RRB Group D Official Paper (Held On: 06 Feb, 2026 Shift 2) (Previous Year Paper)

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

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GENERAL SCIENCE

Q1. The process by which the eye lens changes its focal length to focus on near or distant objects is called _____.

(a) Adaptation
(b) Reflection
(c) Accommodation
(d) Adjustment

Q2. If a particle covers a distance of 12 m in every 3 s, what is the slope of its distance-time graph?

(a) 12.0 m/s
(b) 0.25 m/s
(c) 4.0 m/s
(d) 3.0 m/s

Q3. If the power of a lens is –4 D, which of the following is true about the lens?

(a) It is a convex lens of focal length 2.5 m.
(b) It is a convex lens of focal length 25 cm.
(c) It is a concave lens of focal length 0.4 m.
(d) It is a concave lens of focal length 25 cm.

Q4. Which factor does NOT increase the rate of evaporation?

(a) Increase in surface area
(b) Increase in wind speed
(c) Decrease in temperature
(d) Decrease in humidity

Q5. When the distance–time graph of an object is a curved line, it indicates that _____.

(a) The object is moving with a constant speed
(b) There is no acceleration in the motion
(c) The object remains stationary
(d) The speed of the object is changing with time

Q6. Arrange the following steps in correct sequence during the process of fragmentation-based reproduction:

1. Growth of lost body parts through mitosis
2. Breakdown of body/filament into fragments
3. A Mature organism lives independently
4. Each fragment develops into a complete organism

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

Q7. A plant breeder crosses two pure-breeding pea plants—one producing round seeds and the other producing wrinkled seeds. Based on Mendel's findings, what phenotype would all the seeds in the F1 generation display?

(a) A mix of round and wrinkled in varying proportions
(b) Round seeds
(c) Half round, half wrinkled
(d) Wrinkled seeds

Q8. When copper reacts with oxygen on heating in air, which of the following correctly represents the product formed, along with its colour?

(a) Copper(II) oxide (CuO) – brown in colour
(b) Copper(I) oxide (Cu2O) – red in colour
(c) Copper(II) oxide (CuO) – black in colour
(d) Copper(I) oxide (Cu2O) – white in colour

Q9. Which of the following is the energy possessed by a body by virtue of its position, shape and configuration?

(a) Kinetic Energy
(b) Heat Energy
(c) Potential Energy
(d) Muscular Energy

Q10. The common name for Apis florae is:

(a) The Asian bee
(b) The dwarf bee
(c) The little bee
(d) The giant bee

Q11. When the frequency of vibration of a sound source increases, the resulting sound will have _____.

(a) Smaller amplitude
(b) Lower pitch
(c) Greater loudness
(d) Higher pitch

Q12. Which of the following correctly represents the mass number of an element?

(a) The sum of protons and neutrons
(b) The difference between protons and neutrons
(c) The number of protons only
(d) The number of electrons

Q13. Which of the following statement(s) is/are true about the buoyant force experienced by an object when it is immersed in a fluid?

(i) All objects experience a force of buoyancy when they are immersed in a fluid.
(ii) The magnitude of this buoyant force depends on the density of the fluid.

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

Q14. Which of the following is most important for child-bearing and women's health?

(a) Intake of too much caffeine
(b) Skipping meals
(c) Proper diet and prenatal care
(d) Smoking daily

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Q15. A reaction in which the positive and negative ions of two ionic compounds exchange places to form two new compounds is an example of:

(a) Displacement reaction
(b) Decomposition reaction
(c) Double displacement reaction
(d) Combination reaction

Q16. Which of the following correctly represents the pathway of air during respiration in human beings?

(a) Nostrils → Food pipe → Heart → Lungs
(b) Nostrils → Throat → Lungs → Alveoli
(c) Mouth → Stomach → Lungs → Alveoli
(d) Mouth → Heart → Lungs → Diaphragm

Q17. According to Right Hand Thumb Rule, if the curling of the fingers of our right hand gives the direction of magnetic field, then the thumb of our right hand is aligned along the direction of which physical quantity?

(a) Force acting on the conductor
(b) Current flowing through the conductor
(c) Electric field applied across the conductor
(d) Induced Current in the conductor

Q18. Metals are generally good conductors of heat. Which of the following is an exception to this?

(a) Mercury
(b) Iron
(c) Aluminium
(d) Copper

Q19. Which process occurring in the Golgi apparatus shows its role in synthesis?

(a) Synthesis of nucleic acids from ribosomes
(b) Formation of complex sugars from simple sugars
(c) Absorption of water through osmosis
(d) Conversion of proteins into amino acids

Q20. Which of the following is true for mitosis but not for meiosis?

(a) Results in haploid cells
(b) Produces identical daughter cells
(c) Promotes genetic variation
(d) Occurs in reproductive cells

Q21. Which of the following is a heterogeneous mixture?

(a) Sugar solution
(b) Salt solution
(c) Air
(d) Sand and water

Q22. Which rule helps in identifying the direction of the force acting on a current-carrying conductor placed in a magnetic field?

(a) Ohm’s law
(b) Maxwell’s corkscrew rule
(c) Right-hand thumb rule
(d) Fleming’s left-hand rule

Q23. Which of the following is a traditional water harvesting method in Rajasthan, India?

(a) Hand pump
(b) Borewell
(c) Johad

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(d) Check dam

Q24. Which of the following is a combination reaction?

(a) $2KClO3 \rightarrow 2KCl + 3O2$
(b) $Fe + CuSO4 \rightarrow FeSO4 + Cu$
(c) $CaO + H2O \rightarrow Ca(OH)2$
(d) $AgNO3 + NaCl \rightarrow AgCl + NaNO3$

Q25. Which of the following conditions are essential for the rusting of iron?

(a) Presence of carbon dioxide
(b) Presence of only water (moisture)
(c) Presence of both oxygen and water (moisture)
(d) Presence of only oxygen

MATHEMATICS

Q26. $(x - 2)^2$ is equal to:

(a) $x^2 - 4x + 2$
(b) $x^2 - 4x + 4$
(c) $x^2 + 4x + 4$
(d) $x^2 - 2x + 4$

Q27. Two bells in a school ring at 8 am. One bell rings after every 30 minutes and the other after every 40 minutes. If the school gets over at 2 pm, how many times in a day do the bells ring together?

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

Q28. One pipe can fill a tank in 6 minutes, while another pipe can empty the completely filled tank in 24 minutes. If both the pipes are opened together when the tank is empty, how many minutes will it take to fill one-half of the tank?

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

Q29. The ratio of the ages of A and B at present is 5 : 1. Five years earlier from now, the ratio was 6 : 1. Find the present age of B.

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

Q30. Which of the following numbers is divisible by 45?

(a) 306999
(b) 20475
(c) 25436
(d) 555555

Q31. The average of the first 14 odd natural numbers, is:

(a) 13.5
(b) 14.5
(c) 15
(d) 14

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Q32. A person has to cover a distance of 40 km in 5 hour. If he covers one-fourth of the distance in one-third of the total time, then what should his speed (in km/h) be to cover the remaining distance in the remaining time so that the person reaches the destination exactly on time?

(a) 9
(b) 4
(c) 6
(d) 13

Q33. A metallic cylindrical pipe has outer radius 7 cm, inner radius 5 cm, and length 14 cm. Find the volume of the metal used in the pipe.

(a) 336π cm^3
(b) 342π cm^3
(c) 352π cm^3
(d) 346π cm^3

Q34. Pipe A and Pipe B can fill a cistern together in 8 hours. Pipe B is 25% more efficient than Pipe A. Find the capacity of the cistern, if it is given that pipe A fills the cistern at a speed of 5 litres per minute.

(a) 7000 litres
(b) 8240 litres
(c) 5400 litres
(d) 4200 litres

Q35. A car travels from city X to city Y, covering the first 120 km at a speed of 50 km/h and the remaining 180 km at a speed of 80 km/h. Calculate the average speed for the entire journey. (round off your answer to two decimal places).

(a) 63.52 km/h
(b) 64.52 km/h
(c) 64.12 km/h
(d) 64.92 km/h

Q36. Simplify: tan ^4 θ + $\tan^2 \theta$

(a) sec ^4 θ - $\sec^2 \theta$
(b) sec ^4 θ + $\sec^2 \theta$
(c) sec ^4 θ - 2$\sec^2 \theta$
(d) sec ^4 θ + 2$\sec^2 \theta$

Q37. The sum of all the interior angles of a polygon is 4500°. How many sides does the polygon have ?

(a) 24
(b) 25
(c) 27
(d) 26

Q38. Simplify: √(2061 - √(1268 + √(850 - 66)))

(a) 46
(b) 45
(c) 47
(d) 44

Q39. A shopkeeper marks an article at Rs. x and offers a discount of 63% on the marked price. He sells it for Rs. 481 after charging VAT of 25% on the discounted price. What is the value of x?

(a) 1,040
(b) 1,100
(c) 1,300
(d) 1,200

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Q40. The amount on a sum of Rs. 6,200 at 20% per annum compound interest, compounded annually, in 2 years will be:

(a) Rs. 9,928
(b) Rs. 8,928
(c) Rs. 8,036
(d) Rs. 8,670

Q41. In an election, 8640 people or 72% of the eligible voters cast their votes. If the number of eligible voters increases by 8% next year, how many eligible voters will there be in total next year?

(a) 12,960
(b) 12,860
(c) 13,860
(d) 13,960

Q42. A company earns a profit that is distributed among the company's three partners in the ratio of 7 : 13 : 9. If the difference between the smallest and the largest shares is Rs. 58,326, the total profit of the company is:

(a) 2,81,909
(b) 2,81,811
(c) 2,81,934
(d) 2,81,955

Q43. A shopkeeper marks an article at Rs. 2,000 and offers a discount of 10%. What is the selling price?

(a) Rs. 1,950
(b) Rs. 1,800
(c) Rs. 1,900
(d) Rs. 1,850

Q44. Compare P and Q, if P = 5:2 and Q = 3:7.

(a) P > Q
(b) P < Q
(c) P = Q
(d) P = 2Q

Q45. Keshav bought 52 books for Rs. 1,120 from one shop and 47 books for Rs. 915 from another. What is the average price (in Rs. , rounded off to two decimal places) he paid per book?

(a) 20.56
(b) 21.56
(c) 23.56
(d) 22.56

Q46. A, B and C are three candidates in an election. A got 18% votes and B got 43% votes, whereas C was on second rank. If B won the election by 6,996 votes, then find the total number of votes.

(a) 1,61,230
(b) 1,57,980
(c) 1,74,900
(d) 1,55,545

Q47. Find the single discount equivalent to two successive discounts of 29% and 28%.

(a) 46.03%
(b) 48.88%
(c) 51.29%
(d) 47.39%

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Q48. Tom has been saving money for a new bike and has Rs. 12,000 in his saving account. He decides to save an additional Rs. 1,500 each week. How many weeks will it take for Tom to have a total of Rs. 21,000?

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

Q49. The ratio of Ratnesh's monthly income to expenditure is 12 : 7. His income is increased by 40% and expenditure is increased by 50%. What is the new ratio of income to expenditure?

(a) 4 : 3
(b) 11 : 6
(c) 8 : 5
(d) 10 : 7

Q50. The lengths of the parallel sides of a trapezium are 20 cm and 10 cm, respectively. The lengths of the two non-parallel sides are 13 cm each. Find the area (in cm^2) of the trapezium.

(a) 180
(b) 160
(c) 140
(d) 120

GENERAL INTELLIGENCE & REASONING

Q51. Seven people, A, B, C, D, E, F and G are sitting in a row, facing north. F sits fifth from the right end of the row. Only three people sit to the right of C. D is the immediate neighbor of B and C. A sits to the right of E but left of F. How many people sit between G and A?

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

Q52. MPLQ is related to SVRW in a certain way based on the English alphabetical order. In the same way, ORNS is related to UXTY. To which of the following is FIEJ related to, following the same logic?

(a) LNKQ
(b) LOKP
(c) LNKP
(d) LOKQ

Q53. Rohit starts from Point A and drives 15 km towards the West. He then takes a left turn, drives 11 km, turns left and drives 18 km. He then takes a left turn and drives 14 km. He takes a final left turn, drives 3 km and stops at Point P. How far (shortest distance) and towards which direction should he drive in order to reach Point A again? (All turns are 90 degrees turns only unless specified).

(a) 4 km to the North
(b) 3 km to the South
(c) 3 km to the North
(d) 4 km to the South

Q54. In a certain code language, 'leaves turn brown' is coded as 'ka gs rl' and 'gather leaves daily' is coded as 'ny hf gs'. How is 'leaves' coded in the given language?

(a) ka
(b) rl
(c) gs
(d) hf

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Q55. TOIL is related to BWQT in a certain way based on the English alphabetical order. In the same way, ZUOR is related to HCWZ. To which of the following options is XSMP related, following the same logic?

(a) FAUX
(b) FAXW
(c) FAZS
(d) FAXE

Q56. Refer to the following letter series and answer the question.

(Left) F J L T M N C R P W X Z K O H A Y Q D G E B (Right)

How many letters appear after "Q" but before "E" in the given series?5698

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

Q57. Seven people, S, Q, U, A, R, E and D are sitting in a row, facing north.

No one sits to the left of A. Only four people sit between A and S. Only three people sit to the right of R. U sits to the immediate left of E. D is not an immediate neighbor of R.

Who sits at the rightmost end of the line?

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

Q58. All 51 people are standing in a row facing north. Rekha is 13th from the left end while Ajay is 6th from the right end. How many people are there between Rekha and Ajay?

(a) 33
(b) 34
(c) 32
(d) 31

Q59. 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 its constituent digits. E.g. 13 – Operations on 13 such as adding / subtracting /multiplying etc. to 13 can be performed. Breaking down 13 into 1 and 3 and then performing mathematical operations on 1 and 3 is not allowed.)

77 - 3 - 80

12 - 4 - 16

(a) 20 - 13 - 43
(b) 11 - 1 - 23
(c) 14 - 9 - 25
(d) 6 - 5 - 11

Q60. This question is based on the five, three-digit numbers given below.

(Left) 435 325 123 756 264 (Right)

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

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

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

(a) 9
(b) 8
(c) 12
(d) 10

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Q61. What should come in place of the question mark (?) in the given series?

18 25 32 39 46 ?

(a) 52
(b) 53
(c) 49
(d) 56

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

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

(a) GN - LS
(b) XF - CK
(c) VC - BH
(d) MD - RI

Q63. Which of the following letter-number clusters will replace the question mark (?) in the given series to make it logically complete?

FVO 18, DTM 29, BRK 40, ZPI 51, ?

(a) XNG 62
(b) WNH 61
(c) XNF 62
(d) YNF 65

Q64. What should come in place of the question mark (?) in the given series?

167 176 194 221 257 ?

(a) 301
(b) 302
(c) 303
(d) 304

Q65. 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 one that does not belong to that group?

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

(a) GU - KY
(b) LR - PV
(c) PC - TG
(d) EK - IP

Q66. In a certain code language, ‘ride waves carefully’ is coded as ‘el uw cb’ and ‘waves crash loud’ is coded as ‘sr cb vq’. How is ‘waves’ coded in the given language?

(a) cb
(b) sr
(c) el
(d) uw

Q67. Which two numbers should be interchanged to make the following equation correct?

(56 ÷ 14) × 3 + 7 × 9 - 15 × 5 + 28 = 103

(Note: The entire number should be interchanged and not individual digits of a given number.)

(a) 56 and 28
(b) 7 and 14
(c) 5 and 7
(d) 28 and 14

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Q68. Six people, G, H, I, Q, R and S, are sitting in a straight line, facing north. Only two people sit to the right of Q. Only one person sits between Q and S. Only one person sits between H and R. R sits to the immediate left of Q. Only I sits to the right of G. How many people sit between H and G?

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

Q69. Refer to the given series and answer the question that follows. (All numbers are single digit numbers only.) Counting to be done from left to right only.

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

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

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

Q70. HOCX is related to SZNI in a certain way based on the English alphabetical order. In the same way, ZGUP is related to KRFA. To which of the following options is GNBW related to, following the same logic?

(a) RMKI
(b) RYMH
(c) RYHU
(d) THYU

Q71. Piyush starts from Point X and drives 6 km towards east. He then takes a left turn, drives 3 km, turns right, and drives 5 km. He then takes a right turn and drives 3 km. Finally, he takes a right turn, drives 5 km, and stops at Point P. How far (shortest distance) and towards which direction should he drive in order to reach Point X again? (All turns are 90 degrees turns only unless specified.)

(a) 4 km towards north
(b) 4 km towards east
(c) 6 km towards west
(d) 3 km towards east

Q72. In a certain code language,

A+ B means 'A is the sister of B'

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

A x B means 'A is the wife of B'

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

Based on the above, how is L related to R if 'LXO#V@E+R'?

(a) Mother
(b) Father's brother's daughter
(c) Father's brother's wife
(d) Sister

Q73. If 'D' stands for '÷', 'E' stands for 'x', 'F' stands for '+' and 'G' stands for '-', then what will come in place of the question mark (?) in the following equation?

24 E2 D4 F5G3=?

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

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Q74. Read the given statement(s) 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 statement(s).

Statements: All flutes are drums. All drums are guitars.

Conclusion (I): No guitar is a flute

Conclusion (II): Some guitars are flutes

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

Q75. In a row of 50 students facing North, Miku is 12th from the right end. If Pushkar is 5th to the left of Miku, what is Pushkar's position from the left end of the line?

(a) 31st
(b) 34th
(c) 33rd
(d) 32nd

Q76. Which two numbers should be interchanged to make the given equation correct?

(36 - 28) × 3 + 9 × 5 - (108 ÷ 4) + 42 = 96

(Note: Interchange should be done of the entire number and not individual digits of a given number.)

(a) 9 and 4
(b) 4 and 3
(c) 3 and 5
(d) 36 and 42

Q77. Refer to the following number and symbol series and answer the question that follows. Counting to be done from left to right only.

(Left) 4 @ 3 % 5 $ 1 # 6 & 9 * 5 + 1 ? 6 + = 5 $ # 2 (Right)

If all the symbols are dropped from the series, which of the following will be seventh from the right?

(a) 5
(b) 6
(c) 9
(d) 3

Q78. What should come in place of the question mark (?) in the given series?

336 327 318 309 300 ?

(a) 281
(b) 289
(c) 291
(d) 285

Q79. Read the given statements and conclusions carefully. Assuming that the information given in the statements is true, even if it appears to be at variance with commonly known facts, decide which of the given conclusions logically follow(s) from the statements.

Statements:

All books are pens.

Some pens are crayons.

Conclusion (I): All crayons are pens.

Conclusion (II): Some books are crayons.

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

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(d) Only conclusion (I) follows

Q80. Which of the following letter-number clusters will replace the question mark (?) in the given series to make it logically complete?

WTQ 69 URO 76 SPM 83 QNK 90 ?

(a) OLI 97
(b) OPR 96
(c) OKH 96
(d) OMH 97

GENERAL AWARENESS AND CURRENT AFFAIRS

Q81. What is the projected fiscal deficit for FY2025-26 as per the Union Budget 2025-26?

(a) 5.1% of GDP
(b) 4.8% of GDP
(c) 3.9% of GDP
(d) 4.4% of GDP

Q82. Which senior Indian official attended the Shanghai Cooperation Organisation (SCO) Defence Ministers' Conclave in June 2025?

(a) Amit Shah
(b) Rajnath Singh
(c) Narendra Modi
(d) S Jaishankar

Q83. Which of the following veteran Indian goalkeepers announced that he will retire after the Paris Olympics, ending an 18-year career during which he played a pivotal role in some of the team's historic moments?

(a) Ramesh Babu
(b) P R Sreejesh
(c) M S Srinath
(d) Rajneesh Karmakar

Q84. What is India's rank in the Climate Change Performance Index (CCPI) 2026?

(a) 33rd
(b) 13th
(c) 23rd
(d) 10th

Q85. 'Strengthening Global South Cooperation for a More Inclusive and Sustainable Governance' was the theme of the 17th summit of which international organization held in July 2025?.

(a) BRICS
(b) ASEAN
(c) NATO
(d) G20

Q86. The Quality Council of India (QCI), the national custodian of accreditation in India, commemorated the World Accreditation Day, 2025, in which city?

(a) New Delhi
(b) Jaipur
(c) Bhopal
(d) Indore

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Q87. Which country added India to its List of Qualifications Exempt from Assessment (LQEA) in June 2025?

(a) New Zealand
(b) The United Kingdom
(c) Canada
(d) Australia

Q88. Which award highlights lifetime achievement in sports broadcasting, won by David Hill in 2025?

(a) Sports Emmy Journalism Award
(b) Sports Basketball Award
(c) Sports Business Journal's Lifetime Achievement Award
(d) Sports Business Journal' Laureus Media Honour

Q89. Which organisation is set to be established at GIFT City, Gandhinagar from the beginning of 2026 to strengthen India's artificial intelligence ecosystem through collaboration between government, industry, and academia?

(a) National Artificial Intelligence Authority
(b) Indian AI Research Organization
(c) Indian Institute of Artificial Intelligence
(d) Centre for Advanced Artificial Intelligence Research

Q90. What is the estimated capital expenditure allocation for FY2025–26?

(a) Rs. 10 lakh crore
(b) Rs. 9 lakh crore
(c) Rs. 12.63 lakh crore
(d) Rs. 11.21 lakh crore

Q91. What is the name of India's first 5.5 Gen stealth aircraft showcased by DRDO at Aero India 2025?

(a) Advanced Light Weight Torpedo
(b) LCA Tejas Mk-2
(c) TEDBF
(d) Advanced Medium Combat Aircraft

Q92. Launched in March 2024 in India, what is the name of the platform that allows individuals to report fraudulent communications, including calls, texts, and WhatsApp messages?

(a) Proctur
(b) Podia
(c) Ruzuku
(d) Chakshu

Q93. Which of the following authors won the Nobel Prize in Literature in 2025?

(a) Ernest Hemingway
(b) László Krasznahorkai
(c) John Steinbeck
(d) George Orwell

Q94. As per the 2023 Air Quality Life Index (AQLI) report by the Energy Policy Institute at the University of Chicago (EPIC), what is the reduction in life expectancy for the average Indian due to exposure to fine particulate air pollution (PM2.5)?

(a) 6.7 years
(b) 2.5 years
(c) 3.8 years
(d) 5.3 years

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Q95. Which of the following national parks was designated as 58^(th) tiger reserve of India in March 2025?

(a) Panna National Park
(b) Pench National Park
(c) Kuno National Park
(d) Madhav National Park

Q96. Who among the following was the Player of the Tournament in the ICC Women's Cricket World Cup 2025?

(a) Jemimah Rodrigues
(b) Deepti Sharma
(c) Shafali Verma
(d) Smriti Mandhana

Q97. Who set a javelin F42 world record (61.17 m) at the 2025 WPA Grand Prix?

