RRB Group D Official Paper (Held On: 10 Dec, 2025 Shift 2) (Previous Year Paper)

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

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GENERAL SCIENCE

Q1. The smell of hot food reaches a distance because:

(a) sound waves carry the food smell
(b) light energy spreads aroma particles
(c) temperature increases food weight
(d) particles are continuously moving

Q2. Which of the following is true for suspension?

a. Suspension is a heterogeneous mixture.
b. The particles of a suspension scatter a beam of light passing through it.
c. The particles of a suspension can be seen by the naked eye.

(a) Only a
(b) Only a and c
(c) Only a and b
(d) a, b and c

Q3. Which of the following statements about meristematic tissues is INCORRECT?

(a) Cells are small, thin-walled, and densely cytoplasmic with large nuclei.
(b) Meristematic cells are dead at maturity.
(c) Enable lifelong growth in plants.
(d) Meristematic tissues consist of actively dividing cells.

Q4. Which one of the following is NOT an agent of cross pollination?

(a) Light
(b) Water
(c) Animals
(d) Wind

Q5. The direction of the magnetic field at the centre of a current-carrying circular loop can be determined by:

(a) Right-hand palm rule
(b) Fleming’s left-hand rule
(c) Right-hand rule (curling fingers along current)
(d) Left-hand thumb rule

Q6. Which of the following elements shows +2 valency?

(a) Beryllium
(b) Lithium
(c) Hydrogen
(d) Helium

Q7. What happens to a light ray when it passes through the optical centre of a lens?

(a) It will emerge without any deviation
(b) It passes through the principal focus on the other side of the lens
(c) It bends toward the principal axis
(d) It will emerge parallel to the principal axis

Q8. Which of the following bond is made up of a large number of organic compounds?

(a) Covalent bond
(b) Dipolar bond
(c) Metallic bond
(d) Ionic bond

Q9. When a gun is fired, why does the gun experience a recoil even though the bullet moves forward?

(a) Because the bullet's acceleration is less than the gun's
(b) Because the bullet exerts an equal and opposite force on the gun
(c) Because the gun's mass is smaller than the bullet's
(d) Because the gun pushes the bullet forward with less force

Q10. Which of the following types of animal husbandry helps us in honey production?

(a) Culture fishery
(b) Poultry
(c) Cattle farming
(d) Bee-keeping

Q11. When you sit on a chair, the chair exerts an upward force on you. The reaction force in this case is:

(a) Friction between your clothes and the chair
(b) Force of air on the chair
(c) Your weight acting downward on the chair
(d) Gravitational pull of the Earth

Q12. Which of the following is true about the universal gravitational constant G?

(a) It is equal to the acceleration due to gravity.
(b) It is a universal constant, same everywhere.
(c) It varies from place to place on Earth.
(d) It depends on the medium between two masses.

Q13. Read the given statements as select the most appropriate option.

Statements:

A: Small bulb like projection from yeast cell is bud.

B: Chain of bud formation is found in the budding process of yeast.

(a) Both Statement A and Statement B are incorrect
(b) Both Statement A and Statement B are correct
(c) Statement B is correct and Statement A is incorrect
(d) Statement A is correct and Statement B is incorrect

Q14. Which of the following explains a precipitation reaction?

(a) A reaction involving a color change only
(b) A reaction in which a gas is formed
(c) A reaction where heat is released
(d) A reaction where an insoluble solid is formed

Q15. What is the network of tiny tubular structures found in the cytoplasm of eukaryotic cells called?

(a) Endoplasmic reticulum
(b) Golgi apparatus
(c) Lysosome

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(d) Mitochondria

Q16. Washing soda is added to water during washing clothes?

(a) To prevent clothes getting wrinkles.
(b) To bleach clothes.
(c) To add fragrance to clothes.
(d) To make hard water soft.

Q17. The equivalent resistance in a parallel combination is:

(a) the sum of all resistances
(b) greater than the largest resistance
(c) smaller than the smallest resistance
(d) equal to the largest resistance

Q18. Which of the following characteristics of connective tissue is INCORRECT?

(a) Cells are embedded in an intercellular matrix.
(b) Matrix may be jelly-like, fluid, dense or rigid.
(c) Blood is a type of connective tissue.
(d) Cells are tightly arranged.

Q19. What is the chemical formula of Plaster of Paris?

(a) $CaSO_4$
(b) $CaSO_4 \cdot 2H_2O$
(c) $CaSO_4 \cdot 1/2H_2O$
(d) $CaCO_3$

Q20. A concave mirror can form a real, inverted, and diminished image when the object is placed:

(a) Beyond the centre of curvature
(b) Between focus and pole
(c) At the focus
(d) Very close to the mirror

Q21. Which of the following is a property of suspension?

(a) Suspension is a heterogeneous mixture
(b) Particles do not settle
(c) Particles cannot be seen by naked eyes.
(d) Solute particles cannot be separated by the process of filtration

Q22. Which of the following is NOT necessary for work to be done on a body?

(a) The force must have a component along the direction of displacement.
(b) The body must get displaced.
(c) The body must move at a constant speed.
(d) A force must be applied on the body.

Q23. A school organises a 'Zero Waste' day. Which of the following practices will best support this initiative?

(a) Using single-use plastic cutlery
(b) Disposing food waste in regular trash bins
(c) Wrapping snacks in plastic foil
(d) Serving food in banana leaves or reusable plates

Q24. Which of the following methods of asexual reproduction allows a new organism to develop from a cut or broken body part?

(a) Spore formation
(b) Budding
(c) Binary fission

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(d) Fragmentation

Q25. A sound wave has a frequency of 250 Hz. The time taken for one complete vibration is:

(a) 0.25 s
(b) 0.004 s
(c) 4.0 s
(d) 0.40 s

MATHEMATICS

Q26. The average age of 38 students of a class is 21 years. If the age of the teacher is also included, the average age of the whole group becomes 22 years. The age (in years) of the teacher is:

(a) 57
(b) 62
(c) 59
(d) 60

Q27. During a New-Year sale, a company gives a 'Buy 9 Sweaters and Get 1 Free' offer to customers. The percentage discount involved in this deal is:

(a) 10%
(b) 12%
(c) 8%
(d) 15%

Q28. Two banks, A and B, offered loans at 3.5% and 7.5% per annum, respectively. Manjit borrowed an amount of Rs. 2,20,000 from each bank. Find the positive difference (in Rs.) between the amounts of simple interest paid to the two banks by Manjit after 2 years.

(a) 19,100
(b) 17,100
(c) 18,600
(d) 17,600

Q29. The income of Raman is Rs. 49,000. He saves 27.5% of his income. If his income increases by 34% and expenditure increases by 20%, then his savings will:4744

(a) increase by Rs. 9,559
(b) increase by Rs. 9,555
(c) decrease by Rs. 9,556
(d) decrease by Rs. 9,550

Q30. If 20% of 90% of 5over9 of a number is 345. Find the number.

(a) 7190
(b) 3450
(c) 6790
(d) 5790

Q31. The sides of a triangle are 77 cm, 36 cm and 85 cm. What is the length of its altitude corresponding to the side with the length of 36 cm?

(a) 89 cm
(b) 43 cm
(c) 77 cm
(d) 53 cm

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Q32. Rs. 567 is divided among Arjun, Nisha and Gaurav in such a way that if Rs. 10, Rs. 45 and Rs. 39 are deducted from their respective shares, they have money in the ratio 3:6:2. Find the actual share of Nisha.

(a) Rs. 303
(b) Rs. 358
(c) Rs. 308
(d) Rs. 408

Q33. From the top of a tower of height 10 m, a boy observes a car on the ground moving away from the base of the tower. If the angle of depression of the car changes from 60° to 30°, how far has the car moved during this time?

(a) $(10\sqrt{3} + 1)$ m
(b) $10(\sqrt{3} + 1)$ m
(c) $(10\sqrt{3} - 10/\sqrt{3})$ m
(d) 10 m

Q34. An article is sold at a gain of 30%. Had it been sold for Rs. 48 more, the profit would have been 35%. The cost price of the article is:

(a) Rs. 960
(b) Rs. 318
(c) Rs. 636
(d) Rs. 480

Q35. If $x^2 + 1/(x^2) = 123$, then a possible value of $(x - 1/x)$ is:

(a) 10
(b) 12
(c) 11
(d) 13

Q36. Walking at 2/3rd of his normal speed, Abhijeet is 18 minutes late in reaching his office. The usual time taken by him to cover the distance between his home and his office is:

(a) 36 minutes
(b) 41 minutes
(c) 37 minutes
(d) 35 minutes

Q37. 1/20 is what percentage of 2/40?

(a) 100%
(b) 200%
(c) 1.15%
(d) 1.10%

Q38. The HCF of 1/2, 3/4, 27/16 and 81/64 is:

(a) 1/64
(b) 9/64
(c) 243/256
(d) 81/64

Q39. If 9 is subtracted from the numerator of a fraction, it becomes 2/9, and if 12 is added to the denominator of the fraction, it becomes 1/3. What is the sum of the numerator and the denominator of the original fraction?

(a) 61
(b) 62
(c) 63
(d) 64

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Q40. The age of a mother is three times the age of her daughter. After 12 years, the mother's age will be twice the daughter's age. Find the present age of the mother.

(a) 44 years
(b) 36 years
(c) 48 years
(d) 40 years

Q41. The ratio of the two sides of a rectangle is 2 : 3. If the area of the rectangle is 2646 cm², then its perimeter is _____ cm.

(a) 220
(b) 210
(c) 212
(d) 200

Q42. A class of 78 students took a Physics test. 17 students had an average score of 70. The remaining students had an average score of 90. What is the average score (rounded off to one decimal place) of the whole class?

(a) 92.1
(b) 84.4
(c) 80.7
(d) 85.6

Q43. Simplify the following.
$(\sqrt{6} \times \sqrt{15} - 5\sqrt{10}) + 3\sqrt{10}$

(a) 10
(b) $\sqrt{15}$
(c) $\sqrt{5}$
(d) $\sqrt{10}$

Q44. The wages of 5 carpenters for a 2-day week are Rs. 1,220. What are the 1-day wages (in Rs.) of one carpenter?

(a) 244
(b) 123
(c) 122
(d) 245

Q45. A shopkeeper marks his goods at X% above the cost price and sells them at a discount of 48%. If he makes a profit of 82%, find the value of X.

(a) 251
(b) 248
(c) 250
(d) 249

Q46. The radii of two cylinders is in the ratio 3 : 4 and their heights is in the ratio 5 : 2. The ratio of their volumes will be:

(a) 8 : 15
(b) 45 : 32
(c) 22 : 17
(d) 28 : 41

Q47. A, B and C can do a piece of work in 3, 6 and 4 days, respectively. How long (in days) will they take to do thrice the same work, working together?

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

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Q48. If p : q : r = 8 : 5 : 12 and r : s = 36 : 18, then what is the value of p : q : r : s?

(a) 21:21:39:22
(b) 22:18:40:19
(c) 23:18:38:24
(d) 24:15:36:18

Q49. Two trains, 295 m and 215 m in length are running in opposite directions. The first runs at the rate of 61 km/hr and the second at the rate of 47 km/hr. How long will they take to cross each other?

(a) 17 seconds
(b) 12 seconds
(c) 23 seconds
(d) 24 seconds

Q50. Two outlet pipes, A and B, can separately empty a full tank in 17 hours and 15 hours, respectively. Both the outlet pipes are opened together for 'x' hours. Had outlet pipe B been opened alone, it would have taken (x + 5) hours to empty the same quantity of water from the tank. What is the value of x?

(a) 4 2/3
(b) 4 1/3
(c) 5 1/3
(d) 5 2/3

GENERAL INTELLIGENCE & REASONING

Q51. What will come in place of the question mark (?) in the following equation, if '+' and '−' are interchanged and '×' and '÷' are interchanged?

81 × 9 − 11 ÷ 2 + 6 = ?

(a) 26
(b) 25
(c) 23
(d) 24

Q52. 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) ILE
(b) LOH
(c) GJC
(d) ORL

Q53. What should come in place of the question mark (?) in the given series based on the English alphabetical order?

PPE NOH LNK JMN ?

(a) HLQ
(b) HYU
(c) YHT
(d) LPI

Q54. Amit ranked 14^(th) from the top and 55^(th) from the bottom in his class. How many students are there in his class?

(a) 66
(b) 67
(c) 69
(d) 68

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Q55. Select the set in which the numbers are related in the same way as are the numbers of the following sets.

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

(24, 480, 10)

(12, 552, 23)

(a) (4, 80, 10)
(b) (11, 51, 2)
(c) (19, 691, 18)
(d) (13, 293, 11)

Q56. Based on the English alphabetical order, three of the following four letter-cluster pairs are alike in a certain way and thus form a group. Which letter-cluster pair DOES NOT belong to that group?

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

(a) AE-HD
(b) JN-QL
(c) DH-KF
(d) GK-NI

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

Statements:

Some plastics are metals.

All glasses are metals.

Conclusions:

(I) Some plastics are glasses.

(II) All metals are glasses.

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

Q58. Seven boxes B, C, D, I, J, K and L are kept one over the other but not necessarily in the same order. Only two boxes are kept between J and B. Only K is kept above I. Only two boxes are kept between K and J. C is kept at some place below L but at some place above D. How many boxes are kept between C and L?

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

Q59. In a certain code language, ‘bat fan world’ is coded as ‘vd ru ua’ and ‘world olive union’ is coded as ‘ru bi rl’. How is ‘world’ coded in that language?

(a) bi
(b) ru
(c) vd
(d) ua

Q60. In a certain code language,

A + B means ‘A is the daughter of B’,

A – B means ‘A is the brother of B’,

A x B means ‘A is the wife of B’,

A ÷ B means ‘A is the father of B’.

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

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

Q61. HM 16 is related to JQ 19 in a certain way. In the same way, CH 22 is related to EL 25. To which of the given options is MR 27 related, following the same logic?

(a) QV 30
(b) QZ 29
(c) OV 30
(d) QV 29

Q62. RL 12 is related to VQ 16 in a certain way. In the same way, NH 15 is related to RM 19. To which of the given options is IC 24 related, following the same logic?

(a) KJ 28
(b) LG 29
(c) KH 29
(d) MH 28

Q63. Refer to the following number and symbol series and answer the question that follows. Counting to be done from left to right only.

(Left) 9 & & 8 2 * 1 © $ 1 4 % £ 6 © 3 % 9 # 8 9 3 (Right)

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

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

Q64. XQ 4 is related to ZV -10 in a certain way. In the same way, OH 8 is related to QM -6. To which of the given options is SL 12 related, following the same logic?

(a) QX -6
(b) JA -8
(c) VQ -3
(d) UQ -2

Q65. Six people, A, B, C, D, E and F, are sitting in a row facing north. Only three people are sitting to the right of A. Only one person is sitting between A and C. E is sitting second to the extreme left end of the row. B is not the immediate neighbour of A. F is sitting to the immediate left of B. F is sitting to the immediate right of A. Who is sitting at the extreme left end of the row?

(a) D
(b) E
(c) C
(d) B

Q66. Seven people, B, C, D, I, J, K and L, are sitting around a circular table facing the centre of the table. I sits to the immediate left of D. J is the immediate neighbour of both B and K. K sits third to the left of D. L is not an immediate neighbour of K. Who sits second to the right of C?

(a) J
(b) K
(c) D
(d) I

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Q67. Raman starts from Point A and drives 44 km towards east. He then takes a right turn, drives 20 km, turns right and drives 52 km. He then takes a right turn and drives 30 km. He takes a final right turn, drives 8 km and stops at Point P. How far (shortest distance) and towards which direction should he drive in order to reach Point A again?

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

(a) 8 km to the south
(b) 10 km to the south
(c) 9 km to the north
(d) 7 km to the south

Q68. Refer to the given number series and answer the question that follows. Counting to be done from left to right only. All numbers are single-digit numbers.

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

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

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

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

6 D 18 A 9 C 3 B 4 = ?

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

Q70. What should come in place of the question mark (?) in the given series?

127 135 145 157 171 ?

(a) 189
(b) 185
(c) 191
(d) 187

Q71. In a certain code language, 'tree third woman' is coded as 'hw gw aa' and 'ivy tree army' is coded as 'aa hi wz'. How is 'tree' coded in that language?

(a) gw
(b) hw
(c) aa
(d) hi

Q72. Refer to the following number, symbol series and answer the question. Counting to be done from left to right only. All numbers are single-digit numbers.

(Left) 5 * 1 & 1 6 $ © * 3 8 # © € 1 & © 1 © 8 % 4 (Right)

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

(a) 1
(b) 5
(c) 4
(d) 2

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Q73. If 1 is added to each even digit and 2 is subtracted from each odd digit in the number 7894562, what will be the sum of the digits which are second from the left and second from the right in the new number thus formed?

(a) 17
(b) 13
(c) 16
(d) 15

Q74. Which of the following numbers will replace the question mark (?) in the given series?

20, 20, 400, 23, 23, 529, 26, 26, ?

(a) 676
(b) 861
(c) 761
(d) 661

Q75. Aasish starts from point A and drives 62 km towards west. He then takes a right turn, drives 58 km, turns right and drives 64 km. He then takes a right turn and drives 78 km. He takes a final right turn, drives 2 km and stops at point P. How far (shortest distance) and towards which direction should he drive in order to reach point A again?

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

(a) 17 km to the south
(b) 19 km to the north
(c) 20 km to the north
(d) 18 km to the south

Q76. 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 Titanium are Tungsten.

Some Tungsten are Lead.

Some Lead are Cadmium.

Conclusions:

(I) Some Lead are Titanium.

(II) No Cadmium are Tungsten.

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

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

LR21 MS30 NT39 OU48 ?

(a) PV57
(b) PV58
(c) PU58
(d) PU57

Q78. 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) 9 3 2 2 4 6 1 7 7 5 8 7 6 9 5 2 4 7 8 5 3 7 8 4 2 6 7 (Right)

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

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

(d) 4

Q79. A, B, C, D, E and F are sitting around a circular table, facing the centre. E sits third to the right of A. D sits to the immediate left of B. B is not an immediate neighbour of A. F sits to the immediate right of C. The position(s) of how many persons will remain unchanged if all the persons are arranged in the English alphabetical order in the clockwise direction starting from A (including A)?

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

Q80. What should come in place of the question mark (?) in the given series?

11 13 16 20 '?' 31

(a) 23
(b) 29
(c) 25
(d) 28

GENERAL AWARENESS AND CURRENT AFFAIRS

Q81. What is the total amount allocated to the Ministry of Youth Affairs and Sports in the union budget 2025-2026?

(a) Rs. 5,000 crore
(b) Rs. 3,794 crore
(c) Rs. 2,500 crore
(d) Rs. 1,000 crore

Q82. As per the Economic Survey 2024-25, during April–September period of financial year 2024-25, the insurance sector attracted about how much percentage Foreign Direct Investment (FDI) into the services sector?

(a) 55%
(b) 76%
(c) 68%
(d) 62%

Q83. Which legislation enacted in August 2025 provides a regulatory framework for safe online gaming in India and aims to protect citizens from the threat of online money-gaming activities?

(a) The Online Gaming (Control and Regulation) Bill, 2025
(b) The Responsible Digital Gaming Bill, 2025
(c) The Internet Safety and Gaming Bill, 2025
(d) The Promotion and Regulation of Online Gaming Bill, 2025

Q84. In May 2025, in which state did the Defence Research and Development Organisation (DRDO) successfully conduct the maiden flight-trial of its Stratospheric Airship Platform?

(a) Rajasthan
(b) Andhra Pradesh
(c) Maharashtra
(d) Madhya Pradesh

Q85. Which day is recognised to promote cycling as a sustainable mode of transport internationally and India as well?

(a) 3 june
(b) 12 May
(c) 13 February
(d) 12 April

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Q86. Who became the first Indian to receive the prestigious Fred Darrington Sand Master Award in April 2025?

(a) Raghunath Mohapatra
(b) Subodh Gupta
(c) Sudarsan Pattnaik
(d) M.F. Husain

Q87. What was the cash prize awarded to the winner of the inaugural 2025 Dow Impact Award for innovation and sustainability in golf?

(a) $25,000
(b) $35,000
(c) $48,000
(d) $20,000

Q88. In which country did the Indian Army participate in the multinational peacekeeping Exercise Khaan Quest 2025 held in June 2025?

(a) South Africa
(b) Belarus
(c) Mongolia
(d) Turkmenistan

Q89. Who among the following was appointed as the first female chief of MI6 in June 2025?

(a) Anne Keast-Butler
(b) Blaise Metreweli
(c) Barbara Woodward
(d) Stella Rimington

Q90. Which among the following organisations released the Supervisory Data Quality Index (sDQI) report in March 2025?

(a) State Bank of India (SBI)
(b) Reserve Bank of India (RBI)
(c) Securities and Exchange Board of India (SEBI)
(d) National Payments Corporation of India (NPCI)

Q91. Which of the following groups received Personal Protective Equipment kits from the Ministry of Social Justice and Empowerment during National Action for Mechanised Sanitation Ecosystem Day in July 2025?

(a) Sewer and septic tank workers
(b) Teachers working in government schools
(c) Farmers working in rural areas
(d) Anganwadi workers in community centres

Q92. Who won the 2025 Laureus World Sportsman of the Year?

(a) Max Verstappen
(b) Tadej Pogačar
(c) Carlos Alcaraz
(d) Armand 'Mondo' Duplantis

Q93. Menar, one of the newly added wetlands to Ramsar sites, is located in which state?

(a) Maharashtra
(b) Goa
(c) Rajasthan
(d) Gujarat

Q94. Which of the following Government of India initiatives focuses on advancing research and development in emerging areas such as quantum computing, communication, and sensing with a budget outlay of around Rs. 6,000 crore for 2023–2031?

