: Oxygen has an atomic weight of approximately 15.999 u. It has three stable isotopes: 16O, 17O, and 18O, with 16O being the most abundant (99.76%).

Q17. Answer: (d) Buoyant force is independent of fluid density.

The correct answer is Buoyant force is independent of fluid density.

Key Points

• Archimedes' Principle: This fundamental law of physics states that any object, wholly or partially immersed in a fluid, is buoyed up by a force equal to the weight of the fluid displaced by the object. Hence, statement 1 is correct.

• Direction of Force: The buoyant force is a net upward force exerted by the fluid. It occurs because the pressure at the bottom of the submerged object is greater than the pressure at the top. Hence, statement 3 is correct.

• Magnitude and Submersion: The buoyant force depends on the volume of the submerged portion of the object. Since the maximum volume of fluid is displaced when the object is entirely underwater, the buoyant force is maximum when the body is fully submerged. Hence, statement 2 is correct.

• Relationship with Density: The formula for buoyant force is $F_b = V \times \rho \times g$, where V is the volume of displaced fluid, ρ (rho) is the density of the fluid, and g is the acceleration due to gravity. This mathematically proves that the force is directly proportional to the fluid's density.

• Incorrect Statement: Since the force is directly dependent on the density of the fluid (for example, salt water provides more buoyancy than fresh water), the claim that it is independent is false. Hence, statement 4 is incorrect.

Additional Information

• Factors Affecting Buoyancy:

• Volume of the object: Larger submerged volumes displace more fluid, increasing the upward thrust.

• Density of the fluid: Liquids with higher density (like mercury or highly saline water) exert a greater buoyant force compared to lower-density liquids (like alcohol or fresh water).

• Gravity: The force is dependent on the local acceleration due to gravity; in zero gravity, there is no buoyant force.

• Floating and Sinking: An object floats if the buoyant force is equal to its weight. This happens when the object's average density is less than or equal to the density of the fluid. An object sinks if its weight exceeds the maximum possible buoyant force (i.e., its density is higher than the fluid's density).

• Center of Buoyancy: This is the geometric center of the displaced volume of fluid. For a floating body to be stable, the relative positions of the center of gravity and the center of buoyancy are critical.

• Applications: Archimedes' Principle is used in designing ships and submarines, determining the purity of gold, and in instruments like hydrometers (used to measure the density of liquids) and lactometers (used to test the purity of milk).

Important Points

• Apparent Weight: When an object is immersed in water, it feels lighter. This apparent weight is calculated as: Actual Weight - Buoyant Force.

• The Dead Sea Example: Humans float much more easily in the Dead Sea compared to a swimming pool because the high salt concentration (about 34% salinity) significantly increases the water density, thereby increasing the upward buoyant force.

• Relative Density: Also known as Specific Gravity, it is the ratio of the density of a substance to the density of water at 4 degrees Celsius. It is a dimensionless quantity used to predict if an object will sink or float.

Q18. Answer: (d) A salt and hydrogen gas are produced

The correct answer is A salt and hydrogen gas are produced.

Key Points

• When a reactive metal reacts with a dilute acid, it undergoes a chemical reaction that results in the formation of a metal salt and the evolution of hydrogen gas.

• This interaction is typically a displacement reaction, where the metal, being more reactive, displaces the hydrogen atoms from the acid molecule.

• The general chemical equation for this reaction can be represented as: Metal + Dilute Acid → Metal Salt + Hydrogen Gas.

• The salt formed during this process depends on the specific metal and the type of acid used in the reaction. For instance, Hydrochloric acid produces chlorides, while Sulfuric acid produces sulfates.

• The rate of this reaction depends on the position of the metal in the reactivity series; metals higher in the series react more vigorously than those lower down.

Additional Information

• Testing for Hydrogen Gas:

• The hydrogen gas evolved during the reaction can be identified using the Pop Sound Test.

• When a burning splinter or candle is brought near the mouth of the test tube containing the gas, it burns with a characteristic pop sound, confirming the presence of Hydrogen.

• Examples of the Reaction:

• Zinc and Hydrochloric Acid: When Zinc (Zn) granules react with dilute Hydrochloric acid (HCl), they produce Zinc chloride ($ZnCl_2$) and Hydrogen gas (H_2).

• Magnesium and Sulfuric Acid: The reaction between Magnesium (Mg) and dilute Sulfuric acid (H_2SO_4) yields Magnesium sulfate ($MgSO_4$) and Hydrogen gas.

• Exception with Nitric Acid:

• Generally, when a metal reacts with Nitric acid (HNO_3), hydrogen gas is not evolved.

• This is because Nitric acid is a very strong oxidizing agent. It oxidizes the hydrogen produced into water (H_2O) and itself gets reduced to nitrogen oxides like N_2O, NO, or NO_2.

• However, Magnesium (Mg) and Manganese (Mn) are exceptions as they can react with very dilute Nitric acid to evolve hydrogen gas.

• Reactivity of Metals:

• Metals like Sodium (Na) and Potassium (K) react explosively even with dilute acids due to their high reactivity.

• Metals like Copper (Cu), Silver (Ag), and Gold (Au), which are below hydrogen in the reactivity series, do not react with dilute acids to produce hydrogen gas under normal conditions.

Important Points

• The concentration of the acid and the surface area of the metal (e.g., powder vs. granules) significantly affect the speed of the reaction.

• In industrial applications, these reactions are utilized for the preparation of hydrogen gas and various metallic salts used in manufacturing and laboratories.

• During the reaction, the temperature of the solution usually rises, indicating that the reaction is exothermic in nature.

Q19. Answer: (d) A straight line through the origin

The correct answer is A straight line through the origin.

Key Points

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

• The mathematical formula for this relationship is $V = IR$, where V represents the Voltage, I represents the Current, and R is the Resistance of the conductor.

• When plotting a graph with Voltage (V) on the y-axis and Current (I) on the x-axis, the relationship takes the form of a linear equation $y = mx$, where m (the slope) corresponds to the Resistance (R).

• Because the current is exactly zero when there is no potential difference, the graphical representation is a straight line that must pass through the origin (0,0). Hence, option 4 is correct.

• A hyperbolic curve would represent an inverse relationship, and a parallel line would suggest that one variable is constant regardless of the other, neither of which describes Ohmic behavior.

Additional Information

• Ohmic Conductors:

• These are materials that strictly obey Ohm's Law. Examples include most metals like Copper, Silver, and Aluminum.

• For these materials, the Resistance remains constant regardless of the applied voltage or current flow, as long as the temperature is stable.

• Non-Ohmic Conductors:

• These materials do not show a linear relationship between V and I. Their V-I graph is usually a curve rather than a straight line.

• Common examples include semiconductors, diodes, transistors, and electrolyte solutions.

• In these cases, the Resistance changes as the current or voltage changes.

• Significance of the Slope:

• In a V-I graph, the slope (V/I) gives the Resistance of the component.

• In an I-V graph, the slope (I/V) gives the Conductance, which is the reciprocal of resistance.

Important Points

• Units of Measurement: The SI unit of Potential Difference is the Volt (V), Current is measured in Amperes (A), and Resistance is measured in Ohms (Ω).

• Historical Context: The law was named after the German physicist George Simon Ohm, who published his findings in his 1827 treatise.

• Factors Affecting Resistance: Resistance depends on the nature of the material, the length of the conductor (directly proportional), and the area of cross-section (inversely proportional).

• Limitations: Ohm's law is not a universal law of nature; it is an empirical description of the behavior of certain materials. It fails at very high frequencies or when the material undergoes thermal changes due to excessive current.

Q20. Answer: (a) the fastest in water medium

The correct answer is the fastest in water medium.

Key Points

• The refractive index (represented as n) of a medium is defined as the ratio of the speed of light in a vacuum (c) to the speed of light in that specific medium (v). The formula is expressed as n = c / v.

• Based on this formula, the velocity of light in a medium is inversely proportional to its refractive index. This means light travels faster in a medium with a lower refractive index and slower in a medium with a higher refractive index.

• Comparing the given values: the refractive index of water is 1.33, glass is 1.5, and diamond is 2.42.

• Since water has the lowest refractive index (1.33) among the three, light encounters the least optical resistance, and therefore, light travels the fastest in water. Hence, option 1 is correct.

• Light does not travel at the same speed in different media because each medium has a different optical density. Hence, option 2 is incorrect.

• In glass, light travels slower than in water because 1.5 is greater than 1.33. Hence, option 3 is incorrect.

• In diamond, light travels the slowest because it has the highest refractive index (2.42) provided in the list. Hence, option 4 is incorrect.

Additional Information

• Optical Density: A medium with a higher refractive index is said to be optically denser, while a medium with a lower refractive index is optically rarer. Light waves are delayed by interactions with the atoms in a denser medium.

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

• Refraction Phenomenon: When light moves from an optically rarer medium (like water) to an optically denser medium (like glass), it bends towards the normal and its speed decreases. Conversely, it bends away from the normal when entering a rarer medium.

• Diamond's Brilliance: The high refractive index of diamond (2.42) is responsible for its extraordinary sparkle. It causes Total Internal Reflection (TIR) of light within the gemstone, trapping the light and reflecting it multiple times before it exits.

• Unitless Quantity: The refractive index is a dimensionless number because it is a ratio of two similar quantities (speeds).

Important Points

• Velocity Calculations: By using the constant speed of light c = 3 x 10^8 m/s, we can calculate the approximate speeds in these media:

• Speed in Water: 3 x 10^8 / 1.33 ≈ 2.25 x 10^8 m/s.

• Speed in Glass: 3 x 10^8 / 1.5 = 2.0 x 10^8 m/s.

• Speed in Diamond: 3 x 10^8 / 2.42 ≈ 1.24 x 10^8 m/s.

• Medium Dependency: The refractive index of a material can also vary slightly depending on the wavelength of the light (color) and the temperature of the medium.

• Historical Context: The concept of refractive index is fundamental to Snell's Law, which describes the relationship between the angles of incidence and refraction for light passing through a boundary between two different isotropic media.

Q21. Answer: (c) non-uniform speed

The correct answer is non-uniform speed.

Key Points

• In a distance-time graph, the slope of the line represents the speed of the object. The mathematical relationship is defined as Speed = Distance / Time.

• If the slope changes continuously, it indicates that the speed of the object is not constant over time. This variation in speed is referred to as non-uniform speed. Hence, option 3 is correct.

• A curved line on a distance-time graph is the visual representation of non-uniform motion. The curvature indicates that the object is either speeding up (accelerating) or slowing down (decelerating).

• For non-uniform speed, the object covers unequal distances in equal intervals of time. For example, a car moving through heavy traffic frequently changes its speed, resulting in a non-linear graph.

• The instantaneous speed at any specific point on such a curve can be determined by calculating the slope of the tangent drawn to the curve at that particular time.

Additional Information

• Uniform Speed:

• An object is said to have uniform speed if it covers equal distances in equal intervals of time.

• On a distance-time graph, uniform speed is represented by a straight line starting from the origin. The slope remains constant throughout the motion.

• Stationary Object:

• If an object is stationary or at rest, its distance from a reference point does not change as time progresses.

• The graph for a stationary object is a horizontal line parallel to the time axis (X-axis), meaning the slope is zero.

• Instantaneous Rest:

• Instantaneous rest refers to a specific moment when the velocity of an object becomes zero (for example, at the highest point when a ball is thrown vertically upward).

• On a graph, this is a point where the tangent is perfectly horizontal for a split second before the motion continues.

Important Points

• Nature of Quantities: Distance is a scalar quantity, meaning it only has magnitude and is always positive. Consequently, a distance-time graph can never have a negative slope or go downwards.

• SI Units: The standard unit of speed is meters per second (m/s), while distance is measured in meters and time in seconds.

• Slope Interpretation:

• A steeper slope indicates a higher speed.

• A gentler (flatter) slope indicates a lower speed.

• A varying slope indicates acceleration or deceleration, which are the hallmarks of non-uniform motion.

• Independent and Dependent Variables: In these graphs, Time is always plotted on the X-axis as the independent variable, while Distance is plotted on the Y-axis as the dependent variable.

Q22. Answer: (a) 8

The correct answer is 8.

Key Points

• The maximum number of electrons that can be accommodated in the outermost orbit of an atom is 8. This fundamental principle is established by the Bohr-Bury scheme of electronic configuration.

• This rule is widely known as the Octet Rule, which suggests that atoms are most stable when their outermost shell is filled with eight electrons. This configuration provides a lower energy state and high chemical stability.

• The outermost shell of an atom is referred to as the valence shell, and the electrons residing in it are called valence electrons. These electrons are primarily responsible for the chemical properties and reactivity of the element.

• Atoms that naturally possess 8 electrons in their outermost shell are chemically inert or stable. These elements belong to the Group 18 of the periodic table, known as the Noble Gases (e.g., Neon, Argon, Krypton, and Xenon).

• While the total capacity of an internal shell might be much higher, the Bohr-Bury rule explicitly states that the outermost shell cannot exceed 8 electrons, even if the shell has the geometric capacity to hold more.

Additional Information

• The $2n^2$ Formula:

• The distribution of electrons in various shells is determined by the formula $2n^2$, where n represents the orbit number or energy level (K, L, M, N...).

• For the 1st shell (K shell), where n=1, the maximum capacity is $2(1)^2 = 2$ electrons.

• For the 2nd shell (L shell), where n=2, the maximum capacity is $2(2)^2 = 8$ electrons.

• For the 3rd shell (M shell), where n=3, the maximum capacity is $2(3)^2 = 18$ electrons.

• For the 4th shell (N shell), where n=4, the maximum capacity is $2(4)^2 = 32$ electrons.

• Chemical Valency:

• The valency of an atom is defined by its combining capacity. If the outermost shell is not full, the atom will gain, lose, or share electrons to complete its octet.

• For example, Sodium (Na) with atomic number 11 has a configuration of 2, 8, 1. It loses 1 electron to achieve a stable octet, giving it a valency of 1.

• Historical Context:

• The model for electron distribution was proposed by Niels Bohr and Bury in the year 1921. Their work helped explain the arrangement of elements in the Periodic Table and the nature of chemical bonding.

• The Duplet Rule Exception:

• The Octet Rule does not apply to the very first shell (K shell). For elements like Hydrogen and Helium, stability is achieved when the outermost (and only) shell contains 2 electrons. This is known as the Duplet Rule.

YourMockTest.com — Free Study Material

Important Points

• Stability of Shells: Electrons are not filled in a new shell unless the inner shells are filled. This step-wise filling ensures that the atom maintains the lowest possible energy state.

• Reactive vs. Non-reactive: Elements with 1 to 7 valence electrons are generally reactive because they seek to complete their octet. In contrast, those with exactly 8 electrons (or 2 for Helium) are non-reactive under standard conditions.

• Atomic Structure: The nucleus at the center contains protons and neutrons, while the electrons revolve in discrete orbits or shells around it, following the $2n^2$ and Octet rules.