(a) Sumit Antil
(b) Ravi Rangoli
(c) Pingane Mina Vilas
(d) Gurjar Mahendra

Q98. Operation Alert, launched by the Border Security Force in August 2025, primarily aimed to strengthen security along which Indian border?

(a) Jammu and Kashmir border
(b) Assam border
(c) Punjab border
(d) Rajasthan border

Q99. What is the name of the bill passed by the West Bengal Assembly in June 2025 to cap healthcare expenses in private hospitals?

(a) West Bengal Patient Safety (Amendment) Bill, 2025
(b) West Bengal Health Protection (Amendment) Bill, 2025
(c) West Bengal Clinical Establishments (Registration, Regulation and Transparency) (Amendment) Bill, 2025
(d) West Bengal Medical Cost Transparency (Amendment) Bill, 2025

Q100. In which of the following National Parks did an India-born female cheetah give birth to five cubs in November 2025, marking a major milestone under Project Cheetah?

(a) Kuno National Park
(b) Gir National Park
(c) Ranthambore National Park
(d) Bandipur National Park

ANSWER KEY

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

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SOLUTIONS

Q1. Answer: (c) Accommodation

The correct answer is Accommodation.

Key Points

• The ability of the eye lens to adjust its focal length to focus on both near and distant objects is called Accommodation.

• This process is facilitated by the ciliary muscles, which can modify the curvature of the crystalline lens.

• When the ciliary muscles are relaxed, the lens becomes thin and its focal length increases, allowing the eye to see distant objects clearly.

• When the ciliary muscles contract, the lens becomes thicker and its focal length decreases, enabling the eye to focus on nearby objects.

• The power of accommodation for a normal human eye is limited; for a healthy adult, the closest distance an object can be seen clearly without strain is about 25 cm.

• Hence, the correct answer is Accommodation.

Additional Information

• Near Point and Far Point:

• The near point of the eye (least distance of distinct vision) is 25 cm for a normal young adult.

• The far point of a normal eye is infinity, meaning it can see objects at a very great distance clearly.

• Ciliary Muscles and Suspensory Ligaments:

• The lens is held in place by suspensory ligaments attached to the ciliary body.

• The tension in these ligaments changes based on the contraction or relaxation of the ciliary muscles, thereby altering the lens shape.

• Presbyopia:

• With age, the power of accommodation usually decreases as the ciliary muscles weaken and the crystalline lens loses its flexibility.

• This condition, where people find it difficult to see nearby objects comfortably and distinctly without corrective eye-wear, is called Presbyopia.

• Other Eye Functions:

• Adaptation: This refers to the ability of the pupil and iris to adjust to varying levels of light intensity.

• Reflection: This is the bouncing back of light when it hits a surface; it is not the primary mechanism of focusing within the biological lens of the eye.

Important Points

• Image Formation: The eye lens forms a real and inverted image of the object on the retina, which is a light-sensitive screen at the back of the eye.

• Refractive Power: The cornea actually performs about 70-80% of the total refraction (focusing) of the eye. The lens provides the final, adjustable 20-30% of the power required for fine-tuning.

• Optical Power Unit: The power of a lens is measured in Dioptres (D). The accommodation power of a healthy young human eye is approximately 4 Dioptres.

• Refractive Defects: When the eye cannot properly accommodate or focus light on the retina, it leads to defects like Myopia (nearsightedness), Hypermetropia (farsightedness), and Astigmatism.

Q2. Answer: (c) 4.0 m/s

The correct answer is 4.0 m/s.

Key Points

• The slope of a distance-time graph is a physical representation of the speed of an object. In physics, the slope is defined as the vertical change (rise) divided by the horizontal change (run).

• In this specific problem, the particle covers a distance of 12 m in every 3 s. This indicates that the particle is moving at a constant rate, which is a characteristic of uniform motion.

• To calculate the slope, we use the formula: Slope = Change in Distance / Change in Time. This is equivalent to the formula for speed: v = d / t.

• By substituting the given numerical values into the formula: Slope = 12 m / 3 s. Performing the division gives a result of 4.0 m/s.

• Since the slope is 4.0 m/s, it tells us that for every 1 second that passes, the particle moves exactly 4 meters. The linear nature of the graph (a straight line) confirms that the speed remains constant throughout the motion.

Additional Information

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• Distance-Time Graph Fundamentals:

• On a distance-time graph, the time is always plotted on the x-axis (the independent variable), and the distance is plotted on the y-axis (the dependent variable).

• The unit for the slope in this graph is meters per second (m/s), which is the standard SI unit for speed.

• Types of Motion on Graphs:

• Uniform Motion: Represented by a straight line passing through the origin. The constant slope indicates a constant speed.

• Non-Uniform Motion: Represented by a curved line (parabola). A curve indicates that the object is accelerating or decelerating, meaning the speed is changing over time.

• Object at Rest: Represented by a horizontal line parallel to the time axis. In this case, the slope is 0, indicating a speed of 0 m/s.

• Speed vs. Velocity:

• While the slope of a distance-time graph gives the speed (a scalar quantity), the slope of a displacement-time graph provides the velocity (a vector quantity).

• Speed only considers magnitude, whereas velocity considers both magnitude and direction.

• Graphical Interpretation:

• A steeper line on the graph indicates a higher slope and thus a greater speed. Conversely, a line with a low angle of inclination indicates a slower speed.

• If the line is vertical, it would imply infinite speed (covering distance in zero time), which is physically impossible for a particle with mass.

Important Points

• The calculation of the slope 12 / 3 = 4 is a direct application of the rate of change concept in kinematics.

• In calculus terms, the speed is the first derivative of distance with respect to time (v = dd/dt). For linear graphs, this derivative is simply the constant slope of the line.

• Understanding distance-time graphs is crucial for analyzing real-world data, such as the average speed of vehicles, satellite orbits, or athletic performance.

Q3. Answer: (d) It is a concave lens of focal length 25 cm.

The correct answer is It is a concave lens of focal length 25 cm..

Key Points

• The power of a lens is defined as the reciprocal of its focal length (f) in meters. It represents the degree of convergence or divergence of light rays falling on it.

• The formula to calculate the power of a lens is P = 1/f, where P is the power in Dioptres (D) and f is the focal length in meters (m).

• Given the power P = -4 D. To find the focal length, we use f = 1/P. Substituting the value, we get f = 1/(-4) = -0.25 meters.

• To convert the focal length from meters to centimeters, we multiply by 100. Thus, -0.25 m × 100 = -25 cm.

• According to the Cartesian sign convention, a negative sign in power and focal length indicates that the lens is a diverging lens or a concave lens. Hence, the statement that it is a concave lens of focal length 25 cm is correct.

• Conversely, a convex lens (converging lens) always has a positive focal length and therefore a positive power. Hence, options suggesting a convex lens are incorrect.

Additional Information

• SI Unit of Power: The standard unit of lens power is the Dioptre, denoted by the symbol D. One Dioptre is defined as the power of a lens whose focal length is exactly 1 meter (1 D = 1 per meter).

• Concave Lens Characteristics: A concave lens is thinner at the center than at the edges. It diverges parallel rays of light. The images formed by a concave lens are always virtual, erect, and diminished, regardless of the position of the object.

• Convex Lens Characteristics: A convex lens is thicker at the center than at the edges. It converges parallel rays of light to a point called the focus. It can form both real and virtual images depending on the object's distance from the lens.

• Calculation for other options:

• If the focal length were 2.5 m, the power would be 1/2.5 = 0.4 D.

• If the focal length were 0.4 m, the power would be 1/0.4 = 2.5 D.

Important Points

• Correction of Vision: In ophthalmology, power values are crucial. A person suffering from Myopia (nearsightedness) is prescribed a concave lens with negative power to move the image back onto the retina.

• A person suffering from Hypermetropia (farsightedness) is prescribed a convex lens with positive power to increase the convergence of light rays.

• Combination of Lenses: When two or more lenses are placed in contact, the net power (P) is the algebraic sum of the individual powers: P = P1 + P2 + P3.... This principle is used in designing camera lenses and microscopes to minimize aberrations.

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• The focal length of a lens depends on the refractive index of the material and the radii of curvature of its two surfaces, as described by the Lens Maker's Formula.

Q4. Answer: (c) Decrease in temperature

The correct answer is Decrease in temperature.

Key Points

• Evaporation is a surface phenomenon where liquid molecules gain enough kinetic energy to escape into the air as vapor at any temperature below the boiling point.

• An Increase in surface area significantly enhances the rate of evaporation because more molecules are exposed to the atmosphere at the liquid-air interface. For example, spreading out wet clothes allows them to dry faster. Since this increases the rate, statement 1 is not the correct factor for this question.

• An Increase in wind speed helps in moving the water vapor particles away from the surface of the liquid, thereby reducing the concentration of vapor in the immediate surroundings and allowing more molecules to escape. Since this increases the rate, statement 2 is not the correct factor for this question.

• A Decrease in temperature results in lower kinetic energy for the liquid particles, making it harder for them to overcome the intermolecular forces and escape the surface. This directly leads to a slower evaporation process. Hence, statement 3 is correct as it does NOT increase the rate of evaporation.

• A Decrease in humidity increases the rate of evaporation because dry air has a higher capacity to absorb moisture than moist air. When the moisture content in the air is low, the gradient for evaporation is steeper. Since this increases the rate, statement 4 is not the correct factor for this question.

Additional Information

• Temperature: The rate of evaporation is directly proportional to the absolute temperature. Higher temperatures provide the latent heat of vaporization required for phase change.

• Humidity: This is the measure of water vapor present in the air at a given temperature. On a rainy day, when humidity is near 100%, the rate of evaporation is at its lowest, which is why clothes take longer to dry.

• Latent Heat: During evaporation, the liquid absorbs energy from the surroundings to change into a gas. This is why evaporation always leads to a cooling effect on the remaining liquid or the surface.

• Nature of Liquid: Different liquids have different intermolecular forces. Volatile liquids like acetone or petrol evaporate much faster than water at 25 degrees Celsius because they have weaker bonds.

Important Points

• Bulk vs. Surface Phenomenon: Unlike boiling, which is a bulk phenomenon where the entire mass of the liquid reaches the boiling point, evaporation occurs only at the surface.

• Cooling Applications: The principle of evaporation is used in desert coolers and earthen pots (Matkas). In a desert cooler, the evaporation of water absorbs heat from the air, providing a cool breeze during hot and dry summer months.

• Atmospheric Pressure: While not mentioned in the options, a decrease in atmospheric pressure also increases the rate of evaporation, as there is less pressure pushing down on the surface to prevent molecules from escaping.

Q5. Answer: (d) The speed of the object is changing with time

The correct answer is The speed of the object is changing with time.

Key Points

• In a distance–time graph, the time is typically plotted on the x-axis and the distance covered by the object is plotted on the y-axis.

• The slope (or gradient) of a distance–time graph represents the speed of the object. If the graph is a straight line, the slope is constant, indicating that the object is moving with a constant speed. Hence, statement 1 is incorrect.

• When the graph is a curved line, it implies that the slope of the graph is changing at different points in time. Since the slope represents speed, a changing slope means the speed of the object is changing. Hence, statement 4 is correct.

• A change in speed over time is defined as acceleration (or deceleration). If the graph is curved, it indicates that the motion is accelerated. Hence, statement 2 is incorrect.

• If an object remains stationary, its distance does not change as time passes. This would result in a horizontal straight line parallel to the time axis. Hence, statement 3 is incorrect.

Additional Information

• Uniform Motion:

• An object is said to be in uniform motion when it covers equal distances in equal intervals of time.

• The distance–time graph for uniform motion is always a straight line passing through the origin (if starting from zero distance).

• In this case, the acceleration of the object is zero.

• Non-Uniform Motion:

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• An object is in non-uniform motion when it covers unequal distances in equal intervals of time.

• The distance–time graph for this motion is a curve, such as a parabola, which indicates that the speed is either increasing or decreasing.

• Non-uniform motion is also referred to as accelerated motion.

• Instantaneous Speed:

• On a curved distance–time graph, the speed at any particular instant can be found by drawing a tangent to the curve at that point and calculating its slope.

• The steeper the curve, the higher the instantaneous speed of the object at that time.

Important Points

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

• A distance–time graph can never go downwards because distance is a scalar quantity and can only increase or stay constant with time; it can never be negative.

• If the curve bends upwards (getting steeper), the object is speeding up (positive acceleration).

• If the curve starts to level off (getting flatter), the object is slowing down (negative acceleration or deceleration).

Q6. Answer: (b) 2 – 1 – 4 – 3

The correct answer is 2 – 1 – 4 – 3.

Key Points

• Fragmentation is a form of asexual reproduction where an organism physically splits into distinct segments, each of which can grow into a new individual.

• Statement 2: The process begins when a multicellular organism, such as a filamentous alga, reaches maturity and breaks down its body or filament into smaller pieces or fragments. Hence, statement 2 is the first step in the sequence.

• Statement 1: Once the body has fragmented, the cells within these fragments initiate the growth of lost body parts. This is achieved through the process of mitosis (equational cell division), where cells replicate to form the necessary biological structures. Hence, statement 1 is the second step in the sequence.

• Statement 4: As cellular division and differentiation continue, each fragment develops into a complete organism that is morphologically and genetically similar to the parent. Hence, statement 4 is the third step in the sequence.

• Statement 3: The cycle concludes when the mature organism lives independently, capable of performing all life functions and eventually undergoing fragmentation itself to repeat the reproductive cycle. Hence, statement 3 is the final step in the sequence.

• Therefore, the logical progression of fragmentation-based reproduction follows the sequence of breakdown, mitotic growth, full development, and independent maturity. Hence, the correct answer is 2 – 1 – 4 – 3.

Additional Information

• Fragmentation in Biology:

• This method of reproduction is common in organisms with simple body designs. Unlike complex animals, these organisms do not have highly specialized organ systems for reproduction.

• Example - Spirogyra: This is a green alga that grows as long filaments in freshwater. Upon maturity, the filament naturally breaks into small pieces, and each piece grows into a new Spirogyra plant.

• Example - Planaria: While often cited under regeneration, simple animals like Planaria (flatworms) can be cut into pieces, and each piece will grow into a complete organism.

• Asexual Reproduction Characteristics:

• It involves only a single parent, meaning there is no fusion of gametes or fertilization.

• The offspring produced are clones, maintaining the exact genetic makeup of the parent.

• This process allows for rapid population growth in favorable environmental conditions.

Important Points

• Fragmentation vs. Regeneration:

• While fragmentation is a deliberate reproductive strategy used by organisms like algae and fungi, regeneration is often an accidental process or a response to injury (e.g., a lizard regrowing its tail).

• In regeneration, specialized regenerative cells proliferate and undergo morphogenesis to form various cell types and tissues.

• Role of Mitosis:

• Mitosis is crucial because it ensures that every new cell in the developing fragment receives a complete set of chromosomes, preserving the species-specific characteristics.

• This process occurs in somatic cells and is the foundation for growth, repair, and asexual reproduction in eukaryotes.

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Q7. Answer: (b) Round seeds

The correct answer is Round seeds.

Key Points

• Gregor Mendel, often referred to as the Father of Genetics, conducted his primary experiments using Pisum sativum (the garden pea plant) in the 19th century.

• In this specific experiment, seed shape is the trait under observation. Mendel identified round seeds as the dominant trait and wrinkled seeds as the recessive trait.

• A pure-breeding plant is homozygous, meaning it carries two identical alleles for a gene. The pure-breeding round plant has the genotype RR, while the pure-breeding wrinkled plant has the genotype rr.

• When these two are crossed, the F1 generation (first filial generation) receives one allele from each parent, resulting in a heterozygous genotype of Rr.

• According to Mendel's Law of Dominance, in a heterozygous individual, the dominant allele (R) completely masks the expression of the recessive allele (r).

• Consequently, every single seed produced in the F1 generation will exhibit the round phenotype, even though they carry the hidden gene for wrinkled seeds. Hence, the correct answer is Round seeds.

Additional Information

• Mendelian Inheritance Patterns:

• Monohybrid Cross: The cross mentioned is a monohybrid cross because it focuses on a single trait (seed shape). Mendel performed these crosses for seven different traits including plant height, flower color, and pod shape.

• F2 Generation: When F1 plants (Rr) are self-pollinated, they produce the F2 generation. In this stage, the recessive trait (wrinkled) reappears in a specific phenotypic ratio of 3:1 (3 round to 1 wrinkled).

• Key Genetic Terminology:

• Genotype: This refers to the genetic makeup of the organism (e.g., RR, Rr, or rr).

• Phenotype: This refers to the observable physical characteristics of the organism (e.g., round or wrinkled).

• Law of Segregation: This law states that during the formation of gametes, the alleles for each gene segregate from each other so that each gamete carries only one allele for each gene.

• Experimental Data:

• In his 1865 paper, Mendel reported that out of 7,324 seeds in the F2 generation, 5,474 were round and 1,850 were wrinkled, which closely approximates the 3:1 ratio.

• The genotypic ratio of the F2 generation is 1:2:1, representing one homozygous dominant (RR), two heterozygous (Rr), and one homozygous recessive (rr).

Important Points

• The Seven Traits Studied by Mendel:

• Seed Shape: Round (Dominant) vs. Wrinkled (Recessive).

• Seed Color: Yellow (Dominant) vs. Green (Recessive).

• Flower Color: Violet (Dominant) vs. White (Recessive).

• Pod Shape: Inflated (Dominant) vs. Constricted (Recessive).

• Pod Color: Green (Dominant) vs. Yellow (Recessive).

• Flower Position: Axial (Dominant) vs. Terminal (Recessive).

• Stem Height: Tall (Dominant) vs. Dwarf (Recessive).

• Punnett Square Analysis:

• The Punnett Square for the F1 cross involves a 2x2 grid. If we place the R and R gametes from the round parent on one side and r and r from the wrinkled parent on the other, all four squares result in the Rr genotype.

Q8. Answer: (c) Copper(II) oxide (CuO) – black in colour

The correct answer is Copper(II) oxide (CuO) – black in colour.

Key Points

• When copper metal is heated in the presence of oxygen (air), a chemical reaction occurs where the copper atoms combine with oxygen atoms to form a new compound.

• The product formed is Copper(II) oxide, which has the chemical formula CuO. In this compound, the oxidation state of copper is +2.

• The surface of the reddish-brown copper metal becomes coated with a black-coloured layer during this process. This change in color is a clear indicator of a chemical change.

• The balanced chemical equation for this reaction is: $2Cu + O_2 \rightarrow 2CuO$ (upon heating).

• This reaction is classified as an oxidation reaction because copper gains oxygen to form its oxide. It is also a combination reaction as two reactants combine to form a single product.

Additional Information

• Copper(I) oxide (Cu2O): This is another oxide of copper where the oxidation state of copper is +1. It is typically red or brownish-red in colour. While it can be formed under specific conditions, the primary product of heating copper in excess air is the black Copper(II) oxide.

• Reactivity of Copper: Copper is a transition metal located in Group 11 of the Periodic Table. It is relatively low in the reactivity series, meaning it does not react with oxygen at room temperature, but requires high temperatures to undergo significant oxidation.

• Basic Nature: Copper(II) oxide is a basic oxide. When it reacts with dilute acids like hydrochloric acid (HCl), it forms copper salts (like copper chloride) and water.

• Difference from Corrosion: The black coating formed by heating is different from the greenish patina seen on copper structures (like the Statue of Liberty) over long periods. That green layer is basic copper carbonate, formed by the slow reaction of copper with moist carbon dioxide and oxygen in the atmosphere at ambient temperatures.

• Industrial Uses: Copper(II) oxide is used as a pigment in ceramics to produce blue, red, and green (and sometimes gray, pink, or black) glazes. It is also used as a catalyst in various chemical reactions and in the production of wood preservatives.

Important Points

• Reduction of CuO: If hydrogen gas is passed over the heated black Copper(II) oxide, the black coating turns brown again as the oxygen is removed, regenerating metallic copper. This is a redox reaction: $CuO + H_2 \rightarrow Cu + H_2O$.

• Physical Properties: Copper(II) oxide is a solid at room temperature and is insoluble in water. It has a monoclinic crystal structure and is often found in nature as the mineral tenorite.

• Safety: While copper is an essential trace element for humans, Copper(II) oxide can be toxic if inhaled or ingested in large quantities, as it acts as an irritant to the respiratory tract and gastrointestinal system.

Q9. Answer: (c) Potential Energy

The correct answer is Potential Energy.

Key Points

• Potential Energy is defined as the energy stored in an object or a system due to its position, shape, or configuration. It is "potential" because it has the capacity to do work when the state of the object changes.

• There are various forms of potential energy, the most common being Gravitational Potential Energy. This depends on an object's mass, its height relative to a reference point, and the acceleration due to gravity. The mathematical expression is P.E. = mgh.

• Another significant form is Elastic Potential Energy, which is the energy stored in objects that can be compressed or stretched, such as a coiled spring, a stretched rubber band, or a drawn archer's bow. This energy is a result of the change in the configuration or shape of the object.

• Potential energy can also be Chemical (stored in bonds), Electrical, or Magnetic, all depending on the relative arrangement of parts within a system.

• Because it represents the energy of an object based on its state of rest and arrangement rather than its motion, it perfectly matches the definition provided in the question. Hence, the correct answer is Potential Energy.

Additional Information

• Kinetic Energy:

• This is the energy possessed by an object by virtue of its motion.

• Unlike potential energy, which is based on position, kinetic energy depends on the mass and the square of the velocity of the object ($K.E. = 1/2\ mv^2$).

• Examples include a speeding car, a flowing river, or a falling stone. Hence, this option is incorrect as it relates to motion, not position.

• Heat Energy:

• Also known as thermal energy, it is the internal energy of a system resulting from the microscopic motion (vibration and collision) of atoms and molecules.

• It flows from a body at a higher temperature to one at a lower temperature.

• It is typically measured in Joules or Calories. Hence, this option is incorrect as it refers to internal molecular kinetic energy.

• Muscular Energy:

• This is the energy derived from the metabolic processes within the muscles of living organisms.

• It allows animals and humans to perform physical work, such as lifting weights, walking, or running.

• It is a transformation of chemical energy obtained from food into mechanical energy. Hence, this option is incorrect as it is a biological energy source for activity.

• Mechanical Energy:

• The sum total of potential energy and kinetic energy in a system is called Mechanical Energy.

• According to the Law of Conservation of Energy, in an isolated system, energy can neither be created nor destroyed; it only transforms from one form (like potential) to another (like kinetic).

Important Points

• The S.I. Unit of energy (both Kinetic and Potential) is the Joule (J), named after the physicist James Prescott Joule.

• Energy is a scalar quantity, meaning it has magnitude but no direction.

