RRB Group D Official Paper (Held On: 08 Dec, 2025 Shift 3) (Previous Year Paper)

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

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GENERAL SCIENCE

Q1. What type of image is formed by a concave mirror when the object is placed at infinity?

(a) Same size as the object and real
(b) Highly enlarged and virtual
(c) Enlarged, virtual and upright
(d) Highly diminished, real and inverted

Q2. A common characteristic in all double displacement reaction is:

(a) only one product is formed
(b) the reaction mixture is always colourless
(c) exchange of metal ions between two metal salts
(d) the reaction requires heat to initiate

Q3. Plastic waste has increased a lot in a city over the last 10 years. Which habit of people is most likely causing this?

(a) More people are using buses and trains.
(b) People are using more disposable items instead of long-lasting ones.
(c) People are choosing reusable things.
(d) Plastic bags have been banned.

Q4. When the height of an object is doubled, its potential energy becomes:

(a) zero
(b) triple
(c) double
(d) half

Q5. When calcium oxide reacts with water, the product formed is:

(a) calcium chloride
(b) calcium hydroxide
(c) calcium carbonate
(d) calcium sulphate

Q6. Which of the following statements correctly describes the process of budding in organisms like Hydra?

(a) A bud forms only during sexual reproduction and fuses with the parent organism.
(b) A bud forms as an outgrowth due to repeated cell division and detaches when mature.
(c) A bud forms from specialised cells inside the organism and remains attached for life.
(d) A bud forms from a broken body part and grows into a new organism.

Q7. Mendel conducted his experiments on which plant?

(a) Sunflower
(b) Tomato
(c) Bean plant

(d) Pea plant

Q8. An object with a mass of 10.0 kg is initially moving at a velocity of 3.0 m/s. A constant force of 30.0 N is applied in the opposite direction of its motion for 5.0 s. What is the final velocity of the object?

(a) -12.0 m/s
(b) +18.0 m/s
(c) +12.0 m/s
(d) 0 m/s

Q9. When particles of two different types of matter randomly mix due to the inherent random movement of particles, the process is called:

(a) effusion
(b) intermixing
(c) diffusion
(d) homogenisation

Q10. Which of the following best describes the nutrition process in amoeba?

(a) Ingestion → Digestion → Absorption → Egestion
(b) Absorption → Ingestion → Digestion → Egestion
(c) Diffusion → Ingestion → Digestion → Absorption
(d) Ingestion → Egestion → Absorption → Digestion

Q11. Which mechanism leads to the folding of Mimosa pudica leaves when they are touched?

(a) Change in pH of leaf cells
(b) Change in the water content of leaf cells
(c) Change in light intensity at leaf surface
(d) Change in temperature of the leaves

Q12. Why does carbon form covalent bonds instead of ionic bonds?

(a) It is energetically unfavourable to lose or gain 4 electrons.
(b) It has a very large atomic radius.
(c) Carbon can easily gain or lose 4 electrons.
(d) Carbon has 8 valence electrons.

Q13. In a purely resistive circuit, the electrical energy supplied by the battery is:

(a) stored as magnetic energy
(b) stored as potential energy
(c) completely dissipated as heat
(d) converted only into light

Q14. Which of the following is essential for the propagation of sound waves?

(a) Magnet
(b) Light source
(c) Vacuum
(d) Medium

Q15. The mode of cell division by which germ cells get half the amount of DNA as compared to non-reproductive cells is called _____.

(a) Budding
(b) Meiosis
(c) Mitosis
(d) Amitosis

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Q16. When an object falls freely near the Earth, the direction of its motion:

(a) becomes horizontal
(b) changes continuously
(c) becomes opposite to gravity
(d) remains the same

Q17. When light ray passes from a rarer medium to a denser medium, it _____.

(a) bends towards the normal
(b) bends at a 90° angle
(c) bends away from the normal
(d) does not bend at all

Q18. Which of the following substances burn without a flame?

(a) Charcoal
(b) Petrol
(c) Wax
(d) LPG

Q19. What does the atomic number of an element represent?

(a) Number of neurons in an atom
(b) Mass number of the atom
(c) Total number of electrons and protons
(d) Number of protons in an atom

Q20. Which of the following cell organelles help(s) in cellular reproduction?

(a) Lysosomes
(b) Endoplasmic Reticulum
(c) Plastids
(d) Nucleus

Q21. Consider the following statements and select the correct option.

Statement 1: A fuse is connected in series in an electric circuit.

Statement 2: A fuse wire melts when the current exceeds a safe limit.

(a) Both Statements 1 and 2 are correct.
(b) Only Statement 1 is correct.
(c) Only Statement 2 is correct.
(d) Both Statements 1 and 2 are incorrect.

Q22. A particle starts from rest and moves with uniform acceleration. Which of the following represents the correct velocity-time graph for the particle?

(a) A parabola
(b) A straight line passing through the origin with negative slope
(c) A horizontal line
(d) A straight line passing through the origin with positive slope

Q23. The molecular mass of HNO_3 is 63 atomic mass unit (u). What is atomic mass of oxygen (O)?

(a) 16u
(b) 32u
(c) 48u
(d) 8u

Q24. Which metal is placed just above copper in the reactivity series?

(a) Zinc
(b) Lead
(c) Aluminium

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(d) Iron

Q25. Which part in the neuron i.e. nervous tissue is responsible for protein synthesis?

(a) Axon
(b) Nissl granules
(c) Dendrites
(d) Synaptic bulb

MATHEMATICS

Q26. In a college election, the valid votes for candidates X and Y were in the ratio 7 : 2. The college had 1800 registered voters, of which 20% did not cast their votes and 20% of the votes cast were declared invalid. What is the difference in the number of votes secured by candidates X and Y?

(a) 256
(b) 459
(c) 896
(d) 640

Q27. The sum of the first 12 prime numbers is:

(a) 199
(b) 201
(c) 202
(d) 197

Q28. Simplify the following.

$(8^{21} \div 4^{(28)} \times 2^{5})/((4^{(14)})^{(1/7)} \times 8^{2})$

(a) 2
(b) 4
(c) 8
(d) 16

Q29. A father is 30 years older than his son. After 5 years, he will be twice as old as his son. Find the son's present age.

(a) 27 years
(b) 25 years
(c) 22 years
(d) 20 years

Q30. If the value of 13% of 16% of x is 59.28, then the value of x is:6497

(a) 2580
(b) 2850
(c) 2690
(d) 2760

Q31. DMART is offering Buy 2, get 29 free on grocery items. What is the net percentage discount being offered by DMART? (Correct up to two decimal places)

(a) 92.67%
(b) 97.4%
(c) 93.55%
(d) 95.63%

Q32. A trader purchased a bundle of 15 notebooks for Rs. 1,200 and sold the entire bundle for Rs. 1,040. The loss incurred is equal to the cost price of how many notebooks?

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

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(d) 3

Q33. A 275-metre-long train crosses a platform thrice its length in 44 seconds. What is the speed of the train in km/hr?3714

(a) 98
(b) 85
(c) 81
(d) 90

Q34. Find the value of tan 30° × cos 30°.

(a) √3/2
(b) 1
(c) 1/√2
(d) 1/2

Q35. If A : B = 4 : 6 and B : C = 7 : 10, then A : B : C is:

(a) 14 : 23 : 40
(b) 14 : 31 : 21
(c) 14 : 21 : 30
(d) 14 : 12 : 30

Q36. If $x + 1/x = 13$, then the value of $(x^2 + 1/(x^2))$ is:

(a) 169
(b) 167
(c) 163
(d) 171

Q37. Two trains are moving in opposite directions at speeds of 130 km/hr and 60 km/hr, respectively. The length of one train is 360 m. The time taken by them to cross each other is 12 seconds. The length (in m) of the other train, correct to 2 decimal places, is:3382

(a) 269.96
(b) 273.33
(c) 282.54
(d) 277.92

Q38. The cost of a washing machine is 50% less than the cost of a TV. If the cost of the washing machine increases by 57% and that of the TV decreases by 74%, then what is the percentage change in the total cost of 6 washing machines and 2 TVs?

(a) Increase by 5.2%
(b) Decrease by 5%
(c) Decrease by 1%
(d) Increase by 4.6%

Q39. Quadrilateral ABCD has sides AB = 9 m, BC = 12 m, CD = 14 m and DA = 13 m, taken in order. If angle ABC = 90°, find the area (in m^2) of quadrilateral ABCD.

(a) 128
(b) 135
(c) 148
(d) 138

Q40. In an equilateral triangle ABC of side 18 cm, what is the sum (in cm) of the perpendicular distances of the centroid G from the sides of the triangle?

(a) 9√3
(b) 6√3
(c) 3√3
(d) 12√3

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Q41. The area of a trapezium is 54 sq.units. Its parallel sides are 3x + 1 units and 2x + 2 units, respectively. The distance between the parallel sides is 3y units and x − y = 1. Find the sum of parallel sides.

(a) 12 units
(b) 18 units
(c) 22 units
(d) 16 units

Q42. A shopkeeper marks his goods at X% above the cost price and sells them at a discount of 40%. If he makes a profit of 62%, find the value of X.

(a) 170
(b) 171
(c) 169
(d) 168

Q43. Find the largest number that divides 555, 703, 999 and 1147 leaving the same remainder in each case.

(a) 137
(b) 148
(c) 74
(d) 89

Q44. A, B and C can do a piece of work in 2, 6 and 12 days, respectively. How long (in days) will they take to do thrice the same work, working together?

(a) 8
(b) 5
(c) 4
(d) 12

Q45. Given that C is the third proportional of 16 and B. If B is the sum of the first three even natural numbers, then find the value of C.

(a) 11.74
(b) 9
(c) 7.55
(d) 8.49

Q46. If the mode of the given data is 1332/11 cm., find the value of X.

Height (in cm)	**125 - 130**	**130 - 135**	**135 - 140**	**140 - 145**	**145 - 150**
Number of girls	7	14	X	10	9

(a) 10
(b) 11
(c) 15
(d) 12

Q47. A number is divided into two parts, such that one part is 10 more than the other. If the two parts are in the ratio 5 : 3, find the two parts of the number.

(a) 27 and 17
(b) 26 and 16
(c) 24 and 14
(d) 25 and 15

Q48. What is the mode of the data 20, 21, 15, 16, 20, 17, 18, 16, 15, 14, 19, 20, 18, 14, and 20?

(a) 19
(b) 20
(c) 21
(d) 18

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Q49. Two banks, A and B, offered loans at 3.5% and 7% per annum, respectively. Vijay borrowed an amount of Rs. 4,80,000 from each bank. Find the positive difference (in Rs.) between the amounts of simple interest paid to the two banks by Vijay after 3 years.

(a) 51,400
(b) 51,900
(c) 50,400
(d) 49,900

Q50. Pipes A and B can fill 50% of a tank in 15 and 10 minutes, respectively. There is also an emptying pipe C attached to the tank. If all the three pipes are opened together, the tank is filled in 15 minutes. If the tank is two-third filled, then in how much time (in minutes) C alone will empty the tank completely?

(a) 60
(b) 20
(c) 40
(d) 30

GENERAL INTELLIGENCE & REASONING

Q51. Select the pair which follows the same pattern as that followed by the two set of pairs given below. Both pairs follow the same pattern.

QUT−XBA

YCB−FJI

(a) IML−OTR
(b) ILJ−OSR
(c) ILJ−PTS
(d) IML−PTS

Q52. YPMG is related to VKJB in a certain way based on the English alphabetical order. In the same way, MVAM is related to JQXH. To which of the following options is DGRX related, following the same logic?

(a) ABPO
(b) ABOS
(c) APLO
(d) ABOI

Q53. Which of the given letter-number clusters will replace the question mark (?) in the following series to make it logically complete?

MP33 KN41 IL49 GJ57 ?

(a) EG66
(b) EH66
(c) EG65
(d) EH65

Q54. In a certain code language, ‘iron hip cheek’ is coded as ‘nn nu qw’ and ‘mud iron globe’ is coded as ‘nu yx mt’. How is ‘iron’ coded in the given language?

(a) yx
(b) nn
(c) qw
(d) nu

Q55. 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) PS-WR
(b) SV-ZT

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(c) MP-TN
(d) JM-QK

Q56. Seven boxes, A, B, C, D, I, J and K, are kept one over the other, but not necessarily in the same order.

Only A is kept above I. Only two boxes are kept between I and C. Only K is kept below J. D is not kept immediately above C.

How many boxes are kept between B and K?

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

Q57. 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 mangoes are bananas.

No banana is a kiwi.

Conclusions:

(I): All bananas are mangoes.

(II): No mango is a kiwi.

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

Q58. Refer to the number series given below and answer the question that follows. Counting to be done from left to right only.

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

(Left) 7 3 6 1 9 8 4 4 8 6 1 9 1 6 5 5 5 5 1 4 1 8 4 4 3 3 7 (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) 3
(b) 4
(c) 2
(d) 5

Q59. A, B, C, E, F, P and Q are sitting around a circular table facing the centre. A sits fourth to the left of C. P sits fourth to the right of B. Only two people sit between C and B when counted from the left of C. E is not an immediate neighbour of P or B. F is not an immediate neighbour of P. Who sits third to the right of Q?

(a) C
(b) F
(c) P
(d) B

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

73 63 53 43 33 ?

(a) 23
(b) 24
(c) 21
(d) 22

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

223 ÷ 4 + 164 × 2 - 37 = ?

(a) 847
(b) 826
(c) 837
(d) 811

Q62. Refer to the number series given below and answer the question that follows. Counting to be done from left to right only.

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

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

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

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

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

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

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

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

Q64. P, Q, R, S, T and U are sitting around a circular table facing the centre. R sits on the immediate left of U. S sits second to the right of T. P sits second to the left of R. How many people sit between R and Q when counted from the right of R?

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

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

Statements:

All Zucchinis are Leeks.

All Leeks are Radishes.

Some Radishes are Celeries.

Conclusions:

(I) All Leeks are Celeries.

(II) Some Radishes are Zucchinis.

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

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Q66. A, B, C, D, W, X and Y are sitting around a circular table facing the centre of the table. A sits third to the left of X. Only one person sits between X and C when counted from the left of C. Only two people sit between B and W when counted from the right of W. D is an immediate neighbour of B. Who sits third to the right of Y?

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

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

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

How many such numbers are there, each of which is immediately preceded by a perfect square and also immediately followed by a perfect square? (Note: 1 is also a perfect square.)

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

Q68. What should come in place of the question mark (?) in the given series?

20 25 15 20 10 ?

(a) 15
(b) 20
(c) 25
(d) 5

Q69. SGHE is related to XCMA in a certain way based on the English alphabetical order. In the same way, CYRW is related to HUWS. To which of the following is MQBO related, following the same logic?

(a) SLGM
(b) RMGK
(c) QLFJ
(d) SNHL

Q70. Based on the English alphabetical order, three of the following four letter-cluster pairs are alike in a certain way and thus form a group. Which is the letter-cluster pair that DOES NOT belong to that group?

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

(a) FC-HE
(b) HE-JF
(c) KH-MI
(d) NK-PL

Q71. A man starts from Point A and drives 9 km towards north. He then takes a right turn, drives 15 km, turns right and drives 18 km. He then takes a right turn and drives 23 km. He takes a final right turn, drives 9 km and stops at Point P. How far (shortest distance) and towards which direction should he drive in order to reach Point A again? (All turns are 90 degrees turns only unless specified)

(a) 6 km to the south
(b) 7 km to the west
(c) 5 km to the north
(d) 8 km to the east

Q72. In a certain code language,

A + B means ‘A is the daughter of B’,

A – B means ‘A is the brother of B’,

A x B means ‘A is the wife of B’ and

A ÷ B means ‘ A is the father of B’.

Based on the above, how is D related to J if ' D + F - G ÷ H × J '?

(a) Wife's father's brother's daughter
(b) Wife's mother's brother's daughter
(c) Wife's mother's brother's wife
(d) Wife's father's brother's wife

Q73. What should come in place of the question mark (?) in the given series to make it logically complete?

10 20 31 43 56 ?

(a) 66
(b) 70
(c) 62
(d) 63

Q74. Aman starts from Point M and drives 8 km towards the north. He then takes a left turn, drives 5 km, turns left and drives 13 km. He then takes a right turn and drives 5 km. He then takes a right turn and drives 16 km. He takes a final right turn, drives 10 km and stops at Point P. How far (shortest distance) and in which direction is Point P with respect to Point M? (All turns are 90-degree turns only unless specified.)

(a) 9 km towards the south
(b) 3 km towards the north
(c) 6 km towards the south
(d) 11 km towards the north

Q75. Seven boxes, A, B, C, D, I, J and K, are kept one over the other, but not necessarily in the same order.

Only two boxes are kept between A and C. Only B is kept above K. No box is kept below C. J is kept at some place below D but at some place above I.

Which box is kept third above I?

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

Q76. If 1 is added to each odd digit and 2 is subtracted from each even digit in the number 51784563, then how many digits will appear more than once in the new number thus formed?

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

Q77. Which letter cluster will replace the question mark (?) to complete the given series?

IDR GEO EFL CGI ?

(a) BHE
(b) AHE
(c) AHF
(d) BGF

Q78. Select the set in which the numbers are related in the same way as are the numbers of the following sets.

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

(5, 22, 26)

(11, 40, 44)

(a) (16, 66, 70)
(b) (17, 58, 54)
(c) (16, 55, 59)

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(d) (13, 32, 36)

Q79. Each of the digits in the number 3728645 is arranged in ascending order from left to right. What will be the sum of the digits that are second from the left and second from the right in the new number thus formed?

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

Q80. In a certain code language, ‘OVAL’ is coded as ‘9573’ and ‘LAVS’ is coded as ‘3657’. What is the code for ‘S’ in the given code language?

(a) 6
(b) 3
(c) 7
(d) 5

GENERAL AWARENESS AND CURRENT AFFAIRS

Q81. For Athletics in 2025, what is the age eligibility range for boys' and girls' selection trials at SAI Chennai?

(a) 12 to 18 years
(b) 14 to 20 years
(c) 10 to 16 years
(d) 11 to 19 years

Q82. In June 2025, which educational institution signed an MoU with VRDE to collaborate on advanced defence technologies?

(a) National Institute of Technology, Warangal
(b) COEP Technological University,Pune
(c) Indian Institute of Science, Bengaluru
(d) Rajasthan Technical University

Q83. Which Indian city was ranked the most polluted globally in the World Air Quality Report, 2024, released in March 2025?

(a) Byrnihat
(b) Delhi
(c) Mumbai
(d) Gurugram

Q84. Who is the author of the book 'India: 5,000 Years of History on the Subcontinent', published in June 2025?

(a) John Zubrzycki
(b) Audrey Truschke
(c) Patrick French
(d) William Dalrymple

Q85. In June 2025, Consumer Price Index (CPI) of India inflation for the financial year 2025-26 was projected at:

(a) 3.7%
(b) 4.7%
(c) 5.7%
(d) 6.7%

Q86. Against which country's wrestler did Antim Panghal win her bronze medal match at the Asian Wrestling Championships, 2025?

(a) Kazakhstan
(b) Chinese Taipei
(c) China

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(d) Japan

Q87. In June 2025, which two countries participated in Exercise SHAKTI, a biennial training engagement?

(a) India and France
(b) Nepal and Bhutan
(c) Afghanistan and China
(d) Sri Lanka and the Maldives

Q88. Which of the following banks of India extended the operating hours of the call money market to 7 PM, from 1 July 2025?

(a) Reserve Bank of India
(b) Bank of Baroda
(c) Bandhan Bank
(d) State Bank of India

Q89. In August 2025, NITI Aayog unveiled an innovative framework to evaluate and compare the advancement of States and Union Territories towards their Electric Mobility objectives named _____.

(a) Electric Vehicle Advancement Index
(b) National E-Mobility Mission Plan Index
(c) Sustainable Transport Index
(d) India Electric Mobility Index

Q90. Who received the Sahitya Akademi Translation Prize (awarded in March 2025) for translating Himanshi Joshi's Tere Liye into Punjabi as Tere Laee?

(a) Suvash Satpathy
(b) Anjan Sarma
(c) Srinivas Murmu
(d) Chandan Negi

Q91. What is the main purpose of the 'Model Rules for Felling Trees in Agricultural Lands', released in 2025?

(a) Promoting urban farming only
(b) Banning agroforestry in rural areas
(c) Increasing tax on agricultural produce
(d) Easing business in agroforestry by streamlining rules

Q92. When did Defence Research and Development Organisation (DRDO) and the Indian Navy conduct the successful flight-test of indigenously-developed Vertically-Launched Short-Range Surface-to-Air Missile (VLSRSAM) from the Integrated Test Range (ITR), Chandipur off the coast of Odisha?

(a) March 26, 2025
(b) January 2, 2025
(c) July 16, 2025
(d) May 20, 2025

Q93. In September 2025, the Ministry of Environment, Forest, and Climate Change introduced which of the following to enhance environmental compliance and governance?

(a) Sustainable Practices and Audit Guidelines, 2025
(b) Environmental Sustainability and Compliance Rules, 2025
(c) Environment Audit Rules, 2025
(d) Green Business Certification Framework, 2025

Q94. What was India’s rank in the Corruption Perceptions Index (CPI), 2024?

(a) 85th
(b) 101st
(c) 96th
(d) 93rd

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Q95. As on November 2024, how many Khelo India Athletes received coaching, equipment, medical care, and Out of Pocket Allowance (OPA)?

(a) 3087
(b) 2781
(c) 2000
(d) 2509

Q96. Who won the men's singles title at the 2025 French Open, held in June 2025?

(a) Carlos Alcaraz
(b) Jannik Sinner
(c) Novak Djokovic
(d) Alexander Zverev

Q97. Which city in Madhya Pradesh hosted the foundation stone ceremony of India's first PM MITRA Park, attended by Prime Minister Narendra Modi?

(a) Bhopal
(b) Gwalior
(c) Dhar
(d) Indore

Q98. Who was appointed as the RBI Deputy Governor in April 2025, becoming one of the key figures in shaping India's financial and monetary policy?

(a) Arundhati Bhattacharya
(b) Poonam Gupta
(c) Nirmala Sitharaman
(d) Shaktikanta Das

Q99. Who authored 'Careless People: A Cautionary Tale of Power, Greed, and Lost Idealism', published in 2025?

(a) Alexandra Winslow-Meyer
(b) Sarah Wynn-Williams
(c) Samantha Wynne-Williamson
(d) Susannah Wynn-Wallace

Q100. In June 2025, West Bengal planned to make 800 km green wall along which of the following states, intercepting pollutants entering the State?

(a) Chhattisgarh
(b) Jharkhand
(c) Mizoram
(d) Assam

ANSWER KEY

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

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SOLUTIONS

Q1. Answer: (d) Highly diminished, real and inverted

The correct answer is Highly diminished, real and inverted.

