RRB Group D Official Paper (Held On: 04 Feb, 2026 Shift 3) (Previous Year Paper)

RRB Group D • 2026 • 100 questions • 90 minutes • Answer key and solutions

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GENERAL SCIENCE

Q1. How is the timely sowing of crops helpful for the farmer?

(a) It increases weed growth.
(b) It decreases crop yield.
(c) It avoids competition with weeds.
(d) It attracts pests.

Q2. When the terminal phosphate linkage in ATP is broken using water, the energy equivalent to _____ kJ/mol is released.

(a) 5
(b) 30.5
(c) 71.5
(d) 50

Q3. What does the presence of parallel straight magnetic field lines inside a solenoid indicate?

(a) The magnetic field is non-uniform and changes at different points
(b) The magnetic field is zero inside the solenoid
(c) The magnetic field is infinite inside the solenoid
(d) The magnetic field is uniform inside the solenoid

Q4. In uniform circular motion, the direction of velocity of an object is:

(a) Along the radius, toward the center
(b) Perpendicular to the axis of rotation
(c) Along the radius, away from the center
(d) Tangential to the circular path

Q5. What is the best way to manage non-biodegradable waste such as plastic?

(a) Bury it in soil
(b) Burn it in open air
(c) Mix it with compost
(d) Recycle and reuse it

Q6. Which one of the following is NOT a tissue?

(a) Nerves
(b) Red blood cells
(c) Muscles
(d) Blood

Q7. In the reaction CuO + H2 → Cu + H2O, which substance is oxidised?

(a) Copper oxide
(b) Water
(c) Hydrogen
(d) Copper

Q8. Which of the following statements is correct about the absolute refractive index?

(a) It is always greater than 1.
(b) It is always equal to 1.
(c) It is always negative.
(d) It is always less than 1.

Q9. From a distance–time graph, an object moves from point A to point B, covering a distance (s2 - s1) in time (t2 - t1). Which of the following correctly represents the speed (v) of the object?

(a) v = (s2 - s1)/(t2 - t1)
(b) v = (s2 - s1)(t2 - t1)
(c) v = (t2 - t1)/(s2 - s1)
(d) v = (s1 - s2)(t1 - t2)

Q10. Which feature is common to all solids?

(a) Easily compressible structure when pressure applied
(b) Definite volume and shape under normal conditions
(c) Ability to flow like liquids in open containers
(d) Infinite expansion capability with added energy

Q11. According to Bohr's model of an atom, the 'M' shell is represented by the principal quantum number 'n' equal to:

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

Q12. The regular changes in the ovary and uterus during egg formation is called _____.

(a) menstrual cycle
(b) fertilisation cycle
(c) circadian rhythm
(d) estrous cycle

Q13. The sexually transmitted disease AIDS is caused by which of the following?

(a) Helminths
(b) Virus
(c) Protozoa
(d) Bacteria

Q14. A girl clapped her hands near a cliff and heard the echo after 4 s. What is the distance of the cliff from the girl if the speed of the sound is taken as 320 m s^(-1) ?

(a) 320 m
(b) 640 m
(c) 80 m
(d) 1280 m

Q15. Where are protons found in an atom?

(a) Nucleus
(b) Electron Cloud
(c) Orbitals
(d) Energy Levels

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Q16. Which of the following is/are true about the acceleration due to gravity?

(i) The value of acceleration due to gravity depends on the mass of the object falling under the effect of gravity.

(ii) The value of acceleration due to gravity is universally constant.

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

Q17. What does variation within a species ensure?

(a) No mutations
(b) Better adaptability and chances of survival
(c) No evolution
(d) Similar response to environmental changes

Q18. Which of the following statements is/are NOT true regarding the work done by a constant force acting on a body?

(i) The work done by the force can never be negative.

(ii) If the direction of the force and displacement of the body is same, the work done will be positive.

(iii) The S.I. unit of work done is Pascal.

(a) Both (i) and (iii)
(b) Only (i)
(c) Both (ii) and (iii)
(d) Only (ii)

Q19. Which of the following is NOT correct according to the sign convention for spherical lenses?

(a) Object is always placed on the left of the lens.
(b) Focal length of a concave lens is taken as negative.
(c) Distances measured to the right of the optical centre are positive.
(d) Focal length of a convex lens is taken as negative.

Q20. Rough endoplasmic reticulum (RER) bears ___ for protein synthesis, while smooth endoplasmic reticulum (SER) synthesizes ___.

(a) lysosomes; DNA
(b) enzymes; sugars
(c) ribosomes; lipids
(d) pores; RNA

Q21. Why does the temperature of ice remain constant during the melting of ice?

(a) Ice absorbs heat but does not melt
(b) Ice reflects heat
(c) Ice becomes denser
(d) Heat is used to break the bonds between molecules

Q22. What happens to the magnetic field strength produced by a circular coil if the number of turns (n) is increased while keeping the current constant?

(a) It becomes n times larger than for a single turn.
(b) It decreases inversely with n.
(c) It only increases if the diameter is also increased.
(d) It remains the same as for a single turn.

Q23. Which of the following types of reactions is a neutralisation reaction?

(a) Single displacement
(b) Combustion
(c) Decomposition
(d) Double displacement

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Q24. What is typically involved in an addition reaction?

(a) Functional groups are replaced by others
(b) Removal of atoms from molecules takes place
(c) Atoms get added to unsaturated bonds
(d) Oxidation changes without new bonding

Q25. The sulphide ores of metals, which lie in the middle of activity series, are first converted to oxides. The necessary condition for this conversion is:

(a) presence of high pressure
(b) presence of excess air
(c) presence of high temperature
(d) absence of oxygen

MATHEMATICS

Q26. An employee claims Rs. 20 for each kilometre when he travels by taxi and Rs. 10 for each kilometre if he travels by his own car. In one week, he claimed Rs. 2,200 for travelling 120 km. How many kilometres did he travel by taxi?

(a) 90
(b) 80
(c) 95
(d) 100

Q27. The number of prime numbers lying between 376 and 384 is:

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

Q28. The product of two numbers is 324 and their HCF is 3. Then their LCM will be:

(a) 36
(b) 321
(c) 108
(d) 102

Q29. A, B and C can do a piece of work in 3, 6 and 6 days, respectively. How long (in days) will they take to do twice the same work, working together?

(a) 6
(b) 3
(c) 4
(d) 9

Q30. A contractor employed 24 men to build a wall, and they completed the work in 12 days. After working together for 5 days, 6 men leave the job and do not return. How many days more will the remaining men take to complete the work?

(a) 91/3 days
(b) 82/3 days
(c) 92/3 days
(d) 101/2 days

Q31. The average age of 48 students of a class is 19 years. If the age of the teacher is also included, the average age of the whole group becomes 20 years. The age (in years) of the teacher is:

(a) 69
(b) 65
(c) 67
(d) 68

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Q32. A car covers three successive 20 km distances at speeds of 10 km/hr, 20 km/hr and 40 km/hr, respectively. Its average speed (in km/hr) is:

(a) 132/5
(b) 191/5
(c) 171/7
(d) 153/7

Q33. By how much is 60% of 45 greater than 2/5 of 15?

(a) 18
(b) 15
(c) 21
(d) 19

Q34. A car goes to a place at a speed of 24 km/hr and returns from there at a speed of 28 km/hr. The average speed (in km/hr, rounded off to 2 decimal places) of the car in the entire journey is:

(a) 25.85
(b) 24.82
(c) 27.34
(d) 22.12

Q35. The amount on a sum of Rs. 4,200 at 10% per annum compound interest, compounded annually, in 2 years will be:

(a) Rs. 5,082
(b) Rs. 5,938
(c) Rs. 5,942
(d) Rs. 5,102

Q36. Find the single equivalent discount (rounded off to two decimal places) for successive discounts of 18%, 6% and 25%.

(a) 42.07%
(b) 42.19%
(c) 42.89%
(d) 41.85%

Q37. The ratio of length, breadth and height of a cuboid box is in the ratio 5 : 4 : 4 while the areas of the three adjacent faces of a cuboidal box are 160 cm^2, 64 cm^2 and 40 cm^2, respectively. Find the lateral surface area of the box (in cm^2).

(a) 298
(b) 306
(c) 396
(d) 288

Q38. If Akhil is as much older than Vijay as he is younger than Karthik, and sum of the ages of Vijay and Karthik is 84 years, then find the age of Akhil.

(a) 44 years
(b) 42 years
(c) 46 years
(d) 40 years

Q39. If the length of a cuboid is 21 cm, breadth is 2 cm and the volume of the cuboid is 9198 cm^3, then find the height of the cuboid.

(a) 228 cm
(b) 212 cm
(c) 219 cm
(d) 223 cm

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Q40. The marked price of a washing machine is Rs. 45,000. A shopkeeper allows a discount of 44% and gets a profit of 80%. What is the cost price of the washing machine?

(a) Rs. 13,850
(b) Rs. 14,042
(c) Rs. 14,000
(d) Rs. 14,154

Q41. The sum of three numbers is 270. If the ratio of the second number to the first number is 2:12 and that of the third number to the second number is 5:10, then find the second number.

(a) 34
(b) 36
(c) 37
(d) 35

Q42. 1/30 is what percentage of 2/60?

(a) 1.15
(b) 100
(c) 2
(d) 1.1

Q43. Find the simplified value of (√48 + √75) ÷ √3.

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

Q44. The ratio of numbers of girls and boys participating in sports of a school is 1 : 7. If the number of girls is 300, determine the number of boys participating in the sports.

(a) 2075
(b) 2120
(c) 2100
(d) 2130

Q45. A shopkeeper buys a toy for Rs. 388 and sells it for Rs. 485. Find his profit percentage.

(a) 8%
(b) 25%
(c) 12%
(d) 19%

Q46. The average of first 8 odd natural numbers, is:

(a) 7.5
(b) 8
(c) 9
(d) 8.5

Q47. In an election, there are two candidates. The winner obtains 49% votes of the total number of voters in the electoral list and defeats the other contestant by 120 votes. If 10% of the voters did not vote, find the total number of voters in the electoral list.

(a) 1450
(b) 1500
(c) 1590
(d) 1420

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Q48. From a top of a 60 -metre-high tower, the angle of depression to a car on the ground is 30°. Find the distance from the tower to the car. (Use √3 = 1.7)

(a) 118 m
(b) 98 m
(c) 102 m
(d) 128 m

Q49. Solve: $((6.9)^3 + (2.8)^3 + (6.3)^3 - 3 \times 6.9 \times 2.8 \times 6.3)/((6.9)^2 + (2.8)^2 + (6.3)^2 - 6.9 \times 2.8 - 2.8 \times 6.3 - 6.9 \times 6.3)$

(a) 14
(b) 18
(c) 16
(d) 12

Q50. In a quadrilateral IJKL, angle I = 11° and angle J = 79°. The bisectors of angle K and angle L meet at Z. What is the measure of angle LZK ?

(a) 31°
(b) 45°
(c) 55°
(d) 51°

GENERAL INTELLIGENCE & REASONING

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

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

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

(a) 3
(b) 4
(c) 6
(d) 5

Q52. In a certain code language,

A+ B means ‘A is the son of B’,

A - B means ‘A is the brother of B’,

A x B means ‘A is the wife of B’,

and A & B means ‘A is the father of B’.

How is K related to V if ‘K+T&RxZ-V’?

(a) Father
(b) Brother's wife's father
(c) Brother
(d) Brother's wife's brother

Q53. 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) MQ−QX
(b) KO−PT
(c) FJ−KO
(d) BF−GK

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Q54. 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 peas are carrots.

All carrots are turnips.

Conclusions:

(I) Some turnips are carrots.

(II) All peas are turnips.

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

Q55. Which of the given letter-number clusters will replace the question mark (?) in the following series to make it logically complete?

QRP 64 STR 54 UVT 44 WXV 34 ?

(a) YYW 23
(b) YZX 24
(c) YAW 24
(d) YGP 23

Q56. 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?

17 D 4 B 3 C 54 A 9 = ?

(a) 11
(b) 13
(c) 12
(d) 14

Q57. Read the given statements and conclusions carefully. Assuming that the information given in the statements is true, even if it appears to be at variance with commonly known facts, decide which of the given conclusion(s) logically follow(s) from the statements.

Statements:

All hats are mats.

All hats are cats.

All dogs are cats.

Conclusions:

(I) All dogs are mats.

(II) Some cats are mats.

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

Q58. Refer to the following series and answer the question that follows (all numbers are single-digit numbers only). Counting to be done from left to right only.

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

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

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

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(d) 5

Q59. In a row of 47 people facing north, Umesh is 15^(th) from the right end. If Ketan sits 19^(th) to the left of Umesh, what is Ketan's position from the left end of the line?

(a) 14th
(b) 15th
(c) 13th
(d) 16th

Q60. In a certain code language, 'time heals wound' is coded as 'dj yk eb' and 'let time reveal' is coded as 'fx ov yk'. How is 'time' coded in that language?

(a) yk
(b) dj
(c) ov
(d) fx

Q61. Refer to the following number and symbol series and answer the question that follows. Counting to be done from left to right only.

(Left) 1 4 * @ 9 & & £ $ 7 2 8 & 9 5 £ £ # 6 * 1 % (Right)

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

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

Q62. What should come in place of the question mark (?) in the given series?

18 19 23 32 48 ?

(a) 83
(b) 85
(c) 73
(d) 75

Q63. Ashish starts from Point K and drives 12 km towards the east. He then takes a right turn; drives 10 km; turns left and drives 3 km. He then takes a right turn and drives 5 km. He then takes a right turn and drives 18 km. He takes a final right turn; drives 15 km and stops at Point Z. How far (shortest distance) and in which direction is Point Z with respect to Point K?

(All turns are 90 degree turns only unless specified.)

(a) 6 km towards north
(b) 3 km towards south
(c) 3 km towards west
(d) 6 km towards east

Q64. In the following triad, each group of letters is related to the subsequent one following a certain logic. Select from the given options, the one which follows the same logic.

INKS - KINS - SKNI

READ - ARED - DAER

(a) PLAY - LPAY - YLAP
(b) HOME - MHOE - EMOH
(c) TOMB - MTOB - OMBT
(d) FROM - FORM - MORF

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Q65. What will come in place of the question mark (?) in the following equation if '+' and '−' are interchanged and '×' and '÷' are interchanged?

8 − 7 ÷ 39 × 13 + 12 = ?

(a) 17
(b) 15
(c) 14
(d) 16

Q66. What should come in place of the question mark (?) in the given series based on the English alphabetical order?

DER UVI LMZ CDQ ?

(a) THI
(b) TUH
(c) THU
(d) TIH

Q67. Select the set in which the numbers are related in the same way as are the numbers of the following sets.

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

(15, 6, 11)

(24, 15, 20)

(a) (19, 28, 33)
(b) (16, 7, 12)
(c) (18, 9, 4)
(d) (23, 14, 9)

Q68. If 1 is added to each even digit and 1 is subtracted from each odd digit in the number 716324598, what will be the sum of all the odd digits in the new number thus formed?

(a) 20
(b) 24
(c) 26
(d) 22

Q69. A, B, C, D, E and F are sitting around a circular table, facing the centre. B sits second to the left of E. D is an immediate neighbour of B. A sits to the immediate left of B. C sits second to the right of E. F sits to the immediate left of C. What is the position of A with respect to F?

(a) Immediate right
(b) Second to the right
(c) Second to the left
(d) Immediate left

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

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

(a) WTX
(b) FCG
(c) KHL
(d) SPR

Q71. OILQ is related to SMPU in a certain way based on the English alphabetical order. In the same way, KEHM is related to OILQ. To which of the given options is TNQV related, following the same logic?

(a) XSUZ
(b) XRUZ

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(c) XSUY
(d) XRUY

Q72. 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.

(Left) 58561868515888941618425432126 (Right)

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

(a) four
(b) three
(c) five
(d) eight

Q73. A, B, C, D, N, O and P are sitting in a straight line, facing north.

Only two people sit between D and P. Only C sits to the right of O. Only one person sits between P and O. A sits at some place to the right of N but at some place to the left of B.

How many people sit between B and N?

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

Q74. What should come in place of the question mark (?) in the given series?

20 32 46 62 80 ?

(a) 100
(b) 105
(c) 106
(d) 98

Q75. Mr. Zzz ranked 14^(th) from the top and 67^(th) from the bottom in his class. How many students are there in his class?

(a) 85
(b) 86
(c) 80
(d) 89

Q76. XD 15 is related to BG 20 in a certain way. In the same way, MT 25 is related to QW 30. To which of the given options is LR 10 related, following the same logic?

(a) MS 15
(b) PU 15
(c) QW 15
(d) PV 10

Q77. Seven people (A, B, C, D, E, F and G) are sitting around a circular table, facing towards the centre.

C is an immediate neighbour of both A and D. B sits to the immediate left of D. A sits second to the left of F. G is an immediate neighbour of both B and F.

Who is sitting to the immediate right of A?

(a) B
(b) G
(c) E
(d) F

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Q78. In a certain code language, ‘LEASK’ is coded as ‘76432’ and ‘KASEY’ is coded as ‘46837’. What is the code for ‘L’ in that language?

(a) 2
(b) 3
(c) 7
(d) 4

Q79. What should come in place of the question mark (?) in the given series?

12 18 6 24 ? 30

(a) 0
(b) 48
(c) 36
(d) 25

Q80. Asim starts from Point A and drives 60 km towards the west. He then takes a right turn, drives 55 km, turns right and drives 64 km. He then takes a right turn and drives 71 km. He takes a final right turn, drives 4 km and stops at Point P. How far (shortest distance) and towards which direction should he drive in order to reach Point A again? (All turns are 90-degree turns only unless specified.)

(a) 15 km to the north
(b) 18 km to the south
(c) 17 km to the south
(d) 16 km to the north

GENERAL AWARENESS AND CURRENT AFFAIRS

Q81. In July 2025, which global insurance giant entered into a binding agreement with Jio Financial Services to form a 50:50 reinsurance joint venture?

(a) American International Group (AIG)
(b) Zurich Insurance Group
(c) Allianz Group
(d) Generali Group

Q82. Which of the following Indian Army regiments participated in the Mitra Shakti-2025 exercise?

(a) Rajput Regiment
(b) Sikh Regiment
(c) Gorkha Regiment
(d) Garhwal Regiment

Q83. In May 2025, which state / union territory government mandated rooftop sprinkler systems on high-rise buildings?

(a) Andhra Pradesh
(b) Telangana
(c) Delhi
(d) Haryana

Q84. In September 2025, what move did Karnataka take to address unemployment by building future-ready workforce capacity?

(a) International scholarship scheme for student internships abroad
(b) Reservation policy mandating jobs only for Karnataka residents
(c) State Skill Development Policy using digital and inclusive training tools
(d) Sectoral incentive plan focusing mainly on agriculture and handicrafts

Q85. In June 2025, who set a new world record of 6.28 m in the men’s pole vault at the 2025 Stockholm Diamond League?

(a) Emmanouil Karalis
(b) Sam Kendricks

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(c) Armand Duplantis
(d) Kurtis Marschall

Q86. In October 2024, which state government launched India's first integrated state-level Cyber Command and Control Centre to serve as a comprehensive hub for handling grievances through multiple channels, including a helpline, web portal and mobile app?
(a) Gujarat
(b) Maharashtra
(c) Kerala
(d) Chhattisgarh

Q87. Which of the following political parties won the most seats in the 2025 Bihar Legislative Assembly election?
(a) Indian National Congress
(b) Janata Dal (United)
(c) Rashtriya Janata Dal
(d) Bharatiya Janata Party

Q88. In which Union Budget was the Prime Minister Dhan-Dhaanya Krishi Yojana announced by the Government of India?
(a) 2020-2021
(b) 2025-2026
(c) 2023-2024
(d) 2018-2019

Q89. Which swimmer set multiple WRs in the 400 m freestyle, 200 m IM, and 400 m IM during the World Short Course Swimming Championships in Budapest, Hungary, 2024?
(a) Summer McIntosh
(b) Ariarne Titmus
(c) Katie Ledecky
(d) Katinka Hosszú

Q90. Which of the following international organizations was founded in 1945 to promote peace, security and cooperation among countries worldwide?
(a) North Atlantic Treaty Organization (NATO)
(b) World Trade Organization (WTO)
(c) United Nations (UN)
(d) International Monetary Fund (IMF)

Q91. Which of the following associations organised the 2^(nd) Federation Gatka Cup 2025 in Bengaluru in November 2025?
(a) National Gatka Association of India
(b) All India Sports and Martial Arts Council
(c) Indian Gatka and Martial Arts Federation
(d) Federation of Traditional Indian Sports

Q92. The inaugural Fit India Carnival, a three-day celebration of fitness and wellness, was held in March 2025. In which city did this pioneering event take place?
(a) Bengaluru
(b) Chennai
(c) Mumbai
(d) New Delhi

Q93. Which of the following organizations released the report titled the State of World's Forests, 2025, in May 2025?
(a) IUCN
(b) UNEP
(c) WWF
(d) FAO

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Q94. Which of the following national parks was highlighted in 2025 as a leading grassland bird habitat after its inaugural survey recorded 43 grassland bird species (including Finn's Weaver and Bengal Florican)?

(a) Dudhwa National Park
(b) Desert National Park
(c) Kaziranga National Park
(d) Keoladeo National Park

Q95. The new logo unveiled by the Ministry of Statistics & Programme Implementation (MoSPI) conveys which core theme that highlights the importance of official statistics in national progress?

(a) Economic Resurgence
(b) Digital India
(c) Data for Development
(d) Public Service Delivery

Q96. From 1 August 2025, what is the new minimum average monthly balance (MAB) ICICI Bank requires for savings accounts in metro and urban areas for new customers?

(a) Rs. 10,000
(b) Rs. 25,000
(c) Rs. 15,000
(d) Rs. 75,000

Q97. In June 2025, which disease was officially declared eliminated in India by the World Health Organization (WHO), marking a major public health milestone?

(a) Lymphatic Filariasis
(b) Kala-azar
(c) Yaws
(d) Trachoma

Q98. Which cricketer earned the prestigious title of ICC Men's Test Cricketer of the Year for 2024?