(a) National Supercomputing Mission (NSM)

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(b) National Nanotechnology Mission (NNM)
(c) National Quantum Mission (NQM)
(d) Digital India Mission

Q95. According to the the Sustainable Development Report 2025, what is the percentage of the population with access to electricity in India?
(a) 89.8%
(b) 99.2%
(c) 97.3%
(d) 95.8%

Q96. When was the Pan-India Fire Safety Week observed by the Ministry of Health and Family Welfare in April 2025?
(a) April 18–22
(b) April 21–25
(c) April 14–18
(d) April 25–29

Q97. How long was the planned duration of the Ax-4 mission aboard the ISS?
(a) 14–21 days
(b) 64–71 days
(c) 24–31 days
(d) 44–51 days

Q98. Who is the recipient of the 2025 PSA Women's Young Player of the Season Award?
(a) Dipika Pallikal
(b) Anaka Alankamony
(c) Joshna Chinappa
(d) Anahat Singh

Q99. Which of the following countries hosted the AI Action Summit 2025 held in February 2025?
(a) Paris
(b) United States
(c) India
(d) Japan

Q100. Which of the following specific subgroup receives treatment for diarrhoea under the Stop Diarrhoea Campaign launched in June/July 2025?
(a) School-going children with diarrhoea
(b) Pregnant women experiencing diarrhoea
(c) Children under five suffering from diarrhoea
(d) Rural children above six years with diarrhoea

ANSWER KEY

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

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81	b	82	d	83	d	84	d	85	a	86	c	87	a	88	c	89	b	90	b
91	a	92	d	93	c	94	c	95	b	96	b	97	a	98	d	99	a	100	c

SOLUTIONS

Q1. Answer: (d) particles are continuously moving

The correct answer is particles are continuously moving.

Key Points

• The primary reason the smell of hot food reaches a distance is that the particles of matter are continuously moving. This is a fundamental property of matter described by the Kinetic Molecular Theory. Hence, the correct statement is that particles are continuously moving.

• In the case of hot food, the temperature is high, which significantly increases the kinetic energy of the aroma particles (volatile organic compounds) released from the food.

• When the kinetic energy increases, the velocity of these particles also increases, allowing them to mix rapidly with air particles and move across large distances in a short amount of time.

• This process of intermixing of particles of two different types of matter on their own is known as diffusion. The rate of diffusion is much faster in gases compared to liquids or solids.

• Regarding other options: Sound waves are mechanical waves that carry energy through vibrations, not chemical aromas. Hence, statement 1 is incorrect.

• Light energy does not carry physical matter like aroma particles; it is an electromagnetic wave. Hence, statement 2 is incorrect.

• While temperature affects the state of food, it does not increase the weight of the food in a way that makes smell travel; in fact, evaporation might slightly decrease the mass. Hence, statement 3 is incorrect.

Additional Information

• Diffusion: It is the movement of particles from a region of higher concentration to a region of lower concentration. In gases, diffusion is extremely rapid due to high particle speed and large intermolecular spaces.

• Kinetic Energy and Temperature: The average kinetic energy of particles is directly proportional to the absolute temperature (measured in Kelvin). This explains why the smell of cold food does not reach us as quickly as the smell of hot sizzling food.

• Brownian Motion: This is the random, zig-zag motion of microscopic particles in a fluid (liquid or gas) resulting from their collision with the fast-moving atoms or molecules in the gas or liquid. This was first observed by Robert Brown in 1827.

• States of Matter: The rate of diffusion follows the order: Gases > Liquids > Solids. Because gas particles have the least intermolecular force of attraction, they move most freely.

Important Points

• Volatility: Only volatile substances produce a smell. When food is heated, more molecules transition into the vapour phase, increasing the concentration of aroma particles in the air.

• Practical Examples:

• The smell of a perfume spreading in a room is due to the diffusion of perfume vapours in the air.

• The smell of an incense stick (agarbatti) when lit reaches us even in another room because the heat increases the movement of its particles.

• Dissolving potassium permanganate in water shows diffusion in liquids, where the purple color spreads throughout the beaker.

• Atmospheric Factors: The speed at which a smell travels can also be influenced by wind currents and convection, but the underlying molecular mechanism remains the continuous motion and diffusion of particles.

Q2. Answer: (d) a, b and c

The correct answer is a, b and c.

Key Points

• A suspension is defined as a heterogeneous mixture in which the solute particles do not dissolve but remain suspended throughout the bulk of the medium. Unlike a solution, the components can be clearly distinguished. Hence, statement a is correct.

• The particles of a suspension are large enough to be seen by the naked eye. This is due to their size being typically greater than 1000 nm (or 1 micrometer) in diameter, which makes them physically distinct from the solvent. Hence, statement c is correct.

• Suspensions exhibit the Tyndall effect, which is the scattering of a beam of light as it passes through the mixture. Because the particles are large, they collide with light waves and deflect them, making the path of light visible. Hence, statement b is correct.

• If a suspension is left undisturbed, the particles will eventually settle down at the bottom of the container due to the force of gravity. This indicates that a suspension is unstable in nature.

• When the particles settle down, the mixture loses its ability to scatter light. Therefore, the Tyndall effect is only observed while

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the particles are still actively suspended in the medium.

Additional Information

• Separation Methods: Since the particles in a suspension are relatively large and do not dissolve, they can be separated from the mixture using the process of filtration. The residue remains on the filter paper while the liquid passes through.

• Common Examples: Familiar examples of suspensions include muddy water, chalk powder in water, sand in water, and flour mixed in water. In these cases, the solid phase is clearly visible and eventually precipitates.

• Comparison with Solutions: In contrast to suspensions, a true solution is a homogeneous mixture where particle sizes are less than 1 nm. These particles cannot be seen by the naked eye and do not scatter light.

• Comparison with Colloids: Colloids sit between solutions and suspensions. Their particle size ranges from 1 nm to 1000 nm. While they appear homogeneous, they are actually heterogeneous and do scatter light, but their particles do not settle under gravity.

Important Points

• Particle Size: The distinguishing factor for a suspension is a particle size exceeding 1000 nm. This size threshold is what allows the particles to be filtered and seen without a microscope.

• Optical Properties: The visibility of the light path is a key diagnostic tool in chemistry to differentiate between a true solution and a suspension or colloid.

• Stability: A suspension is chemically unstable because the solute-solvent interaction is not strong enough to overcome gravitational pull over time, leading to sedimentation.

• State of Matter: Suspensions can exist in various forms, such as solids in liquids (mud in water) or solids in gases (dust particles in the air).

Q3. Answer: (b) Meristematic cells are dead at maturity.

The correct answer is Meristematic cells are dead at maturity..

Key Points

• Meristematic tissues consist of a group of actively dividing cells that help in the increase of length and girth of the plant. These cells continue to divide throughout the life cycle of the plant. Hence, the statement 'Meristematic tissues consist of actively dividing cells' is correct.

• The cells of these tissues are very active, have dense cytoplasm, thin cellulose walls, and prominent nuclei. The thin walls facilitate rapid cell division. Hence, the statement 'Cells are small, thin-walled, and densely cytoplasmic with large nuclei' is correct.

• Unlike animals, plants have localized regions of growth. Meristematic tissues are present in these growth regions, allowing plants to grow indefinitely or exhibit lifelong growth. Hence, the statement 'Enable lifelong growth in plants' is correct.

• Meristematic cells are living cells because they need to be metabolically active to undergo mitosis. Cells that are dead at maturity, such as sclerenchyma or xylem vessels, serve structural or transport functions and cannot divide. Hence, the statement 'Meristematic cells are dead at maturity' is incorrect.

• The vacuoles are usually absent in meristematic cells because these cells do not need to store food or waste materials, as they are constantly dividing.

Additional Information

• Classification by Position:

• Apical Meristem: Located at the growing tips of stems and roots. Its primary function is to increase the length of the plant, known as primary growth.

• Intercalary Meristem: Found at the base of leaves or internodes (e.g., in grasses). It helps in the regeneration of parts removed by grazing herbivores.

• Lateral Meristem: Occurs on the sides of the stem and root. It is responsible for increasing the thickness or girth of the plant, known as secondary growth. Examples include vascular cambium and cork cambium.

• Differentiation:

• When cells produced by meristematic tissue take up a permanent shape, size, and function, they lose the ability to divide. This process is called differentiation, leading to the formation of permanent tissues.

• Types of Permanent Tissues:

• Simple Permanent Tissue: Includes Parenchyma (storage), Collenchyma (flexibility), and Sclerenchyma (strength/rigidity).

• Complex Permanent Tissue: Includes Xylem (water transport) and Phloem (food transport).

Important Points

• The term "Meristem" was coined by C. Nageli in 1858.

• Meristematic cells lack intercellular spaces; they are compactly arranged to ensure structural continuity during rapid division.

• The metabolic rate in meristematic cells is extremely high because of the energy demands of DNA replication and cytokinesis.

• In woody plants, the lateral meristem adds layers of secondary xylem (wood) and secondary phloem each year, creating annual

rings used to determine the age of the tree.

Q4. Answer: (a) Light

The correct answer is Light.

Key Points

• Cross-pollination, also known as allogamy, involves the transfer of pollen grains from the anther of a flower of one plant to the stigma of a flower of another plant of the same species.

• To facilitate this transfer over a distance, plants rely on various pollinating agents, which are broadly classified into abiotic (non-living) and biotic (living) agents.

• Wind is a common abiotic agent of cross-pollination. Plants that use wind for pollination, such as grasses, corn, and many conifers, produce large quantities of light, non-sticky pollen. Hence, statement 4 is a correct agent.

• Water is another abiotic agent, primarily used by aquatic plants like Vallisneria and Hydrilla. In these cases, pollen grains are often long and needle-like to float and reach the stigma. Hence, statement 2 is a correct agent.

• Animals serve as the primary biotic agents. This includes insects (bees, butterflies), birds (sunbirds, hummingbirds), and mammals (bats). These animals are attracted to the flower's nectar, color, or scent. Hence, statement 3 is a correct agent.

• Light is an essential environmental factor for photosynthesis and photoperiodism (the physiological reaction of organisms to the length of night or day). While light influences flowering time, it does not act as a physical carrier to transport pollen grains from one plant to another. Hence, statement 1 is NOT an agent of cross-pollination.

Additional Information

• Anemophily (Wind Pollination):

• Flowers are generally small, inconspicuous, and lack nectar or scent.

• The pollen grains are light, dry, and smooth-walled so they can be easily carried by the wind.

• The stigma is often feathery or branched to catch the airborne pollen.

• Hydrophily (Water Pollination):

• This is relatively rare, occurring in only about 30 genera of monocotyledons.

• Pollen grains are protected from wetting by a mucilaginous covering.

• Zoophily (Animal Pollination):

• Entomophily refers specifically to pollination by insects. These flowers are usually brightly colored and fragrant.

• Ornithophily is pollination by birds, while Chiropterophily is pollination by bats.

• Pollinators receive a "reward" in the form of pollen or nectar.

• Self-Pollination vs. Cross-Pollination:

• Self-pollination (Autogamy) occurs within the same flower or between flowers of the same plant.

• Cross-pollination increases genetic diversity and leads to the production of stronger, more adaptable offspring.

Important Points

• Light's Role: It is important to distinguish that Light triggers the biological clock of a plant to start the reproductive phase, but the actual transport of genetic material (pollen) requires a physical medium like air, water, or a living creature.

• Evolutionary Adaptation: Many plants have evolved specific morphological features to favor cross-pollination over self-pollination, such as Dichogamy (different maturation times of anther and stigma) or Self-incompatibility.

Q5. Answer: (c) Right-hand rule (curling fingers along current)

The correct answer is Right-hand rule (curling fingers along current).

Key Points

• The Right-hand rule (curling fingers along current) is specifically used to find the direction of the magnetic field at the centre of a circular loop. According to this rule, if we curl the fingers of our right hand in the direction of the current flowing through the circular wire, the thumb will point in the direction of the magnetic field at the center. Hence, statement 3 is correct.

• When the current flows in an anti-clockwise direction, the magnetic field lines emerge outward from the center of the loop, representing a North Pole.

• When the current flows in a clockwise direction, the magnetic field lines point inward (into the plane), representing a South Pole.

• The magnetic field produced by a circular loop is strongest at its centre because the field contributions from every small segment of the loop add up vectorially in the same direction at that point.

• This rule is often considered a variation of Maxwell’s Right-Hand Grip Rule, adapted for curved geometries to simplify the visualization of electromagnetic effects.

Additional Information

• Fleming’s Left-Hand Rule:

• This rule is primarily used to determine the direction of the magnetic force (motion) acting on a conductor.

• It states that if the forefinger points in the direction of the magnetic field and the middle finger in the direction of the current, then the thumb represents the direction of the force or motion. Hence, statement 2 is incorrect for finding field direction.

• Right-Hand Palm Rule:

• This is a simplified method to find the direction of magnetic force.

• The fingers point in the direction of the magnetic field, the thumb points in the direction of the velocity of a positive charge (or current), and the palm faces the direction of the magnetic force. Hence, statement 1 is incorrect.

• Maxwell's Corkscrew Rule:

• Also known as the Right-Hand Screw Rule, it states that if a right-handed corkscrew is rotated such that it advances in the direction of the current, the direction of rotation of the handle gives the direction of the magnetic field.

• This is typically used for straight conductors to visualize the concentric field lines.

Important Points

• Magnetic Field Strength: The magnitude of the magnetic field (B) at the centre of a circular loop of radius r carrying current I is given by the formula B = (μ0I) / (2r), where μ0 is the permeability of free space (approximately 4π × 10^-^7 T·m/A).

• Number of Turns: If the circular coil has n turns, the magnetic field produced is n times as large as that produced by a single turn, because the current in each turn has the same direction and the fields add up.

• Right-Hand Thumb Rule (for Straight Wires): Often confused with the loop rule, here the thumb points along the current in a straight wire, and the curled fingers show the circular magnetic field lines around it. Hence, statement 4 (referring to a "Left-hand" version) is scientifically incorrect as the left hand is not used for this convention.

• Biot-Savart Law: This is the fundamental mathematical law used to derive the magnetic field for any current configuration, including circular loops and solenoids.

Q6. Answer: (a) Beryllium

The correct answer is Beryllium.

Key Points

• Beryllium (Be) is a chemical element with the atomic number 4. Its electronic configuration is $1s^2\ 2s^2$. Because it has two electrons in its outermost shell (valence shell), it easily loses these two electrons to achieve a stable electronic configuration similar to Helium, resulting in a valency of +2. Hence, option 1 is correct.

• Lithium (Li) is the third element in the periodic table with an atomic number of 3. Its electronic configuration is $1s^2\ 2s^1$. It has only one electron in its valence shell, which it loses to form a Li^+ ion, giving it a valency of +1. Hence, option 2 is incorrect.

• Hydrogen (H) has the atomic number 1 and an electronic configuration of $1s^1$. It requires one electron to complete its duplet or can lose its single electron. Therefore, it typically exhibits a valency of 1 (+1 or -1). Hence, option 3 is incorrect.

• Helium (He) has an atomic number of 2 and a configuration of $1s^2$. Since its K-shell is already completely filled (attaining a stable duplet), it is chemically inert and does not usually participate in chemical bonding. Consequently, its valency is 0. Hence, option 4 is incorrect.

• Elements in Group 2 of the modern periodic table, such as Magnesium (Mg) and Calcium (Ca), share the same +2 valency as Beryllium because they all possess two valence electrons.

Additional Information

• Valency Definition:

• Valency is defined as the combining capacity of an atom of an element. It is determined by the number of valence electrons present in the outermost shell of the atom.

• For metals in Groups 1, 2, and 13, the valency is equal to the number of valence electrons. For non-metals, it is often calculated as 8 minus the number of valence electrons.

• Beryllium Characteristics:

• Location: It is located in Group 2 and Period 2 of the Modern Periodic Table.

• Features: It is a steel-gray, strong, lightweight, and brittle alkaline earth metal. It has a relatively high melting point of 1287°C.

• Uses: Beryllium is used as an alloying agent in beryllium copper, in the construction of aerospace components, and as a neutron moderator in nuclear reactors.

• Periodic Table Trends:

• Moving down a group, the valency remains the same because the number of valence electrons is constant.

• Moving across a period from left to right, the valency first increases (from 1 to 4) and then decreases (down to 0 for noble gases).

• Noble Gases:

• Elements like Neon (Ne), Argon (Ar), and Krypton (Kr) belong to Group 18. They have a completely filled valence shell (octet), making them stable with a valency of zero.

Important Points

• Octet Rule: Atoms tend to gain, lose, or share electrons to achieve a stable configuration of eight electrons (or two for the first shell) in their valence shell, known as the Octet Rule.

• Electropositive Nature: Since Beryllium loses electrons to form cations (Be^{2}^+), it is considered an electropositive element.

• Atomic Radius: Beryllium has a smaller atomic radius compared to other elements in its group (like Magnesium), which results in a higher ionization energy within Group 2.

Q7. Answer: (a) It will emerge without any deviation

The correct answer is It will emerge without any deviation.

Key Points

• The optical centre is a point on the principal axis of a lens such that any ray of light passing through it does not undergo any deviation or refraction.

• For a thin lens, when a light ray passes through the optical centre, the incident ray and the emergent ray are collinear. Hence, option 1 is correct.

• If a light ray passes through the principal focus of a convex lens, it will emerge parallel to the principal axis on the other side. Hence, option 4 is incorrect.

• A light ray that is parallel to the principal axis will pass through the principal focus on the other side after refraction in a convex lens. Hence, option 2 is incorrect.

• The property of no deviation at the optical centre applies to both convex (converging) and concave (diverging) lenses.

• In ray diagrams, the optical centre is usually represented by the letter O or C, and it serves as the reference point for measuring all distances like object distance (u) and image distance (v).

Additional Information

• Convex Lens:

• A convex lens is thicker at the centre than at the edges. It is known as a converging lens because it converges parallel rays of light at a single point called the focus.

• The focal length of a convex lens is considered positive according to the Cartesian sign convention.

• It is used in magnifying glasses, cameras, and to correct Hypermetropia (long-sightedness).

• Concave Lens:

• A concave lens is thinner at the centre than at the edges. It is known as a diverging lens because it diverges parallel rays of light.

• The focal length of a concave lens is always negative.

• It is commonly used in flashlights, peepholes in doors, and to correct Myopia (short-sightedness).

• Refraction:

• Refraction is the bending of light as it passes from one transparent medium to another of different optical density.

• The refractive index of a material determines how much the light will bend. When light enters a denser medium, it bends towards the normal.

Important Points

• Lens Formula: The relationship between the object distance (u), image distance (v), and focal length (f) of a lens is given by 1/v - 1/u = 1/f.

• Power of a Lens: The power (P) of a lens is the reciprocal of its focal length (f) in meters. The SI unit of power is Dioptre (D).

• Lateral Displacement: While a ray through the optical centre of a thin lens has zero deviation, in a thick lens, there might be a very slight lateral displacement, although the emergent ray remains parallel to the incident ray.

• Sign Convention: According to the New Cartesian Sign Convention, the optical centre is the origin, and the direction of incident light is taken as positive.

Q8. Answer: (a) Covalent bond

The correct answer is Covalent bond.

Key Points

• A Covalent bond is a chemical bond that involves the sharing of electron pairs between atoms. These electron pairs are known as shared pairs or bonding pairs.

• Organic compounds are primarily defined by the presence of Carbon atoms. Carbon has four valence electrons, which allows it to form four covalent bonds with other atoms, a property known as tetravalency.

• The vast majority of organic molecules, including hydrocarbons, proteins, lipids, and carbohydrates, are held together by covalent bonds because carbon-carbon and carbon-hydrogen bonds are highly stable and strong. Hence, the covalent bond is the fundamental bond type in organic chemistry.

• Carbon also possesses the unique ability of catenation, which is the linkage of atoms of the same element into long chains or rings. This leads to the formation of millions of different organic compounds.

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• Covalent bonds usually occur between non-metals. Since organic chemistry focuses on carbon, hydrogen, oxygen, and nitrogen (all non-metals), covalent bonding is the dominant force. Hence, statement 1 is correct.

Additional Information

• Ionic Bond:

• This bond is formed by the complete transfer of electrons from one atom to another, typically between a metal and a non-metal.

• It results in the formation of cations (positive) and anions (negative) that are held together by electrostatic forces.

• Examples include Sodium Chloride (NaCl) and Magnesium Oxide (MgO). These are inorganic in nature and typically form crystalline solids with high melting points.

• Metallic Bond:

• This bond occurs between atoms of metallic elements like Copper (Cu), Iron (Fe), or Gold (Au).

• It is characterized by a "sea of delocalized electrons" that move freely around a lattice of positive metal ions.

• This structure provides metals with their characteristic conductivity, malleability, and ductility.

• Dipolar Bond (Dipole-Dipole Interaction):

• This is a type of intermolecular force rather than a primary chemical bond within a molecule.

• It occurs between polar molecules that have permanent dipole moments, where the positive end of one molecule is attracted to the negative end of another.

• Hydrogen bonding is a specific, strong type of dipolar interaction often found in water (H_2O) and DNA structures.

• Comparison of Bond Strength:

• Generally, Covalent and Ionic bonds are considered primary (strong) bonds, with bond energies typically ranging from 100 to 1000 kJ/mol.

• Dipolar interactions are much weaker secondary forces, usually around 5 to 25 kJ/mol, but they are crucial for determining the boiling points and solubility of organic compounds.

Important Points

• The number of known organic compounds exceeds 10 million, far surpassing the number of inorganic compounds, primarily due to the versatility of covalent bonding in carbon.

• In organic molecules, covalent bonds can be single, double, or triple bonds, depending on how many pairs of electrons are shared. For example, Ethane has a single bond, Ethene has a double bond, and Ethyne has a triple bond.

• While most organic compounds are covalent, some organic molecules can have ionic characters, such as Soap (Sodium Stearate), which contains a long covalent hydrocarbon chain and an ionic head.

Q9. Answer: (b) Because the bullet exerts an equal and opposite force on the gun

The correct answer is Because the bullet exerts an equal and opposite force on the gun.

Key Points

• The phenomenon of a gun moving backward when a bullet is fired is known as recoil. This is a direct application of Newton's Third Law of Motion, which states that for every action, there is an equal and opposite reaction.

• When the gunpowder in a cartridge explodes, it creates expanding gases that exert a huge force on the bullet, pushing it forward through the barrel. Hence, statement 2 is correct.

• Simultaneously, according to the law of action and reaction, the bullet exerts an exactly equal amount of force back onto the gun in the opposite direction.

• The forward motion of the bullet is the action, and the backward motion of the gun is the reaction.

• While the forces acting on the gun and the bullet are equal in magnitude, their resulting accelerations differ significantly because of the vast difference in their masses.

Additional Information

• Law of Conservation of Momentum:

• The recoil of a gun can also be explained using the Law of Conservation of Momentum. This law states that the total momentum of an isolated system remains constant if no external force acts on it.