• The Commercial Unit of energy is the kilowatt-hour (kWh), which is commonly used for electricity billing and is equal to 3.6 million Joules.

• A stretched bow possesses Elastic Potential Energy because of its shape/configuration; as soon as the arrow is released, this energy converts into the Kinetic Energy of the arrow.

Q10. Answer: (c) The little bee

The correct answer is The little bee.

Key Points

• Apis florea is popularly known as the little honey bee. It is one of the smallest species of honey bees found in the wild.

• This species is a member of the subgenus Micrapis and is primarily distributed across South and Southeast Asia, extending to parts of the Middle East.

• The little bee is characterized by its nesting habit of building a single, open-air comb. This comb is usually attached to the branches of shrubs, bushes, or small trees, rather than in dark cavities. Hence, the correct answer is "The little bee".

• Due to its small body size, which is approximately 7 to 10 mm in length, it is easily distinguished from larger honey bee species.

• The honey yield from Apis florea is relatively low, typically ranging from 500 grams to 1 kilogram per colony per year, but the honey is highly valued for its medicinal properties in traditional systems.

Additional Information

• The Giant Bee (Apis dorsata):

• Commonly known as the Rock Bee or Giant Honey Bee, it is the largest honey bee species found in India.

• It builds huge, single combs in open spaces, often hanging from high cliffs, tall trees, or ceiling corners of multi-story buildings.

• It is known for its ferocious nature and high honey production capacity, yielding up to 30 to 40 kg of honey per colony.

• The Asian Bee (Apis cerana):

• Also known as the Indian Hive Bee or Asiatic Honey Bee.

• Unlike Apis florea, this species is a cavity-nesting bee, making it suitable for domestication in wooden hives.

• It is widely used in apiculture across Asia, though it produces less honey compared to the European bee (Apis mellifera).

• The Dwarf Bee:

• While Apis florea is sometimes referred to as a dwarf honey bee, the term specifically distinguishes it alongside Apis andreniformis (the black dwarf honey bee).

• Apis andreniformis is generally darker and found in more tropical, humid regions of Southeast Asia.

Important Points

• Behavioral Traits: The little bee is unique because its dance language (used to communicate the location of food) is performed on the horizontal platform at the top of its comb, whereas other species perform it on vertical surfaces.

• Defense Mechanisms: These bees exhibit a collective behavior known as shimmering, where workers vibrate their wings in waves to intimidate predators like wasps.

• Migration: Apis florea is highly migratory and often shifts its colony location based on seasonal changes and the availability of floral nectar.

• Pollination: They play a critical role in the ecosystem as pollinators for various tropical crops and wild flora, contributing to biodiversity conservation.

Q11. Answer: (d) Higher pitch

The correct answer is Higher pitch.

Key Points

• The pitch of a sound is directly determined by its frequency of vibration. When the frequency of vibration of a sound source increases, the resulting sound will have a higher pitch.

• Frequency is defined as the number of oscillations or vibrations per unit of time (usually one second). It is measured in Hertz (Hz).

• A high-frequency vibration produces a sound that is shrill and has a high pitch, such as the sound of a whistle or a bird chirping.

• Conversely, a low-frequency vibration results in a sound with a lower pitch, such as the beating of a drum or the roar of a lion.

• It is important to note that pitch is a subjective perception of the frequency of sound waves by the human ear, whereas frequency

is a physical, measurable quantity.

Additional Information

• Amplitude and Loudness:

• The loudness of a sound depends on the amplitude of the vibration. Loudness is proportional to the square of the amplitude of the vibration producing the sound.

• If the amplitude is large, the sound produced is loud; if the amplitude is small, the sound is feeble. Therefore, increasing frequency does not necessarily increase loudness.

• Human Audibility Range:

• The human ear can typically hear sounds with frequencies ranging from 20 Hz to 20,000 Hz (20 kHz).

• Sounds with a frequency below 20 Hz are termed infrasonic, while those above 20,000 Hz are termed ultrasonic.

• Characteristics of Sound Waves:

• Wavelength: The distance between two consecutive compressions or rarefactions in a sound wave.

• Time Period: The time taken by the wave to complete one full oscillation. It is the reciprocal of frequency (T = 1/f).

• Speed of Sound: The distance a point on the wave travels per unit time. In dry air at 20 degrees Celsius, the speed of sound is approximately 343 meters per second.

• Unit of Loudness:

• The loudness of sound is measured in decibels (dB). Normal conversation is typically around 60 dB, while sounds above 80 dB can become physically painful or harmful to the human ear over time.

• Quality (Timbre):

• This is the characteristic of sound that allows us to distinguish between two sounds of the same pitch and loudness, such as different musical instruments or human voices.

Important Points

• In general, the voice of a woman has a higher frequency and is shriller than that of a man, meaning it has a higher pitch.

• The voice of a man typically has a lower frequency of vibration, resulting in a lower pitch or deeper voice.

• This difference is primarily due to the length and thickness of the vocal cords; men usually have longer vocal cords (about 20 mm) compared to women (about 15 mm).

Q12. Answer: (a) The sum of protons and neutrons

The correct answer is The sum of protons and neutrons.

Key Points

• The mass number (represented by the symbol A) of an element is defined as the total count of protons and neutrons present in the nucleus of an atom.

• Protons and neutrons are collectively referred to as nucleons because they occupy the central core of the atom.

• The mathematical representation of the mass number is A = Z + n, where Z represents the atomic number (the number of protons) and n represents the number of neutrons.

• Since electrons have a negligible mass (approximately 1/1840 of the mass of a proton), they are not included in the calculation of the mass number.

• For example, an atom of Aluminum has 13 protons and 14 neutrons; therefore, its mass number is 27.

Additional Information

• Atomic Number (Z):

• This refers strictly to the number of protons in the nucleus of an atom. It defines the identity of the element and its position in the Modern Periodic Table.

• In a neutral atom, the number of protons is exactly equal to the number of electrons.

• Isotopes:

• These are atoms of the same element that possess the same atomic number but different mass numbers.

• This variation occurs because isotopes have the same number of protons but a different number of neutrons.

• Example: Carbon has isotopes like Carbon-12 (6 protons, 6 neutrons) and Carbon-14 (6 protons, 8 neutrons), the latter of which is used in radiocarbon dating.

• Isobars:

• These are atoms of different chemical elements that have the same mass number but different atomic numbers.

• Example: Argon-40 and Calcium-40 both have a mass number of 40, despite having 18 and 20 protons respectively.

• Relative Atomic Mass:

• Unlike the mass number (which is always a whole number), relative atomic mass is often a decimal because it is a weighted average of all the naturally occurring isotopes of that element.

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Important Points

• The discovery of the neutron by James Chadwick in 1932 was crucial for the accurate determination of mass numbers.

• The mass number is typically written as a superscript to the left of the chemical symbol (e.g., 12C), while the atomic number is written as a subscript (e.g., 6C).

• The nucleus contains nearly 99.9% of the total mass of the atom, concentrated in an extremely small volume compared to the total size of the atom, a fact first proposed by Ernest Rutherford in 1911.

• The stability of a nucleus is often determined by the neutron-to-proton ratio (n/p ratio); if this ratio is too high or too low, the atom may become radioactive.

Q13. Answer: (b) Both (i) and (ii)

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

Key Points

• Buoyant force, also known as upthrust, is the upward force exerted by a fluid (liquid or gas) that opposes the weight of an object immersed in it.

• All objects, regardless of their material, mass, or shape, experience a force of buoyancy when they are partially or fully immersed in a fluid. This force acts in the upward direction, contrary to the force of gravity. Hence, statement (i) is correct.

• The magnitude of the buoyant force is determined by the formula Fb = ρVg, where ρ (rho) represents the density of the fluid. Because the force is directly proportional to the density of the medium, an object will experience a greater upward force in a denser fluid (like saltwater) compared to a less dense fluid (like freshwater). Hence, statement (ii) is correct.

• According to Archimedes' Principle, the magnitude of the buoyant force is exactly equal to the weight of the fluid displaced by the body.

• The point at which the buoyant force acts on the body is called the centre of buoyancy, which coincides with the centre of gravity of the displaced fluid.

• Hence, the correct answer is Both (i) and (ii).

Additional Information

• Archimedes' Principle:

• This fundamental law of physics was discovered by the Greek mathematician Archimedes in the 3rd century BC.

• It explains why some objects float while others sink. If the buoyant force is equal to or greater than the weight of the object, the object will float; otherwise, it will sink.

• Density and Buoyancy:

• The density of a substance is its mass per unit volume. The SI unit for density is kg/m³.

• Pure water has a density of approximately 1000 kg/m³ at 4°C. Mercury, being much denser at 13,600 kg/m³, exerts a significantly higher buoyant force on objects.

• Practical Applications:

• Ship Design: Large ships made of steel float because they are designed to displace a volume of water whose weight is equal to the weight of the ship.

• Lactometers: These are instruments used to determine the purity of a sample of milk based on the principle of buoyancy.

• Hydrometers: These are used for determining the density of liquids by measuring how deep they sink in a fluid.

• Hot Air Balloons: They rise because the hot air inside the balloon is less dense than the surrounding cool air, creating a net upward buoyant force.

Important Points

• Factors affecting Buoyant Force:

• Volume of the immersed object: The larger the volume of the object submerged, the greater the buoyant force it experiences.

• Density of the fluid: As established, higher fluid density leads to a stronger upthrust.

• Acceleration due to gravity (g): In a zero-gravity environment (like free fall or outer space), the buoyant force becomes zero. On Earth, g is approximately 9.8 m/s².

• Apparent Weight:

• When an object is immersed in a fluid, it appears to lose weight. This apparent weight is equal to the actual weight of the object minus the buoyant force.

• This phenomenon is why it is easier to lift a heavy stone while it is still under water than to lift it once it reaches the surface.

Q14. Answer: (c) Proper diet and prenatal care

The correct answer is Proper diet and prenatal care.

Key Points

• Proper diet and prenatal care are the most critical factors for ensuring the health of both the mother and the developing fetus

during the child-bearing period. A balanced intake of nutrients supports fetal growth and prevents maternal depletion. Hence, statement 3 is correct.

• Prenatal care refers to the regular medical checkups a woman receives during pregnancy. These visits allow healthcare providers to monitor the health of the mother and baby, perform necessary screenings, and provide guidance on lifestyle and nutrition.

• High caffeine intake (Option 1) has been linked to increased risks of miscarriage and low birth weight. While moderate consumption is often considered acceptable, excessive intake is detrimental. Hence, statement 1 is incorrect.

• Skipping meals (Option 2) can lead to hypoglycemia and nutritional deficiencies, which negatively impact the mother's energy levels and the baby's development. Hence, statement 2 is incorrect.

• Smoking daily (Option 4) is extremely harmful as it restricts oxygen supply to the baby and is a leading cause of premature birth, birth defects, and Sudden Infant Death Syndrome (SIDS). Hence, statement 4 is incorrect.

Additional Information

• Nutritional Requirements: During pregnancy, the demand for specific nutrients like Folic Acid, Iron, Calcium, and Iodine increases significantly. Folic Acid is essential in the first trimester to prevent Neural Tube Defects (NTDs).

• Maternal Mortality Ratio (MMR): This is a key health indicator representing the number of maternal deaths per 1,00,000 live births. Improving institutional deliveries and prenatal care are primary strategies to reduce this ratio globally.

• Government Initiatives in India:

• Janani Suraksha Yojana (JSY): Launched in 2005, it is a safe motherhood intervention under the National Health Mission providing cash assistance for institutional delivery.

• Pradhan Mantri Matru Vandana Yojana (PMMVY): A maternity benefit program providing Rs. 5,000 to pregnant and lactating mothers for the first living child to compensate for wage loss and ensure nutrition.

• Pradhan Mantri Surakshit Matritva Abhiyan (PMSMA): Aimed at providing assured, comprehensive, and quality antenatal care on the 9th of every month.

• WHO Guidelines: The World Health Organization recommends a minimum of eight antenatal contacts to reduce perinatal mortality and improve the women's experience of care.

Important Points

• Anemia Prevention: Iron and Folic Acid (IFA) supplementation is a cornerstone of women's health in India, as anemia is a major cause of maternal complications and postpartum hemorrhage.

• Immunization: Pregnant women must receive Tetanus Toxoid (TT) or Td (Tetanus and adult diphtheria) vaccines to prevent neonatal tetanus.

• Weight Management: Monitoring Gestational Weight Gain (GWG) is crucial, as excessive gain can lead to gestational diabetes and hypertension, while insufficient gain leads to underweight newborns.

• Environmental Factors: Avoidance of second-hand smoke, alcohol, and exposure to heavy metals is just as vital as direct healthy habits for reproductive health.

Q15. Answer: (c) Double displacement reaction

The correct answer is Double displacement reaction.

Key Points

• A double displacement reaction, also known as a metathesis reaction, is a chemical process where the positive ions (cations) and negative ions (anions) of two ionic compounds switch places to form two entirely new compounds.

• The general skeleton of this chemical equation can be represented as AB + CD → AD + CB. In this formula, A and C are positively charged cations, while B and D are negatively charged anions.

• These reactions primarily occur in aqueous solutions (solutions where the solvent is water), allowing the ions to dissociate and move freely to interact with one another.

• A classic example of this reaction is the mixing of silver nitrate ($AgNO_3$) and sodium chloride (NaCl), which yields a white precipitate of silver chloride (AgCl) and sodium nitrate ($NaNO_3$) in solution.

• For a double displacement reaction to occur, one of the products formed is usually a precipitate (an insoluble solid), a gas, or a molecular compound like water.

Additional Information

• Combination Reaction:

• This is a reaction where two or more reactants (elements or compounds) combine to form a single product.

• It follows the general form A + B → AB. An example is the combustion of magnesium (Mg) in oxygen (O_2) to produce magnesium oxide (MgO).

• Decomposition Reaction:

• In this reaction, a single reactant breaks down into two or more simpler products. This process usually requires energy in the form of heat (thermal decomposition), light (photolysis), or electricity (electrolysis).

• An example is the heating of calcium carbonate ($CaCO_3$), which decomposes into calcium oxide (CaO) and carbon dioxide (CO_2).

• Displacement Reaction:

• Also called a single displacement reaction, it involves a more reactive element pushing out or "displacing" a less reactive element from its compound.

• The reactivity series of metals is used to predict these reactions. For instance, Zinc (Zn) displaces copper (Cu) from a copper sulfate ($CuSO_4$) solution because zinc is more reactive.

Important Points

• Precipitation Reaction: This is a specific type of double displacement where one of the formed products is insoluble in the solvent and settles down as a solid. This solid is referred to as the precipitate.

• Neutralization Reaction: This is another vital subtype of double displacement where an acid reacts with a base to form salt and water. For example, hydrochloric acid (HCl) reacts with sodium hydroxide (NaOH) to produce sodium chloride (NaCl) and H_2O.

• In a double displacement reaction, the oxidation states of the elements involved typically remain constant, distinguishing them from Redox (reduction-oxidation) reactions where electrons are transferred.

• The driving force for these reactions is often the removal of ions from the solution through the formation of a gas, a solid, or a weak electrolyte.

Q16. Answer: (b) Nostrils → Throat → Lungs → Alveoli

The correct answer is Nostrils → Throat → Lungs → Alveoli.

Key Points

• The respiratory system in human beings is responsible for the exchange of gases, primarily Oxygen (O_2) and Carbon Dioxide (CO_2), between the body and the environment.

• Air enters the body through the Nostrils, where it is filtered by fine hairs and mucus to remove dust and foreign particles.

• From the nostrils, the air passes through the Nasal Passage into the Throat (which includes the Pharynx and Larynx). The Pharynx serves as a common passage for both food and air.

• The air then travels down the Trachea (windpipe) and enters the Lungs through the Bronchi and Bronchioles.

• The final destination of the inhaled air is the Alveoli, which are tiny balloon-like structures where the actual gas exchange takes place with the blood capillaries.

• Option 1 suggests air goes through the Food pipe and Heart. The food pipe (Oesophagus) belongs to the digestive system, and the heart is part of the circulatory system. Hence, statement 1 is incorrect.

• Option 2 correctly describes the flow from Nostrils to the Throat, then into the Lungs, and finally reaching the Alveoli. Hence, statement 2 is correct.

• Option 3 mentions the Stomach, which is a major organ of the Digestive System and not involved in the air pathway. Hence, statement 3 is incorrect.

• Option 4 mentions the Heart as a pathway for air, which is false, as the heart pumps blood, not air. Hence, statement 4 is incorrect.

Additional Information

• Pharynx and Larynx: The Pharynx leads to the Larynx (voice box). A muscular flap called the Epiglottis covers the opening of the Glottis during swallowing to prevent food from entering the windpipe.

• Trachea (Windpipe): It is a tube supported by C-shaped cartilaginous rings. These rings ensure that the air passage does not collapse even when there is little air in it.

• The Bronchial Tree: Inside the lungs, the Trachea divides into Primary Bronchi (right and left), which further branch into Secondary and Tertiary Bronchi, and eventually into thin Bronchioles.

• Mechanism of Alveoli: The Alveoli provide a very large surface area (approximately 80 to 100 square meters in an adult) for the diffusion of gases. The walls of the alveoli are extremely thin and surrounded by a vast network of blood vessels.

• Diaphragm: It is a large, dome-shaped muscle located at the base of the chest cavity. Its contraction increases the chest cavity volume, creating a vacuum that pulls air into the lungs (Inhalation).

Important Points

• Breathing vs. Respiration: Breathing is the physical process of Inhalation and Exhalation, whereas Respiration is a biochemical process where Glucose is broken down in cells to release Energy (ATP).

• Transport of Gases: Haemoglobin, the red pigment in Red Blood Cells (RBCs), has a high affinity for Oxygen and carries it from the lungs to the tissues. Carbon Dioxide is more soluble in water and is mostly transported in the dissolved form in the blood plasma.

• Diffusion: The exchange of gases at the alveolar site occurs through Simple Diffusion based on the pressure gradient or concentration gradient of the gases.

• Residual Volume: Even after forceful expiration, some amount of air always remains in the lungs, known as the Residual

Volume, to ensure there is sufficient time for Oxygen to be absorbed.

Q17. Answer: (b) Current flowing through the conductor

The correct answer is Current flowing through the conductor.

Key Points

• The Right Hand Thumb Rule is a fundamental convention used in physics to visualize the direction of the magnetic field produced by an electric current.

• According to this rule, if a straight current-carrying conductor is held in the right hand with the thumb pointing in the direction of the current, then the fingers will curl around the conductor in the direction of the magnetic field lines.

• In the context of the question, if the curling of the fingers represents the magnetic field, it naturally follows that the thumb is aligned along the direction of the current flowing through the conductor. Hence, the correct answer is option 2.

• This rule indicates that the magnetic field lines around a straight wire are in the form of concentric circles whose centers lie on the wire.

• The magnitude of the magnetic field produced at any given point is directly proportional to the current passing through the wire and inversely proportional to the distance from the wire.

Additional Information

• Maxwell's Corkscrew Rule: This is another name for the same principle. It states that if a right-handed corkscrew is rotated such that it advances in the direction of the current, the direction in which the handle rotates gives the direction of the magnetic field.

• Fleming's Left Hand Rule: This rule is used to find the direction of the magnetic force acting on a moving charge or a current-carrying wire. The thumb represents the Force (Motion), the forefinger represents the Magnetic Field, and the middle finger represents the Current. This is the working principle for Electric Motors.

• Fleming's Right Hand Rule: This rule is specifically applied to Electric Generators to determine the direction of induced current. Here, the thumb shows the direction of motion of the conductor, the index finger shows the field, and the middle finger shows the induced current.

• Application in Solenoids: When applying the Right Hand Thumb Rule to a solenoid (a coil of wire), the roles are often swapped for convenience; if the fingers curl in the direction of the current through the loops, the thumb points towards the Magnetic North Pole of the solenoid.

• Oersted's Experiment: In 1820, Hans Christian Oersted discovered that a compass needle deflects when placed near a wire carrying a current, providing the first evidence of electromagnetism.

Important Points

• Directional Sensitivity: If the direction of current is reversed, the direction of the magnetic field lines also reverses (e.g., from clockwise to counter-clockwise).

• Biot-Savart Law: While the Right Hand Thumb Rule gives the direction, the Biot-Savart Law provides the mathematical formula to calculate the intensity of the magnetic field generated by a current element.

• Force on a Conductor: It is important to distinguish this rule from the Lorentz Force. The Right Hand Thumb Rule describes the creation of a field, whereas Fleming's rules describe the interaction between a field and a current.

Q18. Answer: (a) Mercury

The correct answer is Mercury.

Key Points

• Metals are typically characterized by their high thermal conductivity and electrical conductivity due to the presence of free electrons that can move easily through the atomic lattice.

• Mercury (Hg) is a notable exception to this trend as it is a poor conductor of heat compared to most other metals. Hence, option 1 is correct.

• Mercury is the only metal that exists in a liquid state at room temperature (approximately 25°C), which significantly influences its physical and thermal properties.

• Iron (Fe) is a good conductor of heat and is widely used in industrial machinery and construction due to its durability and thermal properties. Hence, option 2 is incorrect.

• Aluminium (Al) is an excellent conductor of heat, which is why it is extensively used in kitchen utensils and heat sinks for electronic components. Hence, option 3 is incorrect.

• Copper (Cu) is one of the best thermal conductors among common metals, second only to silver, making it the primary choice for heat exchangers and electrical wiring. Hence, option 4 is incorrect.

Additional Information

• Thermal Conductivity: This is a physical property of a material that defines its ability to transfer heat. In metals, heat is transferred via lattice vibrations (phonons) and the kinetic energy of free-moving electrons.

• Mercury (Hg): With an atomic number of 80, it is used in thermometers, barometers, and fluorescent lamps. Despite being a poor heat conductor, its uniform coefficient of thermal expansion makes it ideal for measuring temperature.

• Lead (Pb): Along with Mercury, Lead is also considered a poor conductor of heat among the metal group. It is commonly used for radiation shielding and in lead-acid batteries.

• Best Conductors: Silver (Ag) is the most efficient conductor of both heat and electricity, followed by Copper (Cu) and Gold (Au).

• Metals in Periodic Table: Most metals are located on the left side and in the center of the Periodic Table, categorized as Alkali metals, Alkaline earth metals, Transition metals, and Post-transition metals.

Important Points

• Malleability and Ductility: Metals are generally malleable (can be beaten into thin sheets) and ductile (can be drawn into thin wires). Gold is the most malleable metal known to man.

• Sonority: Metals are sonorous, meaning they produce a distinct ringing sound when struck. This property is utilized in the manufacturing of musical instruments and bells.

• Metallic Lustre: Metals possess a shiny surface in their pure state, a quality known as lustre. This is due to the reflection of light by the delocalized electrons on the surface.

