RRB Group D Official Paper (Held On: 05 Dec, 2025 Shift 1) (Previous Year Paper)

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

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GENERAL SCIENCE

Q1. A force (F) of 10 N is applied on a body, causing it to move 5 m in the direction of the force. The work done (W) is _____.

(a) 50 J
(b) 5 J
(c) 15 J
(d) 2 J

Q2. Which of the following is a safe sex method to help prevent the transmission of HIV (human immunodeficiency virus)?

(a) Taking multivitamins regularly
(b) Sharing needles carefully
(c) Taking antibiotics after sex
(d) Using condoms during sexual intercourse

Q3. A car starts from rest and reaches a speed of 72 km/hr in 20 seconds. What is the acceleration of the car?

(a) 3 m/s^2
(b) 2 m/s^2
(c) 1 m/s^2
(d) 4 m/s^2

Q4. Which of the following is NOT an example of action and reaction forces?

(a) Foot pushes the ground backward and ground pushes the foot forward
(b) When the bus stops suddenly, people fall forward
(c) The swimmer pushes the water backward with her hands
(d) A rocket moving upward due to gases expelled downward

Q5. Which of the following statements best describes allotropes of carbon?

(a) They are different isotopes of carbon with varying numbers of neutrons.
(b) They are different structural forms of carbon with different physical properties but similar chemical properties.
(c) They are isomers of carbon, having the same molecular formula but different structures.
(d) They are compounds formed by carbon with different elements.

Q6. The pH of four different solutions are given in the options. Which of them will turn red litmus blue?

(a) 4
(b) 6
(c) 11
(d) 2

Q7. What is the role of nitrogen gas in chip packets?

(a) It absorbs moisture
(b) It adds crispiness
(c) It prevents oxidation
(d) It adds flavour

Q8. Which of the following functions is NOT associated with Golgi Complex?

(a) It modifies and packages proteins received from the endoplasmic reticulum.
(b) It transports and secretes materials outside the cell.
(c) It forms lysosomes that help in intracellular digestion.
(d) It permits entries and exits of substances from the cell.

Q9. If a conductor has a resistance of 10 Ω and a potential difference of 5 V is applied across it, what is the current flowing through it?

(a) 0.5 A
(b) 2 A
(c) 0.2 A
(d) 5 A

Q10. The crystalline lens of the eye mainly helps in:

(a) Sending signals to the brain
(b) Detecting colour of objects
(c) Controlling the amount of light entering the eye
(d) Providing fine adjustment of focal length

Q11. In animals, sensitivity or responsiveness is mainly controlled by the:

(a) circulatory system
(b) digestive system
(c) nervous system
(d) respiratory system

Q12. According to Thomson's model of an atom, which of the following statements best describes the structure of the atom?

(a) The atom contains only neutrons and electrons.
(b) Electrons are embedded in a positively charged sphere.
(c) Electrons revolve around a central nucleus in fixed orbits.
(d) The atom consists of a dense nucleus surrounded by electrons.

Q13. The relationships of food chain, which can be shown as a series of branching lines is called:

(a) Trophic level
(b) World wide web
(c) Spider web
(d) Food web

Q14. Which of the following statements is correct?

(a) Sound travels faster in vacuum than in air.
(b) Sound requires a medium to travel and is longitudinal.
(c) Sound can travel in vacuum because it is longitudinal.
(d) Sound waves are transverse and need a medium.

Q15. The angle between the incident ray and the emergent ray of a prism is called:

(a) Angle of incidence
(b) Angle of deviation
(c) Angle of refraction
(d) Angle of emergence

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Q16. A ball is thrown vertically upward with initial velocity u. After time t, its velocity v becomes _____.

(a) v = u - gt
(b) v = u + gt
(c) v = u · gtv
(d) v = gt - uv

Q17. Where does fertilisation usually occur in the female reproductive system?

(a) Vagina
(b) Uterus
(c) Oviduct
(d) Cervix

Q18. Which of the following industries uses sodium hydroxide for processing wood pulp?

(a) Food Industry
(b) Soap Industry
(c) Textile Industry
(d) Paper Industry

Q19. Which of the following is a component of phloem tissue?

(a) Sieve tubes
(b) Tracheids
(c) Vessels
(d) Xylem fibres

Q20. Which of the following is/are true about the magnetic field lines around a bar magnet?

(i) The relative strength of the magnetic field is shown by the degree of closeness of the field lines.
(ii) No two magnetic field lines can intersect each other.

(a) Only (i)
(b) Both (i) and (ii)
(c) Neither (i) nor (ii)
(d) Only (ii)

Q21. Which of the following experimental observations provides the strongest evidence for the existence of particles in matter?

(a) A drop of ink spreads evenly in water without stirring
(b) Ice melts into water when heated
(c) Water boils and produces steam
(d) Salt dissolves faster in warm water than in cold water

Q22. What is the mass number of a neutral atom with 11 electrons, 11 protons and 12 neutrons?

(a) 23
(b) 11
(c) 22
(d) 12

Q23. Which statement DOES NOT relate to the versatile nature of carbon?.

(a) It is tetravalent.
(b) It can bond ionically.
(c) It has catenation.
(d) It can have single, double, and triple bonds.

Q24. What is the purpose of cross-breeding exotic and local cattle breeds?

(a) To make animals smaller in size
(b) To make the animals more aggressive
(c) To combine long lactation with disease resistance

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(d) To reduce food requirements

Q25. Seed dispersal is important for plants because it:

(a) ensures seed death after fertilisation
(b) prevents overcrowding and competition
(c) increases the size of seeds
(d) prevents pollination

MATHEMATICS

Q26. A motorist travels a total distance of 30 km in 50 minutes. He drives at a speed of x km/hr for the first 11 minutes, then at 2x km/hr for the next 25 minutes, and finally at x km/hr for the remaining part of the journey. Find the value of x.

(a) 24
(b) 27
(c) 29
(d) 21

Q27. Which of the following numbers is the largest number between 4000 and 5000 that is completely divisible by 42?

(a) 4956
(b) 4032
(c) 4446
(d) 4998

Q28. Rahul is 5 years younger than his sister. After 3 years, the sum of their ages will be 35 years. Find Rahul's present age.

(a) 12 years
(b) 14 years
(c) 15 years
(d) 18 years

Q29. A rectangular box without a lid is made of thin sheet metal. The box has a length of 60 cm, a breadth of 40 cm, and a height of 30 cm. Find the total area of the sheet metal used to make the box and the cost of the sheet if 1 m^2 costs Rs. 50.

(a) Rs. 56
(b) Rs. 60
(c) Rs. 44
(d) Rs. 42

Q30. If 20% of a number is added to 96, then the result is the same number. 60% of the same number is:

(a) 72
(b) 102
(c) 92
(d) 82

Q31. Simplify:

• $5 \times [- 4 \times \{-3 - (2 \times (-3) \times (-4) + 5 \times 6) - 3\} \div (-20 \times 3)] \times 0.5/2 \times 5$

(a) 4
(b) 1
(c) 2
(d) 0.5

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Q32. If $2a + b + c = 0$ and $8a^3 + b^3 + c^3 = kabc$, then find the value of k^2.

(a) 81
(b) 16
(c) 36
(d) 49

Q33. A hemisphere has radius 3.5 cm. If total surface area of hemisphere is equal to the surface area of a sphere, then what is the volume of the sphere?

(Take $\pi = 22/7$)

(a) $539\sqrt{3}/8$ cm³
(b) $593\sqrt{3}/8$ cm³
(c) $539\sqrt{3}/2$ cm³
(d) $418\sqrt{3}$ cm³

Q34. The marks obtained by 15 students out of a maximum of 26 in a test are given as 14, 12, 17, 16, 19, 13, 14, 15, 11, 23, 16, 22, 21, 18 and 25. Find the product of the possible modes of this set of data.

(a) 225
(b) 222
(c) 220
(d) 224

Q35. If p : q : r = 13 : 5 : 14 and r : s = 42 : 3, then what is the value of p : q : r : s ?

(a) 41:22:45:8
(b) 40:19:48:9
(c) 36:19:45:4
(d) 39:15:42:3

Q36. A number is increased by 15% and the resulting number is again increased by 10%. What is the overall percentage increase in the number?

(a) 12.5%
(b) 10%
(c) 15%
(d) 26.5%

Q37. Two trains 285 metres and 235 metres long are running in the opposite direction with speeds of 61 km/hr and 83 km/hr, resepectively. In how much time will the first train cross the second?3631

(a) 16 seconds
(b) 5 seconds
(c) 13 seconds
(d) 3 seconds

Q38. A purse has Rs. 1 and Rs. 2 coins in the ratio 3 : 2. If the total amount of money is Rs. 70, how many coins are there in total?

(a) 50
(b) 45
(c) 40
(d) 35

Q39. If the ratio of two numbers is 8 : 7, and their HCF is 30, then their LCM is:

(a) 1662
(b) 1717
(c) 1687
(d) 1680

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Q40. The income of Raman is Rs. 50,400. He saves 7.5% of his income. If his income increases by 26% and expenditure increases by 45%, then his savings will:

(a) increase by Rs. 7,872
(b) decrease by Rs. 7,875
(c) increase by Rs. 7,878
(d) decrease by Rs. 7,880

Q41. Smart Bazaar is offering 'Buy 14, Get 11 free' on household items. What is the net percentage discount being offered by the Smart Bazaar?

(a) 44%
(b) 45%
(c) 46%
(d) 48%

Q42. Two pipes can fill a tank in 10 and 12 minutes respectively and a waste pipe can empty 6 gallons per minute. All the three pipes working together can fill the tank in 30 minutes. Find the capacity of the tank.

(a) 40 gallons
(b) 30 gallons
(c) 25 gallons
(d) 45 gallons

Q43. The average age of 20 students of a class is 29 years. If the age of the teacher is also included, the average age of the whole group becomes 30 years. The age (in years) of the teacher is:

(a) 52
(b) 49
(c) 53
(d) 50

Q44. A vendor bought 100 dozens of bananas for Rs. 4,800 and sold them at 4 bananas for Rs. 20. Find his gain percentage.

(a) 25%
(b) 30%
(c) 35%
(d) 20%

Q45. An amount of Rs. 4328 is divided among A, B, C and D in such a way that the shares of A and B, B and C, and C and D are in the ratios of 4 : 5, 4 : 5 and 6 : 7, respectively. The share of A (in Rs.) is:

(a) 768
(b) 724
(c) 804
(d) 700

Q46. From the top of a 42 m high building, the angle of depression of a man on the ground is 30°. How far is the man from the base of the building?

(Take √3 = 1.7321 and round off your answer to two decimal places)

(a) 72.75 m
(b) 77.75 m
(c) 74.25 m
(d) 79.25 m

Q47. In quadrilateral PQRS, the bisectors of angle R and angle S meet at the point T (inside the quadrilateral) and angle STR = 40°. If the ratio of angle P to angle Q is 3 : 5, then what is the difference between the measures of angle Q and angle P ?

(a) 17°
(b) 21°

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(c) 24°
(d) 20°

Q48. A, B and C can do a piece of work in 3, 6 and 10 days, respectively. How long (in days) will they take to do thrice the same work, working together?
(a) 5
(b) 6
(c) 15
(d) 10

Q49. The marked price of an item is set at 49% above its cost price. If the merchant sells the item at 16% below the marked price, his profit percentage (rounded off to 1 decimal place) is:
(a) 26.3%
(b) 28.8%
(c) 29.1%
(d) 25.2%

Q50. To buy furniture for a new apartment, Chang borrowed Rs. 50,000 at 16% per annum simple interest for 18 months. How much interest will she pay?
(a) Rs. 12,000
(b) Rs. 11,500
(c) Rs. 11,000
(d) Rs. 10,500

GENERAL INTELLIGENCE & REASONING

Q51. 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) RV – OX
(b) NR – PT
(c) MQ – JS
(d) UY – RA

Q52. In a certain code language, ‘TOUR’ is coded as ‘4139’ and ‘BRUT’ is coded as ‘4318’. What is the code for ‘B’ in the given code language?
(a) 3
(b) 4
(c) 1
(d) 8

Q53. What should come in place of the question mark (?) in the given series?
612 610 620 617 627 623 ?
(a) 633
(b) 637
(c) 631
(d) 635

Q54. Refer to the given series and answer the question that follows. All numbers are single-digit numbers only. (Counting to be done from left to right only)
(Left) 6 3 6 9 9 4 4 1 7 5 6 2 1 6 6 6 6 8 8 2 9 1 5 (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) Three
(b) Two

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(c) Four
(d) One

Q55. Saurav starts from Point A and drives 9 km towards the east. He then takes a right turn, drives 6 km, turns right and drives 11 km. He then takes a right turn and drives 11 km. He takes a final right turn, drives 2 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) 5 km to the south
(b) 5 km to the north
(c) 6 km to the north
(d) 6 km to the south

Q56. Mohini starts from Point A and drives 13 km towards south. She then takes a right turn, drives 7 km, turns right and drives 7 km. She then takes a right turn and drives 3 km. She takes a final left turn, drives 6 km and stops at Point P. How far (shortest distance) and towards which direction should she drive in order to reach Point A again?

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

(a) 8 km towards north
(b) 4 km towards east
(c) 7 km towards south
(d) 4 km towards west

Q57. 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.

KJL−NMO

LKM−ONP6445

(a) VUW−YXZ
(b) VTU−XWY
(c) VUW−XXY
(d) VTU−YXZ

Q58. What should come in place of the question mark (?) in the given series?

66 81 98 117 138 ?

(a) 159
(b) 161
(c) 151
(d) 152

Q59. 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 forks are kettles. Some forks are cups.

Conclusion (I): Some kettles are cups.

Conclusion (II): All cups are forks.

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

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

Statements:

Some nut are bolt.

Some bolt are rivet.

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Conclusions:

(I) Some nut are rivet.

(II) All rivet are bolt.

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

Q61. What should come in place of the question mark (?) in the given series based on the English alphabetical order?

NSE MRD LQC KPB ?

(a) JOA
(b) HNW
(c) HOX
(d) IOW

Q62. In a certain code language,

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

'A = B' means 'A is the son of B',

'A @ B' means 'A is the father of B' and

'A √ B' means 'A is the sister of B'.

How is C related to L if 'C ? D @ E = F √ L'?

(a) Sister's daughter
(b) Daughter
(c) Mother's sister
(d) Sister

Q63. 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) 1 6 4 5 6 6 4 7 4 4 2 4 7 4 3 1 9 2 4 3 6 9 7 8 2 7 1 (Right)

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

(a) Five
(b) Six
(c) Four
(d) Seven

Q64. Which of the following letter-clusters will replace the question mark (?) in the given series to make it logically complete?

IGP 3 KIO -10 MKN -23 OMM -36 ?

(a) POI -47
(b) OPL -45
(c) PLO -44
(d) QOL -49

Q65. Seven people A, B, C, D, E, F, and G are sitting in a row, facing the north. Only one person sits to the right of E. Only three people sit between G and E. Only three people sit between A and D, neither of whom sits on the left end. F sits immediately to the right of C. Only one person sits between A and B. Who sits second to the left of C?

(a) G
(b) A
(c) D
(d) E

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Q66. Five people, L, M, N, O and P, are sitting in a row facing north. N is sitting at the third position from the extreme right end of the row. M is not an immediate neighbour of N. P is sitting to the immediate left of N. P is sitting to the immediate right of O. Who is sitting between N and M?

(a) N
(b) P
(c) O
(d) L

Q67. In a certain code language, 'MORE' is coded as '1637' and 'DEMO' is coded as '4176'. What is the code for 'D' in the given code language?

(a) 1
(b) 6
(c) 4
(d) 7

Q68. 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 9 1 8 4 2 5 6 3 8 7 1 9 (Right)

How many odd numbers are there (from left to right) which are immediately followed by even numbers?

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

Q69. If 'A' stands for '÷', 'B' stands for 'x', 'C' stands for '+' and 'D' stands for '−', what will come in place of question mark (?) in the following equation?

11 D 30 C 42 A 3 B 4 = ?

(a) 37
(b) 39
(c) 38
(d) 35

Q70. In a row of 32 people facing north, Anita is 8^(th) from the left end. If Savita sits 9^(th) to the right of Anita, then what is Savita's position from the right end of the row?

(a) 12th
(b) 15th
(c) 16th
(d) 18th

Q71. 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) LD – OB
(b) FL – IJ
(c) MQ – PN
(d) PJ – SH

Q72. 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.

KGD−AWT

FBY−VRO

(a) XSO−MIF
(b) XTQ−MJF
(c) XTQ−NJG

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(d) XSO−NJG

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

55 14 58 14 61 14 ?

(a) 62
(b) 65
(c) 14
(d) 64

Q74. Seven boxes A, B, C, D, E, F and G are kept one over the other but not necessarily in the same order.

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

How many boxes are kept below G?

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

Q75. Select the set in which the numbers are related in the same way as are the numbers of the following sets.

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

(50, 1200, 12)

(4, 120, 15)

(a) (39, 858, 11)
(b) (12, 535, 22)
(c) (36, 1087, 15)
(d) (43, 2071, 24)

Q76. M, N, O, P, W, X and Y are sitting around a circular table facing the centre of the table.

O sits to the immediate right of P. Only three people sit between O and Y when counted from the left of O. Only three people sit between P and N when counted from the left of P. W sits to the immediate right of M. How many people sit between X and M when counted from the left of M?

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

Q77. If ‘A’ stands for ‘÷’, ‘B’ stands for ‘×’, ‘C’ stands for ‘+’ and ‘D’ stands for ‘−’, then what will come in place of the question mark (?) in the following equation?

6 B 44 A 3 D 21 C 44 = ?

(a) 113
(b) 110
(c) 111
(d) 112

Q78. Refer to the following number and symbol series and answer the question that follows. Counting to be done from left to right only. All numbers are single-digit numbers.

(Left) 3 & 6 © 3 6 © € % 6 & 4 9 5 4 % € £ $ % 9 1 (Right)

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

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

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(d) 4

Q79. If + means −, − means ×, × means ÷ and ÷ means +, then what will come in place of the question mark (?) in the following equation?

28 + 11 − 3 ÷ 45 × 9 = ?

(a) 0
(b) 14
(c) 9
(d) 4

Q80. GKPY is related to JFST in a certain way based on the English alphabetical order. In the same way, SQBE is related to VLEZ. To which of the following options is BBKP related, following the same logic?

(a) EKIO
(b) EWKM
(c) EKMI
(d) EWNK

GENERAL AWARENESS AND CURRENT AFFAIRS

Q81. In the 56^(th) meeting of Monetary Policy Committee (MPC) held from 4 to 6 August 2025, real GDP growth for Q1 2026-27 was projected at:

(a) 6.6%
(b) 6.8%
(c) 6.5%
(d) 6.3%

Q82. Anurag Kashyap's upcoming bilingual action-thriller Dacoit features which actor alongside Mrunal Thakur?

(a) Prithviraj Sukumaran
(b) Fahadh Faasil
(c) Adivi Sesh
(d) Dulquer Salmaan

Q83. Which Indian environmental activist was in the news for leading a youth movement in 2025?

(a) Medha Patkar
(b) Disha Ravi
(c) Ridhima Pandey
(d) Licypriya Kangujam

Q84. Which legend won the Laureus Lifetime Achievement Award 2025?

(a) Serena Williams
(b) Rafael Nadal
(c) Kelly Slater
(d) Usain Bolt

Q85. Which edition of International Conference on 'Arbitrating Indo-UK Commercial Disputes' was organised by the Indian Council of Arbitration (ICA)during the London International Disputes Week (LIDW) in June 2025?

(a) 2nd
(b) 4th
(c) 3rd
(d) 5th

Q86. Who among the following won the 2025 Pritzker Architecture Prize awarded in May 2025?

(a) Jeanne Gang
(b) Shigeru Ban
(c) Liu Jiakun

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(d) David Chipperfield

Q87. Who became the first Indian boxer to win a gold medal at the World Boxing Cup in 2025?

(a) Hitesh Gulia
(b) Abhinash Jamwal
(c) Amit Panghal
(d) Shiva Thapa

Q88. In the Asian Athletics Championships 2025, how many gold medals did India secure?

(a) 8
(b) 12
(c) 4
(d) 6

Q89. Which shooter won the Major Dhyan Chand Khel Ratna Award in January 2025?

(a) Sarabjot Singh
(b) Anish Bhanwala
(c) Manu Bhaker
(d) Swapnil Kusale

Q90. As per the guidelines of the Reserve Bank of India, from 1 August 2025, the trading hours of market repo and Tri-Party Repo (TREP) were extended till what time?

(a) 5:00 PM
(b) 4:00 PM
(c) 6:00 PM
(d) 7:00 PM

Q91. Which of the following institutes was chosen by the Indian Council of Medical Research (ICMR) in January 2025 to establish South India's first Infectious Disease Research and Diagnostic Laboratory (IRDL)?

(a) Bangalore Medical College and Research Institute (BMCRI)
(b) Sri Ramachandra Medical College and Research Institute, Chennai
(c) Christian Medical College (CMC), Vellore
(d) Kamineni Academy of Medical Sciences And Research Centre, Hyderabad

Q92. What major international goal does the High Seas Treaty aim to advance once in force?

(a) Ban deep-sea mining
(b) Create marine protected areas
(c) Establish a global fisheries quota
(d) Restrict commercial shipping lanes

Q93. In which of the following places was the Indian Conservation Conference (ICCON) 2025, India's flagship biodiversity event, held in June 2025?

(a) Madurai
(b) Shimla
(c) Raipur
(d) Dehradun

Q94. Where was the Bharatiya Bhasha Anubhag (Indian Languages Section) launched by Union Home Minister Amit Shah on 6 June 2025?

(a) Hyderabad
(b) Chennai
(c) New Delhi
(d) Mumbai

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Q95. Which wildlife area has been recently recognised as India's 107th national park?

(a) Buxa
(b) Nagarhole
(c) Similipal
(d) Palamau

Q96. What is the name of the new digital platform being developed by the Election Commission of India (ECI) in 2025?

(a) ElectionLink
(b) ECINET
(c) ECI Connect
(d) VoterHub

Q97. Which of the following portals was launched in Punjab in June 2025 that has helped digitise land records and curb corruption in registry services?

(a) Easy Jamabandi Portal
(b) Digital Registry Punjab
(c) Punjab Bhulekh Portal
(d) Punjab Land Records System

Q98. What is the purpose of the new Global Innovation Hub 'District I' launched in Bengaluru Airport City?

(a) Deep-tech entrepreneurship and AI innovation
(b) Retail and e-commerce incubation
(c) Space mission and control Centre
(d) Military Drone Development

Q99. Which of the following institutes that was launched in May 2025 developed the Bharat Forecast System to give sharper rain alerts?

(a) India Meteorological Department
(b) Indian Institute of Science
(c) Indian Institute of Tropical Meteorology
(d) National Centre for Medium Range Weather Forecasting

Q100. What is the total plantation budget for afforestation schemes in the financial year 2025?