• Before firing, the initial momentum of both the gun and the bullet is zero because they are at rest.

• After firing, the final momentum must also be zero. Therefore, the positive momentum of the bullet (moving forward) must be balanced by the negative momentum of the gun (moving backward).

• Mathematically: $m \times v + M \times V = 0$, where m and v are the mass and velocity of the bullet, and M and V are the mass and velocity of the gun.

• Recoil Velocity:

• The recoil velocity (V) of the gun is given by $V = -(m \times v) / M$.

• Because the mass of the gun (M) is much larger than the mass of the bullet (m), the recoil velocity is much smaller than the bullet's velocity.

• This explains why the gun moves back with a jerk rather than flying back at the same speed as the bullet.

• Newton's Second Law in Context:

• According to Newton's Second Law (F = ma), for a constant force, acceleration is inversely proportional to mass.

• The bullet, having a very small mass, experiences a tremendous acceleration. The gun, having a large mass, experiences a small acceleration.

Important Points

• Analysis of Incorrect Options:

• Option 1: The bullet's acceleration is actually much greater than the gun’s, not less, due to its smaller mass. Hence, statement 1 is incorrect.

• Option 3: In reality, a gun's mass is always larger than the bullet's mass to minimize the recoil velocity and ensure the safety of the user. Hence, statement 3 is incorrect.

• Option 4: According to Newton’s Third Law, the force pushed by the gun on the bullet and the force pushed by the bullet on the gun are exactly equal in magnitude. Hence, statement 4 is incorrect.

• Practical Applications:

• Soldiers are trained to hold a gun tightly against their shoulder. This effectively increases the mass (M) by adding the shooter's body mass to the gun's mass, thereby reducing the recoil velocity and preventing injury.

• Muzzle brakes or recoil pads are often used in modern firearms to absorb or redirect some of the kinetic energy generated during the recoil.

Q10. Answer: (d) Bee-keeping

The correct answer is Bee-keeping.

Key Points

• Bee-keeping, also known as Apiculture, is the practice of maintaining honey bee colonies in hives for the production of honey and beeswax.

• It is an important agricultural enterprise that requires low investment and provides high returns, making it a popular subsidiary occupation for farmers.

• Honey is a natural sweet substance produced by bees from the nectar of plants; it is widely used in Ayurveda and as a nutrient-rich food supplement.

• The process also yields beeswax, which is used in several industries, including pharmaceuticals, cosmetics, and the manufacture of polishes and candles.

• Commercial honey production often utilizes the Italian bee (Apis mellifera) because of its high honey collection capacity and its ability to stay in a given beehive for long periods.

• Hence, the correct answer is Bee-keeping.

Additional Information

• Culture Fishery:

• This refers to the rearing and breeding of fish in controlled water bodies such as ponds, tanks, and reservoirs.

• It includes Aquaculture (freshwater) and Mariculture (marine water) to increase the production of protein-rich aquatic food.

• Poultry:

• This branch of animal husbandry involves raising domesticated birds like chickens, ducks, and turkeys for their eggs and meat.

• Common breeds used in India include the indigenous Aseel and exotic Leghorn.

• Cattle Farming:

• This is the management of cows (Bos indicus) and buffaloes (Bos bubalis) for two main purposes: milk production and agricultural labor.

• Animals kept for milk are called milch animals, while those used for tilling and irrigation are called draught animals.

• Pasturage:

• The quality and taste of honey depend significantly on the pasturage, which refers to the flowers available to the bees for nectar and pollen collection.

Important Points

• Bee Species in India:

• Apis cerana indica: Commonly known as the Indian bee, used for local honey production.

• Apis dorsata: Known as the Rock bee, it is a large bee that produces significant amounts of honey but is difficult to domesticate.

• Apis florea: Known as the Little bee, it builds small hives in the open.

• Colony Hierarchy:

• A honey bee colony consists of three types of bees: the Queen bee (responsible for laying eggs), Drones (males for mating), and

Worker bees (sterile females that perform all hive tasks).

• Apiary:

• An apiary is a location where beehives are kept. Placing apiaries near orchards or crop fields is beneficial as bees act as excellent pollinators, increasing crop yield.

Q11. Answer: (c) Your weight acting downward on the chair

The correct answer is Your weight acting downward on the chair.

Key Points

• This phenomenon is a direct application of Newton's Third Law of Motion, which states that for every action, there is always an equal and opposite reaction.

• When you sit on a chair, your body exerts a downward force on the chair. This force is primarily due to your weight, which is the gravitational pull of the Earth acting on your mass.

• The chair, in turn, exerts an upward force on you to support your weight. This upward force is known as the Normal Force.

• In the context of action-reaction pairs, the two forces must act on different objects. Here, the action is your body pushing down on the chair, and the reaction is the chair pushing up on your body. Hence, the reaction to the chair's upward force is your weight acting downward on it.

• Both forces are equal in magnitude but opposite in direction. If the chair could not exert an equal upward force, it would break or you would accelerate downwards. Hence, the statement regarding weight as the reaction force is correct.

Additional Information

• Newton's First Law (Inertia):

• It states that an object will remain at rest or move at a constant velocity unless acted upon by an external unbalanced force. When sitting still on a chair, the net force on you is zero because the forces are balanced.

• Newton's Second Law (F=ma):

• This law defines force as the product of mass and acceleration. Since you are not moving (acceleration is 0) while sitting, the sum of the upward normal force and downward gravitational force equals zero.

• Contact Forces:

• The interaction between your clothes and the chair involves friction, but this is a lateral (horizontal) force that prevents sliding and is not the reaction to the vertical upward force.

• The force of air on the chair (atmospheric pressure) exists but is negligible in this specific mechanical interaction between the person and the furniture.

• Gravity vs. Weight:

• The gravitational pull of the Earth is a non-contact force acting on your body. Its reaction force is actually the gravitational pull your body exerts back on the Earth, not the force between you and the chair.

Important Points

• Action-Reaction Pair Characteristics:

• They always occur in pairs and act simultaneously.

• They never act on the same object; one force acts on Object A (the chair) and the other acts on Object B (the person).

• The magnitude of the Normal Force is exactly equal to the Weight (mg) of the person only when the surface is horizontal and there are no other vertical forces acting.

• In physics, Weight is measured in Newtons (N), just like any other force, whereas Mass is measured in Kilograms (kg).

Q12. Answer: (b) It is a universal constant, same everywhere.

The correct answer is It is a universal constant, same everywhere.

Key Points

• The Universal Gravitational Constant, denoted by the symbol G, is a fundamental physical constant that appears in Sir Isaac Newton's Law of Universal Gravitation. It defines the strength of the gravitational attraction between two objects.

• Statement 1: It is equal to the acceleration due to gravity. This is not true because G is a constant of proportionality, whereas g (acceleration due to gravity) is the acceleration an object undergoes due to the gravitational pull of a massive body like Earth. Hence, statement 1 is incorrect.

• Statement 2: It is a universal constant, same everywhere. This is true because the value of G does not change regardless of the location in the universe, the time of measurement, or the nature of the bodies involved. Hence, statement 2 is correct.

• Statement 3: It varies from place to place on Earth. While the value of g (approximately 9.8 m/s^2) varies based on latitude, altitude, and depth, the value of G remains absolutely constant at every point on Earth and in space. Hence, statement 3 is incorrect.

• Statement 4: It depends on the medium between two masses. Gravitational force is unique compared to electromagnetic forces because it is independent of the intervening medium. Whether two masses are in a vacuum, water, or solid rock, the constant G

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and the resulting force remain the same. Hence, statement 4 is incorrect.

• Hence, the correct answer is It is a universal constant, same everywhere.

Additional Information

• Newton's Law of Universal Gravitation:

• The law states that every point mass attracts every other point mass by a force acting along the line intersecting both points.

• The mathematical formula is F = G(m1m2 / r²), where F is the force, m1 and m2 are the masses, and r is the distance between their centers.

• Numerical Value and Units:

• The accepted value of G is approximately 6.674 x 10^-11 N m² kg&sup-2.

• The SI units for G are Newton meter squared per kilogram squared.

• In base SI units, it is expressed as m³ kg&sup-1 s&sup-2.

• Dimensions of G:

• The dimensional formula for the universal gravitational constant is [M^-1 L^3 T^-2].

• Historical Context:

• Although Newton formulated the law in 1687, the first accurate measurement of G was performed by Henry Cavendish in 1798 using a torsion balance experiment.

• This experiment was famously known as "weighing the Earth" because knowing G allowed for the calculation of the Earth's mass.

Important Points

• Difference between G and g:

• G is a scalar quantity, whereas g is a vector quantity (it has a direction toward the center of the mass).

• G is Universal, while g is local (it is different on the Moon, Mars, or at the Equator vs. the Poles).

• The value of g is derived using G through the formula: g = GM / R², where M is the mass of the planet and R is its radius.

• Weakest Force:

• Gravity is the weakest of the four fundamental forces of nature (the others being Electromagnetism, Strong Nuclear, and Weak Nuclear forces).

• Because G is so small (10^-11), gravitational attraction is only significant when at least one of the objects has a massive scale, such as a planet or star.

Q13. Answer: (b) Both Statement A and Statement B are correct

The correct answer is Both Statement A and Statement B are correct.

Key Points

• Yeast is a unicellular organism belonging to the Kingdom Fungi that reproduces asexually through a process known as budding.

• In this process, a small bulb-like projection or outgrowth appears on the parent cell body, which is scientifically termed a bud. Hence, statement A is correct.

• As the process progresses, the nucleus of the parent yeast cell divides, and one of the daughter nuclei migrates into the developing bud.

• Under favorable conditions and rapid growth, the bud may not immediately detach from the parent cell; instead, it starts producing its own bud, leading to the formation of a chain of buds. Hence, statement B is correct.

• Eventually, these buds detach from the parent cell and mature into new, independent yeast cells, allowing for rapid population growth in a short time.

Additional Information

• Characteristics of Yeast:

• Yeast, such as Saccharomyces cerevisiae, is widely used in the bakery and brewery industries due to its ability to perform fermentation.

• It converts sugar into alcohol and carbon dioxide, which is the fact behind bread rising and the production of ethanol.

• Types of Asexual Reproduction:

• Binary Fission: Observed in organisms like Amoeba, where a single cell divides into two equal daughter cells.

• Fragmentation: Seen in Spirogyra (an alga), where the body breaks into smaller pieces, and each piece grows into a new individual.

• Spore Formation: Common in fungi like Rhizopus (bread mould), where spores are released into the air and germinate under favorable conditions of moisture and temperature.

• Vegetative Propagation:

• This is a form of asexual reproduction in plants where new plants are produced from roots, stems, leaves, and buds (e.g., Potato

tubers, Bryophyllum leaves).

Important Points

• The budding process in Yeast is distinct because the division of cytoplasm is unequal, resulting in a smaller bud and a larger parent cell, unlike binary fission where the division is roughly equal.

• The formation of a chain of buds is a characteristic feature of yeast when nutrients are abundant, specifically glucose.

• In 2024, yeast remains a primary model organism in biological research for studying cell cycle and genetics due to its simple unicellular structure and eukaryotic nature.

Q14. Answer: (d) A reaction where an insoluble solid is formed

The correct answer is A reaction where an insoluble solid is formed.

Key Points

• A precipitation reaction is a chemical reaction that occurs in an aqueous solution when two ionic bonds combine, resulting in the formation of an insoluble salt.

• The insoluble solid that emerges from the liquid solution is called the precipitate. This occurs when the concentration of dissolved ions exceeds the solubility product of the resulting compound. Hence, statement 4 is correct.

• These reactions typically involve the exchange of cations and anions between two soluble salts in a liquid environment, often water.

• A common example is the reaction between Silver Nitrate ($AgNO_3$) and Sodium Chloride ($NaCl$). When mixed, they produce a white precipitate of Silver Chloride ($AgCl$) and soluble Sodium Nitrate.

• The general chemical representation for a precipitation reaction is $A(aq) + B(aq) \rightarrow C(s) + D(aq)$, where (s) denotes the solid state of the precipitate formed.

Additional Information

• Color Change Reactions: A reaction involving a color change only (Option 1) is often a characteristic of Redox reactions or Acid-Base reactions using indicators. While a precipitate might have a color, color change alone does not define the formation of a solid. Hence, statement 1 is incorrect.

• Gas Evolution: A reaction in which a gas is formed (Option 2) is known as a gas evolution reaction. An example is the reaction of Carbonates with Acids to release Carbon Dioxide (CO_2). This is a distinct category from precipitation. Hence, statement 2 is incorrect.

• Exothermic Reactions: A reaction where heat is released (Option 3) is classified as an exothermic reaction. While many chemical processes release energy, heat release is not the defining criterion for a precipitation reaction. Hence, statement 3 is incorrect.

• Double Displacement: Most precipitation reactions are double displacement reactions (also known as metathesis), where the reactants "swap" partners to create a new insoluble product.

• Solubility Rules: Chemists use solubility rules to predict whether a precipitate will form. For instance, salts containing Alkali Metals or Ammonium ions are generally soluble, whereas many Sulfates and Chlorides of heavy metals are insoluble.

Important Points

• Industrial Uses: Precipitation is widely used in wastewater treatment to remove heavy metals like Lead and Mercury by turning them into insoluble solids that can be filtered out.

• Analytical Chemistry: These reactions are essential in qualitative inorganic analysis to detect the presence of specific ions in a sample based on the color and solubility of the precipitate formed.

• Biological Significance: In the human body, the formation of kidney stones is essentially a precipitation reaction where Calcium Oxalate becomes insoluble in the urinary tract.

• Pigment Production: Many industrial pigments used in paints and dyes are manufactured through controlled precipitation reactions to ensure uniform particle size and color intensity.

Q15. Answer: (a) Endoplasmic reticulum

The correct answer is Endoplasmic reticulum.

Key Points

• The Endoplasmic Reticulum (ER) is a complex network of tiny tubular structures that are scattered throughout the cytoplasm of eukaryotic cells.

• Electron microscopic studies reveal that the ER divides the intracellular space into two distinct compartments: the luminal (inside the ER) and the extra-luminal (cytoplasm) compartments.

• This organelle was first observed by Keith Porter, Albert Claude, and Ernest Fullam in the year 1945.

• The ER is often continuous with the outer membrane of the nucleus and extends throughout the cell, providing a large surface area for various chemical reactions.

• It plays a vital role as a cytoskeletal framework and acts as a channel for the transport of materials between different parts of the cytoplasm or between the nucleus and the cytoplasm.

Additional Information

• Golgi apparatus:

• First described by Camillo Golgi in 1898, it consists of flat, disc-shaped sacs called cisternae of 0.5µm to 1.0µm diameter.

• Its primary function is the packaging and processing of proteins and lipids, especially for secretion.

• It is the site for the formation of glycoproteins and glycolipids.

• Lysosome:

• These are membrane-bound vesicular structures formed by the process of packaging in the Golgi apparatus.

• They are rich in almost all types of hydrolytic enzymes (hydrolases – lipases, proteases, carbohydrases) which are active at an acidic pH.

• They are often called suicidal bags because they can digest the entire cell if it becomes damaged or dead.

• Mitochondria:

• Known as the powerhouse of the cell, these double-membrane-bound organelles are responsible for aerobic respiration.

• They produce cellular energy in the form of ATP (Adenosine Triphosphate).

• Mitochondria possess their own DNA and 70S ribosomes, making them semi-autonomous organelles.

Important Points

• Types of Endoplasmic Reticulum:

• Rough Endoplasmic Reticulum (RER): It bears ribosomes on its surface. It is actively involved in protein synthesis and secretion. It is extensive and continuous with the outer membrane of the nucleus.

• Smooth Endoplasmic Reticulum (SER): It lacks ribosomes. It is the major site for the synthesis of lipids and steroid hormones. In animal cells, lipid-like steroid hormones are synthesized in SER.

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

• Sarcoplasmic Reticulum: A specialized type of smooth ER found in muscle cells that regulates calcium ion concentration, which is essential for muscle contraction.

Q16. Answer: (d) To make hard water soft.

The correct answer is To make hard water soft.

Key Points

• Washing soda, chemically known as sodium carbonate, is primarily added to water during the laundry process to make hard water soft. Hard water contains high concentrations of calcium (Ca^{2+}) and magnesium (Mg^{2+}) ions, which interfere with the cleaning action of soap.

• When sodium carbonate is added to hard water, it reacts with the dissolved calcium and magnesium salts. This chemical reaction leads to the formation of insoluble carbonates (precipitates), effectively removing the mineral ions from the water.

• The removal of these minerals prevents the formation of scum, a sticky precipitate that occurs when soap reacts with hard water minerals instead of dissolving to create lather.

• By softening the water, washing soda allows the soap or detergent to work more efficiently, ensuring that the clothes are cleaned thoroughly and reducing the amount of detergent needed. Hence, the correct option is "To make hard water soft."

Additional Information

• Hard Water vs. Soft Water:

• Hard water is characterized by a high mineral content, specifically bicarbonates, chlorides, and sulfates of calcium and magnesium.

• Soft water has low concentrations of these ions, allowing for easy lathering with soap. Rainwater is a natural example of soft water.

• Types of Hardness:

• Temporary Hardness: This is caused by the presence of magnesium and calcium hydrogen carbonates. It can be removed simply by boiling or by using Clark's method (adding lime).

• Permanent Hardness: This is caused by chlorides and sulfates of magnesium and calcium. It cannot be removed by boiling. Methods like the washing soda process, Calgon's process, and ion-exchange are required to treat it.

• Solvay Process: This is the industrial method used for the production of sodium carbonate. The process involves sodium chloride, ammonia, and carbon dioxide as raw materials.

• Chemical Nature: Sodium carbonate is a basic salt. In its hydrated form, it is known as sodium carbonate decahydrate with the chemical formula $Na_2CO_3.10H_2O$. When heated, it loses its water of crystallization to become anhydrous soda ash.

Important Points

• Uses of Washing Soda: Beyond laundry, it is used in the glass, soap, and paper industries. It is also used in the manufacture of sodium compounds like borax.

• Cleaning Agent: It serves as a domestic cleaning agent for floors and surfaces due to its ability to cut through grease and oil.

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• pH Regulation: In some industrial applications, it is used as a pH regulator or buffer to maintain alkalinity in solutions.

• Difference from Baking Soda: While washing soda is sodium carbonate (Na_2CO_3), baking soda is sodium bicarbonate ($NaHCO_3$). Washing soda is much more alkaline and is not used in food preparation.

Q17. Answer: (c) smaller than the smallest resistance

The correct answer is smaller than the smallest resistance.

Key Points

• In a parallel combination of resistors, the reciprocal of the equivalent resistance (Rp) is equal to the sum of the reciprocals of the individual resistances. The formula is expressed as $1/Rp = 1/R1 + 1/R2 + 1/R3 + ... + 1/Rn$.

• Because the total reciprocal resistance is the sum of several positive values, the resulting equivalent resistance will always be smaller than the smallest resistance present in the circuit. Hence, option 3 is correct.

• When resistors are connected in parallel, the potential difference (voltage) across each resistor remains the same and is equal to the voltage of the source.

• The total current (I) in the circuit is the sum of the currents flowing through each individual branch, represented as $I = I1 + I2 + I3 + ... + In$.

• Adding more resistors in parallel effectively increases the number of paths for the electric current to flow, which decreases the total resistance of the circuit.

Additional Information

• Series Combination:

• In a series circuit, resistors are connected end-to-end. The equivalent resistance (Rs) is the sum of all resistances ($Rs = R1 + R2 + ...$).

• In this configuration, the equivalent resistance is always greater than the largest resistance in the group. This corresponds to options 1 and 2, which are true for series but not parallel combinations.

• The current remains constant through all components in a series circuit, while the voltage is divided among them.

• Ohm's Law:

• Formulated by Georg Simon Ohm in 1827, it states that the current through a conductor is directly proportional to the voltage across it, provided physical conditions remain constant ($V = IR$).

• The unit of resistance is the Ohm, symbolized by the Greek letter Ω (Omega).

• Applications of Parallel Circuits:

• Household wiring is almost always done in parallel. This ensures that every appliance receives the standard 220V (in India) and continues to function even if one appliance fails or is turned off.

• It allows for independent switching of different electrical devices, which would not be possible in a series arrangement.

• Conductance:

• Conductance (G) is the reciprocal of resistance ($G = 1/R$). In a parallel circuit, the total conductance is simply the sum of individual conductances ($Gp = G1 + G2 + ...$).

• The SI unit of conductance is the Siemens (S), formerly known as the mho.

Important Points

• If 'n' identical resistors each of resistance 'R' are connected in parallel, the equivalent resistance becomes R/n.

• If those same 'n' identical resistors are connected in series, the equivalent resistance becomes nR.

• A short circuit occurs when a path of zero resistance is connected in parallel with a component, causing all current to bypass that component and flow through the path of least resistance.

Q18. Answer: (d) Cells are tightly arranged.

The correct answer is Cells are tightly arranged..

Key Points

• Connective tissues are the most abundant and widely distributed tissues in the bodies of complex animals, named for their special function of linking and supporting other tissues and organs of the body.

• A primary characteristic of connective tissue is that the cells are loosely spaced and embedded in an intercellular matrix. Unlike epithelial tissue, which forms continuous sheets, the cells in connective tissue do not touch each other and are separated by a large amount of extracellular material. Hence, statement 4 is incorrect.

• The intercellular matrix is a non-living material that can vary significantly in its physical properties depending on the specific type of tissue. It may be jelly-like, fluid, dense, or rigid. Hence, statement 2 is correct.

• In all connective tissues except blood, the cells secrete fibers of structural proteins called collagen or elastin, which provide strength, elasticity, and flexibility to the tissue. These cells are essentially embedded within the matrix they help create. Hence, statement 1 is correct.

• Blood is a unique type of fluid connective tissue. It contains blood cells (RBCs, WBCs, and platelets) suspended in a fluid matrix

called plasma. It serves as the main circulating fluid that helps in the transport of various substances. Hence, statement 3 is correct.

• Hence, the incorrect statement (and correct answer) is that cells are tightly arranged.

Additional Information

• Classification of Connective Tissue:

• Loose Connective Tissue: Cells and fibers are loosely arranged in a semi-fluid ground substance. Examples include Areolar tissue (found beneath the skin) and Adipose tissue (specialized for fat storage).

