RRB Group D Official Paper (Held On: 12 Dec, 2025 Shift 3) (Previous Year Paper)

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

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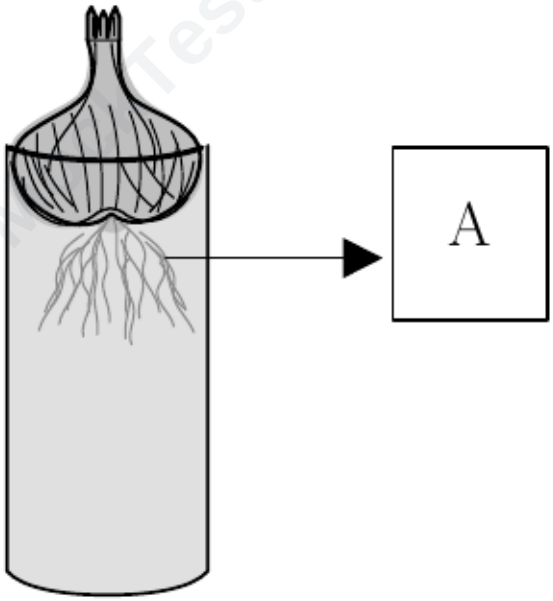
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GENERAL SCIENCE

Q1. Study the experimental set up containing a water filled jar and an onion with growing roots set vertically up. Which type of tissue is present in the portion A of roots tips?



(a) Sclerenchyma
(b) Collenchyma
(c) Meristematic tissue
(d) Parenchyma

Q2. An increase of molecular mass in any homologous series indicates:

(a) decrease melting point and increases boiling point
(b) decrease melting and boiling points
(c) increase melting point and decrease boiling point
(d) increase melting and boiling points

Q3. An electric iron of resistance 15 Ω is connected to 220 V supply. How much heat will be produced in one minute?

(a) 194 kJ
(b) 1.94 kJ
(c) 200 kJ
(d) 500 kJ

Q4. In liquids, a small fraction of particles at the surface, having higher kinetic energy, which is able to break away from the forces of attraction of other particles, will ultimately get converted into which state?

(a) Vapor
(b) Solid
(c) Sublimation
(d) Deposition

Q5. Which of the following is correct if the egg is NOT fertilised with the sperm?

(a) Uterus lining becomes thin
(b) Uterus lining slowly breaks, sheds as blood and mucous
(c) Uterus lining is unaffected
(d) Uterus lining becomes thick and spongy

Q6. Which of the following statements correctly distinguishes a compound from a solution?

(a) Both compound and solution are always homogeneous and chemically bonded.
(b) A compound has a fixed composition and properties distinct from its constituent elements, unlike a solution.
(c) A compound has a variable composition, while a solution has a fixed composition.
(d) A compound can be separated into its components by physical methods, while a solution cannot.

Q7. Match the following animal tissues with their correct features.

a.Squamous Epithelium	**i. Cells are thin and flat and form a delicate lining of the oesophagus**
1. Stratified Squamous Epithelium	ii. It forms the inner lining of the respiratory tract
1. Cuboidal Epithelium	iii. It forms the lining of kidney tubules and ducts of salivary glands
1. Ciliated Columnar Epithelium	Cells are arranged in many layers, as in skin

(a) a iv, b i, c ii, d iii
(b) a i, b iv, c iii, d ii
(c) a iv, b i, c iii, d ii
(d) a i, b iii, c ii, d iv

Q8. A ball of mass 3 kg is placed on a shelf 2 m above the ground. The gravitational potential energy of the ball is (take g = 10 m/s^2):

(a) 30 J
(b) 6 J
(c) 60 J
(d) 300 J

Q9. Which of the following lenses can be used to correct the eye defect myopia?

(a) Cylindrical lens
(b) Convex lens
(c) Plano-convex lens
(d) Concave lens

Q10. The bad taste or smell from the leftover food is caused due to:

(a) the oxidation of fats and oil
(b) the oxidation of sugar
(c) the oxidation of proteins
(d) the oxidation of carbohydrates

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Q11. If the speed of sound in air is 344 m/s, what is the minimum distance required for an observer to hear a distinct echo?

(a) 344 m
(b) 17.2 m
(c) 0.1 m
(d) 34.4 m

Q12. Which of the following is NOT the use of bleaching powder?

(a) as an oxidising agent in many chemical industries
(b) for removing permanent hardness of water
(c) to make drinking water free from germs
(d) for bleaching cotton and linen in the textile industry

Q13. A ball is thrown vertically upwards at a speed of 2 m/s. What will be the maximum height attained and velocity of the body at the highest point, respectively, of the ball?

(Take g = 10 m/s²)

(a) 5 m and 2 m/s
(b) 0.2 m and 0 m/s
(c) 0.2 m and 2 m/s
(d) 5 m and 0 m/s

Q14. Which material is generally used for making resistance wires because it has high resistance and high melting point?

(a) Aluminium
(b) Nichrome
(c) Copper
(d) Silver

Q15. Which of the following particles contribute to the mass number?

(a) Electrons and Protons
(b) Protons and Neutrons
(c) Electrons only
(d) Protons only

Q16. Which of the following metals forms a protective oxide layer on its surface when exposed to air, preventing further corrosion?

(a) Calcium
(b) Aluminium
(c) Sodium
(d) Magnesium

Q17. A car starts from rest is accelerated to a velocity of 60 km/hr in 5 minutes. What is the acceleration of the car?

(a) 0.055 m/s2
(b) 0.025 m/s2
(c) 1 m/s2
(d) 12 m/s2

Q18. In uniform circular motion, which of the following physical quantities remains constant?

(a) Acceleration
(b) Speed
(c) Velocity
(d) Centripetal force

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Q19. According to the sign convention for lenses, all distances measured in the direction of incident light are taken as:

(a) zero
(b) depends on the type of lens
(c) positive
(d) negative

Q20. From the given alternatives, which part of the flower finally changes into a fruit in the flowering plant?

(a) Seed
(b) Flower
(c) Ovary
(d) Ovule

Q21. Through which of the following ways can scientists incorporate desirable characters into crop varieties?

(a) Weed control
(b) Fertilisers
(c) Irrigation
(d) Hybridisation

Q22. In poultry farming, what are the primary purposes for developing improved breeds?

(a) Only manure production
(b) Wool and milk production
(c) Egg and meat production
(d) Decoration and sports

Q23. Budding in Hydra is best classified as:

(a) sexual reproduction
(b) asexual reproduction
(c) fission
(d) fragmentation

Q24. Which type of epithelial tissue is found lining the kidney tubules?

(a) Columnar Epithelium
(b) Skeletal Epithelium
(c) Glandular Epithelium
(d) Cuboidal Epithelium

Q25. Carbon forms a very large number of compounds due to two unique properties. Which of the following correctly identifies these properties?

(a) High melting point and ductility
(b) Good conductivity and sonorous nature
(c) Allotropy and isomerism
(d) Catenation and tetravalency

MATHEMATICS

Q26. Which of the given values can x NOT take without changing the mode in the following data set?

{1, 2, 3, 3, 7, 8, 9, 3, 11, x, 17, 11, 13}

(a) 2
(b) 13
(c) 3
(d) 11

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Q27. Two trains, 259 m and 231 m in length, are running in opposite directions. The first runs at the rate of 55 km/hr and the second at the rate of 71 km/hr. How long will they take to cross each other?

(a) 17 seconds
(b) 11 seconds
(c) 16 seconds
(d) 14 seconds

Q28. If 20% of a number is added to 78, then the result is the same number. 70% of the same number is:

(a) 98.25
(b) 88.25
(c) 78.25
(d) 68.25

Q29. The income of Raman is Rs. 43,500. He saves 17% of his income. If his income increases by 18% and expenditure increases by 20%, then his savings will:

(a) decrease by Rs. 608
(b) increase by Rs. 606
(c) decrease by Rs. 604
(d) increase by Rs. 609

Q30. A person's salary is first reduced by 30% and then increased by 40%. What is the overall percentage decrease in his salary?

(a) 5%
(b) 2%
(c) 1%
(d) 3%

Q31. Aditya can do 1/6 th of a piece of work in 5 days and Bhagawan can do 1/5 th of the same work in 11 days.Find the number of days taken to complete the work if both work together. (Rounded off to one decimal place)

(a) 19.4
(b) 23.1
(c) 15.4
(d) 18.9

Q32. The curved surface area of a cylinder of height 12 cm is 602.88 cm^2. If the radius of the cylinder is doubled and its height is increased by 25%, then find the ratio between the original volume to the new volume of the cylinder.
(Use $\pi = 3.14$)

(a) 2 : 3
(b) 4 : 9
(c) 1 : 5
(d) 3 : 7

Q33. A son's present age is two-fifths of the age of his father. After 8 years from now, his age will be one-half of the age of his father. How old (in years) is the father at present?

(a) 40
(b) 45
(c) 44
(d) 42

Q34. A building casts a shadow of length 46 m, when the angle of elevation of the sun is 60^o .Find the height of the building. (Use $\sqrt{3}=1.7$)

(a) 82.4 m
(b) 66.4 m
(c) 56.2 m
(d) 78.2 m

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Q35. A woman travelled at a speed of 20 m/min for 80 min, and at a speed of 56 m/min for 64 min. Her average speed (in m/min) is:

(a) 40
(b) 29
(c) 42
(d) 36

Q36. One pipe can fill a tank in 2 minutes, while another pipe can empty the completely filled tank in 4 minutes. If both the pipes are opened together when the tank is empty, how many minutes will it take to fill one-fourth of the tank?

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

Q37. The value of 5/14 × 14/(7/5 ÷ 7/11 of 21/5) is :

(a) 1/5
(b) 5/14
(c) 1
(d) 5

Q38. What is the value of x in the following equation?

x ÷ 0.45 = 2660

(a) 1971
(b) 1179
(c) 1197
(d) 1195

Q39. A cricketer has an average of 62 runs over 5 innings. If he scores 296 runs in the 6^(th) inning, by how many runs does his average score increase?

(a) 39
(b) 30
(c) 37
(d) 36

Q40. In triangle ABC, BD perpendicular to AC at D and angle DBC = 14°. E is a point on BC such that angle CAE = 75°. What is the measure of angle AEB ?

(a) 136°
(b) 151°
(c) 166°
(d) 137°

Q41. If an item marked at Rs. 4,820 is sold for Rs. 4,338, then what is the discount percentage?

(a) 8%
(b) 10%
(c) 9%
(d) 11%

Q42. The sum of two numbers is 45 and their difference is 13. Find the smaller number.

(a) 15
(b) 13
(c) 16
(d) 12

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Q43. The length, breadth, and height of a rectangular box are in the ratio 8 : 7 : 5. If the volume of the box is 2240 cm^3, find the total surface area (in cm^2, round off to the nearest tens) of the box.

(a) 1140
(b) 960
(c) 1250
(d) 1050

Q44. Two banks, A and B, offered loans at 3.5% and 7% per annum, respectively. Mahesh borrowed an amount of Rs. 4,60,000 from each bank. Find the positive difference (in Rs.) between the amounts of simple interest paid to the two banks by Mahesh after 2 years.

(a) 31,700
(b) 33,700
(c) 32,200
(d) 33,200

Q45. Aarti, Anil and Naveen started a business in partnership, investing in the ratio of 17:6:17, respectively. At the end of the year, they earned a profit of Rs. 78,600, which is 20% of their total investment. How much did Anil invest (in Rs.)?

(a) 58,788
(b) 58,950
(c) 58,838
(d) 58,880

Q46. Prakhar and Riya together invested Rs. 35,600 in a business. At the end of the year, out of a total profit of Rs. 5,000, Prakhar's share was Rs. 2,300. What was Prakhar's investment?

(a) Rs. 16,390
(b) Rs. 16,675
(c) Rs. 16,376
(d) Rs. 16,235

Q47. If three numbers are in the ratio 3 : 5 : 7 and their total sum is 510, what is the greatest number that can exactly divide all three numbers?

(a) 34
(b) 33
(c) 32
(d) 35

Q48. A shopkeeper marks his goods at X% above the cost price and sells them at a discount of 35%. If he makes a profit of 69%, find the value of X.

(a) 161
(b) 162
(c) 160
(d) 159

Q49. If $8x^2 + 2y^2 + 18z^2 - 4xy - 6yz - 12zx = 0$, then find x : y : z.

(a) 7 : 6 : 4
(b) 2 : 3 : 5
(c) 3 : 4 : 5
(d) 3 : 6 : 2

Q50. Rizwan buys 3 watches, all with the same price, for a total of Rs. 4,800. He sells the first at a profit of Rs. 200, the second at a loss of Rs. 100, and the third at a profit of Rs. 150. What is the overall profit or loss percentage? (Round off to two decimal places)

(a) 5.21% loss
(b) 4.31% loss
(c) 4.31% profit

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(d) 5.21% profit

GENERAL INTELLIGENCE & REASONING

Q51. Refer to the number and symbol series given below and answer the question that follows. Counting to be done from left to right only.

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

(Left) # 9 & 5 1 © * * * @ # & 7 & # $ 8 & 3 1 @ € (Right)

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

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

Q52. What should come in place of the question mark (?) in the given series, based on the English alphabetical order?

RUY PSW NQU LOS ?

(a) JMR
(b) JMQ
(c) JNQ
(d) JNR

Q53. If + means -, - means x, x means ÷, ÷ means +, then what will come in place of the question mark (?) in the following equation?

23 - 15 ÷ 246 + 318 x 6 = ?

(a) 562
(b) 554
(c) 546
(d) 538

Q54. Read the given statements and conclusions carefully. Assuming that the information given in the statements is true, even if it appears to be at variance with commonly known facts, decide which of the given conclusions logically follow(s) from the statements.

Statements:

All kites are banks.

No pencils are kites.

Conclusions:

(I) Some banks are not pencils.

(II) All banks are kites.

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

Q55. Select the pair that follows the same pattern as the one followed by the two pairs given below. Both pairs follow the same pattern.

OPM−KLI

YZW−UVS

(a) BCZ−XYV
(b) BCZ−WYU
(c) BBX−XYV
(d) BBX−WXU

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Q56. What will come in the place of the question mark (?) in the following equation, if '+' and '−' are interchanged and '×' and '÷' are interchanged?

34 - 7 ÷ 6 + 270 × 9 = ?

(a) 44
(b) 42
(c) 46
(d) 48

Q57. Mr. Z starts from Point A and drives 12 km towards the East. He then takes a right turn, drives 17 km, then turns right and drives 32 km. He then takes a right turn and drives 7 km. He then taken a right turn, drives 10 km, then turns left and drives 4 km. He takes a final right turn, drives 10 km, and stops at Point P. How far (shortest distance) and towards which direction should he drive in order to reach Point A again? (All turns are 90-degree turns only, unless specified.)

(a) 6 km to the South
(b) 6 km to the North
(c) 7 km to the North
(d) 7 km to the South

Q58. IB 15 is related to NF 12 in a certain way. In the same way, OH 20 is related to TL 17. To which of the given options is RK 26 related, following the same logic?

(a) WQ 24
(b) UN 24
(c) WO 23
(d) VN 23

Q59. Town X is to the west of Town Y. Town Z is to the north of Town Y. Town W is to the west of Town Z. Town V is to the south of Town W. Town X is to the north-west of Town V. What is the position of Town X with respect to Town W?

(a) North-west
(b) South-east
(c) South-west
(d) North-east

Q60. Refer to the given series and answer the question that follows. All numbers are single digit numbers only. Counting to be done from left to right.

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

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

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

Q61. 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) 4 8 7 4 1 2 6 9 5 3 1 4 (Right)

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

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

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Q62. F, G, H, I, M, N, and O are sitting around a circular table, facing the centre of the table. Only two people sit between F and G, when counted from the right of F. Only two people sit between G and M, when counted from the right of G. Only three people sit between F and N, when counted from the right of F. H sits to the immediate left of I. Who sits third to the left of O?

(a) H
(b) G
(c) F
(d) I

Q63. In a certain code language, 'LEASK' is coded as '76432' and 'KASEY' is coded as '46837'. What is the code for 'L' in the given code language?

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

Q64. Based on the English alphabetical order, three of the following four letter-clusters are alike in a certain way and thus form a group. Which letter-cluster DOES NOT belong to that group? (Note: The odd one out is not based on the number of consonants/vowels or their position in the letter-cluster.)

(a) TPL
(b) UQM
(c) ROJ
(d) VRN

Q65. A, B, C, D, W, X and Y are sitting in a straight line facing north. Only three people sit to the left of D. Only A sits to the right of C. Only three people sit between C and B. X sits at some place to the left of Y but at some place to the right of W. How many people sit between W and Y?

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

Q66. Based on the English alphabetical order, three of the following four letter-clusters are alike in a certain way and thus form a group. Which letter-cluster DOES NOT belong to that group? (Note: The odd one out is not based on the number of consonants/vowels or their position in the letter-cluster.)

(a) TXZ
(b) GKM
(c) AFG
(d) WAC

Q67. Refer to the number series given below and answer the question that follows. Counting to be done from left to right only.

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

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

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

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

Q68. Seven boxes D, E, F, U, V, W and X are kept one over the other but not necessarily in the same order. D is kept immediately above V. W is kept immediately above F. Only U is kept above E. Only one box is kept between U and D. W is not kept at third position from the bottom. How many boxes are kept between X and U?

(a) Three

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

Q69. In a certain code language,
A ± B means ‘A is the wife of B’,
A * B means ‘A is the son of B’,
A Rs. B means ‘A is the father of B’,
and A # B means ‘ A is the sister of B’.
How is D related to O if 'D # R * A ± C Rs. O’ ?
(a) Daughter
(b) Mother
(c) Sister
(d) Wife

Q70. What should come in place of the question mark (?) in the given series?
110 109 111 108 112 107 ?
(a) 113
(b) 119
(c) 115
(d) 117

Q71. What should come in place of the question mark (?) in the given series?
66 56 46 36 26 ?
(a) 13
(b) 14
(c) 16
(d) 15

Q72. A, B, C, D, E and F are sitting around a circular table facing the centre. B sits second to the right of A. D sits second to the left of E. C is on the immediate right of B. Who is sitting on the immediate right of F?
(a) D
(b) B
(c) E
(d) C

Q73. GB 16 is related to KE 13 in a certain way. In the same way, MH 25 is related to QK 22. To which of the given options is SN 28 related, following the same logic?
(a) WP 25
(b) YQ 26
(c) WQ 25
(d) XP 26

Q74. Deepali ranked 9^(th) from the top and 43^(rd) from the bottom in her class. How many students are there in the class?
(a) 41
(b) 21
(c) 51
(d) 53

Q75. In a certain code language, ‘the dog barks’ is coded as ‘av ds tw’ and ‘dog can run’ is coded as ‘rd te av’. How is ‘dog’ coded in the given language?
(a) ds
(b) te

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(c) av
(d) tw

Q76. What will come in place of the question mark (?) in the following equation, if '+' and '−' are interchanged and '×' and '÷' are interchanged?

25 × 5 − 7 ÷ 8 + 10 = ?

(a) 49
(b) 50
(c) 51
(d) 53

Q77. Which of the following letter-number clusters will replace the question mark (?) in the given series to make it logically complete?

HDP 1, JEM -2, LFJ 4, NGG -8, ?

(a) HJP 14
(b) PPO 11
(c) OPP 12
(d) PHD 16

Q78. 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 golds are hens.

No hen is a cow.

Conclusions:

(I) No gold is a cow.

(II) Some cows are hens.

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

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

71 75 83 95 111 ?

(a) 121
(b) 151
(c) 141
(d) 131

Q80. 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.)

(11, 110, 10)

(8, 64, 8)

(a) (12, 120, 10)
(b) (7, 56, 7)
(c) (9, 72, 9)
(d) (10, 80, 9)

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GENERAL AWARENESS AND CURRENT AFFAIRS

Q81. In which of the following years did the Government of India launch the National Critical Mineral Mission?

(a) 2025
(b) 2017
(c) 2021
(d) 2023

Q82. Where will the Billie Jean King Cup Finals be hosted from 2025–2027?

(a) Beijing, China
(b) Shenzhen, China
(c) Seoul, South Korea
(d) Tokyo, Japan

Q83. Where was the Fit India Carnival 2025 held?

(a) India Gate, New Delhi
(b) Jawaharlal Nehru Stadium, New Delhi
(c) Indira Gandhi Indoor Stadium, New Delhi
(d) Red Fort, New Delhi

Q84. Which of the following two countries will co-host the ICC Men's T20 World Cup 2026?

(a) India and Sri Lanka
(b) Sri Lanka and Pakistan
(c) India and Bangladesh
(d) India and UAE

Q85. When was the Union Government of India approved the establishment of the Eighth Pay Commission?

(a) March 2025
(b) April 2025
(c) February 2025
(d) January 2025

Q86. Which authority introduced updated rules for biological resource regulation in India in 2025?

(a) International Eco Research Forum
(b) Central Pollution Control Board
(c) National Environmental Council
(d) National Biodiversity Authority

Q87. Which traditional Islamic purpose aligns with the Waqf (Amendment) Act's 2025 focus on widows' and orphans' welfare?

(a) Madarsa development
(b) Waqf-alal-aulad principle
(c) Nikah registration
(d) Zakat donation

Q88. What rank did India secure in UNICEF's 'The State of the World's Children 2024' report, spotlighting the severe climate risks facing its children?

(a) 54th
(b) 26th
(c) 32nd
(d) 11th

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Q89. Which Bollywood actor announced his comeback with the film Duniyadari in 2025?

(a) Neeraj Shah
(b) Govinda
(c) Mithun Chakraborty
(d) Sanjay Dutt

Q90. Which award recognised Kelly Slater for his lifelong contributions to sport in April 2025?

(a) ESPN Lifetime Honour
(b) Laureus World Sportsman
(c) Laureus Lifetime Achievement Award
(d) Olympic Order

Q91. In January 2025, which of the following states signed an MoU with State Bank of India and Union bank of India to offer zero-premium insurance to government employees?

(a) Maharashtra
(b) Gujarat
(c) Uttar Pradesh
(d) Assam

Q92. An all-women team from the Indian Army, Navy, and Air Force has successfully returned from the country's first-ever international open-sea sailing expedition to Seychelles in June 2025.What is the name of the indigenously-built Indian Armed Services Vessel used for this Sailing Expedition?

(a) Ganga
(b) Durga
(c) Triveni
(d) Bhagirathi

Q93. In the short duration hot test of the semi-cryogenic engine conducted on 24 April 2025 by the Indian Space Research Organisation (ISRO), to validate the engine start-up sequence, the Engine Power Head Test Article was subjected to a hot test for a duration of _____.