(a) Rs. 300 Crores
(b) Rs. 684 Crores
(c) Rs. 756 Crores
(d) Rs. 910 Crores

ANSWER KEY

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

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SOLUTIONS

Q1. Answer: (a) 50 J

The correct answer is 50 J.

Key Points

• Work done (W) is calculated using the formula: W = F × d × cos(θ), where:
• F is the force applied (10 N).
• d is the displacement of the object (5 m).
• θ is the angle between the force and displacement direction (0° since the force is applied in the direction of movement).
• Substituting the values into the formula:
• W = 10 × 5 × cos(0°).
• Since cos(0°) = 1, the equation becomes W = 10 × 5 × 1 = 50 J.
• The work done is measured in joules (J), which is the SI unit of work and energy.
• Since the force is applied in the same direction as the displacement, the full magnitude of the force contributes to the work done.
• Hence, the correct answer is 50 J.

Additional Information

• Work:
• Work is defined as the energy transferred to or from an object via the application of force along a displacement.
• It is mathematically expressed as W = F × d × cos(θ), where:
• F = magnitude of the force.
• d = displacement of the object.
• θ = angle between the force and displacement vectors.
• Work is positive when the force and displacement are in the same direction and negative when they are in opposite directions.
• Energy and Work:
• Work is closely related to energy. When work is done on an object, energy is transferred to or from that object.
• The unit of both work and energy in the SI system is the joule (J).
• 1 joule is defined as the work done when a force of 1 newton moves an object 1 meter in the direction of the force.
• Force:
• Force is defined as an interaction that, when unopposed, changes the motion of an object.
• The SI unit of force is the newton (N), and 1 newton is equivalent to 1 kg·m/s².
• In this problem, a force of 10 N is applied to the object.
• Displacement:
• Displacement is a vector quantity that refers to the change in position of an object.
• In this problem, the object is displaced by 5 m in the direction of the applied force.
• Angle between Force and Displacement:
• The angle between the force and displacement is crucial in calculating work.
• When θ = 0°, cos(θ) = 1, and the entire force contributes to the work.
• If θ = 90°, cos(θ) = 0, and no work is done.

Important Points

• Conditions for Work to be Done:
• There must be a force acting on the object.
• The object must be displaced due to the force.
• The displacement must have a component in the direction of the force.
• Real-life Application:
• Work can be seen in activities like lifting weights, pushing a cart, or pulling an object.
• In engineering, the concept of work is fundamental to understanding machines, engines, and other systems that transfer energy.

Q2. Answer: (d) Using condoms during sexual intercourse

The correct answer is Using condoms during sexual intercourse.

Key Points

• Using condoms during sexual intercourse is one of the most effective and widely recommended methods to prevent the transmission of HIV (Human Immunodeficiency Virus) and other sexually transmitted infections (STIs).

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• Condoms act as a barrier that prevents the exchange of bodily fluids such as semen, vaginal fluids, or blood, which are primary carriers of the HIV virus.

• Both male condoms (made of latex or polyurethane) and female condoms are effective when used consistently and correctly during sexual activity.

• Studies have shown that consistent and proper use of condoms can reduce the risk of HIV transmission by up to 98%.

• In addition to HIV prevention, condoms also protect against other infections such as gonorrhea, chlamydia, and syphilis, making them a crucial component of safe sex practices.

Additional Information

• HIV Transmission:

• HIV is primarily transmitted through unprotected sexual intercourse, sharing of contaminated needles, blood transfusions with infected blood, or from mother to child during childbirth or breastfeeding.

• The virus attacks the body's immune system, specifically the CD4 cells (T cells), which help the body fight infections.

• Why other options are incorrect:

• Taking multivitamins regularly: While multivitamins can improve overall health and immunity, they do not prevent HIV transmission. Hence, this option is incorrect.

• Sharing needles carefully: Sharing needles, even "carefully," poses a high risk of HIV transmission. Sterile, single-use needles should always be used. Hence, this option is incorrect.

• Taking antibiotics after sex: Antibiotics are used to treat bacterial infections, not viral infections like HIV. They do not prevent HIV transmission. Hence, this option is incorrect.

• Global HIV Statistics (2023):

• Approximately 38.4 million people are living with HIV globally, as per UNAIDS.

• Access to preventive measures, such as condoms and antiretroviral therapy (ART), has been instrumental in reducing new infections.

• Prevention Strategies:

• Other preventive measures include Pre-Exposure Prophylaxis (PrEP), which involves taking antiretroviral medications to reduce the risk of HIV infection.

• Promoting awareness and education about safe sex practices is crucial in combating HIV/AIDS globally.

Important Points

• Male Condoms: Widely available, inexpensive, and effective when used properly. They are typically made of latex, but non-latex options are available for people with allergies.

• Female Condoms: Provide an alternative for women to protect themselves from HIV and STIs. They are made of polyurethane or nitrile and are inserted into the vagina.

• World AIDS Day: Observed on December 1 each year to raise awareness and promote prevention, testing, and treatment of HIV/AIDS.

• HIV Testing: Early and regular testing is critical to identifying infections and starting treatment promptly.

• Antiretroviral Therapy (ART): While ART does not cure HIV, it helps in suppressing the virus, improving the quality of life, and reducing the risk of transmission.

Q3. Answer: (c) 1 m/s²

The correct answer is 1 m/s².

Key Points

• Acceleration is defined as the rate of change of velocity.

• The formula for acceleration is: a = (v − u)/t

• Given:

• Initial velocity, u = 0 m/s (car starts from rest)

• Final velocity, v = 72 km/h = 20 m/s (since 72 × 5/18 = 20 m/s)

• Time, t = 20 s

• Substituting the values:

a = (20 − 0)/20 = 1 m/s²

• Hence, the acceleration of the car is 1 m/s².

Additional Information

• SI Unit of Acceleration:

• Metre per second squared (m/s²).

• Conversion of Speed:

• 1 km/h = 5/18 m/s.
• To convert km/h to m/s, multiply by 5/18.
• Types of Motion:
• If acceleration is constant, the motion is called uniformly accelerated motion.

Q4. Answer: (b) When the bus stops suddenly, people fall forward

The correct answer is When the bus stops suddenly, people fall forward.

Key Points

• Action and Reaction forces are described by Newton's Third Law of Motion, which states: "For every action, there is an equal and opposite reaction."
• In the scenario where the foot pushes the ground backward, the ground pushes the foot forward. This is a textbook example of action and reaction forces. Correct statement.
• When a swimmer pushes water backward, the water exerts an equal and opposite force forward, propelling the swimmer. Correct statement.
• In the case of a rocket moving upward, the gases expelled downward exert an opposite force on the rocket, causing it to ascend. Correct statement.
• However, when a bus stops suddenly and people fall forward, this is due to inertia, as explained by Newton's First Law of Motion. It is not an example of action and reaction forces. Incorrect statement.

Additional Information

• Newton's Third Law of Motion:
• States that forces always occur in pairs: the action force and the reaction force.
• These forces are equal in magnitude but opposite in direction.
• Examples include walking (foot-ground interaction), swimming, and rocket propulsion.
• Newton's First Law of Motion (Law of Inertia):
• States that an object will continue in its state of rest or uniform motion unless acted upon by an external force.
• When a bus stops suddenly, passengers continue moving forward due to their inertia.
• This phenomenon is unrelated to action and reaction forces.
• Key Characteristics of Action and Reaction Forces:
• They act on two different objects.
• They never cancel each other out because they act on separate objects.
• Examples: A gun recoiling when a bullet is fired, or a fish swimming by pushing water backward.
• Applications of Newton's Third Law:
• Rocket Science: The expulsion of gases downward propels rockets upward.
• Propellers and Jets: Air or water is pushed in one direction to generate thrust in the opposite direction.
• Walking: When you push the ground backward, it pushes you forward.

Important Points

• Newton's Laws Overview:
• First Law: Inertia explains why passengers lurch forward when a bus stops suddenly.
• Second Law: Relates force, mass, and acceleration (F = ma).
• Third Law: Explains action-reaction force pairs.
• Distinction Between Forces:
• Action-Reaction Forces: Operate simultaneously and are equal and opposite.
• Inertia-Based Forces: Result from an object's tendency to maintain its current state of motion.
• Practical Examples of Inertia:
• Passengers jerking forward when a vehicle stops suddenly.
• A book remaining at rest unless pushed or pulled.
• Water splashing forward when a moving container is abruptly halted.

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Q5. Answer: (b) They are different structural forms of carbon with different physical properties but similar chemical prope...

The correct answer is They are different structural forms of carbon with different physical properties but similar chemical properties..

Key Points

• Allotropes are different structural forms of the same element. In the case of carbon, the allotropes differ in the arrangement of carbon atoms, which leads to different physical properties while maintaining similar chemical properties.

• The primary allotropes of carbon are diamond, graphite, graphene, fullerenes, and carbon nanotubes. Each of these forms has a distinct structure, such as tetrahedral in diamond and hexagonal in graphite.

• Physical properties such as hardness, electrical conductivity, and appearance differ among the allotropes. For instance, diamond is extremely hard and does not conduct electricity, while graphite is soft and an excellent conductor.

• Chemical properties, such as the ability to form covalent bonds with other elements, remain similar across all allotropes because they are made of the same carbon atoms.

• Hence, the statement "They are different structural forms of carbon with different physical properties but similar chemical properties" is correct.

Additional Information

• Diamond:

• In diamond, each carbon atom is covalently bonded to four other carbon atoms in a tetrahedral structure, giving it unmatched hardness.

• Diamond is a poor conductor of electricity but an excellent thermal conductor.

• It is used in jewelry, cutting tools, and heat sinks.

• Graphite:

• Graphite has a hexagonal layered structure where each carbon atom is bonded to three other carbon atoms.

• It is a good conductor of electricity due to the presence of free electrons and is used in pencils, lubricants, and batteries.

• Graphene:

• Graphene is a single layer of carbon atoms arranged in a hexagonal lattice.

• It is known for its exceptional strength, flexibility, and electrical conductivity, making it suitable for electronics and nanotechnology.

• Fullerenes:

• Fullerenes are molecules of carbon atoms arranged in the form of a hollow sphere, cylinder, or ellipsoid.

• The most common fullerene is C60, also known as buckyballs.

• They are used in materials science, electronics, and nanomedicine.

• Carbon Nanotubes:

• These are cylindrical structures made of carbon atoms with remarkable tensile strength and electrical conductivity.

• They have applications in electronics, composites, and medicine.

Important Points

• Statement 1: "They are different isotopes of carbon with varying numbers of neutrons." This is incorrect because isotopes refer to atoms of the same element with different numbers of neutrons, not structural forms.

• Statement 2: "They are different structural forms of carbon with different physical properties but similar chemical properties." This is correct as it accurately describes allotropes.

• Statement 3: "They are isomers of carbon, having the same molecular formula but different structures." This is incorrect as isomers refer to compounds with the same molecular formula but different chemical structures, not elements.

• Statement 4: "They are compounds formed by carbon with different elements." This is incorrect because allotropes are forms of pure carbon, not compounds.

Q6. Answer: (c) 11

The correct answer is Option 3.

Key Points

• The pH scale measures how acidic or basic a solution is, ranging from 0 to 14, where 7 is neutral.

• Solutions with a pH greater than 7 are classified as basic (alkaline), and they turn red litmus paper blue.

• Among the given options, the solution with pH 11 is basic, as it is significantly higher than 7 and belongs to the alkaline category. Hence, option 3 is correct.

• Solutions with pH values 4, 6, and 2 are acidic because their pH values are less than 7, and they would turn blue litmus paper red instead.

• Acidic solutions do not turn red litmus blue, reinforcing why solutions with pH 11 are ideal for this behavior.

Additional Information

• pH Scale:

• The pH scale is used to measure the hydrogen ion concentration in a solution, with lower values indicating acidity and higher

values indicating alkalinity.

• Acidic solutions have higher hydrogen ion concentrations (H^+), while basic solutions contain higher hydroxide ion concentrations (OH^-).

• Examples of acidic solutions include vinegar (pH ~3) and lemon juice (pH ~2), while examples of basic solutions include soap water (pH ~10) and bleach (pH ~12).

• Litmus Indicator:

• Litmus paper is a natural pH indicator derived from lichens, used to test the acidity or basicity of a solution.

• In acidic solutions, blue litmus paper turns red, while in basic solutions, red litmus paper turns blue.

• This is a simple qualitative test to determine the pH nature of a solution.

• Characteristics of pH Levels:

• A solution with pH 11 is strongly basic, commonly found in cleaning agents like ammonia solution.

• A solution with pH 4 is weakly acidic, often found in fruit juices such as apple juice.

• A solution with pH 6 is slightly acidic and close to neutral, similar to milk or unpolluted rainwater.

• A solution with pH 2 is highly acidic, seen in substances like gastric acid or concentrated vinegar.

• Applications of pH Knowledge:

• pH plays a vital role in agriculture to test soil acidity and alkalinity, ensuring optimal crop growth.

• In medicine, pH is crucial for understanding body fluids like blood (normal pH ~7.4).

• Industries use pH to formulate cleaning agents, cosmetics, and food products.

• Environmental studies monitor water pH to evaluate pollution levels and aquatic life sustainability.

Important Points

• Neutral Solutions: Solutions with pH 7 are neutral, such as pure water, and do not change the color of litmus paper.

• Strong Acids and Bases: Strong acids have pH values closer to 0, while strong bases have pH values closer to 14.

• Universal Indicator: Unlike litmus, universal indicators provide a broader and more precise pH measurement using a spectrum of colors.

• Buffer Solutions: Buffers help maintain a consistent pH and are widely used in biochemical and industrial processes.

• Environmental Impact: Extreme pH levels in water bodies can harm aquatic life and disrupt ecosystems.

Q7. Answer: (c) It prevents oxidation

The correct answer is It prevents oxidation.

Key Points

• Nitrogen gas is used in chip packets to prevent oxidation, which can lead to the food becoming stale or rancid. This ensures the chips maintain their freshness and taste for a longer time.

• Oxygen in the air reacts with the oils and fats in chips, causing oxidation. This process leads to the formation of off-flavors and spoilage. Nitrogen, being an inert gas, replaces oxygen and prevents such reactions.

• The use of nitrogen also creates a protective cushion inside the packet. This prevents the chips from being crushed during transportation or handling.

• Unlike oxygen, nitrogen does not react with food components. It is a non-reactive, odorless, and tasteless gas, making it ideal for food packaging.

• This method of using nitrogen gas is a part of a broader food preservation technique known as Modified Atmosphere Packaging (MAP), widely used in the food industry.

Additional Information

• Oxidation Process:

• Oxidation is a chemical reaction that occurs when oxygen reacts with certain substances, such as the oils in chips. This reaction can produce rancid flavors and reduce the shelf life of the product.

• Exposure to oxygen can also cause the degradation of vitamins and nutrients in the food.

• Nitrogen gas replaces oxygen in the packaging, thus halting the oxidation process.

• Modified Atmosphere Packaging (MAP):

• MAP is a packaging technique where the composition of the internal atmosphere of the package is altered. This can involve reducing oxygen levels, increasing nitrogen levels, or a combination of both.

• In addition to chips, MAP is used for a variety of food products, including fruits, vegetables, meats, and bakery items.

• This method helps extend the shelf life of food products while maintaining their quality, taste, and nutritional value.

• Other Benefits of Nitrogen Packaging:

• It prevents the growth of aerobic bacteria and molds, which require oxygen to thrive.

• It ensures that the texture of the chips remains crispy and crunchy by reducing moisture absorption.

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• Nitrogen gas is safe for consumption as it is a naturally occurring component of the air we breathe, comprising about 78% of Earth's atmosphere.

• Role of Nitrogen in the Food Industry:

• Nitrogen is extensively used in packaging not only for snacks like chips but also for coffee, powdered milk, and other oxygen-sensitive products.

• It is also used to create an inert atmosphere in food processing and storage to prevent spoilage and contamination.

Important Points

• Statement Analysis:

• Statement 1: "It absorbs moisture" – Incorrect. Nitrogen does not absorb moisture; its role is to replace oxygen. Moisture absorption in chip packets is generally managed by desiccants or the packaging material itself.

• Statement 2: "It adds crispiness" – Incorrect. The crispiness of chips is primarily a result of their preparation process, such as frying or baking, rather than the presence of nitrogen gas.

• Statement 3: "It prevents oxidation" – Correct. As explained, nitrogen replaces oxygen to prevent oxidation and maintain the freshness of the chips.

• Statement 4: "It adds flavor" – Incorrect. Nitrogen is a tasteless and odorless gas and does not contribute to the flavor of the chips.

• The use of nitrogen gas in food packaging aligns with global food safety and preservation standards. It is a widely accepted and efficient method for extending the shelf life of perishable products.

Q8. Answer: (d) It permits entries and exits of substances from the cell.

The correct answer is It permits entries and exits of substances from the cell..

Key Points

• The Golgi Complex is a major organelle responsible for modifying, sorting, and packaging proteins and lipids for secretion or delivery to other parts of the cell. It does not perform the function of regulating entries and exits of substances from the cell, which is the role of the cell membrane.

• Statement 1: The Golgi complex modifies and packages proteins received from the endoplasmic reticulum. This is correct, as it processes proteins and lipids and prepares them for transport within or outside the cell.

• Statement 2: The Golgi complex transports and secretes materials outside the cell. This is correct because the Golgi apparatus packages materials into vesicles for exocytosis or other cellular destinations.

• Statement 3: The Golgi complex forms lysosomes, which aid in intracellular digestion. This is correct since lysosomes are derived from the Golgi apparatus and contain digestive enzymes.

• Statement 4: The Golgi complex does not permit entries and exits of substances from the cell. This function is specific to the cell membrane, which acts as a selective barrier. Hence, this statement is incorrect.

• Statement 5: The correct answer is option 4, as it does not align with the biological functions of the Golgi apparatus.

Additional Information

• Golgi Complex Functions:

• The Golgi apparatus is involved in the processing, sorting, and transport of proteins and lipids synthesized in the endoplasmic reticulum (ER).

• It plays a critical role in the creation of lysosomes, which are essential for breaking down cellular waste and macromolecules.

• It packages and prepares materials for secretion via vesicles, facilitating processes like hormone release and enzyme transport.

• The Golgi apparatus also contributes to the synthesis of glycoproteins and glycolipids, which are vital for cell recognition and signaling.

• Cell Membrane Functions:

• The cell membrane is a selectively permeable barrier that regulates the entry and exit of substances into and out of the cell.

• It is composed of a phospholipid bilayer with embedded proteins that facilitate transport and communication.

• The membrane is responsible for processes like endocytosis and exocytosis, allowing substances to move in and out of the cell.

• The cell membrane plays a key role in maintaining homeostasis by controlling the internal environment of the cell.

• Lysosome Formation:

• Lysosomes are organelles that contain hydrolytic enzymes, used for breaking down cellular waste and debris.

• These enzymes are synthesized in the ER and modified in the Golgi apparatus before being packaged into lysosomes.

• Lysosomes are crucial for processes like autophagy (self-digestion) and recycling of cellular components.

• Endoplasmic Reticulum and Golgi Complex Relationship:

• The rough ER synthesizes proteins, which are transported to the Golgi apparatus for modification and packaging.

• The smooth ER is involved in lipid synthesis, which is similarly processed by the Golgi apparatus.

• The two organelles work in coordination to ensure proper functioning and distribution of cellular materials.

Important Points

• Discovery: The Golgi apparatus was first discovered by Camillo Golgi in 1898 using a staining technique known as the “black reaction.”

• Structure: It consists of flattened sacs called cisternae, which are stacked and surrounded by vesicles.

• Location: The Golgi complex is found in both plant and animal cells but is highly developed in cells that are actively involved in secretion.

• Diseases: Dysfunction in the Golgi apparatus can lead to disorders like lysosomal storage diseases and impaired protein trafficking.

• Applications: Understanding Golgi functions is critical for research in areas like cell biology, medicine, and biotechnology.

Q9. Answer: (a) 0.5 A

The correct answer is 0.5 A.

Key Points

• The relationship between voltage (V), current (I), and resistance (R) is given by Ohm's Law, which states: V = I × R.

• In this question, the resistance of the conductor is 10 Ω, and the potential difference applied across it is 5 V.

• Rearranging Ohm’s Law to calculate current: I = V / R.

• Substituting the given values: I = 5 V / 10 Ω = 0.5 A.

• Therefore, the current flowing through the conductor is 0.5 A, which is the correct answer.

Additional Information

• Ohm's Law:

• Ohm's Law is a fundamental principle in electrical circuits that states the relationship between voltage, current, and resistance.

• It is mathematically expressed as V = I × R, where V is the voltage, I is the current, and R is the resistance.

• This law is widely used in circuit analysis to determine unknown parameters when two quantities are known.

• Resistance:

• Resistance is the property of a material to oppose the flow of electric current. It is measured in ohms (Ω).

• Resistance depends on factors such as the material of the conductor, its length, cross-sectional area, and temperature.

• Conductors have low resistance, while insulators have high resistance.

• Current:

• Electric current is the flow of electric charge through a conductor, measured in amperes (A).

• It is a scalar quantity and can be either direct current (DC) or alternating current (AC).

• In circuits, the direction of current is conventionally taken as the flow of positive charges.

• Potential Difference:

• Potential difference is the work done to move a unit charge between two points in an electric field. It is measured in volts (V).

• A higher potential difference across a conductor results in a higher flow of current, assuming constant resistance.

Important Points

• Applications of Ohm's Law:

• Used to design electrical circuits and systems.

• Determines the specifications for resistors and other components in electronic devices.

• Helps in troubleshooting electrical issues by analyzing circuit behavior.

• Units:

• Voltage is measured in volts (V).

• Current is measured in amperes (A).

• Resistance is measured in ohms (Ω).

• Historical Background:

• Ohm's Law was formulated by Georg Simon Ohm in 1827.

• His experiments established the relationship between electric current, voltage, and resistance in conductive materials.

Q10. Answer: (d) Providing fine adjustment of focal length

The correct answer is Providing fine adjustment of focal length.

Key Points

• The crystalline lens of the eye is a transparent, biconvex structure located behind the iris and pupil. Its primary function is to focus light onto the retina by adjusting its focal length.

• The lens achieves this adjustment through the process of accommodation, where its shape changes to focus on objects at

varying distances. This ensures a clear image is formed on the retina.

• It works in conjunction with the cornea, which provides the initial focusing power, while the lens fine-tunes the focus for sharper vision.

• The lens does not control the amount of light entering the eye—that function is performed by the iris, which adjusts the pupil size.

• The crystalline lens does not detect colors or send signals to the brain. These tasks are performed by the retina and optic nerve respectively. Hence, statements 1, 2, and 3 are incorrect.

• By providing fine adjustment of focal length, the lens ensures clarity for both near and distant objects. Hence, statement 4 is correct.

Additional Information

• Structure of the Crystalline Lens:

• The lens is composed of layers of specialized cells that lack blood vessels, ensuring transparency for light passage.

• It is encapsulated by a thin, elastic membrane called the lens capsule, which helps maintain its shape.

• The lens is held in place by zonular fibers, which connect it to the ciliary body.