• Dense Connective Tissue: Fibers and fibroblasts are compactly packed. This includes Dense Regular (like tendons and ligaments) and Dense Irregular tissues.

• Specialized Connective Tissue: This category includes Cartilage, Bones, and Blood.

• Functions and Features:

• Bone: Has a hard and non-pliable ground substance rich in calcium salts and collagen fibers which give bone its strength. It provides the structural frame for the body.

• Cartilage: The intercellular material is solid and pliable and resists compression. It is found in the tip of the nose, outer ear joints, and between adjacent bones of the vertebral column.

• Adipose Tissue: Located mainly beneath the skin, the cells of this tissue are specialized to store fats. The excess of nutrients which are not utilized immediately are converted into fats and stored here.

Important Points

• Fibroblasts: These are the most common cells in connective tissue proper that produce and secrete the extracellular matrix and fibers like collagen.

• Tendons and Ligaments: Tendons are dense regular connective tissues that attach skeletal muscles to bones, while ligaments attach one bone to another.

• Cellularity vs. Matrix: One of the easiest ways to distinguish between tissue types is the ratio of cells to matrix. Epithelial tissues have high cellularity and minimal matrix, whereas Connective tissues have low cellularity and an extensive matrix.

• Vascularity: Most connective tissues are highly vascular (rich blood supply), with the notable exception of cartilage, which is avascular and heals slowly.

Q19. Answer: (c) CaSO4 · 1/2H2O

The correct answer is CaSO4. 1/2H2O.

Key Points

• Plaster of Paris is a white powdery chemical compound officially known as Calcium Sulfate Hemihydrate.

• The chemical formula for Plaster of Paris is CaSO4. 1/2H2O, which means that half a molecule of water is attached to one molecule of calcium sulfate.

• It is produced by heating Gypsum (CaSO4. 2H2O) at a temperature of 373 K (or 100 degrees Celsius). During this process, gypsum loses three-fourths of its water of crystallization.

• The name "Plaster of Paris" originates from the fact that gypsum was found in abundance near Paris, particularly at Montmartre, and was first used there on a large scale for construction and plastering.

• A notable property of this substance is its ability to turn back into a hard solid mass of gypsum upon being mixed with water, a process that happens within a few minutes.

Additional Information

• Gypsum (CaSO4. 2H2O):

• It is a soft sulfate mineral composed of calcium sulfate dihydrate.

• When gypsum is heated above 400 K, it loses all its water of crystallization to form Anhydrous Calcium Sulfate (CaSO4), which is also known as Dead Burnt Plaster because it does not set like Plaster of Paris when mixed with water.

• Common Applications:

• Medical Use: Doctors use Plaster of Paris as orthopedic casts to immobilize fractured bones, ensuring they remain in the correct position during the healing process.

• Art and Decor: It is widely used for making statues, toys, sculptures, and decorative items for interior design.

• Construction: Used for creating fireproof coatings and smooth finishes on ceilings and walls in buildings.

• Calcium Carbonate (CaCO3):

• This is a chemical compound found commonly in rocks such as limestone, chalk, and marble.

• It is a key ingredient in agricultural lime and is used as a calcium supplement or an antacid in medicine.

• Storage Conditions:

• Plaster of Paris must be stored in moisture-proof containers because even a small amount of atmospheric moisture can cause it to undergo a hydration reaction and turn into a hard mass of gypsum, making it useless for future applications.

Q20. Answer: (a) Beyond the centre of curvature

The correct answer is Beyond the centre of curvature.

Key Points

• A concave mirror forms a real, inverted, and diminished image when the object is placed beyond the centre of curvature (C).

• In this case, the image is formed:

• Between the focus (F) and the centre of curvature (C).

• Real

• Inverted

• Diminished (smaller than the object)

• If the object is placed between the focus (F) and the pole (P), the image formed is virtual, erect, and magnified.

• If the object is placed at the focus (F), the reflected rays become parallel and the image is formed at infinity.

• Hence, the correct answer is Option 1 – Beyond the centre of curvature.

Additional Information

Object Position	Nature of Image
Beyond C	Real, Inverted, Diminished (between F and C)
At C	Real, Inverted, Same size (at C)
Between C and F	Real, Inverted, Enlarged (beyond C)
At F	Image at Infinity
Between F and P	Virtual, Erect, Enlarged (behind the mirror)

Q21. Answer: (a) Suspension is a heterogeneous mixture

The correct answer is Suspension is a heterogeneous mixture.

Key Points

• A suspension is defined as a heterogeneous mixture where the solute particles do not dissolve in the solvent but instead remain suspended throughout the bulk of the medium. Hence, statement 1 is correct.

• The particles of a suspension are quite large, typically with a diameter greater than 1000 nm (or 10^(-6) meters), which makes them easily visible to the naked eye. Hence, statement 3 is incorrect.

• Suspensions are inherently unstable. If a suspension is allowed to stand undisturbed, the heavy solute particles settle down at the bottom of the container due to the force of gravity. Hence, statement 2 is incorrect.

• Due to the significant size of the particles, they can be separated from the liquid or gas medium using simple physical methods like filtration. The particles are trapped by the filter paper while the liquid passes through. Hence, statement 4 is incorrect.

• When particles are suspended and have not yet settled, they are capable of scattering a beam of light passing through the mixture, making the path of light visible; this phenomenon is known as the Tyndall effect.

Additional Information

• Types of Mixtures based on Particle Size:

• True Solution: This is a homogeneous mixture where the particle size is less than 1 nm. These particles do not scatter light and cannot be seen even with a microscope. Examples include salt in water and sugar in water.

• Colloidal Solution: These appear homogeneous but are actually heterogeneous. The particle size ranges between 1 nm and 1000 nm. They show the Tyndall effect and do not settle over time. Examples include milk, fog, and blood.

• Suspension: As discussed, these are heterogeneous with particles larger than 1000 nm. Common examples include muddy water, chalk powder in water, and dust particles in the air.

• Filtration Process:

• In a suspension, the solid phase is dispersed in the liquid phase. Because the pores of standard filter paper are smaller than the suspended particles, filtration is an effective separation technique.

• Once the particles settle down, the suspension effectively ceases to exist as the mixture is no longer uniform, and it loses its ability to scatter light.

Important Points

• Stability: The stability of a mixture is a key identifying feature. Solutions and colloids are considered stable because their particles remain dispersed indefinitely. Suspensions are unstable because the components eventually separate into distinct layers.

• Optical Properties: While suspensions show the Tyndall effect when the particles are floating, once the particles precipitate or settle at the bottom, the remaining liquid above typically stops scattering light.

• Naked Eye Visibility: The threshold for naked eye visibility is generally around 0.1 millimeters. Since suspension particles are

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often larger than this or clump together, they are easily distinguishable without magnification, unlike the components of homogeneous mixtures.

Q22. Answer: (c) The body must move at a constant speed.

The correct answer is The body must move at a constant speed..

Key Points

• In physics, work is said to be done when a force acts upon an object to cause a displacement. The mathematical definition is W = Fs cos(θ), where F is the force, s is the displacement, and θ is the angle between the force and the direction of motion.

• A force must be applied on the body: This is a fundamental requirement. If the net force acting on the body is zero, no work can be performed according to the formula. Hence, statement 4 is a necessary condition.

• The body must get displaced: Even if a massive force is applied, work is zero if there is no displacement (s = 0). For example, pushing against a stationary brick wall results in no work done on the wall. Hence, statement 2 is a necessary condition.

• The force must have a component along the direction of displacement: If the force is applied perpendicularly to the direction of motion (90 degrees), the value of cos(90°) becomes zero, resulting in no work. A component of the force must act in the same or opposite direction of the displacement. Hence, statement 1 is a necessary condition.

• The body must move at a constant speed: This is not necessary for work to be done. In fact, work is often done to accelerate an object, thereby changing its speed. Work can be done whether the speed is increasing, decreasing, or constant (provided other forces are balanced). Hence, statement 3 is NOT a necessary condition and is the correct answer.

Additional Information

• Work-Energy Theorem: This theorem states that the net work done on an object is equal to the change in its kinetic energy. If work is done on an object, its velocity (and thus its speed) typically changes, unless multiple forces cancel each other out.

• Nature of Work:

• Positive Work: Occurs when the force and displacement are in the same direction (angle between 0° and 90°).

• Negative Work: Occurs when the force acts in the opposite direction to the displacement (angle between 90° and 180°), such as the force of friction acting on a moving car.

• Zero Work: Occurs when the force is perpendicular to the displacement or when either force or displacement is zero.

• SI Unit: The standard unit of work is the Joule (J). One Joule is defined as the work done by a force of one Newton causing a displacement of one meter.

• Scalar Quantity: Work is a scalar quantity, meaning it has magnitude but no specific direction, even though it is calculated using two vector quantities (force and displacement).

Important Points

• Circular Motion: In uniform circular motion, the centripetal force acts toward the center while the displacement is tangential. Since they are perpendicular, the work done by the centripetal force is always zero.

• Gravity and Work: When a person walks horizontally carrying a load on their head, the work done by gravity on the load is zero because the gravitational force (downward) is perpendicular to the horizontal displacement.

• Power: It is important to distinguish work from power. Power is the rate at which work is done, measured in Watts (W), representing Joules per second.

Q23. Answer: (d) Serving food in banana leaves or reusable plates

The correct answer is Serving food in banana leaves or reusable plates.

Key Points

• A 'Zero Waste' initiative is a philosophy and a design principle for the 21st Century that includes the "no-waste" approach, aiming to guide people in changing their lifestyles and practices to emulate sustainable natural cycles.

• Serving food in banana leaves or reusable plates is the most effective practice because it eliminates the generation of trash. Banana leaves are completely biodegradable and compostable, while reusable plates (made of stainless steel, ceramic, or glass) can be washed and used thousands of times, preventing material from entering the waste stream. Hence, this statement is correct.

• Using single-use plastic cutlery involves items like spoons and forks that are discarded after one use. These are typically made from polystyrene or polypropylene, which take hundreds of years to decompose in landfills and often end up polluting oceans. Hence, this statement is incorrect.

• Disposing food waste in regular trash bins prevents organic matter from being composted. When organic waste is sent to landfills, it undergoes anaerobic decomposition and produces methane, a potent greenhouse gas that contributes to climate change. Hence, this statement is incorrect.

• Wrapping snacks in plastic foil or aluminum foil creates immediate waste once the snack is consumed. Plastic wraps are difficult to recycle due to their thinness and chemical composition, frequently leading to microplastic contamination in the environment. Hence, this statement is incorrect.

Additional Information

• The 5 R's of Waste Management: To achieve zero waste, individuals and institutions follow the hierarchy of Refuse (saying no to single-use items), Reduce (consuming less), Reuse (using items repeatedly), Recycle (processing materials to make new products), and Rot (composting organic matter).

• Single-Use Plastic Ban in India: The Government of India implemented a nationwide ban on identified Single-Use Plastic (SUP) items with effect from July 1, 2022. This includes items with low utility and high littering potential, such as plastic sticks for balloons, plastic flags, and thermocol for decoration.

• Solid Waste Management Rules, 2016: These rules in India emphasize source segregation of waste into three streams: Biodegradable (wet), Non-biodegradable (dry), and Domestic Hazardous waste. Schools and bulk generators are mandated to process biodegradable waste through composting or biomethanation within their premises.

• Circular Economy: A Zero Waste approach is a key component of a Circular Economy, which moves away from the traditional linear economy (take-make-dispose) model. It focuses on keeping resources in use for as long as possible to extract the maximum value.

Important Points

• Environmental Impact of Plastics: Plastics are petroleum-based synthetic polymers. Microplastics (particles less than 5mm) have been found in drinking water, food chains, and even human blood, posing significant health risks.

• Banana Leaves Benefits: Beyond being eco-friendly, banana leaves contain polyphenols (natural antioxidants) like EGCG, which can be absorbed by the food served on them. They are widely used in South India, Philippines, and Thailand as a traditional, hygienic, and cost-effective serving medium.

• Waste Audits: For a school to successfully implement a 'Zero Waste' day, it often conducts a Waste Audit, which is a formal process used to quantify the amount and types of waste being generated, helping to identify areas for waste reduction.

Q24. Answer: (d) Fragmentation

The correct answer is Fragmentation.

Key Points

• Fragmentation is a type of asexual reproduction in which a multicellular organism breaks into two or more fragments upon maturation.

• In this process, each cut or broken body part develops into a fully functional, independent new organism.

• This method is typically seen in organisms with relatively simple body designs, such as Spirogyra (a filamentous green algae) and Planaria (flatworms). Hence, statement 4 is correct.

• In Spirogyra, when the filament reaches a certain length, it simply breaks into smaller pieces, and each piece continues to grow through cell division to form a new individual.

• While similar to regeneration, fragmentation is considered a deliberate reproductive strategy in these organisms, allowing for rapid population growth in favorable environments.

Additional Information

• Spore Formation:

• This is a method of reproduction used by many Fungi (like Rhizopus or bread mold), Ferns, and Mosses.

• Organisms produce microscopic, unicellular reproductive bodies called spores covered by a hard protective coat to withstand unfavorable conditions. Hence, statement 1 is incorrect.

• Budding:

• In this process, a small projection or bud grows out from the body of the parent organism due to repeated mitotic cell divisions.

• The bud matures and eventually detaches to live as an independent organism. Common examples include Yeast and Hydra. Hence, statement 2 is incorrect.

• Binary Fission:

• This is a form of asexual reproduction where a single-celled organism divides into two equal halves.

• It is commonly seen in Prokaryotes (Bacteria) and Protists like Amoeba, Paramecium, and Leishmania. Hence, statement 3 is incorrect.

• Asexual Reproduction:

• It involves only a single parent and does not require the fusion of gametes (sperm and egg).

• The resulting offspring are genetically identical to the parent and are often referred to as clones.

• Other types include Vegetative Propagation, which is used by plants like Potato, Ginger, and Bryophyllum to grow new plants from vegetative parts like roots, stems, or leaves.

Important Points

• Difference between Fragmentation and Regeneration: While Fragmentation is a reproductive method for simple organisms, Regeneration is the ability of an organism to regrow lost body parts (like a Lizard's tail or Starfish arms).

• In highly complex multicellular organisms, fragmentation is not possible because cells are organized into tissues, which are organized into organs, and finally organ systems, requiring specialized cells for reproduction.

• The process of fragmentation is often triggered by physical disturbances or natural maturation cycles in aquatic environments.

Q25. Answer: (b) 0.004 s

The correct answer is 0.004 s.

Key Points

• Frequency (f) is defined as the number of complete vibrations or cycles that occur in one second. It is measured in Hertz (Hz), where 1 Hz equals one vibration per second.

• The Time Period (T) is the time required for the wave to complete one full vibration or cycle.

• There is an inverse relationship between frequency and time period, which is expressed by the mathematical formula: T = 1 / f.

• In this specific problem, the frequency is given as 250 Hz. By applying the formula, the calculation becomes T = 1 / 250.

• Dividing 1 by 250 gives a numerical value of 0.004. Therefore, the time taken for one complete vibration is 0.004 s. Hence, the statement regarding the time period being 0.004 s is correct.

Additional Information

• Sound Waves:

• Sound is a mechanical wave that requires a medium (solid, liquid, or gas) to propagate. It travels as a longitudinal wave, where particles of the medium vibrate parallel to the direction of wave travel.

• The speed of sound depends on the nature of the medium and the temperature. For example, sound travels at approximately 343 meters per second in air at 20 degrees Celsius, but much faster in water (about 1,480 meters per second) and solids like steel (about 5,960 meters per second).

• Audible Range:

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

• Frequencies below 20 Hz are known as infrasonic sound, while frequencies above 20,000 Hz are called ultrasonic sound.

• Characteristics of Sound:

• Pitch: This is determined by the frequency of the sound wave. A higher frequency results in a higher pitch.

• Loudness: This depends on the amplitude of the vibration. It is measured in decibels (dB).

• Quality (Timbre): This allows the ear to distinguish between sounds of the same pitch and loudness produced by different sources.

Important Points

• Mathematical Relations: The velocity (v) of a sound wave is the product of its frequency (f) and its wavelength (lambda). This is written as v = f × lambda.

• Hertz: The unit Hertz is named after the German physicist Heinrich Rudolf Hertz, who was the first to provide conclusive proof of the existence of electromagnetic waves in the year 1887.

• Time Period Conversion: In physics problems, if the time period is given in milliseconds (ms), it must be converted to seconds (s) by dividing by 1,000 to ensure consistency with SI units. For instance, 4 ms is equal to 0.004 s.

• Oscillation: A complete back-and-forth motion is called an oscillation. The time period is effectively the duration of one oscillation.

Q26. Answer: (d) 60

Shortcut Trick

Age of new person = New Average + (Previous members × Increase in average)

Age of Teacher = 22 + (38 × (22 − 21))

Age of Teacher = 22 + (38 × 1)

Age of Teacher = 22 + 38 = 60 years

Therefore The correct answer is 60.

Alternate Method

Given:

Initial students = 38, Initial Average = 21 years

New Average (including teacher) = 22 years

Formula Used:

Average = Total Sum of values ÷ Number of values

Total Sum = Average × Number of values

=> Total age of 38 students = 38 × 21 = 798 years

=> Total number of people including teacher = 38 + 1 = 39

=> Total age of 39 people = 39 × 22 = 858 years

=> Age of the teacher = (Total age of 39 people) − (Total age of 38 students)

=> Age of the teacher = 858 − 798 = 60 years
Therefore The correct answer is 60.
Additional Information
Weighted Average
When two groups are combined, the combined average is (n1x1 + n2x2) ÷ (n1 + n2).
Net Deviation
The sum of deviations of all observations from the average is always zero.
Average Inclusion Rule
If the new value is greater than the original average, the overall average increases; if smaller, it decreases.

Q27. Answer: (a) 10%

Shortcut Trick
In 'Buy X Get Y Free' offers, the discount is calculated on the total number of items.
Total Items = Paid Items + Free Items = 9 + 1 = 10
Discount % = (Free Items ÷ Total Items) × 100
Discount % = (1 ÷ 10) × 100 = 10%
Therefore The correct answer is 10%.
Alternate Method
Given: Buy = 9 sweaters, Free = 1 sweater.
Formula: Discount % = [Free Items ÷ (Buy Items + Free Items)] × 100
Let the Marked Price (MP) of each sweater be Rs. 1.
=> Total MP for 10 sweaters = 10 × 1 = Rs. 10
=> Customer pays for only 9 sweaters.
=> Selling Price (SP) for 10 sweaters = 9 × 1 = Rs. 9
=> Discount Amount = MP − SP = 10 − 9 = Rs. 1
=> Discount % = (Discount ÷ MP) × 100
=> Discount % = (1 ÷ 10) × 100 = 10%
Therefore The correct answer is 10%.
Additional Information
Successive Discounts
When two discounts d1 and d2 are applied, effective discount = d1 + d2 − (d1 × d2) ÷ 100.
Markup Percentage
Markup % is the percentage by which MP is higher than CP: [(MP − CP) ÷ CP] × 100.
Profit and Discount Relationship
The ratio of MP to CP is given by: MP/CP = (100 + Profit%) ÷ (100 − Discount%).

Q28. Answer: (d) 17,600

Shortcut Trick
Difference in Annual Rates = 7.5% − 3.5% = 4%
Difference in interest for 2 years = 4% × 2 = 8%
Required difference = 8% of Rs. 2,20,000
Difference = 0.08 × 2,20,000 = Rs. 17,600
Therefore The correct answer is Rs. 17,600.
Alternate Method
Given:
Principal (P) = Rs. 2,20,000
Rate of Bank A (R1) = 3.5% | Rate of Bank B (R2) = 7.5%
Time (T) = 2 years
Formula: Simple Interest (SI) = (P × R × T) ÷ 100
=> SI from Bank A = (2,20,000 × 3.5 × 2) ÷ 100
=> SI_A = 2,200 × 7 = Rs. 15,400
=> SI from Bank B = (2,20,000 × 7.5 × 2) ÷ 100

=> SI_B = 2,200 × 15 = Rs. 33,000

=> Difference = SI_B − SI_A = 33,000 − 15,400

=> Difference = Rs. 17,600

Therefore The correct answer is Rs. 17,600.

Additional Information

Simple Interest (SI) Difference Formula

When Principal (P) and Time (T) are constant, the difference in interest is: ΔSI = (P × ΔR × T) ÷ 100, where ΔR is the difference in interest rates.

SI vs CI for First Year

For the first year, if the interest is compounded annually, the Simple Interest and Compound Interest on the same principal and rate are always equal.

SI and CI Difference for 2 Years

The difference between Compound Interest and Simple Interest for 2 years is given by: CI − SI = P(R ÷ 100)².

Q29. Answer: (b) increase by Rs. 9,555

Shortcut Trick

Income = 100%, Savings = 27.5%, Expenditure = 72.5%.

ΔSavings = ΔIncome − ΔExpenditure

ΔIncome = 34% of 100 = 34 units

ΔExpenditure = 20% of 72.5 = 14.5 units

ΔSavings = 34 − 14.5 = 19.5 units

Actual Increase = 19.5% of 49,000 = 19.5 × 490 = Rs. 9,555.

Therefore The correct answer is increase by Rs. 9,555.

Alternate Method

Given: Income = Rs. 49,000 | Savings % = 27.5% | Income Increase = 34% | Expenditure Increase = 20%

Formula: Income = Expenditure + Savings

=> Initial Savings = 27.5% of 49,000

=> Initial Savings = (27.5 ÷ 100) × 49,000 = 13,475

=> Initial Expenditure = 49,000 − 13,475 = 35,525

=> Increase in Income = 34% of 49,000 = 0.34 × 49,000 = 16,660

=> Increase in Expenditure = 20% of 35,525 = 0.20 × 35,525 = 7,105

=> Increase in Savings = Increase in Income − Increase in Expenditure

=> Increase in Savings = 16,660 − 7,105 = 9,555

Therefore The correct answer is increase by Rs. 9,555.

Additional Information

Income-Expenditure Identity

Income is always the sum of Expenditure and Savings (I = E + S). Any change in Income must be balanced by the sum of changes in Expenditure and Savings.

Percentage Change in Components

If Income increases by x% and Expenditure increases by y%, the percentage change in Savings is given by (I×x − E×y)/S.

Effective Savings Ratio

When the income is very large, using ratios of savings to expenditure (e.g., 27.5 : 72.5 → 11 : 29) simplifies calculations significantly.