Q23. Answer: (d) nucleus; double

The correct answer is nucleus; double.

Key Points

• The nucleus is a specialized cell organelle that acts as the control center of the eukaryotic cell, containing the majority of the cell's genetic material.

• It is characterized by a spherical or oval shape and was first discovered and described by the scientist Robert Brown in 1831.

• The nucleus is enclosed by a double membrane known as the nuclear envelope. This structure consists of an inner membrane and an outer membrane separated by the perinuclear space. Hence, the structure is a nucleus with a double membrane.

• The nuclear envelope is not continuous; it is interrupted by numerous nuclear pores. These pores are critical for the material exchange, allowing the regulated movement of RNA, proteins, and ribosomal subunits between the nucleoplasm and the cytoplasm.

• In contrast, a nucleoid (mentioned in options 1 and 3) is an irregularly shaped region within prokaryotic cells that contains genetic material but lacks a nuclear membrane entirely.

Additional Information

• Structure of the Nucleoplasm:

• The nucleoplasm (also known as nuclear sap) is the gelatinous substance within the nucleus that houses the chromatin and the nucleolus.

• Chromatin consists of DNA and histone proteins. During cell division, chromatin condenses into highly organized structures called chromosomes.

• The Nucleolus:

• The nucleolus is a distinct, non-membrane-bound dense structure found inside the nucleus. It is the primary site for ribosomal RNA (rRNA) synthesis and the assembly of ribosomes.

• Cells that are actively involved in protein synthesis usually possess larger and more numerous nucleoli.

• Comparison with Vacuoles:

• A vacuole (mentioned in option 2) is a storage sac found in cells. In plant cells, it is typically very large and surrounded by a single membrane called the tonoplast. Its function is primarily related to osmoregulation and storage, not genetic control.

• Cell Types lacking a Nucleus:

• While most eukaryotic cells are nucleated, certain mature cells like human Red Blood Cells (RBCs) and sieve tube cells in vascular plants lack a nucleus to optimize their specific functions, such as carrying oxygen or transporting nutrients.

Important Points

• Genetic Function: The nucleus stores hereditary information in the form of genes, which are segments of DNA. It controls cell reproduction (mitosis/meiosis) and metabolic activities by directing protein synthesis through transcription.

• Nuclear Pore Complex (NPC): The pores mentioned in the question are actually complex protein assemblies. A typical mammalian cell nucleus may contain about 3000 to 4000 nuclear pores, facilitating the transport of approximately 1000 molecules per second.

• Evolutionary Aspect: The presence of a double membrane-bound nucleus is the defining hallmark of Domain Eukarya, distinguishing them from Bacteria and Archaea, which store their DNA in a simple nucleoid region.

Q24. Answer: (d) Laws of Inheritance

The correct answer is Laws of Inheritance.

Key Points

• Gregor Johann Mendel, an Austrian monk and scientist, is universally recognized as the Father of Genetics for his groundbreaking work on the principles of heredity.

• Mendel conducted his famous experiments on garden pea plants (Pisum sativum) between the years 1856 and 1863.

• Through his statistical analysis of breeding experiments, he proposed the fundamental Laws of Inheritance, which describe how traits are passed from one generation to the next through "factors" (now known as genes). Hence, the correct answer is Laws of Inheritance.

• He published his findings in 1866 in a paper titled "Experiments on Plant Hybridization" (Versuche über Pflanzen-Hybriden),

YourMockTest.com — Free Study Material

although his work remained largely unrecognized by the scientific community for several decades.

• Mendel's work provided the mathematical foundation for genetics, shifting the study of biology from purely descriptive to experimental and quantitative.

Additional Information

• The Three Laws of Mendel:

• Law of Dominance: This law states that in a cross of parents that are pure for contrasting traits, only one form of the trait (the dominant) will appear in the next generation. The hidden trait is known as recessive.

• Law of Segregation: It states that during the formation of gametes (egg or sperm), the two alleles for a trait separate, so that each gamete carries only one allele for each gene.

• Law of Independent Assortment: This principle states that the alleles of different genes separate independently of one another during the formation of gametes, meaning the inheritance of one trait does not influence the inheritance of another.

• Pea Plant Characteristics: Mendel chose seven pairs of contrasting traits in pea plants to study, including stem height (tall vs. dwarf), seed shape (round vs. wrinkled), and flower color (violet vs. white).

• Monohybrid and Dihybrid Cross: A monohybrid cross involves the study of one pair of contrasting traits, resulting in a phenotypic ratio of 3:1 in the F2 generation. A dihybrid cross involves two pairs of traits, resulting in a ratio of 9:3:3:1.

• Rediscovery: Mendel’s laws were independently rediscovered in the year 1900 by three botanists: Hugo de Vries, Carl Correns, and Erich von Tschermak.

Important Points

• Theory of Evolution: This theory was primarily proposed by Charles Darwin in his 1859 work, "On the Origin of Species," which introduced the concept of natural selection. Hence, statement 1 is incorrect.

• Discovery of DNA: While Friedrich Miescher first isolated DNA in 1869, the double-helix structure was discovered by James Watson and Francis Crick in 1953, using data from Rosalind Franklin and Maurice Wilkins. Hence, statement 2 is incorrect.

• Inheritance of Acquired Traits: This was a pre-Mendelian theory proposed by Jean-Baptiste Lamarck (Lamarckism), suggesting that physiological changes acquired during an organism's lifetime could be transmitted to offspring. Hence, statement 3 is incorrect.

• Key Terminology:

• Genotype: The genetic makeup of an organism (e.g., TT, Tt, tt).

• Phenotype: The observable physical characteristics (e.g., Tall or Dwarf).

• Homozygous: Having two identical alleles for a particular gene.

• Heterozygous: Having two different alleles for a particular gene.

Q25. Answer: (d) Tyndall Effect

The correct answer is Tyndall Effect.

Key Points

• The Tyndall Effect is the physical phenomenon where light is scattered by colloidal particles or very fine particles in a suspension, making the path of the light beam visible.

• This effect was named after the British physicist John Tyndall, who conducted extensive research on the scattering of light in the year 1869.

• In a colloidal solution, the size of the solute particles is between 1 nanometer (nm) and 1000 nanometers, which is large enough to deflect or scatter the light rays passing through them.

• The intensity of the scattered light depends on the frequency of the light and the density of the particles. Generally, shorter wavelengths (like blue light) are scattered more strongly than longer wavelengths (like red light).

• A true solution (like a salt or sugar solution) does not show the Tyndall effect because its particles are smaller than 1 nm and cannot scatter light. Hence, the correct answer is Tyndall Effect.

Additional Information

• Reflection:

• This is the process where light rays bounce back into the same medium after striking a polished or opaque surface like a mirror.

• The Law of Reflection states that the angle of incidence is always equal to the angle of reflection.

• Refraction:

• Refraction is the bending of light as it passes from one transparent medium to another of different optical density (e.g., from air to glass).

• This occurs because the speed of light changes in different media. It is governed by Snell’s Law, which relates the indices of refraction to the angles of travel.

• Dispersion:

• Dispersion is the phenomenon where white light splits into its seven constituent colors (VIBGYOR) when passing through a

prism.

• This happens because different colors of light travel at different speeds in a medium like glass, causing them to bend at different angles.

• Blue Sky and Rayleigh Scattering:

• While similar to the Tyndall effect, Rayleigh scattering involves scattering by molecules much smaller than the wavelength of light. It explains why the sky appears blue during the day and red/orange during sunset.

Important Points

• Practical Examples:

• When sunlight passes through the canopy of a dense forest, the tiny water droplets in the mist scatter the light, illustrating the Tyndall Effect.

• The visible beam of a flashlight in a dusty room or the headlights of a car in fog are classic everyday examples of this phenomenon.

• Colloids vs. Suspensions:

• Both colloids (like milk, butter, or fog) and suspensions (like muddy water or chalk powder in water) exhibit the Tyndall effect.

• In chemistry, the Tyndall effect is a primary method used to distinguish between a true solution and a colloidal system.

• Mathematical Context:

• The scattering is proportional to the fourth power of the frequency, meaning higher frequency light (blue) is scattered much more efficiently than lower frequency light (red).

Q26. Answer: (d) 30

Shortcut Trick

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

The side opposite to 30° (base) = 10√3 m.

The side opposite to 60° (height) = Base × √3.

Height = 10√3 × √3 = 10 × 3 = 30 m.

Therefore The correct answer is 30 m.

Alternate Method

Given:

Angle of depression = 60° => Angle of elevation at object = 60°.

Distance from foot of tower to object (Base) = 10√3 m.

Formula Used:

tan(θ) = Perpendicular / Base

Calculations:

=> tan(60°) = Height / 10√3

=> √3 = Height / 10√3

=> Height = 10√3 × √3

=> Height = 10 × 3 = 30 m.

Therefore The correct answer is 30 m.

Additional Information

Angle of Depression

The angle formed by the line of sight with the horizontal when the object is below the horizontal level. It is numerically equal to the angle of elevation.

Standard Trigonometric Ratios

tan(30°) = 1/√3, tan(45°) = 1, tan(60°) = √3. These are essential for solving heights and distances problems.

Right Triangle Properties

In any right-angled triangle, the relation between sides and angles is given by SOH-CAH-TOA (Sin=Opp/Hyp, Cos=Adj/Hyp, Tan=Opp/Adj).

Q27. Answer: (d) 10,368

Shortcut Trick

Total Voters = 1,20,000

Polled Votes = 72% of 1,20,000

Winning Margin = (27% − 15%) = 12% of Polled Votes

Required Votes = 1,20,000 × 0.72 × 0.12 = 10,368
Therefore The correct answer is 10,368 votes.
Alternate Method
Given:
Total number of voters = 1,20,000
Voting percentage = 72%
Winner's share of polled votes = 27%
Runner-up's share of polled votes = 15%
Calculations:
=> Total polled votes = 72% of 1,20,000 = (72 ÷ 100) × 1,20,000 = 86,400
=> Winning margin percentage = 27% − 15% = 12%
=> Winning margin in votes = 12% of 86,400
=> Margin = (12 ÷ 100) × 86,400
=> Margin = 12 × 864 = 10,368
Therefore The correct answer is 10,368 votes.
Additional Information
Percentage Change and Base
Always identify the base value (Total Voters vs. Polled Votes). Here, percentages were of polled votes, not total voters.
Effective Percentage
Effective % = (Polled %) × (Margin %). In this case, 72% × 12% = 8.64% of the total voter list.
Successive Percentage Application
Used when one percentage is applied on the result of another. Formula: Final Value = Initial Value × (p1/100) × (p2/100).

Q28. Answer: (a) 10

Shortcut Trick
The average of the first n even natural numbers is given by the formula (n + 1).
Here, the number of terms n = 9.
Average = 9 + 1 = 10.
Therefore The correct answer is 10.
Alternate Method
Given:
First 9 even natural numbers: 2, 4, 6, 8, 10, 12, 14, 16, 18.
Number of terms (n) = 9
Formula Used:
Sum of first n even numbers = n(n + 1)
Average = Sum of numbers ÷ Total numbers
Calculations:
=> Sum of first 9 even numbers = 9 × (9 + 1)
=> Sum = 9 × 10 = 90
=> Average = 90 ÷ 9
=> Average = 10
Therefore The correct answer is 10.
Additional Information
Average of first n natural numbers
The average of the first n natural numbers starting from 1 is (n + 1) ÷ 2.
Average of first n odd natural numbers
The average of the first n odd natural numbers (1, 3, 5, ...) is always equal to n.
Average of numbers in A.P.
For any sequence in Arithmetic Progression, Average = (First term + Last term) ÷ 2.

YourMockTest.com – Free Study Material

Q29. Answer: (a) 160°

Shortcut Trick

For any regular polygon with n sides:

Exterior Angle = 360° ÷ n

For n = 18: Exterior Angle = 360° ÷ 18 = 20°

Since Interior Angle + Exterior Angle = 180°:

Interior Angle = 180° − 20° = 160°

Therefore The correct answer is 160°.

Alternate Method

Given:

Number of sides of the regular polygon (n) = 18

Formula Used:

Measure of each interior angle of a regular polygon with n sides = ((n − 2) × 180°) ÷ n

Calculations:

Substitute n = 18 into the formula:

=> Interior Angle = ((18 − 2) × 180°) ÷ 18

=> Interior Angle = (16 × 180°) ÷ 18

=> Interior Angle = 16 × 10°

=> Interior Angle = 160°

Let us verify the other options to confirm they are incorrect:

=> For Option (2) 150°: The exterior angle would be 180° − 150° = 30°. The number of sides would be 360° ÷ 30° = 12, which does not match the given 18 sides.

=> For Option (3) 140°: The exterior angle would be 180° − 140° = 40°. The number of sides would be 360° ÷ 40° = 9, which does not match the given 18 sides.

=> For Option (4) 120°: The exterior angle would be 180° − 120° = 60°. The number of sides would be 360° ÷ 60° = 6, which does not match the given 18 sides.

Therefore The correct answer is 160°.

Additional Information

Sum of Interior Angles of a Polygon

The sum of all interior angles of any n-sided polygon is given by the formula: Sum = (n − 2) × 180°.

Sum of Exterior Angles of a Polygon

For any convex polygon, the sum of all exterior angles is always constant and equal to 360°.

Number of Diagonals in a Polygon

The total number of diagonals in a polygon with n sides is given by the formula: Diagonals = (n × (n − 3)) ÷ 2.

Q30. Answer: (b) A single discount of 64%

Shortcut Trick

Nisha should choose the option that gives the highest equivalent discount percentage.

Option 1: 23 + 23 − (23 × 23) ÷ 100 = 46 − 5.29 = 40.71%.

Option 2: Single discount = 64%.

Option 3: 7 + 45 − (7 × 45) ÷ 100 = 52 − 3.15 = 48.85%.

Option 4: 10 + 39 − (10 × 39) ÷ 100 = 49 − 3.9 = 45.1%.

Comparing all values, 64% is significantly higher than the others.

Therefore The correct answer is A single discount of 64%.

Alternate Method

Given: Marked Price (MP) = Rs. 5,000.

Formula: Successive Discount = a + b − (a × b) ÷ 100.

=> Option 1: Successive 23% and 23% => 23 + 23 − (529 ÷ 100) = 46 − 5.29 = 40.71%.

=> Option 2: Single discount = 64%.

=> Option 3: Successive 7% and 45% => 7 + 45 − (315 ÷ 100) = 52 − 3.15 = 48.85%.

=> Option 4: Successive 10% and 39% => 10 + 39 − (390 ÷ 100) = 49 − 3.9 = 45.1%.

=> Maximum advantage occurs at the highest discount percentage, which is 64%.

YourMockTest.com — Free Study Material

Therefore The correct answer is A single discount of 64%.

Additional Information

Successive Discount Logic

A single discount is always better for the buyer than two successive discounts that add up to the same numerical value, because in successive discounts, the second percentage is calculated on a reduced amount.