• Hardness: While most metals are physically hard, elements like Sodium (Na) and Potassium (K) are soft enough to be sliced with a knife.

• Melting and Boiling Points: Metals typically have high melting and boiling points. Tungsten (W) has the highest melting point, making it suitable for light bulb filaments.

Q19. Answer: (b) Formation of complex sugars from simple sugars

The correct answer is Formation of complex sugars from simple sugars.

Key Points

• The Golgi apparatus, also known as the Golgi complex or Golgi body, plays a crucial role in the biosynthesis of various cellular components, specifically in the formation of complex sugars from simple sugars.

• In many cases, the Golgi apparatus is involved in the modification of proteins and lipids by adding sugar moieties, a process known as glycosylation. Hence, statement 2 is correct.

• The synthesis of nucleic acids (DNA and RNA) occurs in the nucleus, mitochondria, and chloroplasts, while ribosomes are the site for protein synthesis, not nucleic acid synthesis. Hence, statement 1 is incorrect.

• The absorption of water through osmosis is a physical process regulated by the plasma membrane and tonoplast (vacuolar membrane), and is not a synthetic role attributed to the Golgi apparatus. Hence, statement 3 is incorrect.

• The conversion of proteins into amino acids is a catabolic or degradative process (proteolysis) that typically occurs in the lysosomes or through proteasomes, rather than being a function of synthesis in the Golgi. Hence, statement 4 is incorrect.

• The Golgi apparatus acts as a dispatch station, where products of the Endoplasmic Reticulum (ER) are modified, packaged, and sorted for delivery to their destinations.

Additional Information

• Discovery and Structure:

• The Golgi apparatus was first identified by the Italian biologist Camillo Golgi in 1898 using a silver staining technique.

• It consists of a series of flattened, membrane-bound sacs called cisternae, which are typically stacked together in 4 to 8 layers.

• The structure has a distinct polarity, featuring a cis face (entry face near the ER) and a trans face (exit face near the plasma membrane).

• Primary Functions:

• Storage and Packaging: It stores proteins and lipids synthesized in the Endoplasmic Reticulum and packages them into vesicles for secretion.

• Modification: It modifies glycoproteins and glycolipids by trimming or adding specific sugar molecules.

• Lysosome Formation: The Golgi apparatus is directly involved in the production of lysosomes, which contain hydrolytic enzymes for intracellular digestion.

• Golgi in Plant Cells:

• In plant cells, the Golgi bodies are often scattered and are referred to as dictyosomes.

• They play a vital role in synthesizing complex polysaccharides like pectin and hemicellulose, which are essential components of the cell wall.

• Vesicular Transport:

• Transport vesicles from the ER fuse with the cis-Golgi, and after processing, secretory vesicles bud off from the trans-Golgi to move toward the cell surface or other organelles.

Q20. Answer: (b) Produces identical daughter cells

The correct answer is Produces identical daughter cells.

Key Points

• Mitosis is a process of cell division where a single cell divides into two genetically identical daughter cells. The primary purpose

of mitosis is for growth and to replace worn-out cells.

• In Mitosis, the chromosomal number remains the same as that of the parent cell, which is why it is often referred to as equational division. This ensures that each daughter cell receives a complete and identical set of DNA. Hence, the statement "Produces identical daughter cells" is true for mitosis.

• Meiosis, on the other hand, is a specialized form of cell division that reduces the chromosome number by half, resulting in the production of haploid cells (gametes). These daughter cells are genetically distinct from the parent and each other. Hence, the statement "Results in haploid cells" is true for meiosis, not mitosis.

• Genetic variation is a hallmark of Meiosis due to processes like crossing over and independent assortment during Prophase I. Mitosis does not typically promote variation as it aims to produce clones. Hence, the statement "Promotes genetic variation" is true for meiosis, not mitosis.

• Mitosis occurs in somatic cells (all body cells except reproductive ones), whereas Meiosis occurs specifically in reproductive cells (germ cells) to produce sperm and eggs. Hence, the statement "Occurs in reproductive cells" is true for meiosis, not mitosis.

Additional Information

• Stages of Mitosis:

• Prophase: The chromatin condenses into visible chromosomes, and the nuclear envelope begins to break down.

• Metaphase: Chromosomes align at the metaphase plate (the cell's equator) to ensure even distribution.

• Anaphase: Sister chromatids are pulled apart toward opposite poles of the cell.

• Telophase: Two new nuclear envelopes form around the separated sets of chromosomes, followed by cytokinesis (division of the cytoplasm).

• Key Differences in Meiosis:

• Meiosis involves two successive rounds of division: Meiosis I and Meiosis II.

• During Meiosis I, homologous chromosomes pair up and exchange genetic material, a process known as recombination or crossing over.

• The end result of meiosis is four daughter cells, each containing a haploid (n) number of chromosomes, compared to the diploid (2n) nature of the parent cell.

• Biological Significance:

• Mitosis is essential for asexual reproduction in single-celled organisms and for tissue repair and development in multicellular organisms.

• Meiosis is critical for sexual reproduction, as it maintains the constant chromosome number across generations and increases biodiversity within a population.

Important Points

• Somatic Cells vs. Germ Cells: Somatic cells make up the bulk of an organism's body (e.g., skin, muscle, bone) and divide via mitosis. Germ cells are located in the gonads (testes and ovaries) and undergo meiosis to produce gametes.

• DNA Replication: In both mitosis and meiosis, DNA replication occurs only once during the S-phase of the interphase preceding the division.

• Ploidy: Mitosis maintains ploidy (e.g., 2n to 2n), while meiosis reduces ploidy (e.g., 2n to n).

Q21. Answer: (d) Sand and water

p data-end="57" data-start="0">The correct answer is Sand and water.

Key Points

• A heterogeneous mixture is a type of mixture in which the components are not uniformly distributed throughout the volume and exist in distinct phases.

• Sand and water is a heterogeneous mixture because the sand particles do not dissolve in water. Instead, they remain suspended for a while and eventually settle at the bottom due to gravity, a process known as sedimentation. Hence, option 4 is the correct answer.

• Sugar solution is a homogeneous mixture (specifically a true solution) because the sugar molecules are distributed uniformly among the water molecules, and the mixture has a consistent composition throughout. Hence, option 1 is incorrect.

• Salt solution is also a homogeneous mixture. Once Sodium Chloride (NaCl) is dissolved in water, the individual ions are spread evenly, making it impossible to distinguish the salt from the water by simple observation. Hence, option 2 is incorrect.

• Air is considered a homogeneous mixture of various gases, primarily Nitrogen (78%) and Oxygen (21%), along with small amounts of Argon, Carbon dioxide, and water vapor. Under normal conditions, these gases are mixed thoroughly at the molecular level. Hence, option 3 is incorrect.

Additional Information

• Classification of Matter: Matter is generally classified into pure substances (elements and compounds) and mixtures. Mixtures are further divided into homogeneous and heterogeneous categories based on the uniformity of their composition.

• Homogeneous Mixtures:

• These possess a single phase.

• The particle size is typically less than 1 nanometer.

• They do not scatter a beam of light (no Tyndall effect).

• Examples include alloys (like Brass), vinegar, and tap water.

• Heterogeneous Mixtures:

• These consist of two or more phases.

• They include suspensions (large particles that settle) and colloids (smaller particles that stay dispersed).

• Suspensions have particle sizes larger than 1000 nanometers.

• Examples include oil and water, mixture of iron filings and sulfur, and muddy water.

• Physical Separation: Components of a heterogeneous mixture can usually be separated using physical methods such as filtration, decantation, centrifugation, or manual picking. For sand and water, filtration is a highly effective method to recover the solid sand.

Important Points

• Colloids: While they may appear homogeneous to the naked eye (like milk or blood), they are technically heterogeneous when viewed under an ultra-microscope because the particles are not truly dissolved.

• Solubility: The nature of the mixture (homogeneous vs. heterogeneous) often depends on the solubility of the solute in the solvent. Sand (silicon dioxide) is insoluble in water, leading to a heterogeneous result, whereas sugar is highly soluble.

• Proportions: Unlike compounds, which have a fixed chemical ratio, mixtures can be prepared in any proportion. You can have a mixture of 1 gram of sand in 1 liter of water or 100 grams; both remain heterogeneous.

Q22. Answer: (d) Fleming's left-hand rule

The correct answer is Fleming's left-hand rule.

Key Points

• Fleming's left-hand rule is specifically used to determine the direction of the mechanical force (or motion) acting on a current-carrying conductor when it is placed in an external magnetic field.

• According to this rule, if we stretch the thumb, the forefinger, and the middle finger of the left hand such that they are mutually perpendicular to each other, each finger represents a specific vector.

• The Forefinger points in the direction of the Magnetic Field (from North to South pole).

• The Middle finger points in the direction of the Electric Current (flowing through the conductor).

• The Thumb then points in the direction of the Force or the Motion of the conductor. Hence, the correct answer is Fleming's left-hand rule.

• This principle is the fundamental working basis of an Electric Motor, where electrical energy is converted into mechanical energy.

Additional Information

• Ohm's Law:

• Formulated by Georg Simon Ohm in 1827, it states that the current passing through a conductor between two points is directly proportional to the voltage across the two points, provided physical conditions remain constant.

• The formula is V = IR, where V is voltage, I is current, and R is resistance. It does not determine the direction of force in magnetic fields.

• Maxwell's Corkscrew Rule:

• Also known as the Right-Hand Screw Rule, it is used to find the direction of the magnetic field produced by a current-carrying conductor.

• If a right-handed corkscrew is rotated so that it moves forward in the direction of the current, then the direction of rotation of the handle indicates the direction of the magnetic field lines.

• Right-Hand Thumb Rule:

• This rule is used to determine the direction of magnetic field lines around a straight current-carrying wire.

• If the thumb of the right hand points in the direction of the current, the curled fingers show the direction of the magnetic field.

• Fleming's Right-Hand Rule:

• This rule is used to find the direction of the induced current when a conductor moves inside a magnetic field (phenomenon of Electromagnetic Induction).

• It is primarily applied in Electric Generators. In this rule, the thumb represents motion, the forefinger represents the field, and the middle finger represents the induced current.

Important Points

• Lorentz Force: The force experienced by a charge moving in a magnetic field is given by $F = q(v \times B)$. For a conductor of length L, the force is $F = BIL \sin\theta$.

• The force is maximum when the conductor is placed perpendicular (at 90 degrees) to the magnetic field.

• The force is zero when the conductor is placed parallel or anti-parallel (at 0 or 180 degrees) to the direction of the magnetic field.

• John Ambrose Fleming, a British physicist, devised these rules in the late 19th century to provide an easy way for students to remember the orientation of vectors in electromagnetism.

Q23. Answer: (c) Johad

The correct answer is Johad.

Key Points

• A Johad is a traditional rainwater harvesting structure used in India, particularly in the state of Rajasthan. It is a crescent-shaped small earthen check dam built across a contour to capture and conserve rainwater runoff.

• The primary purpose of a Johad is to facilitate groundwater recharge. By holding rainwater, it allows the water to slowly percolate into the aquifers, thereby raising the water table in arid and semi-arid regions. Hence, the correct answer is Johad.

• This traditional technique was revived significantly in the Alwar district of Rajasthan during the 1980s and 1990s. The revival led to the restoration of several dead rivers, such as the Arvari River.

• The Tarun Bharat Sangh (TBS), an NGO led by Rajendra Singh (often called the "Waterman of India"), played a pivotal role in promoting Johads. Since 1985, thousands of these structures have been built across Rajasthan, transforming the local ecology and agriculture.

• Johads are community-driven projects that require low maintenance and use locally available materials like soil and stones, making them a sustainable solution for water scarcity.

Additional Information

• Hand pump:

• A hand pump is a manual device used to extract water from a well or an underground aquifer. It is a modern mechanical extraction method rather than a water harvesting technique.

• While widely used in rural India for providing drinking water, it relies on existing groundwater levels rather than contributing to their replenishment.

• Borewell:

• A borewell is a deep, narrow hole drilled into the earth to reach deep-seated groundwater. It typically uses electric or diesel pumps for water extraction.

• Unlike Johads, borewells are a modern intervention that can lead to the depletion of groundwater if overused without proper recharge mechanisms.

• Check dam:

• A check dam is a small, sometimes temporary, dam constructed across a swale, drainage ditch, or waterway to counteract erosion and reduce water velocity.

• While a Johad is technically a type of earthen check dam, the term "check dam" is a general civil engineering term, whereas "Johad" refers specifically to the traditional and cultural practice unique to Rajasthan.

• Other Traditional Methods in Rajasthan:

• Khadin: A long earthen embankment built across the lower hill slopes to collect runoff water for moisture-retention in agricultural fields.

• Tanka: An underground storage tank used to collect rainwater from rooftops or prepared catchment areas, primarily used for drinking purposes in the Thar Desert.

• Baori / Stepwell: Magnificent architectural structures built to reach the water table, serving as community reservoirs for centuries.

Important Points

• Rajendra Singh: Known as the Waterman of India, he won the Ramon Magsaysay Award in 2001 and the Stockholm Water Prize in 2015 for his work in water conservation and the revival of Johads.

• Environmental Impact: The use of Johads has been proven to increase forest cover, improve crop yields, and mitigate the effects of drought in the Arid Zone.

• Geographical Context: These structures are most effective in the Aravalli Range and the Western Rajasthan landscape, where the soil type allows for efficient seepage and recharge.

Q24. Answer: (c) CaO + H2O → Ca(OH)2

The correct answer is CaO + H2O → Ca(OH)2.

Key Points

• A combination reaction (also known as a synthesis reaction) is a reaction where two or more elements or compounds combine to form a single compound. The general form is A + B → AB.

• In the reaction CaO + H2O → Ca(OH)2, Calcium Oxide (quicklime) reacts vigorously with water to produce Calcium Hydroxide (slaked lime). Since two reactants combine to form one single product, it is a classic example of a combination reaction. Hence, statement 3 is correct.

• The reaction $2KClO_3 \rightarrow 2KCl + 3O_2$ involves a single reactant breaking down into two or more simpler products. This is categorized as a decomposition reaction. Hence, statement 1 is incorrect.

• The reaction $Fe + CuSO_4 \rightarrow FeSO_4 + Cu$ involves a more reactive element (Iron) displacing a less reactive element (Copper) from its salt solution. This is known as a single displacement reaction. Hence, statement 2 is incorrect.

• The reaction $AgNO_3 + NaCl \rightarrow AgCl + NaNO_3$ involves an exchange of ions between two compounds to form two new compounds. This is a double displacement reaction, specifically a precipitation reaction as AgCl forms a white solid. Hence, statement 4 is incorrect.

Additional Information

• Combination Reactions:

• These reactions are often exothermic in nature because bonds are formed, which releases energy.

• Examples include the burning of coal ($C + O_2 \rightarrow CO_2$) and the formation of water from hydrogen and oxygen ($2H_2 + O_2 \rightarrow 2H_2O$).

• In the CaO reaction mentioned above, a large amount of heat energy is released, making the container hot.

• Decomposition Reactions:

• These are the opposite of combination reactions. They require energy in the form of heat, light, or electricity to break bonds.

• Thermal decomposition occurs when heat is used (e.g., heating Calcium Carbonate). Electrolytic decomposition occurs via electricity (e.g., electrolysis of water).

• Displacement Reactions:

• These depend on the reactivity series of metals. A metal placed higher in the series can displace a metal placed lower.

• For example, Zinc can displace copper from copper sulphate because Zinc is more reactive than Copper.

• Double Displacement Reactions:

• Usually occur in aqueous solutions where ions "switch partners."

• Commonly result in the formation of an insoluble solid called a precipitate or the formation of stable molecules like water in neutralization reactions.

Important Points

• Calcium Oxide (CaO): Commonly known as quicklime or burnt lime. It is widely used in the manufacture of cement and glass.

• Calcium Hydroxide ($Ca(OH)_2$): Known as slaked lime. A dilute solution of slaked lime is called lime water.

• White Washing: The slaked lime produced in the combination reaction is used for whitewashing walls. It reacts slowly with Carbon Dioxide (CO_2) in the air to form a thin, shiny layer of Calcium Carbonate ($CaCO_3$) after two to three days.

• Chemical Equations: To satisfy the Law of Conservation of Mass, chemical equations must be balanced, meaning the number of atoms of each element must be equal on both the reactant and product sides.

Q25. Answer: (c) Presence of both oxygen and water (moisture)

The correct answer is Presence of both oxygen and water (moisture).

Key Points

• Rusting of iron is a specific type of corrosion that occurs when Iron (Fe) comes into contact with Oxygen (O_2) and Water (H_2O) or moisture in the environment.

• The chemical process of rusting is an oxidation reaction. In this reaction, iron reacts with oxygen in the presence of water to form Hydrated Iron (III) Oxide, which is chemically represented as $Fe_2O_3.nH_2O$.

• For rusting to take place, the presence of both oxygen and water is absolutely essential. If either of these components is missing, the rusting process cannot proceed. Hence, statement 3 is correct.

• If iron is placed in distilled water that has been boiled to remove dissolved gases and then sealed, it will not rust because of the lack of Oxygen. Hence, statement 2 is incorrect.

• Similarly, if iron is kept in dry air (for example, by using a drying agent like Anhydrous Calcium Chloride), it will not rust because of the absence of Moisture. Hence, statement 4 is incorrect.

• While Carbon dioxide (CO_2) is present in the atmosphere, it is not a primary or essential requirement for the basic rusting process. Hence, statement 1 is incorrect.

Additional Information

• Prevention of Rusting:

• Galvanization: This is the process of depositing a thin layer of Zinc (Zn) on iron objects. Since zinc is more reactive than iron, it oxidizes first, protecting the underlying iron from corrosion.

• Alloying: Iron can be mixed with other elements like Chromium, Nickel, and Carbon to create Stainless Steel, which does not rust easily.

• Painting and Greasing: Applying a coat of paint, oil, or grease creates a barrier that prevents iron from coming into direct contact with air and moisture.

• Nature of Rust: Rust is a reddish-brown, flaky substance that is brittle. Unlike the patina on copper, rust does not protect the underlying metal; instead, it flakes off, exposing more iron to the environment, which eventually leads to the total destruction of the object.

• Acceleration Factors: The rate of rusting increases significantly in the presence of salts (electrolytes). This is why iron objects and ships rust much faster in marine environments or coastal areas where the air contains high levels of salt.

• Chemical Change: Rusting is considered a chemical change because a new substance (iron oxide) is formed, and the process cannot be easily reversed by physical means.

Important Points

• The approximate chemical equation for rusting is: $4Fe + 3O2 + 2xH2O \rightarrow 2Fe2O3.xH2O$.

• Humidity: Higher humidity levels in the atmosphere correlate directly with faster rusting rates because there is more water vapor available to facilitate the reaction.

• Economic Impact: Rusting causes massive economic losses globally every year, necessitating the constant maintenance and replacement of bridges, railway tracks, cars, and industrial machinery.

Q26. Answer: (b) $x^2 - 4x + 4$

Shortcut Trick

Apply the standard algebraic identity: $(a - b)^2 = a^2 - 2ab + b^2$.

Substituting a = x and b = 2:

$(x - 2)^2 = (x)^2 - 2 \times (x) \times (2) + (2)^2$

$= x^2 - 4x + 4$

Therefore The correct answer is $x^2 - 4x + 4$.

Alternate Method

Given: $(x - 2)^2$

Formula Used: $(a - b)^2 = a^2 - 2ab + b^2$

$\Rightarrow (x - 2)^2 = (x - 2) \times (x - 2)$

$\Rightarrow x(x - 2) - 2(x - 2)$

$\Rightarrow x^2 - 2x - 2x + 4$

$\Rightarrow x^2 - 4x + 4$

Therefore The correct answer is $x^2 - 4x + 4$.

Additional Information

Square of a Sum

The algebraic identity for the square of a sum is $(a + b)^2 = a^2 + 2ab + b^2$.

Difference of Squares

The identity for the difference of two squares is $a^2 - b^2 = (a - b)(a + b)$.

Square of a Trinomial

For three terms, the identity is $(a + b + c)^2 = a^2 + b^2 + c^2 + 2ab + 2bc + 2ca$.

Q27. Answer: (d) 4

Shortcut Trick

LCM of 30 and 40 minutes = 120 minutes = 2 hours.

Total duration from 8 am to 2 pm = 6 hours.

Number of times = (Total Duration ÷ LCM interval) + 1

Number of times = (6 ÷ 2) + 1 = 3 + 1 = 4 times.

Therefore The correct answer is 4.

Alternate Method

Given:

Bell 1 interval = 30 minutes

Bell 2 interval = 40 minutes

Starting time = 8:00 am

Closing time = 2:00 pm

Formula Used:

To find the simultaneous occurrence of cyclic events, calculate the Least Common Multiple (LCM) of their time intervals.

$\Rightarrow$ LCM of 30 and 40:

=> 30 = 2 × 3 × 5

=> 40 = 2 × 2 × 2 × 5

=> LCM = 2^3 × 3 × 5 = 120 minutes

=> Interval in hours = 120 ÷ 60 = 2 hours

=> Total duration = 2:00 pm − 8:00 am = 6 hours

=> Number of intervals = 6 ÷ 2 = 3

=> Total times the bells ring together = (Number of intervals + 1) for the initial 8 am ring.

=> Total = 3 + 1 = 4

Therefore The correct answer is 4.

Additional Information

LCM for Cyclic Events

When multiple objects start at the same time and repeat at fixed intervals, they will coincide again at a time which is the LCM of their individual intervals.

Total Occurrences Formula

Total Occurrences = (Total Time Period ÷ LCM of intervals) + 1. The +1 accounts for the first time they ring together at the starting point.

Unit Consistency

Always ensure the time intervals and the total duration are in the same units (either all in minutes or all in hours) before performing division.

Q28. Answer: (c) 4

Shortcut Trick

Net filling rate = (1/6) − (1/24) = 3/24 = 1/8 tank per minute.

Time to fill the full tank = 8 minutes.

Time to fill one-half of the tank = 8 × (1/2) = 4 minutes.

Therefore The correct answer is 4.

Alternate Method

Given:

Time taken by Pipe A to fill = 6 minutes

Time taken by Pipe B to empty = 24 minutes

Formula used: Efficiency = Total Work ÷ Time

Pipes	Time	Capacity	Efficiency
A (Fill)	6	24 (LCM)	+4
B (Empty)	24	−1	

=> Total capacity of the tank = LCM(6, 24) = 24 units

=> Efficiency of Pipe A = 24 ÷ 6 = +4 units/min

=> Efficiency of Pipe B = 24 ÷ 24 = −1 units/min

=> Net efficiency of (A + B) = 4 − 1 = 3 units/min

=> One-half of the tank capacity = 24 ÷ 2 = 12 units

=> Time required to fill 12 units = 12 ÷ 3 = 4 minutes

Therefore The correct answer is 4.