Key Points

• When an object is placed at infinity in front of a concave mirror, the light rays from the object are considered to be parallel to the principal axis.

• These parallel rays converge at the focus of the concave mirror after reflection, forming the image.

• The image formed is highly diminished because all the rays meet at a single point, making the size of the image negligible compared to the object.

• The image is real because it is formed by the actual convergence of rays after reflection.

• The image is inverted because the reflected rays flip the orientation of the object.

Additional Information

• Concave Mirrors:

• Concave mirrors are spherical mirrors that curve inward, resembling the inside of a sphere.

• They are capable of converging light rays and are commonly used in applications like telescopes, headlights, and shaving mirrors.

• Image Formation Based on Object Position:

• If the object is at infinity, the image is formed at the focus, is highly diminished, real, and inverted.

• If the object is beyond the center of curvature, the image is diminished, real, and inverted.

• If the object is at the center of curvature, the image is the same size, real, and inverted.

• If the object is between the focus and the mirror, the image is enlarged, virtual, and upright.

• Applications of Concave Mirrors:

• Used in telescopes for capturing distant celestial objects.

• Applied in dentistry and surgical procedures for magnified viewing.

• Used in solar concentrators to focus sunlight for energy generation.

• In car headlights, concave mirrors are used to create a parallel beam of light.

• Real and Virtual Images:

• A real image is formed when light rays actually converge, and it can be captured on a screen.

• A virtual image is formed when the rays appear to diverge from a point and cannot be captured on a screen.

Important Points

• Principal Focus: The point where parallel rays converge after reflection in a concave mirror.

• Center of Curvature: The center of the sphere from which the mirror segment is derived.

• Focal Length: The distance between the principal focus and the pole of the mirror.

• Mirror Formula: The mathematical relationship governing mirrors: 1/f = 1/v - 1/u, where f = focal length, v = image distance, and u = object distance.

Q2. Answer: (c) exchange of metal ions between two metal salts

The correct answer is exchange of metal ions between two metal salts.

Key Points

• In a double displacement reaction, two ionic compounds exchange their ions to form two new compounds. This process involves the exchange of cations (positively charged ions) and anions (negatively charged ions) between the reacting substances.

• The general representation of a double displacement reaction is:

AB + CD → AD + CB, where A and C are cations, and B and D are anions.

• This type of reaction typically occurs in aqueous solutions, where the ionic compounds are dissolved in water, allowing the ions to move freely and interact with each other.

• An example of a double displacement reaction is the reaction between sodium chloride (NaCl) and silver nitrate (AgNO3):

NaCl + AgNO3 → NaNO3 + AgCl (precipitate).

• Such reactions often result in the formation of a precipitate, a gas, or a neutral molecule such as water, making them easily observable in a laboratory setting.

Additional Information

• Characteristics of Double Displacement Reactions:

• Double displacement reactions typically occur between two ionic compounds in aqueous solutions.

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• These reactions often produce a precipitate, a gas, or a liquid (such as water) as a product.

• They do not involve the transfer of electrons, as opposed to redox reactions. Instead, they involve the rearrangement of ions.

• Types of Double Displacement Reactions:

• Precipitation Reactions: These occur when the exchange of ions results in the formation of an insoluble compound (precipitate). For example:

$BaCl_2 + Na_2SO_4 \rightarrow BaSO_4$ (precipitate) + 2NaCl.

• Neutralization Reactions: These occur between an acid and a base to produce water and a salt. For example:

$HCl + NaOH \rightarrow NaCl + H_2O$.

• Gas Formation Reactions: In some cases, a gas is released as a result of the reaction. For example:

$Na_2CO_3 + 2HCl \rightarrow 2NaCl + H_2O + CO_2$ (gas).

• Explanation of Incorrect Options:

• Option 1: "Only one product is formed" – Incorrect. Double displacement reactions result in the formation of two products, not one.

• Option 2: "The reaction mixture is always colourless" – Incorrect. The reaction mixture can vary in colour based on the compounds involved and the products formed, such as precipitates of varying colours.

• Option 4: "The reaction requires heat to initiate" – Incorrect. Double displacement reactions usually occur spontaneously in aqueous solutions without the need for external heat.

• Examples in Daily Life:

• Soap Scum Formation: When soap reacts with hard water containing calcium or magnesium ions, a precipitate is formed.

• Neutralization in Medicine: Antacids neutralize stomach acid through double displacement reactions.

Q3. Answer: (b) People are using more disposable items instead of long-lasting ones.

The correct answer is People are using more disposable items instead of long-lasting ones.

Key Points

• Plastic waste has significantly increased due to the growing reliance on disposable items like single-use plastic bags, cutlery, bottles, and packaging. These items are often discarded after one use, contributing to the accumulation of non-biodegradable waste.

• Unlike long-lasting or reusable items, disposable items are designed for convenience and are frequently replaced, leading to higher consumption and waste generation. This habit is a primary driver of plastic pollution in cities.

• Disposable plastics are widely used in the food and beverage industry, e-commerce packaging, and retail sectors, which often prioritize cost-effectiveness and convenience over sustainability.

• While some cities have implemented plastic bans or promoted reusable alternatives, the persistent demand for disposable plastics undermines these efforts, further exacerbating the waste crisis.

• Increasing awareness about the environmental impact of disposable plastics and promoting behavioral changes, such as opting for reusable alternatives, can help reduce plastic waste significantly.

Additional Information

• Plastic waste statistics:

• According to the United Nations Environment Programme (UNEP), over 300 million tons of plastic are produced globally each year, and at least 8 million tons end up in the ocean annually.

• In India, the Central Pollution Control Board (CPCB) reported that plastic waste generation amounted to 3.5 million tons annually in 2020.

• Environmental impact of disposable plastics:

• Plastic waste contributes to soil and water pollution, as it takes hundreds of years to decompose, releasing harmful chemicals in the process.

• Animals often mistake plastic for food, leading to ingestion and severe health issues, and in some cases, fatalities.

• Incineration of plastic waste releases toxic gases, contributing to air pollution and climate change.

• Government initiatives to combat plastic waste:

• The Indian government launched the Plastic Waste Management Rules (2016) to regulate the use and disposal of plastic. In 2022, single-use plastics were banned in India.

• The Swachh Bharat Abhiyan (Clean India Mission) emphasizes waste segregation and recycling, including plastic waste.

• Alternatives to disposable plastics:

• Use of biodegradable materials such as jute bags, bamboo straws, and paper-based packaging is gaining popularity.

• Encouraging the use of metal or glass containers for storage and reusable bottles for water and beverages can significantly reduce plastic waste.

Important Points

• Features of disposable plastics:

• They are lightweight, low-cost, and convenient for single-use applications, making them widely used in packaging, food services, and retail.

• However, their non-biodegradable nature poses a significant threat to the environment.

• Impact of bans on plastic waste:

• Bans on single-use plastics have been implemented in various countries, including India, Canada, and the European Union, to curb plastic pollution.

• While these measures are effective, they require strict enforcement and public cooperation to achieve desired results.

Q4. Answer: (c) double

The correct answer is double.

Key Points

• Potential Energy (PE) is given by the formula: PE = m × g × h, where:

• m is the mass of the object (in kilograms).

• g is the acceleration due to gravity (approximately 9.8 m/s^2).

• h is the height of the object above a reference point (in meters).

• When the height (h) of an object is doubled, the formula becomes: PE = m × g × (2h).

• This results in the potential energy becoming 2 × (m × g × h), i.e., double the original potential energy.

• Hence, the potential energy of the object is directly proportional to its height. Doubling the height leads to a doubling of the potential energy.

• Thus, the correct answer is that the potential energy becomes double.

Additional Information

• Potential Energy:

• It is a type of mechanical energy associated with the position of an object in a gravitational field.

• Measured in Joules (J), the SI unit of energy.

• Examples include energy stored in a raised weight, water in a dam, or a compressed spring.

• Gravitational Potential Energy:

• This refers specifically to the energy an object possesses due to its height above a reference level in the Earth's gravitational field.

• It is influenced by three factors: mass (m), gravity (g), and height (h).

• Gravitational potential energy increases with an increase in height or mass.

• Applications of Potential Energy:

• In hydropower plants, water stored in dams possesses potential energy that is converted into kinetic energy to generate electricity.

• In transportation systems, potential energy is utilized in mechanisms like elevators and escalators.

• Roller coasters rely on the conversion of potential energy to kinetic energy for motion.

• Important Characteristics:

• Potential energy depends only on the vertical height and not on the path taken to reach that height.

• It is a scalar quantity and has no direction.

Important Points

• Relationship Between Potential Energy and Height:

• Since PE = m × g × h, if height (h) is halved, the potential energy becomes half of its original value.

• If height is tripled, the potential energy becomes three times the original value.

• Other Forms of Energy:

• Kinetic Energy: Energy associated with the motion of an object, given by KE = 1/2 × m × v^2.

• Elastic Potential Energy: Stored energy in stretched or compressed elastic materials, such as springs.

• Chemical Potential Energy: Energy stored in chemical bonds, such as in fuels or food.

• Practical Implications:

• Understanding potential energy is crucial in fields like engineering, physics, and environmental studies.

• It plays a significant role in designing structures like dams, bridges, and buildings to ensure stability and energy efficiency.

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Q5. Answer: (b) calcium hydroxide

The correct answer is calcium hydroxide.

Key Points

• When calcium oxide (commonly known as quicklime) reacts with water, it forms calcium hydroxide (slaked lime) through an exothermic reaction.

• The chemical equation for this reaction is:

CaO + H2O → Ca(OH)2 + Heat.

• This reaction releases a significant amount of heat, making it an exothermic reaction.

• The product formed, calcium hydroxide, is a white powder or a suspension in water, often used in construction (e.g., making mortar) and as a disinfectant in water treatment.

• Other options like calcium chloride, calcium carbonate, and calcium sulphate are not formed in this reaction. These compounds are the result of entirely different chemical reactions.

Additional Information

• Calcium Oxide (Quicklime):

• It is a chemical compound with the formula CaO.

• Quicklime is a white, caustic, alkaline crystalline solid at room temperature.

• It is commonly used in the production of cement, steel manufacturing, and as a chemical reagent.

• Calcium Hydroxide (Slaked Lime):

• The chemical formula of calcium hydroxide is Ca(OH)2.

• It is widely used in whitewashing, water purification, and as a neutralizing agent in acidic soils.

• When dissolved in water, it forms a solution known as lime water, which turns milky in the presence of carbon dioxide.

• Exothermic Reaction:

• Reactions that release heat to the surroundings are termed as exothermic reactions.

• The reaction between calcium oxide and water is highly exothermic, which can cause boiling and splashing if not handled carefully.

• Incorrect Options Explained:

• Calcium Chloride: Formed by the reaction of calcium and hydrochloric acid, not by reacting calcium oxide with water.

• Calcium Carbonate: Formed when calcium hydroxide reacts with carbon dioxide, resulting in CaCO3.

• Calcium Sulphate: Commonly known as gypsum, it is formed by the reaction of calcium compounds with sulphuric acid or sulphates.

Important Points

• The reaction between calcium oxide and water is an industrially significant process in the production of slaked lime, used in various construction and chemical applications.

• Lime water (a solution of calcium hydroxide in water) is a popular test for carbon dioxide gas as it turns milky in its presence due to the formation of calcium carbonate.

• Calcium hydroxide is used in agriculture to neutralize acidic soils and improve soil fertility.

• Safety measures should be taken while handling quicklime as its reaction with water is vigorous and can cause burns.

Q6. Answer: (b) A bud forms as an outgrowth due to repeated cell division and detaches when mature.

The correct answer is A bud forms as an outgrowth due to repeated cell division and detaches when mature..

Key Points

• Budding is an asexual reproduction process observed in organisms like Hydra, yeast, and some other species.

• In this process, a bud forms as an outgrowth on the body of the parent organism due to repeated mitotic cell division.

• The bud remains attached to the parent organism while it grows and matures, drawing nutrients and support from the parent.

• Once the bud is fully developed, it detaches from the parent and becomes an independent organism capable of surviving on its own.

• This process ensures the continuity of the species without the need for gamete fusion, as seen in sexual reproduction. Hydra is a well-known example of organisms reproducing through budding.

Additional Information

• Explanation of Other Options:

• Option 1: "A bud forms only during sexual reproduction and fuses with the parent organism" – This is incorrect. Budding is a form of asexual reproduction, and the bud does not fuse with the parent; it detaches to form a new organism.

• Option 3: "A bud forms from specialized cells inside the organism and remains attached for life" – This is incorrect. The bud forms externally and detaches once it matures.

• Option 4: "A bud forms from a broken body part and grows into a new organism" – This is incorrect. This description refers to regeneration, not budding. For example, starfish regenerate lost arms, but this is not budding.

• Characteristics of Budding:

• Budding is common in Hydra, yeast, and certain plants and fungi.

• In yeast, the process involves the formation of a small bulge on the parent cell, which grows and eventually separates as a new cell.

• In Hydra, budding occurs through mitotic cell division in the body wall, forming a miniature version of the parent.

• This process is energy-efficient as it does not require the production of gametes or mating.

• Comparison with Other Asexual Reproduction Methods:

• Fragmentation: Seen in organisms like spirogyra, where the body breaks into fragments, and each fragment grows into a new organism.

• Binary Fission: Found in bacteria, where the organism divides into two identical daughter cells.

• Sporulation: Seen in fungi and some plants, where spores develop into new organisms under favorable conditions.

• Importance of Budding:

• Ensures rapid reproduction in favorable conditions.

• Helps maintain the population of species in stable environments.

• Simple and efficient mechanism for producing genetically identical offspring.

Important Points

• Hydra:

• Hydra is a freshwater organism belonging to the phylum Cnidaria.

• It reproduces both sexually and asexually, with budding being its common mode of asexual reproduction.

• Hydra's ability to regenerate is another significant characteristic, which allows it to recover lost body parts.

• Yeast:

• Yeast is a unicellular fungus that reproduces primarily through budding.

• It is used in baking, brewing, and scientific research due to its rapid growth and easy genetic manipulation.

• In yeast, a small bud appears, grows, and eventually separates to form an independent organism.

Q7. Answer: (d) Pea plant

The correct answer is Pea plant.

Key Points

• Gregor Mendel, known as the "Father of Genetics," conducted his experiments on the pea plant (Pisum sativum).

• Mendel chose pea plants because they have distinct and easily observable traits, such as flower color, seed shape, seed color, pod shape, pod color, flower position, and plant height.

• Pea plants are self-pollinating, which allowed Mendel to control breeding and cross-pollination experiments systematically.

• He performed experiments between 1856 and 1863, analyzing the inheritance patterns of these traits over multiple generations.

• Mendel used pea plants to establish the foundational principles of inheritance, including the laws of segregation and the law of independent assortment.

Additional Information

• Why Mendel chose pea plants:

• Pea plants have short life cycles, enabling Mendel to observe many generations in a short period.

• They exhibit seven distinct traits, each with two clear variations (e.g., tall vs. short plants).

• Pea plants can be artificially cross-pollinated or self-pollinated, allowing Mendel to control the experiment.

• Mendel's Laws of Inheritance:

• Law of Segregation: Each organism inherits two alleles for each trait, one from each parent, and these alleles segregate during gamete formation.

• Law of Independent Assortment: Alleles for different traits segregate independently of each other during gamete formation.

• Impact of Mendel's work:

• Mendel's findings laid the foundation for the modern field of genetics.

• His principles were rediscovered in the early 20th century, decades after his experiments were initially overlooked.

• Other plants Mendel could have experimented with:

• Sunflower: Known for its large flowers and ability to grow quickly but lacks distinct, easily observable traits for genetic studies.

• Tomato: Tomatoes also exhibit genetic diversity, but they were not as suitable for controlled pollination experiments.

• Bean plant: Bean plants have genetic variability but were not as ideal for Mendel's experiments as pea plants.

Important Points

• Gregor Mendel:

• Mendel was an Austrian monk who conducted pioneering experiments in genetics.

• He published his work in 1866, but it gained recognition only in the early 20th century.

• Applications of Mendel's discoveries:

• His principles are used in plant breeding and the study of heredity in humans.

• Mendel's laws are fundamental to understanding genetic disorders and inheritance patterns.

Q8. Answer: (a) -12.0 m/s

The correct answer is -12.0 m/s.

Key Points

• Initial velocity of the object: The object has an initial velocity of 3.0 m/s in a specific direction. This is the starting motion of the object. (Correct)

• Mass of the object: The mass of the object is given as 10.0 kg. This is used to compute the acceleration when the force is applied. (Correct)

• Force applied: A constant force of 30.0 N is applied in the opposite direction of motion. This force will decelerate the object. (Correct)

• Duration of force application: The force acts on the object for 5.0 seconds. This time duration is crucial in determining the change in velocity. (Correct)

• Final velocity calculation: Using Newton's second law and kinematic equations, the final velocity is calculated as -12.0 m/s, indicating the object is moving in the opposite direction after deceleration. (Correct)

Additional Information

• Newton's Second Law of Motion: The law states that the force acting on an object is equal to the product of its mass and acceleration. Formula: F = ma. Here, force is 30.0 N, and mass is 10.0 kg. This gives an acceleration of a = F/m = 30/10 = 3.0 m/s^2.

• Acceleration Direction: Since the force is applied in the opposite direction to motion, the acceleration is negative. Thus, a = -3.0 m/s^2.

• Kinematic Equation: The final velocity can be calculated using the equation: v = u + at, where v is the final velocity, u is the initial velocity, a is the acceleration, and t is the time. Substituting the values: v = 3.0 + (-3.0) * 5.0 = 3.0 - 15.0 = -12.0 m/s.

• Negative Velocity: The final velocity being -12.0 m/s indicates that the object has reversed its direction and is now moving opposite to its initial motion.

• Applications of the Concept: This principle is widely used in understanding vehicle braking systems, rocket propulsion, and other real-world scenarios involving motion under opposing forces.

Important Points

• Force Opposing Motion: When a force is applied opposite to the direction of motion, it causes deceleration, which is reflected as a negative acceleration in calculations.

• Sign Convention: In physics problems, the direction of motion is often considered positive, and opposing forces or velocities are assigned negative values.

• Real-Life Example: A car braking to a stop exemplifies deceleration. If the braking force is strong enough, the car can even reverse its direction, similar to the object in this problem.

• Key Formula: Always remember the equation v = u + at for problems involving uniform acceleration or deceleration.

• Practical Implications: Understanding motion under opposing forces is crucial in designing safety systems like airbags, seat belts, and crash avoidance technologies.

Q9. Answer: (c) diffusion

The correct answer is diffusion.

Key Points

• Diffusion is the process by which particles of two different types of matter mix randomly due to their inherent kinetic energy and random motion.

• It occurs naturally without the need for external force or pressure, as particles move from regions of higher concentration to regions of lower concentration.

• This phenomenon is common in both gases and liquids, where molecules are free to move and spread.

• Examples: The fragrance of perfume spreading in a room or sugar dissolving in water are examples of diffusion.

• Diffusion is crucial in biological processes, such as gas exchange in the lungs (oxygen diffuses into blood, and carbon dioxide diffuses out).

Additional Information

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• Effusion:

• Effusion refers to the movement of gas particles through a small hole without collisions between the particles.

• It is governed by Graham's Law, which states that the rate of effusion is inversely proportional to the square root of the molar mass of the gas.

• Example: Gas leaking from a punctured tire is an example of effusion.

• Intermixing:

• Intermixing is a general term referring to the mixing of two or more substances.

• Unlike diffusion, it does not specifically depend on random molecular motion.

• Intermixing can occur due to stirring, agitation, or external forces.

• Homogenisation:

• Homogenisation is a process used to create a uniform mixture where particles are evenly distributed.

• It typically involves mechanical or chemical methods, such as blending or emulsifying.

• Example: Milk is homogenized to distribute fat particles evenly throughout the liquid.

• Scientific Importance:

• Diffusion is a fundamental physical process that helps explain molecular behavior in gases, liquids, and even solids.

• It plays a vital role in numerous fields, including chemistry, biology, and environmental science.

Important Points

• Factors Influencing Diffusion:

• Temperature: Higher temperatures increase the kinetic energy of particles, speeding up diffusion.

• Concentration Gradient: Diffusion occurs faster when there is a greater difference in concentration between two regions.

• Medium: Diffusion is faster in gases, slower in liquids, and extremely slow in solids due to differences in molecular mobility.

• Real-Life Applications:

• Industrial Processes: Diffusion is used in distillation, purification, and chemical reactions.

• Environmental Science: Diffusion explains the dispersion of pollutants in air and water.

• Medical Science: Oxygen and drug molecules diffuse into cells for vital functions.

Q10. Answer: (a) Ingestion → Digestion → Absorption → Egestion

The correct answer is Ingestion → Digestion → Absorption → Egestion.

Key Points

• Amoeba, a unicellular organism, follows a specific nutrition process that involves four steps: Ingestion, Digestion, Absorption, and Egestion. This sequence ensures that the amoeba meets its nutritional requirements efficiently.

• Ingestion: The amoeba engulfs food particles through a process called phagocytosis. It extends its pseudopodia (temporary projections of the cell membrane) to surround the food and forms a food vacuole. Hence, this step is correct.

• Digestion: The food inside the vacuole is broken down into simpler substances with the help of enzymes secreted into the vacuole. These enzymes convert complex nutrients into simpler, absorbable forms. This step is correct.

• Absorption: The digested nutrients are absorbed into the cytoplasm of the amoeba and are used for various cellular processes such as growth and energy production. Hence, this step is correct.

• Egestion: The undigested waste material is expelled out of the cell by the reverse process of phagocytosis, where the cell membrane opens to release the waste. This step is correct.

• The sequence Ingestion → Digestion → Absorption → Egestion accurately describes the process of nutrition in amoeba, ensuring its survival and metabolic activities.

Additional Information

• Nutrition in Amoeba: Amoeba exhibits holozoic nutrition, which involves ingestion of solid food particles and their subsequent digestion, absorption, and egestion.

• Pseudopodia: Amoeba uses its pseudopodia to capture food. These are temporary extensions of the cytoplasm that help in locomotion and food capture.

• Food Vacuole: This is a temporary structure formed around the food particle during ingestion. It acts as the site for digestion where enzymes are secreted.

• Enzymes: The enzymes secreted into the food vacuole play a critical role in breaking down complex substances like carbohydrates, proteins, and lipids into simpler substances that can be absorbed.

• Egestion Process: The waste materials left after digestion are expelled through the cell membrane by a process called exocytosis.

• Energy Usage: The absorbed nutrients are used for various cellular activities such as reproduction, locomotion, and repair.