(a) 6.5 seconds
(b) 4.5 seconds
(c) 3.5 seconds
(d) 5.5 seconds

Q94. The joint maritime drill between the Indian Navy and the Royal Navy that began on 05 October 2025 along India's western seaboard was known as _____.

(a) Operation Abhyaas-25
(b) ZAPAD-25
(c) Yudh Abhyas-25
(d) KONKAN-25

Q95. 'Expanding Quality Higher Education through States and State Public Universities' is a report released in February 2025 by:

(a) NITI Aayog
(b) IIT Bombay
(c) University Grants Commission
(d) Ministry of Education

Q96. In which state was the Rajiv Gandhi Van Samvardhan Yojana launched in June 2025?

(a) Himachal Pradesh
(b) Uttarakhand
(c) Haryana
(d) Punjab

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Q97. Who set a new national record in the men's 10,000 metres at the Ten 2025 athletics meet held in San Juan Capistrano, USA?

(a) Avinash Sable
(b) Gulveer Singh
(c) Kartik Kumar
(d) Gopi T

Q98. Which of the following banks revived its special Fixed Deposit (FD) scheme, known as 'Amrit Vrishti,' with a 444-day tenure, effective from 15 April 2025?

(a) Bank of Baroda
(b) Punjab National Bank
(c) Canara Bank
(d) State Bank of India

Q99. As announced in May 2025, in which of the following states of India, will the first Artificial Intelligence Special Economic Zone be set up?

(a) Gujarat
(b) Telangana
(c) Haryana
(d) Chhattisgarh

Q100. Which gymnast was named Sportswoman of the Year for the fourth time at the Laureus Awards?

(a) Simone Biles
(b) Faith Kipyegon
(c) Rebeca Andrade
(d) Sifan Hassan

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ANSWER KEY

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

SOLUTIONS

Q1. Answer: (c) Meristematic tissue

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

Key Points

• In the given experimental setup, the onion root tips growing in water represent regions of active cell division. The growth of plants occurs only in specific regions where dividing tissues are located.

• The tissue present in portion A of the root tips is the Meristematic tissue. Specifically, this is known as the Apical Meristem, which is situated at the growing tips of stems and roots.

• The primary function of this tissue is to increase the length of the roots and the stem. This process is often referred to as primary growth. Hence, the correct answer is Meristematic tissue.

• Cells of the meristematic tissue are highly active; they possess dense cytoplasm, thin cellulose walls, and prominent nuclei.

• A notable feature of these cells is that they lack vacuoles. This is because vacuoles are typically used for storage or maintaining turgidity in mature cells, whereas meristematic cells are focused entirely on rapid cell division.

Additional Information

• Types of Meristematic Tissues:

• Apical Meristem: Located at the growing tips of roots and shoots. It is responsible for the vertical growth of the plant.

• Lateral Meristem (Cambium): Found on the lateral sides of stems and roots. It is responsible for increasing the girth (thickness) of the plant.

• Intercalary Meristem: Located at the base of leaves or internodes (on twigs). It helps in the elongation of the internodes.

• Simple Permanent Tissues:

• Parenchyma: These are living cells with thin cell walls and large intercellular spaces. They provide support and store food. Some contain chlorophyll (Chlorenchyma) for photosynthesis, while others in aquatic plants have air cavities (Aerenchyma).

• Collenchyma: Provides mechanical support and flexibility, allowing plants to bend without breaking. The cells are living and thickened at the corners due to cellulose and pectin.

• Sclerenchyma: Makes the plant hard and stiff (e.g., husk of coconut). The cells are dead, long, and narrow with walls thickened by lignin, which acts as a chemical cement.

Important Points

• Differentiation: The process by which meristematic cells take up a permanent shape, size, and function is called differentiation. This leads to the development of various types of permanent tissues.

• Root Cap: While portion A contains the meristem, it is usually protected by a root cap (Calyptra) as it pushes through the soil, though in water-based experiments like the onion jar, the root tip activity is most prominent.

• Cell Wall Composition: Unlike sclerenchyma which has lignified walls, the meristematic and parenchyma tissues have primary walls made mostly of cellulose.

Q2. Answer: (d) increase melting and boiling points

The correct answer is increase melting and boiling points.

Key Points

• A homologous series is a sequence of compounds with the same functional group and similar chemical properties in which the members of the series can be branched or unbranched. Successive members differ by a CH2 unit and a molecular mass of 14 units.

• As the molecular mass increases within any homologous series, there is a consistent increase in boiling point. This happens because as the carbon chain length increases, the surface area of the molecule also increases.

• The increase in surface area leads to stronger intermolecular forces, specifically Van der Waals forces (London dispersion forces). More energy is required to break these stronger attractions, thus raising the temperature at which the substance boils. Hence, statement 4 is correct.

• Similarly, the melting point generally increases with an increase in molecular mass. This is due to the increased intermolecular attraction and, in many cases, better packing of larger molecules in a crystal lattice. Hence, statement 1 is incorrect.

• Physical properties like melting and boiling points do not decrease when the molecular mass increases because the attraction between molecules does not weaken with added mass/atoms. Hence, statement 2 is incorrect.

• Since both melting and boiling points typically follow the same upward trend as the carbon chain grows, a decrease in boiling point while mass increases is physically inconsistent for a homologous series. Hence, statement 3 is incorrect.

Additional Information

• Gradation in Physical Properties: While the chemical properties (determined by the functional group) remain almost identical across a series, physical properties show a regular gradation. For example, density and viscosity typically increase as the molecular mass increases.

• Solubility Trends: In a homologous series like alcohols or carboxylic acids, the solubility in water (a polar solvent) decreases as the molecular mass increases. This is because the hydrophobic (water-fearing) alkyl part of the molecule becomes larger relative to the hydrophilic (water-loving) functional group.

• Alkanes Example: In the Alkane series, the first four members (Methane, Ethane, Propane, and Butane) are gases at room temperature. As the molecular mass increases, Pentane (C5H12) through Heptadecane (C17H36) are liquids, and members with higher mass are solids. This clearly illustrates the effect of mass on the state of matter and thermal properties.

• Intermolecular Forces: The magnitude of dispersion forces depends on the polarizability of the molecule, which increases with the number of electrons and the size of the electron cloud. Higher molecular mass directly correlates with more electrons, leading to stronger London dispersion forces.

• Isomerism Impact: While mass is a primary factor, branching can also affect these points. For isomers with the same molecular mass, a more spherical (branched) molecule will have a lower boiling point than a straight-chain molecule due to reduced surface area contact.

Q3. Answer: (a) 194 kJ

The correct answer is 194 kJ.

Key Points

• To calculate the heat produced by an electrical appliance, we use Joule's Law of Heating, which can be expressed using the formula H = (V² / R) × t, where V is voltage, R is resistance, and t is time.

• In this problem, the Voltage (V) supplied is 220 V and the Resistance (R) of the electric iron is 15 Ω (ohms). Hence, the initial parameters are correctly identified.

• The Time (t) given is 1 minute. Since the standard unit of time in physics calculations is seconds, we convert 1 minute to 60 seconds. Hence, the conversion of time is essential for the SI unit system.

• Applying the values to the formula: Heat (H) = (220 × 220 / 15) × 60. First, we simplify the time and resistance: 60 divided by 15 equals 4.

• The calculation then becomes: H = 220 × 220 × 4. Calculating the square of 220 gives 48,400. Multiplying 48,400 by 4 results in 193,600 Joules (J). Hence, the total energy produced is 193,600 J.

• To convert Joules to Kilojoules (kJ), we divide by 1,000. Thus, 193,600 J / 1,000 = 193.6 kJ. This value is approximately 194 kJ. Hence, the final calculated heat production is 194 kJ.

Additional Information

• Joule's Law of Heating:

• This law states that the heat produced in a conductor is directly proportional to the square of the current (I²), the resistance (R), and the time (t) for which the current flows. The primary formula is H = I²Rt.

• By using Ohm's Law (V = IR), we can derive alternative formulas such as H = VIt or H = (V²/R)t depending on the known variables.

• Electric Power:

• Power (P) is the rate at which electrical energy is consumed or converted into other forms like heat. It is measured in Watts (W).

• The power of the iron in this case is P = V²/R = 48,400 / 15 ≈ 3226.67 W.

• Heat is simply Power multiplied by Time (H = P × t).

• Electrical Resistance:

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

• In heating appliances like Electric Irons, Toasters, and Heaters, high resistance materials (like Nichrome) are used to maximize heat production.

• Units of Energy:

• The SI unit of energy and heat is the Joule (J).

• In practical applications, because Joules are very small, we often use Kilojoules (1 kJ = 1,000 J) or Kilowatt-hours (1 kWh = 3.6 × 10^6 J) for commercial electricity billing.

Important Points

• Standard Voltage in India: The domestic power supply in India is typically 220 V at a frequency of 50 Hz.

• Safety Devices: While generating heat is useful in an iron, excessive heat can damage circuits. Therefore, devices like fuses or circuit breakers are used to protect appliances from overloading or short circuits.

• Efficiency: An Electric Iron is designed to be highly efficient at converting electrical energy into thermal energy. The heating element is usually placed between mica sheets for insulation while allowing heat to pass to the metal base.

• Numerical Precision: In competitive exams, 193.6 kJ is often rounded to the nearest whole number, which is 194 kJ, matching the provided options.

Q4. Answer: (a) Vapor

The correct answer is Vapor.

Key Points

• The phenomenon described in the question is known as evaporation, which is a surface phenomenon where liquid changes into vapor at any temperature below its boiling point.

• In any sample of a liquid, the particles are in constant motion and possess varying levels of kinetic energy. While most particles remain within the liquid, those at the surface experience different net forces.

• A small fraction of these surface particles gains enough kinetic energy through collisions to overcome the intermolecular forces of attraction from the surrounding molecules.

• Once these particles break free from the surface, they transition from the liquid phase into the gaseous state, effectively becoming vapor.

• The rate of this conversion is influenced by several factors, including surface area, temperature, humidity, and wind speed. Hence, the correct answer is Vapor.

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Additional Information

• Vaporization vs. Evaporation:

• Vaporization is the general term for a phase transition from liquid to gas. It encompasses two distinct processes: boiling and evaporation.

• Boiling is a bulk phenomenon that occurs throughout the entire volume of the liquid once it reaches a specific boiling point. In contrast, evaporation occurs only at the surface.

• Sublimation:

• This is the process where a substance changes directly from a solid state to a gaseous state without passing through the liquid phase.

• Common examples include dry ice (solid carbon dioxide), naphthalene balls, and camphor.

• Deposition:

• Also known as desublimation, this is the reverse of sublimation. It is the phase transition in which a gas transforms directly into a solid.

• A common example is the formation of frost on a windowpane or a leaf during winter.

• Solidification:

• This process, commonly known as freezing, occurs when a liquid is cooled and its particles lose kinetic energy, eventually settling into a fixed, rigid structure to form a solid.

Important Points

• Cooling Effect of Evaporation: During evaporation, the particles that escape are those with the highest energy. This results in a decrease in the average kinetic energy of the remaining particles, which leads to a decrease in temperature of the liquid. This is why sweating helps cool the human body.

• Kinetic Molecular Theory: This theory explains that the temperature of a substance is directly proportional to the average kinetic energy of its particles. As particles at the surface escape, they take energy away from the system.

• Intermolecular Forces: The strength of the forces of attraction determines how easily a liquid evaporates. Liquids with weak forces, such as alcohol or petrol, are volatile and evaporate much faster than liquids like water.

Q5. Answer: (b) Uterus lining slowly breaks, sheds as blood and mucous

The correct answer is Uterus lining slowly breaks, sheds as blood and mucous.

Key Points

• When an egg (ovum) is released during ovulation and is not fertilized by a sperm, the high levels of progesterone and estrogen required to maintain the pregnancy environment begin to drop.

• The uterus lining (endometrium) does not simply become thin; rather, it undergoes a programmed breakdown because the hormonal support from the corpus luteum is withdrawn. Hence, statement 1 is incorrect.

• The uterus lining slowly breaks down and is discharged through the vagina. This discharge consists of blood, mucous, and endometrial tissue, a process known as menstruation. Hence, statement 2 is correct.

• The uterus lining is significantly affected by the lack of fertilization; it cannot remain "unaffected" as the body must reset the cycle for a new egg release. Hence, statement 3 is incorrect.

• While the uterus lining becomes thick and spongy during the secretory phase (after ovulation) to prepare for a potential embryo, this occurs before the determination of non-fertilization. Once it is clear no fertilization occurred, this thick lining is shed. Hence, statement 4 is incorrect.

• The average menstrual cycle lasts for about 28 days, and the bleeding phase (menstruation) typically lasts for 3 to 7 days.

Additional Information

• Phases of the Menstrual Cycle:

• Menstrual Phase: This is the first phase where the endometrium is shed if fertilization has not occurred. It marks the start of the cycle (Day 1).

• Follicular Phase: This phase overlaps with the menstrual phase and continues until ovulation. The Follicle Stimulating Hormone (FSH) stimulates the ovaries to produce follicles.

• Ovulatory Phase: Around day 14 of a 28-day cycle, a surge in Luteinizing Hormone (LH) triggers the release of a mature egg from the ovary.

• Luteal Phase: After ovulation, the ruptured follicle transforms into the corpus luteum, which secretes progesterone to keep the uterine lining thick. If fertilization does not occur, the corpus luteum withers away.

• Key Hormones involved:

• Estrogen: Responsible for rebuilding the uterine lining after menstruation.

• Progesterone: Known as the pregnancy hormone, it maintains the thick and spongy nature of the endometrium.

• FSH and LH: Pituitary hormones that regulate the maturation of the egg and the timing of ovulation.

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Important Points

• Menarche: This term refers to the first menstrual period in a female's life, typically occurring between the ages of 10 and 15.

• Menopause: This is the biological stage marking the end of menstrual cycles, usually diagnosed after a woman has gone 12 months without a period, typically occurring between 45 and 55 years of age.

• Fertilization: This process usually occurs in the Fallopian tube (Ampulla). If it occurs, the zygote travels to the uterus for implantation, and the menstrual cycle stops during the 9 months of gestation.

• Corpus Albicans: If fertilization does not take place, the corpus luteum degenerates into a white fibrous tissue called the corpus albicans, leading to the drop in progesterone that triggers menstruation.

Q6. Answer: (b) A compound has a fixed composition and properties distinct from its constituent elements, unlike a solution.

The correct answer is A compound has a fixed composition and properties distinct from its constituent elements, unlike a solution.

Key Points

• A compound is a substance formed when two or more chemical elements are chemically bonded together. The elements in a compound are always present in fixed ratios by mass.

• A solution is a homogeneous mixture composed of two or more substances. In a solution, a solute is dissolved in another substance, known as a solvent. Unlike compounds, solutions have a variable composition.

• Statement 1 suggests that both are always chemically bonded. While compounds involve chemical bonds (ionic or covalent), solutions are physical mixtures where components are held by weaker intermolecular forces, not chemical bonds. Hence, statement 1 is incorrect.

• Statement 2 highlights that a compound has a fixed composition (e.g., Water is always H2O) and its properties are entirely different from its constituents (e.g., Water is a liquid, while Hydrogen and Oxygen are gases). A solution, however, retains the properties of its constituents. Hence, statement 2 is correct.

• Statement 3 claims compounds have variable compositions and solutions have fixed ones. This is the reverse of scientific fact; compounds follow the Law of Definite Proportions, whereas solutions can have varying concentrations. Hence, statement 3 is incorrect.

• Statement 4 mentions that compounds can be separated by physical methods. In reality, compounds require chemical methods (like electrolysis) for separation, whereas solutions can often be separated by physical means like distillation or evaporation. Hence, statement 4 is incorrect.

Additional Information

• Chemical Compounds:

• Formation of a compound usually involves an energy change (absorption or release of heat/light).

• The melting and boiling points of a compound are fixed and sharp.

• Examples include Sodium Chloride (NaCl), Carbon Dioxide (CO2), and Methane (CH4).

• Solutions (Homogeneous Mixtures):

• A solution consists of a single phase (e.g., solid, liquid, or gas).

• The particles in a solution are smaller than 1 nanometer in diameter and do not scatter light (no Tyndall effect).

• Examples include Saltwater, Air (gas-in-gas), and Alloys like Brass (solid-in-solid).

Important Points

• Law of Definite Proportions: Proposed by Joseph Proust in 1799, it states that a given chemical compound always contains its component elements in a fixed ratio by mass and does not depend on its source or method of preparation.

• Separation Techniques:

• Physical Methods: Used for mixtures/solutions; includes filtration, centrifugation, and chromatography.

• Chemical Methods: Used for compounds; involves breaking chemical bonds through reactions or electrochemical processes.

• Homogeneity: Both compounds and solutions are homogeneous in nature, meaning they have a uniform appearance and properties throughout a given sample, but their structural formation remains the primary differentiator.

Q7. Answer: (b) a i, b iv, c iii, d ii

The correct answer is a-i, b-iv, c-iii, d-ii.

Key Points

• Squamous Epithelium (a-i): These cells are extremely thin and flat, forming a delicate lining. They are found in places where transportation of substances occurs through a selectively permeable surface, such as the lining of the mouth, the oesophagus, lung alveoli, and blood vessels. Hence, statement a-i is correct.

• Stratified Squamous Epithelium (b-iv): To prevent wear and tear, epithelial cells in the skin are arranged in many layers. Since they are organized in a pattern of layers, this tissue is specifically called stratified squamous epithelium. Hence, statement b-iv is correct.

• Ciliated Columnar Epithelium (c-iii): In the respiratory tract, the columnar epithelial tissue possesses hair-like projections called cilia on the outer surfaces of the cells. These cilia move and their movement pushes mucus forward to clear the passage. Hence, statement c-iii is correct.

• Cuboidal Epithelium (d-ii): This tissue consists of cube-shaped cells and forms the lining of kidney tubules and the ducts of salivary glands. Its primary function in these locations is to provide mechanical support to the organs. Hence, statement d-ii is correct.

• Hence, the correct match is a-i, b-iv, c-iii, d-ii.

Additional Information

• Epithelial Tissue:

• It acts as a protective tissue in the animal body, covering most organs and cavities.

• The cells are tightly packed and form a continuous sheet with almost no intercellular spaces.

• All epithelium is usually separated from the underlying tissue by an extracellular fibrous basement membrane.

• Columnar Epithelium:

• The word "columnar" means "pillar-like." This epithelium facilitates absorption and secretion.

• It is commonly found in the inner lining of the intestine where tall epithelial cells facilitate the movement of nutrients across the epithelial barrier.

• Simple Squamous vs. Stratified:

• Simple squamous epithelium is a single layer of cells, typically involved in diffusion (e.g., in alveoli).

• Stratified versions consist of multiple layers and are primarily for protection against physical or chemical stress.

Important Points

• Glandular Epithelium:

• Sometimes a portion of the epithelial tissue folds inward, and a multicellular gland is formed. This specialized form is known as glandular epithelium, which is responsible for secreting substances at the epithelial surface.

• Connective Tissue Link:

• While epithelial tissue covers the body, it is always supported by connective tissue. However, the basement membrane serves as a non-cellular layer that marks the boundary between the two.

Q8. Answer: (c) 60 J

The correct answer is 60 J.

Key Points

• Gravitational Potential Energy (GPE) is the energy possessed by an object due to its position or height relative to a reference point, typically the ground.

• The formula to calculate the Gravitational Potential Energy is given by: PE = m × g × h, where m represents the mass, g represents the acceleration due to gravity, and h represents the vertical height.

• In the given problem, the mass (m) of the ball is 3 kg, the height (h) of the shelf is 2 m, and the acceleration due to gravity (g) is given as 10 m/s^2.

• By substituting these values into the formula: PE = 3 kg × 10 m/s^2 × 2 m.

• The calculation results in 60 kg·m^2/s^2, which is equivalent to 60 Joules (J). Hence, the calculated value is 60 J.

Additional Information

• Units of Energy: The SI unit of energy, including potential energy, is the Joule (J). One Joule is defined as the work done by a force of one Newton acting over a distance of one meter.

• Dependence on Mass and Height: Potential energy is directly proportional to the mass of the object and its elevation. If the mass is doubled, the potential energy doubles; if the height is doubled, the potential energy also doubles.

• Acceleration due to Gravity: On the surface of the Earth, the standard value of g is approximately 9.8 m/s^2, but for simplified calculations in exams, it is often taken as 10 m/s^2.

• Conservative Force: Gravity is a conservative force, meaning the work done (and thus the change in potential energy) depends only on the initial and final positions of the object, not on the path taken to reach that height.

Important Points

• Zero Reference Level: To measure potential energy, a reference level must be established where the energy is considered zero. Usually, the ground level or the lowest point of the system is chosen as the zero reference.

• Energy Transformation: When the ball is released from the shelf, its Potential Energy will gradually convert into Kinetic Energy as it accelerates downward due to gravity. At the moment before hitting the ground, the potential energy is zero, and the kinetic energy is at its maximum.

• Dimensional Formula: The dimensional formula for energy (and work) is [M^1 L^2 T^-2]. This highlights that energy is a derived quantity involving mass, length, and time.

• Scalar Quantity: Energy is a scalar quantity, meaning it only has magnitude and no specific direction, unlike force or velocity.

Q9. Answer: (d) Concave lens

The correct answer is Concave lens.

Key Points

• Myopia, which is also commonly referred to as Short-sightedness, is a vision condition where a person can see objects that are near clearly, but objects that are farther away appear blurred.

• In a myopic eye, the light rays entering the eye do not focus on the retina as they should; instead, they converge and form an image in front of the retina.

• This defect typically arises due to two main reasons: the elongation of the eyeball (it becomes too long from front to back) or the excessive curvature of the cornea or the eye lens.

• To rectify Myopia, a Concave lens (also known as a diverging lens) is employed. This lens diverges the incoming parallel light rays from a distant object before they enter the eye, allowing the eye's natural lens to focus the image precisely on the retina. Hence, the correct answer is Concave lens.

• Because the focal length of a concave lens is considered negative, the power of spectacles prescribed for a myopic person is expressed as a negative number (e.g., -2.5 D).

Additional Information

• Hypermetropia (Long-sightedness):

• This is a condition where a person can see distant objects clearly but faces difficulty seeing nearby objects.

• It occurs when the eyeball is too short or the focal length of the eye lens is too long, causing the image to form behind the retina.

• It is corrected using a Convex lens (converging lens), which has a positive power.