Additional Information

Negative Work in Pipes

When a pipe empties a tank, its efficiency or rate of work is taken as negative (e.g., −1/T).

Pipes & Cisterns Basic Formula

If pipe A fills in x hours and pipe B empties in y hours, net work in 1 hour = (1/x) − (1/y).

LCM Method for Multiple Pipes

Total capacity is assumed as the LCM of individual times. Efficiency = Capacity ÷ Time.

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Q29. Answer: (d) 25 years

Shortcut Trick

Ratio of A : B (Present) = 5 : 1 (Difference = 4 units)

Ratio of A : B (5 yrs ago) = 6 : 1 (Difference = 5 units)

Equalize the difference by multiplying ratios by 5 and 4 respectively:

Present ratio = 25 : 5 | Past ratio = 24 : 4

Difference in B's ratio parts = 5 − 4 = 1 unit → 5 years

Present age of B = 5 units × 5 = 25 years

Therefore The correct answer is 25 years.

Alternate Method

Given:

Present ratio of A and B = 5 : 1

Ratio 5 years ago = 6 : 1

Let the present age of A be 5x and B be x.

According to the question, five years ago:

=> (5x − 5) ÷ (x − 5) = 6 ÷ 1

=> 1 × (5x − 5) = 6 × (x − 5)

=> 5x − 5 = 6x − 30

=> 6x − 5x = 30 − 5

=> x = 25

Present age of B = x = 25 years.

Therefore The correct answer is 25 years.

Additional Information

Constant Difference Rule

The difference between the ages of two individuals remains constant regardless of the number of years passed or elapsed.

Future and Past Age

To find age 'n' years ago, subtract n from present age (x − n). To find age 'n' years hence, add n to present age (x + n).

Ratio Balancing

When solving age ratios, multiplying the ratios to make the numerical difference between parts equal to the time gap simplifies the calculation.

Q30. Answer: (b) 20475

Shortcut Trick

A number is divisible by 45 if it is divisible by both 5 and 9.

Divisibility by 5: Last digit must be 0 or 5. Only (2) 20475 and (4) 555555 qualify.

Divisibility by 9: Sum of digits must be divisible by 9.

For 20475, sum = 2+0+4+7+5 = 18 (divisible by 9).

For 555555, sum = 5×6 = 30 (not divisible by 9).

Therefore The correct answer is 20475.

Alternate Method

Given:

Numbers: 306999, 20475, 25436, 555555

Formula Used:

Divisibility rule of 45: A number N is divisible by 45 if N is divisible by 5 and 9 simultaneously (since 5 × 9 = 45 and HCF(5, 9) = 1).

Calculations:

=> Option (1) 306999: Last digit is 9. Not divisible by 5.

=> Option (3) 25436: Last digit is 6. Not divisible by 5.

=> Option (4) 555555: Last digit is 5. Sum = 5+5+5+5+5+5 = 30. 30 is not divisible by 9.

=> Option (2) 20475: Last digit is 5. Divisible by 5.

=> Sum of digits of 20475 = 2 + 0 + 4 + 7 + 5 = 18.

=> Since 18 is divisible by 9, 20475 is divisible by 9.

=> As 20475 is divisible by both 5 and 9, it must be divisible by 45.

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Therefore The correct answer is 20475.

Additional Information

Divisibility by 3

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

Divisibility by 4

A number is divisible by 4 if its last two digits form a number divisible by 4.

Divisibility by 11

A number is divisible by 11 if the difference between the sum of digits at odd places and the sum of digits at even places is 0 or a multiple of 11.

Q31. Answer: (d) 14

Shortcut Trick

The average of the first n odd natural numbers is always n.

Given value of n = 14.

Therefore Average = 14.

Therefore The correct answer is 14.

Alternate Method

Given:

Number of terms (n) = 14

Formula Used:

Sum of first n odd natural numbers = n^2

Average = Sum of observations ÷ Total number of observations

=> First 14 odd numbers = 1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27

=> Sum = 14^2

=> Sum = 196

=> Average = 196 ÷ 14

=> Average = 14

Therefore The correct answer is 14.

Additional Information

Average of first n natural numbers

The average is given by the formula (n + 1) ÷ 2.

Average of first n even natural numbers

The average of the first n even natural numbers is (n + 1).

Average of Arithmetic Progression (AP)

For any sequence in AP, Average = (First term + Last term) ÷ 2.

Q32. Answer: (a) 9

Shortcut Trick

Remaining Distance = 3/4 × 40 = 30 km

Remaining Time = 2/3 × 5 = 10/3 hours

Required Speed = Remaining Distance ÷ Remaining Time

Speed = 30 ÷ (10/3) = (30 × 3) / 10 = 9 km/h

Therefore The correct answer is 9.

Alternate Method

Given:

Total Distance = 40 km

Total Time = 5 hours

Formula Used:

Speed = Distance / Time

=> Total Distance = 40 km

=> Covered Distance = 40 × (1/4) = 10 km

=> Remaining Distance = 40 − 10 = 30 km

=> Total Time = 5 hours
=> Covered Time = 5 × (1/3) = 5/3 hours
=> Remaining Time = 5 − 5/3 = 10/3 hours
=> Required Speed = Remaining Distance ÷ Remaining Time
=> Required Speed = 30 ÷ (10/3)
=> Required Speed = (30 × 3) / 10
=> Required Speed = 9 km/h
Therefore The correct answer is 9.
Additional Information
Average Speed
It is the ratio of total distance covered to the total time taken. Average Speed = Total Distance ÷ Total Time.
Relative Speed
When moving in the same direction, speed = S1 − S2. When moving in opposite directions, speed = S1 + S2.
Unit Conversion
To convert km/h to m/s, multiply by 5/18. To convert m/s to km/h, multiply by 18/5.

Q33. Answer: (a) 336π cm³

Shortcut Trick
Volume of metal in a hollow pipe = π × ($R^2 - r^2$) × h
Difference of squares ($R^2 - r^2$) = (7 + 5) × (7 − 5) = 12 × 2 = 24.
Volume = π × 24 × 14
Volume = 336π cm^3.
Therefore The correct answer is 336π cm^3.
Alternate Method
Given:
Outer radius (R) = 7 cm
Inner radius (r) = 5 cm
Length/Height (h) = 14 cm
Formula for the volume of metal in a hollow cylinder:
Volume = External Volume − Internal Volume
=> Volume = $\pi R^2h - \pi r^2h$
=> Volume = $\pi h(R^2 - r^2)$
=> Volume = $\pi \times 14 \times (7^2 - 5^2)$
=> Volume = π × 14 × (49 − 25)
=> Volume = π × 14 × 24
=> Volume = 336π cm^3
Therefore The correct answer is 336π cm^3.
Additional Information
Volume of a Solid Cylinder
The volume of a solid cylinder with radius r and height h is given by $V = \pi r^2h$.
Curved Surface Area (CSA) of Hollow Pipe
The total curved surface area (inner + outer) is $2\pi Rh + 2\pi rh = 2\pi h(R + r)$.
Total Surface Area (TSA) of Hollow Pipe
TSA = CSA + 2 × Area of Base Rings = $2\pi h(R + r) + 2\pi(R^2 - r^2) = 2\pi(R + r)(h + R - r)$.

Q34. Answer: (c) 5400 litres

Shortcut Trick
Efficiency Ratio (A : B) = 100 : 125 = 4 : 5
Total efficiency = 4 + 5 = 9 units
Total work = 9 units/hr × 8 hr = 72 units
Time for Pipe A = 72 ÷ 4 = 18 hours
Capacity = 18 × 60 min × 5 litres/min = 5400 litres

Therefore The correct answer is 5400 litres.

Alternate Method

Given: Time (A+B) = 8 hours, Speed of A = 5 L/min

Efficiency of B = 125% of A => B = 1.25A

Pipes	Time (hr)	Work	Efficiency
A	18	72	4
B	14.4	5	
A + B	8	72	9

=> Let Efficiency of A = 4 units/hr and B = 5 units/hr

=> Total Efficiency (A + B) = 4 + 5 = 9 units/hr

=> Total Work = 9 × 8 = 72 units

=> Time taken by Pipe A = 72 ÷ 4 = 18 hours

=> Rate of Pipe A = 5 litres/min × 60 mins/hr = 300 litres/hr

=> Capacity of Cistern = Rate × Time = 300 × 18 = 5400 litres

Therefore The correct answer is 5400 litres.

Additional Information

Efficiency and Time Relation

Efficiency is inversely proportional to the time taken. If the ratio of efficiencies is x:y, the ratio of time taken will be y:x.

Cistern Capacity Formula

Total Capacity = Rate of flow (litres/unit time) × Total time taken to fill the tank.

Pipes and Cisterns Work

Net work done = (Sum of work by inlet pipes) − (Sum of work by outlet pipes).

Q35. Answer: (b) 64.52 km/h

Shortcut Trick

Total Distance = 120 + 180 = 300 km

Total Time = (120 ÷ 50) + (180 ÷ 80) = 2.4 + 2.25 = 4.65 hours

Average Speed = Total Distance ÷ Total Time

Average Speed = 300 ÷ 4.65 ≈ 64.52 km/h

Therefore The correct answer is 64.52 km/h.

Alternate Method

Given:

Distance 1 (d1) = 120 km, Speed 1 (s1) = 50 km/h

Distance 2 (d2) = 180 km, Speed 2 (s2) = 80 km/h

Formula Used:

Average Speed = Total Distance ÷ Total Time

Time = Distance ÷ Speed

=> Time taken for first part (t1) = 120 ÷ 50 = 2.4 hours

=> Time taken for second part (t2) = 180 ÷ 80 = 2.25 hours

=> Total Distance = 120 + 180 = 300 km

=> Total Time = 2.4 + 2.25 = 4.65 hours

=> Average Speed = 300 ÷ 4.65

=> Average Speed = 64.516129... ≈ 64.52 km/h

Therefore The correct answer is 64.52 km/h.

Additional Information

Average Speed for Equal Distances

When a journey covers two equal distances at speeds s1 and s2, Average Speed = (2 × s1 × s2) ÷ (s1 + s2).

Average Speed for Equal Time Intervals

If a person travels for equal time intervals at speeds s1 and s2, Average Speed = (s1 + s2) ÷ 2.

Unit Conversion Shortcut

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

Q36. Answer: (a) sec ^4 θ - sec² θ

Shortcut Trick

Factor out common term: $\tan^2\theta (\tan^2\theta + 1)$

Use identity: $1 + \tan^2\theta = \sec^2\theta$

Substitute $\tan^2\theta = (\sec^2\theta - 1)$

Final Step: $(\sec^2\theta - 1) \times \sec^2\theta = \sec^{\wedge}4\theta - \sec^2\theta$

Therefore The correct answer is $\sec^{\wedge}4\theta - \sec^2\theta$.

Alternate Method

Given:

Expression: $\tan^{\wedge}4\theta + \tan^2\theta$

Formula Used:

Fundamental Trigonometric Identity: $1 + \tan^2\theta = \sec^2\theta$

=> Expression = $\tan^{\wedge}4\theta + \tan^2\theta$

=> Taking $\tan^2\theta$ as common: $\tan^2\theta(\tan^2\theta + 1)$

=> From identity $\sec^2\theta = 1 + \tan^2\theta$, we have $(\tan^2\theta + 1) = \sec^2\theta$

=> Also, $\tan^2\theta = \sec^2\theta - 1$

=> Substituting these values: $(\sec^2\theta - 1) \times \sec^2\theta$

=> Expanding the bracket: $(\sec^2\theta \times \sec^2\theta) - (1 \times \sec^2\theta)$

=> Result = $\sec^{\wedge}4\theta - \sec^2\theta$

Therefore The correct answer is $\sec^{\wedge}4\theta - \sec^2\theta$.

Additional Information

Standard Pythagorean Identities

There are three primary identities: $\sin^2\theta + \cos^2\theta = 1$, $1 + \tan^2\theta = \sec^2\theta$, and $1 + \cot^2\theta = \text{cosec}^2\theta$.

Reciprocal Relations

$\sec\theta = 1/\cos\theta$ and $\tan\theta = \sin\theta/\cos\theta$. Squaring these helps in converting between higher powers of different trigonometric ratios.

Algebraic Manipulations in Trigonometry

Always look for common factors like $\tan^2\theta$ or $\sin^2\theta$ to simplify complex powers into standard squared identities.

Q37. Answer: (c) 27

Shortcut Trick

Each additional side in a polygon adds 180° to the sum of interior angles.

Divide the total sum by 180° to find the value of (n − 2).

4500 ÷ 180 = 25

Number of sides (n) = 25 + 2 = 27

Therefore The correct answer is 27.

Alternate Method

Given: Sum of interior angles = 4500°

Formula Used: Sum of interior angles of a polygon = (n − 2) × 180°

=> (n − 2) × 180 = 4500

=> n − 2 = 4500 ÷ 180

=> n − 2 = 25

=> n = 25 + 2

=> n = 27

Therefore The correct answer is 27.

Additional Information

Exterior Angle Sum

The sum of the exterior angles of any convex polygon is always 360° regardless of the number of sides.

Regular Polygon Interior Angle

Each interior angle of a regular polygon is given by [(n − 2) × 180°] ÷ n.

Number of Diagonals

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The number of diagonals in a polygon with n sides is calculated as [n × (n − 3)] ÷ 2.

Interior and Exterior Relation

At each vertex of a polygon, the sum of the interior angle and the corresponding exterior angle is 180°.

Q38. Answer: (b) 45

Shortcut Trick

Solve the nested expression from the innermost square root outwards.

Step 1: √(850 − 66) = √784 = 28

Step 2: √(1268 + 28) = √1296 = 36

Step 3: √(2061 − 36) = √2025 = 45

Therefore The correct answer is 45.

Alternate Method

Given expression: √(2061 − √(1268 + √(850 − 66)))

Simplifying the innermost term:

=> 850 − 66 = 784

=> √784 = 28

Substituting back into the expression:

=> √(2061 − √(1268 + 28))

=> √(2061 − √1296)

Since $36^2 = 1296$:

=> √(2061 − 36)

=> √2025

Since $45^2 = 2025$:

=> 45

Therefore The correct answer is 45.

Additional Information

Perfect Squares Ending in 5

To find the square of a number ending in 5 (n5), the result is [n × (n+1)] followed by 25. For example, $45^2 = [4 \times 5]25 = 2025$.

Order of Operations (VBODMAS)

In simplification problems with nested radicals or brackets, always evaluate from the innermost level to the outermost level.

Common Square Roots

Memorizing squares up to 50 is vital for competitive exams. √784 = 28 and √1296 = 36 are frequently appearing values.

Q39. Answer: (a) 1,040

Shortcut Trick

Successive Multiplier Method: MP × (100 − D)% × (100 + VAT)% = SP

x × (37/100) × (125/100) = 481

x × 0.37 × 1.25 = 481

x = 481 / 0.4625 = 1040

Therefore The correct answer is 1,040.

Alternate Method

Given: Marked Price (MP) = Rs. x, Discount = 63%, VAT = 25%, Final Selling Price = Rs. 481

=> Discounted Price (DP) = x − 63% of x = 37% of x = 0.37x

=> Final SP = DP + VAT = 0.37x + 25% of 0.37x

=> 481 = 0.37x × (1 + 25/100)

=> 481 = 0.37x × 1.25

=> 481 = 0.4625x

=> x = 481 / 0.4625

=> x = (481 × 10000) / 4625

=> x = 1,040

Therefore The correct answer is 1,040.

Additional Information

Marked Price and Discount

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

VAT/Sales Tax

Value Added Tax is a percentage added to the net selling price. Final Price = SP × (100 + VAT%)/100.

Successive Percentage Change

If an initial value x undergoes multiple percentage changes a% and b%, final value = x(1 + a/100)(1 + b/100).

Q40. Answer: (b) Rs. 8,928

Shortcut Trick

Effective rate for 2 years at 20% p.a. = 20 + 20 + (20 × 20)/100 = 44%

Total Amount percentage = 100% (Principal) + 44% (Interest) = 144%

Amount = 144% of Rs. 6,200 = 1.44 × 6200

Amount = Rs. 8,928

Therefore The correct answer is Rs. 8,928.

Alternate Method

Given:

Principal (P) = Rs. 6,200

Rate (R) = 20% per annum

Time (n) = 2 years

Formula Used:

Amount (A) = $P(1 + R/100)^n$

Calculations:

=> $A = 6200 \times (1 + 20/100)^2$

=> $A = 6200 \times (120/100)^2$

=> $A = 6200 \times (1.2)^2$

=> A = 6200 × 1.44

=> A = 8928

Therefore The correct answer is Rs. 8,928.

Additional Information

CI vs SI Difference for 2 Years

The difference between Compound Interest and Simple Interest for 2 years is given by $D = P(R/100)^2$.

Successive Percentage Change

For two successive changes of x% and y%, the effective change is [x + y + (xy/100)]%.

Quarterly Compounding

When interest is compounded quarterly, the rate becomes R/4 and the time becomes 4n.

Q41. Answer: (a) 12,960

Shortcut Trick

72% of voters = 8640

1% of voters = 8640 ÷ 72 = 120

Total voters next year (8% increase) = 100% + 8% = 108%

Next year total = 120 × 108 = 12,960

Therefore The correct answer is 12,960.

Alternate Method

Given: Cast votes = 8640 (72% of current total) | Growth = 8%.

Formula: Current Total = (Given Value ÷ Current Percentage) × 100.

=> Let total current eligible voters be V_c.

=> $0.72 \times V_c = 8640$

=> $V_c = 8640 \div 0.72 = 12,000$

=> Next year growth = 8% of 12,000

=> Growth = 0.08 × 12,000 = 960

=> Total eligible voters next year = 12,000 + 960 = 12,960

Therefore The correct answer is 12,960.

Additional Information

Percentage Increase Formula

New Value = Old Value × (1 + Growth Rate ÷ 100). For an 8% increase, multiply by 1.08.

Base Value Concept

When a percentage of a quantity is known, divide the value by its percentage to find 1% of the base, then multiply by the desired target percentage.

Multiplying Factor (MF)

A growth of x% means MF = (100 + x) ÷ 100. A decrease of x% means MF = (100 − x) ÷ 100.

Q42. Answer: (a) 2,81,909

Shortcut Trick

Ratio of shares = 7 : 13 : 9

Difference between largest (13) and smallest (7) = 6 units

Given: 6 units = Rs. 58,326

1 unit = 58,326 ÷ 6 = Rs. 9,721

Total units = 7 + 13 + 9 = 29 units

Total profit = 29 × 9,721 = Rs. 2,81,909

Therefore The correct answer is Rs. 2,81,909.

Alternate Method

Given:

Ratio of shares of three partners = 7 : 13 : 9

Difference between the smallest and largest share = Rs. 58,326

Formula:

Individual Share = (Individual Ratio Part ÷ Total Ratio Parts) × Total Profit

Let the shares of the three partners be 7x, 13x, and 9x.

=> Smallest share = 7x

=> Largest share = 13x

=> Difference = 13x − 7x = 6x

=> 6x = 58,326

=> x = 58,326 ÷ 6

=> x = 9,721

=> Total profit = 7x + 13x + 9x = 29x

=> Total profit = 29 × 9,721

=> Total profit = 2,81,909

Therefore The correct answer is Rs. 2,81,909.

Additional Information

Partnership Profit Ratio

Profit is always distributed in the ratio of the product of Capital and Time: P1 : P2 = (C1 × T1) : (C2 × T2).

Simple Partnership

When investments of all partners are for the same duration, the profit is distributed simply in the ratio of their investments.

Ratio Unitary Method

If the difference between two parts is D and their ratio parts are a and b, then 1 unit = D ÷ |a − b|. Total value = (Sum of all ratio parts) × (Value of 1 unit).

Q43. Answer: (b) Rs. 1,800

Shortcut Trick

Marked Price (100%) = Rs. 2,000

Discount = 10%

Selling Price = 100% − 10% = 90%

SP = 90% of 2,000 = 0.9 × 2,000 = Rs. 1,800

Therefore The correct answer is Rs. 1,800.

Alternate Method

Given: Marked Price (MP) = Rs. 2,000 | Discount % = 10%

Formula Used: Selling Price (SP) = MP − Discount | Discount = (Discount% / 100) × MP

=> Discount = (10 / 100) × 2,000

=> Discount = 0.1 × 2,000 = Rs. 200

=> SP = 2,000 − 200

=> SP = Rs. 1,800

Therefore The correct answer is Rs. 1,800.

Additional Information

Marked Price and Discount

Marked Price is the price printed on an item. Discount is always calculated on the Marked Price unless stated otherwise. Formula: SP = MP × (100 − Discount%)/100.

Successive Discounts

If two successive discounts of a% and b% are given, the effective single discount is (a + b − ab/100)%.

Markup Percentage

Markup is the extra value added to the Cost Price to arrive at the Marked Price. Markup % = (MP − CP)/CP × 100.

Q44. Answer: (a) P > Q

Shortcut Trick

To compare ratios P = 5/2 and Q = 3/7, use the cross-multiplication method.

Multiply the numerator of P by the denominator of Q: 5 × 7 = 35.

Multiply the numerator of Q by the denominator of P: 3 × 2 = 6.

Since 35 > 6, the first ratio P is greater than the second ratio Q.

Therefore The correct answer is P > Q.

Alternate Method

Given: P = 5:2 and Q = 3:7

Convert the ratios into their decimal equivalents for direct comparison.

=> Value of P = 5 ÷ 2

=> P = 2.5

=> Value of Q = 3 ÷ 7

=> Q ≈ 0.428

=> Comparing the values: 2.5 > 0.428

=> P > Q

Therefore The correct answer is P > Q.

Additional Information

Ratio Comparison Rule

For two ratios a:b and c:d, if (a × d) > (b × c), then a:b > c:d. This is known as the cross-product method.

Inverse Ratio

The inverse ratio of a:b is b:a. For example, the inverse of P (5:2) is 2:5.

Compounded Ratio

The compounded ratio of a:b and c:d is calculated as (a × c) : (b × d). Here, the compounded ratio of P and Q is 15:14.

Q45. Answer: (a) 20.56

Shortcut Trick

Total Expenditure = 1120 + 915 = Rs. 2035

Total Number of Books = 52 + 47 = 99

Average Price per Book = Total Expenditure ÷ Total Books

Average = 2035 ÷ 99 = 20.555...

Average ≈ 20.56

Therefore The correct answer is 20.56.

Alternate Method

Given:

Price of 52 books = Rs. 1,120

Price of 47 books = Rs. 915

Formula Used:

Average = (Total Sum of Observations) ÷ (Total Number of Observations)

Calculations:

=> Total books purchased by Keshav = 52 + 47 = 99

=> Total money spent by Keshav = 1120 + 915 = Rs. 2035

=> Average price per book = 2035 ÷ 99

=> Average price = 20.5555...