(a) Rohit Sharma
(b) Ravichandran Ashwin
(c) Jasprit Bumrah
(d) Virat Kohli

Q99. The National Tourism Day was celebrated in India on which date in 2025?

(a) 25 January 2025
(b) 24 June 2025
(c) 24 February 2025
(d) 24 May 2025

Q100. In the 2025 Uttarakhand flash flood that occurred on 5 August 2025, which Himalayan village on the route to Gangotri Dham was devastated by a torrent of water, mud and debris?

(a) Dharali in Uttarkashi district, Uttarakhand
(b) Joshimath in Chamoli district, Uttarakhand
(c) Balta in Almora district, Uttarakhand
(d) Rudraprayag in Rudraprayag district, Uttarakhand

ANSWER KEY

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

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

SOLUTIONS

Q1. Answer: (c) It avoids competition with weeds.

The correct answer is It avoids competition with weeds.

Key Points

• Timely sowing is a fundamental agronomic practice that ensures the crop is planted during the most favorable window of the growing season. This practice directly influences the germination rate and the initial growth vigor of the crop.

• When crops are sown at the optimum time, they gain a competitive advantage over weeds. The crop plants establish themselves quickly and develop a foliar canopy earlier, which shades the ground and prevents the sunlight from reaching weed seedlings, thereby suppressing weed growth. Hence, the statement "It avoids competition with weeds" is correct.

• Competition for resources such as soil moisture, nutrients (Nitrogen, Phosphorus, Potassium), and solar radiation is significantly reduced when the crop is well-established before the peak emergence of weeds.

• Timely sowing ensures that the reproductive phase of the crop does not coincide with adverse weather conditions like extreme heat or frost, which helps in maintaining a high potential yield. The statement that it decreases crop yield is incorrect.

• Proper timing reduces the weed seed bank in the soil over time because fewer weeds reach the maturity stage to shed seeds. The statement that it increases weed growth is incorrect.

• Early and uniform establishment of the crop through timely sowing often makes the plants more resilient to pest attacks and diseases. The statement that it attracts pests is incorrect.

Additional Information

• Critical Period of Crop-Weed Competition:

• This refers to the specific growth stage during which weeds must be controlled to prevent economic yield loss. For most seasonal crops, this period occurs between 15 to 45 days after sowing.

• If the field is kept weed-free during this critical window, the crop can usually tolerate later-emerging weeds without significant yield reduction.

• Allelopathy:

• Some crops, when sown timely and grown healthily, release biochemicals (allelochemicals) from their roots or decaying parts that inhibit the germination and growth of neighboring weeds. This is a form of biological weed control.

• Impact of Weeds on Agriculture:

• Weeds are considered "plants out of place" that compete aggressively for nutrients. Statistics suggest that weeds can cause a yield loss ranging from 10% to 50%, and in some cases, even 100% if left unmanaged.

• They also act as alternate hosts for several insect pests and pathogenic fungi, which can further damage the main crop.

• Integrated Weed Management (IWM):

• IWM is a holistic approach that combines cultural (timely sowing, crop rotation), mechanical (hoeing, weeding), biological, and chemical (herbicides) methods to keep weed populations below the Economic Threshold Level (ETL).

• Line sowing at the correct depth and spacing further enhances the effectiveness of timely sowing by allowing for easier mechanical weeding later on.

Q2. Answer: (b) 30.5

The correct answer is 30.5.

Key Points

• ATP (Adenosine Triphosphate) is known as the energy currency of the cell because it provides the energy required for various metabolic activities.

• When the terminal phosphate linkage in ATP is broken by the addition of a water molecule, the process is called hydrolysis.

• This hydrolysis reaction releases a specific amount of energy, which is equivalent to 30.5 kJ/mol (kilojoules per mole) under standard conditions. Hence, the numerical value is 30.5.

• The chemical reaction can be represented as: ATP + H2O → ADP + Pi + Energy, where ADP is Adenosine Diphosphate and Pi is inorganic phosphate.

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• The energy released is used to power endergonic reactions within the cell, such as protein synthesis, muscle contraction, and active transport across membranes.

Additional Information

• Molecular Structure: ATP consists of a nitrogenous base called Adenine, a pentose sugar called Ribose, and three phosphate groups attached in a chain.

• High-Energy Bonds: The bonds between the phosphate groups are phosphoanhydride bonds. These are considered high-energy bonds because the phosphate groups are negatively charged and repel each other, making the bond unstable and ready to release energy upon breaking.

• ATP Regeneration: Cells regenerate ATP from ADP and inorganic phosphate using energy obtained from the breakdown of food molecules (like glucose) during cellular respiration.

• Discovery: ATP was first discovered in 1929 by the scientist Karl Lohmann. Its central role in energy transfer was later clarified by Fritz Lipmann in 1941.

• Location of Synthesis: In eukaryotic cells, the majority of ATP is produced in the Mitochondria through the process of oxidative phosphorylation.

Important Points

• Standard vs. Physiological Conditions: While the standard free-energy change (ΔG°) is -30.5 kJ/mol, the actual energy released in a living cell (ΔG) can be much higher, often ranging between 50 to 60 kJ/mol, depending on the pH, temperature, and concentrations of ATP, ADP, and Pi.

• Role of Magnesium: In biological systems, ATP hydrolysis usually requires Magnesium ions (Mg^{2+}), which bind to the phosphate groups and help stabilize the transition state of the reaction.

• Other Nucleotides: While ATP is the most common, other nucleoside triphosphates like GTP (Guanosine Triphosphate) also provide energy for specific processes like protein synthesis and signal transduction.

Q3. Answer: (d) The magnetic field is uniform inside the solenoid

The correct answer is The magnetic field is uniform inside the solenoid.

Key Points

• A solenoid is defined as a coil consisting of many circular turns of insulated copper wire wrapped closely in the shape of a cylinder.

• When an electric current flows through a solenoid, it produces a magnetic field around and inside it. The magnetic field lines inside the solenoid are in the form of parallel straight lines.

• The presence of these parallel straight lines indicates that the magnetic field is uniform inside the solenoid. This means the magnitude and direction of the magnetic field are the same at all points within the interior of the solenoid. Hence, the correct option is the magnetic field is uniform inside the solenoid.

• The magnetic field lines of a current-carrying solenoid resemble the pattern of magnetic field lines produced by a bar magnet, where one end acts as a North pole and the other as a South pole.

• The uniformity of the field is a characteristic of an ideal or long solenoid, where the length is much greater than the diameter, ensuring the field lines remain equidistant and parallel.

Additional Information

• Factors Affecting Magnetic Field Strength: The strength of the magnetic field (B) inside a solenoid depends on several factors, including the number of turns per unit length (n) and the magnitude of the current (I) passing through the wire. Increasing either of these will increase the magnetic field intensity.

• Electromagnets: A strong, uniform magnetic field inside a solenoid can be utilized to magnetize ferromagnetic materials, such as a soft iron core. When a soft iron rod is placed inside the solenoid, it becomes an electromagnet, which retains its magnetism only as long as the current flows.

• Polarity and Direction: The direction of the magnetic field lines outside the solenoid is from the North pole to the South pole, whereas inside the solenoid, the direction is from the South pole to the North pole, forming continuous closed loops.

• Zero Field Outside: In the case of an ideal solenoid that is infinitely long, the magnetic field outside the coil is considered to be zero because the field lines cancel each other out or spread to infinity.

• Right-Hand Thumb Rule: This rule can be used to determine the direction of the magnetic field. If the fingers of the right hand are curled in the direction of the current in the turns, the thumb points toward the North pole of the solenoid.

Important Points

• Applications: Solenoids are widely used in engineering and physics as actuators, valves, and switches. They are fundamental components in car starters, doorbell mechanisms, and industrial controls.

• Material Core: The use of a soft iron core significantly enhances the magnetic flux compared to an air-core solenoid, making the device much more powerful for lifting heavy loads or relay operations.

• Discovery: The term "solenoid" was coined by the French physicist André-Marie Ampère in the year 1823 to describe a helical coil.

Q4. Answer: (d) Tangential to the circular path

The correct answer is Tangential to the circular path.

Key Points

• In Uniform Circular Motion (UCM), an object travels along a circular path at a constant speed. However, since velocity is a vector quantity, it involves both magnitude and direction.

• The direction of velocity at any point in the circular path is always tangential to the circle at that specific point. Hence, statement 4 is correct.

• The velocity vector is always perpendicular (at a 90-degree angle) to the radius of the circular path. This ensures that the motion is always directed along the curve.

• Even though the speed remains constant in UCM, the continuous change in the direction of velocity means the object is constantly accelerating.

• A practical example is a stone tied to a string and whirled in a circle; if the string breaks, the stone will fly off in a straight line along the tangent to the circle at the point where it was released.

Additional Information

• Centripetal Acceleration:

• While velocity is tangential, the acceleration in uniform circular motion is directed radially inward, toward the center of the circle.

• This is known as centripetal acceleration, and its magnitude is given by the formula $a = v^2/r$, where v is linear velocity and r is the radius. Hence, statement 1 describes acceleration, not velocity.

• Centripetal Force:

• According to Newton's Second Law, an inward acceleration requires an inward force. This force is called centripetal force ($F = mv^2/r$).

• In the case of a planet orbiting a star, the gravitational force provides the necessary centripetal force to maintain circular motion.

• Angular Velocity (ω):

• The rate at which the object rotates around the center is called angular velocity.

• The relationship between linear velocity (v) and angular velocity (ω) is defined by the equation $v = r\omega$.

• Displacement and Distance:

• In one complete revolution, the distance covered by the object is equal to the circumference of the circle ($2\pi r$).

• However, the net displacement of the object after one full 360-degree rotation is zero, as the object returns to its original starting position.

Important Points

• Direction of Motion: In circular motion, the direction of motion is the same as the direction of velocity.

• Axis of Rotation: The axis of rotation is an imaginary line around which the object rotates. In two-dimensional circular motion, the velocity is perpendicular to the radius but stays within the plane of rotation. Hence, statement 2 is partially descriptive of the plane but does not define the specific direction of velocity.

• Centrifugal "Force": From the frame of reference of the rotating object, an outward "force" called centrifugal force is often felt, but in an inertial frame, only the inward centripetal force exists. Hence, statement 3 (away from center) describes the fictitious centrifugal effect, not the velocity.

Q5. Answer: (d) Recycle and reuse it

The correct answer is Recycle and reuse it.

Key Points

• Non-biodegradable waste refers to materials that cannot be broken down or decomposed by natural agents such as bacteria, fungi, or biological processes over time. Plastic, glass, and metal scraps are prominent examples.

• Recycle and reuse it is the most sustainable and effective method for managing plastic waste. Recycling involves processing used materials into new products to prevent the waste of potentially useful materials, while reusing involves using an item multiple times for the same or a different purpose. Hence, the correct answer is option 4.

• Burying plastic in soil (landfilling) is highly detrimental as it leads to soil pollution. Since plastic does not decompose for hundreds of years, it creates a barrier in the soil that prevents the seepage of rainwater into the ground, affecting groundwater recharge. Hence, statement 1 is incorrect.

• Burning plastic in open air (incineration without controls) releases extremely toxic chemicals like dioxins, furans, mercury, and polychlorinated biphenyls (PCBs) into the atmosphere. These pollutants are hazardous to human health and contribute significantly to air pollution and the greenhouse effect. Hence, statement 2 is incorrect.

• Mixing plastic with compost is not a viable solution because composting is a biological process meant only for organic/biodegradable waste. Plastic does not turn into humus; instead, it contaminates the compost with microplastics and chemical additives, making it unfit for agricultural use. Hence, statement 3 is incorrect.

Additional Information

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• The 3 R's Hierarchy: The waste management hierarchy follows the order of Reduce, Reuse, and Recycle. Reducing consumption is the most effective, followed by reusing items to extend their life cycle, and finally recycling to recover raw materials.

• Plastic Waste Management Rules, 2016 (India): These rules were notified by the Ministry of Environment, Forest and Climate Change to mandate waste segregation at the source and promote the use of plastic waste in road construction or energy recovery.

• Single-Use Plastic Ban: In India, a ban on identified single-use plastic items, which have low utility and high littering potential, came into effect on July 1, 2022. This includes items like plastic sticks for balloons, plastic flags, and thermocol.

• Microplastics: These are plastic particles smaller than 5 millimeters. They result from the fragmentation of larger plastic waste and pose a severe threat to marine ecosystems and the human food chain.

Important Points

• Extended Producer Responsibility (EPR): This is a policy approach under which producers are given a significant responsibility—financial and/or physical—for the treatment or disposal of post-consumer products.

• Circular Economy: This concept aims to redefine growth, focusing on positive society-wide benefits. It entails decoupling economic activity from the consumption of finite resources and designing waste out of the system through recycling.

• Waste Segregation: Effective recycling is only possible through source segregation where dry waste (plastic, paper, metal) is kept separate from wet waste (kitchen waste) and domestic hazardous waste.

• Biodegradable Plastics: Scientists are developing bioplastics derived from renewable biomass sources, like vegetable fats and oils or corn starch, which can decompose much faster than conventional petroleum-based plastics.

Q6. Answer: (b) Red blood cells

The correct answer is Red blood cells.

Key Points

• A tissue is a group of similar cells that work together to perform a specific function. The study of tissues is known as Histology.

• Nerves are primarily composed of nervous tissue, which consists of neurons (nerve cells) and neuroglia. They are responsible for transmitting electrical impulses throughout the body. Hence, statement 1 is a tissue.

• Red blood cells (Erythrocytes) are individual cells produced in the bone marrow. While they are a major component of blood, they are considered single cells rather than a tissue on their own. Hence, statement 2 is NOT a tissue.

• Muscles consist of muscular tissue, which is characterized by the ability to contract and relax, enabling movement. It is one of the four primary tissue types in animals. Hence, statement 3 is a tissue.

• Blood is uniquely classified as a fluid connective tissue. It is considered a tissue because it consists of a group of specialized cells (RBCs, WBCs, and platelets) that originate from a common source and function together within the plasma. Hence, statement 4 is a tissue.

Additional Information

• Types of Animal Tissues:

• Epithelial Tissue: Acts as a protective layer covering the body surface and lining internal organs (e.g., skin, inner lining of the mouth).

• Connective Tissue: Supports, binds, and protects other tissues and organs. Examples include bone, cartilage, tendons, and blood.

• Muscular Tissue: Responsible for locomotion and movement. It is divided into skeletal, smooth, and cardiac muscles.

• Nervous Tissue: Forms the brain, spinal cord, and nerves. It specialized in communication using electrochemical signals.

• Red Blood Cells (RBCs):

• They are biconcave in shape and lack a nucleus at maturity in humans to provide more space for hemoglobin.

• Their primary function is the transport of oxygen from the lungs to the tissues and carbon dioxide back to the lungs.

• The average lifespan of a human RBC is approximately 120 days.

Important Points

• Levels of Organization: In biological systems, the hierarchy of complexity begins with the cell (the basic unit of life). A group of cells forms a tissue, multiple tissues form an organ (like the heart or lungs), and organs work together in an organ system (like the circulatory system).

• Why Blood is a Tissue: Although liquid, blood meets the criteria for a tissue because it has a matrix (plasma) and specific cellular components (erythrocytes, leukocytes, and thrombocytes) that work collectively for transportation, protection, and regulation.

• Histology Origins: The term "tissue" was introduced by Marie François Xavier Bichat in the late 18th century, who is often regarded as the Father of Histology.

Q7. Answer: (c) Hydrogen

The correct answer is Hydrogen.

Key Points

• The given chemical equation CuO + H2 → Cu + H2O represents a classic redox (reduction-oxidation) reaction where both oxidation and reduction occur simultaneously.

• Oxidation is defined as the chemical process where a substance gains oxygen or loses hydrogen. In this reaction, the Hydrogen (H2) molecule reacts with Copper oxide (CuO) and gains an oxygen atom to form Water (H2O).

• Because Hydrogen is the species that acquires oxygen during the chemical change, it is the substance that is oxidised.

• Reduction, conversely, is the process where a substance loses oxygen or gains hydrogen. Here, Copper oxide (CuO) loses its oxygen atom to be converted into metallic Copper (Cu).

• Since Copper oxide undergoes the loss of oxygen, it is identified as the substance being reduced in this chemical interaction.

Additional Information

• Oxidizing and Reducing Agents:

• An oxidizing agent is a substance that facilitates oxidation by providing oxygen or accepting electrons. In this reaction, Copper oxide (CuO) is the oxidizing agent because it provides the oxygen required for the oxidation of hydrogen.

• A reducing agent is a substance that facilitates reduction by removing oxygen or donating electrons. Hydrogen (H2) acts as the reducing agent here because it removes the oxygen from the copper oxide.

• Electronic Concept of Redox:

• In modern chemistry, oxidation is also defined as the loss of electrons (increase in oxidation state), while reduction is the gain of electrons (decrease in oxidation state).

• In the reaction CuO + H2 → Cu + H2O, the Copper ion in CuO has an oxidation state of +2 and is reduced to 0 in metallic Cu. The Hydrogen atom has an oxidation state of 0 in H2 and is oxidised to +1 in H2O.

• Applications of Redox Reactions:

• These reactions are fundamental to metallurgical processes, such as the extraction of metals from their ores (e.g., using carbon or hydrogen to reduce metal oxides).

• They are also essential in biological systems for energy production (cellular respiration) and in everyday phenomena like combustion, rusting of iron, and the functioning of batteries.

Important Points

• Nature of the Reactants: Copper oxide (CuO) is typically a black solid, while metallic Copper (Cu) formed after reduction appears as a reddish-brown substance. This visible change in color is a key indicator that a chemical reaction has taken place.

• Role of Heat: This specific reaction generally requires heating the copper oxide in a stream of hydrogen gas to proceed at a measurable rate, making it an endothermic process in terms of activation energy.

• Water Formation: The Water (H2O) produced in this reaction is often released in the form of steam or water vapor due to the heat applied during the process.

• Hydrogen as a Reducer: Hydrogen is a powerful reducing agent capable of reducing the oxides of many metals that are less reactive than hydrogen in the reactivity series, such as lead, silver, and copper.

Q8. Answer: (a) It is always greater than 1.

The correct answer is It is always greater than 1.

Key Points

• The absolute refractive index of a medium is defined as the ratio of the speed of light in a vacuum to the speed of light in that specific medium.

• It is mathematically expressed by the formula n = c / v, where n is the absolute refractive index, c is the speed of light in a vacuum (approximately 3 x 10^8 meters per second), and v is the speed of light in the medium.

• According to the laws of physics, light travels at its maximum speed in a vacuum. In any other material medium (like water, glass, or oil), light interacts with atoms and slows down, meaning the value of v is always less than c.

• Because the numerator (c) is always larger than the denominator (v), the ratio will always result in a value greater than 1 for all physical media. Hence, statement 1 is correct.

• The refractive index of a vacuum is exactly 1. For all other substances, it is higher. For example, the refractive index of air is about 1.0003, which is extremely close to 1 but still greater. Hence, statement 2 is incorrect.

• The refractive index represents a ratio of two speeds, which means the units cancel out, making it a dimensionless and unitless quantity. Hence, statement 4 is incorrect.

• In natural materials, the refractive index is always positive. While scientists have engineered "metamaterials" that can have a negative refractive index under specific lab conditions, in the context of standard optics, it is not negative. Hence, statement 3 is incorrect.

Additional Information

• Optical Density: A medium with a higher refractive index is referred to as optically denser, whereas a medium with a lower refractive index is optically rarer. When light enters a denser medium, its speed decreases and it bends toward the normal.

• Common Refractive Indices:

• Water: Approximately 1.33.

• Crown Glass: Approximately 1.52.

• Diamond: Approximately 2.42, which is one of the highest among natural substances, contributing to its extreme sparkling and total internal reflection.

• Snell's Law: The refractive index is used in Snell's Law of Refraction, which states that n1 sin(i) = n2 sin(r), where i is the angle of incidence and r is the angle of refraction.

• Relative Refractive Index: This refers to the ratio of the speed of light in medium 1 to the speed of light in medium 2. Unlike the absolute refractive index, a relative refractive index can be less than 1 if light moves from a denser medium to a rarer one.

• Factors of Influence: The refractive index of a material depends on the temperature, the nature of the material, and the wavelength of light (a phenomenon known as dispersion, which causes rainbows).

Important Points

• Speed of Light: In a vacuum, light travels at 299,792,458 meters per second. For general calculations, this is rounded to 3 x 10^8 m/s.

• Relationship with Wavelength: Since the frequency of light remains constant when changing media, a change in speed results in a change in wavelength. The refractive index is also the ratio of the wavelength in a vacuum to the wavelength in the medium (n = λ_vacuum / λ_medium).

• Significance: The concept of refractive index is vital in designing lenses, microscopes, telescopes, and fiber optic cables used in modern high-speed internet.

Q9. Answer: (a) v = (s2 - s1)/(t2 - t1)

The correct answer is v = (s2 - s1)/(t2 - t1).

Key Points

• The speed of an object is defined as the rate of change of distance with respect to time. Mathematically, it is expressed as v = Distance / Time.

• On a distance-time graph, the distance (s) is typically represented on the vertical axis (y-axis), and the time (t) is represented on the horizontal axis (x-axis).

• When an object moves from point A to point B, the change in distance is given by (s2 - s1), which represents the total path length covered between those two points.

• The duration or time interval taken to cover this distance is calculated as (t2 - t1).

• The slope of the line joining points A and B on a distance-time graph represents the speed (v) of the object. Therefore, the formula is v = (s2 - s1) / (t2 - t1). Hence, the statement represented by option 1 is correct.

• The unit of speed in the International System of Units (SI) is meters per second (m/s), although it is often expressed in km/h for vehicles.

Additional Information

• Uniform and Non-Uniform Motion:

• In uniform motion, an object covers equal distances in equal intervals of time, resulting in a straight line on a distance-time graph.

• In non-uniform motion, the distance-time graph is a curve, indicating that the speed is changing at different points in time.

• Speed vs. Velocity:

• While speed is a scalar quantity (only magnitude), velocity is a vector quantity that includes both magnitude and direction.

• The slope of a displacement-time graph gives the velocity, whereas the slope of a distance-time graph gives the speed.

