RRB Group D Official Paper (Held On: 24 Dec, 2025 Shift 3) (Previous Year Paper)

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

Take this paper as a timed mock test

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

yourmocktest.com/pyq/rrb-group-d/rrb-group-d-official-paper-held-on-24-dec-2025-shift-3-previ…

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

GENERAL SCIENCE

Q1. Formula unit mass is defined as:

(a) the molecular mass of a compound
(b) the atomic mass of the lightest element
(c) the sum of atomic masses of all atoms in a formula unit of an ionic compound
(d) the mass of one molecule

Q2. Alloys, air, lemonade, and soda water are examples of which of the following categories of solutions?

(a) Heterogeneous mixture
(b) Colloids
(c) Homogeneous mixture
(d) Suspension

Q3. Which combination reaction also demonstrates the neutralisation of atmospheric pollution components?

(a) Fe + S → FeS
(b) CO + O2 → CO2
(c) CaO + CO2 → CaCO3
(d) SO2 + H2O → H2SO3

Q4. Which of the following statements correctly describes plastids in plant cells?

(a) They are present in both plant and animal cells in equal amount
(b) They are found in prokaryotic cells like bacteria for photosynthesis
(c) They are present only in plant cells and absent in animal cells
(d) They are present only in animal cells and absent in plant cells

Q5. Which device relies on the heating effect of current to protect circuits and appliances by intentionally melting to break the circuit when the current exceeds a specified limit?

(a) Rheostat
(b) Electric iron coil
(c) Electric fuse
(d) Electric bulb filament

Q6. What is the nature of the distance-time graph for an object in non-uniform motion?

(a) A vertical line
(b) A straight line
(c) A horizontal line
(d) A curved line

Q7. Which of the following statements about epithelial tissue is correct?

(a) Epithelial tissue forms a protective covering and regulates material exchange.
(b) Epithelial tissue cells have large intercellular spaces and form a loose sheet.
(c) Epithelial tissue does not play any role in material exchange in the body.
(d) Epithelial tissue mainly connects bones and muscles.

Q8. When an object is placed at infinity in front of a convex lens, the image formed is:

(a) Between F and 2F, real and inverted
(b) At 2F, real and of same size
(c) At the optical centre, virtual and enlarged
(d) At the focus (F), real and highly diminished

Q9. Which process must accompany DNA copying to ensure the formation of functional daughter cells?

(a) Chromosomal mutation
(b) RNA transcription only
(c) Protein synthesis only
(d) Creation of additional cellular apparatus

Q10. After fertilisation, when other parts of the flower fall off, the ovary grows into what form?

(a) Pollen tube
(b) Anther
(c) Fruit
(d) Style

Q11. What is the relationship between the radius of curvature and the focal length for spherical mirrors with small apertures?

(a) Radius of curvature is equal to half the focal length
(b) Radius of curvature is equal to thrice the focal length
(c) Radius of curvature is equal to the focal length
(d) Radius of curvature is equal to twice the focal length

Q12. What is the primary goal of reducing non-biodegradable waste production?

(a) To promote industrial growth
(b) To recycle the waste
(c) To conserve natural resources and minimise pollution
(d) To make more space available in landfills

Q13. The combining capacity of an element to each other primarily depends on which of the following?

(a) Number of protons
(b) Number of energy level
(c) Number of valence electrons
(d) Number of neutrons

Q14. Why does the uterine lining become thick and spongy every month?

(a) To support egg development
(b) To nourish the embryo if fertilisation occurs
(c) To absorb nutrients
(d) To prevent menstruation

Q15. Spring balance A is attached at one end to spring balance B, whose other end is fixed to a rigid support. A force is applied to the free end of spring balance A. Both balances show the same reading. What does this observation indicate?

(a) The force exerted by A on B is greater than that by B on A.
(b) The force exerted by A on B is equal and opposite to the force exerted by B on A.
(c) Both balances exert forces in the same direction.

YourMockTest.com — Free Study Material

(d) Only spring balance A exerts force on B.

Q16. Which of the following is a use of washing soda?

(a) Used in cooking
(b) Used in treatment of hot water
(c) Removes the hardness of water
(d) Used to kill bacteria in water

Q17. Which two properties of carbon are mainly responsible for the formation of a large number of carbon compounds?

(a) Tendency to form ionic bonds and lose electrons
(b) Tetravalency and catenation
(c) High atomic mass and large atomic size
(d) Metallic character and conductivity

Q18. Which of the following statements is correct about gravitational force?

(a) It is always attractive in nature.
(b) It depends on the medium between the objects.
(c) It can be both attractive and repulsive.
(d) It depends on the charge of the objects.

Q19. When a raised hammer falls on a nail and drives it into wood, the work done by the force of the hammer on the nail is positive. In this same scenario, which statement would describe negative work?

(a) The work done by the force exerted by the nail on the hammer.
(b) The work done by the potential energy stored in the hammer.
(c) The work done by the force of gravity acting on the hammer as it falls.
(d) The work done by the force of gravity acting on the nail as it moves into the wood.

Q20. Which of the following correctly describes the relation between frequency (ν)and time period (T)?

(a) ν T = 0
(b) ν/T = 1
(c) ν + T = 1
(d) ν T = 1

Q21. Which of the following happens when the distances between roots and leaves become large in plants?

(a) Diffusion becomes insufficient.
(b) Diffusion becomes faster.
(c) Roots absorb no water.
(d) More chlorophyll is produced.

Q22. A chemical reaction in which two or more substances combine to form a single product is called:

(a) decomposition reaction
(b) combination reaction
(c) double displacement reaction
(d) displacement reaction

Q23. Which of the following statements best describes the properties of a liquid?

(a) No fixed shape, no fixed volume
(b) No fixed shape, fixed volume
(c) Fixed shape, no fixed volume
(d) Fixed shape, fixed volume

Q24. Which of the following rules determines the direction of the magnetic field produced by a current carrying circular loop?

(a) Fleming's Left-Hand rule
(b) Left-Hand Thumb rule
(c) Right-Hand Thumb rule

YourMockTest.com – Free Study Material

(d) Fleming's Right-Hand rule

Q25. Which of the following organisms will accumulate maximum concentration of DDT?

(a) Goat
(b) Spider
(c) Grass
(d) Human

MATHEMATICS

Q26. A girl goes to school at a speed of 20 km/h. She comes back with a speed of 12 km/h. Find her average speed for the whole journey.

(a) 15 km/h
(b) 14 km/h
(c) 17 km/h
(d) 16 km/h

Q27. If the fourth proportion to 17, X and 7 is 91, then find the value of X.

(a) 218
(b) 222
(c) 219
(d) 221

Q28. A pen is purchased for Rs. 40 and sold for Rs. 50. Find the profit percentage.

(a) 35%
(b) 20%
(c) 25%
(d) 22%

Q29. In an examination there are 150 questions and 4 marks are given for every correct answer and 1 mark is deducted for every wrong answer. A candidate attempted all 150 questions and scored 250 marks. Find the number of questions he answered correctly.

(a) 60
(b) 50
(c) 80
(d) 70

Q30. Pipe A can fill a tank alone in 6 hours, Pipe B can fill it in 9 hours, and Pipe C can empty the full tank in 12 hours. If all three pipes are initially opened and after 1.5 hours, pipe C is discovered to be leaking and immediately closed, and if the work done by pipe C during the initial 1.5 hours is x/7 % of the work done by all the three pipes in the initial 1.5 hours, then the number of factors of x is:

(a) 15
(b) 18
(c) 21
(d) 12

Q31. Dolly goes to a shop to purchase a toy bus priced at Rs. 5,300. 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 7% and 7%
(b) Two successive discounts of 43% and 38%
(c) Two successive discounts of 21% each
(d) Single discount of 47%

YourMockTest.com — Free Study Material

Q32. Two trains are running on parallel tracks towards each other. Train A is 250 meters long and is moving at a speed of 90 km/h. Train B is 150 meters long and is moving at a speed of 60 km/h. How much time (rounded off to the nearest seconds) will it take for Train A to completely pass Train B?

(a) 15 seconds
(b) 20 seconds
(c) 10 seconds
(d) 12 seconds

Q33. The monthly incomes of two friends Manjit and Keshav are in the ratio 5 : 9 respectively and each of them saves Rs. 48,000 every month. If the ratio of their monthly expenditure is 1 : 3, then find the monthly income of Manjit (in Rs.).

(a) 80,000
(b) 81,000
(c) 79,000
(d) 1,12,000

Q34. If $a^2 - b^2 = 21$ and $a - b = 3$, what is $a + b$?

(a) 8
(b) 5
(c) 7
(d) 6

Q35. The sides of a triangle are 90 cm, 11 cm and 97 cm. What is the length of its altitude corresponding to the side with the length of 11 cm?

(a) 72 cm
(b) 105 cm
(c) 31 cm
(d) 97 cm

Q36. The number of prime numbers between 308 and 320 is:

(a) 7
(b) 1
(c) 6
(d) 3

Q37. The amount on a sum of Rs. 7,800 at 20% per annum compound interest, compounded annually, in 2 years will be:

(a) Rs. 10,914
(b) Rs. 11,730
(c) Rs. 10,795
(d) Rs. 11,232

Q38. A, B and C can do a piece of work in 3, 2 and 6 days, respectively. How long (in days) will they take to do twice the same work, working together?

(a) 3
(b) 6
(c) 4
(d) 2

Q39. The present ages of Rohit and his father are in the ratio 2 : 5. Four years from now, the ratio of their ages will become 12 : 27. What was the father's age (in years) five years ago from now?

(a) 50
(b) 48
(c) 45
(d) 52

YourMockTest.com — Free Study Material

Q40. Rs. 8,413 is divided among S, B, and C in such a way that if Rs. 32, Rs. 60, and Rs. 71 are deducted from their respective shares, they have money in the ratio 5:11:14. Find the difference between the actual shares of B and C.

(a) Rs. 925
(b) Rs. 775
(c) Rs. 836
(d) Rs. 675

Q41. A building is at a distance of 108 feet from point A on the ground. The angle of elevation of the top of the building from point A is θ. If tan θ = 4/3, then find the height (in feet) of the building.

(a) 140
(b) 138
(c) 144
(d) 135

Q42. The price of fuel decreases by 30%, 40% and 45% in three successive months, but increases by 65% in the fourth month. What is the percentage increase/decrease in the price of fuel in the fourth month as compared to its original price? (Round off your answer to two decimal places.)

(a) Decreases by 61.89%
(b) Increases by 67.69%
(c) Decreases by 63.43%
(d) Increases by 66.65%

Q43. A solid metallic cylinder of radius 4 cm and height 6 cm is melted and recast into smaller solid cylinders of radius 2 cm and height 3 cm. Find the ratio of the total surface areas of one small cylinder to the original cylinder.

(a) 2 : 5
(b) 1 : 4
(c) 1 : 8
(d) 1 : 3

Q44. The cost price of a whiteboard is Rs. 2,800. The shopkeeper gave 87% of discount on the cost price. What is the selling price (in Rs.)?

(a) 526
(b) 316
(c) 364
(d) 399

Q45. Three solid metallic cubes of sides 2 cm, 12 cm and 16 cm are melted to form a new cube. Find the surface area of the cube so formed.

(a) 1744 cm2
(b) 1644 cm2
(c) 1944 cm2
(d) 944 cm2

Q46. The average age of 30 students of a class is 12 years. If the age of the teacher is also included, the average age of the whole group becomes 13 years. The age (in years) of the teacher is:

(a) 45
(b) 43
(c) 46
(d) 44

Q47. Evaluate: $\sqrt{(250 + \sqrt{(19 + \sqrt{289})}) + \sqrt{(620 + \sqrt{(11 + \sqrt{196})}}}$

(a) 31
(b) 41
(c) 45
(d) 25

YourMockTest.com — Free Study Material

Q48. The sum of two numbers is 50 and their LCM is 429. The two numbers are:2607

(a) 11, 39
(b) 16, 34
(c) 4, 46
(d) 9, 41

Q49. A man receives Rs. 7,700 per month as salary. He saves 25% of his salary every month. His expenditure per month is:

(a) Rs. 5,775
(b) Rs. 5,856
(c) Rs. 5,761
(d) Rs. 5,832

Q50. The average of the marks of 12 students in a class is 36. If the marks of each student are doubled, find the new average?

(a) 36
(b) 24
(c) 72
(d) 12

GENERAL INTELLIGENCE & REASONING

Q51. Refer to the given series and answer the question that follows. (All numbers are single digit numbers only.) Counting to be done from left to right only.

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

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

(a) 7
(b) 4
(c) 6
(d) 5

Q52. Which of the following letter-number clusters will replace the question mark (?) in the given series to make it logically complete?

KJN 72 RQU 63 YXB 54 FEI 45 ?

(a) MMO 36
(b) MUD 35
(c) MLP 36
(d) MKO 35

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

(25, 12, 148)

(32, 11, 172)

(a) (40, 13, 210)
(b) (24, 14, 154)
(c) (38, 15, 212)
(d) (19, 35, 214)

YourMockTest.com — Free Study Material

Q54. Six friends, G, H, I, Q, R and S, are sitting around a circular table facing the centre of the table. Only two people sit between Q and I when counted from the left of I. H sits second to the left of S. R sits to the immediate right of S. R sits to the immediate left of Q. Who sits third to the right of G?

(a) R
(b) S
(c) H
(d) Q

Q55. Six people, A, B, C, D, E and F, are sitting in a row, facing the north. A sits third to the left of E. E sits second to the left of F. D sits to the immediate right of E. B sits to the immediate left of C.

How many people sit between C and F?

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

Q56. What should come in place of the question mark (?) in the given series?

11 14 8 17 ? 20

(a) 16
(b) 12
(c) 10
(d) 5

Q57. 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?

16 B 4 D 8 A 3 C 28 A 2 = ?

(a) 40
(b) 36
(c) 38
(d) 35

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

GIK−JLN

CEG−FHJ

(a) XYZ−ACE
(b) XZB−ACE
(c) XYZ−ZBD
(d) XZB−ZCD

Q59. In a certain code language, 'LEMA' is coded as '2564' and 'HELM' is coded as '3246'. What is the code for 'H' in the given code language?

(a) 6
(b) 4
(c) 3
(d) 2

Q60. What should come in place of the question mark (?) in the given series?

100 70 45 25 10 ?

(a) 0
(b) 1
(c) 5
(d) -1

YourMockTest.com — Free Study Material

Q61. 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 ships are eggs.

Some eggs are pencils.

All coins are ships.

Conclusions:

(I): Some ships are pencils.

(II): Some eggs are coins.6376

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

Q62. Refer to the given following number, symbol series and answer the question that follows. Counting to be done from left to right only. All numbers are single-digit numbers.

(Left) $ # @ * & € # 8 * 9 8 2 $ & $ 6 1 2 1 7 5 @ (Right)

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

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

Q63. BQVH is related to HLZE in a certain way. In the same way, HSJQ is related to NNNN. To which of the following is JOWF related, following the same logic?

(a) QKAD
(b) QJBD
(c) PJAC
(d) PKBC

Q64. In a certain code language,

P + Q means ‘P is the mother of Q’,

P # Q means ‘P is the husband of Q’,

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

P % Q means ‘P is the father of Q’.

How is J related to Z if ‘J # S + R & T % Z’?

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

Q65. In the following triads, each group of letters is related to the subsequent one following a certain logic. Select from the given options, the one which follows the same logic.

GATE - ETGA - GTAE

PRAY - YAPR - PARY

(a) JOIN - OIJN - OINJ
(b) USER - REUS - UESR
(c) GUNS - GNUS - SNUG
(d) MODE - EDMO - ODME

YourMockTest.com — Free Study Material

Q66. Z ranked 12^(th) from the bottom and 56^(th) from the top in his class. How many students are there in his class?

(a) 68
(b) 65
(c) 66
(d) 67

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

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

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

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

Q68. Which of the following letter-clusters will replace the question mark (?) in the given series to make it logically complete?

EZC, IDG, MHK, QLO, ?

(a) UPS
(b) UPR
(c) UQS
(d) UQR

Q69. If 1 is added to each odd digit and 2 is subtracted from each even digit in the number 6318547, then what will be the difference between the highest and lowest digits in the new number thus formed?

(a) 1
(b) 5
(c) 6
(d) 3

Q70. What should come in place of the question mark (?) in the given series?

1 2 6 7 16 ?

(a) 17
(b) 15
(c) 18
(d) 21

Q71. Piyush starts from Point A and drives 54 km towards the north. He then takes a right turn, drives 56 km, turns right and drives 59 km. He then takes a right turn and drives 61 km. He takes a final right turn, drives 5 km and stops at Point P. How far (shortest distance) and towards which direction should he drive in order to reach Point A again? (All turns are 90-degree turns only unless specified.)

(a) 6 km to the west
(b) 5 km to the east
(c) 3 km to the east
(d) 7 km to the west

Q72. 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?

12 D 10 C 5 B 21 A 3 = ?

(a) 31
(b) 37
(c) 32
(d) 36

YourMockTest.com — Free Study Material

Q73. This question is based on the five, three-digit numbers given below.

(Left) 658 223 661 257 666 (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) 12
(b) 11
(c) 14
(d) 9

Q74. 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) JN - GK
(b) PT - MR
(c) EI - BF
(d) NR - KO

Q75. In a certain code language, ‘give me more’ is coded as ‘bt lq nz’ and ‘give more water’ is coded as ‘hj bt nz’. How is ‘water’ coded in that language?

(a) bt
(b) hj
(c) nz
(d) lq

Q76. 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) HKM
(b) TWY
(c) YCD
(d) XAC

Q77. Priyanka walks to her uncle’s house. She starts walking from her house towards the north for 3 m, turns left, and walks for 4 m. She then takes a left turn and walks for 5 m. Next, she takes a right turn and walks for 1 m. Finally, she takes a right turn and walks for 2 m to reach her uncle’s house.

How far and in which direction is her house from her uncle’s house?

(a) 5 m towards the east
(b) 7 m towards the east
(c) 4 m towards the north
(d) 3 m towards the west

Q78. Mr. Akte ranked 12^(th) from the bottom and 56^(th) from the top in his class. How many students are there in his class?

(a) 65
(b) 67
(c) 68
(d) 66

Q79. 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 dolphins are whales.

YourMockTest.com — Free Study Material

Some whales are sharks.

Conclusions:

(I) Some dolphins are sharks.

(II) No whale is a dolphin.

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

Q80. Seven friends D, E, F, U, V, W and X are sitting in a straight line facing the north. Only two people are seated to the left of E. Only three people are seated between E and W. Only one person is seated between W and V. U is seated to the immediate left of D. F is not an immediate neighbor of W. How many people are seated to the right of X?

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

GENERAL AWARENESS AND CURRENT AFFAIRS

Q81. By how much has the grant for National Championships in high-priority sports been increased, as per the 2025 announcement?

(a) Rs. 51 lakh
(b) Rs. 39 lakh
(c) Rs. 30 lakh
(d) Rs. 90 lakh

Q82. Who became the first Thai male badminton player to be ranked World No. 1 in men's singles in May 2025?

(a) Lee Zii Jia
(b) Kento Momota
(c) Kunlavut Vitidsarn
(d) Kantaphon Wangcharoen

Q83. According to the Ministry of Environment, Forest and Climate Change's official release dated 1 September 2025 titled "In the last 8 years, Delhi witnesses best AQI figures in 2025 for the January–August period", what was Delhi's average AQI during January–August 2025?

(a) 174
(b) 172
(c) 194
(d) 187

Q84. In June 2025, Indian Space Research Organisation (ISRO) and National Aeronautics and Space Administration (NASA) joint venture NISAR is planned to be launched by _____.

(a) GSLV-P16
(b) PSLV-CA
(c) SSLV
(d) GSLV Mk II

Q85. What was the monthly honorarium announced by the Odisha government for Padma Awardees, starting January 2025?

(a) Rs. 35,000
(b) Rs. 20,000
(c) Rs. 25,000
(d) Rs. 30,000

YourMockTest.com — Free Study Material

Q86. What is the primary focus of Mission Shakti 5.0 launched by Uttar Pradesh Chief Minister Yogi Adityanath?

(a) Infrastructure development
(b) Women's safety, dignity, and self-reliance
(c) Agricultural reforms
(d) Economic development

Q87. In August 2025, the first phase of the Darwin Tree of Life (DToL) project neared completion. What is the primary aim of this international biodiversity initiative?

(a) To sequence the genomes of all eukaryotic species in Britain and Ireland
(b) To decode the genetic basis of rare diseases in isolated human populations
(c) To engineer climate-resilient crops using data from ancestral plant genomes
(d) To map human migration patterns through ancient DNA found in fossils

Q88. According to the World Bank's Global Economic Prospects (June 2025), global growth is projected to slow markedly to what percentage in 2025?

(a) 3.5%
(b) 4.1%
(c) 2.3%
(d) 0.5%

Q89. As per the Reserve Bank of India (RBI), Gross Domestic Product (GDP) growth for 2025-26 is projected for Q4 at:

(a) 6.8%
(b) 6.5%
(c) 6.3%
(d) 6.7%

Q90. In which year did India present its Third Voluntary National Review (VNR) Report on Sustainable Development Goals (SDGs)?

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

Q91. Which city hosted the 38^(th) National Games from 28 January to 14 February 2025?

(a) Delhi
(b) Bengaluru
(c) Dehradun
(d) Mumbai

Q92. In March 2025, a rare long-snouted vine snake was rediscovered in which of the following national parks?

(a) Dudhwa National Park
(b) Kanha National Park
(c) Bandhavgarh National Park
(d) Gir National Park

Q93. The Web-Portal for the Prime Minister's Awards for Excellence in Public Administration 2025 was officially launched on 1 October 2025 by which of the following?

(a) Department of Administrative Reforms and Public Grievances
(b) Centre for Development of Advanced Computing
(c) Bureau of Police Research and Development
(d) Department of Science and Technology

YourMockTest.com — Free Study Material

Q94. In August 2025, the Department of Posts signed a Memorandum of Understanding with which association in an effort to broaden access to mutual fund products, leveraging the trust and reach of post offices across the country?

(a) All India Association of Mutual Fund Advisors
(b) Confederation of Indian Industry
(c) Insurance Regulatory and Development Authority of India
(d) Association of Mutual Funds in India

Q95. Which mobile application was introduced by the National Commission for Women in May 2025 to enhance women's digital literacy and safety in advanced digital tools?

(a) Kaaval Uthavi Emergency Assistance Tool
(b) Digital Saathi for Women Empowerment
(c) Kavalan Safety and Support Platform
(d) Yashoda Artificial Intelligence Learning App

Q96. Which private-sector facility was commissioned for aerospace titanium production?

(a) Hindustan Aeronautics Limited
(b) Tata Aircraft Complex
(c) Bharat Electronics Limited
(d) Aerolloy Technologies

Q97. Which prestigious theatre awards took place on 6 April 2025 at the Royal Albert Hall?

(a) Evening Standard Theatre Awards
(b) Laurence Olivier Awards
(c) Critics' Circle Theatre Awards
(d) Tony Awards

Q98. Where was the main Infantry Day wreath laying ceremony held on the occasion of 79^(th) Valour Day in 2025?

(a) Red Fort
(b) Army Headquarters
(c) National War Memorial
(d) India Gate

Q99. As notified in June 2025, the National Bank for Agriculture and Rural Development (NABARD), in collaboration with ICAR's National Institute for Research on Commercial Agriculture (NIRCA), partnered to train farmers and Farmer Producer Organizations (FPOs) in which state on advanced post-harvest technologies for chilli and turmeric?