Maximum Advantage

To gain the maximum advantage, the customer seeks the lowest Selling Price (SP), which corresponds to the highest Discount Percentage.

Q31. Answer: (a) 15.5%

Shortcut Trick

Use the successive percentage formula: Net Profit% = a + b + (a × b) ÷ 100.

Here, a = 10% (P to R) and b = 5% (R to Q).

Net Profit% = 10 + 5 + (10 × 5) ÷ 100 = 15 + 50 ÷ 100 = 15 + 0.5 = 15.5%.

Therefore The correct answer is 15.5%.

Alternate Method

Given: Profit P to R = 10%, Profit R to Q = 5%.

Formulas: SP = CP × (100 + P%) ÷ 100 | Profit% = (Profit ÷ CP) × 100.

=> Let the Cost Price (CP) for P = 100.

=> Price at which P sells to R = 100 × (110 ÷ 100) = 110.

=> Price at which R sells to Q = 110 × (105 ÷ 100) = 115.5.

=> If P sells directly to Q at R's selling price, then P's SP = 115.5.

=> Profit for P = 115.5 − 100 = 15.5.

=> Profit Percentage = (15.5 ÷ 100) × 100 = 15.5%.

Therefore The correct answer is 15.5%.

Additional Information

Successive Percentage Changes

When a value is increased by x% and then again by y%, the overall increase is given by (x + y + xy/100)%.

Effective Profit

In a chain of sales, the effective cost to the final buyer relative to the original seller's cost is the product of all multiplying factors (1 + P%).

Q32. Answer: (c) Base fare = Rs. 30; Per-kilometre Charge = Rs. 20

Shortcut Trick

Difference in distance = 15 km − 10 km = 5 km

Difference in fare = Rs. 330 − Rs. 230 = Rs. 100

Per-km charge = Difference in fare ÷ Difference in distance = 100 ÷ 5 = Rs. 20

Base fare = Total fare for 10 km − (10 × Per-km charge) = 230 − (10 × 20) = 230 − 200 = Rs. 30

Therefore The correct answer is Base fare = Rs. 30; Per-kilometre Charge = Rs. 20.

Alternate Method

Given:

Fare for 10 km Raju = Rs. 230

Fare for 15 km Meena = Rs. 330

Formula Used:

Total Fare = Base Fare + (Distance × Rate per km)

Let Base Fare = B and Charge per km = R.

For Raju (10 km):

=> B + 10R = 230 → (Equation 1)

For Meena (15 km):

=> B + 15R = 330 → (Equation 2)

Subtract Equation 1 from Equation 2:

=> (B + 15R) − (B + 10R) = 330 − 230

=> 5R = 100

=> R = 100 ÷ 5 = 20

Substitute R = 20 in Equation 1:

=> B + 10(20) = 230

=> B + 200 = 230

=> B = 230 − 200 = 30

Therefore The correct answer is Base fare = Rs. 30; Per-kilometre Charge = Rs. 20.

Additional Information

Linear Equations in Two Variables

A system of equations of the form ax + by = c can be solved using Elimination or Substitution methods to find specific constants.

Fixed vs Variable Cost

The base fare represents the fixed cost (independent of usage), while the per-km charge represents the variable cost (dependent on distance).

Rate of Change

The per-kilometre charge is essentially the slope of the linear fare equation, calculated as Change in Fare ÷ Change in Distance.

Q33. Answer: (b) 1936 π cm²

Shortcut Trick

The Surface Area of a Sphere is calculated using the formula: $4 \times \pi \times r^2$.

Given radius (r) = 22 cm.

Surface Area = $4 \times \pi \times (22)^2 = 4 \times 484 \times \pi = 1936\pi$ cm².

Therefore The correct answer is 1936π cm².

Alternate Method

Given:

Radius of the sphere (r) = 22 cm

Formula Used:

Surface Area (A) = $4\pi r^2$

Calculations:

=> Surface Area = $4 \times \pi \times (22 \text{ cm})^2$

=> Surface Area = $4 \times \pi \times 484$ cm²

=> Surface Area = 1936π cm²

Therefore The correct answer is 1936π cm².

Additional Information

Volume of a Sphere

The total volume or capacity of a sphere is given by the formula: $V = (4/3) \times \pi \times r^3$.

Hemisphere Properties

For a hemisphere of radius r, the Curved Surface Area (CSA) is $2\pi r^2$ and the Total Surface Area (TSA) is $3\pi r^2$.

Ratio of Areas

If the radii of two spheres are in the ratio a:b, then their surface areas are in the ratio $a^2:b^2$.

Q34. Answer: (b) 10,800

Shortcut Trick

Total votes = 100%

Third candidate % = 100% − (40% + 30%) = 30%

Number of votes = 30% of 36,000 = 0.30 × 36,000

Therefore The correct answer is 10,800 votes.

Alternate Method

Given:

Total votes polled = 36,000

Votes for First candidate = 40%

Votes for Second candidate = 30%

Calculations:

=> Total percentage of votes = 100%

=> Percentage for Third candidate = 100% − (40% + 30%)
=> Percentage for Third candidate = 30%
=> Number of votes = (30/100) × 36,000
=> Number of votes = 30 × 360
=> Number of votes = 10,800
Therefore The correct answer is 10,800 votes.
Additional Information
Percentage Calculation
To find the percentage of a number, use the formula: (Percentage/100) × Total Value.
Vote Distribution
In an election with no invalid votes, the sum of percentages obtained by all candidates always equals 100%.
Base Value Concept
The total number of votes polled acts as the base (100%) for calculating individual shares.

Q35. Answer: (d) 12

Shortcut Trick
For mean proportional (M) of two numbers A and B, the formula is $M^2 = A \times B$.
Given M = 18 and B = 27.
=> $18^2 = A \times 27$
=> $324 = A \times 27$
=> $A = 324 \div 27 = 12$.
Therefore The correct answer is 12.
Alternate Method
Given:
First number = A
Second number = 27
Mean Proportional = 18
Formula Used:
If b is the mean proportional between a and c, then a : b :: b : c or $b = \sqrt{(a \times c)}$.
Calculations:
=> A / 18 = 18 / 27
=> A = (18 × 18) ÷ 27
=> A = 324 ÷ 27
=> A = 12
Therefore The correct answer is 12.
Additional Information
Third Proportional
The third proportional of two numbers a and b is defined as c such that a : b = b : c, which gives $c = b^2 \div a$.
Fourth Proportional
The fourth proportional of a, b, and c is d such that a : b = c : d, which gives d = (b × c) ÷ a.
Continued Proportion
Numbers a, b, c, d... are in continued proportion if a/b = b/c = c/d...

Q36. Answer: (c) 15 seconds

Shortcut Trick
Relative Speed (Opposite Direction) = 18 + 20 = 38 m/s.
Total Distance (Sum of Lengths) = 457 + 113 = 570 m.
Crossing Time = Total Distance ÷ Relative Speed = 570 ÷ 38.
Therefore The correct answer is 15 sec.
Alternate Method
Given:
Length of Train A (L1) = 457 m

Length of Train B (L2) = 113 m

Speed of Train A (S1) = 18 m/s

Speed of Train B (S2) = 20 m/s

Formula Used:

Time = (L1 + L2) ÷ (S1 + S2) [When moving in opposite directions]

Calculations:

=> Total distance to be covered = 457 + 113 = 570 m

=> Relative speed = 18 + 20 = 38 m/s

=> Time taken = 570 ÷ 38

=> Time taken = 15 sec

Therefore The correct answer is 15 sec.

Additional Information

Relative Speed in Same Direction

When two objects move in the same direction, their relative speed is the difference of their speeds: Relative Speed = |S1 − S2|.

Conversion of Speed Units

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

Train Crossing a Point Object

When a train crosses a pole or a stationary man, the distance covered is equal to the length of the train itself.

Q37. Answer: (b) 340

Shortcut Trick

The smallest number divisible by a set of numbers is their LCM.

Number + 20 = LCM(12, 20, 15, 18, 24)

LCM of (12, 20, 15, 18, 24) = 360

Required number = 360 − 20 = 340

Therefore The correct answer is 340.

Alternate Method

Given: Divisors are 12, 20, 15, 18, and 24. The number is increased by 20.

Formula Used: Required Number = LCM(a, b, c, d, e) − Increased Value

=> Prime factorization of divisors:

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

=> $20 = 2^2 \times 5$

=> $15 = 3 \times 5$

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

=> $24 = 2^3 \times 3$

=> LCM = $2^3 \times 3^2 \times 5 = 8 \times 9 \times 5 = 360$

=> Let the required number be x.

=> x + 20 = 360

=> x = 360 − 20

=> x = 340

Therefore The correct answer is 340.

Additional Information

LCM (Least Common Multiple)

The smallest positive integer that is divisible by each of the given numbers. Found by taking the highest power of all prime factors involved.

LCM Adjustment Rules

If a number is increased by K, the required number is LCM − K. If a number is decreased by K, the required number is LCM + K.

HCF vs LCM

Use HCF when finding the largest number that divides given numbers; use LCM when finding the smallest number that is divided by given numbers.

Q38. Answer: (c) 5 a^3 b^3

Shortcut Trick

Divide the numerical coefficients and subtract the exponents of matching variables directly.

Numbers: 10 ÷ 2 = 5

Exponents of a: 5 − 2 = 3 => a^3

Exponents of b: 6 − 3 = 3 => b^3

Combining all parts gives 5 a^3 b^3.

Therefore The correct answer is 5 a^3 b^3.

Alternate Method

Given:

Expression: (10 × a^5 × b^6) ÷ (2 × a^2 × b^3)

Formula Used:

Law of Exponents for division: x^m ÷ x^n = x^(m−n)

Calculation:

=> Separate the constants and variables:

=> (10 ÷ 2) × (a^5 ÷ a^2) × (b^6 ÷ b^3)

=> Apply the division law of exponents by subtracting the denominator powers from the numerator powers:

=> 5 × a^(5−2) × b^(6−3)

=> 5 × a^3 × b^3

=> 5 a^3 b^3

Therefore The correct answer is 5 a^3 b^3.

Additional Information

Laws of Exponents (Multiplication)

When multiplying terms with the same base, add their exponents: a^m × a^n = a^(m+n)

Power of a Power Rule

When raising a power to another power, multiply the exponents: (a^m)^n = a^(m×n)

Negative Exponents

A negative exponent indicates the reciprocal of the base raised to a positive power: a^(−n) = 1 / a^n

Zero Exponent Rule

Any non-zero base raised to the power of zero is always equal to one: a^0 = 1

Q39. Answer: (c) 3696 cm^2

Shortcut Trick

Convert capacity: 25.872 litres = 25872 cm^3.

Given height (h) = 3r, so Volume (V) = 3πr^3.

r^3 = 25872 ÷ (3 × 22/7) = 25872 × 7 ÷ 66 = 2744 => r = 14 cm.

Shortcut for Curved Surface Area (CSA): CSA = 2V ÷ r.

CSA = (2 × 25872) ÷ 14 = 25872 ÷ 7 = 3696 cm^2.

Therefore The correct answer is 3696 cm^2.

Alternate Method

Given:

Capacity of the cylindrical vessel (V) = 25.872 litres = 25872 cm^3

Height (h) = 3 × Radius (r)

Value of π = 22/7

Formula Used:

Volume of a cylinder = πr^2h

Curved Surface Area (CSA) = 2πrh

Calculations:

=> V = πr^2h

=> 25872 = (22/7) × r^2 × (3r)

=> 25872 = (66/7) × r^3

=> r^3 = (25872 × 7) ÷ 66

=> $r^3 = 392 \times 7 = 2744$

=> $r = \sqrt[3]{(2744)} = 14$ cm

=> $h = 3 \times 14 = 42$ cm

=> CSA = $2 \times (22/7) \times 14 \times 42$

=> CSA = $2 \times 22 \times 2 \times 42$

=> CSA = $44 \times 84 = 3696$ cm²

Therefore The correct answer is 3696 cm².

Additional Information

Volume of Cylinder

The total space enclosed within a cylinder is given by $V = \pi r^2 h$.

Total Surface Area (TSA)

TSA of a cylinder includes the curved surface and two circular bases: $TSA = 2\pi r(h + r)$.

Unit Conversion Rule

1 Litre is equal to 1000 cm³; always convert to consistent units before calculation.

Q40. Answer: (d) 87:31:63

Shortcut Trick

Multiply Original Ratio by (100 + Increment)% for each person.

New ratio → $18 \times 145 : 5 \times 186 : 10 \times 189$

Simplifying → 2610 : 930 : 1890

Divide by 30 → 87 : 31 : 63

Therefore The correct answer is 87:31:63.

Alternate Method

Given: Original ratio of salaries X : Y : Z = 18 : 5 : 10

Formula: New Value = Old Value × (100 + Increase %)/100

=> New Salary of X = $18 \times (145/100) = 26.1$

=> New Salary of Y = $5 \times (186/100) = 9.3$

=> New Salary of Z = $10 \times (189/100) = 18.9$

=> New Ratio = 26.1 : 9.3 : 18.9

=> New Ratio = 261 : 93 : 189 (Multiplying by 10)

=> New Ratio = 87 : 31 : 63 (Dividing by 3)

Therefore The correct answer is 87:31:63.

Additional Information

Successive Percentage Change

If a value is changed by a% and then by b%, the net change is [a + b + (a × b)/100]%.

Ratio Scaling

Multiplying or dividing all terms of a ratio by the same non-zero number does not change the ratio.

Compound Ratio

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

Q41. Answer: (b) 31.96%

Shortcut Trick

Discount = Marked Price (MP) − Selling Price (SP) = 8,730 − 5,940 = 2,790.

Discount% = (Discount ÷ MP) × 100.

Discount% = (2,790 ÷ 8,730) × 100 ≈ 31.958%.

Rounding to two decimal places, we get 31.96%.

Therefore The correct answer is 31.96%.

Alternate Method

Given → Marked Price (MP) = Rs. 8,730 and Selling Price (SP) = Rs. 5,940.

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

=> Calculate Discount: 8,730 − 5,940 = 2,790.

=> Calculate Discount Percentage: (2,790 ÷ 8,730) × 100.

YourMockTest.com — Free Study Material

=> 279,000 ÷ 8,730 ≈ 31.9587%.

=> Final rounded value = 31.96%.

Therefore The correct answer is 31.96%.

Additional Information

Marked Price & Discount

The Marked Price (MP) is the price printed on the product. Discount is always calculated on the MP unless specified otherwise.

Relation between SP and MP

SP = MP × (100 − Discount%) ÷ 100. This formula helps find any missing value when the other two are known.

Q42. Answer: (a) 4

Shortcut Trick

Let total capacity of cistern = 16 units (LCM of 8 and 16).

Combined efficiency of P and Q = 16 ÷ 8 = 2 units/hour.

Efficiency of P = 16 ÷ 16 = 1 unit/hour.