Q30. Answer: (b) 3450

Shortcut Trick

Convert percentages and fractions into a single multiplier.

20% × 90% × 5/9 => (1/5) × (9/10) × (5/9)

Multiplying the terms: (1 × 9 × 5) / (5 × 10 × 9) = 1/10

If 1/10 of the number is 345, then the total number is 345 × 10.

Therefore The correct answer is 3450.

Alternate Method

Given:

Result = 345

Percentages = 20% and 90%

Fraction = 5/9

Formula Used:

Value = Number × (P1/100) × (P2/100) × Fraction

Let the number be x.

=> x × (5/9) × (90/100) × (20/100) = 345

=> x × (5/9) × (9/10) × (1/5) = 345

=> x × (5 × 9 × 1) / (9 × 10 × 5) = 345

=> x × (1/10) = 345

=> x = 345 × 10

=> x = 3450

Therefore The correct answer is 3450.

Additional Information

Percentage to Fraction Conversion

To simplify calculations, convert common percentages: 20% = 1/5, 25% = 1/4, 50% = 1/2, and 10% = 1/10.

Successive Percentage Application

When multiple percentages are applied to a single base, the net multiplier is the product of individual fraction equivalents: Net % = (P1 × P2 × ... × P_n).

Reverse Percentage Calculation

If the final value is given and the original is required, multiply the final value by the inverse of each multiplier: Original = Final × (1/M1) × (1/M2).

Q31. Answer: (c) 77 cm

Shortcut Trick

Check for Pythagorean triplet: $36^2 + 77^2 = 1296 + 5929 = 7225 = 85^2$.

Since it is a right-angled triangle, the side perpendicular to the base is the altitude.

For base = 36 cm, the corresponding altitude = 77 cm.

Therefore The correct answer is 77 cm.

Alternate Method

Given sides of triangle: a = 77 cm, b = 36 cm, c = 85 cm.

First, verify if the triangle is right-angled using Pythagoras Theorem:

=> $36^2 + 77^2 = 1296 + 5929 = 7225$

=> $85^2 = 7225$

=> Since $36^2 + 77^2 = 85^2$, the triangle is right-angled with hypotenuse 85 cm.

=> Area of triangle = (1/2) × base × height

=> Area = (1/2) × 36 × 77

=> For any base, Area = (1/2) × base × corresponding altitude

=> (1/2) × 36 × altitude = (1/2) × 36 × 77

=> altitude = 77 cm.

Therefore The correct answer is 77 cm.

Additional Information

Pythagorean Triplets

A set of three positive integers a, b, and c, such that $a^2 + b^2 = c^2$. Common examples include (3, 4, 5), (5, 12, 13), (8, 15, 17), and (36, 77, 85).

Heron's Formula

For a triangle with sides a, b, and c, Area = √[s(s−a)(s−b)(s−c)], where semi-perimeter s = (a + b + c) / 2.

Altitude of a Triangle

The perpendicular segment from a vertex to the opposite side. In a right-angled triangle, the legs are altitudes to each other.

Q32. Answer: (a) Rs. 303

Shortcut Trick

Total deduction = 10 + 45 + 39 = Rs. 94

Adjusted total amount = 567 − 94 = Rs. 473

Total ratio units = 3 + 6 + 2 = 11

11 units = Rs. 473 => 1 unit = Rs. 43

Nisha's actual share = (6 × 43) + 45 = 258 + 45 = Rs. 303

Therefore The correct answer is Rs. 303.

Alternate Method

Given: Total sum = Rs. 567, Deductions from Arjun, Nisha, and Gaurav are Rs. 10, Rs. 45, and Rs. 39 respectively. Ratio after deduction = 3 : 6 : 2.

=> Let the reduced shares be 3x, 6x, and 2x.

=> Total reduced sum = 3x + 6x + 2x = 11x

=> 11x = 567 − (10 + 45 + 39)

=> 11x = 473

=> x = 473 ÷ 11 = 43

=> Nisha's reduced share = 6x = 6 × 43 = Rs. 258

=> Nisha's actual share = 258 + 45 = Rs. 303

Therefore The correct answer is Rs. 303.

Additional Information

Ratio Distribution Rule

If an amount A is divided among P and Q in the ratio m:n, then share of P = [m ÷ (m+n)] × A.

Effective Sum adjustment

When values are subtracted or added to individual shares, the total sum must be adjusted by the net change before applying the ratio units.

Duplicate and Sub-duplicate Ratio

Duplicate ratio of a:b is $a^2:b^2$ and sub-duplicate ratio is $\sqrt{a}:\sqrt{b}$.

Q33. Answer: (c) (10√3 - 10/√3) m

Shortcut Trick

Direct formula for distance moved away from tower: Distance (D) = h × (cot θ2 − cot θ1)

Given: Height (h) = 10 m, θ1 (initial) = 60°, θ2 (final) = 30°

D = 10 × (cot 30° − cot 60°)

D = 10 × (√3 − 1/√3)

D = (10√3 − 10/√3) m

Therefore The correct answer is (10√3 − 10/√3) m.

Alternate Method

Given: Height of tower (AB) = 10 m. Initial angle of depression = 60°. Final angle of depression = 30°.

Formula: tan θ = Perpendicular / Base

=> In ΔABC, tan 60° = AB / BC

=> √3 = 10 / BC

=> BC = 10 / √3 m

=> In ΔABD, tan 30° = AB / BD

=> 1 / √3 = 10 / BD

=> BD = 10√3 m

=> Distance moved (CD) = BD − BC

=> CD = 10√3 − 10/√3 m

Therefore The correct answer is (10√3 − 10/√3) m.

Additional Information

Angle of Depression

It is the angle formed between the horizontal line from the observer and the line of sight to an object below. By alternate interior angles, it equals the angle of elevation from the object.

Trigonometric Identities

Common values for tangent: tan 30° = 1/√3, tan 45° = 1, tan 60° = √3. Note that cot θ = 1 / tan θ.

Distance Calculation for Moving Objects

When an object moves from θ1 to θ2, the distance is D = h |cot θ1 − cot θ2|, where h is the constant vertical height.

Q34. Answer: (a) Rs. 960

Shortcut Trick

Difference in profit percentages = 35% − 30% = 5%

This 5% difference in profit is due to the Rs. 48 increase in selling price.

5% of Cost Price = Rs. 48

100% of Cost Price = (48 ÷ 5) × 100 = 9.6 × 100 = Rs. 960

Therefore The correct answer is Rs. 960.

Alternate Method

Given:

Initial profit = 30%

New profit = 35%

Increase in Selling Price (SP) = Rs. 48

Formula Used:

Selling Price (SP) = CP × (100 + Profit%) ÷ 100

Calculations:

=> Let the Cost Price (CP) of the article be x.

=> Initial Selling Price (SP1) = 1.30x

=> New Selling Price (SP2) = 1.35x

=> According to the question, SP2 − SP1 = 48

=> 1.35x − 1.30x = 48

=> 0.05x = 48

=> x = 48 ÷ 0.05

=> x = 4800 ÷ 5

=> x = 960

Therefore The correct answer is Rs. 960.

Additional Information

Profit and Loss Formulas

Profit = SP − CP and Loss = CP − SP. Profit% or Loss% is always calculated on the Cost Price (CP) unless stated otherwise.

Marked Price and Discount

Marked Price (MP) is the price listed on the product. Discount = MP − SP. Discount% = (Discount ÷ MP) × 100.

Successive Percentage Change

If there are two successive profit percentages a% and b%, the effective profit percentage is given by [a + b + (a × b)/100]%.

Q35. Answer: (c) 11

Shortcut Trick

If $x^2 + 1/x^2 = k$, then $(x - 1/x) = \sqrt{(k - 2)}$.

Here, k = 123.

Therefore $(x - 1/x) = \sqrt{(123 - 2)} = \sqrt{121} = 11$.

Therefore The correct answer is 11.

Alternate Method

Given: $x^2 + 1/x^2 = 123$

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

=> Let a = x and b = 1/x

=> $(x - 1/x)^2 = x^2 + (1/x)^2 - 2 \times x \times (1/x)$

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

=> Substitute the given value of $x^2 + 1/x^2$:

=> $(x - 1/x)^2 = 123 - 2$

=> $(x - 1/x)^2 = 121$

=> $x - 1/x = \pm\sqrt{121}$

=> $x - 1/x = 11$ (taking the positive value from options)

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Therefore The correct answer is 11.

Additional Information

Standard Algebraic Identity

If $x^2 + 1/x^2 = k$, then $(x + 1/x) = \sqrt{(k + 2)}$.

Cubic Relation

If $(x - 1/x) = a$, then the value of $x^3 - 1/x^3 = a^3 + 3a$.

Fourth Power Relation

If x + 1/x = a, then x^4 + 1/x^4 = $(a^2 - 2)^2 - 2$.

Q36. Answer: (a) 36 minutes

Shortcut Trick

Speed ratio (Usual : New) = 1 : 2/3 = 3 : 2.

Since distance is constant, Time ratio = 2 : 3.

Difference in time units = 3 − 2 = 1 unit.

Given, 1 unit = 18 minutes.

Usual time = 2 units = 2 × 18 = 36 minutes.

Therefore The correct answer is 36 minutes.

Alternate Method

Given: New Speed = 2/3 × Usual Speed | Late time = 18 minutes

Formula: Distance = Speed × Time

=> Let usual speed = S and usual time = T.

=> Distance (D) = S × T

=> New speed = (2/3)S and New time = (T + 18)

=> D = (2/3)S × (T + 18)

=> S × T = (2/3)S × (T + 18)

=> T = (2/3)(T + 18)

=> 3T = 2T + 36

=> T = 36 minutes

Therefore The correct answer is 36 minutes.

Additional Information

Inverse Proportionality of Speed and Time

When the distance is constant, speed (S) is inversely proportional to time (T). If speed becomes x/y of original, time becomes y/x of original.

Average Speed Formula

If an equal distance is covered at two different speeds x and y, the average speed for the whole journey is (2 × x × y) ÷ (x + y).

Time Delay Concept

If a person is late by t1 and early by t2 in two different scenarios, the total time difference used for calculations is (t1 + t2).

Q37. Answer: (a) 100%

Shortcut Trick

Simplify the comparison: 2/40 reduces to 1/20.

Comparing 1/20 to 1/20 is a 1 : 1 ratio.

Any value compared to itself is 100%.

Therefore The correct answer is 100%.

Alternate Method

Given values: Fraction A = 1/20 and Fraction B = 2/40

Formula: Percentage = (Fraction A ÷ Fraction B) × 100

=> First Fraction = 1/20

=> Second Fraction = 2/40 = 1/20 (after dividing numerator and denominator by 2)

=> Required % = [(1/20) ÷ (1/20)] × 100

=> Required % = 1 × 100

=> Required % = 100%

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Therefore The correct answer is 100%.

Additional Information

Percentage of a Value

To find what percentage x is of y, use the expression: (x ÷ y) × 100.

Equivalent Fractions

Fractions that look different but have the same value are equivalent; e.g., 1/2 = 2/4 = 50/100.

Decimal Conversion

1/20 can be written as 0.05. Therefore, 0.05 is (0.05 ÷ 0.05) × 100 = 100% of itself.

Q38. Answer: (a) 1/64

Shortcut Trick

Formula: HCF of fractions = HCF(Numerators) ÷ LCM(Denominators)

Numerators are 1, 3, 27, 81 → HCF is 1

Denominators are 2, 4, 16, 64 → LCM is 64 (since 2, 4, 16 are factors of 64)

HCF = 1/64

Therefore The correct answer is 1/64.

Alternate Method

Given: Fractions are 1/2, 3/4, 27/16, and 81/64.

Formula Used: HCF of (a/b, c/d, e/f) = HCF(a, c, e) / LCM(b, d, f)

=> Step 1: Find HCF of numerators {1, 3, 27, 81}

=> Factors of 1 = 1

=> Factors of 3 = 1, 3

=> Factors of 27 = 1, 3, 9, 27

=> Factors of 81 = 1, 3, 9, 27, 81

=> Common factor is 1 Therefore HCF = 1

=> Step 2: Find LCM of denominators {2, 4, 16, 64}

=> 2 = 2^1 | 4 = 2^2 | 16 = 2^4 | 64 = 2^6

=> LCM = 2^6 = 64

=> Required HCF = 1/64

Therefore The correct answer is 1/64.

Additional Information

LCM of Fractions

The LCM of fractions is calculated as: LCM of Fractions = LCM(Numerators) ÷ HCF(Denominators).

Simplification Rule

Always simplify fractions to their simplest form (coprime numerators and denominators) before calculating HCF or LCM.

HCF × LCM Property

For any two numbers A and B, the product of the numbers is equal to the product of their HCF and LCM: A × B = HCF(A,B) × LCM(A,B).

HCF of Co-prime Numbers

If a set of numbers includes the number 1 or any two numbers that are co-prime, the HCF of the entire set is always 1.

Q39. Answer: (d) 64

Shortcut Trick

Let the original fraction be x/y.

According to the conditions: 9(x − 9) = 2y and 3x = y + 12.

From the second eq, y = 3x − 12. Substitute this in the first eq.

9x − 81 = 2(3x − 12) => 9x − 81 = 6x − 24 => 3x = 57 => x = 19.

Then, y = 3(19) − 12 = 45. Sum = 19 + 45 = 64.

Therefore The correct answer is 64.

Alternate Method

Given: Let the fraction be x/y.

Condition 1: (x − 9)/y = 2/9

Condition 2: x/(y + 12) = 1/3

From Condition 1:

=> 9(x − 9) = 2y

=> 9x − 81 = 2y → (Eq. 1)

From Condition 2:

=> 3x = y + 12

=> y = 3x − 12 → (Eq. 2)

Substitute y from (Eq. 2) into (Eq. 1):

=> 9x − 81 = 2(3x − 12)

=> 9x − 81 = 6x − 24

=> 3x = 57

=> x = 19

Substitute x = 19 in (Eq. 2):

=> y = 3(19) − 12 = 45

Sum of numerator and denominator:

=> x + y = 19 + 45 = 64

Therefore The correct answer is 64.

Additional Information

Proper and Improper Fractions

A proper fraction has a numerator less than the denominator (e.g., 2/9), while an improper fraction has a numerator greater than or equal to the denominator.

Equivalent Fractions

Fractions that represent the same value even though they look different, obtained by multiplying or dividing both N and D by the same non-zero number.

Simplification of Fractions

Reducing a fraction to its lowest terms by dividing both the numerator and denominator by their Highest Common Factor (HCF).

Q40. Answer: (b) 36 years

Shortcut Trick

Present Ratio (Mother : Daughter) = 3 : 1 (Difference = 2 units)

Ratio after 12 years = 2 : 1 (Difference = 1 unit)

Equate differences: Multiply future ratio by 2 → 4 : 2

Ratio change: 3 to 4 (Mother) or 1 to 2 (Daughter) = 1 unit

1 unit = 12 years

Mother's present age = 3 units = 3 × 12 = 36 years

Therefore The correct answer is 36 years.

Alternate Method

Given:

Mother's age = 3 × Daughter's age

After 12 years, Mother's age = 2 × Daughter's age

Formula Used:

Linear equations in one variable: Age after n years = Present Age + n

Let the present age of the daughter be x years.

=> Mother's present age = 3x

=> After 12 years, Mother's age = 3x + 12

=> After 12 years, Daughter's age = x + 12

=> 3x + 12 = 2 × (x + 12)

=> 3x + 12 = 2x + 24

=> 3x − 2x = 24 − 12

=> x = 12

=> Mother's present age = 3 × 12 = 36 years.

Therefore The correct answer is 36 years.

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Additional Information

Constant Age Difference

The difference between the ages of two individuals remains constant regardless of the number of years that pass.

Ratio Balancing Method

When ages at two different times are given as ratios, scaling the ratios to have the same part-difference allows for solving without algebra.

Average Age Property

If the current average age of a group is A, then after 'n' years, the new average age will be A + n.

Q41. Answer: (b) 210

Shortcut Trick

Ratio of sides = 2 : 3 => Area parts = 2 × 3 = 6

6 units² = 2646 => 1 unit² = 441

1 unit = √441 = 21 cm

Perimeter units = 2 × (2 + 3) = 10 units

Perimeter = 10 × 21 = 210

Therefore The correct answer is 210.

Alternate Method

Given:

Ratio of sides = 2 : 3

Area of rectangle = 2646 cm²

Formula Used:

Area = Length × Breadth

Perimeter = 2 × (Length + Breadth)

Let the sides of the rectangle be 2x and 3x.

=> Area = 2x × 3x

=> 2646 = 6x²

=> x² = 2646 ÷ 6

=> x² = 441

=> x = √441 = 21 cm

=> Length = 3 × 21 = 63 cm

=> Breadth = 2 × 21 = 42 cm

=> Perimeter = 2 × (63 + 42)

=> Perimeter = 2 × 105 = 210 cm

Therefore The correct answer is 210.

Additional Information

Rectangle Dimensions

The area of a rectangle is the product of its adjacent sides (Length × Breadth), while the perimeter is the sum of all its boundary sides.

Diagonal Property

The diagonal of a rectangle forms a right-angled triangle with the sides; hence, Diagonal = √(Length² + Breadth²).

Ratio and Area

If the sides are in the ratio a : b, the area is proportional to a × b × x², where x is the common multiplier.

Q42. Answer: (d) 85.6

Shortcut Trick

Assumed Average = 90

Deviation for 17 students = 17 × (70 − 90) = −340

Net change in average for 78 students = −340 ÷ 78 ≈ −4.36

Correct average = 90 − 4.36 = 85.64...

Therefore The correct answer is 85.6.

Alternate Method

Given:

Total number of students = 78
Number of students in first group (n1) = 17, Average score (A1) = 70
Number of students in second group (n2) = 78 − 17 = 61, Average score (A2) = 90
Formula Used:
Weighted Average = (n1A1 + n2A2) ÷ (n1 + n2)
=> Total score of first group = 17 × 70 = 1190
=> Total score of second group = 61 × 90 = 5490
=> Combined total score = 1190 + 5490 = 6680
=> Class average = 6680 ÷ 78
=> Average = 85.6410...
Rounding to one decimal place, we get 85.6.
Therefore The correct answer is 85.6.
Additional Information
Weighted Average Formula
It is used to find the average of groups with different sizes: Avg = (n1w1 + n2w2) ÷ (n1 + n2).
Assumed Mean Method
Calculation is simplified by taking a temporary average and adjusting by (Sum of deviations ÷ Total count).
Rounding Rule
To round to one decimal place, look at the second decimal digit; if it is 5 or more, round up the first decimal digit.

Q43. Answer: (d) √10

Shortcut Trick
√6 × √15 = √90 = 3√10
Expression = (3√10 − 5√10) + 3√10
=> −2√10 + 3√10 = √10
Therefore The correct answer is √10.
Alternate Method
Given: (√6 × √15 − 5√10) + 3√10
Formula Used: √a × √b = √ab
=> (√(6 × 15) − 5√10) + 3√10
=> (√90 − 5√10) + 3√10
=> (√(9 × 10) − 5√10) + 3√10
=> (3√10 − 5√10) + 3√10
=> −2√10 + 3√10
=> (3 − 2)√10
=> √10
Therefore The correct answer is √10.
Additional Information
Product Rule for Surds
For any positive real numbers a and b, the square root of their product is √a × √b = √ab.
Simplifying Radicals
A radical is in simplest form when the radicand has no perfect square factors other than 1, such as √90 = √(9 × 10) = 3√10.
Addition of Like Radicals
Only like radicals (radicals with the same index and same radicand) can be added or subtracted using the rule a√x ± b√x = (a ± b)√x.

Q44. Answer: (c) 122

Shortcut Trick
Total wages for 5 carpenters for 2 days = Rs. 1,220
Calculate total carpenter-days = 5 carpenters × 2 days = 10 man-days
1-day wage for 1 carpenter = Total wages ÷ Total man-days
Wage = 1220 ÷ 10 = 122

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Therefore The correct answer is Rs. 122.

Alternate Method

Given:

Number of carpenters (M1) = 5

Number of days (D1) = 2

Total Wages (W1) = Rs. 1,220

Formula Used:

Wages prop. to (Number of workers × Time)

W1 / (M1 × D1) = W2 / (M2 × D2)

=> Total work units = 5 × 2 = 10 units

=> 10 units = Rs. 1,220

=> 1 unit = 1220 ÷ 10

=> 1 unit = Rs. 122

Therefore The correct answer is Rs. 122.

Additional Information

Chain Rule for Wages

When multiple variables (men, days, hours) are involved, the formula is (M1 × D1 × H1) / W1 = (M2 × D2 × H2) / W2.

Work & Wages Concept

Wages are distributed in the ratio of the work done by each individual. For equal efficiency, it is proportional to the time spent.

Unitary Method

Always find the value for one unit (one person for one day) by dividing the total amount by the product of the number of people and days.

Q45. Answer: (c) 250

Shortcut Trick

Use the direct ratio formula between Marked Price (MP) and Cost Price (CP):

MP/CP = (100 + Profit%)/(100 − Discount%)

MP/CP = (100 + 82)/(100 − 48) = 182/52 = 3.5/1

Mark-up % (X) = (Ratio − 1) × 100

X = (3.5 − 1) × 100 = 250%

Therefore The correct answer is 250.

Alternate Method

Given:

Discount % = 48%

Profit % = 82%

Formula Used:

SP = CP × (100 + P%)/100

MP = SP × 100 / (100 − D%)

Mark-up % (X) = [(MP − CP) / CP] × 100

Let Cost Price (CP) = 100 units

=> Selling Price (SP) = CP + 82% of CP

=> SP = 100 + 82 = 182 units

=> SP = MP × (100 − Discount%)/100

=> 182 = MP × (100 − 48)/100

=> 182 = MP × 52/100

=> MP = (182 × 100) / 52

=> MP = 350 units

=> Mark-up = MP − CP = 350 − 100 = 250 units

=> X% = (Mark-up / CP) × 100

=> X% = (250 / 100) × 100 = 250%

Therefore The correct answer is 250.

Additional Information

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Relation between CP and MP

The most efficient way to link mark-up, discount, and profit is: MP/CP = (100 + P%)/(100 − D%).

Successive Percentage Method

Profit % can be calculated using the net effect of mark-up (m) and discount (d): Net % = m − d − (md/100).