• Presbyopia:

• This defect usually occurs with aging (often after the age of 40) as the ciliary muscles weaken and the eye lens loses its flexibility and power of accommodation.

• A person with this condition may suffer from both myopia and hypermetropia and often requires Bifocal lenses, where the upper portion is concave and the lower portion is convex.

• Astigmatism:

• This vision defect is caused by an irregularly shaped cornea or lens, preventing light from focusing properly on the retina.

• It results in blurred vision at all distances. It is corrected using Cylindrical lenses.

Important Points

• The Least Distance of Distinct Vision (LDDV), also known as the Near Point of a normal human eye, is 25 cm.

• The Far Point for a healthy human eye is Infinity, meaning a normal eye can see objects clearly from 25 cm to an infinite distance.

• The Power of a Lens is defined as the reciprocal of its focal length (P = 1/f) and is measured in Dioptres (D).

• The Retina acts as a light-sensitive screen containing millions of photoreceptor cells called rods and cones, which convert light into electrical signals sent to the brain via the optic nerve.

• Cataract is another common eye condition, especially in old age, where the crystalline lens becomes opaque or cloudy, leading to vision loss. It is treated through surgery where the natural lens is replaced with an artificial intraocular lens.

Q10. Answer: (a) the oxidation of fats and oil

The correct answer is the oxidation of fats and oil.

Key Points

• The unpleasant smell and bad taste in food items containing fats and oils when kept for a long time is primarily due to a process called rancidity.

• Rancidity occurs when the fats and oils present in food undergo aerial oxidation. This chemical reaction breaks down the fatty acid chains, leading to the formation of volatile substances.

• When food is left exposed to oxygen, the chemical bonds in the lipid molecules are disrupted, resulting in the production of aldehydes, ketones, and carboxylic acids, which are responsible for the off-flavor and foul odor.

• The oxidation of fats and oil is a spontaneous process, but it can be accelerated by factors such as heat, light, and moisture. Hence, the correct answer is the oxidation of fats and oil.

• In contrast, the oxidation of carbohydrates or sugar (fermentation) or proteins (putrefaction) results in different types of spoilage, but the specific "rancid" smell associated with oily leftovers is unique to lipid oxidation.

Additional Information

• Methods to Prevent Rancidity:

• Antioxidants: These are substances that prevent oxidation. Common examples added to commercial foods include BHA

(Butylated Hydroxyanisole) and BHT (Butylated Hydroxytoluene).

• Nitrogen Flushing: Manufacturers of snacks like potato chips flush the bags with Nitrogen gas. Since nitrogen is an unreactive gas, it prevents the chips from coming into contact with oxygen, thereby stopping oxidation.

• Airtight Containers: Keeping food in vacuum-sealed or airtight containers reduces the availability of oxygen, which significantly slows down the process of rancidity.

• Refrigeration: Storing food at low temperatures in a refrigerator slows down the rate of chemical reactions, including the oxidation of fats.

• Types of Rancidity:

• Oxidative Rancidity: Occurs when oxygen from the air reacts with unsaturated fats.

• Hydrolytic Rancidity: Occurs when water (moisture) splits the fatty acid chains away from the glycerol backbone, often catalyzed by enzymes like lipase.

Important Points

• Chemical Reaction: Rancidity is a chemical change because it results in the formation of new substances with different properties and smells.

• Health Impact: Consuming rancid food is not only unpalatable but can also be toxic and may lead to digestive issues or deplete the nutritional value (specifically vitamins) of the food.

• Catalysts: The presence of trace metals like iron or copper can act as catalysts, drastically increasing the speed of fat oxidation.

• Light Sensitivity: Ultraviolet (UV) light can initiate the oxidation process, which is why many oils are sold in dark-colored glass bottles or opaque containers.

Q11. Answer: (b) 17.2 m

The correct answer is 17.2 m.

Key Points

• An echo is a phenomenon where a sound is heard again after being reflected from a surface. To hear a distinct echo, the reflected sound must reach the ear after a specific time interval following the original sound.

• The sensation of sound persists in the human brain for about 0.1 seconds. This is known as the persistence of hearing. If a reflected sound arrives within this timeframe, the brain cannot distinguish it as a separate sound.

• To calculate the minimum distance, we use the formula for distance: Distance = Speed x Time. Given the speed of sound in air is 344 m/s and the minimum time interval is 0.1 seconds, the total distance traveled by the sound (to the obstacle and back) is 344 m/s x 0.1 s = 34.4 m.

• Since the sound travels to the reflecting surface and then returns to the observer, the minimum distance between the source and the obstacle must be half of the total distance. Therefore, 34.4 m / 2 = 17.2 m. Hence, the correct answer is 17.2 m.

• This specific distance of 17.2 m is calculated based on the speed of sound at a specific temperature (usually around 22 degrees Celsius). If the temperature changes, the speed of sound and consequently the required distance will also change.

Additional Information

• Nature of Echo: For an echo to be produced effectively, the reflecting object or surface must be large compared to the wavelength of the sound. Hard surfaces like cliffs, mountains, or walls of large halls are excellent reflectors of sound waves.

• Factors Affecting Speed of Sound: The speed of sound is not constant and varies depending on the medium (solid, liquid, or gas) and temperature. In air, the speed increases by approximately 0.6 m/s for every 1 degree Celsius rise in temperature.

• Reverberation: If the reflecting surface is at a distance less than 17.2 m, the reflected sound blends with the original sound, causing a prolonged sound called reverberation. This is often observed in newly built empty houses or large auditoriums.

• Applications of Echo: The principle of echo is widely used in technology and nature. Bats and dolphins use echolocation to navigate and find food. Humans use it in SONAR (Sound Navigation and Ranging) to measure the depth of the sea or locate underwater objects, and in Ultrasonography for medical diagnostics.

Important Points

• Reflection Laws: Sound follows the same laws of reflection as light. The angle of incidence of sound is equal to the angle of reflection, and the incident wave, reflected wave, and the normal all lie in the same plane.

• Numerical Values: At 0 degrees Celsius, the speed of sound in air is approximately 331 m/s. At this temperature, the minimum distance for an echo would be (331 x 0.1) / 2 = 16.55 m.

• Multiple Echoes: Sometimes, multiple reflections from various surfaces can lead to a series of echoes. A famous example is the Gol Gumbaz in Bijapur, India, where a single sound can be heard echoed multiple times due to its unique architectural design.

Q12. Answer: (b) for removing permanent hardness of water

The correct answer is for removing permanent hardness of water.

Key Points

• Bleaching powder, chemically known as Calcium Oxychloride ($CaOCl_2$), is produced by the action of chlorine gas on dry slaked

lime [Ca(OH)2].

• It is used as an oxidising agent in many chemical industries because it can easily release oxygen for various chemical reactions. Hence, statement 1 is a correct use.

• The most common application of bleaching powder is as a disinfectant or germicide to make drinking water free from germs and pathogens, ensuring safety for human consumption. Hence, statement 3 is a correct use.

• In the textile industry, it is utilized for bleaching cotton and linen, and it is also used for bleaching wood pulp in paper factories and washed clothes in laundries. Hence, statement 4 is a correct use.

• Removing permanent hardness of water is a function associated with Washing Soda (Sodium Carbonate), which precipitates dissolved calcium and magnesium ions. Bleaching powder does not possess the chemical properties required to remove water hardness. Hence, statement 2 is NOT a use of bleaching powder.

• Therefore, the correct answer is for removing permanent hardness of water.

Additional Information

• Washing Soda (Na2CO3.10H2O):

• Washing soda is the common name for Sodium Carbonate Decahydrate.

• Its primary uses include removing permanent hardness from water, the manufacture of glass, soap, and paper, and as a cleaning agent for domestic and industrial purposes.

• It works by reacting with soluble calcium and magnesium salts (chlorides and sulfates) to form insoluble carbonates, which can then be filtered out.

• Hardness of Water:

• Temporary Hardness: Caused by the presence of bicarbonates of calcium and magnesium. It can be removed simply by boiling.

• Permanent Hardness: Caused by the presence of chlorides and sulphates of calcium and magnesium. It requires chemical treatment like the Calgon method or using ion-exchange resins.

• Other Common Chemicals:

• Baking Soda: Known as Sodium Hydrogen Carbonate (NaHCO3), used in antacids and for making baking powder.

• Slaked Lime: Known as Calcium Hydroxide [Ca(OH)2], used in white-washing and neutralization of acidic soils.

Important Points

• Reaction with Air: When bleaching powder is exposed to air, it reacts with carbon dioxide (CO2) to slowly release chlorine gas, giving it a characteristic pungent smell.

• Industrial Application: Apart from bleaching, it is used in the preparation of chloroform (CHCl3).

• Wool Treatment: It is used in the textile industry specifically to make wool unshrinkable, which is a vital feature for garment longevity.

• Storage: Since it decomposes over time and loses its chlorine content, it must be stored in air-tight containers away from moisture.

Q13. Answer: (b) 0.2 m and 0 m/s

The correct answer is 0.2 m and 0 m/s.

Key Points

• When an object is thrown vertically upwards, it moves against the force of gravity, which results in a constant deceleration.

• At the highest point of its trajectory, the object momentarily stops before it begins its descent. Therefore, the final velocity (v) at the maximum height is always 0 m/s.

• To find the maximum height (H), we use the third equation of motion: $v^2 = u^2 + 2as$, where v is final velocity, u is initial velocity, a is acceleration, and s is displacement (height).

• Given data: Initial velocity (u) = 2 m/s, Final velocity (v) = 0 m/s, and acceleration due to gravity (g) = 10 m/s^2. Since the motion is upwards, acceleration (a) = -g = -10 m/s^2.

• Calculation: $(0)^2 = (2)^2 + 2(-10)H$. This simplifies to $0 = 4 - 20H$. Solving for H, we get $20H = 4$, which results in $H = 4/20 = 0.2$ m.

• Thus, the maximum height attained is 0.2 m and the velocity at the highest point is 0 m/s.

Additional Information

• Equations of Motion: These equations describe the relationship between velocity, distance, time, and acceleration for objects moving with uniform acceleration. The three primary equations are $v = u + at$, $s = ut + \frac{1}{2}at^2$, and $v^2 = u^2 + 2as$.

• Acceleration due to Gravity (g): This is the acceleration gained by an object due to the gravitational force of the Earth. Its value is approximately 9.8 m/s^2 near the Earth's surface, but for competitive exams, it is often approximated as 10 m/s^2.

• Time of Ascent: This is the time taken by an object to reach its maximum height. Using the formula $v = u + at$, where $0 = 2 - 10t$, the time of ascent for this ball is 0.2 seconds.

• Kinematics of Vertical Motion: In a vacuum (ignoring air resistance), the Time of Ascent is always equal to the Time of Descent. The speed at which the ball is thrown up will be equal to the speed at which it returns to the starting point.

Important Points

• Sign Convention: It is crucial to assign signs correctly. Usually, upward direction is taken as positive and downward direction as negative. Since gravity always pulls downward, g is taken as -10 m/s² when the object is moving up.

• Zero Velocity at Peak: A common misconception is that acceleration is zero at the peak. However, while velocity is 0 m/s at the highest point, acceleration remains constant at 10 m/s² downwards throughout the entire flight.

• Displacement vs. Distance: If the ball returns to the thrower's hand, the total displacement is 0 m, while the total distance covered would be 0.4 m (0.2 m up + 0.2 m down).

• Independence of Mass: In the absence of air resistance, the maximum height attained by an object depends only on its initial velocity and gravity, not on the mass of the ball.

Q14. Answer: (b) Nichrome

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

Key Points

• Nichrome is an alloy typically consisting of 80% Nickel and 20% Chromium by mass, designed specifically for high-temperature applications.

• It is the preferred material for making resistance wires and heating elements because of its exceptionally high electrical resistivity and high melting point (approximately 1400°C).

• A critical feature of Nichrome is its ability to withstand oxidation; when heated for the first time, it develops a thin, protective layer of chromium oxide that prevents further degradation of the wire even at red-hot temperatures.

• Due to its high resistivity, it converts electrical energy into heat energy efficiently according to Joule’s Law of Heating, making it essential for household appliances.

• It remains mechanically stable and does not become brittle or lose its shape significantly when subjected to repeated heating and cooling cycles.

Additional Information

• Silver:

• It is the best conductor of electricity among all metals due to its extremely low resistivity.

• While it has a melting point of 961.8°C, it is not used for resistance wires because it would require a massive length of wire to generate significant heat, and its cost is prohibitively high.

• Copper:

• It is widely used in electrical household wiring and motors because of its excellent conductivity and ductility.

• With a melting point of 1085°C and low resistance, it is designed to transport electricity with minimal heat loss, the opposite of what is required for a resistance wire.

• Aluminium:

• Commonly used in long-distance power transmission lines because it is lightweight and relatively inexpensive.

• It has a much lower melting point (approximately 660°C) compared to Nichrome, making it unsuitable for high-heat resistance applications as it would melt under high thermal loads.

• Joule's Law of Heating:

• The heat produced in a resistor is directly proportional to the square of the current (I), the resistance (R), and the time (t) for which the current flows. Nichrome maximizes the 'R' factor in this equation.

Important Points

• Applications of Nichrome: It is found in electric irons, hair dryers, toasters, electric ovens, and industrial furnaces.

• Temperature Coefficient: Nichrome has a relatively low temperature coefficient of resistance, meaning its resistance does not fluctuate wildly as it gets hotter, providing consistent performance.

• Alternative Alloys: Other alloys like Manganin (Copper, Manganese, and Nickel) and Constantan are used in standard resistors and potentiometers because their resistance remains nearly constant despite temperature changes, though they are not typically used as heating elements like Nichrome.

• Safety: The high tensile strength of Nichrome at high temperatures ensures that the heating coils do not break or sag easily during operation, which is vital for the safety of consumer electronics.

Q15. Answer: (b) Protons and Neutrons

The correct answer is Protons and Neutrons.

Key Points

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

• Protons and neutrons are collectively known as nucleons because they reside within the atomic nucleus. Hence, statement 2 is correct.

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• The mass of an electron is approximately 1/1836 of the mass of a proton, which is considered negligible when calculating the overall mass number of an atom. Hence, statement 1 and 3 are incorrect.

• While protons contribute to the mass, they are not the sole contributors; neutrons also provide nearly equal mass to the stability and weight of the nucleus. Hence, statement 4 is incorrect.

• The mathematical formula for the mass number is A = Z + N, where Z is the atomic number (number of protons) and N is the neutron number.

Additional Information

• Atomic Number (Z):

• This represents the total number of protons in the nucleus of an atom. It is unique to each chemical element and defines its position in the Periodic Table.

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

• Isotopes:

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

• For example, Hydrogen has three isotopes: Protium (0 neutrons), Deuterium (1 neutron), and Tritium (2 neutrons).

• Isobars:

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

• An example includes Argon-40 and Calcium-40.

• Subatomic Particles Discovery:

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

• Protons were discovered by Ernest Rutherford in 1917 through his gold foil experiment.

• Neutrons were discovered by James Chadwick in 1932, for which he was awarded the Nobel Prize in Physics in 1935.

Important Points

• Mass of Particles:

• The mass of a proton is approximately 1.00727 atomic mass units (amu) or 1.6726 × 10^-27 kg.

• The mass of a neutron is slightly higher, approximately 1.00866 amu or 1.6749 × 10^-27 kg.

• The mass of an electron is 0.000548 amu or 9.1093 × 10^-31 kg.

• Nuclear Force:

• The protons and neutrons are held together in the nucleus by the strong nuclear force, which is the strongest of the four fundamental forces of nature but acts over a very short range (about 1 femtometer).

• Representation:

• An element is often represented as ^A_ZX, where X is the chemical symbol, A is the mass number (top), and Z is the atomic number (bottom).

Q16. Answer: (b) Aluminium

The correct answer is Aluminium.

Key Points

• Aluminium is a highly reactive metal, yet it is widely used for making utensils and aircraft bodies because of its unique resistance to corrosion.

• When Aluminium is exposed to air, it reacts almost instantly with oxygen to form a very thin, tough, and transparent layer of Aluminium Oxide (Al2O3) on its surface.

• Unlike the iron oxide (rust) that forms on steel, which is porous and flakes away, the Aluminium Oxide layer is non-porous and adheres extremely strongly to the parent metal.

• This layer acts as a complete protective barrier, preventing further oxygen and moisture from reaching the underlying metal atoms. Hence, the statement regarding Aluminium is correct.

• This phenomenon is known as Passivation. Because the layer is self-healing, if the surface is scratched, the exposed Aluminium will react with oxygen again to immediately reform the protective shield.

Additional Information

• Sodium (Na) and Calcium (Ca):

• Sodium is a Group 1 alkali metal, while Calcium belongs to Group 2. Both are highly reactive and react vigorously with moisture and oxygen in the air.

• Sodium reacts so violently that it is typically stored under kerosene oil to prevent it from catching fire. They do not form a stable, protective oxide layer to prevent further corrosion.

• Magnesium (Mg):

• Magnesium also forms a thin layer of Magnesium Oxide on its surface when exposed to air. This is why Magnesium ribbons are

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cleaned with sandpaper before burning in a laboratory to remove this layer.

• However, Aluminium is the more prominent example in industrial and chemical contexts for this property, as its oxide layer is significantly more effective and durable across a wider range of pH levels and environmental conditions compared to Magnesium.

• Anodizing:

• This is an industrial process used to increase the thickness of the natural oxide layer on Aluminium parts.

• By using an electrolytic process, the protective layer can be made thicker and more durable, and it can also be dyed in various colors for architectural and consumer electronic applications.

• Corrosion Prevention:

• Common methods to prevent corrosion in other metals include galvanization (coating iron with Zinc), painting, oiling, and electroplating.

• The natural passivation of Aluminium makes it one of the most sustainable and recyclable metals in the world today.

Q17. Answer: (a) 0.055 m/s2

The correct answer is 0.055 m/s2.

Key Points

• The initial velocity of the car is 0 m/s because it starts from rest. Hence, u = 0.

• The final velocity (v) is given as 60 km/hr. To find the acceleration in m/s2, we must convert the units to the SI system.

• The conversion of 60 km/hr to m/s is calculated by multiplying it by 5/18. Therefore, v = 60 x (5/18) = 16.67 m/s.

• The time (t) taken is 5 minutes. This must also be converted into seconds for consistency. Since 1 minute = 60 seconds, the total time is 5 x 60 = 300 seconds.

• Acceleration (a) is defined by the formula a = (v - u) / t. Plugging in the values: a = (16.67 - 0) / 300.

• Performing the calculation: 16.67 / 300 results in 0.0555... m/s2. Rounding this value gives the acceleration as 0.055 m/s2. Hence, the calculated value matches the first option.

Additional Information

• Acceleration: It is a vector quantity that represents the rate at which an object changes its velocity. An object is accelerating if its speed or direction changes.

• Equations of Motion: These equations, formulated by Sir Isaac Newton, describe the relationship between velocity, acceleration, displacement, and time. The first equation is v = u + at.

• Uniform Acceleration: This occurs when the velocity of an object changes by equal amounts in equal intervals of time. A car speeding up steadily on a straight road is an example of linear acceleration.

• Retardation: If the final velocity is less than the initial velocity, the acceleration is negative. This is commonly referred to as deceleration or retardation.

• SI Units: The Standard International unit for velocity is m/s (meters per second) and for acceleration is m/s2 (meters per second squared).

Important Points

• To convert km/hr to m/s, multiply the value by 5/18. Conversely, to convert m/s to km/hr, multiply by 18/5.

• Time Conversion: Always ensure time is in seconds when calculating acceleration in m/s2. 1 hour = 3600 seconds.

• Zero Velocity: Whenever a problem states that an object "starts from rest", the initial velocity (u) is always 0. If an object "comes to a stop", the final velocity (v) is 0.

• Magnitude and Direction: Since acceleration is a vector, it is defined by both magnitude (e.g., 0.055) and direction. In this problem, the magnitude is requested.

Q18. Answer: (b) Speed

The correct answer is Speed.

Key Points

• Uniform Circular Motion (UCM) is defined as the motion of an object traveling along a circular path at a constant rate of motion. In this specific type of motion, the magnitude of the velocity, which is the Speed, remains constant throughout the duration of the movement.

• Velocity is a vector quantity, which means it is defined by both magnitude and direction. Even though the magnitude (speed) is constant in UCM, the direction of motion changes at every single point along the circular trajectory (tangential to the circle). Hence, velocity is not constant.

• Acceleration in uniform circular motion is known as centripetal acceleration. Its magnitude is constant (calculated as v^2/r), but its direction is always pointing toward the center of the circle. As the object moves, this "toward the center" direction relative to the coordinate system changes. Hence, acceleration is not constant.

• Centripetal Force is the net force required to keep an object moving in a circle. While its magnitude (mv^2/r) remains the same if mass, speed, and radius are constant, it is a vector quantity whose direction changes continuously. Hence, centripetal force is not

constant.

• Hence, the correct answer is Speed.

Additional Information

• Kinetic Energy in UCM:

• The Kinetic Energy of a particle is a scalar quantity given by the formula 1/2 mv^2. Since the mass (m) and the speed (v) are both constant in uniform circular motion, the Kinetic Energy of the object remains constant.

• Work Done and Power:

• In Uniform Circular Motion, the centripetal force acting on the object is always perpendicular to the direction of the instantaneous displacement.

• According to the physics definition of work (W = Fd cos theta), when the angle between force and displacement is 90 degrees, the work done is zero. Consequently, the power delivered by the centripetal force is also zero.

• Angular Variables:

• The Angular Velocity (omega) remains constant in UCM. It represents the rate of change of the angular displacement.

• The relationship between linear speed (v) and angular speed (omega) is given by the equation v = r * omega, where r is the radius of the circular path.

• Real-world Examples:

• The motion of the Moon around the Earth is an approximation of uniform circular motion, where the gravitational force provides the necessary centripetal force.

• A satellite orbiting the Earth in a stable circular orbit maintains a constant speed while its velocity vector changes direction continuously.

• The tips of the hands of a clock or a spinning ceiling fan running at a constant setting are classic examples of objects performing UCM.

Important Points

• Vector vs Scalar Quantities:

• It is crucial to distinguish between scalars (like speed and kinetic energy) and vectors (like velocity, acceleration, and force). In UCM, only the magnitudes of the vectors are constant; the vectors themselves are not constant because their directions are in a state of flux.

• Non-Uniform Circular Motion:

• If the speed of the object changes while moving in a circle, it is called Non-Uniform Circular Motion. In such cases, there is a tangential acceleration in addition to the centripetal acceleration, and the speed is no longer constant.

Q19. Answer: (c) positive

The correct answer is positive.