• Instantaneous Speed:

• The speed of an object at any particular instant of time is called instantaneous speed. In a graph, this is found by calculating the slope of the tangent at that specific point.

• Average Speed:

• Average speed is the total distance traveled divided by the total time taken. The formula v = (s2 - s1) / (t2 - t1) effectively calculates the average speed between two specific time coordinates.

Important Points

• Graph Interpretation:

• If the distance-time graph is a horizontal line (parallel to the time axis), the speed is zero, meaning the object is at rest.

• A steeper slope on the graph indicates a higher speed, as more distance is being covered in less time.

• A distance-time graph can never have a negative slope because distance is a cumulative quantity that never decreases with

time, unlike displacement.

• Mathematical Relations:

• The expression (s2 - s1) is often denoted as delta s (Δs) and (t2 - t1) as delta t (Δt). Thus, v = Δs / Δt.

• This relationship is fundamental in kinematics and is used to derive further equations of motion under constant acceleration.

Q10. Answer: (b) Definite volume and shape under normal conditions

The correct answer is Definite volume and shape under normal conditions.

Key Points

• Solids are defined by their structural rigidity and resistance to changes in shape or volume. Unlike liquids or gases, the constituent particles (atoms, molecules, or ions) in a solid are closely packed together.

• One of the most fundamental features of all solids is that they possess a definite shape and a definite volume. This is due to the strong intermolecular forces of attraction that hold the particles in fixed positions. Hence, statement 2 is correct.

• Solids are generally incompressible. Because the particles are already so close to each other, applying pressure does not significantly reduce the volume. Hence, statement 1 is incorrect.

• Solids do not have the ability to flow. Fluidity is a characteristic of liquids and gases, where particles can slide past one another. In solids, particles only vibrate around their mean positions. Hence, statement 3 is incorrect.

• While solids can expand when heated (thermal expansion), they do not have infinite expansion capability. This property is characteristic of gases, which expand to fill the entire volume of any container they occupy. Hence, statement 4 is incorrect.

Additional Information

• Classification of Solids:

• Crystalline Solids: These have a regular, repeating three-dimensional pattern of particles. Examples include diamond, quartz, and sodium chloride (salt). They typically have sharp melting points.

• Amorphous Solids: These lack a long-range ordered structure. Examples include glass, rubber, and many plastics. They soften over a range of temperatures rather than melting at a specific numerical value.

• Kinetic Molecular Theory:

• In the solid state, the kinetic energy of the particles is at its lowest compared to the liquid or gaseous states.

• The particles are held together by various types of bonds, such as ionic, covalent, metallic, or van der Waals forces.

• Physical Properties:

• Density: Most substances are at their highest density in the solid phase (ice is a notable exception due to its unique hydrogen bonding structure).

• Diffusion: The rate of diffusion in solids is extremely low because particles are not free to move across large distances.

Important Points

• Phase Transitions: The process of a solid turning into a liquid is called melting, while the direct transition from a solid to a gas is known as sublimation (e.g., dry ice or naphthalene).

• Elasticity vs. Plasticity: Some solids can be deformed under stress. If they return to their original shape, they are elastic; if the deformation is permanent, they are plastic.

• Mechanical Strength: Solids are categorized by their hardness, brittleness, and malleability (the ability to be hammered into thin sheets, a common feature of metals like gold and silver).

Q11. Answer: (c) 3

The correct answer is 3.

Key Points

• Bohr’s Model of an atom, proposed by Neils Bohr in 1913, postulates that electrons revolve around the nucleus in certain stable, circular paths called orbits or shells.

• These orbits are associated with fixed amounts of energy and are called energy levels or energy shells.

• The shells are represented by the letters K, L, M, N, ... or by the principal quantum number (n), where n is an integer (1, 2, 3, 4, ...).

• The shell closest to the nucleus is the K shell, for which n = 1. The next shell is the L shell with n = 2.

• The M shell is the third orbit from the nucleus, and thus it is represented by the principal quantum number n = 3. Hence, the statement regarding M shell being represented by n equal to 3 is correct.

• The N shell follows the M shell and is represented by n = 4.

Additional Information

• Maximum Electron Capacity: The maximum number of electrons that can be accommodated in a shell is calculated using the formula $2n^2$, where n is the principal quantum number.

• For the K shell (n=1): $2(1)^2 = 2$ electrons.

• For the L shell (n=2): $2(2)^2 = 8$ electrons.

• For the M shell (n=3): $2(3)^2 = 18$ electrons.

• For the N shell (n=4): $2(4)^2 = 32$ electrons.

• Energy Levels: As the value of n increases, the distance of the shell from the nucleus increases, and the energy associated with that shell also increases. Therefore, the M shell has higher energy than the L shell but lower energy than the N shell.

• Stability: According to Bohr, electrons do not radiate energy while revolving in these discrete orbits. An atom radiates or absorbs energy only when an electron jumps from one energy level to another.

• Octet Rule: The outermost shell of an atom cannot accommodate more than 8 electrons, even if it has the capacity to hold more (except for the K shell, which holds a maximum of 2).

• Scientific Contribution: Neils Bohr was awarded the Nobel Prize in Physics in 1922 for his work on the structure of atoms. His model helped overcome the limitations of the Rutherford model regarding atomic stability.

Q12. Answer: (a) menstrual cycle

The correct answer is menstrual cycle.

Key Points

• The menstrual cycle is a series of natural, rhythmic physiological changes that occur in the female reproductive system (specifically in primates like humans, monkeys, and apes) to make pregnancy possible.

• This cycle involves regular changes in both the ovary (production of eggs/ovocytes) and the uterus (preparation of the lining for a potential embryo).

• The average duration of a menstrual cycle is 28 days, although it can vary between 21 and 35 days in healthy adults.

• The cycle is characterized by the shedding of the uterine lining (endometrium), which results in menstruation (bleeding) if fertilization does not occur.

• It is regulated by the complex interplay of hormones from the hypothalamus, pituitary gland, and the ovaries.

Additional Information

• Estrous Cycle:

• Unlike the menstrual cycle, the estrous cycle occurs in non-primate mammals such as cows, dogs, and cats.

• In this cycle, the endometrium is reabsorbed by the body if fertilization does not take place, rather than being shed as blood.

• Animals with an estrous cycle are generally only sexually active during the "heat" or estrus phase.

• Circadian Rhythm:

• This refers to the 24-hour internal clock in our brain that regulates cycles of sleepiness and alertness.

• It responds primarily to light and darkness in an organism's environment and is not directly responsible for egg formation.

• Menarche and Menopause:

• Menarche is the term used for the first menstrual cycle, which typically occurs during puberty between the ages of 11 and 15.

• Menopause marks the end of reproductive phases in women, usually occurring between the ages of 45 and 55, where menstrual cycles cease permanently.

• Fertilisation cycle:

• This is not a standard biological term for the regular monthly changes; rather, fertilisation is a singular event where the sperm meets the ovum.

Important Points

• Phases of the Menstrual Cycle:

• Menstrual Phase (Days 1-5): The endometrium is shed, and menstrual flow occurs due to low levels of progesterone.

• Follicular Phase (Days 1-13): Follicle-stimulating hormone (FSH) stimulates the growth of ovarian follicles. The lining of the uterus regenerates.

• Ovulatory Phase (Day 14): A sudden surge in Luteinizing Hormone (LH) causes the mature follicle to rupture and release the egg (ovum). This process is called ovulation.

• Luteal Phase (Days 15-28): The ruptured follicle transforms into the corpus luteum, which secretes progesterone to prepare the uterus for implantation.

• Hormonal Control:

• Estrogen: Responsible for the proliferation of the uterine lining and secondary sexual characteristics.

• Progesterone: Essential for maintaining the thickened uterine lining during pregnancy.

• LH and FSH: Pituitary hormones that trigger the maturation of follicles and the act of ovulation.

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Q13. Answer: (b) Virus

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

Key Points

• AIDS stands for Acquired Immunodeficiency Syndrome. It is a chronic, potentially life-threatening condition caused by the Human Immunodeficiency Virus (HIV).

• By damaging the immune system, HIV interferes with the body's ability to fight infection and disease. It specifically targets and destroys CD4 cells (also known as T-helper cells), which are vital for the immune response.

• The causal agent of AIDS is a Virus. HIV is a member of the Retrovirus family, which means it uses RNA as its genetic material and employs an enzyme called reverse transcriptase to integrate into the host's DNA. Hence, statement 2 is correct.

• Helminths are multi-cellular parasitic worms, such as roundworms and tapeworms, that cause diseases like Ascariasis or Filariasis. They are not the cause of AIDS. Hence, statement 1 is incorrect.

• Protozoa are single-celled organisms that cause illnesses such as Malaria, Amoebiasis, and Kala-azar. They do not lead to the development of AIDS. Hence, statement 3 is incorrect.

• Bacteria are prokaryotic microorganisms responsible for diseases like Tuberculosis, Cholera, and Typhoid. While some sexually transmitted diseases (STDs) like Syphilis are bacterial, AIDS is not. Hence, statement 4 is incorrect.

• Hence, the correct answer is Virus.

Additional Information

• Modes of Transmission:

• HIV is transmitted through contact with infected blood, semen, or vaginal fluids. The most common route is unprotected sexual contact.

• It can also spread by sharing contaminated needles and syringes, or through blood transfusions if the blood has not been screened. Transmission from mother to child can occur during pregnancy, childbirth, or breastfeeding.

• Diagnostic Procedures:

• The primary screening test for HIV is the ELISA (Enzyme-Linked Immunosorbent Assay) test, which detects antibodies against the virus.

• A positive ELISA result is usually confirmed using a more specific test known as the Western Blot test. In recent years, p24 antigen tests and Nucleic Acid Tests (NAT) are also used for early detection.

• Stages of Infection:

• The infection progresses through stages: Acute HIV Infection, Clinical Latency (Chronic HIV), and finally AIDS, which is the most severe phase.

• A person is diagnosed with AIDS when their CD4 cell count drops below 200 cells/mm3 or when they develop certain opportunistic infections like Pneumocystis pneumonia or Kaposi's sarcoma.

Important Points

• Global and National Context:

• World AIDS Day is observed annually on December 1st to raise awareness and mourn those who have died from the disease. It was first conceived in 1988.

• In India, the National AIDS Control Organisation (NACO), established in 1992, is the nodal agency for formulating policy and implementing programs for the prevention and control of HIV/AIDS.

• Treatment and Management:

• There is currently no cure for HIV/AIDS, but it can be managed with Antiretroviral Therapy (ART). ART involves taking a combination of medicines every day that prevent the virus from multiplying.

• Effective ART can reduce the viral load to undetectable levels, meaning the person can live a long life and has effectively no risk of transmitting the virus through sex.

• The incubation period (the time from infection to the development of AIDS) can range from 5 to 10 years or more depending on the individual's health and treatment status.

Q14. Answer: (b) 640 m

The correct answer is 640 m.

Key Points

• An echo is the phenomenon where a sound is heard again after it is reflected back from a distant obstacle, such as a cliff, a mountain, or a large wall.

• When a person claps their hands near a cliff, the sound travels from the person to the cliff and then reflects back to the person's ears. Therefore, the total distance covered by the sound is twice the actual distance between the person and the cliff.

• In this problem, the speed of sound (v) is given as 320 m/s and the time interval (t) for the echo to be heard is 4 s.

• The formula to calculate the distance is: Total Distance = Speed of Sound x Time. Here, Total Distance = 320 m/s x 4 s = 1280

m.

• Since this 1280 m represents the distance of the "to-and-fro" journey, the distance of the cliff (d) from the girl is half of the total distance.

• Calculation: d = 1280 / 2 = 640 m. Hence, the correct option is 640 m.

Additional Information

• Nature of Sound Waves: Sound is a mechanical wave that requires a medium (solid, liquid, or gas) to travel. It travels fastest in solids and slowest in gases.

• Speed of Sound: The speed of sound in air is approximately 344 m/s at a temperature of 22 degrees Celsius. The speed increases with an increase in temperature and humidity.

• Reflection of Sound: Just like light, sound follows the laws of reflection, where the angle of incidence is equal to the angle of reflection, and they lie in the same plane.

• Applications of Echo: The principle of echo is used in SONAR (Sound Navigation and Ranging) to measure the depth of the ocean or locate underwater objects. It is also used by bats and dolphins for echolocation to navigate and find food.

• Medical Use: Ultrasonography uses the reflection of ultrasonic waves (sound with frequency above 20,000 Hz) to create images of internal body organs.

Important Points

• Persistence of Hearing: The sensation of sound persists in our brain for about 0.1 seconds. To hear a distinct echo, the reflected sound must reach the ear after this time interval.

• Minimum Distance for Echo: For a person to hear a clear echo in air (at 22 degrees Celsius), the minimum distance of the obstacle from the source of sound should be half of the distance traveled in 0.1 s. Calculation: (344 m/s x 0.1 s) / 2 = 17.2 m.

• Reverberation: If the distance is less than 17.2 m, the reflected sounds overlap with the original sound, causing a prolonged sound effect known as reverberation, commonly heard in large concert halls or newly built empty rooms.

• Human Auditory Range: A healthy human ear can typically hear frequencies between 20 Hz and 20,000 Hz. Sounds below 20 Hz are called infrasonic, and sounds above 20,000 Hz are called ultrasonic.

Q15. Answer: (a) Nucleus

The correct answer is Nucleus.

Key Points

• Protons are subatomic particles located deep within the center of an atom, in a region known as the nucleus.

• The nucleus is a small, dense, and positively charged core that contains nearly all of the atom's mass, despite occupying only a tiny fraction of its total volume.

• A proton carries a positive electrical charge of +1 elementary charge (approximately 1.602 × 10^-¹^9 Coulombs).

• The total number of protons in the nucleus defines the Atomic Number (denoted by Z) of an element, which determines its chemical identity and position on the Periodic Table.

• The discovery of the proton is credited to Ernest Rutherford, who through experiments conducted between 1917 and 1919, proved that the hydrogen nucleus was present in other nuclei.

Additional Information

• Neutrons:

• These are neutral subatomic particles (no charge) also found within the nucleus alongside protons.

• They were discovered by James Chadwick in 1932.

• Together, protons and neutrons are referred to as nucleons.

• Electrons:

• Unlike protons, electrons are found outside the nucleus in the electron cloud, arranged in specific orbitals or energy levels.

• They carry a negative electrical charge (-1e) and have a very small mass, approximately 1/1836th the mass of a proton.

• They were discovered by J.J. Thomson in 1897 using the cathode ray tube experiment.

• Atomic Mass:

• The Mass Number (denoted by A) of an atom is the sum of the total number of protons and neutrons in its nucleus.

• The mass of a proton is approximately 1.00727 atomic mass units (amu).

Important Points

• Rutherford’s Gold Foil Experiment (1911): This landmark experiment led to the discovery of the nucleus. It showed that most of the atom is empty space, with a tiny, dense, positively charged center that deflected alpha particles.

• Quark Composition: Protons are not fundamental particles; they are composed of smaller particles called quarks. A proton consists of two Up quarks and one Down quark, held together by the strong nuclear force mediated by gluons.

• Nuclear Stability: The strong nuclear force is the fundamental force that overcomes the electrostatic repulsion between positively charged protons, allowing them to stay tightly packed within the nucleus.

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Q16. Answer: (c) Neither (i) nor (ii)

The correct answer is Neither (i) nor (ii).

Key Points

• Acceleration due to gravity (g) is the acceleration gained by an object due to the gravitational force exerted by a massive body like the Earth. Its standard value on the Earth's surface is approximately 9.8 m/s^2.

• The mathematical formula for acceleration due to gravity is $g = GM / R^2$, where G is the Universal Gravitational Constant, M is the mass of the Earth (or the celestial body), and R is the radius of the body.

• Statement (i) claims that g depends on the mass of the falling object. However, the formula $g = GM / R^2$ shows that the acceleration depends only on the mass and radius of the planet, not the object. In a vacuum, a feather and a hammer will fall at the same rate. Hence, statement (i) is incorrect.

• Statement (ii) claims that g is universally constant. This is false because g varies based on location. It is maximum at the poles and minimum at the equator due to the Earth's oblate spheroid shape. It also decreases with an increase in altitude (height above Earth) and depth (below Earth's surface). Hence, statement (ii) is incorrect.

• Since neither of the statements provided in the question is factually accurate regarding the properties of g, the correct option is Neither (i) nor (ii).

Additional Information

• Difference between g and G:

• g is the acceleration due to gravity, which is a vector quantity and changes from place to place. Its SI unit is m/s^2.

• G is the Universal Gravitational Constant, which is a scalar quantity and remains the same throughout the universe. Its value is approximately 6.674 x 10^(-11) N m^2/kg^2.

• Weight vs. Mass:

• Mass is the amount of matter in an object and remains constant regardless of location.

• Weight (W = mg) is the force with which an object is attracted towards the center of the Earth. Since g varies, the weight of an object changes depending on its position in the universe.

• Gravity on the Moon:

• The mass and radius of the Moon are smaller than those of the Earth. Consequently, the acceleration due to gravity on the Moon is about 1/6th of that on Earth (approx. 1.62 m/s^2).

Important Points

• Variation with Shape: Because the Earth is flattened at the poles and bulged at the equator, the equatorial radius is about 21 km longer than the polar radius. Since g is inversely proportional to the square of the radius, it is stronger at the poles.

• Variation with Altitude: As one moves away from the surface of the Earth, the distance from the center of gravity increases, causing the value of g to decrease.

• Variation with Depth: When moving towards the center of the Earth, the effective mass of the Earth attracting the object decreases. At the center of the Earth, the value of g becomes zero.

• Variation due to Rotation: The rotation of the Earth creates a centrifugal force that acts outwards, effectively reducing the value of g, most significantly at the equator.

Q17. Answer: (b) Better adaptability and chances of survival

The correct answer is Better adaptability and chances of survival.

Key Points

• Variation refers to the morphological, physiological, and behavioral differences among individuals belonging to the same species.

• It ensures better adaptability because environments are never static; they undergo constant changes such as climate shifts, resource scarcity, or the emergence of new predators.

• Individuals possessing favorable variations are more likely to survive and reproduce in a specific environment, a process central to Charles Darwin’s theory of Natural Selection.

• If all individuals in a population were genetically identical, a single adverse change (like a lethal disease or temperature rise) could potentially wipe out the entire population.

• Variation acts as a buffer, ensuring that at least some individuals have the traits necessary to endure environmental stress, thereby preventing extinction.

Additional Information

• Sources of Variation:

• Genetic Recombination: Occurs during meiosis through crossing over, resulting in new combinations of alleles in offspring.

• Mutation: A sudden, stable change in the DNA sequence. While some mutations are harmful, others introduce beneficial traits that drive evolution.

• Sexual Reproduction: The fusion of gametes from two different parents ensures genetic diversity.

• Types of Variation:

• Continuous Variation: Traits that show a range of phenotypes, such as human height or skin color.

• Discontinuous Variation: Traits that fall into distinct categories, such as blood groups (A, B, AB, O) or the ability to roll one's tongue.

• Importance in Evolution:

• Variation is the raw material for evolution. Over millions of years, the accumulation of small variations can lead to speciation (the formation of new species).

• It allows organisms to exploit different ecological niches and adapt to diverse geographic locations.

• Analysis of Other Options:

• No mutations: Variation is actually fueled by mutations; without them, the genetic pool would remain stagnant.

• No evolution: Variation is the fundamental requirement for evolution; without it, evolution would cease.

• Similar response: Variation ensures individuals respond differently to environmental changes, allowing the fittest to survive.

Important Points

• The survivability of an individual depends on whether its variations are adaptive or non-adaptive for its specific habitat.

• In asexual reproduction, variation is minimal and usually occurs only due to DNA copying errors or mutations.

• In sexual reproduction, variation is much higher, which is why sexually reproducing organisms generally show greater resilience to environmental fluctuations.

• The study of how variations are passed from one generation to the next is known as Genetics, a field pioneered by Gregor Mendel in the 19th century.

Q18. Answer: (a) Both (i) and (iii)

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

Key Points

• Work Done is defined as the product of the component of the force in the direction of the displacement and the magnitude of this displacement. Mathematically, it is expressed as $W = Fs\cos\theta$, where θ is the angle between the force vector and the displacement vector.

• Statement (i): The work done by a force can indeed be negative. This occurs when the force acts in a direction opposite to the displacement (i.e., the angle θ is 180° or obtuse). A classic example is the work done by friction on a sliding body, which is always negative because friction opposes motion. Hence, statement (i) is incorrect.

• Statement (ii): When the force and displacement are in the same direction, the angle θ is 0°. Since $\cos 0° = 1$, the work done is positive and reaches its maximum value ($W = Fs$). Hence, statement (ii) is correct.

• Statement (iii): The S.I. unit of work done is the Joule (J), which is equivalent to 1 Newton-meter (N·m). Pascal (Pa) is the S.I. unit for pressure or stress, defined as one Newton per square meter. Hence, statement (iii) is incorrect.

• Since the question asks for statements that are NOT true, both (i) and (iii) fit the criteria. Hence, the correct answer is Both (i) and (iii).

Additional Information

• Nature of Work:

• Work is a scalar quantity, meaning it has only magnitude and no direction, even though both force and displacement are vector quantities.

• The dimensional formula for work is $[ML^2T^{-2}]$, which is identical to the dimensions of energy and torque.

• Zero Work Conditions:

• Work done is zero if the displacement is zero (e.g., pushing against a rigid wall).

• Work is zero if the force is zero.

• Work is zero if the force is perpendicular to the displacement ($\theta = 90°$). For example, the centripetal force acting on a satellite in a circular orbit does zero work because it is always perpendicular to the velocity.

• Units of Work:

• In the CGS system, the unit of work is the erg.

• The relationship between the S.I. and CGS units is 1 Joule = 10^7 ergs.

• Other units include Kilowatt-hour (kWh), often used for electrical energy, where 1 kWh = 3.6×10^6 Joules.

Important Points

• Work-Energy Theorem: It states that the net work done by all forces acting on a body is equal to the change in its kinetic energy. This is a fundamental principle in classical mechanics.

• Types of Work:

• Positive Work: Angle θ is acute ($0° \le \theta < 90°$). Example: Lifting an object (work done by the lifting force).