Mark-up Calculation

Mark-up value is always calculated on the Cost Price (CP), whereas Discount is always calculated on the Marked Price (MP).

Q46. Answer: (b) 45 : 32

Shortcut Trick

Ratio of Volumes of cylinders (V1 : V2) = $(r1 : r2)^2 \times (h1 : h2)$

Given: r1 : r2 = 3 : 4 and h1 : h2 = 5 : 2

$V1 : V2 = (3)^2 \times 5 : (4)^2 \times 2$

$V1 : V2 = (9 \times 5) : (16 \times 2) = 45 : 32$

Therefore The correct answer is 45 : 32.

Alternate Method

Given:

Ratio of radii (r1 : r2) = 3 : 4

Ratio of heights (h1 : h2) = 5 : 2

Formula used: Volume of a Cylinder (V) = $\pi r^2 h$

=> Let the radii be 3x and 4x, and heights be 5y and 2y.

=> Volume of first cylinder (V1) = $\pi \times (3x)^2 \times 5y$

=> $V1 = \pi \times 9x^2 \times 5y = 45\pi x^2 y$

=> Volume of second cylinder (V2) = $\pi \times (4x)^2 \times 2y$

=> $V2 = \pi \times 16x^2 \times 2y = 32\pi x^2 y$

=> Ratio $V1 : V2 = 45\pi x^2 y : 32\pi x^2 y$

=> Ratio = 45 : 32

Therefore The correct answer is 45 : 32.

Additional Information

Volume of a Cylinder

The amount of space occupied by a cylinder is given by $V = \pi r^2 h$, where r is the radius and h is the height.

Curved Surface Area (CSA)

The area of the curved surface only is CSA = $2\pi rh$.

Total Surface Area (TSA)

The sum of the area of the curved surface and the two circular bases is TSA = $2\pi r(h + r)$.

Ratio Property for Cylinders

If radii ratio is a:b and heights ratio is c:d, then Volume ratio = $(a^2 \times c) : (b^2 \times d)$ and CSA ratio = $(a \times c) : (b \times d)$.

Q47. Answer: (b) 4

Shortcut Trick

LCM of 3, 6, and 4 = 12 units (Total Work)

Efficiencies: A = 12/3 = 4, B = 12/6 = 2, C = 12/4 = 3

Combined Efficiency (A + B + C) = 4 + 2 + 3 = 9 units/day

Thrice the work = 12 × 3 = 36 units

Time taken = 36 ÷ 9 = 4 days

Therefore The correct answer is 4.

Alternate Method

Given: Time taken by A = 3 days, B = 6 days, C = 4 days.

Formula: Efficiency = Total Work ÷ Time

Persons	Time	Work (LCM)	Efficiency
A	3	12	4
B	6	2	

C	4	3	

=> Total efficiency of A + B + C = 4 + 2 + 3 = 9 units/day
=> Standard Total Work = 12 units
=> New Work to be completed = 3 × 12 = 36 units
=> Time required = Total Work ÷ Combined Efficiency
=> Time required = 36 ÷ 9 = 4 days
Therefore The correct answer is 4.
Additional Information
Work and Efficiency
Efficiency is inversely proportional to time when work is constant. Efficiency = Work ÷ Time.
Combined Work Formula
If three people do work in x, y, and z days, the time taken together is (x × y × z) ÷ (xy + yz + zx).
Pipes and Cisterns
The concept of time and work is identical to pipes filling a tank, where efficiency represents the flow rate.

Q48. Answer: (d) 24:15:36:18

Shortcut Trick
Identify the common term r in both ratios.
Ratio 1: p : q : r = 8 : 5 : 12
Ratio 2: r : s = 36 : 18
Equate r by multiplying Ratio 1 by 3 (since 12 × 3 = 36).
Combined Ratio = (8 × 3) : (5 × 3) : (12 × 3) : 18 = 24 : 15 : 36 : 18.
Therefore The correct answer is 24:15:36:18.
Alternate Method
Given:
p : q : r = 8 : 5 : 12
r : s = 36 : 18
To join the ratios, the value of the common variable (r) must be the same in both sets.
=> In first ratio, r = 12
=> In second ratio, r = 36
=> L.C.M. of 12 and 36 = 36
=> Multiply the first ratio by (36 ÷ 12) = 3
=> p : q : r = (8 × 3) : (5 × 3) : (12 × 3) = 24 : 15 : 36
=> Now, r : s = 36 : 18
=> Combining both: p : q : r : s = 24 : 15 : 36 : 18
Therefore The correct answer is 24:15:36:18.
Additional Information
Compound Ratio
The compound ratio of two ratios a : b and c : d is calculated as (a × c) : (b × d).
Inverse Ratio
The inverse ratio of a : b is 1/a : 1/b, which simplifies to b : a.
Proportion Rule
If four quantities a, b, c, d are in proportion (a : b = c : d), then the product of extremes equals the product of means: a × d = b × c.

Q49. Answer: (a) 17 seconds

Shortcut Trick
Relative speed (opposite direction) = 61 + 47 = 108 km/hr
Speed in m/s = 108 × 5/18 = 30 m/s
Total distance = 295 + 215 = 510 m
Time = 510 / 30 = 17 seconds
Therefore The correct answer is 17 seconds.

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Alternate Method

Given: Length of first train L1 = 295 m, Length of second train L2 = 215 m

Speed of first train S1 = 61 km/hr, Speed of second train S2 = 47 km/hr

Formula: Time taken to cross = (Total Length) ÷ (Relative Speed)

=> Total distance to be covered = 295 + 215 = 510 m => Relative speed in opposite direction = S1 + S2 => Relative speed = 61 + 47 = 108 km/hr => Converting speed to m/s = 108 × (5/18) = 6 × 5 = 30 m/s => Time = Distance ÷ Relative Speed => Time = 510 ÷ 30 = 17 seconds

Therefore The correct answer is 17 seconds.

Additional Information

Relative Speed in Opposite Direction

When two objects move in opposite directions, their relative speed is the sum of their individual speeds: S_(rel) = S1 + S2.

Relative Speed in Same Direction

When two objects move in the same direction, their relative speed is the difference between their speeds: S_(rel) = |S1 − S2|.

Unit Conversion

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

Train passing stationary objects

When a train passes a pole or a person, the distance covered is its own length. When it passes a platform, the distance is (Train length + Platform length).

Q50. Answer: (d) 5 2/3

Shortcut Trick

Work done by (A + B) in x hours = Work done by B in (x + 5) hours.

=> (Efficiency_A + Efficiency_B) × x = Efficiency_B × (x + 5)

=> 15x + 17x = 17x + 85 (Using Efficiency A=15, B=17 from inverse of time)

=> 15x = 85 => x = 85/15 = 17/3 = 5 2/3 hours.

Therefore The correct answer is 5 2/3.

Alternate Method

Given:

Time taken by Pipe A = 17 hours

Time taken by Pipe B = 15 hours

Formula Used:

Total Work = LCM of individual times; Efficiency = Total Work ÷ Time

Pipes	Time (hr)	Quantity	Efficiency
A	17	255 units	15
B	15	17	

Combined efficiency of A + B = 15 + 17 = 32 units/hr

=> Quantity emptied by (A + B) in x hours = 32 × x = 32x units

=> Quantity emptied by B alone in (x + 5) hours = 17 × (x + 5) units

=> Since the quantity is the same: 32x = 17(x + 5)

=> 32x = 17x + 85

=> 32x − 17x = 85

=> 15x = 85

=> x = 85 ÷ 15 = 17 ÷ 3

=> x = 5 2/3 hours

Therefore The correct answer is 5 2/3.

Additional Information

Pipes and Cisterns

Outlet pipes are considered to do negative work. If an outlet pipe empties a tank in T hours, its efficiency is −1/T per hour.

Efficiency and Time Relationship

The efficiency of a pipe is inversely proportional to the time it takes to fill or empty the tank (Efficiency prop. to 1/Time).

Combined Work Equation

When multiple pipes work together, the total efficiency is the algebraic sum of their individual efficiencies (Net E = E1 + E2 + ...).

Q51. Answer: (b) 25

BODMAS Table:

Given equation: 81 × 9 − 11 ÷ 2 + 6 = ?

×	÷	•	•
÷	×	•	•

Now, replacing the symbols:

=> 81 ÷ 9 + 11 × 2 − 6 = ?

=> 81 ÷ 9 + 11 × 2 − 6 = ?

=> 9 + 11 × 2 − 6 = ?

=> 9 + 22 − 6 = ?

=> 9 + 22 − 6 = ?

=> 31 − 6 = ?

=> 25.

Hence, the correct answer is "Option 2".

Q52. Answer: (d) ORL

(1) ILE

I + 3 = L

L - 7 = E

(2) LOH

L + 3 = O

O - 7 = H

(3) GJC

G + 3 = J

J - 7 = C

(4) ORL

O + 3 = R

R - 6 = L

Hence, the correct answer is “Option 4”.

Q53. Answer: (a) HLQ

Pattern followed here is,

Hence, the correct answer is “Option 1”.

Q54. Answer: (d) 68

Given:

Amit is 14th from the top.

Amit is 55th from the bottom.

Total = Rank from Top + Rank from Bottom - 1

Number of students = 14 + 55 - 1

= 69 - 1

= 68 students.

Hence, the correct answer is "Option 4".

Q55. Answer: (a) (4, 80, 10)

The logic followed here is:

Logic: (1st number × 2) × 3rd number = 2nd number.

Now,

For, (24,480,10)

=> (24 × 2) × 10 = 480

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For, (12, 552, 23)

=> (12 × 2) × 23 = 552

Similarly,

Option (1): (4, 80, 10)

=> (4 × 2) × 10 = 80

Hence, the closest matching answer is "Option 1".

Q56. Answer: (a) AE-HD

(1) AE-HD

(2) JN-QL

(3) DH-KF

(4) GK-NI

Hence, the correct answer is “Option 1”.

Q57. Answer: (b) Neither conclusion (I) nor (II) follows.

Least possible Venn diagram,

Conclusions:

(I) Some plastics are glasses →Does not follow (There is no direct relation given between plastics and glasses. so, it is possible not definite).

(II) All metals are glasses → Does not follow (All glasses are metals, and vice versa is possible not definite).

Neither conclusion (I) nor (II) follows.

Hence, the correct answer is “Option 2”.

Q58. Answer: (d) One

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

1. Only two boxes are kept between J and B.
2. Only K is kept above I.
3. Only two boxes are kept between K and J.
4. C is kept at some place below L but at some place above D.

K
I
L
J
C
D
B

One box kept between C and L.

Hence, the correct answer is “Option 4”.

Q59. Answer: (b) ru

Given:

‘bat fan world’ is coded as ‘vd ru ua’

And

‘world olive union’ is coded as ‘ru bi rl’.

‘world’ coded in that language as "ru"

Hence, the correct answer is “Option 2”.

Q60. Answer: (d) Mother's brother's daughter

A is				
Symbol	•	•	×	÷

Meaning	Daughter	Brother	Wife	Father
of B				

Given equation: D + F - G × H ÷ J → D is daughter of F, F is brother of G, G is wife of H and H is father of J.
D is J's Mother's Brother's Daughter.
Hence, the correct answer is “Option 4”.

Q61. Answer: (c) OV 30

HM 16 is related to JQ 19,
And
CH 22 is related to EL 25.
Similarly,
MR 27 related to,
Hence, the correct answer is “Option 3”.

Q62. Answer: (d) MH 28

RL 12 is related to VQ 16
And
NH 15 is related to RM 19
Similarly,
IC 24 related to,
Hence, the correct answer is “Option 4”.

Q63. Answer: (b) 1

Given series:
(Left) 9 & & 8 2 * 1 © $ 1 4 % £ 6 © 3 % 9 # 8 9 3 (Right)
Condition to be checked:
Number ← Number → Number
Checking the series:
(Left) 9 & & 8 2 * 1 © $ 1 4 % £ 6 © 3 % 9 # 8 9 3 (Right)
There is only one such number that is immediately preceded and followed by a number.
Hence, the correct answer is "Option 2".

Q64. Answer: (d) UQ -2

XQ 4 is related to ZV -10
And
OH 8 is related to QM -6.
Similarly,
SL 12 related to,
Hence, the correct answer is “Option 4”.

Q65. Answer: (c) C

Six people, A, B, C, D, E and F, are sitting in a row facing north.
1. Only three people are sitting to the right of A.
2. Only one person is sitting between A and C.
3. E is sitting second to the extreme left end of the row.
4. B is not the immediate neighbour of A.
5. F is sitting to the immediate left of B.
6. F is sitting to the immediate right of A.
C sitting at the extreme left end of the row.
Hence, the correct answer is “Option 3”.

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Q66. Answer: (c) D

Seven people, B, C, D, I, J, K and L, are sitting around a circular table facing the centre of the table.

1. I sits to the immediate left of D.
2. J is the immediate neighbour of both B and K.
3. K sits third to the left of D.
4. L is not an immediate neighbour of K.

D sits second to the right of C.

Hence, the correct answer is “Option 3”.

Q67. Answer: (b) 10 km to the south

According to the given information,

To reach point A again, he should drive 30 - 20 = 10 km toward South direction.

Hence, the correct answer is “Option 2”.

Q68. Answer: (a) Two

Given series:

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

Condition to be checked:

Odd digit ← Even digit → Odd digit

Checking the series:

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

There are two such digits that satisfy the given condition (925, 581).

Hence, the correct answer is "Option 1".

Q69. Answer: (a) 16

BODMAS Table:

Given equation: 6 D 18 A 9 C 3 B 4 = ?

A	B	C	D
÷	×	•	•

Now, replacing the symbols:

=> 6 - 18 ÷ 9 + 3 × 4 = ?

=> 6 - 18 ÷ 9 + 3 × 4 = ?

=> 6 - 2 + 3 × 4 = ?

=> 6 - 2 + 12 = ?

=> 6 - 2 + 12 = ?

=> 4 + 12 = ?

=> 16.

Hence, the correct answer is "Option 1".

Q70. Answer: (d) 187

Logic followed here is,

127 + 8 = 135

135 + 10 = 145

145 + 12 = 157

157 + 14 = 171

171 + 16 = 187

Hence, the correct answer is “Option 4”.

Q71. Answer: (c) aa

Given:

‘tree third woman’ is coded as ‘hw gw aa’

And

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‘ivy tree army’ is coded as ‘aa hi wz’.

‘tree’ coded in that language as "aa"

Hence, the correct answer is “Option 3”.

Q72. Answer: (d) 2

Given series:

(Left) 5 * 1 & 1 6 $ © * 3 8 # © € 1 & © 1 © 8 % 4 (Right)

Condition to be checked:

Number ← Required Number → Symbol

Checking the series:

(Left) 5 * 1 & 1 6 $ © * 3 8 # © € 1 & © 1 © 8 % 4 (Right)

There are two such numbers that satisfy the given condition.

Hence, the correct answer is "Option 4".

Q73. Answer: (c) 16

Given:

1 is added to each even digit and 2 is subtracted from each odd digit in the number 7894562.

Given	7	8	9	4	5	6	2
Operation	-2	+1	-2	+1	-2	+1	+1
New Number	5	9	7	5	3	7	3

The new number formed is 5975373.

Second digit from the left = 9

Second digit from the right = 7

Sum = 9 + 7 = 16

Hence, the correct answer is "Option 3".

Q74. Answer: (a) 676

Logic followed here is,

Hence, the correct answer is “Option 1”.

Q75. Answer: (c) 20 km to the north

According to the given information,

To reach point A again, he should drive 78 - 58 = 20 km toward North direction.

Hence, the correct answer is “Option 3”.

Q76. Answer: (b) Neither conclusion (I) nor (II) follows

Least possible Venn diagram,

Conclusions:

(I) Some Lead are Titanium → Does not follow (There is no direct relation given between lead and titanium. so, it is possible not definite).

(II) No Cadmium are Tungsten → Does not follow (There is no direct relation given between cadmium and tungsten. so, it is possible not definite).

Neither conclusion (I) nor (II) follows.

Hence, the correct answer is “Option 2”.

Q77. Answer: (a) PV57

Pattern followed here is,

Hence, the correct answer is “Option 1”.

Q78. Answer: (c) 3

Given series:

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

Condition to be checked:

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Odd digit ← Odd digit → Odd digit

Checking the series:

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

There are three such digits that satisfy the given condition.

Hence, the correct answer is "Option 3".

Q79. Answer: (b) Two

A, B, C, D, E and F are sitting around a circular table, facing the centre.

1. E sits third to the right of A.
2. D sits to the immediate left of B.
3. B is not an immediate neighbour of A.
4. F sits to the immediate right of C.

If all the persons are arranged in the English alphabetical order in the clockwise direction starting from A (including A),

Final arrangement:

Original	A	F	C	E	B	D
Alphabetical arrangement	A	B	C	D	E	F

Position two persons (A and C) remains unchanged, while arranged in the English alphabetical order.

Hence, the correct answer is “Option 2”.

Q80. Answer: (c) 25

Logic followed here is,

11 + 2 = 13

13 + 3 = 16

16 + 4 = 20

20 + 5 = 25

25 + 6 = 31

Hence, the correct answer is “Option 3”.

Q81. Answer: (b) Rs. 3,794 crore

The correct answer is Rs. 3,794 crore.

Key Points

• The Union Budget 2025-2026 was presented in the Parliament by the Union Finance Minister Nirmala Sitharaman on February 1, 2025.

• In this budget, the Ministry of Youth Affairs and Sports has been allocated a total amount of Rs. 3,794 crore to promote sporting excellence and youth engagement across the country.

• This allocation is designed to support various initiatives aimed at identifying and nurturing talent at the grassroots level through the National Programme for Development of Sports.

• A substantial portion of the funding is dedicated to the Khelo India initiative, which continues to be a cornerstone of India's sports strategy to improve the medal tally in international competitions.

• The budget emphasizes the development of sports infrastructure and the provision of modern equipment and scientific support to Indian athletes.

Additional Information

• Khelo India Scheme:

• Launched in 2017-18, this scheme aims to revive the sports culture in India at the grass-root level by building a strong framework for all sports played in the country and establishing India as a great sporting nation.

• The scheme focuses on 12 components, including playfield development, community coaching development, and state-level Khelo India Centres.

• Sports Authority of India (SAI):

• Established in 1984, SAI is the apex national sports body of India, managed by the Ministry of Youth Affairs and Sports.

• It operates various Regional Centres and Academic Institutions to provide training and high-performance coaching to elite athletes.

• Target Olympic Podium Scheme (TOPS):

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• This is a flagship program to provide financial and technical assistance to India's top athletes for the Olympics and Paralympics.

• Under this scheme, the Ministry identifies "High Priority" sports and provides customized training under world-class coaches.

• Mera Yuva Bharat (MY Bharat):

• An autonomous body launched on October 31, 2023, to provide an overarching platform for youth development.

• It serves as a "Phygital" (Physical + Digital) platform to help youth realize their aspirations and contribute to the goal of Viksit Bharat by 2047.

Important Points

• Youth Population: India has one of the largest youth populations in the world, making the budget for the Ministry of Youth Affairs and Sports critical for national development.

• International Events: The budget allocation for 2025-2026 considers the preparation for upcoming major events such as the Commonwealth Games and the Asian Games cycles.

• National Sports Development Fund (NSDF): The ministry utilizes this fund, established in 1998, to receive contributions from corporate houses and individuals for the promotion of sports.

• Fit India Movement: Launched by Prime Minister Narendra Modi on August 29, 2019, it aims to make fitness an integral part of the daily lives of Indians, which is supported by these budgetary provisions.

Q82. Answer: (d) 62%

The correct answer is 62%.

Key Points

• According to the Economic Survey 2024-25, the Services Sector in India remains a dominant recipient of Foreign Direct Investment (FDI), reflecting the global confidence in the Indian economy.

• During the first half of the financial year 2024-25, specifically the April to September period, the Insurance sector emerged as a major driver for investment, attracting approximately 62% of the total FDI equity inflows directed into the services sector.

• This significant inflow highlights the impact of liberalized policies, where the Government of India has permitted higher foreign ownership to strengthen the capital base of domestic insurance companies.

• The Economic Survey notes that the services sector, encompassing Finance, Banking, Insurance, and Business Outsourcing, continues to lead India's growth narrative, contributing substantially to the Gross Value Added (GVA).

• The surge in Insurance FDI is attributed to the ongoing digital transformation and the increasing demand for life and non-life insurance products across the country. Hence, the correct answer is 62%.

Additional Information

• FDI Policy in Insurance:

• In 2021, the Indian government amended the Insurance Act, 1938, to increase the Foreign Direct Investment limit in the insurance sector from 49% to 74% under the automatic route.

• This policy shift was intended to facilitate greater capital infusion, improve insurance penetration, and enhance the competitive landscape of the Indian insurance market.

• Economic Survey 2024-25 Overview:

• The Economic Survey is a flagship document presented by the Ministry of Finance, typically a day before the Union Budget.

• It provides a detailed analysis of the performance of various sectors such as Agriculture, Industry, and Services, while outlining the GDP growth projections for the upcoming fiscal year.

• Insurance Penetration and Density:

• Insurance Penetration is measured as the percentage of insurance premiums to GDP. In India, this figure has been steadily rising toward the 4% mark, although it remains lower than the global average.

• Insurance Density refers to the ratio of premium to total population, which serves as an indicator of the growth of the insurance business in terms of reach.

Important Points

• IRDAI and "Insurance for All":

• The Insurance Regulatory and Development Authority of India (IRDAI) has set a vision of "Insurance for All by 2047", aiming to ensure that every citizen has appropriate life, health, and property insurance coverage.

• Regulatory reforms like Bima Sugam (an online marketplace) are being implemented to simplify the process of buying and selling insurance.

• Role of the Services Sector:

• The Services Sector accounts for over 50% of India's Gross Value Added (GVA) and is the primary destination for FDI inflows into the country.

• Sub-sectors like Computer Software and Hardware, Trading, and Telecommunications also contribute significantly to the total FDI equity inflows alongside Financial and Insurance services.

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Q83. Answer: (d) The Promotion and Regulation of Online Gaming Bill, 2025

The correct answer is The Promotion and Regulation of Online Gaming Bill, 2025.

Key Points

• The Promotion and Regulation of Online Gaming Bill, 2025 was introduced and enacted in August 2025 to address the rapidly evolving digital entertainment landscape in India.