Important Points

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• Incorrect Sequences: Other options provided in the question incorrectly describe the order of the nutrition process in amoeba. For example:

• Option 2: "Absorption → Ingestion → Digestion → Egestion" is incorrect because absorption cannot occur before ingestion.

• Option 3: "Diffusion → Ingestion → Digestion → Absorption" is incorrect because diffusion is not a part of the amoeba's nutrition process; it is a mechanism for gas exchange.

• Option 4: "Ingestion → Egestion → Absorption → Digestion" is incorrect as egestion cannot occur before digestion and absorption.

• Locomotion and Feeding: Amoeba's pseudopodia not only help in capturing food but also aid in its movement, making it a versatile survival tool.

• Significance: Understanding the amoeba's nutrition process helps in studying basic life processes and cellular mechanisms in unicellular organisms.

Q11. Answer: (b) Change in the water content of leaf cells

The correct answer is Change in the water content of leaf cells.

Key Points

• Mimosa pudica, commonly known as the "touch-me-not" plant, exhibits a phenomenon known as thigmonasty, where the leaves fold upon touch or mechanical stimulus.

• This movement results from a rapid change in the turgor pressure of cells in specialised structures called the pulvini at the bases of the leaflets and petioles.

• When stimulated, ions like potassium (K^+) are pumped out of the cells in the pulvini, causing water to exit the cells via osmosis. This leads to a loss of turgidity in the cells, resulting in the folding of the leaves.

• This reaction is a defensive mechanism believed to protect the plant from herbivores or environmental stressors, as the sudden movement might deter predators.

• The change in water content is a hydraulic mechanism and occurs within seconds, making it one of the fastest plant movements observed in nature.

Additional Information

• Mechanism of Leaf Folding in Mimosa pudica:

• The specialized structure called the pulvinus contains motor cells that regulate leaf movement.

• When touched, electrical signals called action potentials are generated, triggering ion exchange and water movement.

• The outer cells lose water, causing them to shrink, while inner cells remain turgid, resulting in leaf folding.

• Role of Thigmonasty in Plant Survival:

• Thigmonasty acts as a defense mechanism by making the plant less appealing to herbivores.

• The folding reduces the surface area exposed to sunlight, potentially helping the plant conserve moisture under extreme heat.

• It may also help dislodge harmful insects or dirt particles from the leaves.

• Key Characteristics of Mimosa pudica:

• Mimosa pudica is a leguminous plant and belongs to the family Fabaceae.

• It is a perennial herb native to South and Central America but is now found in tropical and subtropical regions worldwide.

• The plant is known for its sensitive nature, with leaves responding not only to touch but also to temperature changes, vibrations, and light intensity.

• Comparison of Other Stimuli:

• Change in pH: While pH changes can affect cellular processes, they are not directly involved in the rapid folding of Mimosa leaves.

• Change in Light Intensity: Some plants exhibit nyctinasty (movements in response to light), but Mimosa's folding mechanism is unrelated to light changes.

• Change in Temperature: Although temperature can affect plant physiology, it does not trigger the rapid folding of Mimosa pudica leaves.

Important Points

• Electrochemical Signals: Mimosa pudica relies on electrochemical signaling for rapid responses, similar to the nervous system in animals. These signals travel at speeds of up to 10 cm/s.

• Hydraulic Mechanism: The folding of leaves is a result of hydraulic pressure changes and not due to muscular or mechanical forces.

• Scientific Study: The behavior of Mimosa pudica has been studied extensively in plant physiology to understand tropic and nastic movements.

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Q12. Answer: (a) It is energetically unfavourable to lose or gain 4 electrons.

The correct answer is It is energetically unfavourable to lose or gain 4 electrons..

Key Points

• Carbon's electronic configuration: Carbon has an atomic number of 6, and its electronic configuration is $1s^2\ 2s^2\ 2p^2$. It has 4 valence electrons in its outermost shell.

• Energetic considerations for ionic bonding: To form an ionic bond, carbon would need to either gain 4 electrons to achieve a stable octet (resulting in a -4 charge) or lose 4 electrons (resulting in a +4 charge). Both processes require a tremendous amount of energy, making them highly energetically unfavourable.

• Covalent bonding as a solution: Instead of forming ionic bonds, carbon achieves stability by sharing its 4 electrons with other atoms through covalent bonds. This sharing allows carbon to complete its octet with minimal energy expenditure.

• Small atomic size: Carbon's small atomic size makes it suitable for forming stable covalent bonds by overlapping its orbitals with those of other atoms, enabling strong bond formation.

• Versatility of covalent bonding: Carbon forms covalent bonds with a wide variety of elements, including hydrogen, oxygen, nitrogen, and other carbon atoms. This property allows it to create an extensive range of compounds, including organic molecules essential for life.

Additional Information

• Carbon's tetravalency: Carbon is tetravalent, meaning it can form four covalent bonds. This property allows it to create a diverse array of compounds, ranging from simple molecules like methane (CH4) to complex macromolecules like DNA.

• Allotropes of carbon: Carbon exists in several allotropes, including diamond, graphite, and fullerenes. These allotropes demonstrate the versatility of carbon's covalent bonding.

• Hybridization in carbon: Carbon exhibits different types of hybridization (sp, sp^2, sp^3), allowing it to form single, double, and triple bonds. For example, sp^3 hybridization occurs in methane, while sp^2 hybridization is seen in ethene.

• Importance in organic chemistry: Carbon's ability to form stable covalent bonds is the foundation of organic chemistry, which studies compounds primarily composed of carbon and hydrogen.

• Comparison with other elements: Unlike elements such as sodium or chlorine, which readily lose or gain one electron to form ionic bonds, carbon's intermediate position in the periodic table makes covalent bonding the most practical and energetically efficient option.

Q13. Answer: (c) completely dissipated as heat

The correct answer is completely dissipated as heat.

Key Points

• In a purely resistive circuit, the electrical energy supplied by the battery is fully converted into heat energy. This is a fundamental property of resistive components, governed by Joule’s Law of Heating.

• According to Joule's Law, the heat energy generated in a resistive element is proportional to the square of the current, the resistance, and the time for which the current flows. The formula is: $H = I^2RT$, where H is heat, I is current, R is resistance, and T is time.

• Resistors do not store energy in any form. They dissipate energy continuously as heat when current flows through them.

• Unlike inductors or capacitors, which can store energy as magnetic or electric fields respectively, resistors solely serve to oppose the flow of current and convert electrical energy into heat.

• This phenomenon is utilized in various applications, such as electric heaters, toasters, and incandescent light bulbs, where resistive elements are designed to generate heat intentionally.

Additional Information

• Energy Conversion in Resistive Circuits:

• In a resistive circuit, electrical energy is transformed directly into thermal energy due to the opposition to current flow caused by the resistor.

• The power dissipated as heat in the resistor is given by $P = I^2R = V^2/R$, where P is power, I is current, V is voltage, and R is resistance.

• Comparison with Other Components:

• Inductors: Store energy in the form of a magnetic field. The energy stored is given by $E = \frac{1}{2}LI^2$, where L is inductance and I is current.

• Capacitors: Store energy in the form of an electric field. The energy stored is given by $E = \frac{1}{2}CV^2$, where C is capacitance and V is voltage.

• Resistors: Do not store energy but dissipate it entirely as heat.

• Applications of Resistive Heating:

• Electric Heating Devices: Appliances like electric heaters, hair dryers, and ovens use resistive elements to convert electrical energy into heat.

• Incandescent Bulbs: Filaments in these bulbs are resistive and glow due to the heat generated, producing light.

• Fuses: Resistive heating is utilized in fuses to break the circuit when excessive current flows.

• Important Characteristics of a Resistive Circuit:

• Ohmic Behavior: Resistors obey Ohm's Law, where voltage (V) across the resistor is directly proportional to the current (I) flowing through it, i.e., V = IR.

• No Energy Storage: Unlike capacitors or inductors, resistors do not have the ability to store energy.

• Uniform Dissipation: The energy is uniformly dissipated as heat along the resistive element.

Important Points

• Option 1: Stored as magnetic energy – This is incorrect because only inductors can store energy as a magnetic field.

• Option 2: Stored as potential energy – This is incorrect because capacitors, not resistors, store energy as potential energy in the form of an electric field.

• Option 3: Completely dissipated as heat – This is correct as resistors convert all electrical energy into heat.

• Option 4: Converted only into light – This is incorrect. While resistors in devices like incandescent bulbs emit light, it is a by-product of the heat generated.

Q14. Answer: (d) Medium

The correct answer is Medium.

Key Points

• Sound waves require a medium for propagation, as they travel by causing vibrations in the particles of a material medium such as solids, liquids, or gases.

• In a solid medium, particles are closely packed, allowing sound to travel faster compared to liquids and gases.

• Sound cannot travel through a vacuum, as there are no particles present to vibrate and transfer the sound energy. (This makes Option 3 incorrect).

• Unlike light waves, which can travel through a vacuum, sound waves are mechanical waves and depend on the interaction of particles in a medium. (This excludes Options 1, 2).

• The speed of sound varies depending on the medium. For example, sound travels at approximately 343 m/s in air, 1,480 m/s in water, and up to 5,000 m/s in steel.

Additional Information

• Characteristics of Sound Waves:

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

• They are also mechanical waves, requiring a medium such as air, water, or solids to transmit energy.

• Sound waves consist of compressions (regions of high pressure) and rarefactions (regions of low pressure).

• Role of Medium:

• The type of medium affects the speed, intensity, and quality of sound.

• Sound travels fastest in solids, slower in liquids, and slowest in gases, due to the density and elasticity of the medium.

• For example, sound travels faster in water (1,480 m/s) than in air (343 m/s).

• Sound in a Vacuum:

• In a vacuum, there are no particles to vibrate and carry sound waves, so sound cannot propagate.

• This principle is why astronauts in space require radio communication, as space is essentially a vacuum.

• Examples of Sound Propagation:

• In air: Sound from a speaker or a person talking travels through the air to reach your ears.

• In water: Marine animals like dolphins use sound to communicate over long distances underwater.

• In solids: Vibrations from a tuning fork can be felt through a table or metal rod.

Important Points

• Option 1: Magnet - A magnet is unrelated to sound propagation, as it affects magnetic fields, not mechanical waves.

• Option 2: Light Source - A light source emits electromagnetic waves, which can travel through a vacuum, unlike sound waves.

• Option 3: Vacuum - A vacuum lacks particles, making it impossible for sound to propagate through it.

• Option 4: Medium - A medium (solid, liquid, or gas) is essential for the propagation of sound waves, as it provides the particles needed for the transfer of energy.

• Option 5: None - This is incorrect, as a medium is mandatory for sound to travel.

Q15. Answer: (b) Meiosis

The correct answer is Meiosis.

Key Points

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• Meiosis is a type of cell division that occurs in germ cells (reproductive cells).

• It reduces the chromosome number by half, producing four haploid cells (gametes) from a single diploid parent cell.

• This process ensures that the offspring have the same chromosome number as the parent organism when gametes fuse during fertilization.

• Meiosis consists of two sequential stages: Meiosis I and Meiosis II, each with specific phases like prophase, metaphase, anaphase, and telophase.

• During Meiosis I, homologous chromosomes separate, and during Meiosis II, sister chromatids separate, resulting in the formation of four genetically distinct gametes.

• This process is crucial for maintaining genetic diversity through mechanisms like crossing over and independent assortment.

Additional Information

• Budding:

• This is an asexual form of reproduction seen in organisms like yeast and hydra.

• A new individual develops as an outgrowth (bud) on the parent organism and eventually detaches to live independently.

• It does not involve the reduction of chromosome number or the formation of gametes.

• Mitosis:

• Mitosis is a type of cell division in which a single parent cell divides to produce two genetically identical daughter cells.

• It occurs in somatic (non-reproductive) cells and is responsible for growth, tissue repair, and asexual reproduction.

• Unlike meiosis, mitosis maintains the original chromosome number (diploid) in daughter cells.

• Amitosis:

• Amitosis is a direct type of cell division without the formation of spindle fibers or distinct chromosomes.

• It occurs in some unicellular organisms like bacteria and certain protozoa.

• This process is much simpler and lacks the complexity of meiosis or mitosis.

• Role of Meiosis in Genetic Diversity:

• Genetic recombination occurs during crossing over in Prophase I of Meiosis I, which exchanges genetic material between homologous chromosomes.

• Independent assortment of chromosomes during Metaphase I leads to a variety of genetic combinations.

• These mechanisms contribute to evolutionary processes by introducing variability in populations.

Important Points

• Meiosis and Fertilization:

• Meiosis ensures that gametes (sperm and egg) have half the chromosome number (haploid).

• Fertilization restores the diploid chromosome number in the zygote, ensuring species consistency.

• Organisms Exhibiting Meiosis:

• Meiosis occurs in sexually reproducing organisms, including animals, plants, and fungi.

• In plants, meiosis leads to the formation of spores, which eventually develop into gametophytes.

• Medical Relevance:

• Errors in meiosis can lead to chromosomal abnormalities such as Down syndrome, Klinefelter syndrome, or Turner syndrome.

• Understanding meiosis is crucial for fertility treatments and genetic counseling.

Q16. Answer: (d) remains the same

The correct answer is remains the same.

Key Points

• When an object falls freely near the Earth, it is influenced only by the force of gravity. The motion remains in a straight line towards the center of the Earth, and the direction does not change. Hence, the direction of motion remains the same.

• Gravitational force acts vertically downward, pulling the object towards the Earth's surface. There is no force acting to change the direction of motion during free fall.

• The motion of a freely falling object is considered uniformly accelerated motion due to the constant acceleration caused by gravity (9.8 m/s^2 near the Earth's surface).

• In the absence of air resistance, the object moves along a vertical line, with no horizontal forces or components acting on it. Thus, the trajectory remains vertical throughout the fall.

• Options like "becomes horizontal," "changes continuously," or "becomes opposite to gravity" are incorrect as they contradict the principle of free-fall motion governed by gravity.

Additional Information

• Free Fall:

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• Free fall is defined as the motion of a body where gravity is the only force acting on it.

• The acceleration due to gravity is denoted by g and has a standard value of approximately 9.8 m/s² on the Earth's surface.

• During free fall, the object's velocity increases linearly with time, while its position follows a quadratic relationship with time.

• The formula for the distance traveled during free fall is $s = 1/2\ g\ t^2$, where s is the distance, g is the acceleration due to gravity, and t is time.

• Examples include a stone dropped from a height, a ball falling from a building, or a skydiver (without air resistance).

• Influence of Air Resistance:

• In real-world scenarios, air resistance can affect the motion of falling objects, causing deviations from ideal free fall.

• Without air resistance, all objects fall at the same rate regardless of their mass, as demonstrated by Galileo's famous experiment at the Leaning Tower of Pisa.

• Air resistance depends on factors such as the object's shape, surface area, and velocity.

• Misconceptions:

• It is a common misconception that heavier objects fall faster than lighter ones. In the absence of air resistance, objects of different masses fall at the same rate due to gravity.

• Another misconception is that the direction of motion might change during free fall. However, in the absence of external forces like wind or air resistance, the direction remains vertical and constant.

• Applications:

• Free fall concepts are used in calculating time of fall, velocity, and impact force in physics and engineering problems.

• It is also crucial in understanding planetary motion, satellite launches, and celestial mechanics.

Q17. Answer: (a) bends towards the normal

The correct answer is bends towards the normal.

Key Points

• When a light ray passes from a rarer medium (like air) to a denser medium (like water or glass), it bends towards the normal. This phenomenon occurs due to the change in the speed of light as it moves between media of different optical densities.

• The bending of light at the interface of two media is governed by Snell's Law, which states that the ratio of the sine of the angle of incidence to the sine of the angle of refraction is constant for a given pair of media.

• The refractive index of the denser medium is greater than that of the rarer medium, causing the light ray to slow down and bend towards the normal.

• The angle of refraction is always smaller than the angle of incidence when light travels from a rarer to a denser medium.

• Examples of this phenomenon include the bending of light when it passes from air into water, making objects submerged in water appear displaced or distorted.

Additional Information

• Snell's Law:

• Snell's Law is mathematically expressed as: $n1 \sin \theta1 = n2 \sin \theta2$, where n1 and n2 are the refractive indices of the two media, and θ1 and θ2 are the angles of incidence and refraction, respectively.

• It explains the relationship between the angles and the refractive indices of the two media.

• Refractive Index:

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

• For example, the refractive index of air is approximately 1.0003, while that of water is about 1.33, and glass ranges from 1.5 to 1.9.

• Applications of Refraction:

• Refraction is utilized in the design of optical instruments such as lenses, microscopes, and telescopes.

• It is also responsible for natural phenomena like the formation of rainbows and the apparent bending of objects in water.

• Critical Angle and Total Internal Reflection:

• When light travels from a denser medium to a rarer medium, at a certain angle called the critical angle, the refracted ray travels along the boundary.

• If the angle of incidence exceeds the critical angle, the light undergoes total internal reflection, a principle used in optical fibers and periscopes.

Important Points

• Option 2 (bends at a 90° angle): This is incorrect because light does not bend at a 90° angle unless it is incident at the critical angle and refracts along the boundary.

• Option 3 (bends away from the normal): This occurs when light travels from a denser medium to a rarer medium, not the other way around.

• Option 4 (does not bend at all): This is true only if the light ray is incident normally (perpendicular) to the surface, in which case it passes straight through without refraction.

• Understanding the concept of refraction is crucial in fields like optics, physics, and engineering, where precision in light manipulation is required.

Q18. Answer: (a) Charcoal

The correct answer is Charcoal.

Key Points

• Charcoal burns without a flame because it is primarily made up of carbon. During combustion, it undergoes a process called smoldering combustion, which does not produce a visible flame but generates heat and light. Hence, the correct answer is Charcoal.

• Flames are typically the result of the combustion of volatile gases. Substances like petrol, wax, and LPG release significant amounts of volatile gases when heated, leading to the formation of a flame. However, charcoal does not release such gases in large quantities.

• Charcoal undergoes a slow oxidation process when it burns, producing carbon dioxide (CO_2) and heat without the presence of a flame. This is why it is commonly used in applications like barbeques and heating where a steady heat source is needed.

• Unlike petrol, wax, or LPG, charcoal does not contain hydrocarbons that vaporize and ignite, which is necessary for the creation of a flame. Instead, it burns steadily in its solid form.

• Substances like petrol, wax, and LPG produce flames because they involve the combustion of liquid or gaseous hydrocarbons, which are inherently different from the solid carbon structure of charcoal.

Additional Information

• Charcoal:

• Charcoal is produced by heating wood or organic matter in the absence of oxygen, a process called pyrolysis.

• It is primarily composed of carbon, with small amounts of ash and other impurities.

• Charcoal is widely used for cooking and heating because it provides a long-lasting and steady heat source without flames.

• It is also used in industries as a reducing agent in metallurgical processes.

• Petrol:

• Petrol, also known as gasoline, is a hydrocarbon-based liquid fuel derived from crude oil.

• When petrol burns, it vaporizes and ignites, producing a bright flame and significant heat.

• It is primarily used as a fuel for internal combustion engines in vehicles.

• Its high volatility makes it highly flammable, and it burns with a visible flame.

• Wax:

• Wax is a hydrocarbon compound used in candles and other applications. It melts when heated and releases vapors that ignite to produce a flame.

• The combustion of wax involves the release of energy in the form of light and heat.

• Wax candles are commonly used for illumination, decoration, and religious purposes.

• LPG (Liquefied Petroleum Gas):

• LPG is a mixture of propane and butane, which are hydrocarbons. It is stored as a liquid under pressure and vaporizes when released.

• When ignited, LPG burns with a flame, making it suitable for cooking, heating, and other applications.

• It is widely used as a clean and efficient energy source in households and industries.

Important Points

• Burning Process: Substances burn in different ways depending on their physical and chemical properties. For instance:

• Solid Fuels: Like charcoal, they burn without a visible flame due to the lack of volatile compounds.

• Liquid Fuels: Like petrol, they vaporize and burn with a flame due to the combustion of hydrocarbon vapors.

• Gaseous Fuels: Like LPG, they burn with a flame as they are already in the gaseous state and easily mix with oxygen for combustion.

• Flame and Combustion: A flame is produced when a combustible material releases vapors that mix with oxygen and ignite. The absence of such vapors in substances like charcoal results in flameless combustion.

• Applications: Charcoal is preferred in situations where controlled, flameless heat is required, while substances like petrol, wax, and LPG are used where a visible flame is needed.

Q19. Answer: (d) Number of protons in an atom

The correct answer is Number of protons in an atom.

Key Points

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• The atomic number of an element represents the number of protons present in the nucleus of an atom.

• The atomic number is a unique identifier for each element in the periodic table, meaning no two elements share the same atomic number.

• The number of protons in an atom determines its chemical properties and its position in the periodic table.

• For a neutral atom, the number of protons is equal to the number of electrons, ensuring electrical neutrality.

• The atomic number is denoted by the symbol Z in nuclear and atomic physics.

Additional Information

• Option 1: Number of Neutrons in an Atom

• The number of neutrons in an atom is not represented by its atomic number. Instead, neutrons are calculated by subtracting the atomic number from the mass number (Mass Number = Protons + Neutrons).

• The number of neutrons can vary among isotopes of the same element, leading to different atomic masses.

• Option 2: Mass Number of the Atom

• The mass number is the sum of protons and neutrons in the nucleus of an atom.

• Unlike the atomic number, the mass number is not unique to an element because it can vary for isotopes of the same element.

• Option 3: Total Number of Electrons and Protons

• The atomic number does not represent the combined total of electrons and protons. However, in a neutral atom, the number of electrons is equal to the number of protons.

• In ions, the number of electrons differs from the number of protons due to gain or loss of electrons.

• Option 4: Number of Protons in an Atom

• This is the correct answer as the atomic number directly corresponds to the number of protons in the nucleus of an atom.

• For example, the element Hydrogen has an atomic number of 1, meaning it has 1 proton, while Carbon has an atomic number of 6, meaning it has 6 protons.

• Importance of Atomic Number

• The atomic number determines the element's identity and its position in the periodic table.

• It is crucial in defining the element's chemical behavior and reactivity.

Important Points

• Periodic Table: The periodic table is organized based on the atomic number of elements, with elements arranged in increasing order of atomic number.

• Isotopes: Atoms of the same element with the same atomic number but different mass numbers are called isotopes. For example, Carbon-12 and Carbon-14 are isotopes of Carbon.

• Discovery: The concept of the atomic number was proposed by Henry Moseley in 1913 through his work on X-ray spectra.

• Neutral Atoms: In a neutral atom, the atomic number also indicates the number of electrons, which balance the positive charge of the protons.

Q20. Answer: (d) Nucleus

The correct answer is Nucleus.