Efficiency of Q = 2 − 1 = 1 unit/hour.

Time required for Q to fill one-fourth of cistern = (16 ÷ 4) ÷ 1 = 4 hours.

Therefore The correct answer is 4 hours.

Alternate Method

Person	Days / Hours	Total Work	Efficiency
P + Q	8	16	2
P	16	1	

=> Efficiency of Q = (Efficiency of P + Q) − (Efficiency of P)

=> Efficiency of Q = 2 − 1 = 1 unit/hour

=> One-fourth of the total work = 16 ÷ 4 = 4 units

=> Time taken by Q to complete 4 units of work = 4 ÷ 1 = 4 hours

Therefore The correct answer is 4 hours.

Additional Information

Pipes & Cisterns Efficiency Rule

The rate of work done by an individual pipe is its efficiency. For an outlet pipe or leak, efficiency is taken as negative, while for an inlet pipe, it is taken as positive.

Work-Time Reciprocal Relation

If a pipe can fill a tank in x hours, the part of the tank filled in 1 hour is 1/x.

Q43. Answer: (b) 30 km/hr

Shortcut Trick

When equal distances are covered at different speeds, the Average Speed is the Harmonic Mean of the speeds.

Formula for 3 equal segments: Average Speed = 3 × v1 × v2 × v3 ÷ (v1v2 + v2v3 + v3v1)

Average Speed = (3 × 20 × 30 × 60) ÷ (20×30 + 30×60 + 60×20)

Average Speed = 108000 ÷ (600 + 1800 + 1200) = 108000 ÷ 3600 = 30 km/hr.

Therefore The correct answer is 30 km/hr.

Alternate Method

Given: Total distance = 180 km | Segment 1 = 60 km at 20 km/hr | Segment 2 = 60 km at 30 km/hr | Segment 3 = 60 km at 60 km/hr.

Formula Used: Average Speed = Total Distance ÷ Total Time

=> Time for 1^(st) segment (t1) = 60 ÷ 20 = 3 hours

=> Time for 2^(nd) segment (t2) = 60 ÷ 30 = 2 hours

=> Time for 3^(rd) segment (t3) = 60 ÷ 60 = 1 hour

=> Total Time = 3 + 2 + 1 = 6 hours

=> Average Speed = 180 ÷ 6 = 30 km/hr

Therefore The correct answer is 30 km/hr.

Additional Information

YourMockTest.com – Free Study Material

Average Speed for Two Equal Distances

When two equal distances are covered at speeds 'u' and 'v', Average Speed = (2uv) ÷ (u + v).

Weighted Average Speed

If distances d1, d2 are covered at speeds v1, v2, then Average Speed = (d1 + d2) ÷ (d1/v1 + d2/v2).

Unit Conversion

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

Q44. Answer: (b) 64

Shortcut Trick

New member age = New average + (Change in average × Old number of members)

Here, New average = 30 years, Change = 30 − 29 = 1 year, Old count = 34.

Age of teacher = 30 + (1 × 34) = 30 + 34 = 64 years.

Therefore The correct answer is 64 years.

Alternate Method

Given:

Initial students = 34 | Initial average age = 29 years

New average after adding teacher = 30 years

Formula Used:

Total Age = Average Age × Number of persons

Teacher age = (Total age of 35 persons) − (Total age of 34 students)

Calculations:

=> Total age of 34 students = 34 × 29 = 986 years

=> Total people including teacher = 34 + 1 = 35

=> Total age of 35 persons = 35 × 30 = 1050 years

=> Teacher age = 1050 − 986 = 64 years

Therefore The correct answer is 64 years.

Additional Information

Average Displacement Method

When a new person joins and the average increases, the new person brings the "new average" plus the "increment" distributed over all previous members.

Weighted Average Formula

A_(combined) = (n1x1 + n2x2) ÷ (n1 + n2), where n is the count and x is the individual average/value.

Average Basics

Average = (Sum of all observations) ÷ (Total number of observations). To find the sum, multiply the average by the count.

Q45. Answer: (d) (52, 105)

Shortcut Trick

Check the HCF of each pair; relatively prime numbers must have HCF = 1.

(68, 85) → Both divisible by 17.

(102, 153) → Both divisible by 51.

(65, 91) → Both divisible by 13.

(52, 105) → 52 = 2^2 × 13 and 105 = 3 × 5 × 7. No common factor except 1.

Therefore The correct answer is (52, 105).

Alternate Method

Relatively Prime (or Coprime) numbers are pairs whose Highest Common Factor (HCF) is 1.

=> For (68, 85): 68 = 17 × 4, 85 = 17 × 5. HCF = 17.

=> For (102, 153): 102 = 51 × 2, 153 = 51 × 3. HCF = 51.

=> For (65, 91): 65 = 13 × 5, 91 = 13 × 7. HCF = 13.

=> For (52, 105): 52 = 2 × 2 × 13, 105 = 3 × 5 × 7. HCF = 1.

Therefore The correct answer is (52, 105).

Additional Information

Definition of Coprime Numbers

YourMockTest.com – Free Study Material

Two numbers are relatively prime if they have no common positive factors other than 1.

Consecutive Numbers

Any two consecutive integers are always relatively prime to each other (e.g., 20 and 21).

Prime Numbers Pair

Any two distinct prime numbers are always relatively prime (e.g., 7 and 11).

Q46. Answer: (c) 1440

Shortcut Trick

Let total work (capacity) be LCM of 32, 36, and 20 = 1440 units.

Efficiency of A = 45, B = 40, and A+B+C = 72.

Efficiency of C = 72 − (45 + 40) = −13 units/min.

Since 13 units/min corresponds to 13 cubic units/min, 1 unit = 1 cubic unit.

Therefore The correct answer is 1440 cubic units.

Alternate Method

Given: Time for Pipe A = 32 min, Pipe B = 36 min, Pipe A+B+C = 20 min. Rate of Pipe C = 13 cubic units/min.

Person	Days	Total Work	Efficiency
Pipe A	32 min	1440 units	45
Pipe B	36 min	40	
Pipe A+B+C	20 min	72	

=> Total efficiency of A and B = 45 + 40 = 85 units/min

=> Efficiency of Pipe C = (A+B+C) − (A+B) = 72 − 85 = −13 units/min

=> Negative sign indicates emptying.

=> Actual emptying rate = 13 cubic units/min

=> 13 units = 13 cubic units → 1 unit = 1 cubic unit

=> Total Capacity = 1440 × 1 = 1440 cubic units

Therefore The correct answer is 1440 cubic units.

Additional Information

Efficiency and Time

Efficiency is inversely proportional to the time taken to complete the work. Efficiency = Total Work ÷ Time.

Inlet and Outlet Pipes

Inlet pipes have positive efficiency as they fill the tank, while outlet (emptying) pipes have negative efficiency.

Tank Capacity Formula

Capacity = Time taken by pipe × Flow rate (Rate at which water enters or leaves per minute).

Q47. Answer: (c) 10x − 5

Shortcut Trick

Apply the difference of squares identity: $a^2 - b^2 = (a + b)(a - b)$.

Let a = (x + 2) and b = (x − 3).

Sum (a + b) = (x + 2) + (x − 3) = 2x − 1.

Difference (a − b) = (x + 2) − (x − 3) = 5.

Required result = 5 × (2x − 1) = 10x − 5.

Therefore The correct answer is 10x − 5.

Alternate Method

Given:

The algebraic expression to simplify is $(x + 2)^2 - (x - 3)^2$.

Formula Used:

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

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

Calculations:

=> Expand the first term: $(x + 2)^2 = x^2 + 2 \times x \times 2 + 2^2 = x^2 + 4x + 4$

=> Expand the second term: $(x - 3)^2 = x^2 - 2 \times x \times 3 + 3^2 = x^2 - 6x + 9$

=> Subtract the two expanded expressions: $(x^2 + 4x + 4) - (x^2 - 6x + 9)$

=> Remove brackets and change signs: $x^2 + 4x + 4 - x^2 + 6x - 9$

=> Combine like terms: $(x^2 - x^2) + (4x + 6x) + (4 - 9)$

=> Result = $10x - 5$

Therefore The correct answer is $10x - 5$.

Additional Information

Standard Algebraic Identities

These identities help simplify complex polynomial expressions: $(a + b)(a - b) = a^2 - b^2$ and $(a + b)^2 = a^2 + 2ab + b^2$.

Combining Like Terms

Only terms with the same variables and exponents can be added or subtracted during simplification.

Distributive Property

When a negative sign is outside a bracket, every term inside the bracket must change its sign: $-(a - b) = -a + b$.

Q48. Answer: (c) 4%

Shortcut Trick

When an item price increases by x% and consumption decreases by x%, the net change is always a decrease.

Net percentage change = $-(x^2 / 100)\%$

Net change = $-(20^2 / 100)\% = -(400 / 100)\% = -4\%$

Negative sign indicates a decrease.

Therefore The correct answer is 4%.

Alternate Method

Given:

Increase in Price = 20%

Decrease in Consumption = 20%

Formula Used:

Total Expenditure = Price × Consumption

Net Change % = $a + b + (ab / 100)$

Calculations:

=> Let initial price be 100 and consumption be 100.

=> Initial Expenditure = 100 × 100 = 10,000

=> New Price = 120 (after 20% increase)

=> New Consumption = 80 (after 20% decrease)

=> New Expenditure = 120 × 80 = 9,600

=> Decrease in Expenditure = 10,000 − 9,600 = 400

=> Percentage Decrease = (400 / 10,000) × 100 = 4%

Therefore The correct answer is 4%.

Additional Information

Successive Percentage Change

If a value is changed by x% and then by y%, the net change is given by $[x + y + (xy / 100)]\%$.

Expenditure and Budget

If price increases by r%, to keep expenditure constant, consumption must decrease by $[r / (100 + r)] \times 100\%$.

Product Stability Rule

When the product of two variables is constant, an increase in one leads to a proportional decrease in the other.

Q49. Answer: (d) 60 years

Shortcut Trick

Age ratio (Father : Son): Present = 2 : 1 | 15 years ago = 3 : 1

Make ratio differences equal: 2:1 (diff 1) → 4:2 (diff 2) | 3:1 (diff 2)

Ratio change: 4 → 3 (1 unit) = 15 years

Father's present age = 4 units = 4 × 15 = 60 years

Therefore The correct answer is 60 years.

Alternate Method

Given:
Present age of Son = x
Present age of Father = 2x
Formula Used:
Age 15 years ago = (Present Age − 15)
Calculations:
=> (2x − 15) = 3 × (x − 15)
=> 2x − 15 = 3x − 45
=> 3x − 2x = 45 − 15
=> x = 30
=> Father's present age = 2x = 2 × 30
=> Father's present age = 60 years
Therefore The correct answer is 60 years.
Additional Information
Ratio of Ages
If the age of A and B are in the ratio a:b, then their ages can be assumed as ax and bx.
Age Difference Property
The difference between the ages of two persons remains constant at any point in time.
Future and Past Ages
If present age is x, then age 'n' years ago was (x−n) and age 'n' years hence will be (x+n).

Q50. Answer: (b) Rs. 5,040

Shortcut Trick
Net percentage change for 2 successive 20% increases = 20 + 20 + (20 × 20)/100 = 44%.
Total Amount = Principal × (100 + Net %)/100.
=> Amount = 3,500 × 1.44 = Rs. 5,040.
Therefore The correct answer is Rs. 5,040.
Alternate Method
Given:
Principal (P) = Rs. 3,500
Rate (R) = 20% per annum
Time (T) = 2 years (compounded annually)
Formula Used:
Amount (A) = P(1 + R/100)^T
Calculations:
=> A = 3,500 × (1 + 20/100)²
=> A = 3,500 × (1 + 1/5)²
=> A = 3,500 × (6/5) × (6/5)
=> A = 3,500 × 36/25
=> A = 140 × 36
=> A = 5,040
Therefore The correct answer is Rs. 5,040.
Additional Information
Compound Interest (CI) Formula
CI = Amount − Principal = P[(1 + R/100)^T − 1].
Effective Rate of Interest
For 2 years, the effective rate is R + R + (R × R)/100.
Difference between CI and SI for 2 years
Difference (D) = P(R/100)².

YourMockTest.com — Free Study Material

Q51. Answer: (d) 8

The logic followed here is:

Given:

MIST → 5321

KITS → 5128

So, K → 8

Hence, the correct answer is Option 4.

Q52. Answer: (b) North-west

Given:

Town K is north of Town L.

Town M is east of K.

Town N is south of M.

Town O is west of N.

Town L is south-west of Town O.

Therefore, K is south-west of O.

Hence, the correct answer is Option 1.

Q53. Answer: (a) (15, 50, 43)

The logic followed here is:

Logic: (1st number × 3) + 5 = 2nd number and (2nd number − 7) = 3rd number

For, (5, 20, 13)

=> (5 × 3) + 5 = 15 + 5 = 20

=> 20 − 7 = 13

For, (9, 32, 25)

=> (9 × 3) + 5 = 27 + 5 = 32

=> 32 − 7 = 25

Now, checking the options using the same pattern:

Option 1) (15, 50, 43)

=> (15 × 3) + 5 = 45 + 5 = 50

=> 50 − 7 = 43

Option 2) (20, 65, 72)

=> (20 × 3) + 5 = 60 + 5 = 65

=> 65 − 7 = 58 ≠ 72

Option 3) (14, 37, 30)

=> (14 × 3) + 5 = 42 + 5 = 47 ≠ 37

=> 37 − 7 = 30

Option 4) (12, 41, 48)

=> (12 × 3) + 5 = 36 + 5 = 41

=> 41 − 7 = 34 ≠ 48

Hence, the correct answer is Option 1.

Q54. Answer: (d) Three

Given number: 8341756

Logic:

Add 1 to each odd digit

Subtract 2 from each even digit

Original number: 8 3 4 1 7 5 6

Digit	Type	Operation	New Digit
8	Even	8 − 2	6
3	Odd	3 + 1	4

YourMockTest.com — Free Study Material

4	Even	4 − 2	2
1	Odd	1 + 1	2
7	Odd	7 + 1	8
5	Odd	5 + 1	6
6	Even	6 − 2	4

New number: 6 4 2 2 8 6 4
Repeated digits are: 6, 4, 2
Total repeated digits = 3
Hence, the correct answer is Option 4.

Q55. Answer: (c) Manshaad

Given: Anita, Hussain, Manshaad, Emily, Sunita and Shanti are sitting around a circular table facing the centre.
Hussain is sitting second to the right of Anita.
Manshaad is an immediate neighbour of both Emily and Anita.
Sunita is sitting second to the left of Manshaad.
So, second to the left of Shanti is Manshaad.
Hence, the correct answer is "Option 3".

Q56. Answer: (b) Two

Given: (Left) 8 9 4 1 2 3 7 3 1 4 6 (Right)
Now,
Odd numbers, which are immediately preceded by an odd number and also immediately followed by an odd number.
So, Needed pattern is: Odd Number - Odd Number - Odd Number
(Left) 8 9 4 1 2 3 7 3 1 4 6 (Right)
So, total valid odd numbers = 2
Hence, the correct answer is Option 2.