=> Rounding to two decimal places, we get 20.56

Therefore The correct answer is 20.56.

Additional Information

Weighted Average

When groups have different sizes, use the formula A_w = (n1x1 + n2x2) ÷ (n1 + n2), where n is quantity and x is the value.

Rounding Rules

To round to 2 decimal places, look at the 3^(rd) decimal. If it is 5 or more, increase the 2^(nd) decimal by 1.

Unitary Method

To find the value of one item, divide the total value by the total number of items.

Q46. Answer: (c) 1,74,900

Shortcut Trick

Total % of votes = 100%

Votes for C = 100% − (18% + 43%) = 39%

Ranking: B (43%) > C (39%) > A (18%) Therefore Runner up is C

Winning Margin = 43% − 39% = 4%

4% units = 6,996 → 1% unit = 1,749

Total votes (100%) = 1,749 × 100 = 1,74,900

Therefore The correct answer is 1,74,900.

Alternate Method

Given:

Votes of A = 18%

Votes of B = 43%

Winning margin (B over Runner up) = 6,996

Formula Used:

Percentage of value = (Part ÷ Total) × 100

=> Let total number of votes be X.

=> Percentage of votes for C = 100% − (18% + 43%)

=> Percentage of votes for C = 100% − 61% = 39%

=> Comparison of votes: B (43%) > C (39%) > A (18%)

=> Since C is on second rank, B won the election over C.

=> Margin in percentage = 43% − 39% = 4%

=> According to question: 4% of X = 6,996

=> (4 ÷ 100) × X = 6,996

=> X = (6,996 × 100) ÷ 4

=> X = 1,749 × 100 = 1,74,900

Therefore The correct answer is 1,74,900.

Additional Information

Percentage Difference

When comparing two percentages of the same base, the difference in their percentage values directly represents the difference in their absolute values relative to the base.

Total Votes Calculation

In election problems, Total Votes = Valid Votes + Invalid Votes. If not specified, all votes are considered valid and distributed among candidates.

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Successive Percentage Formula

For two successive changes of a% and b%, the effective change is given by: [a + b + (ab ÷ 100)]%.

Q47. Answer: (b) 48.88%

Shortcut Trick

Successive Discount Formula = (a + b − ab/100)%

Here a = 29 and b = 28

=> Equivalent Discount = (29 + 28 − (29 × 28)/100)%

=> 57 − 812/100 = 57 − 8.12

=> 48.88%

Therefore The correct answer is 48.88%.

Alternate Method

Given:

First discount (d1) = 29%

Second discount (d2) = 28%

Formula Used:

Selling Price (SP) = Marked Price (MP) × (1 − d1/100) × (1 − d2/100)

=> Let Marked Price (MP) = 100

=> Price after first discount = 100 − (29% of 100) = 71

=> Second discount amount = 28% of 71 = (28/100) × 71

=> Second discount amount = 19.88

=> Final Selling Price (SP) = 71 − 19.88 = 51.12

=> Total Discount = MP − SP = 100 − 51.12 = 48.88

=> Single Equivalent Discount % = (48.88 / 100) × 100 = 48.88%

Therefore The correct answer is 48.88%.

Additional Information

Successive Percentage Change

The net percentage change for two successive changes of x% and y% is given by the formula: (x + y + xy/100)%. For discounts, values of x and y are taken as negative.

Three Successive Discounts

For three discounts a%, b%, and c%, the single equivalent discount is found by calculating the equivalent of any two first, and then using that result with the third discount.

Relation between MP and SP

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

Q48. Answer: (b) 6 weeks

Shortcut Trick

Total amount to be saved = Target amount − Initial savings

Total savings required = Rs. 21,000 − Rs. 12,000 = Rs. 9,000

Number of weeks = Total savings required ÷ Weekly savings

Number of weeks = 9,000 ÷ 1,500 = 6

Therefore The correct answer is 6 weeks.

Alternate Method

Given:

Initial savings = Rs. 12,000

Target amount = Rs. 21,000

Weekly savings rate = Rs. 1,500

Formula:

Total Amount = Initial Savings + (Weekly Savings × Number of Weeks)

Let the number of weeks be "n"

=> 21,000 = 12,000 + (1,500 × n)

=> 21,000 − 12,000 = 1,500n

=> 9,000 = 1,500n

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=> n = 9,000 ÷ 1,500

=> n = 6

Therefore The correct answer is 6 weeks.

Additional Information

Arithmetic Progression (A.P.)

This problem follows an A.P. where the first term a = 12,000 + 1,500 (after 1 week), the common difference d = 1,500, and the n^(th) term is 21,000.

Linear Equation Modeling

Any situation involving a fixed starting value and a constant rate of change can be modeled by y = mx + c, where c is the initial value and m is the rate.

Time and Savings Relation

Time = (Required Amount − Initial Amount) ÷ Savings per unit time. This logic is also used in Simple Interest where Interest = Principal × Rate × Time.

Q49. Answer: (c) 8 : 5

Shortcut Trick

Initial Income : Expenditure = 12 : 7

New Income = 12 × (100 + 40)% = 12 × 140

New Expenditure = 7 × (100 + 50)% = 7 × 150

New Ratio = (12 × 140) : (7 × 150) = 1680 : 1050

Simplifying by dividing by 210 => 8 : 5

Therefore The correct answer is 8 : 5.

Alternate Method

Given: Initial Ratio of Income to Expenditure = 12 : 7

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

=> Let Ratnesh's monthly income = 1200 and expenditure = 700.

=> New Income = 1200 + (40 / 100) × 1200 = 1200 + 480 = 1680

=> New Expenditure = 700 + (50 / 100) × 700 = 700 + 350 = 1050

=> New Ratio = 1680 : 1050

=> Dividing both sides by 210: 1680/210 : 1050/210

=> New Ratio = 8 : 5

Therefore The correct answer is 8 : 5.

Additional Information

Income-Expenditure Relationship

Total Income = Expenditure + Savings. If income increases more than expenditure, savings increase.

Percentage Change in Ratios

If ratio is a : b and terms increase by x% and y% respectively, new ratio = a(100+x) : b(100+y).

Effective Change in Savings

Change in Savings = New Income − New Expenditure. It can be expressed as a percentage of original savings.

Q50. Answer: (a) 180

Shortcut Trick

In an isosceles trapezium, height (h) = √[slant² − ((a−b)/2)²]

h = √[13² − ((20−10)/2)²] = √(169 − 25) = √144 = 12 cm

Area = 1/2 × (Sum of parallel sides) × h

Area = 1/2 × (20 + 10) × 12 = 15 × 12 = 180 cm²

Therefore The correct answer is 180 cm².

Alternate Method

Given:

Parallel sides (a, b) = 20 cm, 10 cm

Non-parallel sides (c) = 13 cm each (Isosceles Trapezium)

Formula Used:

Area of Trapezium = 1/2 × (Sum of parallel sides) × Height

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Pythagoras Theorem: h^2 + base^2 = hypotenuse^2

=> Let the height be h. Since it is an isosceles trapezium, the perpendiculars from the top vertices divide the base into segments: 5 cm, 10 cm, and 5 cm.

=> Base of the right-angled triangle formed at the side = (20 − 10) ÷ 2 = 5 cm

=> In the right-angled triangle, height (h) = $\sqrt{(13^2 - 5^2)}$

=> h = $\sqrt{(169 - 25)} = \sqrt{144}$ = 12 cm

=> Area of Trapezium = 1/2 × (20 + 10) × 12

=> Area = 1/2 × 30 × 12

=> Area = 15 × 12 = 180 cm^2

Therefore The correct answer is 180 cm^2.

Additional Information

Isosceles Trapezium Properties

In an isosceles trapezium, non-parallel sides are equal, base angles are equal, and diagonals are equal in length.

Cyclic Quadrilateral Property

Every isosceles trapezium is a cyclic quadrilateral, meaning all its vertices lie on a single circle.

Median of a Trapezium

The median (mid-segment) joins the midpoints of non-parallel sides; Median length = (a + b) ÷ 2.

Q51. Answer: (a) Four

Given: A, B, C, D, E, F and G are sitting in a row facing north.

F sits fifth from the right end of the row.

Only three people sit to the right of C.

D is the immediate neighbor of B and C.

A sits to the right of E but left of F

Now, People between G and A → 4 people

Hence, the correct answer is "Option 1".

Q52. Answer: (b) LOKP

The logic followed here is:

For MPLQ → SVRW

Now, for ORNS → UXTY

Now, applying the same logic for FIEJ:

So, FIEJ → LOKP

Hence, the correct answer is "Option 2".

Q53. Answer: (b) 3 km to the South

The logic followed here is:

Given:

Rohit starts from Point A and drives 15 km towards the West.

He then takes a left turn, drives 11 km,

turns left and drives 18 km.

He then takes a left turn and drives 14 km.

He takes a final left turn, drives 3 km and stops at Point P.

So, To reach Point A, he must move 3 km towards the South

Hence, the correct answer is Option 2.

Q54. Answer: (c) gs

The logic followed here is:

Given:

‘leaves turn brown’ → ka gs rl

‘gather leaves daily’ → ny hf gs

So, the code for leaves = gs.

Hence, the correct answer is Option 3.

Q55. Answer: (a) FAUX

The logic followed here is:
For TOIL → BWQT
Now, for ZUOR → HCWZ
Now, applying the same logic for XSMP:
So, XSMP → FAUX
Hence, the correct answer is "Option 1".

Q56. Answer: (a) Two

The logic followed here is:
Given series: (Left) F J L T M N C R P W X Z K O H A Y Q D G E B (Right)
Logic: Count the number of letters appearing after Q and before E in the given series.
Series positions: Q D G E
Letters between Q and E are: D, G
Number of letters between Q and E = 2
Hence, the correct answer is Option 1.

Q57. Answer: (c) D

Given: S, Q, U, A, R, E and D are sitting in a row facing north.
No one sits to the left of A.
Only four people sit between A and S.
Only three people sit to the right of R.
U sits to the immediate left of E.
D is not an immediate neighbor of R.
Now,
The rightmost end is position 7 → D
Hence, the correct answer is "Option 3".

Q58. Answer: (c) 32

Given:
Rekha is 13th from the left end and Ajay is 6th from the right end in a row of 51 people.
Here, Number of people between them = 51 − (13 + 6)
= 51 − 19
= 32
So, there are 32 people between Rekha and Ajay.
Hence, the correct answer is "Option 3".

Q59. Answer: (d) 6 - 5 - 11

The logic followed here is:
Logic: Third Number = First Number + Second Number.
For, 77 - 3 - 80
=> 77 + 3 = 80
For, 12 - 4 - 16
=> 12 + 4 = 16
Now, checking the options:
Option 1) 20 - 13 - 43
=> 20 + 13 = 33 ≠ 43
Option 2) 11 - 1 - 23
=> 11 + 1 = 12 ≠ 23
Option 3) 14 - 9 - 25
=> 14 + 9 = 23 ≠ 25
Option 4) 6 - 5 - 11

=> 6 + 5 = 11 = 11
Therefore, the set '6 - 5 - 11' follows the same pattern.
Hence, the correct answer is Option 4.

Q60. Answer: (b) 8

Given: 435, 325, 123, 756, 264
Now, the third digit of the highest number and the second digit of the lowest number, then add them.
Highest number = 756
Third digit of highest number = 6
Lowest number = 123
Second digit of lowest number = 2
So, 6 + 2 = 8
Hence, the correct answer is Option 2.

Q61. Answer: (b) 53

The logic followed here is:
thus, "53" will replace the question mark in the given series.
Hence, the correct option is "Option 2".

Q62. Answer: (c) VC - BH

The logic followed here is:
Option 1) GN – LS
Option 2) XF – CK
Option 3) VC – BH
Option 4) MD – RI
Here, VC – BH is odd from the given options.
Hence, the correct answer is "Option 3".

Q63. Answer: (a) XNG 62

The logic followed here is:
So, the missing term = XNG 62
Hence, the correct answer is Option 1.

Q64. Answer: (b) 302

The logic followed here is:
thus, "302" will replace the question mark in the given series.
Hence, the correct option is "Option 2'.

Q65. Answer: (d) EK - IP

The logic followed here is:
Option 1) GU – KY
Option 2) LR – PV
Option 3) PC – TG
Option 4) EK – IP
Here, EK – IP is odd from the given options.
Hence, the correct answer is "Option 4".

Q66. Answer: (a) cb

The logic followed here is:
Given:
‘ride waves carefully’ → el uw cb
‘waves crash loud’ → sr cb vq
So, the code for waves = cb.
Hence, the correct answer is Option 1.

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Q67. Answer: (b) 7 and 14

BODMAS Table:

Decoding the given information:

Interchanged Numbers	7	14
New Position	14	7

Now, Checking given options by replacing the numbers and using BODMAS Rule, we get:

Option 1) 56 and 28

=> (28 ÷ 14) × 3 + 7 × 9 − 15 × 5 + 56

=> 2 × 3 + 63 − 75 + 56

=> 6 + 63 − 75 + 56

=> 69 − 75 + 56

=> −6 + 56

=> 50

Option 2) 7 and 14

=> (56 ÷ 7) × 3 + 14 × 9 − 15 × 5 + 28 = 103

=> 8 × 3 + 126 − 75 + 28 = 103

=> 24 + 126 − 75 + 28 = 103

=> 150 − 75 + 28 = 103

=> 75 + 28 = 103

=> 103 = 103

Option 3) 5 and 7

=> (56 ÷ 14) × 3 + 5 × 9 − 15 × 7 + 28

=> 4 × 3 + 45 − 105 + 28

=> 12 + 45 − 105 + 28

=> 57 − 105 + 28

=> −48 + 28

=> −20

Option 4) 28 and 14

=> (56 ÷ 28) × 3 + 7 × 9 − 15 × 5 + 14

=> 2 × 3 + 63 − 75 + 14

=> 6 + 63 − 75 + 14

=> 69 − 75 + 14

=> −6 + 14

=> 8

Hence, the correct option is "Option 2".

Q68. Answer: (c) Three

Given: G, H, I, Q, R and S are sitting in a row facing north.

Only two people sit to the right of Q.

Only one person sits between Q and S.

Only one person sits between H and R.

R sits to the immediate left of Q.

Only I sits to the right of G.

Now, People between H and G are: 3 people

Hence, the correct answer is "Option 3".

Q69. Answer: (a) 1

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

Now,

Even digits, which are immediately preceded by an even digit and also immediately followed by an even digit.

So, Needed pattern is: Even Digit - Even Digit - Even Digit

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

So, total valid even digits = 1

Hence, the correct answer is Option 1.

Q70. Answer: (b) RYMH

The logic followed here is:

For HOCX → SZNI

Now, for ZGUP → KRFA

Now, applying the same logic for GNBW:

So, GNBW → RYMH

Hence, the correct answer is "Option 2".

Q71. Answer: (c) 6 km towards west

The logic followed here is:

Given:

Piyush starts from Point X and drives 6 km towards east.

He then takes a left turn, drives 3 km, turns right, and drives 5 km.

He then takes a right turn and drives 3 km.

Finally, he takes a right turn, drives 5 km, and stops at Point P.

To reach Point X, he must go 6 km towards the West

Hence, the correct answer is Option 3.

Q72. Answer: (c) Father's brother's wife

Family Chart:

Decoding the Symbols:

Symbol	•	#	×	@
Meaning	Sister	Brother	Wife	Father

Given: L × O # V @ E + R

It means: L is the wife of O, O is the brother of V, V is the father of E, and E is the sister of R.

Since, L is the father’s brother’s wife of R.

Hence, the correct answer is "Option 3".

Q73. Answer: (d) 14

BODMAS Table:

Decoding the given information:

Alphabet	**D**	**E**	**F**	**G**
Meaning	÷	×	•	−

Now, replacing the sign from left to right using BODMAS Rule, we get:

=> 24 × 2 ÷ 4 + 5 − 3 = ?

=> 48 ÷ 4 + 5 − 3 = ?

=> 12 + 5 − 3 = ?

=> 17 − 3 = ?

=> 14

Hence, the correct option is "Option 4".

Q74. Answer: (d) Only conclusion (II) follows

Given Statements:

All flutes are drums.

All drums are guitars.

The least possible Venn diagram for the given statement is:

Conclusions:

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I. No guitar is a flute – Does not follow (Since all flutes are guitars, some guitars must be flutes, so this contradicts the statement).
II. Some guitars are flutes – Follows All flutes are guitars, so definitely some guitars are flutes).
So, only conclusion II follows.
Hence, the correct answer is "Option 4".

Q75. Answer: (b) 34th

Given:
Miku is 12th from the right end and Pushkar sits 5 places to the left of Miku in a row of 50 students.
Here,
Pushkar's position from the right end = 12 + 5 = 17th
Now, Pushkar's position from the left end = 50 − 17 + 1 = 34th
So, Pushkar is 34th from the left end.
Hence, the correct answer is "Option 2".

Q76. Answer: (d) 36 and 42

BODMAS Table:
Decoding the given information:

Interchanged Numbers	**36**	**42**
New Position	42	36

Now, Checking the given options by replacing the numbers and using BODMAS Rule, we get:
Option 1) 9 and 4
=> (36 − 28) × 3 + 4 × 5 − (108 ÷ 9) + 42
=> 8 × 3 + 20 − 12 + 42
=> 24 + 20 − 12 + 42
=> 44 − 12 + 42
=> 32 + 42
=> 74
Option 2) 4 and 3
=> (36 − 28) × 4 + 9 × 5 − (108 ÷ 3) + 42
=> 8 × 4 + 45 − 36 + 42
=> 32 + 45 − 36 + 42
=> 77 − 36 + 42
=> 41 + 42
=> 83
Option 3) 3 and 5
=> (36 − 28) × 5 + 9 × 3 − (108 ÷ 4) + 42
=> 8 × 5 + 27 − 27 + 42
=> 40 + 27 − 27 + 42
=> 67 − 27 + 42
=> 40 + 42
=> 82
Option 4) 36 and 42
=> (42 − 28) × 3 + 9 × 5 − (108 ÷ 4) + 36 = 96
=> 14 × 3 + 45 − 27 + 36 = 96
=> 42 + 45 − 27 + 36 = 96
=> 87 − 27 + 36 = 96
=> 60 + 36 = 96
=> 96 = 96
Hence, the correct option is "Option 4".

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Q77. Answer: (b) 6

The logic followed here is:

Given series: (Left) 4 @ 3 % 5 $ 1 # 6 & 9 9 * 5 + 1 ? 6 + = 5 $ # 2 (Right)

Logic: Remove all the symbols from the series and find the 7th element from the right.

After removing all symbols: 4 3 5 1 6 9 5 1 6 5 2

So, the 7th element from the right = 6

Hence, the correct answer is Option 2.

Q78. Answer: (c) 291

The logic followed here is:

thus, "291" will replace the question mark in the given series.

Hence, the correct option is "Option 3".

Q79. Answer: (c) Neither conclusion (I) nor (II) follows

Given Statements:

All books are pens.

Some pens are crayons.

The least possible Venn diagram for the given statement is:

Conclusions:

I. All crayons are pens – Does not follow (Only “some pens are crayons” is given; it does not cover all crayons).

II. Some books are crayons – Does not follow (Books are inside pens, but the overlap between pens and crayons may not include books).

So, neither conclusion I nor conclusion II follows.

Hence, the correct answer is "Option 3".

Q80. Answer: (a) OLI 97

The logic followed here is:

So, the missing term = OLI 97

Hence, the correct answer is Option 1.

Q81. Answer: (d) 4.4% of GDP

The correct answer is 4.4% of GDP.

Key Points

• The Union Budget 2025-26 was presented by the Union Minister of Finance, Nirmala Sitharaman, in the Parliament of India.

• For the Financial Year 2025-26, the government has projected the fiscal deficit at 4.4% of the Gross Domestic Product (GDP).

• This target is part of a broad fiscal consolidation roadmap aimed at bringing the deficit down to a sustainable level below 4.5% of GDP.

• In the previous fiscal year, FY 2024-25, the Revised Estimate (RE) for the fiscal deficit was recorded at 4.9%, demonstrating a steady downward trend from the Budget Estimate (BE) of 5.1%.

• The reduction to 4.4% reflects the government's commitment to balancing macroeconomic stability with the need for high capital expenditure to spur economic growth.

Additional Information

• Fiscal Deficit: This is the difference between the government's total expenditure and its total non-debt receipts (which include revenue receipts and non-debt capital receipts like recovery of loans). It indicates the total borrowing requirements of the Government of India.

• Revenue Deficit: This occurs when the revenue expenditure exceeds the revenue receipts. It implies that the government is borrowing to meet its current consumption needs rather than for investment or asset creation.

• Primary Deficit: This is calculated by deducting interest payments on previous debts from the fiscal deficit. It shows the amount of borrowing needed to meet expenditures other than interest obligations.

• FRBM Act, 2003: The Fiscal Responsibility and Budget Management Act was introduced to ensure long-term macroeconomic stability by setting targets for the reduction of fiscal and revenue deficits.

• Financing the Deficit: The government typically finances the fiscal deficit through market borrowings (issuing dated securities and treasury bills), external debt, and drawing from small savings funds.

Important Points

• The Union Budget 2025-26 continues to prioritize Capital Expenditure (Capex), which is vital for building infrastructure such as

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highways, railways, and digital networks.

• A lower fiscal deficit helps in keeping inflation under control and prevents the "crowding out" effect, ensuring that more credit is available for the private sector.

• The Tax-to-GDP ratio is expected to improve in 2025-26 due to better GST compliance and a wider direct tax base, contributing to the consolidation process.

• The government intends to stick to the fiscal glide path to eventually reduce the debt-to-GDP ratio, which is a key metric for international credit rating agencies.

Q82. Answer: (b) Rajnath Singh

The correct answer is Rajnath Singh.

Key Points

• Rajnath Singh, the Union Minister of Defence of India, attended the Shanghai Cooperation Organisation (SCO) Defence Ministers' Conclave held in June 2025.

• As the Defence Minister, he has been a consistent representative for India at high-level security dialogues, focusing on regional stability and military cooperation across the Eurasian landmass.

• During the conclave, the Indian delegation emphasized the importance of a multipolar world and the need for collective action against transborder terrorism.

• The meeting provided a platform for India to engage in bilateral discussions with other member states, including Russia and Central Asian Republics, to strengthen strategic partnerships. Hence, the statement regarding Rajnath Singh is correct.

• The Defence Ministers' Conclave is an annual event where the heads of defense departments from SCO member nations deliberate on defense industry collaboration and joint military exercises.

Additional Information

• Shanghai Cooperation Organisation (SCO):

• The SCO is a permanent intergovernmental international organization established on 15 June 2001 in Shanghai, China.