Key Points

• Nucleus is the control center of the cell and plays a critical role in cellular reproduction. It houses the cell's genetic material (DNA), which contains instructions for cell division.

• The process of cellular reproduction, including mitosis and meiosis, is regulated by the nucleus. It ensures the accurate replication and distribution of genetic material during cell division.

• The nucleus contains chromosomes composed of DNA and proteins, which are essential for genetic inheritance and cellular functionality.

• It also contains the nucleolus, which is involved in the synthesis of ribosomes, aiding in protein production necessary for cell growth and division.

• Any damage or mutation in the nucleus can lead to errors in cellular reproduction, which might result in diseases such as cancer.

Additional Information

• Lysosomes:

• Lysosomes are known as the "suicidal bags" of the cell due to their ability to break down cellular waste and damaged organelles.

• They play no direct role in cellular reproduction but are involved in autophagy (self-digestion) and maintaining cellular health.

• Endoplasmic Reticulum (ER):

• The ER is responsible for protein and lipid synthesis. It aids in cellular growth but does not directly participate in cellular reproduction.

• The smooth ER synthesizes lipids, while the rough ER assists in protein production through ribosomes.

• Plastids:
• Plastids, including chloroplasts, are found in plant cells and are involved in photosynthesis and storage.
• They do not directly contribute to cellular reproduction but play a role in energy production, supporting cell growth.
• Cellular Reproduction:
• Cellular reproduction is divided into two main types: mitosis (for somatic cells) and meiosis (for gametes).
• Both processes are tightly regulated by the nucleus, ensuring proper genetic material distribution.

Important Points

• Chromosomes:
• These are thread-like structures in the nucleus that contain DNA. Human cells typically have 46 chromosomes, arranged in 23 pairs.
• During cell division, chromosomes ensure genetic material is accurately copied and distributed.
• Cell Cycle:
• The cell cycle consists of Interphase (growth and DNA replication) and Mitotic Phase (division).
• The nucleus plays a vital role in regulating the cell cycle stages, especially during DNA replication in the S-phase of Interphase.
• Mutations:
• Errors in the nucleus during replication can lead to mutations, which may cause genetic disorders or cancer.
• Cellular mechanisms, such as DNA repair processes, work to prevent these errors.

Q21. Answer: (a) Both Statements 1 and 2 are correct.

The correct answer is Both Statements 1 and 2 are correct..

Key Points

• Statement 1: A fuse is connected in series in an electric circuit.
• A fuse is always connected in series with the electrical circuit it protects.
• This ensures that the fuse can effectively interrupt the flow of current to the entire circuit when there is an overload or short circuit.
• By being in series, any excessive current passes through the fuse first, protecting the devices downstream. Hence, Statement 1 is correct.
• Statement 2: A fuse wire melts when the current exceeds a safe limit.
• A fuse is designed with a wire of low melting point and specific current-carrying capacity.
• When the current in the circuit exceeds the safe limit, the heat generated by the excess current causes the fuse wire to melt.
• This action breaks the circuit and prevents damage to electrical appliances and fires caused by overheating. Hence, Statement 2 is correct.
• Both statements are true as they describe the purpose and working principle of a fuse in an electric circuit.

Additional Information

• Fuse:
• A fuse is a safety device used in electrical circuits to protect appliances from overloads and short circuits.
• It is made of a metal or alloy with a low melting point and high conductivity, typically tin-lead alloy or copper.
• Functions of a Fuse:
• It protects electrical devices by interrupting excessive current flow.
• Prevents overheating and potential fire hazards in the circuit.
• Ensures the safety of users by disconnecting the faulty circuit.
• Types of Fuses:
• Cartridge Fuse: Used in appliances and automotive circuits.
• Rewireable Fuse: Common in domestic wiring systems.
• Miniature Circuit Breaker (MCB): Modern alternative to traditional fuses, automatically trips during faults.
• Applications of Fuses:
• Used in domestic wiring systems to protect home appliances.
• Widely utilized in industrial machinery to prevent electrical hazards.
• Essential in automotive circuits to safeguard vehicle electronics.

Important Points

• Melting Point of Fuse Wire:
• The fuse wire is selected based on its low melting point so that it melts quickly during excessive current flow.

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• Proper Rating:

• Fuses must have the correct current rating to provide effective protection; an undersized fuse may blow unnecessarily, while an oversized fuse may fail to protect the circuit.

• Maintenance:

• Regular inspection of fuse connections is necessary to ensure they are functioning properly and are not damaged.

Q22. Answer: (d) A straight line passing through the origin with positive slope

The correct answer is A straight line passing through the origin with positive slope.

Key Points

• A particle starting from rest and moving with uniform acceleration experiences a constant rate of change in velocity over time.

• The mathematical relation between velocity (v), acceleration (a), and time (t) is given by the equation v = u + at, where u is the initial velocity. Since the particle starts from rest, u = 0. Thus, v = at.

• This equation shows that velocity (v) is directly proportional to time (t), resulting in a linear relationship with a positive slope determined by the acceleration (a).

• The graph of velocity versus time for a uniformly accelerated motion is a straight line passing through the origin, as the velocity is zero at time t = 0.

• Among the given options, only a straight line with a positive slope satisfies the condition of uniform acceleration. Hence, the correct graph is a straight line passing through the origin with a positive slope.

Additional Information

• Option 1: A parabola

• A parabolic velocity-time graph is characteristic of non-uniform acceleration, where the rate of change of velocity is not constant. This does not apply to the given scenario of uniform acceleration.

• Option 2: A straight line passing through the origin with negative slope

• A straight line with a negative slope represents uniform deceleration, where the velocity decreases linearly with time. This is not applicable as the particle is accelerating uniformly.

• Option 3: A horizontal line

• A horizontal velocity-time graph indicates a constant velocity, implying zero acceleration. This contradicts the condition of uniform acceleration given in the question.

• Uniform Acceleration:

• It refers to motion where the velocity of an object changes by an equal amount in equal intervals of time. Examples include freely falling bodies under gravity.

• Velocity-Time Graph:

• The slope of a velocity-time graph represents the acceleration. A straight line with a positive slope indicates constant acceleration, while a horizontal line indicates zero acceleration.

• For uniformly accelerated motion starting from rest, the velocity-time graph is always a straight line passing through the origin.

Important Points

• Key Equations of Motion:

• $v = u + at$: Relates velocity, initial velocity, acceleration, and time.

• $s = ut + 1/2\ at^2$: Describes the displacement of an object under uniform acceleration.

• $v^2 = u^2 + 2as$: Relates final velocity, initial velocity, acceleration, and displacement.

• Real-Life Applications of Uniform Acceleration:

• Free fall: Objects falling under gravity experience uniform acceleration (9.8 m/s^2 on Earth).

• Vehicle acceleration: When a car accelerates uniformly from rest, its velocity-time graph forms a straight line.

• Graphical Analysis:

• The area under the velocity-time graph represents the displacement of the object.

• The slope of the graph provides the acceleration of the motion.

Q23. Answer: (a) 16u

The correct answer is 16u.

Key Points

• The molecular mass of HNO3: The molecular mass of nitric acid (HNO3) is given as 63u, where "u" represents atomic mass units.

• Composition of HNO3: Nitric acid is composed of 1 hydrogen atom (H), 1 nitrogen atom (N), and 3 oxygen atoms (O).

• Atomic masses of hydrogen and nitrogen: The atomic mass of hydrogen (H) is 1u, and the atomic mass of nitrogen (N) is 14u.

• Mass contribution of oxygen: The total molecular mass of HNO_3 is calculated as follows:

Molecular mass = Mass of H + Mass of N + (3 × Mass of O)

Substituting the values: 63 = 1 + 14 + (3 × Mass of O).

• Solving for oxygen's atomic mass: Simplifying the equation:

63 = 15 + 3 × Mass of O

48 = 3 × Mass of O

Mass of O = 48 ÷ 3 = 16u.

• Conclusion: The atomic mass of oxygen is 16u.

Additional Information

• Atomic Mass Unit (u):

• An atomic mass unit (u) is a standard unit of mass that quantifies the mass of an atom or molecule. It is equivalent to 1/12th the mass of a carbon-12 atom.

• The atomic masses of elements are expressed in "u" and are based on their isotopic abundances.

• Atomic Mass of Common Elements:

• Hydrogen (H): 1u.

• Carbon (C): 12u.

• Nitrogen (N): 14u.

• Oxygen (O): 16u.

• Molecular Mass:

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

• For example, the molecular mass of water (H_2O) is calculated as:

Molecular mass = (2 × Mass of H) + (1 × Mass of O) = (2 × 1u) + (1 × 16u) = 18u.

• Applications of Atomic and Molecular Mass:

• Used in stoichiometric calculations to determine the proportions of reactants and products in chemical reactions.

• Helps in calculating molar masses, which are crucial for laboratory preparations and industrial processes.

• Essential for understanding molecular structures and their behavior in different states of matter.

• Oxygen in Nature:

• Oxygen is a vital element, making up approximately 21% of Earth's atmosphere.

• It is essential for respiration in living organisms and is a key component of water (H_2O).

• Oxygen is also involved in combustion and various industrial processes, such as steelmaking.

Q24. Answer: (b) Lead

The correct answer is Lead.

Key Points

• The reactivity series is a list of metals arranged in order of their reactivity from most reactive to least reactive. It is a fundamental concept in chemistry used to predict the behavior of metals in reactions.

• Lead is placed just above Copper in the reactivity series. This is because lead is slightly more reactive than copper but less reactive than metals like iron, zinc, or aluminum.

• The placement of lead above copper in the reactivity series means that lead can displace copper from its compounds in certain chemical reactions, such as in displacement reactions.

• Copper, being lower in the series, is less reactive and does not displace hydrogen from acids or react with water under normal conditions. Lead, however, can react with certain acids, although it reacts more slowly compared to more reactive metals like zinc or aluminum.

• The reactivity series is critical in understanding metal extraction and corrosion. For example, lead is used in applications like batteries because of its moderate reactivity and resistance to corrosion, whereas copper is widely used in electrical wiring due to its low reactivity and excellent conductivity.

Additional Information

• Reactivity Series:

• The reactivity series includes metals like potassium, sodium, and calcium at the top (most reactive), and metals like gold and platinum at the bottom (least reactive).

• Metals higher in the reactivity series can displace those lower in the series from their compounds during chemical reactions.

• The series is determined based on reactions with water, acids, and displacement reactions.

• Characteristics of Lead:

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• Atomic Number: 82.
• Symbol: Pb (from its Latin name "Plumbum").
• It is a soft, malleable metal with a bluish-white appearance when freshly cut but tarnishes to a dull gray upon exposure to air.
• Lead is used in batteries, radiation shielding, and weights. It is also resistant to corrosion due to the formation of an oxide layer.
• Characteristics of Copper:
• Atomic Number: 29.
• Symbol: Cu (from its Latin name "Cuprum").
• Copper is a reddish-brown metal known for its excellent thermal and electrical conductivity.
• It is used in electrical wiring, plumbing, and coinage.
• Copper is less reactive, does not corrode easily, and is often alloyed with other metals like zinc to form brass.
• Applications of the Reactivity Series:
• The reactivity series helps in predicting the outcome of displacement reactions.
• It is used in the extraction of metals from their ores. For example, highly reactive metals like aluminum are extracted via electrolysis, while less reactive metals like iron are extracted by reduction with carbon.
• The series also plays a role in understanding and preventing corrosion. Metals lower in the series, like copper, are less prone to corrosion compared to those higher, like iron.

Important Points

• Displacement Reactions: A more reactive metal displaces a less reactive metal from its compound. For example, lead can displace copper from copper sulfate solution.
• Corrosion Resistance: Metals lower in the series, like gold and copper, are less reactive and more resistant to corrosion, making them ideal for jewelry and electrical applications.
• Industrial Usage: Lead, due to its moderate reactivity, is extensively used in lead-acid batteries, while copper's low reactivity and high conductivity make it ideal for electrical wiring.
• Environmental Impact: Both lead and copper must be handled responsibly to prevent environmental contamination, as lead is toxic and copper can accumulate in aquatic ecosystems.

Q25. Answer: (b) Nissl granules

The correct answer is Nissl granules.

Key Points

• Nissl granules are specialized structures found in the cytoplasm of neurons, particularly in the soma (cell body) and dendrites.
• These granules are composed of rough endoplasmic reticulum (RER) and ribosomes, which are crucial for protein synthesis.
• Neurons require extensive protein synthesis to produce neurotransmitters, enzymes, and structural proteins essential for maintaining their function and communication.
• Proteins synthesized by Nissl granules are transported throughout the neuron, including the axon and dendrites, to support cellular activities.
• Nissl granules are absent in the axon and axon hillock, which is why protein synthesis predominantly occurs in the soma and dendrites.
• Hence, Nissl granules are vital for maintaining the structural and functional integrity of neurons.

Additional Information

• Axon:
• The axon is a long, slender projection of a neuron that conducts electrical impulses away from the cell body.
• It does not contain Nissl granules, so protein synthesis does not occur here.
• The axon is primarily involved in transmitting signals to other neurons, muscles, or glands.
• Proteins required in the axon are synthesized in the soma and transported via axoplasmic transport.
• Dendrites:
• Dendrites are branched extensions of the neuron that receive signals from other neurons.
• They contain Nissl granules, allowing limited protein synthesis to occur locally.
• Dendrites play a crucial role in integrating synaptic inputs and transmitting them to the soma.
• Synaptic Bulb:
• The synaptic bulb, also known as the synaptic terminal, is the end of the axon where neurotransmitters are released.
• It does not contain Nissl granules or engage in protein synthesis.
• Proteins and neurotransmitters used in the synaptic bulb are transported from the soma.
• Importance of Protein Synthesis in Neurons:

• Protein synthesis is essential for producing neurotransmitters, maintaining neuronal structure, and repairing damage.
• Neurons have a high metabolic demand, making efficient protein synthesis crucial for their survival and functionality.
• Disruption in protein synthesis can lead to neurological disorders such as Alzheimer's disease or Parkinson's disease.

Important Points

• Location of Nissl Granules:
• Found in the soma and dendrites but absent in the axon and axon hillock.
• This localization ensures that protein synthesis primarily occurs in the regions where it is most required.
• Functions of Nissl Granules:
• Involved in the synthesis of proteins, including enzymes and structural proteins.
• Play a role in neuronal repair and regeneration.
• Essential for maintaining neuronal communication and health.
• Role in Neurological Research:
• Nissl granules are studied extensively in neurobiology to understand neuronal health and diseases.
• Their presence and distribution are used as markers to identify neurons in histological studies.

Q26. Answer: (d) 640

Shortcut Trick

Total Voters = 1800

Valid Votes = 1800 × 0.80 × 0.80 = 1152

Ratio of X : Y = 7 : 2 (Total parts = 9)

Difference = (7 − 2)/9 × 1152 = 5/9 × 1152 = 5 × 128 = 640

Therefore The correct answer is 640 votes.

Alternate Method

Given:

Total registered voters = 1800

Voters who did not vote = 20%

Invalid votes = 20% of votes cast

Calculations:

=> Votes cast = 1800 − (20% of 1800) = 1800 − 360 = 1440

=> Valid votes = 1440 − (20% of 1440) = 1440 − 288 = 1152

=> Total ratio parts = 7 + 2 = 9 units

=> 9 units = 1152

=> 1 unit = 1152 ÷ 9 = 128

=> Difference between X and Y = (7 − 2) units = 5 units

=> 5 units = 5 × 128 = 640

Therefore The correct answer is 640 votes.

Additional Information

Successive Percentage Decrease

When a value decreases by a% and then b%, the final value is Initial × (100−a)/100 × (100−b)/100.

Ratio Distribution

To find the difference between two shares in ratio a:b, use Difference = (a−b)/(a+b) × Total Value.

Valid Votes Calculation

Valid Votes = Total Voters × (Voting %) × (100% − Invalid %). Always calculate invalidity on the casted votes.

Q27. Answer: (d) 197

Shortcut Trick

List the first 12 prime numbers: 2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37.

Group them for faster addition: (2+3+5+7+13+17) + (11+19+31) + (23+29+37).

Calculation: 47 + 61 + 89 = 197.

Therefore The correct answer is 197.

Alternate Method

Given: First 12 prime numbers.

Formula Used: Sum of numbers = n1 + n2 + n3 + ... + n12

=> Prime numbers are natural numbers greater than 1 that have no positive divisors other than 1 and itself.

=> Sum = 2 + 3 + 5 + 7 + 11 + 13 + 17 + 19 + 23 + 29 + 31 + 37

=> Sum = (2 + 3 + 5 + 7) + (11 + 13 + 17 + 19) + (23 + 29 + 31 + 37)

=> Sum = 17 + 60 + 120

=> Sum = 197

Therefore The correct answer is 197.

Additional Information

Definition of Prime Numbers

A prime number is a natural number greater than 1 that has exactly two factors: 1 and the number itself. 2 is the only even prime number.

Sum of First 'n' Primes

There is no simple arithmetic formula for the sum of the first n prime numbers; they must be listed and added individually.

Prime Numbers up to 100

There are exactly 25 prime numbers between 1 and 100. The sum of prime numbers from 1 to 50 is 328.

Q28. Answer: (b) 4

Given:

$(8^{21} \div 4^{(28)} \times 2^5)/((4^{(14)})^{(1/7)} \times 8^2)$

Concept Used:

Laws of exponents

Calculation:

=> $((2^3)^{21} \div (2^2)^{(28)} \times 2^5)/(((2^2)^{(14)})^{(1/7)} \times (2^3)^2)$

=> $(2^{(63)} \div 2^{(56)} \times 2^5)/((2^{(28)})^{(1/7)} \times 2^6)$

=> $(2^{(63-56)} \times 2^5)/(2^{(28/7)} \times 2^6)$

=> $(2^7 \times 2^5)/(2^4 \times 2^6)$

=> $(2^{12})/(2^{(10)})$

=> $2^{(12-10)}$

=> 2^2

=> 4

Therefore The correct answer is 4

Q29. Answer: (b) 25 years

Shortcut Trick

The age difference between two people remains constant over time.

Difference = 30 years. After 5 years, Father : Son = 2 : 1.

Ratio difference (2 − 1) = 1 unit → 30 years.

Son's age after 5 years = 1 unit = 30 years.

Son's present age = 30 − 5 = 25 years.

Therefore The correct answer is 25 years.

Alternate Method

Given: Father is 30 years older than Son. After 5 years, Father = 2 × Son.

Let Son's present age = x years.

Then Father's present age = (x + 30) years.

After 5 years:

=> Son = x + 5

=> Father = (x + 30) + 5 = x + 35

According to the condition:

=> x + 35 = 2 × (x + 5)

=> x + 35 = 2x + 10

=> 2x − x = 35 − 10

=> x = 25

Therefore The correct answer is 25 years.

Additional Information

Constant Age Difference

The numerical difference between the ages of two persons never changes regardless of the number of years passed.

Ratio Method for Ages

If the ratio of ages at two different times is given, equate the parts representing the constant difference to find the value of 1 unit.

Verification

If son is 25, father is 55. In 5 years, son is 30 and father is 60. Since 60 = 2 × 30, the answer is verified.

Q30. Answer: (b) 2850

Shortcut Trick

Direct Calculation: x × 0.13 × 0.16 = 59.28

x = 59.28 ÷ (0.13 × 0.16)

x = 59.28 ÷ 0.0208

x = 2850

Therefore The correct answer is 2850.

Alternate Method

Given:

13% of 16% of x = 59.28

Formula Used:

Percentage Calculation: (a/100) × (b/100) × x = Value

Calculations:

=> (13/100) × (16/100) × x = 59.28

=> (13 × 16 × x) / 10000 = 59.28

=> 208 × x = 59.28 × 10000

=> 208 × x = 592800

=> x = 592800 ÷ 208

=> x = 2850

Therefore The correct answer is 2850.

Additional Information

Successive Percentage

When multiple percentages are applied one after another, it is a chain multiplication of fractions: x × (a/100) × (b/100).

Percentage to Fraction

To simplify calculations, convert common percentages to fractions. For example, 25% = 1/4 and 20% = 1/5.

Base Change Rule

If the value of a number is changed by a% and then b%, the net effective percentage change is [a + b + (ab/100)]%.

Q31. Answer: (c) 93.55%

Shortcut Trick

Discount % = (Free Items ÷ Total Items) × 100

Free Items = 29, Total Items = 2 + 29 = 31

Discount % = (29 ÷ 31) × 100 ≈ 93.55%

Therefore The correct answer is 93.55%.

Alternate Method

Given: Items bought = 2, Items free = 29.

Let the Marked Price (MP) of each item be Rs. 1.

=> Total Marked Price of 31 items = Rs. 31

=> Selling Price (SP) (Price paid for 2 items) = Rs. 2

=> Discount Amount = MP − SP = 31 − 2 = Rs. 29

=> Discount % = (Discount ÷ MP) × 100

=> Discount % = (29 ÷ 31) × 100

=> Discount % = 93.548...

Therefore The correct answer is 93.55%.

Additional Information

Buy X Get Y Free Concept

In such offers, the discount is calculated on the total number of items (X+Y) because the shopkeeper gives away (X+Y) items but charges only for X items.

Successive Discounts

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

Marked Price (MP) vs Selling Price (SP)

Discount is always calculated on the Marked Price. SP = MP × (100 − Discount%)/100.

Q32. Answer: (b) 2

Shortcut Trick

Cost Price of 15 notebooks = Rs. 1,200 => CP of 1 notebook = 1200 ÷ 15 = Rs. 80.

Total Loss = CP − SP = 1,200 − 1,040 = Rs. 160.

Number of notebooks = Total Loss ÷ CP of one notebook = 160 ÷ 80 = 2.

Therefore The correct answer is 2.

Alternate Method

Given:

Total Cost Price (CP) of 15 notebooks = Rs. 1,200

Total Selling Price (SP) of 15 notebooks = Rs. 1,040

Formula Used:

Loss = CP − SP

Loss = n × CP per unit (where n is the number of notebooks)

Calculations:

=> Cost Price (CP) of 1 notebook = 1200 ÷ 15 = Rs. 80

=> Total Loss = 1,200 − 1,040 = Rs. 160

=> Let the loss be equal to the CP of x notebooks.

=> 160 = x × 80

=> x = 160 ÷ 80 = 2

Therefore The correct answer is 2.

Additional Information

Loss and Profit Percentage

Loss% = (Loss ÷ CP) × 100 and Profit% = (Profit ÷ CP) × 100. Both are always calculated on the Cost Price unless specified.

Unitary Method in Profit & Loss

To find the price of a single item when the total is given, divide the Total Price by the Total Quantity.

Selling Price Calculation

When Loss occurs: SP = CP − Loss. When Profit occurs: SP = CP + Profit.