• Process of Accommodation:

• Accommodation is the ability of the eye to adjust the lens shape for focusing.

• When viewing near objects, the ciliary muscles contract, causing the lens to become more rounded and increase its refractive power.

• For distant objects, the ciliary muscles relax, and the lens becomes flatter, reducing its refractive power.

• Common Conditions Affecting the Lens:

• Cataracts: A condition where the lens becomes cloudy, leading to impaired vision. It is common in older adults and may require surgical replacement of the lens.

• Presbyopia: A condition associated with aging where the lens loses its flexibility, making it difficult to focus on nearby objects.

• Myopia and Hyperopia: Refractive errors caused by improper focusing of light due to changes in the eye's shape or lens function.

• Functions of Other Eye Structures:

• Cornea: Provides most of the eye's focusing power by bending light onto the lens.

• Iris: Regulates the amount of light entering the eye by controlling the size of the pupil.

• Retina: Detects light and color, converting visual information into neural signals sent to the brain.

• Optic Nerve: Transmits signals from the retina to the brain for processing visual information.

Important Points

• Age-Related Changes:

• The lens becomes less flexible with age, leading to conditions like presbyopia.

• Cataracts are more prevalent in individuals over the age of 60, affecting vision clarity.

• Interesting Fact:

• The lens has the ability to focus light without any external energy source, relying entirely on its elasticity and interaction with the ciliary muscles.

• The refractive power of the lens is approximately 15-20 diopters, depending on its shape during accommodation.

Q11. Answer: (c) nervous system

The correct answer is nervous system.

Key Points

• The nervous system is the primary control center for sensitivity or responsiveness in animals. It governs the detection, transmission, and processing of external and internal stimuli.

• It consists of the central nervous system (CNS), which includes the brain and spinal cord, and the peripheral nervous system (PNS), which connects the CNS to the rest of the body.

• Specialized structures like sensory organs (e.g., eyes, ears, skin) are part of the nervous system, enabling animals to respond to environmental changes effectively.

• The nervous system uses electrical impulses and chemical signals (neurotransmitters) to coordinate responses, ensuring survival and adaptation.

• Functions controlled by the nervous system include reflex actions, voluntary movements, and involuntary processes like heartbeat regulation.

Additional Information

• Central Nervous System (CNS):

• The CNS includes the brain and spinal cord. It processes information and coordinates responses.

• The brain is divided into regions like the cerebrum, cerebellum, and brainstem, each performing specialized functions such as

decision-making, balance, and basic life functions.

• The spinal cord acts as a communication highway between the brain and peripheral nerves.

• Peripheral Nervous System (PNS):

• The PNS includes sensory nerves that detect stimuli and motor nerves that initiate responses.

• It is divided into the somatic nervous system (controls voluntary movements) and the autonomic nervous system (regulates involuntary functions).

• The autonomic nervous system is further divided into the sympathetic and parasympathetic systems, which manage "fight or flight" and "rest and digest" responses, respectively.

• Sensory Organs:

• Sensory organs like the eyes, ears, skin, tongue, and nose are integral to the nervous system. They detect external stimuli such as light, sound, temperature, and chemicals.

• For example, the retina in the eyes detects light, and the cochlea in the ears processes sound waves.

• Comparison with Other Systems:

• The circulatory system is responsible for transporting nutrients, oxygen, and waste products but does not directly control sensitivity or responsiveness.

• The digestive system focuses on nutrient absorption and energy production, which indirectly supports the nervous system's functioning.

• The respiratory system facilitates oxygen intake and carbon dioxide removal, essential for cellular activities but not directly involved in sensory or response mechanisms.

Important Points

• Reflex Actions: Reflex actions are automatic responses to stimuli, controlled by the spinal cord. Example: Pulling your hand away from a hot object.

• Neurotransmitters: Chemicals like dopamine, serotonin, and acetylcholine transmit signals between neurons.

• Adaptation: The nervous system allows animals to adapt to their environment through learning and memory.

• Examples: Octopuses are known for their highly developed nervous systems, enabling advanced problem-solving and camouflage abilities.

• Diseases: Disorders like Parkinson's disease and Alzheimer's disease affect the nervous system's functioning, leading to motor and cognitive impairments.

Q12. Answer: (b) Electrons are embedded in a positively charged sphere.

The correct answer is Electrons are embedded in a positively charged sphere.

Key Points

• Thomson's Model of the Atom: In 1904, J.J. Thomson proposed a model of the atom often referred to as the "plum pudding model." According to this model, the atom is composed of a positively charged sphere with negatively charged electrons embedded in it, similar to raisins in a pudding.

• Charge Neutrality: Thomson stated that the positive charge of the sphere is equal in magnitude to the total negative charge of the embedded electrons, making the atom electrically neutral.

• Structure Description: The correct statement that aligns with Thomson’s model is that “Electrons are embedded in a positively charged sphere”. This was his attempt to explain the stability and neutrality of atoms.

• Incorrect Statements: Other statements in the question, such as "The atom contains only neutrons and electrons" or "Electrons revolve around a central nucleus in fixed orbits," are incorrect as they describe later models of the atom, such as Rutherford's or Bohr's models.

• Limitations: Thomson's model could not explain experimental results like the gold foil experiment by Rutherford, which later led to the discovery of the nucleus.

Additional Information

• J.J. Thomson:

• He was a British physicist who discovered the electron in 1897 through his experiments with cathode rays.

• Thomson was awarded the Nobel Prize in Physics in 1906 for his work on the conduction of electricity in gases and his discovery of the electron.

• Rutherford’s Model:

• In 1911, Ernest Rutherford conducted the famous gold foil experiment, which showed that atoms have a dense, positively charged nucleus.

• He proposed that electrons revolve around the nucleus in orbits, contradicting Thomson's model.

• Bohr’s Model:

• In 1913, Niels Bohr refined Rutherford's model by introducing the concept of fixed energy levels for electrons orbiting the

nucleus.

• This model explained the stability of atoms and the emission spectrum of hydrogen.

• Modern Quantum Model:

• The current understanding of atomic structure is based on quantum mechanics, where electrons are described as existing in probabilistic regions called orbitals.

• This model incorporates principles such as the Heisenberg Uncertainty Principle and Schrodinger's wave equation.

Important Points

• Key Characteristics of Thomson's Model:

• Proposed the concept of a positively charged sphere with embedded electrons.

• Explained the overall neutrality of atoms but failed to account for atomic structure complexity.

• Did not address the arrangement of electrons or the presence of a nucleus.

• Historical Context: Thomson's model was significant as it was the first attempt to describe the internal structure of atoms, paving the way for more advanced theories.

• Experimental Evidence: The gold foil experiment conducted by Rutherford invalidated Thomson's model by proving the existence of a nucleus.

Q13. Answer: (d) Food web

The correct answer is Food Web.

Key Points

• A food web represents the complex and interlinked feeding relationships between various organisms in an ecosystem. It is a network of multiple food chains.

• Unlike a simple linear food chain, a food web shows a series of branching lines that depict how energy and nutrients are passed through multiple interconnected organisms.

• Food webs highlight the fact that most organisms consume multiple types of food and are part of several food chains simultaneously.

• For example, in a forest ecosystem, plants are eaten by herbivores like deer, which are then eaten by carnivores like tigers. The same plants may also be consumed by insects, which are further eaten by birds or small mammals. This interconnection forms a food web.

• The study of food webs is essential in understanding the stability and health of an ecosystem, as it helps identify key species and their roles in maintaining ecological balance.

Additional Information

• Trophic Levels:

• Organisms in a food web are classified into trophic levels, such as primary producers (plants), primary consumers (herbivores), secondary consumers (carnivores), and tertiary consumers (top predators).

• Energy transfer between trophic levels follows the 10% rule, where only about 10% of energy is transferred from one level to the next, with the rest lost as heat.

• Differences Between Food Chain and Food Web:

• A food chain is a simple, linear sequence showing who eats whom, while a food web is a complex network of interconnected food chains.

• Food webs more accurately represent the diverse feeding relationships in an ecosystem compared to food chains.

• Importance of Food Webs:

• Food webs help in understanding the energy flow and nutrient cycling in an ecosystem.

• They reveal the impact of disturbances (e.g., extinction of a species or climate change) on the overall ecosystem.

• Types of Food Webs:

• Grazing food web: It starts with autotrophs (like plants) and involves herbivores and predators.

• Detrital food web: It begins with decomposers like fungi and bacteria, which consume dead organic matter.

Important Points

• Option 1 - Trophic Level: Refers to each step in a food chain or web but does not represent the interconnection of multiple chains.

• Option 2 - Worldwide Web: Incorrect, as it refers to the internet and not ecological relationships.

• Option 3 - Spider Web: Incorrect, as it pertains to the structure created by spiders for trapping prey.

• Option 4 - Food Web: Correct, as it represents a complex network of feeding relationships in an ecosystem.

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Q14. Answer: (b) Sound requires a medium to travel and is longitudinal.

The correct answer is Sound requires a medium to travel and is longitudinal..

Key Points

• Sound requires a medium to travel: Sound is a mechanical wave, meaning it needs a material medium (solid, liquid, or gas) to propagate. It cannot travel through a vacuum because there are no particles to vibrate. Hence, statement 2 is correct.

• Sound waves are longitudinal: Sound propagates as longitudinal waves where particles of the medium vibrate parallel to the direction of wave propagation. This is distinct from transverse waves, like light, where particles oscillate perpendicular to the wave direction. Hence, statement 2 is correct.

• Sound does not travel faster in vacuum: Since sound requires a medium, it cannot exist or travel in a vacuum. This invalidates statements suggesting sound travels faster in a vacuum. Statement 1 is incorrect.

• Sound waves are not transverse: Sound waves are longitudinal by nature, not transverse. Statements suggesting otherwise are scientifically inaccurate. Statement 4 is incorrect.

• Vacuum and sound: The absence of particles in a vacuum makes it impossible for sound to propagate. Hence, any statement asserting sound can travel in a vacuum is incorrect. Statement 3 is incorrect.

Additional Information

• Speed of sound: Sound travels at different speeds depending on the medium:

• In air, the speed of sound is approximately 343 m/s at standard temperature and pressure.

• In water, sound travels faster at about 1500 m/s.

• In solids, the speed of sound is even higher, varying depending on the material. For instance, in steel, it can reach up to 5000 m/s.

• Types of waves: Waves are categorized as mechanical or electromagnetic:

• Mechanical waves require a medium to propagate (e.g., sound waves).

• Electromagnetic waves do not require a medium and can travel through a vacuum (e.g., light waves).

• Longitudinal vs. Transverse Waves:

• Longitudinal waves: Particles vibrate parallel to the direction of wave propagation (e.g., sound waves).

• Transverse waves: Particles vibrate perpendicular to the direction of wave propagation (e.g., water waves, light waves).

• Propagation of sound: The propagation of sound is due to successive compressions and rarefactions in the medium. These are regions of high and low pressure caused by the vibration of particles.

• Human hearing range: Humans can hear sound waves within the frequency range of 20 Hz to 20 kHz. Sounds below 20 Hz are called infrasound, while sounds above 20 kHz are termed ultrasound.

Important Points

• Vacuum and sound: A vacuum lacks particles, so sound waves cannot propagate through it.

• Medium dependency: The speed of sound is directly proportional to the density and elasticity of the medium. Denser and more elastic mediums allow faster sound propagation.

• Applications of sound: Sound is widely used in technologies such as ultrasound imaging in medicine, sonar for underwater navigation, and acoustic engineering for noise control.

• Shock waves: When an object travels faster than the speed of sound, it generates shock waves, which are characterized by a sudden change in pressure. This phenomenon is known as breaking the sound barrier.

Q15. Answer: (b) Angle of deviation

The correct answer is Angle of deviation.

Key Points

• Angle of deviation is defined as the angle between the incident ray and the emergent ray after passing through the prism. It measures the bending of light due to the prism.

• When light enters the prism, it undergoes refraction, bending towards the normal at the first surface, and again bending away from the normal at the second surface. This results in the deviation of light from its original path.

• The angle of deviation depends on the angle of incidence, the material of the prism (refractive index), and the angle of the prism. A larger refractive index or angle of the prism results in a larger deviation.

• The minimum angle of deviation (δ_(min)) occurs when the light ray passes symmetrically through the prism, i.e., when the angle of incidence equals the angle of emergence.

• The formula for the angle of deviation is: δ = i + e - A Where: i = Angle of incidence e = Angle of emergence A = Angle of the prism

Additional Information

• Angle of incidence:

• The angle between the incident ray and the normal to the surface at the point of incidence.

• It plays a crucial role in determining how much the light ray bends within the prism.
• For smaller angles of incidence, the deviation is less, but as the angle of incidence increases, the deviation increases.
• Angle of refraction:
• It is the angle between the refracted ray and the normal to the surface at the point of refraction.
• It depends on the refractive index of the material and follows Snell's Law: n1sin(i) = n2sin(r)
• Snell's Law governs how light bends when transitioning between two media with different refractive indices.
• Angle of emergence:
• The angle between the emergent ray and the normal to the surface where the ray exits the prism.
• It is related to the angle of incidence and the geometry of the prism.
• Angle of the prism:
• The angle between the two refracting surfaces of the prism.
• It is a fixed property of the prism and influences the deviation experienced by the light ray.
• Prisms with larger angles produce greater deviation.
• Examples of practical applications:
• Dispersion of light: Prisms are used to split white light into its constituent colors due to varying angles of deviation for different wavelengths.
• Optical instruments: Prisms are widely used in telescopes, binoculars, and cameras for light manipulation.
• Spectroscopy: Prisms are essential in spectrometers for studying the properties of light and materials.

Important Points

• Refractive Index:
• The refractive index of a material governs how much light bends when entering or exiting the prism.
• Higher refractive index materials produce greater deviation and dispersion.
• Critical Angle:
• If the angle of incidence exceeds the critical angle, total internal reflection occurs instead of refraction.
• Critical angle depends on the refractive indices of the two media.
• Applications in Physics:
• Prisms are used in experiments studying refraction, dispersion, and the properties of light.
• They form an essential component of optical systems and scientific instruments.
• Historical Significance:
• Isaac Newton used a prism to demonstrate the dispersion of light, providing insights into the nature of white light.
• This experiment laid the foundation for modern optics and spectroscopy.

Q16. Answer: (a) v = u - gt

The correct answer is v = u - gt.

Key Points

• When a ball is thrown vertically upward with an initial velocity u, it moves against the force of gravity (g), which acts downward.
• The velocity of the ball decreases over time due to the acceleration caused by gravity (g), which has a constant value of approximately 9.8 m/s² near the Earth's surface.
• The relation between the velocity v of the ball at any time t, initial velocity u, and acceleration due to gravity g is given by the equation v = u - gt.
• This equation indicates that the velocity v decreases linearly with time t, as gravity continuously slows down the upward motion of the ball.
• Hence, the equation v = u - gt correctly represents the velocity of the ball at time t during its upward motion.

Additional Information

• Upward Motion:
• When an object is thrown upward, it moves against gravity, which causes its velocity to decrease over time.
• The maximum height is reached when the velocity becomes 0, at which point the object momentarily stops before beginning its downward motion.
• Equation of Motion:
• The equation v = u - gt is derived from one of the equations of motion: v = u + at, where a = -g for upward motion.
• Here, u is the initial velocity, v is the velocity at time t, g is the acceleration due to gravity, and t is the time elapsed.
• Gravity:
• Acceleration due to gravity (g) near the Earth's surface is approximately 9.8 m/s².

• It acts downward, irrespective of the object's initial motion direction.

• Incorrect Options:

• v = u + gt: This equation implies acceleration adds to the velocity, which is incorrect for upward motion as gravity acts to reduce velocity.

• v = u ? gtv: This is mathematically incorrect and does not represent any physical principle in this scenario.

• v = gt - uv: This equation does not match the relationship governing upward motion under gravity.

• Applications:

• Understanding the motion of objects under gravity is crucial in fields like physics, engineering, and sports science.

• Examples include projectile motion, space exploration, and designing equipment for sports involving vertical jumps.

Important Points

• Free Fall: If the ball were dropped instead of being thrown, the initial velocity u would be 0, and the velocity would increase due to gravity as v = gt.

• Time to Reach Maximum Height: The time to reach maximum height can be calculated using the formula t = u/g, where u is the initial velocity.

• Symmetry of Motion: The time taken to ascend to the highest point is equal to the time taken to descend back to the ground, assuming no air resistance.

• Energy Considerations: At the maximum height, the object's kinetic energy is converted entirely into potential energy.

• These principles are essential for solving problems related to vertical motion in competitive exams and academic studies.

Q17. Answer: (c) Oviduct

The correct answer is Oviduct.

Key Points

• Fertilisation in humans typically occurs in the oviduct (also known as the fallopian tube), which is a part of the female reproductive system.

• The oviduct is a narrow, muscular tube that connects the ovaries to the uterus and serves as the site where the male sperm meets the female egg (ovum).

• When an egg is released from the ovary during ovulation, it is captured by the fimbriae (finger-like projections) at the end of the oviduct and transported into the tube where fertilisation takes place.

• The fertilised egg (zygote) begins cell division as it travels through the oviduct and eventually implants in the uterus for further development.

• Other parts of the reproductive system, such as the vagina, uterus, or cervix, do not typically facilitate fertilisation but play significant roles in reproduction.

Additional Information

• Oviduct (Fallopian Tube):

• The oviduct is divided into four parts: infundibulum (closest to the ovary), ampulla (the widest section where fertilisation usually occurs), isthmus (a narrow portion), and interstitial portion (where it connects to the uterus).

• The ampulla region provides an ideal environment for fertilisation due to the presence of cilia and secretions that aid in sperm mobility and survival.

• It is critical for the transport of both the egg and sperm, ensuring they meet for fertilisation to occur.

• Other parts of the female reproductive system:

• Vagina: The vagina serves as the passageway through which sperm enters the female reproductive tract. It is not involved in the process of fertilisation.

• Uterus: The uterus is the organ where the fertilised egg implants and grows into a fetus. It does not facilitate fertilisation.

• Cervix: The cervix is the lower part of the uterus that opens into the vagina. It acts as a gateway for sperm to enter the uterus but does not play a direct role in fertilisation.

• Fertilisation Process:

• Fertilisation occurs when a sperm cell penetrates the egg and combines its genetic material with the egg's genetic material, forming a zygote.

• The process involves three main steps: sperm capacitation, penetration of the egg's outer layers, and fusion of the sperm and egg nuclei.

• The zygote undergoes mitotic divisions (cleavage) as it travels down the oviduct toward the uterus.

• Important Points about Human Reproduction:

• Human reproduction is a complex process that involves the coordinated functioning of several organs and hormones.

• The process begins with ovulation, followed by fertilisation in the oviduct, and ends with implantation in the uterus.

• Hormones such as estrogen, progesterone, and luteinizing hormone play crucial roles in regulating the reproductive cycle.

Q18. Answer: (d) Paper Industry

The correct answer is Paper Industry.

Key Points

• Sodium hydroxide (NaOH), also known as caustic soda, is extensively used in the Paper Industry to process wood pulp. It helps in breaking down lignin, a complex organic polymer found in wood.

• The process of converting wood into pulp involves the Kraft pulping or chemical pulping method, where sodium hydroxide is used along with sodium sulfide to remove lignin and separate cellulose fibers.

• This method ensures the production of high-quality paper by providing the necessary conditions for efficient delignification and maintaining the strength of cellulose fibers.

• Other industries such as the Food Industry, Soap Industry, and Textile Industry also use sodium hydroxide, but its primary and most significant application in terms of wood pulp processing is in the Paper Industry.

• Hence, the correct answer is the Paper Industry.

Additional Information

• Sodium Hydroxide in the Paper Industry:

• In the Kraft process, sodium hydroxide plays a crucial role in breaking down lignin, which binds cellulose fibers in wood. This results in the separation of fibers, producing pulp.

• The chemical also helps in adjusting the pH during the bleaching process of pulp, ensuring the removal of residual lignin.

• Sodium hydroxide is used to regenerate chemicals in the recovery cycle of the Kraft process, making it a sustainable and cost-effective choice.

• The Paper Industry is one of the largest consumers of sodium hydroxide globally due to its pivotal role in the pulping and bleaching stages.

• Applications of Sodium Hydroxide in Other Industries:

• Food Industry: Sodium hydroxide is used in food processing to peel fruits and vegetables, process cocoa and chocolate, and thicken ice cream.

• Soap Industry: It is used in the saponification process, where fats and oils react with sodium hydroxide to produce soap and glycerin.

• Textile Industry: Sodium hydroxide is utilized in mercerization, which improves the strength, luster, and dyeing properties of cotton fabrics.

• Important Facts about Sodium Hydroxide:

• It is a highly corrosive alkali with the chemical formula NaOH.

• It is manufactured through the chlor-alkali process, which also produces chlorine and hydrogen as by-products.

• Sodium hydroxide is widely used in industries due to its ability to react with acids, dissolve fats, and break down organic material.

• Environmental Concerns:

• The use of sodium hydroxide in industrial processes must be managed carefully to prevent environmental damage.

• Effluents containing sodium hydroxide should be neutralized before being released into water bodies to avoid harm to aquatic ecosystems.

Q19. Answer: (a) Sieve tubes

The correct answer is Sieve tubes.

Key Points

• Phloem is a complex permanent tissue in vascular plants that transports organic nutrients (mainly sucrose) from the leaves to other parts of the plant.

• Sieve tubes are the primary conducting elements of phloem. They are long, tubular structures formed by a series of sieve tube elements arranged end-to-end.

• The end walls of sieve tube elements have perforations called sieve plates, which facilitate the flow of nutrients and other substances between cells.

• Unlike xylem, which primarily transports water, phloem transports both nutrients and signaling molecules to various parts of the plant.

• Other components of phloem tissue include companion cells, phloem parenchyma, and phloem fibers, but sieve tubes are the primary conducting structures.

Additional Information

• Tracheids:

• Tracheids are elongated cells present in the xylem tissue, not phloem.

• They are responsible for the conduction of water and minerals and provide mechanical support to the plant.

• Tracheids are dead at maturity and have thick, lignified walls.

• Vessels:

• Vessels are another component of the xylem tissue and are not found in phloem.

• They are more specialized than tracheids for water conduction and consist of a series of hollow, cylindrical cells placed end-to-end.

• Vessels are also lignified and dead at maturity.

• Xylem fibers:

• Xylem fibers are supportive, elongated cells present in the xylem tissue.

• They contribute to the mechanical strength of the plant by providing structural support.

• They are not involved in nutrient transport and are unrelated to phloem functions.

• Phloem components and their roles:

• Sieve tubes: Conduct sugars and other nutrients.

• Companion cells: Assist sieve tubes in nutrient transport by providing energy and maintaining metabolic activities.

• Phloem parenchyma: Stores food and other substances.

• Phloem fibers: Provide mechanical support to the phloem tissue.

Important Points

• The phloem is part of the plant's vascular system and works alongside xylem to ensure proper nutrient and water distribution.

• Phloem transport is often described as bidirectional, meaning nutrients can move both upwards and downwards, unlike xylem, which only conducts water and minerals upwards.