(a) West Bengal
(b) Andhra Pradesh
(c) Bihar
(d) Haryana

Q100. Which organisation received the 2025 Laureus Sport for Good Award for using football to support social change?

(a) Street League
(b) Kick4Life
(c) Right to Play
(d) Football for Peace

ANSWER KEY

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

YourMockTest.com – Free Study Material

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

SOLUTIONS

Q1. Answer: (c) the sum of atomic masses of all atoms in a formula unit of an ionic compound

The correct answer is the sum of atomic masses of all atoms in a formula unit of an ionic compound.

Key Points

• The formula unit mass of a substance is the sum of the atomic masses of all atoms in a formula unit of a compound.

• This term is specifically used for substances whose constituent particles are ions rather than discrete molecules. Ionic compounds like Sodium Chloride (NaCl) do not exist as simple individual molecules but as crystalline lattices. Hence, statement 3 is correct.

• The calculation of formula unit mass is identical to the calculation of molecular mass; the only difference is the use of the term "formula unit" for ionic substances.

• The atomic mass of each element is multiplied by the number of atoms of that element present in the chemical formula, and then the results are summed.

• The unit used to express formula unit mass is the unified atomic mass unit, denoted by 'u'.

Additional Information

• Molecular Mass:

• It is the sum of the atomic masses of all the atoms in a molecule of a substance.

• It is used for covalent compounds like Water (H2O) or Methane (CH4), where atoms are bonded together in discrete units.

• For example, the molecular mass of H2O is calculated as (2 × 1.0 u) + (1 × 16.0 u) = 18.0 u.

• Atomic Mass:

• The atomic mass is the mass of a single atom of a chemical element, expressed in atomic mass units (u).

• It is approximately equivalent to the number of protons and neutrons in the nucleus.

• The standard reference for atomic mass is Carbon-12, where one atomic mass unit is defined as exactly 1/12th the mass of one atom of carbon-12.

• Calculation Example (Ionic Compound):

• To calculate the formula unit mass of Calcium Chloride (CaCl2):

• Atomic mass of Calcium (Ca) = 40 u.

• Atomic mass of Chlorine (Cl) = 35.5 u.

• Formula unit mass = 40 + (2 × 35.5) = 40 + 71 = 111 u.

Important Points

• Mole Concept: The molar mass of a substance is the mass of one mole (6.022 × 10^23 units) of that substance, usually expressed in grams per mole (g/mol).

• Distinction: While molecular mass refers to the mass of a single molecule, molar mass refers to the mass of a large collection of molecules or formula units.

• Ionic Lattice: In an ionic solid, there is no single "molecule." For instance, in NaCl, each Sodium ion (Na+) is surrounded by six Chloride ions (Cl-) and vice versa. Therefore, we use the simplest ratio (the formula unit) to define its mass.

• Unified Mass (u): In 1961, the IUPAC adopted the unified atomic mass unit to replace the older oxygen-based scale for better scientific precision across chemistry and physics.

Q2. Answer: (c) Homogeneous mixture

The correct answer is Homogeneous mixture.

Key Points

• A homogeneous mixture is a type of mixture where the components are distributed uniformly throughout the entire volume, and there are no visible boundaries of separation between the constituents.

• Alloys are considered homogeneous mixtures of metals (or a metal and a non-metal) because they show the properties of their constituents and can have variable compositions, yet they cannot be separated into their components by simple physical methods. An example is Brass, which contains approximately 30% Zinc and 70% Copper.

• Air is a homogeneous mixture of various gases. Its main components are Nitrogen (78%) and Oxygen (21%), with smaller amounts of Argon, Carbon dioxide, and water vapor distributed evenly.

• Lemonade and soda water are examples of liquid-state homogeneous mixtures. In lemonade, the sugar, salt, and lemon juice particles are spread so evenly in water that the taste is the same in every drop. Soda water is a solution of Carbon dioxide gas (solute) in water (solvent).

• In all these examples, the particle size is typically less than 1 nanometer (1 nm) in diameter, which means they do not scatter a beam of light and are not visible to the naked eye.

Additional Information

• Heterogeneous Mixture:

• This type of mixture has a non-uniform composition where the different components can often be seen as separate phases.

• Examples include mixtures of sand and salt, iron filings and sulfur, or oil and water.

• Colloids:

• These are mixtures where the particle size (between 1 nm and 1000 nm) is larger than that of a true solution but smaller than a suspension.

• While they may appear homogeneous, they are actually heterogeneous and exhibit the Tyndall Effect (scattering of light). Examples include milk, butter, fog, and clouds.

• Suspension:

• A suspension is a heterogeneous mixture containing large solute particles (greater than 1000 nm) that do not dissolve but settle down when left undisturbed.

• Common examples include chalk powder in water or muddy pond water. The particles are large enough to be seen by the naked eye.

Important Points

• Solvent and Solute: In any homogeneous solution, the component present in the larger amount is called the solvent, and the component in the smaller amount is the solute. For instance, in soda water, water is the solvent and CO2 is the solute.

• Concentration: The amount of solute present in a given amount of solution is known as its concentration, which can be expressed in mass percentage, volume percentage, or molarity.

• Physical Properties: Because homogeneous mixtures (solutions) are mixed at the molecular level, they cannot be separated by filtration. Instead, techniques like evaporation, distillation, or crystallization are required to recover the components.

• Alloy Classification: Although alloys are mixtures, they are often studied under solid solutions in chemistry because the atoms of the different elements are randomly and uniformly distributed in the crystal lattice.

Q3. Answer: (c) CaO + CO2 → CaCO3

The correct answer is CaO + CO2 -> CaCO3.

Key Points

• A Combination Reaction is a type of chemical reaction where two or more substances (elements or compounds) combine to form a single new product.

• The reaction CaO + CO2 → CaCO3 involves Calcium Oxide (Quicklime) reacting with Carbon Dioxide. This is a classic example of a combination reaction because two reactants yield one product, Calcium Carbonate. Hence, statement 3 is correct.

• This reaction also serves as a Neutralization Reaction in an environmental context. Calcium Oxide (CaO) is a Basic Oxide, while Carbon Dioxide (CO2) is an Acidic Oxide. When they react, they form a salt, effectively "neutralizing" the acidic pollutant.

• Carbon Dioxide is a significant atmospheric pollutant and a primary greenhouse gas responsible for global warming. Using alkaline substances like CaO to capture CO2 is a method used in Carbon Capture and Storage (CCS) technologies.

• In industrial applications, this principle is used in scrubbers to remove acidic gases from exhaust flues, thereby reducing the impact of industrial emissions on the atmosphere.

Additional Information

• Atmospheric Pollutants:

• Common pollutants include Carbon Monoxide (CO), Sulfur Dioxide (SO2), Nitrogen Oxides (NOx), and Carbon Dioxide (CO2).

• Neutralization of these pollutants often requires reacting an acidic pollutant with a basic reagent (like lime or limestone) or vice versa.

• Industrial Scrubbing:

• Flue-gas desulfurization (FGD) is a set of technologies used to remove Sulfur Dioxide (SO2) from exhaust flue gases of fossil-fuel power plants.

• Similar to the reaction with CO2, Calcium Oxide or Calcium Hydroxide is often used to neutralize SO2 to prevent Acid Rain.

• Acid-Base Chemistry:

• Metallic oxides like CaO, MgO, and Na2O are generally basic in nature.

• Non-metallic oxides like CO2, SO2, and P2O5 are generally acidic in nature.

• The reaction between a basic oxide and an acidic oxide to form a salt is a form of neutralization that does not necessarily produce water.

Important Points

• Analysis of Incorrect Options:

• Fe + S → FeS: This is a combination reaction between Iron and Sulfur to form Iron(II) Sulfide. While it is a synthesis reaction, it does not involve the neutralization of common atmospheric pollutants. Hence, statement 1 is incorrect.

• CO + O2 → CO2: This is an oxidation or combustion reaction where Carbon Monoxide reacts with Oxygen. While CO is a pollutant, converting it to CO2 (another pollutant) is an oxidation process, not a neutralization reaction. Hence, statement 2 is incorrect.

• SO2 + H2O → H2SO3: This reaction shows Sulfur Dioxide dissolving in Water to form Sulfurous Acid. This reaction actually describes the formation of Acid Rain in the atmosphere, which increases pollution rather than neutralizing it. Hence, statement 4 is incorrect.

• Summary:

• The reaction CaO + CO2 → CaCO3 is the only one that fulfills both criteria: being a combination reaction and performing neutralization of an atmospheric pollutant (CO2) by a basic oxide (CaO).

Q4. Answer: (c) They are present only in plant cells and absent in animal cells

The correct answer is They are present only in plant cells and absent in animal cells.

Key Points

• Plastids are double-membrane-bound organelles found in all plant cells and in euglenoids (certain algae). They are primarily responsible for the synthesis and storage of food.

• They are entirely absent in animal cells, as animals are heterotrophic and do not perform photosynthesis. Hence, statement 1 and statement 4 are incorrect, while statement 3 is correct.

• Prokaryotic cells, such as bacteria, do not contain plastids because they lack membrane-bound organelles altogether. While some bacteria perform photosynthesis, they use specialized structures like chromatophores rather than complex plastids. Hence, statement 2 is incorrect.

• The presence of plastids is one of the primary distinguishing features between plant and animal cells. These organelles contain specific pigments that impart different colors to plant parts and assist in metabolic processes.

• Plastids are large enough to be easily observed under a microscope, making them a key subject in cytology and botany.

Additional Information

• Types of Plastids:

• Chloroplasts: These contain chlorophyll and carotenoid pigments which are responsible for trapping light energy essential for photosynthesis. They are the site of food production in green plants.

• Chromoplasts: These contain fat-soluble carotenoid pigments like carotene and xanthophylls. They provide yellow, orange, or red colors to flowers, fruits, and autumn leaves.

• Leucoplasts: These are colorless plastids of varied shapes and sizes with stored nutrients. Amyloplasts store carbohydrates (starch), Elaioplasts store oils and fats, and Aleuroplasts store proteins.

• Internal Structure:

• Like mitochondria, plastids are semi-autonomous organelles. They possess their own genetic material in the form of double-stranded circular DNA and 70S ribosomes.

• The chloroplast consists of a stroma (fluid matrix), thylakoids (flattened sacs), and grana (stacks of thylakoids). These components manage the light and dark reactions of photosynthesis.

• Evolutionary Origin:

• According to the Endosymbiotic Theory, plastids (and mitochondria) are believed to have originated from free-living prokaryotes that were engulfed by a host cell millions of years ago, establishing a symbiotic relationship.

• Functions:

• Beyond photosynthesis, plastids are involved in the synthesis of amino acids, fatty acids, and the storage of secondary metabolites. They play a crucial role in the development and survival of the plant under various environmental stresses.

Q5. Answer: (c) Electric fuse

The correct answer is Electric fuse.

Key Points

• An electric fuse is a crucial safety device used in electrical circuits to protect against overcurrent and short circuits.

• It operates on the principle of the heating effect of electric current (also known as Joule heating), where the heat produced is proportional to the square of the current ($H = I^2Rt$).

• The fuse consists of a thin wire made of a material with a low melting point and high resistance, typically an alloy of lead and tin (usually 37% lead and 63% tin).

• When the current flowing through the circuit exceeds a predetermined safe limit, the temperature of the fuse wire rises rapidly, causing it to melt and break the electrical path.

• By intentionally melting and "blowing," the fuse effectively isolates the appliance from the power source, preventing potential fire hazards and damage to sensitive components.

• A fuse is always connected in series with the live wire so that all current entering the circuit must pass through it first.

Additional Information

• Electric Bulb Filament:

• The filament is typically made of Tungsten because of its exceptionally high melting point (approximately 3422°C).

• Unlike a fuse, it is designed not to melt; instead, it becomes incandescent (glows white-hot) to produce light when current passes through it.

• Electric Iron Coil:

• Heating appliances like irons and heaters use a heating element made of Nichrome (an alloy of nickel, chromium, and iron).

• Nichrome is chosen because it has high resistivity and does not oxidize (burn) easily even at high temperatures, allowing it to produce steady heat for pressing clothes.

• Rheostat:

• A Rheostat is a variable resistor used to manually adjust the magnitude of current in a circuit without interrupting the power supply.

• It does not protect the circuit by melting; rather, it functions by altering the resistance within the circuit path.

• Fuse Ratings:

• Fuses are categorized by their current rating (measured in Amperes). For example, a 5A fuse is used for low-power circuits (lights, fans), while a 15A fuse is used for heavy-duty appliances like air conditioners and geysers.

Important Points

• Overloading: This occurs when too many high-power appliances are connected to a single socket, drawing a total current that exceeds the capacity of the wires. The fuse melts to prevent the wires from overheating.

• Short Circuiting: This happens when the live wire and neutral wire come into direct contact due to damaged insulation. This causes an immediate and massive surge in current, which the fuse terminates by melting instantly.

• Modern Alternatives: In many modern electrical installations, the traditional fuse has been replaced by Miniature Circuit Breakers (MCBs). Unlike fuses, MCBs are switches that trip during a fault and can be reset manually without the need for replacement.

Q6. Answer: (d) A curved line

The correct answer is A curved line.

Key Points

• Non-uniform motion is defined as the type of motion where an object covers unequal distances in equal intervals of time. This implies that the speed or velocity of the object is not constant throughout its journey.

• In a distance-time graph, the distance is plotted on the Y-axis and time is plotted on the X-axis. The slope of this graph at any given point represents the speed of the object.

• For an object in non-uniform motion, since the speed changes continuously, the slope of the graph must also change. A graph with a changing slope is represented as a curved line rather than a straight one.

• If the speed increases over time (acceleration), the curve of the distance-time graph bends upwards (becoming steeper). If the speed decreases (deceleration), the curve flattens out as time progresses.

• The non-linear relationship between distance and time in such cases is often expressed through higher-order equations, such as quadratic equations for motion with constant acceleration.

Additional Information

• Uniform Motion:

• In uniform motion, an object covers equal distances in equal intervals of time.

• The distance-time graph for uniform motion is always a straight line passing through the origin (if the initial distance is zero). The constant slope indicates a constant speed.

• Object at Rest:

• When an object is stationary, its distance from a reference point does not change as time increases.

• The graph for an object at rest is a horizontal line parallel to the time axis (X-axis). Here, the slope is zero, indicating that the speed is zero.

• Vertical Line Paradox:

• A vertical line on a distance-time graph would mean that an object is covering distance while time remains constant.

• This would imply an infinite speed, which is physically impossible according to the laws of classical mechanics.

• Slope and Speed:

• The mathematical formula for the slope of the distance-time graph is Speed = Distance / Time.

• In calculus, the instantaneous speed is the derivative of distance with respect to time (v = ds/dt). For non-uniform motion, this derivative is a function of time, resulting in the curved nature of the plot.

Important Points

• Acceleration: In non-uniform motion involving constant acceleration, the distance-time graph takes the shape of a parabola. This is derived from the second equation of motion: $s = ut + \frac{1}{2}at^2$, where s is distance, u is initial velocity, a is acceleration, and t is time.

• Real-world Examples: Most real-world movements, such as a car moving in traffic, a train pulling into a station, or a ball thrown upwards, are examples of non-uniform motion and will produce curved lines on a distance-time graph.

Q7. Answer: (a) Epithelial tissue forms a protective covering and regulates material exchange.

The correct answer is Epithelial tissue forms a protective covering and regulates material exchange.

Key Points

• Epithelial tissue is a primary tissue type that covers the external surfaces of the body and lines internal organs and cavities. Its primary role is to act as a barrier and provide protection against mechanical injury, pathogens, and dehydration. Hence, statement 1 is correct.

• The cells in epithelial tissue are tightly packed and form a continuous sheet. They have an extremely small amount of cementing material between them and almost no intercellular spaces. Hence, statement 2 is incorrect.

• This tissue is crucial for regulating the exchange of materials between the body and the external environment, as well as between different parts of the body. The permeability of the epithelial cells allows for the controlled movement of substances. Hence, statement 3 is incorrect.

• Epithelial tissue is always separated from the underlying tissue by an extracellular fibrous basement membrane, which provides structural support.

• The function of connecting bones and muscles is performed by Connective tissue (specifically tendons), not by epithelial tissue. Hence, statement 4 is incorrect.

• Hence, the correct answer is Epithelial tissue forms a protective covering and regulates material exchange.

Additional Information

• Classification Based on Structure:

• Simple Squamous Epithelium: These are extremely thin and flat cells forming a delicate lining. They are found in the lung alveoli and blood vessels where transport of substances occurs through a selective permeable surface.

• Stratified Squamous Epithelium: Found in the skin, these cells are arranged in many layers to prevent wear and tear.

• Columnar Epithelium: These are "pillar-like" cells found where absorption and secretion occur, such as the inner lining of the intestine.

• Cuboidal Epithelium: These cube-shaped cells provide mechanical support and are found in the lining of kidney tubules and ducts of salivary glands.

• Specialized Epithelial Tissues:

• Ciliated Epithelium: In the respiratory tract, columnar epithelial tissue has cilia (hair-like projections) that move to push mucus forward to clear it.

• Glandular Epithelium: Sometimes a portion of the epithelial tissue folds inward to form a multicellular gland, which secretes substances at the epithelial surface.

• Functions:

• Protection: Acts as the first line of defense (e.g., skin).

• Absorption: Absorbs nutrients in the digestive tract.

• Secretion: Secretes hormones, sweat, and enzymes through glandular cells.

• Excretion: Helps in the elimination of waste products in the kidneys.

Important Points

• Key Characteristics: Epithelial tissues are avascular, meaning they do not have their own blood supply; they receive nutrients via diffusion from the underlying connective tissue.

• Location Examples: It covers the skin, the lining of the mouth, the lining of blood vessels, lung alveoli, and kidney tubules.

• Regeneration: Epithelial cells have a high regeneration capacity, which is essential for surfaces that undergo frequent environmental stress or friction.

YourMockTest.com — Free Study Material

Q8. Answer: (d) At the focus (F), real and highly diminished

The correct answer is At the focus (F), real and highly diminished.

Key Points

• A convex lens is a converging lens. When parallel rays of light pass through a convex lens, they converge at a single point called the Principal Focus (F).

• When an object is placed at infinity, the rays coming from it are parallel to the principal axis. After refraction through the lens, these rays intersect at the focus (F) on the opposite side of the lens.

• The nature of the image formed when the object is at infinity is real and inverted. Because the rays actually meet at a point, the image is highly diminished (often described as point-sized). Hence, statement 4 is correct.

• If an image is formed between F and 2F, it is real and inverted, but this only occurs when the object is placed beyond 2F (at a finite distance). Hence, statement 1 is incorrect.

• An image formed at 2F that is real and of the same size occurs only when the object itself is placed exactly at 2F on the other side. Hence, statement 2 is incorrect.

• An image formed virtual and enlarged occurs when the object is placed between the focus (F) and the optical centre (O); such an image is formed on the same side as the object, not at the optical centre. Hence, statement 3 is incorrect.

Additional Information

• Lens Formula: The relationship between the distance of the object (u), the distance of the image (v), and the focal length (f) is given by 1/v - 1/u = 1/f. For an object at infinity, u is considered ∞, making 1/u = 0, therefore v = f.

• Image Characteristics:

• Real Image: An image formed when light rays actually meet. It can be obtained on a screen.

• Inverted Image: An image that is upside down relative to the object. In a convex lens, all real images are inverted.

• Magnification (m): Defined as the ratio of image height to object height (h'/h) or v/u. For an object at infinity, the magnification is nearly zero, indicating a point-sized image.

• Convex Lens Applications: Due to its converging properties, it is used in telescopes (to capture light from distant stars at infinity), microscopes, cameras, and to correct Hypermetropia (long-sightedness).

Important Points

• Optical Centre (O): The central point of the lens through which a ray of light passes without any deviation.

• Principal Axis: An imaginary line passing through the centers of curvature of the two surfaces of the lens.

• Focal Length (f): The distance between the optical centre and the principal focus. For a convex lens, the focal length is positive according to the Cartesian sign convention.

• Power of a Lens (P): Measured in Dioptres (D), it is the reciprocal of the focal length in meters (P = 1/f). A convex lens has positive power.

Q9. Answer: (d) Creation of additional cellular apparatus

The correct answer is Creation of additional cellular apparatus.

Key Points

• DNA copying (also known as DNA replication) is the fundamental process in reproduction that creates a genetic blueprint for the next generation. However, a DNA molecule by itself cannot maintain life or perform metabolic functions without a surrounding environment.

• To ensure that daughter cells are functional and viable, the process of DNA copying must be accompanied by the creation of additional cellular apparatus. This includes the production of cytoplasm, cell membranes, and various organelles like ribosomes and mitochondria. Hence, statement 4 is correct.

• Chromosomal mutation refers to alterations in the structure or number of chromosomes. While mutations provide the basis for evolution, they are not a required accompaniment to ensure functional cells; in many cases, large-scale mutations can lead to cell death or malfunction. Hence, statement 1 is incorrect.

• RNA transcription and protein synthesis are vital biochemical processes occurring within a cell. However, "only" performing transcription or translation is insufficient to form a new daughter cell, as a complete physical cellular structure is required to house these processes. Hence, statements 2 and 3 are incorrect.

• When a cell divides, it effectively splits its cellular apparatus into two parts, each receiving one copy of the DNA. Therefore, the parent cell must double its internal components before cytokinesis occurs.

Additional Information

• DNA (Deoxyribonucleic Acid):

• It is the information source for making proteins. If the information is changed, different proteins will be made, leading to altered body designs.

• The process of DNA copying involves biochemical reactions that are never 100% accurate. This leads to variations during reproduction, which is the raw material for natural selection and evolution.

• Cellular Apparatus Components:

• The cellular apparatus consists of the cytoplasm, where most chemical reactions occur, and enzymes that facilitate DNA replication.

• In eukaryotic cells, this also includes membrane-bound organelles like the Endoplasmic Reticulum, Golgi apparatus, and Mitochondria (the powerhouse of the cell).

• Cell Division Cycle:

• The cell cycle consists of interphase (where DNA and organelles are doubled) and the M-phase (where mitosis or meiosis occurs).

• Cytokinesis is the physical process of cell division, which divides the cytoplasm of a parent cell into two daughter cells.

• Importance of Variation:

• While consistency in DNA copying maintains species stability, minor inaccuracies allow populations to adapt to environmental changes over long periods.

• In asexual reproduction, the daughter cells are almost identical, whereas in sexual reproduction, genetic recombination increases diversity.

Important Points

• Biological Significance: If DNA were copied without a cellular apparatus, the DNA copy would have no metabolic machinery to sustain itself, and it would not be considered a living cell.

• Historical Context: The understanding of DNA as the genetic material was solidified by scientists such as Watson and Crick in 1953, which helped explain how hereditary information is passed during cell division.

• Functionality: A functional daughter cell must be able to perform respiration, nutrition, and growth immediately after division, all of which require a pre-existing cellular structure.

Q10. Answer: (c) Fruit

The correct answer is Fruit.

Key Points

• In plants, fertilization is the process where the male gamete (pollen) fuses with the female gamete (egg) inside the ovule.

• Once fertilization is complete, the flower undergoes several transformations. Most parts, such as the sepals, petals, and stamens, wither and fall away as they are no longer needed.