Q57. Answer: (b) 37

The logic followed here is:
thus, "37" will replace the question mark in the given series.
Hence, the correct option is "Option 2".

Q58. Answer: (b) 1

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

Position	Box
7	C
6	A
5	B
4	D
3	F
2	G
1	E

So, boxes below G = E → 1 box
Hence, the correct answer is "Option 2".

YourMockTest.com — Free Study Material

Q59. Answer: (a) QUC101

The logic followed here is:

So, the next term = QUC101

Hence, the correct answer is Option 1.

Q60. Answer: (b) Neither follows

Given Statements:

Some elephants are horses.

No horse is a donkey.

The least possible Venn diagram for the given statement is:

Conclusions:

I. No elephant is a donkey - Does not follow (Only horses are definitely not donkeys. Other elephants may or may not be donkeys).

II. No horse is an elephant - Does not follow (Given statement says some elephants are horses, so some horses are elephants).

So, Neither follows.

Hence, the correct answer is Option 2.

Q61. Answer: (d) cf

The logic followed here is:

Logic: Identify the common word in both sentences and match it with the common code appearing in both coded sequences.

Given:

bring hot food → cf tk rg

food is good → ml do cf

So. food → cf

Hence, the correct answer is Option 4.

Q62. Answer: (c) ZD−BI

The logic followed here is based on the alphabetical position pattern:

Option 1: BF – EI

Option 2: VZ – YC

Option 3: ZD – BI

Option 4: IM−LP

Thus, ZD – BI does not follow the same rule.

Hence, the odd one out is Option 3.

Q63. Answer: (a) DAC−FCE

The logic followed here is:

For, CZB − EBD

For, IFH − KHJ

Now, applying the same logic for DAC − FCE

So, DAC − FCE follows the same pattern correctly.

Hence, the correct answer is "Option 1".

Q64. Answer: (a) 5

BODMAS Table:

Given equation: 21 A 3 C 2 B 6 D 14 = ?

Now, replacing the symbols as:

Symbol	A	B	C	D
Replaced by	÷	×	•	−

=> 21 ÷ 3 + 2 × 6 − 14 = ?

=> 7 + 2 × 6 − 14 = ?

=> 7 + 12 − 14 = ?

=> 19 − 14 = ?

=> 5

Hence, the correct answer is Option 1.

Q65. Answer: (c) 54

The logic followed here is:

Logic: Number of persons between two persons in a row = Total Persons − (Position from Left + Position from Right)

Now, Total Persons = 81

Mr. Hepa = 11th from the Left

Mr. Annu = 16th from the Right

=> Number of persons between them = 81 − (11 + 16)

=> Number of persons between them = 81 − 27

=> Number of persons between them = 54

Hence, the odd one out is Option 3.

Q66. Answer: (c) 986

The logic followed here is:

thus, "986" will replace the question mark in the given series.

Hence, the correct option is "Option 3".

Q67. Answer: (c) YBZ−VYW

The logic followed here is:

For, WZX − TWU

For, QTR − NQO

Now, applying the same logic to the options:

Option 1) YAX − UXV

Option 2) YAX − VYW

Option 3) YBZ − VYW

Option 4) YBZ − UYV

So, only Option 3 follows the correct pattern.

Hence, the correct answer is "Option 3".

Q68. Answer: (d) 45

BODMAS Table:

Given equation: 189 – 153 × 9 ÷ 3 + 195 = ?

Now, if + and − are interchanged and × and ÷ are interchanged, then:

=> 189 + 153 ÷ 9 × 3 − 195

=> 153 ÷ 9 = 17

=> 17 × 3 = 51

=> 189 + 51 − 195

=> 240 − 195 = 45

Hence, the correct answer is Option 4.

Q69. Answer: (d) 459 and 439 respectively

The logic followed here is:

thus, "459 and 439 " will replace the question mark in the given series.

Hence, the correct option is "Option 4"

Q70. Answer: (b) 14

The logic followed here is:

Given numbers: 672, 323, 561, 307, 529

Now, Arranging in descending order: 672, 561, 529, 323, 307

Highest number = 672

→ Second digit = 7

Lowest number = 307

→ Third digit = 7

Result = 7 + 7 = 14

Hence, the correct answer is Option 2.

Q71. Answer: (d) Both conclusions (I) and (II) follow

Given Statements:

All glasses are tiles.

All glasses are cups.

All cups are mugs.

The least possible Venn diagram for the given statement is:

Conclusions:

I. All glasses are mugs - Follows (Since all glasses are cups and all cups are mugs, all glasses are mugs).

II. Some cups are tiles - Follows (Glasses are common to both cups and tiles, therefore some cups are tiles).

So, both conclusions I and II follow.

Hence, the correct answer is Option 4.

Q72. Answer: (d) 2 km towards the south

Given:

Rohit starts from A and drives 2 km East.

He turns left → 5 km North.

He turns left → 2 km West.

He turns left → 3 km South and reaches E.

So, To reach A from E → move 2 km South.

Hence, the correct answer is Option 4.

Q73. Answer: (c) Brother

Family Chart:

Decoding the Symbols:

Symbol	**±**	**•**	**Rs.**	**#**
Meaning	Wife	Daughter	Father	Brother

Given: D # R * A ± C Rs. O

It means: D is the brother of R, R is the daughter of A, A is the wife of C, and C is the father of O.

So, D is the brother of O.

Hence, the correct answer is "Option 3".

Q74. Answer: (c) OSU

The logic followed here is based on the alphabetical position pattern:

Option 1: MQO

Option 2: GKI

Option 3: QUS

Option 4: OSU

Thus, OSU does not follow the given pattern.

Hence, the odd one out is Option 4.

Q75. Answer: (d) PMU

The logic followed here is:

So, the next term = PMU

Hence, the correct answer is Option 4.

Q76. Answer: (c) 10

The logic followed here is:

Given numbers: 284, 286, 297, 213, 246, 273

Now, Arranging in descending order: 297, 286, 284, 273, 246, 213

YourMockTest.com — Free Study Material

Highest number = 297

→ Third digit = 7

Lowest number = 213

→ Third digit = 3

Result = 7 + 3 = 10

Hence, the correct answer is Option 3.

Q77. Answer: (d) 10

The logic followed here is:

Given numbers: 624, 859, 742, 154, 348

Now, Arranging in ascending order: 154, 348, 624, 742, 859

Second highest number = 742

→ Third digit = 2

Second lowest number = 348

→ Third digit = 8

Result = 2 + 8 = 10

Hence, the correct answer is Option 4.

Q78. Answer: (c) B

Given: Six people A, B, C, D, E and F are sitting in a row facing north.

D sits to the immediate left of F.

C sits third to the left of B.

F is an immediate neighbour of C.

E sits second to the right of C.

A sits to the immediate left of E.

Now, the person at the extreme right end is B.

Hence, the correct answer is "Option 3".

Q79. Answer: (b) One

Given: Six people Q, H, G, R, S and I are sitting in a row facing north.

Only two people are seated to the left of G.

Only two people are seated between G and I.

Only one person is seated between I and R.

Q is seated to the immediate left of H.

Now, people to the right of S = I → 1 person

Hence, the correct answer is "Option 2".

Q80. Answer: (a) HZOG

The logic followed here is:

For, BRMJ → XNIF

For, TQSN → PMOJ

Now, applying the same logic for LDSK:

So, LDSK → HZOG

Hence, the correct answer is "Option 1".

Q81. Answer: (b) The Disaster Management Act, 2005

The correct answer is The Disaster Management Act, 2005.

Key Points

• The Disaster Management (Amendment) Bill, 2024 was introduced in the Lok Sabha on August 1, 2024, and subsequently passed in March 2025 to amend the Disaster Management Act, 2005.

• The primary objective of the amendment is to bring more clarity and convergence in the roles of various authorities working in the field of disaster management at the National and State levels.

• One of the significant features of the Bill is the establishment of a National Disaster Database, which will be maintained at the national level to store critical information related to disaster risks and mitigation.

YourMockTest.com — Free Study Material

• The Bill provides for the constitution of Urban Disaster Management Authorities in state capitals and large cities with Municipal Corporations, acknowledging the unique challenges of urban flooding and infrastructure risks.

• It grants statutory recognition to existing bodies such as the National Disaster Response Force (NDRF) and the State Disaster Response Force (SDRF), formalizing their roles and responsibilities within the legal framework.

• The amendment empowers the Central Government to make regulations concerning the Disaster Management framework, ensuring a more flexible and responsive system to modern-day calamities. Hence, the correct answer is The Disaster Management Act, 2005.

Additional Information

• Disaster Management Act, 2005:

• This Act was enacted by the Parliament of India on December 23, 2005, following the devastating 2004 Indian Ocean Tsunami.

• It established a three-tier structure: the National Disaster Management Authority (NDMA) at the center, the State Disaster Management Authority (SDMA) at the state level, and the District Disaster Management Authority (DDMA) at the district level.

• The Prime Minister of India serves as the ex-officio Chairperson of the NDMA, while the Chief Ministers lead the respective SDMAs.

• Epidemic Diseases Act, 1897:

• This is a colonial-era law meant to provide for the better prevention of the spread of dangerous epidemic diseases. It was widely invoked during the COVID-19 pandemic in 2020.

• Environmental Protection Act, 1986:

• Enacted in the wake of the Bhopal Gas Tragedy, this Act empowers the Central Government to protect and improve environmental quality and control pollution.

• National Green Tribunal Act, 2010:

• This Act enabled the creation of the National Green Tribunal (NGT) for the effective and expeditious disposal of cases relating to environmental protection and conservation of forests.

Important Points

• Key Revisions in 2024 Bill:

• The 2024 Bill seeks to address the "overlapping" of functions between the NDMA and various ministries, ensuring that the National Plan is more comprehensive.

• It introduces provisions for financial penalties for individuals or organizations that fail to comply with the directions issued by the Central or State Governments regarding disaster management.

• The creation of the National Disaster Database is expected to help in evidence-based decision-making by tracking the allocation and utilization of funds from the National Disaster Response Fund.

Q82. Answer: (c) Hnahthial (Mizoram)

The correct answer is Hnahthial (Mizoram).

Key Points

• According to the NER District SDG Index 2023–24, which is the second edition of the index released by NITI Aayog, Hnahthial district in Mizoram secured the first rank in the Northeastern Region.

• Hnahthial achieved a top score of 75.39 out of 100, indicating significant progress across various socio-economic and environmental parameters.

• The index was developed by NITI Aayog in collaboration with the Ministry of Development of North Eastern Region (MDoNER) and with technical support from the United Nations Development Programme (UNDP).

• Following Hnahthial, the district of Aizawl in Mizoram stood second with a score of 75.24, while Siaha (also in Mizoram) and East Sikkim (Sikkim) followed closely in the rankings.

• The 2023–24 edition of the index evaluated the performance of 103 districts across the eight states of Northeast India using a framework of 84 indicators spanning 15 Sustainable Development Goals (SDGs).

• Hence, the correct answer is Hnahthial (Mizoram).

Additional Information

• Sustainable Development Goals (SDGs):

• The SDGs are a collection of 17 global goals set by the United Nations in 2015 to be achieved by the year 2030. They cover issues like poverty, hunger, health, education, climate change, and social justice.

• In India, NITI Aayog is the nodal agency responsible for monitoring the progress of these goals at the national and sub-national levels.

• NER District SDG Index:

• This regional index is specifically designed to address the unique challenges and geographical diversity of the North Eastern Region, ensuring that development is tailored to local needs.

• The eight states covered are Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, and Tripura.

• Performance Categorization:

• Districts are categorized based on their SDG scores: Aspirant (0–49), Performer (50–64), Front Runner (65–99), and Achiever (100).

• In the latest report, all 103 districts in the NER fell into either the Front Runner or Performer categories, showing a general upward trend in development.

Important Points

• NITI Aayog (National Institution for Transforming India):

• It was established on 1 January 2015, replacing the Planning Commission. It functions as the premier policy think tank of the Government of India.

• The Prime Minister serves as the Ex-officio Chairperson, while the Vice-Chairperson and CEO lead the administrative functions.

• SDG India Index 2023–24 (National Level):

• At the national level, the SDG India Index 2023–24 showed that Uttarakhand and Kerala were the top-performing states, while Bihar was ranked at the bottom.

• The national composite score for India improved from 66 in 2020-21 to 71 in 2023-24, reflecting significant advancements in Goal 1 (No Poverty) and Goal 13 (Climate Action).

• Goal-Specific Performance in NER:

• Mizoram and Sikkim have consistently performed well in Goal 3 (Good Health and Well-being) and Goal 4 (Quality Education), contributing to the high ranking of their districts like Hnahthial and Aizawl.

Q83. Answer: (c) Tennis

The correct answer is Tennis.

Key Points

• Rafael Nadal is a world-renowned professional athlete from Spain who has dominated the sport of Tennis for over two decades.

• He is the recipient of the 2025 Sporting Icon Award, a prestigious honor bestowed upon him in recognition of his unparalleled contribution to the sport, his resilient spirit, and his role as a global ambassador for athletic excellence.

• Known affectionately as the "King of Clay," Nadal is most famous for his record-breaking performance at Roland Garros (The French Open), where he has won a staggering 14 titles, a feat unmatched by any other player in the history of the game.

• Throughout his illustrious career, he has captured a total of 22 Grand Slam men's singles titles, placing him among the top three most successful male players of all time alongside Novak Djokovic and Roger Federer.

• His style of play is characterized by extreme topspin, incredible physical endurance, and a relentless competitive drive, making him one of the most formidable opponents on all court surfaces, including grass and hard courts.

Additional Information

• Career Achievements and Grand Slams:

• In addition to his 14 French Open titles, Nadal has won the US Open 4 times, the Australian Open 2 times, and Wimbledon 2 times.

• He completed the Career Grand Slam (winning all four major tournaments) at the age of 24, becoming the youngest man in the Open Era to achieve this milestone.

• Olympic Success:

• Rafael Nadal is a two-time Olympic Gold Medalist. He won the singles gold at the 2008 Beijing Olympics and the doubles gold at the 2016 Rio Olympics alongside Marc Lopez.

• By winning all four Grand Slams and an Olympic gold in singles, he achieved the rare Career Golden Slam.

• Retirement and Legacy:

• Nadal officially announced his retirement from professional tennis in late 2024, with his final competitive appearance taking place during the Davis Cup Finals.

• He spent a total of 209 weeks as the World No. 1 in the ATP Rankings and finished as the year-end No. 1 five times (2008, 2010, 2013, 2017, and 2019).

• Off-Court Contributions:

• He established the Rafa Nadal Academy in his hometown of Manacor, Mallorca, to train the next generation of tennis players using his unique methodology.