• The process of nutrient transport in the phloem is termed translocation, which is driven by pressure-flow mechanisms.

• Phloem is found in all vascular plants, including gymnosperms and angiosperms.

• The proper functioning of the phloem is vital for plant growth, reproduction, and survival as it delivers energy-rich compounds to growing and storage tissues.

Q20. Answer: (b) Both (i) and (ii)

The correct answer is Both (i) and (ii).

Key Points

• The relative strength of the magnetic field: The closeness of magnetic field lines represents the relative strength of the magnetic field. The closer the lines, the stronger the magnetic field in that region. This is a fundamental property of magnetic field lines. Hence, statement (i) is correct.

• Intersection of magnetic field lines: Magnetic field lines never intersect each other. If they did, it would mean that at the point of intersection, the magnetic field has two different directions, which is physically impossible. Hence, statement (ii) is correct.

• Magnetic field around a bar magnet: The magnetic field lines emerge from the north pole of the bar magnet and enter the south pole, forming closed loops. This pattern demonstrates the continuous nature of magnetic field lines.

• Representation of field strength: The density of field lines (lines per unit area) around a bar magnet visually indicates the intensity of the magnetic field in a particular region.

• Applications: Understanding magnetic field lines is crucial in various applications such as designing magnets, electric motors, and magnetic resonance imaging (MRI).

Additional Information

• Magnetic field lines:

• Magnetic field lines are imaginary lines that represent the direction and strength of a magnetic field.

• They are denser near the poles of a magnet, indicating stronger magnetic fields in these areas.

• The field lines are continuous loops that extend from the north pole to the south pole outside the magnet and from the south pole to the north pole inside the magnet.

• Magnetic field properties:

• The magnetic field is a vector quantity, having both magnitude and direction.

• The strength of the magnetic field decreases as the distance from the magnet increases.

• Applications of magnetic fields:

• Magnetic fields are used in various devices such as electric motors, generators, transformers, and magnetic storage devices.

• They are also used in medical imaging techniques such as MRI.

• Earth's magnetic field:

• The Earth behaves like a giant bar magnet with its magnetic field lines extending from the magnetic south pole to the magnetic north pole.

• It protects the Earth from harmful solar radiation by deflecting charged particles.

• Magnetic field visualization:

• Iron filings can be used to visualize magnetic field lines. When placed near a magnet, the filings align themselves along the field lines.

• This experiment helps in understanding the pattern and distribution of magnetic fields around a magnet.

Important Points

• Magnetic monopoles: Unlike electric charges, magnetic monopoles do not exist. Every magnet has both a north and a south pole.

• Magnetism in materials: Materials can be classified as diamagnetic, paramagnetic, or ferromagnetic based on their response to magnetic fields.

• Historical significance: The study of magnets dates back to ancient Greece, where naturally occurring magnets were first discovered in the region of Magnesia.

• Modern advancements: Magnetic materials are used in advanced technologies such as maglev trains, data storage devices, and magnetic levitation systems.

Q21. Answer: (a) A drop of ink spreads evenly in water without stirring

The correct answer is A drop of ink spreads evenly in water without stirring.

Key Points

• The observation where a drop of ink spreads evenly in water without stirring demonstrates the concept of the existence of particles in matter.

• This phenomenon is caused by the random motion of particles in both the ink and water, known as Brownian motion.

• It provides evidence that matter is made up of tiny particles that are in constant motion.

• When ink is added to water, the particles of ink mix with the water particles due to their random motion, leading to uniform spreading. This proves that the particles of matter are continuously moving and interacting.

• This is the strongest evidence compared to other options, as it directly demonstrates the particle nature of matter and their movement without the need for external force or heating.

Additional Information

• Ice melts into water when heated:

• This demonstrates the change of state of matter due to heat energy.

• When ice is heated, the molecules gain kinetic energy and transition from a solid (fixed structure) to a liquid (free-moving particles).

• While this shows that particles in matter can change states, it does not directly prove their existence.

• Water boils and produces steam:

• This is an example of the phase transition of matter from liquid to gas upon heating.

• Boiling increases the kinetic energy of water molecules, allowing them to overcome intermolecular forces and escape as steam.

• It supports the idea of particle interaction but does not directly provide evidence for the existence of particles.

• Salt dissolves faster in warm water than in cold water:

• When salt dissolves in water, the particles of salt mix with water particles due to the interaction between them.

• Warmer water provides more kinetic energy to the water molecules, speeding up the dissolution process.

• While this indicates particle interaction, the evidence is indirect compared to the ink diffusion example.

• Key Characteristics of Particles of Matter:

• Small size: Particles of matter are extremely small and cannot be seen with the naked eye.

• Constant motion: Particles are always moving, as evidenced by Brownian motion.

• Interparticle spaces: Matter has spaces between its particles, allowing diffusion or dissolution.

• Attraction: Particles of matter attract each other with varying strength depending on the state (solid, liquid, gas).

Important Points

• Brownian Motion:

• Discovered by Robert Brown in 1827, it refers to the random motion of particles suspended in a fluid.

• This motion is caused by the collision of fluid particles with the suspended particles.

• It provides strong evidence for the particle nature of matter.

• Diffusion:

• It is the process by which particles spread out from a region of higher concentration to a region of lower concentration.

• Diffusion occurs in gases, liquids, and even solids, demonstrating the movement and interaction of particles.

• Examples include the spreading of perfume in air or ink in water.

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Q22. Answer: (a) 23

The correct answer is 23.

Key Points

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

Mass Number = Number of Protons + Number of Neutrons.

• In the given case, the atom has 11 protons and 12 neutrons. Thus, the mass number can be calculated as: Mass Number = 11 + 12 = 23.

• The atom is described as neutral. This means the number of protons (positively charged) equals the number of electrons (negatively charged). Hence, the atom has 11 electrons as it has 11 protons.

• The mass number does not include electrons since their mass is negligible compared to protons and neutrons.

• Therefore, the correct mass number of this neutral atom is 23.

Additional Information

• Atomic Number:

• The atomic number is the number of protons in the nucleus of an atom. It defines the chemical element. For example, an atom with 11 protons has an atomic number of 11, which corresponds to the element sodium (Na).

• The number of electrons in a neutral atom equals its atomic number. In this case, the atom has 11 electrons.

• Isotopes:

• Atoms of the same element can have different numbers of neutrons, leading to different mass numbers. These are called isotopes.

• For instance, the isotopes of hydrogen include protium (1 proton, 0 neutrons, mass number = 1), deuterium (1 proton, 1 neutron, mass number = 2), and tritium (1 proton, 2 neutrons, mass number = 3).

• Subatomic Particles:

• Atoms are composed of three main subatomic particles: Protons (positively charged, located in the nucleus), Neutrons (neutral, located in the nucleus), and Electrons (negatively charged, orbiting the nucleus).

• Protons and neutrons have approximately the same mass, which is significantly larger than the mass of electrons. Hence, they contribute most to the atom's mass.

• Mass Number vs Atomic Mass:

• The mass number is a whole number representing the total number of protons and neutrons in an atom's nucleus.

• The atomic mass is a weighted average of all the isotopes of an element, expressed in atomic mass units (amu).

• For example, the atomic mass of sodium is approximately 22.99 amu, while its most common isotope has a mass number of 23.

Q23. Answer: (b) It can bond ionically.

The correct answer is It can bond ionically.

Key Points

• Statement 1: It is tetravalent – Carbon has a valency of 4, meaning it can form four covalent bonds with other atoms, including carbon atoms. This allows it to create stable and complex molecules. Hence, this statement is correct.

• Statement 2: It can bond ionically – Carbon primarily forms covalent bonds, not ionic bonds, due to its small size and the requirement of a very high amount of energy to lose or gain four electrons to achieve a stable electronic configuration. Hence, this statement is incorrect.

• Statement 3: It has catenation – Catenation is the ability of carbon to form long chains and rings with other carbon atoms. This property makes carbon versatile in forming various organic compounds. Hence, this statement is correct.

• Statement 4: It can have single, double, and triple bonds – Carbon can form all three types of bonds (single, double, and triple) with itself or other elements, enabling diverse molecular structures. Hence, this statement is correct.

• Statement 5: No specific statement provided – Not applicable to the question.

Additional Information

• Versatility of Carbon:

• The versatility of carbon is primarily due to its tetravalency and its ability to form strong covalent bonds with other elements.

• Carbon can form chains, branched structures, and rings due to catenation.

• It can bond with a wide variety of elements, such as hydrogen, oxygen, nitrogen, and halogens, to form numerous compounds.

• Carbon’s ability to form multiple bonds (single, double, and triple) allows for the formation of diverse organic and inorganic compounds.

• Covalent Bonding:

• Carbon forms covalent bonds by sharing electrons with other atoms to attain a stable electronic configuration.

• The strength and stability of covalent bonds contribute to the diversity of organic molecules.

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• Ionic Bonding:

• Carbon does not typically form ionic bonds because it would require either losing or gaining four electrons, which is highly energy-intensive and not feasible under normal conditions.

• Instead, carbon prefers to share electrons, forming covalent bonds.

• Catenation:

• Catenation is the ability of carbon to form long chains, branched structures, and rings by bonding with itself.

• This property is unique and significant in forming complex organic molecules, such as hydrocarbons and biomolecules.

• Applications of Carbon's Versatility:

• Carbon's versatility is the foundation of organic chemistry, which studies carbon-based compounds.

• It is the basis for the formation of essential biomolecules such as proteins, carbohydrates, lipids, and nucleic acids.

• Carbon compounds are also used in industrial applications, including fuels, polymers, and pharmaceuticals.

Q24. Answer: (c) To combine long lactation with disease resistance

The correct answer is To combine long lactation with disease resistance.

Key Points

• Cross-breeding between exotic and local cattle breeds aims to combine the beneficial traits of both breeds, ensuring better productivity and adaptability.

• Exotic breeds, such as Jersey and Holstein Friesian, are known for their high milk yield and long lactation periods.

• Local breeds, such as Gir, Sahiwal, and Red Sindhi, are better adapted to local environmental conditions and are highly disease-resistant.

• The goal of cross-breeding is to produce offspring that exhibit both higher milk production (a trait of exotic breeds) and resilience to diseases (a trait of local breeds).

• This approach enhances the overall economic viability of cattle farming by reducing costs associated with healthcare and improving milk productivity.

Additional Information

• Exotic Breeds:

• Jersey: Originating from the British Channel Island of Jersey, this breed is known for its high milk fat content and adaptability to varying climates.

• Holstein Friesian: Originating from the Netherlands, this breed is globally recognized for its high milk yield and is often used in commercial dairy farming.

• Indigenous Breeds:

• Gir: A native Indian breed, known for its heat tolerance, disease resistance, and milk production.

• Sahiwal: Originating from Punjab, this breed is renowned for its high milk yield and adaptability to tropical climates.

• Red Sindhi: Known for its hardiness and suitability for both milk production and draught work.

• Advantages of Cross-Breeding:

• Improved milk production due to traits inherited from exotic breeds.

• Enhanced disease resistance and heat tolerance due to traits from indigenous breeds.

• Better economic returns for farmers by reducing veterinary costs and increasing productivity.

• Challenges of Cross-Breeding:

• Cross-bred animals may require specialized feeding and care.

• Potential for loss of genetic diversity in indigenous breeds if not managed properly.

• Breeding programs need to be monitored to ensure the sustainability of the resulting population.

• Relevant Programs in India:

• Rashtriya Gokul Mission: Aims to preserve and develop indigenous breeds through scientific breeding techniques.

• National Dairy Plan (NDP): Focuses on increasing milk production and improving the productivity of milch animals through genetic improvements.

Important Points

• Long Lactation Period: Exotic breeds like Holstein Friesian can produce milk for extended durations, making them ideal for commercial dairy farming.

• Disease Resistance: Indigenous breeds have a natural immunity to local diseases, reducing dependency on veterinary interventions.

• Economic Impact: Cross-breeding helps farmers achieve higher profitability by combining productivity and resilience traits.

• Breeding Techniques: Programs like artificial insemination ensure controlled cross-breeding to achieve desirable traits without compromising genetic diversity.

Q25. Answer: (b) prevents overcrowding and competition

The correct answer is prevents overcrowding and competition.

Key Points

• Seed dispersal is a mechanism by which plants spread their seeds to different locations to ensure the survival of their species.

• It helps prevent overcrowding and competition among plants. If seeds fall directly beneath the parent plant, they may face competition for sunlight, water, and nutrients. Hence, option 2 is correct.

• Seed dispersal enhances genetic diversity by allowing seeds to grow in varied environments, reducing the risk of localized extinction due to pests, diseases, or unfavorable conditions.

• It aids in colonizing new areas, ensuring the spread and growth of plants in diverse ecosystems.

• Different methods of seed dispersal include wind, water, animals, and mechanical forces, each adapted to specific plant types and environments.

Additional Information

• Statement Analysis:

• 1) Ensures seed death after fertilization: This statement is incorrect. Seed dispersal does not lead to seed death; rather, it ensures survival by spreading seeds to favorable locations.

• 2) Prevents overcrowding and competition: This is the correct statement. Dispersal ensures that seedlings grow in areas where they do not compete with the parent plant or other seedlings for resources.

• 3) Increases the size of seeds: This statement is incorrect. Seed dispersal does not influence the size of seeds; seed size is determined by genetic and environmental factors during development.

• 4) Prevents pollination: This statement is incorrect. Seed dispersal occurs after pollination and fertilization; it does not prevent pollination.

• Methods of Seed Dispersal:

• Wind dispersal: Seeds are lightweight or winged, allowing them to be carried away by wind. Examples include dandelions and maples.

• Water dispersal: Seeds adapted for floating are dispersed by water. Examples include coconut and lotus.

• Animal dispersal: Seeds with hooks or sticky surfaces attach to animals, or fruits are eaten and seeds excreted. Examples include burdock and cherries.

• Mechanical dispersal: Some plants have explosive mechanisms to shoot seeds away. Examples include touch-me-not (Impatiens).

• Importance of Seed Dispersal:

• Ensures the survival and spread of plant species across diverse ecosystems.

• Promotes biodiversity by allowing plants to colonize new areas.

• Reduces the likelihood of competition between parent plants and offspring.

• Helps plants adapt to changing environmental conditions, ensuring long-term survival.

Important Points

• Environmental Adaptations:

• Plants have evolved diverse seed dispersal mechanisms based on their ecosystems. For instance, coastal plants rely on water dispersal while desert plants utilize wind dispersal.

• Seed dispersal strategies are critical to maintaining balance in ecosystems and ensuring the regeneration of forests and grasslands.

• Ecological Role:

• Seed dispersal directly supports pollinators and animals that depend on plants for food, ensuring ecosystem stability.

• It aids in the reforestation of degraded areas and contributes to climate change mitigation by promoting vegetation growth.

Q26. Answer: (a) 24

Shortcut Trick

Total time = 50 minutes. Remaining time = 50 − (11 + 25) = 14 minutes.

Total Distance = Σ(Speed × Time). Use speed in km/hr and time in hours.

30 = (x × 11/60) + (2x × 25/60) + (x × 14/60)

30 = (11x + 50x + 14x) / 60 => 30 = 75x / 60 => 30 = 1.25x

x = 30 / 1.25 = 24

Therefore The correct answer is 24 km/hr.

Alternate Method

Given: Total Distance = 30 km, Total Time = 50 min.

Formula Used: Distance = Speed × Time

=> Time1 = 11 min, Time2 = 25 min, Time3 = 50 − (11 + 25) = 14 min.

=> Total Distance = (Speed1 × Time1) + (Speed2 × Time2) + (Speed3 × Time3)

=> 30 = [x × (11/60)] + [2x × (25/60)] + [x × (14/60)]

=> 30 = (11x/60) + (50x/60) + (14x/60)

=> 30 = (11x + 50x + 14x) / 60

=> 30 = 75x / 60

=> 1800 = 75x

=> x = 1800 / 75 = 24

Therefore The correct answer is 24 km/hr.

Additional Information

Unit Conversion

To convert minutes to hours, divide by 60. To convert km/hr to m/s, multiply by 5/18.

Average Speed

Average Speed = Total Distance ÷ Total Time. For equal distances at speeds u and v, Average Speed = 2uv/(u+v).

Relative Speed

In the same direction, relative speed is (u − v). In the opposite direction, it is (u + v).

Q27. Answer: (d) 4998

Shortcut Trick

To find the largest number below 5000 divisible by 42, divide 5000 by 42.

5000 ÷ 42 => Quotient = 119, Remainder = 2.

Largest number = 5000 − Remainder = 5000 − 2 = 4998.

Check: 4998 is between 4000 and 5000 and is exactly divisible by 42.

Therefore The correct answer is 4998.

Alternate Method

Given: Range is 4000 to 5000 and divisor is 42.

Formula Used: Dividend = (Divisor × Quotient) + Remainder

=> Divide 5000 by 42 to find the nearest multiple.

=> 5000 = 42 × 119 + 2

=> The largest multiple less than or equal to 5000 = 42 × 119

=> 42 × 119 = 4998

=> Since 4000 < 4998 < 5000, it satisfies the condition.

Therefore The correct answer is 4998.

Additional Information

Divisibility Rule of 42

A number is divisible by 42 if it is simultaneously divisible by its prime factors 2, 3, and 7.

Finding Multiples in a Range

To find the smallest number in a range (a, b) divisible by n, calculate: a + (n − (a mod n)). To find the largest, calculate: b − (b mod n).

Remainder Theorem

Subtracting the remainder from the dividend always results in a number perfectly divisible by the divisor.

Q28. Answer: (a) 12 years

Shortcut Trick

Total age after 3 years = 35 years.

Total present age = 35 − (3 × 2) = 29 years.

Let Rahul age be R. Then sister age = R + 5.

2R + 5 = 29 => 2R = 24 => R = 12 years.

Therefore The correct answer is 12 years.

Alternate Method

Given: Difference between ages = 5 years; Sum after 3 years = 35 years.

Let Rahul present age = x years
Then Sister present age = x + 5 years
After 3 years:
=> (x + 3) + (x + 5 + 3) = 35
=> 2x + 11 = 35
=> 2x = 35 − 11
=> 2x = 24
=> x = 12
Therefore The correct answer is 12 years.
Additional Information
Age Difference Property
The difference between the ages of two people remains constant throughout their lives, regardless of how many years pass.
Sum of Ages Calculation
To find the sum of ages 'n' years ago or 'n' years hence, subtract or add (n × number of persons) to the present sum.
Ratio of Ages
If the ratio of ages is given, use the multiplier method (kx and ky) to set up linear equations based on the conditions provided.

Q29. Answer: (d) Rs. 42

Shortcut Trick
Area of metal sheet used = Base area + Area of 4 walls
Area = (60 × 40) + 2 × 30 × (60 + 40) = 2400 + 6000 = 8400 cm²
Convert to m²: 8400 ÷ 10,000 = 0.84 m²
Total Cost = 0.84 × 50 = Rs. 42
Therefore The correct answer is Rs. 42.
Alternate Method
Given:
Length (L) = 60 cm, Breadth (B) = 40 cm, Height (H) = 30 cm
Cost rate = Rs. 50 per m²
Formula Used:
Area of box without a lid = LB + 2H(L + B)
Calculations:
=> Total Area = (60 × 40) + 2 × 30 × (60 + 40)
=> Total Area = 2400 + 60 × 100
=> Total Area = 2400 + 6000 = 8400 cm²
=> Area in m² = 8400 ÷ 10000 = 0.84 m²
=> Total Cost = Area × Rate
=> Total Cost = 0.84 × 50 = Rs. 42
Therefore The correct answer is Rs. 42.
Additional Information
Total Surface Area of Cuboid
The surface area including the top lid is given by TSA = 2(LB + BH + HL).
Lateral Surface Area
The area of the four vertical walls only is LSA = 2H(L + B).
Unit Conversion
Since 1 m = 100 cm, it follows that 1 m² = 100 × 100 = 10,000 cm².

Q30. Answer: (a) 72

Given:
20% of number + 96 = number
Formula Used:
Percentage = value ÷ 100
Calculation:

=> Let number = x
=> (20 ÷ 100)x + 96 = x
=> 0.2x + 96 = x
=> x − 0.2x = 96
=> 0.8x = 96
=> x = 96 ÷ 0.8
=> x = 120
=> 60% of number = (60 ÷ 100) × 120
=> 60% = 72
Therefore The correct answer is 72.

Q31. Answer: (b) 1

Given:
-5 × [-4 × {-3 - (2 × (-3) × (-4) + 5 × 6) - 3} ÷ (-20 × 3)] × 0.5/(2 × 5)
Concept Used:
BODMAS rule
Calculation:
=> -5 × [-4 × {-3 - (2 × 12 + 30) - 3} ÷ (-60)] × 0.5/10
=> -5 × [-4 × {-3 - (24 + 30) - 3} ÷ (-60)] × 0.5/10
=> -5 × [-4 × {-3 - 54 - 3} ÷ (-60)] × 0.5/10
=> -5 × [-4 × (-60) ÷ (-60)] × 0.5/10
=> -5 × [240 ÷ (-60)] × 0.5/10
=> -5 × (-4) × 0.5/10
=> 20 × 0.5/10
=> 20 × 1/20
=> 1
Therefore The correct answer is 1

Q32. Answer: (c) 36

Shortcut Trick
Use the standard algebraic identity: If x + y + z = 0, then $x^3 + y^3 + z^3 = 3xyz$.
Here, let x = 2a, y = b, and z = c. Given that 2a + b + c = 0.
Applying the identity: $(2a)^3 + b^3 + c^3 = 3 \times (2a) \times b \times c$ => $8a^3 + b^3 + c^3 = 6abc$.
Comparing with kabc, we get k = 6.
Calculation: $k^2 = 6^2 = 36$.
Therefore The correct answer is 36.
Alternate Method
Given: 2a + b + c = 0 and $8a^3 + b^3 + c^3 = kabc$.
Formula Used: $x^3 + y^3 + z^3 - 3xyz = (x + y + z)(x^2 + y^2 + z^2 - xy - yz - zx)$
=> Let x = 2a, y = b, z = c.
=> Since x + y + z = 0, $x^3 + y^3 + z^3 = 3xyz$.
=> $(2a)^3 + b^3 + c^3 = 3 \times 2a \times b \times c$
=> $8a^3 + b^3 + c^3 = 6abc$
=> Given: $8a^3 + b^3 + c^3 = kabc$
=> kabc = 6abc
=> k = 6
=> $k^2 = 6^2 = 36$
Therefore The correct answer is 36.
Additional Information
Special Identity Condition
For any three variables, the relation $a^3 + b^3 + c^3 - 3abc = (a + b + c)(a^2 + b^2 + c^2 - ab - bc - ca)$ holds true.
Sum of Cubes when Sum is Zero

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If the sum of three terms is zero, their cubes sum to exactly three times their product. Example: (−5) + 2 + 3 = 0 => $(-5)^3 + 2^3 + 3^3 = 3(-5)(2)(3) = -90$.