• The ovary begins to enlarge and ripen due to hormonal changes, eventually transforming into the Fruit. Hence, the correct answer is Fruit.

• Simultaneously, the ovules located inside the ovary develop into seeds. Each seed contains an embryo, which is the result of the zygote developing through cell division.

• The primary function of the fruit is to protect the developing seeds and aid in their dispersal to ensure the continuation of the plant species.

Additional Information

• Floral Parts and their Post-Fertilization Fate:

• Ovary Wall: The wall of the ovary develops into the pericarp (the fruit wall). In some plants, like mango, this becomes fleshy, while in others, like mustard, it becomes dry and hard.

• Ovule: This structure matures into the seed. The integuments of the ovule harden to form the seed coat (testa and tegmen).

• Zygote: The fertilized egg cell develops into the embryo, which consists of the radicle, plumule, and cotyledons.

• Classification of Fruits:

• True Fruits: These develop exclusively from the mature ovary after fertilization. Examples include grapes, blueberries, and tomatoes.

• False Fruits: Also known as accessory fruits, these develop from the ovary along with other floral parts like the thalamus or receptacle. Examples include apple, strawberry, and cashew.

• Parthenocarpic Fruits: These are fruits that develop without fertilization and are typically seedless, such as banana.

• Explanation of Other Options:

• Anther: This is the pollen-producing part of the stamen. It is a male reproductive organ and typically dries up and falls off after the pollination stage.

• Style: This is the stalk of the pistil that connects the stigma to the ovary. After fertilization, it usually withers and disappears.

• Pollen Tube: This is a tubular structure produced by the pollen grain to deliver male gametes to the embryo sac. It is a temporary structure that degrades once its function is served.

Important Points

• Double Fertilization: This is a unique feature of angiosperms (flowering plants) where one male gamete fuses with the egg to form a zygote, and another fuses with two polar nuclei to form the Primary Endosperm Nucleus (PEN).

• Endosperm: The PEN develops into the endosperm, a tissue that provides nutrition to the growing embryo during seed development.

• Fruit Ripening: This physiological process involves the breakdown of chlorophyll, the softening of the pericarp, and the conversion of starches into sugars, making the fruit attractive to animals for dispersal.

Q11. Answer: (d) Radius of curvature is equal to twice the focal length

The correct answer is Radius of curvature is equal to twice the focal length.

Key Points

• In the study of optics, specifically for spherical mirrors, there is a fundamental geometric relationship between the radius of curvature (R) and the focal length (f).

• The radius of curvature (R) is defined as the radius of the hollow sphere of glass of which the reflecting surface of the mirror forms a part. It is the distance from the pole (P) to the center of curvature (C).

• The focal length (f) is the distance between the pole (P) and the principal focus (F) of the mirror.

• For spherical mirrors with a small aperture, the principal focus (F) lies exactly halfway between the pole (P) and the center of curvature (C).

• This geometric arrangement leads to the mathematical formula: R = 2f. This implies that the radius of curvature is twice the focal length. Hence, the correct answer is Radius of curvature is equal to twice the focal length.

Additional Information

• Types of Spherical Mirrors:

• Concave Mirror: A spherical mirror with its reflecting surface curved inwards, facing towards the center of the sphere. It is also known as a converging mirror.

• Convex Mirror: A spherical mirror with its reflecting surface curved outwards. It is also known as a diverging mirror.

• Aperture: The diameter of the reflecting surface of a spherical mirror is called its aperture. The relationship R = 2f is an approximation that holds true primarily for mirrors where the aperture is much smaller than the radius of curvature.

• Principal Axis: This is the imaginary straight line passing through the pole and the center of curvature of a spherical mirror.

• Sign Convention: According to the New Cartesian Sign Convention, the focal length of a concave mirror is considered negative, while the focal length of a convex mirror is considered positive.

Important Points

• Paraxial Rays: The derivation of the formula R = 2f assumes that the light rays are paraxial, meaning they strike the mirror very close to the principal axis and make small angles with it.

• Spherical Aberration: If the aperture of the mirror is large, the rays falling far from the axis (marginal rays) do not meet at the same focal point as the paraxial rays. This defect is known as spherical aberration.

• Numerical Application: If a convex mirror has a radius of curvature of 32 cm, its focal length would be 16 cm (f = R/2). Similarly, if a concave mirror has a focal length of 10 cm, its radius of curvature is 20 cm.

• This relationship is essential for using the Mirror Formula: 1/f = 1/v + 1/u, where v is the image distance and u is the object distance.

Q12. Answer: (c) To conserve natural resources and minimise pollution

The correct answer is To conserve natural resources and minimise pollution.

Key Points

• Non-biodegradable waste refers to materials that cannot be broken down or decomposed by biological processes or natural agents like bacteria, fungi, and microorganisms over a reasonable period of time. Examples include plastics, glass, metals, and certain synthetic chemicals.

• The primary goal of reducing the production of such waste is to conserve natural resources. Many non-biodegradable items are derived from finite resources; for instance, plastic is manufactured from petroleum and natural gas, while metal cans require the mining of ores. By reducing waste, we lower the demand for raw material extraction.

• Another critical objective is to minimise pollution. Since these materials persist in the environment for hundreds to thousands of years, they accumulate in soil and water bodies, leading to long-term environmental degradation. Hence, the statement in option 3 is the correct primary goal.

• Reducing waste at the source is more effective than managing it later. While recycling (Option 2) is a management strategy, the "reduction" of production specifically aims to prevent the initial energy consumption and carbon footprint associated with manufacturing.

• Landfill management (Option 4) is a logistical benefit of waste reduction. However, it is considered a secondary administrative goal rather than the fundamental environmental purpose of "reducing production."

Additional Information

• Impact on Ecosystems: Non-biodegradable waste, particularly microplastics, enters the food chain through marine life and

terrestrial animals. This leads to bioaccumulation and biomagnification, where toxic chemicals increase in concentration at higher trophic levels, ultimately affecting human health.

• The 3R and 5R Principles: Modern environmental management follows the hierarchy of Refuse, Reduce, Reuse, Repurpose, and Recycle. "Reduce" is placed at the top because it prevents the creation of waste entirely, whereas "Recycle" is the last resort due to the energy required for processing.

• Economic and Industrial Context: Contrary to promoting industrial growth (Option 1) in the traditional sense, waste reduction encourages a Circular Economy. In a circular economy, products are designed for durability and repairability rather than planned obsolescence.

• Global and National Initiatives:

• In India, the Plastic Waste Management Rules, 2016 (amended in 2021 and 2022) aim to phase out single-use plastics to protect the environment.

• The Swachh Bharat Abhiyan launched in 2014 emphasizes waste segregation at the source to ensure non-biodegradable materials do not contaminate organic waste.

Important Points

• Decomposition Timeframes: Understanding the persistence of waste is vital. A plastic bottle can take up to 450 years to decompose, while glass bottles may take 1 million years. In contrast, organic paper decomposes in 2-6 weeks.

• Pollution Types: Non-biodegradable waste contributes to Leachate formation in landfills, which can seep into groundwater, causing heavy metal contamination (e.g., Lead, Mercury, and Cadmium from electronic waste).

• Legislation: The Environment Protection Act, 1986 provides the framework for the Government of India to take all such measures as it deems necessary for protecting and improving the quality of the environment, including regulating hazardous waste.

• Global Policy: The Basel Convention is an international treaty designed to reduce the movements of hazardous waste between nations, specifically to prevent the transfer of non-biodegradable toxic waste from developed to developing countries.

Q13. Answer: (c) Number of valence electrons

The correct answer is Number of valence electrons.

Key Points

• The combining capacity of an atom of an element is known as its valency. It describes how many chemical bonds an atom can form with other atoms.

• This capacity primarily depends on the number of valence electrons, which are the electrons present in the outermost shell of an atom. Atoms interact with each other to achieve a stable electronic configuration, typically following the Octet Rule. Hence, the correct answer is Number of valence electrons.

• According to the Octet Rule, atoms are most stable when their outermost shell is completely filled with eight electrons (or two for the K-shell). Atoms gain, lose, or share electrons to reach this state.

• For elements in Group 1, 2, and 13, the valency is usually equal to the number of valence electrons (1, 2, and 3 respectively). For elements in Groups 15, 16, and 17, the valency is determined by subtracting the number of valence electrons from 8.

• The chemical reactivity of an element is fundamentally determined by these electrons. For example, Sodium (Na) has 1 valence electron and a valency of 1, while Chlorine (Cl) has 7 valence electrons and a valency of 1 (calculated as 8 - 7).

Additional Information

• Number of Protons:

• The number of protons in the nucleus defines the atomic number (Z) of an element and identifies the element itself.

• While the positive charge of protons attracts electrons, it is the distribution of those electrons, not the protons themselves, that determines the combining capacity. Hence, the statement regarding the number of protons is incorrect.

• Number of Energy Levels:

• Electrons revolve around the nucleus in specific energy levels or shells (K, L, M, N). The number of energy levels determines the atomic radius and the size of the atom.

• While the distance of the outermost shell from the nucleus affects how strongly electrons are held, the primary driver for bonding is the specific occupancy of the valence shell. Hence, the statement regarding the number of energy levels is incorrect.

• Number of Neutrons:

• Neutrons are subatomic particles found in the nucleus with no electrical charge. The number of neutrons contributes to the atomic mass (A) of the element.

• Varying the number of neutrons results in isotopes of the same element, but this does not change the chemical properties or the valency of the atom significantly. Hence, the statement regarding the number of neutrons is incorrect.

• Noble Gases:

• Elements like Helium (He), Neon (Ne), and Argon (Ar) have their outermost shells completely filled.

• Because they already possess a stable configuration, their valency is zero, meaning they have little to no combining capacity under normal conditions and are chemically inert.

YourMockTest.com — Free Study Material

Important Points

• Variable Valency: Some elements, particularly transition metals like Iron (Fe) or Copper (Cu), exhibit variable valency because they can lose electrons from both their outermost shell and the shell just below it.

• Ionic vs. Covalent Bonding: When atoms transfer valence electrons, an ionic bond is formed (e.g., NaCl). When they share valence electrons, a covalent bond is formed (e.g., H2O).

• Lewis Dot Structures: This is a common method used to represent the number of valence electrons as dots around the symbol of an element, helping to visualize the combining capacity.

Q14. Answer: (b) To nourish the embryo if fertilisation occurs

The correct answer is To nourish the embryo if fertilisation occurs.

Key Points

• The uterus is a hollow, pear-shaped organ in the female reproductive system where a baby develops during pregnancy. Every month, the inner lining of the uterus, known as the endometrium, undergoes changes to prepare for a potential pregnancy.

• The uterine lining becomes thick, soft, and spongy due to an increased supply of blood vessels and tissues. This specialized environment is designed to facilitate the implantation of a fertilized egg (embryo).

• The primary function of this thickened lining is to nourish the embryo by providing essential nutrients and oxygen required for its initial growth and development after fertilisation. Hence, statement 2 is correct.

• The development of the egg occurs within the ovaries, not the uterine lining; therefore, the thickness is not meant to support egg maturation. Hence, statement 1 is incorrect.

• While the lining is rich in nutrients, its purpose is to sustain a growing fetus rather than the general absorption of nutrients for the mother's metabolic needs. Hence, statement 3 is incorrect.

• The thickening of the lining is a precursor to menstruation if pregnancy does not occur, rather than a mechanism to prevent it. Menstruation is actually the shedding of this very lining. Hence, statement 4 is incorrect.

Additional Information

• The Menstrual Cycle:

• The menstrual cycle typically lasts about 28 days, although it can range from 21 to 35 days in healthy adults. It is regulated by the interaction of hormones from the pituitary gland and the ovaries.

• During the proliferative phase, the hormone estrogen causes the endometrium to grow and thicken.

• Following ovulation (usually around day 14), the secretory phase begins, where progesterone makes the lining receptive to the embryo.

• Role of the Placenta:

• If implantation is successful, the embryo and the uterine wall eventually form the placenta. This organ serves as the lifeline between the mother and the fetus, exchanging waste, oxygen, and nutrients.

• Hormonal Regulation:

• Progesterone is the key hormone responsible for maintaining the thickened uterine lining. If fertilisation does not occur, the levels of progesterone and estrogen drop significantly.

• This hormonal decline triggers the breakdown of the endometrium, leading to menstruation, which marks day 1 of a new cycle.

• Anatomy and Features:

• The endometrium is highly vascularized, meaning it contains a dense network of capillaries to ensure the embryo has immediate access to the mother's blood supply upon attachment.

Q15. Answer: (b) The force exerted by A on B is equal and opposite to the force exerted by B on A.

The correct answer is The force exerted by A on B is equal and opposite to the force exerted by B on A.

Key Points

• This observation is a classic demonstration of Newton's Third Law of Motion, which states that for every action, there is an equal and opposite reaction.

• When a force is applied to the free end of spring balance A, it exerts a force on spring balance B. This is the action force. Simultaneously, spring balance B exerts a force of equal magnitude but in the opposite direction back on spring balance A. This is the reaction force.

• The fact that both balances show the same reading indicates that the magnitude of the force exerted by A on B is exactly equal to the magnitude of the force exerted by B on A. Hence, statement 2 is correct.

• The force exerted by A on B cannot be greater than the force exerted by B on A, as this would violate the fundamental principles of mechanics and symmetry in physical interactions. Hence, statement 1 is incorrect.

• In an action-reaction pair, the forces always act in opposite directions along the same line of action; they can never act in the same direction. Hence, statement 3 is incorrect.

• According to the laws of physics, forces always exist in pairs. It is impossible for spring balance A to exert a force on B without B

exerting an equivalent reaction force back on A. Hence, statement 4 is incorrect.

Additional Information

• Newton's Third Law of Motion:

• Formulated by Sir Isaac Newton in 1687 in his work Philosophiæ Naturalis Principia Mathematica.

• The law implies that forces always result from interactions between two different bodies.

• Action and reaction forces act on different objects, which is why they do not cancel each other out to result in zero net force on a single object.

• Spring Balance Mechanism:

• A spring balance (or Newton meter) works on the principle of Hooke's Law, which states that the extension of a spring is directly proportional to the load or force applied to it (F = kx).

• It measures tension. In this setup, the tension throughout the connected system is uniform, leading to identical readings on both scales.

• Practical Examples of Newton's Third Law:

• Recoil of a Gun: When a bullet is fired (action), the gun moves backward (reaction).

• Walking: When we walk, we push the ground backward (action), and the ground pushes us forward (reaction).

• Rocket Propulsion: The exhaust gases pushed out of the back (action) create a thrust that moves the rocket forward (reaction).

Important Points

• Nature of Interaction: In the given scenario, the rigid support plays a crucial role. It provides the necessary pulling force on spring balance B, which allows the tension to be maintained across the entire chain.

• Magnitude and Direction: Action and reaction are always simultaneous. There is no time lag between the action and the reaction.

• Force Units: The reading on the spring balance is typically measured in Newtons (N), which is the SI unit of force, or sometimes in kilogram-force (kgf). 1 kgf is approximately equal to 9.8 Newtons.

• Tension in Strings/Springs: If the springs are considered massless, the tension remains constant at every point in the system, ensuring that the internal forces between balance A and B are perfectly balanced.

Q16. Answer: (c) Removes the hardness of water

The correct answer is Removes the hardness of water.

Key Points

• Washing soda, chemically known as Sodium carbonate decahydrate ($Na_2CO_3.10H_2O$), is a crystalline solid that is widely used for domestic and industrial purposes.

• One of its most significant applications is that it removes the permanent hardness of water. Hardness in water is caused by the presence of calcium and magnesium salts; washing soda reacts with these soluble salts to form insoluble carbonates, which can then be easily removed. Hence, statement 3 is correct.

• Washing soda is not typically used in cooking. For culinary purposes, Sodium bicarbonate ($NaHCO_3$), also known as baking soda, is used to make food fluffy and soft. Hence, statement 1 is incorrect.

• While it is used in water treatment, its specific chemical function is the removal of calcium and magnesium ions rather than general "treatment of hot water" in a broad sense. Hence, statement 2 is incorrect.

• It is not used to kill bacteria in water. Chemicals like Chlorine, Potassium permanganate, or Bleaching powder (Calcium oxychloride) are used as disinfectants to kill germs and bacteria in drinking water. Hence, statement 4 is incorrect.

• Hence, the correct answer is Removes the hardness of water.

Additional Information

• Chemical Properties and Synthesis:

• Washing soda is produced via the Solvay process, which involves the reaction of sodium chloride, ammonia, and carbon dioxide in water.

• The anhydrous form of sodium carbonate (Na_2CO_3) is known as soda ash.

• It is a basic salt, meaning it turns red litmus paper to blue when dissolved in water.

• Industrial Applications:

• It is a key ingredient in the glass, soap, and paper industries. In glass manufacturing, it acts as a flux for silica, lowering the melting point of the mixture.

• It is used in the manufacture of various sodium compounds, such as Borax ($Na_2B_4O_7.10H_2O$).

• It serves as a powerful cleaning agent for domestic laundry because it helps emulsify grease and oils.

• Removal of Hardness:

• Permanent hardness is caused by chlorides and sulfates of magnesium and calcium. Since these cannot be removed by boiling, Sodium carbonate is added to precipitate the metal ions as insoluble carbonates.

• The reaction can be represented as: $MCl_2 + Na_2CO_3 \rightarrow MCO_3$ (precipitate) + 2NaCl (where M is Calcium or Magnesium).

Important Points

• Efflorescence: When washing soda crystals (the decahydrate form) are exposed to air, they lose nine molecules of water of crystallization to form a monohydrate ($Na_2CO_3.H_2O$). This process of losing water molecules is called efflorescence.

• Difference from Baking Soda: It is crucial to distinguish between Washing Soda (Na_2CO_3) and Baking Soda ($NaHCO_3$). While both are sodium salts, baking soda is safe for ingestion and used in fire extinguishers, whereas washing soda is primarily for cleaning and industrial use.

• Water Softening: In many detergent formulations, sodium carbonate is included to prevent the calcium and magnesium ions from interfering with the action of the surfactant, ensuring the soap can lather effectively even in hard water areas.

Q17. Answer: (b) Tetravalency and catenation

The correct answer is Tetravalency and catenation.

Key Points

• Catenation is the unique property of carbon atoms to form covalent bonds with other carbon atoms, resulting in long chains, branched chains, or closed rings. This ability is due to the very strong carbon-carbon bond energy. Hence, statement 2 is correct regarding catenation.

• Tetravalency refers to the fact that carbon has 4 valence electrons in its outermost shell. This allows a single carbon atom to form four chemical bonds with other atoms like hydrogen, oxygen, nitrogen, or sulfur. Hence, statement 2 is correct regarding tetravalency.

• The small size of the carbon atom allows its nucleus to hold the shared pairs of electrons strongly. This results in the formation of exceptionally stable and strong bonds, which is a major factor in the existence of a vast number of carbon compounds.

• Carbon primarily forms covalent bonds rather than ionic bonds. This is because carbon has 4 electrons in its valence shell, and losing or gaining 4 electrons would require a massive amount of energy. Hence, statement 1 is incorrect.

• Carbon is a non-metal and has a relatively low atomic mass of 12 and a small atomic size. These properties are opposite to what is suggested in some incorrect options. Hence, statements 3 and 4 are incorrect.

Additional Information

• Organic Chemistry: This is the dedicated branch of chemistry that deals with the study of carbon and its compounds. Today, millions of organic compounds are known to scientists, far exceeding the number of compounds formed by all other elements combined.

• Isomerism: Due to its unique bonding capabilities, carbon compounds often exhibit isomerism, where molecules have the same chemical formula but different structural arrangements, further increasing the diversity of carbon structures.

• Atomic Properties: Carbon has the atomic number 6 and its electronic configuration is 2, 4. It belongs to Group 14 and Period 2 of the Modern Periodic Table.

• Allotropes of Carbon: Carbon exists in various forms in nature called allotropes. The most common ones include Diamond (the hardest natural substance), Graphite (a good conductor of electricity), and Buckminsterfullerene (a spherical molecule with 60 carbon atoms).

• Functional Groups: Carbon chains can be attached to various functional groups such as alcohol (-OH), aldehyde (-CHO), carboxylic acid (-COOH), and ketones (>C=O), which determine the chemical properties of the resulting organic compounds.

Important Points

• The C-C bond energy is approximately 348 kJ/mol, which is significantly higher compared to other elements like Silicon (approx. 297 kJ/mol), explaining why carbon shows the highest degree of catenation.

• Hydrocarbons are the simplest carbon compounds, consisting only of carbon and hydrogen. They are classified into Saturated (alkanes) and Unsaturated (alkenes and alkynes) based on the presence of single, double, or triple bonds.

• In 2024, carbon remains the backbone of life and biotechnology, as it is found in DNA, proteins, carbohydrates, and fats.

Q18. Answer: (a) It is always attractive in nature.

The correct answer is It is always attractive in nature.

Key Points

• Gravitational force is a fundamental force of nature that acts between any two objects with mass. According to Newton's Law of Universal Gravitation, every particle in the universe attracts every other particle with a force that is directly proportional to the product of their masses and inversely proportional to the square of the distance between them.

• Statement 1: It is always attractive in nature. Gravity is purely a pull force; unlike magnetic or electric forces, it never pushes objects apart. Every object with mass exerts a gravitational pull on every other object. Hence, statement 1 is correct.

• Statement 2: It depends on the medium between the objects. This is false because the Universal Gravitational Constant (G) is independent of the nature of the intervening medium. Whether two objects are in a vacuum, water, or air, the gravitational force between them remains the same. Hence, statement 2 is incorrect.

• Statement 3: It can be both attractive and repulsive. In classical physics, gravity has no repulsive component. It only serves to bring masses together. Repulsion is a characteristic of electrostatic forces (between like charges) and magnetic forces (between

like poles). Hence, statement 3 is incorrect.

• Statement 4: It depends on the charge of the objects. Gravitational force is determined strictly by mass and distance. It does not matter if an object is positively charged, negatively charged, or neutral; its gravitational influence depends only on its mass content. Hence, statement 4 is incorrect.

• The mathematical expression for this force is F = G(m1m2)/r^2, where F is the force, m1 and m2 are the masses, r is the distance between their centers, and G is the Gravitational Constant.

Additional Information

• Universal Gravitational Constant (G): The value of G was first experimentally determined by Henry Cavendish in 1798. Its accepted value is approximately 6.674 x 10^-11 N m^2/kg^2. Because this value is so small, gravitational force is only easily observable when at least one of the objects has a massive scale, such as a planet or a star.

• Weakest Fundamental Force: Despite its role in holding galaxies together, gravity is the weakest of the four fundamental forces (the others being electromagnetism, the strong nuclear force, and the weak nuclear force). For instance, the electromagnetic attraction between an electron and a proton is significantly stronger than their gravitational attraction.

• Central and Conservative Force: Gravity is a central force, meaning it acts along the line joining the centers of the two bodies. It is also a conservative force, which implies that the work done by gravity on an object is independent of the path taken and depends only on the initial and final positions.

• Long-Range Force: Gravity is a long-range force that exists between objects regardless of how far apart they are. It follows the inverse-square law, meaning the force decreases rapidly as distance increases, but theoretically, it never reaches zero.