Key Points

• According to the New Cartesian Sign Convention, the optical center (O) of the lens is treated as the origin, and the principal axis of the lens is taken as the X-axis of the coordinate system.

• All distances measured in the direction of incident light (usually from left to right) are taken as positive. Hence, the correct answer is positive.

• Conversely, all distances measured in the direction opposite to the direction of incident light are taken as negative.

• The object is always placed to the left of the lens, which implies that the incident light moves from left to right.

• Distances measured perpendicular to and above the principal axis (upward) are taken as positive.

• Distances measured perpendicular to and below the principal axis (downward) are taken as negative.

Additional Information

• Object Distance (u): Since the object is always placed on the left side of the lens, the object distance (u) is always negative according to the sign convention.

• Focal Length (f):

• The focal length of a convex lens (converging lens) is always positive because its principal focus lies on the right side of the optical center.

• The focal length of a concave lens (diverging lens) is always negative because its principal focus lies on the left side of the optical center.

• Image Distance (v):

• For a real image, which is formed on the right side of the lens, the image distance (v) is positive.

• For a virtual image, which is formed on the left side (same side as the object), the image distance (v) is negative.

• Magnification (m): This is the ratio of the height of the image (h') to the height of the object (h).

• If magnification is negative, the image is real and inverted.

• If magnification is positive, the image is virtual and erect.

Important Points

• Lens Formula: The relationship between object distance (u), image distance (v), and focal length (f) is given by the formula: 1/f = 1/v - 1/u. It is vital to apply the correct signs to these values before calculation.

• Power of a Lens (P): The power of a lens is defined as the reciprocal of its focal length in meters (P = 1/f).

• The SI unit of power is Dioptre (D).

• A convex lens has positive power, while a concave lens has negative power.

• Height Convention: The height of the object (h) is usually taken as positive as it is placed above the principal axis. The height of the image (h') is positive for virtual images and negative for real images.

• Optical Center: It is the central point of a lens. A ray of light passing through the optical center emerges without any deviation.

Q20. Answer: (c) Ovary

The correct answer is Ovary.

Key Points

• In flowering plants, the ovary is the basal, swollen part of the carpel (or pistil), which serves as the female reproductive organ.

• After the process of fertilization occurs, the ovary undergoes a series of biological transformations and eventually matures into a fruit. Hence, the correct answer is Ovary.

• This transformation is primarily driven by the secretion of plant hormones such as auxins, gibberellins, and ethylene, which stimulate the growth and ripening of the ovarian tissues.

• The wall of the ovary develops into the pericarp, which constitutes the external skin and the fleshy part of the fruit.

• During this stage of the plant's life cycle, other floral parts such as the sepals, petals, and stamens generally wither and fall off, although in some species, the calyx may persist.

Additional Information

• Ovule and Seed Development:

• The ovules, which are housed inside the ovary, contain the female gametes. Following successful fertilization, these ovules develop into seeds.

• The protective layers of the ovule, known as integuments, harden to form the seed coat (testa and tegmen).

• Classification of Fruits:

• True Fruits: These are fruits that develop exclusively from the mature ovary. Examples include Mango, Grape, and Tomato.

• False Fruits (Accessory Fruits): These develop from the ovary along with other floral parts like the thalamus or receptacle. Common examples are Apple, Pear, and Strawberry.

• Parthenocarpic Fruits: In some cases, a fruit develops without fertilization. This process is called parthenocarpy, and the resulting fruits (such as Banana and certain varieties of Grapes) are typically seedless.

• Angiosperms:

• Flowering plants are classified as Angiosperms. Their defining characteristic is the production of seeds enclosed within a fruit, unlike Gymnosperms where seeds are naked.

Important Points

• Structure of the Carpel: A typical carpel consists of three main parts: the stigma (receives pollen), the style (the tube-like structure), and the ovary (the base containing ovules).

• The Pericarp: The pericarp is often differentiated into three distinct layers: the epicarp (outer skin), mesocarp (middle fleshy layer), and endocarp (inner layer surrounding the seed).

• Double Fertilization: A unique feature of angiosperms where one male gamete fuses with the egg to form a zygote (2n), and the other fuses with the polar nuclei to form the Primary Endosperm Nucleus (3n), which provides nutrition to the developing embryo.

• Seed Dispersal: The primary evolutionary function of the fruit is to protect the seeds and aid in their dispersal through various agents like animals, wind, or water.

Q21. Answer: (d) Hybridisation

The correct answer is Hybridisation.

Key Points

• Hybridisation is the primary method used by scientists to incorporate desirable characters into crop varieties by crossing two genetically dissimilar plants. Hence, statement 4 is correct.

• This process can be categorized into three types based on the level of genetic difference: Intervarietal (between different varieties of the same species), Interspecific (between two different species of the same genus), and Intergeneric (between different genera).

• The main objective of this technique is to produce a hybrid that combines the best traits of both parents, such as high yield,

better nutritional quality, and resistance to pests.

• Another modern way of incorporating traits is through genetic manipulation, where a specific gene is introduced into the plant's DNA to create Genetically Modified Crops (GM crops).

• Scientists specifically look for traits like biotic resistance (protection against diseases, insects, and nematodes) and abiotic resistance (tolerance to drought, salinity, waterlogging, heat, and cold).

Additional Information

• Weed Control:

• This refers to the management of unwanted plants (weeds) that compete with crops for nutrients, light, and water.

• Methods include mechanical removal, preventative measures like timely sowing, and the use of chemicals called herbicides. While essential for crop protection, it does not alter the genetic character of the variety. Hence, statement 1 is incorrect.

• Fertilisers:

• These are commercially produced plant nutrients containing Nitrogen (N), Phosphorus (P), and Potassium (K).

• They are used to ensure vegetative growth (leaves, branches, and flowers) and healthy plants, but they provide external nourishment rather than internal character changes. Hence, statement 2 is incorrect.

• Irrigation:

• It is the artificial application of water to the soil for assisting in the production of crops.

• Common systems include wells (dug wells and tube wells), canals, river lift systems, and tanks. This is a management practice and not a method of genetic improvement. Hence, statement 3 is incorrect.

Important Points

• Aims of Crop Variety Improvement:

• Higher Yield: To increase the productivity of the crop per acre.

• Improved Quality: Examples include the baking quality in wheat, protein quality in pulses, and oil quality in oilseeds.

• Change in Maturity Duration: Developing varieties that take a shorter time from sowing to harvesting, allowing farmers to grow multiple rounds of crops in a year.

• Wider Adaptability: Developing varieties that can grow under different climatic conditions across various locations.

• Desirable Agronomic Characteristics: For instance, tallness and profuse branching are desirable for fodder crops, while dwarfness is desired in cereals so that fewer nutrients are consumed by the plant body.

Q22. Answer: (c) Egg and meat production

The correct answer is Egg and meat production.

Key Points

• Poultry farming is the practice of raising domestic birds such as chickens, ducks, turkeys, and geese for the purpose of producing food for human consumption.

• The primary commercial and nutritional goal of developing improved breeds in poultry is to maximize the output of egg and meat production. These are the two major sources of animal protein derived from birds. Hence, statement 3 is correct.

• Improved breeds are genetically selected to ensure higher growth rates, better egg-laying capacity, and resistance to diseases.

• While poultry droppings are used as manure (organic fertilizer) because they are rich in nitrogen and phosphorus, the development of new breeds is never focused solely on manure production. Hence, statement 1 is incorrect.

• Products like wool are obtained from sheep or rabbits, and milk is obtained from cattle, goats, or buffaloes. These are not outputs of poultry farming. Hence, statement 2 is incorrect.

• Breeds developed for decoration (ornamental birds) or sports (like cockfighting) represent a very small, niche segment and are not the primary purpose of agricultural poultry development. Hence, statement 4 is incorrect.

Additional Information

• Broilers: These are poultry birds raised specifically for meat production. They are known for their fast growth rate and high feed conversion ratio, usually reaching market weight within 6 to 8 weeks.

• Layers: These birds are raised specifically for egg production. A commercial layer bird starts laying eggs at the age of approximately 20 weeks and continues for a period of 52 to 72 weeks.

• Indigenous vs. Exotic Breeds:

• Indigenous breeds like Aseel are known for their hardiness and disease resistance but have lower productivity.

• Exotic breeds like Leghorn (from Italy) or Rhode Island Red (from USA) are used for their high egg-laying capacity.

• Cross-breeding Objectives: Breeding programs often cross indigenous and exotic varieties to develop new breeds with traits such as tolerance to high temperatures, low maintenance requirements, and reduction in the size of the egg-laying bird (to consume less feed).

Important Points

• Nutritional Requirements: Poultry feed must be balanced with proteins, carbohydrates, fats, minerals, and vitamins. Specifically,

high levels of Vitamin A and Vitamin K are maintained in poultry feeds for healthy growth.

• Disease Management: Poultry birds are susceptible to various diseases caused by viruses (e.g., Ranikhet disease and Bird Flu/H5N1), bacteria (e.g., Salmonellosis), and fungi. Proper vaccination and sanitation are essential in farming.

• Housing and Shelter: For optimal production, birds require well-ventilated shelters with controlled temperature and clean bedding (litter) to prevent the spread of infections.

Q23. Answer: (b) asexual reproduction

The correct answer is asexual reproduction.

Key Points

• Budding is a form of asexual reproduction in which a new organism develops from an outgrowth or bud due to cell division at one particular site.

• In Hydra, a bud develops as an outgrowth due to repeated mitotic cell division at a specific point on the body. Hence, statement 2 is correct.

• These buds develop into tiny individuals and, when fully mature, detach from the parent body to become new independent individuals.

• Because the process involves only a single parent and does not involve the fusion of gametes, it is strictly classified as asexual.

• The offspring produced through budding are genetically identical to the parent, essentially being clones.

Additional Information

• Hydra:

• It is a freshwater organism belonging to the phylum Cnidaria and the class Hydrozoa.

• Hydra is well-known for its regenerative ability; it does not appear to die of old age, a phenomenon known as biological immortality.

• While it primarily reproduces asexually through budding, it can also undergo sexual reproduction, typically under unfavorable environmental conditions like winter or lack of food.

• Other modes of reproduction mentioned in options:

• Sexual Reproduction: Involves the fusion of male and female gametes (sperm and egg) to produce genetically diverse offspring. Hydra can develop testes and ovaries for this purpose, but budding is its most common method.

• Fission: A type of asexual reproduction common in unicellular organisms like Amoeba (binary fission) or Plasmodium (multiple fission), where the parent cell divides into two or more daughter cells. Hence, statement 3 is incorrect in the context of Hydra's primary budding process.

• Fragmentation: A process where an organism breaks into several pieces, and each piece grows into a new individual. This is common in Spirogyra and Planaria. While Hydra has regenerative powers, "budding" is a specialized, programmed developmental process distinct from accidental fragmentation. Hence, statement 4 is incorrect.

Important Points

• Mitosis vs. Meiosis: During budding, cells divide via mitosis, ensuring the chromosome number remains the same as the parent. In sexual reproduction, meiosis occurs to produce haploid gametes.

• Exogenous Budding: In Hydra, the bud forms on the external surface of the body, which is known as exogenous budding. This is different from endogenous budding seen in sponges (where gemmules are formed).

• Yeast Budding: Similar to Hydra, Yeast (a unicellular fungus) also reproduces by budding, though it happens at a cellular level rather than a multicellular tissue level.

• Environmental Factors: The rate of budding in Hydra is highly dependent on food availability and water temperature. Under optimal conditions, a Hydra can produce a new bud every 2 to 3 days.

Q24. Answer: (d) Cuboidal Epithelium

The correct answer is Cuboidal Epithelium.

Key Points

• Cuboidal Epithelium is composed of a single layer of cube-like cells with round, centrally located nuclei.

• This type of tissue is typically found in the lining of kidney tubules and the ducts of salivary glands.

• The primary functions of Cuboidal Epithelium are secretion and absorption, and it also provides mechanical support to the organs.

• In certain parts of the kidney, specifically the proximal convoluted tubule (PCT), the cuboidal cells possess microvilli (finger-like projections) which form a brush border to significantly increase the surface area for reabsorption.

• This tissue acts as a protective layer while facilitating the movement of molecules into and out of the tubular lumen.

Additional Information

• Columnar Epithelium:

• These consist of tall and pillar-like cells where the nuclei are often located at the base.

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• They are found in the lining of the stomach and intestine, where absorption and secretion occur.

• In the respiratory tract, these cells may have cilia on their outer surfaces, forming ciliated columnar epithelium to help move mucus forward.

• Glandular Epithelium:

• This is a specialized form of epithelial tissue where a portion of the tissue folds inward to form a multicellular gland.

• These cells are specialized for secreting substances like sweat, oil, enzymes, and hormones.

• Squamous Epithelium:

• These are extremely thin and flat cells that form a delicate lining.

• They are located in the lining of blood vessels, lung alveoli, and the esophagus where transport of substances occurs through a selectively permeable surface.

• When arranged in many layers to prevent wear and tear, it is called Stratified Squamous Epithelium, which forms the skin.

• Simple vs. Compound Epithelium:

• Simple epithelium is composed of a single layer of cells and functions as a lining for body cavities, ducts, and tubes.

• Compound epithelium consists of two or more cell layers and has a protective function, as seen in the dry surface of the skin or the moist surface of the buccal cavity.

Important Points

• All epithelial tissues are usually separated from the underlying tissue by an extracellular fibrous basement membrane.

• The cells are compactly packed with very little intercellular matrix.

• Since epithelial tissue covers the external surface and internal linings, anything entering or leaving the body must cross at least one layer of epithelium.

• The term "Skeletal Epithelium" is not a standard biological classification for epithelial tissue; skeletal generally refers to connective tissue (bone/cartilage) or muscular tissue.

Q25. Answer: (d) Catenation and tetravalency

The correct answer is Catenation and tetravalency.

Key Points

• Carbon possesses the unique ability to form covalent bonds with other carbon atoms, leading to the formation of long chains, branched chains, or even ring structures. This specific property of self-linking is known as catenation.

• Because of catenation, carbon compounds can have a variety of structures ranging from simple molecules like methane to complex structures like DNA and proteins. Hence, this property is a primary reason for the large number of carbon compounds.

• Carbon has an atomic number of 6 and a electronic configuration of 2, 4, meaning it has four valence electrons. This characteristic is known as tetravalency.

• With four available electrons for bonding, carbon can form four single bonds, or combinations of double and triple bonds with other atoms such as hydrogen, oxygen, nitrogen, and sulfur. Hence, tetravalency allows for a vast diversity of chemical combinations.

• The other options mentioned, such as ductility, sonorous nature, and conductivity, are primarily physical properties associated with metals, whereas the question asks for properties that lead to the formation of a large number of compounds (chemical diversity). Hence, option 4 is the correct identification.

Additional Information

• Isomerism in Carbon: Apart from catenation and tetravalency, carbon compounds also show isomerism, where compounds with the same molecular formula possess different structural arrangements. This further multiplies the number of possible carbon-based molecules.

• Bond Strength and Stability: The C-C bond is exceptionally strong and stable compared to other elements. While elements like Silicon (Si) also show catenation, their chains are highly reactive and unstable because their atomic size is larger, making the nucleus less effective at holding shared electron pairs.

• Organic Chemistry: The study of carbon compounds is so vast that it constitutes a dedicated branch of science called Organic Chemistry. Most of the substances we use daily, such as plastics, medicines, fuels (Petrol, Diesel), and food (Carbohydrates, Fats), are organic compounds.

• Small Atomic Size: Carbon belongs to Period 2 and Group 14 of the Periodic Table. Its small atomic radius allows it to form multiple bonds (double and triple bonds) effectively, which larger atoms in the same group struggle to do.

Important Points

• Allotropy: While not a reason for the number of compounds, carbon exists in various allotropic forms like Diamond, Graphite, and Fullerenes. Diamond is the hardest known natural substance, while graphite is a good conductor of electricity.

• Hydrocarbons: The simplest carbon compounds are hydrocarbons, consisting only of carbon and hydrogen. These are classified into Saturated (Alkanes) and Unsaturated (Alkenes and Alkynes) based on the types of bonds present.

• Functional Groups: The replacement of hydrogen atoms in a hydrocarbon chain with other atoms or groups (like -OH for Alcohol,

-COOH for Carboxylic acid) creates different classes of carbon compounds with distinct chemical properties.

Q26. Answer: (d) 11

Shortcut Trick

The mode is the value that appears most frequently in a data set.

In the given set (excluding x), 3 appears 3 times and 11 appears 2 times.

Current Mode = 3.

If x = 11, the frequency of 11 becomes 3, which is equal to the frequency of 3.

This makes the data bimodal (two modes: 3 and 11), thereby changing the original mode.

Therefore The correct answer is 11.

Alternate Method

Given Data: {1, 2, 3, 3, 7, 8, 9, 3, 11, x, 17, 11, 13}

Step 1: Arrange the known values in ascending order and find their frequencies.

Ordered known values: {1, 2, 3, 3, 3, 7, 8, 9, 11, 11, 13, 17}

=> Frequency of 3 = 3 times

=> Frequency of 11 = 2 times

=> Frequency of all other numbers = 1 time

=> Initial Mode = 3 (most frequent value)

=> If x = 11, then Frequency of 11 = 2 + 1 = 3

=> Now, 3 and 11 both occur 3 times, making the set bimodal.

=> For any other given option (2, 13, 3), the value 3 remains the unique mode.

Therefore The correct answer is 11.

Additional Information

Definition of Mode

The mode is the observation which occurs with the maximum frequency. A data set can have one mode (unimodal), two modes (bimodal), or more (multimodal).

Empirical Formula

The relationship between the three measures of central tendency is: Mode = 3 × Median − 2 × Mean.

Effect of Outliers

Unlike the mean, the mode is not affected by extreme values (outliers) in the dataset.

Q27. Answer: (d) 14 seconds

Shortcut Trick

Total distance = Sum of lengths = 259 + 231 = 490 m

Relative speed (Opposite) = Sum of speeds = 55 + 71 = 126 kmph

Convert Speed: 126 × (5/18) = 7 × 5 = 35 m/sec

Time = 490 ÷ 35 = 14 sec

Therefore The correct answer is 14 sec.

Alternate Method

Given: Length of Train A = 259 m, Length of Train B = 231 m, Speed of Train A = 55 kmph, Speed of Train B = 71 kmph.

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

=> Total Distance = L1 + L2 = 259 + 231 = 490 m

=> Relative Speed = S1 + S2 = 55 + 71 = 126 kmph

=> Speed in m/sec = 126 × (5/18) = 35 m/sec

=> Time taken = 490 ÷ 35

=> Time taken = 14 sec

Therefore The correct answer is 14 sec.

Additional Information

Relative Speed in Same Direction

When two objects move in the same direction, the relative speed is the difference of their speeds: |S1 − S2|.

Unit Conversion

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

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Train Crossing Stationary Object

When a train crosses a pole or a person, the distance covered is equal to the length of the train itself.

Q28. Answer: (d) 68.25

Shortcut Trick

Let number = x

Given: x − 20% of x = 78 → 80% of x = 78

x = 78 ÷ 0.8 = 97.5

70% of x = 0.7 × 97.5 = 68.25

Therefore Answer = 68.25

Alternate Method

Given:

20% of a number + 78 = number

Formula used:

Percentage = (Part/Whole) × 100

Calculation:

=> Let the number = x

=> 20% of x + 78 = x

=> 0.2x + 78 = x

=> x − 0.2x = 78

=> 0.8x = 78

=> x = 78 ÷ 0.8 = 97.5

=> 70% of x = 0.7 × 97.5 = 68.25

Therefore The correct answer is 68.25.

Additional Information

Percentage Basics

x% = x/100. So 20% = 0.2 and 70% = 0.7.

Forming Equations

Translate statements into equations carefully to solve unknown values.

Shortcut Idea

If a part is added to get the whole, subtract that part to simplify quickly.

Decimal Conversion

Use decimal form of percentages for faster calculation.

Q29. Answer: (d) increase by Rs. 609

Shortcut Trick

Income = 100, Savings = 17, Expenditure = 83

New Income = 100 × 1.18 = 118

New Expenditure = 83 × 1.20 = 99.6

New Savings = 118 − 99.6 = 18.4

Increase in Savings = 18.4 − 17 = 1.4 units

100 units = Rs. 43,500 => 1.4 units = (43500 ÷ 100) × 1.4 = 435 × 1.4 = Rs. 609

Therefore The correct answer is increase by Rs. 609.

Alternate Method

Given: Initial Income = Rs. 43,500, Savings % = 17%, Income Increase = 18%, Expenditure Increase = 20%.

Formula Used: Income = Expenditure + Savings

=> Initial Savings = 17% of 43,500 = 0.17 × 43,500 = Rs. 7,395

=> Initial Expenditure = 43,500 − 7,395 = Rs. 36,105

=> New Income = 43,500 × (118 ÷ 100) = Rs. 51,330

=> New Expenditure = 36,105 × (120 ÷ 100) = Rs. 43,326

=> New Savings = 51,330 − 43,326 = Rs. 8,004

=> Change in Savings = 8,004 − 7,395 = Rs. 609 (increase)

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Therefore The correct answer is increase by Rs. 609.

Additional Information

Income-Expenditure Alligation

Percentage change in income always lies between the percentage change in expenditure and percentage change in savings. It can be solved using Alligation with Expenditure and Savings as parts.

Percentage Change Rule

Percentage change = (Final Value − Initial Value) ÷ Initial Value × 100. If the result is positive, it is an increase; if negative, it is a decrease.

Q30. Answer: (b) 2%

Shortcut Trick

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

Here, x = −30 (reduction) and y = +40 (increase).

Net change = −30 + 40 + [(−30 × 40) / 100]

Net change = 10 − 12 = −2%

Negative sign indicates a decrease.

Therefore The correct answer is 2%.

Alternate Method

Given: Initial reduction = 30%, followed by increase = 40%.

=> Let the initial salary be 100 units.

=> After 30% reduction: 100 − (30% of 100) = 100 − 30 = 70 units.

=> After 40% increase on 70: 70 + (40% of 70) = 70 + 28 = 98 units.

=> Overall percentage change = (Final Value − Initial Value) / Initial Value × 100

=> Overall decrease = (100 − 98) / 100 × 100 = 2%.

Therefore The correct answer is 2%.

Additional Information

Successive Percentage Formula

The net change for two successive percentage changes a% and b% is given by (a + b + ab/100)%. Use positive values for increase and negative values for decrease.