General Expansion

The expression $a^2 + b^2 + c^2 - ab - bc - ca$ can be rewritten as $\frac{1}{2}[(a-b)^2 + (b-c)^2 + (c-a)^2]$.

Q33. Answer: (a) 539√3/8 cm³

Shortcut Trick

Relation: Since $3\pi r_h^2 = 4\pi r_s^2$, the Radius ratio is $r_s = r_h \times (\sqrt{3}/2)$.

Calculation: $r_s = 3.5 \times (\sqrt{3}/2) = 7\sqrt{3}/4$ cm.

Volume = $(4/3) \times (22/7) \times (7\sqrt{3}/4)^3 = 539\sqrt{3}/8$ cm³.

Therefore The correct answer is 539√3/8 cm³.

Alternate Method

Given:

Radius of Hemisphere (r_h) = 3.5 cm = 7/2 cm.

Total Surface Area of Hemisphere = Surface Area of Sphere.

Formula Used:

Total Surface Area of Hemisphere = $3\pi r^2$

Surface Area of Sphere = $4\pi r^2$

Volume of Sphere = $(4/3)\pi r^3$

Calculations:

=> $3 \times \pi \times (3.5)^2 = 4 \times \pi \times r_s^2$

=> $3 \times (7/2)^2 = 4 \times r_s^2$

=> $3 \times (49/4) = 4 \times r_s^2$

=> $r_s^2 = (3 \times 49) / (4 \times 4) = 147/16$

=> $r_s = \sqrt{(147/16)} = (7\sqrt{3})/4$ cm

=> Volume of Sphere = $(4/3) \times (22/7) \times ((7\sqrt{3})/4)^3$

=> Volume = $(4/3) \times (22/7) \times (343 \times 3\sqrt{3} / 64)$

=> Volume = $(22 \times 49 \times \sqrt{3}) / 16 \times 2$ (after simplification)

=> Volume = 539√3/8 cm³

Therefore The correct answer is 539√3/8 cm³.

Additional Information

Total Surface Area of a Sphere

The total surface area of a sphere is equal to its curved surface area, given by $4\pi r^2$.

Curved Surface Area of a Hemisphere

The curved surface area includes only the dome part and is given by $2\pi r^2$.

Volume of a Hemisphere

The volume of a hemisphere is exactly half that of a sphere: $V = (2/3)\pi r^3$.

Q34. Answer: (d) 224

Shortcut Trick

List the frequency of each observation in the given data set.

Observation 14 occurs 2 times and observation 16 occurs 2 times.

Since 2 is the maximum frequency, the possible modes are 14 and 16.

Product of modes = 14 × 16 = 224.

Therefore The correct answer is 224.

Alternate Method

Given: Marks of 15 students = {14, 12, 17, 16, 19, 13, 14, 15, 11, 23, 16, 22, 21, 18, 25}

Formula Used: Mode is the value that appears most frequently in a data set. A set with two modes is bimodal.

=> Count the frequency of each score:

11 → 1 | 12 → 1 | 13 → 1 | 14 → 2 | 15 → 1 | 16 → 2 | 17 → 1 | 18 → 1 | 19 → 1 | 21 → 1 | 22 → 1 | 23 → 1 | 25 → 1

=> The maximum frequency is 2, which occurs for marks 14 and 16.

=> Possible modes = 14 and 16.

=> Product = 14 × 16

=> Product = 224.

Therefore The correct answer is 224.

Additional Information

Mode

The value in a data set that occurs with the highest frequency. It is a measure of central tendency.

Bimodal and Multimodal

If two values share the same maximum frequency, the data is bimodal. If more than two, it is multimodal.

Empirical Formula

For a moderately skewed distribution: Mode = 3 × Median − 2 × Mean.

Q35. Answer: (d) 39:15:42:3

Shortcut Trick

To combine p : q : r and r : s, make the value of r common in both ratios.

In the first ratio, r = 14. In the second ratio, r = 42.

Multiply the first ratio by 3 to make r = 42: (13 × 3) : (5 × 3) : (14 × 3) = 39 : 15 : 42.

Now combine with r : s = 42 : 3 → 39 : 15 : 42 : 3.

Therefore The correct answer is 39:15:42:3.

Alternate Method

Given: p : q : r = 13 : 5 : 14 and r : s = 42 : 3

Formula Used: Ratio equalization method.

=> p : q : r = 13 : 5 : 14

=> r : s = 42 : 3

=> To equalize r, LCM(14, 42) = 42.

=> Multiply (p : q : r) by 3 → (13 × 3) : (5 × 3) : (14 × 3) = 39 : 15 : 42

=> Resulting p : q : r : s = 39 : 15 : 42 : 3

Therefore The correct answer is 39:15:42:3.

Additional Information

Compound Ratio

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

Ratio Balancing

When combining multiple ratios (A:B and B:C), ensure the common term (B) has the same numerical value by multiplying by appropriate factors.

Simplification of Ratio

A ratio can be simplified by dividing or multiplying all terms by the same non-zero constant without changing its value.

Q36. Answer: (d) 26.5%

Shortcut Trick

Apply the successive percentage increase formula: x + y + (x × y)/100

Overall % increase = 15 + 10 + (15 × 10)/100

Overall % increase = 25 + 1.5 = 26.5%

Therefore The correct answer is 26.5%.

Alternate Method

Given: First increase = 15%, Second increase = 10%

Formula: Net Change = [(Final Value − Initial Value) / Initial Value] × 100

=> Let the initial number be 100.

=> After 15% increase, number = 100 + 15% of 100 = 115

=> After 10% increase on 115, number = 115 + 10% of 115 = 115 + 11.5 = 126.5

=> Overall increase = 126.5 − 100 = 26.5

=> Overall percentage increase = (26.5 / 100) × 100 = 26.5%

Therefore The correct answer is 26.5%.

Additional Information

Successive Percentage Change

When a value is changed by a% and then by b%, the net change is given by (a + b + ab/100)%. Use positive for increase and negative for decrease.

Multiplier Method

A 15% increase corresponds to a multiplier of 1.15, and a 10% increase corresponds to 1.1. Net Multiplier = 1.15 × 1.1 = 1.265. Total increase = 1.265 − 1 = 0.265.

Successive Decrease

For two successive discounts of d1% and d2%, the Equivalent Discount = (d1 + d2 − d1d2/100)%.

Q37. Answer: (c) 13 seconds

Shortcut Trick

Total distance to be covered = Sum of lengths of trains = 285 + 235 = 520 m.

Relative speed (opposite direction) = 61 + 83 = 144 km/hr.

Convert Relative Speed to m/s: 144 × (5/18) = 8 × 5 = 40 m/s.

Time taken = Total Distance ÷ Relative Speed = 520 ÷ 40 = 13 sec.

Therefore The correct answer is 13 sec.

Alternate Method

Given:

Length of first train (L1) = 285 m

Length of second train (L2) = 235 m

Speed of first train (S1) = 61 km/hr

Speed of second train (S2) = 83 km/hr

Formula Used:

Time = (L1 + L2) ÷ (S1 + S2)

Conversion: 1 km/hr = 5/18 m/s

Calculations:

=> Total Length = 285 + 235 = 520 m

=> Relative Speed = 61 + 83 = 144 km/hr

=> Relative Speed in m/s = 144 × (5/18) = 40 m/s

=> Time = 520 ÷ 40

=> Time = 13 sec

Therefore The correct answer is 13 sec.

Additional Information

Relative Speed Concept

When two objects move in opposite directions, relative speed = S1 + S2. When moving in the same direction, relative speed = |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 Distance

When a train crosses another train or a platform, the total distance covered is the sum of their respective lengths.

Q38. Answer: (a) 50

Shortcut Trick

Value ratio of coins = (Denomination × Ratio) = (1 × 3) : (2 × 2) = 3 : 4.

Total value units = 3 + 4 = 7 units.

7 units = Rs. 70 → 1 unit = Rs. 10.

Total number of coins = (3 + 2) × (Value of 1 unit ÷ Denomination base) = 5 × 10 = 50 coins.

Therefore The correct answer is 50 coins.

Alternate Method

Given: Ratio of Rs. 1 and Rs. 2 coins = 3 : 2. Total amount = Rs. 70.

Formula Used: Total Value = ∑(Number of coins × Denomination)

=> Let the number of Rs. 1 coins be 3x and Rs. 2 coins be 2x.

=> (1 × 3x) + (2 × 2x) = 70

=> 3x + 4x = 70

=> 7x = 70

=> x = 10

=> Total coins = 3x + 2x = 5x

=> Total coins = 5 × 10 = 50

Therefore The correct answer is 50 coins.

Additional Information

Coin Value Concept

The value of coins is always the product of the count of coins and their individual face value. Ratio of values = (n1 × v1) : (n2 × v2).

Ratio and Proportion

If a total quantity Q is divided in ratio a : b, the parts are [a/(a+b)] × Q and [b/(a+b)] × Q.

Q39. Answer: (d) 1680

Shortcut Trick

For two numbers in ratio a : b with HCF = H, the LCM is given by: LCM = a × b × H.

Given a = 8, b = 7, and H = 30.

LCM = 8 × 7 × 30 = 56 × 30 = 1680.

Therefore The correct answer is 1680.

Alternate Method

Given:

Ratio of two numbers = 8 : 7

HCF of numbers = 30

Formula Used:

Numbers = (Ratio part) × HCF

Product of two numbers = HCF × LCM

Calculations:

=> First number = 8 × 30 = 240

=> Second number = 7 × 30 = 210

=> We know, First Number × Second Number = HCF × LCM

=> 240 × 210 = 30 × LCM

=> LCM = (240 × 210) ÷ 30

=> LCM = 8 × 210

=> LCM = 1680

Therefore The correct answer is 1680.

Additional Information

Fundamental Property of HCF and LCM

For any two positive integers x and y, the product of the numbers is always equal to the product of their HCF and LCM (x × y = HCF × LCM).

Co-prime Numbers

If two numbers are co-prime (HCF = 1), then their LCM is simply the product of the two numbers.

Ratio and Multiples

If the ratio of two numbers is x : y, the numbers can be represented as xH and yH, where H is the HCF.

Q40. Answer: (b) decrease by Rs. 7,875

Shortcut Trick

Initial Savings = 7.5% → Expenditure = 92.5% (Ratio 3 : 37)

Income Change (26%) = [Expenditure Change (45%) × 37 + Savings Change (x%) × 3] ÷ 40

1040 = 1665 + 3x => 3x = −625 => x = −208.33%

Change in Savings = 50,400 × 7.5% × (−208.33/100) = Rs. 3,780 × (−2.0833) = −Rs. 7,875

Therefore The correct answer is decrease by Rs. 7,875.

Alternate Method

Initial Values:

=> Income = Rs. 50,400
=> Savings = 7.5% of 50,400 = 50,400 × 0.075 = Rs. 3,780
=> Expenditure = 50,400 − 3,780 = Rs. 46,620
New Values:
=> New Income = 50,400 × 1.26 = Rs. 63,504
=> New Expenditure = 46,620 × 1.45 = Rs. 67,599
=> New Savings = New Income − New Expenditure = 63,504 − 67,599 = −Rs. 4,095
Change in Savings:
=> Change = New Savings − Initial Savings = −4,095 − 3,780 = −Rs. 7,875
Therefore The correct answer is decrease by Rs. 7,875.
Additional Information
Income-Expenditure Relation
Always remember the fundamental equation: Income = Expenditure + Savings.
Percentage Change in Components
If Income increases by x%, Exp by y%, and Savings by z%, then: I × x = E × y + S × z.
Alligation Method
The percentage change in income is the weighted average of percentage changes in expenditure and savings.

Q41. Answer: (a) 44%

Shortcut Trick
Discount % = (Free Items ÷ Total Items) × 100
Free items = 11, Total items = 14 + 11 = 25
Discount % = (11 ÷ 25) × 100 = 11 × 4 = 44%
Therefore The correct answer is 44%.
Alternate Method
Given: Items purchased = 14, Items free = 11.
Formula: Discount % = [Free Quantity / (Purchased + Free Quantity)] × 100
=> Let the Marked Price (MP) of 1 item be Rs. 1.
=> Total MP of 25 items (14 + 11) = Rs. 25.
=> Selling Price (SP) for customer = MP of 14 items = Rs. 14.
=> Discount = MP − SP = 25 − 14 = Rs. 11.
=> Discount % = (11 ÷ 25) × 100
=> Discount % = 44%
Therefore The correct answer is 44%.
Additional Information
Buy X Get Y Free
This is a promotional scheme where the total quantity is X + Y, and the discount is equivalent to the price of Y items. Formula: Discount % = [Y / (X+Y)] × 100.
Successive Discounts
When two discounts a% and b% are given, the equivalent single discount is [a + b − (ab/100)]%.
Marked Price and Selling Price
Selling Price = Marked Price × [(100 − Discount%) / 100]. Discount is always calculated on the Marked Price (MP).

Q42. Answer: (a) 40 gallons

Shortcut Trick
Let A and B be filling pipes and C be the waste pipe.
Total Work (LCM of 10, 12, 30) = 60 units.
Combined Efficiency (A+B−C) = 60 ÷ 30 = 2.
Individual Efficiencies: A = 6, B = 5. Therefore 6 + 5 − C = 2 => C = 9 units/min.
Emptying Time for C = 60 ÷ 9 = 20/3 minutes. Capacity = (20/3) × 6 = 40 gallons.
Therefore The correct answer is 40 gallons.
Alternate Method

Given: Pipe A fills in 10 mins, Pipe B fills in 12 mins, Pipe C empties 6 gallons/min, and A+B−C fills in 30 mins.

Pipe	Time (min)	Total Work (LCM)	Efficiency
Pipe A	10	60 units	6
Pipe B	12	5	
A + B − C	30	2	

=> Efficiency of (A + B − C) = 2
=> 6 + 5 − Efficiency of C = 2
=> Efficiency of C = 11 − 2 = 9 units/min
=> Since 60 units represent the total capacity, the time taken by C to empty the full tank alone = 60 ÷ 9 = 20/3 minutes
=> Capacity of tank = Time taken by C × Rate of flow of C
=> Capacity = (20/3) × 6 = 20 × 2 = 40 gallons
Therefore The correct answer is 40 gallons.
Additional Information
Pipes and Cisterns Logic
Filling pipes have positive efficiency (+), while emptying or waste pipes have negative efficiency (−).
Capacity Formula
Tank Capacity = Time taken by a pipe to fill/empty the tank × Rate of flow (gallons or liters per minute).
Combined Rate Rule
If pipe A fills in 'x' and pipe B empties in 'y', the net work done in one hour = (1/x − 1/y).

Q43. Answer: (d) 50

Shortcut Trick
Initial average age of 20 students = 29 years
New average age after including teacher = 30 years
Increase in average = 30 − 29 = 1 year
Teacher's age = New average + (Initial students × Increase in average)
Teacher's age = 30 + (20 × 1) = 50 years
Therefore The correct answer is 50 years.
Alternate Method
Given:
Number of students (n1) = 20
Average age of students (A1) = 29 years
Total number of persons (n2) = 21
New average age (A2) = 30 years
=> Total age of 20 students = 20 × 29 = 580 years
=> Total age of the whole group (21 persons) = 21 × 30 = 630 years
=> Teacher's age = Total age of group − Total age of students
=> Teacher's age = 630 − 580
=> Teacher's age = 50 years
Therefore The correct answer is 50 years.
Additional Information
Definition of Average
Average is the central value of a set of data, calculated as the sum of all values divided by the total number of values.
Inclusion Property
When a new member is added and the average increases, the new member's value is higher than the original average.
Sum of Observations
Sum = Average × Number of observations. This is used to find the total age or total value before and after changes.

Q44. Answer: (a) 25%

Shortcut Trick
Cost Price (CP) of 1 banana = 4800 ÷ (100 × 12) = Rs. 4

Selling Price (SP) of 1 banana = 20 ÷ 4 = Rs. 5
Gain % = (SP − CP)/CP × 100
Gain % = (5 − 4)/4 × 100 = 1/4 × 100 = 25%
Therefore The correct answer is 25%.
Alternate Method
Given:
Total Cost Price (CP) = Rs. 4,800
Quantity = 100 dozens = 100 × 12 = 1,200 bananas
Selling Price (SP) per 4 bananas = Rs. 20
Calculations:
=> CP per banana = 4800 ÷ 1200 = Rs. 4
=> SP per banana = 20 ÷ 4 = Rs. 5
=> Profit per banana = SP − CP = 5 − 4 = Rs. 1
=> Gain Percentage = (Profit ÷ CP) × 100
=> Gain Percentage = (1 ÷ 4) × 100 = 25%
Therefore The correct answer is 25%.
Additional Information
Profit and Loss Basics
Profit occurs when SP > CP. Profit = SP − CP. Loss occurs when CP > SP. Loss = CP − SP.
Percentage Calculation
Both Gain % and Loss % are always calculated on the Cost Price (CP) unless stated otherwise. Formula: (Value Change ÷ Base CP) × 100.
Unitary Method
To simplify calculations, always find the price per single unit for both buying and selling transactions.

Q45. Answer: (a) 768

Shortcut Trick
Combine ratios A : B (4 : 5), B : C (4 : 5), and C : D (6 : 7).
A : B : C : D => (4×4×6) : (5×4×6) : (5×5×6) : (5×5×7) = 96 : 120 : 150 : 175.
Total units = 96 + 120 + 150 + 175 = 541 units.
541 units = Rs. 4328 → 1 unit = Rs. 8.
Share of A = 96 × 8 = Rs. 768.
Therefore The correct answer is Rs. 768.
Alternate Method
Given:
Total amount = Rs. 4328
Ratio A : B = 4 : 5, B : C = 4 : 5, C : D = 6 : 7
Calculations:
=> To find A : B : C : D, we equalize the common terms B and C.
=> A : B = 4 : 5 (Multiply by 4) = 16 : 20
=> B : C = 4 : 5 (Multiply by 5) = 20 : 25
=> So, A : B : C = 16 : 20 : 25
=> Now, A : B : C = 16 : 20 : 25 (Multiply by 6) = 96 : 120 : 150
=> C : D = 6 : 7 (Multiply by 25) = 150 : 175
=> Combined Ratio A : B : C : D = 96 : 120 : 150 : 175
=> Sum of ratios = 96 + 120 + 150 + 175 = 541
=> Share of A = (96 ÷ 541) × 4328
=> Share of A = 96 × 8 = Rs. 768
Therefore The correct answer is Rs. 768.
Additional Information
Compounding Ratios
When multiple ratios are given (A:B, B:C, C:D), the ratio A:D can be found by multiplying the individual fractions: (A/B) × (B/C) ×

(C/D).

Ratio Balancing

To combine ratios, make the common term (like B or C) equal in both ratios by multiplying with appropriate constants.

Direct Proportion

The share of each person is directly proportional to their respective ratio unit when the total amount is fixed.

Q46. Answer: (a) 72.75 m

Shortcut Trick

In a 30°−60°−90° right-angled triangle, the ratio of sides is 1 : √3 : 2.

Side opposite to 30° (Building Height) = 1 unit = 42 m.

Side opposite to 60° (Distance from Base) = √3 units = 42 × √3.

Distance = 42 × 1.7321 = 72.7482 m ≈ 72.75 m.

Therefore The correct answer is 72.75 m.

Alternate Method

Given:

Height of the building (h) = 42 m

Angle of depression = 30° => Angle of elevation from man to top = 30°.

Formula Used:

tan θ = Perpendicular ÷ Base

Calculations:

=> tan 30° = Height of building ÷ Distance from base

=> 1 ÷ √3 = 42 ÷ x

=> x = 42 × √3

=> x = 42 × 1.7321

=> x = 72.7482 m

=> x ≈ 72.75 m

Therefore The correct answer is 72.75 m.

Additional Information

Angle of Depression and Elevation

The angle of depression from an observer to an object is numerically equal to the angle of elevation from the object to the observer because they are alternate interior angles.

Standard Values of Tan

Common trigonometric ratios: tan 30° = 1/√3, tan 45° = 1, and tan 60° = √3.

Rounding Rules

When rounding to two decimal places, if the third decimal digit is 5 or more, increase the second decimal digit by 1.

Q47. Answer: (d) 20°

Shortcut Trick

The angle formed by the bisectors of two adjacent angles of a quadrilateral is equal to half the sum of the other two angles:

angle STR = (angle P + angle Q) ÷ 2

=> angle P + angle Q = 2 × 40° = 80°

Since the ratio of angle P : angle Q is 3 : 5, the difference is:

Difference = [(5 − 3) ÷ (3 + 5)] × 80° = (2 ÷ 8) × 80° = 20°

Therefore The correct answer is 20°.

Alternate Method

Given:

=> In quadrilateral PQRS, the bisectors of angle R and angle S meet at T.

=> angle STR = 40°

=> Ratio of angle P : angle Q = 3 : 5

Formula Used:

=> Sum of interior angles of a triangle = 180°

=> Sum of interior angles of a quadrilateral = 360°

Calculations:

Let the angle bisectors of angle S and angle R meet at T inside the quadrilateral.

=> angle TSR = angle S ÷ 2

=> angle TRS = angle R ÷ 2

In triangle STR:

=> angle STR + angle TSR + angle TRS = 180°

=> 40° + (angle S ÷ 2) + (angle R ÷ 2) = 180°

=> (angle S + angle R) ÷ 2 = 180° − 40°

=> (angle S + angle R) ÷ 2 = 140°

=> angle S + angle R = 280°

In quadrilateral PQRS, the sum of all interior angles is 360°:

=> angle P + angle Q + angle R + angle S = 360°

=> angle P + angle Q + 280° = 360°

=> angle P + angle Q = 360° – 280°

=> angle P + angle Q = 80°

Given that the ratio of angle P to angle Q is 3 : 5:

=> Let angle P = 3k and angle Q = 5k

=> 3k + 5k = 80°

=> 8k = 80°

=> k = 10°

Now, calculating the individual angle measures:

=> angle P = 3 × 10° = 30°

=> angle Q = 5 × 10° = 50°

The difference between the measures of angle Q and angle P is:

=> angle Q − angle P = 50° − 30° = 20°

Therefore The correct answer is 20°.

Additional Information

Angle Bisector Theorem in Quadrilaterals

The angle formed by the bisectors of two adjacent angles of any quadrilateral is always equal to half the sum of the remaining two angles. Formula: angle STR = (angle P + angle Q) ÷ 2.

Sum of Interior Angles of a Polygon

The sum of the interior angles of an n-sided polygon is given by the formula (n − 2) × 180°. For a quadrilateral (n = 4), the sum is always 360°.

Opposite Angle Bisectors in a Quadrilateral

If the bisectors of two opposite angles of a quadrilateral intersect, the angle between them is equal to half the difference of the other two opposite angles.

Q48. Answer: (a) 5

Shortcut Trick

Total Work = LCM of 3, 6, 10 = 30 units.

Efficiencies: A = 10, B = 5, C = 3. Combined Efficiency = 10 + 5 + 3 = 18.

Thrice Work = 30 × 3 = 90 units.

Time Required = 90 ÷ 18 = 5 days.

Therefore The correct answer is 5 days.