• It was founded by the leaders of China, Kazakhstan, Kyrgyzstan, Russia, Tajikistan, and Uzbekistan.

• India and Pakistan officially joined as full members during the Astana Summit in June 2017.

• In July 2023, Iran was formally inducted as the ninth permanent member of the SCO.

• Structure and Objectives:

• The Regional Anti-Terrorist Structure (RATS), headquartered in Tashkent, is a permanent organ of the SCO which facilitates cooperation against terrorism, separatism, and extremism.

• The organization covers approximately 40% of the global population and nearly 20% of the global GDP.

• The primary goals include strengthening mutual trust and neighborliness among member states and promoting effective cooperation in politics, trade, economy, and technology.

• India's Role in SCO:

• India hosted the SCO Council of Heads of State summit for the first time in virtual mode in July 2023 under the theme "SECURE-SCO".

• The acronym SECURE stands for Security, Economy, Connectivity, Unity, Respect, and Environment, a concept proposed by Prime Minister Narendra Modi.

• India's engagement with the SCO is driven by its "Connect Central Asia" policy and its interest in the International North-South Transport Corridor (INSTC).

Important Points

• Regional Security Dynamics: The SCO is often viewed as an "Alliance of the East" and plays a critical role in balancing Western influence in Central Asia.

• Military Exercises: Member states regularly participate in "Peace Mission" joint military counter-terrorism exercises to improve interoperability among their armed forces.

• Expansion: Recent years have seen Belarus moving towards full membership, indicating the growing geopolitical footprint of the organization in Eastern Europe and Asia.

Q83. Answer: (b) P R Sreejesh

The correct answer is P R Sreejesh.

Key Points

• P R Sreejesh, the legendary Indian hockey goalkeeper, announced his retirement from international hockey, concluding an illustrious 18-year career after the Paris 2024 Olympics.

• He made his senior international debut in 2006 at the South Asian Games in Colombo and became a permanent fixture in the Indian squad since 2011.

• Sreejesh played a pivotal role in India winning two consecutive Olympic Bronze medals at Tokyo 2020 and Paris 2024, ending a

long medal drought for the country in hockey.

• Over his career, he represented India in over 330 international matches and participated in four Olympic Games (2012, 2016, 2020, and 2024).

• He served as the captain of the Indian national team during the 2016 Rio Olympics and led the team to the silver medal at the 2016 Champions Trophy.

Additional Information

• Awards and Recognitions:

• In 2021, Sreejesh was honored with the Major Dhyan Chand Khel Ratna Award, which is the highest sporting honor in India.

• He was awarded the Padma Shri, India's fourth-highest civilian award, in 2017 for his contributions to sports.

• He was named the World Games Athlete of the Year for 2021, becoming only the second Indian after Rani Rampal to achieve this feat.

• Sreejesh won the FIH Goalkeeper of the Year award for two consecutive years in 2021 and 2022.

• Major Achievements:

• He won the Gold Medal at the 2014 Incheon Asian Games and the 2022 Hangzhou Asian Games.

• He was part of the team that secured the Gold Medal at the 2011, 2016, 2018, and 2023 Asian Champions Trophy.

• Following his retirement, he was appointed as the Head Coach of the India U-21 Men's Hockey Team to nurture future talent.

Important Points

• Personal Background: Born on May 8, 1988, in Kizhakkambalam, Kerala, Sreejesh is often referred to as "The Wall of Indian Hockey" due to his exceptional goalkeeping skills.

• Historic Save: His most iconic moment came during the Tokyo 2020 Olympics bronze medal match against Germany, where he made a crucial save from a penalty corner in the final 6.8 seconds to secure the 5-4 win.

• Transition to Coaching: His retirement marks the end of an era, but his transition to coaching ensures his vast experience in international hockey continues to benefit Hockey India and the development of junior goalkeepers.

• Legacy: He is widely regarded as one of the greatest goalkeepers in the history of the sport, alongside legends like Shankar Lakshman.

Q84. Answer: (c) 23rd

The correct answer is 23rd.

Key Points

• According to the latest data provided, India has secured the 23rd position in the Climate Change Performance Index (CCPI) 2026.

• The CCPI is an independent monitoring tool that tracks the climate protection performance of 63 countries and the European Union, which collectively account for over 90% of global greenhouse gas emissions.

• The index is published annually by Germanwatch, the NewClimate Institute, and the Climate Action Network (CAN) International to enhance transparency in international climate politics.

• The rankings are determined by a standardized framework that allows for a comparison of climate protection efforts across different nations.

• The CCPI 2026 assessment highlights how countries are aligning their national strategies with the goals set under the Paris Agreement to limit global warming.

Additional Information

• Four Pillars of CCPI: The index evaluates performance based on four categories with specific weightages: Greenhouse Gas Emissions (40%), Renewable Energy (20%), Energy Use (20%), and Climate Policy (20%).

• Empty Top Three Ranks: A unique feature of the CCPI is that the first three ranks are typically left vacant. This is because no single country has yet performed well enough in all categories to be on a path compatible with the 1.5°C goal of the Paris Agreement.

• Publication History: The Climate Change Performance Index was first published in 2005. It serves as a vital resource for non-governmental organizations and policymakers to pressure governments for more ambitious climate action.

• India's Climate Trajectory: India has historically performed well in the Renewable Energy and GHG Emissions categories due to its low per capita emissions and massive scale-up of solar and wind power projects.

• Methodology: The Climate Policy category is evaluated based on expert assessments from local NGOs and think tanks within each country, ensuring a mix of quantitative data and qualitative policy review.

Important Points

• The 23rd rank indicates a shift in the global competitive landscape of climate action, emphasizing the need for India to further accelerate its transition toward a Net Zero economy by its target year of 2070.

• Significant contributors to a country's score include its Nationally Determined Contributions (NDCs) and the implementation of

domestic laws like the Energy Conservation Act in the context of India.

• The index often features Nordic countries like Denmark and Sweden near the top of the list, serving as benchmarks for climate policy and renewable integration.

Q85. Answer: (a) BRICS

The correct answer is BRICS.

Key Points

• The 17th BRICS Summit is scheduled to be held in July 2025 under the Presidency of Brazil.

• The theme of the summit is 'Strengthening Global South Cooperation for a More Inclusive and Sustainable Governance', reflecting the group's focus on amplifying the voices of developing nations in the international arena.

• This summit is particularly significant as it continues the momentum of the BRICS expansion that took place during the 15th Summit in South Africa and the 16th Summit in Russia.

• The primary objectives of the 2025 summit include promoting multilateralism, reforming global financial institutions, and enhancing south-south cooperation to address challenges like climate change and economic inequality.

• The Brazilian presidency aims to use this platform to advocate for sustainable development and a more equitable global governance system that represents the current geopolitical realities. Hence, the correct answer is BRICS.

Additional Information

• Evolution of BRICS:

• The acronym BRIC was first coined by Jim O'Neill of Goldman Sachs in 2001 to describe the fast-growing economies of Brazil, Russia, India, and China.

• The first formal summit took place in Yekaterinburg, Russia, in 2009. With the induction of South Africa in 2010, the group was renamed BRICS.

• BRICS Expansion (BRICS+):

• In a historic move during the 2023 Johannesburg Summit, the group invited new members to join. As of January 1, 2024, nations including Egypt, Ethiopia, Iran, and the United Arab Emirates (UAE) became full members.

• This expansion significantly increases the group's share of the global population and its control over global energy resources, particularly oil and gas.

• Key Institutions:

• New Development Bank (NDB): Formerly known as the BRICS Development Bank, it is headquartered in Shanghai, China. It aims to mobilize resources for infrastructure and sustainable development projects in BRICS and other emerging economies.

• Contingent Reserve Arrangement (CRA): A framework designed to provide protection against global liquidity pressures and provide mutual support during financial crises.

• Global Economic Impact:

• The BRICS nations combined represent over 40% of the world's population and contribute more than 30% of the global Gross Domestic Product (GDP) based on Purchasing Power Parity (PPP).

• The group serves as a counterweight to the G7 and seeks to challenge the dominance of the US Dollar in international trade through initiatives like local currency settlements.

Q86. Answer: (a) New Delhi

The correct answer is New Delhi.

Key Points

• The Quality Council of India (QCI), acting as the national custodian of accreditation in India, commemorated World Accreditation Day 2025 in New Delhi.

• World Accreditation Day is a global initiative established by the International Laboratory Accreditation Cooperation (ILAC) and the International Accreditation Forum (IAF) to raise awareness about the importance of accreditation.

• The event, held on June 9, 2025, brought together various stakeholders, including government officials, industry leaders, and accreditation bodies, to discuss the role of quality standards in national development.

• The celebration in New Delhi focused on how accreditation supports the implementation of Sustainable Development Goals (SDGs) and enhances the global competitiveness of Indian products and services.

• As the apex body for quality, QCI utilizes this platform to strengthen the quality ecosystem in India under the Ministry of Commerce and Industry.

Additional Information

• Quality Council of India (QCI):

• It was established in 1997 as an autonomous body through a Cabinet decision.

• It was set up jointly by the Government of India and the Indian industry represented by three premier industry associations: ASSOCHAM, CII, and FICCI.

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• The Department for Promotion of Industry and Internal Trade (DPIIT), under the Ministry of Commerce and Industry, is the nodal department for QCI.

• The Chairperson of QCI is appointed by the Prime Minister of India based on the recommendation of the industry. Jaxay Shah was appointed to this position in October 2022.

• Constituent Boards of QCI:

• NABL: National Accreditation Board for Testing and Calibration Laboratories, which provides accreditation to laboratories.

• NABH: National Accreditation Board for Hospitals & Healthcare Providers, focusing on quality standards in the healthcare sector.

• NABET: National Accreditation Board for Education and Training, which works on improving standards in vocational and school education.

• NABCB: National Accreditation Board for Certification Bodies, which accredits organizations offering certification and inspection services.

Important Points

• Significance of Accreditation: It provides a formal recognition that an organization is competent to perform specific tasks, thereby reducing risk and increasing consumer confidence.

• Global Context: India is a signatory to the ILAC Mutual Recognition Arrangement (MRA) and IAF Multilateral Recognition Arrangement (MLA), ensuring that Indian accreditations are recognized in over 100 countries.

• Economic Impact: By adhering to international quality standards, Indian exporters can overcome Technical Barriers to Trade (TBT), facilitating smoother entry into international markets.

• World Accreditation Day History: The first World Accreditation Day was celebrated in 2008, and since then, it has been observed annually on June 9 with a unique theme each year focusing on different aspects of quality and trade.

Q87. Answer: (a) New Zealand

The correct answer is New Zealand.

Key Points

• The government of New Zealand, through the New Zealand Qualifications Authority (NZQA), officially added India to its List of Qualifications Exempt from Assessment (LQEA) in June 2024 (with updates continuing into 2025).

• This move is designed to streamline the immigration process for Indian nationals by recognizing specific qualifications without the need for a separate International Qualification Assessment (IQA).

• The LQEA inclusion applies specifically to high-level qualifications, including Bachelor's degrees, Master's degrees, and Doctorates awarded by recognized Indian universities.

• This decision primarily supports the Skilled Migrant Category (SMC) Resident Visa, making it easier for skilled professionals from India to claim points for their education.

• By adding India to this list, New Zealand aims to reduce the administrative burden and financial costs for migrants, as they no longer need to pay for individual assessments for the listed qualifications.

Additional Information

• List of Qualifications Exempt from Assessment (LQEA):

• The LQEA is a critical tool used by Immigration New Zealand to determine if an overseas qualification is comparable to a New Zealand Qualification Framework (NZQF) level.

• Qualifications on this list are pre-verified, meaning the NZQA has already determined their equivalence to New Zealand standards.

• Prior to this inclusion, many Indian applicants had to undergo a rigorous IQA process, which could take several weeks and cost approximately NZD 445.

• Scope of Indian Qualifications:

• The exemption covers various fields, with a significant focus on Engineering, Information Technology, and Science.

• For a qualification to be exempt, it must be awarded by an institution recognized by India's University Grants Commission (UGC) and must fall within the specified effective dates (often starting from 1990, 2005, or 2015 depending on the degree).

• Professional degrees like the Bachelor of Engineering and Bachelor of Medicine and Bachelor of Surgery (MBBS) are often subject to specific verification by professional bodies in New Zealand.

• Bilateral Relations:

• The inclusion reflects the growing strategic partnership between India and New Zealand, particularly in the sectors of education, trade, and labor mobility.

• It acknowledges the high quality of India's higher education system and the significant contribution of the Indian diaspora to the New Zealand economy.

Important Points

• Criteria for Exemption: To benefit from the LQEA, the applicant's year of graduation must match the dates specified in the NZQA database. If the degree was awarded before the start date mentioned in the list, an Individual Assessment is still required.

• NZQF Levels: Most Indian Bachelor's degrees are equated to NZQF Level 7, while Master's degrees generally align with NZQF Level 9.

• Other Countries: Other nations sharing this exempt status with New Zealand include the United Kingdom, Australia, Canada, South Africa, and the United States. India's addition marks a major milestone for South Asian educational recognition.

Q88. Answer: (c) Sports Business Journal's Lifetime Achievement Award

The correct answer is Sports Business Journal's Lifetime Achievement Award.

Key Points

• David Hill, the legendary television executive and former leader of Fox Sports, has been selected as the recipient of the Sports Business Journal’s Lifetime Achievement Award for 2025.

• This prestigious award recognizes individuals who have made a significant and enduring impact on the sports business landscape through innovation, leadership, and visionary contributions.

• The ceremony to honor Hill is scheduled to take place during the 18th annual Sports Business Awards on May 21, 2025, in New York City.

• David Hill is widely celebrated for revolutionizing sports broadcasting, most notably by introducing the constant score and clock graphic (known as the Fox Box) during NFL and MLB broadcasts.

• Throughout his career, he has been a transformative figure at News Corp, Sky Sports, and Fox, fundamentally changing how fans across the United States and the United Kingdom consume live sports.

Additional Information

• Sports Business Journal (SBJ):

• It is a leading national weekly trade publication that provides comprehensive coverage of the sports industry, including marketing, media, and facility development.

• The Lifetime Achievement Award is one of its highest honors, previously awarded to icons such as Billie Jean King, Jerry Jones, and Dick Ebersol.

• Career of David Hill:

• Born in Australia, Hill began his career in journalism before moving into television production.

• In the 1990s, he moved to the United States to help launch Fox Sports after the network famously outbid CBS for the NFL's NFC package in 1994.

• He served as the Chairman and CEO of Fox Sports and later as the President of Fox Sports Media Group, overseeing major events like the Super Bowl, World Series, and Daytona 500.

• Technical Innovations:

• Beyond the Fox Box, Hill was instrumental in developing the FoxTrax (the "glowing puck") for the NHL and enhancing the audio quality of NASCAR broadcasts to make viewers feel closer to the action.

• His work emphasized the entertainment aspect of sports, integrating music, dynamic graphics, and innovative camera angles.

Important Points

• Global Influence: Before his success in America, David Hill played a critical role in the 1991 launch of Sky Sports in the United Kingdom, which transformed the English Premier League into a global media powerhouse.

• Industry Impact: The 2025 award highlights his ability to blend technology with storytelling, a legacy that continues to influence every major sports network today, including ESPN, NBC, and Turner Sports.

• Recognition: In addition to the SBJ honor, Hill has won multiple Sports Emmy Awards and is a member of the Sports Broadcasting Hall of Fame (inducted in 2017).

Q89. Answer: (b) Indian AI Research Organization

The correct answer is Indian AI Research Organization.

Key Points

• The Indian AI Research Organization (often referred to in the context of the IndiaAI Innovation Centre) is a pivotal institution designed to be the cornerstone of India’s technological advancement in the field of Artificial Intelligence.

• This organization is scheduled to be established at GIFT City (Gujarat International Finance Tec-City) in Gandhinagar, with operations expected to commence from the beginning of 2026.

• The primary mandate of the organization is to strengthen the domestic AI ecosystem by facilitating high-level collaboration between government bodies, private industry players, and academic institutions.

• It functions as a central part of the IndiaAI Mission, aiming to develop indigenous Foundational Models and Large Language Models (LLMs) tailored to the Indian context and languages.

• The establishment aims to reduce India's dependence on foreign AI technologies by fostering Research and Development (R&D) and creating a robust pipeline for AI talent and intellectual property.

Additional Information

• The IndiaAI Mission: Approved by the Union Cabinet in March 2024, the mission has a total financial outlay of Rs. 10,372.92 crore. It is implemented by the IndiaAI Independent Business Division (IBD) under the Digital India Corporation.

• Computing Infrastructure: A significant portion of the mission involves the IndiaAI Supercomputing Capacity, which aims to establish a high-end scalable AI computing ecosystem with 10,000 or more GPUs (Graphics Processing Units) through public-private partnerships.

• GIFT City, Gandhinagar: As India's first International Financial Services Centre (IFSC) and a dedicated Smart City, it provides a regulatory-friendly environment and world-class infrastructure, making it an ideal location for global tech hubs and research organizations.

• IndiaAI Datasets Platform: This initiative under the mission will provide non-personal datasets to Indian startups and researchers, ensuring they have the high-quality data necessary to train complex AI models.

• Socio-Economic Applications: The research conducted will focus on critical sectors such as Healthcare, Agriculture, and Education, utilizing AI to solve large-scale problems specific to the Indian population and geography.

Important Points

• Ministry Involvement: The initiative is spearheaded by the Ministry of Electronics and Information Technology (MeitY) to ensure India remains competitive in the global AI race.

• Startup Support: The IndiaAI Startup Financing pillar is designed to provide streamlined funding and support for deep-tech startups, enabling them to move from prototypes to commercial products.

• Future Skills: The mission includes IndiaAI FutureSkills, which focuses on increasing the availability of AI courses at undergraduate, graduate, and post-graduate levels to build a workforce of AI professionals.

• Data Governance: The framework emphasizes ethical AI development and data privacy, aligning with India's broader digital governance goals and the Digital Personal Data Protection Act.

Q90. Answer: (d) Rs. 11.21 lakh crore

The correct answer is Rs. 11.21 lakh crore.

Key Points

• The Government of India, under the leadership of Union Finance Minister Nirmala Sitharaman, has significantly increased the outlay for Capital Expenditure (CapEx) to drive economic growth.

• For the upcoming fiscal cycle, the estimated capital expenditure allocation has been set at Rs. 11.21 lakh crore, which is a substantial rise intended to modernize infrastructure across the nation.

• This allocation reflects the government's commitment to the "Viksit Bharat" vision, focusing on long-term asset creation rather than short-term consumption.

• The Rs. 11.21 lakh crore figure represents approximately 3.4% of the Gross Domestic Product (GDP), indicating a massive push towards capital-intensive projects.

• This funding is primarily directed toward the Ministry of Railways, Ministry of Road Transport and Highways, and the Power sector to improve connectivity and logistical efficiency.

Additional Information

• Understanding Capital Expenditure (CapEx):

• Capital Expenditure refers to the funds used by the government to acquire, upgrade, and maintain physical assets such as roads, bridges, tunnels, and railway lines.

• Unlike revenue expenditure, which covers operational costs like salaries and pensions, CapEx has a multiplier effect on the economy, creating jobs and boosting private investment.

• The steady increase from Rs. 10 lakh crore in FY 2023-24 to the current levels demonstrates a consistent strategy of infrastructure-led development.

• Fiscal Deficit and Management:

• The Ministry of Finance aims to manage this high CapEx while maintaining a path of fiscal consolidation.

• The target is to reduce the Fiscal Deficit to below 4.5% by FY 2025-26, balancing growth with financial stability.

• Higher Capital Expenditure is often funded through market borrowings, but the resulting asset creation helps in servicing debt through increased tax revenues in the long run.

Important Points

• Support to State Governments:

• The Union Budget continues the scheme of 50-year interest-free loans to state governments for capital investment.

• An outlay of Rs. 1.3 lakh crore is often earmarked within these broader schemes to encourage states to undertake urban reforms and infrastructure projects.

• Economic Impact:

• Investment in Capital Expenditure is expected to crowd-in private investment, which had been sluggish in previous years.

• Projects like the PM Gati Shakti National Master Plan are integrated with this funding to ensure multi-modal connectivity across

the country.

• Large-scale allocations help in the timely completion of national projects like the Dedicated Freight Corridors and Expressways.

Q91. Answer: (d) Advanced Medium Combat Aircraft

The correct answer is Advanced Medium Combat Aircraft.

Key Points

• The Advanced Medium Combat Aircraft (AMCA) is India's indigenous program to develop a 5.5 Generation stealth multi-role fighter aircraft.

• During Aero India 2025, held at Air Force Station Yelahanka in Bengaluru, the DRDO (Defence Research and Development Organisation) showcased the progress and the stealth features of the AMCA.

• The project is spearheaded by the Aeronautical Development Agency (ADA) in collaboration with Hindustan Aeronautics Limited (HAL).

• It is designed to possess stealth characteristics, including a low Radar Cross-Section (RCS), achieved through a special airframe design, internal weapons bays, and the use of Radar Absorbent Materials (RAM).

• The AMCA is intended to be a twin-engine aircraft capable of supercruise (supersonic flight without using afterburners) and equipped with advanced AESA radar and integrated avionics.

Additional Information

• LCA Tejas Mk-2:

• This is a 4.5-generation medium-weight fighter currently under development to replace the Mirage 2000, Jaguar, and MiG-29 fleets of the Indian Air Force.

• It features a more powerful GE-F414 engine compared to the Mk-1 and has a higher payload capacity.

• TEDBF (Twin Engine Deck Based Fighter):

• This is a carrier-based multi-role combat aircraft being developed for the Indian Navy.

• It is intended to operate from India's indigenous aircraft carrier, INS Vikrant, and the INS Vikramaditya, replacing the MiG-29K.

• Advanced Light Weight Torpedo (ALWT):

• This refers to naval ammunition rather than an aircraft; it is an anti-submarine weapon developed by NSTL (Naval Science and Technological Laboratory) under DRDO.

• Stealth Technology:

• Stealth technology involves techniques used to make aircraft, ships, or missiles less visible to radar, infrared, and sonar detection.

• The AMCA incorporates a "serpentine" intake duct to shield the engine fan blades, which are a major source of radar reflection.

Important Points

• Phased Development: The AMCA is planned to be developed in two phases: Mark-1 (equipped with US-made GE-414 engines) and Mark-2 (which aims to use a more powerful indigenous engine currently being planned in collaboration with international partners).

• Aero India 2025: This is the 15th edition of the biennial air show, serving as a major hub for the "Make in India" initiative in the defense and aerospace sectors.

• Operational Timeline: The first prototype of the AMCA is expected to be rolled out by 2028-2029, with flight testing commencing shortly after.

• Strategic Significance: With the successful induction of AMCA, India will join a select group of nations, including the USA (F-22, F-35), Russia (Su-57), and China (J-20), that possess indigenous fifth-generation stealth fighter technology.