Multiplying Factor Method

Net Factor = (1 − d1/100) × (1 + i1/100). In this case, 0.7 × 1.4 = 0.98. Since 0.98 < 1, it represents a decrease of (1 − 0.98) × 100 = 2%.

Base Change Property

Successive changes are independent of the initial value. If the order is reversed (40% increase then 30% decrease), the net result remains the same.

Q31. Answer: (a) 19.4

Shortcut Trick

Aditya's total time = 5 × 6 = 30 days.

Bhagawan's total time = 11 × 5 = 55 days.

Time taken together = (Product of days) ÷ (Sum of days) = (30 × 55) ÷ (30 + 55).

Together = 1650 ÷ 85 ≈ 19.41 days.

Therefore The correct answer is 19.4 days.

Alternate Method

Given:

Aditya: 1/6 work in 5 days.

Bhagawan: 1/5 work in 11 days.

Person	Days	Total Work	Efficiency
Aditya	30	330	11
Bhagawan	55	6	

=> Total Work = LCM(30, 55) = 330 units.

=> Combined efficiency of Aditya and Bhagawan = 11 + 6 = 17 units/day.

=> Time required = Total Work ÷ Combined Efficiency
=> Time = 330 ÷ 17
=> Time = 19.411...
Therefore The correct answer is 19.4 days.
Additional Information
Total Work and Fractions
If a person does 1/n part of work in D days, the total time taken to complete the full work (1 unit) is n × D days.
Combined Work Formula
For two people A and B completing a work in 'a' and 'b' days respectively, time taken together is (a × b) ÷ (a + b).
Efficiency and Days
Efficiency is inversely proportional to the time taken. More efficiency results in fewer days to complete the same work.

Q32. Answer: (c) 1 : 5

Shortcut Trick
The Volume of a cylinder is directly proportional to the square of the Radius and the Height: V prop. to $r^2 \times h$.
Given the radius is doubled ($r \rightarrow 2r$) and the height increases by 25% ($h \rightarrow 1.25h$).
Ratio of Original Volume to New Volume = $(1^2 \times 1) : (2^2 \times 1.25)$
Ratio = $1 : (4 \times 1.25) = 1 : 5$.
Therefore The correct answer is 1 : 5.
Alternate Method
Given: Original height (h1) = 12 cm, Curved Surface Area (CSA) = 602.88 cm^2, $\pi = 3.14$.
Formula Used: CSA = $2\pi rh$ | Volume (V) = $\pi r^2 h$
=> $2 \times 3.14 \times r1 \times 12 = 602.88$
=> $75.36 \times r1 = 602.88$
=> Original Radius (r1) = 602.88 ÷ 75.36 = 8 cm
=> New Radius (r2) = 2 × 8 = 16 cm
=> New Height (h2) = 12 + (25% of 12) = 12 + 3 = 15 cm
=> Original Volume (V1) = $3.14 \times 8^2 \times 12$
=> New Volume (V2) = $3.14 \times 16^2 \times 15$
=> Ratio V1 : V2 = $(8 \times 8 \times 12) : (16 \times 16 \times 15)$
=> Ratio = $(1 \times 1 \times 12) : (2 \times 2 \times 15) = 12 : 60 = 1 : 5$
Therefore The correct answer is 1 : 5.
Additional Information
Cylinder Surface Areas
Curved Surface Area (CSA) is $2\pi rh$, while Total Surface Area (TSA) includes both circular bases: TSA = $2\pi r(h + r)$.
Volume Scaling Rule
If the Radius is changed by a factor of 'x' and Height by a factor of 'y', the Volume changes by a factor of $x^2 \times y$.
Percentage Change in Volume
If radius increases by a% and height by b%, the Volume increases by $[(1 + a/100)^2(1 + b/100) - 1] \times 100\%$.

Q33. Answer: (a) 40

Shortcut Trick
Ratio of Son : Father at present = 2 : 5 (Difference = 3)
Ratio after 8 years = 1 : 2 (Difference = 1)
Make differences equal: Multiply second ratio by 3 → 3 : 6
Ratio change: 2 → 3 or 5 → 6 is 1 unit, which equals 8 years.
Father's present age = 5 units = 5 × 8 = 40 years.
Therefore The correct answer is 40 years.
Alternate Method
Given: Son's age = 2/5 of Father's age; After 8 years, Son = 1/2 of Father.
Let the Father's present age be 5x and Son's present age be 2x.
=> $(2x + 8) / (5x + 8) = 1/2$

=> 2 × (2x + 8) = 1 × (5x + 8)

=> 4x + 16 = 5x + 8

=> 5x − 4x = 16 − 8

=> x = 8

=> Father's present age = 5x = 5 × 8 = 40 years.

Therefore The correct answer is 40 years.

Additional Information

Ratio Difference Method

When the same value is added to both terms of a ratio, ensure the numerical difference between the ratio parts remains constant to find the unit value quickly.

Age Relation Constants

The age difference between two people always remains constant regardless of the number of years passed or decreased.

Q34. Answer: (d) 78.2 m

Shortcut Trick

In a 30º–60º–90º triangle, the side opposite to 60º is √3 times the side opposite to 30º.

Side opposite to 30º (Shadow) = 46 m.

Side opposite to 60º (Height) = 46 × √3 m.

Height = 46 × 1.7 = 78.2 m.

Therefore The correct answer is 78.2 m.

Alternate Method

Given:

Shadow length (BC) = 46 m

Angle of elevation (θ) = 60º

Formula Used:

tan θ = Perpendicular (Height) ÷ Base (Shadow)

Calculations:

=> tan 60º = h ÷ 46

=> √3 = h ÷ 46

=> h = 46 × √3

=> h = 46 × 1.7

=> h = 78.2 m

Therefore The correct answer is 78.2 m.

Additional Information

Trigonometric Ratios

For height and distance problems, remember tan 30º = 1/√3, tan 45º = 1, and tan 60º = √3.

Angle of Elevation vs Depression

The angle of elevation from an observer to an object is equal to the angle of depression from the object to the observer due to alternate interior angles.

Standard Square Root Values

Always check the question for specific approximations: √2 ≈ 1.414 and √3 ≈ 1.732 (used as 1.7 here).

Q35. Answer: (d) 36

Shortcut Trick

Average Speed = Total Distance ÷ Total Time

Total Distance = (20 × 80) + (56 × 64) = 1600 + 3584 = 5184 m

Total Time = 80 + 64 = 144 min

Average Speed = 5184 ÷ 144 = 36 m/min

Therefore The correct answer is 36 m/min.

Alternate Method

Given:

Speed1 (v1) = 20 m/min, Time1 (t1) = 80 min

Speed2 (v2) = 56 m/min, Time2 (t2) = 64 min

Formula Used:
Distance (d) = Speed × Time
Average Speed = (d1 + d2) ÷ (t1 + t2)
Calculations:
=> d1 = 20 × 80 = 1600 m
=> d2 = 56 × 64 = 3584 m
=> Total Distance = 1600 + 3584 = 5184 m
=> Total Time = 80 + 64 = 144 min
=> Average Speed = 5184 ÷ 144
=> Average Speed = 36 m/min
Therefore The correct answer is 36 m/min.
Additional Information
Average Speed (Equal Distances)
If a person travels equal distances at speeds x and y, the average speed is 2xy ÷ (x + y).
Average Speed (Equal Time)
If a person travels for equal time intervals at speeds x and y, the average speed is (x + y) ÷ 2.
Conversion of Units
To convert km/h to m/s, multiply by 5/18. To convert m/s to km/h, multiply by 18/5.

Q36. Answer: (d) 1

Shortcut Trick
Net filling efficiency per minute = (1 ÷ 2) − (1 ÷ 4) = 1 ÷ 4 of the tank.
Therefore, it takes 4 minutes to fill the entire tank.
To fill one-fourth of the tank, time taken = 4 × (1 ÷ 4) = 1 minute.
Therefore The correct answer is 1 minute.
Alternate Method
Given:
Time taken by filling pipe (A) = 2 minutes
Time taken by emptying pipe (B) = 4 minutes
Formula Used:
Total Work = LCM of individual times
Efficiency = Total Work ÷ Time
Pipe
Time (mins)
Total Capacity (LCM)
Efficiency
Pipe A (Inlet)
2
4 units
+2 units/min
Pipe B (Outlet)
4
−1 unit/min
Calculations:
=> Net efficiency of both pipes = Efficiency of A + Efficiency of B = 2 − 1 = 1 unit/min
=> Target volume to fill = One-fourth of the total capacity = 4 ÷ 4 = 1 unit
=> Time required to fill the target volume = Target volume ÷ Net efficiency
=> Time = 1 ÷ 1 = 1 minute
Therefore The correct answer is 1 minute.
Additional Information
Inlet and Outlet Pipes
An inlet pipe fills a tank (positive work) while an outlet pipe empties the tank (negative work).

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Combined Rate Formula

If an inlet pipe fills in x minutes and an outlet pipe empties in y minutes (where y > x), the net rate of filling when both are open is (y − x) ÷ (xy) per minute.

Q37. Answer: (d) 5

Shortcut Trick

Cancel first: (5/14 × 14) = 5

Convert mixed number: 2 1/5 = 11/5

Inside: (7/5) ÷ (7/11 × 11/5) = (7/5) ÷ (7/5) = 1

So expression = 5 ÷ 1

Therefore Answer = 5

Alternate Method

Given:

(5/14) × 14 ÷ [(7/5) ÷ (7/11) of 2 1/5]

Concept Used:

BODMAS rule

Calculation:

=> (5/14) × 14 ÷ [(7/5) ÷ (7/11) × 11/5]

=> (5/14) × 14 ÷ [(7/5) ÷ (77/55)]

=> (5/14) × 14 ÷ [(7/5) ÷ (7/5)]

=> (5/14) × 14 ÷ 1

=> 5 ÷ 1

=> 5

Therefore The correct answer is 5.

Additional Information

BODMAS Rule

Brackets → Orders → Division/Multiplication → Addition/Subtraction

Of Means Multiply

In such expressions, of is treated as multiplication.

Fraction Division

a/b ÷ c/d = a/b × d/c

Mixed Fraction

Convert mixed numbers into improper fractions before solving.

Q38. Answer: (c) 1197

Shortcut Trick

Direct multiplication: x = 2660 × 0.45

Split 0.45 into (0.50 − 0.05)

x = (2660 × 0.50) − (2660 × 0.05)

x = 1330 − 133 = 1197

Therefore The correct answer is 1197.

Alternate Method

Given:

Equation: x ÷ 0.45 = 2660

Calculations:

=> x / 0.45 = 2660

=> x = 2660 × 0.45

=> x = 2660 × (45 / 100)

=> x = 26.6 × 45

=> x = 1197

Therefore The correct answer is 1197.

Additional Information

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BODMAS Rule

It defines the order of operations: Brackets, Of, Division, Multiplication, Addition, and Subtraction.

Decimal Multiplication

To multiply by a decimal, ignore the decimal point first, multiply the integers, then place the decimal point based on the sum of decimal places in the factors.

Q39. Answer: (a) 39

Shortcut Trick

Initial average of 5 innings = 62.

Excess runs scored in 6^(th) inning = 296 − 62 = 234.

This excess is equally distributed among all 6 innings to find the increase in average.

=> Increase in average = 234 ÷ 6 = 39.

Therefore The correct answer is 39 runs.

Alternate Method

Given:

Average of 5 innings = 62 runs

Runs in 6^(th) inning = 296 runs

Formula Used:

Average = Total Runs ÷ Number of Innings

Calculations:

=> Total runs in 5 innings = 5 × 62 = 310 runs

=> Total runs after 6^(th) inning = 310 + 296 = 606 runs

=> New average = 606 ÷ 6 = 101 runs

=> Increase in average = New Average − Old Average

=> Increase = 101 − 62 = 39 runs

Therefore The correct answer is 39 runs.

Additional Information

Concept of Average Change

When a new value is added, the Average Increase = (New Value − Old Average) ÷ Total Count including the new entry.

Total Sum from Average

To find the Total Sum, always multiply the Average by the Number of items: Sum = Average × n.

Net Deviation Rule

The sum of deviations of all observations from their arithmetic mean is always zero (Σ(x − x) = 0).

Q40. Answer: (b) 151°

Shortcut Trick

In right-angled ΔBDC, angle C = 90° − angle DBC = 90° − 14° = 76°.

angle AEB is the exterior angle of ΔAEC at vertex E.

By the exterior angle theorem, angle AEB = angle CAE + angle C.

angle AEB = 75° + 76° = 151°.

Therefore The correct answer is 151°.

Alternate Method

Given: BD perpendicular to AC, angle DBC = 14°, angle CAE = 75°.

Formula Used: Sum of angles in a triangle = 180°.

=> In ΔBDC, angle BDC = 90° (since BD perpendicular to AC).

=> angle BCD = 180° − (angle BDC + angle DBC) = 180° − (90° + 14°) = 76°.

=> In ΔAEC, angle AEC = 180° − (angle CAE + angle ACE) = 180° − (75° + 76°) = 29°.

=> Since B, E, and C are collinear points on a straight line, angle AEB + angle AEC = 180°.

=> angle AEB = 180° − 29° = 151°.

Therefore The correct answer is 151°.

Additional Information

Exterior Angle Theorem

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The measure of an exterior angle of a triangle is equal to the sum of the measures of its two remote interior angles.

Angle Sum Property

The sum of the interior angles of any triangle is always 180°.

Complementary Angles

In a right-angled triangle, the two non-right angles are complementary, meaning their sum is exactly 90°.

Q41. Answer: (b) 10%

Shortcut Trick

Discount = Marked Price (MP) − Selling Price (SP) = 4,820 − 4,338 = 482.

Discount% = (Discount ÷ MP) × 100 = (482 ÷ 4,820) × 100.

Discount% = (1/10) × 100 = 10%.

Therefore The correct answer is 10%.

Alternate Method

Given: Marked Price (MP) = Rs. 4,820, Selling Price (SP) = Rs. 4,338.

Formula: Discount% = [(MP − SP) ÷ MP] × 100

=> Discount = 4,820 − 4,338 = 482

=> Discount% = (482 ÷ 4,820) × 100

=> Discount% = 0.1 × 100 = 10%

Therefore The correct answer is 10%.

Additional Information

Marked Price & Discount

Marked Price is the price tag on an item. Discount is always calculated on the Marked Price unless otherwise stated.

Selling Price Calculation

SP = MP × (100 − Discount%) ÷ 100. This is useful when the percentage and MP are known.

Q42. Answer: (c) 16

Shortcut Trick

To find the smaller number when the sum (S) and difference (D) are given:

Smaller number = (Sum − Difference) ÷ 2

=> (45 − 13) ÷ 2 = 32 ÷ 2 = 16

Therefore The correct answer is 16.

Alternate Method

Given:

Sum of numbers = 45

Difference of numbers = 13

Let the two numbers be x and y (where x > y).

=> x + y = 45 --- (Equation 1)

=> x − y = 13 --- (Equation 2)

Subtracting Equation 2 from Equation 1:

=> (x + y) − (x − y) = 45 − 13

=> 2y = 32

=> y = 32 ÷ 2

=> y = 16

Therefore The correct answer is 16.

Additional Information

Finding the Larger Number

The larger number can be found using the formula: (Sum + Difference) ÷ 2. In this case, (45 + 13) ÷ 2 = 29.

Verification of Results

Check the sum and difference of 29 and 16: 29 + 16 = 45 and 29 − 16 = 13. The values are correct.

Product of Numbers

The product of two numbers can be expressed as $[(Sum)^2 - (Difference)^2] \div 4$.

Q43. Answer: (d) 1050

Shortcut Trick

Product of ratio parts = 8 × 7 × 5 = 280 units³

Scale factor $x^3 = 2240 \div 280 = 8 \Rightarrow x = 2$

Surface area ratio units = 2 × (8×7 + 7×5 + 5×8) = 262 units²

Actual Total Surface Area = 262 × 2² = 1048 ≈ 1050 cm²

Therefore The correct answer is 1050 cm².

Alternate Method

Given:

Ratio of Length (L), Breadth (B), and Height (H) = 8 : 7 : 5

Volume of the rectangular box = 2240 cm³

Formula Used:

Volume of cuboid = L × B × H

Total Surface Area (TSA) = 2(LB + BH + HL)

=> Let L = 8x, B = 7x, and H = 5x

=> Volume = 8x × 7x × 5x = 2240

=> $280x^3 = 2240$

=> $x^3 = 2240 \div 280 = 8$

=> x = 2 cm

=> Actual dimensions: L = 16 cm, B = 14 cm, H = 10 cm

=> TSA = 2 × (16 × 14 + 14 × 10 + 10 × 16)

=> TSA = 2 × (224 + 140 + 160) = 2 × 524 = 1048 cm²

=> Rounding off to the nearest tens: 1048 ≈ 1050 cm²

Therefore The correct answer is 1050 cm².

Additional Information

Lateral Surface Area of Cuboid

It represents the area of the four side walls and is calculated as: LSA = 2 × H × (L + B).

Diagonal of a Cuboid

The length of the longest rod that can be placed inside the box is $\sqrt{(L^2 + B^2 + H^2)}$.

Surface Area of a Cube

For a cube with side 'a', the Total Surface Area is 6a² and the Volume is a³.

Q44. Answer: (c) 32,200

Shortcut Trick

Net difference in interest rate for 2 years = (7% − 3.5%) × 2 = 7%.

Interest difference = 7% of Rs. 4,60,000.

Difference = (7 ÷ 100) × 4,60,000 = 7 × 4,600 = Rs. 32,200.

Therefore The correct answer is Rs. 32,200.

Alternate Method

Given:

Principal (P) = Rs. 4,60,000

Rate of Bank A (R1) = 3.5% p.a.

Rate of Bank B (R2) = 7% p.a.

Time (T) = 2 years

Formula Used:

Simple Interest (SI) = (P × R × T) ÷ 100

Calculations:

=> Interest from Bank A (SI1) = (4,60,000 × 3.5 × 2) ÷ 100

=> SI1 = 4,600 × 7 = Rs. 32,200

=> Interest from Bank B (SI2) = (4,60,000 × 7 × 2) ÷ 100

=> SI2 = 4,600 × 14 = Rs. 64,400

=> Positive Difference = SI2 − SI1 = Rs. 64,400 − Rs. 32,200

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=> Difference = Rs. 32,200

Therefore The correct answer is Rs. 32,200.

Additional Information

Simple Interest Concept

Simple interest is calculated only on the principal amount. The formula is SI = (P × R × T) ÷ 100.

Effective Rate of Interest

For simple interest, the effective rate for T years is simply R × T percent of the principal.

Difference between SI and CI

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

Q45. Answer: (b) 58,950

Shortcut Trick

Total investment × 20% = Total Profit.

Total investment = 78,600 ÷ 0.20 = Rs. 3,93,000.

Ratio of investments (Aarti : Anil : Naveen) = 17 : 6 : 17.

Sum of ratio parts = 17 + 6 + 17 = 40 units.

Anil's investment = (Total Investment ÷ 40) × 6 = (3,93,000 ÷ 40) × 6.

Anil's investment = 9,825 × 6 = Rs. 58,950.

Therefore The correct answer is Rs. 58,950.

Alternate Method

Given → Profit = Rs. 78,600 | Profit% = 20% | Ratio = 17 : 6 : 17.

Formulas: Investment = (Profit ÷ Profit%) × 100 | Individual Share = (Total × Ratio Part) ÷ Total Parts.

=> Let Total Investment be X.

=> 20% of X = 78,600 => (20 ÷ 100) × X = 78,600.

=> X = (78,600 × 100) ÷ 20 = 78,600 × 5 = 3,93,000.

=> Total ratio parts for Aarti, Anil, and Naveen = 17 + 6 + 17 = 40.

=> Value of 1 part = 3,93,000 ÷ 40 = 9,825.

=> Anil's investment (6 parts) = 6 × 9,825 = 58,950.

Therefore The correct answer is Rs. 58,950.

Additional Information

Partnership Profit Distribution

In a partnership, if the time period is constant, the profit is shared in the ratio of investments. Formula: Profit1 : Profit2 = Investment1 : Investment2.

Return on Investment (ROI)

ROI% or Profit% on investment is calculated as: (Total Profit ÷ Total Investment) × 100.

Q46. Answer: (c) Rs. 16,376

Shortcut Trick

Profit ratio of Prakhar to Riya = 2300 : (5000 − 2300) = 2300 : 2700 = 23 : 27.

Total investment ratio parts = 23 + 27 = 50 units.

50 units corresponds to the total investment of Rs. 35,600.

1 unit = 35600 ÷ 50 = Rs. 712.

Prakhar's investment = 23 units × 712 = Rs. 16,376.

Therefore The correct answer is Rs. 16,376.

Alternate Method

Given → Total Investment = Rs. 35,600, Total Profit = Rs. 5,000, Prakhar's Profit = Rs. 2,300.

Formulas: Profit Ratio = Investment Ratio (when time is constant) | Individual Profit = (Individual Investment ÷ Total Investment) × Total Profit.

=> Riya's Profit = Total Profit − Prakhar's Profit = 5000 − 2300 = Rs. 2,700.

=> Investment of Prakhar : Investment of Riya = 2300 : 2700 = 23 : 27.

=> Let Prakhar's investment be 23x and Riya's be 27x.

=> 23x + 27x = 35600 => 50x = 35600 => x = 712.

=> Prakhar's investment = 23 × 712 = 16376.

Therefore The correct answer is Rs. 16,376.

Additional Information

Partnership Principle

In a partnership, if the time period of investment is the same for all partners, the profit is distributed in the direct ratio of their capital investments.

Variable Time Period

If time periods differ, Profit Ratio = (Capital1 × Time1) : (Capital2 × Time2).

Q47. Answer: (a) 34

Shortcut Trick

The greatest number that can exactly divide all three numbers is their HCF.

Sum of ratio parts = 3 + 5 + 7 = 15 units.

Given, 15 units = 510.

Since the numbers are multiples of their HCF, the value of 1 unit represents the HCF of the numbers.

HCF = 510 ÷ 15 = 34.

Therefore The correct answer is 34.

Alternate Method

Given: Ratio of numbers = 3 : 5 : 7, Total sum = 510.

Formula Used: Sum of numbers = Sum of (Ratio × Common factor).

Let the three numbers be 3x, 5x, and 7x, where x is the HCF.

=> 3x + 5x + 7x = 510

=> 15x = 510

=> x = 510 ÷ 15

=> x = 34

The numbers are 102, 170, and 238. The greatest common divisor is 34.

Therefore The correct answer is 34.

Additional Information

Highest Common Factor (HCF)

HCF is the largest positive integer that divides each of the integers without a remainder. For numbers in ratio a : b : c, the HCF is the common multiplier.