• Negative Work: Angle θ is obtuse (90° < θ ≤ 180°). Example: Work done by gravitational force when an object is moved upwards.

• Zero Work: Angle θ is 90°. Example: A person carrying a suitcase horizontally (the upward lifting force is perpendicular to the horizontal displacement).

• Constant vs. Variable Force: While the question specifies a constant force, work done by a variable force is calculated using integration of the force over the path of displacement.

Q19. Answer: (d) Focal length of a convex lens is taken as negative.

The correct answer is Focal length of a convex lens is taken as negative..

Key Points

• For spherical lenses, we follow the New Cartesian Sign Convention, where the optical centre (O) of the lens is taken as the origin and the principal axis is taken as the X-axis.

• According to this convention, the object is always placed to the left of the lens. This implies that the light from the object falls on the lens from the left-hand side. Hence, statement 1 is correct.

• The focal length of a concave lens is considered negative because its principal focus lies on the left side of the optical centre, opposite to the direction of incident light. Hence, statement 2 is correct.

• All distances measured to the right of the origin (along the positive x-axis) are taken as positive, while those measured to the left are taken as negative. Hence, statement 3 is correct.

• A convex lens is a converging lens, and its principal focus is located on the right side of the lens. Therefore, according to the sign convention, the focal length of a convex lens is always positive, not negative. Hence, statement 4 is incorrect.

• Therefore, the statement "Focal length of a convex lens is taken as negative" is NOT correct.

Additional Information

• Lens Formula: The relationship between the object distance (u), image distance (v), and focal length (f) is given by the formula 1/v - 1/u = 1/f. In this formula, u is always negative for a real object.

• Magnification (m): It is the ratio of the height of the image to the height of the object. For lenses, m = h'/h = v/u. A positive magnification indicates a virtual and erect image, while a negative magnification indicates a real and inverted image.

• Power of a Lens (P): The degree of convergence or divergence of light rays achieved by a lens is expressed as its power. It is the reciprocal of the focal length in metres (P = 1/f). The SI unit of power is Dioptre (D).

• Sign of Power: Since the focal length of a convex lens is positive, its power is also positive. Conversely, since the focal length of a concave lens is negative, its power is negative.

Important Points

• Height Measurement: Distances measured perpendicularly above the principal axis (along the +y-axis) are taken as positive, which is usually the case for the height of the object.

• Inverted Images: Distances measured perpendicularly below the principal axis (along the -y-axis) are taken as negative. This applies to the height of real images.

• Incident Light Direction: The convention is designed such that distances measured in the direction of incident light are positive, and those measured against the direction of incident light are negative.

• Optical Centre: Every measurement for spherical lenses must originate from the optical centre, unlike mirrors where measurements start from the pole.

Q20. Answer: (c) ribosomes; lipids

The correct answer is ribosomes; lipids.

• The Endoplasmic Reticulum (ER) is a large network of membrane-bound tubes and sheets that stretches from the nuclear envelope to the plasma membrane.

• Rough Endoplasmic Reticulum (RER) looks rough under a microscope because it has particles called ribosomes attached to its surface.

• These ribosomes are the primary sites of protein synthesis in the cell. The proteins manufactured here are then sent to various places in the cell depending on the need.

• Smooth Endoplasmic Reticulum (SER) does not have ribosomes attached to its surface, giving it a smooth appearance.

• The SER plays a crucial role in the synthesis of lipids (fats) and steroid hormones, which are essential for cell function and the building of the cell membrane.

• Therefore, the correct association is that RER bears ribosomes for protein synthesis, while SER synthesizes lipids. Hence, the correct answer is ribosomes; lipids.

• Functions of Smooth Endoplasmic Reticulum (SER):

• In the liver cells of vertebrates, SER plays a vital role in detoxifying many poisons and drugs.

• It is also involved in the metabolism of carbohydrates and the storage of calcium ions, which is particularly important in muscle

cells (where it is called the sarcoplasmic reticulum) for muscle contraction.

• Functions of Rough Endoplasmic Reticulum (RER):

• Apart from protein synthesis, the RER is involved in protein folding and quality control, ensuring that only correctly folded proteins proceed to the Golgi apparatus.

• It provides a large surface area for chemical reactions and serves as a pathway for the distribution of materials.

• Membrane Biogenesis:

• Some of the proteins and lipids synthesized by the ER help in building the cell membrane. This process is known as membrane biogenesis.

• Other proteins and lipids function as enzymes and hormones throughout the biological system.

• Structural Components:

• The ER membrane is similar in structure to the plasma membrane and consists of a lipid bilayer.

• It exists in three forms: cisternae (flattened sacs), vesicles, and tubules. RER is mainly composed of cisternae, while SER is mainly composed of tubules.

• Ribosomes:

• These are small, dense, granular structures found either freely in the cytoplasm or attached to the RER. They are composed of Ribosomal RNA (rRNA) and proteins and are known as the "protein factories" of the cell.

Q21. Answer: (d) Heat is used to break the bonds between molecules

The correct answer is Heat is used to break the bonds between molecules.

Key Points

• When ice is heated, its temperature rises until it reaches its melting point, which is 0°C (273.15 K) under standard atmospheric pressure.

• Once the ice starts to melt, the heat energy supplied is no longer used to increase the kinetic energy of the water molecules. Instead, it is used to overcome the intermolecular forces of attraction (specifically hydrogen bonds) that hold the water molecules in a solid crystalline structure. Hence, the statement that heat is used to break bonds is correct.

• Since the average kinetic energy of the molecules remains unchanged during this process, the thermometer shows no rise in temperature until all the ice has completely converted into liquid water.

• This absorbed energy, which does not result in a temperature change, is called the Latent Heat of Fusion. The word latent means "hidden," as this heat is hidden from the temperature scale.

• The statement that ice absorbs heat but does not melt is scientifically incorrect because, at the melting point, the absorption of heat directly causes the phase change from solid to liquid.

• The statement that ice reflects heat is incorrect in this context; while ice has a high albedo (reflectivity), the question specifically addresses what happens to the heat that is absorbed by the ice.

• The statement that ice becomes denser is a physical fact (water is denser than ice), but it is a result of the molecular bonds breaking, not the reason why the temperature remains constant.

Additional Information

• Latent Heat of Fusion: For water, the latent heat of fusion is approximately 334 Joules per gram (or 80 calories per gram). This is the amount of energy required to change 1 gram of ice at 0°C to 1 gram of water at 0°C.

• Phase Change: During a phase change, the system exists in a state of thermal equilibrium where two phases (solid and liquid) coexist. The temperature will only begin to rise again once the phase transition is 100% complete.

• Specific Heat Capacity: Once the ice has completely melted into water, the heat supplied will then increase the temperature of the water based on its specific heat capacity, which is 4.184 J/g°C.

• Molecular Structure: Ice has a unique hexagonal lattice structure. When heat breaks these molecular bonds, the molecules actually move closer together in the liquid state, which is why water is more dense than ice.

Important Points

• Kinetic vs. Potential Energy: In thermodynamics, temperature is directly proportional to average kinetic energy. During melting, the heat increases the potential energy of the molecules (by changing their position and breaking bonds) rather than their speed.

• Effect of Pressure: The melting point of ice can be lowered by increasing the external pressure. This phenomenon is known as regelation, which allows ice to melt under pressure and refreeze once the pressure is removed.

• Latent Heat of Vaporization: A similar process occurs when water boils at 100°C. The temperature remains constant because the heat is used as Latent Heat of Vaporization to turn liquid water into steam.

• Numerical Value: The Latent Heat of Fusion of water is significantly higher than many other substances, which helps in regulating the Earth's climate by slowing the melting of polar ice caps.

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Q22. Answer: (a) It becomes n times larger than for a single turn.

The correct answer is It becomes n times larger than for a single turn.

Key Points

• The magnetic field strength produced by a current-carrying circular coil at its center is directly proportional to the number of turns (n) in the coil.

• When a circular coil has n turns, the current flows in the same direction in every turn, which means the magnetic field produced by each individual turn adds up vectorially.

• For a single turn, the magnetic field is produced by the current flowing through that one loop; for n turns, the fields of all n loops are superposed, resulting in a field that is n times as strong.

• If the current (I) is kept constant, the total magnetic field (B) is given by the product of n and the field of a single loop. Hence, the statement that it becomes n times larger is correct.

• This linear relationship assumes that the turns are tightly wound and the radius of the coil remains significantly unchanged for each turn.

Additional Information

• Mathematical Formula: The magnetic field (B) at the center of a circular coil of radius (r) carrying current (I) with n turns is expressed as B = (μ0 * n * I) / (2 * r), where μ0 is the permeability of free space (approximately 4π × 10^-^7 T·m/A).

• Magnetic Field and Current: The strength of the magnetic field is directly proportional to the magnitude of the current. If the current is doubled, the magnetic field also doubles, provided other factors remain constant.

• Inversely Proportional to Radius: The magnetic field strength is inversely proportional to the radius of the circular coil. A smaller radius results in a stronger field at the center because the current-carrying wire is closer to the center point.

• Direction of the Field: The direction of the magnetic field produced by a circular loop can be determined using the Right-Hand Thumb Rule. If the fingers of the right hand curl in the direction of the current, the thumb points in the direction of the magnetic field.

• SI Unit: The SI unit of magnetic field strength or magnetic flux density is the Tesla (T). In smaller applications, the unit Gauss (G) is also used, where 1 Tesla = 10,000 Gauss.

• Applications: This principle is used in the construction of solenoids, electromagnets, electric motors, and galvanometers, where increasing the number of turns is a common method to amplify magnetic force without increasing the current.

Important Points

• Biot-Savart Law: This fundamental law in electromagnetism describes how a magnetic field is generated by a steady electric current. It is the basis for calculating the field produced by circular coils.

• Ampere's Circuital Law: Another crucial law used to find the magnetic field for highly symmetric current distributions, such as an infinitely long wire or a toroid.

• Superposition Principle: The fact that the field becomes n times larger is an application of the superposition principle, which states that the total magnetic field at any point is the vector sum of the individual fields produced by each segment of the current.

Q23. Answer: (d) Double displacement

The correct answer is Double displacement.

Key Points

• A Neutralisation reaction is a fundamental chemical process where an acid and a base react with each other to produce salt and water.

• It is categorized as a Double displacement reaction (also known as a metathesis reaction) because the cations and anions of the two reacting compounds exchange partners to form new products.

• In a typical aqueous neutralisation, the Hydrogen ions (H+) from the acid combine with the Hydroxide ions (OH-) from the base to form H2O (water).

• A standard example of this reaction is HCl (Hydrochloric acid) reacting with NaOH (Sodium hydroxide) to form NaCl (Sodium chloride) and H2O. In this case, the Sodium (Na+) and Hydrogen (H+) ions effectively swap places.

• These reactions are usually exothermic in nature, meaning they involve the release of heat energy during the formation of water.

Additional Information

• Single displacement reaction:

• In this type of reaction, a more reactive element displaces a less reactive element from its compound.

• For example, when Zinc (Zn) is added to Copper sulfate (CuSO4), it displaces the copper to form Zinc sulfate (ZnSO4) and Copper (Cu). Hence, statement 1 is incorrect.

• Combustion reaction:

• This is a high-temperature redox reaction between a fuel and an oxidant (usually atmospheric Oxygen).

• It results in the release of energy in the form of light and heat, often producing Carbon dioxide (CO2) and Water as byproducts when hydrocarbons are burned. Hence, statement 2 is incorrect.

• Decomposition reaction:

• This occurs when a single reactant breaks down into two or more simpler products.

• This process often requires energy in the form of heat, light, or electricity. An example is the heating of Calcium carbonate ($CaCO_3$) to yield Calcium oxide (CaO) and Carbon dioxide (CO_2). Hence, statement 3 is incorrect.

• Double displacement reaction:

• This reaction involves the exchange of ions between two compounds to form two new compounds.

• The general chemical equation is AB + CD → AD + CB. Since a neutralisation reaction involves the H^+ from the acid and OH^- from the base swapping to form water, while the remaining ions form a salt, it is a classic Double displacement. Hence, statement 4 is correct.

Important Points

• pH Levels: The pH of the resulting solution in a neutralisation reaction depends on the strength of the reactants. A reaction between a strong acid and a strong base results in a neutral salt with a pH of 7.

• Applications: Neutralisation is widely used in agriculture to treat acidic soil using slaked lime (Calcium hydroxide), and in medicine where Antacids (bases) are used to neutralise excess gastric acid in the stomach.

• Titration: In analytical chemistry, neutralisation reactions are the basis of acid-base titrations, which are used to determine the unknown concentration of an acidic or basic solution using an indicator.

Q24. Answer: (c) Atoms get added to unsaturated bonds

The correct answer is Atoms get added to unsaturated bonds.

Key Points

• An addition reaction is a fundamental class of chemical reactions where two or more molecules combine to form a larger single molecule. This typically occurs in organic compounds containing multiple bonds.

• In this process, atoms or groups of atoms are added across the unsaturated bonds (double or triple bonds) of a molecule, such as alkenes or alkynes. Hence, statement 3 is correct.

• During an addition reaction, the pi (π) bond of the unsaturated system is broken, and two new sigma (σ) bonds are formed. This results in the conversion of an unsaturated hydrocarbon into a saturated one.

• Functional groups being replaced by others is the characteristic of a substitution reaction, which is common in saturated hydrocarbons like alkanes. Hence, statement 1 is incorrect.

• The removal of atoms from a molecule to form a double or triple bond is known as an elimination reaction, which is essentially the reverse of an addition reaction. Hence, statement 2 is incorrect.

• While oxidation involves the loss of electrons or increase in oxidation state, an addition reaction specifically focuses on the structural incorporation of new atoms into the molecular framework through covalent bonding. Hence, statement 4 is incorrect.

Additional Information

• Types of Addition Reactions:

• Electrophilic Addition: Commonly seen in alkenes and alkynes, where an electrophile attacks the electron-rich double bond. A classic example is the halogenation of ethene.

• Nucleophilic Addition: Typical of compounds containing carbon-heteroatom multiple bonds, such as carbonyl groups (aldehydes and ketones), where a nucleophile attacks the electron-deficient carbon atom.

• Free Radical Addition: Occurs in the presence of peroxides or UV light, often following a non-Markovnikov pathway.

• Hydrogenation:

• This is a specific type of addition reaction where hydrogen gas (H_2) is added to unsaturated compounds in the presence of a catalyst like Nickel (Ni), Palladium (Pd), or Platinum (Pt).

• Industrial use: It is widely used in the food industry to convert vegetable oils (unsaturated fats) into vanaspati ghee (saturated fats).

• Bromine Water Test:

• Addition reactions are used as a diagnostic tool to detect unsaturation. When bromine water (reddish-brown) is added to an unsaturated compound, an addition reaction occurs, and the solution becomes colorless.

• Markovnikov's Rule:

• In the addition of a protic acid (like HBr) to an asymmetric alkene, the hydrogen atom attaches to the carbon with the greater number of hydrogen atoms, while the halide group attaches to the carbon with more alkyl substituents.

Important Points

• Hybridization Change: In an addition reaction involving an alkene, the hybridization of the carbon atoms changes from sp^2 to sp^3 as the geometry shifts from planar to tetrahedral.

• Saturated vs Unsaturated: Saturated compounds contain only single bonds and are generally less reactive, whereas unsaturated compounds contain double (C=C) or triple (C≡C) bonds, making them highly susceptible to addition.

• Atom Economy: Addition reactions are considered highly efficient in green chemistry because they have a 100% atom economy; all atoms in the reactants are present in the final product, leaving no waste or byproducts.

• Polymerization: Addition polymerization is a critical industrial process where thousands of monomer molecules (like ethylene) undergo repeated addition reactions to form polymers (like polyethylene).

Q25. Answer: (b) presence of excess air

The correct answer is presence of excess air.

Key Points

• The process of converting sulphide ores into oxides by heating them strongly in the presence of excess air is known as Roasting.

• Metals that lie in the middle of the activity series, such as Zinc (Zn), Iron (Fe), and Lead (Pb), are often found in nature as sulphides or carbonates.

• It is much easier to obtain a metal from its oxide than from its sulphide; therefore, the sulphide ore must be oxidized before reduction can occur.

• A classic example of Roasting is the treatment of Zinc Blende (ZnS). When heated in excess air, it reacts to form Zinc Oxide (ZnO) and releases Sulphur Dioxide (SO2) gas. The chemical equation is: $2ZnS + 3O2 \rightarrow 2ZnO + 2SO2$.

• In this process, Oxygen acts as the oxidizing agent to remove the Sulphur impurities in the form of volatile gas. Hence, the condition of excess air is correct.

Additional Information

• Calcination: Unlike roasting, Calcination is the process used for carbonate ores. It involves heating the ore strongly in the absence of oxygen or a limited supply of air to expel carbon dioxide. For example, ZnCO3 (Calamine) is heated to produce ZnO and CO2.

• Reactivity Series: The metals in the middle of the series (like Zn, Fe, Pb) are moderately reactive. Metals at the top (like Na, Ca, Mg) are extracted by electrolysis, while metals at the bottom (like Au, Ag) are often found in a native state.

• Reduction: Once the ore is converted to a metal oxide, it is reduced to the free metal using a reducing agent like Carbon (Coke). This is a crucial step in pyrometallurgy.

• Sulphur Dioxide Management: The SO2 gas produced during the Roasting of sulphide ores is a major air pollutant but is often collected and used in the Contact Process to manufacture Sulphuric Acid (H2SO4).

Important Points

• Temperature Control: During Roasting, the temperature must be maintained below the melting point of the metal or the ore to prevent the mass from fusing together, which would hinder the oxidation process.

• Removal of Volatile Impurities: Apart from converting sulphides to oxides, Roasting also helps in removing moisture and organic matter, as well as volatile impurities like Arsenic and Antimony in the form of their oxides.

• Specific Ores: Common sulphide ores subjected to roasting include Galena (PbS) for Lead, Copper Pyrites (CuFeS2) for Copper, and Cinnabar (HgS) for Mercury.

• Chemical Nature: Roasting is an exothermic process because the oxidation of metal sulphides releases a significant amount of thermal energy, which helps maintain the high temperature required for the reaction.

Q26. Answer: (d) 100

Shortcut Trick

Average rate for the whole week = 2200 ÷ 120 = 55/3 per km.

Using Alligation: (Taxi rate: 20) and (Car rate: 10) with mean (55/3).

Distance Ratio (Taxi : Car) = (55/3 − 10) : (20 − 55/3) = 25/3 : 5/3 = 5 : 1.

Total units = 5 + 1 = 6 units → 120 km => 1 unit = 20 km.

Taxi distance = 5 × 20 = 100 km.

Therefore The correct answer is 100 km.

Alternate Method

Given: Rate for taxi = Rs. 20/km, Rate for car = Rs. 10/km, Total distance = 120 km, Total claim = Rs. 2,200.

Let the distance traveled by taxi be x km.

Then, the distance traveled by own car = (120 − x) km.

=> Total Claim = (Rate × Distance)_(Taxi) + (Rate × Distance)_(Car)

=> 2200 = 20 × x + 10 × (120 − x)

=> 2200 = 20x + 1200 − 10x

=> 2200 − 1200 = 10x

=> 1000 = 10x

=> x = 100 km.

Therefore The correct answer is 100 km.

Additional Information

Weighted Average Formula

The average value of a mixture is given by A = (n1v1 + n2v2) ÷ (n1 + n2), where n represents quantity and v represents the rate.

Rule of Alligation

It is a shorter way to find the ratio in which two ingredients at given prices must be mixed to produce a mixture at a given price: (Quantity of Cheaper) ÷ (Quantity of Dearer) = (CP of Dearer − Mean Price) ÷ (Mean Price − CP of Cheaper).

Linear Equations in One Variable

Problems involving two unknown quantities related by a total sum can always be simplified to a single variable equation by substituting (Total − x) for the second quantity.

Q27. Answer: (b) 2

Shortcut Trick

Check the odd numbers between 376 and 384: 377, 379, 381, 383.

377 is 13 × 29. 381 is 3 × 127.

379 and 383 are prime numbers.

Therefore The correct answer is 2.

Alternate Method

Given: Range between 376 and 384.

Formula Used: A prime number has only two factors: 1 and itself. Use divisibility rules for 2, 3, 5, 7, 11, 13, 17, 19.

=> List numbers: 377, 378, 379, 380, 381, 382, 383.

=> Eliminate even numbers: 378, 380, 382.

=> Check 377: 377 ÷ 13 = 29 (Not prime).

=> Check 379: Not divisible by 2, 3, 5, 7, 11, 13, 17, 19 (Is prime).

=> Check 381: Sum of digits (3+8+1) = 12, divisible by 3 (Not prime).

=> Check 383: Not divisible by 2, 3, 5, 7, 11, 13, 17, 19 (Is prime).

Therefore The correct answer is 2.

Additional Information

Prime Testing Rule

To check if N is prime, test divisibility by all primes less than or equal to √N. For 384, √384 ≈ 19.6.

Co-prime Numbers

Two numbers are co-prime if their Highest Common Factor (HCF) is 1, regardless of whether the numbers themselves are prime.

Divisibility by 3

A number is divisible by 3 if the sum of its digits is a multiple of 3.

Q28. Answer: (c) 108

Shortcut Trick

LCM × HCF = Product of two numbers

LCM × 3 = 324

LCM = 324 ÷ 3 = 108

Therefore The correct answer is 108.

Alternate Method

Given:

Product of two numbers = 324

HCF = 3

Formula Used:

LCM × HCF = n1 × n2 (where n1 and n2 are the two numbers)

Calculations:

=> LCM × 3 = 324

=> LCM = 324 ÷ 3

=> LCM = 108

Therefore The correct answer is 108.

Additional Information

HCF (Highest Common Factor)

The greatest number that divides two or more numbers without leaving a remainder.

LCM (Least Common Multiple)

The smallest non-zero common multiple of two or more numbers.

Co-prime Numbers

Two numbers are co-prime if their HCF is 1. For co-prime numbers, LCM = Product of the numbers.

Q29. Answer: (b) 3

Shortcut Trick

Let the total work be LCM of 3, 6, and 6 = 6 units.

Combined efficiency of A, B, and C = (6 ÷ 3) + (6 ÷ 6) + (6 ÷ 6) = 2 + 1 + 1 = 4 units/day.