Q33. Answer: (d) 90

Shortcut Trick

Total Distance = Train Length + Platform Length = 1 + 3 = 4 units of Train Length.

Speed (m/s) = (4 × 275) ÷ 44 = 1100 ÷ 44 = 25 m/s.

Speed (km/hr) = 25 × (18/5) = 5 × 18 = 90 km/hr.

Therefore The correct answer is 90 km/hr.

Alternate Method

Given:

Length of Train (L_T) = 275 m

Length of Platform (L_P) = 3 × 275 = 825 m

Time (t) = 44 seconds

Formula Used:

Speed = Total Distance ÷ Time

Total Distance = Length of Train + Length of Platform

Calculations:

=> Total Distance = 275 + 825 = 1100 m

=> Speed in m/s = 1100 ÷ 44

=> Speed in m/s = 25 m/s

=> Speed in km/hr = 25 × (18 ÷ 5)

=> Speed in km/hr = 5 × 18 = 90 km/hr

Therefore The correct answer is 90 km/hr.

Additional Information

Unit Conversion

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

Relative Speed

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

Train Crossing Stationary Objects

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

Q34. Answer: (d) 1/2

Shortcut Trick

Use the trigonometric identity: tan θ = sin θ ÷ cos θ.

=> tan 30° × cos 30° = (sin 30° ÷ cos 30°) × cos 30° = sin 30°.

We know that sin 30° = 1/2.

Therefore The correct answer is 1/2.

Alternate Method

Given: expression tan 30° × cos 30°.

Formula Used: Standard values of trigonometric ratios at 30°.

=> Value of tan 30° = 1/√3

=> Value of cos 30° = √3/2

=> Calculation: (1/√3) × (√3/2)

=> Result: 1/2

Therefore The correct answer is 1/2.

Additional Information

Trigonometric Ratios of 30°

sin 30° = 1/2, cos 30° = √3/2, tan 30° = 1/√3, cot 30° = √3, sec 30° = 2/√3, cosec 30° = 2.

Fundamental Identities

tan θ = sin θ / cos θ and $\sin^2\theta + \cos^2\theta = 1$.

Complementary Angles

sin 30° = cos 60° and tan 30° = cot 60°.

Q35. Answer: (c) 14 : 21 : 30

Shortcut Trick

Simplify A : B = 4 : 6 = 2 : 3.

Multiply the first ratio by the first term of the second ratio (7) and the second ratio by the second term of the first ratio (3).

A : B = 2×7 : 3×7 = 14 : 21

B : C = 7×3 : 10×3 = 21 : 30

Therefore The correct answer is 14 : 21 : 30.

Alternate Method

Given:

A : B = 4 : 6

B : C = 7 : 10

To combine the ratios, the value of B must be the same in both.

=> LCM of 6 and 7 = 42

=> Multiply (A : B) by 7 → (4 × 7) : (6 × 7) = 28 : 42

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=> Multiply (B : C) by 6 → (7 × 6) : (10 × 6) = 42 : 60

=> A : B : C = 28 : 42 : 60

=> Divide by 2 → 14 : 21 : 30

Therefore The correct answer is 14 : 21 : 30.

Additional Information

Compound Ratio

The compound ratio of a:b and c:d is (ac) : (bd). It is obtained by multiplying the corresponding terms.

Duplicate and Sub-duplicate Ratio

The duplicate ratio of a : b is $a^2 : b^2$, while the sub-duplicate ratio is $\sqrt{a} : \sqrt{b}$.

Proportion Rule

If a, b, c, d are in proportion, then a × d = b × c (Product of extremes = Product of means).

Q36. Answer: (b) 167

Given:

$x + 1/x = 13$

Formula Used:

$(x + 1/x)^2 = x^2 + 1/x^2 + 2$

$x^2 + 1/x^2 = (x + 1/x)^2 - 2$

Calculation:

=> $(13)^2 = 169$

=> $x^2 + 1/x^2 = 169 - 2$

=> $x^2 + 1/x^2 = 167$

Therefore The correct answer is 167.

Q37. Answer: (b) 273.33

Shortcut Trick

Relative Speed (Opposite) = 130 + 60 = 190 km/hr.

Convert to m/s = 190 × (5/18) = 475/9 m/s.

Total Distance (L1 + L2) = Relative Speed × Time = (475/9) × 12 = 1900/3 ≈ 633.33 m.

L2 = 633.33 − 360 = 273.33 m.

Therefore The correct answer is 273.33 m.

Alternate Method

Given: Speed of Train 1 (S1) = 130 km/hr, Speed of Train 2 (S2) = 60 km/hr, Length of Train 1 (L1) = 360 m, Time (t) = 12 s.

Formula Used: Relative Speed = (L1 + L2) ÷ Time

=> Relative Speed = 130 + 60 = 190 km/hr

=> Relative Speed in m/s = 190 × (5/18) = 52.777... m/s

=> Distance = Speed × Time

=> 360 + L2 = (190 × 5/18) × 12

=> 360 + L2 = 190 × (5/3) × 2 = 190 × 10/3

=> 360 + L2 = 1900/3

=> L2 = 633.333... − 360

=> L2 = 273.33 m

Therefore The correct answer is 273.33 m.

Additional Information

Relative Speed Concept

When two objects move in opposite directions, their speeds are added (S1 + S2). When they move in the same direction, their speeds are subtracted (S1 − S2).

Unit Conversion

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

Train Crossing Case

When two trains of lengths L1 and L2 cross each other, the total distance traveled is always L1 + L2, regardless of the direction.

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Q38. Answer: (d) Increase by 4.6%

Shortcut Trick

Let the cost of a TV = 100. Then the cost of a Washing Machine (WM) = 50.

Initial Total Cost (6 WM + 2 TV) = (6 × 50) + (2 × 100) = 300 + 200 = 500.

Net change in total cost = [6 × (50 × 57%) + 2 × (100 × −74%)] = [171 − 148] = +23.

Percentage change = (23 ÷ 500) × 100 = 4.6%.

Therefore The correct answer is Increase by 4.6%.

Alternate Method

Given:

=> Let Cost Price (CP) of a TV = Rs. 100.

=> CP of a Washing Machine (WM) = 50% less than TV = 100 − 50 = Rs. 50.

Calculations:

=> Total Initial Cost of 6 WM and 2 TV = (6 × 50) + (2 × 100) = 300 + 200 = Rs. 500.

=> New CP of WM = 50 + (57% of 50) = 50 + 28.5 = Rs. 78.5.

=> New CP of TV = 100 − (74% of 100) = 100 − 74 = Rs. 26.

=> Total New Cost = (6 × 78.5) + (2 × 26) = 471 + 52 = Rs. 523.

=> Change in Cost = 523 − 500 = Rs. 23.

=> Percentage Change = (23 ÷ 500) × 100 = 4.6%.

Therefore The correct answer is Increase by 4.6%.

Additional Information

Percentage Change

It is calculated as [(Final Value − Initial Value) ÷ Initial Value] × 100.

Weighted Average Method

For multiple items, Net % Change = (n1c1 + n2c2 + ...) ÷ (n1 + n2 + ...) where n is quantity and c is percentage change.

Successive Percentage

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

Q39. Answer: (d) 138

Shortcut Trick

For a right-angled triangle with legs 9 m and 12 m, the hypotenuse is 15 m (using the standard 3-4-5 triplet scaled by 3).

Area of right-angled ΔABC = (1/2) × 9 × 12 = 54 m².

The other triangle ΔACD has sides 13 m, 14 m, and 15 m. This is a standard 13-14-15 triangle whose area is always exactly 84 m².

Total Area of quadrilateral ABCD = 54 + 84 = 138 m².

Therefore The correct answer is 138 m².

Alternate Method

Given:

Sides of quadrilateral ABCD: AB = 9 m, BC = 12 m, CD = 14 m, DA = 13 m

Angle angle ABC = 90°

Formula Used:

Area of right-angled triangle = (1/2) × base × height

Heron's Formula for area of a triangle = √[s(s − a)(s − b)(s − c)], where s = (a + b + c) ÷ 2 is the semi-perimeter.

Calculations:

In right-angled ΔABC, applying Pythagoras' theorem:

=> $AC^2 = AB^2 + BC^2$

=> $AC^2 = 9^2 + 12^2$

=> $AC^2 = 81 + 144 = 225$

=> AC = √225 = 15 m

Now, calculate the area of ΔABC:

=> Area(ΔABC) = (1/2) × AB × BC

=> Area(ΔABC) = (1/2) × 9 × 12 = 54 m²

For ΔACD, the sides are AC = 15 m, CD = 14 m, and DA = 13 m:

=> Semi-perimeter (s) = (15 + 14 + 13) ÷ 2 = 42 ÷ 2 = 21 m

Using Heron's Formula for Area(ΔACD):

=> Area(ΔACD) = √[21 × (21 − 15) × (21 − 14) × (21 − 13)]

=> Area(ΔACD) = √[21 × 6 × 7 × 8]

=> Area(ΔACD) = √[7056] = 84 m²

Total Area of quadrilateral ABCD:

=> Area(ABCD) = Area(ΔABC) + Area(ΔACD)

=> Area(ABCD) = 54 + 84 = 138 m²

Option Analysis:

=> Option (1) - 128 m²: Incorrect, as it does not equal the sum of the areas of the two constituent triangles.

=> Option (2) - 135 m²: Incorrect, which may arise from calculation errors in applying Heron's formula.

=> Option (3) - 148 m²: Incorrect, as the sum of the areas of ΔABC and ΔACD is exactly 138 m².

=> Option (4) - 138 m²: Correct, as the total area of the quadrilateral is the sum of the areas of ΔABC (54 m²) and ΔACD (84 m²).

Therefore The correct answer is 138 m².

Additional Information

Pythagorean Triplets

A set of three positive integers a, b, and c such that $a^2 + b^2 = c^2$. Common triplets include (3, 4, 5), (5, 12, 13), (8, 15, 17), and their multiples.

Heron's Formula

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

Standard 13-14-15 Triangle

A triangle with side lengths 13, 14, and 15 is a classic geometry problem favorite. Its semi-perimeter is always 21, and its area is always exactly 84.

Q40. Answer: (a) 9√3

Shortcut Trick

In an equilateral triangle, the sum of perpendicular distances from any point inside the triangle to its sides is always equal to the altitude (height) of the triangle.

This is known as Viviani's Theorem.

Height (h) = (√3 ÷ 2) × side

Sum of distances = h = (√3 ÷ 2) × 18 = 9√3 cm.

Therefore The correct answer is 9√3 cm.

Alternate Method

Given: Side of the equilateral triangle (a) = 18 cm.

Formula Used: Height (h) = (√3 ÷ 2) × a; Distance of centroid from side = h ÷ 3.

=> Height (h) of triangle ABC = (√3 ÷ 2) × 18 = 9√3 cm.

=> In an equilateral triangle, the centroid (G) is also the incenter.

=> The perpendicular distance from the centroid to any side is the inradius (r).

=> r = h ÷ 3 = 9√3 ÷ 3 = 3√3 cm.

=> Sum of distances (p1 + p2 + p3) = 3 × r = 3 × 3√3 = 9√3 cm.

Therefore The correct answer is 9√3 cm.

Additional Information

Viviani's Theorem

For any point inside an equilateral triangle, the sum of its perpendicular distances to the sides is constant and equal to the altitude (h) of the triangle.

Inradius and Circumradius

In an equilateral triangle of side 'a', the inradius (r) is a ÷ (2√3) and the circumradius (R) is a ÷ √3. Note that R = 2r.

Area of Equilateral Triangle

The area of an equilateral triangle is given by the formula (√3 ÷ 4) × a^2, where 'a' is the side length.

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Q41. Answer: (b) 18 units

Shortcut Trick

Sum of parallel sides = (3x + 1) + (2x + 2) = 5x + 3; Height = 3y = 3(x − 1).

Area = 1/2 × (Sum) × Height => 54 = 1/2 × (5x + 3) × 3(x − 1).

Test options for (5x + 3): If Sum = 18 units, then 5x + 3 = 18 => 5x = 15 => x = 3.

If x = 3, then Height = 3(3 − 1) = 6 units.

Area = 1/2 × 18 × 6 = 54 sq. units. This matches the given area.

Therefore The correct answer is 18 units.

Alternate Method

Given:

Area of trapezium = 54 sq. units

Parallel sides (a, b) = (3x + 1) units and (2x + 2) units

Distance (h) = 3y units and x − y = 1 => y = x − 1

Formula Used:

Area of a trapezium = 1/2 × (sum of parallel sides) × height

Calculations:

=> Sum of parallel sides = (3x + 1) + (2x + 2) = 5x + 3

=> Height (h) = 3(x − 1)

=> 54 = 1/2 × (5x + 3) × 3(x − 1)

=> 108 = 3 × (5x + 3)(x − 1)

=> 36 = $5x^2$ − 5x + 3x − 3

=> $5x^2$ − 2x − 39 = 0

=> $5x^2$ − 15x + 13x − 39 = 0

=> 5x(x − 3) + 13(x − 3) = 0

=> (x − 3)(5x + 13) = 0

=> x = 3 (Since x must be positive to keep lengths valid)

=> Sum of parallel sides = 5(3) + 3 = 18 units.

Therefore The correct answer is 18 units.

Additional Information

Area and Median of Trapezium

The median (or midsegment) of a trapezium is parallel to the bases and its length is the average of the bases: Median = (a + b) / 2. Thus, Area = Median × Height.

Quadratic Roots Shortcut

For $ax^2 + bx + c = 0$, the roots are given by $[-b \pm \sqrt{(b^2 - 4ac)}] / 2a$. In geometry, discard negative or non-physical roots.

Isosceles Trapezium

A trapezium where the non-parallel sides are equal is an isosceles trapezium, and its base angles are equal.

Q42. Answer: (a) 170

Shortcut Trick

Apply the relation: MP/CP = (100 + Profit%)/(100 − Discount%)

MP/CP = (100 + 62)/(100 − 40) = 162/60 = 2.7/1

Marked-up Percentage X = (2.7 − 1) × 100 = 170%

Therefore The correct answer is 170.

Alternate Method

Given: Discount = 40%, Profit = 62%

Formula: Marked Price (MP) = CP × (1 + X/100) and Selling Price (SP) = MP × (1 − D/100)

=> Let Cost Price (CP) = 100

=> Since Profit = 62%, Selling Price (SP) = 100 + 62 = 162

=> Discount = 40%, so SP = 60% of MP

=> 162 = 0.60 × MP

=> MP = 162 / 0.60 = 270

=> Marked-up value (X) = MP − CP = 270 − 100 = 170

Therefore The correct answer is 170.

Additional Information

Mark-up and Profit Relation

The effective percentage change after a mark-up (X%) and a discount (D%) results in Profit (P%), given by: P = X − D − (XD/100).

Successive Discounts

If two successive discounts d1% and d2% are given, the single equivalent discount is (d1 + d2 − d1d2/100)%.

No Profit No Loss

When SP = CP, it is called the break-even point. This occurs when the mark-up percentage is equal to the discount percentage applied on the marked price.

Q43. Answer: (b) 148

Shortcut Trick

To find the largest number that divides a set of numbers leaving the same remainder, find the HCF of their differences.

Differences: 703 − 555 = 148, 999 − 703 = 296, 1147 − 999 = 148.

HCF of (148, 296, 148) = 148.

Therefore The correct answer is 148.

Alternate Method

Given:

Four numbers: 555, 703, 999, and 1147.

Formula Used:

The largest number dividing a, b, c, d leaving same remainder = HCF of (|a − b|, |b − c|, |c − d|).

Calculations:

=> First Difference = 703 − 555 = 148

=> Second Difference = 999 − 703 = 296

=> Third Difference = 1147 − 999 = 148

=> Required number = HCF of (148, 296, 148)

=> 148 = 148 × 1

=> 296 = 148 × 2

=> Therefore, HCF = 148

Therefore The correct answer is 148.

Additional Information

HCF with Same Remainder Case

When the remainder is same but not given, the required greatest divisor is the HCF of the absolute differences between the numbers.

HCF with Different Remainders Case

If the remainders r1, r2, r3 are different and given for numbers x, y, z, then the required greatest divisor is HCF of (x − r1, y − r2, z − r3).

Q44. Answer: (c) 4

Shortcut Trick

Combined efficiency of A, B, and C = (1/2 + 1/6 + 1/12) of total work.

Total work done by them in 1 day = (6 + 2 + 1)/12 = 9/12 = 3/4 units.

Time taken for 1 unit of work = 4/3 days.

Time taken for thrice the work = 3 × (4/3) = 4 days.

Therefore The correct answer is 4 days.

Alternate Method

Given: Time taken by A = 2 days, B = 6 days, C = 12 days.

Formula Used: Total Work = LCM of individual days; Efficiency = Total Work ÷ Days.

Person	Days	Total Work	Efficiency
A	2	12	6
B	6	2	

C	12	1	

=> Total efficiency of A + B + C = 6 + 2 + 1 = 9 units/day.
=> Original work = 12 units.
=> Thrice the work = 3 × 12 = 36 units.
=> Time taken = New Total Work ÷ Total Efficiency
=> Time taken = 36 ÷ 9 = 4 days.
Therefore The correct answer is 4 days.
Additional Information
Work and Efficiency Relation
Time and efficiency are inversely proportional. If a person finishes work in 'n' days, their 1-day efficiency is 1/n.
Combined Work Formula
For three people A, B, and C, time taken together is 1/[(1/A) + (1/B) + (1/C)] or (ABC)/(AB + BC + CA) days.
Multiple Work Factor
If the work is multiplied by 'k', the time taken by the same team also gets multiplied by 'k', keeping efficiency constant.

Q45. Answer: (b) 9

Shortcut Trick
B = sum of first 3 even natural numbers = 2 + 4 + 6 = 12.
For third proportional C of 16 and 12: 16 : 12 :: 12 : C.
C = (12 × 12) ÷ 16 = 144 ÷ 16 = 9.
Therefore The correct answer is 9.
Alternate Method
Given: First value = 16, Second value = B, Third proportional = C.
Formula Used: If c is the third proportional to a and b, then a : b = b : c => $c = b^2 \div a$.
Calculations:
=> First three even natural numbers are 2, 4, and 6.
=> B = 2 + 4 + 6 = 12.
=> 16 : 12 = 12 : C
=> C = (12 × 12) ÷ 16
=> C = 144 ÷ 16
=> C = 9
Therefore The correct answer is 9.
Additional Information
Mean Proportional
The mean proportional between two numbers a and b is √(a × b).
Fourth Proportional
If a, b, and c are three numbers, their fourth proportional d is calculated as a : b = c : d, which gives d = (b × c) ÷ a.
Sum of First n Even Numbers
The sum of the first n even natural numbers is given by the formula n(n + 1). For n=3, Sum = 3(3 + 1) = 12.

Q46. Answer: (a) 10

Shortcut Trick
Identify the modal class from the given mode 133 2/11, which lies in the interval 130 − 135.
Apply the simplified mode relation: Mode − L = [(f1 − f0) ÷ (2f1 − f0 − f2)] × h
3 2/11 = [(14 − 7) ÷ (28 − 7 − X)] × 5
35/11 = [7 ÷ (21 − X)] × 5 => 35/11 = 35 ÷ (21 − X)
Comparing denominators: 11 = 21 − X => X = 10
Therefore The correct answer is 10.
Alternate Method
Given:
Mode = 133 2/11 cm = 1465/11 cm

Modal Class = 130 − 135 (since the mode lies in this range)

Lower limit (L) = 130

Frequency of modal class (f1) = 14

Preceding frequency (f0) = 7

Succeeding frequency (f2) = X

Class width (h) = 5

Formula Used:

Mode = L + [(f1 − f0) ÷ (2f1 − f0 − f2)] × h

Calculations:

=> 1465/11 = 130 + [(14 − 7) ÷ (2 × 14 − 7 − X)] × 5

=> 1465/11 − 130 = [7 ÷ (28 − 7 − X)] × 5

=> (1465 − 1430) / 11 = 35 ÷ (21 − X)

=> 35/11 = 35 ÷ (21 − X)

=> 21 − X = 11

=> X = 21 − 11

=> X = 10

Therefore The correct answer is 10.

Additional Information

Definition of Mode

The Mode is the value that appears most frequently in a data set. For grouped data, it is estimated using the modal class (the class with the highest frequency).

Empirical Relationship

For a moderately skewed distribution, the relationship between measures of central tendency is: Mode = 3 × Median − 2 × Mean.

Modal Class Property

The modal class is the interval with the highest frequency. In this problem, after finding X = 10, the frequency 14 remains the maximum, confirming 130-135 is the correct modal class.

Q47. Answer: (d) 25 and 15

Shortcut Trick

Ratio of two parts = 5 : 3

Difference in ratio units = 5 − 3 = 2 units

Actual difference given = 10

2 units = 10 => 1 unit = 5

Parts are 5 × 5 = 25 and 3 × 5 = 15

Therefore The correct answer is 25 and 15.

Alternate Method

Given: Ratio = 5 : 3, Difference = 10

Method: Linear Equation

=> Let the two parts be 5x and 3x.

=> 5x − 3x = 10

=> 2x = 10

=> x = 5

=> First part = 5 × 5 = 25

=> Second part = 3 × 5 = 15

Therefore The correct answer is 25 and 15.

Additional Information

Ratio and Proportion

A ratio compares two quantities by division. If a : b = c : d, then a, b, c, d are in proportion where ad = bc.

Unitary Method in Ratios

To find individual values, divide the total quantity or the difference by the sum or difference of the ratio parts respectively.

Q48. Answer: (b) 20

Shortcut Trick

Mode is defined as the observation that appears most frequently in the data set.

By inspection, the number 20 appears 4 times, which is more than any other number in the list.

Numbers like 14, 15, 16, and 18 appear only 2 times, while 17, 19, and 21 appear only once.

Therefore The correct answer is 20.

Alternate Method

Given data: 20, 21, 15, 16, 20, 17, 18, 16, 15, 14, 19, 20, 18, 14, 20

Formula: Mode = Value with the Maximum Frequency

Frequency of each term:

=> 14 occurs 2 times

=> 15 occurs 2 times

=> 16 occurs 2 times

=> 17 occurs 1 time

=> 18 occurs 2 times

=> 19 occurs 1 time

=> 20 occurs 4 times

=> 21 occurs 1 time

=> Maximum frequency is 4, which belongs to the number 20.

Therefore The correct answer is 20.

Additional Information

Mean (Arithmetic Average)

It is the sum of all observations divided by the total number of observations: Mean = $\Sigma x_i \div n$.

Median

The middle value of a data set when it is arranged in ascending or descending order. For odd n, it is the ((n+1)/2)^(th) term.

Empirical Relationship

For a moderately skewed distribution, the relationship between mean, median, and mode is: Mode = 3 × Median − 2 × Mean.