Alternate Method

Given: Time taken by A = 3 days, B = 6 days, C = 10 days.

Formula Used: Total Work = LCM(Individual Days); Efficiency = Work ÷ Time; Time = Total Work ÷ Combined Efficiency.

Person	Days	Total Work	Efficiency
A	3	30	10
B	6	5	
C	10	3	

=> Total Efficiency of (A + B + C) = 10 + 5 + 3 = 18 units/day.
=> Original Work = 30 units.
=> Thrice the Work = 3 × 30 = 90 units.
=> Time taken = 90 ÷ 18
=> Time taken = 5 days.
Therefore The correct answer is 5 days.
Additional Information
Combined Work Formula
For two people, Time = (A × B) ÷ (A + B). For three people, Time = (ABC) ÷ (AB + BC + CA).
Work and Wages
Wages are always distributed in the ratio of the Efficiency of the workers if they work for the same duration.
Man-Days Formula
(M1 × D1 × H1) ÷ W1 = (M2 × D2 × H2) ÷ W2, where M is men, D is days, H is hours, and W is work.

Q49. Answer: (d) 25.2%

Shortcut Trick
Apply the successive percentage change formula: Net Change = a + b + (ab ÷ 100)
Here, a = +49% (markup) and b = −16% (discount).
Net Profit % = 49 − 16 − (49 × 16 ÷ 100)
Net Profit % = 33 − 7.84 = 25.16% ≈ 25.2%
Therefore The correct answer is 25.2%.
Alternate Method
Given: Marked Price (MP) is 49% above Cost Price (CP), Discount is 16% on MP.
=> Let Cost Price (CP) = 100
=> Marked Price (MP) = 100 + 49% of 100 = 149
=> Selling Price (SP) = MP − 16% of MP
=> SP = 149 − (16 ÷ 100 × 149) = 149 − 23.84
=> SP = 125.16
=> Profit = SP − CP = 125.16 − 100 = 25.16
=> Profit Percentage = (Profit ÷ CP) × 100 = (25.16 ÷ 100) × 100 = 25.16%
=> Rounded to 1 decimal place = 25.2%
Therefore The correct answer is 25.2%.
Additional Information
Marked Price & Discount
Discount is always calculated on the Marked Price (MP). SP = MP × (100 − Discount%) ÷ 100.
Markup Percentage
Markup is the increase over CP to arrive at MP. MP = CP × (100 + Markup%) ÷ 100.
Relationship Formula
MP ÷ CP = (100 + Profit%) ÷ (100 − Discount%). This is used when both profit and discount are given.

Q50. Answer: (a) Rs. 12,000

Shortcut Trick
Total Interest percentage for the period = Rate × Time
Time = 18 months = 1.5 years
Effective Interest % = 16% × 1.5 = 24%
Simple Interest = 24% of Rs. 50,000 = 24 × 500 = Rs. 12,000
Therefore The correct answer is Rs. 12,000.
Alternate Method
Given:
Principal (P) = Rs. 50,000
Rate (R) = 16% per annum
Time (T) = 18 months

Formula Used:

Simple Interest (SI) = (P × R × T) ÷ 100

Calculations:

=> Convert time to years: T = 18 ÷ 12 = 1.5 years

=> SI = (50000 × 16 × 1.5) ÷ 100

=> SI = 500 × 16 × 1.5

=> SI = 500 × 24

=> SI = Rs. 12,000

Therefore The correct answer is Rs. 12,000.

Additional Information

Total Amount Formula

The total amount (A) to be paid back is the sum of Principal and Simple Interest: A = P + SI.

Time Conversion

Always ensure time (T) is in years. If given in days, divide by 365; if in months, divide by 12.

Direct Relation

Simple Interest is directly proportional to Principal, Rate, and Time. If any one doubles, SI also doubles (keeping others constant).

Q51. Answer: (b) NR – PT

The position and positional values or English Alphabets are:

The pattern followed here is:

Each letter-cluster pair follows the pattern -3, +2.

Let's check each option:

1. RV – OX

This letter-cluster pair follows the pattern -3 +2.

2. NR – PT

This letter-cluster pair does not follow the pattern -3 +2.

3. MQ – JS

This letter-cluster pair follows the pattern -3 +2.

4. UY – RA

This letter-cluster pair follows the pattern -3 +2.

Thus, NR – PT is the odd one out.

Hence, the correct answer is "Option 2".

Q52. Answer: (d) 8

Given: In a certain code language, ‘TOUR’ is coded as ‘4139’ and ‘BRUT’ is coded as ‘4318’.

Thus, 8 is the code for ‘B’ in the given code language.

Hence, the correct answer is "Option 4".

Q53. Answer: (a) 633

Given: 612 610 620 617 627 623 ?

The logic followed here is:

Thus, 633 should come in place of the question mark (?) in the given series.

Hence, the correct answer is "Option 1".

Q54. Answer: (b) Two

Given: (Left) 6 3 6 9 9 4 4 1 7 5 6 2 1 6 6 6 6 8 8 2 9 1 5 (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 two 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 2".

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Q55. Answer: (a) 5 km to the south

Given: Saurav starts from Point A and drives 9 km towards the east. He then takes a right turn, drives 6 km, turns right and drives 11 km. He then takes a right turn and drives 11 km. He takes a final right turn, drives 2 km and stops at Point P.

Thus, Saurav should drive 5 km to the south to reach point A from point P.

Hence, the correct answer is "Option 1".

Q56. Answer: (b) 4 km towards east

Given: Mohini starts from Point A and drives 13 km towards south. She then takes a right turn, drives 7 km, turns right and drives 7 km. She then takes a right turn and drives 3 km. She takes a final left turn, drives 6 km and stops at Point P.

Thus, Mohini should drive 4 km towards east to reach point A from point P.

Hence, the correct answer is "Option 2".

Q57. Answer: (a) VUW−YXZ

The position and positional values or English Alphabets are:

Given:

KJL−NMO

LKM−ONP6445

Each letter-cluster pair follows the pattern +3, +3, +3.

Let's check each option:

1. VUW – YXZ

This letter-cluster pair follows the pattern +3, +3, +3.

2. VTU – XWY

This letter-cluster pair does not follow the pattern +3, +3, +3.

3. VUW – XXY

This letter-cluster pair does not follow the pattern +3, +3, +3.

4. VTU – YXZ

This letter-cluster pair does not follow the pattern +3, +3, +3.

Thus, VUW−YXZ follows the same pattern.

Hence, the correct answer is "Option 1".

Q58. Answer: (b) 161

Given: 66 81 98 117 138 ?

The logic followed here is:

Thus, 161 should come in place of the question mark (?) in the given series.

Hence, the correct answer is "Option 2".

Q59. Answer: (c) Only conclusion (I) follows.

Statements: All forks are kettles. Some forks are cups.

The least possible Venn diagram for the given statement is:

Conclusion (I): Some kettles are cups. - True (Because, All forks are kettles and Some forks are cups, which means some forks which are kettles are cups.)

Conclusion (II): All cups are forks. - False (Because, Some forks are cups, which does not imply that All cups are forks.)

Thus, Only conclusion (I) follows.

Hence, the correct answer is "Option 3".

Q60. Answer: (c) Neither conclusion (I) nor (II) follows

Statements:

Some nut are bolt.

Some bolt are rivet.

The least possible Venn diagram for the given statement is:

Conclusions:

(I) Some nut are rivet. - False (There is no definite relation between brinjals and peacocks, it can be possible but it is not definite)

(II) All rivet are bolt. - False (Bevause, Some bolt are rivet, which doesn't imply that All rivet are bolt)

Thus, Neither conclusion (I) nor (II) follows.

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Hence, the correct answer is "Option 3".

Q61. Answer: (a) JOA

The position and positional values or English Alphabets are:

Given: NSE MRD LQC KPB ?

The logic followed here is:

Thus, JOA should come in place of the question mark (?) in the given series based on the English alphabetical order.

Hence, the correct answer is "Option 1".

Q62. Answer: (a) Sister's daughter

Family Chart:

Decoding the Symbols:

A is				
Symbol	?	=	@	√
Meaning	daughter	son	father	sister
to B				

Given: C ? D @ E = F √ L

It means: C is the daughter of D, D is the father of E, E is the son of F, F is the sister of L.

Thus, C is L's Sister's daughter.

Hence, the correct answer is "Option 1".

Q63. Answer: (a) Five

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

Now,

Even numbers, each of which is immediately preceded by an odd number and also immediately followed by an even number.

So, the needed pattern is: Odd — Even — Even

Thus, there are 5 even number, each of which is immediately preceded by an odd number and also immediately followed by an even number.

Hence, the correct answer is "Option 1".

Q64. Answer: (d) QOL -49

The position and positional values or English Alphabets are:

Given: IGP 3 KIO -10 MKN -23 OMM -36 ?

The logic followed here is:

Thus, 'QOL -49' will replace the question mark (?) in the given series to make it logically complete.

Hence, the correct answer is "Option 4".

Q65. Answer: (a) G

Given: Seven people A, B, C, D, E, F, and G are sitting in a row, facing the north.

1. Only one person sits to the right of E.
2. Only three people sit between G and E.
3. Only three people sit between A and D, neither of whom sits on the left end.
4. F sits immediately to the right of C.
5. Only one person sits between A and B.

The above statement cannot be satisfied in case II, so it is eliminated.

Thus, G sits second to the left of C.

Hence, the correct answer is "Option 1".

Q66. Answer: (d) L

Given: Five people, L, M, N, O and P, are sitting in a row facing north.

1. N is sitting at the third position from the extreme right end of the row.
2. M is not an immediate neighbour of N.

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3. P is sitting to the immediate left of N.
4. P is sitting to the immediate right of O.
L, the only person left will occupy the vacant position.
Thus, L is sitting between N and M.
Hence, the correct answer is "Option 4".

Q67. Answer: (c) 4

Given: In a certain code language, ‘MORE’ is coded as ‘1637’ and ‘DEMO’ is coded as ‘4176’.
Thus, '4' is the code for ‘D’ in the given code language.
Hence, the correct answer is "Option 3".

Q68. Answer: (a) Three

Given: (Left) 7 9 1 8 4 2 5 6 3 8 7 1 9 (Right)
Now,
Odd numbers which are immediately followed by even numbers.
So, the needed pattern is: Odd - Even
Thus, there are three odd numbers, each of which is immediately followed by an even number.
Hence, the correct answer is "Option 1".

Q69. Answer: (a) 37

BODMAS Rule:
Decoding the given information:

Letter	A	B	C	D
Meaning	÷	×	•	•

Given equation: 11 D 30 C 42 A 3 B 4 = ?
Now replacing the sign from left to right using BODMAS Rule, we get:
=> 11 − 30 + 42 ÷ 3 × 4 = ?
=> 11 − 30 + 14 × 4 = ?
=> 11 − 30 + 56 = ?
=> 67 - 30 = ?
=> 37 = ?
Hence, the correct answer is "Option 1".

Q70. Answer: (c) 16th

Given: In a row of 32 people facing north, Anita is 8th from the left end. If Savita sits 9th to the right of Anita.
Total people = 32
Anita is 8th from the left
Savita is 9th to the right of Anita
So, Anita’s position from left = 8
Savita’s position from left = 8 + 9 = 17
Now Savita's from right:
Position from right = Total − Left position + 1
= 32 − 17 + 1
= 33 - 17
= 16
Thus, Savita's position from the right end of the row is 16th.
Hence, the correct answer is "Option 3".

Q71. Answer: (c) MQ – PN

The position and positional values or English Alphabets are:
The pattern followed here is:
Each letter-cluster pair follows the pattern +3, -2.

Let's check each option:
1. LD – OB
This letter-cluster pair follows the pattern +3, -2.
2. FL – IJ
This letter-cluster pair follows the pattern +3, -2.
3. MQ – PN
This letter-cluster pair does not follow the pattern +3, -2.
4. PJ – SH
This letter-cluster pair follows the pattern +3, -2.
Thus, MQ – PN is the odd one out.
Hence, the correct answer is "Option 3".

Q72. Answer: (c) XTQ−NJG

The position and positional values or English Alphabets are:
The logic followed here is:
KGD−AWT
FBY−VRO
Let's check each option:
1. XSO – MIF
This pair dos not follow the same logic.
2. XTQ – MJF
This pair dos not follow the same logic.
3. XTQ – NJG
This pair follows the same logic.
4. XSO – NJG
This pair dos not follow the same logic.
Thus, XTQ−NJG follows the same pattern.
Hence, the correct answer is "Option 3".

Q73. Answer: (d) 64

Given: 55 14 58 14 61 14 ?
The logic followed here is:
Thus, 64 should come in place of the question mark (?) in the given series.
Hence, the correct answer is "Option 4".

Q74. Answer: (c) 1

Given: Seven boxes A, B, C, D, E, F and G are kept one over the other but not necessarily in the same order.
1. Only three boxes are kept below D.
2. Only two boxes are kept between D and E.
3. Only C is kept above A.
4. F is kept at some place below B and at some place above G.

C
A
B
D
F
G
E

Thus, 1 box is kept below G.
Hence, the correct answer is "Option 3".

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Q75. Answer: (a) (39, 858, 11)

The logic followed here is:

Logic: second number = first number × third number × 2

(50, 1200, 12) → 50 × 12 × 2 = 1200

(4, 120, 15) → 4 × 15 × 2 = 120

Let's check each option:

1. (39, 858, 11) → 39 × 11 × 2 = 858

2. (12, 535, 22) → 12 × 22 × 2 = 528 ≠ 535

3. (36, 1087, 15) → 36 × 15 × 2 = 1080 ≠ 1087

4. (43, 2071, 24) → 43 × 24 × 2 = 2064 ≠ 2071

Thus, (39, 858, 11) follows the same pattern.

Hence, the correct answer is "Option 1".

Q76. Answer: (d) Two

Given: M, N, O, P, W, X and Y are sitting around a circular table facing the centre of the table.

1. O sits to the immediate right of P.

2. Only three people sit between O and Y when counted from the left of O.

3. Only three people sit between P and N when counted from the left of P.

4. W sits to the immediate right of M.

X, the only person left will occupy the vacant position.

Thus, two people sit between X and M when counted from the left of M.

Hence, the correct answer is "Option 4".

Q77. Answer: (c) 111

BODMAS Rule:

Decoding the given information:

Letter	A	B	C	D
Meaning	÷	×	•	•

Given equation: 6 B 44 A 3 D 21 C 44 = ?

Now replacing the sign from left to right using BODMAS Rule, we get:

=> 44 ÷ 3 × 6 − 21 + 44 = ?

=> 14.67 × 6 − 21 + 44 = ?

=> 88 + 44 − 21 = ?

=> 132 − 21 = ?

=> 111 = ?

Hence, the correct answer is "Option 3".

Q78. Answer: (a) 2

Given: (Left) 3 & 6 © 3 6 © € % 6 & 4 9 5 4 % € £ $ % 9 1 (Right)

Now,

Numbers, each of which is immediately preceded by a symbol and also immediately followed by a symbol.

So, the needed pattern is: Symbol — Number — Symbol

Thus, there are 2 numbers, each of which is immediately preceded by a symbol and also immediately followed by a symbol.

Hence, the correct answer is "Option 1".

Q79. Answer: (a) 0

BODMAS Rule:

Decoding the given information:

Symbol	•	•	×	÷
Meaning	•	×	÷	•

Given equation: 28 + 11 − 3 ÷ 45 × 9 = ?

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Now replacing the sign from left to right using BODMAS Rule, we get:

=> 28 − 11 × 3 + 45 ÷ 9 = ?

=> 28 − 11 × 3 + 5 = ?

=> 28 + 5 − 33 = ?

=> 33 − 33 = ?

=> 0 = ?

Hence, the correct answer is "Option 1".

Q80. Answer: (d) EWNK

The position and positional values or English Alphabets are:

Given: GKPY is related to JFST in a certain way based on the English alphabetical order. In the same way, SQBE is related to VLEZ.

The logic followed here is:

Similarly,

Thus, BBKP is related to EWNK.

Hence, the correct answer is "Option 4".

Q81. Answer: (a) 6.6%

The correct answer is 0.066.

Key Points

• The 56th meeting of the Monetary Policy Committee (MPC) was held from 4 to 6 August 2025.

• During this meeting, the real GDP growth projection for Q1 2026-27 was discussed.

• The projected real GDP growth rate for Q1 2026-27 was announced as 0.066 (6.6%).

• This projection reflects the expected economic performance in the first quarter of the fiscal year 2026-27, considering current economic trends and policy measures.

• The MPC's primary mandate is to ensure price stability while supporting growth, and such GDP projections are integral to policy decisions.

Additional Information

• Monetary Policy Committee (MPC):

• The MPC was formed under the Reserve Bank of India Act, 1934 and is responsible for fixing the benchmark interest rate in India.

• It consists of 6 members, including 3 RBI officials and 3 external members appointed by the government.

• The MPC aims to maintain inflation within the target range while fostering economic growth.

• Real GDP Growth:

• Real GDP growth measures the economic growth rate adjusted for inflation, providing a clearer picture of the economy's performance.

• It is a critical indicator used by policymakers, analysts, and investors to assess economic health.

• Economic Projections:

• The RBI and MPC often release growth projections to inform stakeholders and adjust monetary policy accordingly.

• Projections are based on factors like global economic trends, domestic inflation, fiscal policies, and geopolitical events.

• Inflation Targeting:

• India adopted inflation targeting as a monetary policy framework in 2016, with the MPC tasked with maintaining inflation within a specified range.

• The target is 4% (+/- 2%), ensuring price stability while supporting growth.

Important Points

• GDP Measurement:

• Gross Domestic Product (GDP) is the total value of goods and services produced in a country over a specific period.

• It is measured in real terms (adjusted for inflation) and nominal terms (current prices).

• Factors Influencing GDP Growth:

• Several factors impact GDP growth, including investment rates, consumer spending, fiscal policies, and global trade dynamics.

• Unexpected events like natural disasters, pandemics, or geopolitical tensions can also affect growth rates.

• RBI's Role:

• The Reserve Bank of India (RBI) plays a pivotal role in managing monetary policy to influence GDP growth and inflation.

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• Tools like repo rate, reverse repo rate, and cash reserve ratio are used to regulate liquidity and credit availability in the economy.

Q82. Answer: (c) Adivi Sesh

The correct answer is Adivi Sesh.

Key Points

• Anurag Kashyap is a renowned Indian filmmaker known for his unique and unconventional storytelling style, often focusing on gritty and realistic themes in his movies.

• His upcoming bilingual action-thriller Dacoit features prominent actors Mrunal Thakur and Adivi Sesh. Adivi Sesh is widely recognized for his versatile acting and impactful roles in Telugu cinema.

• Adivi Sesh, known for films like Goodachari, Kshanam, and Major, has established himself as a rising star in Indian cinema, particularly in the thriller and action genres.

• The film Dacoit is set to be a bilingual production, catering to both Hindi and Telugu audiences, ensuring a broader reach and appeal.

• Mrunal Thakur, who has gained recognition for her performances in films like Sita Ramam and Super 30, is paired alongside Adivi Sesh, promising a strong on-screen dynamic.

• The decision to cast Adivi Sesh in the film highlights his growing prominence in Indian cinema and his ability to deliver nuanced performances in complex roles.

Additional Information

• About Anurag Kashyap:

• Anurag Kashyap is celebrated for his movies like Gangs of Wasseypur, Black Friday, and Dev.D, which are considered groundbreaking in Indian cinema.

• He often explores themes like socio-political issues, crime, and human psychology, earning critical acclaim both nationally and internationally.

• Kashyap's films are known for their realistic settings, compelling narratives, and strong performances.

• About Adivi Sesh:

• Adivi Sesh is an actor, director, and screenwriter who primarily works in Telugu cinema.

• He gained widespread recognition for his performance in Major (2022), a biographical drama based on the life of Major Sandeep Unnikrishnan, a hero of the 26/11 Mumbai attacks.

• His films often feature suspenseful and action-packed narratives, making him a favorite among thriller genre enthusiasts.

• Sesh has received several accolades for his performances, including awards for best actor and screenplay.

• About Mrunal Thakur:

• Mrunal Thakur is an Indian actress who transitioned from television to films, showcasing versatility in both mediums.

• She rose to fame with her performances in movies like Super 30, Toofaan, and Sita Ramam, earning critical and audience appreciation.

• Mrunal is known for her ability to portray emotional depth and strong characters.

• Other Actors Considered:

• Prithviraj Sukumaran: A leading actor in Malayalam cinema, known for films like Lucifer and Driving License.

• Fahadh Faasil: An acclaimed actor in Malayalam cinema, celebrated for his performances in Kumbalangi Nights and Joji.

• Dulquer Salmaan: A versatile actor in Malayalam, Tamil, and Hindi films, known for movies like Sita Ramam and The Zoya Factor.

• While these actors have significant contributions in their respective industries, Adivi Sesh was chosen for Dacoit based on the requirements of the role and his proven expertise in action-thrillers.

Important Points

• Bilingual Films:

• Bilingual films are produced in two languages simultaneously, aiming to cater to diverse linguistic audiences.

• They often feature actors from different industries, allowing cross-cultural collaboration and broader market appeal.

• Examples include Baahubali, Saaho, and Kantara, which gained immense popularity across India.

• Genre of Dacoit:

• The action-thriller genre often combines high-stakes narratives with intense action sequences, creating an engaging cinematic experience.

• Some notable Indian action-thrillers include Baby, Drishyam, and Ek Tha Tiger.

• This genre appeals to viewers looking for adrenaline-fueled storytelling with gripping suspense.

Q83. Answer: (d) Licypriya Kangujam

The correct answer is Licypriya Kangujam.

Key Points

• Licypriya Kangujam, often referred to as the "Indian Greta Thunberg," is a prominent Indian environmental activist who gained global attention for her efforts to combat climate change.

• Born on 2 October 2011 in Manipur, India, Licypriya became active in environmental advocacy at the young age of 7. She is one of the youngest climate activists in the world.

• In 2025, she led a significant youth movement advocating for stronger climate actions and the implementation of policies to safeguard the environment for future generations.

• Her activism includes urging the Government of India to pass a climate law to mitigate the effects of climate change and protect biodiversity.

• She is the founder of the Child Movement, an organization that empowers children to raise their voices against climate inaction and environmental degradation.

• Licypriya has addressed several international forums, including the United Nations Climate Conferences, and has received numerous accolades for her contributions to environmental preservation.

Additional Information

• About Licypriya Kangujam:

• Licypriya is widely recognized for her campaign to make environmental education a mandatory subject in schools in India.

• At the age of 9, she was awarded the prestigious Dr. APJ Abdul Kalam Children Award for her remarkable contributions to environmental advocacy.

• She introduced the concept of the SUKIFU (Survival Kit for the Future), an innovative portable device to address air pollution, which gained attention globally.

• Notable Contributions of Other Options:

• Medha Patkar: An Indian social activist known for her work in the Narmada Bachao Andolan, focusing on environmental and human rights issues.

• Disha Ravi: A young Indian climate activist and a member of the Fridays for Future movement. She gained attention in 2021 for her involvement in environmental campaigns.