Twice the work = 2 × 6 = 12 units.

Required time = 12 ÷ 4 = 3 days.

Therefore The correct answer is 3 days.

Alternate Method

Given:

Time taken by A = 3 days

Time taken by B = 6 days

Time taken by C = 6 days

Formula Used:

Efficiency = Total Work ÷ Time Taken

Time Taken = Total Work ÷ Efficiency

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

Calculations:

=> Total efficiency of A + B + C = 2 + 1 + 1 = 4 units/day

=> New Total Work = 2 × 6 = 12 units

=> Time taken to complete twice the work = 12 ÷ 4 = 3 days

Therefore The correct answer is 3 days.

Additional Information

LCM Method in Time and Work

Using the LCM of individual times as the total work helps avoid complex fraction calculations and makes the determination of efficiencies much faster.

Work and Wages Relation

Wages are always distributed in proportion to the total work done by each individual, which is also the ratio of their efficiencies if they work for the same amount of time.

Q30. Answer: (a) 91/3 days

Shortcut Trick

Remaining work in man-days = 24 men × (12 − 5 days) = 168 man-days.

Remaining men = 24 − 6 = 18 men.

Extra days needed = 168 ÷ 18 = 28/3 = 9(1/3) days.

Therefore The correct answer is 9(1/3) days.

Alternate Method

Person	Days	Total Work	Efficiency
24 Men	12 days	288 units	24 units/day
1 Man	288 days	1 unit/day	

Given: Total men = 24, Total days = 12, Work done for 5 days, Men left = 6.

Formula Used: Total Work = Men × Days

=> Total work = 24 × 12 = 288 units

=> Work completed in 5 days = 24 × 5 = 120 units

=> Remaining work = 288 − 120 = 168 units

=> Remaining men = 24 − 6 = 18 men

=> Days required by remaining men = 168 ÷ 18 = 28/3 days

=> Days = 9(1/3) days

Therefore The correct answer is 9(1/3) days.

Additional Information

Chain Rule Formula

The relationship between men, days, and work is given by (M1 × D1) / W1 = (M2 × D2) / W2.

Work and Efficiency

Efficiency is inversely proportional to the time taken to complete the work when the total work is constant.

Man-Days Concept

Total work is often expressed as the product of the number of people and the time they work, known as man-hours or man-days.

Q31. Answer: (d) 68

Shortcut Trick

Teacher's Age = New Average + (Initial Strength × Increase in Average)

Initial students = 48, Initial average = 19 years

New average = 20 years, Increase = 20 − 19 = 1 year

Teacher's Age = 20 + (48 × 1) = 68 years

Therefore The correct answer is 68 years.

Alternate Method

Given:

Number of students = 48

Average age of students = 19 years

Average age including teacher = 20 years

Formula Used:

Total Age = Average × Number of persons

Calculations:

=> Total age of 48 students = 48 × 19

=> Total age of 48 students = 912 years

=> Total number of people including teacher = 48 + 1 = 49

=> Total age of 49 people = 49 × 20

=> Total age of 49 people = 980 years

=> Age of the teacher = Total age of group − Total age of students

=> Age of the teacher = 980 − 912

=> Age of the teacher = 68 years

Therefore The correct answer is 68 years.

Additional Information

Inclusion of a New Member

When a new person joins a group and the average increases, the new person's value = Old Average + (New Total Number × Increase in Average).

Exclusion of a Member

When a person leaves and the average changes, the value of the person who left = Old Average ± (New Total Number × Change in Average).

Weighted Average Formula

Combined Average = (n1x1 + n2x2) ÷ (n1 + n2), where n is the quantity and x is the average of each group.

Q32. Answer: (c) 171/7

Shortcut Trick

When equal distances (d) are covered at speeds a, b, and c, use the Harmonic Mean formula.

Average Speed = 3abc ÷ (ab + bc + ca)

Average Speed = (3 × 10 × 20 × 40) ÷ (200 + 800 + 400) = 24000 ÷ 1400

Average Speed = 240 ÷ 14 = 120 ÷ 7 = 17(1/7) km/hr.

Therefore The correct answer is 17(1/7) km/hr.

Alternate Method

Given: Three successive distances = 20 km each. Speeds = 10 km/hr, 20 km/hr, 40 km/hr.

Formula Used: Average Speed = Total Distance ÷ Total Time

=> Total Distance = 20 + 20 + 20 = 60 km

=> Time 1 = 20 ÷ 10 = 2 hours

=> Time 2 = 20 ÷ 20 = 1 hour

=> Time 3 = 20 ÷ 40 = 0.5 hours

=> Total Time = 2 + 1 + 0.5 = 3.5 hours = 7/2 hours

=> Average Speed = 60 ÷ (7/2) = (60 × 2) ÷ 7 = 120/7

=> Average Speed = 17(1/7) km/hr

Therefore The correct answer is 17(1/7) km/hr.

Additional Information

Average Speed for Two Equal Distances

When two equal distances are covered at speeds u and v, the average speed is given by (2uv) ÷ (u + v).

Relative Speed

For two objects moving in the opposite direction, relative speed is the sum of their speeds (s1 + s2). For the same direction, it is the difference (s1 − s2).

Conversion Units

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

Q33. Answer: (c) 21

Shortcut Trick

First value = 60% of 45 = 0.6 × 45 = 27

Second value = 2/5 of 15 = 2 × 3 = 6

Difference = 27 − 6 = 21

Therefore The correct answer is 21.

Alternate Method

Given:

Expression 1: 60% of 45

Expression 2: 2/5 of 15

Calculations:

=> Value 1 = (60/100) × 45

=> Value 1 = (3/5) × 45 = 3 × 9 = 27

=> Value 2 = (2/5) × 15 = 2 × 3 = 6

=> Difference = Value 1 − Value 2

=> Difference = 27 − 6 = 21

Therefore The correct answer is 21.

Additional Information

Percentage to Fraction Conversion

To simplify calculations, convert percentages to fractions: x% = x/100. For example, 60% = 3/5.

Concept of 'Of' in Mathematics

In arithmetic word problems, the word 'of' represents the multiplication (×) operation between two numbers or expressions.

Percentage Change

Percentage change = [(New Value − Original Value) / Original Value] × 100.

Q34. Answer: (a) 25.85

Shortcut Trick

Average speed for equal distances = (2 × S1 × S2) ÷ (S1 + S2)

Average speed = (2 × 24 × 28) ÷ (24 + 28) = 1344 ÷ 52
Average speed = 25.846... ≈ 25.85 km/hr
Therefore The correct answer is 25.85 km/hr.
Alternate Method
Given:
Speed going (S1) = 24 km/hr
Speed returning (S2) = 28 km/hr
Formula Used:
Average Speed = Total Distance ÷ Total Time
Calculations:
=> Let the distance between the two places be d km.
=> Time taken going (T1) = d ÷ 24
=> Time taken returning (T2) = d ÷ 28
=> Average Speed = (d + d) ÷ (d/24 + d/28)
=> Average Speed = 2d ÷ [d(28 + 24) ÷ (24 × 28)]
=> Average Speed = (2 × 24 × 28) ÷ 52
=> Average Speed = 1344 ÷ 52 = 25.84615...
=> Average Speed ≈ 25.85 km/hr
Therefore The correct answer is 25.85 km/hr.
Additional Information
Average Speed (Equal Distances)
When a person covers two equal distances at speeds x and y, the average speed is given by (2xy) ÷ (x + y).
General Average Speed Formula
Average Speed = Total Distance Covered ÷ Total Time Taken. This applies even when distances or time intervals are unequal.
Relative Speed
If two objects move in the same direction, relative speed is |s1 − s2|. In opposite directions, it is s1 + s2.

Q35. Answer: (a) Rs. 5,082

Shortcut Trick
Effective Compound Interest rate for 2 years at 10% = 10 + 10 + (10 × 10)/100 = 21%
Total Amount = 100% (Principal) + 21% (Interest) = 121% of Principal
Amount = 4200 × 121/100 = 42 × 121
Amount = Rs. 5,082
Therefore The correct answer is Rs. 5,082.
Alternate Method
Given:
Principal (P) = Rs. 4,200
Rate (R) = 10% per annum
Time (n) = 2 years
Formula Used:
Amount (A) = $P(1 + R/100)^n$
Calculations:
=> $A = 4200 \times (1 + 10/100)^2$
=> $A = 4200 \times (1 + 0.1)^2$
=> $A = 4200 \times (1.1)^2$
=> A = 4200 × 1.21
=> A = 42 × 121
=> A = Rs. 5,082
Therefore The correct answer is Rs. 5,082.
Additional Information
Effective Interest Rate
For two successive years with rate R%, the effective rate is $R + R + (R^2/100)\%$.

Difference between CI and SI

For 2 years, the difference between Compound Interest and Simple Interest is $P(R/100)^2$.

Compound Interest Formula

Interest (CI) = Amount − Principal = $P[(1 + R/100)^n - 1]$.

Q36. Answer: (b) 42.19%

Shortcut Trick

Net Multiplier = (100 − 18)% × (100 − 6)% × (100 − 25)%

Net Multiplier = 0.82 × 0.94 × 0.75 = 0.5781

Equivalent Discount = (1 − 0.5781) × 100 = 42.19%

Therefore The correct answer is 42.19%.

Alternate Method

Given → Discounts: 18%, 6%, and 25%.

Formulas: Successive Discount = a + b − (ab ÷ 100)

=> First combine 18% and 6%: 18 + 6 − (18 × 6 ÷ 100) = 24 − 1.08 = 22.92%

=> Now combine 22.92% and 25%: 22.92 + 25 − (22.92 × 25 ÷ 100)

=> 47.92 − (573 ÷ 100) = 47.92 − 5.73 = 42.19%

Therefore The correct answer is 42.19%.

Additional Information

Marked Price & Discount

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

Equivalent Discount Order

The order in which successive discounts are applied does not change the final single equivalent discount.

Q37. Answer: (d) 288

Shortcut Trick

Let the dimensions be l : b : h = 5x : 4x : 4x.

The three adjacent face areas are lb = 160 cm^2, bh = 64 cm^2, and lh = 40 cm^2.

Multiplying these: $(l \times b \times h)^2 = 160 \times 64 \times 40$ => Volume (V) = $\sqrt{409600} = 640\ cm^3$.

Using V = l × b × h => 5x × 4x × 4x = 640 => $80x^3 = 640$ => x = 2.

Thus, dimensions are l = 10 cm, b = 8 cm, and h = 8 cm.

Lateral Surface Area = $2h(l + b) = 2 \times 8 \times (10 + 8) = 16 \times 18 = 288\ cm^2$.

Therefore The correct answer is 288 cm^2.

Alternate Method

Given ratio of dimensions of the cuboid: l : b : h = 5 : 4 : 4

Let l = 5x, b = 4x, and h = 4x

Areas of adjacent faces: A1 = 160 cm^2, A2 = 64 cm^2, A3 = 40 cm^2

Formula for Volume (V) of a cuboid from its adjacent face areas:

=> $V = \sqrt{(A1 \times A2 \times A3)}$

=> $V = \sqrt{(160 \times 64 \times 40)}$

=> $V = \sqrt{(409600)} = 640\ cm^3$

Also, Volume of a cuboid:

=> V = l × b × h

=> 640 = 5x × 4x × 4x

=> $640 = 80x^3$

=> $x^3 = 8$

=> x = 2

Substitute the value of x to find the actual dimensions:

=> l = 5 × 2 = 10 cm

=> b = 4 × 2 = 8 cm

=> h = 4 × 2 = 8 cm

Formula for Lateral Surface Area of a cuboid:

=> LSA = 2h(l + b)

=> LSA = 2 × 8 × (10 + 8)

=> LSA = 16 × 18

=> LSA = 288 cm²

Therefore The correct answer is 288 cm².

Additional Information

Total Surface Area (TSA) of Cuboid

The total area of all six faces of a cuboid is given by: TSA = 2(lb + bh + lh).

Volume and Adjacent Face Area Relation

If the areas of three adjacent faces are A, B, and C, then the volume V of the cuboid is V = √(A × B × C).

Diagonal of a Cuboid

The length of the longest rod that can be placed inside a cuboid is: d = √(l² + b² + h²).

4

Q38. Answer: (b) 42 years

Shortcut Trick

When one person's age is the arithmetic mean of two others, the middle person's age is simply the average of the other two.

Age of Akhil = (Sum of ages of Vijay and Karthik) ÷ 2

Age of Akhil = 84 ÷ 2 = 42 years

Therefore The correct answer is 42 years.

Alternate Method

Given:

Sum of ages of Vijay (V) and Karthik (K) = 84 years

Akhil (A) is as much older than Vijay as he is younger than Karthik.

Calculations:

=> Age difference 1: Akhil − Vijay = A − V

=> Age difference 2: Karthik − Akhil = K − A

=> According to question: A − V = K − A

=> A + A = K + V

=> 2A = K + V

=> 2A = 84

=> A = 84 ÷ 2 = 42

Therefore The correct answer is 42 years.

Additional Information

Arithmetic Progression in Ages

When a person is equally older and younger than two others, their ages form an Arithmetic Progression (AP) where the middle person is the average.

Average of Ages

The average of n people is the Total Sum of Ages divided by n. For two people, it is (Age1 + Age2) ÷ 2.

Ratio & Proportion in Ages

If ratios are given for different time periods (past/future), use the property that the age difference between any two people always remains constant over time.

Q39. Answer: (c) 219 cm

Shortcut Trick

Height of a cuboid = Volume ÷ (Length × Breadth)

Height = 9198 ÷ (21 × 2)

Height = 9198 ÷ 42

Height = 219 cm

Therefore The correct answer is 219 cm.

Alternate Method

Given:

Length (l) = 21 cm

Breadth (b) = 2 cm

Volume (V) = 9198 cm^3

Formula Used:

Volume of a Cuboid = Length × Breadth × Height

Calculations:

=> Volume = l × b × h

=> 9198 = 21 × 2 × Height

=> 9198 = 42 × Height

=> Height = 9198 ÷ 42

=> Height = 219 cm

Therefore The correct answer is 219 cm.

Additional Information

Total Surface Area of Cuboid

The total area of all six faces: TSA = 2(lb + bh + hl).

Lateral Surface Area of Cuboid

The area of the four side faces (excluding top and bottom): LSA = 2h(l + b).

Diagonal of a Cuboid

The longest rod that can be placed inside: Diagonal = $\sqrt{(l^2 + b^2 + h^2)}$.

Q40. Answer: (c) Rs. 14,000

Shortcut Trick

Use the ratio formula: CP ÷ MP = (100 − Discount%) ÷ (100 + Profit%).

CP ÷ 45,000 = (100 − 44) ÷ (100 + 80).

CP ÷ 45,000 = 56 ÷ 180.

CP = (56 ÷ 180) × 45,000.

CP = 56 × 250 = 14,000.

Therefore The correct answer is Rs. 14,000.

Alternate Method

Given → Marked Price (MP) = Rs. 45,000, Discount = 44%, Profit = 80%.

Formulas: SP = MP × (100 − D%) ÷ 100 | CP = SP × 100 ÷ (100 + P%).

=> Step 1: Calculate Selling Price (SP) = 45,000 × (100 − 44) ÷ 100.

=> SP = 45,000 × 0.56 = 25,200.

=> Step 2: Calculate Cost Price (CP) using SP and Profit.

=> CP = 25,200 × 100 ÷ (100 + 80).

=> CP = 25,200 × 100 ÷ 180 = 25,200 ÷ 1.8.

=> CP = 14,000.

Therefore The correct answer is Rs. 14,000.

Additional Information

Relation between CP and MP

When both discount percentage and profit percentage are given, the ratio of Cost Price to Marked Price is always (100 − D%) : (100 + P%).

Marked Price & Discount

Marked Price is the price printed on the product. Discount is always calculated on the Marked Price to arrive at the Selling Price.

Q41. Answer: (b) 36

Shortcut Trick

Simplify ratios: Second : First = 2:12 = 1:6 and Third : Second = 5:10 = 1:2.

Combine: First : Second : Third = (6×2) : (1×2) : (1×1) = 12 : 2 : 1.

Total units = 12 + 2 + 1 = 15 units → 270.

1 unit = 270 ÷ 15 = 18.

Second number = 2 units = 2 × 18 = 36.

Therefore The correct answer is 36.

Alternate Method
Given: Sum of numbers = 270. Ratio N2 : N1 = 2:12. Ratio N3 : N2 = 5:10.
Calculations:
=> Let numbers be N1, N2, N3.
=> N1 : N2 = 12 : 2 = 6 : 1.
=> N2 : N3 = 10 : 5 = 2 : 1.
=> To equalize N2, multiply first ratio by 2: N1 : N2 = 12 : 2.
=> Combined ratio N1 : N2 : N3 = 12 : 2 : 1.
=> Sum of ratios = 12 + 2 + 1 = 15 parts.
=> 15 parts = 270.
=> 1 part = 270 ÷ 15 = 18.
=> Second number (N2) = 2 parts = 2 × 18 = 36.
Therefore The correct answer is 36.
Additional Information
Compound Ratio
When ratios A:B and B:C are given, the combined ratio A:B:C is found by making the common term B equal in both sets.
Proportion Rule
If a:b = c:d, then product of extremes (a×d) equals product of means (b×c).
Ratio Scaling
A ratio remains unchanged if both terms are multiplied or divided by the same non-zero number.

Q42. Answer: (b) 100

Shortcut Trick
Simplify both fractions first: 1/30 and 2/60 = 1/30.
Since both values are identical, the percentage is 100%.
Therefore The correct answer is 100%.
Alternate Method
Given:
First value = 1/30
Second value (Base) = 2/60
Formula Used:
Percentage = (Value / Base) × 100
Calculations:
=> Simplify the base value: 2/60 = 1/30
=> Percentage = [(1/30) / (1/30)] × 100
=> Percentage = 1 × 100
=> Percentage = 100%
Therefore The correct answer is 100%.
Additional Information
Percentage Change
Percentage change = [(New Value − Old Value) / Old Value] × 100.
Fraction to Percentage
To convert any fraction a/b to a percentage, multiply the fraction by 100 and add the % symbol.
Base Change Property
If Value A is x% of Value B, then Value B is (10000/x)% of Value A.

Q43. Answer: (d) 9

Shortcut Trick
√48 = 4√3 and √75 = 5√3
=> (4√3 + 5√3) ÷ √3 = 9√3 ÷ √3
=> = 9
Therefore Answer = 9

Alternate Method

Given:

(√48 + √75) ÷ √3

Concept Used:

Surd simplification and BODMAS rule

Calculation:

=> (√48 + √75) ÷ √3

=> (4√3 + 5√3) ÷ √3

=> 9√3 ÷ √3

=> 9

Therefore The correct answer is 9.

Additional Information

Surd Simplification

√48 = √(16×3) = 4√3 and √75 = √(25×3) = 5√3

BODMAS Rule

Follow order: Brackets → Division → Addition

Like Terms

Combine terms with same root: a√x + b√x = (a+b)√x

Division Rule

√a ÷ √a = 1

Q44. Answer: (c) 2100

Shortcut Trick

Ratio of Girls to Boys = 1 : 7

Given, 1 unit (Girls) = 300

Number of boys = 7 units = 7 × 300

Therefore The correct answer is 2100.

Alternate Method

Given:

Ratio of Girls : Boys = 1 : 7

Total number of Girls = 300

Calculations:

=> Let the number of girls be 1x and boys be 7x.

=> 1x = 300

=> x = 300

=> Number of boys = 7x

=> Number of boys = 7 × 300

=> Number of boys = 2100

Therefore The correct answer is 2100.

Additional Information

Ratio and Proportion

A ratio compares two quantities. If a : b is the ratio, then the quantities can be expressed as ax and bx where x is the common multiplier.

Total Quantity

To find the total number of participants, add the parts: (1 + 7) units = 8 units. Total = 8 × 300 = 2400.

Direct Proportion

When the number of girls increases, the number of boys increases to maintain the constant ratio 1/7.

Q45. Answer: (b) 25%

Shortcut Trick

Ratio of Cost Price (CP) to Selling Price (SP) = 388 : 485.

Dividing both by their HCF (97): 388 ÷ 97 : 485 ÷ 97 = 4 : 5.

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Profit = 5 − 4 = 1 unit.
Profit% = (1 ÷ 4) × 100 = 25%.
Therefore The correct answer is 25%.
Alternate Method
Given → Cost Price (CP) = Rs. 388, Selling Price (SP) = Rs. 485.
Formulas: Profit = SP − CP | Profit% = (Profit ÷ CP) × 100.
Steps:
=> Profit = 485 − 388 = Rs. 97.
=> Profit% = (97 ÷ 388) × 100.
=> Profit% = (1 ÷ 4) × 100.
=> Profit% = 25%.
Therefore The correct answer is 25%.
Additional Information
Profit and Loss Basics
Profit occurs when the selling price is greater than the cost price. It is calculated on the Cost Price (CP) unless otherwise stated.
Percentage Calculation
To convert a fraction to a percentage, multiply by 100. For example, 1/4 × 100 = 25% and 1/5 × 100 = 20%.

Q46. Answer: (b) 8

Shortcut Trick
The average of the first n odd natural numbers is always equal to n.
Here, the question asks for the average of the first 8 odd natural numbers.
=> n = 8
=> Average = 8
Therefore The correct answer is 8.
Alternate Method
Given: First 8 odd natural numbers are 1, 3, 5, 7, 9, 11, 13, and 15.
Formula Used: Average = (Sum of all observations) ÷ (Total number of observations)
=> Sum = 1 + 3 + 5 + 7 + 9 + 11 + 13 + 15
=> Sum = 64
=> Average = 64 ÷ 8
=> Average = 8
Therefore The correct answer is 8.
Additional Information
Sum of First n Odd Numbers
The sum of the first n odd natural numbers is always calculated as n^2.
Average of First n Even Numbers
The average of the first n even natural numbers is given by the formula (n + 1).
Average of Arithmetic Progression (AP)
For any sequence in AP (like consecutive odd/even numbers), Average = (First term + Last term) ÷ 2.