Bimodal and Multimodal Data

If two or more values have the same maximum frequency, the data set is called bimodal (two modes) or multimodal (multiple modes).

Q49. Answer: (c) 50,400

Shortcut Trick

Difference in Annual Interest Rate = 7% − 3.5% = 3.5%

Total difference in Percentage Interest for 3 years = 3.5% × 3 = 10.5%

Positive difference in interest amount = 10.5% of Rs. 4,80,000

=> 4,80,000 × (10.5 ÷ 100) = 4,800 × 10.5 = 50,400

Therefore The correct answer is Rs. 50,400.

Alternate Method

Given:

Principal (P) for both banks = Rs. 4,80,000

Rate of interest for Bank A (R1) = 3.5% p.a.

Rate of interest for Bank B (R2) = 7% p.a.

Time period (T) = 3 years

Formula Used:

Simple Interest (SI) = (P × R × T) ÷ 100

Calculations:

=> SI paid to Bank A = (4,80,000 × 3.5 × 3) ÷ 100

=> SI paid to Bank A = 4,800 × 10.5 = Rs. 50,400

=> SI paid to Bank B = (4,80,000 × 7 × 3) ÷ 100

=> SI paid to Bank B = 4,800 × 21 = Rs. 1,00,800

=> Required Difference = Rs. 1,00,800 − Rs. 50,400

=> Required Difference = Rs. 50,400

Therefore The correct answer is Rs. 50,400.

Additional Information

Simple Interest Properties

Simple Interest remains constant every year if the principal and rate are unchanged. Total SI = Principal × Net Rate %.

Interest Difference Concept

When Principal and Time are same, Difference in Interest = P × (R2 − R1) × T ÷ 100.

SI vs CI for 2 years

The difference between Compound Interest and Simple Interest for 2 years is given by $P(R \div 100)^2$.

Q50. Answer: (c) 40

Shortcut Trick

Time for 100% tank: A = 30 min, B = 20 min, A + B − C = 15 min.

Total Capacity (LCM of 30, 20, 15): 60 units.

Efficiencies: A = 2, B = 3, A + B − C = 4 => 2 + 3 − C = 4 => C = 1.

Emptying Time for 2/3 tank: (2/3 × 60) ÷ 1 = 40 minutes.

Therefore The correct answer is 40 minutes.

Alternate Method

Given:

Pipe A fills 50% in 15 min => 100% in 30 min.

Pipe B fills 50% in 10 min => 100% in 20 min.

Combined time (A + B + C) = 15 min (C is emptying).

Person	Days	Total Work	Efficiency
Pipe A	30 min	60 units	2
Pipe B	20 min	3	
A + B − C	15 min	4	

Calculations:

=> Efficiency of A + B = 2 + 3 = 5 units/min

=> Efficiency of (A + B − C) = 4 units/min

=> Efficiency of C = 5 − 4 = 1 unit/min

=> Capacity to be emptied = 2/3 × 60 = 40 units

=> Time taken by C = 40 ÷ 1 = 40 minutes

Therefore The correct answer is 40 minutes.

Additional Information

Efficiency of Emptying Pipe

An emptying pipe always carries a negative efficiency in calculations when combined with filling pipes.

Time and Work Relation

Total Work = Time × Efficiency. When work is constant, time is inversely proportional to efficiency.

Pipes and Cisterns Logic

If a pipe fills 1/n part in 1 minute, the total time to fill the tank is n minutes.

Q51. Answer: (d) IML−PTS

The position and positional values or English Alphabets are:

Given:

QUT−XBA

YCB−FJI

The pattern followed here is:

Each letter-cluster pair follows the pattern +7, +7, +7.

Let's check each option:

1. IML–OTR

This letter-cluster pair does not follow the pattern +7, +7, +7.

2. ILJ–OSR

This letter-cluster pair does not follow the pattern +7, +7, +7.

3. ILJ–PTS

This letter-cluster pair does not follow the pattern +7, +7, +7.

4. IML–PTS

This letter-cluster pair follows the pattern +7, +7, +7.

Thus, IML−PTS follows the same pattern.

Hence, the correct answer is "Option 4".

Q52. Answer: (b) ABOS

The position and positional values or English Alphabets are:

Given: YPMG is related to VKJB in a certain way based on the English alphabetical order. In the same way, MVAM is related to JQXH.

The logic followed here is:

Similarly,

Thus, DGRX is related to ABOS.

Hence, the correct answer is "Option 2".

Q53. Answer: (d) EH65

The position and positional values or English Alphabets are:

Given: MP33 KN41 IL49 GJ57 ?

The logic followed here is:

Thus, EH65 will replace the question mark (?) in the following series to make it logically complete.

Hence, the correct answer is "Option 4".

Q54. Answer: (d) nu

Given: In a certain code language, ‘iron hip cheek’ is coded as ‘nn nu qw’ and ‘mud iron globe’ is coded as ‘nu yx mt’.

Thus, ‘iron’ is coded as "nu" in the given language.

Hence, the correct answer is "Option 4".

Q55. Answer: (a) PS-WR

The position and positional values or English Alphabets are:

The pattern followed here is:

Each letter-cluster pair follows the pattern +7, -2.

Let's check each option:

1. PS–WR

This letter-cluster pair does not follow the pattern +7, -2.

2. SV–ZT

This letter-cluster pair follows the pattern +7, -2.

3. MP–TN

This letter-cluster pair follows the pattern +7, -2.

4. JM–QK

This letter-cluster pair follows the pattern +7, -2.

Thus, PS-WR is the odd one out.

Hence, the correct answer is "Option 1".

Q56. Answer: (d) Two

Given: Seven boxes, A, B, C, D, I, J and K, are kept one over the other, but not necessarily in the same order.

1. Only A is kept above I.
2. Only K is kept below J.
3. D is not kept immediately above C.
4. Only two boxes are kept between I and C.

A

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I
D
C
J
K

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

A
I
D
B
C
J
K

Thus, two boxes are kept between B and K.

Hence, the correct answer is "Option 4".

Q57. Answer: (c) Neither follows

Statements:

Some mangoes are bananas.

No banana is a kiwi.

The least possible Venn diagram for the given statement is:

Conclusions:

(I): All bananas are mangoes. - False (Because, Some mangoes are bananas.)

(II): No mango is a kiwi. - False (There is no definite relation between mango and kiwi, it can be possible but it is not definite)

Thus, Neither follows.

Hence, the correct answer is "Option 3".

Q58. Answer: (a) 3

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

Now,

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

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

Thus, there are 3 even numbers, each of which is immediately preceded by an odd number and also immediately followed by an odd number.

Hence, the correct answer is "Option 1".

Q59. Answer: (b) F

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

1. A sits fourth to the left of C.
2. P sits fourth to the right of B.
3. Only two people sit between C and B when counted from the left of C.
4. E is not an immediate neighbour of P or B.
5. F is not an immediate neighbour of P.

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

Thus, F sits third to the right of Q.

Hence, the correct answer is "Option 2".

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Q60. Answer: (a) 23

Given: 73 63 53 43 33 ?

The logic followed here is:

Thus, 23 should come in place of the question mark (?) in the given series.

Hence, the correct answer is "Option 1".

Q61. Answer: (a) 847

BODMAS Rule:

Given equation: 223 ÷ 4 + 164 × 2 − 37 = ?

Now, if '+' and '−' are interchanged and '×' and '÷' are interchanged, then:

=> 223 × 4 − 164 ÷ 2 + 37 = ?

=> 223 × 4 − 82 + 37 = ?

=> 892 + 37 − 82 = ?

=> 929 − 82 = ?

=> 847 = ?

Hence, the correct answer is "Option 1".

Q62. Answer: (a) 2

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

Now,

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

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

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

Hence, the correct answer is "Option 1".

Q63. Answer: (d) Three

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

Now,

Odd digits, each of which is immediately preceded by an odd digit and also immediately followed by an even digit.

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

Thus, there are 3 odd digits, each of which is immediately preceded by an odd digit and also immediately followed by an even digit.

Hence, the correct answer is "Option 4".

Q64. Answer: (b) 1

Given: P, Q, R, S, T and U are sitting around a circular table facing the centre.

1. R sits on the immediate left of U.

2. P sits second to the left of R.

3. S sits second to the right of T.

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

Thus, 1 people sit between R and Q when counted from the right of R.

Hence, the correct answer is "Option 2".

Q65. Answer: (c) Only conclusion (II) follows.

Statements:

All Zucchinis are Leeks.

All Leeks are Radishes.

Some Radishes are Celeries.

The least possible Venn diagram for the given statement is:

Conclusions:

(I) All Leeks are Celeries. - False (There is no definite relation between leeks and celeries, it can be possible but it is not definite)

(II) Some Radishes are Zucchinis. - True (Because, All Zucchinis are Leeks and All Leeks are Radishes, which means some radishes being leeks are Radishes.)

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Thus, Only conclusion (II) follows.

Hence, the correct answer is "Option 3".

Q66. Answer: (b) A

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

1. A sits third to the left of X.

2. Only one person sits between X and C when counted from the left of C.

3. Only two people sit between B and W when counted from the right of W.

4. D is an immediate neighbour of B.

Thus, A sits third to the right of Y.

Hence, the correct answer is "Option 2".

Q67. Answer: (b) Four

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

Now,

Numbers, each of which is immediately preceded by a perfect square and also immediately followed by a perfect square.

So, the needed pattern is: Perfect Square — Number — Perfect Square

Thus, there are four numbers, each of which is immediately preceded by a perfect square and also immediately followed by a perfect square.

Hence, the correct answer is "Option 2".

Q68. Answer: (a) 15

Given: 20 25 15 20 10 ?

The logic followed here is:

Thus, 15 should come in place of the question mark (?) in the given series.

Hence, the correct answer is "Option 1".

Q69. Answer: (b) RMGK

The position and positional values or English Alphabets are:

Given: SGHE is related to XCMA in a certain way based on the English alphabetical order. In the same way, CYRW is related to HUWS.

The logic followed here is:

Similarly,

Thus, MQBO is related to RMGK.

Hence, the correct answer is "Option 2".

Q70. Answer: (a) FC-HE

The position and positional values or English Alphabets are:

The pattern followed here is:

Each letter-cluster pair follows the pattern +2, +1.

Let's check each option:

1. FC–HE

This letter-cluster pair does not follow the pattern +2, +1.

2. HE–JF

This letter-cluster pair follows the pattern +2, +1.

3. KH–MI

This letter-cluster pair follows the pattern +2, +1.

4. NK–PL

This letter-cluster pair follows the pattern +2, +1.

Thus, FC-HE is the odd one out.

Hence, the correct answer is "Option 1".

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Q71. Answer: (d) 8 km to the east

Given: A man starts from Point A and drives 9 km towards north. He then takes a right turn, drives 15 km, turns right and drives 18 km. He then takes a right turn and drives 23 km. He takes a final right turn, drives 9 km and stops at Point P.

Thus, he should drive 8 km to the east in order to reach Point A again.

Hence, the correct answer is "Option 4".

Q72. Answer: (a) Wife's father's brother's daughter

Family Chart:

Decoding the Symbols:

A is				
Symbol	•	•	x	÷
Meaning	daughter	brother	wife	father
to B				

Given: D + F – G ÷ H × J

It means: D is the daughter of F, F is the brother of G, G is the father of H, H is the wife of J.

Thus, D is J's Wife's father's brother's daughter.

Hence, the correct answer is "Option 1".

Q73. Answer: (b) 70

Given: 10 20 31 43 56 ?

The logic followed here is:

Thus, 70 should come in place of the question mark (?) in the given series to make it logically complete.

Hence, the correct answer is "Option 2".

Q74. Answer: (d) 11 km towards the north

Given: Aman starts from Point M and drives 8 km towards the north. He then takes a left turn, drives 5 km, turns left and drives 13 km. He then takes a right turn and drives 5 km. He then takes a right turn and drives 16 km. He takes a final right turn, drives 10 km and stops at Point P.

Thus, Point P is 11 km towards the north with respect to Point M.

Hence, the correct answer is "Option 4".

Q75. Answer: (b) D

Given: Seven boxes, A, B, C, D, I, J and K, are kept one over the other, but not necessarily in the same order.

1. Only two boxes are kept between A and C.
2. Only B is kept above K.
3. No box is kept below C.
4. J is kept at some place below D but at some place above I.

B
K
D
A
J
I
C

Thus, box D is kept third above I.

Hence, the correct answer is "Option 2".

Q76. Answer: (a) Three

Given: If 1 is added to each odd digit and 2 is subtracted from each even digit in the number 51784563.

Thus, three digits 2, 4 and 6 appear more than once in the new number thus formed.

Hence, the correct answer is "Option 1".

Q77. Answer: (c) AHF

The position and positional values or English Alphabets are:

Given: IDR GEO EFL CGI ?

The logic followed here is:

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

Hence, the correct answer is "Option 3".

Q78. Answer: (c) (16, 55, 59)

The logic followed here is:

Logic: (a, b, c) → (a × 3) + 7 = b and c = b + 4

(5, 22, 26) → (5 × 3) + 7 = 15 + 7 = 22 and 26 = 22 + 4

(11, 40, 44) → (11 × 3) + 7 = 33 + 7 = 40 and 44 = 40 + 4

Let's check each option:

1. (16, 66, 70) → (16 × 3) + 7 = 48 + 7 = 55 ≠ 66 and 70 = 66 + 4

2. (17, 58, 54) → (17 × 3) + 7 = 51 + 7 = 58 but 54 ≠ 58 + 4 = 62

3. (16, 55, 59) → (16 × 3) + 7 = 48 + 7 = 55 and 59 = 55 + 4

4. (13, 32, 36) → (13 × 3) + 7 = 39 + 7 = 46 ≠ 32 and 36 = 32 + 4

Thus, (16, 55, 59) is the set in which the numbers are related in the same way as the given sets.

Hence, the correct answer is "Option 3".

Q79. Answer: (a) 10

Given: Each of the digits in the number 3728645 is arranged in ascending order from left to right.

Digit second from the left = 3

Digit second from the right = 7

sum = 3 + 7 = 10

Thus, 10 will be the sum of the digits that are second from the left and second from the right in the new number thus formed.

Hence, the correct answer is "Option 1".

Q80. Answer: (a) 6

Given: In a certain code language, ‘OVAL’ is coded as ‘9573’ and ‘LAVS’ is coded as ‘3657’.

Thus, 6 is the code for ‘S’ in the given code language.

Hence, the correct answer is "Option 1".

Q81. Answer: (a) 12 to 18 years

The correct answer is 12 to 18 years.

Key Points

• The age eligibility range for boys' and girls' selection trials in SAI Chennai for Athletics in 2025 has been set as 12 to 18 years.

• This age range ensures that young athletes falling within the developmental age group are provided opportunities to participate in national-level training and competitions.

• The selection trials aim to identify potential talent within the stipulated age group and nurture them under the Sports Authority of India (SAI) framework.

• The age range aligns with global norms for youth athletic competitions, ensuring participants are physically and mentally ready for rigorous training and competition.

• The trials are a part of SAI's commitment to improving sports standards in India by systematically identifying and training athletes from a young age.

Additional Information

• Sports Authority of India (SAI):

• SAI is the apex national sports body established in 1984 under the Ministry of Youth Affairs and Sports, Government of India.

• It is responsible for the development of sports infrastructure and nurturing talent across various sports disciplines.

• SAI operates through regional centers, including SAI Chennai, which focuses on sports development in southern India.

• Age Eligibility in Sports:

• Age eligibility criteria vary across sports and competitions to ensure fair play and proper categorization of athletes.

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• In athletics, youth categories often range between 12 to 18 years, allowing young athletes to hone their skills and transition into senior-level competitions.

• The age range also ensures proper physiological and psychological development of athletes, which is critical for long-term success in sports.

• SAI Selection Trials:

• Selection trials are conducted to identify talented athletes who can be trained under expert coaches and provided access to advanced facilities.

• Trials involve rigorous performance assessments, including fitness tests, skill demonstrations, and competition simulations.

• Selected athletes are enrolled in programs such as the National Sports Academy and are provided scholarships, accommodation, and other benefits.

• Youth Development in Sports:

• Youth development programs aim to nurture young athletes by providing them structured training, exposure to competitive events, and access to modern sports infrastructure.

• These programs are essential for creating a pipeline of talented athletes who can represent the country at international events like the Olympics and World Championships.

• India's focus on youth sports development has led to initiatives like Khelo India and Target Olympic Podium Scheme (TOPS).

Important Points

• Selection Criteria:

• Age eligibility is a critical factor in ensuring fairness and competitiveness in trials.

• Other criteria include physical fitness, skill level, and performance in previous competitions.

• Potential athletes are assessed by expert panels comprising coaches, physiotherapists, and sports scientists.

• Khelo India Program:

• Launched in 2018, the Khelo India program aims to identify and nurture young talent in sports.

• It focuses on grassroots sports development and provides financial support to athletes.

• The program includes annual Khelo India Youth Games and scholarships for promising athletes.

• Global Age Eligibility Standards:

• Most international youth athletic competitions, such as the World Youth Championships, have similar age eligibility ranges.

• This ensures uniformity across nations and helps athletes transition smoothly into senior-level competitions.

• Countries like the United States and Australia follow similar youth development frameworks.

Q82. Answer: (b) COEP Technological University,Pune

The correct answer is COEP Technological University, Pune.

Key Points

• In June 2025, COEP Technological University, Pune signed a Memorandum of Understanding (MoU) with the Vehicle Research and Development Establishment (VRDE), a laboratory under the Defence Research and Development Organisation (DRDO).

• This partnership aims to foster collaboration in the development of advanced defence technologies to strengthen India’s defence capabilities.

• The MoU focuses on joint research, technology exchange, and fostering innovation in areas such as automotive engineering, armored vehicles, and mobility solutions.

• COEP Technological University is renowned for its expertise in engineering and applied sciences, which aligns with VRDE’s focus on developing cutting-edge defence systems.

• Such collaborations are pivotal in enhancing the indigenization of defence technologies and reducing dependence on imports.

Additional Information

• COEP Technological University, Pune:

• Established in 1854, COEP is one of India’s oldest engineering institutions, located in Pune, Maharashtra.

• The university specializes in mechanical engineering, robotics, AI-driven systems, and automotive research.

• It has a history of contributing to innovation and research that supports national development goals.

• COEP collaborates with various industries and government organizations for applied research and development projects.

• Vehicle Research and Development Establishment (VRDE):

• VRDE is a key laboratory under DRDO located in Ahmednagar, Maharashtra.

• It specializes in the design, development, and testing of military vehicles, including tanks, armoured personnel carriers, and other mobility platforms.

• VRDE plays a critical role in modernizing India’s defence forces through indigenous technology development.

• Key achievements include contributions to the development of Arjun Main Battle Tank and other vehicles for the Indian Army.

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• Importance of Defence Research Collaborations:

• Collaborations between academic institutions and defence organizations enhance research capabilities and foster innovation.

• These partnerships are crucial for reducing dependency on foreign technologies and achieving self-reliance in defence.

• Joint projects in areas like armoured vehicle engineering, ballistic protection, and mobility systems bolster national security.

• Such initiatives align with India's Atmanirbhar Bharat mission for achieving self-sufficiency in technology and manufacturing.

• Other Academic Institutions in the Context:

• National Institute of Technology, Warangal: A premier engineering institution in Telangana, known for its work in structural engineering and material sciences but not related to VRDE collaborations.

• Indian Institute of Science, Bengaluru: Renowned for its contributions to aerospace and defence research, focusing on advanced scientific methodologies.

• Rajasthan Technical University: Primarily focused on technical education and research but does not have specific collaborations with VRDE in 2025.

Important Points

• Significance of the MoU:

• The MoU between COEP Technological University and VRDE highlights the importance of academia-industry collaboration in defence innovation.

• It facilitates the exchange of knowledge, expertise, and resources to develop indigenous systems for the Indian defence forces.

• This initiative underscores India's commitment to strengthening its defence sector and achieving technological self-reliance.

• Role of DRDO:

• DRDO is India's premier organization for defence research and development, working under the Ministry of Defence.

• It is responsible for the design, development, and production of advanced weapon systems and technologies.

• Collaborations with academic institutions help DRDO leverage specialized expertise for cutting-edge innovations.

Q83. Answer: (b) Delhi

The correct answer is Delhi.

Key Points

• Delhi was ranked as the most polluted city globally according to the World Air Quality Report, 2024, released in March 2025.

• The report is published annually by IQAir, a Swiss air quality technology company, which provides global rankings based on PM2.5 concentrations.

• Delhi recorded extremely high levels of PM2.5 pollution, surpassing other cities globally. PM2.5 levels are a key metric for measuring air pollution as they represent fine particulate matter harmful to human health.

• The main contributors to Delhi's pollution include vehicular emissions, industrial activities, construction dust, crop burning in neighboring states, and seasonal changes like winter smog.

• Delhi's air quality has been a growing concern due to repeated instances of air quality index (AQI) readings reaching "severe" levels, particularly during winter months.

Additional Information

• World Air Quality Report:

• The report by IQAir ranks cities and countries globally based on their average annual PM2.5 concentration, measured in micrograms per cubic meter.

• PM2.5 refers to particulate matter with a diameter of less than 2.5 micrometers, which can penetrate the lungs and bloodstream, causing severe health risks.

• Countries like India, Pakistan, Bangladesh, and China frequently top the rankings due to their industrial activities and urbanization.

• The report uses data from government monitoring stations and independent air quality monitoring systems.

• Main Sources of Pollution in Delhi:

• Vehicular emissions: Delhi has a high density of vehicles, contributing significantly to air pollution.

• Crop residue burning: Farmers in neighboring states like Punjab and Haryana burn crop residues, adding to Delhi's pollution during specific seasons.

• Industrial emissions: Industrial activities release harmful pollutants, including PM2.5 and PM10 particles.

• Construction dust: Ongoing infrastructure projects contribute to suspended particulate matter in the air.

• Seasonal factors: Winter weather conditions trap pollutants closer to the ground, worsening air quality.

• Impact of Air Pollution:

• Air pollution is linked to serious health issues, including respiratory diseases, cardiovascular problems, and premature deaths.

• Delhi frequently experiences public health emergencies due to toxic air quality, leading to school closures and advisories against

outdoor activities.

• Long-term exposure to PM2.5 particles is associated with reduced life expectancy and increased risk of chronic illnesses.

• Measures to Combat Pollution:

• The Indian government has launched initiatives like the National Clean Air Programme (NCAP) to reduce PM2.5 levels by 20-30% by 2024.

• Delhi has implemented the Odd-Even Scheme to reduce vehicular emissions during peak pollution periods.

• Efforts to transition to cleaner fuels, such as compressed natural gas (CNG), and promote electric vehicles are underway.