• Ridhima Pandey: An Indian environmental activist who filed a petition with the United Nations in 2017, urging action against climate change. At the age of 9, she was one of the youngest petitioners to challenge global leaders on their inaction.

• Global Youth Movements:

• Youth-led climate movements have gained momentum worldwide, with activists like Greta Thunberg inspiring millions to demand urgent climate action.

• These movements emphasize the need for sustainability, renewable energy adoption, and policies to reduce carbon emissions.

Important Points

• Licypriya's Advocacy:

• She emphasizes the role of youth participation in decision-making processes related to climate policies.

• Her campaigns focus on reducing plastic waste, mitigating air pollution, and promoting afforestation.

• Impact of Youth Movements:

• Youth movements like Licypriya's have played a crucial role in holding governments accountable for their commitments under agreements like the Paris Climate Accord.

• They also inspire citizens worldwide to adopt eco-friendly habits and support sustainable development initiatives.

Q84. Answer: (c) Kelly Slater

The correct answer is Kelly Slater.

Key Points

• Kelly Slater, an American professional surfer, is widely regarded as one of the greatest surfers of all time.

• He has won a record-breaking 11 World Surf League Championships, showcasing his dominance in the sport over decades.

• Slater was honored with the prestigious Laureus Lifetime Achievement Award in 2025 for his exceptional contribution to surfing and his unparalleled achievements in the sport.

• Beyond his sporting accomplishments, Slater is also known for his work in environmental conservation and advocacy for ocean health, further solidifying his legacy.

• His influence on surfing extends beyond competition, as he has also contributed to the development of surfing equipment and wave pool technology.

Additional Information

• Kelly Slater's Career Highlights:

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• He started surfing at a very young age and turned professional in the 1990s.

• He won his first World Championship title in 1992 and continued his dominance across multiple decades.

• Slater holds the record for being both the youngest (20 years old) and the oldest (39 years old) world champion in the history of professional surfing.

• Laureus Awards:

• The Laureus World Sports Awards were established in 2000 to honor the best sports achievements across the globe.

• The Lifetime Achievement Award is one of the highest honors, given to individuals who have made an extraordinary impact on their respective sports.

• Environmental Advocacy:

• Kelly Slater is a prominent advocate for ocean health and environmental sustainability.

• He co-founded the clothing brand Outerknown, which focuses on sustainable and ethical production practices.

• Slater has partnered with organizations like Surfrider Foundation and Sea Shepherd to promote marine conservation.

• Innovations in Surfing:

• Slater has contributed to the advancement of surfboard design and technology.

• He developed the Kelly Slater Wave Company, which created an artificial wave pool that offers perfect surfing conditions year-round.

Important Points

• Serena Williams:

• An iconic tennis player with 23 Grand Slam singles titles, Williams is considered one of the greatest athletes of all time.

• However, she did not win the Laureus Lifetime Achievement Award in 2025.

• Rafael Nadal:

• A legendary tennis player with 22 Grand Slam titles, Nadal has made significant contributions to the sport.

• He has been honored with several accolades but not the Laureus Lifetime Achievement Award in 2025.

• Usain Bolt:

• The fastest man in history, Bolt holds the world records in the 100m and 200m sprints.

• While Bolt has won multiple Laureus Awards, he did not receive the Lifetime Achievement Award in 2025.

Q85. Answer: (c) 3rd

The correct answer is 3rd Edition.

Key Points

• The 3rd edition of the International Conference on 'Arbitrating Indo-UK Commercial Disputes' was organized by the Indian Council of Arbitration (ICA) during the London International Disputes Week (LIDW) in June 2025.

• The conference aimed to strengthen India-UK arbitration relations, focusing on resolving commercial disputes involving businesses from both nations.

• The event provided a platform for legal professionals, arbitrators, and business leaders to discuss the challenges and developments in arbitration practices between the two countries.

• The Indian Council of Arbitration (ICA) is a premier arbitration body in India, established to promote alternative dispute resolution mechanisms and ensure efficient resolution of disputes.

• London International Disputes Week (LIDW) is an annual event that gathers professionals from across the globe to focus on dispute resolution developments, including arbitration and mediation practices.

Additional Information

• Indian Council of Arbitration (ICA):

• Established in 1965, ICA operates under the aegis of the Federation of Indian Chambers of Commerce and Industry (FICCI).

• It is responsible for promoting arbitration as a means of alternative dispute resolution (ADR) in India.

• ICA organizes conferences, training programs, and seminars to educate professionals about arbitration and ADR mechanisms.

• London International Disputes Week (LIDW):

• LIDW is held annually in London, UK, with participation from global legal and arbitration professionals.

• The event focuses on cross-border disputes, arbitration practices, and innovations in dispute resolution.

• It encourages collaboration between nations to improve arbitration frameworks and practices.

• India-UK Commercial Relations:

• The UK is one of India's leading trade partners, with bilateral trade valued at billions of dollars annually.

• Arbitration plays a critical role in resolving disputes arising from business transactions and contractual disagreements between entities in both countries.

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• Strengthening arbitration mechanisms can improve business confidence and promote smoother trade relations.

• Arbitration Practices:

• Arbitration is a widely recognized and utilized method for resolving disputes outside of traditional court systems.

• It involves appointing neutral arbitrators who deliver legally binding decisions based on evidence and arguments presented by parties.

• India has adopted the Arbitration and Conciliation Act, 1996, which aligns with international standards like the UNCITRAL Model Law.

Important Points

• Arbitration and Conciliation Act, 1996:

• This Act governs arbitration proceedings in India and incorporates provisions for domestic and international arbitration.

• It aims to reduce the burden on Indian courts by encouraging alternative dispute resolution mechanisms.

• UNCITRAL Model Law:

• The United Nations Commission on International Trade Law (UNCITRAL) Model Law serves as a framework for countries to establish or reform their arbitration laws.

• India's Arbitration Act aligns with the UNCITRAL standards, ensuring international acceptance of Indian arbitration practices.

• Cross-Border Arbitration:

• Cross-border arbitration resolves disputes involving parties from different nations.

• It emphasizes neutrality, efficiency, and enforceability of awards under treaties like the New York Convention.

Q86. Answer: (c) Liu Jiakun

The correct answer is Liu Jiakun.

Key Points

• Liu Jiakun is a renowned Chinese architect celebrated for his unique architectural style that blends modernism with traditional Chinese aesthetics.

• He was awarded the 2025 Pritzker Architecture Prize, often regarded as the "Nobel Prize of Architecture," in May 2025.

• The Pritzker Prize recognizes architects who have made significant contributions to humanity through the art of architecture.

• Liu Jiakun's work is widely acclaimed for its focus on sustainability, cultural preservation, and community integration.

• One of his notable projects includes the Luodai Museum of Hakka Culture in China, which showcases his ability to harmonize modern architecture with local traditions.

Additional Information

• Pritzker Architecture Prize:

• Established in 1979 by the Pritzker family of Chicago to honor architects whose work demonstrates talent, vision, and commitment.

• Previous winners include Jean Nouvel (2008), Zaha Hadid (2004), and David Chipperfield (2023).

• The award includes a cash prize of $100,000 and a bronze medallion.

• Liu Jiakun's Architectural Philosophy:

• His designs focus on human-centric architecture, promoting harmony between the built environment and its inhabitants.

• He incorporates local materials and techniques, ensuring sustainability and cultural relevance.

• Other Options:

• Jeanne Gang: An American architect known for the Aqua Tower in Chicago. She has not won the 2025 Pritzker Prize.

• Shigeru Ban: A Japanese architect acclaimed for his work with paper and cardboard in disaster relief projects. He won the Pritzker Prize in 2014.

• David Chipperfield: A British architect known for his minimalist designs. He won the Pritzker Prize in 2023.

• Significance of the Pritzker Prize:

• The prize highlights the role of architecture in addressing global challenges, including urbanization, sustainability, and cultural preservation.

• It serves to inspire architects worldwide to pursue excellence and innovation in their work.

Q87. Answer: (a) Hitesh Gulia

The correct answer is Hitesh Gulia.

Key Points

• Hitesh Gulia became the first Indian boxer to win a gold medal at the World Boxing Cup in 2025, making history and bringing immense pride to the nation.

• The World Boxing Cup is one of the most prestigious international boxing tournaments, where athletes from around the globe

compete for top honors.

• Hitesh Gulia's victory showcased exceptional skill, determination, and preparation, marking a milestone in Indian boxing history.

• His win highlights the growing prominence of Indian boxers on the global stage, reflecting the advancements in training and support for sports in India.

• This achievement further inspires young athletes across the country to pursue boxing and other sports with dedication and passion.

Additional Information

• Hitesh Gulia:

• Hitesh Gulia is an emerging talent in Indian boxing, known for his agility, precision, and powerful punches.

• He hails from Haryana, a state that has produced numerous prominent athletes in India.

• Gulia's win at the World Boxing Cup 2025 has set a benchmark for Indian boxers, proving their capability to excel at the international level.

• He competed in the lightweight category and defeated some of the best boxers in the world to secure the gold medal.

• World Boxing Cup:

• The World Boxing Cup is organized by the International Boxing Association (IBA) and is considered one of the toughest competitions in the sport.

• It features athletes from all over the world, competing across various weight categories.

• The event serves as a platform to showcase talent and often acts as a precursor to the Olympics and other major global competitions.

• Winning a gold medal at this event is a remarkable achievement, as it requires a combination of skill, strategy, and mental toughness.

• Other Indian Boxing Achievements:

• Mary Kom, a six-time world champion, has been a pioneer in Indian boxing and has inspired generations of boxers.

• Amit Panghal won a silver medal at the 2019 AIBA World Boxing Championships, establishing himself as one of the top Indian boxers.

• Shiva Thapa, a highly celebrated Indian boxer, has won multiple medals at international events, including the Asian Championships.

• The success of these boxers has contributed to the growing popularity of boxing in India and has led to increased support for the sport.

• India's Boxing Support System:

• The Boxing Federation of India (BFI) plays a crucial role in organizing tournaments, training camps, and providing infrastructure for boxers.

• Government schemes such as Target Olympic Podium Scheme (TOPS) provide financial and logistical support to elite athletes.

• Training facilities like the National Boxing Academy in Rohtak have been instrumental in nurturing talent.

• Collaboration with international coaches and exposure to global tournaments have significantly improved the performance of Indian boxers.

Important Points

• India's Boxing Legacy:

• Indian boxers have consistently performed well at events like the Commonwealth Games, Asian Games, and Olympics.

• Vijender Singh became the first Indian boxer to win an Olympic medal (bronze) in 2008 Beijing Olympics.

• The rise of professional boxing leagues in India has further boosted the popularity of the sport.

• Future of Indian Boxing:

• With increasing investment in sports infrastructure and training, the future of Indian boxing looks promising.

• Young talents like Hitesh Gulia are expected to lead the next generation of Indian boxers on the global stage.

• Efforts to promote sports at the grassroots level are helping identify and nurture talent in rural and urban areas.

Q88. Answer: (a) 8

The correct answer is 8 gold medals.

Key Points

• The Asian Athletics Championships is a biennial athletics competition organized by the Asian Athletics Association (AAA), featuring top athletes from across Asia.

• In the 2025 Asian Athletics Championships, India secured a total of 8 gold medals, showcasing a remarkable performance in various track and field events.

• The events in which India excelled included sprints, long-distance races, jumps, and throws, highlighting the nation's diverse

talent in athletics.

• This achievement marks a significant milestone in India's athletics history, as it demonstrates the growing competitiveness and skill of Indian athletes on an international platform.

• India has been consistently improving its performance in the Asian Athletics Championships over the years, reflecting the impact of better training facilities, coaching, and talent scouting programs.

Additional Information

• Significance of the Asian Athletics Championships:

• The Asian Athletics Championships is one of the most prestigious athletics events in Asia, providing a platform for athletes to compete at the highest level.

• The competition serves as a preparatory event for global tournaments like the Olympic Games and the World Athletics Championships.

• It fosters unity and sportsmanship among Asian countries while promoting athletic excellence in the region.

• India’s Historical Performance:

• India has been a consistent performer in the Asian Athletics Championships, often finishing among the top countries in the medal tally.

• At the 2017 edition in Bhubaneswar, India achieved its best-ever performance, winning 29 medals, including 12 golds.

• India's medal-winning athletes often hail from diverse disciplines, showcasing the country’s growing talent pool in athletics.

• Key Athletes to Watch:

• India has produced several noteworthy athletes who excel in regional and global competitions, such as Neeraj Chopra (javelin throw), Hima Das (sprinting), and Dutee Chand (sprinting).

• These athletes inspire the younger generation and contribute to the growing popularity of athletics in India.

• Government Initiatives:

• The Indian government has launched initiatives like Target Olympic Podium Scheme (TOPS) and Khelo India to support athletes and promote sports at the grassroots level.

• These programs provide financial assistance, world-class training facilities, and international exposure to Indian athletes.

Important Points

• Asian Athletics Association (AAA):

• The AAA is the governing body for athletics in Asia, established in 1973.

• It organizes various regional events, including the Asian Athletics Championships, to promote athletics in the continent.

• Training and Development:

• India’s athletics training infrastructure has seen significant improvements, with world-class facilities like the NIS Patiala and foreign coaching camps.

• Focus on sports science and injury management has played a crucial role in enhancing athletes' performance.

• Medal Tally Impact:

• The 8 gold medals won by India in the 2025 Asian Athletics Championships have elevated the country’s ranking among the top-performing nations in Asia.

• This performance is likely to motivate further investment in athletics and inspire upcoming athletes.

Q89. Answer: (c) Manu Bhaker

The correct answer is Manu Bhaker.

Key Points

• Manu Bhaker is a renowned Indian shooter who gained international recognition for her exceptional performances in various shooting events.

• She has represented India in multiple prestigious competitions, including the ISSF World Cups, Commonwealth Games, and Asian Games.

• In January 2025, Manu Bhaker was awarded the Major Dhyan Chand Khel Ratna Award, India's highest sporting honor, for her outstanding contribution to sports.

• The award recognized her achievements, including her multiple gold medals in international shooting tournaments and her role in elevating India's profile in the sport.

• The Major Dhyan Chand Khel Ratna Award is presented annually by the Ministry of Youth Affairs and Sports to honor athletes who have demonstrated exceptional performance at the international level.

• Manu Bhaker's selection for the award was based on her consistent performance, dedication, and ability to inspire young athletes in India.

Additional Information

• Major Dhyan Chand Khel Ratna Award:

• The award was renamed in honor of Major Dhyan Chand, India's legendary hockey player, who is widely regarded as one of the greatest athletes in the country's history.

• The award is given to athletes across all sports disciplines, recognizing their exceptional achievements and contributions to Indian sports.

• Recipients receive a medallion, certificate, and a cash prize as part of the honor.

• It serves as a motivation for athletes and promotes excellence in sports.

• Manu Bhaker's Achievements:

• She won a gold medal at the 2018 ISSF World Cup in Guadalajara, Mexico, becoming one of the youngest Indian shooters to achieve this milestone.

• Manu Bhaker secured medals at the 2018 Commonwealth Games and the 2018 Youth Olympic Games, showcasing her talent on global platforms.

• Her consistent performances in 10m Air Pistol and 25m Sports Pistol events have earned her accolades and recognition globally.

• She has emerged as a role model for aspiring shooters in India, inspiring them to pursue excellence in the sport.

• Other Notable Shooters:

• Sarabjot Singh: A talented Indian shooter known for his performances in air pistol events, but he has not yet received the Major Dhyan Chand Khel Ratna Award.

• Anish Bhanwala: India's youngest gold medalist at the Commonwealth Games, specializing in rapid-fire pistol events.

• Swapnil Kusale: An Indian rifle shooter who has represented India at various international competitions.

• Importance of Shooting in Indian Sports:

• Shooting has become one of India's most successful sports in international competitions, contributing significantly to India's medal tally at events like the Olympics and Commonwealth Games.

• Indian shooters, including Abhinav Bindra, Rahi Sarnobat, and Manu Bhaker, have played a pivotal role in promoting the sport domestically and globally.

• The government provides extensive support through schemes like Target Olympic Podium Scheme (TOPS) to nurture talent and prepare athletes for major tournaments.

Important Points

• Eligibility for Major Dhyan Chand Khel Ratna Award: Athletes must have demonstrated exceptional performance at the international level over a period of four years.

• Objective: The award aims to motivate athletes and promote excellence in sports in India.

• Selection Process: A selection committee evaluates the performance, achievements, and impact of nominees before recommending recipients.

• Impact: The award boosts the morale of athletes and highlights the importance of sports in national development.

Q90. Answer: (b) 4:00 PM

The correct answer is Sat Dec 30 1899 16:00:00 GMT+0521 (India Standard Time).

Key Points

• As per the Reserve Bank of India (RBI), starting from 1 August 2025, the trading hours for market repo and Tri-Party Repo (TREP) markets were extended till 4:00 PM IST.

• The move is aimed at enhancing the liquidity and efficiency in the financial markets by allowing more time for participants to execute trades.

• A market repo is a short-term borrowing tool where one party sells securities to another with an agreement to repurchase them at a predetermined price and date.

• Tri-Party Repo (TREP) is a similar mechanism involving a third-party agent for collateral management, which ensures reduced settlement risks.

• The extension aligns with RBI's broader objective of deepening financial markets and encouraging more participation from stakeholders.

Additional Information

• Market Repo:

• This is a tool for short-term borrowing and lending in the money market.

• It involves selling securities with an agreement to repurchase them at a later date.

• It is used by banks, financial institutions, and other participants to manage liquidity needs.

• Tri-Party Repo (TREP):

• Involves a third-party agent (usually a clearing corporation) to manage collateral.

• It reduces settlement and counterparty risks.

• TREP is widely used in India for short-term borrowing and lending in the money market.

• Reserve Bank of India (RBI):
• The central bank of India, established on 1 April 1935, headquartered in Mumbai.
• RBI regulates the monetary policy and ensures the stability of the financial system.
• It also oversees the functioning of payment systems and manages India's foreign exchange.
• Impact of Extended Trading Hours:
• Provides market participants with additional time to complete transactions.
• Enhances liquidity and allows better price discovery in the financial markets.
• Encourages more participation from investors, traders, and other stakeholders.

Important Points

• RBI's Role in Financial Markets:
• RBI regulates the money, foreign exchange, and government securities markets.
• It ensures smooth market operations and facilitates the development of financial infrastructure.
• Key Features of Repo Transactions:
• Repo rate is the rate at which RBI lends to commercial banks.
• It is a critical tool for implementing monetary policy.
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Q91. Answer: (a) Bangalore Medical College and Research Institute (BMCRI)

The correct answer is Bangalore Medical College and Research Institute (BMCRI).

Key Points

• The Indian Council of Medical Research (ICMR) selected the Bangalore Medical College and Research Institute (BMCRI) in January 2025 to establish South India's first Infectious Disease Research and Diagnostic Laboratory (IRDL).
• The IRDL aims to enhance the capability of diagnosing and conducting advanced research on infectious diseases, which are a major public health concern in India.
• Bangalore Medical College and Research Institute (BMCRI), located in Bangalore, Karnataka, is known for its excellence in medical education and healthcare services, making it an ideal choice for hosting this advanced facility.
• The laboratory will focus on addressing the challenges posed by emerging infectious diseases and will help in strengthening the public health infrastructure in the region.
• This initiative aligns with the ICMR's mission to improve public health research and preparedness for tackling outbreaks and pandemics effectively in India.

Additional Information

• About Bangalore Medical College and Research Institute (BMCRI):
• Founded in 1955, BMCRI is one of the oldest and most reputed medical institutions in Karnataka.
• It is affiliated with the Rajiv Gandhi University of Health Sciences (RGUHS), Karnataka.
• BMCRI operates several associated hospitals, including Victoria Hospital, Bowring and Lady Curzon Hospital, and Vanivilas Women and Children's Hospital.
• The institute is a hub for medical research and training, contributing significantly to healthcare advancements in the region.
• Indian Council of Medical Research (ICMR):
• Established in 1911, ICMR is the apex body in India for the formulation, coordination, and promotion of biomedical research.
• It operates under the Department of Health Research, Ministry of Health and Family Welfare, Government of India.
• ICMR plays a pivotal role in addressing public health challenges such as infectious diseases, non-communicable diseases, and environmental health.
• Importance of Infectious Disease Research and Diagnostic Laboratory (IRDL):
• IRDLs are crucial for the early detection, diagnosis, and management of infectious diseases.
• They help in identifying emerging and re-emerging pathogens, thereby aiding in outbreak preparedness and response.
• Such laboratories also facilitate collaborative research and contribute to the development of vaccines, therapeutics, and diagnostic tools.
• Other Selected Institutes for IRDL:
• While BMCRI is the first in South India, ICMR has been working to establish similar advanced facilities in other parts of India to strengthen the national disease surveillance network.

Important Points

• Emerging Infectious Diseases:
• India has faced outbreaks of diseases like Nipah Virus, Zika Virus, COVID-19, and H1N1 Influenza, highlighting the need for enhanced diagnostic and research facilities.

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• IRDLs are vital for studying antimicrobial resistance (AMR), a growing public health challenge in India and globally.

• Public Health Infrastructure in India:

• ICMR's efforts to establish IRDLs contribute to building a robust disease surveillance system and improving healthcare delivery.

• This initiative aligns with the Government of India's vision of achieving Universal Health Coverage (UHC) and strengthening public health capacity.

Q92. Answer: (b) Create marine protected areas

The correct answer is Create marine protected areas.

Key Points

• The High Seas Treaty is a landmark agreement developed under the United Nations to ensure the protection and sustainable use of marine biodiversity beyond national jurisdictions.

• One of the treaty's primary goals is to establish marine protected areas (MPAs) in regions beyond national waters, which cover nearly two-thirds of the world's oceans.

• These marine protected areas will help conserve biodiversity, protect endangered marine species, and ensure that ecosystems are resilient to climate change and human exploitation.

• The treaty emphasizes the regulation of activities like fishing, shipping, and deep-sea mining to reduce human-induced harm to marine ecosystems.

• The agreement aligns with the 30x30 conservation target, which aims to protect 30% of the world's oceans by the year 2030, as part of global efforts to combat biodiversity loss.

• The treaty also promotes international collaboration for scientific research and equitable sharing of marine genetic resources.

Additional Information

• Marine Protected Areas (MPAs):

• MPAs are designated zones in oceans and seas where human activities are regulated to protect marine biodiversity and ecosystems.

• Examples include coral reef preservation, fish spawning areas, and habitats for endangered marine species such as whales and turtles.

• Globally, less than 10% of the oceans are currently protected, necessitating stronger international efforts.

• MPAs contribute to sustainable fisheries, tourism, and carbon sequestration by preserving marine ecosystems.

• Deep-Sea Mining:

• Deep-sea mining involves extracting minerals from the ocean floor, such as cobalt, nickel, and rare earth elements, which are critical for technology manufacturing.

• However, this activity poses risks to marine biodiversity, including the destruction of fragile deep-sea habitats.

• Under the High Seas Treaty, deep-sea mining activities will be subject to stringent environmental assessments.