Ratio and Sum Relationship

If numbers are in ratio p : q : r and their sum is S, then the common factor x = S ÷ (p + q + r).

Least Common Multiple (LCM)

LCM of numbers in ratio a : b : c (where a, b, c are coprime) is HCF × a × b × c.

Q48. Answer: (c) 160

Shortcut Trick

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

Ratio MP ÷ CP = (100 + 69) ÷ (100 − 35) = 169 ÷ 65.

Simplified ratio = 13 ÷ 5 (dividing both by 13).

Mark-up percentage (X) = [(13 − 5) ÷ 5] × 100 = (8 ÷ 5) × 100 = 160%.

Therefore The correct answer is 160.

Alternate Method

Given: Discount = 35%, Profit = 69%, Mark-up = X%.

Formulas: SP = CP × (100 + Profit%) ÷ 100 | SP = MP × (100 − Discount%) ÷ 100 | X% = [(MP − CP) ÷ CP] × 100.

=> Let Cost Price (CP) be 100.

=> Selling Price (SP) = 100 + 69% of 100 = 169.

=> Since Discount is 35%, SP = 65% of Marked Price (MP).

=> 169 = MP × (65 ÷ 100) => MP = (169 × 100) ÷ 65 = 16900 ÷ 65 = 260.

=> Mark-up (X) = MP − CP = 260 − 100 = 160.

=> Value of X = (160 ÷ 100) × 100 = 160%.

Therefore The correct answer is 160.

Additional Information

Marked Price and Discount

Discount is always calculated on the Marked Price (MP). SP = MP − Discount.

Successive Percentage Formula

Profit% = Mark-up% − Discount% − (Mark-up × Discount) ÷ 100. This is useful for finding the effective change between three variables.

Q49. Answer: (d) 3 : 6 : 2

Shortcut Trick

Divide the equation $8x^2 + 2y^2 + 18z^2 − 4xy − 6yz − 12zx = 0$ by 2.

=> $4x^2 + y^2 + 9z^2 − 2xy − 3yz − 6zx = 0$

This is in the form $a^2 + b^2 + c^2 − ab − bc − ca = 0$, where a = 2x, b = y, c = 3z.

Since this identity implies a = b = c, we get 2x = y = 3z.

To find the ratio, x : y : z = 1/2 : 1 : 1/3 = 3 : 6 : 2.

Therefore The correct answer is 3 : 6 : 2.

Alternate Method

Given: $8x^2 + 2y^2 + 18z^2 − 4xy − 6yz − 12zx = 0$

Formula Used: $a^2 + b^2 + c^2 − ab − bc − ca = 1/2[(a − b)^2 + (b − c)^2 + (c − a)^2]$

=> $8x^2 + 2y^2 + 18z^2 − 4xy − 6yz − 12zx = 0$

Dividing by 2:

=> $4x^2 + y^2 + 9z^2 − 2xy − 3yz − 6zx = 0$

=> $(2x)^2 + (y)^2 + (3z)^2 − (2x)(y) − (y)(3z) − (3z)(2x) = 0$

=> $1/2[(2x − y)^2 + (y − 3z)^2 + (3z − 2x)^2] = 0$

For the sum of squares to be zero, each term must be zero:

=> 2x − y = 0 => 2x = y

=> y − 3z = 0 => y = 3z

Combining these, 2x = y = 3z. Let 2x = y = 3z = 6k (LCM of 2, 1, 3 is 6).

=> x = 3k, y = 6k, z = 2k

=> x : y : z = 3k : 6k : 2k = 3 : 6 : 2

Therefore The correct answer is 3 : 6 : 2.

Additional Information

Algebraic Identity Condition

The expression $a^2 + b^2 + c^2 − ab − bc − ca$ is always non-negative and equals zero if and only if a = b = c.

Sum of Squares Property

If $A^2 + B^2 + C^2 = 0$ for real numbers, then A = 0, B = 0, and C = 0 must be true simultaneously.

Ratio Conversion

If ax = by = cz, then the ratio x : y : z is 1/a : 1/b : 1/c, which can be simplified by multiplying with the LCM of a, b, and c.

Q50. Answer: (d) 5.21% profit

Shortcut Trick

Total Cost Price (CP) of 3 watches = Rs. 4,800.

Net Profit/Loss = Sum of individual profits and losses.

Net Profit = 200 − 100 + 150 = Rs. 250.

Overall Profit% = (Net Profit ÷ Total CP) × 100.

Overall Profit% = (250 ÷ 4800) × 100 = 250 ÷ 48 = 5.2083...%.

Therefore The correct answer is 5.21% profit.

Alternate Method

Given: Total CP = Rs. 4,800; Profit1 = Rs. 200; Loss2 = Rs. 100; Profit3 = Rs. 150.

Formulas: Total Profit = ∑Profits − ∑Losses | Profit% = (Profit ÷ CP) × 100

=> Total Cost Price (CP) = Rs. 4,800.

=> Total Selling Price (SP) = (1600+200) + (1600−100) + (1600+150) = 1800 + 1500 + 1750 = Rs. 5,050.

=> Total Profit = SP − CP = 5050 − 4800 = Rs. 250.

=> Profit Percentage = (250 ÷ 4800) × 100 = 5.2083...%.

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=> Rounding off to two decimal places, we get 5.21%.

Therefore The correct answer is 5.21% profit.

Additional Information

Overall Profit and Loss

When multiple articles are sold, the net profit or loss is the algebraic sum of the individual profits and losses. A positive result indicates profit, while a negative result indicates loss.

Rounding Off Rules

If the third decimal digit is 5 or greater, the second decimal digit is increased by 1. Here, 5.208... becomes 5.21%.

Q51. Answer: (a) 2

Given: (Left) # 9 & 5 1 © * * * @ # & 7 & # $ 8 & 3 1 @ € (Right)

Now,

Symbols, each of which is immediately preceded by a number and also immediately followed by a number.

So, the needed pattern is: Number — Symbol — Number

Thus, there are 2 such symbols, each of which is immediately preceded by a number and also immediately followed by a number.

Hence, the correct answer is "Option 1".

Q52. Answer: (b) JMQ

The position and positional values or English Alphabets are:

Given: RUY PSW NQU LOS ?

The logic followed here is:

Thus, JMQ should come in place of the question mark (?) in the given series, based on the English alphabetical order.

Hence, the correct answer is "Option 2".

Q53. Answer: (d) 538

BODMAS Rule:

Decoding the given information:

Symbol	•	•	×	÷
Meaning	•	×	÷	•

Given equation: 23 - 15 ÷ 246 + 318 x 6 = ?

Now replacing the sign from left to right using BODMAS Rule, we get:

=> 23 × 15 + 246 − 318 ÷ 6 = ?

=> 23 × 15 + 246 − 53 = ?

=> 345 + 246 − 53 = ?

=> 591 − 53 = ?

=> 538 = ?

Hence, the correct answer is "Option 4".

Q54. Answer: (b) Only conclusion (I) follows.

Statements:

All kites are banks.

No pencils are kites.

The least possible Venn diagram for the given statement is:

Conclusions:

(I) Some banks are not pencils. - Follow (Because, all kites are banks and no pencils are kites, which means the banks being kites are not pencils.)

(II) All banks are kites. - Does not follow (Because, all kites are banks does not mean all banks are kites, it means some banks are kites.)

Thus, only conclusion (I) follows.

Hence, the correct answer is "Option 2".

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Q55. Answer: (a) BCZ−XYV

The position and positional values or English Alphabets are:

The pattern followed here is:

Each letter-cluster pair follows the pattern -4, -4, -4.

OPM−KLI

YZW−UVS

Let's check each option:

1. BCZ–XYV

This letter-cluster pair follows the pattern -4, -4, -4.

2. BCZ–WYU

This letter-cluster pair does not follow the pattern -4, -4, -4.

3. BBX–XYV

This letter-cluster pair does not follow the pattern -4, -4, -4.

4. BBX–WXU

This letter-cluster pair does not follow the pattern -4, -4, -4.

Thus, BCZ−XYV follows the same pattern as the one followed by the two pairs given.

Hence, the correct answer is "Option 1".

Q56. Answer: (c) 46

Shortcut Trick

Interchange signs: (− → +), (÷ → ×), (+ → −), (× → ÷).

New expression: 34 + 7 × 6 − 270 ÷ 9

Using BODMAS: 34 + 42 − 30

Final value: 76 − 30 = 46

Therefore The correct answer is 46.

Alternate Method

Given equation: 34 − 7 ÷ 6 + 270 × 9 = ?

Rule: Interchange (+) with (−) and (×) with (÷).

=> Modified equation: 34 + 7 × 6 − 270 ÷ 9

=> 34 + 7 × 6 − (270 ÷ 9)

=> 34 + 7 × 6 − 30

=> 34 + (7 × 6) − 30

=> 34 + 42 − 30

=> 76 − 30

=> 46

Therefore The correct answer is 46.

Additional Information

BODMAS Rule

Simplification always follows the sequence: Brackets, Orders, Division, Multiplication, Addition, and then Subtraction.

Sign Interchange Method

In logical reasoning, ensure all pairs of signs are swapped simultaneously before initiating the calculation to prevent BODMAS errors.

Q57. Answer: (b) 6 km to the North

Given: Mr. Z starts from Point A and drives 12 km towards the East. He then takes a right turn, drives 17 km, then turns right and drives 32 km. He then takes a right turn and drives 7 km. He then taken a right turn, drives 10 km, then turns left and drives 4 km. He takes a final right turn, drives 10 km, and stops at Point P.

Thus, he should drive 6 km to the North in order to reach Point A again.

Hence, the correct answer is "Option 2".

Q58. Answer: (c) WO 23

The position and positional values or English Alphabets are:

Given: IB 15 is related to NF 12 in a certain way. In the same way, OH 20 is related to TL 17.

The logic followed here is:

Similarly,

Thus, RK 26 is related to WO 23, following the same logic.

Hence, the correct answer is "Option 3".

Q59. Answer: (c) South-west

Given: Town X is to the west of Town Y. Town Z is to the north of Town Y. Town W is to the west of Town Z. Town V is to the south of Town W. Town X is to the north-west of Town V.

Thus, Town X is to the South-west of Town W.

Hence, the correct answer is "Option 3".

Q60. Answer: (a) 3

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

Now,

Even numbers, each of which is immediately preceded by an odd number and also immediately followed by an even number.

So, the needed pattern is: Odd — Even — Even

Thus, there are 3 even numbers, each of which is immediately preceded by an odd number and also immediately followed by an even number.

Hence, the correct answer is "Option 1".

Q61. Answer: (b) One

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

Now,

Even digits, each of which is immediately preceded by an odd digit and also immediately followed by an odd digit.

So, the needed pattern is: Odd — Even — Odd

Thus, there is one even digit, each of which is immediately preceded by an odd digit and also immediately followed by an odd digit.

Hence, the correct answer is "Option 2".

Q62. Answer: (d) I

Given: F, G, H, I, M, N, and O are sitting around a circular table, facing the centre of the table.

1. Only two people sit between F and G, when counted from the right of F.

2. Only two people sit between G and M, when counted from the right of G.

3. Only three people sit between F and N, when counted from the right of F.

4. H sits to the immediate left of I.

O, the only person left will occupy the vacant position.

Thus, I sits third to the left of O.

Hence, the correct answer is "Option 4".

Q63. Answer: (a) 2

Given: In a certain code language, ‘LEASK’ is coded as ‘76432’ and ‘KASEY’ is coded as ‘46837’.

Thus, 2 is the code for ‘L’ in the given code language.

Hence, the correct answer is "Option 1".

Q64. Answer: (c) ROJ

The position and positional values or English Alphabets are:

The pattern followed here is:

Each letter-cluster follows the pattern -4, -4.

Let's check each option:

1. TPL

This letter-cluster follows the pattern -4, -4.

2. UQM

This letter-cluster follows the pattern -4, -4.

3. ROJ

This letter-cluster does not follow the pattern -4, -4.

4. VRN

This letter-cluster follows the pattern -4, -4.

Thus, ROJ is the odd one out.

Hence, the correct answer is "Option 3".

Q65. Answer: (b) Three

Given: A, B, C, D, W, X and Y are sitting in a straight line facing north.

1. Only three people sit to the left of D.
2. Only A sits to the right of C.
3. Only three people sit between C and B.
4. X sits at some place to the left of Y but at some place to the right of W.

Thus, three people sit between W and Y.

Hence, the correct answer is "Option 2".

Q66. Answer: (c) AFG

The position and positional values or English Alphabets are:

The pattern followed here is:

Each letter-cluster follows the pattern +4, +2.

Let's check each option:

1. TXZ

This letter-cluster follows the pattern +4, +2.

2. GKM

This letter-cluster follows the pattern +4, +2.

3. AFG

This letter-cluster does not follow the pattern +4, +2.

4. WAC

This letter-cluster follows the pattern +4, +2.

Thus, AFG is the odd one out.

Hence, the correct answer is "Option 3".

Q67. Answer: (d) 1

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

Now,

Even numbers, each of which is immediately preceded by an odd number and also immediately followed by an even number.

So, the needed pattern is: Odd — Even — Even

Thus, there is 1 even number, each of which is immediately preceded by an odd number and also immediately followed by an even number.

Hence, the correct answer is "Option 4".

Q68. Answer: (a) Three

Given: Seven boxes D, E, F, U, V, W and X are kept one over the other but not necessarily in the same order.

1. Only U is kept above E.
2. Only one box is kept between U and D.
3. D is kept immediately above V.
4. W is not kept at third position from the bottom.
5. W is kept immediately above F.

U
E
D
V
W

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W
F

X, the only box left will occupy the vacant position.

U
E
D
V
X
W
F

Thus, three boxes are kept between X and U.

Hence, the correct answer is "Option 1".

Q69. Answer: (c) Sister

Family Chart:

Decoding the Symbols:

A is				
Symbol	±	•	Rs.	#
Meaning	wife	son	father	sister
to B				

Given: D # R * A ± C Rs. O

It means: D is the sister of R, R is the son of A, A is the wife of C, C is the father of O.

Thus, D is the Sister of O.

Hence, the correct answer is "Option 3".

Q70. Answer: (a) 113

Given: 110 109 111 108 112 107 ?

The logic followed here is:

Thus, 113 should come in place of the question mark (?) in the given series.

Hence, the correct answer is "Option 1".

Q71. Answer: (c) 16

Given: 66 56 46 36 26 ?

The logic followed here is:

Thus, 16 should come in place of the question mark (?) in the given series.

Hence, the correct answer is "Option 3".

Q72. Answer: (a) D

Given: A, B, C, D, E and F are sitting around a circular table facing the centre.

1. B sits second to the right of A.
2. D sits second to the left of E.
3. C is on the immediate right of B.

F, the only person left will occupy the vacant position.

Thus, D is sitting on the immediate right of F.

Hence, the correct answer is "Option 1".

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Q73. Answer: (c) WQ 25

The position and positional values or English Alphabets are:

Given: GB 16 is related to KE 13 in a certain way. In the same way, MH 25 is related to QK 22.

The logic followed here is:

Similarly,

Thus, SN 28 is related to WQ 25, following the same logic.

Hence, the correct answer is "Option 3".

Q74. Answer: (c) 51

Given: Deepali ranked 9th from the top and 43rd from the bottom in her class.

Total students = Rank from top + Rank from bottom − 1

Total students = 9 + 43 − 1

= 52 − 1

= 51

Thus, there are 51 students in the class.

Hence, the correct answer is "Option 3".

Q75. Answer: (c) av

Given: In a certain code language, ‘the dog barks’ is coded as ‘av ds tw’ and ‘dog can run’ is coded as ‘rd te av’.

Thus, ‘dog’ is coded as 'av' in the given language.

Hence, the correct answer is "Option 3".

Q76. Answer: (c) 51

BODMAS Rule:

Given equation: 25 × 5 − 7 ÷ 8 + 10 = ?

Now, if ‘+’ and ‘−’ are interchanged and ‘×’ and ‘÷’ are interchanged, then the equation becomes:

=> 25 ÷ 5 + 7 × 8 − 10 = ?

=> 5 + 7 × 8 − 10 = ?

=> 5 + 56 − 10 = ?

=> 61 − 10 = ?

=> 51 = ?

Hence, the correct answer is "Option 3".

Q77. Answer: (d) PHD 16

The position and positional values or English Alphabets are:

Given: HDP 1, JEM -2, LFJ 4, NGG -8, ?

The logic followed here is:

Thus, PHD 16 will replace the question mark (?) in the given series to make it logically complete.

Hence, the correct answer is "Option 4".

Q78. Answer: (a) Only conclusion (I) follows.

Statements:

All golds are hens.

No hen is a cow.

The least possible Venn diagram for the given statement is:

Conclusions:

(I) No gold is a cow. - Follow (Because, all golds are hens and no hen is a cow, which means no gold is a cow.)

(II) Some cows are hens. - Does not follow (Because, no hen is a cow, so some cows are not hens.)

Thus, only conclusion (I) follows.

Hence, the correct answer is "Option 1".

Q79. Answer: (d) 131

Given: 71 75 83 95 111 ?

The logic followed here is:

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Thus, 131 should come in place of the question mark (?) in the given series.

Hence, the correct answer is "Option 4".

Q80. Answer: (a) (12, 120, 10)

The logic followed here is:

Logic: (a, b, c) → a × c = b

11 × 10 = 110

8 × 8 = 64

Let's check each option:

1. (12, 120, 10) → 12 × 10 = 120

2. (7, 56, 7) → 7 × 7 = 49 ≠ 56

3. (9, 72, 9) → 9 × 9 = 81 ≠ 72

4. (10, 80, 9) → 10 × 9 = 90 ≠ 80

Thus, (12, 120, 10) is the set in which the numbers are related in the same way as the given sets.

Hence, the correct answer is "Option 1".

Q81. Answer: (a) 2025

The correct answer is 2025.

Key Points

• The National Critical Mineral Mission was announced by the Union Finance Minister Nirmala Sitharaman during the Union Budget 2024-25 presentation, with the mission scheduled to be established and fully operationalized in 2025.

• The primary mandate of the mission is to ensure a sustainable supply chain of minerals that are essential for the country's high-tech industries, including telecommunications, defense, and space.

• The mission focuses on three main pillars: domestic production, recycling of critical minerals, and the overseas acquisition of mineral assets to reduce import dependency. Hence, the mention of 2025 as the launch/operational year for this comprehensive framework is correct.

• It aims to create a robust ecosystem for the development of critical mineral technology and to train a specialized skilled workforce to manage the extraction and processing of these strategic resources.

• The mission is part of India's broader strategy to secure minerals like Lithium, Copper, Cobalt, and Rare Earth Elements, which are indispensable for the green energy transition.

Additional Information

• Definition of Critical Minerals:

• Critical minerals are those metallic or non-metallic elements that are vital for the modern economy and national security, yet whose supply chain is at risk of disruption.

• In 2023, the Ministry of Mines identified a list of 30 critical minerals for India, including Nickel, Graphite, Titanium, and Germanium.

• Khanij Bidesh India Limited (KABIL):

• KABIL is a joint venture company formed by three public sector undertakings: National Aluminium Company Ltd. (NALCO), Hindustan Copper Ltd. (HCL), and Mineral Exploration and Consultancy Ltd. (MECL).

• It was established to identify, acquire, and develop strategic mineral assets overseas, ensuring a steady supply of Lithium and Cobalt for India’s Electric Vehicle (EV) sector.

• Policy and Regulatory Framework:

• The Mines and Minerals (Development and Regulation) Amendment Act, 2023, allowed the central government to auction 24 critical and strategic minerals, which were previously reserved for the public sector.

• This policy shift is intended to encourage private sector participation in the exploration and mining of deep-seated minerals.

• Global Context and Sustainability:

• India joined the Mineral Security Partnership (MSP), a US-led global initiative, to bolster international cooperation in securing critical mineral supply chains.

• Securing these minerals is a prerequisite for India to achieve its Net Zero emissions target by the year 2070, as they are used in solar panels, wind turbines, and energy storage systems.

Q82. Answer: (b) Shenzhen, China

The correct answer is Shenzhen, China.

Key Points

• The International Tennis Federation (ITF) officially announced that the Billie Jean King Cup Finals will be hosted in Shenzhen,

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China, for a three-year period from 2025 to 2027.

• This decision marks a significant shift for the tournament, moving it to the Asian market after several years of being held in Europe, specifically in Seville and Malaga, Spain.

• The selection of Shenzhen was based on the city's proven track record of hosting elite international tennis events, including the WTA Finals, and its world-class infrastructure.

• The move is part of the ITF's strategic goal to increase the global footprint of women's team tennis and capitalize on the growing popularity of the sport in the Far East. Hence, the correct answer is Shenzhen, China.

• The competition features the world's top female players representing their national teams, competing for the most prestigious trophy in international women's team sports.

Additional Information

• Billie Jean King Cup:

• Known as the "World Cup of Tennis," it was formerly called the Federation Cup (1963–1995) and the Fed Cup (1995–2020).

• It was rebranded in September 2020 to honor Billie Jean King, a 39-time Grand Slam champion and a lifelong advocate for gender equality in sports.

• The tournament was launched in 1963 to celebrate the 50th anniversary of the International Tennis Federation.

• Tournament Format:

• The Finals involve 12 teams competing in a group stage followed by knockout semi-finals and a final.

• Teams qualify through regional zones and a Qualifying Round held earlier in the year.

• Host City - Shenzhen:

• Shenzhen is a major sub-provincial city and Special Economic Zone in Guangdong Province, China.

• It is recognized as a global technology hub and has increasingly become a preferred destination for high-profile athletic championships due to its state-of-the-art venues.

• Prize Money:

• Under the ITF's current partnership with Tory Burch and other sponsors, the Billie Jean King Cup offers equivalent prize money to the men's Davis Cup, promoting financial parity in the sport.

Important Points

• The 2024 Finals are taking place in Malaga, Spain, serving as a precursor to the move to China in 2025.

• The United States holds the record for the most titles won in the history of the competition, with 18 wins as of 2024.

• Hosting the event in Shenzhen between 2025 and 2027 aligns with China's sports development plan to attract major international organizations and promote the tennis industry domestically.

• The Billie Jean King Cup remains the world's largest annual international team competition in women's sports in terms of the number of nations participating.

Q83. Answer: (b) Jawaharlal Nehru Stadium, New Delhi

The correct answer is Jawaharlal Nehru Stadium, New Delhi.