Important Points

• Difference between 'G' and 'g': While G is a universal constant that stays the same everywhere in the universe, g (acceleration due to gravity) is a variable. On Earth, the average value of g is 9.8 m/s^2, but it changes depending on the altitude, latitude, and the mass of the celestial body (e.g., g on the Moon is about 1/6th of that on Earth).

• Weight vs. Mass: Mass is the amount of matter in an object and is constant everywhere. Weight is the gravitational force acting on that mass (Weight = mass x g). Therefore, your weight would change on different planets, but your mass would remain the same.

• Role in the Universe: Gravitational force is responsible for the formation of stars, planets, and galaxies. It causes the tides in the oceans (due to the Moon's pull) and keeps the Earth in orbit around the Sun.

Q19. Answer: (a) The work done by the force exerted by the nail on the hammer.

The correct answer is The work done by the force exerted by the nail on the hammer.

Key Points

• Work Done in physics is defined as the product of the component of the Force in the direction of the displacement and the magnitude of this Displacement. It is mathematically expressed as W = Fs cos(θ), where θ is the angle between the force and displacement vectors.

• Negative Work occurs when the Force acting on an object and the Displacement of that object are in opposite directions. This happens when the angle θ is 180 degrees, making the Cosine value -1.

• In the given scenario, according to Newton's Third Law of Motion, when the hammer exerts a force on the nail (action), the Nail exerts an equal and opposite Reaction Force on the hammer (reaction).

• As the hammer moves Downward (displacement), the force exerted by the nail on the hammer is directed Upward. Since the force and displacement are in opposite directions, the work done by the nail on the hammer is Negative. Hence, statement 1 is correct.

• The Force of Gravity acts Downward on the hammer. As the hammer falls Downward, the force and displacement are in the same direction. This results in Positive Work. Hence, statement 3 is incorrect.

• Similarly, the Force of Gravity acts Downward on the nail. As the nail moves Downward into the wood, the force and displacement are in the same direction, resulting in Positive Work. Hence, statement 4 is incorrect.

Additional Information

• Positive Work: This occurs when the force has a component in the direction of the displacement (0 ≤ θ < 90 degrees). A common example is a horse pulling a cart or Gravity doing work on a falling body.

• Zero Work: Work done is zero if the Displacement is zero, the Force is zero, or if the force and displacement are Perpendicular to each other (θ = 90 degrees). For example, a person carrying a heavy box on their head while walking horizontally does Zero Work against gravity because the force (upward) is perpendicular to the motion (horizontal).

• Units of Work: The SI unit of work is the Joule (J). One Joule is defined as the work done by a force of 1 Newton causing a displacement of 1 Meter. In CGS units, it is measured in Ergs.

• Work-Energy Theorem: This theorem states that the net Work Done on an object is equal to the change in its Kinetic Energy. If negative work is done on an object (like the nail pushing against the hammer), the object's Kinetic Energy decreases, causing it to slow down or stop.

Important Points

• Frictional Force: Friction is a classic example of a force that often does Negative Work because it usually acts in a direction Opposite to the motion of the object.

• Conservative Forces: Gravitational Force and Electrostatic Force are examples of conservative forces where the work done depends only on the Initial and Final Positions and not the path taken.

• Potential Energy: When the hammer is "raised," work is done against gravity to store Gravitational Potential Energy. This energy is converted into Kinetic Energy as the hammer falls to hit the nail.

• Nature of Work: Work is a Scalar Quantity, meaning it has magnitude but no specific direction, even though it is calculated using Vector components like force and displacement.

Q20. Answer: (d) ν T = 1

The correct answer is ν T = 1.

Key Points

• Frequency (ν) is defined as the number of complete oscillations or cycles of a wave that occur in a unit of time (usually one second).

• Time Period (T) is defined as the time taken by a wave to complete one full cycle or oscillation.

• The relationship between frequency and time period is reciprocal. This means that as the time period of a wave increases, its frequency decreases, and vice versa.

• Mathematically, this relationship is expressed as ν = 1/T. When we rearrange this equation by multiplying both sides by T, we get the product ν T = 1. Hence, statement 4 is correct.

• If the relationship was ν T = 0, it would imply that either the frequency or the time duration is zero, which is not possible for a physical wave. Hence, statement 1 is incorrect.

• The expression ν / T = 1 suggests that frequency and time period are directly proportional and equal, which contradicts the laws of physics. Hence, statement 2 is incorrect.

• The expression ν + T = 1 is incorrect because frequency (1/s) and time (s) have different physical dimensions and cannot be added together in a standard physical equation. Hence, statement 3 is incorrect.

Additional Information

• SI Units: The SI unit of frequency is the Hertz (Hz), named after the German physicist Heinrich Rudolf Hertz. 1 Hz is equal to 1 cycle per second. The unit of the Time Period is the second (s).

• Wave Speed Formula: The speed of a wave is determined by its frequency and wavelength (λ), represented by the formula Speed = ν × λ.

• Angular Frequency: In many physics applications, angular frequency (ω) is used, which is related to frequency by the formula ω = 2πν or ω = 2π/T. It is measured in radians per second.

• Audible Range: For a human ear, the standard audible frequency range is between 20 Hz and 20,000 Hz. A frequency of 20 Hz corresponds to a Time Period of 0.05 seconds.

• Dimensional Analysis: In dimensional formulas, Time (T) has the dimension [T], and Frequency (ν) has the dimension [T^-¹]. Their product results in a dimensionless constant of 1.

Important Points

• Inverse Relationship: A high-frequency wave (like Ultraviolet rays) has a very short time period, whereas a low-frequency wave (like Radio waves) has a long time period.

• Periodic Motion: This relationship is fundamental to all types of periodic motion, including the movement of a simple pendulum, the vibration of a guitar string, and electromagnetic radiation.

• Practical Application: In electronics, the clock speed of a processor is measured in Gigahertz (GHz). A 1 GHz processor completes 1,000,000,000 cycles in one second, meaning the Time Period for a single cycle is 1 nanosecond (10^-^9 s).

Q21. Answer: (a) Diffusion becomes insufficient.

The correct answer is Diffusion becomes insufficient..

Key Points

• In plants with small body designs, energy and raw materials can easily move to all parts of the plant body through the process of diffusion.

• However, if the distance between the roots and the leaves becomes large—which occurs as the plant grows in size and complexity—the process of diffusion becomes insufficient to provide raw materials to the leaves and energy to the roots. Hence, statement 1 is correct.

• Diffusion is a passive, relatively slow process that works efficiently only over short distances (cellular level or across a few cells). It cannot meet the high metabolic demands of large multicellular organisms like tall trees. Hence, statement 2 is incorrect.

• To overcome this limitation, plants have evolved a dedicated transportation system consisting of vascular tissues to move substances over long distances.

• While the distance increases, the roots continue to absorb water; however, without a specialized system, that water would never reach the canopy. Hence, statement 3 is incorrect.

• The production of chlorophyll is primarily dependent on light availability, genetics, and mineral nutrients (like Magnesium and Iron) rather than the physical distance between plant organs. Hence, statement 4 is incorrect.

Additional Information

• Vascular System in Plants:

• To manage long-distance transport, plants utilize two specialized tissues: Xylem and Phloem.

• Xylem is responsible for the unidirectional transport of water and minerals from the roots to the leaves. It consists of tracheids and vessels which form a continuous system of water-conducting channels.

• Phloem facilitates translocation, which is the movement of soluble products of photosynthesis (like sucrose and amino acids) from the leaves to storage organs and growing parts of the plant. This transport is bidirectional.

• Mechanism of Water Movement:

• At the roots, cells in contact with the soil actively take up ions, creating a concentration gradient that pulls water into the root (Root Pressure).

• For very tall plants, transpiration pull acts as the main driving force. As water evaporates through the stomata in the leaves, it creates a suction that pulls water columns upward through the xylem.

Important Points

• Energy Needs: Large plants have a high proportion of dead cells (in tissues like xylem), which results in relatively low energy needs compared to animals, allowing them to survive with slower transport systems despite the large distances.

• Diffusion vs. Bulk Flow: Diffusion relies on random molecular motion, whereas the transport in vascular plants is a bulk flow or mass flow system driven by pressure differences.

• Distance Impact: If a plant relied solely on diffusion to transport water, it is estimated that it would take years for a single molecule of water to travel from the roots to the top of a tall tree.

Q22. Answer: (b) combination reaction

The correct answer is combination reaction.

Key Points

• A combination reaction, also known as a synthesis reaction, is a process where two or more elements or compounds react to form a single new substance. Hence, the correct answer is combination reaction.

• The general chemical representation for this type of reaction is A + B → AB, where A and B are the reactants and AB is the sole product.

• These reactions are predominantly exothermic in nature because the formation of new chemical bonds typically releases energy in the form of heat or light.

• A classic example is the burning of coal, where solid Carbon (C) reacts with Oxygen (O_2) from the air to produce Carbon Dioxide (CO_2) gas.

• Another common instance is the reaction between Quicklime (Calcium Oxide, CaO) and water (H_2O) to form Slaked Lime (Calcium Hydroxide, $Ca(OH)_2$), which is characterized by the evolution of a large amount of heat.

Additional Information

• Decomposition Reaction:

• This is the opposite of a combination reaction, where a single reactant breaks down into two or more simpler products.

• It usually requires energy in the form of heat, light, or electricity to break the existing bonds. For example, Calcium Carbonate ($CaCO_3$) decomposes into Calcium Oxide (CaO) and Carbon Dioxide (CO_2) when heated. Hence, statement 1 is incorrect.

• Displacement Reaction:

• In this reaction, a more reactive element displaces or removes a less reactive element from its compound or salt solution.

• A well-known example is Iron (Fe) reacting with Copper Sulfate ($CuSO_4$) solution, where Iron displaces Copper to form Iron Sulfate ($FeSO_4$) and solid Copper. Hence, statement 4 is incorrect.

• Double Displacement Reaction:

• This involves an exchange of ions between two compounds to form two new substances.

• Often, one of the products is a precipitate (an insoluble solid). For example, Sodium Sulfate (Na_2SO_4) reacts with Barium Chloride ($BaCl_2$) to form Barium Sulfate ($BaSO_4$) precipitate and Sodium Chloride (NaCl). Hence, statement 3 is incorrect.

Important Points

• Industrial Applications: Combination reactions are vital in the Haber Process for the industrial production of Ammonia (NH_3), where Nitrogen and Hydrogen gases combine under high pressure and temperature.

• Nature of Reactants: Combination reactions can occur between two elements (like H_2 and O_2), two compounds (like CaO and H_2O), or an element and a compound (like CO and O_2).

• Oxidation-Reduction (Redox): Many combination reactions are also Redox reactions, where there is a simultaneous loss and gain of electrons between the reacting species.

• Law of Conservation of Mass: In every chemical reaction, including combination reactions, the total mass of the reactants must equal the total mass of the products, necessitating the balancing of chemical equations.

Q23. Answer: (b) No fixed shape, fixed volume

The correct answer is No fixed shape, fixed volume.

Key Points

• Matter in the liquid state is characterized by its ability to flow and change shape, but it maintains a constant volume under consistent temperature and pressure.

• A liquid has no fixed shape because the kinetic energy of its particles is high enough to overcome the rigid bonds seen in solids. This allows particles to slide past one another, meaning the liquid takes the shape of whatever container it occupies.

• Liquids possess a fixed volume because the intermolecular forces of attraction are still strong enough to keep the particles close together. Unlike gases, the particles in a liquid do not have enough energy to completely escape the attraction of their neighbors.

• Because the particles are packed closely, liquids have very low compressibility. This means that even under high pressure, the volume of a liquid remains virtually unchanged.

• Liquids are often described as fluids, a category they share with gases, due to their shared property of fluidity (the ability to flow).

Additional Information

• Solid State:

• Solids have a fixed shape and a fixed volume.

• The particles are held together by very strong intermolecular forces in a lattice structure, which prevents them from moving out of fixed positions.

• They exhibit high density and are incompressible.

• Gaseous State:

• Gases have no fixed shape and no fixed volume.

• Particles move randomly at high velocities because intermolecular forces are almost negligible.

• Gases will expand to fill the entire volume of any container and are highly compressible.

• Specific Properties of Liquids:

• Surface Tension: This is the force that causes the surface of a liquid to act like a stretched elastic sheet. It is caused by cohesive forces between molecules.

• Viscosity: This refers to a liquid's resistance to flow. For example, glycerin or honey has a higher viscosity than water.

• Diffusion: Liquids undergo diffusion, where particles mix due to their kinetic motion. The rate of diffusion in liquids is slower than in gases but faster than in solids.

• Phase Changes:

• Vaporization: The process of a liquid changing into a gas when heat is added.

• Freezing: The process of a liquid changing into a solid when energy is removed, reaching the freezing point (e.g., 0°C for water).

Important Points

• While water is the most common liquid on Earth, other substances like mercury are liquid at room temperature (approx 25°C).

• The density of a liquid is generally lower than that of its solid form, with the notable anomaly of water, where ice is less dense than liquid water due to hydrogen bonding.

• The Boiling Point is the specific temperature at which the vapor pressure of the liquid equals the external atmospheric pressure.

• Pascal's Law relates to liquids, stating that pressure applied to an enclosed fluid is transmitted undiminished to every portion of the fluid.

Q24. Answer: (c) Right-Hand Thumb rule

The correct answer is Right-Hand Thumb rule.

Key Points

• The Right-Hand Thumb rule, also known as Maxwell’s Corkscrew Rule, is the fundamental principle used to determine the direction of the magnetic field associated with a current-carrying conductor, including a circular loop.

• According to this rule, if you imagine holding a current-carrying straight conductor in your right hand such that the thumb points in the direction of the current, then your fingers will wrap around the conductor in the direction of the field lines of the magnetic field.

• When applied to a circular loop, every section of the wire generates magnetic field lines in the form of concentric circles. By applying the Right-Hand Thumb rule to any segment of the loop, one can see that the field lines inside the loop all point in the same direction.

• At the center of the circular loop, these magnetic field lines appear as straight lines. The strength of the magnetic field produced

YourMockTest.com – Free Study Material

is directly proportional to the amount of current flowing through the loop and the number of turns in the coil.

• The direction of the magnetic field depends on the direction of the current; if the current flows in a clockwise direction, the magnetic field enters the face of the loop (acting as a South Pole), and if it flows anticlockwise, the field emerges from it (acting as a North Pole).

Additional Information

• Fleming's Left-Hand Rule:

• This rule is primarily used to find the direction of the magnetic force acting on a moving charge or a current-carrying wire placed in an external magnetic field.

• It is the working principle behind electric motors.

• The thumb represents the direction of the force (motion), the forefinger represents the magnetic field, and the middle finger represents the current.

• Fleming's Right-Hand Rule:

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

• It is the fundamental principle for electric generators.

• The thumb points in the direction of the motion of the conductor, the forefinger in the direction of the magnetic field, and the middle finger indicates the direction of the induced current.

• Magnetic Field of a Solenoid:

• A solenoid is a long coil containing a large number of close turns of insulated copper wire.

• The magnetic field produced by a solenoid is similar to that of a bar magnet, with one end behaving as a magnetic North pole and the other as a magnetic South pole.

• The Right-Hand Thumb rule is also used here to visualize the field lines looping through the center of the coil.

• SI Units and Constants:

• The SI unit of magnetic field strength (magnetic flux density) is the Tesla (T).

• The magnetic effect of current was first discovered by H.C. Oersted in 1820, proving the link between electricity and magnetism.

Q25. Answer: (d) Human

The correct answer is Human.

Key Points

• The phenomenon of the progressive increase in the concentration of a non-biodegradable toxicant at each successive trophic level is known as Biological Magnification or Biomagnification.

• DDT (Dichlorodiphenyltrichloroethane) is a well-known non-biodegradable pesticide that is fat-soluble and cannot be metabolized or excreted by organisms effectively.

• In a typical food chain, the concentration of DDT increases as it moves from producers to top consumers.

• Grass: Being a producer (Trophic Level 1), it contains the lowest concentration of the chemical as it absorbs it from the soil or water. Hence, this option is incorrect for maximum concentration.

• Goat: As a primary consumer (Trophic Level 2) that feeds on grass, the concentration of DDT increases in its body tissues compared to the grass. Hence, this option is incorrect.

• Spider: Usually acting as a secondary consumer (Trophic Level 3) or predator, it would have a higher concentration than its prey, but still lower than top-tier predators. Hence, this option is incorrect.

• Human: Humans generally occupy the top trophic level in most food webs (as tertiary or quaternary consumers). Because they consume products from various lower levels (like goats or plants), the accumulated DDT reaches its maximum concentration in their bodies. Hence, the statement that humans accumulate the maximum concentration is correct.

• Since DDT is not excreted, it gets stored in the fatty tissues of the organisms, leading to severe physiological issues at higher levels.

Additional Information

• Bioaccumulation vs. Biomagnification:

• Bioaccumulation refers to the increase in the concentration of a substance in a single organism over time.

• Biomagnification refers to the increase in concentration as the substance is passed up the food chain from one trophic level to the next.

• Characteristics of DDT: It was first synthesized in 1874, but its insecticidal properties were discovered by Paul Hermann Müller in 1939 (who received a Nobel Prize in 1948). It is highly persistent in the environment, meaning it does not break down easily for decades.

• Environmental Impact: High concentrations of DDT in birds interfere with calcium metabolism, leading to the thinning of eggshells and premature breaking, which caused a decline in bird populations like the Bald Eagle and Peregrine Falcon.

• Silent Spring: The book Silent Spring, written by Rachel Carson in 1962, played a crucial role in highlighting the dangers of DDT,

eventually leading to its ban for agricultural use in the United States in 1972 and subsequently in many other countries under the Stockholm Convention.

• Human Health Effects: Long-term exposure to high levels of DDT in Humans is linked to endocrine disruption, reproductive issues, and potential carcinogenic effects.

Important Points

• Trophic Levels: In an ecosystem, energy flows from Producers to Herbivores and then to Carnivores. While energy decreases at each level (following the 10% Law), the concentration of non-biodegradable pollutants increases.

• Factors required for Biomagnification: The pollutant must be long-lived, mobile, soluble in fats (lipophilic), and biologically active.

• Current Status: Although banned for agriculture, DDT is still used in some countries for vector control to combat diseases like Malaria and Leishmaniasis under World Health Organization (WHO) guidelines.

Q26. Answer: (a) 15 km/h

Shortcut Trick

When the distance traveled is the same for both speeds, use the Harmonic Mean formula.

Average Speed = (2 × x × y) ÷ (x + y)

Average Speed = (2 × 20 × 12) ÷ (20 + 12) = 480 ÷ 32 = 15 km/h.

Therefore The correct answer is 15 km/h.

Alternate Method

Given: Speed to school (x) = 20 km/h, Speed coming back (y) = 12 km/h.

Formula Used: Average Speed = Total Distance ÷ Total Time

=> Let the distance between home and school be D.

=> Total distance = D + D = 2D

=> Time taken to go (t1) = D ÷ 20

=> Time taken to return (t2) = D ÷ 12

=> Total Time = (D/20) + (D/12) = (3D + 5D) ÷ 60 = 8D/60

=> Average Speed = 2D ÷ (8D/60) = (2D × 60) ÷ 8D = 120 ÷ 8

=> Average Speed = 15 km/h

Therefore The correct answer is 15 km/h.

Additional Information

Average Speed for Different Distances

If the distances are different, use the basic formula: (Total Distance) ÷ (Total Time taken for all segments).

Three Equal Distances

If a journey is covered in three equal parts at speeds u, v, and w, Average Speed = (3uvw) ÷ (uv + vw + wu).

Relative Speed

If two bodies move in the same direction, relative speed = S1 − S2. If in opposite directions, relative speed = S1 + S2.

Q27. Answer: (d) 221

Shortcut Trick

Fourth Proportion Rule: Product of Means = Product of Extremes

Given values: 17, X, 7, 91 are in proportion.

=> 17 × 91 = X × 7

=> X = (17 × 91) ÷ 7 = 17 × 13 = 221

Therefore The correct answer is 221.

Alternate Method

Given: First term (a) = 17, Second term (b) = X, Third term (c) = 7, Fourth term (d) = 91.

Formula Used: a ÷ b = c ÷ d

=> 17 ÷ X = 7 ÷ 91

=> 17 ÷ X = 1 ÷ 13

=> X = 17 × 13

=> X = 221

Therefore The correct answer is 221.

Additional Information

Fourth Proportion

If four quantities a, b, c, d are such that a : b = c : d, then d is called the fourth proportion to a, b, and c.

Third Proportion

If a, b, c are in continued proportion such that a : b = b : c, then c is the third proportion, given by $c = b^2 \div a$.

Mean Proportion

The mean proportion between two numbers a and b is $\sqrt{(a \times b)}$.

Q28. Answer: (c) 25%

Shortcut Trick

Ratio of Cost Price (CP) to Selling Price (SP) = 40 : 50 = 4 : 5.

Profit units = 5 − 4 = 1 unit.

Profit % = (Profit units ÷ CP units) × 100 = (1 ÷ 4) × 100 = 25%.

Therefore The correct answer is 25%.

Alternate Method

Given: Cost Price (CP) = Rs. 40, Selling Price (SP) = Rs. 50.

Formulas: Profit = SP − CP | Profit % = (Profit ÷ CP) × 100

=> Profit = 50 − 40 = Rs. 10.

=> Profit % = (10 ÷ 40) × 100.

=> Profit % = (1 ÷ 4) × 100 = 25%.

Therefore The correct answer is 25%.

Additional Information

Profit and Loss Basics

Profit occurs when Selling Price (SP) is greater than Cost Price (CP). Formula: Profit = SP − CP.

Loss Calculation

Loss occurs when Cost Price (CP) is greater than Selling Price (SP). Formula: Loss % = (Loss ÷ CP) × 100.

Q29. Answer: (c) 80

Shortcut Trick

Assume all 150 questions were correct: Total marks = 150 × 4 = 600 marks.

Actual marks scored = 250 marks. Difference = 600 − 250 = 350 marks.

Penalty per wrong answer = 4 (loss of mark) + 1 (negative mark) = 5 marks.

Number of wrong questions = 350 ÷ 5 = 70.

Number of correct questions = 150 − 70 = 80.

Therefore The correct answer is 80.

Alternate Method

Given: Total questions = 150, Correct marks = 4, Wrong marks = −1, Total score = 250.

Formula Used: Total Marks = (Correct × 4) − (Wrong × 1)

=> Let Correct questions be x and Wrong questions be (150 − x).

=> 4x − 1(150 − x) = 250

=> 4x − 150 + x = 250

=> 5x = 400

=> x = 80

Therefore The correct answer is 80.

Additional Information

Alligation Method

Average marks per question = 250 ÷ 150 = 5/3. Using alligation between +4 and −1 gives the ratio of questions.

Negative Marking Impact

Every wrong answer reduces the potential score by (Positive Marks + Absolute Negative Marks).

Score Calculation

Total Score = $N_c \times M_c - N_w \times M_w$ where N is count and M is marks per question.

Q30. Answer: (b) 18

Shortcut Trick

Let Total Work (LCM of 6, 9, 12) = 36 units.

Efficiencies: A = 6, B = 4, C = −3. Combined (A+B+C) = 7 units/hr.

Work done in 1.5 hrs: Total = 7 × 1.5 = 10.5 units; Pipe C = |−3 × 1.5| = 4.5 units.

Ratio of C's work to total work: (4.5 ÷ 10.5) × 100 = (3/7) × 100 = 300/7%.