• He is also heavily involved in philanthropy through the Rafa Nadal Foundation, which focuses on social integration and education for vulnerable children and youth.

Important Points

• Rivalries: Nadal was part of the legendary "Big Three" era, which elevated the popularity of tennis worldwide through intense rivalries with Roger Federer (the "Fedal" rivalry) and Novak Djokovic.

• Awards: Beyond the 2025 Sporting Icon Award, he has received the Laureus World Sportsman of the Year award multiple times (2011 and 2021) and the Prince of Asturias Award in 2008.

• Davis Cup: He has been a pivotal member of the Spanish Davis Cup team, helping his country win the title on five occasions (2004, 2008, 2009, 2011, and 2019).

Q84. Answer: (d) fell to Rs. 88.33 per USD

The correct answer is fell to Rs. 88.33 per USD.

Key Points

• On 1 September 2025, the Indian Rupee experienced significant selling pressure, causing it to breach a new historic low of Rs. 88.33 against the US Dollar.

• The primary drivers for this depreciation included a strengthening US Dollar Index (DXY) and consistent Foreign Institutional Investor (FII) outflows from the Indian capital markets. Hence, the statement regarding the fall to 88.33 is correct.

• The Reserve Bank of India (RBI) reportedly intervened in the Non-Deliverable Forward (NDF) and spot markets by selling US Dollars through public sector banks to provide support to the local currency.

• Global economic factors, such as high crude oil prices and rising US Treasury yields, contributed to the rupee's vulnerability, as India is a major importer of energy.

• The intervention by the central bank was aimed at curbing excessive volatility rather than targeting a specific exchange rate level, allowing the rupee to recover slightly after hitting the record low.

Additional Information

• Currency Depreciation:

• This is the fall in the value of a currency in a floating exchange rate system due to market forces like demand and supply.

• A weaker rupee makes exports more competitive but increases the cost of imports, leading to imported inflation in the domestic economy.

• Role of the Reserve Bank of India (RBI):

• The RBI manages the exchange rate through its Foreign Exchange Reserves, which include Foreign Currency Assets (FCA), Gold, Special Drawing Rights (SDRs), and the Reserve Position in the IMF.

• In 2024-2025, India’s Forex Reserves have been maintained at high levels to shield the economy from external shocks and speculative attacks on the currency.

• External Factors:

• The monetary policy of the US Federal Reserve plays a crucial role; when the Fed raises interest rates, capital often flows back to the United States, weakening currencies in Emerging Markets like India.

• The Current Account Deficit (CAD) is also a vital indicator; a widening deficit puts structural pressure on the rupee's value over the long term.

Important Points

• Exchange Rate Management: Unlike a fixed regime, India follows a managed float system where the market determines the rate, but the RBI steps in to prevent wild fluctuations.

• Impact on Sectors:

• Beneficiaries: IT services, textiles, and pharmaceuticals often benefit from a weaker rupee as their dollar-denominated earnings translate into more rupees.

• Losers: Oil marketing companies, importers of electronics, and students studying abroad face higher costs when the rupee falls to record lows like 88.33.

• Historical Context: The rupee has seen a gradual depreciation over the decades, moving from around Rs. 4.76 in 1947 to over Rs. 80 in 2022, and reaching the Rs. 88 mark in late 2025.

Q85. Answer: (b) Nagpur

The correct answer is Nagpur.

Key Points

• On October 5, 2024, Prime Minister Narendra Modi inaugurated Asia's longest double-decker flyover in Nagpur, Maharashtra.

• The flyover, known as the Pardi Flyover, spans a length of approximately 5.3 kilometers, setting a new benchmark for urban infrastructure in India and across the continent.

• This massive project was developed as a joint venture between the National Highways Authority of India (NHAI) and the Maharashtra Metro Rail Corporation (Maha Metro).

• The structure is located on National Highway 53 (NH-53) and is designed to decongest the heavily crowded Pardi, Kapsi, and HB Town areas of Nagpur.

• The project features a unique multi-layer transport system where the Nagpur Metro runs on the uppermost level, a multi-lane flyover for vehicular traffic exists in the middle, and the existing ground-level road serves local traffic, all supported by a single pier

(pillar) system.

Additional Information

• Engineering Marvel: The flyover is considered a masterpiece of modern engineering because it utilizes a single-column pier to support both the highway flyover and the Metro rail tracks, significantly saving space in dense urban environments.

• Connectivity: The flyover provides seamless connectivity for commuters traveling towards Bhandara, Raipur, and Kolkata, effectively bypassing the chaotic traffic of East Nagpur.

• Nagpur's Infrastructure Record: This is not the first record for the city; Nagpur previously held the Guinness World Record for the longest double-decker viaduct (3.14 km) on Wardha Road, which was also built by Maha Metro and NHAI.

• Cost and Scope: The Pardi project is part of a larger infrastructure push in Maharashtra, involving an investment of several hundred crores to modernize the National Highway network passing through the "Orange City."

• Environmental Impact: By reducing idling time at traffic signals and providing a dedicated corridor for heavy vehicles, the project aims to lower carbon emissions and fuel consumption in the region.

Important Points

• National Highway 53: This is a major East-West corridor connecting Gujarat and Odisha; the inauguration of the Nagpur section is vital for inter-state trade and logistics.

• PM-GatiShakti: The integration of Metro and Road infrastructure in this project aligns with the PM-GatiShakti National Master Plan, which emphasizes multimodal connectivity and integrated infrastructure planning.

• Safety Features: The flyover is equipped with advanced lighting systems, drainage facilities, and sound barriers to ensure safety and comfort for both motorists and residents in nearby localities.

• Year of Achievement: The completion and inauguration in 2024 mark a significant milestone in India's goal to build world-class highways and urban transit systems simultaneously.

Q86. Answer: (c) NITI Aayog

The correct answer is NITI Aayog.

Key Points

• On 26 May 2025, the NITI Aayog released a landmark report titled 'Designing a Policy for Medium Enterprises', which outlines a strategic framework to bolster the growth of the MSME sector. Hence, the correct answer is NITI Aayog.

• The report identifies Medium Enterprises as the "missing middle" in India's industrial landscape and proposes a dedicated roadmap to transform them into globally competitive growth engines.

• Key recommendations in the report focus on Ease of Doing Business (EoDB), providing better access to credit, and facilitating technological upgrades for firms that have graduated from being small-scale units.

• The document emphasizes the need for structural reforms to help these enterprises integrate into Global Value Chains (GVCs), thereby contributing significantly to India's goal of becoming a USD 5 trillion economy.

• It suggests the creation of sector-specific clusters and specialized Export Promotion Cells to assist Medium Enterprises in expanding their footprint in international markets.

Additional Information

• Definition of Medium Enterprises:

• According to the revised MSME classification effective from 1 July 2020, an enterprise is categorized as Medium if its investment in plant and machinery or equipment does not exceed Rs. 50 crore and its annual turnover does not exceed Rs. 250 crore.

• This composite criteria of investment and turnover was introduced to encourage firms to scale up without fear of losing government benefits.

• About NITI Aayog:

• The National Institution for Transforming India (NITI Aayog) was established on 1 January 2015, replacing the erstwhile Planning Commission.

• It serves as the apex public policy think tank of the Government of India, providing both directional and policy inputs while fostering Cooperative Federalism.

• The Prime Minister of India acts as the ex-officio Chairperson of the Aayog.

• Importance of the MSME Sector:

• The Micro, Small, and Medium Enterprises (MSME) sector is often called the backbone of the Indian economy, contributing nearly 30% to the GDP and approximately 45% to total exports.

• It provides employment to over 11 crore people across the country, making it the second-largest employer after agriculture.

• Schemes like Udyam Registration, the RAMP (Raising and Accelerating MSME Performance) program, and the Emergency Credit Line Guarantee Scheme (ECLGS) are designed to support this vital sector.

• Role of Other Agencies:

• The Reserve Bank of India (RBI) regulates the flow of Priority Sector Lending (PSL) to MSMEs.

• The Securities and Exchange Board of India (SEBI) facilitates capital raising for smaller firms through SME Exchanges like NSE Emerge and BSE SME.

Q87. Answer: (a) Tamil Nadu

The correct answer is Tamil Nadu.

Key Points

• The Government of India has established two Defence Industrial Corridors (DICs) in the country, one in Uttar Pradesh and the other in Tamil Nadu, to promote self-reliance in defence manufacturing.

• As of the recent updates leading into 2024-2025, these two corridors have successfully attracted cumulative investments worth over Rs. 8,658 crore, demonstrating a significant push toward indigenous production.

• The Tamil Nadu Defence Industrial Corridor (TNDIC) consists of five strategic nodes: Chennai, Hosur, Salem, Coimbatore, and Tiruchirappalli. Hence, the statement regarding the second state is correct.

• The Uttar Pradesh Defence Industrial Corridor (UPDIC) is spread across six nodes: Agra, Aligarh, Chitrakoot, Jhansi, Kanpur, and Lucknow.

• The primary objective of these corridors is to create a robust ecosystem for defence production, involving both Public Sector Undertakings (DPSUs) and private sector players, including MSMEs and Startups.

• These corridors were announced in the Union Budget 2018-19 to reduce the import dependency of the Indian Armed Forces and bolster the Aatmanirbhar Bharat initiative.

Additional Information

• Tamil Nadu Defence Industrial Corridor (TNDIC):

• The state of Tamil Nadu was selected due to its existing strong manufacturing base and high rank in the Export Preparedness Index.

• The Tiruchirappalli node focuses heavily on ordnance factories, while Chennai leverages its port accessibility for global supply chains.

• Major companies like Tata Group, L&T, and TVS have expressed significant investment interests in this corridor.

• Uttar Pradesh Defence Industrial Corridor (UPDIC):

• The Lucknow node is being developed as a hub for aerospace and missile technology, including projects like the BrahMos missile unit.

• The Aligarh node has seen rapid development with several small-scale industries setting up units for components and hardware.

• Ministry of Defence Initiatives:

• The Department of Defence Production facilitates these corridors by providing infrastructure support and testing facilities.

• The Innovations for Defence Excellence (iDEX) scheme is integrated with these corridors to foster innovation and technology development by Startups.

• The government has implemented the Defence Acquisition Procedure (DAP) 2020, which prioritizes Buy (Indian-IDDM) categories to support local industries.

• Economic Impact:

• The corridors are expected to generate massive employment opportunities (direct and indirect) for skilled youth in North and South India.

• By the year 2025, the government aims to achieve a turnover of Rs. 1,75,000 crore (US$ 25 billion) in defence manufacturing, including exports of Rs. 35,000 crore.

Important Points

• The investment of Rs. 8,658 crore is a combined figure reflecting the progress made in both states since the inception of the project.

• The Defence Investor Cell has been created within the Ministry of Defence to provide single-window clearance and assistance to potential investors in these corridors.

• A total of 108 Positive Indigenisation Lists have been notified by the government, ensuring that the items listed are sourced only from domestic manufacturers located within such industrial hubs.

Q88. Answer: (c) Bharat Heavy Electricals Limited (BHEL)

The correct answer is Bharat Heavy Electricals Limited (BHEL).

Key Points

• In August 2025, the Defence Metallurgical Research Laboratory (DMRL), a premier laboratory of the Defence Research and Development Organisation (DRDO), transferred the manufacturing technology for high-strength radomes to Bharat Heavy Electricals Limited (BHEL).

• This Technology Transfer (ToT) is aimed at indigenizing the production of critical components used in aerospace and defense applications. Hence, the correct answer is Bharat Heavy Electricals Limited (BHEL).

YourMockTest.com — Free Study Material

• The technology involves the fabrication of advanced ceramic-based radomes that can withstand extreme aerodynamic heating and mechanical stresses encountered during high-speed flights of missiles and aircraft.

• DMRL, located in Hyderabad, specializes in the development of advanced metallurgical materials, and this collaboration with BHEL marks a significant milestone under the Atmanirbhar Bharat initiative.

• BHEL will now be responsible for the mass production of these radomes, ensuring a steady supply for the Indian Armed Forces and reducing dependency on foreign imports.

Additional Information

• Bharat Heavy Electricals Limited (BHEL):

• Established in 1964, BHEL is one of India's largest engineering and manufacturing enterprises and holds the prestigious Maharatna status.

• It is headquartered in New Delhi and operates under the Ministry of Heavy Industries.

• While traditionally known for power equipment, BHEL has significantly expanded into the Defense and Aerospace sector, producing Super Rapid Gun Mounts (SRGM), simulators, and space-grade solar cells.

• Defence Metallurgical Research Laboratory (DMRL):

• DMRL is a constituent laboratory of DRDO, primarily focused on research and development of advanced materials, alloys, and processing technologies.

• It has played a pivotal role in developing Abhay (heavy alloy) and Bio-Medical implants, apart from critical defense materials.

• Radomes:

• A radome is a structural, weatherproof enclosure that protects a radar antenna.

• It is constructed from materials that minimally attenuate the electromagnetic signals transmitted or received by the antenna.

• For high-speed missiles, radomes must be made of high-strength ceramic materials to resist temperatures exceeding 1000 degrees Celsius.

Important Points

• Significance of the ToT: The transfer of technology ensures that the IP (Intellectual Property) remains within the country, fostering a Defense Industrial Ecosystem.

• Collaborative Research: This specific technology was developed over several years of research at DMRL, specifically for supersonic and hypersonic flight profiles.

• Self-Reliance: By enabling a Public Sector Undertaking (PSU) like BHEL to manufacture these components, India moves closer to achieving 100% indigenization in missile sub-systems.

Q89. Answer: (b) Rohtak

The correct answer is Rohtak.

Key Points

• The 6th edition of the UMAI National Muaythai Championship was successfully organized in the city of Rohtak, located in the state of Haryana.

• Scheduled and held in June 2025, the championship saw participation from hundreds of athletes representing various states and Union Territories across India.

• The event was conducted under the aegis of the United Muaythai Association - India (UMAI), which is the national governing body for the sport, affiliated with the International Federation of Muaythai Associations (IFMA).

• The primary objective of holding the championship in Rohtak was to provide a professional platform for Muaythai practitioners to showcase their skills and to select the national team for upcoming international tournaments.

• The city of Rohtak was chosen due to its robust sports infrastructure and its reputation as a hub for combat sports in North India.

Additional Information

• Understanding Muaythai:

• Known as the "Art of Eight Limbs," Muaythai is a traditional martial art from Thailand that utilizes fists, elbows, knees, and shins for striking.

• It was officially recognized by the International Olympic Committee (IOC) during the 138th IOC Session held in Tokyo in July 2021, making it eligible for future Olympic Games.

• United Muaythai Association - India (UMAI):

• UMAI is responsible for the development, regulation, and promotion of Muaythai throughout the Republic of India.

• It ensures that Indian athletes adhere to the anti-doping regulations set by the World Anti-Doping Agency (WADA) and the National Anti-Doping Agency (NADA).

• Rohtak as a Sports Destination:

• Rohtak is home to the Rajiv Gandhi Sports Complex, which features world-class facilities for various indoor and outdoor sports.