• Strict regulations on construction activities and industrial emissions have been introduced to curb pollution.

Important Points

• IQAir: A Swiss-based air quality technology company that provides real-time air quality data and publishes annual reports on global pollution levels.

• PM2.5 particles: Fine particulate matter less than 2.5 micrometers in diameter, considered highly hazardous due to their ability to penetrate human lungs and bloodstream.

• Air Quality Index (AQI): A numerical scale used to measure and report air quality levels, ranging from "Good" to "Hazardous."

• National Clean Air Programme (NCAP): Launched by the Indian government in 2019, aiming to reduce air pollution in cities across India.

• Seasonal Smog: Smog formation during winters in Delhi is aggravated by temperature inversion and stagnant air conditions, trapping pollutants closer to the surface.

Q84. Answer: (b) Audrey Truschke

The correct answer is Audrey Truschke.

Key Points

• Audrey Truschke is a prominent historian and scholar specializing in Indian history, particularly the Mughal Empire and Sanskrit texts.

• She is the author of several notable works, including "Culture of Encounters" and "Aurangzeb: The Man and the Myth", which provide critical insights into Indian history.

• The book "India: 5,000 Years of History on the Subcontinent", published in June 2025, reflects her expertise in chronicling India's extensive historical journey, including its cultural, political, and religious evolution.

• Audrey Truschke is known for her balanced approach to history, often challenging popular narratives while grounding her work in deep academic research.

• The book is likely to delve into India's rich heritage, spanning from ancient civilizations like the Indus Valley Civilization to modern-day developments, offering readers a comprehensive overview.

Additional Information

• John Zubrzycki:

• John Zubrzycki is an Australian author and journalist, known for his works on Indian history and culture.

• His notable books include "The Last Nizam" and "The Shortest History of India", focusing on India's royal dynasties and historical legacies.

• He is not associated with the book "India: 5,000 Years of History on the Subcontinent."

• Patrick French:

• Patrick French is a renowned British author and historian specializing in South Asian studies.

• His works include "India: A Portrait", which examines contemporary India through the lens of its politics, economics, and society.

• Although he has contributed significantly to Indian studies, he is not the author of the mentioned book.

• William Dalrymple:

• William Dalrymple is a Scottish historian and writer known for his works on Indian history, particularly the colonial period.

• His notable books include "The Anarchy" and "White Mughals", which provide detailed accounts of India's British colonial rule.

• While Dalrymple is a leading voice in historical narratives, he is not linked to the book "India: 5,000 Years of History on the Subcontinent."

• Historical Context of the Book:

• The book "India: 5,000 Years of History on the Subcontinent" likely covers India's journey from ancient times, including the Indus Valley Civilization, Vedic Age, and Maurya Empire, to modern developments like independence and globalization.

• It may discuss the impact of various invasions, including the Mughals and British, on India's socio-cultural and economic fabric.

• The book is expected to provide a comprehensive analysis of India's contributions to philosophy, science, art, and literature over millennia.

Important Points

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• Audrey Truschke's Academic Background:

• She holds a Ph.D. in South Asian studies from Columbia University, focusing on the cultural history of the Indian subcontinent.

• Her expertise lies in the study of Sanskrit texts, Mughal history, and the interaction between different cultures in India.

• Publication Trends:

• Books like "India: 5,000 Years of History on the Subcontinent" are crucial for understanding India's complex historical evolution.

• Authors such as Audrey Truschke contribute to global knowledge by presenting nuanced interpretations of India's past.

• India's Historical Significance:

• India is home to one of the world's oldest civilizations, and its history spans over 5,000 years.

• It has been a melting pot of cultures, religions, and philosophies, making it a unique subject of study for historians like Audrey Truschke.

Q85. Answer: (a) 3.7%

The correct answer is 0.037.

Key Points

• Consumer Price Index (CPI) measures changes in the price level of a basket of consumer goods and services purchased by households over time. It is a key indicator of inflation.

• In June 2025, the Consumer Price Index (CPI) inflation for the financial year 2025-26 was projected at 3.7% (0.037 in decimal form). This projection indicates a moderate inflation level.

• The Reserve Bank of India (RBI) utilizes CPI as a primary measure to monitor and control inflation in the economy, ensuring price stability.

• Projection of CPI inflation is significant for formulating monetary policies, as inflation directly impacts economic growth, interest rates, and purchasing power.

• The projected value of 0.037 (3.7%) reflects efforts to maintain inflation within the RBI's target range, which is typically 2%-6% as per the Monetary Policy Framework Agreement.

Additional Information

• Consumer Price Index (CPI):

• CPI is calculated by taking the weighted average of prices of a basket of goods and services essential for households, such as food, clothing, housing, and transportation.

• It is published monthly by the Ministry of Statistics and Programme Implementation (MoSPI).

• CPI is categorized into various groups: CPI for Industrial Workers (CPI-IW), CPI for Agricultural Labourers (CPI-AL), CPI for Rural Labourers (CPI-RL), and CPI (Urban and Rural).

• The base year for the current CPI in India is 2012.

• Inflation Targeting in India:

• The Monetary Policy Framework Agreement (2016) between the Government of India and the Reserve Bank of India (RBI) sets an inflation target of 4% (+/- 2%).

• The RBI uses tools like the repo rate, reverse repo rate, and cash reserve ratio to control inflation.

• Maintaining inflation within the target ensures economic stability, growth, and protection of consumer purchasing power.

• Importance of CPI Inflation Projections:

• Projections guide fiscal and monetary policies, enabling the government and RBI to take proactive measures.

• They influence interest rates, investments, and savings, having a direct impact on the economy.

• Projections also help businesses and individuals make informed financial decisions.

• Other Inflation Indices in India:

• Wholesale Price Index (WPI): Measures price changes at the wholesale level and serves as a complementary indicator to CPI.

• GDP Deflator: Measures inflation in all domestically produced goods and services, offering a broader perspective compared to CPI and WPI.

Important Points

• The Consumer Price Index (CPI) is essential for understanding inflation trends and their impact on economic stability and growth.

• Inflation directly affects the purchasing power of individuals, making its control crucial for equitable economic development.

• Projections like 0.037 (3.7%) aid in maintaining inflation within a reasonable range, ensuring macro-economic balance.

• The RBI's inflation-targeting strategy aligns with global best practices, prioritizing price stability.

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Q86. Answer: (b) Chinese Taipei

The correct answer is Chinese Taipei.

Key Points

• Antim Panghal, a highly talented Indian wrestler, secured the bronze medal at the Asian Wrestling Championships 2025, showcasing her exceptional skills and determination.

• She faced a wrestler from Chinese Taipei in her bronze medal match and emerged victorious, solidifying her position as a rising star in Indian wrestling.

• Antim Panghal's achievement is significant as it highlights the growing prowess of Indian athletes in international wrestling competitions.

• The Asian Wrestling Championships is a prestigious tournament where wrestlers from across Asia compete, and winning a medal is a matter of immense pride for the country.

• Her victory against Chinese Taipei's wrestler was a testament to her technical expertise, physical endurance, and mental resilience.

Additional Information

• Asian Wrestling Championships:

• The Asian Wrestling Championships is an annual event organized by the United World Wrestling (UWW), featuring top wrestlers from Asia competing in various weight categories.

• It includes three styles of wrestling: Freestyle, Greco-Roman, and Women's Wrestling.

• The event serves as a platform for wrestlers to qualify for global tournaments, including the World Championships and the Olympics.

• Antim Panghal:

• Antim Panghal is one of India's promising young wrestlers, known for her agility, strength, and tactical prowess on the mat.

• She has represented India in various national and international competitions, earning accolades for her performances.

• Chinese Taipei:

• Chinese Taipei refers to Taiwan in international sports competitions due to geopolitical considerations.

• The country has a growing presence in sports like wrestling, judo, and weightlifting, producing skilled athletes who compete at the international level.

• India's Wrestling Achievements:

• India has a rich history in wrestling, with notable wrestlers like Sushil Kumar, Bajrang Punia, and Vinesh Phogat achieving success on the world stage.

• The country's wrestling ecosystem has strengthened over the years, supported by initiatives like Khelo India and academies such as Chhatrasal Stadium.

Important Points

• Asian Wrestling Championships 2025:

• The 2025 edition of the championships saw increased participation from Asian countries, reflecting the growing popularity of wrestling across the continent.

• India's performance in the tournament was commendable, with multiple athletes securing medals across various categories.

• Women's Wrestling in India:

• Women's wrestling has seen significant growth in India, with athletes like Geeta Phogat, Sakshi Malik, and Vinesh Phogat inspiring a new generation of wrestlers.

• The government and private organizations have introduced various schemes to promote women's participation in wrestling.

Q87. Answer: (a) India and France

The correct answer is India and France.

Key Points

• Exercise SHAKTI is a biennial military exercise conducted between India and France. It focuses on enhancing defense cooperation and interoperability between the two nations.

• The exercise involves joint training and operational exercises between the Indian Army and the French Army, emphasizing counter-terrorism operations in semi-urban and urban environments.

• In June 2025, the latest edition of Exercise SHAKTI was held, showcasing the long-standing defense partnership between India and France.

• The exercise aims to strengthen military-to-military relations and enhance mutual understanding of combat tactics, equipment, and strategies.

• Exercise SHAKTI is part of a broader framework of bilateral defense cooperation agreements, including naval and air force collaborations between India and France.

Additional Information

• India-France Defense Cooperation:

• India and France share a robust defense partnership, including cooperation in defense equipment, technology transfer, and joint military exercises.

• The partnership extends to naval, air force, and army collaborations, including exercises such as Exercise Varuna (naval) and Exercise Garuda (air force).

• France has been a key supplier of defense equipment to India, including the Rafale fighter jets and Scorpene submarines.

• Counter-Terrorism Focus:

• Exercise SHAKTI primarily emphasizes counter-terrorism training, enabling both nations to strengthen their capabilities to combat global terrorism.

• The training involves scenario-based exercises, including hostage rescue, urban warfare, and reconnaissance missions.

• Global Strategic Partnership:

• India and France have strengthened their strategic partnership through bilateral agreements covering defense, nuclear energy, and space cooperation.

• The Indo-French partnership plays a critical role in ensuring stability and security in the Indo-Pacific region.

• Other Bilateral Exercises:

• India conducts similar joint exercises with other nations, such as Exercise Yudh Abhyas (India-US), Exercise Indra (India-Russia), and Exercise Sampriti (India-Bangladesh).

• These exercises foster military cooperation, skill-sharing, and operational synergy among participating nations.

Important Points

• India's Defense Strategy:

• India has actively participated in joint military exercises to enhance its defense capabilities and strengthen international ties.

• These exercises are crucial for improving interoperability between forces and sharing expertise on modern warfare tactics.

• France's Role in Global Defense:

• France has been a prominent contributor to global defense and security, participating in joint exercises and peacekeeping missions worldwide.

• It emphasizes counter-terrorism, cybersecurity, and maritime security in its defense collaborations.

• Significance of Exercise SHAKTI:

• This exercise symbolizes the long-standing friendship and shared values of democracy, freedom, and mutual respect between India and France.

• It contributes to regional and global peace, ensuring preparedness against emerging security threats.

Q88. Answer: (a) Reserve Bank of India

The correct answer is Reserve Bank of India.

Key Points

• The Reserve Bank of India (RBI), as the central bank of India, is responsible for regulating and overseeing the country's monetary and financial systems.

• In a move to enhance liquidity management and promote efficiency in the financial markets, the RBI extended the operating hours of the call money market to 7 PM, effective from 1 July 2025.

• The call money market is an important segment of the money market where banks and financial institutions borrow and lend money for short durations, typically one day.

• Extending the operating hours allows better flexibility for financial institutions to manage their liquidity and short-term funding requirements effectively.

• This decision aligns with the RBI’s broader goal of strengthening market infrastructure and ensuring the stability of the financial system.

Additional Information

• Reserve Bank of India (RBI):

• Established on April 1, 1935, under the Reserve Bank of India Act, 1934.

• Headquartered in Mumbai, it is India's central banking institution, which controls the issuance and supply of the Indian Rupee.

• RBI is responsible for regulating India's banking sector and ensuring monetary stability in the country.

• The current Governor of RBI (as of October 2023) is Shaktikanta Das.

• Call Money Market:

• The call money market is a subset of the money market where banks and financial institutions lend and borrow funds for a very short period, usually overnight.

• This market is crucial for maintaining short-term liquidity in the banking system.

• The interest rate in the call money market is known as the call rate, which serves as an indicator of the liquidity situation in the market.

• Significance of Extended Hours:

• Extended hours improve the efficiency of liquidity management, enabling banks to respond to end-of-day cash flow mismatches.

• It aligns with international practices, enhancing India's financial market infrastructure.

• Such reforms support the deepening of the financial markets, making them more resilient and accessible.

• Other Related Markets:

• The notice money market is where funds are borrowed or lent for periods between 2 and 14 days.

• The term money market deals with borrowing and lending for periods exceeding 14 days.

Important Points

• The call money market is an unsecured market, meaning no collateral is required for borrowing and lending transactions.

• It primarily caters to the short-term liquidity needs of financial institutions, including commercial banks, cooperative banks, and primary dealers.

• The RBI monitors the call money market as part of its monetary policy framework to ensure liquidity stability in the banking system.

• Changes in the call rate can indicate shifts in liquidity conditions and are closely watched by economists and financial analysts.

Q89. Answer: (d) India Electric Mobility Index

The correct answer is India Electric Mobility Index.

Key Points

• India Electric Mobility Index (IEMI) was launched by NITI Aayog in August 2025 as a framework to evaluate and compare the progress of States and Union Territories in achieving their electric mobility goals.

• The index aims to provide a comprehensive assessment of the efforts undertaken by various states and UTs to transition toward sustainable transportation systems.

• It covers key parameters such as policy implementation, infrastructure development, adoption rates of electric vehicles (EVs), and investment trends in electric mobility.

• The framework encourages healthy competition among states and UTs to accelerate their electric mobility initiatives, fostering innovation and collaboration in this sector.

• The IEMI is an essential component of India's broader push toward achieving net-zero emissions and promoting clean energy usage in the transportation sector.

Additional Information

• Electric Vehicle Advancement Index:

• This name suggests a potential tool to measure the progress in EV adoption but is not the name of the framework launched by NITI Aayog.

• It could hypothetically focus on global or national trends in EV adoption and related technological advancements.

• National E-Mobility Mission Plan Index:

• The National Electric Mobility Mission Plan (NEMMP) was launched in 2013 by the Government of India to promote faster adoption and manufacturing of EVs.

• Though this plan plays an important role in India's electric mobility ecosystem, it is not the framework introduced in 2025.

• Sustainable Transport Index:

• This name implies a broader focus on sustainable transportation, including public transport and other eco-friendly measures.

• However, it does not specifically focus on electric mobility as the India Electric Mobility Index does.

• India Electric Mobility Index:

• This framework is a unique initiative aimed at tracking and encouraging the progress of states and UTs toward electric mobility goals.

• By emphasizing data-driven decision-making, it aligns with India's commitment to achieving global climate change mitigation targets.

Important Points

• EV Adoption in India:

• India aims to achieve 30% EV penetration in passenger vehicles, 70% in commercial vehicles, and 80% in two- and three-wheelers by 2030.

• Government initiatives such as the Faster Adoption and Manufacturing of Hybrid and Electric Vehicles (FAME) scheme have been instrumental in driving EV adoption.

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• Infrastructure Challenges:

• A lack of adequate charging infrastructure remains a major barrier to EV adoption in India.

• Efforts are underway to establish widespread charging networks, including public-private partnerships.

• Global Context:

• Countries like Norway and China are leading in EV adoption, serving as models for India's initiatives.

• India's ambitious goals align with global efforts to reduce carbon emissions and combat climate change.

Q90. Answer: (d) Chandan Negi

The correct answer is Chandan Negi.

Key Points

• Sahitya Akademi Translation Prize 2025: The Sahitya Akademi Translation Prize is awarded annually to recognize significant contributions to the translation of literary works into Indian languages.

• Himanshi Joshi's Novel Tere Liye: Himanshi Joshi is a renowned Hindi writer, and her novel Tere Liye is a critically acclaimed work known for its emotional depth and narrative style.

• Translation into Punjabi: The novel Tere Liye was translated into Punjabi as Tere Laee, showcasing a seamless transition of emotions and cultural nuances from one language to another.

• Chandan Negi: Chandan Negi is recognized for his exceptional skills in literary translation, which successfully preserved the essence of the original text while making it accessible to Punjabi readers. Hence, the correct answer is Chandan Negi.

• March 2025 Announcement: The award for the translation of Tere Liye into Punjabi was officially announced in March 2025 by the Sahitya Akademi, honoring excellence in literary translation.

Additional Information

• Sahitya Akademi Translation Prize:

• The Sahitya Akademi, established in 1954, is India’s premier literary organization dedicated to promoting literature in 24 Indian languages.

• The Translation Prize, instituted in 1989, acknowledges outstanding translations of literary works into Indian languages listed in the Eighth Schedule of the Constitution.

• It includes a monetary award of Rs. 50,000 along with a citation.

• Himanshi Joshi:

• Himanshi Joshi is celebrated for her contribution to Hindi literature, particularly for works that explore themes of human relationships and emotions.

• Her novel Tere Liye is noted for its portrayal of complex interpersonal dynamics and has resonated with readers across India.

• Chandan Negi:

• Chandan Negi is a renowned Punjabi translator known for his ability to preserve the original work's style, tone, and cultural context.

• His translation of Tere Liye as Tere Laee has been lauded for its linguistic accuracy and emotional fidelity.

• Significance of Literary Translation:

• Translation plays a crucial role in bridging linguistic and cultural gaps, allowing readers to experience diverse literary traditions.

• It helps promote regional literature on a national and global platform, enhancing cultural understanding and appreciation.

Important Points

• Criteria for Sahitya Akademi Translation Prize:

• Only translations of works originally written in one of the 24 recognized Indian languages are eligible for the award.

• The translation must reflect the original's content, style, and cultural essence while ensuring linguistic accuracy.

• Prominent Past Winners:

• Several eminent translators have received this award for their significant contributions to Indian literature, showcasing the diverse linguistic heritage of India.

Q91. Answer: (d) Easing business in agroforestry by streamlining rules

The correct answer is Easing business in agroforestry by streamlining rules.

Key Points

• The 'Model Rules for Felling Trees in Agricultural Lands', released in 2025, aim to streamline the rules and regulations governing the felling of trees on agricultural lands. This is intended to remove unnecessary barriers and bureaucratic delays for farmers and businesses involved in agroforestry.

• The primary goal of these rules is to encourage agroforestry, which integrates trees into agricultural landscapes, enhancing both economic and ecological benefits. By simplifying the process, the rules aim to facilitate the widespread adoption of agroforestry practices.

• The initiative supports the government's broader objectives to promote sustainable agriculture and increase farmers' incomes by enabling them to derive economic benefits from tree farming and timber production.

• Under these rules, the process for obtaining permissions to cut trees on agricultural land has been made faster and more transparent. Farmers can now focus on planting and harvesting trees without excessive regulatory burden.

• The environmental safeguards in the model rules ensure that tree felling is balanced with reforestation efforts, promoting ecological sustainability while supporting economic growth in rural areas.

Additional Information

• Agroforestry Benefits:

• Economic Benefits: Farmers can earn additional income by growing and selling timber, fruits, or other tree-based products.

• Environmental Benefits: Agroforestry helps in soil conservation, water retention, and carbon sequestration, reducing greenhouse gas emissions.

• Biodiversity: It promotes biodiversity by creating habitats for various flora and fauna.

• Climate Resilience: Trees act as windbreaks and provide shade, helping to stabilize microclimates and protect crops from extreme weather.

• Previous Agroforestry Initiatives:

• National Agroforestry Policy (2014): India became the first country to introduce a dedicated agroforestry policy to promote the integration of trees into agricultural landscapes.

• Sub-Mission on Agroforestry: Launched in 2016-17 under the National Mission for Sustainable Agriculture, this initiative provides financial and technical support to farmers adopting agroforestry practices.

• Streamlined Process for Tree Felling:

• The 2025 model rules are designed to reduce delays in granting tree-felling permits, which previously discouraged farmers from planting trees on their land.

• The rules also emphasize the use of digital platforms for applications and approvals, ensuring greater transparency and efficiency.

• Agroforestry and the Economy:

• The agroforestry sector contributes significantly to India's economy by providing raw materials for industries like paper, furniture, and bioenergy.

• Encouraging agroforestry can help India meet its climate goals, such as increasing forest cover and achieving carbon neutrality targets.

Important Points

• Challenges in Agroforestry:

• Farmers often face challenges such as lack of awareness, high initial costs, and complicated legal requirements for tree felling.

• The 2025 model rules address these issues by simplifying regulations and providing support for capacity-building initiatives.

• Global Context:

• Countries like China and Brazil have successfully integrated agroforestry into their agricultural policies, reaping significant economic and environmental benefits.

• India's initiatives are in line with global efforts to promote sustainable agriculture and combat deforestation.

• Key Data: Agroforestry contributes to 1.5-2% of India's GDP and is a critical component of the country's strategy to achieve 33% forest cover under its National Forest Policy.

• Farmers adopting agroforestry under government schemes have seen an average income increase of 20-30% over traditional farming methods.

Q92. Answer: (a) March 26, 2025

The correct answer is Wed Mar 26 2025 00:00:00 GMT+0530 (India Standard Time).

Key Points

• Defence Research and Development Organisation (DRDO) and the Indian Navy conducted a successful flight-test of the Vertically-Launched Short-Range Surface-to-Air Missile (VLSRSAM) on March 26, 2025.

• The test was conducted at the Integrated Test Range (ITR), Chandipur, located off the coast of Odisha, India.

• The VLSRSAM is an indigenously-developed missile, showcasing India's focus on enhancing its self-reliance in defense technology.

• The missile was designed to provide short-range air defense capabilities, targeting aerial threats such as fighter aircraft, helicopters, unmanned aerial vehicles (UAVs), and other airborne objects.

• The flight-test was aimed at evaluating the missile's performance parameters, including its precision, launch mechanism, and effectiveness in intercepting aerial targets.

• This marks a significant milestone for India's defense sector, reinforcing its Make in India initiative in weaponry development.

Additional Information

• Defence Research and Development Organisation (DRDO):

• DRDO is India's premier organization for research and development in defense technologies.

• Established in 1958, DRDO operates under the Ministry of Defence.

• Its mission is to develop state-of-the-art systems and technologies for India's armed forces, including missiles, radar systems, combat vehicles, and electronics.

• Some notable achievements include the development of Agni and Prithvi series of missiles, Tejas fighter aircraft, and Astra air-to-air missile.