Comparing with x/7%, we get x = 300. Factors of 300 = $2^2 \times 3^1 \times 5^2$ → (2+1)(1+1)(2+1) = 18.

Therefore The correct answer is 18.

Alternate Method

Pipe	Time (hrs)	Total Work (units)	Efficiency (units/hr)
Pipe A	6	36	6
Pipe B	9	4	
Pipe C (Outlet)	12	−3	

Calculations:

=> Net efficiency of (A + B + C) = 6 + 4 − 3 = 7 units/hr

=> Work done by all three in 1.5 hours = 7 × 1.5 = 10.5 units

=> Work done (magnitude) by Pipe C in 1.5 hours = 3 × 1.5 = 4.5 units

=> Percentage of C's work relative to total = (4.5 ÷ 10.5) × 100

=> Percentage = (45 ÷ 105) × 100 = (3 ÷ 7) × 100 = 300/7 %

=> Given percentage = x/7 %, therefore x = 300

=> Prime factorization of 300 = $2^2 \times 3^1 \times 5^2$

=> Number of factors = (2 + 1) × (1 + 1) × (2 + 1) = 3 × 2 × 3 = 18

Therefore The correct answer is 18.

Additional Information

Total Number of Factors

If a number N = p^a × q^b × r^c where p, q, r are prime factors, then the total number of factors is (a+1)(b+1)(c+1).

Efficiency Concept in Pipes

Inlet pipe efficiency is positive (+), and outlet pipe (leak) efficiency is negative (−). Net work is the algebraic sum of efficiencies.

LCM Method

Total capacity of the tank is assumed as the Least Common Multiple (LCM) of individual times to simplify unit calculations.

Q31. Answer: (b) Two successive discounts of 43% and 38%

Shortcut Trick

To gain the maximum advantage, Dolly should choose the option with the highest equivalent discount percentage.

Successive discounts formula: a + b − (a × b ÷ 100).

Option 1: 7 + 7 − 0.49 = 13.51% | Option 3: 21 + 21 − 4.41 = 37.59%.

Option 4: Single discount = 47%.

Option 2: 43 + 38 − (43 × 38 ÷ 100) = 81 − 16.34 = 64.66%.

Comparing 13.51%, 64.66%, 37.59%, and 47%, the value 64.66% is the highest.

Therefore The correct answer is Two successive discounts of 43% and 38%.

Alternate Method

Given → Marked Price (MP) = Rs. 5,300.

Formulas: Successive Discount = a + b − (ab ÷ 100) | Net Discount % = (Total Discount ÷ MP) × 100.

=> Calculate effective discount for Option 2: 43 + 38 − (43 × 38)/100.

=> 81 − (1634/100) = 81 − 16.34 = 64.66%.

=> Calculate effective discount for Option 3: 21 + 21 − (21 × 21)/100 = 42 − 4.41 = 37.59%.

=> Comparing all options, Option 2 offers the maximum discount.

Therefore The correct answer is Two successive discounts of 43% and 38%.

Additional Information

Successive Discounts

When a series of discounts are applied one after another, the net discount is always less than the sum of individual percentages due to the reducing base.

Maximum Advantage

YourMockTest.com — Free Study Material

For a buyer, the best option is the one that results in the lowest Selling Price (SP), which occurs at the highest Effective Discount Rate.

Q32. Answer: (c) 10 seconds

Shortcut Trick

Relative Speed (Opposite Direction) = S1 + S2 = 90 + 60 = 150 km/h.

Convert speed to m/s: 150 × (5/18) = 125/3 m/s.

Total Distance = Length_A + Length_B = 250 + 150 = 400 m.

Time = 400 ÷ (125/3) = (400 × 3) ÷ 125 = 1200 ÷ 125 = 9.6 seconds.

Therefore The correct answer is 10 sec.

Alternate Method

Given: Length of Train A = 250 m, Length of Train B = 150 m, Speed of A = 90 km/h, Speed of B = 60 km/h.

Formula Used: Time = (Total Distance) ÷ (Relative Speed)

=> Total Distance = 250 + 150 = 400 m

=> Relative Speed = 90 + 60 = 150 km/h

=> Relative Speed in m/s = 150 × (5/18) = 41.67 m/s

=> Time taken = 400 ÷ 41.67 ≈ 9.6 seconds

=> Rounding off to nearest seconds ≈ 10 seconds

Therefore The correct answer is 10 sec.

Additional Information

Relative Speed Concept

When two objects move in opposite directions, relative speed is the sum of their speeds (S1 + S2). In the same direction, it is the difference (S1 − S2).

Unit Conversion

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

Crossing Objects

When a train crosses another train or a bridge, total distance is the sum of lengths of both objects.

Q33. Answer: (a) 80,000

Shortcut Trick

Income ratio = 5 : 9, Expenditure ratio = 1 : 3.

Difference in income parts = 9 − 5 = 4; Difference in expenditure parts = 3 − 1 = 2.

To equalize savings, multiply expenditure ratio by 2 → 2 : 6.

Savings (parts) = 5 − 2 = 3 parts. Given 3 parts = Rs. 48,000 → 1 part = Rs. 16,000.

Manjit income = 5 parts = 5 × Rs. 16,000 = Rs. 80,000.

Therefore The correct answer is Rs. 80,000.

Alternate Method

Given:

Income of Manjit = 5x, Income of Keshav = 9x.

Monthly Savings of each = Rs. 48,000.

Formula Used:

Income − Savings = Expenditure

Calculations:

=> (5x − 48,000) / (9x − 48,000) = 1 / 3

=> 3 × (5x − 48,000) = 1 × (9x − 48,000)

=> 15x − 1,44,000 = 9x − 48,000

=> 15x − 9x = 1,44,000 − 48,000

=> 6x = 96,000

=> x = 16,000

=> Monthly income of Manjit = 5x = 5 × 16,000 = Rs. 80,000.

Therefore The correct answer is Rs. 80,000.

Additional Information

Income, Expenditure and Savings

Basic relation: Income = Expenditure + Savings. If savings are equal for both, the difference between income units and expenditure units must be made equal.

Ratio Balancing Method

To balance ratios (a : b) and (c : d), multiply the terms by the difference of the other ratio: (a−b) and (c−d) to make the step-differences equal.

Cross Multiplication Method

For equations like (ax−k)/(bx−k) = m/n, the direct shortcut is x = k(n−m) / (an−bm).

Q34. Answer: (c) 7

Shortcut Trick

Use the standard algebraic identity for the difference of squares: $a^2 - b^2 = (a - b)(a + b)$.

Given: $a^2 - b^2 = 21$ and $a - b = 3$.

Directly divide the product by the known factor: $(a + b) = (a^2 - b^2) \div (a - b)$.

Calculation: $21 \div 3 = 7$.

Therefore The correct answer is 7.

Alternate Method

Given:

$a^2 - b^2 = 21$

$a - b = 3$

Formula Used:

The identity for $a^2 - b^2$ is expressed as the product of the sum and difference of the terms: $a^2 - b^2 = (a - b)(a + b)$.

Calculations:

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

$\Rightarrow 21 = 3 \times (a + b)$

$\Rightarrow a + b = 21 \div 3$

$\Rightarrow a + b = 7$

Therefore The correct answer is 7.

Additional Information

Difference of Squares

This identity states that the difference of two squares is equal to the product of the sum and the difference of the two terms: $a^2 - b^2 = (a + b)(a - b)$.

Square of a Binomial (Sum)

The expansion of the square of a sum is: $(a + b)^2 = a^2 + 2ab + b^2$.

Square of a Binomial (Difference)

The expansion of the square of a difference is: $(a - b)^2 = a^2 - 2ab + b^2$.

Relationship between Identities

The identities can be linked: $(a + b)^2 - (a - b)^2 = 4ab$.

Q35. Answer: (a) 72 cm

Shortcut Trick

Calculate semi-perimeter (s) = (90 + 11 + 97) ÷ 2 = 99 cm.

Area of triangle = $\sqrt{[99 \times (99-90) \times (99-11) \times (99-97)]} = \sqrt{[99 \times 9 \times 88 \times 2]}$.

Area = $\sqrt{[9 \times 11 \times 9 \times 8 \times 11 \times 2]} = \sqrt{[9^2 \times 11^2 \times 16]} = 9 \times 11 \times 4 = 396$ cm².

Altitude (h) on side 11 cm = (2 × Area) ÷ base = (2 × 396) ÷ 11 = 72 cm.

Therefore The correct answer is 72 cm.

Alternate Method

Given:

Sides of the triangle are a = 90 cm, b = 11 cm, and c = 97 cm.

Formula Used:

Semi-perimeter (s) = (a + b + c) ÷ 2

Area (A) = $\sqrt{[s(s - a)(s - b)(s - c)]}$

Area (A) = (1 ÷ 2) × base × altitude (h)

Calculations:

=> s = (90 + 11 + 97) ÷ 2 = 198 ÷ 2 = 99 cm
=> Area = √[99 × (99 − 90) × (99 − 11) × (99 − 97)]
=> Area = √[99 × 9 × 88 × 2]
=> Area = √[11 × 9 × 9 × 11 × 8 × 2]
=> Area = √[11² × 9² × 16] = 11 × 9 × 4 = 396 cm²
=> Altitude (h) corresponds to base 11 cm:
=> 396 = (1 ÷ 2) × 11 × h
=> h = (396 × 2) ÷ 11
=> h = 36 × 2 = 72 cm
Therefore The correct answer is 72 cm.
Additional Information
Heron's Formula
It is used to find the area of a triangle when all three sides are known: Area = √[s(s−a)(s−b)(s−c)], where s is the semi-perimeter.
Altitude of a Triangle
The altitude is the perpendicular distance from a vertex to the opposite side (base). Height = (2 × Area) ÷ Base.
Semi-Perimeter
The semi-perimeter of a triangle is half the sum of the lengths of its sides: s = (a + b + c) ÷ 2.

Q36. Answer: (d) 3

Shortcut Trick
Identify numbers between 308 and 320: 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319.
Eliminate even numbers and numbers ending in 5: 309, 311, 313, 317, 319.
Check divisibility: 309 (3+0+9=12, div by 3), 319 (11 × 29).
Remaining prime numbers: 311, 313, 317.
Therefore The correct answer is 3.
Alternate Method
Given: Range of numbers from 308 to 320.
Formula Used: A prime number is a natural number greater than 1 that has no positive divisors other than 1 and itself.
Calculations:
=> Numbers in range: {309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319}
=> 309: 3 + 0 + 9 = 12 (Divisible by 3) → Composite
=> 311: Not divisible by 2, 3, 5, 7, 11, 13, 17 (√311 ≈ 17.6) → Prime
=> 313: Not divisible by 2, 3, 5, 7, 11, 13, 17 (√313 ≈ 17.7) → Prime
=> 317: Not divisible by 2, 3, 5, 7, 11, 13, 17 (√317 ≈ 17.8) → Prime
=> 319: 11 × 29 = 319 → Composite
=> Even numbers (310, 312, 314, 316, 318) and 315 are Composite.
=> Total prime numbers = 3 (311, 313, 317).
Therefore The correct answer is 3.
Additional Information
Prime Number Definition
Numbers with exactly two factors (1 and the number itself). 2 is the only even prime number.
Divisibility Test for 11
Difference between the sum of digits at odd places and even places is 0 or divisible by 11. For 319: (3+9) − 1 = 11.
Checking Primes
To check if N is prime, test divisibility by primes up to √N.

Q37. Answer: (d) Rs. 11,232

Shortcut Trick
Successive effective Compound Interest rate for 2 years at 20% = 20 + 20 + (20 × 20)/100 = 44%.
Total Amount = 100% (Principal) + 44% (Interest) = 144% of Principal.
Amount = 1.44 × 7800 = Rs. 11,232.
Therefore The correct answer is Rs. 11,232.

Alternate Method
Given:
Principal (P) = Rs. 7,800
Rate (R) = 20% per annum
Time (n) = 2 years (compounded annually)
Formula Used:
Amount (A) = $P(1 + R/100)^n$
Calculations:
=> $A = 7800 \times (1 + 20/100)^2$
=> $A = 7800 \times (1 + 1/5)^2$
=> $A = 7800 \times (6/5)^2$
=> $A = 7800 \times (36/25)$
=> $A = 312 \times 36$
=> A = Rs. 11,232
Therefore The correct answer is Rs. 11,232.
Additional Information
Compound Interest Formula
Interest (CI) = Amount − Principal = $P[(1 + R/100)^n - 1]$.
Effective Rate for 2 Years
Equivalent rate for 2 years at R% compound interest is $[2R + R^2/100]\%$.
Difference between CI and SI for 2 years
Difference = $P(R/100)^2$. For 20% on Rs. 7,800, Difference = $7800 \times (20/100)^2$ = Rs. 312.

Q38. Answer: (d) 2

Shortcut Trick
Total work (LCM of 3, 2, 6) = 6 units.
Efficiency of A = 2, B = 3, C = 1.
Total Efficiency = 2 + 3 + 1 = 6 units/day.
Twice the work = 6 × 2 = 12 units.
Time taken = 12 ÷ 6 = 2 days.
Therefore The correct answer is 2 days.
Alternate Method
Given:
Time taken by A = 3 days, B = 2 days, C = 6 days.
Formula Used:
Total Work = LCM of individual days; Efficiency = Work ÷ Time; Time = Work ÷ Efficiency

Person	Days	Total Work	Efficiency
A	3	6	2
B	2	3	
C	6	1	

Calculations:
=> Combined Efficiency of A + B + C = 2 + 3 + 1 = 6 units/day
=> Target Work = 2 × Total Work = 2 × 6 = 12 units
=> Time taken together = 12 ÷ 6 = 2 days
Therefore The correct answer is 2 days.
Additional Information
Work and Efficiency Relationship
Efficiency is inversely proportional to the time taken to complete a task. Efficiency = Work ÷ Time.
Pipes & Cisterns
Similar to time and work, but involves negative work (leakage/outlet pipes). Net efficiency = Σ Filling efficiency − Σ Emptying

YourMockTest.com — Free Study Material

efficiency.

Work & Wages

Wages are generally distributed in the ratio of the efficiency of the workers if they work for the same duration.

Q39. Answer: (c) 45

Shortcut Trick

Present ratio Rohit : Father = 2 : 5 (difference = 3)

Future ratio (after 4 years) = 12 : 27 = 4 : 9 (difference = 5)

Equalize differences: Present (2:5) × 5 = 10 : 25 | Future (4:9) × 3 = 12 : 27

Ratio increase of 2 units (12 − 10 or 27 − 25) represents 4 years => 1 unit = 2 years.

Father's present age = 25 × 2 = 50 years. Age 5 years ago = 50 − 5 = 45 years.

Therefore The correct answer is 45 years.

Alternate Method

Given: Present ratio = 2 : 5, Ratio after 4 years = 12 : 27.

Formula: Let Rohit's age be 2x and Father's age be 5x.

=> (2x + 4) / (5x + 4) = 12 / 27

=> (2x + 4) / (5x + 4) = 4 / 9

=> 9 × (2x + 4) = 4 × (5x + 4)

=> 18x + 36 = 20x + 16

=> 2x = 20 => x = 10

=> Father's present age = 5x = 5 × 10 = 50 years.

=> Father's age 5 years ago = 50 − 5 = 45 years.

Therefore The correct answer is 45 years.

Additional Information

Ratio Difference Equality

When the same number of years is added to two people, the age difference between them remains constant. Adjust the ratios by multiplying to keep the difference parts equal.

Present vs. Past/Future Age

If present age is A, then age 'n' years ago is A − n and age after 'm' years is A + m.

Cross-Multiplication Method

Used for solving ratio changes: (Initial Ratio) → (Change) → (Final Ratio). Helpful in problems involving additions or subtractions from both quantities.

Q40. Answer: (c) Rs. 836

Shortcut Trick

Total amount to be deducted = 32 + 60 + 71 = Rs. 163.

Remaining sum = 8413 − 163 = Rs. 8250.

Ratio of shares = 5 : 11 : 14 | Total ratio parts = 5 + 11 + 14 = 30.

Value of 1 unit = 8250 ÷ 30 = Rs. 275.

Difference between B and C (ratio units) = 14 − 11 = 3 units.

Difference in actual shares = (3 × 275) + (71 − 60) = 825 + 11 = Rs. 836.

Therefore The correct answer is Rs. 836.

Alternate Method

Given: Total sum = Rs. 8,413. Deductions: S = Rs. 32, B = Rs. 60, C = Rs. 71. Ratio after deduction = 5 : 11 : 14.

Formula Used: Share = (Ratio part × Total remaining sum / Sum of ratios) + Deducted amount.

=> Total Deductions = 32 + 60 + 71 = Rs. 163

=> Remaining Sum = 8413 − 163 = Rs. 8250

=> Let the parts be 5x, 11x, and 14x

=> 5x + 11x + 14x = 8250

=> 30x = 8250 → x = 275

=> Actual share of B = 11 × 275 + 60 = 3025 + 60 = Rs. 3085

=> Actual share of C = 14 × 275 + 71 = 3850 + 71 = Rs. 3921

=> Difference = 3921 − 3085 = Rs. 836

YourMockTest.com — Free Study Material

Therefore The correct answer is Rs. 836.

Additional Information

Ratio Division with Constants

When fixed amounts are subtracted or added before dividing a sum, always calculate the net change to the total sum first before applying the ratio parts.

Direct Difference Shortcut

The difference between two shares (A and B) can be calculated as (Difference in Ratio Parts × Unit Value) + (Difference in respective deducted/added constants).

Q41. Answer: (c) 144

Shortcut Trick

In a right-angled triangle, tan θ represents the ratio of Height to Base.

Given tan θ = 4/3, let Height = 4 units and Base = 3 units.

According to the question, Base = 108 feet.

3 units → 108 feet => 1 unit = 36 feet.

Height = 4 units => 4 × 36 = 144 feet.

Therefore The correct answer is 144 feet.

Alternate Method

Given: Distance from point A to building (Base) = 108 feet, Angle of elevation = θ, tan θ = 4/3.

Formula Used: tan θ = Perpendicular (Height) ÷ Base

=> Let the height of the building be h.

=> tan θ = h ÷ 108

=> 4/3 = h ÷ 108

=> h = (4 × 108) ÷ 3

=> h = 4 × 36

=> h = 144 feet.

Therefore The correct answer is 144 feet.

Additional Information

Trigonometric Ratios

In a right-angled triangle: sin θ = P/H, cos θ = B/H, and tan θ = P/B.

Angle of Elevation

It is the angle formed by the line of sight with the horizontal when looking upwards at an object.

Pythagorean Triplet

For tan θ = 4/3, the sides follow the (3, 4, 5) triplet where Hypotenuse² = Base² + Height².

Q42. Answer: (a) Decreases by 61.89%

Shortcut Trick

Let the original price be 100.

Successive changes: 100 × 0.70 × 0.60 × 0.55 × 1.65

=> 100 × 0.42 × 0.55 × 1.65 => 23.1 × 1.65 = 38.115

Net Change = 100 − 38.115 = 61.885% ≈ 61.89% decrease.

Therefore The correct answer is Decreases by 61.89%.

Alternate Method

Given: Successive decreases of 30%, 40%, 45% and an increase of 65%.

Formula: Final Price = Initial Price × (1 − d1/100) × (1 − d2/100) × (1 − d3/100) × (1 + i1/100)

=> Final Price = 100 × (1 − 0.30) × (1 − 0.40) × (1 − 0.45) × (1 + 0.65)

=> Final Price = 100 × 0.70 × 0.60 × 0.55 × 1.65

=> Final Price = 100 × 0.38115 = 38.115

=> Percentage Decrease = (100 − 38.115)/100 × 100 = 61.885%

Therefore The correct answer is Decreases by 61.89%.

Additional Information

Successive Percentage Formula

For two successive changes a% and b%, the net effective change is (a + b + ab/100)%. Use negative values for decrease.

Multiplying Factor Method

A decrease of x% is equivalent to multiplying the value by (1 − x/100), while an increase of x% is equivalent to multiplying by (1 + x/100).

Base Change Property

When comparing the final value back to the original base, the percentage change is calculated as (Difference ÷ Original Value) × 100.

Q43. Answer: (b) 1 : 4

Shortcut Trick

Ratio of Total Surface Area (TSA) of cylinders = [r × (r + h)] / [R × (R + H)]

Given: Original Cylinder (R, H) = (4, 6) and Small Cylinder (r, h) = (2, 3)

Required Ratio = [2 × (2 + 3)] / [4 × (4 + 6)]

Required Ratio = [2 × 5] / [4 × 10] = 10 / 40 = 1 / 4

Therefore The correct answer is 1 : 4.

Alternate Method

Given:

Radius of Original Cylinder (R) = 4 cm

Height of Original Cylinder (H) = 6 cm

Radius of Small Cylinder (r) = 2 cm

Height of Small Cylinder (h) = 3 cm

Formula Used:

Total Surface Area of a Cylinder = 2πr(r + h)

Calculations:

=> Total Surface Area (TSA) of Original Cylinder = 2 × π × 4 × (4 + 6)

=> TSA of Original Cylinder = 2 × π × 4 × 10 = 80π cm²

=> Total Surface Area (TSA) of one small cylinder = 2 × π × 2 × (2 + 3)

=> TSA of small cylinder = 2 × π × 2 × 5 = 20π cm²

=> Required Ratio = TSA of small cylinder : TSA of original cylinder

=> Required Ratio = 20π : 80π = 1 : 4

Therefore The correct answer is 1 : 4.

Additional Information

Curved Surface Area (CSA) of Cylinder

The area of only the curved part is given by CSA = 2πrh.

Volume of Cylinder

The space occupied by the cylinder is Volume = πr²h.

Melting and Recasting

When a solid is melted and recast, the total Volume remains constant. Number of items = Total Volume ÷ Volume of one new item.

Q44. Answer: (c) 364

Shortcut Trick

The Selling Price (SP) is calculated by subtracting the Discount from the Cost Price (CP) when the discount is applied to the CP.

Multiplier for SP = CP × (100 − Discount%) ÷ 100

SP = 2800 × (100 − 87) ÷ 100

SP = 2800 × 13 ÷ 100 = 28 × 13

SP = 364

Therefore The correct answer is Rs. 364.

Alternate Method

Given: Cost Price (CP) = Rs. 2,800 and Discount% = 87%.

Formulas: Discount Value = (Discount% ÷ 100) × CP | SP = CP − Discount Value

=> Discount Value = (87 ÷ 100) × 2800

=> Discount Value = 87 × 28 = 2436

=> SP = 2800 − 2436

=> SP = 364

Therefore The correct answer is Rs. 364.

Additional Information

Cost Price and Discount

Usually, Discount is calculated on the Marked Price (MP). However, if the question specifies that the discount is given on the Cost Price (CP), we treat the CP as the base value for calculations.

Profit/Loss Scenarios

If the SP is less than the CP (as in this case due to a high discount on CP), the shopkeeper incurs a Loss. Loss = CP − SP.

Q45. Answer: (c) 1944 cm2

Shortcut Trick

Total Volume of new cube = $2^3 + 12^3 + 16^3$

=> Volume = 8 + 1728 + 4096 = 5832 cm^3

Side of the new cube (a) = $\sqrt[3]{5832} = 18$ cm

Total Surface Area = $6 \times 18^2 = 6 \times 324 = 1944$ cm^2

Therefore The correct answer is 1944 cm^2.