Key Points

• The Fit India Carnival 2025 was hosted at the historic Jawaharlal Nehru Stadium in New Delhi, serving as a central hub for fitness enthusiasts and athletes from across the country.

• This event was organized under the aegis of the Fit India Movement, a nation-wide initiative that aims to encourage people to inculcate physical activity and sports in their everyday lives.

• The carnival featured a wide array of activities including traditional Indian sports, modern fitness workshops, yoga sessions, and nutrition counseling to provide a holistic approach to health.

• The Ministry of Youth Affairs and Sports played a pivotal role in coordinating the event, ensuring mass participation from schools, colleges, and various sports organizations.

• The 2025 edition of the carnival focused on the theme of "Fitness for All," emphasizing that age and physical condition should not be barriers to maintaining an active lifestyle. Hence, the correct answer is Jawaharlal Nehru Stadium, New Delhi.

Additional Information

• Fit India Movement:

• Launched by Prime Minister Narendra Modi on 29 August 2019, coinciding with National Sports Day.

• The movement was envisioned as a multi-stakeholder effort involving government departments, NGOs, and private sector entities to transform India into a fit nation.

• It includes several sub-programs like Fit India School Week, Fit India Freedom Run, and the Fit India Quiz, which is the state's largest fitness and sports quiz for school students.

• Jawaharlal Nehru Stadium (JLN):

• Located in Lodhi Colony, New Delhi, it is a flagship sports venue with a seating capacity of approximately 60,000 people.

• It was originally built for the 1982 Asian Games and underwent significant renovation for the 2010 Commonwealth Games.

• The stadium is equipped with world-class facilities for track and field events and is frequently used for international football matches.

• National Sports Day:

• Celebrated annually on August 29th in India to commemorate the birth anniversary of the legendary hockey player Major Dhyan Chand.

• On this day, the President of India confers various sports awards such as the Major Dhyan Chand Khel Ratna Award, Arjuna Award, and Dronacharya Award at Rashtrapati Bhavan.

Important Points

• Fit India Mobile App:

• To supplement the movement, the government launched the Fit India Mobile App in August 2021, which allows users to track their daily step count, calorie intake, and sleep patterns.

• The app serves as a digital companion for citizens to monitor their fitness goals and participate in virtual fitness challenges.

• Infrastructure and Accessibility:

• The choice of Jawaharlal Nehru Stadium for the 2025 Carnival highlights the importance of utilizing public sports infrastructure to promote community-level engagement.

• Events like these are crucial for achieving the targets set under the Sustainable Development Goals (SDG), particularly Goal 3, which focuses on Good Health and Well-being.

Q84. Answer: (a) India and Sri Lanka

The correct answer is India and Sri Lanka.

Key Points

• The ICC Men's T20 World Cup 2026 is scheduled to be the tenth edition of the biennial Twenty20 International (T20I) tournament played by men's national teams and organized by the International Cricket Council (ICC).

• It was officially confirmed that India and Sri Lanka will co-host the event, which is expected to take place in February and March 2026.

• Both India and Sri Lanka have secured automatic qualification for the tournament by virtue of being the host nations.

• The 2026 edition will follow the same format as the 2024 tournament, featuring a total of 20 teams competing for the trophy.

• This marks a significant return of the global event to the subcontinent; while India hosted the 2016 edition (and the 2021 edition was hosted by the BCCI in UAE/Oman), Sri Lanka last hosted the tournament in 2012.

Additional Information

• Recent Edition (2024): The ninth edition of the T20 World Cup was co-hosted by the West Indies and the United States in June 2024. India emerged as the champions after defeating South Africa in a thrilling final held at Kensington Oval, Barbados.

• Future Hosts: The ICC has laid out a clear roadmap for future tournaments. The 2028 edition is set to be hosted by Australia and New Zealand, while the 2030 edition will see England, Ireland, and Scotland as co-hosts.

• History of the Tournament: The inaugural ICC World Twenty20 was held in 2007 in South Africa. India won the first-ever title under the leadership of MS Dhoni, defeating Pakistan in the final.

• Governing Body: The International Cricket Council (ICC), headquartered in Dubai, UAE, is the global governing body of cricket. It is responsible for the organization and governance of cricket's major international tournaments, including the ODI World Cup, T20 World Cup, and the World Test Championship.

Important Points

• Qualification Criteria: Apart from the hosts, the top 8 teams from the 2024 T20 World Cup (excluding the hosts) and teams ranked highest in the ICC Men's T20I Team Rankings as of a specific cut-off date will qualify. The remaining slots are filled through regional qualifiers.

• Tournament Format: The 20 teams are typically divided into four groups of five. The top two teams from each group advance to the Super 8 stage, followed by the semi-finals and the final.

• Impact on Cricket: By hosting the event in India and Sri Lanka, the ICC aims to leverage the massive cricket fan base in South Asia, ensuring high stadium attendance and global viewership numbers.

Q85. Answer: (d) January 2025

The correct answer is January 2025.

Key Points

• The Union Cabinet, chaired by Prime Minister Narendra Modi, approved the proposal to establish the 8th Central Pay Commission (CPC) on January 29, 2025.

• The commission has been set up to review and recommend changes to the salary structure, allowances, and pension benefits for central government employees and pensioners.

• The 8th Pay Commission will be headed by Justice (Retired) Abhay Manohar Sapre, who is a former judge of the Supreme Court of India.

• This decision comes in line with the historical trend of establishing a new pay commission approximately every 10 years to address the evolving economic needs of the workforce.

• The formal announcement of the approval was made by Union Minister Ashwini Vaishnaw during a press briefing following the cabinet meeting in January 2025. Hence, the statement regarding the approval date is correct.

Additional Information

• Beneficiaries and Scope:

• The recommendations of the 8th Pay Commission are expected to impact over 48.67 lakh central government employees and approximately 67.95 lakh pensioners across the country.

• It covers personnel from the Civil Services, Defense Forces, and various autonomous bodies funded by the Union Government.

• Implementation Timeline:

• While the commission was approved in January 2025, its recommendations are widely anticipated to be implemented starting from January 1, 2026.

• The commission typically takes about 18 to 24 months to conduct consultations with stakeholders and submit its comprehensive report to the Ministry of Finance.

• Historical Precedents:

• The 7th Pay Commission was established in February 2014, headed by Justice Ashok Kumar Mathur, and its recommendations came into effect from January 2016.

• The first-ever Pay Commission in India was established in 1946, and since then, they have been instrumental in standardizing the pay scales and dearness allowance (DA) mechanisms.

• Economic Factors:

• The commission evaluates the Consumer Price Index (Industrial Workers) to determine the inflation impact on the purchasing power of employees.

• Key discussions usually revolve around the Fitment Factor, which is the multiplier used to arrive at the new basic pay from the old pay structure.

Important Points

• Terms of Reference: The 8th Pay Commission is tasked with examining the Principles of Pay and the structure of emoluments, including retirement benefits and Death-cum-Retirement Gratuity.

• Fiscal Impact: The implementation of such commissions usually leads to a significant increase in the fiscal deficit as the government's wage bill increases. For instance, the 7th CPC implementation cost the exchequer approximately Rs. 1.02 lakh crore annually.

• Justice Abhay Manohar Sapre: His appointment as Chairman is significant given his experience in the judiciary; he previously served as the Chief Justice of the Gauhati High Court before his elevation to the Supreme Court.

• Demand from Unions: Several Employee Federations and Unions had been demanding the constitution of the commission since 2023 due to rising cost of living and the completion of the 10-year cycle of the previous commission.

Q86. Answer: (d) National Biodiversity Authority

The correct answer is National Biodiversity Authority.

Key Points

• The National Biodiversity Authority (NBA) is the primary regulatory body in India responsible for the implementation of the Biological Diversity Act, 2002.

• In 2025, the authority introduced updated rules and guidelines to streamline the process of accessing biological resources and associated knowledge, focusing on Ease of Doing Business while maintaining conservation standards.

• The NBA is a statutory autonomous body established in 2003 under the Ministry of Environment, Forest and Climate Change, with its headquarters located in Chennai.

• The updated 2025 regulations further refine the Access and Benefit Sharing (ABS) mechanism, ensuring that the benefits derived from the commercial use of biological resources are shared equitably with local Biodiversity Management Committees (BMCs).

• The authority performs a facilitative and advisory role to the Government of India on issues related to the conservation of biodiversity and the sustainable use of its components. Hence, the correct answer is National Biodiversity Authority.

Additional Information

• The Biological Diversity Act, 2002:

• This Act was enacted to meet the obligations under the United Nations Convention on Biological Diversity (CBD), to which India became a party in 1994.

• It aims at the conservation of biological resources, their sustainable use, and the fair and equitable sharing of benefits arising out

of the use of biological resources.

• Institutional Structure:

• The Act provides for a three-tier institutional structure: the National Biodiversity Authority (NBA) at the national level, State Biodiversity Boards (SBBs) at the state level, and Biodiversity Management Committees (BMCs) at the local level (Panchayats and Municipalities).

• The BMCs are responsible for preparing People's Biodiversity Registers (PBRs), which document local biological resources and traditional knowledge.

• Recent Legislative Changes:

• The Biological Diversity (Amendment) Act, 2023, laid the groundwork for the 2025 rules by decriminalizing certain offenses and exempting AYUSH practitioners and cultivated medicinal plants from certain compliance requirements.

• The 2023 amendment also sought to encourage foreign investment in the sector while safeguarding the interests of indigenous communities.

Important Points

• Regulatory Scope: The NBA regulates activities such as the commercial utilization of biological resources, bio-survey, and bio-utilization by non-Indians or foreign entities.

• Intellectual Property Rights (IPR): Any person or entity seeking Intellectual Property Rights for an invention based on biological resources or knowledge obtained from India must obtain prior approval from the NBA.

• Global Context: The NBA also works to ensure compliance with the Nagoya Protocol on Access and Benefit Sharing, which was adopted in 2010 and came into force in 2014.

• Conservation Sites: The National Biodiversity Authority has the power to notify areas of biodiversity importance as Biodiversity Heritage Sites (BHS) in consultation with local bodies.

Q87. Answer: (b) Waqf-alal-aulad principle

The correct answer is Waqf-alal-aulad principle.

Key Points

• The Waqf (Amendment) Bill, 2024, which has been under intense deliberation by a Joint Parliamentary Committee (JPC) through 2024 and into 2025, seeks to fundamentally reform the management of Waqf properties in India.

• One of the primary focuses of the 2025 legislative agenda regarding Waqf is the protection and welfare of vulnerable groups, specifically widows and orphans, ensuring they are not deprived of their rights through discriminatory practices.

• The Waqf-alal-aulad is a traditional Islamic principle where a Waqf is created for the maintenance and support of the donor's descendants and family; the new amendment clarifies that such endowments must explicitly ensure the inheritance rights of women and widows are protected. Hence, the correct answer is Waqf-alal-aulad principle.

• The proposed changes aim to prevent the misuse of the Waqf-alal-aulad provision, which was sometimes used to bypass succession laws to the detriment of female heirs.

• By aligning the Waqf-alal-aulad with broader social welfare goals, the Government of India intends to ensure that the income generated from these private trusts effectively supports the orphans and destitute family members as originally intended by Sharia.

Additional Information

• Definition of Waqf:

• A Waqf is a permanent dedication of movable or immovable property for any purpose recognized by Muslim Law as pious, religious, or charitable.

• Properties dedicated as Waqf are "tied up" and cannot be sold, transferred, or inherited, and the usufruct (income) is used for the specified charitable cause.

• Types of Waqf:

• Waqf-fi-sabilillah: Properties dedicated for public utility, such as mosques, graveyards, and Madarsas.

• Waqf-e-Khairi: Endowments created for general philanthropic purposes, including the establishment of hospitals and schools for the poor.

• Waqf-alal-aulad: A private Waqf where the benefit is reserved for the settlor's family; once the family line ends, the property becomes public Waqf for the poor.

• The Mutawalli:

• The Mutawalli is the manager or custodian of the Waqf property. They do not own the property but are responsible for its administration according to the Waqf-nama (deed).

• The 2024-2025 amendments propose stricter accountability measures for Mutawallis to prevent the encroachment or mismanagement of assets.

Important Points

• Reforming the Waqf Act, 1995: The new Bill seeks to rename the Waqf Act, 1995 to the Unified Waqf Management,

Empowerment, Efficiency and Development Act, 1995.

• Representation of Women: The Amendment Act mandates the inclusion of at least two women in the Central Waqf Council and the State Waqf Boards to ensure gender-sensitive decision-making regarding widows' welfare.

• Digitization and Transparency: A major feature of the 2025 focus is the digitization of Waqf records through the WAMSI (Waqf Assets Management System of India) portal to track income meant for orphans and social welfare.

• Role of the Collector: The proposed bill gives District Collectors the authority to determine whether a property is Waqf or Government land, aiming to resolve long-standing land disputes and encroachments.

• Zakat vs. Waqf: While Zakat is an annual charitable donation (obligatory alms-giving) based on wealth, Waqf is a permanent endowment of specific assets; both serve the Islamic goal of poverty alleviation.

Q88. Answer: (b) 26th

p>The correct answer is 26th.

Key Points

• UNICEF released its flagship report titled 'The State of the World's Children 2024: The Future of Childhood in a Changing World', which highlights the major global shifts impacting children.

• In this assessment, India secured the 26th rank globally regarding the severity of climate risks faced by its child population.

• The report identifies three major "megatrends" that will shape children's lives by 2050: demographic shifts, climate and environmental crises, and frontier technologies like Artificial Intelligence (AI).

• India is classified among the countries where children are at extremely high risk due to multiple overlapping environmental shocks, such as heatwaves, floods, and air pollution.

• The 2024 report emphasizes that without urgent climate action, the number of children exposed to extreme climate hazards will increase dramatically by the mid-century.

Additional Information

• Children's Climate Risk Index (CCRI):

• The ranking is often derived from the CCRI, which uses geospatial data to measure children's exposure to environmental hazards and their vulnerability based on access to essential services.

• India's rank of 26th indicates that it is among the most vulnerable nations, trailing only behind several African and South Asian neighbors in terms of risk severity.

• Environmental Hazards in India:

• Children in India face significant threats from ambient air pollution, which contributes to high rates of respiratory infections.

• The country also experiences frequent water scarcity and vector-borne diseases, which are exacerbated by rising global temperatures.

• Demographic Megatrend:

• The report projects that while the global child population will remain around 2.3 billion, the share of children in low-income countries (especially in Africa) will rise, while it will decline in developed nations.

• In India, the demographic transition means the country must invest heavily in education and healthcare now to reap a demographic dividend.

Important Points

• UNICEF (United Nations Children's Fund):

• Established on 11 December 1946 by the UN General Assembly to provide emergency food and healthcare to children and mothers in countries devastated by World War II.

• Headquartered in New York City, it operates in over 190 countries and territories to protect child rights.

• Digital Divide:

• The 2024 report warns of a growing digital divide; while frontier technologies offer opportunities, nearly 26% of people in low-income countries have no internet access, disproportionately affecting children's future employability.

• Global Outlook:

• Countries like Central African Republic, Chad, and Nigeria often rank at the very top of the risk index, signifying the highest level of danger for children globally.

• The UN Convention on the Rights of the Child (UNCRC) remains the legal framework guiding these reports to ensure equity and sustainability for the next generation.

Q89. Answer: (b) Govinda

The correct answer is Govinda.

Key Points

• The veteran Bollywood actor Govinda has officially announced his much-anticipated comeback to the silver screen with a new film titled Duniyadari.

• The film is slated for a release in the year 2025, marking a major return for the actor who was a dominant force in Hindi cinema during the 1990s.

• The announcement of Duniyadari was made through various social media platforms and promotional interactions, creating significant buzz among fans of the "Hero No. 1" star.

• This project is expected to revive the comedy-drama genre that Govinda is best known for, potentially featuring the signature dance numbers and comic timing that defined his career.

• The comeback is seen as a strategic move by the actor to reconnect with his massive audience base and introduce his unique style to the Gen Z and Millennial demographics.

Additional Information

• Early Career and Rise to Fame: Born as Govind Arun Ahuja on December 21, 1963, he made his acting debut in the 1986 film Ilzaam. His exceptional dancing skills and relatable persona quickly made him a household name.

• The David Dhawan Partnership: One of the most successful phases of his career was his collaboration with director David Dhawan. Together, they delivered over 17 films, including massive hits like Raja Babu (1994), Coolie No. 1 (1995), and Saajan Chale Sasural (1996).

• Political Stint: Govinda had a successful run in politics when he joined the Indian National Congress and was elected as a Member of Parliament (MP) for the Mumbai North constituency during the 2004 General Elections, serving until 2009.

• Awards and Accolades: Over his career spanning more than three decades, he has won several Filmfare Awards, including the Best Comedian award for Haseena Maan Jaayegi (1999) and a Special Award for his performance in Saajan Chale Sasural.

• Legacy in Dance: He is widely regarded as one of the most expressive dancers in Indian Cinema, influencing contemporary stars like Varun Dhawan and Ranveer Singh with his fluid and rhythmic "street-style" dance moves.

Important Points

• Versatility: While primarily known for comedy, Govinda has showcased his acting range in serious and negative roles in films such as Hatya (1988) and Shikari (2000), for which he received critical acclaim.

• The "No. 1" Series: He is the only actor in Bollywood history to have a series of films titled with the "No. 1" suffix, such as Hero No. 1, Aunty No. 1, Anari No. 1, and Beti No. 1, signifying his massive commercial appeal.

• Global Recognition: In 1999, he was voted as the tenth-greatest star of stage or screen of the last thousand years in a BBC News Online poll, highlighting his international footprint.

• Recent Appearances: Before the 2025 announcement, his last notable appearances were in films like Kill Dil (2014) and Happy Ending (2014), where he played supporting yet impactful roles.

Q90. Answer: (c) Laureus Lifetime Achievement Award

The correct answer is Laureus Lifetime Achievement Award.

Key Points

• The legendary surfer Kelly Slater was honored with the Laureus Lifetime Achievement Award in April 2025 during the prestigious Laureus World Sports Awards ceremony.

• This recognition celebrates his unparalleled career and lifelong contributions to the world of surfing and global sports, marking him as one of the most influential athletes of his generation.

• Kelly Slater has secured a record-breaking 11 World Surf League (WSL) titles, making him the most successful professional surfer in history. Hence, the statement regarding the Laureus Lifetime Achievement Award is correct.

• He holds the unique distinction of being both the youngest world champion at age 20 in 1992 and the oldest world champion at age 49 in 2011 (though he continued competing well into his 50s).

• The award also acknowledges his impact on the sport's evolution, including his development of wave pool technology and his long-standing commitment to ocean conservation.

Additional Information

• Laureus World Sports Awards:

• Established in 1999 by the Laureus Sport for Good Foundation, these awards are often referred to as the "Oscars of Sport."

• The Lifetime Achievement Award is one of the highest honors, previously bestowed upon icons such as Pelé, Tiger Woods, and Roger Federer.

• The 2025 ceremony served as a platform to highlight athletes who have used their status to create positive social change.

• Kelly Slater's Career and Achievements:

• Born in 1972 in Cocoa Beach, Florida, USA, Slater turned professional in 1990.

• He dominated the ASP World Tour (now WSL) through the 1990s and 2000s, revolutionizing the sport with his innovative techniques and competitive drive.

• He was also a pioneer in the "Kelly Slater Wave Company," which created the Surf Ranch in Lemoore, California, featuring the world's most advanced man-made wave.

• Other Recognition:

• Before receiving the lifetime honor, Slater was a four-time winner of the Laureus World Action Sportsperson of the Year award (won in 2007, 2009, 2011, and 2012).

• The Olympic Order is the highest award of the Olympic Movement, usually given to those with a direct impact on the Olympic Games; while Slater's sport joined the Olympics in Tokyo 2020, the Laureus award specifically targets his entire multi-decade career.

Important Points

• Longevity in Sport: Kelly Slater competed at the highest level for over three decades, a feat rarely seen in high-impact sports.

• Socio-Economic Impact: His success helped transition surfing from a niche subculture into a multi-billion dollar global industry.

• Environmental Advocacy: He has been a vocal advocate for the protection of marine ecosystems, working with organizations like Reef Check and Sea Shepherd.

Q91. Answer: (d) Assam

The correct answer is Assam.

Key Points

• In January 2025, the Assam Government signed a landmark Memorandum of Understanding (MoU) with the State Bank of India (SBI) and Union Bank of India to provide financial security to its workforce.

• The primary objective of this agreement is to offer zero-premium personal accident insurance coverage to approximately 4.25 lakh permanent state government employees.

• Under this arrangement, employees do not have to pay any monthly or annual charges to avail of the insurance benefits, as the coverage is linked to their salary accounts maintained with these banks.

• The MoU was finalized in the presence of Chief Minister Himanta Biswa Sarma, who emphasized the state’s commitment to the welfare and social security of its employees and their families.

• This initiative covers accidental death and permanent total disability, ensuring that the legal heirs or the employees themselves receive substantial financial support during unforeseen tragic events.

Additional Information

• Specific Bank Benefits:

• State Bank of India (SBI): Provides a Personal Accident Insurance (Death) cover of Rs. 40 lakh and an Air Accident Insurance (Death) cover of Rs. 1 crore to the account holders.

• Union Bank of India: Offers a Personal Accident Insurance (Death) cover of Rs. 55 lakh, which is one of the highest packages provided under such state-bank collaborations.

• Eligibility Criteria: The scheme is specifically tailored for permanent employees of the Assam Government whose salaries are processed through the Corporate Salary Package (CSP) of the participating banks.

• Implementation Strategy: The insurance is "zero-premium" because the banks provide these benefits as part of their value-added services for maintaining large-scale government salary accounts, requiring no financial contribution from the state exchequer or the employee.

• Significance: This move is part of Assam's broader administrative reforms to improve the living standards and financial resilience of its public servants, following other initiatives like the Mukhya Mantri Lok Sevak Arogya Yojana.

• Geographic Reach: The service will be available to employees posted across all districts of Assam, including remote areas, provided they utilize the specified banking channels for their remuneration.

Important Points

• Personal Accident Insurance (PAI): This is a type of policy that provides financial compensation in the event of injuries, disability, or death caused solely by violent, accidental, external, and visible means.

• Corporate Salary Package: A customized banking product offered to employees of corporate entities and government departments, which usually includes benefits like zero-balance accounts, unlimited ATM withdrawals, and complimentary insurance covers.

• Financial Inclusion: By integrating insurance with banking accounts, the Assam government is promoting financial literacy and ensuring that even the lower-tier employees have access to high-value protection plans.

Q92. Answer: (c) Triveni

The correct answer is Triveni.