• The state of Haryana has a long-standing history of producing medal-winning athletes in wrestling, boxing, and now Muaythai,

contributing significantly to India's tally in the Asian Games and Commonwealth Games.

• Championship Categories:

• The National Muaythai Championship typically features weight categories ranging from 45 kg to over 91 kg for male and female participants.

• Divisions include Elite Senior, Under-23, and Youth categories (Junior and Sub-Junior), ensuring a pipeline of talent for the national squad.

Important Points

• The 2025 championship in Rohtak served as a crucial qualification event for the IFMA World Muaythai Championships.

• The event highlighted the growing popularity of martial arts in India, with an increasing number of female athletes participating in full-contact combat sports.

• State governments, particularly Haryana, have been incentivizing such national championships to promote sports tourism and youth engagement.

Q90. Answer: (c) Biometric Authentication System

The correct answer is Biometric Authentication System.

Key Points

• The Ministry of Women and Child Development (MWCD) announced the mandatory implementation of the Biometric Authentication System for beneficiary registration under Poshan 2.0, effective from 1st August 2025.

• This significant decision was communicated during the Zonal Meeting held at Kevadia, Gujarat (near the Statue of Unity), where representatives from various states and Union Territories gathered to review the progress of nutrition and women empowerment schemes.

• The introduction of biometric-based verification aims to enhance transparency and ensure that the benefits of Take Home Ration (THR) and Hot Cooked Meals (HCM) reach the intended genuine beneficiaries without leakages.

• The system will involve Aadhaar-based authentication or other biometric markers to verify the physical presence of children (0-6 years), pregnant women, and lactating mothers at Anganwadi Centres (AWCs).

• By transitioning to this technology-based method, the government intends to eliminate "ghost beneficiaries" and streamline the data recorded on the Poshan Tracker application. Hence, the correct answer is Biometric Authentication System.

Additional Information

• Mission Saksham Anganwadi and Poshan 2.0:

• Launched in 2021-22, it is an Integrated Nutrition Support Programme that seeks to address the challenges of malnutrition in children, adolescent girls, pregnant women, and lactating mothers.

• The mission focuses on three primary verticals: Nutrition Support for POSHAN, Early Childhood Care and Education (ECCE), and Anganwadi Infrastructure.

• It targets the reduction of Stunting, Under-nutrition, Anemia, and Low Birth Weight across the country.

• Poshan Tracker Application:

• It is a robust ICT-based platform launched by the Ministry of Women and Child Development for real-time monitoring of nutrition service delivery.

• The application enables Anganwadi Workers (AWWs) to enter data regarding growth monitoring, vaccination, and ration distribution.

• As of recent data, more than 10 crore beneficiaries are registered on the platform, and it tracks the Height and Weight of children monthly to identify Wasting and Stunting.

Important Points

• Administrative Strategy: The shift to Biometric Authentication is a part of the government's Digital India initiative to improve governance and accountability in social welfare programs.

• Geographic Focus: The choice of Kevadia, Gujarat for the Zonal Meeting highlights the focus on sharing best practices and regional cooperation among Western States and UTs.

• Infrastructure Upgrade: Under the Saksham Anganwadi component, over 2 lakh Anganwadis are being upgraded with better connectivity, clean water, and digital learning tools to support the new authentication protocols.

• Direct Benefit Transfer (DBT) Analogy: Similar to DBT in other sectors, this biometric integration ensures that the last-mile delivery of nutrition is accurately mapped to the individual's Aadhaar identity.

Q91. Answer: (a) Rs. 1 crore

The correct answer is Rs. 1 crore.

Key Points

• The Insurance Regulatory and Development Authority of India (IRDAI) imposed a monetary penalty of Rs. 1 crore on Acko General Insurance in May 2025.

• The penalty was directed towards the insurer for various regulatory violations, primarily concerning the outsourcing of activities and non-compliance with prescribed insurance business guidelines.

• The regulatory action followed an onsite inspection conducted by the authority, which highlighted deviations from the IRDAI (Protection of Policyholders' Interests) Regulations and the Insurance Act, 1938.

• The enforcement of this penalty underscores the regulator's commitment to ensuring market discipline and protecting the rights of individual policyholders within the Indian insurance sector.

• Acko General Insurance was instructed to remit the penalty amount of Rs. 1 crore to the Government of India and to take corrective measures to prevent future lapses in their operational framework.

Additional Information

• IRDAI (Insurance Regulatory and Development Authority of India):

• It is a statutory body formed under the IRDA Act, 1999, tasked with regulating and promoting the insurance and re-insurance industries in India.

• The authority is headquartered in Hyderabad, Telangana, having moved from New Delhi in 2001.

• The primary objective of IRDAI is to protect the interests of the policyholders, regulate the solvency margins of companies, and ensure the orderly growth of the insurance market.

• Acko General Insurance:

• Founded in 2016 by Varun Dua, it is a digital-first insurance company in India that provides specialized products like motor insurance, health insurance, and gadget protection.

• The company is known for its direct-to-consumer model, which leverages technology and data analytics to offer low-cost premiums and fast claim settlements.

• It has received significant backing from global investors and is part of the growing InsurTech ecosystem in the Asia-Pacific region.

• Regulatory Powers:

• Under Section 102 of the Insurance Act, 1938, IRDAI has the legal authority to impose penalties on insurance companies for failing to comply with directives or for violating legislative provisions.

• Inspections and audits are regularly conducted to ensure that insurers maintain sufficient capital adequacy and follow ethical underwriting practices.

Important Points

• In India, the insurance sector is governed by the Ministry of Finance and operates under the framework of the Insurance Act, 1938 and the IRDA Act, 1999.

• Penalties such as the Rs. 1 crore fine act as a deterrent against mis-selling and the unauthorized use of third-party service providers (outsourcing) that may compromise data security or service quality.

• Maintaining high standards of corporate governance is mandatory for all general insurance companies to sustain their license to operate granted by the regulator.

Q92. Answer: (a) Bharat Earth Movers Limited (BEML)

The correct answer is Bharat Earth Movers Limited (BEML).

Key Points

• In October 2024, BEML Limited (formerly Bharat Earth Movers Limited) secured a major contract from the Integral Coach Factory (ICF), Chennai, for the design, manufacturing, and commissioning of India's first indigenous high-speed trainsets.

• The contract is valued at approximately Rs. 866.87 crore and marks a significant step toward the Mumbai-Ahmedabad High-Speed Rail (MAHSR) project, often referred to as the Bullet Train project.

• Under this agreement, BEML will produce two high-speed trainsets, each consisting of 8 cars. These trains are designed to reach a test speed of 280 kmph and an operational speed of 250 kmph.

• The manufacturing of these trainsets will take place at BEML's Bangalore complex, with the delivery of the first set expected by late 2026.

• This initiative is a critical component of the 'Make in India' campaign, aimed at reducing dependence on foreign technology for high-speed rail operations.

Additional Information

• BEML Limited:

• It is a Schedule 'A' Central Public Sector Enterprise (CPSE) under the Ministry of Defence, Government of India.

• Headquartered in Bengaluru, it operates in three major business verticals: Defence & Aerospace, Mining & Construction, and Rail & Metro.

• The company has historically been a pioneer in manufacturing Metro coaches and EMU (Electric Multiple Unit) trainsets for Indian Railways.

• Mumbai-Ahmedabad High-Speed Rail (MAHSR):

• The project covers a total length of 508 kilometers, connecting the financial hub of Mumbai with the industrial city of Ahmedabad.

• It is being implemented by the National High-Speed Rail Corporation Limited (NHSRCL).

• The project utilizes Japanese Shinkansen technology and is largely funded by the Japan International Cooperation Agency (JICA) through a soft loan.

• Integral Coach Factory (ICF):

• Located in Perambur, Chennai, it is a premier production unit of Indian Railways.

• ICF is the developer of the Vande Bharat Express (Train 18) and is now leading the indigenous development of higher-speed rolling stock.

Important Points

• Technical Specifications: The new trainsets will feature fully air-conditioned cabins, revolving chairs, and advanced safety systems such as KAVACH (though adapted for high speeds) and Level-2 automation.

• Timeline: The Surat-Bilimora section (50 km) of the bullet train corridor is expected to be the first to open, with trials potentially starting by 2026.

• Economic Impact: The local manufacturing contract awarded to BEML is expected to boost local ancillary industries and create specialized engineering jobs in the aerospace and rail sectors.

• Comparison: While Japan will provide the E5 series Shinkansen trains for the bulk of the MAHSR operations, the BEML-ICF project serves as a pilot for developing domestic high-speed rail technology for future corridors across India.

Q93. Answer: (d) Bengaluru

The correct answer is Bengaluru.

Key Points

• The city of Bengaluru was chosen to host the first Indian Grand Prix (IGP) athletics meet of the 2025 season, scheduled to take place in March 2025.

• The event is organized under the aegis of the Athletics Federation of India (AFI), which is the apex body for managing athletics in the country.

• The Sree Kanteerava Stadium in Bengaluru serves as the primary venue for this high-profile competition, featuring top Indian athletes across various track and field disciplines.

• The Indian Grand Prix series is a crucial part of the domestic calendar, providing athletes with the opportunity to achieve qualification standards for major international events such as the World Athletics Championships and other continental meets.

• The first leg of the 2025 series in Bengaluru focuses on identifying early-season form and allowing athletes to test their training progress after the winter off-season.

Additional Information

• Athletics Federation of India (AFI):

• The AFI was formed in 1946 and is responsible for the development and promotion of athletics in India.

• It is affiliated with World Athletics, the Asian Athletics Association (AAA), and the Indian Olympic Association.

• The headquarters of the AFI is located in New Delhi.

• Structure of the Indian Grand Prix:

• The IGP is typically conducted in multiple legs (e.g., IGP 1, IGP 2, IGP 3, and IGP 4) across different cities to ensure wide geographical participation.

• Cities like Thiruvananthapuram, Patiala, and Bhubaneswar are other prominent hosts for subsequent legs of the series.

• The competition includes events such as 100m, 200m, 400m, 800m, Long Jump, Shot Put, and Javelin Throw.

• Bengaluru as a Sports Hub:

• Bengaluru is home to the Sports Authority of India (SAI) Netaji Subhas Southern Centre, which is a premier training base for Indian track and field athletes.

• The city's moderate climate and elevation make it an ideal location for middle and long-distance runners to train and compete.

Important Points

• Role of the Meet: The March 2025 meet acts as a season opener, allowing the National Selection Committee to monitor the performance of athletes under the National Coaching Camps.

• Anti-Doping Measures: During the Indian Grand Prix, the National Anti-Doping Agency (NADA) actively conducts testing to ensure a clean sporting environment and adherence to WADA guidelines.

• Technological Integration: Modern meets in India now utilize advanced electronic timing systems and photo-finish technology to ensure accuracy in record-keeping for national records.

• Key Participants: Expected participants in such meets often include high-profile names in Indian athletics, including those who have represented India in the Olympics and Asian Games.

Q94. Answer: (a) Commercial trucks

The correct answer is Commercial trucks.

Key Points

• The FASTag Annual Plan or Monthly Pass system is a specialized subscription model designed primarily for private vehicle owners who reside within a specific proximity of a toll plaza.

• Commercial trucks are classified as Heavy Goods Vehicles (HGV) or Multi-Axle Vehicles (MAV) and are typically excluded from these specific personal annual plans, as they are governed by commercial tolling rates based on load and distance. Hence, option 1 is the correct answer.

• Vehicles like Private cars, Jeeps, and Vans are categorized under Class 4 (Light Motor Vehicles) and are the primary beneficiaries of discounted passes if they are used for non-commercial purposes. Hence, options 2, 3, and 4 are incorrect as they are included in such plans.

• The National Highways Authority of India (NHAI) implemented these plans to provide relief to local residents, allowing for unlimited trips within a calendar month or year for a fixed nominal fee, provided the vehicle is registered for personal use.

• The eligibility for these annual or monthly plans often requires the vehicle owner to provide proof of residence within a 20-kilometer radius of the specific toll plaza where the plan is to be applied.

Additional Information

• FASTag Technology:

• It utilizes Radio Frequency Identification (RFID) technology for making toll payments directly from the linked prepaid or savings account.

• The FASTag is affixed on the windscreen of the vehicle and enables a person to drive through toll plazas without stopping for cash transactions.

• As of February 15, 2021, the Ministry of Road Transport and Highways made FASTag mandatory for all vehicles in India to ensure seamless traffic flow and reduce fuel consumption.

• Vehicle Classification and Toll Fees:

• Vehicles are divided into classes such as Class 4 (Cars/Jeeps/Vans), Class 5 (Light Commercial Vehicles), Class 6 (Bus/Truck), and Class 7 (MAV).

• Commercial trucks often pay significantly higher toll rates than private vehicles because of the higher wear and tear they cause to the highway infrastructure.

• The National Highways Fee (Determination of Rates and Collection) Rules, 2008, govern the structure of these fees and the provision of monthly passes for local traffic.

• One Vehicle, One FASTag Initiative:

• Launched by NHAI in 2024, this initiative aims to discourage the use of a single FASTag for multiple vehicles or linking multiple FASTags to a single vehicle.

• It enhances the efficiency of Electronic Toll Collection (ETC) and ensures that the vehicle class registered matches the physical vehicle passing through the toll lane.

Important Points

• IHMCL (Indian Highway Management Company Limited): This organization, incorporated by NHAI, carries out Electronic Tolling and other ancillary projects of National Highways.

• Issuing Entities: FASTags are issued by over 30 certified banks and various Point of Sale (POS) locations across the country, including petrol pumps and Common Service Centres (CSC).

• Validity: A FASTag typically has a validity of 5 years, but the linked annual plans or monthly passes must be renewed periodically as per the NHAI guidelines.

• Blacklisting: If the FASTag account has insufficient balance, the tag is blacklisted, and the vehicle owner may be required to pay double the toll amount in cash or via electronic modes at the plaza.

Q95. Answer: (a) Percival Everett

p>The correct answer is Percival Everett.

Key Points

• Percival Everett is the recipient of the 2025 Pulitzer Prize for Fiction for his acclaimed novel 'James'.

• The novel 'James' serves as a creative and powerful reimagining of Mark Twain’s 1884 masterpiece, 'Adventures of Huckleberry Finn'. Hence, the statement regarding the novel's origin is correct.

• The narrative is told entirely from the perspective of Jim, the enslaved man who flees with Huck Finn. This shift in viewpoint provides Jim with a complex internal life, intellectual depth, and a distinct voice that was largely absent in the original text. Hence, the statement regarding the perspective of the novel is correct.

• The book explores heavy themes such as racial identity, the hypocrisy of slavery, and the subversive power of language and literacy in 19th-century America.

• 'James' was widely praised by critics for its satirical edge and its ability to deconstruct a classic of the American literary canon while standing as a significant work of art on its own.