Alternate Method

Given: Sides of the three metallic cubes are a1 = 2 cm, a2 = 12 cm, and a3 = 16 cm.

Formula Used:

1. Volume of a cube = $(side)^3$

2. Total Surface Area of a cube = $6 \times (side)^2$

Calculations:

=> Volume of the first cube (V1) = $2^3 = 8$ cm^3

=> Volume of the second cube (V2) = $12^3 = 1728$ cm^3

=> Volume of the third cube (V3) = $16^3 = 4096$ cm^3

=> Total Volume of the new cube = V1 + V2 + V3

=> Total Volume = 8 + 1728 + 4096 = 5832 cm^3

=> Let the side of the new cube be 'A'. Then, $A^3 = 5832$

=> $A = \sqrt[3]{5832} = 18$ cm

=> Total Surface Area of the new cube = $6 \times A^2$

=> Total Surface Area = $6 \times 18^2 = 6 \times 324$

=> Total Surface Area = 1944 cm^2

Therefore The correct answer is 1944 cm^2.

Additional Information

Volume of a Cube

The amount of space occupied by the cube is calculated as $side^3$.

Lateral Surface Area (LSA)

The area of the four vertical faces of the cube is given by $4 \times side^2$.

Diagonal of a Cube

The longest distance between any two corners of a cube is side × √3.

Total Surface Area (TSA)

The sum of the areas of all six faces of the cube is $6 \times side^2$.

Q46. Answer: (b) 43

Shortcut Trick

Teacher's age = New Average + (Initial number of students × Increase in average)

Change in average = 13 − 12 = 1 year

Teacher's age = 13 + (30 × 1)

Teacher's age = 13 + 30 = 43 years

Therefore The correct answer is 43 years.

Alternate Method

Given:

Number of students = 30
Initial average age = 12 years
Number of people including teacher = 30 + 1 = 31
New average age = 13 years
Formula Used:
Average = Sum of observations ÷ Number of observations
=> Sum = Average × Number of observations
Calculations:
=> Total age of 30 students = 30 × 12 = 360 years
=> Total age of 31 people (including teacher) = 31 × 13
=> Total age of 31 people = 403 years
=> Age of the teacher = (Total age of 31 people) − (Total age of 30 students)
=> Age of the teacher = 403 − 360
=> Age of the teacher = 43 years
Therefore The correct answer is 43 years.
Additional Information
Weighted Average
When two groups with averages A1 and A2 are combined, the combined average is (n1A1 + n2A2) ÷ (n1 + n2).
Average with Replacement
If one person is replaced, the age of the new person = Age of replaced person + (Total items × Increase in Average).
Net Deviation Method
The sum of deviations of all observations from their arithmetic mean is always zero. This is useful for finding missing values in a dataset.

Q47. Answer: (b) 41

Shortcut Trick
Solve the nested square roots step-by-step starting from the innermost to the outermost.
First part: √289 = 17 → √(19 + 17) = √36 = 6 → √(250 + 6) = √256 = 16
Second part: √196 = 14 → √(11 + 14) = √25 = 5 → √(620 + 5) = √625 = 25
Final sum = 16 + 25 = 41
Therefore The correct answer is 41.
Alternate Method
Given:
√(250 + √(19 + √289)) + √(620 + √(11 + √196))
Calculations:
=> Solve the innermost square roots first: √289 = 17 and √196 = 14
=> Substitute these values back into the expression:
=> √(250 + √(19 + 17)) + √(620 + √(11 + 14))
=> Simplify the addition inside the remaining inner roots:
=> √(250 + √36) + √(620 + √25)
=> Solve the next set of square roots: √36 = 6 and √25 = 5
=> Substitute these values back into the outermost roots:
=> √(250 + 6) + √(620 + 5)
=> Simplify the addition:
=> √256 + √625
=> Solve the final outermost square roots: √256 = 16 and √625 = 25
=> 16 + 25 = 41
Therefore The correct answer is 41.
Additional Information
BODMAS Rule
Always follow the order of Brackets, Orders (powers and roots), Division, Multiplication, Addition, and Subtraction when simplifying arithmetic expressions.

YourMockTest.com — Free Study Material

Nested Square Roots

When simplifying continuous or nested radicals, always start evaluating from the innermost root and work your way outwards step-by-step until the outermost root is solved.

Perfect Squares 1 to 30

Memorizing squares up to 30 (e.g., $14^2 = 196$, $16^2 = 256$, $17^2 = 289$, $25^2 = 625$) significantly increases your calculation speed in simplification and number system problems.

Q48. Answer: (a) 11, 39

Shortcut Trick

Check the options to see which pair satisfies both conditions: Sum = 50 and LCM = 429.

Option 1: 11 + 39 = 50. LCM of 11 and 39 (since 11 is prime and not a factor of 39) = 11 × 39 = 429.

Option 2: 16 + 34 = 50. LCM of 16 and 34 must be even (not 429).

Option 3: 4 + 46 = 50. LCM must be even (not 429).

Option 4: 9 + 41 = 50. LCM = 9 × 41 = 369 ≠ 429.

Therefore The correct answer is 11, 39.

Alternate Method

Given: Sum of numbers (x + y) = 50, LCM(x, y) = 429.

Formula: Product of two numbers = HCF × LCM

=> Let the numbers be x and y.

=> Factorize 429: 429 = 3 × 11 × 13.

=> We need two factors whose sum is 50.

=> Possible pairs from factors: (11, 39) or (13, 33) etc.

=> 11 + 39 = 50. (Condition satisfied)

=> 13 + 33 = 46. (Condition not satisfied)

=> Therefore, the numbers are 11 and 39.

Therefore The correct answer is 11, 39.

Additional Information

Relation between HCF and LCM

For any two numbers a and b, Product of numbers (a × b) = HCF(a, b) × LCM(a, b).

Co-prime Numbers

If two numbers are co-prime, their HCF is 1 and their LCM is equal to their product.

HCF property

The HCF of two numbers is always a factor of their LCM and also a factor of their sum and difference.

Q49. Answer: (a) Rs. 5,775

Shortcut Trick

Expenditure % = 100% − Savings %

Expenditure % = 100% − 25% = 75%

Monthly Expenditure = 75% of Rs. 7,700

Monthly Expenditure = 3/4 × 7,700 = 3 × 1,925 = Rs. 5,775

Therefore The correct answer is Rs. 5,775.

Alternate Method

Given:

Total Monthly Salary = Rs. 7,700

Savings Rate = 25%

Formula Used:

Expenditure = Salary − Savings

=> Monthly Savings = 25% of Rs. 7,700

=> Monthly Savings = (25/100) × 7,700

=> Monthly Savings = 0.25 × 7,700 = Rs. 1,925

=> Monthly Expenditure = Total Salary − Monthly Savings

=> Monthly Expenditure = 7,700 − 1,925

=> Monthly Expenditure = Rs. 5,775

Therefore The correct answer is Rs. 5,775.

Additional Information

Percentage Change

Percentage change = (New Value − Old Value) / Old Value × 100. It is used to calculate the percentage increase or decrease in salary or expenditure.

Successive Percentage

If a value changes by a% and then by b%, the effective change is (a + b + ab/100)%. This is useful in calculating multi-step salary increments or tax impacts.

Income, Savings and Expenditure Relation

Income is always the sum of Expenditure and Savings. If any two components are known, the third can be found using Income = Expenditure + Savings.

Q50. Answer: (c) 72

Shortcut Trick

If every observation in a data set is multiplied by a constant k, the new average is the old average multiplied by k.

Given k = 2 (doubled) and old average = 36.

=> New average = 36 × 2 = 72.

Therefore The correct answer is 72.

Alternate Method

Given:

Total number of students = 12

Average marks of 12 students = 36

Formula Used:

Average = Sum of observations ÷ Number of observations

Sum of observations = Average × Number of observations

Calculations:

=> Total marks of 12 students = 36 × 12 = 432

=> Since marks of each student are doubled, the new sum will be double the old sum.

=> New total marks = 432 × 2 = 864

=> New Average = New total marks ÷ Number of students

=> New Average = 864 ÷ 12

=> New Average = 72

Therefore The correct answer is 72.

Additional Information

Effect of Addition/Subtraction on Average

If a constant k is added or subtracted from each observation, the new average becomes (Old Average ± k).

Effect of Multiplication/Division on Average

If each observation is multiplied or divided by k, the new average becomes (Old Average × k) or (Old Average ÷ k) respectively.

Properties of Average

The average always lies between the minimum and maximum values of the data set. If all observations are equal to x, then the average is also x.

Q51. Answer: (d) 5

Given Series:

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

Required Pattern:

Odd → Odd → Even

Checking the series:

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

Odd numbers satisfying the condition:

→ 1 in (3 1 2)

→ 3 in (1 3 4)

→ 9 in (9 9 4)

→ 7 in (7 7 8)

→ 9 in (3 9 8)

Therefore, there are 5 such odd numbers.

Hence, the correct answer is "Option 4".

Q52. Answer: (c) MLP 36

The logic followed here is:

For the Letter Clusters:

Each corresponding letter in the next cluster is obtained by adding 7 to the positional value of the previous letter.

For the Numbers:

The numbers follow a pattern of decreasing by 9 in each step.

The next cluster in the series is MLP 36.

Hence, the correct answer is "Option 3"..

Q53. Answer: (c) (38, 15, 212)

Logic followed here is:

The third number is obtained by multiplying the sum of the first and second numbers by 4.

Logic: (First number + Second number) × 4 = Third number

For (25, 12, 148) →

1st Num	2nd Num
25	12

Sum of numbers = 25 + 12 = 37

Result = 37 × 4 = 148

For (32, 11, 172) →

1st Num	2nd Num
32	11

Sum of numbers = 32 + 11 = 43

Result = 43 × 4 = 172

The pattern observed is: (First Number + Second Number) × 4 = Third Number.

Similarly, let's check the options:

For (38, 15, 212) →

1st Num	2nd Num
38	15

Sum of numbers = 38 + 15 = 53

Result = 53 × 4 = 212

Therefore, the set (38, 15, 212) follows the same logic.

Hence, the correct answer is "Option 3".

Q54. Answer: (b) S

Given:

Six friends G, H, I, Q, R and S are sitting around a circular table facing the centre.

1. Only two people sit between Q and I when counted from the left of I.

2. H sits second to the left of S.

3. R sits to the immediate right of S.

4. R sits to the immediate left of Q.

Arrangement:

Finding third to the right of G:

From G, moving towards the right:

1st right → Q

2nd right → R

YourMockTest.com — Free Study Material

3rd right → S
Therefore, S sits third to the right of G.
Hence, the correct answer is "Option 2".

Q55. Answer: (c) Two

Given Information:
A sits third to the left of E.
E sits second to the left of F.
D sits to the immediate right of E.
B sits to the immediate left of C.
Find the number of people between C and F:
C and F have E and D between them.
So, there are 2 people between C and F.
Hence, the correct answer is "Option 3".

Q56. Answer: (d) 5

Logic followed here is:
The series is formed by an alternating pattern of adding and subtracting consecutive multiples of 3 (3, 6, 9, 12, 15...).
Therefore, the value that should come in place of the question mark is 5.
Hence, the correct answer is "Option 4".

Q57. Answer: (b) 36

Given Mapping:

Letter	Operation
A	×
B	÷
C	•
D	−

Given Equation:
16 B 4 D 8 A 3 C 28 A 2
Replace the letters with symbols:
16 ÷ 4 − 8 × 3 + 28 × 2
Apply BODMAS rule:
=> (16 ÷ 4) − (8 × 3) + (28 × 2) = ?
=> 4 - 24 + 56 = ?
=> 60 - 24 = ?
=> 36 = ?
Hence, the correct answer is "Option 2".

Q58. Answer: (b) XZB−ACE

Logic followed here is:
In each pair, the second set of letters is obtained by adding 3 to the positional value of each letter in the first set.
For GIK is related to JLN →
CEG is related to FHJ →
The pattern observed is: (Each letter's positional value) + 3 = Next set's positional value.
Similarly, for the option XZB-ACE:
Therefore, the pair which follows the same pattern is XZB−ACE.
Hence, the correct answer is "Option 2".

Q59. Answer: (c) 3

Given Codes:
‘LEMA’ → ‘2564’

‘HELM’ → ‘3246’

Therefore, the code for H is 3.

Hence, the correct answer is "Option 3".

Q60. Answer: (a) 0

Logic followed here is: The series is formed by subtracting consecutive values that decrease by 5 at each step.

For the given series progression →

Therefore, the value that should come in place of the question mark is 0.

Hence, the correct answer is "Option 1".

Q61. Answer: (c) Only conclusion (II) follows

Statements:

All ships are eggs.

Some eggs are pencils.

All coins are ships.

Conclusion (I): Some ships are pencils: Does not follows (because, We only know that some eggs are pencils.It is not necessary that those eggs are ships.)

Checking Conclusion (II): Some eggs are coins: Follows (because,All coins are ships and all ships are eggs.So, all coins are eggs.Hence, some eggs can definitely be coins.)

Hence, the correct answer is "Option 3".

Q62. Answer: (a) 1

Given Series:

(Left) $ # @ * & € # 8 * 9 8 2 $ & $ 6 1 2 1 7 5 @ (Right)

Required Condition:

Number → Symbol → Symbol

Checking the series:

(Left) $ # @ * & € # 8 * 9 8 2 $ & $ 6 1 2 1 7 5 @ (Right)

Valid symbol:

→ $ in (2 $ &)

Therefore, there is only 1 such symbol.

Hence, the correct answer is "Option 1".

Q63. Answer: (c) PJAC

Logic followed here is:

Each letter in the first group of letters is shifted by a specific sequence of positions (+6, -5, +4, -3) to determine the corresponding letter in the second group.

BQVH is related to HLZE →

HSJQ is related to NNNN →

The pattern observed is: The letters follow a positional shift of +6, -5, +4, and -3.

Similarly, let's find the related word for JOWF:

Therefore, the code for 'JOWF' is PJAC.

Hence, the correct answer is "Option 3".

Q64. Answer: (d) Father’s father

Given:

P + Q → P is the mother of Q

P # Q → P is the husband of Q

P & Q → P is the sister of Q

P % Q → P is the father of Q

Expression:

J # S + R & T % Z

Family chain:

T is the father of Z.

YourMockTest.com — Free Study Material

R is the sister of T, so R is Z's aunt.
S is the mother of R and T.
J is the husband of S.
Therefore, J is the father of T.
Since T is the father of Z, J becomes Z's grandfather.
Hence, J is Father's father of Z.
Therefore, the correct answer is "Option 4".

Q65. Answer: (b) USER - REUS - UESR

Given Triads:
GATE → ETGA → GTAE
PRAY → YAPR → PARY
Observe the pattern:
GATE → ETGA
From the first word:Last two letters come first in reverse.First two letters move to the end
ETGA → GTAE
3rd and 1st letters comes first.4th and 2nd letters comes then
Check the options:
Option 2: USER - REUS - UESR
(RE) + (US) = REUS
Now,
REUS → UESR
So, this follows the same logic.
Hence, the correct answer is "Option 2".

Q66. Answer: (d) 67

Given:
Z is 56^(th) from the top and 12^(th) from the bottom.
Formula:
Total students = Rank from top + Rank from bottom − 1
Calculation:
= 56 + 12 − 1
= 68 − 1
= 67
Hence, the total number of students in the class is 67.
Therefore, the correct answer is "Option 4".

Q67. Answer: (b) 2

Given Series:
(Left) 9 5 2 4 6 5 9 9 5 3 5 5 1 7 6 3 8 5 1 4 4 5 5 9 8 8 9 (Right)
Required Pattern:
Odd → Even → Odd
Checking the series:
(Left) 9 5 2 4 6 5 9 9 5 3 5 5 1 7 6 3 8 5 1 4 4 5 5 9 8 8 9 (Right)
Even numbers satisfying the condition:
→ 6 in (7 6 3)
→ 8 in (3 8 5)
Therefore, there are 2 such even numbers.
Hence, the correct answer is "Option 2".

Q68. Answer: (a) UPS

Logic followed here is:
Each letter in the cluster is increased by 4 in its respective position to obtain the next cluster in the series.

YourMockTest.com — Free Study Material

The pattern observed for each letter is: (Previous letter's positional value) + 4.

Therefore, the letter-cluster that will replace the question mark is UPS.

Hence, the correct answer is "Option 1".

Q69. Answer: (c) 6

Given Number:

6318547

Rule:

Add 1 to each odd digit.

Subtract 2 from each even digit.

Applying the rule:

6 → 4

3 → 4

1 → 2

8 → 6

5 → 6

4 → 2

7 → 8

New number formed: 4426628

Highest and Lowest Digits:

Highest digit = 8

Lowest digit = 2

Difference:

8 − 2 = 6

Hence, the correct answer is "Option 3".

Q70. Answer: (a) 17

Logic followed here is:

The series follows an alternating pattern where 1 is added to a term, followed by adding the square of a consecutive natural number (starting from 2) to the next term.

For the given series progression:

Code = 16 + 1 = 17

Therefore, the value that should come in place of the question mark is 17.

Hence, the correct answer is "Option 1".

Q71. Answer: (b) 5 km to the east

Given:

Piyush starts from Point A.

1. Drives 54 km north

2. Turns right and drives 56 km

3. Turns right and drives 59 km

4. Turns right and drives 61 km

5. Turns right and drives 5 km to reach Point P

Net movement = 5 km west

So, Point P is 5 km west of Point A.

To reach Point A again, Piyush must travel 5 km towards the east.

Hence, the correct answer is "Option 2".

Q72. Answer: (b) 37

Given:

SYMBOLS	MEANING
A	÷

YourMockTest.com — Free Study Material

B	×
C	•
D	•

Expression:

12 D 10 C 5 B 21 A 3

Replacing the symbols:

12 − 10 + 5 × 21 ÷ 3

=> 12 - 10 + 5 × 21 ÷ 3 = ?

=> 12 - 10 + 5 × 7 = ?

=> 12 - 10 + 35 =?

=> 47 - 10 = ?

=> 37 = ?

Hence, the correct answer is "Option 2".

Q73. Answer: (d) 9

Given Numbers:

658, 223, 661, 257, 666

Highest and Lowest Numbers:

Highest number = 666

Lowest number = 223

Required Digits:

Second digit of highest number (666) = 6

Third digit of lowest number (223) = 3

Addition:

6 + 3 = 9

Hence, the resultant is 9.

Q74. Answer: (b) PT - MR

Logic followed here is: The letters in the second cluster of each pair are obtained by subtracting 3 from the positional values of the corresponding letters in the first cluster.

For Option (1): JN - GK →

Checking Option (2): PT - MR →

For Option (3): EI - BF →

For Option (4): NR - KO →

Therefore, 'PT - MR' is the odd one out as it does not follow the -3 shift pattern for both letters.

Hence, the correct answer is "Option 2".

Q75. Answer: (b) hj

Given Codes:

‘give me more’ → ‘bt lq nz’

‘give more water’ → ‘hj bt nz’

So, the remaining word water is coded as the remaining code hj.

Hence, the correct answer is "Option 2".

Q76. Answer: (c) YCD

Logic followed here is:

The difference between the positional values of consecutive letters in the cluster follows a specific pattern (+3, +2), except for the odd one out.

Option 1: HKM

Option 2: TWY

Option 3: YCD

Option 4: XAC

YourMockTest.com — Free Study Material

The pattern observed in HKM, TWY, and XAC is: (+3, +2). However, YCD follows a (+4, +1) pattern.
Therefore, the letter-cluster that does not belong to the group is YCD.
Hence, the correct answer is "Option 3".

Q77. Answer: (a) 5 m towards the east

Given:
Priyanka starts from her house.
1. Walks 3 m north
2. Turns left and walks 4 m
3. Turns left and walks 5 m
4. Turns right and walks 1 m
5. Turns right and walks 2 m to reach her uncle’s house
Step-by-step movement:
So, uncle’s house is 5 m west of Priyanka’s house.
Therefore, Priyanka’s house is 5 m towards the east from her uncle’s house.
Hence, the correct answer is "Option 1".

Q78. Answer: (b) 67

Given:
Mr. Akte is 56^(th) from the top and 12^(th) from the bottom.
Formula:
Total students = Rank from top + Rank from bottom − 1
Calculation:
= 56 + 12 − 1
= 68 − 1
= 67
Hence, the total number of students in the class is 67.
Therefore, the correct answer is "Option 2".

Q79. Answer: (a) Neither conclusion (I) nor (II) follows.

Statements:
Some dolphins are whales.
Some whales are sharks.
Venn Diagram Logic:
Conclusions:
(I) Some dolphins are sharks: Does not Follows (Because no direct relation between dolphins and sharks is definitely given.)
(II) No whale is a dolphin: Does not Follows(Because the statement says some dolphins are whales.)
Therefore Neither conclusion (I) nor conclusion (II) follows.
Hence, the correct answer is "Neither conclusion (I) nor conclusion (II) follows".

Q80. Answer: (b) One

Given:
Seven friends D, E, F, U, V, W and X are sitting in a straight line facing north.
1. Only two people are seated to the left of E.
2. Only three people are seated between E and W.
3. Only one person is seated between W and V.
4. U is seated to the immediate left of D.
5. F is not an immediate neighbour of W.
Finding people to the right of X:
Only W is seated to the right of X.
Therefore, only One person is seated to the right of X.
Hence, the correct answer is "Option 2".

YourMockTest.com — Free Study Material

Q81. Answer: (d) Rs. 90 lakh

The correct answer is Rs. 90 lakh.

Key Points

• In a significant move to bolster the domestic sports ecosystem, the Ministry of Youth Affairs and Sports, Government of India, announced a revised financial assistance structure in early 2025.

• As per the 2025 announcement, the grant for organizing National Championships in the High-Priority sports category has been increased to Rs. 90 lakh.

• Previously, the financial assistance for this category was capped at Rs. 51 lakh, marking an increase of approximately 76% to ensure better facilities and competitive standards.

• For the Priority sports category, the grant has been enhanced from Rs. 30 lakh to Rs. 75 lakh, representing a substantial 150% jump in funding.

• For the Other sports category (categorized as 'Others'), the assistance for conducting National Championships has been raised from Rs. 22 lakh to Rs. 30 lakh.

• This decision is part of the broader Scheme of Assistance to National Sports Federations (NSFs), aimed at professionalizing the conduct of national-level tournaments.

Additional Information

• Scheme of Assistance to National Sports Federations (NSFs):

• This is a flagship central scheme that provides financial support to NSFs for training and participation of Indian athletes in international competitions.

• It covers the cost of National Coaching Camps, foreign exposures, equipment purchase, and the salary of National Coaches.

• The revision in 2025 reflects the government's commitment to the Vision 2047 for sports, focusing on grassroots development and podium finishes.

• Categorization of Sports:

• High-Priority: Includes disciplines like Athletics, Archery, Boxing, Shooting, Wrestling, and Badminton where India has strong medal prospects at the Olympics and Asian Games.

• Priority: Includes sports that are part of the Olympics, Asian Games, or Commonwealth Games but require further development to reach world-class levels.

• Others: Includes sports that are recognized by the Ministry but are not currently part of the major multi-sport international events.

Important Points

• The Ministry of Youth Affairs and Sports has also increased the remuneration for support staff and coaches to attract and retain high-quality talent within the Indian sports system.