Key Points

• An all-women team representing the Indian Army, Indian Navy, and Indian Air Force scripted history by successfully completing the first-ever international open-sea sailing expedition to Seychelles in June 2025.

• The expedition was conducted on the indigenously-built Indian Armed Services Vessel (IASV) named Triveni, which is a 56-foot sailing yacht designed for long-distance maritime voyages.

• The crew consisted of 12 women officers, with four members selected from each of the three services, demonstrating

unprecedented inter-service synergy and cooperation.

• The voyage commenced from Kochi, Kerala, and covered a distance of approximately 1,500 nautical miles across the Indian Ocean to reach Victoria, Seychelles.

• This initiative was aimed at promoting Nari Shakti (Women Power) and showcasing the professional capabilities of women in the Indian Armed Forces in the domain of adventure and maritime navigation.

Additional Information

• Vessel Characteristics: The Triveni is a testament to the Atmanirbhar Bharat (Self-Reliant India) initiative, as it was indigenously designed and constructed in India, equipped with modern navigation and communication systems for open-sea survival.

• Route and Duration: The expedition was flagged off in May 2025 and navigated through challenging weather conditions and monsoon winds in the Arabian Sea before reaching its destination in June 2025.

• International Relations: The arrival of the all-women team in Seychelles was a significant diplomatic gesture, reinforcing the Security and Growth for All in the Region (SAGAR) vision promoted by the Government of India.

• Training and Preparation: Before the international leg, the officers underwent rigorous training at the Indian Naval Watermanship Training Centre (INWTC) and participated in several coastal trial runs to build endurance and technical skills.

Important Points

• Tri-Service Integration: This expedition is a prime example of the Chief of Defence Staff (CDS) mandate to integrate the three wings of the military for joint operations and adventure activities.

• Historical Context: This mission follows the legacy of previous maritime feats like Navika Sagar Parikrama (the all-women circumnavigation of the globe), but it is unique for being the first tri-service international open-sea sailing mission.

• Global Impact: By reaching the port of Victoria, the team highlighted India's maritime prowess and its commitment to fostering gender equality within the Defence Services on a global stage.

• Technical Skill: The crew managed all aspects of the voyage themselves, including navigation, seamanship, and mechanical repairs mid-sea, proving the high standard of training provided by the Indian Armed Forces.

Q93. Answer: (c) 3.5 seconds

The correct answer is 3.5 seconds.

Key Points

• The Indian Space Research Organisation (ISRO) successfully conducted a short-duration hot test of the Engine Power Head Test Article (EPHTA) of the semi-cryogenic engine on 24 April 2024 (mentioned as 2025 in the context of the specific test sequence validation).

• The test was performed at the ISRO Propulsion Complex (IPRC) located in Mahendragiri, Tamil Nadu.

• The primary objective of this specific test was to validate the engine start-up sequence using the hot-gas generator and the turbopump.

• The engine was subjected to a hot test for a precise duration of 3.5 seconds. This short burst was critical to confirm the initial ignition and propellant flow synchronization.

• The test successfully achieved the ignition of the pre-burner and verified the functional performance of the high-pressure turbopumps and control valves.

Additional Information

• Semi-cryogenic Engine Technology:

• The semi-cryogenic engine developed by ISRO uses a combination of Liquid Oxygen (LOX) as the oxidizer and Isrosene (a special grade of kerosene) as the fuel.

• Unlike fully cryogenic engines that use Liquid Hydrogen, semi-cryogenic engines are more cost-effective and have a higher fuel density, allowing for more compact tank designs.

• Thrust Capacity:

• The engine is designed to produce a nominal thrust of 2000 kN (kilo-Newtons), making it one of the most powerful engines in ISRO's inventory.

• It works on the Oxidiser-Rich Staged Combustion (ORSC) cycle, which provides high efficiency and specific impulse.

• Significance for LVM3:

• This engine is intended to replace the L110 liquid stage (which uses Vikas engines) in the LVM3 (Launch Vehicle Mark-3).

• By incorporating the semi-cryogenic stage, the payload carrying capacity of the LVM3 is expected to increase from the current 4 tonnes to approximately 6 tonnes to Geostationary Transfer Orbit (GTO).

• Development Agency:

• The Liquid Propulsion Systems Centre (LPSC) is the lead center for the design and development of this high-thrust semi-cryogenic engine.

• Ongoing tests like the EPHTA are precursors to the integrated engine testing and eventual flight qualification.

Important Points

• Propellant Advantages: Isrosene is an eco-friendly, refined version of kerosene. It is much easier to handle at ambient temperatures compared to liquid hydrogen, which must be kept at -253 degrees Celsius.

• Future Missions: This propulsion technology is vital for India's future heavy-lift missions and the Next Generation Launch Vehicle (NGLV), which aims to provide low-cost access to space.

• Success Milestones: This 3.5-second test followed a series of low-pressure and intermediate-pressure tests, marking a significant milestone in India's journey toward self-reliance in advanced rocket propulsion.

Q94. Answer: (d) KONKAN-25

The correct answer is KONKAN-25.

Key Points

• The joint maritime drill known as KONKAN-25 is a bilateral exercise conducted between the Indian Navy and the Royal Navy of the United Kingdom.

• This edition of the exercise commenced on 05 October 2025 and was hosted along India’s western seaboard, highlighting the growing strategic partnership between the two nations.

• The primary objective of KONKAN-25 is to enhance interoperability, facilitate the exchange of best practices, and strengthen maritime cooperation in the Indian Ocean Region.

• The exercise involved a series of complex naval maneuvers, including anti-surface warfare, anti-air warfare, and anti-submarine warfare drills, aimed at maintaining a high state of readiness.

• Participation included guided-missile frigates, destroyers, and maritime patrol aircraft from both the Indian Navy and the Royal Navy, showcasing advanced naval capabilities.

Additional Information

• Exercise KONKAN:

• The KONKAN series of exercises was institutionalized in the year 2004 and has since grown in scale and complexity.

• It is named after the Konkan Coast, which refers to the rugged section of the western coastline of India, spanning parts of Maharashtra, Goa, and Karnataka.

• These exercises serve as a cornerstone of India-UK maritime relations, ensuring stability and security in the critical sea lines of communication.

• Other Indo-UK Military Exercises:

• Exercise Ajeya Warrior: A biennial training event conducted between the Indian Army and the British Army to enhance counter-insurgency and counter-terrorism operations.

• Exercise Indradhanush: A joint air force exercise between the Indian Air Force (IAF) and the Royal Air Force (RAF) focusing on air combat tactics and aerial refueling.

• Strategic Significance of the Western Seaboard:

• The Western Seaboard of India is a vital maritime zone guarded by the Western Naval Command, which is headquartered in Mumbai.

• It plays a crucial role in safeguarding India's exclusive economic zone (EEZ) and protecting maritime trade routes against piracy and other unconventional threats.

• International Maritime Cooperation:

• Joint drills like KONKAN-25 reflect India's commitment to the "Security and Growth for All in the Region" (SAGAR) initiative, promoting collective security and prosperity.

• The Royal Navy often deploys its Carrier Strike Group (CSG) or individual warships to participate in such bilateral engagements to demonstrate global reach and influence.

Q95. Answer: (a) NITI Aayog

The correct answer is NITI Aayog.

Key Points

• The report titled ‘Expanding Quality Higher Education through States and State Public Universities’ was released in February 2025 by NITI Aayog (National Institution for Transforming India).

• The primary focus of this report is to strengthen State Public Universities (SPUs), which are considered the backbone of India's higher education system, catering to the vast majority of students across the country.

• It emphasizes the reorganization and revitalization of these institutions to align with the goals set out in the National Education Policy (NEP) 2020.

• The report highlights that while Centrally Funded Technical Institutes (CFTIs) receive significant attention, State Public Universities account for nearly 85% of the total student enrollment in higher education, making their improvement crucial for national development.

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• The document provides a roadmap for states to enhance academic quality, research output, and administrative efficiency within their respective university systems.

Additional Information

• NITI Aayog:

• Established on January 1, 2015, it replaced the erstwhile Planning Commission. It serves as the apex public policy think tank of the Government of India.

• The Prime Minister serves as the Ex-officio Chairperson, while the Vice-Chairperson is appointed directly by the Prime Minister.

• It focuses on Cooperative Federalism, ensuring that states are active partners in the national development agenda.

• State Public Universities (SPUs):

• These are universities established or incorporated by a State Act. They are primarily funded by the respective State Governments.

• According to the All India Survey on Higher Education (AISHE), these institutions face challenges such as faculty shortages, limited financial autonomy, and infrastructure gaps compared to central institutions.

• The February 2025 report suggests a collaborative funding model where the Central Government and State Governments work together to boost the Gross Enrolment Ratio (GER).

• National Education Policy (NEP) 2020:

• The policy aims to increase the Gross Enrolment Ratio in higher education, including vocational education, from 26.3% (2018) to 50% by the year 2035.

• It promotes multidisciplinary education and moves away from rigid silos of subjects, a theme central to the NITI Aayog report.

• Other Educational Bodies:

• University Grants Commission (UGC): A statutory body set up by the Department of Higher Education in 1956, responsible for maintaining standards of university education in India.

• Ministry of Education: Formerly the Ministry of Human Resource Development, it is the parent ministry responsible for the implementation of educational laws and national policies.

Important Points

• The report suggests that states should create a State Higher Education Council (SHEC) to better coordinate between the state government and universities.

• It identifies that financial sustainability is a major hurdle, recommending that SPUs explore alumni funding, industry partnerships, and consultancy services to diversify their revenue streams.

• The 2025 report also touches upon the digital transformation of higher education, advocating for better ICT infrastructure in rural and semi-urban locations to bridge the digital divide.

Q96. Answer: (a) Himachal Pradesh

The correct answer is Himachal Pradesh.

Key Points

• The Rajiv Gandhi Van Samvardhan Yojana was officially launched by the Government of Himachal Pradesh in June 2025 to boost the state's green cover and promote sustainable forestry.

• The primary objective of this scheme is the regeneration of degraded forests and the systematic protection of biodiversity across the Himalayan region.

• It emphasizes the participation of local communities and Gram Panchayats in plantation activities, ensuring that the ecological benefits reach the grassroots level. Hence, the state of Himachal Pradesh is the correct answer.

• The scheme aims to mitigate the impact of climate change by creating a robust carbon sink through the planting of native tree species that are well-suited to the local altitude and climate.

• Under this initiative, the State Forest Department provides technical support and quality saplings to farmers and youth groups to encourage agroforestry and ecosystem restoration.

Additional Information

• Geographical Significance:

• Himachal Pradesh is a mountain state where forests play a vital role in maintaining the hydrological balance and preventing soil erosion in the Indo-Gangetic plains.

• As of recent surveys, the recorded forest area in the state accounts for a significant percentage of its total geographical area, and schemes like this are designed to reach the target of 30% forest cover.

• Strategic Initiatives:

• The state has previously launched various schemes such as 'Ek Buta Beti Ke Naam' and 'Vidyarthi Van Mittar Yojana' to instill environmental consciousness among students and families.

• The Rajiv Gandhi Van Samvardhan Yojana specifically targets ecological restoration in areas affected by natural calamities and

landslides, which are frequent in the hilly terrain.

• Economic and Social Impact:

• Besides environmental benefits, the scheme provides employment opportunities to the local workforce through nursery management and fencing of protected areas.

• By focusing on Non-Timber Forest Produce (NTFP), the yojana helps in augmenting the income of rural households who depend on forest resources for their livelihood.

Important Points

• Conservation Goals: The Government of Himachal Pradesh under the leadership of Chief Minister Sukhvinder Singh Sukhu has prioritized making the state a 'Green State' by the year 2026.

• Environmental Laws: All activities under the Rajiv Gandhi Van Samvardhan Yojana are aligned with the Forest Conservation Act, 1980 and the National Forest Policy, 1988.

• Monitoring: The implementation of the scheme is monitored through Geographic Information System (GIS) mapping and remote sensing to track the survival rate of the saplings planted during monsoon seasons.

Q97. Answer: (b) Gulveer Singh

The correct answer is Gulveer Singh.

Key Points

• Gulveer Singh shattered the national record in the men's 10,000 metres during "The TEN" athletics meet held in San Juan Capistrano, California, USA.

• He clocked a remarkable time of 27:41.81, significantly improving upon the previous long-standing Indian record. Hence, the statement regarding the record holder is correct.

• The previous national record of 28:02.89 was held by Surendra Singh, which had remained unbeaten since 2008. Gulveer Singh managed to shave off nearly 21 seconds from the 16-year-old mark.

• By achieving this feat at the high-profile California meet, Gulveer Singh finished second in his heat, demonstrating his growing prowess in long-distance running on the international stage.

• The performance was part of a targeted effort by Indian athletes to qualify for major international championships, including the Olympics and World Athletics Championships, by competing in fast-paced races in the USA.

Additional Information

• Gulveer Singh:

• He hails from Uttar Pradesh and has emerged as one of India's premier distance runners.

• Apart from the 10,000m record, he also won a bronze medal in the 10,000m event at the 2022 Asian Games held in Hangzhou.

• His training regimen often involves high-altitude camps and international exposure to compete against global elite runners.

• Avinash Sable:

• Avinash Sable is a legendary Indian athlete who holds national records in the 3000m steeplechase and the 5000m.

• He was also present at the same meet but dropped out of the 10,000m race mid-way. Sable is well-known for his silver medal at the 2022 Commonwealth Games.

• The TEN Meet:

• This is an elite athletics event hosted by Sound Running in San Juan Capistrano, USA, specifically designed for athletes to achieve Olympic and World Championship qualifying standards in the 10,000m distance.

• The event is famous for its "pacing lights" and high-quality fields that help runners maintain a record-breaking tempo.

• Kartik Kumar:

• Another prominent Indian distance runner who often trains and competes alongside Gulveer Singh. He also participated in the 2022 Asian Games, where he won the silver medal in the 10,000m, just ahead of Gulveer.

Important Points

• Significance of the Timing: Gulveer Singh's time of 27:41.81 is a milestone for Indian athletics as it brings an Indian runner closer to the sub-27:30 mark, which is typically the benchmark for world-class competitive distance running.

• Historical Context: The 10,000m record in India had been stagnant for over a decade. The transition from Surendra Singh's era in 2008 to the current era led by Gulveer and Sable marks a significant shift in the quality of middle and long-distance training in the country.

• Future Prospects: Such performances are crucial for World Ranking points, which help athletes qualify for the World Athletics Championships and the Olympic Games even if they do not meet the direct entry standard (which is often around 27:00.00).

Q98. Answer: (d) State Bank of India

The correct answer is State Bank of India.

Key Points

• The State Bank of India (SBI), India's largest commercial bank, introduced and revived a specialized retail term deposit scheme named 'Amrit Vrishti'.

• The scheme features a unique tenure of 444 days, designed to provide a higher interest rate for a specific short-to-medium-term investment horizon.

• As per the latest update, the scheme became effective from 15 April 2025, offering competitive returns in the current financial market.

• Under the Amrit Vrishti scheme, the general public is offered an interest rate of 7.25% per annum.

• Senior Citizens are eligible for an additional spread of 50 basis points (0.50%) over the standard rate, resulting in a yield of 7.75% per annum.

• This initiative aims to mobilize domestic retail deposits and provide Non-Resident Indians (NRIs) with lucrative investment options for their NRO accounts.

Additional Information

• State Bank of India (SBI):

• It is a Fortune 500 statutory body and the largest public sector bank in India, headquartered in Mumbai.

• The bank's origins trace back to the Bank of Calcutta in 1806, and it was eventually nationalized as SBI on 1 July 1955.

• It holds a market share of approximately 25% in terms of total deposits and loans in the Indian banking system.

• Other Special FD Schemes:

• Amrit Kalash: A 400-day tenure scheme offering 7.10% for the general public and 7.60% for senior citizens.

• SBI WeCare: A special deposit scheme specifically for Senior Citizens for a minimum period of 5 years and a maximum of 10 years.

• Digital Accessibility:

• The Amrit Vrishti scheme can be easily accessed and opened via the YONO SBI mobile application, Internet Banking, or by visiting any SBI branch across the country.

• The scheme is applicable to deposits of less than Rs. 2 Crores.

• Economic Significance:

• Special FD schemes like Amrit Vrishti are strategic tools used by banks to manage liquidity and attract long-term stable funds amidst fluctuating Repo Rates set by the Reserve Bank of India (RBI).

Important Points

• The interest on the Amrit Vrishti scheme is calculated on a quarterly basis, though depositors can opt for monthly or half-yearly payouts depending on their financial needs.

• Pre-mature withdrawal and loan facilities against the deposit are generally available under this scheme, subject to the bank's standard terms and conditions.

• Tax Deducted at Source (TDS) is applicable on the interest earned as per the Income Tax Act, 1961, unless relevant exemptions like Form 15G/15H are submitted.

• The scheme provides an excellent opportunity for conservative investors to lock in higher rates before potential monetary policy easing by the central bank.

Q99. Answer: (d) Chhattisgarh

p>The correct answer is Chhattisgarh.

Key Points

• As per the announcement in May 2025, India’s first Artificial Intelligence Special Economic Zone (AI SEZ) is set to be established in the state of Chhattisgarh.

• This specialized zone will be located in Naya Raipur (Atal Nagar), which is recognized as India's first planned greenfield smart city.

• The primary objective of this AI SEZ is to create a dedicated ecosystem for technological innovation, Machine Learning (ML), and Deep Learning research and development.

• The state government aims to attract global tech giants and startups by providing specialized infrastructure, tax incentives, and high-speed digital connectivity within the zone.

• The project is expected to generate significant employment opportunities for IT professionals and engineers, positioning Chhattisgarh as a central hub for the fourth industrial revolution in India.

• By establishing this zone, the state intends to diversify its economy from mining and metallurgy towards high-tech services and software exports. Hence, the correct answer is Chhattisgarh.

Additional Information

• Special Economic Zones (SEZs) in India:

• SEZs are duty-free enclaves treated as foreign territory for trade operations, duties, and tariffs.

• They are governed by the Special Economic Zones Act, 2005, which came into effect in February 2006.

• The main goals are to increase Foreign Direct Investment (FDI), boost exports, and create large-scale employment.

• Naya Raipur (Atal Nagar):

• It is the administrative capital of Chhattisgarh and is designed as a Smart City with modern amenities.

• The city already hosts IIIT-NR (International Institute of Information Technology), which will likely collaborate with the AI SEZ for research and skill development.

• Other Tech Hubs mentioned in options:

• Telangana: Known for its Hyderabad IT hub (HITEC City), the state has a strong AI framework and launched the "Year of AI" initiative in 2020.

• Gujarat: Home to GIFT City (Gujarat International Finance Tec-City), which is India's first operational International Financial Services Centre (IFSC).

• Haryana: Features Gurugram, a major satellite city known as a financial and technology center, housing many Fortune 500 companies.

Important Points

• The setting up of an AI SEZ aligns with the National Strategy for Artificial Intelligence released by NITI Aayog, which focuses on #AIforAll.

• Key Benefits: Units within the SEZ typically enjoy 100% Income Tax exemption on export income for the first 5 years and 50% for the next 5 years.

• Digital India Mission: This move supports the Government of India's vision to transform the country into a trillion-dollar digital economy by 2026-27.

• Central India's Growth: Traditionally known for agriculture and industry, the inclusion of an AI SEZ represents a major shift in Central India's economic profile towards knowledge-based industries.

Q100. Answer: (a) Simone Biles

The correct answer is Simone Biles.

Key Points

• Simone Biles was honored as the Sportswoman of the Year at the Laureus World Sports Awards held in April 2024. This victory marked the fourth time she has received this prestigious individual accolade, having previously won in 2017, 2019, and 2020.

• The 2024 awards ceremony took place at the Palacio de Cibeles in Madrid, Spain, celebrating the greatest sporting achievements of the past year.

• Biles received the award following a historic comeback to competitive gymnastics in 2023. After a two-year hiatus to focus on her mental health following the Tokyo 2020 Olympics, she returned to win four gold medals at the World Artistic Gymnastics Championships in Antwerp, Belgium.

• By winning her fourth Laureus Sportswoman of the Year title, Simone Biles joined an elite group of athletes, further solidifying her status as the most decorated gymnast in the history of the sport with a total of 37 medals across the Olympics and World Championships.

• The award recognizes her resilience and dominance, particularly her performance in 2023 where she became the first woman to land the Yurchenko double pike vault in international competition, now named the Biles II.

Additional Information

• Laureus World Sports Awards:

• Established in 1999 by founding patrons Daimler and Richemont, the awards are often referred to as the "Oscars of Sports."

• The first ceremony was held in 2000 in Monte Carlo, where Tiger Woods and Marion Jones were the initial winners.

• The shortlists for the awards are created by a panel of over 1,000 specialized sports media members from more than 70 countries.

• Other Notable 2024 Winners:

• Novak Djokovic was named the Sportsman of the Year for a record-equaling fifth time, matching the feat of Roger Federer.

• Aitana Bonmati, the Spanish footballer, made history by winning the Sportswoman of the Year nomination and the Team of the Year award with the Spain women's national football team.

• Jude Bellingham, the Real Madrid and England midfielder, won the Breakthrough of the Year award for his exceptional performance in 2023.

• Competitors for Sportswoman of the Year 2024:

• Faith Kipyegon: A Kenyan middle-distance runner who set three world records in 2023 in the 1,500m, 5,000m, and one mile events.

• Rebeca Andrade: A Brazilian gymnast who won five medals at the 2023 World Championships, providing stiff competition to Biles.

• Sifan Hassan: An Ethiopian-born Dutch athlete who won the London Marathon and Chicago Marathon in her debut year at that distance in 2023.

Important Points

• Simone Biles' Career Statistics:

• She was born on March 14, 1997, in Columbus, Ohio. At age 27, she continues to compete at the highest level.

• She holds 7 Olympic medals, including 4 gold, 1 silver, and 2 bronze, earned during the Rio 2016 and Tokyo 2020 Games.

• Biles has five skills named after her in the Code of Points: two on floor exercise, two on vault, and one on balance beam, reflecting her technical innovation in gymnastics.

• In 2022, she was awarded the Presidential Medal of Freedom by Joe Biden, becoming the youngest person ever to receive the highest civilian honor in the United States.

• Impact on Mental Health:

• Biles is widely credited with sparking a global conversation on athlete mental health after withdrawing from several events at the 2021 Tokyo Olympics due to "twisties" (a psychological block).

• Her 2024 Laureus win serves as a validation of her decision to prioritize well-being over competition, demonstrating a successful return to peak performance.

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