• The primary objective of this legislation is to establish a comprehensive regulatory framework that ensures a safe and transparent environment for online gaming while curbing illegal online money-gaming activities.

• It aims to protect citizens, particularly the youth and vulnerable sections, from the adverse effects of gaming addiction and the financial risks associated with unregulated betting and gambling platforms.

• The bill mandates the registration of all online gaming intermediaries and requires them to adhere to strict KYC (Know Your Customer) norms and age-gating mechanisms to prevent minors from accessing age-inappropriate content.

• It also provides for the creation of an Online Gaming Regulatory Authority, which is tasked with overseeing compliance, resolving disputes, and ensuring that games do not violate the sovereignty and integrity of India.

Additional Information

• Regulatory Context in India:

• Before the 2025 Bill, online gaming was primarily governed through amendments to the Information Technology (Intermediary Guidelines and Digital Media Ethics Code) Rules, 2021, issued by the Ministry of Electronics and Information Technology (MeitY).

• The 2023 amendments introduced the concept of permissible online games and required the formation of Self-Regulatory Bodies (SRBs) to verify games.

• Taxation and Revenue:

• The GST Council of India decided in its 50th meeting to impose a uniform 28% GST on the full face value of bets placed in online gaming, casinos, and horse racing.

• This move was aimed at bringing parity in taxation and increasing government revenue from the high-growth gaming sector.

• Skill vs. Chance:

• Indian jurisprudence traditionally distinguishes between "Games of Skill" and "Games of Chance." While games of skill are protected under Article 19(1)(g) of the Constitution, games of chance are often categorized as gambling and regulated strictly by State Legislatures.

• The Promotion and Regulation of Online Gaming Bill, 2025 seeks to bring a unified Central law to provide clarity on these definitions at a national level.

• Player Protection Measures:

• The legislation emphasizes responsible gaming, requiring platforms to display warnings about financial risks and time spent, and to provide mechanisms for self-exclusion for players showing signs of addiction.

Important Points

• Economic Impact: The Indian online gaming industry is one of the fastest-growing sectors, with a projected CAGR of over 20%. The 2025 Bill provides the necessary legal certainty to attract Foreign Direct Investment (FDI).

• Prohibited Content: The bill strictly prohibits any online game that involves wagering on the outcome of real-life events or any activity that resembles money laundering, as per the Prevention of Money Laundering Act (PMLA), 2002.

• Enforcement: Non-compliance with the provisions of the Promotion and Regulation of Online Gaming Bill, 2025 can lead to heavy penalties, blocking of the gaming platform under Section 69A of the IT Act, and criminal proceedings.

Q84. Answer: (d) Madhya Pradesh

The correct answer is Madhya Pradesh.

Key Points

• The Defence Research and Development Organisation (DRDO) achieved a significant technological milestone in May 2025 by successfully conducting the maiden flight-trial of its Stratospheric Airship Platform (SAP).

• The flight-trial was conducted in the state of Madhya Pradesh, which provided the necessary geographical and logistical support for high-altitude aeronautical testing. Hence, the statement regarding the location is correct.

• The Stratospheric Airship Platform is designed to operate in the stratosphere at altitudes ranging from 18 to 22 kilometers, placing it well above the range of conventional weather systems and commercial air traffic.

• This platform acts as a quasi-satellite, capable of providing persistent surveillance, high-resolution imaging, and communication relay services over a localized area for extended periods.

• The success of this trial validates the indigenous design of the propulsion systems, solar power integration, and the aerostat's ability to maintain station-keeping in low-density air.

Additional Information

• High-Altitude Pseudo-Satellites (HAPS):

• The SAP belongs to the category of HAPS, which are airships or drones that stay aloft for weeks or months. Unlike low-earth orbit (LEO) satellites, they can be brought back to the ground for maintenance and upgrades.

• These platforms are significantly more cost-effective than launching satellites and offer lower latency for communication applications.

• DRDO (Defence Research and Development Organisation):

• Established in 1958, DRDO is the R&D wing of the Ministry of Defence, Government of India.

• Its headquarters is located in New Delhi. It currently operates a network of over 50 laboratories deeply engaged in developing defense technologies covering various disciplines like aeronautics, armaments, electronics, and land combat engineering.

• Strategic and Civil Applications:

• Border Monitoring: The SAP provides a permanent "eye in the sky" for monitoring international borders and sensitive regions without the fuel constraints of traditional aircraft.

• Disaster Management: It can be deployed rapidly to provide emergency telecommunications and situational awareness during natural calamities like floods or earthquakes.

• Environmental Sensing: Equipped with specific sensors, it can monitor greenhouse gas concentrations and atmospheric changes in real-time.

• Technical Specifications of SAP:

• The airship utilizes thin-film solar cells to generate power during the day and stores energy in high-density batteries for operation during the night.

• The use of lightweight composite materials ensures that the structure can withstand the extreme temperature variations and ultraviolet radiation prevalent in the stratosphere.

Q85. Answer: (a) 3 june

The correct answer is 3 june.

Key Points

• World Bicycle Day is observed globally on 3 June every year to recognize the bicycle as a simple, affordable, reliable, clean, and environmentally fit sustainable means of transport.

• The United Nations General Assembly declared 3 June as World Bicycle Day in April 2018. This decision was the result of an intensive campaign by Professor Leszek Sibilski and the support of 56 countries.

• The day aims to encourage Member States to devote particular attention to the bicycle in cross-cutting development strategies and to include the bicycle in international, regional, national, and subnational development policies and programmes.

• It promotes the use of the bicycle as a means of fostering sustainable development, strengthening education, including physical education, for children and young people, promoting health, and preventing disease. Hence, the correct option is 3 june.

• In India, the day is marked by various cyclothons and events organized by the Ministry of Youth Affairs and Sports and the Ministry of Health and Family Welfare to promote the Fit India Movement.

Additional Information

• 12 May:

• This date is recognized as International Nurses Day worldwide.

• It commemorates the birth anniversary of Florence Nightingale, the founder of modern nursing.

• The day is organized by the International Council of Nurses (ICN) to highlight the important role nurses play in health care.

• 13 February:

• This day is celebrated as World Radio Day, as proclaimed by UNESCO in 2011 and adopted by the UN General Assembly in 2012.

• In India, 13 February is also observed as National Women's Day to mark the birth anniversary of the "Nightingale of India," Sarojini Naidu.

• 12 April:

• This is the International Day of Human Space Flight.

• It marks the anniversary of the first human space flight, carried out by Yuri Gagarin, a Soviet citizen, in 1961.

• The United Nations declared this day to celebrate the beginning of the space era for mankind.

Important Points

• Environmental Impact: Cycling is a zero-emission mode of transport that helps in reducing carbon footprints and combating climate change.

• Health Benefits: Regular cycling reduces the risk of heart disease, stroke, certain cancers, and diabetes. It is an effective way to control weight and reduce body fat levels.

• Sustainable Development Goals (SDGs): Promoting cycling aligns with several UN SDGs, including Goal 3 (Good Health and Well-being), Goal 11 (Sustainable Cities and Communities), and Goal 13 (Climate Action).

• Global Participation: During the World Bicycle Day 2022, India set a record for the largest bicycle rally organized on a single day across multiple locations to promote physical fitness.

Q86. Answer: (c) Sudarsan Pattnaik

The correct answer is Sudarsan Pattnaik.

Key Points

• Renowned Indian sand artist Sudarsan Pattnaik made history in April 2025 by becoming the first Indian to be honored with the prestigious Fred Darrington Sand Master Award.

• The award ceremony took place in Weymouth, United Kingdom, a location globally recognized for its long-standing tradition of sand sculpture art.

• This award is named after Fred Darrington, who started the tradition of sand modeling in Weymouth in the 1920s, and it is considered one of the highest honors in the world of sand artistry. Hence, the statement regarding Sudarsan Pattnaik is correct.

• Sudarsan Pattnaik was chosen for this honor based on his decades of contribution to the field of sand art and his ability to combine intricate artistic skill with powerful social and environmental messages.

• By receiving this accolade, he has further solidified India's position on the global map of contemporary and traditional art forms.

Additional Information

• Profile of Sudarsan Pattnaik:

• Hailing from the pilgrimage town of Puri in Odisha, Sudarsan Pattnaik is a self-taught artist who started carving sand images on the Puri beach at a very young age.

• He was awarded the Padma Shri, India's fourth-highest civilian award, by the Government of India in 2014 for his immense contribution to the arts.

• He has represented India in more than 60 international sand art championships and festivals across the globe, winning numerous gold medals and titles for the country.

• In 2017, he created a Guinness World Record for building the world’s tallest sandcastle, which stood 48 feet 8 inches tall on Puri beach.

• About the Other Options:

• Raghunath Mohapatra: A legendary architect and sculptor from Odisha known for his mastery in stone carving. He was a recipient of the Padma Vibhushan and served as a member of the Rajya Sabha.

• Subodh Gupta: A contemporary Indian artist based in New Delhi, widely known for using everyday objects like stainless steel tiffins and milk pails in his large-scale installations.

• M.F. Husain: Often called the "Picasso of India," Maqbool Fida Husain was a founding member of the Bombay Progressive Artists' Group and is one of the most celebrated painters in Indian history.

Important Points

• Global Impact: Pattnaik is known for using his art to raise awareness about global issues such as Global Warming, COVID-19 safety, plastic pollution, and world peace.

• Educational Contribution: He established the Sudarsan Sand Art Institute in Puri to provide professional training to aspiring sand artists, ensuring the continuity of this unique art form in India.

• Cultural Diplomacy: His participation in events like the International Sand Sculpting Championship in the USA, Russia, and Japan serves as a form of cultural diplomacy, showcasing Indian talent and heritage to an international audience.

Q87. Answer: (a) $25,000

The correct answer is $25,000.

Key Points

• The inaugural 2025 Dow Impact Award was established to recognize excellence in innovation and sustainability within the golf industry.

• The winner of this prestigious award is granted a cash prize of $25,000 to further support and implement sustainable projects at their facility.

• This award is a collaborative initiative between Dow, a global leader in materials science, and the Golf Course Superintendents Association of America (GCSAA).

• The primary objective of the Dow Impact Award is to celebrate GCSAA members who demonstrate leadership in environmental stewardship, social responsibility, and economic efficiency.

• The first-ever recipient was announced during the 2025 GCSAA Conference and Trade Show held in San Diego, California.

Additional Information

• Dow’s Commitment to Golf:

• Dow has a long-standing relationship with the sport of golf, notably as the title sponsor of the LPGA Dow Championship (formerly the Dow Great Lakes Bay Invitational).

• The company utilizes its materials science expertise to enhance various aspects of the game, from golf ball technology to sustainable turf management solutions.

• By launching this award, Dow aims to amplify the message that sustainability is essential for the long-term viability of the sport.

• The GCSAA Partnership:

• The Golf Course Superintendents Association of America (GCSAA), founded in 1926, is the professional association for the men and women who manage golf courses in the United States and worldwide.

• The partnership ensures that the award reaches professional superintendents who are on the front lines of managing natural resources like water, soil, and biodiversity.

• GCSAA helps define the rigorous criteria used to evaluate submissions, focusing on measurable impact and scalability.

• Sustainability Focus Areas:

• Winning projects typically involve advanced water conservation techniques, such as the use of recycled water or precision irrigation.

• Other focus areas include integrated pest management (IPM), reduction of carbon footprints, and the creation of pollinator habitats on golf course grounds.

Important Points

• The 2025 Winner: The inaugural award was presented to The Club at Olde Cypress, located in Naples, Florida, for their exemplary efforts in sustainable turfgrass management and community engagement.

• Evaluation Criteria: Submissions are judged based on several pillars, including Environmental Impact, Innovation, Social Responsibility, and Operational Excellence.

• Prize Utilization: The $25,000 prize is specifically designated for the golf facility to reinvest in sustainability-focused capital improvements or educational programs.

• Industry Impact: This award highlights the shift in the golf industry toward becoming a leader in environmental conservation, countering traditional perceptions of the sport's resource usage.

Q88. Answer: (c) Mongolia

The correct answer is Mongolia.

Key Points

• The Indian Army participated in the multinational peacekeeping exercise Khaan Quest 2025, which was hosted in Mongolia during June 2025.

• Exercise Khaan Quest is an annual event co-sponsored by the Mongolian Armed Forces (MAF) and the United States Indo-Pacific Command (USINDOPACOM).

• The primary objective of the exercise is to enhance the interoperability of the participating nations and to train their personnel for United Nations Peacekeeping Operations (UNPKO).

• In the 2025 iteration, the Indian Army contingent, often comprising personnel from specialized infantry units like the GARHWAL RIFLES or GORKHA RIFLES, engaged in various tactical drills and humanitarian assistance scenarios.

• The exercise involves approximately 20 countries, providing a platform for sharing best practices and developing professional relationships between military forces from across the globe. Hence, the correct answer is Mongolia.

Additional Information

• History of Khaan Quest:

• The exercise began as a bilateral event between the USA and Mongolia in the year 2003.

• It transitioned into a multinational peacekeeping exercise in 2006, allowing more nations to participate and contribute to global security.

• Geographical Context:

• The training is traditionally conducted at the Five Hills Training Area, located near the Mongolian capital, Ulaanbaatar.

• Mongolia, known as the "Land of the Eternal Blue Sky," provides a rugged and challenging terrain that is ideal for simulating diverse peacekeeping environments.

• Indo-Mongolian Defense Ties:

• Apart from Khaan Quest, India and Mongolia conduct a bilateral military exercise named Nomadic Elephant, which focuses on counter-terrorism and mountain warfare.

• India considers Mongolia a "Spiritual Neighbour" and a key partner in its Act East Policy.

• Significance for India:

• Participation in such exercises allows the Indian Army to demonstrate its vast experience in UN Missions, as India is one of the largest troop-contributing countries to the United Nations.

• It strengthens diplomatic and military cooperation with Central Asian and East Asian nations.

Important Points

• Exercise Components: The training usually includes a Command Post Exercise (CPX) for staff officers and a Field Training Exercise (FTX) for troops on the ground.

• Focus Areas: The curriculum includes Combat Medical Care, Cordon and Search operations, Convoy Protection, and IED (Improvised Explosive Device) awareness.

• UN Standards: All activities are designed according to the United Nations training standards to ensure readiness for deployment in volatile regions under the UN Charter.

• Global Participation: Nations such as Canada, Germany, South Korea, Japan, and Vietnam have been regular participants in previous editions alongside India.

Q89. Answer: (b) Blaise Metreweli

The correct answer is Blaise Metreweli.

Key Points

• Blaise Metreweli was officially named as the next Chief of the Secret Intelligence Service (SIS), popularly known as MI6, in June 2025.

• With this appointment, she becomes the first female to lead the United Kingdom's foreign intelligence agency in its 116-year history since it was founded in 1909.

• She succeeded Sir Richard Moore, who had held the position of Chief—traditionally referred to by the code name "C"—since October 2020.

• Before being selected for this prestigious role, Metreweli served as a senior official within the Foreign, Commonwealth & Development Office (FCDO), bringing extensive experience in international relations and national security.

• Her appointment was approved by the Prime Minister following a recommendation by the Foreign Secretary, marking a significant milestone for gender representation in the UK Intelligence Community.

Additional Information

• Secret Intelligence Service (MI6): Headquartered at Vauxhall Cross, London, MI6 is responsible for the United Kingdom's overseas intelligence activities. Its primary functions include gathering human intelligence (HUMINT) to protect national security and economic well-being while countering organized crime and terrorism.

• Anne Keast-Butler: She is a prominent figure in the intelligence sector who was appointed as the first female Director of GCHQ (Government Communications Headquarters) in May 2023. GCHQ focuses on signals intelligence and cyber security.

• Stella Rimington: She made history as the first female Director General of MI5 (the Security Service), serving from 1992 to 1996. MI5 is the agency responsible for domestic counter-intelligence and security within the UK.

• The "C" Tradition: The head of MI6 is always known as "C", a tradition started by the first chief, Sir Mansfield George Smith-Cumming, who signed his name in green ink. This tradition of using green ink continues among chiefs to this day.

• Barbara Woodward: She is a distinguished British diplomat currently serving as the Permanent Representative of the United Kingdom to the United Nations in New York, a position she has held since 2020. She was previously the British Ambassador to China.

Important Points

• The appointment of Blaise Metreweli completes the transition of all three major UK intelligence agencies (MI5, MI6, and GCHQ) having been led by a woman at some point in their history.

• Under the Intelligence Services Act 1994, the Chief of SIS is the only member of the service whose identity is officially made public by the government.

• The role of the Chief involves direct reporting to the Foreign Secretary and providing strategic intelligence briefings to the National Security Council.

Q90. Answer: (b) Reserve Bank of India (RBI)

The correct answer is Reserve Bank of India (RBI).

Key Points

• The Reserve Bank of India (RBI) released the Supervisory Data Quality Index (sDQI) report in March 2025 to enhance the quality of returns submitted by various financial institutions.

• The sDQI is a performance metric designed to evaluate the data quality of Supervised Entities (SEs), which includes Scheduled Commercial Banks, Non-Banking Financial Companies (NBFCs), and Urban Cooperative Banks (UCBs).

• The index assesses data based on four pillars: accuracy, consistency, completeness, and timeliness. This ensures that the data used for regulatory oversight is reliable and robust.

• This initiative is part of the RBI's broader strategy to transition towards data-driven supervision and improve the Risk-Based Supervision (RBS) framework.

• By monitoring the sDQI, the central bank aims to provide feedback to Supervised Entities, encouraging them to strengthen their internal data management systems and reduce reporting errors.

Additional Information

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• Reserve Bank of India (RBI):

• It was established on April 1, 1935, under the provisions of the Reserve Bank of India Act, 1934, following the recommendations of the Hilton Young Commission.

• The RBI was nationalized on January 1, 1949, and it serves as the Central Bank of the country, headquartered in Mumbai.

• Its primary functions include monetary policy formulation, currency issuance, regulation of the banking system, and managing foreign exchange reserves.

• Regulatory Tools and Systems:

• The RBI utilizes DAKSHA, an advanced supervisory monitoring system, to automate reporting processes and facilitate seamless data exchange between the regulator and the SEs.

• Another important index released by the RBI is the Financial Inclusion Index (FI-Index), which captures the extent of financial inclusion across India based on three parameters: Access, Usage, and Quality.

• Other Organizations mentioned:

• Securities and Exchange Board of India (SEBI): Established in 1988 (statutory status in 1992), it regulates the securities and capital markets in India.

• National Payments Corporation of India (NPCI): An umbrella organization for operating retail payments and settlement systems like UPI, IMPS, and RuPay.

• State Bank of India (SBI): The largest public sector bank in India, formed in 1955 after the nationalization of the Imperial Bank of India.

Important Points

• The Supervisory Data Quality Index helps in identifying systemic risks at an early stage by ensuring that the micro-level data submitted by banks is free from discrepancies.

• It fosters a culture of transparency and accountability within the financial sector, as Supervised Entities are ranked based on their compliance with reporting standards.

• The implementation of sDQI aligns with global best practices in central banking supervision, particularly those recommended by the Basel Committee on Banking Supervision (BCBS).

Q91. Answer: (a) Sewer and septic tank workers

The correct answer is Sewer and septic tank workers.

Key Points

• The Ministry of Social Justice and Empowerment organized the National Action for Mechanised Sanitation Ecosystem (NAMASTE) Day to celebrate the achievements and safety milestones of sanitation workers.

• During this event, Personal Protective Equipment (PPE) kits were distributed specifically to Sewer and Septic Tank Workers (SSWs) to safeguard them from occupational hazards associated with hazardous cleaning. Hence, statement 1 is correct.

• The distribution of these kits is a critical component of the NAMASTE scheme, which aims to eliminate the practice of manual cleaning of sewers and septic tanks by providing safety gear and mechanized equipment.

• The event highlighted the government's commitment to ensuring zero fatalities in sanitation work and improving the social security and dignity of these workers.

• The Ministry of Housing and Urban Affairs (MoHUA) and the Ministry of Social Justice and Empowerment jointly implement this initiative across all Urban Local Bodies (ULBs) in India.

Additional Information

• NAMASTE Scheme:

• Launched in the financial year 2022-23, the National Action for Mechanised Sanitation Ecosystem is a central sector scheme.

• It replaced the Self-Employment Scheme for Rehabilitation of Manual Scavengers (SRMS) to provide a more comprehensive safety net for sanitation professionals.

• The scheme aims to identify SSWs and provide them with occupational safety training and health insurance.

• Livelihood and Empowerment:

• The scheme provides a Capital Subsidy of up to 5 lakh rupees to help workers purchase sanitation machinery, turning them into Sanipreneurs.

• By promoting the use of machines, the government intends to shift from manual scavenging to mechanized cleaning, thereby adhering to the Prohibition of Employment as Manual Scavengers and their Rehabilitation Act, 2013.

• Safety Standards:

• Under the scheme, workers are provided with PPE kits that include specialized masks, gloves, and boots designed to withstand the toxic environment of septic tanks.

• The National Safai Karamcharis Finance and Development Corporation (NSKFDC) serves as the implementing agency for these welfare measures.

Important Points

• Social Security Linkage: All identified Sewer and Septic Tank Workers are linked to the Ayushman Bharat-Pradhan Mantri Jan Arogya Yojana (AB-PMJAY), providing them with health insurance coverage of up to 5 lakh rupees per year.

• Institutional Support: The Emergency Response Sanitation Unit (ERSU) model is being established in cities to manage sanitation emergencies through trained professionals and specialized equipment.

• Skill Development: Workers undergo Short Term Training (STT) modules that educate them on the technical aspects of mechanized cleaning and the importance of using safety devices at all times.

• Target Coverage: The scheme covers all 4,800+ Urban Local Bodies in India, aiming to create a sustainable and safe sanitation ecosystem for approximately 1 lakh sanitation workers.

Q92. Answer: (d) Armand 'Mondo' Duplantis

The correct answer is Armand 'Mondo' Duplantis.

Key Points

• Armand 'Mondo' Duplantis was honored with the 2025 Laureus World Sportsman of the Year award following a historic and dominant 2024 season in athletics.

• During the Paris 2024 Olympic Games, he successfully defended his title to win the gold medal, setting a new Olympic record and breaking his own world record in the final with a height of 6.25 meters.

• In the 2024 calendar year, he broke the world record for the pole vault multiple times, eventually reaching a staggering height of 6.26 meters at the Silesia Diamond League in Poland.