Q92. Answer: (d) Chakshu

The correct answer is Chakshu.

Key Points

• The Government of India launched the Chakshu facility on March 4, 2024, as a significant step towards enhancing citizen security in the telecommunications sector.

• Chakshu is an integrated feature of the Sanchar Saathi portal (sancharsaathi.gov.in), developed by the Department of Telecommunications (DoT).

• The platform allows citizens to proactively report suspected fraudulent communications received through calls, SMS, or social media platforms like WhatsApp. Hence, the statement regarding its function is correct.

• It specifically targets reporting for scams related to KYC updates, bank account or SIM card deactivation threats, gas connection issues, and impersonation of government officials or relatives.

• The initiative aims to create a secure digital ecosystem by allowing the DoT to identify and block mobile numbers and resources used by cyber-criminals before they can cause financial harm.

Additional Information

• Digital Intelligence Platform (DIP):

• Alongside Chakshu, the Union Minister for Communications, Ashwini Vaishnaw, launched the Digital Intelligence Platform (DIP).

• The DIP is a non-public portal designed for real-time information sharing and coordination among Telecom Service Providers (TSPs), Law Enforcement Agencies (LEAs), and Financial Institutions.

• It helps in identifying the misuse of telecom resources and aids in the investigation of cyber-crimes and financial frauds.

• Sanchar Saathi Portal:

• This is a citizen-centric initiative of the Department of Telecommunications to empower mobile subscribers.

• Other key features include CEIR (Central Equipment Identity Register) for blocking lost or stolen mobiles and TAFCOP to check the number of mobile connections taken in one's name.

• Reporting Mechanism:

• If a user has already fallen victim to a financial fraud or cyber-crime, they should not use Chakshu; instead, they must report it to the cyber-crime helpline number 1930 or visit the official portal at www.cybercrime.gov.in.

• Chakshu is strictly for suspected fraud attempts rather than reported losses.

Important Points

• Impact of Telecom Security: Since the inception of the Sanchar Saathi portal, the government has successfully disconnected over 1 crore mobile connections obtained through fraudulent means.

• Legal Framework: These initiatives are backed by the Telecommunications Act, 2023, which provides the necessary legal teeth to handle spam and fraudulent activities.

• Proactive Action: By reporting on Chakshu, a user helps the Department of Telecommunications to trigger re-verification of the suspect number. If the re-verification fails, the SIM card is disconnected immediately.

• Future Scope: The platform is expected to evolve to include AI-based detection of phishing links and automated spam filtering in collaboration with TSPs like Airtel, Jio, and VI.

Q93. Answer: (b) László Krasznahorkai

The correct answer is László Krasznahorkai.

Key Points

• The Swedish Academy announced László Krasznahorkai as the winner of the Nobel Prize in Literature for the year 2025.

• László Krasznahorkai is a highly acclaimed Hungarian novelist and screenwriter known for his demanding and complex prose, often featuring incredibly long sentences and a distinct, recursive style.

• He was awarded the prize for his "enigmatic and grand narratives that capture the intensity of human experience and the disintegration of reality." Hence, the correct answer is László Krasznahorkai.

• His most famous works include the 1985 novel Satantango and the 1989 masterpiece The Melancholy of Resistance, both of which were adapted into acclaimed films by director Béla Tarr.

• With this win, he becomes the second Hungarian author to receive this prestigious honor, following Imre Kertész who won in 2002.

• The author's literary career spans several decades, beginning with his debut in 1977, and he has previously won the International Booker Prize in 2015.

Additional Information

• Ernest Hemingway:

• He was an American novelist and short-story writer who won the Nobel Prize in Literature in 1954.

• He is best known for his "iceberg theory" of writing and classic works like The Old Man and the Sea and A Farewell to Arms. Statement 1 is incorrect as he won in the mid-20th century.

• John Steinbeck:

• An American author who received the Nobel Prize in Literature in 1962.

• His writing often focused on the social and economic issues of the Great Depression, notably in The Grapes of Wrath and Of Mice and Men. Statement 3 is incorrect.

• George Orwell:

• The British author of 1984 and Animal Farm never won a Nobel Prize in Literature during his lifetime.

• He passed away in January 1950, and the Nobel Prize is generally not awarded posthumously. Statement 4 is incorrect.

Important Points

• The Nobel Prize in Literature:

• It has been awarded annually since 1901, according to the will of Alfred Nobel.

• The selection is made by the 18 members of the Swedish Academy based in Stockholm.

• The prize includes a gold medal, a diploma, and a cash award, which in 2024 and 2025 was approximately 11 million Swedish krona (SEK).

• Criteria for the award include the author producing "in the field of literature the most outstanding work in an ideal direction."

• Significance of the 2025 Award:

• The choice of László Krasznahorkai highlights the Swedish Academy's continued interest in deep, philosophical European literature.

• His works are often described as post-modernist and dystopian, reflecting the anxieties of late 20th-century and early 21st-century society.

Q94. Answer: (d) 5.3 years

The correct answer is 5.3 years.

Key Points

• The 2023 Air Quality Life Index (AQLI) report, published by the Energy Policy Institute at the University of Chicago (EPIC), reveals that air pollution is the single greatest threat to human health in India.

• According to the study, the average Indian resident is set to lose 5.3 years of life expectancy due to PM2.5 pollution if current levels persist, relative to the World Health Organization (WHO) guideline of 5 µg/m³.

• The report highlights that 100% of India's population lives in areas where the annual average particulate pollution level exceeds the WHO guideline.

• In comparison to other health risks, particulate pollution reduces life expectancy more than cardiovascular diseases (which shorten life by 4.5 years) and tobacco use (which shortens life by 2.8 years).

• The AQLI data is based on pollution levels recorded in 2021, and it underscores that India is the world's second most polluted country after Bangladesh.

Additional Information

• The Indo-Gangetic Plain (IGP):

• This region is identified as the most polluted area in India, housing more than 500 million people (about 38.9% of the population).

• Residents of the IGP are on track to lose about 7.8 years of life expectancy if the 2021 pollution levels continue.

• Impact on Delhi:

• Delhi is cited as the most polluted city in the world. In the national capital, residents could gain 11.9 years of life expectancy if pollution were reduced to meet the WHO standards.

• Even if India meets its own National Ambient Air Quality Standards (NAAQS) of 40 µg/m³, Delhi residents could still gain 8.5 years of life.

• Definition of PM2.5:

• PM2.5 refers to atmospheric particulate matter that has a diameter of less than 2.5 micrometers.

• These fine particles are hazardous because they can penetrate deep into the lungs and enter the bloodstream, causing respiratory and cardiovascular issues.

• South Asia Context:

• The region of South Asia (including India, Pakistan, Bangladesh, and Nepal) accounts for more than half of the total life years lost globally due to pollution.

• Between 1998 and 2021, average annual particulate pollution in India increased by 67.7%, further reducing life expectancy.

Important Points

• National Clean Air Programme (NCAP):

• Launched in January 2019 by the Ministry of Environment, Forest and Climate Change (MoEFCC), NCAP is a long-term strategy to tackle air pollution.

• The programme initially aimed for a 20% to 30% reduction in PM2.5 and PM10 concentrations by 2024 (taking 2017 as the base year).

• The target was later updated to achieve a 40% reduction in particulate matter concentration in 131 cities by the year 2026.

• WHO Guidelines:

• In September 2021, the World Health Organization updated its Global Air Quality Guidelines (AQGs), reducing the safe annual average limit for PM2.5 from 10 µg/m³ to 5 µg/m³.

• This change reflects the increased scientific evidence of the harmful effects of air pollution even at very low concentrations.

Q95. Answer: (d) Madhav National Park

The correct answer is Madhav National Park.

Key Points

• In March 2025, the Government of India officially notified Madhav National Park as the 58th Tiger Reserve of the country.

• It is located in the Shivpuri district of Madhya Pradesh and spans an area of approximately 354 square kilometers.

• The designation was finalized following the recommendation and approval of the National Tiger Conservation Authority (NTCA)

to ensure better protection and habitat management for the big cats.

• This declaration makes Madhav National Park the eighth tiger reserve in the state of Madhya Pradesh, further strengthening its reputation as India's "Tiger State".

• The primary objective of this designation is to facilitate the re-establishment of a breeding tiger population in the Gwalior-Chambal region, where tigers had historically roamed but had disappeared over the decades.

• Hence, the correct answer is Madhav National Park.

Additional Information

• Panna National Park:

• Located in Panna and Chhatarpur districts of Madhya Pradesh, it was declared a Tiger Reserve in 1994.

• It is famous for its successful Tiger Reintroduction Project started in 2009 after the local tiger population had vanished.

• It is also home to the Ken River, which is part of the Ken-Betwa river linking project.

• Pench National Park:

• This park straddles the border of Madhya Pradesh and Maharashtra. It was designated a Tiger Reserve in 1992.

• It served as the inspiration for Rudyard Kipling's famous work, "The Jungle Book", featuring the character Mowgli.

• The park is named after the Pench River that flows through it from north to south.

• Kuno National Park:

• Located in the Sheopur district of Madhya Pradesh, it gained global attention in September 2022.

• It is the site for the Action Plan for Introduction of Cheetah in India, where African Cheetahs from Namibia and South Africa were released.

• While it hosts a variety of predators, it has not yet been designated as a primary Tiger Reserve.

• Madhav National Park History:

• Established in 1958, it was named after Madho Rao Scindia, the Maharaja of Gwalior.

• The park features the Sakhya Sagar Lake, a Ramsar site, and the George Castle, built at the highest point for King George V.

Important Points

• Project Tiger: Launched on April 1, 1973, from Jim Corbett National Park, it is a major conservation program to protect the National Animal of India.

• National Tiger Conservation Authority (NTCA): A statutory body constituted under the Wildlife (Protection) Act, 1972, responsible for the management of Tiger Reserves.

• Conservation Status: Tigers are listed as Endangered on the IUCN Red List and are included in Schedule I of the Wildlife (Protection) Act, 1972.

• Ecological Corridor: The Madhav Tiger Reserve is vital as it acts as a bridge between the Ranthambore Tiger Reserve in Rajasthan and the Kuno-Panna landscape, facilitating the natural dispersal of wildlife.

• Tiger Census: India conducts a National Tiger Estimation every four years. According to recent reports, India holds more than 75% of the world's wild tiger population.

Q96. Answer: (b) Deepti Sharma

The correct answer is Deepti Sharma.

Key Points

• The ICC Women's Cricket World Cup 2025 was the 13th edition of the premier 50-over international tournament, hosted by India across various iconic venues.

• Deepti Sharma was adjudged the Player of the Tournament for her remarkable consistency and all-round brilliance throughout the competition. Hence, statement 2 is correct.

• As a versatile off-spinner and left-handed batter, she played a pivotal role in India's journey to winning their maiden World Cup title, contributing significantly in both departments.

• During the tournament, Deepti Sharma scalped 18 wickets at an impressive economy rate and scored over 300 runs, often anchoring the middle order during pressure situations.

• Her ability to deliver under pressure was most evident in the semi-finals and finals, where her tactical bowling in the middle overs restricted the opposition's scoring rate.

• Jemimah Rodrigues provided stability to the batting order and played several match-winning cameos, but she was not the recipient of the tournament's top individual honor. Hence, statement 1 is incorrect.

• Shafali Verma was known for her explosive starts at the top of the order, providing India with high-scoring powerplays, yet she did not win the overall player award. Hence, statement 3 is incorrect.

• Smriti Mandhana finished as one of the highest run-scorers of the tournament, hitting multiple centuries, but the Player of the Tournament was awarded to Sharma for her dual-role impact. Hence, statement 4 is incorrect.

Additional Information

• ICC Women’s Cricket World Cup:

• The Women’s World Cup is the oldest world championship in cricket, with the first edition held in England in 1973, two years before the first men's tournament.

• The 2025 edition marked a significant milestone as India hosted the event solely, boosting the popularity of women's sports in the subcontinent.

• Historically, Australia has been the most successful team, winning the title 7 times prior to the 2025 event.

• Deepti Sharma’s Career Highlights:

• Born in Agra, Uttar Pradesh, she made her international debut in 2014.

• She holds the record for the highest individual score by an Indian woman in ODIs, scoring 188 against Ireland in 2017.

• She is a prominent figure in franchise cricket, representing teams in the Women’s Premier League (WPL) and The Hundred.

Important Points

• Smriti Mandhana, who captained a few matches and opened the batting, was the vice-captain of the Indian team during this victorious campaign.

• The 2025 World Cup Final was held at the Narendra Modi Stadium in Ahmedabad, witnessing a record-breaking crowd for a women’s cricket match in India.

• The International Cricket Council (ICC) increased the prize money for the 2025 tournament to ensure pay parity with the men’s equivalent events, a historic move for the sport.

• Other notable performers included Sophie Ecclestone (England) for bowling and Beth Mooney (Australia) for batting, who were also in contention for the top award.

Q97. Answer: (d) Gurjar Mahendra

The correct answer is Gurjar Mahendra.

Key Points

• Gurjar Mahendra etched his name in the history books by setting a new world record in the men's javelin F42 category.

• This feat was achieved during the 2025 World Para Athletics (WPA) Grand Prix, which was held in Dubai, United Arab Emirates.

• He recorded a monumental throw of 61.17 meters, surpassing previous benchmarks in the F42 classification. Hence, the correct answer is Gurjar Mahendra.

• The F42 category is designated for para-athletes with lower limb impairments, such as leg length differences or impaired muscle power, which affects their movement but allows them to compete from a standing position.

• Mahendra's achievement is a significant milestone for Indian para-sports, showcasing the high level of technical skill and physical preparation among Indian field athletes.

• The 2025 WPA Grand Prix serves as a critical qualification event for the upcoming World Para Athletics Championships, making this record-breaking performance even more vital for his career trajectory.

Additional Information

• World Para Athletics Grand Prix:

• The Grand Prix series is a global circuit of elite competitions organized under the International Paralympic Committee (IPC).

• The Dubai Grand Prix, also known as the Fazza International Para Athletics Championships, is one of the premier stops in the circuit, often hosting hundreds of athletes from over 60 countries.

• These events provide athletes with the opportunity to achieve world rankings and meet Minimum Entry Standards (MES) for the Paralympic Games.

• Para-Athletics Classifications (Javelin):

• F42: This class is for athletes with a single leg impairment above the knee or a combination of limb deficiencies that result in similar functional limitations.

• Sumit Antil (F64): He is one of India's most famous para-athletes who holds the world record in the F64 category (athletes with a leg amputation competing with prosthetics). He won gold medals at the Tokyo 2020 and Paris 2024 Paralympics.

• F40/F41: These classes are for athletes of short stature (dwarfism). Athletes like Ravi Rangoli have competed in these categories for India in various field events.

• Growth of Para-Sports in India:

• The Government of India, through the Target Olympic Podium Scheme (TOPS), provides specialized training, foreign exposure, and financial assistance to elite para-athletes.

• The Paralympic Committee of India (PCI) is the national governing body responsible for selecting and training athletes for international meets like the WPA Grand Prix.

Important Points

• The 61.17 m throw by Gurjar Mahendra is particularly impressive as it signifies a leap in the performance standards for the F42 class, which historically had lower distances compared to the F64 or F46 classes.

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• Other Indian athletes like Pingane Mina Vilas also participated in the 2025 Dubai event, contributing to India's overall medal tally at the Grand Prix.

• Records set at WPA Grand Prix events are officially recognized by World Para Athletics for the purpose of world rankings and seeding in major championships.

• The year 2025 is a crucial year for athletes to build momentum heading into the next Asian Para Games and the 2028 Los Angeles Paralympics cycle.

Q98. Answer: (d) Rajasthan border

The correct answer is Rajasthan border.

Key Points

• Operation Alert was officially launched by the Border Security Force (BSF) in August 2025 to enhance security and vigilance along the International Border (IB) between India and Pakistan.

• The primary focus of this intensive security exercise was the Rajasthan border, which includes critical sectors such as Jaisalmer, Barmer, Bikaner, and Sri Ganganagar.

• This operation is traditionally carried out in the days leading up to Independence Day on 15 August to prevent any attempts of infiltration, smuggling, or anti-national activities by terrorist elements during the national festival.

• During Operation Alert, the BSF increases its manpower on the frontline, deploying even those personnel usually assigned to administrative tasks to ensure 24/7 surveillance and patrolling.

• The operation involves advanced electronic surveillance, increased camel patrolling in the Thar Desert, and coordination with local police and intelligence agencies to maintain a high state of readiness.

Additional Information

• Border Security Force (BSF):

• The BSF was established on 1 December 1965 following the Indo-Pak War to ensure the security of the borders of India.

• It is one of the five Central Armed Police Forces (CAPF) and is under the administrative control of the Ministry of Home Affairs.

• The BSF is currently responsible for guarding the 3,323 km long India-Pakistan border and the 4,096 km long India-Bangladesh border.

• Geographical Context of Rajasthan Border:

• The International Border in Rajasthan spans approximately 1,037 km.

• The terrain is characterized by shifting sand dunes of the Thar Desert, making it a challenging environment for surveillance, requiring specialized units like the BSF Camel Contingent.

• Related Operations:

• Apart from Operation Alert, the BSF conducts Operation Sard Hawa during the winter months (usually January) to counter infiltration during periods of thick fog along the western border.

• These exercises are crucial for testing the operational efficiency of surveillance equipment and the physical readiness of the jawans in extreme weather conditions.

Important Points

• Strategic Importance: The Rajasthan border is strategically sensitive due to its proximity to Pakistan's Sindh and Punjab provinces.

• Technology Integration: Under the Comprehensive Integrated Border Management System (CIBMS), the BSF utilizes drones, thermal imagers, and underground sensors to monitor the Rajasthan frontier.

• Public Safety: Such operations also aim to boost the confidence of the civilian population living in the border villages by showcasing the strength and presence of the armed forces.

Q99. Answer: (c) West Bengal Clinical Establishments (Registration, Regulation and Transparency) (Amendment) Bill, 2025

The correct answer is West Bengal Clinical Establishments (Registration, Regulation and Transparency) (Amendment) Bill, 2025.

Key Points

• The West Bengal Legislative Assembly passed the West Bengal Clinical Establishments (Registration, Regulation and Transparency) (Amendment) Bill, 2025 in June 2025 to address the rising costs of private healthcare.

• The primary objective of this amendment is to cap healthcare expenses and regulate the charges for various medical services in private hospitals and nursing homes across the state.

• It focuses on ensuring transparency in billing, particularly regarding diagnostic tests, bed charges, and the cost of medicines, which have often been reported as exorbitant.

• The bill grants additional powers to the West Bengal Clinical Establishment Regulatory Commission (WBCERC) to enforce these price caps and investigate complaints of overcharging.

• This legislation aims to protect patients from financial exploitation while maintaining a standard of quality healthcare delivery

within the private sector.

Additional Information

• The 2017 Parent Act:

• The West Bengal Clinical Establishments (Registration, Regulation and Transparency) Act was first enacted in 2017 to replace the older 2010 Act.

• It was designed to bring private clinical establishments under a strict regulatory framework to ensure better patient care and accountability.

• The 2017 Act mandated the creation of the WBCERC, which serves as a grievance redressal body for patients and their families.

• Regulatory Commission Functions:

• The WBCERC is headed by a retired High Court Judge and includes members from the medical, administrative, and social service fields.

• It has the authority to award compensation to victims of medical negligence or those who have been overcharged by clinical establishments.

• The commission can also cancel the registration of a hospital if it fails to comply with the state-mandated guidelines.

Important Points

• Specific Caps and Slabs: The 2025 Amendment introduces standardized price slabs for common surgeries and ICU (Intensive Care Unit) facilities to prevent arbitrary pricing by different hospitals.

• Mandatory Disclosures: Under the new provisions, every clinical establishment must display a detailed price list in Bengali, English, and Hindi at a prominent location within the premises.

• Penalties for Violation: Establishments found violating the cost-capping norms may face a fine ranging from Rs. 1 lakh to Rs. 20 lakh, or even the suspension of their trade license.

• Patient Rights: The bill reinforces the Charter of Patient Rights, emphasizing that no patient should be denied emergency treatment due to an inability to pay an immediate deposit.

• Universal Healthcare Vision: This move is part of the state's broader vision, led by Chief Minister Mamata Banerjee, to integrate private healthcare resources with public welfare goals, similar to the Swasthya Sathi scheme.

Q100. Answer: (a) Kuno National Park

The correct answer is Kuno National Park.

Key Points

• The milestone event of an India-born female cheetah giving birth to five cubs occurred in Kuno National Park in November 2025. This represents the successful establishment of the second generation of cheetahs on Indian soil.

• Project Cheetah is the world’s first intercontinental large wild carnivore translocation project, which was officially launched by the Prime Minister on September 17, 2022.

• The project involved bringing cheetahs from Namibia (8 cheetahs) and South Africa (12 cheetahs) to restore the species in India after it was declared extinct in the country in 1952.

• Kuno National Park is located in the Sheopur and Morena districts of Madhya Pradesh. It was selected because of its suitable grassland-woodland habitat and adequate prey base.

• The birth of cubs to an India-born mother is considered a critical indicator of the long-term success of the reintroduction program, proving that the translocated population can successfully mature and reproduce in the local environment.

Additional Information

• Gir National Park:

• Located in Gujarat, it is the only natural habitat in the world where Asiatic Lions are found.

• It was established in 1965 and plays a vital role in the conservation of the Panthera leo leo subspecies.

• Ranthambore National Park:

• Situated in the Sawai Madhopur district of Rajasthan, it is one of the most famous Tiger Reserves in India.

• It is located at the junction of the Aravalli and Vindhya hill ranges and is known for its diurnal Bengal Tigers.

• Bandipur National Park:

• Located in the state of Karnataka, it was established as a tiger reserve under Project Tiger in 1973.

• It is a part of the Nilgiri Biosphere Reserve and is known for its significant population of Elephants and Tigers.

• Cheetah Extinction in India:

• The cheetah was officially declared extinct from India in 1952 due to over-hunting and habitat loss.

• The last physical evidence of the Asiatic cheetah in India was recorded in 1947 in the Korea district of present-day Chhattisgarh.

Important Points

• Geographical Features of Kuno: The park spans an area of approximately 748 square kilometers. It is characterized by Kardhai, Khair, and Salai trees and is intersected by the Kuno River, which is a major tributary of the Chambal River.

• Monitoring and Management: The cheetahs in Kuno are monitored 24/7 using satellite radio collars and dedicated ground teams to ensure their safety and health within the acclimatization bomas and the open forest.

• Species Difference: The cheetahs introduced in Kuno are African Cheetahs (Acinonyx jubatus jubatus), as the Asiatic Cheetah population is currently restricted only to Iran and is too small to permit translocation.

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