• 30x30 Conservation Target:

• The 30x30 initiative was adopted during the 2022 UN Biodiversity Conference (COP15) in Montreal, Canada.

• It aims to protect 30% of terrestrial and marine ecosystems by 2030 to halt biodiversity loss.

• The High Seas Treaty plays a crucial role in achieving this goal by focusing on ocean conservation beyond national jurisdictions.

• Importance of International Collaboration:

• The treaty fosters cooperation among nations to address global challenges like overfishing, habitat destruction, and climate change.

• It emphasizes equitable sharing of marine genetic resources, which are vital for pharmaceutical and scientific advancements.

• Scientific research under the treaty will help track ocean health and guide policy decisions.

Important Points

• UN Convention on the Law of the Sea (UNCLOS):

• The High Seas Treaty builds on the UNCLOS framework, which governs maritime activities and defines international waters.

• UNCLOS, established in 1982, provides legal principles for ocean governance, but lacked provisions for high seas biodiversity conservation.

• The treaty addresses this gap by focusing on sustainability and environmental protection.

• Threats to Marine Biodiversity:

• Overfishing: Many fish populations are being exploited beyond sustainable levels.

• Climate Change: Rising sea temperatures and ocean acidification disrupt ecosystems and species survival.

• Pollution: Plastics and other pollutants harm marine life and degrade habitats.

• Habitat Destruction: Activities like trawling and mining damage fragile marine ecosystems.

• Implementation Challenges:

• Effective enforcement of the treaty will require significant financial and technological investments.

• Global coordination is essential to balance conservation goals with economic interests like fishing and shipping.

Q93. Answer: (d) Dehradun

The correct answer is Dehradun.

Key Points

• The Indian Conservation Conference (ICCON) 2025, India's flagship biodiversity event, was held in Dehradun, Uttarakhand.

• Dehradun, known for its proximity to the Himalayan biodiversity hotspots, serves as an ideal location for hosting such events due to its rich natural resources and institutional expertise in environmental conservation.

• The ICCON 2025 focused on addressing key challenges such as climate change, wildlife protection, habitat restoration, sustainable development, and biodiversity conservation.

• Dehradun is home to prominent institutions like the Wildlife Institute of India (WII) and the Forest Research Institute (FRI), which provided logistical and technical support for the conference.

• Participants included representatives from national and international organizations, scientists, environmentalists, policymakers, and students, making ICCON 2025 a globally recognized event for biodiversity conservation.

Additional Information

• Dehradun:

• Location: Capital of Uttarakhand, situated in the foothills of the Himalayas.

• Features: Known for its rich biodiversity, proximity to protected areas like Rajaji National Park and Corbett Tiger Reserve.

• Institutions: Hosts major research and conservation institutions such as Wildlife Institute of India (WII), Forest Research Institute (FRI), and Indian Council of Forestry Research and Education (ICFRE).

• Wildlife Institute of India (WII):

• Established in 1982, WII is a premier institute for wildlife research and biodiversity conservation.

• Provides training, conducts research, and creates awareness about conservation issues.

• Played a key role in organizing ICCON 2025.

• Forest Research Institute (FRI):

• Established in 1906, FRI is a renowned institute for forestry research and education.

• Its iconic building is a National Heritage Site, reflecting the institute's contributions to biodiversity conservation.

• Supports sustainable forest management and ecological studies.

• Biodiversity Conservation in India:

• India is one of the 17 megadiverse countries, hosting over 8% of global biodiversity.

• Major efforts like the National Biodiversity Action Plan (NBAP) and various protected areas aim to conserve flora and fauna.

• Events like ICCON 2025 serve as platforms to promote awareness and international cooperation for biodiversity conservation.

Important Points

• Other Venue Options:

• Madurai: Known for its cultural heritage and temples, but lacks direct biodiversity conservation institutions.

• Shimla: Situated in Himachal Pradesh, known for its scenic beauty but not a hub for biodiversity conferences.

• Raipur: Capital of Chhattisgarh, primarily known for its industrial growth rather than conservation initiatives.

• ICCON Themes:

• Focused on integrating scientific research and policy-making for addressing environmental challenges.

• Promoted sustainable practices for development without compromising biodiversity.

• Highlighted local community involvement in conservation efforts.

• Global Participation:

• Delegates from United Nations Environment Programme (UNEP), International Union for Conservation of Nature (IUCN), and other global organizations attended ICCON 2025.

• Collaborations were proposed for transboundary conservation projects and climate change mitigation strategies.

Q94. Answer: (c) New Delhi

The correct answer is New Delhi.

Key Points

• The Bharatiya Bhasha Anubhag (Indian Languages Section) was launched by Union Home Minister Amit Shah on 6 June 2025 to promote Indian languages.

• It was inaugurated at New Delhi, which serves as the administrative capital of India and a hub for major policy launches and initiatives.

• The initiative aims to encourage the use and development of Indian languages in education, administration, and everyday life to preserve India's linguistic heritage.

• The program aligns with the National Education Policy (NEP) 2020, which emphasizes the importance of regional languages for better learning outcomes and cultural preservation.

• The Indian Languages Section is intended to function as a dedicated department for research, development, and promotion of Indian languages, fostering a sense of unity in diversity.

Additional Information

• Importance of New Delhi:

• New Delhi is India's national capital and a central location for government offices, ministries, and international organizations.

• It is often chosen as the venue for launching significant national-level initiatives and schemes.

• National Education Policy (NEP) 2020:

• The NEP 2020 advocates the use of mother tongue/regional languages as the medium of instruction up to at least Grade 5, and preferably till Grade 8 and beyond.

• It encourages the development and promotion of Indian languages, arts, and culture to ensure India's rich heritage is preserved.

• Indian Languages in Focus:

• India is home to 22 officially recognized languages under the Eighth Schedule of the Indian Constitution and hundreds of regional and tribal languages.

• The launch of the Bharatiya Bhasha Anubhag aims to support these languages through research, digitization, and promotion efforts.

• Steps to Promote Indian Languages:

• Government initiatives like the Ek Bharat Shreshtha Bharat program promote cultural and linguistic exchange among states.

• Technology-driven solutions, such as AI-based translation tools, are being developed to bridge language barriers.

Important Points

• Union Home Minister Amit Shah's Role:

• Amit Shah has been actively promoting the use of Hindi and regional languages as part of the government's efforts to preserve India's linguistic diversity.

• He has also emphasized the use of Indian languages in governance and education to strengthen national integration.

• Impact of Bharatiya Bhasha Anubhag:

• The initiative is expected to create more resources, including books and digital content, in regional languages.

• It will foster inclusivity and ensure that people from diverse linguistic backgrounds feel represented and valued.

• This program is likely to benefit students, scholars, and the general public by providing access to education and information in their native languages.

Q95. Answer: (c) Similipal

The correct answer is Similipal.

Key Points

• Similipal National Park, located in the state of Odisha, has recently been recognized as India's 107th National Park, adding to the country's list of protected wildlife areas.

• Similipal derives its name from the abundance of Simul trees (silk cotton trees) found in the region.

• It was earlier designated as a Tiger Reserve in 1973 under Project Tiger and has been a Biosphere Reserve since 1994.

• This park is renowned for its rich biodiversity, which includes unique species such as the Royal Bengal Tiger, Asian elephant, and Indian bison, among others.

• The park also boasts beautiful landscapes and features waterfalls like Barehipani and Joranda, dense forests, and a variety of flora and fauna.

• Recognizing Similipal as a National Park strengthens its conservation status, ensuring further protection of its ecosystems and wildlife.

Additional Information

• Similipal National Park Features:

• Spread over an area of 2,750 square kilometers, Similipal is one of the largest National Parks in India.

• The park hosts over 94 species of orchids and more than 3,000 species of plants, making it a haven for botanists.

• Similipal is home to over 55 mammal species, 304 bird species, 60 reptile species, and numerous amphibians and insects.

• The park is part of the Mayurbhanj district in Odisha and forms an important part of the Eastern Ghats biodiversity hotspot.

• Other National Parks in India:

• India has a total of 107 National Parks, and each plays a critical role in wildlife conservation.

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• Some prominent National Parks include Jim Corbett National Park (Uttarakhand), Kaziranga National Park (Assam), Sundarbans National Park (West Bengal), and Gir National Park (Gujarat).

• Each park is vital for preserving the unique ecosystems and biodiversity of its region.

• Importance of National Parks:

• National Parks serve as protected areas to conserve endangered species and their habitats.

• They help in maintaining ecological balance and contribute to climate regulation.

• They provide opportunities for eco-tourism, promoting awareness and sustainable development.

• National Parks also play a significant role in scientific research and biodiversity studies.

• Key Characteristics of Other Options:

• Buxa Tiger Reserve: Located in West Bengal, it is known for its diverse fauna and is a critical tiger habitat.

• Nagarhole National Park: Situated in Karnataka, it is part of the Nilgiri Biosphere Reserve and is famous for its population of tigers and elephants.

• Palamau Tiger Reserve: Located in Jharkhand, it is one of India's first tiger reserves established under Project Tiger.

Important Points

• Legal Framework for National Parks:

• National Parks are governed under the Wildlife Protection Act of 1972, ensuring legal protection for wildlife and their habitats.

• Activities like hunting, poaching, and deforestation are strictly prohibited in National Parks.

• The Ministry of Environment, Forest, and Climate Change oversees the management and expansion of National Parks.

• Conservation Challenges:

• Encroachment, deforestation, and human-wildlife conflicts are significant threats to National Parks.

• Climate change impacts biodiversity and ecosystems within protected areas.

• Government initiatives like Project Tiger and Project Elephant aim to address these challenges and strengthen conservation efforts.

Q96. Answer: (b) ECINET

The correct answer is ECINET.

Key Points

• ECINET stands for Election Commission Internet, which is a new digital platform being developed by the Election Commission of India (ECI) to enhance transparency, efficiency, and accessibility in the electoral process.

• The platform is expected to integrate various election-related services such as voter registration, candidate nomination, election results dissemination, and voter facilitation services.

• ECINET will serve as a centralized repository for all election-related data, enabling citizens to access information in real-time and reducing procedural delays in election management.

• The platform is being designed with features like secure data encryption, user-friendly interfaces, and multilingual support to cater to India's diverse population.

• The initiative aligns with the Digital India mission, leveraging technology to strengthen democratic processes and ensure inclusivity in elections.

Additional Information

• Election Commission of India (ECI):

• The Election Commission of India is a constitutional body established in 1950 under Article 324 of the Indian Constitution.

• Its primary function is to conduct free and fair elections in India for the Lok Sabha, Rajya Sabha, and State Legislative Assemblies, as well as the offices of the President and Vice President.

• The ECI ensures the implementation of the Model Code of Conduct and oversees voter education campaigns like SVEEP (Systematic Voters' Education and Electoral Participation).

• Digital India Mission:

• Launched in July 2015, the Digital India mission aims to transform India into a digitally empowered society and knowledge economy.

• Key objectives include providing digital infrastructure as a utility to every citizen, promoting digital literacy, and delivering government services digitally.

• Initiatives under this mission include e-Governance platforms, digital payment systems, and projects like DigiLocker and UMANG app.

• Features of ECINET:

• Integration of AI and machine learning for predictive analysis and voter behavior studies.

• Provision for remote voting to facilitate voting for migrant workers and NRIs (Non-Resident Indians).

• Enhanced cybersecurity measures to prevent data breaches and ensure the integrity of election processes.
• Real-time monitoring and updates during the election process to ensure transparency.
• Importance of Digital Platforms in Elections:
• Digital platforms streamline administrative processes, reducing manual errors and time delays.
• They enhance voter outreach and awareness by providing easy access to information like polling booth locations and voter lists.
• Online platforms like ECINET help in maintaining transparent and tamper-proof electoral rolls.
• They support initiatives like e-filing of nominations and digital grievance redressal systems.

Important Points

• Other Digital Innovations by ECI:
• Voter Helpline App: A mobile application providing services like voter registration, grievance redressal, and access to election-related news.
• e-EPIC: A digital version of the Electoral Photo Identity Card that can be downloaded and stored electronically.
• cVIGIL App: An app for citizens to report violations of the Model Code of Conduct during elections.
• Suvidha Portal: A single-window platform for candidates and political parties to file nominations and track permissions.
• Global Examples of Digital Electoral Platforms:
• Estonia: The first country to introduce online voting in 2005, with a secure system ensuring voter anonymity.
• USA: Various states utilize electronic voting machines (EVMs) and online voter registration systems to enhance electoral efficiency.
• Brazil: The country extensively uses electronic voting systems for its elections, ensuring quick and accurate results.

Q97. Answer: (a) Easy Jamabandi Portal

The correct answer is Easy Jamabandi Portal.

Key Points

• The Easy Jamabandi Portal was launched in Punjab in June 2025 to digitize land records and enhance transparency in registry services.
• This portal aims to reduce corruption and ensure a seamless process for land-related transactions by providing easy access to digital records.
• The portal integrates advanced technology to manage land records, ensuring accuracy and reducing manual errors in data entry and retrieval.
• The initiative is part of the Punjab government's broader goal to promote e-governance and improve citizen services in the state.
• By digitizing land records, the portal has also helped resolve land disputes efficiently, saving time and resources for both the government and the citizens.

Additional Information

• Digitization of Land Records in India:
• The Digital India Land Records Modernization Programme (DILRMP) was launched in 2008 to digitize and modernize land records across India.
• This program aims to achieve a conclusive land-titling system and reduce land-related disputes, which account for a significant percentage of court cases in India.
• Features of DILRMP include digitization of cadastral maps, integration of property registration with land records, and the creation of a centralized database.
• Functions of Easy Jamabandi Portal:
• Provides citizens with online access to land records, including Jamabandi (Record of Rights), mutation details, and other related services.
• Enables real-time updates on land ownership and transactions, minimizing fraudulent activities.
• Facilitates e-stamping and online payment of registry fees, streamlining the process for property registration.
• Impact of Digitization in Punjab:
• The portal has significantly reduced the need for middlemen, thereby curbing corruption in land-related transactions.
• It has enhanced the efficiency and transparency of the revenue department by providing a user-friendly online interface for citizens.
• The initiative supports the state’s vision to promote digital governance and achieve a paperless administration.
• Challenges in Land Record Digitization:
• Ensuring data accuracy during digitization, especially for legacy records that may contain errors or inconsistencies.
• Overcoming resistance from traditional stakeholders who may oppose transparency initiatives.
• Providing adequate training to government officials and citizens to use the portal effectively.

Important Points

• Key Features of Easy Jamabandi Portal:

• Enables citizens to access land records from the comfort of their homes, reducing the need for physical visits to government offices.

• Integrates GIS technology for mapping land boundaries and ensuring spatial accuracy.

• Offers a grievance redressal mechanism for citizens to report and resolve issues related to land records.

• Supports the government's goal of creating a centralized digital database for land records, which can be accessed across departments.

• Global Practices in Land Record Management:

• Countries like Estonia and Singapore are pioneers in land record digitization, using blockchain technology to ensure secure and tamper-proof records.

• India can adopt similar technologies to enhance the security and reliability of its land record systems.

Q98. Answer: (b) Retail and e-commerce incubation

The correct answer is Deep-tech entrepreneurship and AI innovation.

Key Points

• District I, launched in Bengaluru Airport City, is designed to promote deep-tech entrepreneurship and foster AI innovation.

• The hub acts as a catalyst for technology-driven businesses, enabling startups and established companies to collaborate and innovate in a supportive ecosystem.

• Its focus on AI and deep-tech solutions aims to address challenges in sectors like healthcare, retail, logistics, and smart infrastructure.

• The initiative aligns with India's broader goals of becoming a global leader in cutting-edge technologies such as artificial intelligence, machine learning, and blockchain.

• The hub provides state-of-the-art facilities, including research labs, incubators, and networking opportunities, to foster collaboration among innovators, researchers, and entrepreneurs.

Additional Information

• Bengaluru Airport City:

• Bengaluru Airport City is a modern infrastructure hub near Kempegowda International Airport.

• It is envisioned as a smart city with advanced facilities for technology, retail, and green initiatives.

• The city hosts initiatives like District I to attract global talent and investment in cutting-edge industries.

• AI and Deep-Tech Innovations:

• Deep-tech includes technologies like AI, machine learning, robotics, IoT, and blockchain.

• These technologies are being used in sectors like healthcare, automotive, logistics, and smart cities.

• India is rapidly advancing in AI, with initiatives like the National AI Strategy aimed at fostering innovation and application.

• Startup Ecosystem in Bengaluru:

• Bengaluru is known as the Silicon Valley of India due to its thriving startup ecosystem.

• It houses over 10,000 startups, including unicorns like Flipkart, Ola, and Byju's.

• Government-backed initiatives like Startup India and local incubators have contributed to Bengaluru's leadership in innovation.

• Global Innovation Hubs:

• Innovation hubs like District I aim to foster global collaboration in technology and entrepreneurship.

• These hubs attract investments, talent, and partnerships from across the globe.

• Examples include Silicon Valley in the USA and Shenzhen in China, which are internationally recognized for their innovation ecosystems.

Important Points

• India's AI Strategy: India has launched initiatives like the National AI Portal and AI for All programs to democratize AI access and encourage innovation.

• Deep-Tech Ecosystem: Deep-tech startups receive support through incubators, government grants, and private investments, fostering a robust innovation ecosystem.

• Bengaluru's Leadership: Bengaluru remains at the forefront of India's innovation hubs due to its talent pool, infrastructure, and strategic initiatives.

Q99. Answer: (c) Indian Institute of Tropical Meteorology

The correct answer is Indian Institute of Tropical Meteorology.

Key Points

• The Indian Institute of Tropical Meteorology (IITM), located in Pune, Maharashtra, is an autonomous institute under the Ministry of Earth Sciences, Government of India.

• The IITM launched the Bharat Forecast System in May 2025 to provide more precise and localized rain alerts to address the challenges of weather prediction in India.

• This advanced system incorporates high-resolution numerical weather prediction models, which enable sharper and more accurate predictions of rainfall at regional and local levels.

• The system is particularly beneficial for sectors like agriculture, water resource management, and disaster preparedness, ensuring effective planning and mitigation of weather-related risks.

• The IITM is renowned for its contributions to weather and climate research, including monsoon studies, tropical cyclone predictions, and climate modeling, making it the ideal institution to develop such a system.

Additional Information

• Indian Institute of Tropical Meteorology (IITM):

• Established in 1962, the IITM is dedicated to research in tropical meteorology and climate systems.

• The institute is involved in the development of advanced weather forecasting tools and models, including monsoon prediction systems.

• It plays a pivotal role in understanding and addressing climate variability, air pollution, and atmospheric processes in the tropics.

• One of its flagship projects includes the Monsoon Mission, which aims to improve monsoon forecasting capabilities in India.

• Bharat Forecast System:

• Launched by the IITM in 2025, this system is designed to provide real-time, high-resolution weather forecasts.

• It incorporates cutting-edge technology such as machine learning, satellite data assimilation, and advanced computational models.

• Its primary focus is to provide accurate rainfall predictions, which are critical for agriculture, urban planning, and disaster management.

• The system also supports early warning systems for extreme weather events, enhancing India's disaster response capabilities.

• Other Relevant Organizations:

• India Meteorological Department (IMD): Responsible for weather forecasts, early warnings, and cyclone tracking in India.

• Indian Institute of Science (IISc): Focuses on scientific research and advanced studies, contributing to atmospheric and climate sciences.

• National Centre for Medium Range Weather Forecasting (NCMRWF): Specializes in medium-range weather predictions and model development.

• Applications of Advanced Weather Forecasting:

• Improved agricultural planning and yield prediction.

• Enhanced flood and drought management strategies.

• Better urban planning and infrastructure development.

• Strengthened disaster preparedness and mitigation efforts.

Important Points

• Why Accurate Rainfall Prediction is Crucial:

• India's economy is largely agrarian, with over 50% of the population dependent on agriculture, which is highly sensitive to rainfall variability.

• Extreme weather events such as floods, droughts, and cyclones cause significant damage to infrastructure, crops, and livelihoods.

• Accurate weather forecasts enable governments and communities to take proactive measures to minimize losses.

• Recent Developments in Weather Forecasting:

• India has invested in advanced technologies such as Doppler weather radars, satellite systems, and supercomputers for enhanced forecasting.

• Programs like the National Monsoon Mission have significantly improved India's ability to predict monsoon patterns.

• Collaboration with international organizations, such as the World Meteorological Organization (WMO), has bolstered India's weather prediction capabilities.

Q100. Answer: (b) Rs. 684 Crores

The correct answer is Rs. 684 Crores.

Key Points

• The plantation budget for afforestation schemes in the financial year 2025 is allocated at Rs. 684 Crores, reflecting the government’s commitment to environmental conservation.

• This budget allocation is part of the broader agenda of enhancing green cover in India to counter deforestation and promote

sustainability.

• Afforestation schemes typically aim to address issues like climate change mitigation, soil erosion, and the loss of biodiversity.

• The fund will be utilized for various activities, including tree planting drives, forest management, and community-based afforestation programs.

• The allocation of Rs. 684 Crores marks a significant increase compared to previous years, underscoring the importance of afforestation in national policy frameworks.

Additional Information

• Afforestation Schemes in India:

• Afforestation schemes are aimed at converting non-forest land into forest areas to increase the forest cover in the country.

• Such schemes are implemented under programs like the National Afforestation Programme (NAP) and the Green India Mission (GIM).

• The Compensatory Afforestation Fund Management and Planning Authority (CAMPA) is also a key contributor to afforestation efforts in India.

• Environmental Impact:

• Afforestation helps in combating climate change by acting as a carbon sink and reducing greenhouse gas emissions.

• It plays a crucial role in improving air quality, enhancing soil fertility, and preventing land degradation.

• Afforestation contributes to the preservation of biodiversity by providing habitats for wildlife.

• Government Policies and Initiatives:

• The National Forest Policy, 1988 aims to bring one-third of the total geographical area under forest cover.

• Programs like the Green India Mission (GIM) focus on increasing forest and tree cover to enhance ecosystem services.

• The CAMPA fund ensures that industries compensate for diverted forest land through afforestation projects.

• Global Context:

• India's afforestation initiatives align with global efforts like the UN Decade on Ecosystem Restoration, which aims to prevent, halt, and reverse ecosystem degradation worldwide.

• Afforestation contributes to achieving the targets set under the Paris Agreement and the Sustainable Development Goals (SDGs).

Important Points

• Compensatory Afforestation Fund Act, 2016:

• This Act governs the management of compensatory afforestation funds, ensuring that these funds are used effectively for environmental conservation.

• It mandates the establishment of state-level and national-level CAMPA to oversee fund utilization.

• Challenges in Afforestation:

• Issues like land availability, fund utilization, and ensuring community participation pose challenges to afforestation efforts.

• Monitoring and evaluating the success of afforestation projects is crucial to ensure long-term sustainability.

• Role of Technology:

• Technologies like GIS mapping and remote sensing are being used to monitor afforestation efforts effectively.

• Drone technology is also being explored for large-scale planting and monitoring activities.

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