• The enhancement of grants for National Championships is expected to encourage NSFs to host events in Tier-2 and Tier-3 cities, thereby increasing the geographical reach of various sports.

• The Sports Authority of India (SAI) plays a pivotal role in monitoring the utilization of these funds and ensuring that the benefits reach the athletes directly.

• This funding boost is timed strategically as India prepares for the 2026 Asian Games and looks forward to the 2028 Los Angeles Olympics.

Q82. Answer: (c) Kunlavut Vitidsarn

The correct answer is Kunlavut Vitidsarn.

Key Points

• Kunlavut Vitidsarn made history in May 2025 by becoming the first male player from Thailand to reach the World No. 1 spot in the BWF World Rankings for the men’s singles category.

• His rise to the top of the global rankings followed a period of exceptional consistency on the BWF World Tour and major international championships.

• One of his most significant career milestones was winning the Gold Medal at the 2023 BWF World Championships held in Copenhagen, where he defeated Kodai Naraoka in the final.

• He further solidified his standing as a global badminton icon by securing a Silver Medal at the Paris 2024 Olympic Games, marking a historic achievement for Thai badminton.

• Before his senior success, he was a dominant force in the junior circuit, becoming the first male player to win three consecutive World Junior Championship titles in 2017, 2018, and 2019.

Additional Information

• Badminton World Federation (BWF) Ranking System:

• The World No. 1 ranking is determined by the total points accumulated by a player in their top 10 tournament results over the preceding 52 weeks.

YourMockTest.com — Free Study Material

• Achieving this rank requires deep runs into high-level tournaments such as Super 750 and Super 1000 events.

• Other Candidates in the Options:

• Lee Zii Jia: A prominent player from Malaysia who reached a career-high of World No. 2 and won the prestigious All England Open in 2021.

• Kento Momota: A legendary former World No. 1 from Japan who holds the record for the most titles won in a single season (11 titles in 2019).

• Kantaphon Wangcharoen: A fellow Thai player who became the first Thai man to win a medal (Bronze) at the BWF World Championships in 2019.

Important Points

• Historical Context: While Ratchanok Intanon became the first Thai player to reach World No. 1 in the women's singles category in 2016, Kunlavut Vitidsarn is the first to do so in the men's division, completing a major milestone for the sport in Thailand.

• Training Background: Kunlavut trains at the Banthongyod Badminton School in Bangkok, the same academy that produced former world champion Ratchanok Intanon.

• Playing Style: Known by his nickname "View," his game is characterized by exceptional defensive skills, net play precision, and high stamina, which allows him to outlast aggressive power hitters.

• Age and Career Peak: Born in May 2001, reaching the World No. 1 position at age 24 in 2025 represents the peak of his physical and tactical development.

Q83. Answer: (b) 172

The correct answer is 172.

Key Points

• According to the Ministry of Environment, Forest and Climate Change (MoEFCC), Delhi recorded its best average Air Quality Index (AQI) for the January–August period in 2025, with a value of 172.

• This data was highlighted in an official release dated 1 September 2025, titled "In the last 8 years, Delhi witnesses best AQI figures in 2025 for the January–August period".

• The average AQI of 172 in 2025 is a significant improvement compared to the same period in previous years: it was 187 in 2024, 174 in 2023, and 194 in 2022.

• This figure represents the lowest average AQI for the first eight months of the year since 2018, excluding the outlier year of 2020, which saw drastic reductions in pollution due to the COVID-19 lockdown.

• The improvement reflects the impact of sustained efforts and various policy interventions implemented to curb air pollution in the National Capital Region (NCR). Hence, the correct answer is 172.

Additional Information

• Air Quality Index (AQI):

• The AQI is a numerical scale used by government agencies to communicate to the public how polluted the air currently is or how polluted it is forecast to become.

• In India, the National Air Quality Index was launched in October 2014 to provide "One Number- One Colour-One Description" for the common man to judge the air quality.

• The Central Pollution Control Board (CPCB) monitors and calculates the AQI based on eight major pollutants: PM10, PM2.5, NO2, SO2, CO, O3, NH3, and Pb.

• AQI Categories:

• The index is divided into six categories: Good (0–50), Satisfactory (51–100), Moderately Polluted (101–200), Poor (201–300), Very Poor (301–400), and Severe (401–500).

• An average of 172 falls within the 'Moderately Polluted' category, which may cause breathing discomfort to people with lungs, asthma, and heart diseases.

• Pollution Control Measures in Delhi:

• The Commission for Air Quality Management (CAQM) in NCR and Adjoining Areas is responsible for the overall strategy to tackle pollution.

• The Graded Response Action Plan (GRAP) is a set of emergency measures that kick in to prevent further deterioration of air quality in Delhi-NCR based on different AQI thresholds.

• Initiatives such as the promotion of Electric Vehicles (EVs), shifting to PNG (Piped Natural Gas) in industries, and dust management at construction sites have contributed to the downward trend in AQI levels.

Important Points

• Comparative Data:

• In 2024, the average AQI for the January–August period was 187.

• In 2023, the average AQI for the same period was 174.

• The 2025 data shows a decrease in the concentration of Particulate Matter (PM2.5 and PM10), which are the primary concerns for Delhi's air quality.

• Meteorological Factors:

• Apart from government policy, meteorological factors such as rainfall and wind speed during the Monsoon and summer months play a crucial role in determining the average AQI.

• The Ministry of Environment noted that the number of 'Good' to 'Moderate' air quality days has been steadily increasing over the last few years due to both favorable weather and strict enforcement of environmental laws.

Q84. Answer: (d) GSLV Mk II

The correct answer is GSLV Mk II.

Key Points

• The NISAR (NASA-ISRO Synthetic Aperture Radar) is a joint Earth-observing mission between the Indian Space Research Organisation (ISRO) and the National Aeronautics and Space Administration (NASA).

• The mission is scheduled to be launched in June 2025 from the Satish Dhawan Space Centre (SDSC) located in Sriharikota, Andhra Pradesh.

• The primary launch vehicle designated for this mission is the GSLV Mk II (Geosynchronous Satellite Launch Vehicle Mark II), which is a three-stage heavy-lift vehicle developed by ISRO.

• NISAR will be the first satellite mission to use two different radar frequencies, the L-band and the S-band, to measure changes in our planet's surface less than a centimeter across.

• The L-band SAR (Synthetic Aperture Radar) is provided by NASA's Jet Propulsion Laboratory (JPL), while ISRO has developed the S-band SAR, the spacecraft bus, and the launch services.

• Hence, the correct answer is GSLV Mk II.

Additional Information

• GSLV Mk II (Geosynchronous Satellite Launch Vehicle Mark II):

• The GSLV Mk II is the largest launch vehicle currently in operational use by India, featuring a Cryogenic Upper Stage (CUS).

• It is a 4th generation launch vehicle designed to place satellites into Geosynchronous Transfer Orbit (GTO) and Low Earth Orbit (LEO).

• The vehicle has a payload capacity of approximately 2,500 kg to GTO and up to 5,000 kg to LEO.

• NISAR Mission Objectives:

• The mission aims to observe Earth's land and ice surfaces globally with unprecedented precision to understand climate change, ecosystem disturbances, and natural hazards.

• It will map the entire globe in 12 days and provide spatially and temporally consistent data for understanding changes in Earth's ecosystems, ice mass, and natural disasters like earthquakes, tsunamis, volcanoes, and landslides.

• The data will also support agricultural monitoring, groundwater management, and tracking the rate of sea-level rise.

Important Points

• NASA-ISRO Partnership: This collaboration represents a landmark agreement between India and the United States in the field of space exploration, signed in 2014.

• Synthetic Aperture Radar (SAR): Unlike optical sensors, SAR can penetrate clouds and darkness, allowing the satellite to collect data day and night, regardless of weather conditions.

• Mission Life: The NISAR mission has a planned duration of at least 3 years, during which it will provide critical data to the scientific community for global environmental research.

• Budget and Logistics: The total cost of the mission is estimated to be around 1.5 billion USD, making it one of the world's most expensive Earth-imaging satellites.

Q85. Answer: (d) Rs. 30,000

The correct answer is Rs. 30,000.

Key Points

• The Odisha government, led by Chief Minister Mohan Charan Majhi, announced a revision in the monthly honorarium for the state's Padma Awardees.

• Starting from January 2025, the monthly honorarium for these distinguished individuals will be increased to Rs. 30,000.

• Before this announcement, the awardees were receiving a monthly sum of Rs. 25,000; thus, an increment of Rs. 5,000 has been implemented.

• This financial support is provided to recipients of the Padma Vibhushan, Padma Bhushan, and Padma Shri who hail from the state of Odisha.

• The decision reflects the state's commitment to honoring and supporting eminent personalities who have made significant contributions to Arts, Science, Literature, Social Work, and other fields.

YourMockTest.com - Free Study Material

Additional Information

• The Padma Awards:

• These are among the highest civilian honors in India, instituted in the year 1954.

• The awards are announced every year on the occasion of Republic Day (January 26).

• The awards are classified into three categories: Padma Vibhushan (for exceptional and distinguished service), Padma Bhushan (distinguished service of high order), and Padma Shri (distinguished service in any field).

• Odisha's Recognition:

• Several individuals from Odisha have been conferred with these awards for their mastery in Odissi dance, Pattachitra painting, tribal welfare, and linguistics.

• In the 2024 Padma Awards list, personalities like Gopinath Swain (Art), Bhagabat Padhan (Art), and Binod Kumar Pasayat (Art) from Odisha were among the notable recipients.

• Welfare Initiatives:

• States in India often provide additional perks to Padma Awardees, such as monthly stipends, health insurance, or free travel on state-run buses, to ensure their well-being in their old age.

Important Points

• Eligibility: The honorarium is generally provided to those awardees who are in need of financial assistance or as a mark of state respect, depending on the specific state government guidelines.

• Implementation: The Rs. 30,000 amount is set to be credited to the accounts of the beneficiaries from the first month of 2025.

• Selection Process: While the State Government provides the honorarium, the selection for the Padma Awards is done by the Padma Awards Committee, which is constituted by the Prime Minister every year.

Q86. Answer: (b) Women's safety, dignity, and self-reliance

The correct answer is Women's safety, dignity, and self-reliance.

Key Points

• Mission Shakti 5.0 was officially launched by Uttar Pradesh Chief Minister Yogi Adityanath on October 3, 2024, to coincide with the auspicious occasion of Shardiya Navratri.

• The primary focus of this phase is to strengthen the three pillars of women's empowerment: safety (Suraksha), dignity (Samman), and self-reliance (Swavalamban) across the state of Uttar Pradesh.

• A major highlight of Mission Shakti 5.0 is the mobilization of Shakti Didis, who are female government officials and volunteers who visit gram panchayats and urban wards to bridge the gap between the government and women citizens.

• The mission aims to provide a secure environment by strictly enforcing laws against perpetrators of crimes against women and ensuring that help is accessible through dedicated helplines such as 1090 (Women Power Line) and 112 (Emergency Response Support System).

• The campaign also emphasizes self-reliance by encouraging women to participate in Self-Help Groups (SHGs) and educating them on how to benefit from various state-led economic initiatives.

Additional Information

• Evolution of the Mission: The Mission Shakti initiative was first introduced in October 2020 as a multi-phase campaign to address gender-based violence and promote female empowerment in India's most populous state.

• Financial Empowerment: One of the key schemes linked to this mission is the Mukhya Mantri Kanya Sumangala Yojana, which provides a financial incentive of Rs 25,000 (increased from Rs 15,000 in 2024) to support the health and education of girl children.

• Institutional Support: To ensure effective implementation, Mission Shakti Booths have been established in all 1,528 police stations in Uttar Pradesh, providing a safe space for women to report grievances without hesitation.

• Social Security: The state government utilizes this platform to promote the Destitute Women Pension Scheme, which provides monthly financial assistance to widows and women in economic distress to ensure their dignity is maintained.

• Impact and Data: Since its inception, the mission has contributed to Uttar Pradesh achieving a high conviction rate in cases related to crimes against women, demonstrating the effectiveness of integrated policing and judicial monitoring.

Important Points

• Inter-departmental Cooperation: The success of Mission Shakti 5.0 relies on the coordination of 27 government departments, including Home, Women and Child Development, Basic Education, and Secondary Education.

• Technology Integration: The Safe City Project, integrated under the broader umbrella of Mission Shakti, uses CCTV surveillance and AI-based analytics in public places to enhance the real-time safety of women in major cities.

• Awareness Drives: Special programs are conducted in schools and colleges during the 9-day festival of Navratri to educate young girls about good touch and bad touch, cyber safety, and their legal rights under the POCSO Act.

YourMockTest.com — Free Study Material

Q87. Answer: (a) To sequence the genomes of all eukaryotic species in Britain and Ireland

The correct answer is To sequence the genomes of all eukaryotic species in Britain and Ireland.

Key Points

• The Darwin Tree of Life (DToL) project is a pioneering scientific initiative aimed at sequencing the genomes of all 70,000 eukaryotic species found in Britain and Ireland.

• Launched in October 2019, the project reached a major milestone in August 2025 as it neared the completion of its first phase, which involved establishing high-quality reference genomes for key families of organisms.

• The primary objective of the DToL is to provide a complete genetic catalog of biodiversity, which helps scientists understand evolutionary relationships, ecosystem dynamics, and the genetic health of species. Hence, option 1 is correct.

• Unlike human-centric genomic studies, this project focuses on eukaryotes, which encompass all complex life forms including animals, plants, fungi, and protists, while excluding bacteria and archaea.

• The initiative is a collaborative effort led by the Wellcome Sanger Institute, involving partners such as the Natural History Museum, the Royal Botanic Gardens, Kew, and several UK universities.

Additional Information

• Earth BioGenome Project (EBP): The Darwin Tree of Life project serves as the British and Irish regional node of the Earth BioGenome Project, an international "moonshot" effort to sequence the genomes of all 1.8 million known eukaryotic species on Earth within a 10-year timeframe.

• Genomic Technology: The project utilizes cutting-edge long-read sequencing and Hi-C technologies to produce "chromosomal-level" assemblies, which are far more accurate than older "short-read" methods used in the early 2000s.

• Conservation and Climate Change: By mapping these genomes, researchers can identify genetic markers for climate resilience and disease resistance, providing vital data for conservationists working to protect endangered species in the UK and Ireland.

• Open Access Data: All genomic data generated by the DToL is made publicly available through the European Nucleotide Archive (ENA), ensuring that the global scientific community can use the information for biomedical research and biotechnology.

• Comparison with other options:

• Decoding the genetic basis of rare diseases is the focus of projects like the 100,000 Genomes Project led by Genomics England.

• Engineering climate-resilient crops using ancestral data is a specific field of agricultural genomics, often handled by organizations like CGIAR.

• Mapping migration patterns through ancient DNA is the domain of paleogenomics, famously led by researchers like Svante Pääbo.

Important Points

• Scope: The project covers a vast array of life, from the Golden Eagle and Red Squirrel to obscure fungi and single-celled organisms found in marine and terrestrial habitats.

• Economic Impact: The genetic data acts as a "biological library," potentially leading to the discovery of new antibiotics, biofuels, and sustainable materials derived from nature.

• Participating Institutions: Key contributors include the University of Oxford, University of Edinburgh, the Marine Biological Association, and the Earlham Institute.

• Milestones: By 2025, the project has successfully sequenced thousands of species that had never been genetically mapped before, setting a global standard for biodiversity genomics.

Q88. Answer: (c) 2.3%

The correct answer is 2.3%.

Key Points

• According to the World Bank's flagship report titled Global Economic Prospects released in June 2025, the global economy is expected to witness a significant deceleration.

• The report projects that global growth will slow markedly to 2.3% in 2025, reflecting the ongoing impact of tight monetary policies and restrictive credit conditions.

• This growth rate of 2.3% is a downward revision compared to earlier optimistic projections, highlighting the fragility of the post-pandemic recovery. Hence, the correct option is 2.3%.

• The World Bank identifies persistent inflation, high interest rates, and reduced fiscal support as the primary drivers behind this cooling of the global economic engine.

• Economic activity in Advanced Economies is expected to remain subdued, while Emerging Markets and Developing Economies (EMDEs) face challenges related to high debt levels and sluggish investment growth.

Additional Information

• The World Bank:

• Established in 1944 at the Bretton Woods Conference, the World Bank is an international financial institution that provides loans and grants to the governments of low- and middle-income countries.

• It is headquartered in Washington, D.C., and operates with the primary goal of reducing poverty and promoting shared prosperity across the globe.

• Global Economic Prospects (GEP) Report:

• The GEP is a semi-annual report published by the World Bank, typically in January and June, examining global economic developments and prospects.

• The report provides essential data for policymakers, investors, and academics to understand the trajectory of Gross Domestic Product (GDP) and trade cycles.

• Economic Terminologies:

• GDP Growth: The annual percentage growth rate of GDP at market prices based on constant local currency.

• Monetary Tightening: A policy implemented by Central Banks (like the Federal Reserve or RBI) to reduce the money supply and curb inflation, often by raising benchmark interest rates.

Important Points

• The June 2025 report emphasizes that geopolitical tensions and trade fragmentation are significant downside risks that could further dampen growth below the 2.3% mark.

• For many developing nations, the projected slowdown poses a threat to Sustainable Development Goals (SDGs), as lower growth limits the resources available for education, healthcare, and infrastructure.

• The World Bank urges global cooperation to address debt distress in low-income countries and to accelerate the energy transition to mitigate long-term economic risks.

Q89. Answer: (b) 6.5%

The correct answer is 6.5%.

Key Points

• The Reserve Bank of India (RBI), in its Monetary Policy Committee (MPC) meeting held in December 2024, provided the first set of projections for the fiscal year 2025-26 (FY26).

• As per the RBI, the Real Gross Domestic Product (GDP) growth for Q4 of 2025-26 is projected to be 6.5%. Hence, the correct answer is 6.5%.

• For the entire fiscal year 2025-26, the RBI has projected a growth rate of 6.8%, assuming a normal monsoon and stable global conditions.

• The quarterly projections for FY26 are as follows: Q1 at 7.2%, Q2 at 6.8%, Q3 at 6.7%, and Q4 at 6.5%.

• These projections are vital for investors, policymakers, and businesses to gauge the health and trajectory of the Indian economy.

Additional Information

• Gross Domestic Product (GDP):

• GDP represents the total monetary value of all finished goods and services produced within a country's borders in a specific time period.

• It serves as a comprehensive scorecard of a country’s economic health and is calculated by the National Statistical Office (NSO) under the Ministry of Statistics and Programme Implementation (MoSPI) in India.

• Monetary Policy Committee (MPC):

• The MPC is a six-member committee constituted by the Central Government under Section 45ZB of the RBI Act, 1934.

• It is chaired by the Governor of the Reserve Bank of India, currently Shaktikanta Das.

• The primary objective of the MPC is to maintain price stability while keeping in mind the objective of growth.

• Growth Drivers for FY26:

• The RBI expects growth to be supported by resilient domestic demand, a revival in rural consumption, and sustained government capital expenditure.

• The manufacturing and services sectors continue to be the primary engines of the Indian economy, showing robust Purchasing Managers' Index (PMI) figures.

Important Points

• Inflation Targeting:

• Along with GDP projections, the RBI also monitors Consumer Price Index (CPI) inflation. The medium-term target for CPI inflation is 4% with a band of +/- 2%.

• For FY26, CPI inflation is projected to moderate, which provides a conducive environment for economic growth.

• Fiscal Year Cycle:

• The financial year in India begins on 1st April and ends on 31st March of the following year.

• Q4 refers to the final quarter of the fiscal year, spanning from January to March.

• Global Context:

• The RBI's projections consider global headwinds such as geopolitical tensions, volatile commodity prices, and monetary policy

stances of major central banks like the US Federal Reserve.

Q90. Answer: (b) 2025

The correct answer is 2025.

Key Points

• India is scheduled to present its Third Voluntary National Review (VNR) report on the Sustainable Development Goals (SDGs) in the year 2025.

• The VNR is a process through which countries assess and present progress made in achieving the 17 Sustainable Development Goals and the pledge to leave no one behind.

• This report will be presented at the United Nations High-Level Political Forum (HLPF), which is the main platform for the follow-up and review of the 2030 Agenda for Sustainable Development.

• NITI Aayog, the premier policy think tank of the Government of India, is the nodal agency responsible for overseeing the implementation of SDGs and preparing the VNR.

• The Third VNR in 2025 will highlight India's efforts in "Accelerating the delivery of sustainable, resilient, and innovative solutions" to overcome global challenges and meet the 2030 deadline.

Additional Information

• Previous VNRs of India:

• First VNR (2017): India presented its inaugural review in 2017, focusing on early-stage implementation of schemes like Pradhan Mantri Jan Dhan Yojana and Swachh Bharat Mission.

• Second VNR (2020): Presented during the HLPF in July 2020, this report was titled "Decade of Action: Taking SDGs from Global to Local," emphasizing the localization of goals across States and Union Territories.

• SDG India Index: To monitor progress domestically, NITI Aayog launched the SDG India Index in 2018. It ranks states based on their performance across various social, economic, and environmental indicators.

• The 17 SDGs: Also known as Global Goals, these were adopted by the United Nations in 2015 as a universal call to action to end poverty, protect the planet, and ensure that by 2030 all people enjoy peace and prosperity.

• Global Monitoring: The VNRs aim to facilitate the sharing of experiences, including successes, challenges, and lessons learned, with a view to accelerating the implementation of the 2030 Agenda.

Important Points

• Localization of SDGs: India has been recognized globally for its efforts in localizing SDGs through district-level monitoring and creating a competitive environment among states to achieve targets.

• Viksit Bharat @2047: India’s progress on SDGs is increasingly being aligned with the long-term vision of becoming a developed nation (Viksit Bharat) by the year 2047, the centenary of its independence.

• Digital Public Infrastructure (DPI): A significant part of the Third VNR documentation is expected to focus on how India's DPI (like Aadhaar, UPI, and Gati Shakti) has acted as a multiplier for achieving goals related to Financial Inclusion (Goal 8) and Industry, Innovation, and Infrastructure (Goal 9).

• Climate Action: India’s commitment to the Panchamrit targets announced at COP26 and its progress toward Net Zero by 2070 are central themes in the environmental segment of the SDG reviews.

Q91. Answer: (c) Dehradun

The correct answer is Dehradun.

Key Points

• The 38th National Games were hosted by the state of Uttarakhand, with Dehradun serving as the primary host city and central hub for the majority of the sporting events.

• The games were scheduled to be held from 28 January to 14 February 2025, a timeline finalized by the Indian Olympic Association (IOA) in coordination with the state government.

• This event marks the first time that Uttarakhand has hosted the National Games, highlighting the state's growing sports infrastructure and its capability to organize multi-sport events of national importance.

• The Indian Olympic Association, led by its President P.T. Usha, officially approved the venues and the schedule after reviewing the readiness of the sports complexes in the state.

• The official mascot for the 38th National Games is the Himalayan Monal, which is also the state bird of Uttarakhand, symbolizing the rich natural heritage and high-altitude spirit of the region.

Additional Information

• History of National Games:

• The National Games of India were first held in 1924 in Lahore (in undivided India) as the Indian Olympic Games.

• The event was renamed the National Games in 1940 during the Bombay edition to better reflect its national character.

• Previous Edition:

• The 37th National Games were hosted by Goa in 2023, specifically from October 25 to November 9.