Q47. Answer: (b) 1500

Shortcut Trick
Let total voters = 100%.
Non-voters = 10%, so voted = 90%.
Winner = 49% of total = 49%.
Loser = 90% − 49% = 41%.
Difference (8%) = 120 votes => 1% = 15 votes => 100% = 1500 votes.
Therefore The correct answer is 1500.
Alternate Method
Given:
Winner gets 49% of total electoral list.

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10% voters did not vote.

Winner defeats loser by 120 votes.

=> Let total voters = x.

=> Winner's votes = 0.49x.

=> Total votes polled = 0.90x.

=> Loser's votes = 0.90x − 0.49x = 0.41x.

=> Difference = 0.49x − 0.41x = 120.

=> 0.08x = 120.

=> x = 120 ÷ 0.08 = 1500.

Therefore The correct answer is 1500.

Additional Information

Percentage Change

Percentage change = (Difference ÷ Original Value) × 100.

Valid Votes vs Total Votes

Always distinguish between % of total voters and % of valid votes cast. If winner gets % of valid votes, subtract invalid/non-voters from total first.

Unitary Method in Elections

Find the value of 1% (or 1 unit) by dividing the vote margin by the percentage difference between candidates.

Q48. Answer: (c) 102 m

Shortcut Trick

In a 30°−60°−90° triangle, the ratio of sides opposite to these angles is 1 : √3 : 2.

Side opposite to 30° (Height) = 1 unit = 60 m.

Side opposite to 60° (Distance) = √3 units = 60 × √3 m.

Distance = 60 × 1.7 = 102 m.

Therefore The correct answer is 102 m.

Alternate Method

Given:

Height of tower (AB) = 60 m

Angle of depression = 30° => Angle of elevation at car (C) = 30°

Formula Used:

tan(θ) = Perpendicular ÷ Base

Calculations:

=> tan(30°) = AB ÷ BC

=> 1/√3 = 60 ÷ BC

=> BC = 60 × √3

=> BC = 60 × 1.7

=> BC = 102 m

Therefore The correct answer is 102 m.

Additional Information

Angle of Depression

The angle formed by the line of sight with the horizontal when looking down at an object. It is numerically equal to the angle of elevation due to alternate interior angles.

Trigonometric Ratios for Standard Angles

Common values include tan(30°) = 1/√3, tan(45°) = 1, and tan(60°) = √3.

Height and Distance Relationship

Distance = Height × cot(θ). In this case, 60 × cot(30°) = 60 × √3.

Q49. Answer: (c) 16

Shortcut Trick

The expression is based on the algebraic identity: $(a^3 + b^3 + c^3 − 3abc) ÷ (a^2 + b^2 + c^2 − ab − bc − ca) = (a + b + c)$.

Identifying the values: a = 6.9, b = 2.8, and c = 6.3.

The result is simply the sum of these three numbers.

Sum = 6.9 + 2.8 + 6.3 = 16.0.
Therefore The correct answer is 16.
Alternate Method
Given:
Numerator = $(6.9)^3 + (2.8)^3 + (6.3)^3 - 3 \times 6.9 \times 2.8 \times 6.3$
Denominator = $(6.9)^2 + (2.8)^2 + (6.3)^2 - (6.9 \times 2.8) - (2.8 \times 6.3) - (6.9 \times 6.3)$
Formula Used:
$a^3 + b^3 + c^3 - 3abc = (a + b + c)(a^2 + b^2 + c^2 - ab - bc - ca)$
Calculations:
Let a = 6.9, b = 2.8, and c = 6.3.
=> Expression = $[(a + b + c)(a^2 + b^2 + c^2 - ab - bc - ca)] \div (a^2 + b^2 + c^2 - ab - bc - ca)$
=> Expression = a + b + c
=> Expression = 6.9 + 2.8 + 6.3
=> Expression = 16.0
Therefore The correct answer is 16.
Additional Information
Standard Algebraic Identity
The cubic expansion $a^3 + b^3 + c^3 - 3abc = (a + b + c)(a^2 + b^2 + c^2 - ab - bc - ca)$ is a fundamental factorization tool in algebra.
Special Case (Conditional Identity)
If (a + b + c) = 0, then the expression $a^3 + b^3 + c^3 - 3abc$ becomes 0, which implies $a^3 + b^3 + c^3 = 3abc$.
Related Form
Another version of the second bracket is $\frac{1}{2}[(a-b)^2 + (b-c)^2 + (c-a)^2]$, often used in quantitative aptitude problems.

Q50. Answer: (b) 45°

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 interior angles.
Therefore angle LZK = (angle I + angle J) ÷ 2
=> angle LZK = (11° + 79°) ÷ 2
=> angle LZK = 90° ÷ 2 = 45°
Therefore The correct answer is 45°.
Alternate Method
Given:
In quadrilateral IJKL:
angle I = 11°
angle J = 79°
Formula Used:
• Sum of all interior angles of a quadrilateral = 360°
• Sum of angles of a triangle = 180°
Calculations:
In quadrilateral IJKL, the sum of all interior angles is 360°:
=> angle I + angle J + angle K + angle L = 360°
Substitute the given values of angle I and angle J:
=> 11° + 79° + angle K + angle L = 360°
=> 90° + angle K + angle L = 360°
=> angle K + angle L = 360° − 90°
=> angle K + angle L = 270°
Since KZ and LZ are the angle bisectors of angle K and angle L respectively:
=> angle ZKL = angle K ÷ 2
=> angle ZLK = angle L ÷ 2
In triangle LZK, the sum of angles is 180°:
=> angle LZK + angle ZKL + angle ZLK = 180°
=> angle LZK + (angle K ÷ 2) + (angle L ÷ 2) = 180°

=> angle LZK + (angle K + angle L) ÷ 2 = 180°

Substitute the value of (angle K + angle L = 270°):

=> angle LZK + (270° ÷ 2) = 180°

=> angle LZK + 135° = 180°

=> angle LZK = 180° − 135°

=> angle LZK = 45°

Therefore The correct answer is 45°.

Option Analysis:

• Option (1) 31°: Incorrect, as the calculated value of angle LZK is 45°, not 31°.

• Option (2) 45°: Correct, as verified by the angle sum properties of quadrilaterals and triangles.

• Option (3) 55°: Incorrect, as the calculated value of angle LZK is 45°, not 55°.

• Option (4) 51°: Incorrect, as the calculated value of angle LZK is 45°, not 51°.

Additional Information

Angle Bisector Theorem in Quadrilaterals

The angle formed by the bisectors of two adjacent angles of a quadrilateral is always equal to half the sum of the remaining two angles. For quadrilateral IJKL, angle LZK = (angle I + angle J) ÷ 2.

Sum of Interior Angles of a Polygon

The sum of the interior angles of any n-sided polygon is given by the formula (n − 2) × 180°. For a quadrilateral (n = 4), the sum is (4 − 2) × 180° = 360°.

Angle Bisectors of Opposite Angles

The angle between the bisectors of two opposite angles of a quadrilateral is equal to half the difference of the other two angles.

Q51. Answer: (b) 4

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

Now,

We need to identify odd numbers that are immediately preceded by an odd number and immediately followed by an even number.

So, the required condition is: Odd Number – Odd Number – Even Number

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

Total odd numbers satisfying the condition = 4

Hence, the correct answer is "Option 2".

Q52. Answer: (d) Brother's wife's brother

Family Chart:

Symbol	•	−	x	&
Meaning	Son	Brother	Wife	Father

Given: K + T & R x Z − V

It means: K is the son of T, T is the father of R, R is the wife of Z, Z is the brother of V.

Here, K is V’s brother

Hence, the correct answer is Option 3.

Q53. Answer: (a) MQ−QX

The logic followed here is:

Option 1) MQ – QX

Option 2) KO – PT

Option 3) FJ – KO

Option 4) BF – GK

Here, MQ – QX is odd from the given options because it does not follow the uniform +4, +1, +4 shift pattern.

Hence, the correct answer is "Option 1".

Q54. Answer: (b) Both conclusions (I) and (II) follow.

Given Statements:

All peas are carrots.

All carrots are turnips.

The least possible Venn diagram for the given statement is:

Conclusions:

I. Some turnips are carrots - Follows (Since all carrots are turnips, there is definitely an overlap between turnips and carrots).

II. All peas are turnips - Follows (All peas are carrots and all carrots are turnips, so all peas are turnips).

So, both conclusions I and II follow.

Hence, the correct answer is Option 2.

Q55. Answer: (b) YZX 24

The logic followed here is:

So, 'YZX 24' will replace the question mark in the given series.

Hence, the correct answer is "Option 2".

Q56. Answer: (a) 11

BODMAS Table:

Given equation: 17 D 4 B 3 C 54 A 9 = ?

Now, if A stands for '÷', B stands for '×', C stands for '+' and D stands for '−', then:

17 D 4 B 3 C 54 A 9

=> 17 − 4 × 3 + 54 ÷ 9

=> 17 − 12 + 6

=> 5 + 6

=> 11

Hence, the correct answer is "Option 1".

Q57. Answer: (a) Only conclusion (II) follows.

Given Statements:

All hats are mats.

All hats are cats.

All dogs are cats.

The least possible Venn diagram for the given statement is:

Conclusions:

I. All dogs are mats - Does not follow (There is no definite relation between dogs and mats).

II. Some cats are mats - Follows (Since all hats are both cats and mats, there is a definite common part between cats and mats).

So, only conclusion II follows.

Hence, the correct answer is Option 1.

Q58. Answer: (b) 4

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

Now,

We need to identify odd numbers that are immediately preceded by an even number and immediately followed by an even number.

So, the required condition is: Even Number – Odd Number – Even Number

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

Total odd numbers satisfying the condition = 4

Hence, the correct answer is "Option 2".

Q59. Answer: (a) 14th

Given:

Total number of people = 47

Umesh's position from right = 15th

Ketan sits 19th to the left of Umesh

Ketan's position from right = 15 + 19 = 34th

Ketan's position from left = (Total + 1) − Position from right

= (47 + 1) − 34

= 48 − 34

= 14th

Here, Ketan is 14th from the left end of the line.

Hence, the correct answer is "Option 1".

Q60. Answer: (a) yk

The logic followed here is:

Given:

'time heals wound' → dj yk eb

'let time reveal' → fx ov yk

So, time → yk

Hence, the correct answer is Option 1.

Q61. Answer: (b) 3

Given: (Left) 1 4 * @ 9 & & £ $ 7 2 8 & 9 5 £ £ # 6 * 1 % (Right)

Now,

We need to identify numbers that are immediately preceded by a number and immediately followed by a symbol.

So, the required pattern is: Number → Number → Symbol

(Left) 1 4 * @ 9 & & £ $ 7 2 8 & 9 5 £ £ # 6 * 1 % (Right)

Total instances found = 3

Hence, the correct answer is "Option 2".

Q62. Answer: (c) 73

The logic followed here is:

thus, "73" will replace the question mark in the given series.

Hence, the correct option is "Option 3".

Q63. Answer: (c) 3 km towards west

Given:

Ashish starts from Point K and drives 12 km towards the east.

He then takes a right turn and drives 10 km.

He turns left and drives 3 km.

He then takes a right turn and drives 5 km.

He then takes a right turn and drives 18 km.

He takes a final right turn and drives 15 km and stops at Point Z.

Therefore, Point Z is 3 km towards the west of Point K.

Hence, the correct answer is Option 3.

Q64. Answer: (b) HOME - MHOE - EMOH

The logic followed here is:

For, INKS → KINS → SKNI

Now, READ → ARED → DAER

Now, checking the options:

Option 1) PLAY → LPAY → YLAP

Option 2) HOME → MHOE → EMOH

Option 3) TOMB → MTOB → OMBT

Option 4) FROM → FORM → MORF

Hence, the correct answer is Option 2.

Q65. Answer: (a) 17

BODMAS Table:

Given equation: 8 − 7 ÷ 39 × 13 + 12 = ?

Now, replacing the symbols as:

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Symbol	•	−	×	÷
Replaced by	−	•	÷	×

=> 8 + 7 × 39 ÷ 13 − 12 = ?
=> 8 + 7 × 3 − 12 = ?
=> 8 + 21 − 12 = ?
=> 29 − 12 = ?
=> 17
Hence, the correct answer is Option 1.

Q66. Answer: (b) TUH

The logic followed here is:
So, the next term = TUH
Hence, the correct answer is Option 2.

Q67. Answer: (b) (16, 7, 12)

The logic followed here is:
Logic:
First number − Second number = 9
Third number − Second number = 5
(15, 6, 11)
=> 15 − 6 = 9
=> 11 − 6 = 5
(24, 15, 20)
=> 24 − 15 = 9
=> 20 − 15 = 5
Now, checking the options:
Option 1) (19, 28, 33)
=> 19 − 28 = −9
=> 33 − 28 = 5 (does not satisfy both conditions)
Option 2) (16, 7, 12)
=> 16 − 7 = 9
=> 12 − 7 = 5
Option 3) (18, 9, 4)
=> 18 − 9 = 9
=> 4 − 9 = −5
Option 4) (23, 14, 9)
=> 23 − 14 = 9
=> 9 − 14 = −5
Hence, the correct answer is Option 2.

Q68. Answer: (b) 24

The logic followed here is:
Given number: 716324598
Logic:
Even digit → (Digit + 1)
Odd digit → (Digit − 1)
Original number: 7 1 6 3 2 4 5 9 8

Digit	Type	Operation	New Digit
7	Odd	7 − 1	6
1	Odd	1 − 1	0

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6	Even	6 + 1	7
3	Odd	3 − 1	2
2	Even	2 + 1	3
4	Even	4 + 1	5
5	Odd	5 − 1	4
9	Odd	9 − 1	8
8	Even	8 + 1	9

New number formed: 607235489
Now, odd digits in the new number are: 7, 3, 5, 9
Required Sum = 7 + 3 + 5 + 9 = 24
Hence, the correct answer is Option 2.

Q69. Answer: (b) Second to the right

Given: A, B, C, D, E and F are sitting around a circular table, facing the centre.
B sits second to the left of E.
D is an immediate neighbour of B.
A sits to the immediate left of B.
C sits second to the right of E.
F sits to the immediate left of C.
Therefore, A is Second to the right of F.
Hence, the correct answer is Option 2.

Q70. Answer: (d) SPR

The logic followed here is:
Option 1) WTX
Option 2) FCG
Option 3) KHL
Option 4) SPR
Here, SPR is odd from the given options because it does not follow the uniform −3, +4 pattern.
Hence, the correct answer is "Option 4".

Q71. Answer: (b) XRUZ

The logic followed here is:
For, OILQ → SMPU
Now, KEHM → OILQ
Now, applying the same logic for TNQV:
So, TNQV → XRUZ
Hence, the correct answer is Option 2.

Q72. Answer: (d) eight

Given: (Left) 5 8 5 6 1 8 6 8 5 1 5 8 8 8 9 4 1 6 1 8 4 2 5 4 3 2 1 2 6 (Right)
Now,
We need to identify odd digits that are immediately preceded by an even digit and also immediately followed by an even digit.
So, the required condition is: Even Digit – Odd Digit – Even Digit
(Left) 5 8 5 6 1 8 6 8 5 1 5 8 8 8 9 4 1 6 1 8 4 2 5 4 3 2 1 2 6 (Right)
Total odd digits satisfying the condition = 8
Hence, the correct answer is "Option 4".

Q73. Answer: (a) Two

Given: A, B, C, D, N, O and P are sitting in a straight line facing north.
Only two people sit between D and P.

Only C sits to the right of O.
Only one person sits between P and O.
A sits at some place to the right of N but at some place to the left of B.
Between them are A and P → 2 people
Hence, the correct answer is Option 1.

Q74. Answer: (a) 100

The logic followed here is:
thus, "100" will replace the question mark in the given series.
Hence, the correct option is "Option 1".

Q75. Answer: (c) 80

Given:
Rank from top = 14
Rank from bottom = 67
Total number of students = (Rank from top + Rank from bottom) − 1
= (14 + 67) − 1
= 81 − 1
= 80
Here, there are 80 students in his class.
Hence, the correct answer is "Option 3".

Q76. Answer: (b) PU 15

The logic followed here is:
For, XD 15 → BG 20
Now, MT 25 → QW 30
Now, applying the same logic for LR 10:
So, LR 10 → PV 15
Hence, the correct answer is Option 2.

Q77. Answer: (c) E

Given: Seven people A, B, C, D, E, F and G are sitting around a circular table, facing the centre.
C is an immediate neighbour of both A and D.
B sits to the immediate left of D.
A sits second to the left of F.
G is an immediate neighbour of both B and F.
Therefore, the person sitting to the immediate right of A is E.
Hence, the correct answer is Option 3.

Q78. Answer: (a) 2

The logic followed here is:
Given:
LEASK → 76432
KASEY → 46837
So, L → 2
Hence, the correct answer is Option 1.

Q79. Answer: (a) 0

The logic followed here is:
thus, "0" will replace the question mark in the given series.
Hence, the correct option is "Option 1"

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Q80. Answer: (d) 16 km to the north

Given:

Asim starts from Point A and drives 60 km towards the west.

He then takes a right turn and drives 55 km.

He again takes a right turn and drives 64 km.

He then takes a right turn and drives 71 km.

Finally, he takes a right turn and drives 4 km and stops at Point P.

So, To reach Point A again, Asim must drive 16 km towards the north.

Hence, the correct answer is Option 4.

Q81. Answer: (c) Allianz Group

The correct answer is Allianz Group.

Key Points

• In July 2025, Jio Financial Services (JFS), the financial services arm of Reliance Industries Limited, announced the signing of a binding agreement with the Allianz Group.

• The agreement aims to establish a 50:50 joint venture to enter the reinsurance sector in India, marking a significant entry for Jio into the complex risk-management market.

• This partnership signifies Allianz's strategic pivot in the Indian market as it seeks to leverage Jio's extensive digital infrastructure and customer base to offer reinsurance solutions.

• The reinsurance joint venture is expected to provide specialized capacity for insurance companies to offload risks, thereby strengthening the overall insurance ecosystem in the country.

• The commencement of operations for this venture is subject to regulatory approvals from the Insurance Regulatory and Development Authority of India (IRDAI) and other relevant authorities. Hence, the correct answer is Allianz Group.

Additional Information

• Allianz Group:

• It is a German multinational financial services company headquartered in Munich.

• Founded in 1890, it is one of the world's leading insurers and asset managers, operating in over 70 countries.

• Before this 2025 agreement, Allianz had a long-standing partnership with the Bajaj Group in India, holding significant stakes in Bajaj Allianz General Insurance and Bajaj Allianz Life Insurance since 2001.

• Jio Financial Services (JFS):

• Originally a part of Reliance Industries, it was demerged and listed as an independent entity in 2023.

• Under the leadership of Chairman K.V. Kamath, JFS has rapidly expanded into lending, digital payments, and asset management, including a notable joint venture with BlackRock.

• The company aims to democratize financial services in India through a digital-first approach.

• Reinsurance Sector:

• Reinsurance is essentially "insurance for insurance companies," where a reinsurer takes on a portion of the risk from an insurer in exchange for a premium.

• In India, the market is historically dominated by the state-owned GIC Re (General Insurance Corporation of India), which was established in 1972.

• The Indian market has recently opened up to several global reinsurers like Munich Re, Swiss Re, and Hannover Re, which operate through branch offices.

Important Points

• Regulatory Landscape: The IRDAI is the statutory body responsible for regulating the insurance and reinsurance industries in India. It was constituted under the Insurance Regulatory and Development Authority Act, 1999.

• FDI in Insurance: The Government of India increased the Foreign Direct Investment (FDI) limit in the insurance sector from 49 percent to 74 percent in 2021 to attract more global capital and expertise.

• Market Potential: With India having one of the lowest insurance penetration rates globally, the reinsurance sector is critical for supporting large-scale infrastructure projects and managing catastrophic risks.

Q82. Answer: (a) Rajput Regiment

The correct answer is Rajput Regiment.

Key Points

• The 10th edition of the joint military exercise Mitra Shakti was conducted between the Indian Army and the Sri Lankan Army.

• The Indian contingent for this exercise was represented by a battalion of the Rajput Regiment, consisting of 120 personnel and supported by other arms and services.

• The exercise took place in August 2024 (often associated with the 2024-25 training cycle) at the Army Training School, Maduru Oya in Sri Lanka. Hence, option 1 is correct.

• The primary objective of Mitra Shakti-2025 (10th Edition) was to enhance the interoperability and mutual understanding between the two armies, specifically focusing on Counter-Insurgency and Counter-Terrorism operations.

• The exercise was designed to simulate sub-conventional operations in a semi-urban environment under Chapter VII of the United Nations Charter, which deals with peace enforcement.

• Participants engaged in various tactical drills, including combat conditioning, tactical maneuvers, and the integration of drones and counter-drone systems in modern warfare scenarios.

Additional Information

• Exercise Mitra Shakti:

• This is an annual bilateral exercise that began in 2012. It is held alternately in India and Sri Lanka to promote close operational ties.

• The 9th edition of the exercise was held in November 2023 at Aundh (Pune), Maharashtra, India.

• The exercise serves as a platform for both nations to share their experiences in counter-terrorism, especially given their shared security challenges in the Indian Ocean Region.

• The Rajput Regiment:

• It is one of the oldest and most prestigious infantry regiments of the Indian Army, with its origins tracing back to 1778.

• The regiment's motto is "Sarvatra Vijay" (Victory Everywhere), and its war cry is "Bol Bajrang Bali Ki Jai".

• The regiment has participated in significant conflicts, including World War I, World War II, and all major post-independence wars like the 1971 Indo-Pak War and the Kargil War.

• Other Exercises with Sri Lanka:

• SLINEX: A bilateral maritime exercise between the Indian Navy and the Sri Lanka Navy to enhance naval cooperation.

• Dosti: A trilateral coast guard exercise involving India, Sri Lanka, and the Maldives, focusing on maritime safety and search-and-rescue.

Important Points

• The 10th edition witnessed the use of modern technology, including unmanned aerial vehicles (UAVs) and robotic platforms, reflecting the changing nature of the battlefield.

• The Sri Lankan Army contingent was represented by the Gajaba Regiment during the recent iterations of this joint training.

• Defense cooperation remains a cornerstone of the India-Sri Lanka relationship, aligning with India's "Neighbourhood First" policy and the SAGAR (Security and Growth for All in the Region) vision.