• Indian Navy's Role:

• The Indian Navy plays a pivotal role in safeguarding India's maritime interests and ensuring security in the Indian Ocean region.

• Collaborating with DRDO, the Navy supports the development and testing of advanced weapons and systems for enhancing naval capabilities.

• Its partnership in the VLSRSAM development highlights the importance of integrating indigenous technologies into naval defense systems.

• Integrated Test Range (ITR), Chandipur:

• Located in Odisha, ITR Chandipur serves as a hub for testing missiles and other defense systems developed by DRDO.

• It is equipped with advanced facilities for assessing missile trajectories, flight dynamics, and target engagement capabilities.

• The site has been used for testing various weapons, including Ballistic Missile Defense (BMD) systems and surface-to-air missiles.

• Vertically-Launched Short-Range Surface-to-Air Missile (VLSRSAM):

• The VLSRSAM is part of India's initiative to develop indigenous missile systems for strengthening its defense capabilities.

• It is designed to intercept and neutralize short-range aerial threats, ensuring the protection of critical assets and installations.

• The missile's vertical launch capability enables its deployment on naval ships, providing flexibility and operational efficiency.

• Its development aligns with India's goal of achieving self-reliance in defense technology under the Make in India initiative.

Important Points

• Significance of Indigenous Missile Development:

• Indigenous development reduces dependence on foreign suppliers and boosts the domestic defense industry.

• It enhances India's strategic autonomy and provides a competitive edge in global defense markets.

• Such initiatives contribute to job creation and the development of high-tech infrastructure within the country.

• Make in India Initiative:

• Launched by the Government of India in 2014, this initiative aims to transform India into a global manufacturing hub.

• It emphasizes fostering innovation, enhancing skill development, and attracting investments in key sectors, including defense.

• The development of systems like VLSRSAM showcases the successful implementation of this initiative in the defense domain.

• Global Context:

• India's advancements in missile technology place it among countries like the USA, Russia, and China, which have robust indigenous defense capabilities.

• Such developments contribute to India's stature as a regional and global security provider in the Indian Ocean region.

Q93. Answer: (c) Environment Audit Rules, 2025

The correct answer is Environment Audit Rules, 2025.

Key Points

• The Environment Audit Rules, 2025 were introduced by the Ministry of Environment, Forest, and Climate Change in September 2025 to enhance environmental compliance and governance.

• These rules aim to establish a structured mechanism for conducting environmental audits across industries, ensuring adherence to environmental laws and regulations.

• The audits focus on evaluating the implementation of sustainability practices, compliance with environmental norms, and the impact of industrial activities on ecosystems.

• The rules emphasize the adoption of transparent reporting mechanisms, where industries must submit environmental audit reports periodically to regulatory authorities.

• The initiative is designed to strengthen the capacity of industries to address climate change challenges, reduce pollution, and promote sustainable development.

Additional Information

• Environmental Audits:

• Environmental audits are systematic evaluations of an organization's environmental compliance, focusing on adherence to laws,

regulations, and standards.

• The audits help identify areas of improvement, ensuring industries take corrective actions to mitigate their environmental impact.

• They involve assessing waste management, energy usage, water conservation, air quality monitoring, and biodiversity protection.

• Global examples include initiatives like the ISO 14001 environmental management system, which sets standards for environmental audits.

• Ministry of Environment, Forest, and Climate Change:

• This ministry is the nodal agency responsible for implementing policies and programs related to environment protection, forest conservation, and combating climate change in India.

• It formulates rules, regulations, and guidelines under various acts like the Environment Protection Act, 1986, and the Air and Water Acts.

• Some of its notable initiatives include the National Action Plan on Climate Change (NAPCC) and the Compensatory Afforestation Fund Management and Planning Authority (CAMPA).

• Comparison of Options:

• Sustainable Practices and Audit Guidelines, 2025: This option emphasizes sustainable practices but does not specifically address environmental audits. It is not the correct answer.

• Environmental Sustainability and Compliance Rules, 2025: While it highlights compliance, it lacks the direct emphasis on audits, making it incorrect.

• Green Business Certification Framework, 2025: This framework focuses on certifying businesses for sustainable practices but does not encompass a structured audit process as outlined by the Environment Audit Rules, 2025.

• Important Points:

• Environmental compliance: It refers to industries adhering to environmental laws, regulations, and standards to minimize their ecological impact.

• Periodic reporting: The Environment Audit Rules, 2025 mandate industries to submit environmental audit reports to track compliance and identify gaps.

• Climate change mitigation: The audits play a vital role in helping industries implement strategies to reduce carbon emissions and enhance sustainability.

• Such initiatives align with India's commitments under the Paris Agreement and its Nationally Determined Contributions (NDCs).

Q94. Answer: (c) 96th

The correct answer is 96th.

Key Points

• The Corruption Perceptions Index (CPI) is an annual ranking of countries by their perceived levels of corruption, as determined by expert assessments and opinion surveys.

• In the 2024 Corruption Perceptions Index, India ranked 96th globally, reflecting its position among 180 countries and territories.

• The CPI is published by Transparency International, a global civil society organization leading the fight against corruption.

• The CPI scores countries on a scale of 0 to 100, where 0 indicates highly corrupt and 100 indicates very clean. India scored moderately on this index.

• India's ranking was influenced by factors such as corruption in public sector institutions, lack of transparency in governance, and inefficiencies in the legal and judicial systems.

Additional Information

• About Corruption Perceptions Index (CPI):

• The CPI was first launched in 1995 and has since become a benchmark tool in measuring corruption worldwide.

• It draws on data sources from institutions such as the World Bank, World Economic Forum, and private risk assessment agencies.

• The index focuses on corruption in the public sector, including bribery, embezzlement, and nepotism.

• India's Historical CPI Performance:

• India's ranking and score have fluctuated over the years due to changes in governance and policy reforms.

• In the 2023 CPI, India ranked 85th, indicating a slight decline in its perceived integrity in 2024.

• Key Factors Influencing India's Ranking:

• Weak enforcement of anti-corruption laws and regulations.

• Limited public access to information on government functioning.

• The prevalence of bribery and red tape in business dealings.

• Global Trends in CPI 2024:

• The highest-ranking countries were Denmark, Finland, and New Zealand, with scores close to 90.

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• Countries with the lowest scores included Somalia, Syria, and South Sudan, indicating severe corruption.

Important Points

• Transparency International:

• Founded in 1993, it is a non-governmental organization headquartered in Berlin, Germany.

• It works globally to combat corruption and prevent criminal activities in public and private sectors.

• India's Anti-Corruption Measures:

• Implementation of the Lokpal and Lokayuktas Act, 2013 to address public grievances related to corruption.

• Digitization of public services to reduce human intervention and curb bribery.

• Strengthening of anti-corruption bodies like the Central Vigilance Commission (CVC) and Central Bureau of Investigation (CBI).

• Impact of CPI Rankings:

• CPI rankings influence foreign investments, as countries with higher scores are seen as more stable and reliable.

• It helps governments and policymakers identify gaps in governance and prioritize anti-corruption reforms.

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Q95. Answer: (b) 2781

The correct answer is Option 2.

Key Points

• As of November 2024, a total of 2781 Khelo India Athletes have been provided with coaching, equipment, medical care, and Out of Pocket Allowance (OPA). This initiative is part of the Khelo India Scheme launched by the Government of India to promote sports at the grassroots level.

• The Khelo India Scheme focuses on identifying talented athletes across India and nurturing them through structured training programs, state-of-the-art facilities, and financial support.

• Out of Pocket Allowance (OPA): Each athlete under the scheme is given a monthly allowance of Rs. 10,000 to cover incidental expenses such as travel, diet, and other necessities related to their training and participation in sports events.

• The scheme has been instrumental in providing holistic development for athletes, ensuring they have access to world-class coaching and medical care to excel in national and international tournaments.

• This initiative aligns with the Government’s vision to make India a global powerhouse in sports by nurturing young talent and providing them with the necessary resources to succeed.

Additional Information

• Khelo India Scheme:

• The Khelo India Program was launched by the Ministry of Youth Affairs and Sports in 2018 to revive India’s sports culture at the grassroots level by building a strong framework for all sports played in the country.

• The scheme involves talent identification, training, and support for athletes under the age of 17 years across various disciplines.

• Under the initiative, athletes are selected through Khelo India Games, which include events such as the Khelo India Youth Games and Khelo India University Games.

• Athletes chosen under this scheme receive financial assistance of Rs. 5 lakh annually for eight years, along with access to expert coaching and infrastructure support.

• Components of the Scheme:

• Coaching: Athletes are trained by top coaches to ensure skill enhancement and optimal performance in national and international competitions.

• Equipment: High-quality sports equipment is provided to athletes, ensuring they have access to the best tools to improve their performance.

• Medical Care: Comprehensive medical services, including physiotherapy and injury management, are offered to ensure athletes’ physical well-being.

• Out of Pocket Allowance: A monthly allowance of Rs. 10,000 is provided to cover incidental expenses.

• Achievements Under the Scheme:

• The program has successfully produced athletes who have represented India in prestigious events like the Olympics, Asian Games, and Commonwealth Games.

• Notable athletes such as Neeraj Chopra and Mirabai Chanu have received support under this scheme and have achieved international acclaim.

• Eligibility Criteria:

• Athletes aged between 8-17 years are eligible for selection under the Khelo India Scheme.

• The program covers athletes from diverse socioeconomic backgrounds, ensuring inclusivity and equal opportunity.

Important Points

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• Government Investment: The Indian Government has allocated Rs. 1,756 crore for the Khelo India Scheme for the years 2023-24 to ensure extensive outreach and development.

• Infrastructure Development: The program emphasizes the creation of sports infrastructure, including stadiums and training centers, across rural and urban regions to promote sports.

• Global Recognition: The scheme has improved India's ranking in international sports, highlighting the importance of nurturing young talent.

• Policy Alignment: The Khelo India initiative aligns with the National Sports Policy, which aims to make sports an integral part of India's culture and education system.

Q96. Answer: (a) Carlos Alcaraz

The correct answer is Carlos Alcaraz.

Key Points

• Carlos Alcaraz won the Men's Singles title at the 2025 French Open, held in June 2025. This victory solidified his position as one of the top players in men's tennis.

• The French Open, also known as Roland-Garros, is one of the four Grand Slam tennis tournaments and is played on clay courts.

• Carlos Alcaraz, hailing from Spain, is known for his exceptional skill on clay courts, a surface that has historically favored players with strong baseline games and stamina.

• By defeating top players in the tournament, Alcaraz showcased his powerful groundstrokes, agility, and mental toughness, which are critical on the demanding clay surface.

• This win marked another milestone in Alcaraz's career, further establishing him as the next dominant player in the post-"Big Three" era of tennis.

Additional Information

• Carlos Alcaraz:

• Born on May 5, 2003, in El Palmar, Spain, Alcaraz is widely regarded as the future of men's tennis.

• He is known for his exceptional all-court game and ability to adapt to different surfaces, with a particular affinity for clay courts.

• Alcaraz turned professional in 2018 and quickly rose through the ranks, earning his first ATP title in 2021.

• By 2025, he had already won several major titles and was regarded as a serious contender in every Grand Slam tournament.

• French Open:

• The French Open is held annually at Stade Roland-Garros in Paris, France, and is the only Grand Slam tournament played on clay courts.

• The tournament is known for its rigorous physical demands due to the slower playing surface and longer matches.

• It was established in 1891 and became an international event in 1925.

• Other Contenders:

• Jannik Sinner: The Italian player is known for his powerful baseline game and has been a consistent performer on the ATP Tour, but he fell short in 2025.

• Novak Djokovic: A tennis legend with multiple Grand Slam titles, Djokovic struggled in the latter stages of the 2025 French Open due to the rising dominance of younger players like Alcaraz.

• Alexander Zverev: Known for his strong serve and all-round game, Zverev was a contender but did not manage to reach the finals in 2025.

• Importance of Clay Courts:

• Clay courts slow down the ball and produce a high bounce, favoring players with strong defense and stamina.

• Many of the greatest players in tennis history, such as Rafael Nadal, have excelled on clay.

• The surface requires a unique skill set, including sliding techniques and patience during rallies.

Important Points

• Rafael Nadal: Nadal holds the record for the most French Open titles and is often referred to as the "King of Clay."

• Grand Slam Tournaments: The four Grand Slam tournaments are the Australian Open, French Open, Wimbledon, and US Open.

• Young Players: Alcaraz's victory reflects the ongoing generational shift in tennis, with younger players starting to dominate the sport.

• Strategy on Clay: Matches on clay often last longer, requiring mental resilience and physical endurance, both of which were displayed by Alcaraz in 2025.

Q97. Answer: (c) Dhar

The correct answer is Dhar.

Key Points

• Dhar, a city located in the state of Madhya Pradesh, hosted the foundation stone ceremony of India's first PM MITRA Park.

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• The event was attended by Prime Minister Narendra Modi, highlighting the strategic importance of the initiative in enhancing the textile sector.

• PM MITRA Park stands for Prime Minister Mega Integrated Textile Region and Apparel Park, a visionary project aimed at establishing integrated textile parks across India.

• The objective of the PM MITRA Park is to boost India's textile industry by creating world-class infrastructure for manufacturing, reducing logistics costs, and fostering innovation and sustainability.

• Madhya Pradesh was chosen as one of the key locations for this initiative due to its favorable policies, accessibility, and potential to contribute significantly to the textile and apparel sector.

Additional Information

• PM MITRA Parks Scheme:

• The scheme was announced in 2021 by the Ministry of Textiles under the guidance of the Indian Government.

• It aims to establish 7 Mega Textile Parks across India over a period of 5 years.

• The parks are designed to integrate various processes like spinning, weaving, dyeing, printing, and garment manufacturing under one roof to enhance efficiency.

• This initiative aligns with the vision of Aatmanirbhar Bharat and aims to create 21 lakh direct and indirect employment opportunities.

• Each PM MITRA Park is developed in partnership with state governments, with financial assistance from the Centre, including a budget allocation of Rs. 4,445 crore.

• Importance of Dhar:

• Dhar is a historical city in Madhya Pradesh known for its cultural heritage and geographical significance.

• The selection of Dhar as a site for PM MITRA Park underscores its potential to emerge as a hub for textile manufacturing and trade in the region.

• The city is well-connected to major markets and has favorable policies that support industrial growth, making it a strategic choice.

• Textile Industry in India:

• The textile and apparel sector is a key contributor to the Indian economy, accounting for approximately 2% of GDP.

• India is one of the largest producers of cotton and natural fibers globally.

• The sector is labor-intensive and employs millions of people, with a significant portion being women.

• Government schemes like PM MITRA Park are aimed at enhancing global competitiveness and promoting exports in the textile sector.

• Madhya Pradesh’s Role in Textile Growth:

• The state has favorable policies and infrastructure that support the growth of industries like textiles.

• It is home to several cotton-growing regions, making it a natural choice for textile-related projects.

• Initiatives like PM MITRA Park further strengthen Madhya Pradesh’s role in contributing to India’s textile exports and employment generation.

Important Points

• Objective of PM MITRA Parks:

• To create world-class textile manufacturing facilities and attract investment in the sector.

• To reduce logistics costs by integrating production and distribution processes within the park.

• To foster innovation, sustainability, and skill development in the textile sector.

• To enhance India’s position as a global textile hub and boost exports.

• Selection Criteria for PM MITRA Park Locations:

• Availability of raw materials and skilled labor.

• Connectivity to domestic and international markets via transportation networks.

• Supportive state government policies and infrastructure readiness.

• Potential for job creation and industrial growth.

Q98. Answer: (b) Poonam Gupta

The correct answer is Poonam Gupta.

Key Points

• Poonam Gupta was appointed as the RBI Deputy Governor in April 2025, a significant role in shaping India's financial and monetary policy.

• She is known for her expertise in macroeconomic research, and her appointment reflects the government's focus on strengthening the economic policy framework.

• Poonam Gupta previously served as the Director-General of the National Council of Applied Economic Research (NCAER), India's premier economic research institute, which focuses on high-quality, evidence-based economic research.

• Her contributions have been pivotal in areas such as economic growth, trade policy, and public finance, making her a prominent figure in India's economic policymaking space.

• As Deputy Governor, Poonam Gupta will play a key role in managing aspects such as monetary policy formulation, foreign exchange management, and financial market development.

Additional Information

• Reserve Bank of India (RBI):

• The Reserve Bank of India is India's central bank and regulatory authority responsible for the issuance of currency and management of monetary policy.

• It was established on April 1, 1935, under the Reserve Bank of India Act, 1934.

• The RBI is responsible for regulating the banking system, ensuring financial stability, and overseeing India's foreign exchange reserves.

• The Deputy Governors of RBI assist the Governor in executing the bank's functions and are usually assigned specific portfolios like monetary policy, banking regulation, or financial market development.

• Key Functions of RBI:

• Monetary Policy: Formulating policies to control inflation, stabilize the currency, and promote growth.

• Currency Issuance: Responsible for issuing and managing the supply of the Indian currency.

• Financial Regulation: Regulating and supervising banks and other financial institutions.

• Foreign Exchange Management: Managing India's foreign exchange reserves and ensuring stability in the foreign exchange market.

• Importance of Deputy Governors:

• The Deputy Governors are appointed to oversee specific aspects of the RBI's functions, ensuring effective policymaking and implementation.

• They play a crucial role in representing the RBI in interactions with global financial institutions and government bodies.

• Deputy Governors are often involved in drafting policies related to economic growth, financial inclusion, and banking reforms.

• Other Notable RBI Deputy Governors:

• Shaktikanta Das: Served as RBI Governor after holding senior positions in the Ministry of Finance.

• Arundhati Bhattacharya: Former Chairperson of the State Bank of India, known for her contributions to India's banking sector.

• Nirmala Sitharaman: India's current Finance Minister, although she has not served as Deputy Governor, her policy decisions significantly influence the RBI.

Important Points

• Selection Process:

• The appointment of RBI Deputy Governors is typically done by the Appointments Committee of the Cabinet (ACC), headed by the Prime Minister.

• Candidates are selected based on their expertise in economics, banking, or finance.

• Challenges for the Deputy Governor:

• Managing inflation and ensuring economic stability amidst global uncertainties.

• Strengthening India's financial system and increasing financial inclusion.

• Formulating policies to address challenges in areas like non-performing assets (NPAs) and digital banking.

Q99. Answer: (b) Sarah Wynn-Williams

The correct answer is Sarah Wynn-Williams.

Key Points

• Sarah Wynn-Williams is the author of the book ‘Careless People: A Cautionary Tale of Power, Greed, and Lost Idealism.’

• The book was published in the year 2025, making it a recent addition to literature on socio-political themes.

• It is a comprehensive exploration of themes like power, greed, and the erosion of idealism, drawing parallels with modern societal dynamics.

• The author, Sarah Wynn-Williams, is renowned for her critical analysis of socio-political issues, making this work a significant contribution to contemporary literature.

• The book has been widely recognized for its insightful examination of the consequences of unchecked power and materialism, serving as both a cautionary tale and a reflection of societal realities.

Additional Information

• About the Author:

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• Sarah Wynn-Williams is a well-regarded author and commentator on socio-political issues, with expertise in analyzing themes of power dynamics and societal change.
• She has a background in political science and has written extensively on topics such as governance, ethics, and human behavior.
• Her works often emphasize the interplay between individual actions and their impact on collective societal structures.
• Themes Explored in the Book:
• The book delves into the psychological and moral consequences of greed and unbridled ambition.
• It highlights the erosion of idealism in the face of materialism and the pursuit of power.
• The narrative incorporates historical and contemporary examples to illustrate its arguments, making it relatable and impactful.
• Critical Reception:
• The book has been praised for its depth of analysis and its ability to provoke thought about the direction of modern society.
• Critics have lauded the author's ability to connect abstract concepts with real-world implications.
• It is considered a must-read for individuals interested in political theory, ethics, and societal development.
• Importance of the Book:
• The book serves as a wake-up call for individuals and leaders to reflect on their actions and values.
• It underscores the need for balancing ambition with ethical considerations to ensure sustainable societal progress.
• The lessons drawn from the narrative are applicable across various domains, including politics, economics, and personal growth.

Important Points

• Significance of the Title:
• The title, 'Careless People', signifies the disregard for consequences that often accompanies excessive power and greed.
• It serves as a metaphor for the broader societal trends of negligence and moral decay.
• Relevant Comparisons:
• The themes resonate with classic works like 'The Great Gatsby', which also explores the consequences of ambition and materialism.
• It provides a modern-day perspective on issues that have long been subjects of literary and philosophical discourse.
• Impact on Readers:
• The book encourages readers to critically evaluate their own values and the societal structures they contribute to.
• It serves as a reminder of the importance of ethical leadership and the need for collective accountability.

Q100. Answer: (b) Jharkhand

The correct answer is Jharkhand.

Key Points

• In June 2025, the state of West Bengal announced its plan to create an 800 km long green wall along its border with Jharkhand.
• The green wall is intended to act as a natural barrier for intercepting air pollutants entering West Bengal from neighboring states.
• This initiative is part of West Bengal's efforts to combat environmental pollution and improve air quality in the region.
• The green wall will consist primarily of dense vegetation and trees strategically planted along the border to filter pollutants and provide ecological benefits.
• Jharkhand was chosen due to its proximity and shared border with West Bengal, which facilitates the direct entry of pollutants carried by wind currents from industrial zones.

Additional Information

• Pollution Concerns in West Bengal:
• West Bengal faces significant challenges related to air pollution due to emissions from industries, vehicles, and neighboring states.
• Industrial activities in Jharkhand, especially in mining and manufacturing sectors, contribute to the movement of pollutants across state borders.
• Creating a green wall is a proactive measure to mitigate these cross-border environmental impacts.
• Green Wall Concept:
• A green wall refers to a dense plantation of trees and vegetation designed to act as a natural barrier against pollutants.
• This approach has been adopted globally to reduce the effects of air pollution, improve biodiversity, and contribute to climate change mitigation.
• Green walls can also serve as noise barriers and enhance the aesthetic appeal of urban and rural landscapes.
• Jharkhand:
• Location: Jharkhand is situated in the eastern part of India and shares borders with West Bengal, Bihar, Odisha, Chhattisgarh,

and Uttar Pradesh.

• Economy: The state is rich in mineral resources and is known for its mining and industrial activities.

• Environmental Impact: Industrial emissions and mining activities in Jharkhand contribute to regional air pollution, impacting neighboring states like West Bengal.

• Environmental Initiatives in India:

• India has launched several initiatives to address pollution, including the National Clean Air Programme (NCAP) and afforestation drives.

• States are increasingly adopting regional measures like green walls to complement these national efforts.

• Such initiatives align with India's commitment to international environmental agreements, including the Paris Agreement on climate change.

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