Additional Information

• Percival Everett:

• He is a highly prolific American novelist and a Distinguished Professor of English at the University of Southern California.

• Born in 1956 in Georgia, his work often utilizes metafiction and satire to critique contemporary American culture and racial politics.

• He is also well-known for his 2001 novel 'Erasure', which was later adapted into the Academy Award-winning film 'American Fiction' in 2023.

• The Pulitzer Prize for Fiction:

• This is one of the seven Pulitzer Prizes annually awarded for Letters, Drama, and Music.

• The award was established in 1917 through the will of Joseph Pulitzer, a prominent newspaper publisher.

• It is administered by Columbia University in New York City and honors distinguished fiction by an American author, preferably dealing with American life.

• The Narrative of 'James':

• In Everett's retelling, Jim is revealed to be highly literate and articulate, choosing to speak in a "slave dialect" only as a survival mechanism around white characters.

• This linguistic subversion is a central feature of the novel, highlighting the agency and intelligence of those oppressed by systemic racism.

Important Points

• Literary Impact: Reimagining classics has become a significant trend in contemporary literature, allowing modern authors to fill historical silences and provide voices to marginalized characters from canonical texts.

• Context of the 2025 Award: The recognition of 'James' by the Pulitzer Board underscores the ongoing relevance of American history and the Antebellum South in understanding current societal structures.

• Critical Recognition: Before winning the Pulitzer Prize, 'James' was also a finalist for other major awards like the National Book Award, cementing its status as one of the most important books of the mid-2020s.

Q96. Answer: (b) Rishabh Pant

The correct answer is Rishabh Pant.

Key Points

• Virat Kohli, though a legendary figure in Indian cricket and a prolific run-scorer, did not achieve the milestone of scoring centuries in both innings of the Headingley Test in 2025. Hence, statement 1 is incorrect.

• Rishabh Pant etched his name in the history books by scoring centuries in both the first and second innings of the 1st Test against England at Headingley in 2025. Hence, statement 2 is correct.

• KL Rahul was a key part of the top order during the 2025 series, but he did not record twin centuries in this specific match at Leeds. Hence, statement 3 is incorrect.

• Jasprit Bumrah, the premier fast bowler and a vital leader in the Indian attack, focused on his bowling performance and did not score centuries in both innings. Hence, statement 4 is incorrect.

• The feat made Rishabh Pant the first Indian wicket-keeper to score twin centuries in a Test match played in England, significantly boosting India's position in the ICC World Test Championship.

• Hence, the correct answer is Rishabh Pant.

Additional Information

• Headingley Cricket Ground:

• Located in Leeds, West Yorkshire, this historic ground was established in 1890 and has been a primary venue for Test cricket in England since 1899.

• The ground is famous for some of the most dramatic matches in cricket history, including the 1981 Ashes Test and the 2019 heroics by Ben Stokes.

• Twin Centuries in Test Cricket:

• Scoring a century (100 runs or more) in both innings of a single Test match is a rare achievement that requires immense concentration and physical stamina.

• Other Indian legends who have achieved this include Vijay Hazare, Sunil Gavaskar (who did it three times), Rahul Dravid, Virat Kohli, Ajinkya Rahane, and Rohit Sharma.

• Rishabh Pant's Profile:

• Born on October 4, 1997, in Roorkee, Uttarakhand, Pant is a left-handed wicket-keeper-batsman known for his aggressive and fearless approach.

• He made his Test debut in 2018 and has since become a match-winner for India in overseas conditions, including memorable knocks in Australia (Gabba, 2021) and England (Edgbaston, 2022).

Important Points

• Match Conditions: The 1st Test at Headingley in 2025 was played in typical English conditions during June, where the Duke ball offered significant swing and seam movement, making Pant's achievement even more remarkable.

• ICC World Test Championship (WTC): This match was part of the WTC 2025-2027 cycle. India's victory, fueled by Pant's twin tons, secured 12 points for the team in their quest to reach the WTC Final at Lord's.

• Statistical Milestone: By scoring twin centuries, Pant joined an elite global group of wicket-keepers like Adam Gilchrist and Kumar Sangakkara who have dominated games with the bat while maintaining their keeping duties.

Q97. Answer: (b) SUNRISE – Solar Upcycling Network for Recycling, Innovation & Stakeholder Engagement

The correct answer is SUNRISE – Solar Upcycling Network for Recycling, Innovation & Stakeholder Engagement.

Key Points

• The SUNRISE initiative, which stands for Solar Upcycling Network for Recycling, Innovation & Stakeholder Engagement, was officially launched during the Eighth Session of the International Solar Alliance (ISA) Assembly.

• The assembly was held at the prestigious Bharat Mandapam in New Delhi during October 2025, bringing together global leaders to discuss the future of solar energy.

• The primary objective of the SUNRISE programme is to address the burgeoning challenge of solar photovoltaic (PV) waste and to establish a robust framework for circularity within the solar industry.

• It focuses on the upcycling of end-of-life solar modules, ensuring that valuable materials such as silver, silicon, and glass are recovered and reintroduced into the production cycle.

• The initiative seeks to foster innovation in recycling technologies and facilitate stakeholder engagement between governments, private manufacturers, and environmental agencies to create a sustainable ecosystem. Hence, the correct answer is SUNRISE – Solar Upcycling Network for Recycling, Innovation & Stakeholder Engagement.

Additional Information

• International Solar Alliance (ISA):

• The ISA is a collaborative platform launched in 2015 by India and France on the sidelines of the COP21 in Paris.

• Headquartered in Gurugram, India, it aims to mobilize more than USD 1000 billion of investment in solar energy solutions by 2030.

• The Assembly is the apex decision-making body of the ISA, in which each member country is represented and decisions regarding the implementation of the ISA Framework Agreement are made.

• Solar Waste Management:

• As global solar capacity increases, the volume of PV waste is projected to reach several million tonnes by the year 2050.

• Proper recycling is essential to prevent heavy metals like lead and cadmium from leaching into the soil, posing significant environmental risks.

• The circular economy model promoted by SUNRISE helps reduce the dependency on virgin raw materials, thereby lowering the overall carbon footprint of solar energy production.

• Bharat Mandapam:

• Located at Pragati Maidan, New Delhi, it is India’s largest International Exhibition-cum-Convention Centre (IECC).

• It has become a focal point for high-level international summits, including the G20 Summit in 2023 and subsequent ISA Assemblies.

Important Points

• Global Impact: The launch of SUNRISE aligns with the Sustainable Development Goals (SDGs), specifically Goal 7 (Affordable and Clean Energy) and Goal 12 (Responsible Consumption and Production).

• Technological Innovation: The programme encourages the development of automated disassembly and chemical leaching processes to maximize the purity of recovered materials from old panels.

• Regulatory Frameworks: A key part of the Stakeholder Engagement involves assisting member nations in drafting Extended Producer Responsibility (EPR) guidelines for solar manufacturers.

Q98. Answer: (c) Ministry of AYUSH

The correct answer is Ministry of AYUSH.

Key Points

• The National Dhanwantari Ayurveda Awards are conferred annually by the Ministry of AYUSH, Government of India, to recognize eminent practitioners and institutions for their outstanding contributions to Ayurveda.

• In 2025, these awards continued to highlight the government's commitment to promoting traditional Indian medicine on both national and global platforms.

• The award ceremony is typically held on Ayurveda Day, which is celebrated every year on the occasion of Dhanwantari Jayanti (Dhanteras).

• The award includes a citation, a trophy, and a cash prize of Rs. 5 lakh, making it one of the most prestigious honors in the field of traditional medicine. Hence, the correct answer is the Ministry of AYUSH.

• The primary objective of these awards is to encourage research, clinical excellence, and the propagation of Ayurvedic principles to improve public health.

Additional Information

• Ministry of AYUSH:

• The ministry was formed on 9th November 2014 to ensure the optimal development and propagation of AYUSH systems of healthcare.

• It covers Ayurveda, Yoga and Naturopathy, Unani, Siddha, and Homoeopathy.

• The ministry plays a vital role in the National AYUSH Mission (NAM), which aims to provide cost-effective AYUSH services through upgraded AYUSH hospitals and dispensaries.

• Ayurveda Day:

• The first Ayurveda Day was celebrated in 2016.

• It is observed to create awareness about the health benefits of Ayurveda and to reduce the burden of disease and related morbidity.

• The date of celebration varies each year as it follows the Hindu lunar calendar, falling on Dhanteras.

• Global Significance:

• India, through the Ministry of AYUSH, has collaborated with the World Health Organization (WHO) to establish the Global Centre for Traditional Medicine (GCTM) in Jamnagar, Gujarat.

• This initiative aims to harness the potential of traditional medicine from across the world through modern science and technology.

Important Points

• Lord Dhanwantari: In Hindu mythology, Lord Dhanwantari is worshipped as the God of Medicine and an avatar of Lord Vishnu, who emerged during the Samudra Manthan (churning of the ocean) with the nectar of immortality (Amrit).

• Ministry of Education: Primarily responsible for school education, literacy, and higher education in India. It does not handle traditional medicine awards.

• Ministry of Culture: Focuses on the preservation and promotion of art, culture, and heritage, including museums and monuments.

• Ministry of Tribal Affairs: Focuses on the socio-economic development of Scheduled Tribes (STs) through various schemes like the Eklavya Model Residential Schools.

• The National Dhanwantari Ayurveda Award is specifically tailored for those who have dedicated 20 years or more to the service of Ayurveda, ensuring only veteran experts receive this high distinction.

Q99. Answer: (c) Bamboo mask-making

p data-end="57" data-start="0">The correct answer is Bamboo mask-making.

Key Points

• Rebakanta Mahanta is a master craftsman from Assam who has dedicated over six decades to the preservation and promotion of Mukha Shilpa, the traditional art of bamboo mask-making.

• In January 2025, the Government of India announced the Padma Shri award for him in the field of Art, recognizing his exceptional contribution to the cultural heritage of Assam.

• He is based in Sivasagar district and is associated with the Khatpar Satra, where he has been instrumental in teaching this ancient art form to the younger generation to ensure its survival.

• His expertise lies in creating intricate masks used in Bhaona, a traditional form of Satriya mythological theatre. These masks are traditionally made from bamboo, clay, and cloth.

• Through his Samaguri-style influences and his own innovations, he has made the masks more flexible and lightweight, allowing performers to use them more effectively during Satriya dance and drama performances.

Additional Information

• The Art of Mukha Shilpa (Mask-making):

• Bamboo mask-making is a 500-year-old tradition in Assam, primarily centered around the river island of Majuli and various Satras (monasteries).

• The tradition was initiated by the 15th-16th century saint-reformer Srimanta Sankardeva. He used these masks as a visual aid to depict characters from the Ramayana, Mahabharata, and Puranas during Bhaona performances.

• The masks are categorized into three types: Mukh Mukha (covering only the face), Lotokoi Mukha (larger masks with moving parts), and Bor Mukha (giant masks covering the entire body).

• Geographical Indication (GI) Tag:

• In March 2024, the Majuli Mask Making craft was officially granted the Geographical Indication (GI) tag, which provides legal protection and recognizes its unique origin and traditional methods.

• This recognition has helped in global branding and preventing the imitation of this Assamese craft by commercial manufacturers.

• Materials and Techniques:

• The process begins with a framework made of split bamboo. This is covered with cotton cloth dipped in a paste of clay and cow dung to give it a skin-like texture.

• Once dry, the masks are painted using natural pigments like Hengul (vermilion) and Haital (yellow orpiment), ensuring that the craft remains eco-friendly and deeply rooted in tradition.

Important Points

• Bhaona and Satriya Culture:

• Bhaona is a traditional form of entertainment with religious messages, prevalent in Assam. It was created by Mahapurush Srimanta Sankardeva to propagate Neo-Vaishnavism.

• The masks play a crucial role in bringing characters like Ravana, Hanuman, Narasimha, and various demons to life on stage, making the spiritual teachings accessible to the common people.

• Other Options Context:

• Madhubani painting: A famous folk art from the Mithila region of Bihar, characterized by geometric patterns and vibrant natural dyes.

• Kathakali: A highly stylized classical dance-drama from Kerala, known for its heavy make-up and elaborate costumes, though it also uses facial paint that resembles masks.

• Pottery: While Assam has a rich tradition of Hira and Kumar pottery, Rebakanta Mahanta's specific 2025 Padma Shri recognition is explicitly for his mask-making mastery.

Q100. Answer: (a) Maria Corina Machado

The correct answer is Maria Corina Machado.

Key Points

• Maria Corina Machado is a prominent Venezuelan politician and the founder of the liberal political party Vente Venezuela. She has been a leading figure in the movement for democracy and human rights in South America.

• She was awarded the Nobel Peace Prize in 2025 (as per the provided data) for her unwavering commitment to peaceful transition and her leadership during the 2024 presidential elections in Venezuela.

• Despite being disqualified from holding public office by the National Electoral Council of the Maduro regime, she successfully mobilized millions of citizens to participate in democratic processes and civic resistance.

• Her efforts focused on transparency, electoral integrity, and the rule of law, making her a global symbol of courage against authoritarianism. Her work with the civil organization Súmate, founded in 2002, laid the groundwork for her long-term advocacy for fair elections.

• The award recognizes her role in maintaining a non-violent struggle despite facing intense political repression, arrests of her team members, and personal security threats.

Additional Information

• Malala Yousafzai:

• She is a Pakistani activist for female education who was shot by the Taliban in 2012.

• She became the youngest-ever Nobel Peace Prize laureate in 2014 at the age of 17.

• She co-founded the Malala Fund to advocate for 12 years of free, safe, and quality education for girls globally.

• Svetlana Tikhanovskaya:

• She is the leader of the Belarusian democratic movement who ran against Alexander Lukashenko in the 2020 election.

• Since the disputed results, she has led the United Transition Cabinet from exile in Lithuania, advocating for the release of political prisoners and new elections.

• She has received numerous international honors, including the Sakharov Prize from the European Parliament.

• Greta Thunberg:

• A Swedish environmental activist who gained international recognition in 2018 for her "School Strike for Climate".

• She addressed the United Nations Climate Action Summit in 2019 and was named Time Person of the Year at age 16.

• Her movement, Fridays for Future, has mobilized millions of youth across over 150 countries to demand climate justice.

Important Points

• The Nobel Peace Prize was established by the 1895 will of Alfred Nobel and was first awarded in 1901.

• Unlike the other five Nobel Prizes which are awarded in Stockholm, Sweden, the Peace Prize is awarded annually in Oslo, Norway.

- The Norwegian Nobel Committee, consisting of five members appointed by the Storting (the Norwegian Parliament), is responsible for selecting the laureates.
- The award ceremony traditionally takes place on December 10, the anniversary of Alfred Nobel's death. The prize includes a gold medal, a diploma, and a cash award of 11 million Swedish krona (as of 2024).

More previous year papers and mock tests: **www.yourmocktest.com/pyq**

YourMockTest.com — Free Study Material