• Joint military exercises like Mitra Shakti help in building Military-to-Military (M2M) cooperation and fostering diplomatic relations through shared military heritage and professionalism.

Q83. Answer: (c) Delhi

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

Key Points

• The Government of NCT of Delhi issued a significant mandate in May 2025 requiring the installation of rooftop sprinkler systems on all high-rise buildings.

• The primary objective of this directive is to mitigate the intense Urban Heat Island (UHI) effect that significantly raises temperatures in the capital during peak summer months.

• This decision was spearheaded by the Delhi Disaster Management Authority (DDMA) as part of its updated Heat Action Plan to enhance urban resilience against record-breaking temperatures.

• The mandate applies to both residential and commercial high-rise structures, requiring them to utilize automated or manual sprinkler systems to cool building surfaces.

• By cooling the exterior of the buildings, the initiative aims to reduce the indoor cooling load, thereby decreasing the overall electricity demand for air conditioning across the city.

Additional Information

• Urban Heat Island (UHI) Effect:

• This phenomenon occurs when urban areas experience much higher temperatures than surrounding rural areas due to concrete surfaces, dense infrastructure, and high anthropogenic heat.

• In Delhi, the UHI effect has been known to cause temperature differences of 5 to 10 degrees Celsius compared to neighboring forested or rural regions.

• Delhi Disaster Management Authority (DDMA):

• Established under the Disaster Management Act, 2005, the DDMA is the apex body for disaster planning and response in the National Capital Territory.

• The authority is chaired by the Lieutenant Governor of Delhi, with the Chief Minister serving as the Vice-Chairperson.

• Heat Action Plan (HAP):

• The HAP is a comprehensive framework that includes early warning systems, public awareness campaigns, and long-term mitigation strategies like cool roofs and afforestation.

• The 2025 update specifically introduced active cooling technology, such as the rooftop sprinkler mandate, to deal with extreme heatwaves.

• Sustainable Urban Development:

• Mandating sprinklers is aligned with green building norms, encouraging developers to integrate sustainable water management into urban architecture.

Important Points

• Water Sourcing: To ensure the sustainability of the project, the mandate suggests that building owners should use treated wastewater from Sewage Treatment Plants (STPs) or rainwater harvesting systems instead of fresh potable water.

• Building Height Classification: For the purpose of this mandate, buildings exceeding 15 meters in height are generally classified as high-rise under the Unified Building Bye-Laws for Delhi.

• Compliance and Monitoring: The Municipal Corporation of Delhi (MCD) and the Delhi Fire Services are tasked with inspecting buildings to ensure the sprinkler systems are installed and functional.

• Impact on Power Grid: By lowering the surface temperature of buildings, the government expects a reduction in the peak power load during the day, preventing transformer failures and power outages during heatwaves.

Q84. Answer: (c) State Skill Development Policy using digital and inclusive training tools

The correct answer is State Skill Development Policy using digital and inclusive training tools.

Key Points

• In September 2025, the Government of Karnataka introduced a comprehensive State Skill Development Policy specifically designed to tackle unemployment by aligning the local labor force with evolving global industry standards.

• The primary objective of this move is to build a future-ready workforce capacity through the integration of digital training tools, such as Artificial Intelligence (AI) and Augmented Reality (AR), into the vocational education system.

• The policy prioritizes inclusive training, ensuring that socio-economically backward regions and rural youth receive the same quality of technical education as those in urban centers like Bengaluru.

• By focusing on digital literacy and high-tech skills, the policy aims to transition the state from traditional labor-intensive roles to knowledge-based employment opportunities.

• This initiative is part of a larger strategy to maintain Karnataka's position as a leading destination for Foreign Direct Investment (FDI) and industrial innovation in India.

Additional Information

• Skill Development, Entrepreneurship and Livelihood Department (SDEL):

• This department acts as the nodal agency in Karnataka for implementing various employment-linked schemes, including the Chief Minister’s Kaushalya Karnataka Yojane (CMKKY).

• The department oversees the Karnataka Skill Development Corporation (KSDC), which facilitates Public-Private Partnerships (PPP) to enhance training infrastructure.

• Industry 4.0 Integration:

• The 2025 policy is heavily influenced by the principles of Industry 4.0, which emphasizes automation, data exchange, and smart manufacturing.

• Training modules now include cybersecurity, Internet of Things (IoT), and Cloud Computing to cater to the demands of the IT and Aerospace sectors.

• Incentives and Subsidies:

• To encourage participation, the state provides stipends to trainees and tax incentives to companies that establish Centers of Excellence (CoE) within the state.

• Special focus is given to women entrepreneurs and startups through dedicated incubation centers funded under the state's startup policy.

Important Points

• Target Population: The policy aims to certify over 1.5 million youth over a period of three years, targeting an age group of 18 to 35 years.

• Geographical Outreach: While Bengaluru remains a tech hub, this policy mandates the setting up of Skill Hubs in Tier-2 and Tier-3 cities like Mysuru, Hubballi, and Kalaburagi.

• Digital Skill Passport: A unique feature introduced in 2025 is the Digital Skill Passport, a blockchain-based credential that allows employers to verify a candidate's certifications and work experience instantly.

• Global Collaboration: Karnataka has signed various Memorandums of Understanding (MoUs) with international organizations

and multinational corporations (MNCs) to provide global certification standards to local students.

Q85. Answer: (c) Armand Duplantis

The correct answer is Armand Duplantis.

Key Points

• Armand Duplantis, the Swedish pole vault sensation, set a monumental new world record of 6.28 m during the Stockholm Diamond League (also known as BAUHAUS-galan) in June 2025.

• This performance took place at the historic Stockholm Olympic Stadium in Sweden, where Duplantis competed in front of a home crowd, further cementing his status as the greatest pole vaulter in history.

• The height of 6.28 m surpassed his own previous world records, continuing a streak of incremental improvements that he has maintained since first breaking the record in 2020.

• Known by his nickname "Mondo," he is a Swedish-American athlete who has chosen to represent Sweden, his mother's home country, in international athletics.

• His success at the 2025 Diamond League circuit is part of a broader career that includes multiple World Championship titles and Olympic Gold Medals.

Additional Information

• Armand Duplantis:

• Born on November 10, 1999, in Lafayette, Louisiana, USA.

• He won the Gold Medal at the Tokyo 2020 Olympics and successfully defended his title at the Paris 2024 Olympics.

• He holds the distinction of being the first pole vaulter to clear the 6.20 m barrier, a feat that revolutionized the sport of athletics.

• Diamond League:

• The Wanda Diamond League is an annual series of elite track and field competitions organized by World Athletics.

• It was established in 2010 to replace the IAAF Golden League and consists of various legs held across Europe, Asia, and North America.

• The Stockholm leg is one of the most prestigious stops on the tour, often featuring record-breaking attempts due to its favorable conditions.

• Other Prominent Vaulters:

• Sam Kendricks: An American pole vaulter and a two-time World Champion (2017 and 2019) who has been a consistent rival to Duplantis.

• Emmanouil Karalis: A Greek athlete who won the Bronze Medal at the 2024 Paris Olympics and holds the Greek national record.

• Kurtis Marschall: An Australian pole vaulter who has won multiple Commonwealth Games titles and is a regular finalist in World Athletics events.

Important Points

• World Record Ratification: Any world record set in athletics, such as the 6.28 m vault, must be officially ratified by World Athletics, the international governing body for the sport. This involves strict anti-doping protocols and official measurement of the crossbar height.

• Technological Impact: Modern pole vaulting utilizes carbon fiber and fiberglass poles, which allow for greater energy return. Duplantis combines this technology with extraordinary approach speed and technical acrobatics to clear heights that were previously thought impossible.

• Historical Context: Before Duplantis, the pole vault world record was famously held by Sergey Bubka for many years, followed by Renaud Lavillenie of France, who cleared 6.16 m in 2014.

Q86. Answer: (b) Maharashtra

The correct answer is Maharashtra.

Key Points

• In October 2024, the state government of Maharashtra launched India’s first integrated state-level Cyber Command and Control Centre (C4).

• The facility was officially inaugurated by the Deputy Chief Minister of Maharashtra, Shri Devendra Fadnavis, at Mahape in Navi Mumbai on October 3, 2024.

• This center serves as a comprehensive hub for citizens to report cybercrimes through multiple platforms, including a dedicated helpline number 14407, a specialized web portal, and a mobile application.

• The primary objective of this project is to provide a swift response to cyber-related grievances and to tackle the rising instances of financial frauds and digital threats across the state.

• The Cyber Command and Control Centre is equipped with advanced technology, including Artificial Intelligence (AI) and Machine Learning (ML), to monitor and mitigate cyber-attacks in real-time.

Additional Information

• Maharashtra Cyber Security Project:

• The Cyber Command and Control Centre is a major component of the larger Maharashtra Cyber Security Project, which has an estimated budget of approximately Rs. 837 crore.

• This initiative aims to modernize the state's cyber defense infrastructure, making it one of the most technologically advanced security hubs in the country.

• Integrated Operations:

• The center brings together 50 representatives from various banks and financial institutions to work alongside police officials and technical experts.

• This integration ensures that the "Golden Hour" (the critical period immediately after a crime) is utilized effectively to freeze fraudulent transactions and recover stolen money for victims.

• Technical Capabilities:

• The facility includes specialized units for digital forensics, malware analysis, and threat intelligence to stay ahead of evolving cyber-criminal tactics.

• It will provide support to all district-level cyber police stations in Maharashtra, acting as a central nervous system for cyber law enforcement.

• Global Context:

• The establishment of this center places Maharashtra at the forefront of digital safety in India, aligning with global standards for cybersecurity governance.

• By centralizing grievance handling, the government aims to increase the conviction rate in cyber-related cases, which has historically been a challenge due to the borderless nature of such crimes.

Important Points

• The helpline 14407 will be operational 24/7 to assist victims of online scams and identity theft.

• The project involves collaboration with private sector security firms and global technology partners to ensure the latest software and encryption standards are used.

• The Navi Mumbai facility is expected to serve as a model project that other states in India might replicate to strengthen their own digital security frameworks.

Q87. Answer: (d) Bharatiya Janata Party

The correct answer is Bharatiya Janata Party.

Key Points

• The Bharatiya Janata Party (BJP) emerged as the political party with the most seats in the 2025 Bihar Legislative Assembly election.

• The elections were conducted to elect representatives for the 243 constituencies of the Bihar Vidhan Sabha.

• To achieve a majority and form the government independently, a party or coalition requires at least 122 seats in the Bihar Legislative Assembly.

• The Bharatiya Janata Party focused its 2025 campaign on the "Viksit Bihar" (Developed Bihar) agenda, emphasizing infrastructure, industrial growth, and central government schemes.

• The Election Commission of India (ECI) managed the multi-phase polling process across all 38 districts of the state to ensure a fair democratic exercise.

Additional Information

• Bihar Legislative Assembly (Vidhan Sabha):

• The Bihar Legislative Assembly is the lower house of the bicameral legislature of Bihar. It has a total strength of 243 elected members.

• The assembly's term is five years, as per the provisions of the Constitution of India, unless it is dissolved earlier by the Governor.

• The assembly meetings are held at the Vidhan Sabha Bhawan located in the capital city, Patna.

• Major Political Rivals in Bihar:

• Rashtriya Janata Dal (RJD): Led by the Lalu Prasad Yadav family, the RJD is a major regional force. In the 2020 elections, it had emerged as the single largest party with 75 seats, though it sits in the opposition or as a coalition partner depending on the term.

• Janata Dal (United) (JD-U): Under the leadership of Nitish Kumar, the JD(U) has been a central pillar of Bihar politics for over two decades, often playing the role of a "kingmaker" in coalition politics.

• Indian National Congress (INC): The INC generally contests as part of the Mahagathbandhan (Grand Alliance) in Bihar, representing a national perspective alongside regional interests.

• Election Significance:

• The 2025 election was critical for determining the state's trajectory regarding the Caste Census implementation and Special Category Status demands.

• The voter turnout in Bihar remains a significant indicator of political awareness, with a high percentage of women voters and youth participating in the 2025 polls.

• The BJP's victory reflects its expanding footprint in the Hindi Heartland and its ability to consolidate votes across various demographic segments.

Important Points

• Constitutional Context: Under Article 170 of the Constitution of India, the composition of the Legislative Assemblies is defined, ensuring direct election by the people.

• Governor's Role: Following the 2025 results, the Governor of Bihar invited the leader of the Bharatiya Janata Party (or the leader of the largest coalition) to form the government and prove their majority on the floor of the house.

• Historical Trend: Bihar was the first state in India to implement 50% reservation for women in Panchayati Raj Institutions, a factor that heavily influences the voting patterns observed in the 2025 Assembly elections.

Q88. Answer: (b) 2025-2026

The correct answer is 2025-2026.

Key Points

• The Prime Minister Dhan-Dhaanya Krishi Yojana (PM-DDKY) was announced by the Union Finance Minister Nirmala Sitharaman during the presentation of the Union Budget 2025-26 on February 1, 2025.

• This initiative is a comprehensive scheme aimed at achieving Atmanirbharta (self-reliance) in the production of pulses and oilseeds, which are critical components of India's food basket.

• The scheme focuses on enhancing the entire value chain, including production, storage, processing, and marketing of agricultural produce to ensure higher returns for farmers.

• A primary objective of PM-DDKY is to reduce India's heavy dependency on imports for edible oils, thereby saving foreign exchange and strengthening national food security.

• The budget allocation for this scheme is designed to provide farmers with access to high-yielding variety (HYV) seeds, modern farming technology, and robust market linkages. Hence, the correct answer is 2025-2026.

Additional Information

• Focus on Oilseeds:

• The Union Budget 2025-26 places significant emphasis on mustard, groundnut, sesame, soybean, and sunflower to boost domestic edible oil production.

• This aligns with the Atmanirbhar Oilseeds Abhiyan, which seeks to bridge the gap between demand and domestic supply.

• Agricultural Infrastructure:

• The government aims to strengthen Digital Public Infrastructure (DPI) in agriculture to facilitate crop estimation and digital credit for farmers.

• PM-DDKY is expected to integrate with existing schemes like PM-KISAN to provide a holistic support system for small and marginal farmers.

• Budgetary Strategy for Farmers:

• The Union Budget 2025-26 increased the Agricultural Credit Target to a record high to ensure adequate liquidity for rural entrepreneurs and farmers.

• Special provisions have been made for Climate-Resilient Agriculture, developing 109 new varieties of 32 field and horticultural crops for cultivation by farmers.

Important Points

• Economic Impact: By promoting the Prime Minister Dhan-Dhaanya Krishi Yojana, the government intends to stabilize retail inflation related to food items, particularly pulses.

• Natural Farming: As part of the broader agricultural vision in the 2025-2026 budget, one crore farmers across the country are to be initiated into Natural Farming over the next two years, supported by certification and branding.

• Procurement and MSP: The scheme works in tandem with the government's commitment to Minimum Support Price (MSP) operations, ensuring that the increased production of Dhan (Grains) and Dhaanya (Wealth/Crops) translates into financial security for the agricultural community.

Q89. Answer: (a) Summer McIntosh

The correct answer is Summer McIntosh.

Key Points

• Summer McIntosh, a teenage swimming sensation from Canada, delivered one of the most dominant performances in aquatic history at the World Short Course Swimming Championships (25m) held in Budapest, Hungary, in December 2024.

• During the championships, she set a new World Record in the 400m Freestyle with a staggering time of 3:51.30, showcasing her exceptional endurance and speed in the 25-meter pool.

• She continued her record-breaking spree in the 200m Individual Medley (IM), clocking a time of 2:01.86 to shatter the previous global mark. This event requires mastery over all four swimming strokes: butterfly, backstroke, breaststroke, and freestyle.

• In the 400m Individual Medley (IM), she established another World Record with a time of 4:18.43, further cementing her status as the world's premier medley swimmer.

• Her performance in Budapest marked the first time a swimmer had broken three individual world records at a single World Short Course Championship in the modern era.

Additional Information

• Athlete Profile: Summer McIntosh was born in August 2006 in Toronto. She is the daughter of Jill Horstead, who competed in swimming for Canada at the 1984 Los Angeles Olympics.

• Olympic Success: Prior to her success in Budapest, McIntosh was the standout performer at the Paris 2024 Olympic Games, where she won three gold medals (400m IM, 200m Butterfly, and 200m IM) and one silver medal.

• Short Course vs. Long Course: Short Course swimming takes place in a 25-meter pool, which emphasizes the "turns" and "underwater phases" more than Long Course swimming, which is conducted in a 50-meter Olympic-sized pool.

• World Aquatics: The event in Budapest was organized by World Aquatics (formerly known as FINA), the international federation recognized by the International Olympic Committee (IOC) for administering international competitions in water sports.

• Comparison: While Katie Ledecky (USA) and Ariarne Titmus (Australia) are legendary figures in freestyle swimming, Summer McIntosh has distinguished herself by combining elite freestyle speed with world-class proficiency in the butterfly and medley disciplines.

Important Points

• Medley Order: In Individual Medley (IM) events, the strokes must be swum in the order of Butterfly, Backstroke, Breaststroke, and Freestyle. Summer McIntosh is currently considered the most versatile swimmer globally due to her strength in all four segments.

• Historical Context: The 2024 World Short Course Championships saw Budapest hosting the event at the Duna Arena, a venue famous for hosting multiple World Aquatics Championships (2017 and 2022).

• Records: World Records in short course are often faster than long course times because swimmers benefit from more frequent wall push-offs and streamlined glides during turns.

Q90. Answer: (c) United Nations (UN)

The correct answer is United Nations (UN).

Key Points

• The United Nations (UN) is an international organization founded on October 24, 1945, following the end of World War II.

• Its primary mission is to maintain international peace and security, develop friendly relations among nations, and promote social progress, better living standards, and human rights.

• The organization was established by 51 founding member states who signed the UN Charter in San Francisco, USA. As of today, it has grown to include 193 member states.

• The UN succeeded the League of Nations, which had failed to prevent the second global conflict. It operates through six principal organs: the General Assembly, the Security Council, the Economic and Social Council (ECOSOC), the Trusteeship Council, the International Court of Justice (ICJ), and the UN Secretariat.

• The Secretary-General serves as the chief administrative officer of the organization, representing the United Nations on the global stage.

Additional Information

• North Atlantic Treaty Organization (NATO):

• NATO was established on April 4, 1949, with the signing of the North Atlantic Treaty (Washington Treaty).

• It is a political and military alliance of 32 member countries from Europe and North America, committed to the principle of collective defense.

• Its headquarters is located in Brussels, Belgium.

• World Trade Organization (WTO):

• The WTO is the only global international organization dealing with the rules of trade between nations.

• It officially commenced operations on January 1, 1995, under the Marrakesh Agreement, replacing the General Agreement on Tariffs and Trade (GATT) which had been in place since 1948.

• It is headquartered in Geneva, Switzerland, and currently consists of 164 member states.

• International Monetary Fund (IMF):

• The IMF was conceived at a UN conference in Bretton Woods, New Hampshire, USA, in July 1944 and began formal existence in December 1945.

• Its main functions are to foster global monetary cooperation, secure financial stability, facilitate international trade, and promote sustainable economic growth.

• The organization is based in Washington, D.C., and provides loans and technical assistance to its 190 member countries.

Important Points

• The UN Security Council is responsible for maintaining international peace and consists of 15 members: 5 permanent members (China, France, Russian Federation, the United Kingdom, and the United States) and 10 non-permanent members elected for two-year terms.

• The UN Day is celebrated every year on October 24 to mark the anniversary of the entry into force of the UN Charter in 1945.

• The United Nations headquarters is situated on international territory in New York City, although the land was donated by the Rockefeller family.

Q91. Answer: (a) National Gatka Association of India

The correct answer is National Gatka Association of India.

Key Points

• The 2nd Federation Gatka Cup 2025 was organized by the National Gatka Association of India (NGAI), which is the apex body for the sport in the country.

• The tournament was held in Bengaluru, Karnataka, in November 2025, marking a major step in promoting traditional martial arts in South India.

• The event featured Gatkadars (players) from various states, competing in both Soti (stick) and Farri (shield) categories to demonstrate agility and skill.

• The National Gatka Association of India is responsible for standardizing the rules and regulations of Gatka to transform it from a traditional martial art into a recognized competitive sport.

• The NGAI works under the aegis of the World Gatka Federation to ensure the sport gains international visibility and follows a professional format.

Additional Information

• Gatka Martial Art:

• Gatka is a traditional Sikh martial art that originated in the 15th century in the Punjab region.

• It was primarily developed by the Sikh Gurus, particularly Guru Hargobind Ji and Guru Gobind Singh Ji, for self-defense and training of the Khalsa warriors.

• The sport uses a Soti (a wooden stick made of bamboo) and a Farri (a leather shield) as the primary equipment for sparring.

• Recognition as a National Sport:

• The Ministry of Youth Affairs and Sports, Government of India, has officially recognized Gatka as a national sport.

• It was included in the Khelo India Youth Games starting from the 2021 edition, which significantly boosted its popularity among the youth across India.

• In 2023, Gatka made its debut as a medal sport in the 37th National Games held in Goa.

Important Points

• The National Gatka Association of India (NGAI) was established in 2001 and is led by Harjeet Singh Grewal, who has been instrumental in creating a National Rulebook for the sport.

• The NGAI is affiliated with the International Sikh Martial Arts Academy (ISMAA), which provides technical support and training for referees and coaches.

• Tournaments like the Federation Cup serve as vital platforms for selecting athletes for the World Gatka Championship and other international exhibitions.

• The 2025 tournament in Bengaluru highlighted the association's efforts to achieve secular participation and geographical diversity within the sport's ecosystem.

Q92. Answer: (d) New Delhi

The correct answer is New Delhi.

Key Points

• The inaugural Fit India Carnival, a landmark event celebrating health and physical activity, was organized in New Delhi.

• This three-day celebration took place from March 14 to March 16, 2025, marking a significant milestone in the national fitness narrative.

• The venue for this pioneering event was the Major Dhyan Chand National Stadium, a premier multi-purpose sports facility located near India Gate.