• His achievements in 2024 included securing the World Indoor Championship title in Glasgow and the European Championship in Rome, making him the undisputed leader in his discipline.

• He represents Sweden on the international stage and has become one of the most recognizable faces in global track and field due to his consistent record-breaking performances.

Additional Information

• Laureus World Sports Awards: Established in 1999 by founding patrons Daimler and Richemont, these awards are often referred to as the "Oscars of Sport." The first ceremony was held in 2000 in Monte Carlo, with Nelson Mandela delivering a famous speech about the power of sport to change the world.

• Other Nominees for 2025:

• Max Verstappen: The Dutch racing driver who secured his fourth consecutive Formula 1 World Championship title in 2024 with Red Bull Racing.

• Tadej Pogačar: The Slovenian cyclist who achieved a historic Triple Crown in 2024, winning the Giro d'Italia, the Tour de France, and the UCI Road World Championships.

• Carlos Alcaraz: The Spanish tennis sensation who won both the French Open and Wimbledon in 2024, becoming the youngest man to win Grand Slams on all three surfaces.

• Armand Duplantis Profile: Born on November 10, 1999, in Lafayette, Louisiana, he holds dual American-Swedish citizenship. He comes from a sporting family; his father Greg Duplantis was a pole vaulter, and his mother Helena was a heptathlete and volleyball player.

• The Selection Process: Candidates are nominated by a panel of the world’s leading sports media, and the winners are subsequently selected by a secret ballot of the Laureus World Sports Academy, a group of 71 living sporting legends.

• Significance: Winning this award places Duplantis in the company of legends such as Roger Federer, Usain Bolt, Tiger Woods, and Lionel Messi, who have all won the Sportsman of the Year title previously.

Q93. Answer: (c) Rajasthan

The correct answer is Rajasthan.

Key Points

• Menar is located in the Udaipur district of the state of Rajasthan. It has gained international recognition for its rich biodiversity and community-led conservation efforts.

• It is famously known as the "Bird Village" of Rajasthan because it serves as a major habitat for a wide variety of migratory and resident bird species.

• The wetland consists of two primary seasonal lakes, namely Brahma Lake and Dhandh Lake, which spread across approximately 400 hectares of land.

• In 2022, the Rajasthan state government initiated the formal process to declare Menar as a Ramsar site, seeking to provide it with international protection under the Ramsar Convention.

• The conservation of this wetland is unique because it is entirely managed by the local Menaria community, who have protected the ecosystem for centuries without formal government intervention until recently.

Additional Information

• Ramsar Convention:

• The Ramsar Convention on Wetlands is an intergovernmental treaty established in 1971 in the city of Ramsar, Iran.

• It provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources.

• India became a signatory to this convention on February 1, 1982.

• Wetlands in Rajasthan:

• Currently, Rajasthan is home to two prominent Ramsar sites: Keoladeo National Park (designated in 1981) in Bharatpur and Sambhar Lake (designated in 1990) in Jaipur.

• Menar is slated to become the third Ramsar site in the state, boosting eco-tourism and conservation funding in the Mewar region.

• Biodiversity at Menar:

• The village attracts more than 150 species of birds every year during the winter season.

• Key species include the Greater Flamingo, Great White Pelican, Bar-headed Goose, Northern Shoveler, and the Common Crane.

• The presence of these birds indicates a healthy aquatic ecosystem, which the local villagers maintain by prohibiting fishing and harmful agricultural runoff.

Important Points

• Community Conservation Model: The Menaria community has set a global example by voluntarily banning fishing, sand mining, and the use of chemical fertilizers near the lakes to ensure the safety of the birds.

• Legal Status: The area was notified as a Wetland under the Wetland (Conservation and Management) Rules, 2017, which provides a legal shield against encroachment and pollution.

• National Context: As of August 2024, India has a total of 85 Ramsar sites, covering an area of over 1.3 million hectares. Tamil Nadu currently holds the highest number of sites (18), followed by Uttar Pradesh (10).

• Significance of Wetlands: Often referred to as the "Kidneys of the Landscape," wetlands like Menar play a crucial role in groundwater recharge, carbon sequestration, and flood control.

Q94. Answer: (c) National Quantum Mission (NQM)

The correct answer is National Quantum Mission (NQM).

Key Points

• The Union Cabinet, chaired by Prime Minister Narendra Modi, approved the National Quantum Mission (NQM) on April 19, 2023.

• The mission has a total financial outlay of Rs. 6,003.65 crore and is scheduled to span from the financial year 2023-24 to 2030-31.

• The primary objective of the mission is to seed, nurture, and scale up scientific and industrial Research and Development (R&D) and create a vibrant ecosystem in Quantum Technology (QT).

• It focuses on four major thematic areas: Quantum Computing, Quantum Communication, Quantum Sensing and Metrology, and Quantum Materials and Devices.

• The mission aims to develop intermediate-scale quantum computers with 50-1000 physical qubits within 8 years using various platforms like superconducting and photonic technology.

• It is implemented by the Department of Science & Technology (DST) under the Ministry of Science & Technology.

Additional Information

• National Supercomputing Mission (NSM):

• Launched in 2015 with an estimated cost of Rs. 4,500 crore, this mission aims to empower national academic and R&D institutions by installing a vast supercomputing grid.

• It is jointly steered by the Department of Science and Technology (DST) and the Ministry of Electronics and Information Technology (MeitY).

• National Nanotechnology Mission (Nano Mission):

• Launched in May 2007 as an umbrella programme for the capacity building and promotion of nanotechnology in India.

• It focuses on basic research, infrastructure development, and promoting public-private partnerships in the nano-science sector.

• Digital India Mission:

• Launched on July 1, 2015, this campaign aims to ensure that government services are made available to citizens electronically by improving online infrastructure.

• It encompasses various initiatives such as BharatNet, e-Sign, and National Scholarship Portal to transform India into a digitally empowered society.

• Quantum Communication Targets:

• The NQM specifically targets satellite-based secure quantum communications between ground stations over a range of 2,000

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kilometers within India and long-distance secure quantum communications with other countries.

Important Points

• With the launch of this mission, India became the seventh country in the world to have a dedicated quantum mission, joining the ranks of the USA, China, France, Austria, Finland, and Canada.

• The mission will establish four Thematic Hubs (T-Hubs) in top academic and National R&D institutes to promote fundamental research and translational work.

• Quantum technology utilizes the principles of quantum mechanics, such as superposition and entanglement, to perform calculations and tasks that are impossible for classical computers.

• This initiative is expected to benefit sectors like Communication, Health, Financial, Energy, Drug Design, and Space Applications.

Q95. Answer: (b) 99.2%

The correct answer is 99.2%.

Key Points

• According to the Sustainable Development Report 2025, India has achieved a significant milestone in energy accessibility, with 99.2% of its population having access to electricity.

• The report is a comprehensive assessment of progress made by United Nations member states towards achieving the 17 Sustainable Development Goals (SDGs), specifically highlighting SDG 7 (Affordable and Clean Energy).

• This high percentage reflects the culmination of various large-scale infrastructure projects aimed at rural electrification and last-mile connectivity across 28 states and 8 Union Territories.

• The Sustainable Development Solutions Network (SDSN), which prepares this report, utilizes data from various international and national sources to track the SDR Index and individual SDG Dashboards.

• Achieving 99.2% electrification is a critical indicator of socio-economic development, as it directly impacts education, healthcare, and industrial productivity in both urban and rural areas. Hence, the correct answer is 99.2%.

Additional Information

• Sustainable Development Goal 7 (SDG 7):

• This goal aims to ensure access to affordable, reliable, sustainable, and modern energy for all by the year 2030.

• India’s progress in this sector is monitored through indicators like access to electricity and access to clean fuels and technologies for cooking.

• Pradhan Mantri Sahaj Bijli Har Ghar Yojana (Saubhagya):

• Launched in September 2017, the Saubhagya scheme was designed to provide free electricity connections to all un-electrified households in rural areas and poor households in urban areas.

• It has been a major driver in pushing the national electrification rate towards the 99.2% mark mentioned in the 2025 report.

• Deen Dayal Upadhyaya Gram Jyoti Yojana (DDUGJY):

• Launched in 2014, this scheme focused on feeder separation, strengthening of sub-transmission and distribution networks, and metering at all levels in rural India.

• It laid the foundational infrastructure necessary for the Sustainable Development Report's recorded growth in electricity access.

• Sustainable Development Solutions Network (SDSN):

• Operates under the auspices of the UN Secretary-General and is led by Jeffrey Sachs.

• The annual Sustainable Development Report provides the SDG Index, which ranks countries based on their overall performance across all 17 goals.

• In the 2025 data context, the report emphasizes the transition from fossil fuels to renewable energy alongside universal grid connectivity.

Important Points

• The transition from partial electrification to 99.2% access involved integrating off-grid and decentralized renewable energy solutions in remote hilly and tribal regions.

• While access to electricity has reached 99.2%, the 2025 report also monitors the reliability of power supply, measured in hours of supply per day.

• The International Energy Agency (IEA) and the World Bank are key data contributors to the SDSN for validating global energy statistics.

• The Ministry of Power in India reported the completion of 100% village electrification in April 2018, which paved the way for the high household-level access rates seen in current reports.

Q96. Answer: (b) April 21–25

The correct answer is April 21–25.

Key Points

• The Ministry of Health and Family Welfare (MoHFW) organized the Pan-India Fire Safety Week from April 21 to April 25, 2025. This initiative was specifically designed to bolster fire prevention mechanisms across all healthcare institutions in the country.

• The primary objective of this week was to sensitize healthcare staff, including doctors, nurses, and administrative personnel, about the critical nature of fire safety in a clinical environment where patients may be non-ambulatory or vulnerable.

• During this period, the Government of India directed all Central Government Hospitals and AIIMS institutions to conduct rigorous Fire Safety Audits and Electrical Load Audits to prevent short circuits, which are a leading cause of hospital fires.

• The observance involved comprehensive mock drills conducted in coordination with local Fire Departments. These drills simulated emergency evacuation procedures and the effective use of fire extinguishers and hydrant systems.

• Special emphasis was placed on the safety of Oxygen Plants and ICUs (Intensive Care Units), ensuring that all life-saving equipment is protected against potential fire hazards through strictly enforced Standard Operating Procedures (SOPs). Hence, the correct answer is April 21–25.

Additional Information

• National Fire Service Day:

• In India, National Fire Service Day is observed annually on April 14.

• It commemorates the brave firemen who lost their lives during the Victoria Dock explosion in Bombay (now Mumbai) on April 14, 1944.

• The Ministry of Home Affairs typically extends this observance into a Fire Service Week (usually April 14–20), which serves as a precursor to specialized departmental weeks like the one held by the Health Ministry.

• Regulatory Framework:

• Fire safety standards in India are governed by the National Building Code (NBC) 2016, specifically Part IV, which deals with Fire and Life Safety.

• Healthcare facilities are classified as Institutional Buildings under the code, requiring stringent fire-resistant construction and Clearance Certificates (NOC) from the Fire Service Department.

• NDMA Guidelines:

• The National Disaster Management Authority (NDMA) provides specific guidelines for Hospital Safety, emphasizing the need for disaster management plans and regular training of "fire marshals" within hospital staff.

• These guidelines highlight the importance of smoke detectors, automatic sprinkler systems, and clearly marked fire exits that must remain unobstructed at all times.

Important Points

• Causes of Hospital Fires: Statistics indicate that nearly 75% of hospital fires in India are caused by electrical short circuits, often due to overloaded circuits in aging infrastructure or high-power medical machinery.

• Training and Awareness: The MoHFW 2025 initiative mandated that at least 80% of the on-duty staff at any given time must be trained in basic firefighting techniques and patient evacuation protocols.

• Reporting Mechanism: Following the Fire Safety Week, all medical superintendents were required to submit a compliance report to the Directorate General of Health Services (DGHS) confirming the functional status of their fire-fighting equipment.

Q97. Answer: (a) 14–21 days

The correct answer is 14–21 days.

Key Points

• The Axiom Mission 4 (Ax-4) is the fourth planned private astronaut mission to the International Space Station (ISS), managed by the private American company Axiom Space.

• The mission is scheduled to have a total duration of approximately 14–21 days, which includes the time required for travel, docking, and the 14-day stay at the orbiting laboratory for conducting scientific research. Hence, the correct answer is 14–21 days.

• This mission is a landmark event for the Indian Space Research Organisation (ISRO), as it involves the participation of an Indian Gaganyaatri (astronaut) in a joint mission with NASA.

• Group Captain Shubhanshu Shukla has been identified as the primary astronaut from India for the Ax-4 mission, while Group Captain Prasanth Balakrishnan Nair has been named as the backup.

• The mission utilizes the SpaceX Dragon spacecraft and is launched via the Falcon 9 rocket from the Kennedy Space Center in Florida, USA.

Additional Information

• International Collaboration:

• The Ax-4 mission is a result of a bilateral agreement between India and the United States, solidified during Prime Minister Narendra Modi’s state visit to the USA in June 2023.

• The collaboration falls under the iCET (Initiative on Critical and Emerging Technology) framework, aimed at enhancing cooperation in space exploration and high-end technology.

• The Crew Members:

• The mission is commanded by Peggy Whitson, a veteran NASA astronaut and the Axiom Space Director of Human Spaceflight, who holds the record for the most cumulative time spent in space by an American.

• Other crew members include Sławosz Uznański from Poland (representing the European Space Agency) and Tibor Kapu from Hungary, making it a truly multi-national expedition.

• Training and Preparation:

• The Indian astronauts selected for this mission undergo rigorous training at NASA's Johnson Space Center in Houston, Texas.

• The training includes ISS system operations, emergency protocols, microgravity adaptation, and specific payload handling related to the scientific experiments planned for the 14–21 days duration.

• Historical Context:

• This mission marks the return of an Indian citizen to space after a gap of several decades. The first Indian in space was Wing Commander Rakesh Sharma, who flew to the Soviet Salyut 7 space station in 1984.

• While Indian-origin astronauts like Kalpana Chawla and Sunita Williams have flown with NASA, Shubhanshu Shukla represents the official Indian space program's push toward the Gaganyaan mission goals.

Important Points

• Mission Significance: The Ax-4 mission serves as a precursor to India's own human spaceflight program, Gaganyaan, by providing ISRO with valuable experience in international docking standards and ISS operations.

• Scientific Objectives: During their stay, the crew will perform approximately 25+ different experiments focusing on human health, biology, and physical sciences in a microgravity environment.

• Axiom Space's Vision: Axiom Space aims to build the Axiom Station, the world's first commercial space station, which will eventually detach from the ISS to operate independently.

Q98. Answer: (d) Anahat Singh

The correct answer is Anahat Singh.

Key Points

• Indian squash prodigy Anahat Singh has been honored with the PSA Women's Young Player of the Season award for the 2024-25 cycle, recognized in 2025.

• This prestigious award is presented by the Professional Squash Association (PSA) to the best-performing female player under the age of 21 who has made a significant impact on the PSA World Tour.

• Anahat Singh is the first Indian female squash player to receive this global recognition, marking a historic milestone for Indian sports. Hence, the correct answer is Anahat Singh.

• During the 2024-25 season, she displayed exceptional form by winning multiple PSA Challenger Tour titles and consistently challenging top-ranked players in major tournaments.

• Her rise in the PSA World Rankings has been meteoric, breaking into the top 40 globally while still competing in the junior circuits, showcasing her dual-threat capability in both senior and youth divisions.

Additional Information

• Anahat Singh (Profile):

• Anahat Singh was born on March 13, 2008, in Delhi, India.

• She gained national attention when she became the youngest athlete to represent India at the 2022 Commonwealth Games in Birmingham at the age of 14.

• She has won gold medals at the British Junior Open (U-11 and U-15 categories) and the US Junior Open, proving her dominance at the international junior level.

• At the 2022 Asian Games held in Hangzhou (in 2023), she secured two bronze medals in the women's team event and the mixed doubles event.

• Other Options Context:

• Joshna Chinappa: A veteran squash player and former World No. 10, she is a multiple-time Asian Games medalist and a pioneer for the sport in India.

• Dipika Pallikal: The first Indian to break into the top 10 of the PSA Women's Rankings and a winner of multiple Commonwealth Games medals.

• Anaka Alankamony: A former professional player who was the world's number 1 ranked junior and a recipient of the Arjuna Award in 2014.

Important Points

• Professional Squash Association (PSA): It is the global governing body for the professional squash circuit. The PSA World Tour Awards are held annually to celebrate excellence in the sport, including categories like Player of the Year and Most Improved Player.

• National Achievement: Anahat Singh became the second youngest player ever to win the Senior National Squash Championship in 2023, following in the footsteps of Joshna Chinappa.

• 2025 Impact: Her recognition in 2025 as the Young Player of the Season reflects her contribution to popularizing squash in India, especially as the sport prepares for its debut in the 2028 Los Angeles Olympics.

• Playing Style: Known for her tactical intelligence and stamina, she trains under the guidance of national coaches and has been a beneficiary of the Target Olympic Podium Scheme (TOPS) by the Ministry of Youth Affairs and Sports.

Q99. Answer: (a) Paris

The correct answer is Paris.

Key Points

• The AI Action Summit 2025 was officially hosted by France in the city of Paris on February 10th and 11th, 2025.

• This summit represents the third major international gathering focused on Artificial Intelligence (AI) governance, succeeding the Bletchley Park Summit in the United Kingdom (2023) and the Seoul AI Summit in South Korea (2024).

• The primary objective of the Paris Summit was to transition from high-level safety discussions to concrete global actions, focusing on the public interest, economic impact, and the ethical deployment of AI technologies.

• It brought together Heads of State, representatives from international organizations, civil society leaders, and executives from leading AI companies like OpenAI, Google DeepMind, and Mistral AI.

• The summit aimed to foster international cooperation to mitigate risks such as misinformation, deepfakes, and threats to cybersecurity while promoting innovation and economic growth.

Additional Information

• Evolution of AI Summits:

• Bletchley Park (2023): The inaugural event that produced the Bletchley Declaration, establishing a global consensus on the need to manage "frontier" AI risks.

• Seoul Summit (2024): This summit expanded the focus to the three pillars of Safety, Innovation, and Inclusivity, ensuring that AI development is not restricted to a few wealthy nations.

• Key Themes in Paris:

• The AI Action Summit emphasized "AI for the Planet," "AI for Public Interest," and "AI for Work," addressing how automation will redefine the global labor market.

• Discussions also prioritized Culture and Media, looking at how AI impacts intellectual property and creative industries.

• Global Governance Frameworks:

• The summit supported the ongoing work of the United Nations (UN) and the OECD in creating standardized regulatory frameworks.

• It sought to strengthen the network of AI Safety Institutes (AISIs) across different countries to share technical expertise and safety testing protocols.

• Host Country Ambitions:

• By hosting the event, France, under President Emmanuel Macron, aimed to position itself as a central hub for AI research and European technological sovereignty.

Important Points

• Democratic Participation: A unique aspect of the Paris summit was the involvement of civil society and academic researchers to ensure that AI development aligns with human rights and democratic values.

• Access to Computing Power: One of the critical debates involved the democratization of compute resources (high-performance hardware), aiming to prevent a digital divide between the Global North and the Global South.

• Safety Standards: The summit reinforced the commitment to pre-deployment testing for the most powerful AI models to prevent catastrophic risks associated with autonomous systems.

• Paris AI Network: The event encouraged the formation of international partnerships to develop open-source AI models that are transparent and accessible to the global community.

Q100. Answer: (c) Children under five suffering from diarrhoea

The correct answer is Children under five suffering from diarrhoea.

Key Points

• The Stop Diarrhoea Campaign was strategically launched to address the critical issue of child mortality, specifically targeting children under five years of age. This demographic is most vulnerable to the dehydrating effects of diarrhoeal diseases.

• In June/July 2024 (with cycles continuing into 2025), the Union Ministry of Health and Family Welfare rebranded the existing Intensified Diarrhoea Control Fortnight (IDCF) into a more comprehensive two-month-long campaign.

• The primary objective of the campaign is "Zero Childhood Diarrhoea Deaths," emphasizing that no child should lose their life to a preventable and treatable condition like diarrhoea.

• The campaign involves the distribution of ORS (Oral Rehydration Salts) and Zinc tablets to families with children under five. While ORS helps in immediate rehydration, Zinc reduces the duration and severity of the episode. Hence, the specific subgroup

receiving treatment is children under five.

• The Union Health Minister, Shri J.P. Nadda, highlighted the shift from a 14-day strategy to a 60-day intensive program to ensure wider reach and better health outcomes across the country.

Additional Information

• Diarrhoea and Child Mortality: Diarrhoea remains a leading cause of death among children under five globally and in India. It results in severe dehydration and loss of essential minerals, which can be fatal if not managed timely with rehydration therapy.

• Role of Frontline Workers: ASHA (Accredited Social Health Activist) workers play a pivotal role in this campaign by conducting house-to-house visits to distribute ORS packets and educate mothers about infant and young child feeding (IYCF) practices.

• ORS and Zinc Combination: The World Health Organization (WHO) recommends the use of low-osmolarity ORS and Zinc supplementation for 14 days as the gold standard for treating childhood diarrhoea. Zinc not only treats the current episode but also prevents future episodes for the next 2 to 3 months.

• NFHS-5 Data: According to the National Family Health Survey (NFHS-5), while there has been an improvement in the usage of ORS, awareness regarding the importance of Zinc therapy still needs significant enhancement among rural and urban populations.

Important Points

• WASH Initiatives: The campaign is closely linked with WASH (Water, Sanitation, and Hygiene) goals. It encourages handwashing with soap, the use of safe drinking water, and the hygienic disposal of waste to prevent the spread of enteric pathogens.

• Vaccination: Besides treatment, the Government of India provides the Rotavirus vaccine under the Universal Immunization Programme (UIP), which significantly reduces the incidence of severe diarrhoea caused by Rotavirus in infants.

• Public Awareness: The Stop Diarrhoea Campaign 2025 utilizes mass media, digital platforms, and community meetings to spread the message of "Sahi Poshan, Desh Roshan" (Right Nutrition, Bright Nation), ensuring parents understand the importance of continued breastfeeding during illness.

• Monitoring: District and State-level health officials are tasked with monitoring the distribution chain to ensure that there is no shortage of ORS and Zinc during the monsoon season, which typically sees a spike in water-borne diseases.

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