• In the 37th edition, the state of Maharashtra emerged as the champion, winning the Raja Bhalindra Singh Trophy for the best-performing team.

• Infrastructure and Venues:

• To accommodate the 38th National Games, infrastructure was developed across several clusters, including Haldwani, Rishikesh, Nainital, and Rudrapur, in addition to Dehradun.

• Key venues in Dehradun include the Maharana Pratap Sports College and the Raipur Sports Complex, which underwent significant upgrades for various indoor and outdoor disciplines.

• Significance:

• The National Games serve as a critical scouting ground for the Olympics and Asian Games, allowing the Ministry of Youth Affairs and Sports to identify top-tier talent across 38 or more sporting disciplines.

Important Points

• Organizing Body: The Indian Olympic Association (IOA) is the apex body responsible for selecting the host state and supervising the technical conduct of the games.

• State Participation: Athletes from all 28 states and 8 Union Territories, as well as the Services Sports Control Board (SSCB), participate in this biennial event.

• Economic Impact: Hosting the 38th National Games in 2025 was expected to provide a major boost to Uttarakhand's tourism industry and generate employment through the development of sports tourism.

• Sports Policy: The event aligns with the "Khelo India" vision to create a vibrant sports culture and provides Uttarakhand an opportunity to showcase its hospitality to thousands of visiting athletes and officials.

Q92. Answer: (a) Dudhwa National Park

The correct answer is Dudhwa National Park.

Key Points

• In March 2025, a rare long-snouted vine snake was rediscovered and documented in the Dudhwa National Park, which is located in the Lakhimpur Kheri district of Uttar Pradesh.

• The long-snouted vine snake (belonging to the genus Ahaetulla) is an arboreal reptile known for its slender body and distinctively pointed snout, which aids in its specialized predatory behavior in dense foliage.

• This rediscovery is of great ecological significance as the species is rarely sighted in the Terai-Arc Landscape, and its presence indicates a thriving and undisturbed ecosystem within the park.

• The sighting occurred during a specialized herpetofaunal survey conducted by wildlife researchers and the Uttar Pradesh Forest Department to catalog rare reptilian species.

• The snake is characterized by its vivid green color, which provides excellent camouflage among the leaves, making it extremely difficult to spot during routine patrols. Hence, the correct answer is Dudhwa National Park.

Additional Information

• Dudhwa National Park:

• It was established as a National Park in January 1977 and covers an area of approximately 490 square kilometers.

• The park is a vital part of the Dudhwa Tiger Reserve, which also encompasses the Kishanpur Wildlife Sanctuary and the Katarniaghat Wildlife Sanctuary along the Indo-Nepal border.

• It is renowned for being the last refuge for the Barasingha (Swamp Deer) in the Gangetic plains and serves as a critical habitat for Bengal Tigers and One-horned Rhinoceros.

• The landscape is dominated by Sal forests (Shorea robusta), extensive marshes, and tall grasslands, typical of the Terai region.

• Vine Snakes (Genus Ahaetulla):

• These snakes are mildly venomous (rear-fanged) but are generally harmless to humans; their venom is primarily used to immobilize small prey like lizards and frogs.

• They possess horizontal pupils, a rare feature among snakes, which provides them with binocular vision and excellent depth perception for hunting.

• The long-snouted variety is specifically adapted to the high-canopy environments of tropical and sub-tropical forests.

Important Points

• Conservation Status: The Terai region of Uttar Pradesh is a high-priority conservation zone due to its proximity to the Himalayan foothills and its role as a wildlife corridor between India and Nepal.

• Biodiversity Significance: Dudhwa National Park is home to over 450 species of birds, making it a premier destination for ornithology and ecotourism in Northern India.

• Geographical Context: The park is influenced by the Suheli and Mohana rivers, which create the wetland ecosystem necessary for the survival of the endangered flora and fauna of the region.

• Recent Discoveries: The March 2025 discovery of the vine snake follows a series of efforts by the Government of India to strengthen biodiversity databases through the National Biodiversity Authority.

Q93. Answer: (a) Department of Administrative Reforms and Public Grievances

The correct answer is Department of Administrative Reforms and Public Grievances.

Key Points

• The web portal for the Prime Minister's Awards for Excellence in Public Administration 2025 was officially launched on 1 October 2025 by the Department of Administrative Reforms and Public Grievances (DARPG).

• The dedicated portal, www.pmawards.gov.in, was made operational to facilitate the registration and submission of applications from across the country in a completely digital and paperless manner.

• The primary objective of these awards is to recognize the extraordinary and innovative work performed by Districts as well as Central and State Government Organizations to ensure the welfare of citizens.

• For the 2025 cycle, the scheme has been redesigned to reflect the priorities of Viksit Bharat, focusing on holistic development and the effective implementation of priority programs.

• The launch marks the beginning of a multi-tier evaluation process where Civil Servants showcase their contributions toward nation-building and governance reforms.

Additional Information

• Department of Administrative Reforms and Public Grievances (DARPG):

• It is the nodal agency for administrative reforms and redressal of public grievances under the Ministry of Personnel, Public Grievances and Pensions.

• The department is responsible for formulating policy guidelines for government agencies to improve operational efficiency and citizen-centric governance.

• The PM's Awards Scheme:

• Instituted in the year 2006, the scheme acknowledges the exemplary performance of Civil Servants in the implementation of flagship programs.

• The award consists of a Trophy, a Citation, and a Cash Incentive which is utilized for institutional strengthening or project replication in the winning districts.

• Evaluation Process:

• The selection involves a rigorous three-tier process: screening by an Expert Committee, evaluation by an Empowered Committee, and final approval by the Prime Minister of India.

• Parameters for evaluation include citizen feedback, field visits, and outcome-based indicators.

Important Points

• Civil Services Day: The awards are traditionally conferred every year on 21 April, which is celebrated as Civil Services Day in India to commemorate the address of Sardar Vallabhbhai Patel to the first batch of probationers at Metcalfe House in 1947.

• Maximum Governance, Minimum Government: This scheme is a pillar of the government's vision to promote transparency, accountability, and technology-driven administration across all 700+ districts of India.

• Incentivizing Excellence: By highlighting success stories, the portal encourages the replication of best practices in different geographical and socio-economic terrains of the country.

Q94. Answer: (d) Association of Mutual Funds in India

The correct answer is Association of Mutual Funds in India.

Key Points

• In August 2025, the Department of Posts (operating as India Post) officially signed a Memorandum of Understanding (MoU) with the Association of Mutual Funds in India (AMFI).

• The primary objective of this strategic partnership is to broaden the access to mutual fund products across the length and breadth of the country, specifically targeting rural and semi-urban populations.

• By leveraging the extensive network of over 1,60,000 post offices, the initiative seeks to utilize the high level of trust and last-mile connectivity that the postal department enjoys in India.

• This collaboration aims to facilitate financial inclusion by providing a simplified and reliable platform for common citizens to invest in market-linked financial instruments.

• The move is expected to significantly increase the penetration of Systematic Investment Plans (SIPs) and other mutual fund schemes among retail investors who previously had limited access to formal wealth management services.

Additional Information

• Department of Posts (India Post):

• It functions under the Ministry of Communications of the Government of India.

• Established in 1854 by Lord Dalhousie, it has grown into the most widely distributed postal network in the world.

• Beyond traditional mail, it provides various financial services through the Post Office Savings Bank (POSB), which is one of the oldest and largest banking systems in the country.

• Association of Mutual Funds in India (AMFI):

• AMFI is the apex body of all Asset Management Companies (AMCs) in India that are registered with SEBI.

• It was incorporated on August 22, 1995, as a non-profit organization to maintain professional standards and ethics in the mutual fund industry.

• One of its major functions is to promote investor awareness through campaigns like "Mutual Funds Sahi Hai."

• Regulatory Oversight:

• The mutual fund industry in India is regulated by the Securities and Exchange Board of India (SEBI), established under the SEBI Act, 1992.

• SEBI ensures transparency, protects investor interests, and monitors the Net Asset Value (NAV) disclosures of various schemes.

Important Points

• Financial Inclusion Goals: This MoU aligns with the Government of India's mission to ensure that financial services reach the "Antyodaya" (the last person in the queue).

• Reach Statistics: While private banks and broking firms are concentrated in Tier-1 and Tier-2 cities, India Post reaches more than 6,00,000 villages, providing a unique geographical advantage for AMFI members.

• Diversification: The introduction of mutual funds via post offices allows traditional savers to transition from fixed-income assets like Fixed Deposits (FDs) to equity and hybrid funds, potentially earning higher inflation-adjusted returns over the long term.

• Trust Factor: For many rural households, the Postman or Gramin Dak Sevak is a trusted advisor, making the adoption of new financial products smoother compared to digital-only platforms.

Q95. Answer: (d) Yashoda Artificial Intelligence Learning App

The correct answer is Yashoda Artificial Intelligence Learning App.

Key Points

• The National Commission for Women (NCW) introduced the Yashoda Artificial Intelligence Learning App in May 2025 to address the evolving needs of women in the digital era.

• The primary objective of this application is to enhance digital literacy and provide specialized training in advanced digital tools, specifically focusing on Artificial Intelligence (AI) applications. Hence, the correct answer is Yashoda Artificial Intelligence Learning App.

• The app offers comprehensive modules on Generative AI (GenAI), data analytics, and machine learning, tailored for women entrepreneurs, students, and professionals to bridge the gender digital divide in India.

• Safety is a core component of the platform, featuring advanced tools for deepfake detection, cyber-harassment prevention, and online safety guidelines to protect women from digital threats.

• The initiative aligns with the Digital India vision, empowering women with the skills necessary to navigate the 4th Industrial Revolution safely and effectively.

Additional Information

• National Commission for Women (NCW):

• Established in January 1992 as a statutory body under the National Commission for Women Act, 1990.

• The commission is mandated to review constitutional and legal safeguards for women, recommend remedial legislative measures, and facilitate grievance redressal.

• It operates under the Ministry of Women and Child Development, Government of India.

• Digital Shakti Campaign:

• Prior to the Yashoda App, the NCW launched the Digital Shakti campaign in June 2018.

• It was designed to make women digitally skilled and aware of cyber crimes. The campaign has seen several phases (e.g., Digital Shakti 4.0 and 5.0), reaching millions of women across the country.

• Comparison with Other Mobile Applications:

• Kaaval Uthavi: A mobile application launched by the Tamil Nadu Police in 2022. It is primarily an emergency assistance tool featuring an SOS button for citizens, especially women, to seek immediate police help.

• Kavalan-SOS: Another safety app integrated into the Tamil Nadu state police network, designed for personal safety in distress situations.

• Digital Saathi: Generally refers to various NGO-led or UNICEF-supported programs aimed at rural digital empowerment, but it is not the specific May 2025 NCW AI initiative.

Important Points

• Features of the Yashoda App:

• Multilingual Support: The app is available in 12 major Indian languages to ensure inclusivity for women from diverse geographic locations.

• Certification: Upon completion of the learning modules, users receive a certificate recognized by the National Skill Development Corporation (NSDC).

• AI-Based Mentor: The app includes a virtual AI assistant named Yashoda that provides real-time guidance and answers queries related to cybersecurity.

• Legal and Policy Context:

• The launch of such tools is supported by Article 15(3) of the Constitution of India, which allows the State to make special provisions for women and children.

• It also complements the Information Technology (IT) Act, 2000, by educating users on how to report cyber offences through the national portal.

Q96. Answer: (d) Aerolloy Technologies

The correct answer is Aerolloy Technologies.

Key Points

• Aerolloy Technologies, which is a wholly-owned subsidiary of PTC Industries Limited, commissioned a state-of-the-art facility dedicated to the production of aerospace-grade titanium castings and superalloys.

• The facility is situated in Lucknow, Uttar Pradesh, and forms a critical part of the Uttar Pradesh Defence Industrial Corridor (UPDIC).

• It represents a milestone as the first private-sector facility in India capable of manufacturing complex titanium components for aerospace and defence applications, which were previously largely imported.

• The plant utilizes high-end technology such as Vacuum Arc Remelting (VAR) and investment casting to produce high-purity materials required for aircraft engines and structural airframes.

• This commissioning aligns with the Atmanirbhar Bharat initiative, aiming to achieve self-reliance in the manufacturing of strategic materials and reducing the defence import bill of the country.

Additional Information

• Hindustan Aeronautics Limited (HAL):

• It is a Public Sector Undertaking (PSU) headquartered in Bengaluru, Karnataka.

• HAL is involved in the design, fabrication, and assembly of aircraft, jet engines, and helicopters like the LCA Tejas and Dhruv.

• Tata Aircraft Complex:

• Inaugurated in October 2024 in Vadodara, Gujarat, it is the first private-sector Final Assembly Line (FAL) for military aircraft in India.

• The facility is a collaboration between Tata Advanced Systems Limited (TASL) and Airbus to produce C-295 transport aircraft.

• Bharat Electronics Limited (BEL):

• A Navratna PSU established in 1954 under the Ministry of Defence.

• It specializes in advanced defence electronics, including radars, sonar, communication systems, and Electronic Warfare (EW) equipment.

• Titanium in Aerospace:

• Titanium is highly valued in the aerospace industry for its exceptional strength-to-weight ratio and high corrosion resistance.

• It is used extensively in landing gears, turbine blades, and fasteners because it can maintain its properties at extremely high temperatures.

Important Points

• The Uttar Pradesh Defence Industrial Corridor is one of the two corridors established by the Government of India (the other being in Tamil Nadu) to promote the Make in India program in the defence sector.

• The facility by Aerolloy Technologies is a part of the BrahMos missile manufacturing ecosystem, as titanium components are vital for missile airframes and engines.

• By producing titanium powders and castings locally, India aims to secure its supply chain for future fifth-generation fighter aircraft (AMCA) and other high-tech defence platforms.

Q97. Answer: (b) Laurence Olivier Awards

The correct answer is Laurence Olivier Awards.

Key Points

• The Laurence Olivier Awards, widely known as the Olivier Awards, are scheduled to take place on 6 April 2025.

• The prestigious ceremony is traditionally held at the Royal Albert Hall in London, which has served as the home for the awards since 2017.

• These awards are organized and presented annually by the Society of London Theatre (SOLT) to recognize excellence in professional theatre in London.

• The 2025 event continues the tradition of honoring the best of the West End, covering a wide array of categories including plays, musicals, dance, and opera.

• Eligibility for the awards is generally restricted to productions that have opened in theatres represented by the Society of London Theatre during the previous year.

Additional Information

• Historical Background:

• The awards were established in 1976 and were originally known as the Society of West End Theatre Awards.

• In 1984, the awards were renamed in honor of the legendary British actor and director Lord Laurence Olivier, following his permission.

• Global Significance:

• The Olivier Awards are considered the most prestigious honors in British theatre, carrying a status equivalent to the Tony Awards on Broadway in the United States.

• The Trophy:

• The winners receive a bronze figurine that depicts Sir Laurence Olivier in his iconic role as Henry V at the Old Vic theatre in 1937.

• Categories of Recognition:

• The awards encompass diverse categories such as Best New Play, Best New Musical, Best Actor, Best Actress, and technical awards for Best Set Design and Best Costume Design.

Important Points

• Tony Awards: These are the highest honors for Broadway productions in New York City. While similar in prestige to the Oliviers, they focus on the American theatre industry.

• Evening Standard Theatre Awards: Established in 1955, these are the oldest theatrical awards in the United Kingdom, presented by the Evening Standard newspaper.

• Critics' Circle Theatre Awards: These awards are decided by the Drama Section of The Critics' Circle, an association of professional British critics. They are often regarded for reflecting the critical consensus rather than industry-voted sentiment.

• Royal Albert Hall: Opened in 1871 by Queen Victoria, this London landmark hosts many major cultural events, including the BBC Proms and major film premieres, in addition to the Olivier Awards.

Q98. Answer: (c) National War Memorial

The correct answer is National War Memorial.

Key Points

• The main wreath-laying ceremony for the 79th Infantry Day, also celebrated as Valour Day (Shaurya Diwas) in 2025, was organized at the National War Memorial in New Delhi.

• This day is celebrated every year on October 27 to commemorate the first military action of independent India in 1947.

• During the ceremony, the Chief of Army Staff (COAS), along with senior military commanders and decorated veterans, pays homage to the bravehearts who laid down their lives for the nation.

• The 2025 celebration marks the 79th anniversary of the landing of the 1st Battalion of the Sikh Regiment at Srinagar Airfield to protect Jammu and Kashmir from invaders.

• The event serves as a reminder of the tenacity, courage, and dedication of the Infantry, which is the largest fighting arm of the Indian Army.

Additional Information

• Historical Context of 1947: Following the signing of the Instrument of Accession by Maharaja Hari Singh, Indian troops were airlifted to Srinagar to repel Pakistani tribal raiders. This was the first time Indian soldiers engaged in combat after Independence.

• The National War Memorial (NWM): Inaugurated on February 25, 2019, the NWM is located near India Gate in New Delhi. It features the Amar Chakra (Circle of Immortality), Veerta Chakra (Circle of Bravery), Tyag Chakra (Circle of Sacrifice), and Rakshak Chakra (Circle of Protection).

• The "Queen of the Battle": The Infantry is traditionally referred to as the Queen of the Battle because it is the primary combat arm that captures and holds ground, often engaging in close-quarter combat.

• Infantry School: The Infantry School, located in Mhow (Madhya Pradesh) and Belgaum (Karnataka), is the premier training institution for the infantry, focusing on tactical training and weapon proficiency.

Important Points

• Major Somnath Sharma: A notable name associated with the early defense of Srinagar is Major Somnath Sharma of the 4th Kumaon Regiment, who became the first recipient of the Param Vir Chakra (PVC), India's highest military decoration, for his bravery at Budgam.

• Significance of the 79th Year: Reaching the 79th year of this tradition highlights the long-standing legacy and evolving modernization of the infantry units, incorporating advanced technology and night-vision capabilities.

• Participation: While the main ceremony occurs in New Delhi, similar wreath-laying events take place at various Command Headquarters and war memorials across India to honor local regional regiments.

• Shaurya Diwas: The term Shaurya Diwas is often used interchangeably with Infantry Day to specifically honor the valour shown during the 1947 operations that saved the Kashmir Valley from occupation.

Q99. Answer: (b) Andhra Pradesh

The correct answer is Andhra Pradesh.

Key Points

• In June 2025, the National Bank for Agriculture and Rural Development (NABARD) entered into a strategic partnership with the National Institute for Research on Commercial Agriculture (NIRCA), an arm of the Indian Council of Agricultural Research (ICAR).

• The collaboration is specifically designed to provide high-end training to farmers and Farmer Producer Organizations (FPOs) located in Andhra Pradesh.

• The primary focus of this training program is the implementation of advanced post-harvest technologies for two major commercial crops: Chilli and Turmeric.

• By focusing on post-harvest management, the initiative aims to reduce quantitative and qualitative losses that occur after the harvest, thereby increasing the net income of the farming community in the state.

• The training modules include modern drying techniques, sorting and grading automation, cold storage management, and standardized packaging to meet international export requirements. Hence, the correct answer is Andhra Pradesh.

Additional Information

• Andhra Pradesh Agriculture Profile:

• The state is the largest producer of Chilli in India, contributing significantly to the national output. The Guntur Chilli Market in Andhra Pradesh is recognized as the largest chilli market in Asia.

• Andhra Pradesh also holds a prominent position in Turmeric production, with major cultivation areas located in districts like Guntur, Krishna, and Prakasam.

• The state is a key player in agricultural exports, and the introduction of advanced technology is expected to enhance the Global Value Chain (GVC) participation of local farmers.

• NABARD (National Bank for Agriculture and Rural Development):

• Established on July 12, 1982, based on the recommendations of the B. Sivaraman Committee.

• Headquartered in Mumbai, it serves as the peak development finance institution for providing credit for the promotion and development of agriculture, small-scale industries, and rural crafts.

• It plays a vital role in refinancing and supporting FPOs through various schemes like the Producers Organization Development Fund (PODF).

• ICAR-NIRCA and Technology Transfer:

• The Indian Council of Agricultural Research (ICAR) is an autonomous body under the Ministry of Agriculture and Farmers Welfare.

• NIRCA focuses on commercializing agricultural research and ensuring that innovations in biotechnology and post-harvest engineering reach the grassroots level.

• The integration of IoT (Internet of Things) and AI-based grading systems in spice processing is a major component of their 2025-2030 roadmap.

Important Points

• Farmer Producer Organizations (FPOs): These are collectives of small and marginal farmers that provide better bargaining power, access to technology, and market linkages. The Government of India aimed to form 10,000 new FPOs to double farmers' income.

• Post-Harvest Losses: In India, post-harvest losses in spices like chilli and turmeric can range from 10% to 25% due to improper drying and lack of scientific storage. Modern technologies such as Solar Tunnel Dryers and Vacuum Packaging are essential to mitigate these losses.

• Export Standards: For spices, maintaining low Aflatoxin levels is a critical requirement for exports to the European Union and the USA. The NABARD-NIRCA partnership emphasizes Good Agricultural Practices (GAP) to ensure safety and quality compliance.

Q100. Answer: (b) Kick4Life

The correct answer is Kick4Life.

Key Points

• The 2025 Laureus Sport for Good Award was awarded to Kick4Life for its pioneering work in using football as a vehicle for social change and community development.

• Kick4Life is a world-renowned social enterprise and football club based in Maseru, Lesotho, which became the first football club in the world to be dedicated entirely to social impact.

• Founded in 2005, the organization focuses on addressing critical social issues in Southern Africa, including HIV/AIDS prevention, gender equality, and youth employment.

• The award recognizes Kick4Life's holistic approach, which includes a football academy, health education programs, and vocational training to empower young people in Lesotho.

• Through its unique social enterprise model, the organization runs the No. 7 Restaurant and a boutique hotel, redirecting all profits back into its charitable community programs.

Additional Information

• Laureus Sport for Good Award:

• This category of the Laureus World Sports Awards highlights organizations that use the power of sport to end violence, discrimination, and disadvantage.

• It was established alongside the main awards in 2000, inspired by the words of Nelson Mandela, who stated that "Sport has the power to change the world."

• Street League:

• This is a leading United Kingdom-based charity that utilizes football and dance fitness to tackle youth unemployment.

• It helps young people from disadvantaged backgrounds gain employability skills and move into full-time education or training.

• Right To Play:

• Headquartered in Toronto, Canada, this international non-profit was founded in 2000 by Johann Olav Koss.

• It operates in over 15 countries across Africa, Asia, and the Middle East, using various forms of play to protect, educate, and empower children.

• Football for Peace:

• A global diplomatic and sports organization co-founded by Kashif Siddiqi and Elias Figueroa.

• It is supported by the United Nations and works to create neutral territories to foster dialogue and peace between conflicting communities and cultures.

Important Points

• Impact of Kick4Life: Since its inception, Kick4Life has reached over 250,000 young people with health testing and life skills education. Its Lesotho-based model is considered a global benchmark for sport-for-development initiatives.

• HIV Prevalence: The organization operates in Lesotho, a country with one of the highest HIV prevalence rates in the world (approximately 21%), making its health-centric football curriculum vital for the nation's demographic health.

• Sustainability: The social enterprise wing of Kick4Life ensures that the project is not solely dependent on international grants, fostering local economic growth through its hospitality ventures in Maseru.

More previous year papers and mock tests: **www.yourmocktest.com/pyq**

YourMockTest.com — Free Study Material