• The event was spearheaded by the Ministry of Youth Affairs and Sports, Government of India, to foster a culture of wellness among citizens.

• The carnival served as a platform for sports exhibitions, wellness workshops, and interactive sessions featuring Olympians and fitness influencers to inspire the public.

Additional Information

• Fit India Movement:

• It was launched by Prime Minister Narendra Modi on August 29, 2019, which coincides with National Sports Day.

• The movement aims to address the rising lifestyle diseases in India by promoting simple ways to stay fit and active in daily life.

• Significance of March 2025:

• The Fit India Carnival in 2025 was designed to move beyond traditional sports and include modern fitness trends like CrossFit, Zumba, and Aerial Yoga.

• It showcased the integration of technology in fitness, including wearable devices and AI-driven health monitoring.

• National Sports Day:

• Celebrated every year on August 29 to commemorate the birth anniversary of hockey legend Major Dhyan Chand.

• The stadium in New Delhi where the carnival was held is named in his honor to recognize his contribution to Indian sports.

• Collaborative Efforts:

• The initiative involves collaboration between the Ministry of Health and Family Welfare and the Ministry of Education to implement fitness protocols in schools and colleges.

• Programs like Fit India School Week and Fit India Quiz have been successful in engaging millions of students across the country.

• Infrastructure in New Delhi:

• As the host city, New Delhi offers world-class facilities such as the Indira Gandhi Arena and Jawaharlal Nehru Stadium, which frequently host national and international sports events.

Important Points

• Fit India Freedom Run: One of the most popular campaigns under the movement, encouraging citizens to run at their own pace and location to promote cardiovascular health.

• Age Group Focus: The movement is inclusive, targeting children (5-18 years), adults (18-65 years), and senior citizens (above 65 years) with tailored fitness protocols.

• Holistic Wellness: The 2025 carnival emphasized mental health alongside physical fitness, including meditation and stress management clinics.

• Economic Impact: The promotion of such events boosts the Indian fitness industry, which includes gyms, health tech startups, and sports apparel brands.

Q93. Answer: (d) FAO

The correct answer is FAO.

Key Points

• The report titled the State of the World's Forests (SOFO) is a flagship publication released by the Food and Agriculture Organization (FAO) of the United Nations.

• It is published biennially (every two years) and provides a comprehensive overview of the status of the world's forests, forest policy developments, and the contribution of forestry to sustainable development.

• The 2024-2025 reporting focus typically emphasizes the role of forest-sector innovations in addressing global challenges like climate change, biodiversity loss, and sustainable resource management.

• The report serves as a critical data source for tracking progress toward the Sustainable Development Goals (SDGs), particularly SDG 15 (Life on Land), and the Global Forest Goals of the United Nations Strategic Plan for Forests.

• The FAO utilizes data from the Global Forest Resources Assessment (FRA) to compile these reports, ensuring that international policymakers have access to science-based evidence for forest conservation and restoration.

Additional Information

• Food and Agriculture Organization (FAO):

• Established on October 16, 1945, the FAO is a specialized agency of the United Nations that leads international efforts to defeat hunger.

• Its headquarters are located in Rome, Italy, and it operates in over 130 countries worldwide.

• The FAO is responsible for monitoring global agriculture, forestry, and fisheries, providing a platform for nations to negotiate agreements and debate policy.

• International Union for Conservation of Nature (IUCN):

• Founded in 1948 and headquartered in Gland, Switzerland, it is known for maintaining the IUCN Red List of Threatened Species.

• It brings together government and civil society organizations to protect nature and accelerate the transition to sustainable development.

• United Nations Environment Programme (UNEP):

• Established in June 1972 following the Stockholm Conference, it is headquartered in Nairobi, Kenya.

• It acts as the global authority that sets the environmental agenda and promotes the coherent implementation of the

environmental dimension of sustainable development within the UN system.

• World Wide Fund for Nature (WWF):

• An international non-governmental organization founded in 1961, headquartered in Gland, Switzerland.

• It focuses on wilderness preservation and the reduction of human impact on the environment, famously publishing the Living Planet Report every two years.

• Global Forest Resources Assessment (FRA):

• Coordinated by the FAO, the FRA provides essential data on the world's forest resources every five years, complementing the biennial SOFO reports.

Q94. Answer: (c) Kaziranga National Park

The correct answer is Kaziranga National Park.

Key Points

• Kaziranga National Park and Tiger Reserve (KNPTR), located in the state of Assam, conducted its inaugural grassland bird survey in early 2025.

• The survey was a milestone in avian conservation, recording a total of 43 grassland bird species within the park's unique ecosystem.

• The exercise highlighted the park as a leading grassland bird habitat, specifically identifying rare and threatened species such as the Finn’s Weaver and the Bengal Florican.

• This census was part of a broader effort to monitor biodiversity beyond the park's famous megafauna, using the point count method across multiple ranges including Kohora, Bagori, and Agoratoli.

• The documentation of Finn's Weaver is particularly significant as it is one of the rarest weaver birds in the world, with very few viable populations remaining in the Terai and Brahmaputra floodplains.

Additional Information

• Kaziranga National Park:

• It was declared a World Heritage Site by UNESCO in 1985.

• It is home to two-thirds of the world's population of the Great One-horned Rhinoceros.

• The park is situated on the banks of the Brahmaputra River and is characterized by tall elephant grass, marshland, and dense tropical moist broadleaf forests.

• Bengal Florican (Houbaropsis bengalensis):

• It is listed as Critically Endangered on the IUCN Red List.

• This bird is a grassland specialist and serves as an indicator species for the health of the alluvial grassland ecosystem.

• Other National Parks in Options:

• Dudhwa National Park: Located in Lakhimpur Kheri, Uttar Pradesh, it is part of the Terai Arc Landscape and also hosts the Bengal Florican, but it was not the site of the specific 43-species survey mentioned for 2025.

• Desert National Park: Situated in Rajasthan near Jaisalmer, it is the primary habitat for the Great Indian Bustard (another grassland bird) rather than the Bengal Florican.

• Keoladeo National Park: Located in Bharatpur, Rajasthan, it is a UNESCO World Heritage Site famous primarily as a wetland habitat for migratory waterfowl like the Siberian Crane (formerly).

Important Points

• Conservation Status: The Finn's Weaver is classified as Endangered, and its discovery in high numbers during the 2025 survey reinforces the importance of Kaziranga as a crucial conservation hub.

• Survey Methodology: The 2025 survey involved over 100 volunteers and forest officials, covering approximately 20-25 square kilometers of intense grassland patches to ensure accurate data collection.

• Habitat Management: The success of these bird populations is often attributed to the controlled grassland burning and management practices carried out by the Assam Forest Department to maintain the short-grass and tall-grass mosaic.

• BirdLife International: Kaziranga has also been identified as an Important Bird Area (IBA) by BirdLife International due to its role in the conservation of globally threatened avian species.

Q95. Answer: (c) Data for Development

The correct answer is Data for Development.

Key Points

• The Ministry of Statistics & Programme Implementation (MoSPI) recently unveiled its new logo, which symbolizes the modernization of the national statistical system and its alignment with India’s journey toward becoming a developed nation.

• The core theme conveyed by the new logo is “Data for Development,” emphasizing that accurate and timely official statistics are the backbone of national progress and socio-economic planning.

• The logo is designed to represent the integration of data and technology, reflecting the ministry's mission to provide reliable, timely, and credible data for evidence-based policy-making.

• This rebranding highlights the importance of the National Statistical Office (NSO) in capturing the diverse realities of the country through numbers, which eventually drive sustainable development and equitable growth.

• The unveiling of the logo coincided with the ministry's efforts to enhance data transparency and accessibility, ensuring that statistical insights are available to citizens, researchers, and policymakers alike to foster an informed society.

Additional Information

• Ministry of Statistics & Programme Implementation (MoSPI):

• MoSPI was created as an independent ministry in 1999 following the merger of the Department of Statistics and the Department of Programme Implementation.

• It serves as the nodal agency for the planned development of the statistical system in India, ensuring the quality of statistics released and maintaining international standards.

• The ministry is responsible for key economic indicators such as the Consumer Price Index (CPI), the Index of Industrial Production (IIP), and Gross Domestic Product (GDP) estimates.

• National Statistics Day:

• India celebrates National Statistics Day every year on 29th June.

• This date marks the birth anniversary of Prof. Prasanta Chandra Mahalanobis, who is widely regarded as the Father of Indian Statistics and the founder of the Indian Statistical Institute (ISI).

• The day is dedicated to sensitizing the public, especially the younger generation, about the role and importance of statistics in socio-economic planning and policy formulation.

• Structural Components:

• The ministry consists of two main wings: the National Statistical Office (NSO) and the Programme Implementation Wing.

• The NSO is further divided into the Central Statistics Office (CSO) and the National Sample Survey Office (NSSO), which conduct large-scale surveys on employment, expenditure, and industrial activities.

• The Programme Implementation Wing monitors the performance of infrastructure sectors and the implementation of the Members of Parliament Local Area Development Scheme (MPLADS).

• Digital Initiatives:

• To support the "Data for Development" theme, the ministry launched the e-Sankhyiki Portal in 2024.

• This portal acts as a centralized repository for national indicators and official statistics, significantly improving the ease of doing research and enhancing public service delivery through data.

• The integration of Artificial Intelligence (AI) and Machine Learning (ML) in data processing is a key feature of the ministry's vision for a Digital India.

Q96. Answer: (c) Rs. 15,000

The correct answer is Rs. 15,000.

Key Points

• ICICI Bank, one of India's leading private sector lenders, has announced a revision in the minimum average monthly balance (MAB) requirements for its savings account holders.

• From 1 August 2025, the new MAB requirement for savings accounts in metro and urban areas will be Rs. 15,000.

• Prior to this revision, the required minimum average monthly balance for these geographical locations was typically set at Rs. 10,000.

• This specific update is applicable to new customers who initiate their banking relationship with ICICI Bank on or after the 1st of August, 2025.

• The bank's decision to increase the MAB is part of its periodic review of service charges and operational costs associated with maintaining liquid savings accounts in high-cost areas.

Additional Information

• Geographical Classification: Banks in India categorize branches into Metro, Urban, Semi-Urban, and Rural tiers to determine different MAB thresholds based on the local economic landscape.

• MAB Calculation: The Minimum Average Monthly Balance is calculated by adding the daily closing balances of the account for every day in a calendar month and dividing the total by the number of days in that month.

• Non-Maintenance Charges: If a customer fails to maintain the stipulated Rs. 15,000 balance, ICICI Bank levies a non-maintenance charge. This penalty is usually a percentage of the shortfall between the actual balance and the required MAB.

• Exempted Accounts: Certain types of accounts, such as Salary Accounts, Basic Savings Bank Deposit Accounts (BSBDA), and Pradhan Mantri Jan Dhan Yojana (PMJDY) accounts, are typically zero-balance accounts and do not require an MAB.

• Industry Trends: Other major private banks like HDFC Bank and Axis Bank also periodically adjust their minimum balance requirements to align with inflation and the rising costs of digital banking infrastructure.

Important Points

• Implementation Date: The change is strictly scheduled for 1 August 2025, and customers opening accounts before this date may be governed by the previous schedule of charges until further notice.

• Customer Communication: Regulators like the Reserve Bank of India (RBI) mandate that banks must inform customers of any change in service charges or balance requirements at least 30 days in advance.

• Tiered Services: Higher MAB requirements often come with added benefits such as a higher number of free ATM transactions, discounted locker rentals, and personalized wealth management services.

Q97. Answer: (d) Trachoma

p>The correct answer is Trachoma.

Key Points

• India achieved a landmark in global public health in June 2025 when the World Health Organization (WHO) officially declared the elimination of Trachoma as a public health problem in the country.

• Trachoma is a neglected tropical disease (NTD) caused by infection with the bacterium Chlamydia trachomatis, which is the leading infectious cause of blindness worldwide.

• The elimination of this disease follows decades of persistent efforts under the National Trachoma Control Program, which was first launched by the Government of India in 1963.

• India successfully implemented the WHO-recommended SAFE strategy, which stands for Surgery, Antibiotics, Facial cleanliness, and Environmental improvement, to curb the transmission and impact of the disease.

• With this validation, India has joined a growing list of countries that have eliminated this debilitating disease, significantly improving the quality of life and visual health for millions in endemic regions.

Additional Information

• Understanding the SAFE Strategy:

• Surgery: Used to treat trachomatous trichiasis, the advanced stage where eyelashes turn inward and scratch the eyeball.

• Antibiotics: Mass drug administration of Azithromycin is conducted to treat the community-wide pool of infection.

• Facial Cleanliness: Promotes hygiene to reduce the spread of the bacteria from one person to another.

• Environmental Improvement: Focuses on better access to water and sanitation (WASH) to eliminate breeding sites for flies that transmit the bacteria.

• Comparison with Other Diseases:

• Kala-azar (Visceral Leishmaniasis): India is on the verge of eliminating Kala-azar, having met the target of less than 1 case per 10,000 population at the block level, but formal WHO certification for the entire nation is a separate process.

• Lymphatic Filariasis: Commonly known as Elephantiasis, India has set a national goal to eliminate this disease by 2027, utilizing mass drug administration campaigns.

• Yaws: India was the first country in the world to be certified Yaws-free by the WHO in May 2016.

• Transmission and Impact: Trachoma is transmitted through contact with eye and nose discharges from infected people, particularly young children. It is also spread by flies that have been in contact with the eyes and noses of infected people. Left untreated, repeated infections lead to permanent corneal opacity and blindness.

Important Points

• Elimination Criteria: To be validated as having eliminated Trachoma as a public health problem, a country must prove that the prevalence of trachomatous inflammation—follicular (TF) in children aged 1–9 years is less than 5% in each formerly endemic district.

• Global Milestones: India is the 19th country globally to be validated by the WHO for eliminating trachoma as a public health problem, a testament to the strength of the National Health Mission.

• Historical Context: Over the years, India has successfully eliminated several major diseases, including Smallpox (1977), Polio (2014), and Maternal and Neonatal Tetanus (2015), marking steady progress toward Universal Health Coverage.

• Economic Benefits: The elimination of Trachoma prevents the loss of productivity associated with vision impairment and blindness, providing a significant boost to the socio-economic development of rural and marginalized communities.

Q98. Answer: (c) Jasprit Bumrah

The correct answer is Jasprit Bumrah.

Key Points

• Jasprit Bumrah, the premier Indian fast bowler, has been recognized for his extraordinary dominance in the longest format of the game, particularly throughout the 2023-2024 cycle.

• In February 2024, Jasprit Bumrah created history by becoming the first Indian pacer to reach the Number 1 spot in the ICC Men's Test Player Rankings.

• His performance in the Test series against England in 2024 was a major factor in this recognition, where he picked up 19 wickets

in just three matches, including a match-winning 9-wicket haul in the Vizag Test.

• Bumrah's ability to perform across different conditions, from the pace-friendly tracks of South Africa to the spinning tracks of India, solidified his reputation as the world's most versatile red-ball bowler.

• The ICC Awards are presented annually to honor the best performers in international cricket; for the 2024 evaluation period, Bumrah's impact on Test Cricket was deemed the most significant among global nominees.

Additional Information

• International Cricket Council (ICC):

• The ICC is the global governing body for cricket, founded as the Imperial Cricket Conference in 1909.

• It is headquartered in Dubai, United Arab Emirates, and is responsible for organizing major global tournaments like the World Test Championship (WTC) and the ODI World Cup.

• Virat Kohli:

• While a legend in Test cricket, Virat Kohli was recently honored as the ICC Men’s ODI Cricketer of the Year 2023 following his record-breaking 765 runs in the 2023 ODI World Cup.

• Ravichandran Ashwin:

• The veteran off-spinner reached the historic milestone of 500 Test wickets in February 2024 during the Rajkot Test against England, becoming only the second Indian to do so after Anil Kumble.

• ICC Men's Test Cricketer of the Year Award:

• This prestigious award was introduced in 2004. Past winners include greats like Dale Steyn, Sachin Tendulkar, and Ricky Ponting.

• The award considers players' performances in Test matches over a 12-month period, evaluating wickets, runs, and match-winning contributions.

• Rohit Sharma:

• The current Indian Captain who led the team to the final of the ICC World Test Championship 2021-23 and the ICC Men's Cricket World Cup 2023.

Important Points

• Jasprit Bumrah is often referred to as a "generational talent" due to his unique bowling action and high-speed accuracy.

• In 2024, he became the fastest Indian pacer to reach 150 Test wickets, achieving the feat in just 34 matches.

• The ICC Test Rankings are updated weekly, but the ICC Annual Awards provide a cumulative recognition of a player's excellence over the entire calendar year or season.

Q99. Answer: (a) 25 January 2025

The correct answer is 25 January 2025.

Key Points

• National Tourism Day in India is celebrated every year on 25 January to raise awareness about the importance of tourism for the country's economy and social development.

• In the year 2025, the day was celebrated on its traditional date of 25 January, which fell on a Saturday.

• The primary objective of this day is to highlight the cultural heritage, natural beauty, and diversity of India to both domestic and international tourists.

• The Ministry of Tourism, Government of India, acts as the nodal agency for organizing various events, seminars, and cultural programs across different states to mark this occasion.

• The celebration emphasizes Sustainable Tourism and encourages citizens to explore the vast landscapes of the nation, from the Himalayas to the backwaters of Kerala.

Additional Information

• World Tourism Day: Unlike the national celebration, World Tourism Day is observed globally on 27 September every year under the leadership of the United Nations World Tourism Organization (UNWTO).

• Economic Significance: The tourism sector is a vital component of India’s Service Sector, contributing significantly to the Gross Domestic Product (GDP) and serving as a major source of Foreign Exchange Earnings.

• Government Initiatives: Schemes like Swadesh Darshan and PRASHAD (Pilgrimage Rejuvenation and Spiritual Augmentation Drive) have been launched to develop theme-based tourist circuits and rejuvenate pilgrimage sites.

• Dekho Apna Desh: This is an initiative by the Ministry of Tourism to promote domestic travel among Indians, urging them to visit at least 15 tourist destinations within India by the year 2022 (and continued as a recurring theme).

• Employment: The tourism industry is one of the largest employers in India, providing livelihoods to millions of people in hospitality, transportation, guiding, and handicrafts sectors.

Important Points

• Date History: While 25 January is dedicated to National Tourism Day, the same date is also observed as National Voters' Day in

India to mark the foundation day of the Election Commission of India (established in 1950).

• Incredible India: The Incredible India campaign is the international marketing initiative by the Government of India to promote tourism in the country to a global audience.

• Diverse Tourism Products: India offers a wide range of tourism products including Medical Tourism, Eco-Tourism, Adventure Tourism, and Religious Tourism, which are highlighted during the celebrations.

• Statistical Data: In recent years, India has seen a steady rise in the Foreign Tourist Arrivals (FTAs), and the government aims to position India as a top global destination by 2030 through policy reforms and infrastructure development.

Q100. Answer: (a) Dharali in Uttarkashi district, Uttarakhand

The correct answer is Dharali in Uttarkashi district, Uttarakhand.

Key Points

• Dharali village, located in the Uttarkashi district of Uttarakhand, witnessed a devastating flash flood on 5 August 2025. The event was triggered by intense cloudbursts in the higher reaches of the Himalayas, causing the Kheer Ganga rivulet to overflow with immense force.

• The village is a significant transit point situated on the Gangotri National Highway (NH-34), approximately 20 kilometers before the Gangotri Dham. It is famous for its apple orchards and its proximity to the Bhagirathi River.

• The 2025 flash flood caused a massive torrent of water, mud, and debris to sweep through the settlement, leading to the burial of several houses and the blockage of the National Highway. This disaster disrupted the Char Dham Yatra, leaving hundreds of pilgrims stranded.

• Historically, Dharali and surrounding areas like Harsil have been vulnerable to such ecological disturbances due to their geographical location in the High Himalayan zone, where steep slopes and loose soil contribute to rapid debris flows during monsoon seasons.

• Joshimath is located in the Chamoli district and is primarily known for land subsidence issues rather than being on the direct route to Gangotri Dham. Hence, statement 2 is incorrect.

• Balta is a village in the Almora district, which is part of the Kumaon division, whereas the flood occurred in the Garhwal division. Hence, statement 3 is incorrect.

• Rudraprayag is a district headquarters at the confluence of the Alaknanda and Mandakini rivers, serving as the gateway to Kedarnath, not the specific village devastated on the Gangotri route in this context. Hence, statement 4 is incorrect.

Additional Information

• Uttarkashi District: Established on 24 February 1960, it is one of the northernmost districts of India, sharing an international border with Tibet (China). It houses the origins of the Ganga (at Gangotri) and Yamuna (at Yamunotri) rivers.

• Gangotri Dham: One of the four sites in the Chota Char Dham pilgrimage. The temple is dedicated to Goddess Ganga and is located at an elevation of 3,100 meters. The region is ecologically sensitive and falls under the Gangotri National Park administration.

• Cloudburst Dynamics: A cloudburst is an extreme amount of precipitation in a short period (usually exceeding 100 mm per hour). In the Himalayas, these are frequent during the monsoon months (July to September) due to the orographic lifting of moisture-laden winds.

• Harsil Valley: Located very close to Dharali, Harsil is known as the "Mini Switzerland of India." It sits at an altitude of 2,620 meters and is inhabited by the Bhotia tribe. The area is critical for border security and tourism.

Important Points

• Disaster Management: Following the 2025 flood, the State Disaster Response Force (SDRF) and National Disaster Response Force (NDRF) conducted extensive operations. Under the Disaster Management Act, 2005, the district administration is empowered to evacuate vulnerable zones.

• Geological Vulnerability: The Main Central Thrust (MCT) passes through the Uttarkashi region, making it seismically active (Zone V) and prone to landslides. The 1991 Uttarkashi earthquake (magnitude 6.8) remains one of the most significant tectonic events in this area.

• National Highway 34: This highway connects Rishikesh to Gangotri. Constant maintenance is required due to the fragile shale and schist rock formations that frequently collapse during heavy rains.

• Ecological Impact: The accumulation of debris in the Bhagirathi River can lead to the formation of temporary artificial lakes, which pose a downstream threat of Glacial Lake Outburst Floods (GLOF) or flash floods if the blockages burst suddenly.

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